

Fiscal Year 2003
Archaeological Site Monitoring and Management
Activities Along the Colorado River in Grand Canyon
National Park.

2003

CHAPTER ONE

INTRODUCTION

The River Corridor Monitoring Program (RCMP) consists of cooperative agreements between Grand Canyon National Park and the Bureau of Reclamation, Interagency Acquisition Number 99-AA-40-2340 (modification #3), and between Grand Canyon National Park and Northern Arizona University (NAU), CA 120099009. The following report fulfills a requirement of a Programmatic Agreement (PA) on cultural resources established in 1994 to address Section 106 responsibilities and determine the methods for the mitigation of impacts from the operations of Glen Canyon Dam. The PA and this report focus on National Register Eligible properties affected by or with the potential to be affected by operations of the dam. Any and all work completed including monitoring, checkdam maintenance, trail work, revegetation, data recovery, and recommendations or assessments for additional treatments are guided by the Monitoring and Remedial Action Plan (MRAP) as developed in 1994 and amended in 2000 (U.S. Department of the Interior/Bureau of Reclamation /National Park Service 2000) See Appendix A. All work is guided by the MRAP until completion of a Historic Preservation Plan.

SUMMARY OF WORK COMPLETED IN FISCAL YEAR 2003

In the absence of a final Historic Preservation Plan, the MRAP guides the ongoing identification, monitoring and remedial work conducted at cultural resources impacted or potentially impacted by dam operations (U.S. Department of the Interior/Bureau of Reclamation /National Park Service 2000). Monitoring data are used to identify impacts to significant historic properties. Remedial actions are conducted to curtail further loss of cultural remains.

The RCMP consists primarily of monitoring National Register eligible historic properties, making recommendations for treatments to effected properties, and conducting recommended treatments under the guidance of PA members and resource specialists from the NPS, Hualapai Tribe, and the Zuni Conservation Project. Fieldwork was conducted on seven river trips sponsored by different Federal agencies.

Work completed on the BOR sponsored trip consisted of regularly scheduled site monitoring, and checkdam monitoring and maintenance. Total station mapping, trail maintenance, vegetation work, and trail obliteration work was conducted on three separate NPS Cooperative Resource Trips (CRT). These trips are sponsored by the Colorado River Fund with work directed by the NPS with assistance from the commercial river guides participating on the CRT river trips. One NPS river patrol trip was made available to complete site monitoring. RCMP staff also participated in two other scientific research trips funded through the Grand Canyon Monitoring and Research Center (GCMRC)(Pederson 2001;Rubin 2003). Research centered on historic properties having the potential to be impacted by dam operations.

Field work in FY03 included archaeological site monitoring of 69 individual sites (Sites listed on a biennial or three to five year schedule support variation in the number of sites visited each year.), trail work at three sites and graffiti removal at one site. Carbon samples were collected at nine sites. Soil samples were collected at five sites. Repeat measurements of drainage cross sections were taken at five sites and two additional sites were added to the cross section work. New total station maps were completed for seven sites. In anticipation of another research flow, medium format photos were taken at five sites in locations where change is expected. See Chapter 2 for the list of sites monitored in FY03 and Chapter 5 for the sites receiving treatment coupled with detailed descriptions of the work.

Since the BOR/NPS sponsored stabilization workshop in 1995, Zuni Conservation Project members have been present on every checkdam maintenance river trip for consultation and construction of checkdams. Reclamation gave Zuni Conservation Project personnel additional funds to construct and maintain checkdams. This dollar amount was separate from the dollars for participating in the AMP. Beginning in FY2000 - FY2001 Reclamation has not acknowledged that work completed by Zuni tribal members costs anything. They have assumed, without any direct communication to the Park that the cost can be covered in an NPS budget that was decreased by 25% in FY2000 and has not shown an increase in the past five years to reflect an endorsement of Zuni Conservation Project participation. If PA representatives agree to

have NPS contract the checkdam work to the Zuni, NPS will accept that responsibility with the appropriate funding.

In FY2002 NPS was able to fund Zuni participation, however this year NPS did not have additional funds to support Zuni Conservation Project personnel involvement. In the absence of the highly experienced Zuni Conservation Project employees it was difficult to determine the magnitude of maintenance work required on the existing checkdams. Yet based on the many years of working with Zuni Conservation Project personnel NPS archaeologists concluded that 10 of the 27 sites with checkdams monitored for effectiveness needed maintenance. A total of 36 of the 260 existing checkdams were treated.

Visitation by RCMP staff to archaeological sites in FY03 resulted in the discovery of 15 new features or diagnostic artifacts at 11 sites. Of these 11 sites visited, four sites had new features identified during regular monitoring or mapping activities. The remaining seven sites where new features were found were visited during the fine, integrated sediment transport (FIST) river trip. Trip participants included sedimentologists, geomorphologists and archaeologists. See Appendix B for a list of sites where new features and artifacts were newly exposed or newly recorded with a description of the newly recorded materials. This table displays an accumulation of new finds throughout the years of the NPS Monitoring and Treatment Program.

NAU staff oversees lab activities with a focus on database design and management, data analysis, excavation report completion, and cross-section profile and map amendments. FY03 marks the first year using the redesigned Access database. Additional design and data cleanup is still necessary, including merging photodatabases and incorporating GIS information. RCMP staff members have been working to georeference site boundaries on orthophotos in conjunction with the GCMRC. As a means of clarifying field and lab duties for outside interest groups, Standard Operating Procedures (SOPs) were developed by RCMP staff for all activities conducted for the project both in the field and in the lab. See Appendix C. Ongoing projects include updates to all site maps and digitizing cross-sections in the lab. NAU Anthropology is completing two excavation reports and the NAU Geology department is finalizing a report on photographic comparisons.

This year RCMP staff worked with several researchers on projects related to terrestrial research, cultural resource research design, remote sensing and checkdam effectiveness, and eolian transport. Charcoal, flotation, and pollen samples were taken at nine sites as part of a research project through the GCMRC looking at eolian transport of sediments and erosion at cultural sites.

Public outreach by RCMP staff included participation in the Grand Canyon Field Institute, the Colorado River Management Plan and the Grand Canyon River Guides land and river-based training seminars. In addition, archaeology presentations were given to students at Sechrist Elementary School in Flagstaff AZ, to the Grand Canyon River Guides at the land-based session and to Technical Working Group (TWG) members at the November 2002 and February 2003 meetings.

On-going involvement outside the Programmatic Agreement is varied and includes coordination with the Parks Colorado River Management Program (CRMP) process, Fire Management Planning, and development of NPS river protocols for better coordination in conducting treatment among different NPS divisions. RCMP archaeologists are coordinating consultation for inadvertent discoveries per NAGPRA with PA Signatory Tribal members to generate treatment plans for each of the nine tribes affiliated with Grand Canyon.

The following report details the work completed in FY03. This includes detailed site descriptions and actions for all sites visited. This report also provides some interesting trends observed by RCMP staff and derived from both checkdam and monitoring data.

CHAPTER TWO

MONITORING RESULTS AND IMPACTS TO CULTURAL RESOURCES

FY03 marks the twelfth year of archaeological site monitoring along the Colorado River by RCMP archaeologists. This chapter summarizes the results of FY03 monitoring, presents an analysis of erosional impacts, and investigates the frequency and variety of visitor-related impacts to the 69 archaeological sites visited. In general, observation, quantifiable measurements, and replicable and descriptive data determine site impacts. Impacts indicate change in a characteristic or property of an archaeological site (Spoerl 1988:17).

Changes to Monitor Form in FY03

There were two minor changes to the monitoring form in FY03 (see Appendix D). Both changes pertain to page 2 in the Recommendations Section. For Question #28, Preservation Options, the variables “obliterate trail” and “retrail” were combined into a single variable called “trail work.” This change was made to simplify tracking of recommendations (also known as recommended or remedial actions) from initial recording on the monitor form through assessment and completion. Obliterating trails and retrailing often go hand in hand when preservation actions are performed at a site, and both come under the broader definition of “trail work.” The specific type of trail work performed is documented in the comments and assessments. PA representatives did not review this change to the form because no information is lost or gained.

The second change involves Question #29, Recovery Options. The variable “testing” was renamed “research.” The purpose of this change is to eliminate confusion between testing, data recovery, and other recovery options. The new variable “research” will include limited testing, mapping, sampling, and medium format photography. “Other” recovery measures are artifact analysis and surface collection. PA representatives did not review this change because it was a matter of changing semantics and working with the redesigned database, not losing or gaining information. RCMP archaeologists are open to discussing and amending these changes at the next PA meeting.

Monitoring Sample

RCMP archaeologists monitored 69 sites in FY03. In addition to Reclamation supporting two full time and one part time archaeologists, the FY03 budget allowed for one river trip, during which 35 sites were visited. The remaining monitoring work was accommodated through other NPS trips (Revegetation, Stabilization, River Patrol, or Cooperative Resource Trips). In addition, Jennifer Dierker, RCMP archaeologist, was able to monitor 9 sites while accompanying Joel Pederson's GCMRC-funded research trip (checkdam effectiveness). This is cost effective considering funds available however it is not efficient from an archaeological standpoint.

One site, C:13:099, was monitored twice in FY03 because erosion is very active at this site (which has been recommended for data recovery since FY93), and valuable archaeological information is being lost. Table 1 lists the sites monitored in FY03, their location according to river reach, drainage type, and property type. Type of impact (active erosion or visitation) recorded in FY03 is indicated by an “E” or “V”. Some sites had no impacts in FY03, but have had impacts in other years. Chapter 3, Site Specific Monitoring Recommendations, includes a history of the observed impacts at each site since monitoring began in 1992.

Table 1. Sites Monitored in FY03 (N = 69 Sites).

Site Number N = 69	Impact		River Reach*	Drainage Type**	Property Type***
	Erosion N = 51	Visitation N = 36			
A:15:022			10	Terrace	Roaster Complex
A:15:047		V	10	Terrace	Artifact Scatter
A:16:148	E	V	10	Terrace	Roasting Feature
A:16:160	E	V	10	Terrace	Roaster Complex
A:16:167	E	V	10	Terrace	Roaster Complex
A:16:174	E		10	River	Roasting Feature
A:16:180	E		10	River	Roasting Feature
B:09:317		V	10	No Drainage	Roasting Feature
B:10:224			7	No Drainage	Thermal Feature
B:10:225	E		7	Terrace	Small Structure
B:10:237	E		8	Terrace	Roaster Complex
B:11:275	E		8	River	Small Structure
B:11:281	E		8	Terrace	Thermal Feature
B:13:001		V	10	Terrace	Small Structure
B:14:095	E		7	Terrace	Roaster Complex
B:15:097	E	V	6	No Drainage	Artifact Scatter
B:15:135	E		7	Terrace	Small Structure
B:15:138		V	7	River	Thermal Feature
B:15:139	E		6	No Drainage	Artifact Scatter
C:02:094		V	1	No Drainage	Historic Structure
C:02:096	E		1	River	Structure-Thermal Feature Complex
C:02:098		V	1	River	Artifact Scatter
C:05:004		V	3	No Drainage	Artifact Scatter
C:05:037	E		3	Terrace	Thermal Feature
C:06:005		V	2	No Drainage	Rockart
C:09:031		V	4	River	Special Activity Locus
C:09:050		V	4	Side Canyon	Special Activity Locus
C:09:084			4	Terrace	Artifact Scatter
C:13:006	E	V	4	River	Small Structure
C:13:010	E	V	5	River	Pueblo
C:13:033	E		5	No Drainage	Small Structure
C:13:069	E	V	5	Terrace	Small Structure
C:13:070	E	V	5	River	Small Structure
C:13:098		V	5	River	Historic Structure
C:13:099	E	V	5	River	Structure-Thermal Feature Complex
C:13:100	E	V	5	River	Pueblo
C:13:101	E		5	Terrace	Structure-Thermal Feature Complex
C:13:272	E		5	River	Small Structure
C:13:273	E	V	5	River	Roaster Complex
C:13:291	E	V	5	River	Small Structure
C:13:321	E		5	River	Roaster Complex
C:13:322		V	5	No Drainage	Rockart
C:13:327	E		5	River	Roasting Feature
C:13:336	E		5	Terrace	Thermal Feature
C:13:339	E	V	5	River	Small Structure
C:13:346	E	V	5	Terrace	Small Structure
C:13:347	E		5	River	Small Structure
C:13:348	E	V	5	Terrace	Artifact Scatter

Site Number N = 69	Impact		River Reach*	Drainage Type**	Property Type***
	Erosion N = 51	Visitation N = 36			
C:13:349	E		5	Terrace	Historic Structure
C:13:363			5	No Drainage	Small Structure
C:13:371	E		5	Side Canyon	Structure-Thermal Feature Complex
C:13:381	E		5	River	Thermal Feature
C:13:385	E		5	Terrace	Small Structure
C:13:386	E		5	Terrace	Small Structure
G:03:003	E	V	10	River	Roaster Complex
G:03:004	E		10	River	Roaster Complex
G:03:020	E		10	River	Roaster Complex
G:03:024	E	V	10	River	Roaster Complex
G:03:028	E	V	10	River	Roaster Complex
G:03:038	E	V	10	River	Roaster Complex
G:03:040	E		10	Terrace	Roaster Complex
G:03:041	E	V	10	River	Roaster Complex
G:03:048	E		11	No Drainage	Artifact Scatter
G:03:052		V	11	No Drainage	Roaster Complex
G:03:064	E		10	River	Roaster Complex
G:03:067	E	V	11	River	Roasting Feature
G:03:072	E	V	11	River	Roaster Complex
G:03:077			11	No Drainage	Rockart
G:03:080	E	V	11	River	Structure-Thermal Feature Complex

- Column totals for site numbers by Reach (R): 3 in R1, 1 in R2, 2 in R3, 4 in R4, 25 in R5, 2 in R6, 5 in R7, 3 in R8, 18 in R10, 6 in R11.
- ** Column totals for site numbers by Drainage Type: 22 Terrace, 32 River, 13 No drainage, 2 Side canyon
- *** Column totals for site numbers by Property Type: 2 Pueblos, 2 Special activity locus, 3 Rock art, 3 Historic structures, 5 Structure-Thermal feature complex, 6 Roaster features, 6 Thermal features, 8 Artifact scatters, 16 Small structures, 18 Roaster complex,

The 69 monitored sites are distributed over 10 river reaches (Schmidt and Graf 1988). Sixty two percent of the sites are located in Reaches 5 and 10 (Table 2) which contain the highest site density and are the most open and alluviated sections of the canyon (Fairley et. al 1994).

Table 2. Site Frequency by River Reach for Sites Monitored in FY03.

River Reach	River Mile	Number of Sites	Percent
1	0-11.3	3	4.3
2	11.3-22.6	1	1.4
3	22.6-35.9	2	2.9
4	35.9-61.5	4	5.8
5	61.5-77.4	25	36.2
6	77.4-117.8	2	2.9
7	117.8-125.5	5	7.2
8	125.5-139.9	3	4.3
9	139.9-159.9	0	0
10	159.9-213.8	18	26.1
11	213.8-235.0	6	8.7
Total		69	100.0

The FY03 sample consists of 32 sites with river-based drainages (46.4%), 22 sites with terrace-based drainages (31.9%), 2 sites with side canyon drainages (2.9%), and 13 sites with no on-site drainages (18.8%). The “no drainage” sites are located in predam alluvium and have the potential for developing drainages. The river and terrace-based sites are located primarily in Reaches 5 and 10.

The site types within this year’s sample comprise of a variety of property types (see Figure 1). Roasting features and small structures comprise almost half the sample (34 or 49.3%). Small structures predominate in Reach 5 (mile 61.5 to 77.4). Roaster complexes predominate in Reach 10 (mile 159.9 to 213.8).

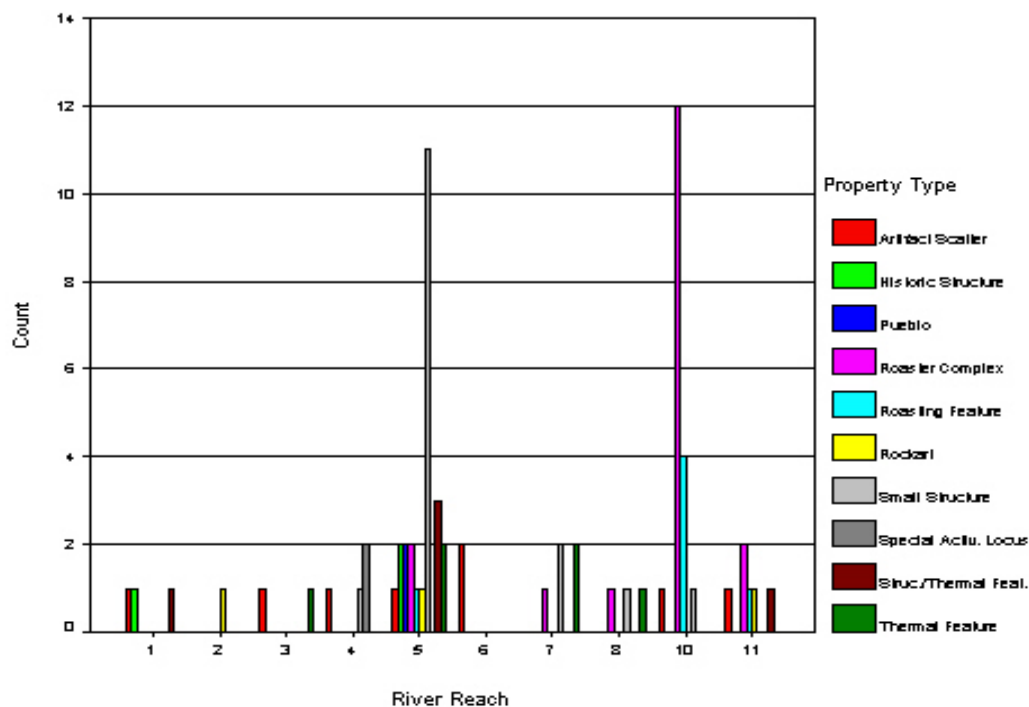


Figure 1. Sites monitored in FY03 by river reach and property type (N = 69 Sites).

IMPACTS TO ARCHAEOLOGICAL SITES

Since the initiation of archaeological site monitoring along the river corridor in 1992 (Coder, et al. 1994a), a distinction has been made between those impacts deriving from geological processes and those that result from human behavior. The RCMP has come to call these two kinds of impacts “physical” and “visitor-related.” The primary reason for the distinction is that the NPS is primarily responsible, under Section 110 of NHPA, to alleviate any damage done to river corridor sites by visitors to Grand Canyon National Park. In contrast, the BOR is responsible, under Section 106 of NHPA, for physical impacts resulting from the significant environmental changes that have occurred to the river system due to placement and operation of the Dam. These impacts are cumulative, difficult and costly to quantify, and are not easily distinguished from physical impacts unrelated to dam operations (Dierker et. al 2002)

RCMP archaeologists continue to identify, analyze, and evaluate physical impacts to National Register eligible historic properties along the Colorado River, and perform remedial actions to preserve these resources. While quantification of physical impacts is limited, archaeologists consistently document whether on-site erosion is active or inactive. When a site exhibits active erosion there is change observed since the last monitoring episode. Inactive erosion is defined as no observable change since the last monitoring episode. Archaeological sites currently experiencing active erosion are the subject of this section. See Appendix E for tables and graphs of both active and inactive erosion by type (surface erosion, gullyng, arroyo cutting, bank slump, side canyon erosion, eolian/alluvial activity, and “other” erosion).

During FY03, active erosion was recorded at 52 (75%) archaeological sites. Active erosion categories noted on the monitoring form include the following: surface erosion, gullying, arroyo cutting, bank slump, eolian/alluvial erosion or deposition, side canyon erosion and “other”. Surface erosion consists of any and all sheetwashing, channeling or rilling from the modern surface level to a depth of ten centimeters. Gullies are channels or trenches that extend ten centimeters to one meter below the modern ground surface. Entrenched gullies can become arroyos which channel more than one meter below the surface. Bank slump refers to the deflation or collapse of alluvial sediments along gullies, arroyos or the river itself. Eolian sediments erode or are deposited by wind action, while running water directs alluvial processes. Side canyon erosion includes rain-induced flooding and debris flows from canyons draining onto terraces or into the Colorado River. Some headward movement may also be associated with side canyon erosion. The “other” category is reserved for the identification of impacts not previously defined or regularly identified by monitors such as animal caused erosion, rock spall onto features or vegetation growth unearthing cultural remains.

Most of the sites (36 or 69%) with active erosion are in Reaches 5 and 10 (Figure 2). Reaches 3 and 4 have the fewest number of sites with impacts (1 each). There is active erosion in 9 of the 13 river reaches along the river corridor.

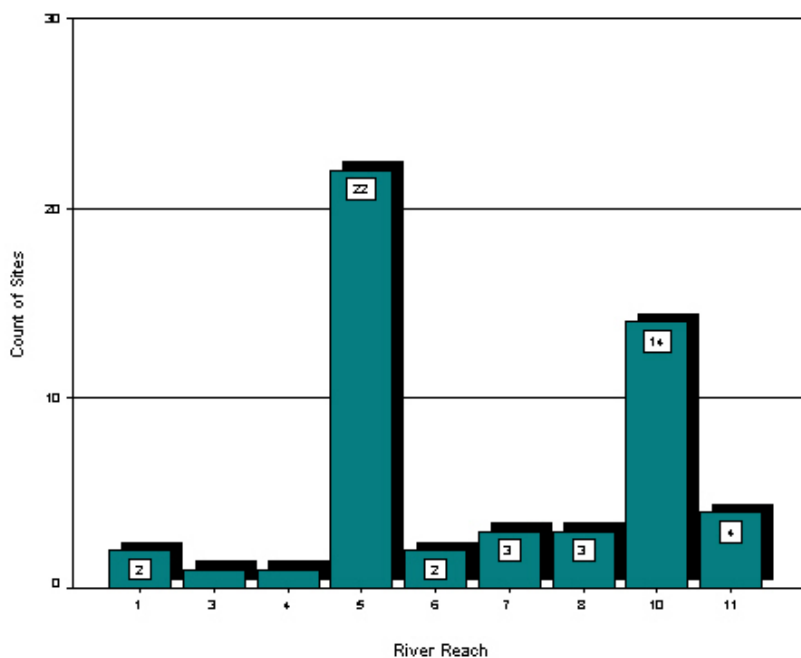


Figure 2. Actively eroding archaeological sites by river reach, FY03 (N = 52 Sites).

Sites with river and terrace-based drainages have been recorded as sustaining the greatest amount of damage due to actively occurring erosional processes (Figure 3). Sites with river-based drainages comprise 29 or 56% of the sample, while sites with terrace-based drainages comprise 35% (18). For this reason, RCMP archaeologists prioritize remedial actions based upon whether sites have river or terrace-based drainages. Most sites with river-based drainages are a top priority and many are recommended for data recovery. RCMP archaeologists have observed that sites with terrace-based drainages can often be successfully treated with a variety of preservation measures that do not require removal or destruction of cultural resources. These preservation measures include planting vegetation, installing checkdams or reseeding the areas with grasses.

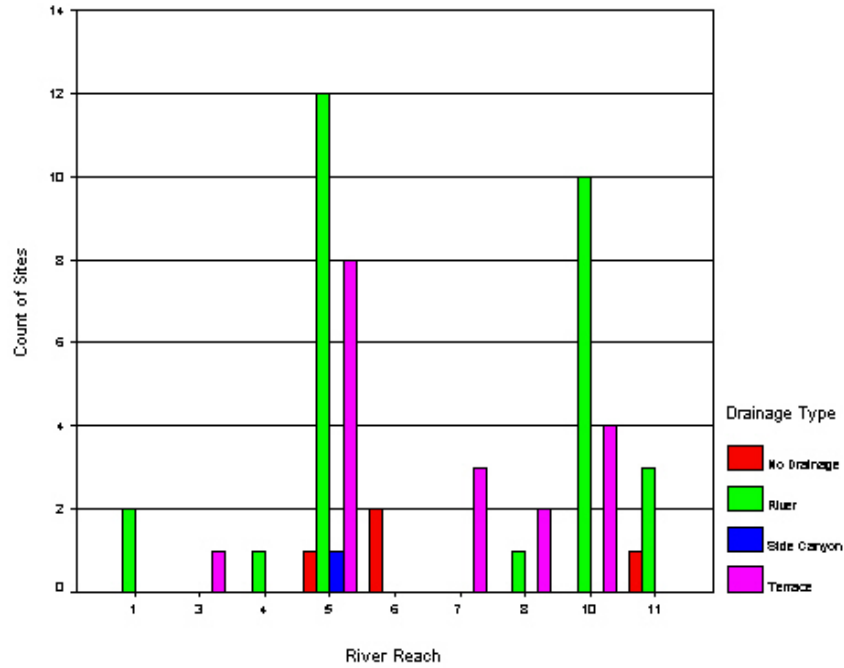


Figure 3. Actively eroding archaeological sites by river reach and drainage type, FY03 (N = 52 Sites).

A variety of property types are sustaining loss of cultural material or site integrity along the river corridor (Figure 4 below). At most of the sites monitored in FY03 the physical impacts were recent (53 or 77% of sites). These impacts had occurred since the last monitoring visit. Sites actively eroding via river-based drainages include artifact scatters, roasting or thermal features and complexes, small structures, and pueblos. Sites actively eroding via terrace-based drainages include artifact scatters, historic structures, roasting or thermal features, and small structures.

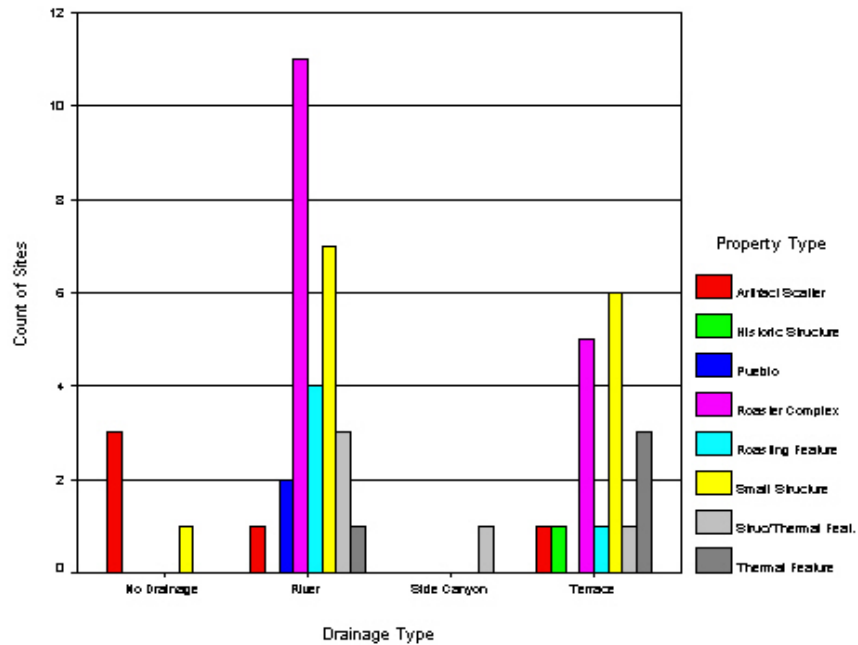


Figure 4. Actively Eroding Archaeological Sites by Drainage and Property Type, FY03 (N = 52 Sites).

Surface erosion, gully, and eolian/alluvial activities were the primary types of erosion recorded during FY03 (281 or 67% of occurrences). These types of erosion occurred most frequently to artifact scatters, roasting features/hearths, and structures.

An important part of the monitoring process is providing recommendations for site management. RCMP archaeologists provide specific recommendations for each site that is monitored each year. The monitoring recommendations are the basis upon which sites are prioritized for treatment. For the 69 sites visited in FY03, archaeologists recommended data recovery (full scale site excavation) at 16 of the actively eroding sites (C:02:096, C:02:098, C:13:010, C:13:069, C:13:070, C:13:099, C:13:100, C:13:273, C:13:291, C:13:327, C:13:339, C:13:347, C:13:348, C:13:371, G:03:020, and G:03:064), all of which have been recommended for data recovery before. Other recovery options are recommended at 7 sites (B:11:281, C:02:096, C:05:037, C:13:069, C:13:272, C:13:371, and C:13:386). These options include profiling, sampling, testing, cross-sections, inclusion in the FIST eolian transport study, or preparing a treatment plan in consultation with PA representatives). Archaeologists recommended trail work at 6 sites (C:02:098, C:13:069, C:13:099, C:13:100, G:03:003, and G:03:080), planting vegetation at 2 sites (C:02:098 and C:13:006), checkdams at 1 site (G:03:020), and other options (checkdam monitoring, profiling, and stabilization) at 5 sites (B:15:097, C:13:336, G:03:024, G:03:028, and G:03:080). For sites located near/on the Hualapai boundary consultation is recommended as an administrative function.

Erosional processes are not the only source of damage to archaeological sites along the river corridor. Human visitors play a role too. Social trailing, footprints, moving or rearranging artifacts, camping on sites and vandalism cause significant damage, especially over time. The next section is a discussion of visitor-related impacts as they are observed and recorded by RCMP monitors.

VISITOR-RELATED IMPACTS

Visitors to the Grand Canyon's river corridor got there by boat, by helicopter, or on foot, but all required NPS permits. Some are recreational users and some are administrative users. In all, approximately 23,000 participate in Colorado River trips each year (U.S. Department of the Interior 2003). Controlled water discharge from Glen Canyon Dam has allowed the river-rafting business to prosper, and has led to increased visitor use (Valentine 1979). The cumulative impact of each footprint, each tent, each curious researcher or each curious hand reaching to touch a rock art panel or pick up an artifact can be unfavorable in this fragile environment.

During FY03, RCMP monitors observed visitor-related impacts at 37 sites (54%). These sites are listed in Table 1. At 20 sites (29%), visitor impacts had occurred since the last monitoring visit. The types of archaeological features most commonly disturbed or damaged by visitors include artifact scatters (20 or 29% of sites), roasting features or hearths (17 or 25%), and structures or storage features (11 or 16%).

Archaeologists also record the types of impacts (collection piles, trails, on-site camping, vandalism, and "other"). Trails lead the list of visitor-related impacts in FY03, as they have most years since RCMP began monitoring. Archaeologists observed trails (whether for social, hiking, scouting, or research purposes) at 27 sites (39%). Forty-one percent of these sites are located in Reach 10 (miles 160 to 214) and 22% in Reach 5 (miles 62 to 77).

Of particular interest this fiscal year is that RCMP archaeologists noted a fair amount of trampling, soil compaction, and footprints (categorized as "other" visitor impacts) at 20 sites (29%). Monitors attributed almost half of these to scientific researchers. According to preliminary findings for the NPS Colorado River Management Plan collected data demonstrate that researchers outside the NPS and Grand Canyon Monitoring and Research Center (GCMRC) complete of approximately 1% of the research in the river corridor. The NPS and GCMRC comprise an equal amount of use on the river. Discussions are underway within the Park and between NPS and GCMRC in regards to minimizing archaeological site impacts. Valentine and Dolan estimate that trampling displaces 230 cubic meters of sand downslope and eventually into the river (Valentine 1979). Without sediment replacement by large floods, the cumulative effect of researchers walking about a site can be significant. Scientists may not even know that they are walking through archaeological features or stepping on artifacts. Monitoring can also contribute to site erosion, but

RCMP monitors know where features and artifacts are on a site and have been trained to step carefully and minimize impact.

Monitors recorded vandalism at three sites: A:15:047, B:09:317, and C:02:094. Someone put large river cobbles in many of the mortars in front of the overhang at A:15:047. This action can scratch the surface of the mortar and encourage people to use the cobbles as grinding implements. At B:09:317, someone moved and stacked rocks adjacent to a roasting feature. Other visitors disturbed the NPS trail obliteration work at the mouth of National Canyon. Finally, new graffiti is present on the historic inscription panel at C:02:094. Several people wrote their names in charcoal or scratched the rock surface.

Three sites have visitor impacts that are directly related to river fluctuations and/or dam operations. These are A:16:160, C:02:094, and C:02:098. The last two sites are located very close to the river (within 15 meters of 10,000 cfs) and are used by fishermen. Higher water levels push campers onto the terraces, causing trailing and site impact.

The following section includes detailed descriptions of each site monitored during FY03. The information is in order by site number. The property type of each site is listed, along with the current monitoring schedule. Chapter 3 also includes a summary of the previous work completed at each site and a summary of the monitoring observations.

CHAPTER THREE

SITE SPECIFIC MONITORING RECOMMENDATIONS

As identified within the PA, the MRAP calls for monitoring historic properties within the area of potential effect and the implementation of remedial actions for treating sites subject to impact (U.S. Department of the Interior/Bureau of Reclamation /National Park Service 2000). The following chapter details all 69 sites monitored in FY03. Each site retains aspects of integrity and is National Register eligible.

This year three sites previously determined to have “no drainage” and on the inactive schedule were re-evaluated for drainage type and monitoring schedule. Re-evaluation of these sites resulted in the recognition that sites located on predam alluvium without drainages at the time they were recorded, still had the potential for drainage development.

RCMP archaeologists monitored 65 sites and an additional four sites within the APE were monitored by NPS River Patrol personnel. New features were recorded at six sites monitored in FY03. Regarding the monitoring schedules of the 69 total sites visited, five monitoring frequencies were reduced due to their stable condition, four sites had monitoring frequency increase due to advanced erosional activity, and four were placed on the inactive monitoring list. These sites demonstrated a record of stability through time though located within the APE. Site plan view maps are included in Appendix F.

A:15:022 Roaster Complex Five-year Schedule

This site consists of three distinct fire features, scattered fire-cracked rock and a surface assemblage of lithics and sherds. A single Desert Side-Notched point was located on the surface. Sherds represented by Southern Paiute, Cerbat (Hualapai), and formative Puebloan ceramics indicate multi-component occupations. The site is located on a sand-covered basalt bench over 100 meters from the river 16 meters above the 28,000 cfs level.

Previous Work

The site was initially recorded by NPS survey personnel in January, 1991 (Fairley et. al 1994) and monitored in FY96 (Leap et. al 1996). No additional RCMP work has been implemented.

Monitoring Observations Summary

Minor gullying on-site does reach the local drainage that empties into the river but it originates on a bedrock terrace so there is no effect on-site due to baselevel changes in the system. Current channeling of runoff on-site does not effect cultural features. The entire terrace is covered with animal burrows. Burrowing is disturbing charcoal and there is the potential for the exposure of more artifacts. No human visitation was discernable. The current recommendation is to continue visiting the site on a five year schedule.

A:15:047 Artifact Scatter Five-year Schedule

This site consists of a small isolated rockshelter 16 meters from the river containing groundstone and lithic debris. No ceramics are present and cultural affiliation is unknown. The site is situated at the contact of a basalt flow and an older consolidated river channel. The channel deposit is comprised of river cobbles in clastic sediment. In 1994, seventeen bedrock mortars were found on scoured ledges just below the site adjacent to the river. These mortars make use of natural concavities in the Muav Limestone.

Previous Work

The site was initially recorded by NPS survey personnel in March 1991 (Fairley et. al 1994) and monitored in FY96 (Leap et. al 1996). The mortars were mapped and incorporated into the site file in October 1994. No additional RCMP work has been implemented.

Monitoring Observations Summary

There is no evidence of erosion occurring on the floor of the rockshelter since it was recorded. Periodically, river cobbles dislodge from the roof of the shelter and fall onto the surface. The research flow of March 1996 deposited sand on the lower ledges just upstream from the site. In FY96, the site was placed on a five-year monitoring schedule. FY03 monitors observed that someone had placed large river cobbles in many of the mortars in front of the overhang. Monitoring will continue every five years.

A:16:148 Roasting Feature Five-year Schedule

This aceramic site consists of a fire-cracked rock/roasting pit activity area of unknown cultural affiliation. The site covers a broad area (100 x 60 meters), and contains three fire-cracked rock/charcoal lens areas and a small number of lithics. Area 1 consists of fire-cracked rock concentrations, charcoal, a widespread ash lens, a diffuse bone scatter, and a few flakes. Area 2 contains fire-cracked rock and charcoal. Area 3 contains two fire-cracked rock concentrations, some charcoal, and sparse lithics. No groundstone, ceramics, or architecture is present on the surface, although one biface fragment was observed. The site is on an alluvial terrace where soil deposition is extensive. For this reason the site probably has good overall integrity and additional cultural material may be buried below the surface.

Previous Work

The site was originally recorded in 1990 (Fairley et. al 1994) and monitored in FY94, FY96, and FY98 (Coder et. al 1995a) (Leap et. al 1996; Leap et. al 1998). No additional RCMP work has been implemented.

Monitoring Observations Summary

FY03 monitoring staff re-evaluated the drainage type and determined that what was previously a no drainage site now contained a terrace-based drainage. Monitoring staff recommend a five year monitoring schedule.

A:16:160 Roasting Feature Five-year Schedule

This site consists of a cluster of six fire features and an artifact concentration including lithics, charcoal, bone, a mano and metate. The site is located on an alluvial terrace adjacent to a major side canyon drainage. Thick vegetation covers the site deterring erosional processes and human visitation.

Previous Work

The site was originally recorded in 1990 (Fairley et. al 1994) and monitored in FY94 and FY98 (Coder et. al 1995a; Leap et. al 1998). Trail obliteration work was completed in FY03.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Trail Work	11/22/2002

Monitoring Observations Summary

FY03 monitoring staff noted that the trail was more eroded with downslope movement of fire-cracked rock. Surface erosion and gullying are active. Trail maintenance was conducted on the November, 2002 CRF river trip with extensive trail re-routing and revegetation work conducted under the guidance of the NPS Rehabilitation and Revegetation specialists. The GRCA Revegetation crew will continue annual trail maintenance. RCMP staff will monitor the site every five years.

A:16:167 Roaster Complex Five-year Schedule

This site consists of five separate roasting features (Feature 1-5) and a small, partially collapsed, scoured rockshelter with a few artifacts (Feature 6). Artifacts suggest that this is a multi-component site, with both Pueblo I to Pueblo III Virgin and late prehistoric-early historic Pai/Paiute occupations. The roasting

features are spread over about a half an acre of stabilized dune surface. Archaeologists identified flakes, a ground slab, and one cobble hand tool on-site. Buried materials are highly probable.

Previous Work

The site was initially recorded in 1990 (Fairley et. al 1994) and monitored in FY93, FY94, FY96, and FY98 (Coder et. al 1994;Coder et. al 1995a;Leap et. al 1996;Leap et. al 1998). In FY98 retraining was recommended. Trail work was not necessary because the lush vegetation that was noted during this monitoring session healed the trails. No additional RCMP work has been implemented.

Monitoring Observations Summary

FY03 monitoring staff identified several unrecorded bifaces and ceramics. Vegetation was very lush within the site boundary. A five-year monitoring schedule is recommended.

A:16:174 Roasting Feature Three-year Schedule

A:16:174 consists of two artifact concentrations, a large roasting feature, and scattered fire-cracked rock. Lithic evidence includes flakes, a mano/chopper, two grinding slabs, and a mano/pecking stone. Two flake tools probably functioned as cutting and/or scraping tools. Ceramics from this site include three Cerbat Brown Ware sherds. This site represents a late prehistoric-early historic Pai rockshelter situated on an alluvial terrace, abutting steep slopes and local cliffs of conglomerate. Shallow overhangs provide some shelter. FY96 monitors discovered a slate pendent in Area B and FY98 monitors discovered a new mano fragment.

Previous Work

Archaeologists recorded the site in 1990 (Fairley et. al 1994). RCMP staff monitored it in FY93, FY94, FY96, FY98, and FY01(Coder et. al 1994;Coder et. al 1995a) (Leap et. al 1996) (Dierker et. al 2001;Leap et. al 1998). FY98 monitors recommended checkdam installation and in FY98 a total station map was completed (Leap et. al 1998). FY98 monitors also recommended collecting bone fragments for analysis. This work has yet to be completed. RCMP staff and Zuni Conservation Project staff assessed and installed eight checkdams in FY99 and plotted them on the total station map (Leap et. al 2000). In FY2000 checkdam maintenance resulted in alteration of four checkdams and construction of one new checkdam (Leap and Kunde 2000). In FY2001 checkdam maintenance was completed at eight checkdams. No checkdam maintenance was required in FY03.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Total Station Map	03/07/98
Checkdam Installation	11/19/1998
Checkdam Maintenance	04/26/2000
Checkdam Maintenance	10/24/2000
Checkdam Maintenance	05/02/2002

Monitoring Observations Summary

FY03 monitoring staff observed no significant change at the rockshelter, increased vegetation and Feature 1 and increased eolian deposition at Scatter B. This year archaeologists recommended that the monitoring schedule be changed from biennial to every three years. Based on the information collected throughout the years, RCMP archaeologists agree with this recommendation. Annual checkdam monitoring and maintenance will continue.

A:16:180 Roasting Feature Biennial Schedule

This site contains at least two buried roasting features, fire-cracked rock, and one red chert tertiary flake. Two manos were found as well as a Coconino Sandstone grinding slab. Cultural affiliation remains unknown. Radiocarbon collected from Feature 1 indicates a date of AD 1685 to 1745.

Previous Work

Archaeologists recorded the site in 1991(Fairley et. al 1994). RCMP staff monitored A:16:180 in FY96 and FY98 (Leap et. al 1996) (Leap et. al 1998). FY96 monitors recommended installing checkdams at this site. Due to the precarious position of Feature 1 in a river-based drainage, RCMP staff assessed this site in FY96 for checkdams and data recovery. A total station map was completed in FY96. Feature 1 (roasting feature) was excavated in FY97 to curtail further loss of archaeological information (Yeatts 1998). FY98 archaeologists recommended planting vegetation over a trail that formed as a result of excavations. After assessment by NPS archaeologists, it was determined that this action was not necessary because the trail was slowly healing by itself. After data recovery, Zuni conservators constructed six checkdams in the main drainage to prevent the erosion of Feature 2. All six checkdams needed maintenance in FY99 due to the steep alluvial terrace, heavy run-off through the river-based drainage, and continued drainage downcutting to reach a postdam lowered baselevel (Hereford et. al 1993). Minor checkdam maintenance was required in FY00 and FY01. No checkdam maintenance was required in FY02 or FY03.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Total Station Map	09/05/96
Data Recovery	03/01/1997
Checkdam Installation	03/02/1997
Checkdam Maintenance	11/19/1998
Checkdam Maintenance	04/26/2000
Checkdam Maintenance	10/24/2000

Monitoring Observations Summary

FY03 monitoring staff observed no change at Feature 2 though the drainage below checkdam 5 was actively downcutting with the potential to adversely effect Feature 2. Annual checkdam monitoring and maintenance and biennial site monitoring will continue.

B:09:317 Roasting Feature Biennial Schedule

This site consists of two loci. Locus A is located on the upstream side of a major side canyon drainage overlooking the river and includes a large roasting pit with flakes and a complete projectile point. Locus B, located downstream of the drainage, is a thermal feature at the base of a Muav Limestone cliff. In FY96 a pair of prickly pear tongs were collected. Cultural affiliation is Pai/Paiute. This site is significant to the Hualapai as it is associated with individuals who have living descendants at Peach Springs today.

Previous Work

J. Balsom originally recorded the site in 1986 (no report on file), and it was re-recorded by NPS personnel in 1990 (Fairley et. al 1994). The site was monitored in FY93, FY94, FY95, FY96, FY98, and FY01(Coder et. al 1994) (Coder et. al 1995a;Coder et. al 1995b) (Leap et. al 1996;Leap et. al 1998) (Dierker et. al 2001). Trail work was completed in FY97 and has successfully deterred visitation. Additional trail work was required in FY01 and FY02. CRT river trip personnel annually check the status of trail obliteration and conduct maintenance as needed. Because this site is important to the Hualapai Tribe, they have expressed appreciation for the treatment that NPS has performed and expect a continuation of this work.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Trail Obliteration	11/16/1996
Trail Work	04/03/2001
Trail Obliteration	11/15/2001

Monitoring Observations Summary

FY03 monitoring staff observed burrowing at the feature and vandalism. The feature was disturbed by someone piling rocks in the area of the rodent burrowing. A hole 30 centimeters wide and 15 centimeters deep was recorded. Hualapai tribal members were notified and had also recorded the presence of this vandalism. Trail obliteration maintenance work was completed and biennial monitoring will continue.

B:10:224 Thermal Feature Four-year Schedule

B:10:224 consists of two fire features adjacent to a major side canyon. Archaeologists observed artifacts on the surface during the survey. Feature 1 is a 1.5-meter diameter mounded roaster in pristine condition, rising 40+ cm above the surface. Feature 2 is the remnants of a burned sandstone slab cist eroding out of the edge of the cutbank into the main drainage. Cultural affiliation is unknown.

Previous Work

Archaeologists recorded the site in September 1990 (Fairley et. al 1994) and the RCMP monitored it in FY92, FY93, FY94, FY95, and FY99 (Coder et. al 1994; Coder et. al 1995a; Coder et. al 1995b; Coder et. al 1994) (Leap et. al 2000). In FY92 and FY93 archaeologists noted that planting vegetation may stabilize Feature 2, located precariously along a bank adjacent to a side canyon. In FY99 and this year archaeologists suggested that planting vegetation would not stabilize this slope and that data recovery of Feature 2 was necessary before it was lost to further downslope erosion. The May 2003 FIST trip participants evaluated this site for evidence of eolian processes.

Monitoring Observations Summary

FY03 monitoring staff noted the vegetation growing out of the center of Feature 1 has doubled in size since last monitored in FY99. Feature 2 is more exposed on the bank of the side canyon. The recommendation for data recovery at Feature 2 will continue. The site will be monitored every four years.

B:10:225 Small Structure Five-year Schedule

This site is located under a shallow overhang and on the slip face of a steep dune. It consists of two small structures along an overhang wall. A midden associated with the structures contains groundstone fragments, sherds, and lithics. Ceramics indicate a Pueblo II occupation.

Previous Work

The site was originally recorded in 1990 (Fairley et. al 1994) and monitored in FY93, FY94, and FY98 (Coder et. al 1994) (Coder et. al 1995a) (Leap et. al 1998). FY94 archaeologists J. Balsom and T.J. Ferguson changed the monitoring schedule to every 3 - 5 years because the site was relatively stable, only noting minor dune migration. Archaeologists in FY98 also noted minor dune migration and changed the schedule to every 5 years.

Monitoring Observations Summary

FY03 monitoring staff observed that the outer edges of both Features 1 and 2 are eroding down the slope. A new drainage has developed north of the overhang and is actively downcutting through the dune sand. Runoff may expose more of the features. Monitor this site every five years.

B:10:237 Roaster Complex Five-year Schedule

This site is an open roaster complex with lithic debris and PII sherds. It is situated on a dune-covered debris flow at the mouth of a major side canyon. A route out of the inner canyon originates at this site. The site is located approximately 100 meters from the river but only 14 meters above the 28,000 cfs level.

Previous Work

The site was initially recorded by NPS personnel in September, 1990 (Fairley et. al 1994) and monitored in FY96 (Leap et. al 1996). In FY97, the site was assessed for erosion control measures (Leap et. al 1997).

The assessment revealed that though these is the potential for future downslope erosion, it is not presently active and no preservation options were warranted. No additional RCMP work has been implemented.

Monitoring Observations Summary

FY03 monitoring staff noted the presence of gullies that have the potential to expose more cultural material. The small gully adjacent to Feature 3 should be assessed for checkdams during the next monitoring episode. A five-year monitoring schedule is recommended.

B:11:275 Small Structure

Five-year Schedule

This site consists of two partial walls in a rockshelter at the base of the Bass Limestone. No artifacts are associated with this site. The walls extend from the back of the overhang, defining at least one cleared activity area with charcoal. The structure has been partially filled in with debris from the overhanging formation and silt/sand from alluvial river deposits. Archaeological and temporal affiliation are unknown.

Previous Work

Archaeologists originally recorded the site in 1991 (Fairley et. al 1994) and the RCMP staff monitored it in FY95 and FY98 (Coder et. al 1995b) (Leap et. al 1998). Archaeologists have not recommended any remedial actions for this site. No additional RCMP work has been implemented.

Monitoring Observations Summary

Minor surface erosion has occurred below the packrat midden. Charcoal is being impacted. An animal has burrowed into the back of the shelter and sheep have been through here. A small gully from the pour over to the shelter is present. This gully appears to be a new development. FY99 monitoring staff recommended the site be tested for intact cultural deposits. The Hopi Cultural Resource Advisory Team (CRAT) members have expressed that this site may have cultural value to their people (criteria A and B), and prior to implementing any management action, CRAT would like to be consulted. The site is eligible for the National Register as a contributing element to the Canyon district. Subsurface testing is a means by which to make this site eligible under criterion D. The site is on predam alluvium and the subsurface remains have the potential to be exposed. FY03 monitoring staff suggest that monitoring continue every five years due to the presence of the pour over and small gully and their ability to expose more remains.

B:11:281 Thermal Feature

Biennial Schedule

This is a light-to-moderate-density scatter of sherds, lithics, and groundstone fragments distributed around the northeast margin of a sand-covered talus bench overlooking the river. A northeast-flowing tributary borders the southeast side of the bench/site area. Artifacts are concentrated in several more or less level areas. There are no distinct features or structures, but the presence of sandstone and limestone cobbles and FCR suggest the likelihood of buried roasting features and possibly one or two structures. Ceramics indicate a PII Formative affiliation. A Parowan projectile point was found and collected, and a cobble chert core, quartz chopper/hammerstone, and grinding slab were seen.

Previous Work

This site was initially recorded in January 1991 (Fairley et. al 1994) and monitored in FY95, FY99, and FY01(Coder et. al 1995b); (Leap et. al 2000); (Dierker et. al 2001). This site was also included in the studies conducted by K. Thompson and A. Potochnik (Thompson and Potochnik 2000). Placement of a drainage cross section for repeat measurements occurred in FY03.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Cross Section	03/25/2003

Monitoring Observations Summary

FY03 monitoring staff observed that these nick points had been recently active, downcutting further. Minor surface erosion and deflation were also observed. During this year monitoring, a cross-section was placed at the north end of the gully above the current headcut to track drainage development and advancement. Biennial monitoring will continue.

**B:13:001 Small Structure
Four-year Schedule**

This is a small multi-component site consisting of remnant wall features dividing probable activity areas against a Bright Angel Shale cliff. Both walls are dry-laid and only one to two courses high. Associated with the walls is a small hearth/roasting feature with bone, charcoal, and a couple of slabs. Other prehistoric artifacts include a few Redwall Chert and river cobble flakes, a mano, and a polished cobble. The site's historic component includes a small trash pile of glass and tin cans dating from the 1940s and 1950s. Cultural/temporal association for the prehistoric component is unknown.

Previous Work

The site was originally recorded in 1969, re-recorded by NPS survey personnel in 1990 (Fairley et. al 1994), and monitored in FY97(Leap et. al 1997). No additional RCMP work has been implemented.

Monitoring Observations Summary

FY03 monitoring staff noted that the site is moderately protected from physical impacts due to its proximity to a Bright Angel Shale cliff wall. It was recommended that survey photos be compared to the current condition, as it is possible that many of the rock elements have been completely altered by visitation. Continue monitoring every five years.

**B:14:095 Roaster Complex
Four-year Schedule**

The site contains two loci, A and B, including roasting features, lithics, and sherds representing a Puebloan PI-PII affiliation. The site is located in the dunes near some large debris boulders which have washed down from a large side canyon.

Previous Work

This site was recorded in September 1990 (Fairley et. al 1994) and monitored in FY93, FY95, and FY99, (Coder et. al 1994;Coder et. al 1995b) (Leap et. al 2000). No additional RCMP work has been implemented. The FIST trip stopped here to assess eolian processes in May 2003.

Monitoring Observations Summary

FY03 monitoring staff observed active surface erosion and eolian erosion. Dune sand is moving and vegetation types appear to be changing. There is the potential for entrenched drainages to develop if vegetation traps eolian sand and hinders its movement. The site will be monitored every four years.

**B:15:097 Artifact Scatter
Three-year Schedule**

This site consists of the remains of the William Bass cable car system. The cables (cut by Park officials on the right bank in 1971) extend from the river upslope 30 meters to a schist outcrop. The cable car is located seven meters downslope from the outcrop. Locus A includes several cables of varying widths and the cable car. Locus B consists of related historic artifacts, campfire remnants, rock features, a platform, and a constructed trail. The cable system was used during the early decades of the 20th Century.

Previous Work

R. Euler and A. Trinkle Jones initially recorded the site in July 1978 (no report on file). NPS archaeologists re-recorded the site in 1990 (Fairley et. al 1994). Monitoring occurred in FY97 and FY99 (Leap et. al 1997) (Leap et. al 2000). FY97 archaeologists noted that sand was being re-worked by wind, thus newly exposed remains may surface. FY99 archaeologists noted that at high water flows there is only

one camp along this stretch of the river and it is adjacent to this site. An inventory of the artifacts was completed during the FY99 monitoring episode. No additional RCMP work has been implemented.

Monitoring Observations Summary

FY03 monitoring staff observed basal erosion affecting the platform in Locus B and the tripod. A faint trail is present and minor rearrangement of historic artifacts is evident. Recommendations for treatment include the application of a wood preservative, stabilization of the platform and documenting the trails to both Loci A and B. Obviously the treatments recommended this year are unrelated to Glen Canyon Dam operations however, due to site location high flows released from the dam could impact the site. Monitoring frequency will change from every five years to every three based on the new deterioration noted during the FY03 visit. After completion of treatment it is likely that the monitoring frequency will decrease.

B:15:135 Small Structure

Four-year Schedule

This site is located on the west side of a drainage at the base of a Tapeats Sandstone outcrop within an alluvial terrace. It consists of a rockshelter with upright sandstone slab walls outlining a habitation area. The associated artifacts (a few flakes, several lithic tools, and a sherd) suggest a late prehistoric-early historic Pai association. The site contains possible buried artifacts and architectural features.

Previous Work

This site was initially recorded by NPS survey personnel in October 1990 (Fairley et. al 1994) and monitored in FY93, FY94, FY95, and FY96, (Coder et. al 1994; Coder et. al 1995a) (Coder et. al 1995b) (Leap et. al 1996). No additional RCMP work has been implemented.

Monitoring Observations Summary

FY03 monitoring staff reassessed the drainage type from no drainage to terrace-based. Minor downslope erosion of upright slab walls is evident with minor eolian filling. The monitoring schedule was changed this fiscal year from five years to every four years due to the presence of a new gully and recent deterioration to walls.

B:15:138 Thermal Feature

Annual Schedule

RCMP archaeologists identified and recorded this site in April 1997 (Leap et. al 1997). This site consists of two concentrations of fire-cracked rock and a sparse scatter of lithics and sherds. Feature 2 appears to be the remains of a slab-lined roasting feature. Feature 1 has no intact morphology and is an array of fire-cracked rock with associated artifacts. Multiple trails are on and near the site due to its proximity to Blacktail Canyon, a popular side canyon hiked by river runners.

Previous Work

RCMP staff recorded the site in 1997 and have monitored the site annually (Leap et. al 1997; Leap et. al 1998) (Leap et. al 2000) (Dierker et. al 2001; Dierker et. al 2002; Leap and Kunde 2000). The trail directly below Feature 2 was obliterated at the time the site was recorded and a new trail was outlined below the site. Visitors (river runners) destroyed the work the following summer. In September 1997 a total station map was completed (Leap et. al 1997). Though the trail work was destroyed, a second round of obliteration was conducted in October 1998 by the NPS. FY98 monitors recommended planting vegetation. NPS personnel conducted additional trail work in FY99 (Hubbard 1999). Access was blocked off to the drainage by using dead brush found in the side canyon drainage. It was determined that the features are most vulnerable to river runners coming back to camp from the upper Tapeats Sandstone ledges. A small rock cairn was constructed and hidden in the ledges so it is only visible from above. Theoretically, hikers will see the cairn from above, directing them down the ledges away from the site. RCMP staff placed deadfall in the drainage to slow down erosion and to block the upper portion of Feature 2. Approximately seven meters of the area was treated and all work was photographed. FY99 archaeologists recommended planting vegetation. The GRCA Revegetation crew suggested that four to five people could collect and plant seed and bunch grasses if a revegetation project is to be implemented. Also, dead brush placed on top of the newly planted grass will propagate vegetation growth. In November

2001 a crew of CRT personnel conducted trail obliteration and revegetation. The NPS base program will continue managing for visitor impacts.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Trail Work	04/20/1997
Total Station Map	09/17/1997
Trail Work	03/01/1999
Plant Vegetation	11/11/2001
Trail Work	11/11/2001

Monitoring Observations Summary

The slab lined roasting feature, Feature 2, is again recommended for data recovery. This recommendation stands for the last four years. Data recovery is the only alternative to a total loss of information. It is possible that data recovery could be conducted on a CRT-sponsored river trip. The gully at Feature 2 has been active. Increased surface erosion is present at both Feature 1 and 2. Archaeologists, in FY03 recommend continued trail monitoring and maintenance and continued annual site monitoring. Although the site may not seem deserving of an annual monitoring schedule it is one of the 22 core monitoring sites (see Chapter 2 for explanation of "core monitoring" sites) from which detailed data analyses will be completed.

**B:15:139 Artifact Scatter
Five-year Schedule**

The site consists of two flat areas sheltered by shallow overhangs at the base of a cliff with historic and prehistoric artifacts. Two components are indicated: Pueblo II (as a result of one sherd) and early 20th Century (1900-1930) Euro-American. Shelter A is a small area with historic cans, one sherd (North Creek Corrugated), a granite cobble mano (worked on both sides), and a large mammal bone, possibly a burro. Shelter B contains a schist rock alignment, two metal plates, and one metal can. The historic artifacts may be related to trail building/mining activities by William Bass.

Previous Work

The site was originally recorded by NPS personnel in 1990 (Fairley et. al 1994) and monitored in FY97 (Leap et. al 1997). No additional RCMP work has been implemented.

Monitoring Observations Summary

FY03 monitoring staff observed animal burrowing. Increased vegetation is also present, warranting continued monitoring every five years.

**C:02:094 Historic Structure
Biennial Schedule**

The recorded portions of this site consist of a dugway at Lees Ferry that accessed the lower ferry on the left bank, numerous historic inscriptions associated with the dugway/ferry crossing, and large wooden posts on the right bank that were also associated with the crossing. These wooden posts are thought to be mooring posts. The ferry was established in 1873 and used until 1898; and built as a means of avoiding the Lee's Backbone road. There are many historic names and dates written in axle grease and/or tar on a rock surface plus four carved initials at the base of the dugway. Other inscriptions are located at the top of the dugway, but were not re-recorded by the 1990-91 survey crews. The names belong to mostly Mormon immigrants travelling on the Honeymoon Trail between the outposts on the Little Colorado River and the temple in St. George, Utah. Dated names cluster from 1890 to 1898 and were executed on a rock while passengers waited for a ride across the river. There is an ephemeral rock wall between the upstream and downstream portions of the panel, plus modern graffiti. RCMP monitors found two Tusayan corrugated sherds and three secondary flakes eroding from the surface approximately four meters below the panel in FY98. This new information changes the site class to both historic and prehistoric.

Previous Work

Portions of the site were originally recorded as part of the Lees Ferry Historic District by P. Geib in the 1980s under site number C:02:011. The 1990-91 survey crew, after recording both right and left bank areas, decided to isolate the lower ferry crossing as a site unto itself, which was designated C:02:094 (Fairley et. al 1994). The site was monitored in FY92, FY93, FY96, FY97, FY98, FY99, and FY01 (Coder et. al 1994; Coder et. al 1994) (Leap et. al 1996) (Leap et. al 1997; Leap et. al 1998; Leap et. al 2000) (Dierker et. al 2001). GRCA and RCMP staff removed graffiti associated with the panel in 1996 and again in 2001, and documented the inscriptions with a medium format camera in FY97 (Leap 1997b).

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Graffiti Removal	11/05/1996
Graffiti Removal	10/01/1996
Medium Format Photos	02/19/1997
Graffiti Removal	10/31/2001

Monitoring Observations Summary

FY03 monitoring staff observed two new occurrences of vandalism. Graffiti removal is recommended for the next CRT river trip. The recent fire rings and associated charcoal on-site should also be removed with a screen as these pieces are what is being used to vandalize the site. Biennial monitoring will continue, as the drainage may be active and expose more prehistoric artifacts thus enhancing the interpretation of the site.

C:02:096 Structure-Thermal Feature Complex Semi-annual Schedule

The site consists of two sheltered areas separated by a drainage and talus cone. The upstream area (Locus A) consists of a shallow overhang with an ephemeral wall. The wall consists of small, local limestone cobbles in a single ground level course. The front of the shelter ledge might exhibit some alignment and level preparation. One large tertiary flake of white-orange Kaibab Chert was noted, as well as a long, tapered river cobble (pestle shape), pecked on two faces with a smooth surface on another margin. Locus B is located about 60 meters downstream of Locus A under a west-facing Kaibab Limestone overhang. An arroyo occurs beneath the overhang dripline, exposing layers of river-deposited silt/sand inter-bedded with coarser sand and gravel colluvium. Several layers of charcoal and cultural features are exposed in the arroyo cutbanks as well. O'Connor and others (O'Connor et. al 1994) reported finding fluvial-transported charcoal at a depth of about 2.5 m below present ground surface, near the bottom of the stratigraphic section. The radiocarbon dates from this research date from 4567-4125 B.P. FY97 monitors recorded a partially mineralized, worked stick in Locus A. FY97 monitors discovered new lithics and a Moenkopi Corrugated sherd eroding from Locus B. FY00 monitors recorded a point base, charcoal and other lithic debitage on the arroyo floor not previously identified.

Previous Work

Archaeologists originally recorded the site in 1991 (Fairley et. al 1994) and the RCMP staff have monitored this site annually since FY95 (Coder et. al 1995b; Leap et. al 1996) (Leap et. al 1997; Leap et. al 1998; Leap et. al 2000) (Dierker et. al 2001; Dierker et. al 2002; Leap and Kunde 2000). Monitoring staff recommended checkdam installation in FY96. In FY97 the RCMP and ZCT staff assessed this area for checkdam installation and determined that the arroyo system is at an active stage that would not be conducive to checkdam construction. Surveyors completed a total station map in FY97. In FY97, FY98, FY99, FY00, FY01, and FY02 monitoring staff consistently recommended data recovery for features newly exposed at Locus B. FY99 monitoring staff collected charcoal samples for radiocarbon dating from Features 2 and 9. Carbon samples were returned and Feature 2 dates 3220 +/- 80 BP and Feature 9 dates 3560 +/- 70 BP. This site was included in the studies conducted by K. Thompson and A. Potochnik (Thompson and Potochnik 2000). The cultural PEP panel had data recovery discussions while at this site. In May 2003 the FIST trip participants stopped here to assess eolian processes.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Total Station Map	10/28/1996
Carbon Samples	02/22/1999

Monitoring Observations Summary

Features 1, 2, 3, 5, 6, and 9 all exhibit erosion due to bank slump and deepening of the arroyo cut. The arroyo continues to be active and all features have been directly impacted by this activity. Although data recovery is recommended annually, it has yet to be implemented due to budgetary constraints. Until then, archaeologists again recommend profiling the arroyo walls and sampling as a priority before full scale data recovery is completed. It will be difficult to determine rates of change at this location because repeat mapping will be highly destructive to the site. The site will be monitored semi-annually due to the high degree of erosion and the continued exposure of cultural remains.

C:02:098 Artifact Scatter**Annual Schedule**

The site consists of an overhang with a charcoal scatter, one sherd, one sandstone mano, and a flake scatter. The terrace at the base of the overhang has been cut by high water, and charcoal is eroding from this cut. Cultural affiliation is unknown.

Previous Work

Archaeologists recorded the site in 1991 (Fairley et. al 1994) and RCMP staff monitored it in FY95, FY97, FY98, FY99, FY00, and FY01, (Coder et. al 1995b) (Leap et. al 1997; Leap et. al 1998) (Leap et. al 2000) (Dierker et. al 2001; Leap and Kunde 2000). FY95 monitoring staff recommended trail work, planting vegetation and testing for subsurface cultural material. The GRCA trail crew completed trail obliteration in FY96. This site was recommended for data recovery in FY97. FY98 monitoring staff recommended installing checkdams and surveyors completed a total station map. FY99 monitoring staff noted that no new trails were apparent, however, erosion has obliterated some of the previous trail work. FY99 monitoring staff and Zuni Conservation Project staff assessed the gullies/trails for checkdam construction and scheduled work in FY00. This work, however, has been postponed until the checkdam research conducted by Joel Pederson is finalized (Pederson 2001). This site was also included in the studies conducted by K. Thompson and A. Potochnik (Thompson and Potochnik 2000).

Monitoring staff have consistently recorded angler trails, trash, tackle and recent charcoal at one end of the overhang. FY03 monitoring staff observed channel initiation and several nick points within the old obliterated trails and the main trail. Obliterating the trail would not be successful due to the entrenched nature of the trail beginning at the parking area upstream of this location. The NPS revegetation crew took a replicated photograph for future comparison.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Trail Work	11/02/1995
Total Station Map	03/31/1998

Monitoring Observations Summary

The drainages below the site have become large arroyos since last monitored. Zuni Conservation Project personnel concluded that checkdams will not work here. The overhang remains unchanged. Visitation at this site is inevitable due to the extensive trail network leading from the parking lot to the river. While obliteration is not possible, revegetation work should occur annually to maintain trails and avoid multiple trailing. FY03 monitoring staff recommend data recovery for the entire site. They also suggested that NPS River Patrol personnel monitor the site rather than RCMP personnel due to the amount of visitor impacts observed. Revegetation of the newly developed drainage will help curtail additional sediment loss. Annual monitoring will continue.

C:05:004 Artifact Scatter

NPS River Patrol –Annual Schedule

This site is the equipment cache of a 19th century trapper or prospector located inside a small cave. The site contains a handful of historic artifacts. These artifacts include traps, tools and kitchen objects.

Previous Work

Members of a USGS trip took the first photograph of this site in 1923. This photograph, taken by Lewis R. Freeman, was published in *National Geographic* in 1924 (Freeman 1924). Robert Euler (GRCA) assigned a site number and recorded a list of artifacts in 1975. The site was re-recorded by the 1990-91 survey (Fairley et. al 1994). The RCMP staff monitored the site in FY92, FY93, FY94, FY98, and FY99 (Coder et. al 1994; Coder et. al 1995a; Coder et. al 1994; Leap et. al 1998) (Leap 2000). In FY98, the RCMP staff completed an inventory of the artifacts and the site was monitored by GRCA River Patrol rangers for ARPA violations.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Inventory	10/01/1997

Monitoring Observations Summary

FY03 monitoring staff observed no physical changes. Modern visitors occasionally leave “offerings” such as a wood carving or a candle. The current recommendation is to keep the site on an inactive schedule and monitor it only before and after experimental flows over 45,000 cfs. NPS River Patrol will monitor the site annually for visitor-related disturbances and relate to the RCMP archaeologists of any physical impacts occurring or not occurring.

C:05:037 Thermal Feature

Four-year Schedule

C:05:037 consists of two partially exposed fire features, several flakes, and a few sherds. The sherds indicate a Puebloan and Southern Paiute presence. This site is located on a reworked dune system overlying a talus slope and debris fan. A popular camp is situated less than 100 m downstream from the site. Although the ephemeral nature of the site does not necessarily attract visitation, it is a nice walk from camp so a trail is present and trash is generally found on the site in minor amounts.

Previous Work

This site was initially recorded in October 1990 (Fairley et. al 1994). It has been monitored annually from FY92 through FY95 and then the schedule was changed to every four years and monitored in FY99 (Coder et. al 1994; Coder et. al 1995a; Coder et. al 1994) (Coder et. al 1995b) (Leap et. al 2000). No additional RCMP work has been implemented. The FIST trip stopped here to assess eolian processes in May 2003.

Monitoring Observations Summary

FY03 monitoring staff observed eolian aggradation at Feature 1, making it less apparent than in previous photographs. Monitoring will continue every four years.

C:06:005 Rock art

NPS River Patrol –Annual Schedule

This site consists of a rock image of three pecked figures on a Supai Sandstone bedrock ledge. An anthropomorph, a pecked line, and “U” shaped element comprise the figures. The elements have experienced only minimal wind and water erosion, making the figures less defined. Cultural affiliation is unknown.

Previous Work

The site was initially recorded in 1979, re-recorded in 1989 by NPS archaeologists (Fairley et. al 1994), and has been monitored annually by RCMP staff from FY94 through FY98 (Coder et. al 1995a; Coder et.

al 1995b; Leap et. al 1997; Leap et. al 1996; Leap et. al 1998; Leap et. al 2000). GRCA River Patrol monitored the site in FY99 and FY03. The Southern Paiute Consortium trip stopped here in September, 1994; Hopi and Zuni visited the site in 1995. The site, and thus the immediate area, has cultural significance to the Southern Paiute Consortium, Hopi, and Zuni people. Graffiti removal was conducted here in FY97. Medium format black-and-white and color prints were taken for archival purposes prior to the research flow of 1996 (Mitigation and Monitoring of Cultural Resources in Response to the Experimental Habitat Building Flow in Glen and Grand Canyons, Spring 1996 1996).

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Graffiti Removal	11/05/1996
Medium Format Photos	02/20/1997

Monitoring Observations Summary

FY03 monitoring staff observed spalling approximately 1.5 meters east of the figure. People walking on the fragile parts of the rock surface likely cause this spalling.

**C:09:031 Special Activity Locus
NPS River Patrol –Annual Schedule**

C:09:031 consists solely of the grave of Grand Canyoneer Wilson "Willie" Beigle Taylor who died of a heart attack during a river trip with Otis "Doc" Marston in June 1956. The grave is marked with a bronze plaque.

Previous Work

The grave site is a well-known and often visited location in the river corridor. It was recorded as an actual site by Euler in 1978 and was re-recorded in 1990 (Fairley et. al 1994). The site was monitored in FY95 and FY99 (Coder et. al 1995b) (Leap et. al 2000). The RCMP & GRCA conducted trail work at this site in FY97 (Leap et. al 1997). This site was also included in the studies conducted by Thompson and Potochnik (Thompson and Potochnik 2000). Thompson and Potochnik, 1999, noted that a river-based drainage had formed since the last monitoring visit in FY95.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Trail Work	11/08/1996

Monitoring Observations Summary

The site will be monitored annually by NPS river patrol. They will document all physical impacts observed and relay that information to RCMP archaeologists to update the database.

**C:09:050 Special Activity Locus
Annual Schedule**

The site originally consisted of a single complete Tusayan Black-on-Red mug/pitcher eroding out of a cutbank, and nine rectangular rock cobbles in an alignment adjacent to Little Nankoweap Creek. After its discovery, the vessel was stabilized with local cobbles and boulders, then covered with sand. Park Archaeologist J. Balsom subsequently collected the vessel, and several others from the same locale, on a later episode. This is considered a Late Pueblo I-Early Pueblo II Formative site and most likely a burial site. On 10/10/97 archaeologists on a routine visit observed a 3 x 3 m scatter of fire-cracked rock located about 5 m south of the pot cache on the southeast facing slope.

Previous Work

This site was discovered and initially recorded by NPS survey personnel in September of 1990 (Fairley et. al 1994). Due to the site's proximity to a major river camp and the precarious nature of their depositional situation, the four vessels were subsequently removed to the South Rim at the discretion of the Park Archaeologist. The site was monitored once in FY92 and semi-annually from FY93 through FY00, then

annually from FY01 to the present (Coder et. al 1994;Coder et. al 1994) (Coder et. al 1995a) (Coder et. al 1995b;Leap et. al 1996) (Leap et. al 1997;Leap et. al 1998) (Dierker et. al 2001;Dierker et. al 2002;Leap and Kunde 2000;Leap et. al 2000). Medium format photographs of the pot cache location were taken in FY95 and FY98(Leap 1995a). Hereford et al. included this site in their geomorphic map of the Nankoweap area (Hereford et. al 1996b). In FY97 personnel from the Zuni Conservation Project assessed the area for checkdam placement. At that same time, an extensive water diversion structure was constructed at the base of the cutbank to curtail further erosion from side canyon flooding and bank slump (Leap et. al 1997). After stabilization, a total station map was completed of the entire site. No checkdam maintenance has been necessary since construction in FY97.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Medium Format Photos	03/28/1995
Checkdams	04/14/1997
Total Station Map	04/22/1997

Monitoring Observations Summary

FY03 monitoring staff observed minor surface erosion and eolian activity. Annual checkdam monitoring and maintenance and annual site monitoring are recommended due to the potential for the exposure of new cultural remains. This site is also considered a core monitoring site (see Chapter 2 for "core monitoring" discussion) and the information gathered from this site may be valuable in future data analyses.

C:09:084 Artifact Scatter Five-year Schedule

This site consists of corrugated sherds, manuported cobbles and a corncob. FY96 monitoring staff identified several large flakes on-site not recorded during the survey. The site is located at the base of a Bright Angel Shale cliff, resulting in a somewhat sheltered location. The site is 60 meters from the river and five meters above the 28,000 cfs level.

Previous Work

The site was originally recorded in 1990 (Fairley et. al 1994) and monitored in FY96, and FY98 (Leap et. al 1996) (Leap et. al 1998). In FY98 the site was assessed for checkdam installation. No work was warranted. No additional RCMP work has been implemented.

Monitoring Observations Summary

FY03 monitoring staff did not observe any change. The site will continue to be monitored every five years.

C:13:006 Small Structure Annual Schedule

The site is eroding out of a reworked dune at the mouth of a major side canyon. It consists of a Pueblo II Kayenta ceramic and lithic scatter eroding from a dune face with a fire-cracked rock and cobble-strewn, ashy midden. Survey personnel identified four to five possible rooms present but in fair to poor condition. Due to active erosion in the dune area, several additional features have been exposed and recorded since the river corridor survey. In FY95 monitors made several additions to the site map, including walls eroding out of gullies, an additional roasting pit, an artifact concentration, and several new drainage channels. Groundstone is present though no formal tools have been observed.

Previous Work

The site was recorded in the early 1960s, 1965, and 1984 and again in 1990 (Fairley et. al 1994). River corridor archaeologists monitored this site annually in FY92 and FY93, semiannually in FY94 and FY95, and back to annual from FY96 to FY03(Coder et. al 1994;Coder et. al 1995a;Coder et. al 1995b;Coder et. al 1994) (Leap et. al 1997;Leap et. al 1996;Leap et. al 1998) (Leap and Kunde 2000;Leap et. al 2000) (Dierker et. al 2001;Dierker et. al 2002). In FY95 a stationary camera was placed across from the site (Coder et. al 1995b), but was removed after FY96 because the photographs only showed considerable changes, not the moderate changes observed during monitoring episodes (Leap et. al 1996). In FY95 the

Zuni Conservation Program personnel assessed the site for checkdam installation. In FY96 a GRCA recreational specialist and revegetation employee assessed the site for planting vegetation and placing jute mat on the deflated areas. The site was mapped with a total station in FY96 (Leap et. al 1996), and medium format photographs were taken prior to the Beach Habitat Building Flow (BHBF) in 1996. Twelve checkdams were built in the two active gully systems and jute mat was laid in the deflated dune areas (Leap et. al 1996). Additional vegetation work was completed at this site in FY97. In FY97 and FY99 Zuni Conservation Program personnel conducted minor maintenance on some of the original checks. Increased sediment deposition demonstrated at this site is a result of checkdam construction. It was determined that grass plugs and additional seed should be collected from the slope directly across 60 Mile drainage from this site. Grass plugs could then be transplanted on-site to further anchor and secure the dune area. This area was researched by Thompson and others in 1998 and 1999 (Thompson and Potochnik 2000). Annual checkdam monitoring resulted in maintenance at two checkdams and construction of one new checkdam in FY2000 (Leap et. al 2000). CRT personnel planted cacti and grasses in November, 2001. This site is part of Joel Pederson's remote sensing project through the GCMRC with results due to be completed in 2003. Checkdam maintenance was required in 2003 due to extremely active gullying at both drainages and the development of a new drainage between FY02 and FY03. Five checkdams required minor maintenance and four new nickpoint treatments were constructed. The FIST trip stopped here to assess eolian processes in May 2003.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Checkdams	02/16/1996
Medium Format Photos	02/16/1996
Total Station Map	08/27/1996
Plant Vegetation	02/22/1997
Plant Vegetation	04/15/1997
Checkdam Maintenance	04/15/1997
Checkdam Maintenance	11/11/1998
Identified Seeds to Replant	02/01/2000
Checkdam Maintenance	04/17/2000
Checkdam Maintenance	10/15/2000
Plant Vegetation	11/06/2001
Total Station Map	02/16/2002
Total Station Map	09/29/2003
Checkdam Maintenance	03/19/2003

Monitoring Observations Summary

Transplanting vegetation is only a stop-gap measure. Data recovery is recommended for the heavy artifact concentration. Surface artifacts are moving downslope, though there still appears to be a lot of intact cultural material. FY03 monitoring staff observed that the two gullies on-site were active with downcutting, nickpoint development and small headcuts off the sides beginning to develop. A new gully also developed within the last year. Annual checkdam monitoring and maintenance and annual site monitoring will continue.

C:13:010 Pueblo Annual Schedule

This is a large, multi-component habitation site divided into three "locales." Locale 1 was recorded in 1965 and Locales 2 and 3 were discovered on a 1983 GRCA monitoring trip. Five structures and 21 features are assigned to Locale 1, including a pithouse, several one to four room masonry structures, a pueblo, cists/hearths, and rubble/wall alignments. Four structures and 16 features are noted at Locale 2, including rooms and rubble piles. Locale 3 contains two structures and five features, including a shelter, cists and wall/room remains. Testing results suggest the site may have had two to three occupations, including use by Pueblo I and Pueblo II Puebloan; ceramics also suggest a late prehistoric-early historic Hopi connection. For details consult the 1984 excavation report (Jones 1986) and Miller et al. 2001 draft. It has been postulated that large debris from upstream temporarily blocked off river flow to this location and when the

debris flow was breached, large amounts of deposition occurred at this location (T. Melis personnel communication 2003).

Previous Work

Archaeologists conducted data recovery at this site in 1984 (Jones 1986) as a result of a large side canyon debris flow and high water releases that inundated cultural remains along the river. GRCA closed this site to visitors in 1985 due to the fragility of the terrain. Geomorphologists completed a topographic map of C:13:010 in 1993 using photogrammetry (Hereford et. al 1993). The RCMP staff monitored the site annually since 1995 (Coder et. al 1995b) (Leap et. al 1997; Leap et. al 1996; Leap et. al 1998) (Dierker et. al 2001; Dierker et. al 2002; Leap and Kunde 2000; Leap et. al 2000). FY95 monitors recommended stabilization and total station mapping. FY96 monitors recommended installing checkdams and data recovery. During the 1996 research flow, the RCMP staff conducted supplemental monitoring efforts at this site (Balsom and Larralde 1996). FY97 monitors recommended data recovery, total station mapping, stabilization, and checkdams. After an assessment in FY97, monitors determined that checkdams would not be effective. FY98 monitors recommended data recovery. The RCMP staff assessed the site for data recovery in FY97 and FY98. In FY98 and FY99 the RCMP staff implemented a limited data recovery project and completed medium format photography. The NAU staff will complete a separate report detailing this work upon completion of the analyses, see Miller et. al. Draft, 2001. This site was also included in the studies conducted by K. Thompson and A. Potochnik (Thompson and Potochnik 2000). Since 1999, RCMP staff have annually recommended completion of a phased data recovery project. In May 2003 the FIST trip stopped at this location to assess the eolian processes active here and identified a malachite pendant and a partial pendant of turquoise or amazanite.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
*Close Site	01/01/1985
Data Recovery	04/28/1998
MF Photos	04/28/1998
Data Recovery	02/01/1999
Total Station Map	08/01/01
Carbon Sample	03/21/03

* Closure by Park.

Monitoring Observations Summary

Although the site is officially closed, monitoring data show that visitation continues at this highly fragile site. Features at this site continue to be subjected to active rilling, gully and arroyo development, downcutting and headcut advancement. Deflation is apparent in some locations. FY03 archaeologists continue the recommendation of a phased data recovery approach because the site is so immense. Features at this site continue to be subjected to active eolian deposition and erosion, active gully and arroyo cutting, active surface erosion and channel initiation. RCMP personnel will continue annual site monitoring.

C:13:033 Small Structure Inactive Schedule

This is an open site with the remains of a sub-rectangular, three-sided structure open to the south. Six flakes are located 15 meters west-northwest of the structure. No other artifacts have previously been found on this site (although some minor ash staining was noted in the southeast corner of the structure). This is a probable Pueblo I-III habitation site, inferred from other sites found in the area.

Previous Work

C:13:033 was initially recorded and mapped by Euler and Powers in 1962, and again by Balsom and Fairley in 1984. It was re-recorded during the 1990-1991 survey by NPS personnel (Fairley et. al 1994). The site was monitored by the RCMP in FY96 (Leap et. al 1996). Hereford included this site in his photogrammetry map of the Palisades area (Hereford et. al 1993). No additional RCMP work has been implemented.

Monitoring Observations Summary

The site is currently stable. The greatest potential for impact is from runoff directed by the sandstone ledges behind the structure. FY03 monitoring staff observed minor surface erosion though this does not appear to be a threat to the structure due to the compacted nature of the depositional context. RCMP monitoring staff recommend that the schedule change to inactive.

C:13:069 Small Structure Annual Schedule

This large site consists of several cists and masonry structures. Feature 1 is a slab-lined cist remnant. Feature 2 may be a masonry room with a midden. Feature 3 is a masonry wall. Feature 4 consists of eroding slabs where additional architecture may be present. Feature 5 is a well-preserved cist. Feature 6 is a masonry room. Feature 6B is another masonry room outside of the main dune area. Ceramics suggest a Pueblo II-early Pueblo III affiliation. The site is near the Tanner Trail and a well-used boat camp.

Previous Work

Prescott College personnel originally recorded this site in 1972. NPS personnel re-recorded this site in 1990 (Fairley et. al 1994), and monitoring occurred in FY93, FY95, FY96, FY97 and annually since FY99 (Coder et. al 1994; Coder et. al 1995b) (Leap et. al 1996) (Dierker et. al 2001; Dierker et. al 2002; Leap and Kunde 2000; Leap et. al 1997; Leap et. al 2000). As part of the GCES Phase 1 program, Ted Melis took a carbon sample at this location. No information has been disseminated to the RCMP office concerning the results as the sample appears to have been too small for processing. In 1992, the GRCA Revegetation crewmembers conducted trail obliteration, revegetation, and stabilization of minor drainages. Medium format photos were taken of this site in FY96 (Leap 1996). Upon completion of a stabilization assessment in FY97, six checkdams were constructed along the drainage bisecting the features. One existing checkdam was reconstructed and five new checkdams were built. A total station map was also completed in FY97. See Hereford (Hereford et. al 1993) (Hereford 1996) for photogrammetric topography mapping of the immediate area. Monitoring staff observed that human impacts were high, and included distinct trails, trail-caused erosion, and minimal on-site camping. This site is at particular risk due to the adjacent river camp that is highly used, especially during the May to October season. Backpackers throughout the year also use the area and a major trail cuts directly through the site. CRT personnel conducted extensive trail obliteration work here in November 2001. Checkdam maintenance occurred at Checkdam 4 in FY2002. Checkdam maintenance was required at Checkdams 2 and 4 in FY03. In May 2003 FIST trip participants visited the site to assess eolian processes. A carbon sample was collected from a burned beam at Feature 2.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Checkdams	02/24/1997
Total Station Map	04/24/1997
Trail Work	11/08/2001
Checkdam Maintenance	04/27/2002
Checkdam Maintenance	03/21/2003
Carbon Sample	03/21/2003

Monitoring Recommendations

The drainage adjacent to Features 1 and 2 continues to be very active. Checkdam maintenance was required again at Checkdam 4 to redirect runoff away from Features 1 and 2. Checkdam 2 also required maintenance work. Features 3, 4, and 5 are unchanged. Feature 6 has minor visitor-related impacts and a new trail. Data recovery continues to be recommended again as a salvage recovery for Features 1 and 2. Continue annual checkdam monitoring and maintenance and annual site monitoring.

C:13:070 Small Structures Annual Schedule

This site has four loci (A-D) and is situated on a highly dissected terrace. Locus A has three artifact scatters near the drainage mouth and along the terrace edge to the northeast. Locus B is a rubble mound

that suggests a small masonry structure. Abundant sherds and lithics are located around the structure and upslope. Locus C consists of a dense scatter of charcoal (historic) and artifacts (prehistoric) scattered over the surface. Locus D includes several artifacts and three to four charred logs exposed in an arroyo that may be the remains of a roof. The quantity and diversity of artifacts suggests that this is a habitation site, however, few architectural features are visible. Artifacts indicate a Pueblo II-early Pueblo III occupation. In FY96 monitors found small mammal bones on the northeast edge of Locus A, and in FY97 they found a basalt axe fragment in the artifact concentration of Locus D. Both the roof remains and the axe fragment are rare in Grand Canyon.

Previous Work

The site was originally recorded in 1973 and re-recorded in 1991 by NPS personnel (Fairley et. al 1994). The site was monitored in previous years by GRCA, and more recently monitored under the RCMP: semi-annually from FY94 – FY96 and annually from FY97 to the present (Coder et. al 1995a; Coder et. al 1995b) (Leap et. al 1996) (Dierker et. al 2001; Dierker et. al 2002; Leap and Kunde 2000; Leap et. al 1997; Leap et. al 1998; Leap et. al 2000). In FY95 medium format photographs were taken for drainage documentation. In FY95 PA members wanted RCMP staff to select certain sites to measure artifact movement within one-meter square. These surface analysis units were removed in FY96 as per discussions with PA representatives (Leap, et al. 1996). The results of one year were inconclusive and highly subjective. In May 1996 the Zuni Cultural Resource Advisory Team (ZCRAT) monitored the site and their recommendation was to install several checkdams. A total station map of Loci B, C and D was completed in September 1997 in anticipation of some type of preservation treatment (Leap and Kunde 1997). Upon further assessment in FY97 and FY99 with the ZCT personnel, it was determined that installing checks "would be a time consuming, expensive and a risky effort." It was determined that the arroyo systems were (are) too advanced for any practical stabilization effort. In FY99 samples were taken from the charred logs (possible roof fall) in Locus D. Carbon samples from Locus D have dates of 870 +/-60 BP and 790 +/- 60 BP. This site was also included in the studies conducted by K. Thompson and A. Potochnik (Thompson and Potochnik 2000). The Protocol Evaluation Panel (PEP) participants stopped at this location in March 2000. Trail obliteration work was completed on a CRT trip in November 2001. Cross-sections were established here in February 2003 to track arroyo activity (recording cut and fill processes). The FIST trip stopped at this site to assess eolian processes in May 2003.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
MF Photos	03/31/1995
Total Station Map	07/31/1997
Carbon Samples	02/01/1999
Trail Work	11/08/2001
Cross-sections	02/21/2003
Carbon Sample	05/12/2003

Monitoring Observations Summary

As in previous monitoring observations, active gullying and arroyo cutting are present. The channel at Locus D continues to downcut and portions of the charcoal beams have eroded several meters downslope. Impacts observed include surface erosion, deflation, active gullying and arroyo cutting. Artifacts and structural remains are all affected by these impacts. Data recovery at Locus D has been a recommendation since FY99. Annual monitoring will continue.

C:13:098 Historic Structure Annual Schedule

This historic mine and cabin site contains two loci. Locus A consists of two mine adits at the base of the Palisades cliff along the Palisades fault. The main adit is situated about 10 m above the surrounding terrain with an extensive tailings pile below it. The second adit is located about 10 m below and 20 m south of the main adit. About 225 m south-southwest is Locus B, which includes a log cabin constructed of driftwood logs. The cabin measures 2.6 x 4.1 m (interior) and is five courses high. The floor is partially paved with sandstone slabs, with a log/board bed frame in the northeast corner. A canvas tent probably formed the

upper walls and roof. About four meters due south of the cabin door is a driftwood log "fence". This structure is made of stacked logs up to four courses high. It may have been a windbreak. Artifacts date from 1900-1920 to the mid-1930s. In FY98 monitors found a cist feature eroding in the drainage near the cabin that is probably associated with other prehistoric sites in the vicinity.

Previous Work

This site was initially recorded by Euler and Jones in 1978 and then re-recorded by NPS personnel in 1990 (Fairley et. al 1994). GRCA documents from 1929 and 1930 reveal an investigation made by the Park Service on the lode mining claims by George W. McCormick and others in May 1913 (Busch 1930;Daly 1929). RCMP staff monitored the site semiannually from FY93 to FY98 (Coder et. al 1994;Coder et. al 1995a;Coder et. al 1995b) (Leap et. al 1997;Leap et. al 1996). In FY98 the schedule was changed to annual.(Leap et. al 1998) (Leap and Kunde 2000;Leap et. al 2000) (Dierker et. al 2001;Dierker et. al 2002). See Hereford (Hereford 1993) for a photogrammetric topographic map of the immediate area. In FY95, FY96, and FY98 the cabin and associated artifacts were photographed with a medium format camera. Currently, and prior to the inception of this program, NPS trail crews have maintained the trails in the area. From FY93 to the present monitors have observed visitor impacts (trailing and collection piles). Trail work was completed at this site in FY99. It has been suggested that C:13:098 be considered for an education and interpretation stop along the river corridor however the process has yet to be initiated by the Park. Visitation to this site has resulted in impacts to the adjacent sites and increased gullying in places where initial trailing exists. Trail work was conducted here on CRF trips in 2000 and 2001.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Total Station Map	04/29/1994
MF Photos	03/30/1995
Trail Work	02/25/1999
Trail Maintenance	02/25/1999

Monitoring Recommendations

FY03 monitoring staff observed the stability of channeling north of the cabin. Sheet wash is present. The prehistoric cist is unchanged since 2001. Trail maintenance should continue annually by the NPS Trail Rehabilitation and CRF personnel. Annual monitoring will continue as long as the site is not used for interpretation.

C:13:099 Structure-Thermal Feature Complex Semiannual Schedule

This site contains two loci of fire-cracked rock, buried and collapsed structures and artifacts. Archaeologists identified several charcoal lenses, burned rock features and artifact concentrations. Many of the features are eroding out of the coppice dunes, bisected by a highly active drainage system. The drainage system has uncovered the majority of this site since 1978, evidenced by several newly exposed features recorded by GRCA archaeologists. FY94 monitors recorded Features 6 and 7 eroding from the active drainage. FY95 monitors recorded Feature 8 eroding from the active arroyo. RCMP staff identified two new probable cists eroding from the active arroyo in FY98. RCMP archaeologists tested the probable features in FY99 and did not discover cultural material. Since 1990, RCMP staff discovered numerous lithics and sherds eroding from the active arroyo and scattered throughout the drainage system. An assemblage of forty sherds suggests an Early-mid Pueblo II Puebloan occupation. Lithic evidence from this site includes two mano-like objects, ground to create a knife-like edge, as well as pecked grinding stones and hammerstones. Five charcoal samples were taken from several features on-site in the early 1990s. Dates range from 140 years B.P. to 1410 years B.P. Additional samples taken during data recovery in FY99 show dates as early as A.D. 80. This report is being compiled by NAU.

Previous Work

R. Euler and A. Trinkle-Jones originally recorded the site in 1978. Prior to the implementation of the monitoring program (late 1980s) GRCA conducted excavation and collected samples of a deteriorating feature (Feature 3). The RCMP staff have monitored C:13:099 semiannually since FY93 (Coder et. al

1994;Coder et. al 1995a;Coder et. al 1995b) (Leap et. al 1996) (Leap et. al 1997;Leap et. al 1998) (Dierker et. al 2001;Dierker et. al 2002;Leap and Kunde 2000;Leap et. al 2000). FY94 monitors recommended trail work, installing checkdams, total station mapping and subsurface testing. FY95 monitors recommended trail work, planting vegetation, installing checkdams, subsurface testing, data recovery and total station mapping. In FY95 the GRCA trail crew performed trail obliteration work along the Beamer Trail, which relocated the hiking trail near the river to reduce visitor impacts.

In September 1995 RCMP staff and representatives from state and federal agencies, and tribal entities constructed 44 checkdams at C:13:099 (Leap and Coder 1995). C:13:099 is the first location where Zuni-style checkdams were built in the river corridor. Archaeologists used a photogrammetric map (Hereford et. al 1993)for recording, prior to completion of a total station map in FY97. Each checkdam was photo-documented before and after its construction with 35mm prints and slides. FY96 monitors recommended additional trail work and planting vegetation. Trail obliteration work was completed in FY97. RCMP staff conducted additional monitoring efforts during the research flow of 1996 (Mitigation and Monitoring of Cultural Resources in Response to the Experimental Habitat Building Flow in Glen and Grand Canyons, Spring 1996 1996). FY97 monitors recommended checkdam maintenance and data recovery. FY98 monitors recommended data recovery, planting vegetation and checkdam maintenance. Checkdam maintenance projects were completed in FY97 and FY98 (Leap et. al 1997;Leap et. al 1998). Monitors recommended medium format photography and projects were completed in FY95, FY96, FY98, FY01, and FY02 (Coder et. al 1995b;Dierker et. al 2001;Dierker et. al 2002;Leap et. al 1996;Leap et. al 1998). FY99 monitors recommended trail work, planting vegetation and data recovery. Archaeologists conducted feature excavation and exploratory testing at Features 1, 3, 7, 9 and 10 in FY99. NAU staff will disseminate the results of this project in FY04. FY99 monitors recommended more extensive excavation. This site was also included in the studies conducted by K. Thompson and A. Potochnik (Thompson and Potochnik 2000). During FY2000 CRT river trips it was determined that planting arrowweed and grasses along the side of the trail that borders this site may aid in curtailing increased visitation. No checkdam maintenance was required in FY2000 though minor maintenance was completed in FY01 and in FY03. CRT personnel completed trail obliteration work in the area of the Palisades camp in November 2001. J. Pederson has incorporated the river-based drainages at this site into his GCMRC-sponsored remote sensing project due to be completed in 2003. In May 2003 the FIST trip stopped at this location to assess the eolian processes active here.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Medium Format Photos	03/30/1995
Checkdams	09/15/1995
Trail Work	09/15/1995
Trail Work	04/15/1997
Checkdam Maintenance	02/22/1997
Total Station Map	07/27/1997
Checkdam Maintenance	02/26/1998
Total Station Remap	09/01/1998
Data Recovery	04/17/1999
Checkdam Maintenance	10/16/2000
Plant Vegetation	11/07/2001
Trail Work	11/07/2001
GCMRC Total Station Map	02/17/2002
GCMRC Total Staion Map	9/29/2002
Checkdam Maintenance	03/20/2003

Monitoring Observations Summary

The river-based drainages have been active with alluvially transported sediments in the drainage. FY03 monitoring staff observed bank slump and surface erosion at Feature 3. Feature 1 had active gullying, surface erosion and some downslope movement of sediments. The recommendation for data recovery

continues here. Checkdam monitoring and maintenance will continue annually and the site will be monitored semiannually.

**C:13:100 Pueblo
Annual Schedule**

This site is an open Pueblo II habitation site. Feature 1 is a rectangular habitation room. Feature 2 is another probable habitation room with a possible south entrance; it has standing walls two to three courses high. Adjoining Feature 2 is Feature 3, a small, more difficult to define structure; there may be another room attached to the southwest wall of Feature 3. Features 4 and 8 are probably associated rooms. Both features are exposed in an arroyo, with walls two to three courses high. Features 5 and 6 are the remains of slab-lined cists of Dox Sandstone. A charcoal stain in a trail evidences Feature 7. South of the dwellings is an eroding drainage two meters across and 50 cm deep. Lithics and ceramics are scattered down the slope directly above the drainage. There is a heavy groundstone concentration near Features 5 and 6. Groundstone tools include six manos, four metates/slabs, eight hammerstones, and two sandstone knives. Seven ceramic sherds were also found. During the September 1995 erosion control project, archaeologists located a new feature (Feature 9) consisting of upright Dox Sandstone slabs in an arroyo. FY97 monitors discovered two new features. Feature 10 is a charcoal lens north of Feature 7 and Feature 11 is a circular cist/hearth eroding adjacent to the drainage.

Previous Work

Archaeologists originally recorded C:13:100 in 1978, re-recorded in 1990 by the NPS survey (Fairley et. al 1994). The site was monitored by GRCA archaeologists until FY92. Beginning in FY93, the RCMP staff monitored the site semi-annually, and annually since FY97 (Coder et. al 1994; Coder et. al 1995a; Coder et. al 1995b) (Leap et. al 1997; Leap et. al 1996) (Leap et. al 1998) (Dierker et. al 2001; Dierker et. al 2002; Leap and Kunde 2000; Leap et. al 2000). FY94 monitors recommended revegetation work, trail work, checkdam installation, total station mapping and stabilization. FY95 monitors recommended planting vegetation and trail work due to heavy visitation. The RCMP staff conducted appropriate assessments and in FY95 trail work and checkdam installations were conducted (Leap and Coder 1995). Although planting vegetation was recommended in FY95, the trail work and checkdam installations completed was so effective, no vegetation needed to be planted to further obscure the trails or slow down the erosion in the gullies.

This site received additional monitoring during the research flow of 1996 (Mitigation and Monitoring of Cultural Resources in Response to the Experimental Habitat Building Flow in Glen and Grand Canyons, Spring 1996 1996). FY96 monitors recommended additional trail work. The area received further trail obliteration work in FY97 and surveyors completed a total station map in July 1997. Prior to completion of the total station map, RCMP staff used a photogrammetric topography map to plot additional features (Hereford 1993). Monitors recommended medium format photography and projects were completed in FY95, FY96, FY98, and FY01. FY98 monitors recommended checkdam maintenance, testing and data recovery at Features 5, 6, 7, 9, 10, and 11 before losing more cultural information. The RCMP staff and Zuni Conservation Program staff completed checkdam maintenance in February 1998. FY99 monitors again recommended data recovery at Features 5, 6, 9, and 11. This site was also included in the studies conducted by K. Thompson and A. Potochnik (Thompson and Potochnik 2000). Checkdam maintenance in FY2000 resulted in the alteration of four checkdams.

It was suggested by the GRCA Revegetation crew that intensive planting in this area between the trail and the site occur, filling in the dune with arrowweed and grasses to curtail future visitation. Checkdam maintenance was required in FY2001 though no maintenance was performed because this location is part of the J. Pederson research. CRT personnel transplanted bunch grasses and cacti in the dune area near the camp and completed minor trail obliteration in November 2001. J. Pederson has incorporated the river-based drainages at this site into his GCMRC-sponsored remote sensing project due to be completed in 2003. Minor checkdam maintenance occurred at four checkdams in FY2003. In May 2003 the FIST trip stopped at this location to assess the eolian processes active here.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Surface Analysis Unit	02/26/1994
Checkdams	09/15/1995
Trail Work	09/15/1995
MF Photos	09/15/1995
Trail Work	10/15/1995
Medium Format Photos	02/17/1996
Trail Work	04/15/1997
Total Station Map	07/27/1997
Checkdam Maintenance	02/26/1998
Checkdam Maintenance	10/16/2000
Research	02/17/2002
Research	09/29/2002
Checkdam Maintenance	03/20/2003

Monitoring Recommendations

FY03 monitoring staff observed no change at Features 1, 2, 3, 6, and 7. Feature 5 has alluvial deposition. Features 4 and 8 have active gullying. Feature 10 has minor surface erosion. The river-based drainages have been active, transporting a lot of sediment downstream. Data recovery at Features 5, 6, 7, 8, and 9 continues to be a recommendation, as well as annual checkdam monitoring and maintenance. The site will continue to be monitored on an annual schedule.

**C:13:101 Structure-Thermal Feature Complex
Three-year Schedule**

C:13:101 is a Pueblo II habitation including a structural outline, numerous cist features, and artifacts. The site is situated on a transport slope that is prone to intensive surface runoff. It is also proximal to a major hiking trail and located within 100 meters of a river camp. The site is located in the predam high water zone. This is an open, multiple-feature site with roasting pits, a room, cists, and artifacts eroding out of dunes. It is divided into two loci (A and B). The features in Locus A include one to five or more slab-lined cists comprised of sandstone slabs. Artifacts include a metate and several manos. Ceramics are present, but in small quantities. Lithic flakes are abundant and scattered evenly over the area. A turquoise pendant was found eroding from a dune in the vicinity. Locus B consists of a masonry room and a cluster of grinding implements. Two roasting pits, each about five meters in diameter, are located about 75 meters southeast of the site. Additional artifacts are eroding from the dune base. Ceramics indicate a Late Pueblo I-Early Pueblo II occupation.

Previous Work

This site was initially recorded by Euler and Jones in 1978 and recorded in greater detail by NPS survey personnel in 1990 (Fairley et. al 1994). It was noted in 1978 that a hiker had used slabs from a cist for a modern fire pit. The site was monitored annually between FY93 and FY96 (Coder et. al 1994; Coder et. al 1995a) (Coder et. al 1995b; Leap et. al 1996). The NPS trail crew obliterated the hiking trail that passed through the site in 1993. This has had a very positive effect on the area in general and on the site specifically. Hereford included this site in his geomorphic map of the Palisades area (Hereford et. al 1993). The site was mapped with a total station on a CRF trip in February 2003.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Trail Obliteration	10/01/1993
Total Station Map	02/18/2003

Monitoring Observations Summary

Overall, Locus A is located in sandy alluvial strata so it is very fragile. The vegetation present is comprised mostly of annual grasses so the dunes continue to actively migrate. This area continues to slowly deflate. Locus B is located in a cobbled area, no change was observed. The monitoring schedule has been increased to every three years due to the potential for new cultural material to be exposed in the shifting sand dunes.

C:13:272 Small Structure Biennial Schedule

This is a multi-component site with two separate loci. Locus A consists of two masonry structures (Features 1 and 2) with a sparse scatter of artifacts, and a more ephemeral feature (Feature 3) consisting of a curving cluster of mostly small sandstone rocks eroding out of a deflated area. These rocks seem too small for building elements, but do not look fire-cracked either. Artifacts are generally sparse at this locus, but include sherds, lithics, a metate, a two-handed mano, and a small mano with a beveled face that may also have been used as a knife. Locus B contains two concentrations of sandstone cobbles (Features 4 and 5) that may be hearths and a Sandstone slab wall with a partial Sosi Black-on-White bowl, Feature 6 which was first exposed in FY03. Ceramics suggest a PII occupation.

Previous Work

This site was originally documented by J. Balsom and H. Fairley in 1984 and recorded in greater detail by NPS survey personnel in 1990 (Fairley et. al 1994). The site was monitored annually from FY92 to FY95 (Coder et. al 1994; Coder et. al 1994) ;(Coder et. al 1995a) (Coder et. al 1995b), and biennially from FY96 to the present (Leap and Kunde 2000; Leap et. al 1996) (Dierker et. al 2001). The drainages situated within the site have been studied by geomorphologists (Hereford 1993) (Thompson and Potochnik 2000) and have been mapped on a topographic map using aerial photogrammetry [Hereford, 1993 #20]. In 1991 H. Fairly collected carbon from Feature 5. The dates range from 330+/- 50 to 40+/- 60 B.P. C:13:272 was also one of the sites monitored prior to and after the beach habitat building flow of 1996 (Mitigation and Monitoring of Cultural Resources in Response to the Experimental Habitat Building Flow in Glen and Grand Canyons, Spring 1996; Burchett et. al 1996). Medium format photographic replication began in FY95 and continues today. In FY99 a soil description encompassing the site area was completed by NRCS (Lindsey and Fisher 1999). The Beamer Trail transected the site prior to FY93, adding to the adverse impacts. The GRCA trail and rehabilitation crews rerouted the trail below the site in September 1999. Since then, the old trail has not received much use. Minor trail work in FY02 included disguising old trail offshoots and previously used campsites. The site was mapped with a total station on a CRF trip February 19, 2003 when Feature 6, a wall and ceramic vessel were identified eroding from an active arroyo. A sample was taken for macrobotanical analysis. In May 2003 FIST trip participants visited the site to assess the eolian processes.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Carbon Sample	11/01/1991
Medium Format Photos	02/17/1996
Trail Work	11/17/2001
Total Station Map	02/18/2003
Sample Taken	03/20/2003

Monitoring Observations Summary

Sediments have moved from within Feature 1 and deflation continues to be the only observed impact. Feature 3 has minor surface erosion. Feature 5 has a prickly pear cactus growing in the roaster, though both Features 4 and 5 appear unchanged. Runoff is now being transported along an entrenched trail. The old trail does have vegetation growing in it though water continues to flow in the trail. There is active gullying at Feature 6. This feature will continue to be exposed, as checkdams would not be effective due to the drainage length and lack of eolian or alluvial sediments upstream of the feature. Archaeologists will

continue biennial monitoring and watch Feature 6 for exposure of additional cultural material due to active gullying.

C:13:273 Roaster Complex Annual Schedule

This site consists of four roasting features, a slab-lined cist and two artifact concentrations. The roasting features all contain fire-cracked rock and charcoal. AC-1 includes over 50 items of lithic debitage and about 15-25 ceramic items. AC-2 consists of seven flakes, ten sherds, and one piece of groundstone. Feature 1, a large donut-shaped roasting feature, is similar in morphology to many of the roasters in the western Canyon. Ceramics indicate an early Pueblo I to Pueblo II Puebloan occupation. Radiocarbon dates taken from Feature 5, a roasting feature, may indicate a Basketmaker III occupation. Conventional radiocarbon ages received are 1360+/-50 BP and 1390 +/- 60 BP.

Previous Work

Archaeologists recorded the site in 1990 (Fairley et. al 1994) and the RCMP staff have monitored it in FY93, and annually since FY95 (Coder et. al 1994; Coder et. al 1995b; Coder et. al 1995b; Dierker et. al 2001; Dierker et. al 2001; Dierker et. al 2002; Dierker et. al 2002; Leap et. al 1997; Leap et. al 1996; Leap et. al 1998; Leap et. al 1998; Leap et. al 2000). FY95 monitors recommended stabilization and retrailing. In FY95 RCMP staff conducted archaeological clearance work prior to a GRCA trail crew retrailing project (Leap 1995b). FY96 and FY97 monitors recommended stabilization for Feature 3 due to its precarious location on the edge of an active drainage. FY97 monitors recommended data recovery for Features 3 and 5. In FY97 surveyors mapped the site with a total station instrument, RCMP staff conducted a data recovery assessment and archaeologists excavated Feature 5 (Yeatts 1998). FY99 monitors obliterated an access trail from the side canyon that directly impacted Feature 4. Because the Beamer Trail bisects the site, access and visitation are continued impacts. The GRCA trail crew maintains the trail in this area. In May 2003 the FIST trip stopped at this location to assess the eolian processes active here. A white ashy lens extending towards the river was observed and a sample was collected. The sample will be sent to the NAU volcanology lab. FIST trip members speculated the lens might be volcanic.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Test for Compliance	11/08/1994
Trail Work	02/26/1995
Total Station Map	08/30/1996
Data Recovery	02/23/1997
Trail Work	02/25/1999
Volcanic Sample	05/10/2003

Monitoring Recommendations

FY03 monitoring staff observed minor surface erosion and increased vegetation at Feature 4. Bank slump is actively receding back the cut bank at Feature 3. Data recovery is recommended because Feature 3 may slump in. Some slump adjacent to the fire-cracked rock has occurred recently. Features 1 and 2 appear unchanged. NPS trail maintenance will continue. Because Feature 1 is located next to a heavily used trail, annual site monitoring will continue. There is the potential for the exposure of additional cultural material at Feature 3.

C:13:291 Small Structure Annual Schedule

The site consists of standing walls of several structures and Dox Sandstone cists. Feature 1 is a two-meter long wall with a juniper post just downslope. Feature 2 was a slab-lined cist with a room exposed in a cutbank. FY95 monitors noted that Feature 2 was completely obliterated by the river-based arroyo. Feature 3 is an exposed wall and room outline in a gully. Feature 4 is a hearth or cist. Feature 5 is a cluster of Dox slabs that may be coursed. Artifacts include nineteen sherds and lithics, including a chopper, a hammerstone, and a bi-edge tool. Sediment and slope wash cover the site to a depth of more than one meter in some areas. Apparently the site was constructed on a terrace, and has since been covered

periodically by slope wash and fluvial sand. It has been postulated that large debris from upstream temporarily blocked off river flow to this location and when the debris flow was breached, large amounts of deposition occurred at this location (T. Melis personnel communication 2003). During the initial recording in 1988 a metate and mano were measured, documented and relocated in a more stable area on site. FY96 monitors discovered a Tusayan Whiteware/Sosi Black-on-White sherd below Feature 3. Artifacts indicate a Mid-late Pueblo II occupation. M. Yeatts located feature 6, a cist, during a total station mapping project in FY97. Feature 7, a wall with charcoal was located by RCMP monitoring staff in FY02.

Previous Work

Archaeologists originally recorded the site in 1988 and again in 1990 (Fairley et. al 1994). The RCMP staff monitored the site annually since FY92 (Coder et. al 1994;Coder et. al 1995a;Coder et. al 1995b;Coder et. al 1995b;Coder et. al 1994;Dierker et. al 2001;Dierker et. al 2001;Dierker et. al 2002;Dierker et. al 2002;Leap and Kunde 2000;Leap et. al 1997;Leap et. al 1996;Leap et. al 1998;Leap et. al 1998;Leap et. al 2000;Leap et. al 2000). Monitors recommended checkdams and total station mapping in FY94, but after further assessment, the RCMP staff and Zuni conservators concluded that the drainages were too mature for checkdams. FY95 monitors recommended some form of stabilization for Features 1 and 4. During the research flow of 1996, visitors created a trail through the site on their way to Unkar Delta. The research flow created extensive cutbank erosion below the site, obliterating the formerly used trail. The RCMP staff obliterated the newly created trail in FY97, at which time a total station map was completed. An additional effort included medium format photography during the research flow (Mitigation and Monitoring of Cultural Resources in Response to the Experimental Habitat Building Flow in Glen and Grand Canyons, Spring 1996 1996). FY98 monitors recommended testing, data recovery, radiocarbon samples, and dendrochronology samples. FY99 monitors recommended data recovery for Features 1, 4 and 5, and continued trail maintenance. Minor trail maintenance was conducted in FY99. RCMP staff could not collect charcoal from the site in FY99 due to the charcoal disappearance through intensive erosion. This site was also included in the studies conducted by K. Thompson and A. Potochnik (Thompson and Potochnik 2000). Continued on-site trailing has been attributed to river-runners walking from a nearby camp to the Unkar Delta. In FY2000 the GRCA Revegetation crew planted seedlings in the area above Feature 5. CRT personnel rerouted the trail below the site, near the river in December 2000. Orthographic photos from the NPS may enable better measurements to understand bank retreat rates. A carbon sample was collected from Feature 7 in March 2003. The FIST trip stopped here to assess eolian processes in May 2003.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Medium Format Photos	02/20/1996
Trail Work	04/17/1997
Total Station Map	07/30/1997
Trail Work	02/27/1999
Data Recovery	02/27/1999
Plant Vegetation	02/01/2000
Trail Work	12/09/2000
Carbon Sample	03/21/2003

Monitoring Observations Summary

FY03 monitoring staff observed continued active gullying at Feature 3. Features 1 and 4 also have active arroyo cutting. Rill activity is present above Feature 6, though the feature appears stable. Feature 7 is more exposed in the cutbank. RCMP archaeologists recommend annual maintenance for the trail below the site. Data recovery continues to be recommended for Features 1, 3, 4 and now for Feature 7 also. Annual monitoring will continue.

C:13:321 Roaster Complex Annual Schedule

This site consists of four roasting features and a rubble mound of Dox Sandstone. The rubble mound may be associated with a historic cabin (C:13:092) located south of the site. Ceramics, fire-cracked rock and

shaped Dox Sandstone "lid" were found on-site. Over thirty flakes are present in the roasting features, as well as groundstone including four mano fragments and two cobbles. The Puebloan ceramics indicate a timeframe of AD 1050-1200, though specific cultural affiliation remains undetermined. In FY03 an olivella or connas shell that had been modified on two sides was found and reburied on the FIST trip in May 2003. This site may be associated with C:13:009.

Previous Work

Archaeologists originally recorded the site in 1989 and re-recorded on the GRCA river survey. GRCA personnel monitored it until transferred to the RCMP. The RCMP staff have monitored the site annually since FY93 (Coder et. al 1994; Coder et. al 1995a) (Coder et. al 1995b) (Leap et. al 1996) (Dierker et. al 2001; Dierker et. al 2002; Leap and Kunde 2000; Leap et. al 1997; Leap et. al 1998; Leap et. al 2000). FY94 monitors recommended total station mapping and radiocarbon dating of Feature 5. FY95 monitors recommended mapping, testing and stabilization of Feature 5 in FY95. This site was one of three sites selected for data recovery prior to the research flow in 1996. RCMP staff conducted excavation at Feature 4, the only feature that would have been impacted by the flood. After excavation, the RCMP staff determined that Feature 4 had no subsurface deposits (Mitigation and Monitoring of Cultural Resources in Response to the Experimental Habitat Building Flow in Glen and Grand Canyons, Spring 1996 1996). Monitors also took medium format photography before and after the flood (Leap 1995b). These photos were replicated in FY00. See Hereford (Hereford 1993) for photogrammetric mapping used prior to the completion of a total station map of the site in FY97. FY97 and FY98 monitors recommended continued close monitoring of Feature 5 due to ongoing erosion. Data recovery has also been recommended at this vulnerable feature. This site was also included in the studies conducted by K. Thompson and A. Potochnik (Thompson and Potochnik 2000). The FIST trip stopped here to assess eolian processes in May 2003.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Surface Analysis Unit	02/28/1994
Test	02/18/1996
Medium Format Photos	02/18/1996
Total Station Map	09/01/1996

Monitoring Observations Summary

Eolian erosion continues to be observed at all features with the exception of Feature 2 where eolian deposition has been observed. Feature 5 continues to be undercut and data recovery of this feature is still recommended. Annual monitoring will continue.

C:13:322 Rock Art

NPS River Patrol –Annual Schedule

This site consists of six faint images pecked into a Dox Sandstone overhang. There are three letters also pecked into the wall above the elements that are likely modern graffiti, though there is no record of the history of this incident. A fire feature and lithics were found in association with the pictographs. The site is considered to be Pueblo I-III Formative.

Previous Work

The site was originally recorded as a pictograph panel in 1989. The river corridor survey incorporated the fire feature and lithics into the site boundary in 1990 (Fairley et. al 1994). The site was monitored by RCMP staff in FY94, FY96, FY98, and FY99 (Coder et. al 1995a) (Leap et. al 1996) (Leap et. al 1998) (Leap et. al 2000). A medium format photograph was taken of the site during the 1996 Beach Habitat Building Flow (Mitigation and Monitoring of Cultural Resources in Response to the Experimental Habitat Building Flow in Glen and Grand Canyons, Spring 1996 1996).

Summary of RCMP Work Implemented

Remedial Action	Date Completed
MF Photos	02/18/1996

Monitoring Data Summary

No physical impacts were observed. This site is well protected from natural elements. No new visitor-related disturbances were observed. The incised letters are still present. It is recommended that they be removed as soon as possible if it is determined that it is not recent. It is also suggested that this site be placed on the inactive list and only monitored by archaeologists before and after experimental floods higher than 45,000 cfs. GRCA River Patrol will visit the site annually to check on any ARPA violations.

C:13:327 Roasting Feature Biennial Schedule

This is a campsite consisting of several fire features, concentrations of lithic debris, bone, and a single Moenkopi corrugated sherd. The site is situated on the edge of a high alluvial cutbank. It is also adjacent to the Hance-Tanner Trail. A roasting feature, slab-lined hearth, a 5 meter diameter lithic concentration which may be associated with the roasting feature, and charcoal lenses in adjacent arroyo cuts were discovered during geomorphologic research activities on-site.

Previous Work

The site was originally recorded in 1990 (Fairley et. al 1994) and monitored in FY96, FY98, and FY01 (Leap et. al 1996) (Dierker et. al 2001; Leap et. al 1998). NPS personnel conducted test excavations in conjunction with trail work in 1992. Carbon samples taken at this time date the site from the late Archaic age through the 16th century, indicating multiple use of the area. This site is included in the Hereford et al. topographic map of the Tanner region (Hereford 1993). Retrailing took place during FY96 and obliteration of the old trail occurred in FY97 (Leap et. al 1997; Leap et. al 1996). Checkdams were recommended in FY96 and an assessment for stabilization was conducted prior to construction of three checkdams and terrace fortification in FY97 (Leap et. al 1997). Total station mapping occurred in FY97 upon completion of stabilization work (Leap et. al 1997). In FY99 the Zuni Conservation Project staff performed maintenance on one checkdam (Leap and Kunde 2000). This site was also included in the studies conducted by K. Thompson and A. Potochnik (Thompson and Potochnik 2000). No checkdam maintenance was required in FY03.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Carbon Sample	1992
Total Station Map	02/22/1997
Checkdam Installation	02/24/1997
Trail Work	11/01/1996
Trail Work	02/18/1996
Checkdam Maintenance	11/13/1998

Monitoring Observations Summary

The gully has become a river-based drainage with a large nick point over one meter in depth. The checkdams in this drainage are gone. The dune at Feature 1 has retreated 2 to 3 feet and bone continues to be exposed. Feature 2 has eolian deposition and less vegetation. RCMP staff will continue annual checkdam monitoring and maintenance as well as biennial site monitoring.

C:13:336 Thermal Feature Biennial Schedule

This site consists of two concentrations of lithics and sherds, a possible hearth and a roasting feature. A cobble alignment eroding out of a dune may be the remnants of a possible structure. FY94 monitoring staff recorded a new artifact concentration, Feature 4, not recorded during the survey. C:13:336 is a Puebloan occupation site located within the predam highwater zone adjacent to the Beamer Trail. The site is situated less than four meters above the current 28,000 cfs level. This site is located in the vicinity of the Palisades Complex on an alluvial terrace proximal (48 m) to the river. A veneer of reworked sand covers the surface of the terrace and the site can be seen in the deflated areas between the low dune crests. The Beamer Trail

also transects this site adding in some unspecified degree to the adverse impact. C:13:336 is within the boundaries of the USGS (Hereford 1993) geomorphologic study.

Previous Work

The site was originally recorded in 1986 and mapped in 1990 (Fairley et. al 1994). This site has been monitored in FY92, FY94, FY96, and FY98 (Coder et. al 1995a;Coder et. al 1994) (Leap et. al 1996;Leap et. al 1998). Checkdam installation, recommended in FY96 was assessed in FY98. Five checkdams were constructed in FY98. Trail obliteration work is on going by the GRCA Rehabilitation Trail Crew. A total station map was produced on a CRF river trip in February 2003. No checkdam maintenance has occurred since FY00.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Checkdam Installation	11/12/1998
Checkdam Maintenance	10/16/2000
Total Station Map	02/18/2003

Monitoring Observations Summary

FY92, FY94 and FY03 monitoring staff observed incremental downcutting in the gullies at this site. The gully that intersects the artifact concentration has experienced some increased deflation and widened between FY96 and FY98. In FY03 new nick points and three new channels were observed. The features appear unchanged though annual checkdam monitoring and maintenance will continue. Biennial site monitoring will continue as the downcutting of the gully may expose additional cultural material.

C:13:339 Small Structure Annual Schedule

The site consists of a mid-late Pueblo II habitation buried on an alluvial terrace, comprised of a burned rock midden, a buried hearth, a shrine, and several rock alignments. The burned rock midden, with sparse lithics and ceramics, is located on the north side of the site. It is eroding out of a cutbank. Two historic hearths are also located on-site. The site is situated against a Dox Sandstone cliff.

Previous Work

The site was originally recorded in 1990 (Fairley et. al 1994) and monitored in FY93, and annually since FY95(Coder et. al 1994;Coder et. al 1995b) (Leap et. al 1996) (Leap et. al 1997) (Dierker et. al 2001;Dierker et. al 2002;Leap and Kunde 2000;Leap et. al 1998;Leap et. al 2000). Retrailing was conducted (Leap 1994) along with total station mapping in September 1998. Mitigation was proposed for this site in FY95 (Leap 1994). This site was included in the studies conducted by K. Thompson and A. Potochnik (Thompson and Potochnik 2000). Human impacts observed during the survey included distinct trails, trail caused erosion, and rearrangement of rocks. The Beamer Trail intersects this area down to a lower terrace.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Data Recovery	11/08/1994
Trail Work	02/01/1995
Total Station Map	10/14/1997

Monitoring Observations Summary

FY03 monitoring staff observed the collapse of large slabs at Feature 4 due to deflation and surface erosion. The left site of the feature is slumped in. Feature 5 has surface erosion and deflation. The gully at Feature 2 has widened and threatens the feature. Feature 1 has minor surface erosion. Feature 6 has increased vegetation. The NPS Rehabilitation Crew will continue annual trail maintenance. Data recovery

is recommended for Features 4 and 5 before integrity is lost. Annual site monitoring will continue for newly exposed material.

**C:13:346 Small Structure
Three-year Schedule**

This is a storage site with an associated artifact scatter consisting of four slab-lined cists, over 100 PII sherds, and many lithics. The site is located on an alluvial terrace. According to Fred Nials (personal communication, 2001), the site is located on a small alluvial fan with the distal end cut off by a flood that removed the toe of the fan and alluvial deposits acquired at that time. The dunes are changing the course of the gullies and this will likely continue. The dunes are protecting the site but these dunes also continue to migrate and diminish.

Previous Work

The site was initially recorded by NPS survey personnel in September, 1990 (Fairley et. al 1994) and monitored in FY96, FY99, and FY01 (Leap et. al 1996) (Leap et. al 2000); (Dierker et. al 2001). The site was assessed for erosion control in FY96 and FY97. In FY97, nine checkdams were constructed by the Zuni Conservation Project personnel and a total station map was completed (Leap et. al 1997). Minor alteration of four checkdams by the Zuni team occurred in FY99 (Leap et. al 2000). No checkdam maintenance was required in FY00. The site is part of a GCMRC-sponsored checkdam research project conducted by J. Pederson with results due in 2003. Five brush checkdams were rebuilt in FY03. In May 2003 the FIST trip stopped at this location to assess the eolian activity.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Checkdam Installation	02/24/1997
Total Station Map	02/24/1997
Checkdam Maintenance	11/13/1998
Research	02/19/2002
Research	9/30/2002
Checkdam Maintenance	03/21/2003

Monitoring Observations Summary

The drainages have been extremely active and all of the checkdams have failed since last monitored. There appears to be some wood eroding from the drainage that is not associated with previous checkdams. This wood may be part of a structure as it is not mesquite from the surrounding area. RCMP staff will continue annual checkdam maintenance and monitor the site every three years. The drainages are actively downcutting with the presence of new nick points. There is the potential for additional artifacts to be exposed.

**C:13:347 Small structure
Annual Schedule**

This site consists of a masonry room and metate eroding out of a steep arroyo. Artifacts observed on-site include a serpentine pipe fragment and a large Black Mesa Black-on-White sherd identified by monitoring staff since initial recording of the site. No other artifacts have been exposed.

Previous Work

Archaeologists recorded the site in 1990 (Fairley et. al 1994) and the RCMP staff monitored it in FY92 and FY93, and annually since FY95 (Coder et. al 1994; Coder et. al 1995b; Coder et. al 1994; Leap et. al 1996) (Dierker et. al 2001; Dierker et. al 2002; Leap and Kunde 2000; Leap et. al 1997; Leap et. al 1998; Leap et. al 2000). FY94 monitors discovered a serpentine pipe bowl fragment eroding from the arroyo next to the wall. Monitors collected the pipe bowl fragment and curated it at the South Rim in FY94. FY95 monitors discovered a Black Mesa Black-on-White sherd eroding from the same location. FY96 monitors conducted medium format photography before the research flow and recommended checkdam installation and data recovery. FY97 monitors recommended data recovery, testing and installing checkdams. ZCP staff and

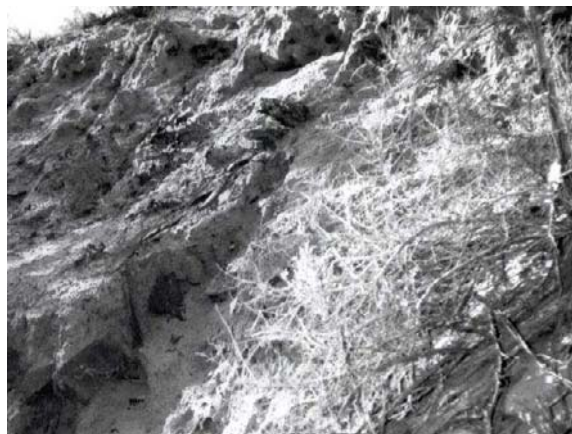
RCMP staff assessed the site for preservation action in FY97 and determined that data recovery was appropriate. Surveyors completed a total station map for this site in FY97 (Leap et. al 1997). FY98 monitors recommended data recovery before more artifacts and information was lost. RCMP staff conducted exploratory testing in FY99 to determine if the exposed wall continued into the arroyo cutbank. Testing indicated that the wall does extend into the dune and that cultural materials are still intact. A report on the findings is still in progress. The large Black Mesa Black-on-White sherd was collected during exploratory testing in FY99 due to its vulnerable position in the arroyo. RCMP archaeologists have recommended more extensive data recovery since 1998. The FIST trip stopped here to assess eolian processes in May 2003.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
MF Photos	02/19/1996
Total Station Map	04/25/1997
Test for Feature Significance	02/26/1999

Monitoring Data Recommendations

FY03 monitoring staff observed that more sections of the wall are being exposed. In addition to the east-west wall originally recorded, now a wall running north south has been exposed. Approximately two to three courses are exposed on the new portion of the wall as shown in Figure 5. The erosion is caused by slump from the downstream slope of the drainage and undercutting from below in the absence of flood deposits in the mouth of this drainage. The drainage is widening. Excavation continues to be recommended. Annual monitoring will continue.



(a)



(b)

Figure 5. Site C:13:347, partial wall exposure in 12/1990, (b) the same wall in 3/2003.

C:13:348 Artifact Scatter Biennial Schedule

The site consists of a moderate to high-density artifact scatter with jacal fragments suggesting buried, perhaps burned, structures. An estimated 75-100 sherds and 50-75 lithics are eroding out of alluvial deposits, somewhat concentrating into two main areas. The largest concentration contains the jacal fragments. Lithics reflect a light, unstaged reduction strategy, using primarily medium to coarse-grained materials. A few groundstone items were also noted. A wide variety of sherd types are present suggestive of a Late PII-early PIII occupation. The site was evidently used for habitation. According to F. Nials (personal communication, 2001), the site is located on a small alluvial fan of eolian-transported sands on top of gravels. A flood that removed the toe of the fan and alluvial deposits acquired at that time has cut off the distal end. The dunes are changing the course of the gullies and this will likely continue. The dunes are protecting the site but these dunes also continue to migrate and diminish.

Previous Work

The site was initially recorded in September, 1990 by NPS survey personnel (Fairley et. al 1994) and monitored in FY96, FY98, and FY01 (Leap et. al 1996) (Leap et. al 1998); (Dierker et. al 2001). In FY96 it was recommended that the gullies be stabilized with brush linings to protect the buried remains from eroding down the drainage. Installation of five checkdams was completed in FY97 along with a total station map (Leap et. al 1997). Minor maintenance work was conducted on the checkdams in FY99 (Leap and Kunde 2000). No checkdam maintenance was required in FY2000. In FY01 Fred Nials (personal communication 3/29/2001) stated that there would be little erosion here due to the substrate and little downcutting would occur. Nials stated that only minimal deposition would occur above the checkdams. This site was part of the GCMRC-sponsored checkdam research conducted by J. Pederson with results due in 2003. Total station maps were made in February and September 2002 as part of the Pederson research project to evaluate the effectiveness of brush checks. Checkdam maintenance was required in March 2003. Three brush checkdams were rebuilt and one new brush lining was constructed. In May 2003 the FIST trip stopped at this location to assess the eolian activity.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Checkdam Installation	04/16/1997
Total Station Map	04/24/1997
Research	02/19/2002
Research	09/29/2002
Checkdam Maintenance	03/21/2003

Monitoring Observations Summary

FY03 monitoring staff observed active gullying and exposure of new artifacts adjacent to the northern artifact scatter. Data recovery should be considered at the northern artifact scatter as new artifacts are being exposed in the headcut of the drainage. RCMP staff will continue annual checkdam monitoring and biennial site monitoring.

C:13:349 Historic Structure/Prehistoric Component Annual Schedule

This multi-component site consists of a historic cabin/dugout, fire-cracked rock, and artifacts. No artifacts indicating function were found in association with the structure. The prehistoric components are both pre-ceramic and PI-II Puebloan. Charcoal fragments were observed below the structure in a drainage but appear to pre-date the use of the historic structure. There are eight remaining wood pieces to the historic structure. The back of the structure, consisting now of just one foundation pine plank, is banked against a dune. The prehistoric fire-cracked rock midden/roasting pits have good assemblages of sherds and lithics, but no formal tools were noted. The site is located in mesquite-anchored dunes. New charcoal lenses and fire-cracked rock have been exposed since the initial recording of the site.

Previous Work

The site was originally recorded in 1990 (Fairley et. al 1994). Annual monitoring began in FY93(Coder et. al 1994;Coder et. al 1995a;Coder et. al 1995b;Leap et. al 1996) (Leap et. al 1997) (Dierker et. al 2001;Dierker et. al 2002;Leap and Kunde 2000;Leap et. al 1998;Leap et. al 2000).

A profile was examined at this site to better understand flood and debris flows along the terrace (Hereford 1993) and incorporated into the Lower Tanner section of that report. The site was photographed with a medium format camera in FY96, FY97, and FY98 (Leap et. al 1997;Leap et. al 1996;Leap et. al 1998). A total station map of the site was completed in 1997 and the site was remapped in September 1998. The Zuni Conservation Program in FY97 assessed the site for stabilization. Stabilization was determined to be inappropriate at this location due to the maturity of the arroyo. Feature 2 was completely excavated in FY99 (Kunde 1999). The report detailing the results will be disseminated upon completion of artifact analysis by NAU. This site was also included in the studies conducted by K. Thompson and A. Potochnik

(Thompson and Potochnik 2000). In May 2003 the FIST trip stopped at this location to assess eolian activity and a carbon sample was collected from a non-cultural lens.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Carbon Samples	03/25/1992
MF Photos	02/18/1996
MF Photos	02/24/1997
Total Station Map	06/08/1997
MF Photos	03/01/1998
Data Recovery	02/01/1999
Carbon Sample	05/10/2003

Monitoring Observations Summary

FY03 monitoring staff observed increased vegetation and eolian deposition at Feature 3. Increased vegetation was observed at Feature 1, otherwise no change. The arroyo is filling in with eolian deposition. Minor downcutting was also observed. Annual site monitoring will continue.

**C:13:363 Small Structure
Inactive Schedule**

This site is in a rockshelter at the base of the exposed Shinumu Quartzite. It contains the remains of two small, standing, side walls that are four to five courses high and dry-laid. The large amount of rock fall in front of the shelter probably functioned as another "wall". A large corrugated sherd and a single one-handed sandstone mano were the only cultural artifacts on-site. A small piece of wood in the corner of the shelter was obviously imported. The single sherd suggests a late Pueblo II-early Pueblo III cultural affiliation.

Previous Work

NPS personnel recorded this site in 1991 (Fairley et. al 1994), and it was monitored in FY97 (Leap et. al 1997). No additional RCMP work has been implemented.

Monitoring Observations Summary

No physical impacts occurred since the survey, although packrat feces are abundant. Human disturbances were also not observed. The site was unchanged from 1991 through 2003. As no physical impacts threaten the integrity of this site, it will be placed on the inactive monitoring schedule.

**C:13:371 Structure-Thermal Feature Complex
Annual Schedule**

This is a mid-late Pueblo II Puebloan habitation area with a possible reoccupation in proto historic time. The site is situated on a debris fan and on both sides of an unnamed side canyon. It consists of several rockshelters, some with dry-laid masonry walls, possible room rubble, several fire-cracked rock concentrations, and a lithic/ceramic scatter. Feature 1 consists of two small rock overhangs each with two to three course dry-laid masonry walls, possibly the remains of storage features. Features 2, 3, and 4 are fire-cracked rock concentrations. Feature 5 is an architectural unit consisting of two rooms. Feature 6 consists of two fire-cracked rock concentrations, one three meters in diameter and the other three by five meters with artifacts. Feature 7 is a fire-cracked rock scatter with a few artifacts. In general, each fire-cracked rock area has at least some artifacts associated with it. FY97 monitors found a Tapeats Sandstone mano below Feature 6. An overhang shelter with roasting feature was also identified on the talus slope above the site. Redwall and Kaibab Chert flakes are in the overhang and charcoal is present inter-mixed in the roaster with fire-cracked rock.

Previous Work

Archaeologists recorded the site in 1990 (Fairley et. al 1994) and the RCMP staff monitored it at least annually since FY92 (Coder et. al 1994; Coder et. al 1995a; Coder et. al 1995b; Coder et. al 1994) (Leap et.

al 1996) (Leap et. al 1997).(Leap et. al 1998;Leap et. al 2000) (Leap and Kunde 2000) (Dierker et. al 2001) (Dierker et. al 2002). Monitors recommended a combination of data recovery, testing, planting vegetation, and installing checkdams since FY94 (Leap and Kunde 2000;Leap et. al 1997;Leap et. al 1996;Leap et. al 1998;Leap et. al 2000). FY94 monitors recommended total station mapping and collecting charcoal. In FY95 monitors recommended checkdams and planting vegetation. In FY96 Zuni Conservation Program staff, GRCA trail crew, and RCMP personnel constructed three checkdams adjacent to Features 3 and 5 (Leap et. al 1996). FY96 monitors assessed the site for planting vegetation and decided that none would be planted. FY96 monitors collected charcoal from Features 2 and 4. Radiocarbon dates with a 2 sigma, 95% probability indicate Feature 2 dates ranging between AD 1665 and 1950 and a Feature 4 age range between AD 1445 and 1655 (Leap et. al 1998). Prior to the research flow of 1996, Feature 8 was tested for subsurface deposits. The results showed that Feature 8 was the remains of a debris flow (Mitigation and Monitoring of Cultural Resources in Response to the Experimental Habitat Building Flow in Glen and Grand Canyons, Spring 1996 1996). In FY96 the site was mapped with a total station instrument and medium format photos were taken before and after the Beach Habitat Building Flow (BHBF) research flow (Leap et. al 1996). FY98 monitors recommended testing Feature 6 and 7, collecting a charcoal sample at Feature 3 and full data recovery of Feature 2. FY98 monitors replicated medium format photos taken during the 1996 research flow (Leap et. al 1998). Zuni Conservation Program staff completed checkdam maintenance at Checkdam 2 in FY99. FY99 monitors noted that Checkdams 1 and 3 were in stable condition. FY00 monitors replicated medium format photographs taken prior to and following the 1996 research flow. Shoreline photographs continue to be duplicated annually. No checkdam maintenance was required in FY00 or FY01. Minor checkdam maintenance was completed in FY02. No checkdam maintenance was required in FY03. In May 2003 the FIST trip stopped at this location to assess the eolian processes.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Total Station Map	01/01/1996
Test for Feature Significance	02/17/1996
Checkdam Installation	02/17/1996
Carbon Samples	02/17/1996
MF Photos	02/17/1996
MF Photos	04/27/1996
MF Photos	04/18/1998
Checkdam Maintenance	11/11/1998
Checkdam Maintenance	04/26/2002

Monitoring Observations Summary

FY03 monitoring staff observed the gully at Feature 2 continues to incise and downcut. The gully at Feature 5 is minorly active with movement of debris in drainage. Feature 4 continues to slump. Features 3, 6, and 7 are unchanged. Data recovery continues to be recommended for Features 2 and 3. RCMP staff will continue annual checkdam monitoring and maintenance. Monitoring frequency was reduced from semi-annual to annual.

C:13:381 Thermal Feature Inactive Schedule

C:13:381 consists of a heavily eroded fire feature, lithics, and a burned artiodactyl bone. Artifacts found within the vicinity of the hearth include a projectile point tip, a biface fragment, fire-cracked rock, and a few flakes. Cultural affiliation is not known.

Previous Work

GRCA personnel recorded the site in March 1991 (Fairley et. al 1994). The RCMP staff monitored the site in FY92, FY93, FY94, and FY96 (Coder et. al 1994;Coder et. al 1995a;Coder et. al 1994) (Leap et. al 1996). Monitors recommended checkdam installation and stabilization in FY96. A total station map was completed in FY97. The site was assessed in FY97 and Zuni Conservators personal constructed three

checkdams in the river-based drainage. Checkdam 1 received minor maintenance in FY98. Checkdams 1 and 2 received maintenance in FY99. No checkdam maintenance was required in FY03.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Total Station Map	02/24/1997
Checkdam Installation	02/25/1997
Checkdam Maintenance	04/24/1998
Checkdam Maintenance	11/14/1998
Checkdam Maintenance	04/20/2000
Checkdam Maintenance	10/18/2000
Trail Work	04/28/2002
Checkdam Maintenance	03/21/2003

Monitoring Observations Summary

Due to heavy rains, the gully was active in FY03 but only minor displacement of checkdam rocks occurred. No work is recommended. Annual checkdam monitoring and maintenance will continue.

C:13:385 Small Structure

Biennial Schedule

C:13:385 is a 12th century Puebloan habitation site consisting of two slab-lined features and associated artifacts dominated by Kayenta ceramics with chipped stone and hand tools, groundstone, and shaped slabs. The site is located on an alluvial terrace with an eolian component present on the surface.

Previous Work

This site was initially recorded in April 1991 (Fairley et. al 1994) and was monitored in FY93, FY94, FY95, FY99, and FY01 (Coder et. al 1994; Coder et. al 1995a) (Coder et. al 1995b); (Leap et. al 2000) (Dierker et. al 2001). A surface analysis unit was placed at this site in FY94, however, these units were discontinued by the project in FY96 (Leap et. al 1996). A total station map was produced on a CRF trip in February 2003. The FIST trip stopped here to assess eolian processes in May 2003.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Total Station Map	02/21/2003

Monitoring Observations Summary

FY03 monitoring staff observed minor surface erosion at Features 1 and 2. Though annual grasses appear to have stabilized the terrace, the features are very vulnerable due to their location on a steep slope. Because of the high potential for the discovery of new cultural material due to slope retreat, biennial monitoring will continue.

C:13:386 Small Structure

Semiannual Schedule

The site consists of a slab-lined cist, a structure consisting of two upright sandstone slabs with a two-handed mano and trough metate. A pecked stone is also present. Feature 3 is a rubble mound with ceramics. A pot cache consisting of two Deadmans Black-on-Red partial bowls, a Sosi Black-on-White ladle, and seed bowl have eroded from a dune between the cist and the activity area. The site dates around A.D. 1050 -1100 based on the presence of the ceramic types. The site is on a dune slope just above the mesquite and driftwood zone. Eolian erosion continues to uncover more cultural material. Structure 2 consists of two upright Dox Sandstone slabs at the base of a Dox outcrop overlooking the dune where Structure 1 is located. There are no other slabs in the area and the positioning of the two slabs parallel to one another suggests they are a cultural manifestation, likely the remains of a structure. While recording Structure 2, an artifact concentration was observed five meters west of the structure. Artifacts include a

two-handed mano, a sandstone metate, one upright Dox Sandstone slab, and a hammerstone. This concentration area also overlooks the dune where the cist and ceramic vessels are located.

Previous Work

This site was originally recorded in 1991 (Fairley et. al 1994) and monitored in FY93, FY94, FY96, FY98 and then semiannually beginning in FY00 after discovery of the vessels (Coder et. al 1994; Coder et. al 1995a) (Leap et. al 1996) (Dierker et. al 2001; Dierker et. al 2002; Leap and Kunde 2000; Leap et. al 1998). During the course of their geomorphological investigations, K. Thompson and A. Potochnik identified the first exposed vessel eroding from a dune in a region not known to be actively eroding. Thompson and Potochnik reported their find and a vague location of where the vessel was located. On the RCMP 2000-1 river trip, two archaeologists and three monitoring assistants stopped to identify the location and classification of the vessel. The newly identified bowl was photographed with black and white and color slide film and left in the position in which it was found. In addition to the bowl, a mano and 2 sandstone slabs were identified with the vessel.

Less than 30 days later, this site was monitored during the 2000-2 river trip. Archaeologists discovered the bowl had eroded down the dune and fallen into the drainage at the base of the dune. A large amount of sand had also eroded from the dune face to reveal additional slabs, what appeared to be the other portion of the Deadmans Black-on-Red bowl and a complete Sosi Black-on-White ladle. The fragile context of these vessels (sitting fully exposed on the dune) and the rapid nature in which the erosion occurred caused the archaeologists to rebury the two vessels, on-site, away from the dune edge in a more stable location. Prior to reburial, the vessels were photographed with color slide and black-and-white film with scale.

Discovery of the two ceramic vessels has allowed the RCMP to identify cultural affiliation of the site as Kayenta Puebloan and the occupation date to be approximately AD 1050 – 1100. This has contributed greatly to a better understanding of occupations of this terrace along the river corridor. Function of the site can also be inferred from the presence of food processing tools.

Monitoring in FY02 lead to the discovery of human remains eroding from the same dune face where the ceramic vessels were located. NAGPRA affiliation letters were sent to all PA tribes, initiating the NAGPRA process. In April 2002, monitoring staff and one member each from the Pueblo of Zuni and the Paiute Tribe assessed the erosion of the burial. Logs and brush were placed over the burial in an attempt to decrease further eolian erosion by trapping sediments. A total station map of the site was produced on a CRF trip in February 2003. The FIST trip stopped here to assess eolian processes in May 2003. A carbon sample was taken from the area May 12, 2003 though not directly within the site boundary.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Stabilized dune	11/08/2001
Stabilized dune	04/28/2002
Total Station Map	02/21/2003

Monitoring Observations Summary

The burial was further exposed and brush used to stabilize the slope has slumped down since last monitored. The arroyo below the burial is active. Structure 1 has increased eolian deposition and surface erosion. Structure 2 appears unchanged. The risk for continued exposure of cultural materials is high. Semiannual monitoring and consultation with tribal members will continue.

G:03:003 Roaster Complex Annual Schedule

The rockshelter (Feature 1) was originally recorded by G. Gumerman and R. Euler on 9/4/69, and the GRCA survey crew added four roasting features (Features 2-5) in 1991 (Fairley et. al 1994). Feature 1 is a shallow overhang and midden. There is a large amount of lithic debris, including obsidian flakes, an Elko base, a biface tip, and groundstone fragments. Charcoal, ashy soil, and fire-cracked rock are also present. Ceramics suggest both late Pueblo I to early Pueblo II Formative and late prehistoric-early historic Pai

affiliations. The remaining features (Features 2-5) are roasters of varying sizes, some with tools, lithics, and ceramics. FY92 monitors noted nails, more projectile points, and sherds, and the FY96 monitors found a projectile point at Feature 2 near the dripline and trail.

Previous Work

R. Euler and G. Gumerman initially recorded this site in minimal fashion in 1969. Sherds were collected and an analysis was completed. Field notes state that the condition of the site was "undisturbed" and the potential for a rewarding excavation was "excellent." Euler and Jones visited the site again in 1981. More sherds were collected and a simple sketch map was made. G:03:003 was recorded in more detail by NPS survey personnel in January of 1991 (Fairley et. al 1994).

River corridor monitors have visited the site at least annually since FY92 (Coder et. al 1994; Coder et. al 1995a; Coder et. al 1995b; Coder et. al 1994) (Leap et. al 1996) (Leap et. al 1997; Leap et. al 1998) (Leap et. al 2000) (Dierker et. al 2001; Dierker et. al 2002; Leap and Kunde 2000). In FY95 site overviews were taken with a medium format camera. In FY96 the features were plotted with a total station unit and overlain on a topographic map created by Thompson and others (Thompson et. al 1996). At this time the Zuni Conservation Program personnel also assessed the site for checkdam installation (Leap 1996). Three checkdams were built in the river-based drainage downstream of the site (Leap 1996; Leap 1998). They were placed in this drainage at the suggestion of K. Thompson and K. Burke in FY96. Thompson and Burke felt that according to aerial photogrammatic maps, this particular drainage could cause some substantial site destruction if untreated. From FY96 to FY98 the three checkdams were in good condition with little to no maintenance required. In FY99, however, a heavy rainstorm occurred, and as a result, the ZCT staff and RCMP staff constructed ten new checkdams in the river-based drainage, and extensive work was completed on two of the original checkdams. A few large rocks were removed from the third original checkdam to define a central channel (Leap and Kunde 2000). The new checkdams need to be mapped on the 1993 Hereford map with a total station. This site was also included in the studies conducted by K. Thompson and A. Potochnik (Thompson and Potochnik 2000). Checkdam maintenance occurred in FY00 and FY01.

The site receives a great number of visitors, and as a result, multiple trails bisect features and several collection piles exist. Aerial photographs taken over the last 25 years show a geometric increase in the social trailing at Granite Park in general. This trend is enhanced by the local big horn sheep that spend considerable time in this area due to the lush grass growth accompanied by the wet winters. NPS and Hualapai representatives have performed re-trailing and trail obliteration in FY96 and FY97, yet people continue to visit the site. A letter was published in the Boatman's Quarterly by L. Jackson and L. Leap requesting river runners and researchers to minimize their impact to the area (Jackson and Leap 1996). Trail obliteration from the drainage to the site by CRT personnel occurred in November 2001. The lower drainage at this site is part of J. Pederson's GCMRC-sponsored remote sensing project due to be completed in 2003 two total station maps were produced during this project. Trail maintenance was required here on the November 2002 CRF river trip. No checkdam maintenance was required here in FY03. In May 2003 FIST trip participants stopped at this site to assess eolian processes.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
MF Photos	04/04/1995
Trail Work	03/03/1996
Checkdam Installation	03/03/1996
Total Station Map	03/03/1996
Checkdam Maintenance	04/25/1997
Trail Maintenance	04/26/1997
Checkdam Maintenance	11/21/1998
Checkdam Maintenance	04/26/1999
Checkdam Maintenance	04/28/2000

Checkdam Maintenance	10/25/2000
Plant Vegetation	11/17/2001
Trail Maintenance	11/17/2001
Total Station Map	02/27/2002
Total Station Map	10/09/2002
Trail Maintenance	11/2002
Cross Section	03/28/2003

Monitoring Observations Summary

Collection piles are present throughout Feature 1. Feature 2 has minor downslope movement of fire-cracked rock. A large rodent burrow is present on the north side of the trail below the feature. This burrow may collapse due to trailing and expose additional fire-cracked rock and perishables. Features 3 and 4 look good. Feature 5 is unchanged. The checkdams are unchanged and the drainage has been minorly active. Continue annual checkdam monitoring and maintenance. Recommend that the cryptogamic soils be redistributed using a metal rake to promote new growth on the next CRF river trip. Trail obliteration is required from the main drainage. Continue annual monitoring.

G:03:004 Roaster Complex Annual Schedule

The site is located at the mouth of a major side canyon and is situated less than 100 m from an established boat camp. This site contains several roasting features, two rockshelters, rock images, and historic remains. The two rockshelters have a midden containing charcoal, burned soil, fire-cracked rock, and artifacts. One shelter has several historic mason jars and other trash dating to the 1930s, plus the inscription "M BUNDY". The ceiling of this shelter, below the inscription, has some faint prehistoric hematite figures. The remaining features are roasting pits. In addition to the historic component, the site may be affiliated with both Pueblo I-III occupation and late prehistoric-early historic Pai/Paiute. A fire-cracked rock concentration with no artifacts on the downstream side of Indian Canyon is probably affiliated with the main site. During FY96 monitors added historic cans to the site map, and in FY97 monitors recorded a newly exposed slab-lined feature (Feature 8) identified by Helen Fairley in FY95. Feature 8 was completely excavated in November 2000. In FY98 archaeologists recorded a chert awl in the midden area that was not previously identified.

Previous Work

This site was initially recorded in 1972 and revisited several times throughout the 1970s. Sherds were collected and analyzed and a few notes were taken. No further descriptive work or mapping was completed, but on each occasion more sherds were collected and typed. NPS survey personnel re-recorded the site in 1991 (Fairley et. al 1994). From FY93 to FY95 the site was monitored twice a year and, in FY96 the monitoring schedule changed to annual (Coder et. al 1994; Coder et. al 1995a) (Coder et. al 1995b; Leap et. al 1996) (Leap et. al 1997; Leap et. al 1998) (Dierker et. al 2001; Dierker et. al 2002; Leap and Kunde 2000; Leap et. al 2000).

In FY95 retrailing and trail obliteration were completed and minimal work was completed on a total station map. In FY97 more trail work was needed and medium format black-and-white and color photographs were taken of the historic inscription. After trail work was completed in FY95 a letter was published in the Boatman's Quarterly requesting that visitors use the designated trail that leads directly to the "Bundy jars", and not traverse through the prehistoric areas (Bullets 1995). Commercial users did not honor this request and more trail work was needed in April 1997. RCMP staff drafted a second letter to the Park's concessionaire representative in June 1997 regarding commercial use of the area. This letter requested that the commercial guides use the new, designated trail or the commercial outfitters would be responsible for any necessary mitigation. A final assessment for trail maintenance was conducted in FY99. This assessment was to implement trail work prior to excavations and to produce a plan for a new trail after excavations were completed. This site was also included in the studies conducted by K. Thompson and A. Potochnik (Thompson and Potochnik 2000). The features were mapped with a total station instrument in FY00 in preparation for data recovery work with the GRCA Fee Demo program. Data recovery and trail work occurred in 11/18/2000 on a Colorado River Fund river trip (Hubbard 2001).

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Trail Work	01/01/1995
Trail Work	01/01/1997
MF Photos	03/04/1997
Total Station Map	10/01/2000
Data Recovery	11/18/2000
Trail Work	11/18/2000
Trail Work	05/04/2002

Monitoring Recommendations

FY03 monitoring observed minor surface erosion. Eolian erosion observed on previous monitoring trips is currently inactive. Features 1 and 2 and the midden are primarily impacted by visitation. Continue annual monitoring, as the threat of exposure of additional cultural materials is likely.

**G:03:020 Roaster Complex
Annual Schedule**

The site is comprised of seven main features divided into two loci: A and B, each on opposite sides of a large side canyon. Locus A contains Features 1, 2, 5, and 6. Locus B contains Features 3 and 4. Feature 1 was originally described as being two charcoal lenses eroding from a high dune with associated fragments of burned bone. Feature 2 is a large "classic" donut-shaped roasting pit with manos, charcoal, a few flakes, and several pecked processing stones. Feature 3 is an eroding roasting pit with a discernable rock outline on top. Feature 4 is a diffuse scatter of fire-cracked rock. Feature 5 is a disturbed area of fire-cracked rock at the edge of the side canyon. Feature 6 is another eroding fire-cracked rock area with bone. Features 7, 8, and 9 were all thermal features. Feature 7 was recorded during the survey and Features 8 and 9 were exposed in FY98 and FY99, respectively. All three features were excavated in FY99 (Dierker 2002). Cultural affiliation is unknown, but presumed to be Pai and/or Paiute.

Previous Work

The site was originally recorded in 1978 by R. Euler with further recording by NPS personnel in 1991 (Fairley et. al 1994). The site has been monitored at least annually since FY92 (Coder et. al 1994; Coder et. al 1995a; Coder et. al 1995b; Coder et. al 1994) (Leap et. al 1996) (Leap et. al 1997) (Dierker et. al 2001; Dierker et. al 2002; Leap and Kunde 2000; Leap et. al 1998; Leap et. al 2000). Zuni Conservation Program personnel assessed the site in the fall of FY99 and determined that checkdams were not an appropriate stabilization procedure. In FY97 a total station map of the site was completed (Leap et. al 1997). This site was also included in the studies conducted by K. Thompson and A. Potochnik (Thompson and Potochnik 2000). In the spring of FY99 Features 7, 8 and 9 were excavated. After excavations, trails were obliterated. Repeat total station mapping of these drainages could provide excellent data on the progression and rate of erosional processes effecting archaeological resources at this location. Cross section profiles of the small gullies south of Feature 2 have been taken to aid in determining rates of change at this site. Consultation with F. Nials (Personal communication, 2000) and J. Pederson (Personal communication, 2001) have resulted in the recommendation of a water diversion bar above the gullies to redirect runoff away from Feature 2. In May 2003 the FIST trip participants visited this location to assess the eolian processes.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Total Station Map	08/06/1997
Trail Work	11/21/1998
Data Recovery	11/21/1998
Trail Work	02/01/1999
Cross-Section	03/29/2003

Monitoring Observations Summary

Feature 2 has active gullying with nick points present in the drainage. There has also been some minor eolian deposition in the drainage. Features 1, 3, 4, 5, and 6 are unchanged. Continue the recommendation for data recovery at Feature 2. Recommend placement of a water diversion bar above Feature 2 to prevent additional headcut advancement from runoff. Continue cross section profiles and annual monitoring.

G:03:024 Roaster Complex Biennial Schedule

The site consists of five roasting features with associated ceramics and lithics. The artifacts are concentrated around the fire-cracked rock middens as well as dispersed downslope. Tools include tabular grinding slabs, cobble manos, a drill/perforator, and a cobble chopper. Raw material types include Kaibab and Redwall Chert, chalcedony, and Partridge Creek Obsidian. Unidentifiable burned bone was also observed. The ceramic assemblage suggests use during Pueblo II occupation, late Prehistoric-Protohistoric Pai, and historic Pai and Paiute, the latter suggested by a few broken brown glass fragments and a metal artifact. In FY94 monitors found a chert biface west of Feature 2 newly exposed in an active gully.

Previous Work

The site was first recorded in 1991 (Fairley et. al 1994) by NPS survey personnel and monitored in FY93, FY94, FY95, FY97, FY98, and FY01 (Coder et. al 1994; Coder et. al 1995a) (Coder et. al 1995b; Leap et. al 1997; Leap et. al 1998) (Dierker et. al 2001). In FY96, GRCA, Hualapai representatives and RCMP personnel completed trail obliteration. A letter was published in the *Boatman's Quarterly* requesting minimal use of this area by researchers and river runners (Jackson and Leap 1996). A total station map of the features was completed and overlain on a topographic map produced by Thompson et al. (Thompson and Potochnik 2000). In FY97 the Zuni Conservation Projects personnel completed an assessment, and as a result, five checkdams were constructed near Features 2, 3 and 4 (Dierker 2002; Leap 1997c). In FY99 all checkdams had minor restructuring and an additional nine were installed (Leap and Kunde 2000). This site was also included in the studies conducted by K. Thompson and A. Potochnik (Thompson and Potochnik 2000). FY00 checkdam maintenance required alteration at four checkdams and construction of one new checkdam (Leap and Kunde 2000). Minor checkdam maintenance occurred at Checkdam 4 in March 2003. In May 2003 the FIST trip stopped at this location to assess the eolian processes.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Total Station Map	03/03/1996
Trail Work	03/03/1996
Checkdam Installation	04/27/1997
Checkdam Maintenance	11/21/1998
Checkdam Maintenance	04/28/2000
Checkdam Maintenance	10/25/2000
Checkdam Maintenance	05/04/2002
Checkdam Maintenance	03/28/2003

Monitoring Recommendations

Feature 1 has less vegetation present though the feature appears well cemented in cryptogamic soil. Features 2 and 3 have active gullying with several small nick points in the gully. Charcoal and ash-stained soils are being exposed at Feature 2. Feature 3 has rodent burrowing. Feature 4 has active arroyo cutting and eolian deposition. Feature 5 is unchanged. Continue annual checkdam monitoring and maintenance. Continue biennial monitoring, as information potential is high at this site.

G:03:028 Roaster Complex Biennial Schedule

The site is divided into six loci of activity (A-F). Locus A consists of two roasting features with fire-cracked rock, ash, charcoal, a lithic concentration and some ceramics. Locus B is a light scatter of lithic

debitage, including a point base, and a sherd. Locus C is a tight concentration of about 20 flakes and a sherd. Locus D contains three "blow-out" or "dug-out" areas that may be wickiup depressions with associated flakes and fire-cracked rock, plus additional fire-cracked rock, lithic concentrations and a grouping of buried slabs. Locus E is an area of possible domestic activity, represented by four possible wickiup depressions--some with encircling stone "foundations", and associated lithics, sherds, groundstone, and fire-cracked rock. Locus F has one well-defined roaster, and other fire-cracked rock concentrations that may represent more roasting features. Lithicdebitage consists of a wide variety of cherts and obsidian, and reflects expedient reduction. Pueblo II Formative sherds dominate at Loci A, B, and E, while late prehistoric-early historic Pai sherds are seen at Loci C, D, and also E. The site is located on low stabilized dunes covering an alluvial terrace.

Previous Work

The site was officially recorded in 1991 by NPS personnel (Fairley et. al 1994) and monitored in FY93, twice in FY94, once in FY95, FY97, FY99, and FY01(Coder et. al 1994;Coder et. al 1995a;Coder et. al 1995b) (Leap et. al 1997;Leap et. al 2000) (Dierker et. al 2001). The GRCA trail crew obliterated extensive trailing in FY95. In FY96 the features were located with a total station instrument and overlain on the 1995 topographic map produced by Hereford (Hereford 1996). In FY96 GRCA trail crew also completed trail obliteration, retrailing, and vegetation to deter visitation (Leap et. al 1996). This site was also included in the studies conducted by K. Thompson and A. Potochnik (Thompson and Potochnik 2000). FY2000 monitors recommended that trail obliteration and planting cactus and grasses should be completed. All of the work on the delta will take an estimated three days. Deadfall could be collected on the delta and across the river for use in the trail obliteration effort. The Hualapai will be consulted about the proposal for work on the delta.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Trail Obliteration	01/01/1995
Total Station Map	03/03/1996
Trail Work	03/03/1996
Plant Vegetation	03/03/1996
Trail Work	11/17/2001
Plant Vegetation	11/17/2001

Monitoring Observations Summary

No changes were observed at Loci B, C, or D. Burrowing has increased at Feature 2. Surface erosion and burrowing are active at Feature 1. Feature 3 has active gullying and surface erosion with movement of debris such as wood on the surface of the feature. Recommend checkdam trail rehabilitation work on the next CRF river trip. Consult with the Hualapai Tribe regarding major trail obliteration on the terrace top. The 1996 rehabilitation work is beginning to degrade substantially. Biennial monitoring will continue.

G:03:038 Roaster Complex

Biennial Schedule

This site consists of four roasting features, a possible wickiup ring and associated ceramics. Feature 1 is a scatter of fire-cracked rock. FY97 monitors discovered a new roasting feature at the contact of the alluvial terrace and the talus slope. RCMP archaeologists recorded a newly exposed roasting feature on the September 1998 mapping trip in proximity to the river. Sherds indicate a multi-component site with Pueblo I to early Pueblo II Virgin and late prehistoric-early historic Paiute occupation.

Previous Work

Archaeologists recorded the site in 1991 (Fairley et. al 1994) and the RCMP staff monitored it in FY96, FY98, and FY01 (Leap et. al 1996); (Leap et. al 1998); (Dierker et. al 2001). FY96 monitors recommended checkdam installation. In FY97 an assessment was made and Zuni Conservation Project staff installed brush linings. Surveyors completed a total station map in FY97. FY98 archaeologists recommended installing jute mat to curtail deflation and establish vegetation. Zuni Conservation Project staff performed

maintenance on all the previous brush checks and added 11 rock checkdams in FY99 (Leap and Kunde 2000). FY99 monitors noted on the April river trip that additional checkdam maintenance was needed. FY99 archaeologists assessed Feature 4 for data recovery and decided to continue monitoring the preservation treatment instead of excavating. During a September 1998 mapping trip D. Hubbard, an RCMP archaeologist, discovered a roasting feature below the main site area near the river. The archaeologist recommended data recovery at this feature due to its physical condition and potential for lost cultural material. Checkdam monitoring resulted in maintenance work at five checkdams in FY00 (Leap and Kunde 2000). In FY01 it was determined that no further checkdam construction or maintenance would occur here as the drainage catchment is too large to effectively trap sediments in the drainages using conventional checkdam methods. The site is part of a GCMRC-sponsored checkdam research project with results due in 2003. Total station maps were produced in February and September 2002 for Pederson research (Pederson 2001).

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Checkdam Installation	04/24/1997
Total Station Map	06/15/1997
Checkdam Maintenance	11/20/1998
Checkdam Maintenance	04/26/2000
Research	02/25/2002
Research	10/072002

Monitoring Observations Summary

Feature 1 appears unchanged though vegetation adjacent to the feature is falling into the side canyon. Features 2 and 4 are unchanged. Feature 3 has increased surface erosion and gullying. Active eolian erosion is also present at Feature 3. Feature 5 may be undercut by active gullying in the future. Gullies are actively downcutting and filling in at different locations at this site. The Pederson project will be useful in understanding how catchment sizes effect runoff. Continue biennial monitoring.

G:03:040 Roaster Complex

Biennial Schedule

The site consists of two activity loci (A and B) that represent at least two at Locus A and six to seven roasting features at Locus B, with associated debitage and many formal tools. Locus A may be one large roasting feature that has been eroded by a wash, or more than one feature with elements eroding together. Fire-cracked rock elements at both loci are of predominately limestone cobbles, with a variety of Kaibab and/or Redwall Chert flakes in association. At least part of Locus A (the fire-cracked rock on the southern edge of the locus) forms a semi-circle that is half blown out by a side canyon drainage. Locus B contains a much more obvious circular fire-cracked rock feature with additional, smaller fire-cracked rock concentrations around it. The main feature is slightly mounded and has a clear center. Many tertiary flakes, including bifacial thinning flakes, are present. Tools include a sandstone slab metate fragment, flakes with retouch and use wear -- some possibly used as scrapers, biface/preforms, and cores. Cultural affiliation and site chronology are unknown though assumed to be Pai/Paiute due to the site proximity to Arroyo Grande.

Previous Work

Archaeologists recorded the site in 1991 (Fairley et. al 1994) and have monitored it at least annually from FY94 to FY98 (Coder et. al 1995a; Coder et. al 1995b; Leap et. al 1997; Leap et. al 1996; Leap et. al 1998; Leap et. al 1998). In FY98, RCMP monitors changed the monitoring schedule to biennial and the site was monitored in FY01 (Dierker et. al 2001). FY95 monitors recommended total station mapping at this site. In FY96 monitors recommended installing checkdams and data recovery at Locus B. Surveyors mapped the site with a total station instrument in FY96 (Leap et. al 1996), but no data recovery was performed. Zuni Conservation Project staff constructed four checkdams near Locus B in FY97 (Leap et. al 1997). A large side-canyon flood completely took out two checkdams in FY99. The other three

checkdams (one adjacent to the side canyon and two in a terrace-based drainage) were unaffected. No checkdam maintenance has been required on the brush checkdams. According to F. Nials (personal communication, 2001) the drainage with the brush checkdams will probably only downcut another ten centimeters at the most. Cross sections were installed at this site in FY01.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Total Station Map	02/29/1996
Checkdam Installation	04/25/1997
Cross Section	04/06/2001
Cross Section	03/29/2003

Monitoring Observations Summary

Features in Locus B on the dune terrace appear unchanged with recent growth of spring vegetation and dense cryptogamic soils. The gully below Locus B is very active causing an increase in bank slump. Locus A appears stable but recent bank slump as the potential to erode the north edge of the Locus. Locus C is unchanged. Continue biennial monitoring due to the threat of impact to Loci A and B from bank slump.

G:03:041 Roaster Complex Annual Schedule

This site consists of three large roasting features. Archaeologists recorded a sparse lithic scatter, two cores, a chopper, and one Tizon wiped sherd on-site. The late prehistoric-early historic Pai site appears to have been a temporary hunting camp, based on the absence of grinding implements and the abundance of bone.

Previous Work

Archaeologists recorded the site in 1991 (Fairley et. al 1994) and the RCMP staff monitored it in FY96, FY98, FY99, FY00, FY01, and FY02 (Leap et. al 1996) (Leap et. al 1998) (Dierker et. al 2001; Dierker et. al 2002; Leap and Kunde 2000; Leap et. al 2000). The RCMP staff recommended stabilization in FY96. In FY97 the site was assessed for checkdams and Zuni Conservation Program personnel constructed three rock and brush linings in the drainages below the site. A total station map was completed in FY97. FY98 monitors recommended planting vegetation and obliterating trails caused by remedial activities. RCMP staff assessed this area for trail obliteration and planting vegetation in FY99 and found that the trails were recovering naturally. Checkdam maintenance occurred at one checkdam and six additional checkdams were built in FY99. This site was included in the studies conducted by K. Thompson and A. Potochnik (Thompson and Potochnik 2000). Checkdam monitoring resulted in the maintenance of checkdams in FY00 and FY01. The drainage with the checkdams and an adjacent drainage were extensively mapped in March and September, 2002 by J. Pederson as part of a GCMRC-sponsored remote sensing project due to be completed in 2003. No checkdam maintenance was required in FY03.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Total Station Map	06/16/1997
Checkdam Installation	04/25/1997
Checkdam Maintenance	11/21/1998
Checkdam Maintenance	04/28/2000
Checkdam Maintenance	10/25/2000
Research	02/26/2002
Research	10/08/2002

Monitoring Observations Summary

Feature 3 has increased surface erosion and the gully has filled in substantially with eolian deposition. The drainage appears to be "U" shaped rather than actively downcutting in a "V" shape. Features 1 and 2 are

unchanged. Annual checkdam monitoring and maintenance will continue as will annual site monitoring due to the likeliness of additional cultural material being exposed.

G:03:048 Artifact Scatter

Five-year Schedule

G:03:048 is a shallow rock shelter located on Tapeats Sandstone ledges surrounded by steep rocky talus slopes. Artifacts are common on the surface and include: flakes, numerous groundstone items (fragmented and complete), two Desert Side-Notched points, charcoal and at least two Southern Paiute utility gray ware sherds. The artifacts indicate a Paiute occupation.

Previous Work

This site was located and recorded in March of 1991 (Fairley et. al 1994) and was monitored in FY95, and FY99(Coder et. al 1995b) (Leap et. al 2000). No additional RCMP work has been implemented.

Monitoring Observations Summary

The dripline from the Tapeats Sandstone overhang is causing alluvial deposition, which has filled in the previous rill that was forming in 1998. There is active rodent burrowing and animal trailing through the overhang. The animal activity has not uncovered any additional cultural material. Recommend reducing the monitoring schedule from every four to every five years.

G:03:052 Roaster Complex

Five-year Schedule

The site is situated on a dune-covered sandstone bench. It is composed of three roasting pit features, one large area of fire-cracked rock, and an associated lithic scatter. A single sherd of Moapa Brown ware was also observed on the surface suggesting a late PI-early PII Virgin association. FY96 monitors identified an additional fire-cracked rock area only seven meters from one of the originally recorded features.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Trail Obliteration	03/05/1997

Previous Work

Archaeologists recorded the site in 1991 (Fairley et. al 1994) and the RCMP staff monitored the site in FY96, and FY98 (Leap et. al 1996) (Leap et. al 1998). FY96 monitoring staff recommended trail obliteration, and gully stabilization. After an assessment in FY97, only minor trail obliteration was completed. FY98 monitoring staff recommended planting vegetation though it was determined unnecessary in the spring of 2003 due to heavy concentrations of vegetation.

Monitoring Observations Summary

Features 1 and 2 have increased vegetation. Feature 3 is unchanged. The previous recommendation of planting vegetation is not necessary at this time. A lot of annuals are growing all over the site. Continue five-year monitoring schedule.

G:03:064 Roaster Complex

Annual Schedule

This site consists of 15 features including mostly roasting features. Charcoal lenses are present in several of the arroyo cuts. Artifacts associated with the roasting features include lithics, ceramics, a shell bead, and groundstone. Lithics include a flake drill and a reworked Elko Corner-Notched projectile point. The ceramic assemblage suggests a multi-component site: Pueblo I-III Formative and late prehistoric-early historic Pai/Paiute. This could be one of the most informative sites in western Grand Canyon with potential for dating and chronology building. FY96 monitors discovered a large Redwall Chert point tip exposed in the river-based drainage across from Feature 1. FY97 monitors discovered a chert awl at Feature 6. RCMP staff on the September 1997 mapping trip discovered newly exposed Jeddito Yellow Ware sherds, obsidian flakes, an olivella shell bead, and two new probable roasting features/fire-cracked rock scatters exposed by

the river-based arroyo. FY98 monitors discovered new fire-cracked rock features exposed by the arroyo. FY99 monitors discovered seven new charcoal lenses exposed in the river-based arroyo.

Previous Work

Archaeologists recorded the site in 1991 (Fairley et. al 1994) and RCMP staff monitored it at least annually since FY94(Coder et. al 1995a) (Coder et. al 1995b;Leap et. al 1997;Leap et. al 1996) (Dierker et. al 2001;Dierker et. al 2002;Leap and Kunde 2000;Leap et. al 1998;Leap et. al 2000). In FY93 archaeologists collected radiocarbon samples resulting in a range of dates from 170 +/- 50 BP to 2670 +/- 140 BP. FY94 monitors recommended planting vegetation, installing checkdams, and total station mapping. FY95 monitors conducted medium format photography of the active drainage (Leap 1995a). FY95 and FY96 monitors recommended testing and total station mapping. In FY95 total station mapping began and in FY97 a complete map was produced. FY96 monitors also recommended either an attempt at stabilization or full site excavation. FY98 monitors recommended obliterating trails caused from five days of intensive site mapping and data recovery. After further assessment it was determined that the trails were recovering naturally. FY99 monitors recommended data recovery and remapping of the arroyo headcuts to identify their rate of advancement. The RCMP collected charcoal samples from charcoal lens D and Feature 1 in FY99. These samples are curated at the South Rim collection facility. The samples will be sent for dating in the near future. This site was also included in the studies conducted by K. Thompson and A. Potochnik (Thompson and Potochnik 2000). In May 2003 the FIST trip stopped at this location to assess the eolian processes.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
MF Photos	04/04/1995
Total Station Map	04/22/1997
Carbon Samples	03/06/1999

Monitoring Observations Summary

Features 2, 3, 5, 7, 8, 9, 10, 11, and 14 are unchanged. Feature 1 has increased cryptogamic soil development. Features 2, 7, and 12 show active animal burrowing. Feature 4 has increased eolian deposition. Feature 6 has active bank slump. A feature 13 is bisected by an active gully. Feature 15, a new hearth feature was identified by monitoring staff. The arroyo all have active cut bank erosion and recent alluvial activity in the drainage bottoms. There is evidence of continual bank slump, surface erosion, eolian deposition, and alluvial impact. The arroyos continue to be active, exposing artifacts, features, and charcoal lenses, therefore data recovery should be considered after consultation with the Hualapai Tribe. Annual monitoring will continue.

G:03:067 Roasting Feature Biennial Schedule

The site consists of five fire-cracked rock middens with associated lithics and a dispersed flake scatter. Archaeologists discovered two thin bifaces and one Moapa Brown Ware sherd upslope of Feature 1, suggestive of a late Pueblo I-early Pueblo II Virgin affiliation.

Previous Work

Archaeologists recorded the site in 1991 (Fairley et. al 1994) and the RCMP staff monitored it annually from FY92 to FY95 (Coder et. al 1994;Coder et. al 1994) (Coder et. al 1995a) (Coder et. al 1995b). In FY95 the monitoring schedule changed to biennial and the RCMP staff monitored the site in FY97, FY99, and FY01 (Leap et. al 1997) (Dierker et. al 2001;Leap et. al 2000). FY94 and FY95 monitors recommended obliterating on-site trails. The GRCA trail crew conducted trail obliteration in FY96. FY99 monitors recommended trail maintenance and assessment for brush and rock linings in the drainages near Features 1 and 4. RCMP staff assessed the site and determined that no checkdams would be built. GRCA trail maintenance is warranted due to three large and heavily used camps below this site. In FY2000, a trail near Feature 1 was obliterated.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Trail Work	03/03/1996
Trail Work	02/01/2000

Monitoring Observations Summary

Feature 1 has a lot of new vegetation growth. The gully on the northwestern edge of the feature has annual grasses growing in it and appears to have minimal alluvial activity where it has filled in a flattened out. There is minor gullying at the base of the features as it dumps into the dune terrace. Feature 2 appears stable. There is alluvial deposition where the previous rill is filling and cryptogamic soils are developing. Features 3, 4 and 5 have heavy cryptogamic soil development and appear stable. Trail obliteration work has been successful. Biennial monitoring will continue.

**G:03:072 Roaster Complex
Annual Schedule**

This is an extensive roasting feature complex that includes an overhang shelter previously recorded as historic site G:03:023. The prehistoric component of that site is described here as G:03:072. Fourteen features (Features 1-14) are present. All but Feature 1 are roasting features or hearth/fire-cracked rock scatters of various shapes and sizes, some with associated groundstone, lithics, and sherds. Feature 1 is the overhang shelter, which, in addition to the historic component described as site G:03:023, has a prehistoric component consisting of a lithic scatter downslope of the shelter and in the shelter fill. Ceramics observed indicate that this may be a multi-component site, with both late Pueblo I-early Pueblo II Virgin occupation and late prehistoric-early historic Pai and Paiute occupations. On a total station mapping trip in FY98 RCMP monitors identified newly exposed diagnostic artifacts in a gully. They include one biface, sherds and groundstone.

Previous Work

The site was originally recorded in 1991 (Fairley et. al 1994), monitored once in FY93, and monitored annually since FY95 (Coder et. al 1994; Coder et. al 1995b; Leap et. al 1996) (Leap et. al 1997) (Dierker et. al 2001; Dierker et. al 2002; Leap and Kunde 2000; Leap et. al 1998; Leap et. al 2000). In FY96 an assessment was made for checkdam installation. In FY97 a total station map was completed and 14 checkdams were placed in three river-based and side canyon-based drainages (Leap et. al 1997). In FY99 checkdam maintenance resulted in building two new checkdams and altering one original checkdam (Leap and Kunde 2000). Minor to moderate alluvial deposition as a result of building checkdams is evident in two of the four drainages with checkdams. Data recovery has been recommended at Features 11, 12, and 14. Checkdam monitoring resulted in maintenance work at Checkdam 16 and construction of one new checkdam in FY00 (Leap and Kunde 2000). Checkdam maintenance was also performed in FY01. The drainages on-site were extensively mapped by J. Pederson in March 2002 as part of a GCMRC-sponsored remote sensing project due to be completed in 2003. No checkdam maintenance was required here in FY03. In May 2003 the FIST trip stopped at this location to assess the eolian processes.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Checkdams	03/05/1997
Total Station Map	03/05/1997
Checkdam Maintenance	11/22/1998
Checkdam Maintenance	04/29/2000
Checkdam Maintenance	10/26/2000
Research	02/28/2002
Research	10/13/2002

Monitoring Recommendations

Features 2, 3, 4, 5, 7, and 9 are unchanged. Feature 6 has minor surface erosion. Feature 8 has minor surface erosion and less vegetation. Feature 10 has increased cryptogamic soils present but there is also

minor downslope movement of fire-cracked rock. Feature 11 is slightly more exposed due to eolian erosion. Feature 12 is almost completely buried by eolian deposition. Feature 13 shows minor erosion caused by the downcutting of a gully adjacent to the feature. Active gullying is directly impacting feature 14. Minor surface erosion effects many features here. Data recovery has been recommended here for some time and continues to be the recommendation. Continue annual checkdam monitoring and maintenance. Continue annual site monitoring.

**G:03:077 Rock Art
River Patrol - Annual Schedule**

G:03:077 consists of three hematite pictographs and an associated grinding slick located in a major tributary of the Colorado River. The site is located adjacent to a permanent water source and has a trail leading directly to it. Cultural affiliation is unknown. The Hualapai Tribe has indicated that this is a Traditional Cultural Property of the Hualapai tribe and they should be consulted regarding any action taken or change noted at this site.

Previous Work

This site was recorded in April 1991 (Fairley et. al 1994) and was monitored in FY93, FY95, and FY99 (Coder et. al 1994;Coder et. al 1995b) (Leap et. al 2000). Medium format photographs were taken of the pictographs (Leap et. al 1997), (Hubbard 1997a;Hubbard 1997b). Additionally, GRCA trail crews have maintained the established trail over many years.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
Medium Format Photos	03/05/1997

Monitoring Observations Summary

The pictographs look good. There is no sign of erosional impacts. The grinding slicks are also unchanged. It is recommended that the site be placed on the inactive schedule and monitored by the NPS river patrol. If Tribal trips stop here they may also be able to alert the RCMP in the event of vandalism.

**G:03:080 Structure-Thermal Feature Complex
Annual Schedule**

The site is divided into two loci. Locus A contains numerous lithics, sherds, hand tools, and extensive rock images. The pictographs and lone petroglyph are in poor condition. Spalling and salt seep have covered several of the images. This locus is on a sheltered bench at the base of a basalt cliff, just upstream from the dune that Locus B is located on. Locus B consists of nine separate structural and fire features. Numerous artifacts are present, including fire-cracked rock, lithics, ceramics, groundstone, tools, shell fragments, and charcoal. This site has excellent potential for buried materials and datable features. Ceramics suggest a late prehistoric-early historic Pai affiliation. In March of FY95 monitors recorded a newly exposed thermal feature (Feature 9).

Previous Work

The site was originally recorded in 1991 (Fairley et. al 1994), monitored once in FY92 and FY93, and annually since FY95 (Coder et. al 1994;Coder et. al 1995b;Coder et. al 1994;Leap et. al 1997;Leap et. al 1996) (Dierker et. al 2001;Dierker et. al 2002;Leap and Kunde 2000;Leap et. al 1998;Leap et. al 2000). In FY97, medium format black-and-white and color prints were taken of Locus A (Hubbard 1997a;Hubbard 1997b), and an attempt was made to sketch several of the distinct rock art figures. In FY99 visitor-related impacts (trailing) were observed at an all time high. Trails led from the camp, across Locus B, to Locus A. The pictographs (Locus A) are a popular attraction stop for commercial river runners and Hualapai river-runners who make the uprun. FY99 archaeologists recommended that several trails be obliterated by planting vegetation throughout the site. They noted that visitor-related impacts, in particular trailing, should be addressed and managed by the Hualapai Nation. A specific site plan for management is also recommended.

Summary of RCMP Work Implemented

Remedial Action	Date Completed
MF Photos	03/05/1997

Monitoring Observations Summary

There is an increase in vegetation. Deflation of sediments has occurred and a gully is forming adjacent to Feature 4. Features 3, 5, 6, 7, and 8 are unchanged. Feature 9 has less vegetation but appears stable. Locus A has minor sheetwash in the overhang area along the dripline. Recommend trail obliteration or defining one trail from the upstream side of the basalt wall to the pictographs. Consult with Hualapai tribe prior to trail obliteration work. Continue annual site monitoring.

CHAPTER FOUR

EROSION CONTROL STRUCTURES

MONITORING AND MAINTENANCE

Erosion control structures, referred to as checkdams, have been utilized both prehistorically and historically in Grand Canyon. Several sites along the river corridor contain prehistoric structures that were used to control runoff to agricultural fields (Fairley et. al 1994). Today, with the supervision of Zuni Conservation Project personnel, the RCMP aids in the construction and maintenance of traditionally designed checkdams to curtail erosion that adversely effects National Register eligible historic properties. This approach began during a three day workshop sponsored by the BOR and NPS in May 1995 and continues annually.

In addition to the Zuni/RCMP checkdam work researchers from Utah State University conducted a study at nine sites with checkdams between February and October 2002. This is the first study to address the effectiveness of checkdams on archaeological sites within the river corridor. Data collection included total station mapping, soil resistency, soil infiltration rates, vegetation type identification, and photogrammetric remote sensing. The study was intended to test the effectiveness of checkdams and compare photogrammetry techniques as a method of monitoring. The results of this study are currently in draft form though presentations on the results have been presented to the Technical Work Group and as a GCMRC brown bag series. Results show that checkdams do in fact reduce erosion, that sites with high erosion rates contain steep gradients, and there is a suggestion that checkdams constructed of woody debris may be more effective than checkdams constructed with rock (Pederson 2001). As a result of this study, checkdam maintenance in FY03 focused more on using woody debris at checkdams requiring maintenance in locations where such materials were available.

Checkdams are currently monitored and maintained by RCMP staff at 27 sites within the APE. Checkdams have been constructed to slow down erosion occurring due to drainage development within cultural site boundaries. A total of 260 checkdams exist at the 27 sites. Until FY03, the checkdam construction and maintenance has been guided by participation from the Zuni Conservation Program (ZCP). Unfortunately in FY03, no ZCP personnel accompanied RCMP staff on the annual river trip.

In FY03 the total number of checkdams was reduced from 265 to 260. This number is fluid from year to year as checkdams merge together, are covered by sediments, or blown out and not rebuilt. At one site in particular, G:03:058, all of the checkdams that were present in 2000 are now completely covered in sediments and vegetation. Because these checkdams successfully trapped sediments, and filled in the channel, they are no longer visible from the modern ground surface. The checkdams constructed at this location did not require maintenance work. Of the 260 total checkdams, 36 (14%) required maintenance this fiscal year. Table 3 lists all sites with checkdams and whether or not they required maintenance in FY03. Appendix G consists of a table of all sites with checkdams and the entire maintenance history for each checkdam. The following chapter outlines geomorphic settings for sites containing checkdams followed by FY03 monitoring results, maintenance information, and future work assessments.

Table 3. Sites with Checkdams and Maintenance Required in FY03 (N = 27 Sites).

Site Number	Maintenance Required
A:15:005	No
A:16:149	No
A:16:174	No
A:16:180	No
B:14:107	No
C:02:101	Yes
C:09:050	No
C:13:006	Yes
C:13:069	Yes
C:13:099	Yes
C:13:100	Yes
C:13:327	No
C:13:336	No
C:13:346	Yes
C:13:348	Yes
C:13:359	No
C:13:371	No
C:13:381	No
G:03:002	Yes
G:03:003	No
G:03:024	Yes
G:03:025	No
G:03:026	No
G:03:040	No
G:03:041	No
G:03:058	No
G:03:072	No

Geomorphic Setting and Site Specific Monitoring and Maintenance

The following table lists sites with checkdams based on different geologic reaches along the Colorado River. The reach system was first described by Schmidt and Graf (Schmidt and Graf 1988) and used in the RCMP survey report (Fairley et. al 1994). Table 4 summarizes the number of sites and checkdams per reach including the number of checkdams requiring maintenance in FY03.

Table 4. Number of Sites with Checkdams by River Reach and Requiring Maintenance in FY03 (N = 27 Sites).

River Reach	Sites with Checkdams	Number of total Checkdams	Checkdams with Maintenance Work
1	1	15	5
4	2	23	5
5	10	119	19
7	1	1	0
10	11	81	2
11	2	21	0

Specific work conducted at sites with checkdams and the overall condition of checkdams and drainages as they were observed in FY03 is described below.

A:15:005 –5 checkdams, 1 River-based drainage and 1 Side Canyon-based drainage

The site is located within a broad debris fan at the mouth of a side canyon. The site is covered in deep alluvium with extensive vegetation on the upriver side of the site.

No maintenance has been conducted here since the checkdams were installed in November 1998. In FY03 archaeologists observed that the drainage had not been active. There are many new plants growing in and around the checkdams including brittle bush and annual grasses. The drainage was obscured by the lush vegetation growth.

A:16:149 –7 checkdams, 1 River-based drainage

The site is situated in a broad and deep deposit of alluvium heavily anchored by vegetation. No eolian processes are active at this site.

Zuni/RCMP crewmembers installed checkdams in 1999. Only one checkdam, checkdam 7, has required any maintenance since installation. This maintenance consisted of treating headcut advancement in FY02. In FY03 the drainage was not active and no change was observed in the checkdams or the drainage.

A:16:174 –5 checkdams, 1 River-based drainage

The site is located within a narrow deposit of alluvium with no material available for re-depositing on the upstream talus slope. Active eolian processes continue to hamper vegetation growth. Some portions of the site are completely devoid of vegetation.

In 1998, Zuni/RCMP crewmembers constructed eight checkdams. Maintenance in FY00 resulted in combining three checkdams into one rock lining, combining two rock linings into one, and construction of one new checkdam. One checkdam, checkdam 5, was completely buried by alluvial transported sediments. To date, there are five checkdams in the drainage. In FY02 maintenance was completed at two checkdams. In FY03 the drainage was not active and no maintenance work was required.

A:16:180 –7 checkdams, 2 River-based drainages

This site overtops a deep deposit of alluvium that was cut back by river flows. The site is positioned along the very edge of the high terrace and is extremely vulnerable to terrace erosion. Some eolian process occurs.

Zuni/RCMP crewmembers constructed six checkdams in 1997. Some maintenance work has been required as the checkdams are in a very steep and active drainage. One additional rock lining was added near Feature 2 in FY00. In FY03 no maintenance work was conducted at this site. The lining near Feature 2 is unchanged.

B:14:107 –1 Water Diversion Bar, 1 Terrace-based drainage

The site is located within a broad alluvial deposit comprised of predam sand and silt. There are active eolian processes though a small amount of vegetation does anchor some of the surrounding sediment.

The bar, originally constructed in 1997 by Zuni/RCMP crewmembers was extended in 1998. In FY00 the same crewmembers rearranged five rocks at the end of the bar. No change was observed in FY03. No maintenance work has been needed since FY00.

C:02:101-15 checkdams, 2 River-based drainages with three tributaries

The site is situated on a narrow deposit of predam alluvium atop a steep talus slope. The site boundary has very little vegetation present. Eolian processes are actively exposing more of the cultural remains. Small portions of the lower drainage occasionally show signs of eolian transport and deposition.

In FY97 Zuni/RCMP crewmembers built 14 checkdams to stabilize the dune terrace where a sensitive feature is located. Maintenance work was completed by the same crewmembers in FY98, FY00 and FY02. In FY03 RCMP crewmembers combined several checkdams to produce longer rock linings.

Maintenance work was required at Checkdams 9, 10, 11, 12 and 17. Both drainages have been actively downcutting. RCMP archaeologists conducted the following work: added limestone rocks to Checkdam 9 to fill in voids, rearranged existing rock and brushed down the drainage sides at Checkdam 10, combined checkdams 10 and 11 into one checkdam, and added ½ a bucket of small rock to Checkdam 12. RCMP staff rearranged existing rocks and brushed down the drainage sides to fill in the channel with sediment. At Checkdam 17, the existing rocks were also rearranged by RCMP crewmembers to continue to block runoff flows.

C:09:050 –1 Water Diversion Bar with 4 arms, 1 Side-canyon based drainage

The site is situated in a deep alluvial deposit that is now a steep cutbank of a side canyon drainage. In the event of a large side canyon debris flow, the site could be completely washed away.

The water diversion bar was originally constructed in 1997 to protect an archaeological site that may contain very sensitive cultural material. No maintenance work has been conducted since the water diversion bar was originally constructed. The side canyon drainage has not been active. The water diversion bar is stable.

C:13:006 –22 checkdams, 2 River and Side Canyon-based drainages, one with three arms

This site is located atop a deep alluvial deposit overlaying a side canyon debris fan. Vegetation consists primarily of cacti and annual grasses. Eolian processes are active here and the features are extremely vulnerable to continued erosion.

Zuni/RCMP crewmembers constructed 14 checkdams in 1996 in two separate drainages. Minor maintenance was necessary in FY97, FY99, FY00, and FY03. Fine sediments and a large, steep catchment area contribute to the downcutting of the drainages.

GCMRC sponsored a checkdam research project supervised by Joel Pederson (University of Utah). This site was selected and research began in FY00 and the results were drafted in FY03 (Pederson 2001). Nickpoints and plunge pools at Checkdams 3, 4, 7, 8 and 11 required maintenance. Four new checkdams were also constructed. A new drainage has developed this year that merges with the main drainage creating a third arm of this drainage. Figure 6 shows before and after photographs of how this drainage was treated with a rock lining.

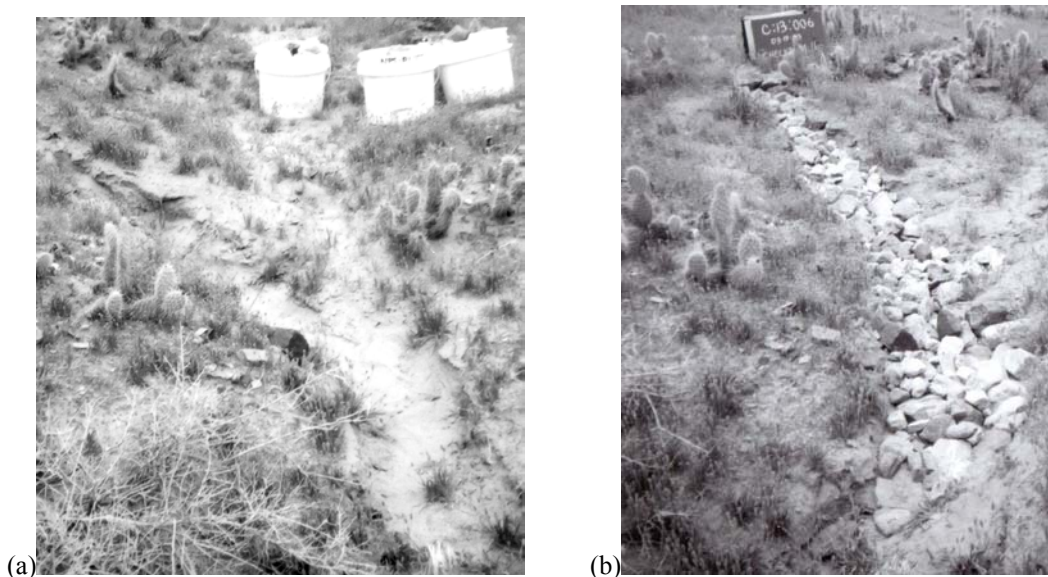


Figure 6. Site C:13:006, Checkdam 15: newly developed drainage prior to rock lining (Photo a). Photo b illustrates the drainage after treatment.

C:13:069 –6 Checkdams, 1 Terrace-based drainage

The site is situated at the mouth of a large side canyon alluvial fan topped with predam alluvium. Several large dunes are present, all but one anchored by vegetation. Active eolian processes allow for continued introduction of new sediment into the drainage. Figure 7 shows three consecutive checkdam monitoring episodes where sediment has been deposited on both the upstream and downstream sides of Checkdam 2. This checkdam is an example of the successful accumulation of sediments by checkdams.



Figure 7. Site C:13:006, Checkdam 2: observed during three separate monitoring and maintenance episodes (Photo a 1997, Photo b 1998, and Photo c 2000). Note extensive sediment accumulation along both the upstream and downstream sides of the checkdam (Photo c).

The checkdams, originally constructed in FY97 by Zuni/RCMP crewmembers required no maintenance until FY02. Checkdam 4 was breached in FY02 and again in FY03. Checkdam 1 has been buried by eolian processes of the dune moving across the upper portion of the drainage. In FY03 the drainage was very active below the features, exposing new cultural material. Maintenance was conducted at Checkdams 2 and 4.

C:13:099 –53 Checkdams, 1 River-based drainage with 2 arms

This site is located atop a flat and open alluvial deposit overlaying a side canyon debris flow. The site is buffered by a series of active sand dunes.

As a result of the BOR/NPS stabilization workshop in May 1995 Palisades Delta was chosen as the experimental area for building a variety of checkdams to see which ones would be most effective in this type of environment. After the original construction of checkdams in 1995, no maintenance work was

required until 1997 when the drainages were extremely active and 16 checkdams required maintenance work. Additional work was conducted in FY98 and many checkdam types were altered from their original construction type to lower the height of the checkdams. Only minor maintenance relative to the number of checkdams present has been conducted since FY98. GCMRC sponsored a checkdam research project supervised by Joel Pederson (University of Utah). This site was chosen, and research began in FY00. The results were drafted in FY03 (Pederson 2001). Maintenance work in FY03 was conducted at Checkdams 11, 26, 37, 42, and 43. Most maintenance consisted of adding ½ to 1 bucket of rock or gravels to the checkdams. The drainage was active with downcutting and plunge pools below the checkdams requiring maintenance.

C:13:100 –26 Checkdams, 1 River-based drainage with 2 arms

As with C:13:099 this site is also located atop a flat and open alluvial deposit overlaying a side canyon debris flow. The site is buffered by a series of active sand dunes. High salt concentrations in the fine-grained sediment contribute to the vulnerability to erosion at this location.

Twenty-six checkdams were originally installed here in 1995 with no maintenance required until February 1998 when the drainage was extremely active and 15 checkdams required some form of maintenance. Since that time, only minor maintenance has even been conducted at this location. GCMRC sponsored a checkdam research project supervised by Joel Pederson (University of Utah). This site was selected and research began in FY00. The results were drafted in FY03 (Pederson 2001). There was actually only minor activity within the drainages and three checkdams, 8, 11, and 12 required maintenance.

C:13:327 –4 Checkdams, 1 Terrace-based drainage

The site is located on a high alluvial terrace truncated by the Colorado River. The site is adjacent to a deflated dune field. Eolian processes are active. The steep terrace edge makes this site vulnerable to catastrophic erosion.

Three checkdams were originally constructed in FY97 in an extensive terrace-based drainage at the location of the headcut, a large nickpoint, and as a terrace fortification. The fortification was extended in FY00 and one additional checkdam was built. Checkdam 2 was obliterated by active bank slump. The drainage has been very active with headcut advancement resulting in the slumping of eroded sediments into the drainage and burying of some checkdams and blowing out of the others. The checkdams in the main drainage will not be maintained as the drainage is too steep and deep to effectively curtail erosion.

C:13:336 –5 checkdams, 1 Terrace-based drainage

This site is located on a flat and open alluvial deposit overlaying a side canyon debris flow. Active dune migration contributes to some infilling of drainages by eolian processes. Sparse vegetation anchors the sediments in portions of this site.

The five original checkdams constructed in 1998 have successfully curtailed further downcutting in the drainage. In FY00 checkdam 5 was completely covered by sediments trapped in the drainage. Staff added more rock to the remaining 4 checkdams to see if additional sediments could be trapped. No other work has been completed at this drainage. The drainage has not been active. The checkdams are secure; no maintenance work was required.

C:13:346 –9 Checkdams, 2 Terrace-based drainages

A thin layer of predam alluvium at the base of a gently sloping talus slope is the setting for this site. High dunes that actively rework sand along the lower margins of the site boundary also buffer the site. While runoff does not occur in association with high velocity, downcutting does occur and is exposing subsurface cultural remains.

Nine checkdams were originally constructed in the two drainages, six in one and three in the adjacent drainage. Minor maintenance work was conducted in FY99 and in FY00 one checkdam had been completely covered in alluvium. In FY02 the drainages were active and the checkdams were breached. GCMRC sponsored a checkdam research project supervised by Joel Pederson (University of Utah). This site was chosen and research began in FY00 and the results were drafted in FY03 (Pederson 2001).

Checkdams 1, 3-6 were completely breached, headcut advancement occurred and the presence of several nickpoints necessitated maintenance work. Five checkdams were reconstructed using brush and sand.

C:13:348 –6 checkdams, 2 Terrace-based drainages

Adjacent to C:13:346, this site shares all the depositional characteristics, including its location on a thin layer of predam alluvium at the base of a gently sloping talus slope. High dunes that actively rework sand along the lower margins of the site boundary also buffer the site. Runoff does not occur at a fast rate due to the gentle slope, yet the downcutting that has been documented does expose subsurface cultural remains.

Five brush checkdams were constructed in FY97. No maintenance was required until the drainages blew out in FY02. GCMRC sponsored a checkdam research project supervised by Joel Pederson (University of Utah). This site was selected and research began in FY00 and the results were drafted in FY03 (Pederson 2001). FY03 monitoring staff observed that the drainages had headcut advancement and nickpoint development.

C:13:359 –4 Checkdams, 1 Terrace-based drainage

This site is located on top of a layer of predam alluvium that is heavily blanketed by vegetation. The site boundary is isolated because the site abuts a bedrock cliff and talus face.

Checkdams constructed in FY97 were altered in FY99 by removing rock from the center of two checkdams and placing this rock along the drainage banks. In FY00 Checkdams 1 and 2 had plunge pools present below the checkdams and these were filled in with rock. Since that time no additional maintenance has been conducted. The drainage has not been active even though the adjacent side canyon experienced a flash flood last year. The checkdams appear to be trapping sediment above them.

C:13:371 –3 checkdams, 1 River-based drainage

A deep alluvial deposit overlaying a debris flow is the setting for this site. The remnants of older deflated dunes containing cultural materials can be seen in some locations. Active downcutting and eolian erosion contribute to the vulnerability at this site.

Three checkdams were originally constructed in 1996. Only one checkdam has required maintenance: Checkdam 2 was maintained in FY00 and FY02. No work was completed in FY03 and the checkdams are secure.

C:13:381 –4 Checkdams, 1 Terrace-based drainage

This site is located at the mouth of a side canyon debris flow. Alluvium overtops the debris flow. Large boulders from the flow contribute to the steep nature of the drainage at this site. The drainage is downcutting through a hearth feature. No eolian processes are active at this location.

Maintenance work was conducted on Checkdams 1 and 2 in FY98, FY99, and FY00. In FY01 Checkdams 2 and 3 required maintenance. In FY03, monitoring staff observed that the drainage was minorly active with maintenance work conducted at Checkdam 4. One half of one bucket of medium sized rock was added to a plunge pool at this checkdam. The upper checkdams are trapping sediment.

G:03:002 – 6 Checkdams, 2 Terrace-based drainages

This site is located on a Holocene terrace. In many locations, mesquite trees, cacti, and annual grasses anchor the sediments.

Five checkdams were initially constructed in FY97. In FY00 September rains breached three checkdams. Maintenance work conducted the following February resulted in merging two checkdams into one and constructing two new checkdams. Minor maintenance occurred in FY00 and FY01. Checkdam 2 was blown out in FY02 but not repaired. In FY03, maintenance was required due to the presence of a plunge pool below Checkdam 1. The headcut was filled in with granite rock and brush. The drainage below Checkdam 1 is too deep to fill in. The upper drainage appears to be inactive. Figure 8 shows before and after photographs of treatment to Checkdam 1. Small gravels and brush were used to fill in the spaces between the drainage wall and the checkdam and the spaces between large rocks in the checkdam itself.

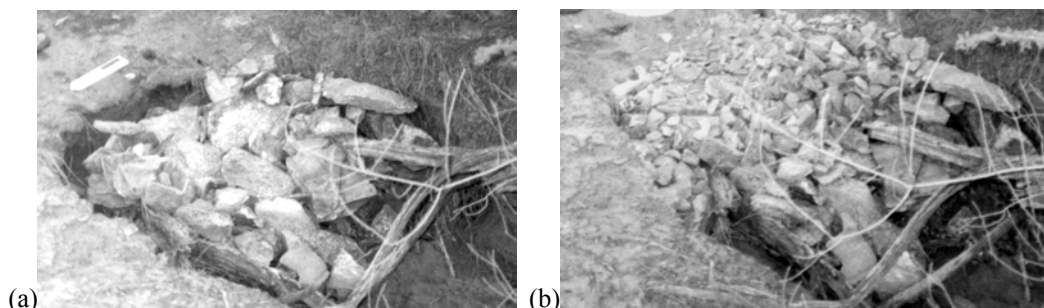


Figure 8. Site G:03:002, Checkdam 1: an example of treating headcut advancement (Photo a) with small gravels and brush (Photo b).

G:03:003 – 19 Checkdams, 1 Terrace-based drainage

This site is located atop a high flat predam terrace adjacent to a side canyon drainage. The upper portions of the site contain the remains of deflated dunes anchored by creosote bushes, cryptogamic soils and annual grasses. The drainages are broad and U-shaped; suggesting that downcutting will be slow and gradual. There are no active eolian processes within the site boundary.

Three checkdams were initially constructed in FY96. Two additional checkdams were added in FY97. Heavy rains in FY99 led to the obliteration of two checkdams and reconstruction or construction of a total of 10 checkdams, 6 of which were nickpoint treatments. Only minor maintenance occurred in FY00 and FY01. GCMRC sponsored a checkdam research project supervised by Joel Pederson (University of Utah). This site was selected for the research that began in FY00. The results were drafted in FY03 (Pederson 2001). The drainage has been minorly active. Some areas between checkdams are still damp and filled with clay soils. The checkdams are secure and no maintenance work was necessary.

G:03:024 – 12 Checkdams, 2 Terrace-based drainages

This site is located atop a large Holocene terrace. Vegetation anchoring surrounding landscape consists of mesquite tree, cactus, and annual grasses. Some portions of the site are devoid of vegetation.

Four checkdams were initially constructed in FY97. In FY99 several checkdams had been breached and many nickpoints were present in the drainage. Ten new checkdams were constructed. The lower section of the drainage continues to be very active and not all the original checkdams are still in place. In FY03 it was observed that the drainage had been active with lots of eolian deposition. The meander at Checkdam 4 is now cutting into the bank. Brush was added at this location to fill the channel and curtail further widening of the channel.

G:03:025 – 4 Checkdams, 1 Terrace-based drainage

The site is located within a broad open alluviated terrace. The headcut to the main drainage is located in the center of the site boundary. The alluvial deposit is extensive and there is potential for drastic downcutting. No eolian processes are active within the site boundary.

Three checkdams were originally constructed in February 1996. Construction of an additional checkdam and minor maintenance to Checkdam 1 occurred in FY97. Minor maintenance was necessary in FY99, FY00, and FY01. FY03 monitoring staff observed that the drainage has not been active. No maintenance work was necessary. The existence of the checkdams has increased site preservation.

G:03:026 – 6 Checkdams, 1 River-based drainage

The site is located in a deposit of alluvium along the edge of a broad Holocene terrace. The site is adjacent to a major side canyon and is vulnerable to side canyon flooding. The drainages are deep and wide with large nickpoints that were treated at the time of initial checkdam construction. The vegetation is changing and dying off at this location and active eolian processes do contribute to the build up of sediments within the checkdams.

The five original checkdams were constructed in FY96. Maintenance work was required on all checkdams in FY97. Minor maintenance work was required in FY99 and one new checkdam was constructed as a nickpoint treatment. Additional maintenance work was conducted in FY01 and FY02. FY03 monitoring staff observed no changes to the checkdams or the drainage. No maintenance work was necessary.

G:03:040 –2 Checkdams, 1 Terrace-based drainage

The site is located within a broad and deep alluvial deposit. Several large dunes are present within the site boundary and securely anchored by vegetation. Side canyon flooding has deeply incised the drainage present in FY97. The terrace-based drainage is U-shaped and did not exhibit such catastrophic changes as compared to the side canyon drainage.

Four checkdams, two rock and two brush checkdams were constructed in FY97 in two separate drainages on-site. Checkdam 1 was obliterated in FY99 and Checkdam 2 in FY00 due to bank retreat and side canyon flooding. Checkdams 3 and 4 have remained unchanged with no maintenance required since they were installed. The drainage has not been active. There are lots of annual grasses growing within the brush checkdams. No maintenance work was necessary.

G:03:041 –8 Checkdams, 2 Terrace-based drainages

The site is situated high atop a deep alluvial terrace. Steep channels incise the terrace that has been truncated by the Colorado River. The drainages when active also continue to downcut as evidenced by nickpoints between checkdams. Active eolian processes are beginning to fill in the active channels.

Initial checkdam construction included two brush and rock checkdams at the head cuts of each drainage. The drainage with Checkdam 1 was extremely active in FY99 leading to the construction of seven new checkdams close together in the same drainage, many of these were subsequently blown out and only two checkdams were rebuilt in FY00. The drainage is currently filled with eolian sands.

GCMRC sponsored a checkdam research project supervised by Joel Pederson (University of Utah). This site was chosen and research began in FY00 and the results were drafted in FY03 (Pederson 2001). The drainage was full of annual grasses when monitored in May 2003. Eolian processes have blown more sand into the drainage.

G:03:058 –9 Checkdams, 2 Terrace-based drainages

The site is situated in a deposit of finely sorted predam alluvium overtopping a side canyon debris flow. There is very little vegetation on-site with the exception of creosote bushes topping the remains of deflated dunes. Eolian processes are active.

Initial checkdam construction consisted of two rock and brush checkdams in one drainage in FY97. In FY99, several new nickpoints appeared in the drainage resulting in the construction of four new checkdams. The drainage continued to be extremely active with all checkdams obliterated and reconstructed and two new checkdams constructed. The drainages were inactive for the next two years. In FY03 the checkdams were covered in sediments and vegetation as shown in Figure 9. The drainages have completely filled in with sediment and vegetation is growing throughout the drainage. The checkdams have been successful and are barely visible on the surface. No work was necessary.

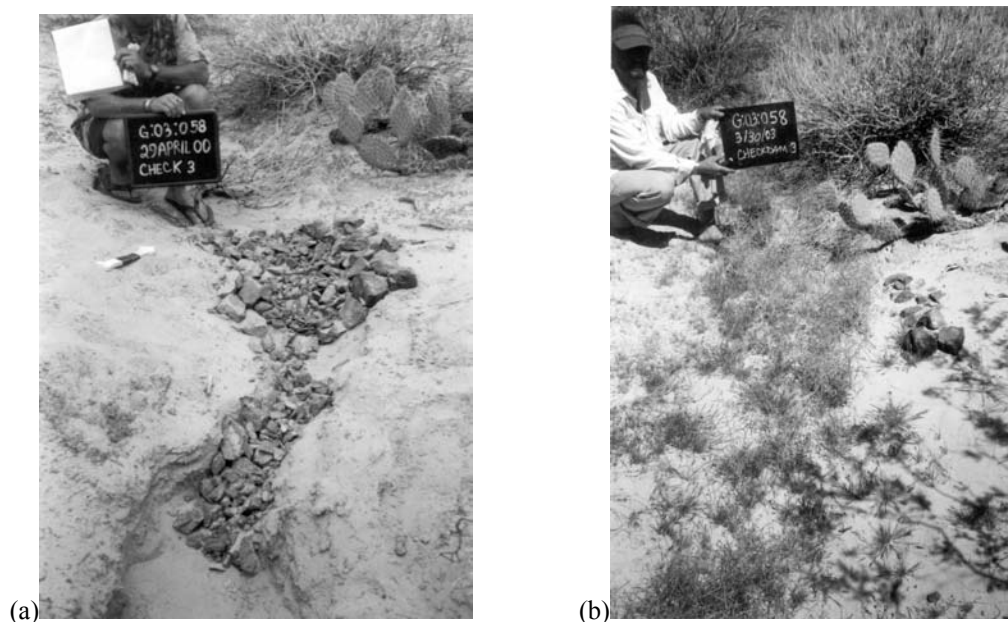


Figure 9. Site G:03:058, Checkdams 8 and 9 in 2000 (Photo a) and again in 2003 (Photo b).

G:03:072 –12 Checkdams, 1 River-based and 2 Terrace-based drainages

The site is located in deep alluvium overlaying a side canyon debris flow. The side canyon drains through the center of the site. Portions of the site with heavy vegetation are experiencing less eolian reworking of sediments. Other portions of the site that are less vegetated are cyclically downcut and filled in.

In FY97 15 rock checkdams were constructed in the three drainages on-site. In FY99 four checkdams were obliterated and it was decided not to rebuild them. Three checkdams did receive minor maintenance. Checkdam 16, a nickpoint treatment constructed in FY00 has been the only checkdam requiring maintenance since FY00. GCMRC sponsored a checkdam research project supervised by Joel Pederson (University of Utah). This site was selected and researched beginning in FY00. Results were drafted in FY03 (Pederson 2001). Active eolian processes have helped to fill in some areas where the drainages were active. No maintenance work was conducted here. All the checkdams are successfully trapping sediments and preventing further downcutting.

CHECKDAM RECOMMENDATIONS FOR FY2004

Checkdam monitoring and maintenance will continue in FY04. The 27 sites with checkdams will be monitored for checkdam effectiveness during regular site monitoring activities.

Additional recommendations for new checkdam installation have been made at four sites that currently do not have checkdams. All four of these sites, C:02:098, C:13:329, G:03:020, and G:03:056 have been assessed by members of the RCMP staff and outside consultants such as geomorphologists, geoarchaeologists, and checkdam specialists from the Zuni Conservation Project.

C:02:098 has been assessed for checkdam installation by ZCP staff. The recommendation is to armor the upstream drainage with small to medium sized rocks. Placement of logs in the location of the old trail will also deter runoff.

Sites C:13:329 and G:03:020 have been recommended for water diversion bars. In both cases features are located at the base of slopes with steep gradients. Experience has shown that erosion of steep slopes is accelerated by checkdams that tend to pool water that pours over resulting in greater destruction and drainage deepening. Placement of diversion bars above the drainage and ultimately above the cultural features will re-direct water away from sensitive archaeological remains.

G:03:056 has been assessed for checkdam installation by the ZCP. The recommendation is to line the bottom portion of the gully with rocks, creating a rock lining. This assessment was made in FY2002.

CHANNEL CROSS SECTION PROFILES

Channel cross section profiles were first established at specific archaeological sites along the river corridor in FY2001. The purpose of the cross sections is to quantify change in sediment distribution at specific locations along the channel. These locations might be above and below checkdams to evaluate their effectiveness, or across a gully with headward migration.

The channel is the bed where a natural flow of water (rain) runs through or near a site, i.e. a drainage or gully. The deepest part of the channel is called the thalweg. Elevation or depth measurements are taken at consistent intervals and at the edges of drainages and the thalweg.

RCMP archaeologists use two methods to measure channel cross sections. The most accurate, but most expensive and logistically challenging method is to use a total station survey instrument. A total station was used at two sites this fiscal year, C:13:070 and C:13:099. The second method is a low technology, inexpensive way to measure erosion or deposition in channels. It involves stretching a measuring tape between rebar (placed securely in the ground, but able to remove them if necessary) endpoints, using a line level, and taking vertical measurements into the channel. Using the same reference points and trajectory each time the channel is measured ensures repeatability. The reader is directed to Figure 10 and Harrelson et al. for a field guide to these techniques (Harrelson 1994). Documentary photographs are taken regardless of the method used. See Appendix H: Cross Section Profiles for time comparison graphs of each cross section profile. Geomorphologists and Zuni Conservation Project personnel suggested the sites that have currently been chosen to have cross sections.

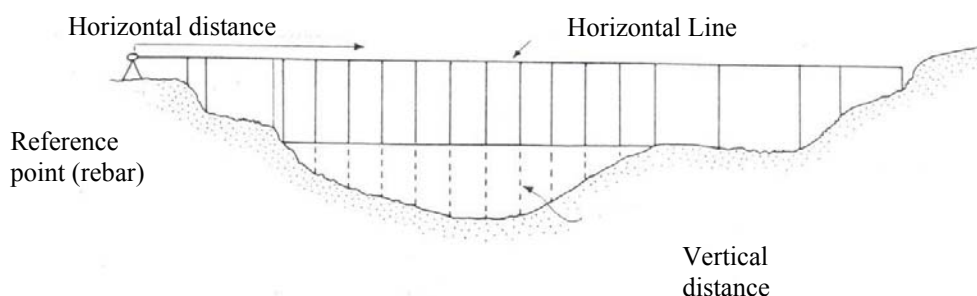


Figure 10. Diagram of a cross section across a drainage. Adapted from Harrelson et al. (Harrelson 1994).

B:11:281 – Since FY98, the gully southwest of Feature 1 (roasting feature) has been actively migrating upslope. This year RCMP monitors established three cross sections beginning several meters above the current headcut (Profile 1) and continuing downslope approximately one-meter apart (profiles 2 and 3). Cross section measurements will be taken next year, providing a Time 1 to Time 2 comparison of how each profile changes.

C:13:070 – This is the first year for cross section profiles at this site. Two profiles were established using a total station instrument. The cross sections are located in Locus D, the main arroyo. Cross section #1

spans the arroyo width and is located approximately two meters above the terrace edge. Cross section #2 is four meters above cross section #1. Measurements will be taken next year for comparison.

C:13:099 – Three cross section profiles have been established in a river-based gully. Profile 1 is above Checkdam 10, Profile 2 is located above Checkdam 13, and Profile 3 is above Checkdam 35N. Measurements were taken in FY01 and FY02 using a tape and line level. There was a slight increase in deposition (0.161 and 0.280 sq. m) at Profiles 1 and 3. Profile 2 indicated 0.013 sq. m of erosion. A different method (total station elevations) was used at these profiles in FY03 and the data cannot be compared with the previous years because the data are incompatible.

C:13:329 – Feature 2 (artifact scatter) has been impacted by active gullying since FY2001. Monitors recorded the presence of three nickpoints adjacent to Feature 2 in March 2001. For this reason, two cross section profiles were placed in FY2003 to track gully entrenchment. Profile measurements will be taken again next year for a Time 1 to Time 2 comparison.

G:03:003 – Three cross section profiles, located in the same river-based gully, were placed in April 2001 to evaluate the effectiveness of checkdams. Profile 1, furthest upstream, was located above Checkdam 2. Profile 2 was situated between Checkdams 8 and 9, while Profile 3 was located just above Checkdam 5. Results indicate that there was sediment deposition at Profile 1 (+0.064 sq. m) and Profile 2 (+0.657 sq. m) between April 2001 and March 2003. Profile 3 showed some erosion (-0.028 sq. m) between May 2002 and March 2003, but an overall one-half square meter of deposition (+0.526) since April 2001.

G:03:020 - Two cross section profiles were placed in an active river-based gully in April 2001. There are no checkdams within this gully. The profiles were established to measure changes in erosion/deposition at the two locations. Between April 2001 and May 2002, approximately 0.116 sq. m of sediment was deposited at Profile 1 (furthest downstream). Between May 2002 and March 2003, a small amount of this sediment was washed or blown away (0.046 sq. m). Deposition (0.17 sq. m) occurred at Profile 2.

G:03:040 – Two cross section profiles were placed in a terrace-based gully near several checkdams. Profile 1 is northwest (below) of Checkdam 4. Profile 2 is southeast (above) of Checkdam 3. Measurements were not taken during in May 2002. However, deposition occurred at both locations (0.471 and 0.346 sq. m.) between April 2001 and March 2003.

CHAPTER FIVE

REMEDIAL ACTIONS IMPLEMENTED IN FY2003

SPONSORED RIVER TRIPS

NPS River Trips

The NPS Colorado River Fund-sponsored Cooperative River Trips (CRT) provided logistical support and staff for RCMP projects. Work accomplished on the trips this year included total station mapping, trail obliteration and/or retrailing, and planting vegetation.

November 9-26, 2002 was the first CRT available to RCMP staff. Fifteen sites were monitored, trail work was completed at three sites and medium format photography occurred at five sites (Appendix I). Medium format photography began in 1996 prior to the experimental flood of 45,0000 cfs and since then, RCMP staff have created a database illustrating changes in the beaches near or at selected cultural sites. Mark Manone of NAU will complete his analysis of this database this fiscal year and attempt to quantify the changes exhibited in the photographs.

On the February CRT trip (14-24, 2003) seven sites were mapped with a total station unit. These maps supplement the original sketched field maps completed during the 1990-91 inventory and provide quantitative data regarding the physical changes of a site through time. For more detail see the two CRT reports in Appendix I.

The Park also sponsored several tamarisk removal trips this fiscal year. Lisa Leap participated in one trip October 10-28, 2002 (Appendix I). In addition to monitoring the removal of tamarisk situated near archaeological sites along the River, archaeological monitoring occurred at seven sites.

Grand Canyon Monitoring and Research Center

RCMP archaeologist Jennifer Dierker participated on a river trip (September 27 to October 14, 2002) sponsored by GCMRC and supervised by Joel Pederson (Utah State University). The goals of this study were to assess the performance of erosion-control structures (checkdams), to determine the accuracy and utility of aerial photogrammetry for monitoring gullies, and to build on a geomorphic understanding of the erosion in the river corridor (Pederson 2001).

For PA members this project is commonly referred to as the checkdam research project. The purpose of this trip was to compare this years finding to last years. They collected data to test the effectiveness of monitoring archaeological sites using LIDAR and remote sensing techniques. Another research objective was to analyze the effectiveness of previously constructed checkdams; and provide recommendations for future monitoring efforts. A total of 11 total station maps were generated and nine sites were monitored. In addition to the purposes of the research mentioned above, map data will supplement the total station map data collected since 1996. The data have been collected to identify the rates of change on archaeological sites through time by measuring changes in the drainage systems. See Appendix J for the Pederson river trip report.

A second GCMRC sponsored trip occurred later in the fiscal year (May 4 - 19, 2003). This trip was an outgrowth of the GCMRC physical science program. Specifically, David Rubin, a USGS sedimentologist, wrote a workplan to test the hypotheses that eolian deposition on archaeological sites might be enhanced if sand bars were larger, more abundant, finer grained, less frequently inundated (drier), or less vegetated (Rubin 2003). A total of 38 archaeological sites were visited. Each site visit resulted in in-depth conversations of the cultural material exposed, the immediate geomorphology (including the approximate location of the site relevant to CFS levels provided by USGS geomorphologist David Topping), and the on-site depositional context (see Figure 11). Six carbon samples were collected on the trip. These samples all came from newly exposed (never previously recorded) cultural materials. See Appendix K for the eolian transport river trip report.



Figure 11. Grand Canyon Monitoring and Research Center sponsored a river trip in May 2003 for eolian transport research at archaeological sites located along the river corridor.

Bureau of Reclamation

A single BOR funded trip launched from Lees Ferry March 17 and took off the river at Diamond Creek March 31, 2003. Thirty-five sites were monitored, checkdam maintenance was necessary at 10 of the 27 sites visited (see Chapter 4 for checkdam results), graffiti removal occurred at one site, three carbon samples were collected at three newly exposed cultural features, and cross sections measurements were collected at five sites.

REMEDIAL ACTIONS IMPLEMENTED IN FY2003

Checkdam Maintenance

Checkdam effectiveness was called into question by PA and TWG members for the past two years. Until that question was answered, the BOR requested that NPS archaeologists not construct checkdams at sites where checkdams had not been previously installed. This request was honored to and for the past two years maintenance of the existing checkdams has been the only action taken.

Joel Pederson, University of Utah geomorphologist, was funded by GCMRC to answer the question of checkdam effectiveness. He gave a presentation at the May 2003 TWG meeting in Phoenix, AZ and reported that "...checkdams do work to reduce erosion". He also noted that the "woody debris checkdams appear to work better than rock linings". The recommendations he made to TWG regarding checkdams were to "...continue erosion control, especially woody debris structures" and to "undertake necessary maintenance".

In FY03, 10 of the 27 sites with checkdams received maintenance (see Table 5). For more detail see the discussion in Chapter 4. In FY95 PA signatories agreed to have specialists with the Zuni Conservation Program supervise all work completed on the checkdams. FY03 was the first year since 1995 with no Zuni representation. In the past the BOR supplemented funds for their participation in this PA program. In FY02 NPS provided funding for Zuni participation in the checkdam monitoring and maintenance program. This year there were no funds available to subsidize Zuni participation.

Table 5. Archaeological Sites Containing Checkdams that Received Maintenance in FY2003 (N = 10 Sites).

Site Number	Sponsored Trip	Checkdam Maintenance Comments
C:02:101	BOR	Maintenance work was completed at Checkdams 9, 10, 11, 12, and 17 in drainage 2.
C:13:006	BOR	Two new rock checkdams were built and two new nickpoint treatments were built. Nickpoint treatments are located on the southern drainage. The new checkdams were built on the northern part of the site
C:13:069	BOR	Checkdams 2 and 4 required maintenance work.
C:13:099	BOR	Maintenance work was conducted at Checkdams 11, 26, 37, 42, and 43.
C:13:100	BOR	Maintenance work was completed at Checkdams 8, 10, 11/12. Plunge pools had impacted all checkdams.
C:13:348	BOR	One new brush lining was completed (Checkdam 6). Maintenance work was conducted at Checkdams 1, 2, 3 and 4.
C:13:381	BOR	1/2 a bucket was added to Checkdam 4 below the checkdam to fill in a plunge pool.
C:13:346	BOR	Checkdams 1, 3, 4, 5, and 6 were rebuilt. All checkdams are of brush construction.
G:03:002	BOR	Checkdam 1 was altered using brush and rock.
G:03:024	BOR	Checkdam 4 had brush added to the area in the meander where the drainage actively downcut.

Trailwork and Planting Vegetation

In FY99 the BOR questioned whether visitor-related impacts should be the responsibility of the BOR or NPS. Impacts by visitation have been acknowledged in the Adaptive Management Program however the NPS has taken on the responsibility to fulfill their own management goals of the corridor. The NPS has maintained, defined and obliterated human trails near archaeological sites. In FY03, three sites scheduled for monitoring also required trailwork (see Table 6). This work was completed on an NPS trip and supervised by NPS revegetation staff and trail crew personnel. An archaeologist was on-hand to ensure no disturbance to archaeological materials.

Table 6. NPS Trail and Vegetation Work Conducted at Archaeological Sites Located along the River Corridor and Maintained in FY03 (N = 3 Sites).

Site Number	Sponsored Trip	Trailwork and Vegetation Planting Comments
A:16:160	NPS	Lined an existing trail into the drainage. Covered old trail in vertical mulch. Planted grasses, arrowweed and bushes. Also brought in cryptogammic soil to help cover up the old trail. Entire work area was covered in duff. Approximately 25 meters of trail were worked on.
G:03:003	NPS	Raked 30 meters of trail to stimulate cryptogammic growth and obliterated a trail adjacent to Granite Creek by sprinkling two buckets of duff over the trail.
G:03:026	NPS	Completed trail obliteration of six access points off the camp terrace to the upper terrace in one hour. Used vertical mulch and duff. Transplanted prickly pear pads of differing sizes to the six trails leading from the camp terrace to the upper terrace. Both single and multiple pads were transplanted.

Graffiti Removal

Graffiti removal was completed at site C:05:007 on the BOR sponsored trip by base funded Park archaeologists. This site consists of a rare juniper tree (perhaps 300 years old) with a historic inscription comprised of Harry McDonald's initials (H. McD). Driftwood accumulated around the tree is the result of the 1957 flood. McDonald was a member of the 1889-1890 Stanton expedition. Stanton found McDonald

at Cataract Canyon, where he was possibly working a mine. Harry was a "handy" person who proved useful for Stanton's purposes (Fairley et. al 1994;Thompson and Potochnik 2000).

The site was officially recorded by NPS personnel in 1990 on the archaeological inventory completed for the Glen Canyon Dam EIS. Baseline monitoring in 1990 describes the site as being in excellent condition, "The tree appears healthy, with no major dead limbs or exposed roots, and the carving is also undisturbed; no vandalism or natural deterioration"(Fairley et. al 1994).

In 1995 RCMP monitors visited the site and determined that no additional monitoring was necessary based on the fact that no disturbance had occurred for the past 5 years. In 1997 RCMP personnel completed medium format photography on all the rock art located along the river corridor. This inscription was included in that project(Hubbard 1997a;Hubbard 1997b).

In May 9, 2002 a commercial river guide reported the following at Phantom Ranch: "Harry McDonald inscription on a juniper tree, circa Stanton expedition, has new damage/graffiti above it. Dead bark of tree defaced above the inscription". This information was sent to the river patrol rangers.

On May 10 this information was given to NPS archaeologists. Fortunately there was an NPS river patrol trip leaving a few days after receipt of this information. An NPS archaeologist went on the river trip to complete a more detailed assessment. The archaeologists noted that the incised, scratched graffiti was not as deep or clean as a knife cut, but it looked like the vandal used a rock or stick. It extended above the H. McD inscription and was not decipherable (see Figure 12a). There was also incised graffiti noted on a nearby boulder ["TLS 2000" AND "RYAN SWEENEY".



Figure 12. Graffiti recorded by NPS archaeologists at site C:05:007 in May 2002 (Photo a). On 3-18-03 base Park archaeologists (Jan Balsom and Grace Ellis) removed the graffiti with sandpaper (Photo b).

On the FY03 BOR sponsored trip base funded Park archaeologists used sandpaper to remove the vandalism on the tree (see Figure 12b) and the rock. Additional work on the boulder with graffiti included mixing clay and water and covering the rock to mask the incised lettering. Because this is only a mask, it is imperative to revisit the site to determine if additional removal is necessary. The San Juan BLM was contacted regarding the removal of graffiti on desert varnish. We anticipate applying their methods to this site if necessary. The NPS ARPA officer, Joe Sumner is investigating the case.

Total Station Mapping

The RCMP archaeologists have monitored archaeological sites along the river corridor since 1992, but it was not until 1995 that Programmatic Agreement signatories approved total station mapping. In 1996 it was the BOR's view that total station mapping be used as a tool first and foremost to enable us to measure quantitatively the amount and location of erosion at threatened sites and to guide plans for remedial action.

The intent was to concentrate on threatened sites -- sites we know are experiencing serious sediment loss from erosion in preparation for treatment(s).

Total station mapping of archaeological sites is a function of the NPS archaeological long-term monitoring program. As stated in the Glen Canyon EIS, Appendix A, "This... long-term monitoring program... emphasizes measurement of those parameters, or attributes, that might change with time and whose change might be related to operations of Glen Canyon [Dam]." Additionally, "To effectively monitor impacts of dam operations on cultural sites, baseline information must be complete, with accurate maps, descriptions, and photographs of each site having potential of being impacted." (U.S. Department of the Interior/Secretary of the Interior 1996).

More specifically the Monitoring and Remedial Action Plan (MRAP) included the parameters for total station mapping. The Plan includes specific directions on what sites to map (sites receiving remediation and a set of control sites), and the types of features to map (features, artifact concentrations, diagnostic/exotic material culture, significant natural features, erosional features, and datum points for photo referencing). At every site where total station maps are generated, repeat mapping will occur (U.S. Department of the Interior and Service 1997).

Beginning in FY00, the BOR eliminated the funding for the total station-mapping program. Because of the quantitative information that can be acquired through mapping (volumetric change identified to predict the rate of change of a site through time), NPS believes it is a very valuable technique for monitoring cultural sites along the river corridor. Therefore NPS has been adamant about continuing this program. The research completed by Pederson and others (Paul Peterson) also support the fact that current photogrammetry remote sensing technology is not yet appropriate for monitoring moderate to small-scale gullies (Handout, May 2003, Technical Working Group Meeting, Phoenix), but is surely useful for larger sized arroyos.

A total of 99 sites have been mapped or remapped using a total station unit. This year seven new site maps (see Table 7) were generated using a total station instrument. Additionally, through the research completed by Pederson and others, 11 sites mapped as early as 1996 were remapped. This makes for an important data set that can be analyzed to quantify the physical condition of sites or identify trends over time. Complete analysis of these maps has been delayed due to the incompatibility between the software programs used to generate the maps and the lack of funding to complete analyses.

Table 7. Archaeological Sites Located along the River Corridor and Mapped in FY03 by NPS Personnel using a Total Station Instrument (N = 18 Sites).

Site Number	Sponsored Trip	Total Station Mapping Comments
A:15:003	GCMRC/Pederson	Control site for remote sensing research
C:09:075	GCMRC/Pederson	Control site for remote sensing research
C:13:006	GCMRC/Pederson	Remote sensing research
C:13:099	GCMRC/Pederson	Remote sensing research
C:13:100	GCMRC/Pederson	Remote sensing research
C:13:101	NPS	Completed mapping
C:13:272	NPS	Completed mapping and identified a new structure and ceramic vessel.
C:13:334	NPS	Completed mapping and identified three new features.
C:13:336	NPS	Completed site map and checkdam locations
C:13:346	GCMRC/Pederson	Remote sensing research
C:13:348	GCMRC/Pederson	Remote sensing research
C:13:385	NPS	Completed site map
C:13:386	NPS	Completed mapping of burial, dune and surrounding features. Also identified one new feature.
C:13:389	NPS	Completed map of overhang and roasters.
G:03:003	GCMRC/Pederson	Remote sensing research

G:03:038	GCMRC/Pederson	Remote sensing research
G:03:041	GCMRC/Pederson	Remote sensing research
G:03:072	GCMRC/Pederson	Remote sensing research

Cross sections

In FY2001 NPS archaeologists initiated a cross section program as suggested by Fred Nials, independent contractor (Dierker et. al 2001). Cross section profiles are intended to aid in gathering quantitative data on erosional and depositional changes at specific locations in drainages. The purpose is to acquire quantitative data that will supplement data from the monitoring form, total station maps, and the checkdams: i.e., data we have collected for the past 7 to 10 years. Two of the sites had cross sections completed on the February CRT trip using a total station instrument. To date a total of seven sites have cross sections (see Table 8, Chapter 4 and Appendix H).

Table 8. Archaeological Sites Located along the Colorado River Corridor that Contain Cross Sections (N = 7 Sites).

Site Number	Sponsored Trip	Cross section Comments
C:13:070	NPS	Installed two cross-sections and mapped the sections with a total station unit. This is the first year for cross-sections at this site.
C:13:099	NPS	Third year for cross-section measurements. This year the measurements were taken with a total station unit.
C:13:329	BOR	First year to measure two cross-sections in the only gully at this site.
B:11:281	BOR	First year to measure three cross-sections at the north end of the gully (above the current headcut).
G:03:003	BOR	Third year for taking vertical measurements at cross-sections 1, 2, and 3.
G:03:020	BOR	Third year for measuring two cross-sections (1 and 2).
G:03:040	BOR	Third year for taking vertical measurements at cross-sections 1 and 2.

Collections

Nine carbon samples were collected from nine newly exposed cultural features in FY2003. The majority (six) of the collections occurred on the May GCMRC eolian transport river trip. The trip was an outgrowth of the GCMRC physical science program. David Rubin, a USGS sedimentologist, wrote a workplan to test the hypotheses that eolian deposition on archaeological sites might be enhanced if sand bars were larger, more abundant, finer grained, less frequently inundated (drier), or less vegetated (Rubin 2003). Although previous studies have made such observations (Hereford et. al 1993; Thompson and Potochnik 2000; Wiele and Margaret Franseen 1999) no one has addressed the questions of whether the dam and its operations have reduced eolian transport. Additionally, no research has been done that asked the question whether dam operations could be modified to intensify eolian transport from active bars and to increase deposition on archaeological sites (Rubin 2003). The trip goals were to visit as many archaeological sites as possible and to make an initial assessment concerning the impact of eolian deposition in respect to the preservation of archaeological sites. Carbon samples of cultural features situated in or on eolian and alluvial deposits were collected to aid in the Rubin research. Refer to the eolian transport/NPS river trip report (Appendix G) mailed to PA representatives July 2003.

Results of recent carbon sampling reveal that three sites date to the Basketmaker Period. The dates for features at B:16:911 are solid Basketmaker II/ early Archaic. These dates indicate atypical river occupation when compared to the inventory in 1990-1991 (Fairley et. al 1994). It is the belief of the NPS archaeologists and others that additional occupation representing Basketmaker and Archaic do exist yet they are buried beneath the typical Puebloan sites. Data recovery is the only means to prove or disprove this.

At site B:13:002 the 1990-1991 survey crew (Fairley et. al 1994) indicated a Pueblo II affiliation based on surface ceramics with a historic component. Dating of a newly exposed hearth feature approximately 1 meter below the surface specifies a date of AD 225 - 445 (2 sigma calibration).

C:13:069 was initially recorded in 1972 by R.C. Euler. J. Balsom and H. Fairley completed a second recording in 1984 and a third recording during the survey (1990-1991)(Fairley et. al 1994). All recordings pointed toward a Pueblo II to early Pueblo III affiliation. A sample was taken from a newly exposed burnt roof beam in the drainage west of Feature 2 indicates a probable Basketmaker II connection.

Two sites appear to date the Pueblo I Period. A carbon date from Feature 7, at site C:13:291, which is a newly exposed burnt roof beam, indicates a Pueblo I affiliation. During the 1990-1991 survey, surface ceramics indicated a late Pueblo I to Early Pueblo II affiliation (Fairley et. al 1994). Feature 7 is located approximately 1 meter below present ground surface. The ceramics that were analyzed were on the ground surface so the results of the carbon dating could indicate previous occupation at the same location. Reoccupation of these sites is not surprising due to the limited living space along the river corridor.

A new wall alignment was exposed west of Feature 49 at site C:13:010 (frequently referred to as Furnace Flats). A carbon date of AD 700 - 900 was the result of the analysis. This date supports the findings found during the excavations by A. Trinkle-Jones (Jones 1986).

To reiterate, carbon dates (even with all their scrutiny, i.e. old wood, contamination) supply some of the more pertinent information needed to expand upon the cultural history of the Canyon, specifically the river corridor. The Canyon is not just a corridor of Pueblo II sites. NPS archaeologists sense that most, if not all the terraces were reoccupied for several hundreds of years. Through preliminary research conducted by Rubin and Draut (Rubin 2003) one could hypothesize that river sands through eolian transport covered evidence of early lifestyles. This process continued through time until the present. Today the results exhibit that items found on the surface (typically Pueblo II for the Colorado River Corridor, Grand Canyon National Park) only paint part of the picture. The earlier information is buried below.

Soil samples were collected in FY03 and will be sent to NAU for macro- and micro-botanical analyses. A hearth sample was collected from Feature 4, at site B:16:911 on the eolian transport trip, and two soil samples were collected from eroding features on the BOR sponsored trip. Feature 7, a newly exposed structure from C:13:291 was uncovered after the September 2002 rains. Feature 6, an exposed vessel within a possible structure at site C:13:272 was discovered by RCMP archaeologists in February 2002. Only half of the rim of the bowl is exposed and it appears to be Sosi Black on White. The wall is merely 4 semi tabular sandstone rocks that are in an alignment. Samples were taken from the bowl and within the immediate surrounding area.

An ash-like, non-cultural sample was collected at C:13:273 on the eolian transport trip. This sample came from an extensive lens located near Feature 3 and extending toward the river's edge. Sedimentologists thought this lens could be volcanic. See Figure 13 for the location of the exposed white ash. USGS will analyze the sample. Table 9 lists the sites where samples were taken in FY03.



Figure 13. Dave Rubin, USGS sedimentologist and Fred Nials, geoarchaeologist prepare to collect samples for the eolian transport research (May 2003).

Table 9. Archaeological Sites along the Colorado River Corridor Where Samples Were Taken in FY03 (N = 10 Sites).

Site Number	Date Collected	Collection Comments	Carbon Date Results
B:13:002	5-16-03	A charcoal sample was collected from a newly exposed fire-cracked rock feature in hopes to date the deposit above the Colorado River deposit. It is estimated to be 1200 AD.	Feature 5 - 2 sigma calibration Cal AD 225 - 445 (Cal BP 1725 - 1505)
B:16:911	5-14-03	Two samples were taken (charcoal and pollen) from Feature 4 (roasting feature) during the May 4-19, 2003 GCMRC FIST trip (eolian transport). (A second carbon sample was taken last year from Feature 1. This is the first roasting feature that was exposed.)	Feature 1 - 2 sigma calibration Cal BC 360 - 80 (Cal BP 2320 - 2030) Feature 4 - 2 sigm calibration Cal BC 760 - 635 (Cal BP 2710 - 2585) and Cal BC 560 - 370 (Cal BP 2510 - 2320)
C:13:010	3-21-03	A new wall alignment was exposed west of Feature 49 with some exposed charcoal. A carbon sample was collected this March on the BOR sponsored trip.	New Feature west of Feature 49 - 2 sigma calibration Cal AD 700 - 900 (Cal BP 1250 - 1050)
C:13:069	3-21-03	A sample was taken from the newly exposed burnt roof beam in the drainage below (west of) Feature 2.	Roof beam - 2 sigma calibration Cal AD 225 - 435 (Cal BP 1725 - 1505)
C:13:070	5-12-03	A burnt roof beam that had fallen into the arroyo prior to our visit was collected and placed in the GRCA Museum Collection at the S. Rim for a type sample. A depositional sample was collected during the May 4-19, 2003 GCMRC FIST trip (eolian transport). Dave Rubin (USGS) collected the sample from a large flood sample located in an arroyo cut just below Locus D. Rubin sampled this structure with	

Site Number	Date Collected	Collection Comments	Carbon Date Results
		hopes of retrieving dates. T. Melis discussed thermal luminescence as a dating method.	
C:13:272	10-16-02	Newly exposed vessel within a possible structure (Feature 6) was exposed after heavy rains in September 2002. Soil was removed from the vessel for macro- and micro-botanical analyses.	
C:13:273	5-10-03	A sample was collected during the May 4-19, 2003 GCMRC FIST trip (eolian transport). D. Topping, USGS collected the sample from an extensive white lens observed throughout the arroyo cuts. This lens went to the river and was speculated to be volcanic ash from Mount Trumble or Sunset eruptions. USGS will follow up on the identification.	
C:13:291	3-21-03	In September 2002 a side canyon flood exposed a new cultural structure (Feature 7). It is composed of uprights and burnt roof beams. A carbon sample was collected this March from a portion of a burnt beam and sent in for dating. An additional collection was made of, what is presumed to be the floor of the structure. This sample will be sent to NAU for macro- and micro-botanical analyses.	Feature 7 - 2 sigma calibration Cal AD 880 - 1030 (Cal BP 1070 - 920)
C:13:349	5-10-03	A carbon sample from a non-cultural deposit was collected during the May 4-19, 2003 GCMRC FIST trip (eolian transport). Ted Melis, GCMRC collected the sample, just above an alluvial flood deposit. The date of this sample will help interpret the events near and/or during the time of occupation.	Noncultural carbon - 2 sigma calibration Cal AD 255 - 435 (Cal BP 1695 - 1515)
C:13:386	5-12-03	A depositional sample was collected during the May 4-19, 2003 GCMRC FIST trip (eolian transport). Dave Rubin, USGS, collected the sample from the large arroyo cut just upstream of the site. Climbing ripples (indicative of a Colorado River flood deposit) were observed.	

INFORMATION MANAGEMENT

For the purposes of the RCMP, information management is the means whereby project staff plan, collect, organize, use, disseminate, and store data and information (Wilson 2002). Data are the facts (numbers and text). Data that have been processed, organized, and integrated become information useful for decision-making (Management Information Systems: Solving Business Problems with Information Technology). Two part-time NAU staff conduct information management activities each year, many of which are ongoing. The highlights for FY2003 include testing the new database, writing Standard Operating Procedures for field and laboratory activities, database management, data processing and analysis, the orthophotography project, and answering requests for information.

Database Design

In FY02, NPS hired a database consultant to integrate and normalize the project databases. This work resulted in a customized application in MS Access97. Testing, debugging, and revisions to the database design continue during FY03 by NAU staff knowledgeable in MS Access97. Goals for FY04 include integration with the GRCA Science Center Archaeology database, merging of the photographic databases, and incorporation of Geographic Information System (GIS) applications. This work will also be beneficial when incorporating data into the GCMRC database.

Standard Operating Procedures (SOPs)

Redesign of the project database in FY02, and the data cleaning activities that ensued, made it apparent that project procedures needed to be updated and clarified. To this end, NAU and RCMP staff revised and expanded previously written field and laboratory procedures (Appendix C). The new SOPs contain information about field preparations, trip logistics, monitoring fieldwork, photography (including medium format), remedial action field work, mapping, and data entry procedures. This was completed to assist non-project staff in the field and in the lab.

Database Management

Many activities are included under the heading "Database Management," and most relate to the electronic data that the project collects and maintains. Data entry, cleaning, migration, organization, and documentation are some of the database management tasks completed in FY03. NAU staff also conduct file management, create backups (including off-site storage), and fix problems in the software applications, including answering technical questions and providing data to other staff members.

Data Processing and Analysis

NAU staff is in charge of processing the data collected during monitoring and remedial action activities. They maintain the computer files, paper files and records, update the site records as needed, and create tables and graphs for reports and presentations. Each year a descriptive analysis of that year's monitoring data is produced, as has been since FY92. NAU staff perform basic statistical analyses of the data for each year's annual report and provide information to RCMP staff members at their request. An NAU graphics specialist, who tracks the successive changes to the site, is digitizing site maps. NAU personnel process the cross section data, calculate area of loss or gain, and generate graphs to depict any change.

Orthophotography Project

In conjunction with the GCMRC, NAU and NPS archaeologists (with assistance from the Western Archeological Conservation Center) are digitizing archaeological site polygons onto color, 22cm resolution orthophotographs (aerial remote sensing images) of the Colorado River corridor. The purpose of this project is to have site locations in a GIS so that various geographic analyses can be performed on the archaeology data. This task was a recommendation of the Protocol Evaluation Panel review in FY99. One result of a spatial analysis would be a more accurate determination of how water releases from Glen Canyon Dam will directly or indirectly impact archaeological sites.

GCMRC is providing a computer, ArcMap software, and the aerial images. Archaeological site boundaries, derived from the 1990-91 inventory survey black-and-white aerial images with mylar overlays, are transposed onto the color orthophotographs as polygons. Universal Transverse Mercator site locations are plotted as points, but have a limited accuracy. The project will continue into FY2004 if the appropriate funds are available. One observation made thus far is that there are errors in the site location data obtained during the 1990-91 survey and some information is incomplete. Ground truthing the site locations is crucial.

Requests for Information

In addition to internal staff requests, NAU personnel occasionally receive requests for data from other NPS entities, PA Signatory members, Tribal members, or scientific researchers. In FY2003, such requests were made by archaeologists at Glen Canyon National Recreation Area, GRCA Archaeology Division, and the Colorado River Management Plan. Additionally, four researchers requested data from the project files. Helen Fairley requested information for the Colorado River Corridor research design. Scott Urquhart from Colorado State University, a social science statistician, was provided monitoring data for long-term trends analysis. Dave Rubin, USGS has requested site information for the eolian transport study, and Joel Pederson, University of Utah, requested site information for remote sensing and checkdam research.

CHAPTER SIX

FY2004 SCOPE OF WORK

SITES TO MONITOR AND ASSOCIATED REMEDIAL WORK

Seventy sites are scheduled for monitoring in FY2004. Of the 70 sites, 22 have been monitored annually since 1992. We consider the 22 sites our core-monitoring sample, and therefore if available funding is limited this year, priority will be given to visiting those 22 sites.

There are 141 remedial actions recommended at 89 sites. Some sites have multiple remedial action recommendations. This number has increased by 36 (105 to 141) since last year for several reasons: increased erosion, stalling and delaying of the MRAP actions, and limited access to sites due to the decreased number of river trips. We anticipate a continual rise in remedial recommendations until these issues are addressed and resolved.

The 141 recommendations are categorized as follows: four sites recommended for checkdams; 10 sites recommended for planting vegetation; 24 sites recommended for trail work; and 24 sites recommended for some other form of preservation treatment. For data recovery options: 34 sites are recommended for data recovery; 30 sites are recommended for research (dating flood deposits in conjunction with archaeological deposits, eolian sand transport studies, research current flood deposits through medium format photography, testing a site for integrity, analyze cross-section data in relation to erosional and depositional gully processes); and 15 sites are recommended for other types of data collection such as total station mapping, subsurface testing and artifact collections. See Appendix L for detailed descriptions of the work recommended. Priority will be given to sites scheduled for annual monitoring and having river-based drainages. Work will be completed in such a manner as described in the MRAP (U.S. Department of the Interior/Bureau of Reclamation /National Park Service 2000).

Implementation of recommended work depends on the available time and money and the type of work involved. Remedial work such as transplanting vegetation and trailwork can take very little effort and time and can be completed on most regularly scheduled trips. On the other hand, recommendations for mapping and data recovery require trips where time can be scheduled for such work. Table 10 below summarizes the proposed fieldwork to be completed this year.

Table 10. Summary of Sites to Monitor in FY04 with the Additional Remedial Work Recommended (N = 70 Sites).

Site Number	Currently Identified TCPs*	Property Type	Drainage Type	Monitor Schedule	Remedial Work
A:15:003	Yes	Roaster Complex	River and Side Canyon	3 years	
A:15:005	Yes	Structure-Thermal Feature Complex	River	Biennial	Plant Vegetation, Trail Work
A:15:021	Yes	Roasting Feature	No Drainage	3 years	C14 Sample
A:15:026	Yes	Roaster Complex	No Drainage	5 years	
A:15:027	Yes	Roasting Feature	No Drainage	5 years	
A:15:039	Yes	Roaster Complex	River	3 years	Assess for Preservation Work, Data Recovery
A:15:040		Thermal Feature	Terrace	5 years	
A:15:048		Roaster Complex	River	3 years	
A:15:051	Yes	Roasting Feature	Terrace	5 years	
A:16:004	Yes	Structure-Thermal	Terrace	Biennial	Plant Vegetation, Trail Work

Site Number	Currently Identified TCPs*	Property Type	Drainage Type	Monitor Schedule	Remedial Work
		Feature Complex			
A:16:158		Artifact Scatter	River	5 years	
A:16:159	Yes	Artifact Scatter	Terrace	3 years	MF Photos, Close Site
A:16:163	Yes	Small Structure	No Drainage	5 years	MF Photos
A:16:175	Yes	Thermal Feature	River	3 years	Checkdams
A:16:185	Yes	Special Activity Locus	No Drainage	3 years	Consult with Hualapai
B:09:314		Small Structure	No Drainage	5 years	
B:11:272		Roasting Feature	Terrace	4 years	Trail Work
B:14:093		Thermal Feature	Terrace	Biennial	
B:14:105	Yes	Small Structure	River	Biennial	Plant Vegetation, Trail Work, Checkdam Assessment
B:14:107	Yes	Thermal Feature	Terrace	3 years	Checkdams
B:15:127	Yes	Roasting Feature	No Drainage	5 years	
B:15:128	Yes	Artifact Scatter	No Drainage	3 years	
B:15:138		Thermal Feature	River	Annual	Data Recovery, Trail Work, Restrict Camping
C:02:092	Yes	Artifact Scatter	River	3 years	Map
C:02:096	Yes	Structure-Thermal Feature Complex	River	Semiannual	Research, Profile & Sample, Data Recovery
C:02:098		Artifact Scatter	River	Annual	Trail Work, Data Recovery, Checkdams, Plant Vegetation, Map
C:09:050	Yes	Special Activity Locus	Side Canyon	Annual	Checkdams, Trail Work
C:09:082	Yes	Roasting Feature	No Drainage	5 years	
C:13:006	Yes	Small Structure	River	Annual	Checkdams, Plant Vegetation, Data Recovery
C:13:007	Yes	Small Structure	Side Canyon	4 years	Revegetation
C:13:009	Yes	Pueblo	River	Biennial	Map, Artifact Analysis, Data Recovery, Test
C:13:010	Yes	Pueblo	River	Annual	
C:13:069	Yes	Small Structure	Terrace	Annual	Data Recovery, Trail Work, Research
C:13:070	Yes	Small Structure	River	Annual	Data Recovery, Research, Map, Trail Work
C:13:092	Yes	Historic Structure	No Drainage	5 years	
C:13:098		Historic Structure	River	Annual	
C:13:099	Yes	Structure-Thermal Feature Complex	River	Semiannual	Plant Vegetation, Trail Work, Finish Map, Data Recovery, Research
C:13:100	Yes	Pueblo	River	Annual	Trail Work, Data Recovery, Plant Vegetation
C:13:273	Yes	Roaster Complex	River	Annual	Data Recovery, Trail Work, Research
C:13:291	Yes	Small Structure	River	Annual	Data Recovery, Map, Research, Trail Work
C:13:321	Yes	Roaster Complex	River	Annual	C14 Sample, Data Recovery
C:13:334	Yes	Structure-Thermal Feature Complex	River	3 years	Map
C:13:339	Yes	Small Structure	River	Annual	Trail Work, Plant Vegetation, Data Recovery
C:13:342	Yes	Historic Structure	No Drainage		
C:13:343	Yes	Small Structure	Side Canyon	Biennial	Data Recovery

Site Number	Currently Identified TCPs*	Property Type	Drainage Type	Monitor Schedule	Remedial Work
C:13:347	Yes	Small Structure	River	Annual	Data Recovery, Research
C:13:349	Yes	Historic Structure	Terrace	Annual	Data Recovery, Test, Research
C:13:359	Yes	Small Structure	River	3 years	
C:13:371	Yes	Structure-Thermal Feature Complex	Side Canyon	Semiannual	Data Recovery, Research, Erosion Control
C:13:373	Yes	Thermal Feature	No Drainage	3 years	Data Recovery, Map
C:13:386	Yes	Small Structure	Terrace	Semiannual	Research, Map, Consult with Tribes on Treatment Plan
C:13:387	Yes	Small Structure	River	Biennial	
C:13:389	Yes	Structure-Thermal Feature Complex	No Drainage	3 years	Data Recovery, Other1, Map, Test
G:02:009		Historic Structure	Terrace		
G:03:003	Yes	Roaster Complex	River	Annual	Consult with Hualapai, Plant Vegetation, Trail Work, Map
G:03:004	Yes	Roaster Complex	River	Annual	Trail Work, Surface Collection, Data Recovery
G:03:020		Roaster Complex	River	Annual	Checkdams, Data Recovery, Profile & C14 Sample, Map, Trail Work
G:03:025	Yes	Roaster Complex	River	3 years	Trail Work
G:03:026	Yes	Roaster Complex	Terrace	3 years	Trail Work, Plant Vegetation
G:03:030		Roaster Complex	Terrace	Biennial	Checkdams, Map
G:03:032	Yes	Roaster Complex	Terrace	3 years	Test
G:03:041	Yes	Roaster Complex	River	Annual	
G:03:043	Yes	Thermal Feature	River	Biennial	Data Recovery
G:03:044	Yes	Structure-Thermal Feature Complex	River	Biennial	Map, Data Recovery, Checkdams
G:03:055	Yes	Thermal Feature	River	5 years	Checkdams
G:03:058		Roasting Feature	Terrace	3 years	Plant Vegetation, Trail Work
G:03:064	Yes	Roaster Complex	River	Annual	Checkdams, Data Recovery, Plant Vegetation, Test, Map, Consult with Hualapai and Paiute
G:03:072	Yes	Roaster Complex	River	Annual	Data Recovery, Test
G:03:076		Roasting Feature	River	3 years	
G:03:080	Yes	Structure-Thermal Feature	River and Side Canyon	Annual	Consult with Hualapai, Trail Work, Plant Vegetation

*Specific tribes were not identified in this column out of respect for those tribes.

Annual checkdam maintenance has occurred since 1995 with the exception of FY02 when Joel Pederson, University of Utah geomorphologist, requested no maintenance due to his checkdam research at eight sites. Last year 10 of the 27 sites with checkdams required maintenance (See Chapter 4 for details). Because of the unpredictable nature of checkdam maintenance we have always completed the work annually on the BOR sponsored trip. Having a trip devoted to maintenance allows us to modify the schedule to accommodate our needs. Participating on other trips does not allow this to happen. We will schedule a remedial action trip for checkdam maintenance and we are hopeful that personnel from the Zuni Conservation Program will participate. In the Pederson et al 2003 draft report (Pederson 2001), he recommended to "continue monitoring, construction, and especially maintenance of erosion-control structures." (P.93).

The collection of crosssection data will continue in FY2004 at B:11:281, C:13:070, C:13:099, C:13:329, G:03:003, G:03:020, and G:03:040 as time and access to the river permits. This work was initiated in April

2001 and is used to supplement information regarding checkdam effectiveness and the trends in the monitoring data.

INFORMATION MANAGEMENT

Data application testing, data migration/cleaning, data documentation, and design modification will continue in FY2004. For the past three years NAU has been scanning site maps and making electronic updates. This allows for RCMP archaeologists to go into the field with updated maps to observe where the changes occurred during the last visit and where they occur presently. Creating digital copies of changes (as different layers) demonstrate degradation or improvement of the site through time. It is one more form of data collection used to justify site treatment. Along with digitizing the site maps, NAU personnel will continue updating and analyzing the crosssection data collected in the field.

Documenting change through photography has been a substantial part of this monitoring and remedial action program. In FY00 and FY01 NAU was contracted to digitize as many photographs as possible related to the RCMP program. Of the 9000+ photographs that our office has generated since 1990, less than a third have been digitized. This year we will pick up where NAU stopped. Digitizing photographs enables us to tie in photographs with the entire database. It just makes the data more manageable when it is in one location. This will also improve upon the techniques of archiving the photographs.

With the completion of georeferenced site polygons, RCMP archaeologists are able to take the orthophotographs into the field to ground truth the locations. As a result of the lab work, it is apparent that there are several locational errors that need to be corrected. Once locations are finalized in the field the maps will be updated with exact site locations in the office. We will also be able to digitize the pertinent drainages (river-, terrace-based drainages), impact areas, and catchment areas on the sites. GRCA archaeologists will have, readily accessible, georeferences of all the sites in the corridor. The accuracy of these locations could easily be used to model historic flows. As recommended by Thompson and Potochnik (Thompson and Potochnik 2000) once all the archaeological sites are accurately plotted, catchment areas and stream lengths can be accurately calculated for all sites. This will aid in the creation of a predictive model. These completed maps will also improve the working relationship between RCMP archaeologists and GCMRC researchers. These data will be available to tribal representatives upon formal request. Currently NPS has prepared a budget proposal for the BOR to complete this work in FY04.

Lab time will be devoted to new data entry and data analyses. There are over 200 variables that can be looked at individually or in combination to gather information on trends, erosion, and management activities. Because some data are qualitative, statistical tests may include descriptive statistics and frequency distributions, contingency tables or Chi Squares, and to a limited extent, analyses of variants and/or non-parametric statistics. The NAU database manager will continue working with the NAU Statistical Consulting Laboratory to enhance our statistical capabilities.

Some issues we could address include: looking at the occurrence of individual types of erosion through time at all sites or a subset of sites; compare one type of erosion to another; make correlations between a particular geomorphic setting and types of erosion, or drainage types and types of erosion; correlate schedules with the actions and observations to identify the appropriateness of either the schedules or the actions; identify how site integrity has been compromised, if it has been compromised. The list of issues is far from exhausted. We hope to meet with PA representatives individually or collectively to discuss these and other topics they may want the RCMP archaeologists to address based on the data collected.

PUBLIC OUTREACH

As in the past, RCMP archaeologists anticipate working with other programs outside of the river corridor monitoring program. The typical programs include the annual GCMRC symposium, and the Guides Training Seminar (land-based and river-based seminars). Additional projects we will be involved in include the Colorado River Management Plan, GCMRC research, and cultural resource orientations for researchers working along the river corridor. Furthermore, results of our data analyses will give us the opportunity to present at different venues.

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