Fiscal Year 2004

Archaeological Site Monitoring and Management Activities along the Colorado River in Grand Canyon National Park

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CHAPTER ONE
INTRODUCTION AND METHODS

Through a cooperative agreement between the Bureau of Reclamation and the National Park Service (IA 99-AA-40-2340), the River Corridor Monitoring Program (RCMP) is charged with the ongoing identification, monitoring and treatment of National Register eligible historic properties along the Colorado River corridor impacted by or with the potential to be impacted by Glen Canyon Dam operations. The following report fulfills the annual reporting requirement of the National Park Service (NPS) as outlined in the Monitoring and Remedial Action Plan (MRAP). The information presented relates to the core accomplishments of fiscal year 2004 including the identification of the on-going impacts to historic properties, the condition of both the historic properties and previously implemented remedial actions intended to limit further impact, assessments for new remedial actions, and recommendations for additional maintenance work necessary to limit impacts. Until a final Historic Preservation Plan (HPP) is completed, the MRAP serves as the guidance document for activities related to monitoring, preservation, and treatment of National Register eligible properties within the project area (USDOI, 1994; 2000).

Core accomplishments in FY04 include the following: site condition monitoring and impact identification at 37 sites along the river corridor, checkdam condition monitoring and maintenance recommendations at 27 sites, GIS polygon delineation and location updates at 46 sites, and remedial action treatment recommendations at 22 sites. Laboratory accomplishments include: GIS database design, methods, and implementation in ArcGIS 8.3, digitizing the site boundary polygons, individual checkdams, and impact areas for sites monitored in FY04, metadata for the GIS layers, and GIS analysis of site location in relation to flow lines and impact area within site boundaries. The RCMP Access database underwent minor design updates, integration with the Grand Canyon database, data entry, cleaning, and backups. RCMP archaeologists also participated in two GCMRC-sponsored aeolian transport river trips. The first trip set up instrumentation at locations where aeolian transport may play a role in site preservation. The second trip cleared stratigraphic profiles at selected historic properties to determine the type and extent of aeolian deposition and reworking.

The scope of work for FY2005 continues the GIS site boundary project; 166 actively monitored sites are identified for polygon updates. As time permits, visits to sites may also include monitoring activities. The 27 sites with checkdams will be monitored and checkdams maintained in FY05 under the supervision of Zuni Conservation Program personnel.

METHODS

To complete the tasks identified for FY04, the NPS project staff dedicated to the RCMP program and Grand Canyon National Park (GRCA) base program archaeologists participated in all or part of five Colorado River trips. Base GRCA programs provided logistical support for RCMP staff members to participate on three river trips and the GCMRC provided logistical support for RCMP staff to participate on two river trips. Field visits are necessary for monitoring of sites and checkdams and to ground truth the GIS site location layer.

Database

Preparation for field activities follows the RCMP standardized methods for generating field forms, compiling field books, and site documentation, including photographs. Appendix A contains SOPs for field and laboratory work and a blank monitoring form. All forms are generated from the RCMP MS Access database. The database is queried for a list of the sites scheduled to be monitored each fiscal year and any remedial action recommendations scheduled for completion. Sites with checkdams are also included for annual monitoring.

All variables collected during the course of field work are entered into the database. These variables include monitoring data, remedial action assessments or treatment summaries, drainage monitoring for sites with checkdams, and the status of individual checkdams.

GIS

In FY04 RCMP staff began the process of transferring the 1990-91 Grand Canyon River corridor survey data, specifically site location, into a GIS. Georeferencing of site locations was one recommendation of the 2000 PEP (Doelle, 2000). The May 2002 ortho-rectified imagery used to develop the GIS layer has 22 centimeter pixel resolution and 30 centimeter horizontal accuracy. The survey data were transferred into a GIS layer using heads-up digitizing on top of the May 2002 imagery. It soon became apparent that the point data were imprecise due to several factors including incomplete data and multiple transfers of data by hand onto different maps at different scales to get the Universal Transverse Mercator (UTM) location point data.

Historically, archaeology survey crews marked the site locations on aerial photographs; in some cases locations were marked as points and in other instances site locations were marked as polygons. These aerial photographs were returned to the lab and the information was transferred onto 7.5 minute USGS quad maps. UTMs were then determined using a UTM coordinate grid from the site plot on the 7.5 minute topographic maps.

RCMP staff found that, in some cases, these data were substantially in error and additional field work was necessary to check the location information (Figure 1). The aerial photograph for the Little Nankoweap drainage shows the original location of a UTM plot, the site boundary digitized using the aerial photograph and the site boundary after completion of ground truthing (Figure 1).

The RCMP archaeologists have determined that field checking (ground truthing) the data is a necessary step in the process of transferring and updating location information. Ground truthing begins with a print out of the orthophotographic image with the site UTM and boundary. Field personnel locate the site using the orthophotographic image, maps, and site location descriptive information. The boundary of the site is then traced onto the image.

Once the data have been ground truthed, corrected site location information is digitized into a GIS layer. The result of this work includes accurate geo-referenced site boundaries that can be combined with other layers in a GIS. To date, 55 unique historic properties have been ground truthed for site location accuracy.

Methods for digitizing field data have been explicitly devised by RCMP staff. In addition to the creation of GIS data layers, the RCMP staff have input all metadata related to the GIS, digitized checkdams, cross-sections, and area of impact locations for GIS data analysis.

Figure 1. Orthographic image with three different location data for the Little Nankoweap site. (The green circle is the UTM plot, the middle pink hexagon is the aerial photo transfer of the site boundary, and the larger pink polygon is the ground truthed site location polygon.)

GIS data analysis for FY2003 included identifying the location of historic properties in relation to the BOR generated flow line and the Holocene deposits. GIS was also used to analyze the impacted areas within the boundary of a historic property. A more in depth description of this analysis is found in Chapter 6.

Monitoring

Monitoring is repeat visitation and measurement to determine if the historic properties retain the elements that make them eligible for listing on the National Register of Historic Places. This is determined by comparing site condition through time and identifying the processes that affect site condition, which may lead to management recommendations for treatment.

Monitoring occurs by visiting a historic property. Photographs and a previous monitoring form aid RCMP staff in determining the physical and visitor-related processes that may or may not be actively altering the site. These processes are explicitly defined (Appendix A) and the definitions have been used by RCMP staff since revision of the monitoring form in 1994. Monitoring forms are completed on-site. Changes observed are photographed and treatment recommendations are made. These data are entered into the RCMP Access database.

In FY04, 37 historic properties were visited by RCMP and GRCA staff archaeologists (Figure 2). Of these 37 sites, active erosion in the form of surface erosion, gullying, arroyo cutting and bank slump was observed 55 times. Eolian activity was observed at 13 sites. Visitation was observed at 12 of the 37 sites (Figure 3).

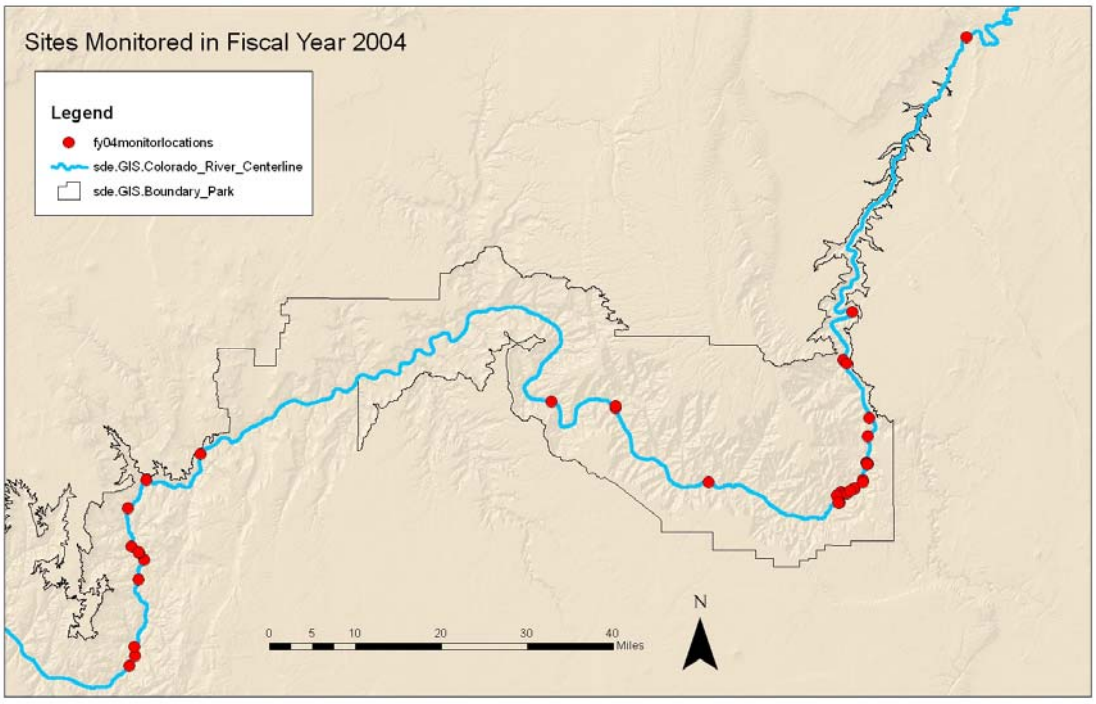


Figure 2. Location of 37 sites monitored in FY04.

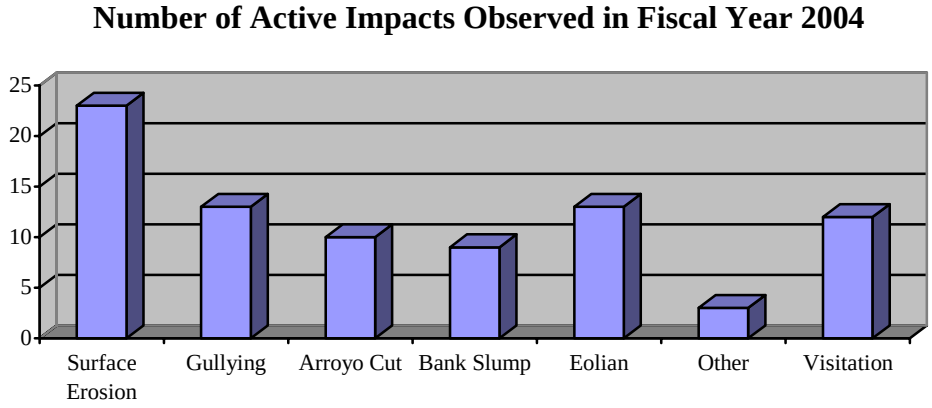


Figure 3. Occurrences of active physical or visitor-related impacts in FY04.

Treatment Recommendations

When impacts threaten the condition of historic properties, treatment recommendations are made to limit further site destruction or preserve specific features. These treatment recommendations have all been identified by NPS and PA representatives as appropriate forms of treatment for historic properties within the project area. These treatment options are identified in the MRAP and summarized on the monitoring form to prompt field personnel to consider treatment options that have been successfully implemented in the past (Appendix A).

Once a treatment recommendation is made, it triggers an assessment for work. The assessment is conducted by RCMP staff with consultation from experts in other fields, such as GRCA vegetation specialists, trails rehabilitation specialists, or Zuni Conservation Project (ZCP) members.

In FY04, 36 treatment recommendations were made;16 of the recommendations are related to preservation methods, such as trail work, planting vegetation and construction of checkdams (Figure 4). Recovery options include research and data recovery; 20 recovery-related treatment recommendations were made in FY04. Data recovery was the most common recommendation with 13 occurrences. Figure 4 shows the type of treatment recommendation and the number of occurrences in FY04.

Treatment Recommendations made during FY04 Monitoring Activities

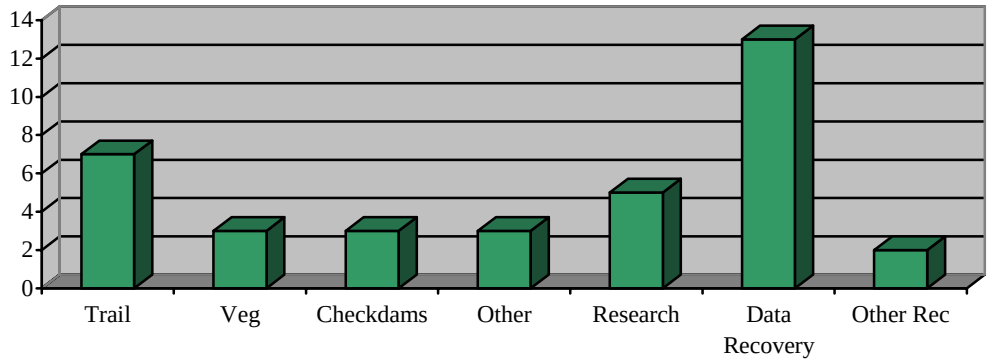


Figure 4. The type of treatment recommendation and the number of occurrences in FY04.

Chapter 3 contains site-specific observations, including previous recommendations and work implemented and monitoring observations specific to FY04. Chapter 4 contains detailed information on checkdam condition at the 27 sites within the project area.

A scope of work for FY05 is provided in Chapter 7. The focus of work will be continuing the GIS ground truthing location project and conducting preservation treatment recommendations identified in FY04. Once site boundaries have been revised, UTMs will also be revised by calculating point data as a center point within the site boundary polygon.

CHAPTER TWO

SITE CONDITION MONITORING

Each site monitored in FY04 is listed with its current monitoring schedule. The "Site Description" is included as a reference so that specific features mentioned in the text can be understood in relation to their feature type. The "Previous Work" section includes all work conducted through the RCMP; this work is also summarized in the "Summary of Previous Work Implemented" table. The "Summary of Monitoring Activity" graphs provide the reader with a sense of physical and visitor-related activity on-site and document relative frequency of those activities. A brief narrative of impact activity is also provided. The "FY04 Monitoring Observations" are taken directly from the comment fields of each site monitoring form. This information includes comments on both physical and visitor-related impacts and recommendations for future monitoring and remedial actions.

Rather than omit information, all site-specific data are included so that the reader may choose specific information or trends to focus on. Site-specific checkdam work is addressed in a separate chapter.

SITE SPECIFIC MONITORING OBSERVTIONS AND RECOMMENDATIONS

A:15:005 Roaster Complex

Biennial Schedule

This site consists of a pictograph panel, a habitation/special activity area against the base of a cliff, and two roasting features on an alluvial terrace below and adjacent a side canyon. The site may be associated with late prehistoric-early historic Pai or Paiute use. Locus A consists of red (hematite) pictograph panels on fallen, angular, limestone boulders. Locus B contains two expedient single-course stone walls against a cliff base with lithics, groundstone, and charcoal. Locus C consists of two roasting features: F1 is a six meter diameter pit on a ridge in the main drainage; F2 is a deflating fire feature with flakes, charcoal, groundstone, and several brown ware sherds.

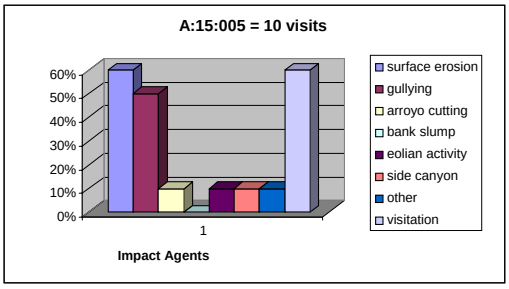
Previous Work

R. Euler originally recorded the pictographs in 1984. The site was re-recorded by NPS personnel in 1991 (Fairley et al., 1994), and monitored by RCMP staff in FY93, FY95 - FY00, FY02, and FY03 (Coder et al., 1994; Coder et al., 1995; Leap et al., 1996; Leap et al., 1997; Leap et al., 1998; Leap et al., 2000; Leap and Kunde, 2000; Dierker et al., 2002; Leap et al., 2003). In FY97 GCMRC personnel completed a total station map of Locus C and trail work was conducted by GRCA staff. GRCA continues minor trail maintenance on an as needed basis (Leap et al., 1997). The hematite elements were photographed with a medium format camera in FY97. The Southern Paiute Consortium visited this location to conduct ethnographic interviews regarding the pictograph panel. In FY99, the Zuni Conservation Program assessed the site for checkdam work. Upon assessment, five checkdams were installed in an active gully near Feature 1(Kunde 1999). This site was also included in the studies conducted by K. Thompson and A. Potochnik (Thompson and Potochnik, 2000). The February 2000 Colorado River Conservation Program [referred to in previous reports as CRF (Colorado River Funds) or CRT (Colorado River Trip), which is a Park sponsored river trip] assessed this location for revegetation and trail work to deter continued visitation and destruction of the roasting features by trailing. The trail work completed by the GRCA trail crew in FY97 has successfully deterred visitation. The site location was properly positioned on the May 2002 orthographic images and digitized in the lab (Polygon).

Summary of Previous Work Implemented

Remedial Actions	Date Completed
Total Station Map	02/28/1996
MF Photos	03/04/1997
Trail Work	01/01/1997
Total Station Remap	09/01/1998
Checkdam Construction	11/20/1998
Polygon	08/31/2003

Summary of Monitoring Activity



Gullying and surface erosion at Locus C are the prime concern at this site. However, there are no direct impacts to the integrity of any features at this time. An active gully cutting trend was observed from 1993 to 1995 and again from 1998 to 2000. Checkdam construction has resulted in no new active downcutting in the gully. Surface erosion is incipient on-site. Visitation is evidenced by a faint trail adjacent to the two roasters at Locus C. Visitation to the pictographs does occur though no established trail is apparent due to the access up a side canyon drainage.

FY04 Monitoring Observations Summary

Features 1 and 2 at Locus C have minor down-slope erosion. Loci A and B appear to be stable at this time. Continue biennial monitoring. Continue annual checkdam maintenance and monitoring. Trail obliteration has been completed by GRCA trail crew in the past. This work will continue as a Park responsibility.

A:16:159 Artifact Scatter with Rock Art

Three Year Schedule

This site consists of an overhang with sherds, lithics, tools, and pictographs; the shelter has experienced a lot of post-occupational wall and ledge fall (spalling). Artifacts include both Virgin Anasazi and Pai ceramics (including a Moapa spindle whorl), lithic debris dominated by large pieces of shatter, an Acheulean-like chopper with two use surfaces, a locally-procured basalt grinding slab with incipient use wear, and a small cobble percussion/pecking stone. Three broken cores and an apparent battered cobble round are also included in the assemblage. Also present on-site is a two-figure pictograph in red pigment three meters above the bench, depicting two small anthropomorphs. More elements were present, but have deteriorated, leaving only small pigment remnants. As the ceramics indicate, the site is multi-component, with PII Virgin and late prehistoric-early historic Pai occupations.

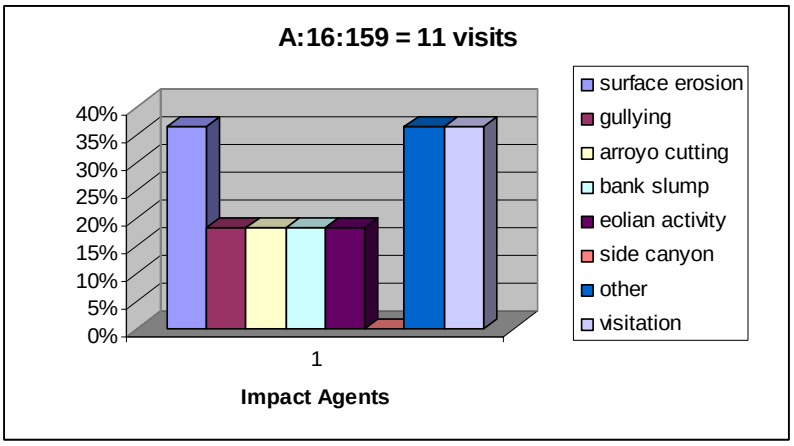
Previous Work

This site was originally recorded in 1990 (Fairley et al., 1994) and monitored by RCMP staff in FY96 and FY04 (Leap et al., 1996). The RCMP has taken archival medium format photographs of the pictograph. The site location was properly positioned on the May 2002 orthographic images and digitized in the lab (Polygon).

Summary of Previous Work Implemented

Remedial Action	Date Completed
MF Photos	03/03/1997
Polygon	08/31/2003

Summary of Monitoring Observations



Rock spalling, surface erosion and visitation have been the most consistent impacts to the site, but even then it has been incipient. It was only in FY92 and FY93 that some channel cutting threatened the site, but aft FY93 these threats retreated. Visitation to the site is evidenced by a faint trail from upstream leading to the site and resulting in the occasional displacement of surface artifacts.

FY04 Monitoring Observations Summary

Recent coyote scat was observed in the overhang. The site appears very stable with no physical impacts observed. The grinding slick downslope of the site has 2 grinding surfaces. A trail up to the site exists on an unstable sandy bank. The site has seen minimal physical impacts though visitor-related impacts have been recorded. Access by monitors should be limited, as the upstream route to the site is sandy and visible from the river. Continue monitoring every three years. Access to the site should be from the downriver side of the site.

B:15:138 Thermal Feature
Annual Schedule

RCMP archaeologist identified and recorded this site in April 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 since it was recorded (Leap et al., 1997; Leap et al., 1998; Leap et al., 2000; Leap and Kunde, 2000; Dierker et al., 2001; Dierker et al., 2002; Leap et al., 2003). The trail directly below Feature 2 was obliterated by GRCA trail crew 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, trail obliteration was conducted in October 1998 and in FY99. Access was blocked off to the drainage by using dead brush found in the side canyon drainage. RCMP staff placed deadfall in the drainage to block the upper portion of Feature 2. Approximately seven meters of the area was treated and all work was photographed. FY98 monitors 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 CRCP personnel conducted trail obliteration and revegetation. The site location was properly positioned on the May 2002 orthographic images and digitized in the lab (Polygon).

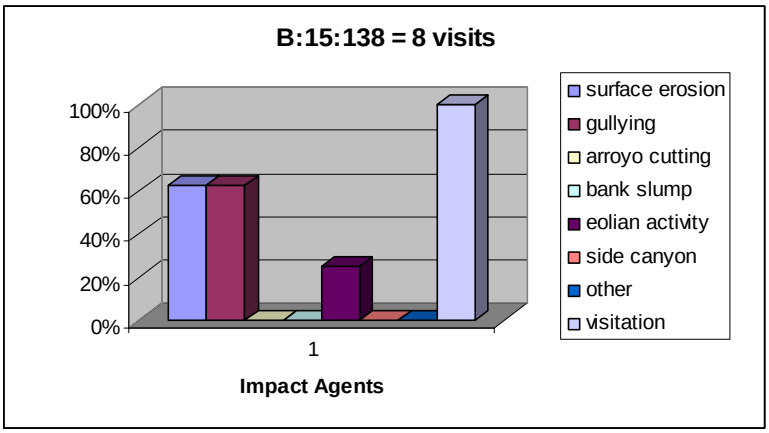
Summary of Previous Work Implemented

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
Polygon	08/31/2003
NPS Trail Work	09/09/2003

FY04 Remedial Action Summary

Review of previous site photo indicated that brush placed in the upper trail to the side canyon has been breached. Most of the brush had been trampled or pushed aside. The social trail heads upslope through the site and serves as a primary route to the side canyon. The trail is moderately compacted and is approximately 50 centimeters wide. The trail had been previously blocked by brush as part of the trail obliteration. This trail has the potential to be a channel for runoff. The brush was replaced so that it was identical to previous trail obliteration photos. Approximate dimensions are 3 meters long, 0.5 meter wide and 0.5 meter deep. The work should be monitored annually after the tourist season.

Summary of Monitoring Observations



Since the recording of this site, archaeologists have witnessed site degradation from active physical and visitor-related impacts. Water channeling and soil compaction from visitor use will continue at this site as it has been demonstrated that any attempts to preserve the site have been unsuccessful. Surface erosion and eolian activity have stripped Feature 1of its surrounding matrix. Active gullying at Feature 2 from 1999 to present does threaten feature integrity. The feature has been recommended for data recovery since 2000. NPS will continue to conduct trail obliteration and vegetation work to deter trailing over the feature and encourage plant growth until a treatment plan is determined for this site, which could include letting the feature erode.

FY04 Monitoring Observations Summary

There is a considerable amount of eolian deposition in and adjacent to Feature 1. Feature 2 looks unchanged since the last monitoring visit. Continue annual trail maintenance. Data recovery is recommended for Feature 2 as it is very vulnerable to visitor-related impacts and valuable information could be lost. Currently the outline of the feature is discernable and the contents inside appear undisturbed. Continue annual site monitoring. Trail work was completed during the monitoring visit.

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. In FY95 archaeologists found two sherds – a Moenkopi corrugated sherd (cultural affiliation is Kayenta Anasazi) and a Flagstaff Black-on-White sherd (PIII).

Previous Work

Archaeologists recorded the site in (Fairley et al., 1994) and RCMP staff monitored it in FY95, FY97, FY98, FY99, FY00, FY01, FY02, FY03 (Coder et al., 1995; Leap et al., 1997; Leap et al., 1998; Leap et al., 2000; Leap and Kunde, 2000; Dierker et al., 2001; Dierker et al., 2002; Leap et al., 2003). FY95 monitoring staff recommended trail work, planting vegetation and testing for subsurface cultural material. The GRCA trail crew completed trail obliteration work 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 checkdam evaluation studies are completed. This site was also included in the studies conducted by K. Thompson and A. Potochnik (Thompson and Potochnik, 2000).

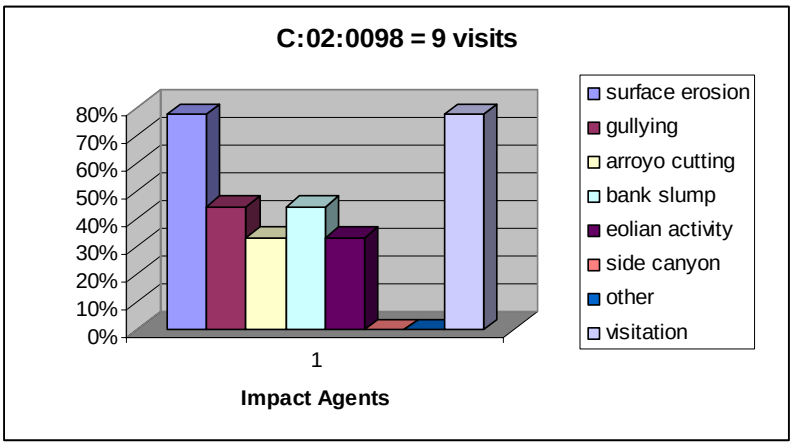
Monitoring staff have consistently recorded angler trails, trash, tackle and recent charcoal at one end of the overhang. FY97, FY99 and FY03 monitoring staff observed channel initiation and several nick points within the old obliterated trails and the main trail. In FY2000 the GRCA Revegetation and Rehabilitation crew, determined that arrowweed would be planted in the active drainage leading from the overhang to the beach area. This location had previously been the focus of trail obliteration work by the GRCA during FY96 monitoring. Obliterating the trail was not successful due to the entrenched nature of the trail beginning at the parking area upstream of this location. A replicated photograph was taken for future comparison by the revegetation crew. The site location was properly positioned on the May 2002 orthographic images and digitized in the lab (Polygon).

Summary of Previous Work Implemented

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

Polygon	08/31/2003

Summary of Monitoring Observations



Surface erosion is incipient throughout the years. It is not until FY99 and FY00 that the monitoring data indicate the site progressively and consistently became active, thus worsen its state. This is observed mostly with channeling erosion and visitation. Active gully down cutting adjacent to the historic inscription resulted in the exposure of prehistoric artifacts. In 2000, continued active gully down cutting resulted in the transition from a gully to an arroyo. The proximity of this site to the river has also resulted in active bank slump. Visitation is prevalent through the site as an access point to the river by anglers.

FY04 Monitoring Observations Summary

The arroyos and gullies are all examples of trails that have become unmanageable drainage channels. These drainages have been active and are moving through the site. This site would be affected by visitors even more if there were a high river flow. Many people visit this location to fish and to admire the river. As a result, there are multiple trails, many of which have become drainages. Litter is prevalent all over this site. This area needs to have a site plan including some sample data recovery work to determine the extent of buried deposits. Duplication of the total station map is crucial to measure volumetric change and compare with previous maps. Create and maintain one trail to the river and increase trash pick up in the area. Maybe a trashcan could be placed closer to the site. One large sediment influx could fix the entire site by filling in the arroyos and gullies. Flood deposits are present here. Depending on the type of experimental flow it also has the potential to scour.

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 a major side canyon. After its discovery, the vessel was stabilized with local cobbles and boulders, and then covered with sand. Park Archaeologist J. Balsom subsequently collected the vessel and several others from the same locale, after another episode of erosion. A three by three meter scatter of fire-cracked rock was located in October 1997 approximately five meters south of the pot cache on the southeast facing slope. The scatter was plotted on the total station map. The fire-cracked rock is made up of limestone and sandstone. This is considered a Late Pueblo I-Early Pueblo II Formative site.

Previous Work

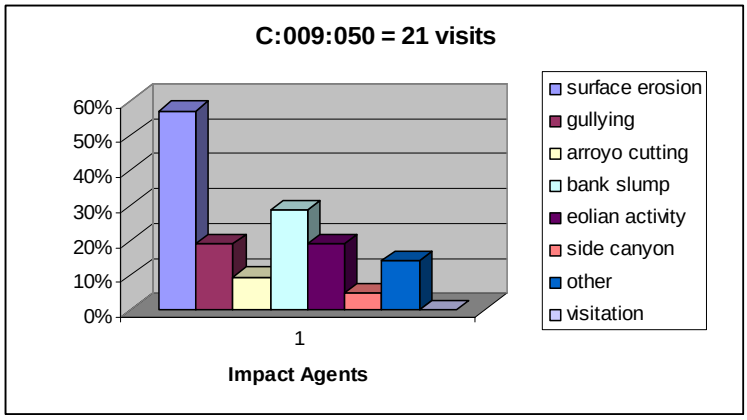
This site was discovered and initially recorded by NPS survey personnel in September of 1990 (Fairley et al., 1994). Due to the site's proximity to a major river camp and the precarious nature of their depositional situation, the four vessels were subsequently removed and taken to the South Rim at the 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., 1993; Coder et al., 1994; Coder et al., 1995; Leap et al., 1997; Leap et al., 1998; Leap et al., 2000; Leap and Kunde, 2000; Dierker et al., 2001; Dierker et al., 2002; Leap et al., 2003). Medium format photographs of the pot cache

were taken in FY95 and FY98. Hereford et al. included this site in their geomorphic map of the Nankoweap area (Hereford et al., 1996). In FY97 an extensive water diversion structure was constructed at the base of the cutbank to curtail further erosion from side canyon flooding and bank slump. After stabilization, a total station map was completed of the entire site. No checkdam maintenance has been necessary since construction in FY97. The site location was properly positioned on the May 2002 orthographic images and digitized in the lab (Polygon).

Summary of Previous Work Implemented

Remedial Action	Date Completed
MF Photos	03/28/1995
Checkdam Installation	04/14/1997
Total Station Map	04/22/1997
MF Photos	04/18/1998
Polygon	08/21/2003

Summary of Monitoring Observations



Surface erosion and eolian activity are incipient and consistently observed throughout the monitoring episodes. It appears that FY92 and FY93 had some water channeling activity but it dissipated in the following years. Because side canyon flooding has the potential to obliterate this site, a water diversion structure was constructed to protect the site. Although the pot cache was removed, no further testing was conducted at the feature. The likelihood of additional vessels or human remains is high however based on the stability represented through the monitoring data, monitoring episodes should be decreased.

FY04 Monitoring Observations Summary

Erosion is ongoing from the location of the pot cache and SSW towards the major side canyon drainage. As noted in FY03, sheet wash is active. Vegetation -primarily grasses visible in previous photographs of the FCR are no longer present though there is a good development of cryptobiotic soil crust on the surface. It is recommended that additional vegetation be planted on-site. Consider mulching the slope where the fire-cracked rock is located to encourage additional vegetation growth. The trail does not directly access the site though it is adjacent to the site boundary. No impacts from visitation were observed. Continue to monitor the pot cache location for additional artifacts exposed by erosion. Checkdam monitoring and maintenance should continue annually.

C:09:082 Roasting Feature and Artifact Scatter
Five Year Schedule

This site consists of an activity area (Feature 1) with groundstone, ceramics and lithic debris eroding from a dune face, and a roasting/fire feature (Feature 2) in a lower, deflated area of the dune. Feature 2 is 45 meters northwest of Feature 1, with few associated artifacts. Artifact density is light overall, with the bulk of the artifacts on a sandy, cactus-covered slope on the southwest side of the site. This appears to be a Mid-late PII Puebloan occupation. In May, 2003,

during the GCMRC FIST (Grand Canyon Monitoring and Research Center Fine Integrated Sediment Transport) trip, burnt daub was found in Feature 1 indicating a possible habitation site.

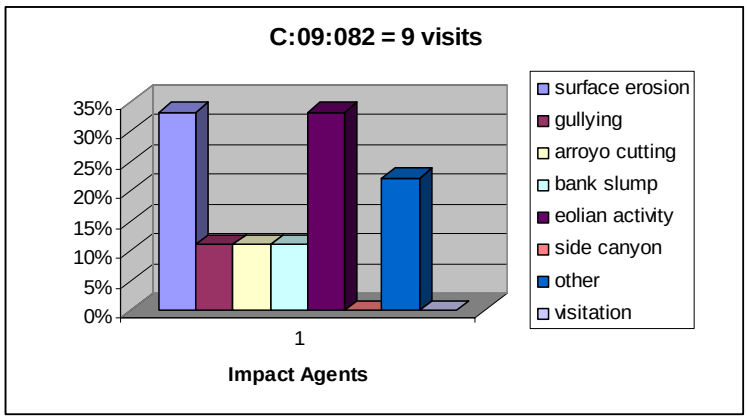
Previous Work

This site was originally recorded in October, 1990 (Fairley et al., 1994) and monitored by RCMP staff at least annually since FY92 (Coder et al., 1995; Leap et al., 1997; Leap et al., 1998; Leap et al., 2000; Leap and Kunde, 2000; Dierker et al., 2001; Dierker et al., 2002; Leap et al., 2003). The site location was properly positioned on the May 2002 orthographic images and digitized in the lab (Polygon).

Summary of Previous Work Implemented

Remedial Action	Date Completed
Polygon	08/21/2003

Summary of Monitoring Observations



Incipient eolian movement is the prominent agent impacting the site. However, the erosion or deposition of sediment only allows archaeologists to either find new artifacts or have previous artifacts buried. There have not been any impacts that have threatened the integrity. The gully and arroyo cut identified in FY93 were later determined to be outside the site boundary. Visitation has not been a problem at this site.

FY04 Monitoring Observations Summary

Feature 1 has very little change. Feature 2 has minor eolian deflation. This site is in a moderately active dune field and therefore has the potential to cover or uncover the recorded features and expose unrecorded cultural remains. Fire-cracked rock and bone fragments have been found due to eolian reworking. No visitation disturbances were noted. No work is recommended at this time. The monitoring schedule will remain on a five year schedule.

C:13:006 Small Structure
Annual Schedule

This site 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. Four to five possible rooms have also been identified in fair to poor condition. The site is eroding out of a reworked dune at the mouth of a major side canyon. 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 an additional roasting pit, an artifact concentration, and several new drainage channels. Groundstone is present though no formal tools have been observed.

Previous Work

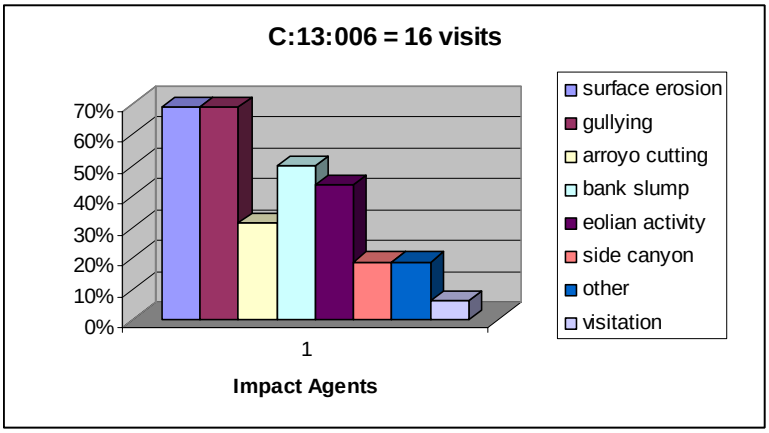
The site was recorded in the early 1960s, 1965, and 1984 and again in 1990 (Fairley et al., 1994). River corridor archaeologists monitored this site annually in FY92 and FY93, semiannually in FY94 and FY95, and back to annual from FY95 to FY03 (Coder et al., 1995; Leap et al., 1997; Leap et al., 1998; Leap et al., 2000; Leap and Kunde, 2000; Dierker et al., 2001; Dierker et al., 2002; Leap et al., 2003). In FY95 a stationary camera was placed across from the site (Coder et al., 1995), but was removed after FY96 because the photographs only showed stochastic 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 dune areas. The site was mapped with a total station in FY96 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. 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 from the 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. CRCP personnel planted cacti and grasses in November 2001. This site was part of Joel Pederson's remote sensing project through the GCMRC. 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 knickpoint treatments were constructed. The FIST trip stopped here to assess eolian processes in May 2003. The site location was properly positioned on the May 2002 orthographic images and digitized in the lab (Polygon).

Summary of Previous Work Implemented

Remedial Action	Date Completed
Checkdam Installation	02/16/1996
MF 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	10/11/1997
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
GCMRC Map & Research	02/16/2002

GCMRC Map & Research	09/29/2003
Checkdam Maintenance	03/19/2003
Polygon	08/31/2003

Summary of Monitoring Observations



Surface erosion is the predominant impact to the site, but at a smaller scale. Gullying followed by bank slump and eolian activity are not as active however, gullying and bank slump can cause more harm than surface erosion and eolian activity. Active gully down cutting led to the transition from a gully to an arroyo in 2002. Active arroyo cutting on the upper terrace and headward advancement of the drainage indicate continued drainage expansion. Checkdam construction appears to have slowed the drainage down cutting though maintenance is required. Active drainage down cutting and expansion threaten the integrity of this site. Side canyon flooding truncated the mouth of one gully in 1998. Visitation does not occur at this site.

FY04 Monitoring Observations Summary

Active erosion is present in the drainage on the upper terrace, but no artifacts are visible in the cut. This cut should be assessed for additional stabilization work. Vegetation is growing in the area where the matting was previously placed. No sign of human visitation was observed. Continue annual monitoring and annual checkdam monitoring and maintenance.

C:13:007 Small Structure

Four Year Schedule

This is a Mid-late PII-early PIII Puebloan occupation consisting of three, possibly four structural outlines (F1-4). Feature 1 is an L-shaped structure open to the east. Feature 2 is the remains of a rectangular structure outline, also open toward the river. Feature 3 is another L-shaped structure. Feature 4 is the remnant corner of a single-course structure. Some fire-cracked rock, sherds, a few flakes, ashy soil, and rodent bones of questionable affinity are present; no formal tools were recorded.

Previous Work

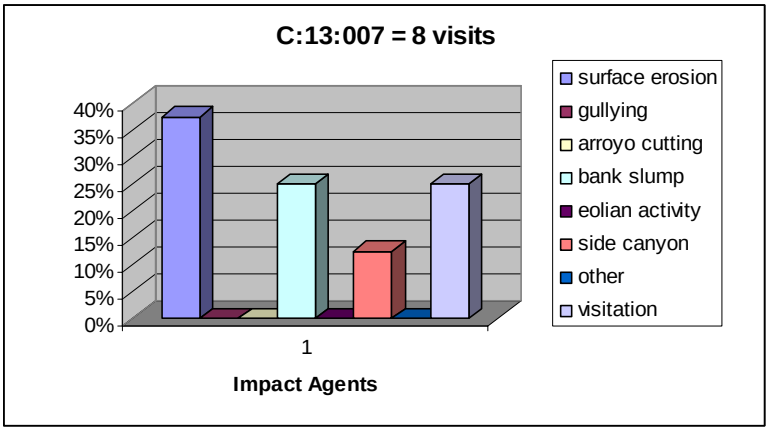
This site was discovered in the early 1960s and recorded in 1965 by Prescott College. GRCA archaeologists recorded the site in 1990 (Fairley et al., 1994). RCMP staff monitored the site in FY93, FY94, FY95, FY97 and FY98 (Coder et al., 1993; Coder et al., 1994; Coder et al., 1995; Leap et al., 1997; Leap et al., 1998) . In 1992 the GRCA trail crew stabilized a portion of the site by constructing a retaining wall and placing jute mat and grass seed across the site's surface. Heavy rains in 1993 obliterated the retaining wall, but the GRCA trail crew repaired the wall in 1994

(Coder et al., 1995). No other remedial actions were recommended after the trail project except for maintaining the stabilization work completed in FY92. R. Hereford completed a photogrammetric map in 1993 that includes the site area (Hereford et al., 1993). This site was also included in the studies conducted by K. Thompson and A. Potochnik (Thompson and Potochnik, 2000). Monitors consistently recorded increased visitation and on-site camping. Two access routes from the camp to the site were blocked on 11/6/01 and continue to successfully deter visitation to the site. The site location was properly positioned on the May 2002 orthographic images and digitized in the lab (Polygon).

Summary of Previous Work Implemented

Remedial Action	Date Completed
NPS Trail Work	11/08/1992
NPS Wall Stabilization	11/08/1992
NPS Wall Stabilization Maintenance	11/04/1994
NPS Trail Maintenance	11/06/2001
Polygon	08/31/2003

Summary of Monitoring Observations



Surface erosion and bank slump have occurred incipiently since 1991. Arroyo cutting threatens the integrity of Feature 5 How can it threaten it if it has been inactive or absent. Maybe say that although the arroyo cut has been inactive, it poses a major threat to the integrity of Feature 5. Visitation to the terrace and expansion of camp site locations by river-runners is successfully managed by NPS trail crews.

FY04 Monitoring Observations Summary

There is minor surface erosion on-site. Active rilling is occurring in the artifact concentration just south of Feature 4. All features appear relatively unchanged since last monitored. The trails have not been used recently nor has any camping occurred recently. There are no footprints or other

evidence of visitation. Trail maintenance should continue by NPS Trail personnel. Continue monitoring the site every four years.

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. The site contains numerous river-based drainages.

Previous Work

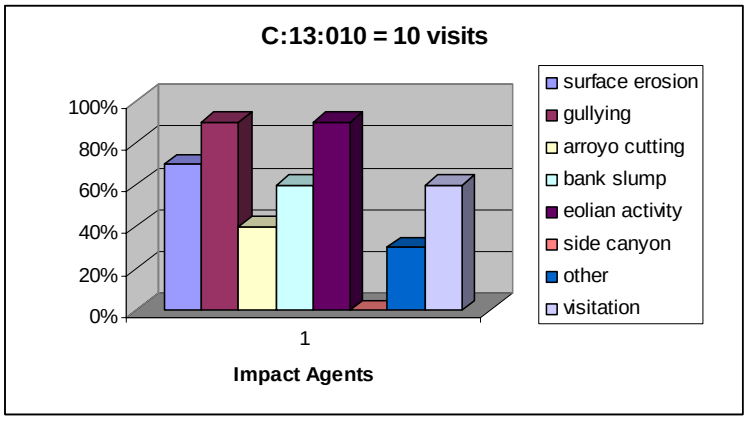
Archaeologists conducted data recovery at this site in 1984 (Jones, 1986) as a result of high water releases that inundated cultural remains along the river. GRCA closed this site to visitors in 1985 due to the fragility of the terrain. Geomorphologists completed a topographic map of C:13:010 in 1993 using photogrammetry (Hereford et al., 1993). The RCMP staff monitored the site annually since FY95 (Coder et al., 1995; Leap et al., 1997; Leap et al., 1998; Leap et al., 2000; Leap and Kunde, 2000; Dierker et al., 2001; Dierker et al., 2002; Leap et al., 2003). 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 because the erosion was so advanced. 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. This site was also included in the studies conducted by K. Thompson and A. Potochnik (Thompson and Potochnik, 2000). Since 1999, the RCMP archaeologists have annually recommended completion of a phased data recovery project. A carbon sample was taken from a newly exposed thermal feature in March 2003. The calibrated date is AD 700-900. In May 2003 the FIST trip stopped at this location to assess the eolian processes active here. The site location was properly positioned on the May 2002 orthographic images and digitized in the lab (Polygon).

Summary of Previous 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
Research	03/02/2003
Polygon	03/13/2003

* Official closure by Park.

Summary of Monitoring



Observations

Gullying and eolian erosion have been the most consistently observed impacts to this site, while surface erosion has also been active. Features at this site continue to be subjected to active rilling, gully and arroyo development, down cutting and headcut advancement and new channel initiation. Data recovery has been recommended with only minor feature based excavation conducted so far. Active gully and arroyo incision and expansion threaten the integrity of this site. Visitation has occurred despite the closure in 1985. However, visitation is minor compared to the physical erosion occurring on site.

FY04 Monitoring Observations Summary

Surface erosion is active at Feature 10. A new photo was taken of Feature 31. Although no change was observed the area represents a steep and fragile area that could go anytime. A new fire-cracked rock feature was observed with a gully on the north side of it. At Feature 7, the southern portion of the wall is very fragile with basal erosion and a lack of any mortar remaining. There is continued surface erosion and unstable walls at Structure 9. Feature 38 remains in poor condition, adjacent to the gully though there is no observable change since 2003. Although Feature 39 is on a steep slope, it appears stable since 1998. Feature 34 has new erosion along the northeast side of the structure. Feature 2 is stable, as is Structure 4. Structure 49 has had significant sediment loss on the southwestern section of the wall. Feature 5 is stable but in poor condition. No human visitation was noted. Data recovery continues to be recommended due to the active drainage damage that occurs throughout the site. Continue annual site monitoring.

C:13:069 Small Structure
Annual Schedule

This 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. A carbon sample taken in 2003 dated the site AD 225-445. Ceramics suggest a Pueblo II-early Pueblo III affiliation.

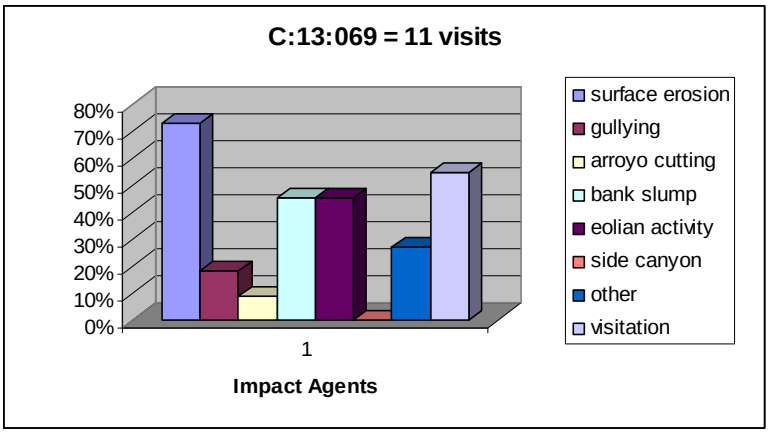
Previous Work

Prescott College personnel originally recorded this site in 1972. NPS personnel re-recorded it in 1990 (Fairley et al., 1994), and monitoring occurred in FY93, and annually since FY95 (Coder et al., 1994; Coder et al., 1995; Leap et al., 1997; Leap et al., 1998; Leap et al., 2000; Leap and Kunde, 2000; Dierker et al., 2001; Dierker et al., 2002; Leap et al., 2003) . In 1992, the GRCA Rehabilitation Project conducted trail obliteration, revegetation, and stabilization of minor drainages. Medium format photos were taken of this site in FY96 (Leap et al., 1996). Upon completion of a stabilization assessment in FY97, six checkdams were constructed within the drainage that bisects the site. 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., 1996) for photogrammetric topography mapping of the immediate area. Maintenance work on the checkdams was completed in FY99. CRCP personnel conducted extensive trail obliteration work in November 2001. Checkdam maintenance occurred at Checkdam 4 in FY2002. Checkdam maintenance was required at Checkdams 2 and 4 in FY03. A burned beam was exposed in the drainage in front of Feature 2. A carbon sample was taken. The calibrated date was AD 225-445. The FIST trip stopped at this site to assess eolian processes in May 2003. The site location was properly positioned on the May 2002 orthographic images and digitized in the lab (Polygon).

Summary of Previous Work Implemented

Remedial Action	Date Completed
MF Photos	02/19/1996
Checkdam Installation	02/24/1997
Total Station Map	04/24/1997
Checkdam Maintenance	FY99
Trail Work	11/08/2001
Checkdam Maintenance	04/27/2002
Checkdam Maintenance	03/21/2003
Carbon Sample	03/21/2003
Polygon	03/21/2003

Summary of Monitoring Observations



There was much erosive activity at the site in FY93, but after that year erosion was incipient throughout. Surface erosion, bank slump and eolian activity are incipient here. Active gully down cutting in FY02 resulted in the exposure of a burned beam adjacent to Feature 2. Checkdams within this gully are upstream of the features; some are adjacent to F1 and F2. Feature 1 and 2 integrity is threatened by continued drainage expansion due to bank slump. The gully and arroyo have not been active for a couple years now. Since the checks were installed there has been only one active year. Need to make sure the text reflects the table and visa versa. Visitation in the form of trailing adjacent to Features 1 and 2 and bisecting Feature 6 is being addressed by the NPS trail crew and does not currently affect feature integrity.

FY04 Monitoring Recommendations

Feature 2 has more bank slump and surface erosion. The feature continues to erode down into the adjacent gully. Feature 1 appears unchanged. Features 3 and 4 are in fragile condition though appearing unchanged from last monitoring episode. Feature 6 is unchanged with annual grasses and forbs covering the surface of the feature. Feature 5 has no change from the 1998 photograph. A trail bisects this site between Features 1 and 2 and Feature 6. Feature 6 is most impacted by people veering off the trail and through the feature. The NPS trail crew conducts maintenance work at this trail since it leads to an attraction site. No change is visible to the drainage. There is no evidence of runoff. No maintenance work is required. Continue annual checkdam monitoring and maintenance. The gully cutting but the gully isn't active. Data recovery is recommended because of the potential for the checkdams to fail, thus destroying the features. into Features 1 and 2 will continue to expose cultural material and therefore data recovery is recommended for these two features. Continue annual monitoring because in the past nine years of monitoring, only one season exhibited no activity (FY99).

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 on the surface. 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.

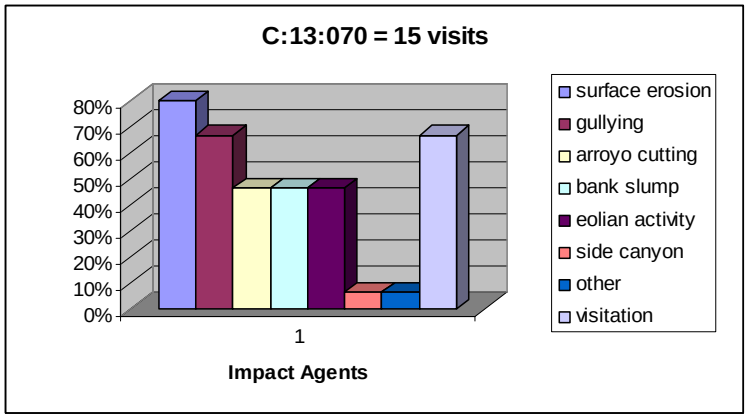
Previous Work

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., 1994; Coder et al., 1995; 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; Leap et al., 2003). 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. 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 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 Cal AD 1000 to AD 1250 and Cal AD 1160 to AD 1300. This site was also included in the studies conducted by K. Thompson and A. Potochnik (Thompson and Potochnik, 2000). Trail obliteration work was completed on a CRT trip in November 2001. Cross-sections were established here in February, 2003 to track arroyo headcut advancement. The FIST trip stopped at this site to assess eolian processes in May 2003. A carbon sample was taken by D. Rubin. The site location was properly positioned on the May 2002 orthographic images and digitized in the lab (Polygon).

Summary of Previous 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
Polygon	03/13/2004

Summary of Monitoring Observations



Incipient erosion through channeling occurs in the early years; however, beginning in FY99, the erosion becomes more consistent. There has been a trend of active gully and arroyo down cutting and expansion since at least just prior to the recording of this site. Both drainage down cutting and channel widening threaten the integrity of the feature at Locus D. The gully at Locus B does not threaten feature integrity at this time. Visitation to Locus B is active for tribal access and does not threaten feature integrity. Loci A and C are not currently threatened by the active channel down cutting and widening that is occurring at this time.

FY04 Monitoring Summary

Locus B has surface erosion and deflation continuing. The large mesquite tree in front of the dune is now dead. The dune will likely blow away when the root system of this tree deteriorates. Locus A has active gullying throughout the area. The gully in the main artifact area at the top of the dune is unstable. Although we had no photo to compare, this may be a good location for a new cross section. Locus C is stable at the main artifact concentration. Recent charcoal and campfire activity is evident in the center of the photograph. A large arroyo is beginning to develop downstream of this area between Loci C and D. A collection pile is evident at Locus B in association with Zuni offerings (turquoise). It is recommended that the profiles of the arroyo at Locus D be mapped as they are very active. Collected cross section data at Locus D elaborate on this. Recommend complete remapping of the site to track gully and arroyo development. Establish fixed photo points tied to the mapping project. Continue annual site monitoring. Data recovery has been recommended for Locus D in the past and we continue this recommendation.

C:13:092 Historic Structure

Five Year Schedule

This multi-component site consists of an historic habitation camp, and a prehistoric artifact scatter. The main historic feature is the remains of a small, rectangular foundation/tent platform constructed of driftwood and 2-3 inches thick hard-hewn pine planks (Feature 1). About five meters to the east of this is another possible foundation of beams and driftwood (Feature 2). There is a possible sandstone outhouse foundation about 50 meters east. There is little historic artifact debris on the site. Remains include the bulk of a small, cast-iron stove; a three-inch-long piece of half-inch rod with a threaded end; numerous wire-cut nails; and a single fragment of opaque, aqua bottle glass. To the north, on a talus slope, is a small, sparse, prehistoric artifact scatter of sherds and lithics. The historic component is probably turn-of-the-century; the prehistoric component appears to be Late PI-early PII Puebloan. In FY95 archaeologists found two grayware sherds north of the cabin. One was Tusayan corrugated, and probably associated with site C:13:321. Their location was plotted on the site map. On 8/24/03, L. Leap found a section of a prehistoric wall west of Feature 1. The location is off the site map, therefore it was not plotted.

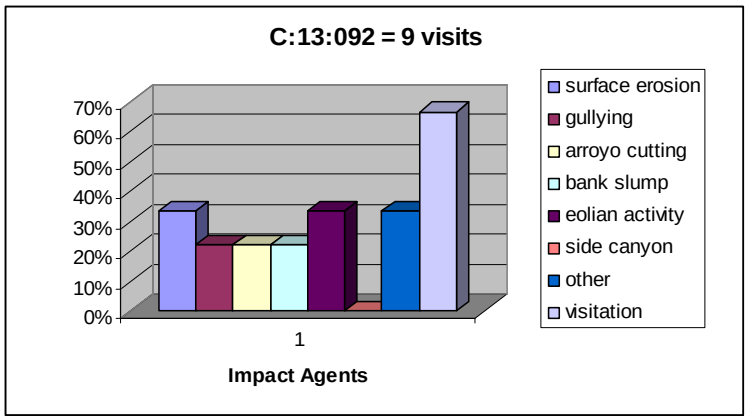
Previous Work

This site was originally recorded in (Fairley et al., 1994) and monitored by RCMP archaeologists in FY95 and FY04 (Coder et al., 1995). The site location was properly positioned on the May 2002 orthographic images and digitized in the lab (Polygon).

Summary of Previous Work Implemented

Remedial Action	Date Completed
Polygon	08/21/2003

Summary of Monitoring Observations



Surface erosion and eolian activity are incipient here as evidenced by newly exposed and recorded prehistoric artifacts. No active channel downcutting or expansion threatens site integrity. Visitation is evidenced by the movement of historic artifacts between monitoring episodes which does not threaten the integrity of the site at this time.

FY04 Monitoring Observations Summary

Some deflation of sand was observed in the structure areas. This deflation does not appear to be threatening the site. Large metal stove pieces have been moved by visitors since 1996. The pieces recorded are still present, but their locations have changed. A trail is forming on the west side of the terrace. This trail may travel through a prehistoric site. Continue 5 year monitoring schedule. Minor visitor impacts are the only impacts observed. These impacts are not affecting overall site integrity. I think we should rethink this one and discuss turning it over to Amy's program.

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 a cliff along a fault. The main adit is situated about 10 meters above the surrounding terrain with an extensive tailings pile below it. The second adit is located about 10 meters below and 20 meters south of the main adit. About 225 meters south-southwest is Locus B, which includes a log cabin constructed of driftwood logs. The cabin measures 2.6 x 4.1 meters (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 near the cabin.

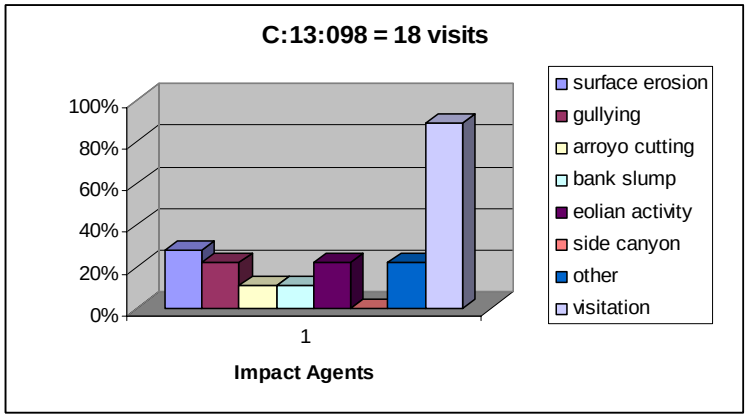
Previous Work

This site was initially recorded by R. Euler and T. 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. RCMP archaeologists monitored the site semiannually from FY93 to FY98 (Coder et al., 1994; Coder et al., 1995; Leap et al., 1996; Leap et al., 1997; Leap et al., 1998). In FY98 the schedule was changed to annual, and this schedule continues (Leap et al., 2000; Leap and Kunde, 2000; Dierker et al., 2001; Dierker et al., 2002; Leap et al., 2003). See Hereford (Hereford, 1993) for a photogrammetric topographic map of the immediate area. In FY95 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 FY97. Visitation to this site has resulted in increased gullying in places where incipient trailing exists. Trail work was conducted here on CRCP trips in 2000 and 2001. The site location was properly positioned on the May 2002 orthographic images and digitized in the lab (Polygon).

Summary of Previous Work Implemented

Remedial Action	Date Completed
Total Station Map	04/29/1994
MF Photos	03/30/1995
MF Photos	09/15/1995
MF Photos	02/17/1996
MF Photos	04/27/1996
MF Photos	02/28/1998
Trail Work	02/25/1999
Trail Maintenance	02/25/1999
Polygon	08/21/2003

Summary of Monitoring Observations



Surface erosion and eolian activity are incipient. It appears that visitor-related impacts have been the consistent impact to this site. Historic artifacts continue to be moved around the site and within the cabin. The prehistoric component of this site remains in good condition and has not had any new impacts observed since 2001. A small gully adjacent to the historic cabin has not actively down cut since 1994. Visitation does not immediately threaten site integrity and is being addressed by the NPS trail crew.

04 Monitoring Observations Summary

No new or active erosion has occurred since the last monitoring visit. The prehistoric cist is unchanged since 2001. Trail maintenance should continue annually by the NPS Trail Rehabilitation and CRCP personnel. Continued visitor disturbances were noted at the artifact stump as seen by a new collection pile which was dispersed by monitoring staff.

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. Since 1990, RCMP staff discovered numerous lithics and sherds eroding from the active arroyo and scattered throughout the drainage system to the river. 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. Carbon samples taken in FY99 show dates as early as A.D. 80 (Dierker and Downum 2004).

Previous Work

Archaeologists originally recorded the site in 1978. Prior to the implementation of the monitoring program (late 1980s) GRCA conducted excavation and collected samples on site. Five charcoal samples were taken with dates ranging from 140 years B.P. to 1410 years B.P. The RCMP staff monitored C:13:099 semiannually since FY93 (Coder et al., 1994; Coder et al., 1995; 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; Leap et al., 2003). 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.

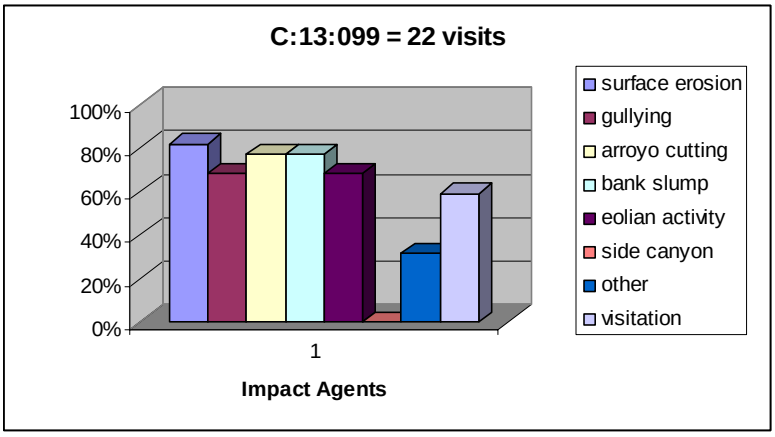
In September 1995 RCMP staff and Programmatic Agreement (PA) representatives from state and federal agencies, and tribal entities constructed 44 checkdams at C:13:099 (Leap and Coder, 1995). C:13:099 is the first location where Zuni-style checkdams were built in the river corridor. Archaeologists used 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 archaeologists conducted additional monitoring efforts during the research flow of 1996 (Balsom and Larralde, 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. Monitors recommended medium format photography and these projects were completed in FY95, FY96 and FY98 and FY01. 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 (Dierker and Downum, 2004) though more extensive excavation continues to be recommended. This site was also included in the studies conducted by K. Thompson and A. Potochnik (Thompson and Potochnik, 2000). During FY00 CRCP 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 FY2001 and in FY2003. CRCP 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 (Pederson et al., 2003). Minor checkdam maintenance occurred at five checkdams in FY03. In May 2003 the FIST trip stopped at this location to assess the eolian processes active here. This is one of their areas where stratigraphy work was completed. Preliminary findings of this research can be found in the USGS open-file reports (Draut et al., In press). The site location was properly positioned on the May 2002 orthographic images and digitized in the lab (Polygon).

Summary of Previous Work Implemented

Remedial Action	Date Completed
MF Photos	03/30/1995
MF Photos	09/15/1995

Checkdam Installation	09/15/1995
Trail Work	09/15/1995
MF Photos	02/17/1996
MF Photos	04/27/1996
Trail Work	04/15/1997
Checkdam Maintenance	02/22/1997
Total Station Map	07/27/1997
Checkdam Maintenance	02/26/1998
MF Photos	02/28/1998
Total Station Remap	09/01/1998
Data Recovery	04/17/1999
MF Photos	09/15/2000
Checkdam Maintenance	10/16/2000
MF Photos	03/28 /2001
Plant Vegetation	11/07/2001
Trail Work	11/07/2001
GCMRC Map & Research	02/17/2002
GCMRC Map & Research	9/29/2002
MF Photos	11/12/2002
Checkdam Maintenance	03/20/2003
Polygon	11/12/2003

Summary of Monitoring Observations



There has been active down cutting, and channel widening at least since the site was recorded in 1978. Active surface erosion, leading to the development of rills has resulted in the transition to a gully to an arroyo at Feature 1. Checkdam construction has resulted in sediment deposition, and possibly curtailing channel deepening. Breaching does occur and therefore widening of the drainage is evident. The experimental flood flows in 1996 did reach and plug up the mouths of the arroyos (see Yeatts, 1997 & 1998). The integrity of Features 1, 3, 4 and 6 is threatened by active channel incision and expansion. NPS trail crews maintain the Beamer Trail adjacent to this site. Visitation may threaten site integrity due to the continued exposure of new cultural material. Data recovery continues to be recommended at this site.

FY04 Monitoring Observations

Heavy rains on 11/12/03 affected this delta. There is standing water in the playa area behind the site. The main arroyo continues to downcut and expand as evidenced by the formation of another step away from the arroyo walls. There is continued gullying at Feature 1, arroyo cutting on the side and surface erosion are also present. Feature 3 has continued

surface erosion and bank slump. Feature 4 has continued arroyo cutting adjacent to the feature and surface erosion. Feature 5 looks unchanged. The arroyo arm at Feature 6 is downcutting into a narrower channel. The arroyo arm is channelizing south, and could threaten Feature 1 at some point in the future. No sign of human visitation was observed. The drainage has been recently active with evidence of alluvial transport in the thalweg in some locations. Checkdams 45, 50, 22, 29 and 25 have been obliterated. Checkdams 42, 9, 10, 11, 12, 14, 15, 21, and 34 require maintenance. Continue with data recovery recommendation. No sediment has been deposited on the features or within the drainages, only erosion is occurring with further downcutting. The drainage is 2 to 3 meters wide below Checkdam 10 at the junction with the Tanner/Beamer Trail. This past summer a lot of sherds and flakes ended up at the beach, washed from the site into the river.

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 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 centimeters 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, near Features 5 and 6.

Previous Work

Archaeologists originally recorded C:13:100 in 1978 and it was monitored by GRCA archaeologists until FY92. Beginning in FY93, the RCMP archaeologists monitored the site semi-annually, and annually since FY97 (Coder et al., 1993; Coder et al., 1994; Coder et al., 1995; 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; Leap et al., 2003). FY94 monitors recommended revegetation work, trail work, checkdam installation, total station mapping and stabilization. FY95 archaeologists 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). FY95 archaeologists decided that no vegetation would be planted.

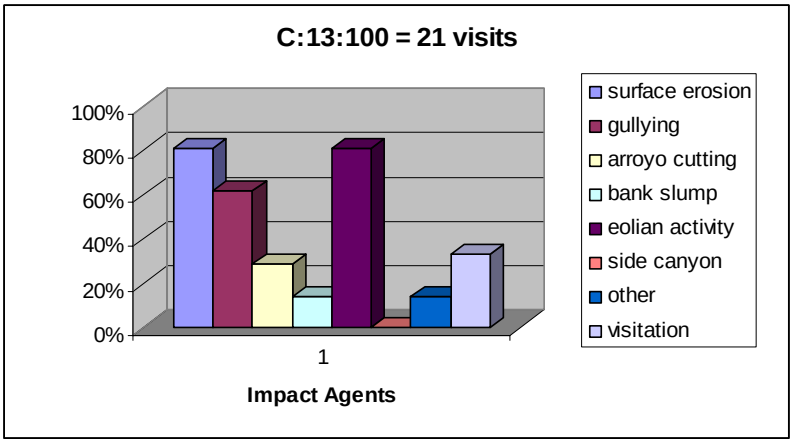
This site received additional monitoring during the research flow of 1996 (Balsom and Larralde, 1996). FY96 monitors recommended additional trail work. The area received further trail obliteration work in FY97 and surveyors completed a total station map in July 1997. Prior to completion of the total station map, RCMP staff used a photogrammetric topography map to plot additional features (Hereford et al., 1996). Monitors recommended medium format photography and these photo 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 J. Pederson incorporated the river-based drainage at this site into his GCMRC-sponsored remote sensing project (Pederson 2001). CRCP personnel transplanted bunch grasses and cacti in the dune area near the camp and completed minor trail obliteration in November 2001. 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. The site location was properly positioned on the May 2002 orthographic images and digitized in the lab (Polygon).

Summary of Previous Work Implemented

Remedial Action	Date Completed
Checkdam Installation	09/15/1995
Trail Work	09/15/1995
MF Photos	09/15/1995
Trail Work	10/15/1995
MF Photos	02/17/1996
MF Photos	04/27/1996
Trail Work	04/15/1997
Total Station Map	07/27/1997
Checkdam Maintenance	02/26/1998
MF Photos	02/28/1998
Checkdam Maintenance	10/16/2000
MF Photos	11/12 /2001
GCMRC Map & Research	02/17/2002
GCMRC Map & Research	09/29/2002
Checkdam Maintenance	03/20/2003
Polygon	11/12/2003

Summary of Monitoring Observations



Surface erosion is the most consistently (over 80% of the time) identified impacts to the site followed by gullying. Surface erosion and eolian activity are active at Features 3, 5, 7, 10 and 11. Active gully and arroyo expansion threaten the integrity of Features 4, 5, 6, 8 and 9. Data recovery has been recommended for Features 5, 6, 7, 8 and 9. Visitation is incipient though it does not affect the integrity of the site. The NPS trail crew routinely maintains the Beamer Trail adjacent to this site.

Summary of Monitoring Observations

Surface erosion is occurring at Features 7, 10 and 11. Water has pooled through and then drained at Features 5, 6, 8 and 9. This activity was caused by the rains on 11/12/03. Feature 4 looks good, the dune south of Feature 4 is blowing eolian sands into this part of the drainage. Features 1 and 2 look unchanged. Feature 3 has minor eolian erosion. All checkdams located below the Tanner trail have been breached and require maintenance. Checkdam 7 has been obliterated. The upper checkdams are doing well and holding sediment. Human disturbance was not observed. Although quite active, this site is in better condition than the adjacent site, C:13:099. Continue annual monitoring.

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. Concentration 1 includes over 50 items of lithic debitage and about 15-25 ceramic items. Concentration 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 occupation. Radiocarbon dates taken from Feature 5 (a roasting pit located approximately 50 centimeters below the current ground surface) indicate an earlier occupation of AD 575 to AD 775.

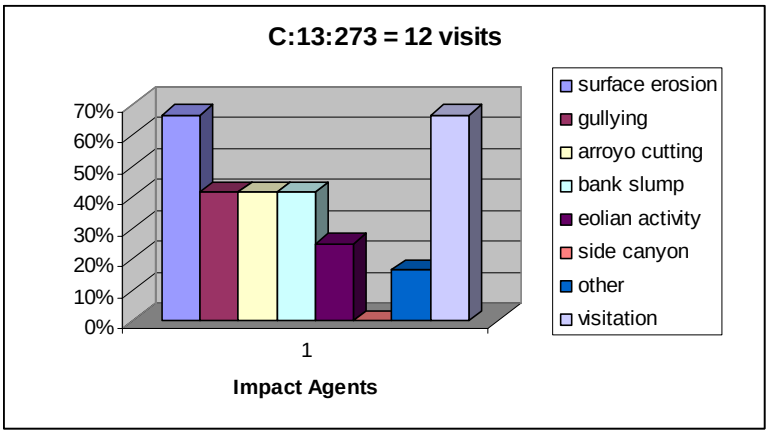
Previous Work

Archaeologists recorded the site in 1990 (Fairley et al., 1994)and the RCMP staff have monitored it annually since FY93 (Coder et al., 1994; Coder et al., 1995; 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; Leap et al., 2003). FY95 monitors recommended stabilization and retrailing. In FY95 RCMP staff conducted archaeological clearance work prior to a GRCA trail crew retrailing project. 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 active eolian processes. The sites location was properly positioned on the May 2002 orthographic images and digitized in the lab (Polygon).

Summary of Previous 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
Ash Sample	05/10/2003
Polygon	08/21/2003

Summary of Monitoring Observations



Surface erosion is the most frequently documented form of impact to the site however gullying, arroyo cutting and bank slump, although incipient can be detrimental to the sites integrity as several features are adjacent to these impacts, thus directly impacted by their activity. For example, Feature 3 is threatened by active gully and arroyo down cutting and expansion. Data recovery has been recommended at Feature 3 since 1997. As bank slump and headward movement of channels continue, Features 1 and 2 will be in a same predicament as Feature 3. Surface erosion is incipient at Feature 4. Visitation is adjacent to the site along the Tanner Trail however the features are quite obscure and visitor disturbance is currently not a threat to the site. This trail is routinely maintained by the NPS trail crew.

FY04 Monitoring Observations Summary

Feature 3 is in poor condition, collapsing and being bisected by an arroyo with active channel deepening. Gullying and sheet wash also impact Feature 3. Features 1, 2, and 4 look stable and unchanged. With the exception of the Beamer/Tanner Trail running through Feature 1, no other trails or visitor-related impacts are present. The Beamer/Tanner Trail needs to be maintained here so it does not entrench. Data recovery or testing is strongly recommended 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 an upright 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 washed away by the river-based arroyo. Feature 3 is a wall exposed in a gully. Feature 4 is a hearth or cist. Feature 5 is a cluster of Dox slabs aligned in a semi-circle and 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. During the initial recording in 1988 a metate and mano were measured, documented and relocated. FY96 monitors discovered a Tusayan Whiteware Sosi Black-on-White sherd below Feature 3. Artifacts indicate a Mid-late Pueblo II occupation, a carbon sample from Feature 7 suggests Pueblo I occupation. Feature 6, a cist, was located by M. Yeatts during a total station mapping project in FY97. Feature 7, a wall with charcoal was located by staff in FY02 after a recent rainstorm had cut back a bank. Carbon samples indicate CA AD 880-1030.

Previous Work

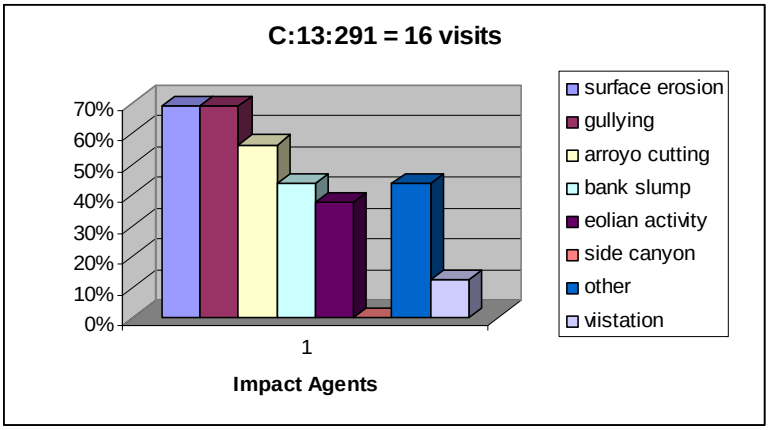
Archaeologists originally recorded the site in 1988 and again in 1990 (Fairley et al., 1994). The RCMP staff monitored the site annually since FY92 (Coder et al., 1993; Coder et al., 1994; Coder et al., 1995; Leap et al., 1996; Leap et al., 1997; Leap et al., 1998; Leap et al., 2000; Leap and Kunde, 2000; Dierker et al., 2001; Dierker et al., 2002; Leap et al., 2003). 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. An additional effort included medium format photography during the research flow to document the changes in the bank before and after the flood (Balsom and Larralde, 1996). The RCMP staff obliterated the newly created trail in FY97, at which time a total station map was completed. 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. CRCP personnel rerouted the trail below the site, near the river in December, 2000. The site location was properly positioned on the May 2002 orthographic images and digitized in the lab (Polygon). Continue the Medium Format photographs in an attempt to measure bank retreat or growth.

Summary of Previous Work Implemented

Remedial Action	Date Completed
MF Photos	02/20/1996
MF Photos	04/30/1996
Trail Work	04/17/1997

Total Station Map	07/30/1997
Trail Work	02/27/1999
Data Recovery	02/27/1999
Identified Seeds to Replant	02/01/2000
MF Photos	05/21/2000
Trail Work	12/09/2000
MF Photos	03/29/2001
MF Photos	11/13/2002
Carbon Sample	03/21/2003
Polygon	08/21/2003

Summary of Monitoring Observations



Surface erosion and gullying are the most common occurrences for site impact followed by arroyo cutting and bank slump and eolian activity. Active gully and arroyo cutting and expansion threaten the integrity of Features 1, 3, 4 and 7. Feature 7 was newly exposed in an active arroyo cutbank. Visitation has occurred along the site boundary and does not affect site integrity. Trailing to a nearby interpretive site is maintained by the NPS trail crew.

FY04 Monitoring Observations

Heavy rains (summer monsoons) have resulted in gullying and arroyo downcutting and channel widening. Features 1, 3, and 4 are directly threatened. Feature 7 is still intact but the charcoal has either washed away or has been covered up by arroyo activity. The trail below the site should be maintained to keep visitor traffic off the site. All features at this site should be excavated immediately due to the erosion that has occurred consistently throughout the years. Continue annual monitoring until excavations are completed.

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 this site. Ceramics, fire-cracked rock, shell, and a 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. Ceramic evidence includes several Puebloan sherds ranging from A.D. 1050-1200, though specific cultural affiliation remains undetermined. This site may be associated with rather extensive site nearby, C:13:009.

Previous Work

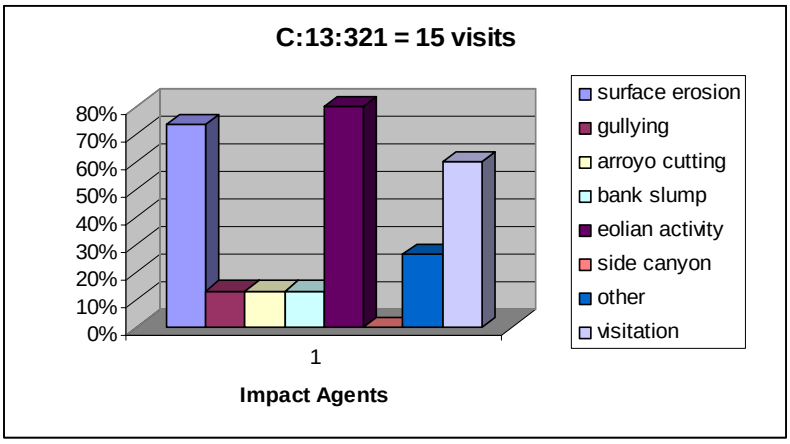
Archaeologists originally recorded the site in 1989 and GRCA personnel monitored it until transferred to the RCMP. The RCMP archaeologists have monitored the site annually since FY93 (Coder et al., 1994; Coder et al., 1995; Leap et al., 1996; Leap et al., 1997; Leap et al., 1998; Leap et al., 2000; Leap and Kunde, 2000; Dierker et al., 2001; Dierker et al., 2002; Leap et al., 2003). 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 testing, the RCMP staff determined that Feature 4 had no subsurface deposits (Balsom and Larralde, 1996). Monitors also took medium format photography before and after the flood. These photos were replicated in FY00, FY2001 and FY2002. See Hereford (Hereford et al., 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, a new shell artifact was identified at that time as well. The site location was properly positioned on the May 2002 orthographic images and digitized in the lab (Polygon).

Summary of Previous Work Implemented

Remedial Action	Date Completed
Test	02/18/1996
MF Photos	02/18/1996
MF Photos	04/28/1996
Total Station Map	09/01/1996
MF Photos	09/17/2000
MF Photos	03/29/2001
MF Photos	11/13/2002
Polygon	08/21/2003

Summary of Monitoring Observations



Surface erosion and eolian activity have been the driving forces for site change since the site was recorded. Previous gully and arroyo cuts have been in-filled by eolian activity. These drainages are again becoming exposed due to eolian activity in the form of sediment loss. The integrity of Feature 5 is threatened by the potential for gully activity –the feature is situated at the edge of the gully. Data recovery has been recommended for Feature 5. Visitation was previously an issue when the adjacent beach was used as a river camp, this is no longer the case because the beach has lost significant amounts of sand.

FY04 Monitoring Observations Summary

Feature 1 has experienced no change since 2000 though there is the potential for eolian activity. Feature 2 has some rock movement due to erosion and animal activity. Feature 3 has additional deflation with more of the feature exposed than was present in the 1997 photo. Features 1, 2, and 3 have some rodent burrows nearby. Feature 5 has increased sediment

deposition along the SW side of the feature. Feature 6 has more deposition from the collapse of the north dune, compared to the 1995 photo there is approximately 5 centimeters more sand. Feature 7 appears undisturbed but is in a deflated area with the potential for additional displacement. No noticeable visitor-related impacts. This site will be researched through the GCMRC FIST eolian transport study in FY04. Data recovery at Feature 5 will be conducted when and if it can be coordinated with the FIST study. In May, 2002 mesquite branches were placed on Feature 5 to trap sediment in the gully and these simple maneuver has proven to be beneficial although annual monitoring will continue.

C:13:334 Small Structure and Roasting Feature
Three Year Schedule

This is an open site with three features and an artifact scatter. Feature 3 is a roasting pit composed of Dox sandstone elements. It is four meters in diameter and is eroding out of the terrace. Ten meters south of the roasting pit is Feature 1, a three-sided possible habitation structure with sandstone foundation elements in slightly upright positions. It is three meters square. Feature 2 is a lithic/sherd scatter approximately three to four meters in diameter. About four meters south of the scatter is Feature 4, a circular cist. An amorphous group of Dox sandstone rocks lies four meters west of the roasting feature. Artifacts suggest a Late PI-early PII Cohonina affiliation. Note: in Sept. 1996 a backpacker found a white biface at the edge of the playa, under a bush. The 97-1 monitors were able to locate it but did not collect. The 01-2 monitors identified Hopi utility wares, Jeddito and Awatavi sherds on-site. While completing a total station map on 2/18/03, J. Dierker discovered additional features including more fire-cracked rock eroding out near Feature 3, another cist, an area of ashy soil, some slabs, and bone (probably horse).

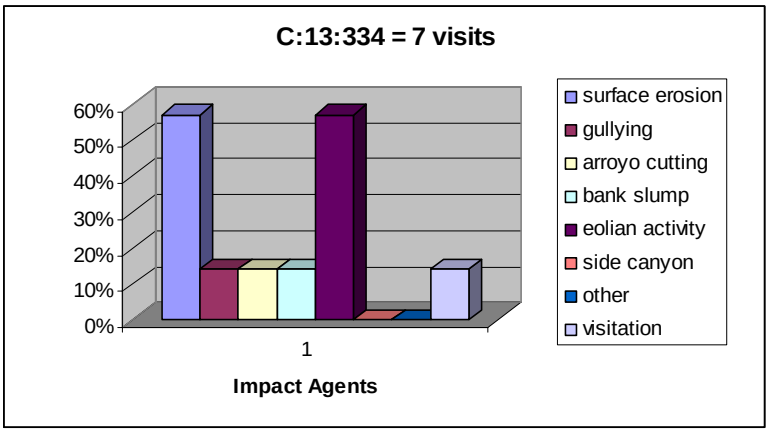
Previous Work

The site was recorded in 1990 (Fairley et al., 1994) and monitored by RCMP staff in FY93, FY95, FY99, FY01 and FY04 (Coder et al., 1994; Coder et al., 1995; Leap et al., 2000; Leap and Kunde, 2000; Dierker et al., 2001). A total station map was completed on a CRF trip in 2003. The site location was properly positioned on the May 2002 orthographic images and digitized in the lab (Polygon).

Summary of Previous Work Implemented

Remedial Action	Date Completed
Total Station Map	02/18/2003
Polygon	08/21/2003

Summary of Monitoring Observations



Surface erosion and eolian activity are the dominant impact agents. These agents do no pose a threat to site integrity. If the catchment area (the network actively threatening C:13:099) enlarges there is the potential for active channel down cutting and widening which may threaten feature integrity.

FY04 Monitoring Observations Summary

Surface erosion and general alluvial reworking are slightly evident at Features 2 and 4. Features 1 and 3 are stable. No human disturbance was observed. Continue monitoring every three years.

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, 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 near a Dox Sandstone cliff.

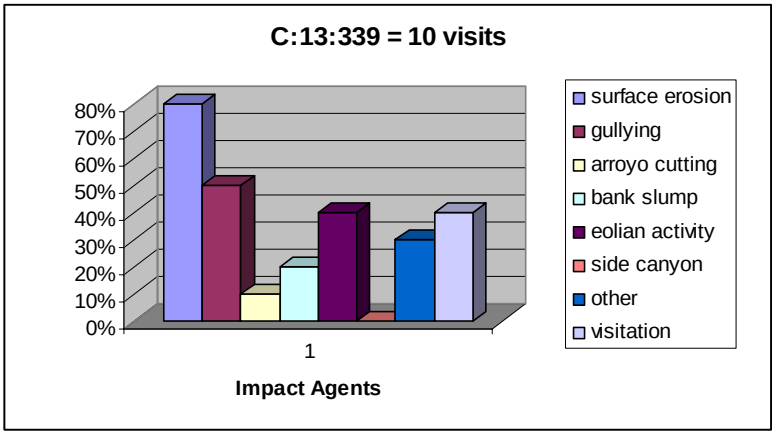
Previous Work

The site was originally recorded in 1990 (Fairley et al., 1994) and monitored in FY93, and annually since FY95 (Coder et al., 1993; Coder et al., 1995; 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; Leap et al., 2003). Retrailing was conducted in FY95 by the Park. Total station mapping was also completed in September 1998. Mitigation was proposed for this site in FY95. 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, and rearrangement of rocks. The Beamer Trail intersects this area down to a lower terrace. Planting vegetation may help stabilize the cutbank where Features 5 and 6 are located. The site location was properly positioned on the May 2002 orthographic images and digitized in the lab (Polygon).

Summary of Previous Work Implemented

Remedial Action	Date Completed
Data Recovery	11/08/1994
Trail Work	02/01/1995
Polygon	08/21/2003

Summary of Monitoring Observations



Surface erosion, particularly in the deflated areas has been observed as incipient though does not threaten feature integrity. Observations show active gully down cutting increasing slightly in the past 6 monitoring episodes with the potential to threaten the integrity of Features 2, 3 and 5. Checkdam installation may preserve integrity at this feature and more than likely decrease erosion of the gully. The Beamer Trail goes directly through the site; however, because these features are somewhat difficult to discern no direct visitor impacts have been observed. The only visitor impact agent is the trail and this is routinely maintained by the Park.

FY04 Monitoring Observations

Feature 4 is in poor condition with downslope rock movement. Feature 5 is also in poor condition with a lot of downslope movement of fire-cracked rock. The gully south of Feature 2 is getting larger and abutting the feature. Rock movement is also present at Feature 2. No human disturbances were observed though trail maintenance is required. Trail work will continue at the Park level annually. Testing and data recovery are highly recommended at Features 5 and 6. The gully south of Feature 2 should be treated immediately. Continue annual monitoring due to the activity observed at this site.

C:13:347 Small structure
Annual Schedule

This site consists of a masonry wall 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. No other artifacts were found.

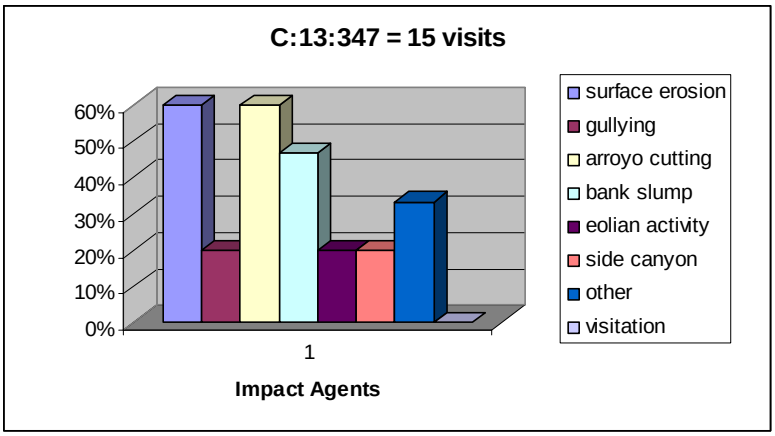
Previous Work

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., 1993; Coder et al., 1994; Coder et al., 1995; 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; Leap et al., 2003). 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. 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 sediment 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. Monitoring staff have recommended more extensive data recovery since 1998. The FIST trip stopped here to assess eolian processes in May, 2003.

Summary of Previous Work Implemented

Remedial Action	Date Completed
MF Photos	02/19/1996
Total Station Map	04/25/1997
Total Station Remap	09/01/1998
Test for Feature Significance	02/26/1999
Polygon	08/21/2003

Summary of Monitoring Observations



Active arroyo down cutting and expansion directly threatens the integrity of this site. Subsurface testing indicates additional buried cultural remains are present. Data recovery has been recommended here since 1995. Visitation does not occur at this location.

FY04 Monitoring Observations Summary

The mano is in the arroyo still and in a precarious spot. We could loose this in a big washout. There has been extreme arroyo activity here and bank slump, exposing the structure at an increasing rate. The arroyo is approximately 50 centimeters deeper. No human disturbances were noted. Preservation is not an option here. Data recovery is recommended before the structure collapses. Continue annual monitoring.

C:13:349 Prehistoric Site and Historic Structure
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

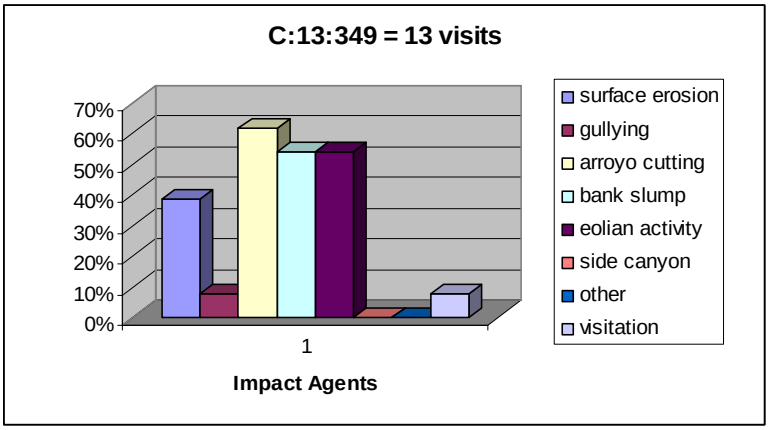
The site was originally recorded in 1990 (Fairley et al., 1994) and monitored annually since FY93 (Coder et al., 1994; Coder et al., 1995; Leap et al., 1996; Leap et al., 1997; Leap et al., 1998; Leap et al., 2000; Leap and Kunde, 2000; Dierker et al., 2001; Dierker et al., 2002; Leap et al., 2003). A profile was examined at this site to better understand flood and debris flows along the terrace (Hereford et al., 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. A total station map of the site was completed in 1997 and the site was remapped in September 1998. The site was assessed for stabilization by the Zuni Conservation Program in FY97. Stabilization was determined to be inappropriate at this location due to the maturity of the arroyo. Feature 2 was completely excavated in FY99. 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 the eolian processes active here, a carbon sample collected at that time dated to CA AD 255-435.

Summary of Previous 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
Total Station Remap	09/01/1998
Data Recovery	02/01/1999
Carbon Sample	05/10/2003
Polygon	03/13/2004

Summary of Monitoring Observations



Active surface erosion and eolian erosion are incipient at Features 3 and 4 though they do not currently threaten the integrity of these features. Active arroyo cutting has resulted in the excavation of Features 2 and 5. Feature 1 is threatened by headward migration of the arroyo. An ephemeral gully adjacent to the arroyo developed in 2003. This gully and the arroyo have the potential to expose additional cultural materials. The visitation present in 2003 consisted of a single set of footprints directly through Feature 3.

FY04 Monitoring Observations Summary

Feature 3 appears more exposed due to wind erosion although no cultural materials have moved since it was last monitored. Feature 2 was excavated and no longer exists. Feature 5 no longer exists. Feature 1, the historic structure appears stable and unchanged. The main arroyo cut at this site is active but is not impacting Feature 1. Continue annual monitoring for newly exposed materials in the arroyo cut. No visitation was observed. Monitor for newly exposed materials in the active arroyo cut.

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

This is a mid-late Pueblo II habitation area situated on a debris fan and on both sides of an unnamed side canyon. The site 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

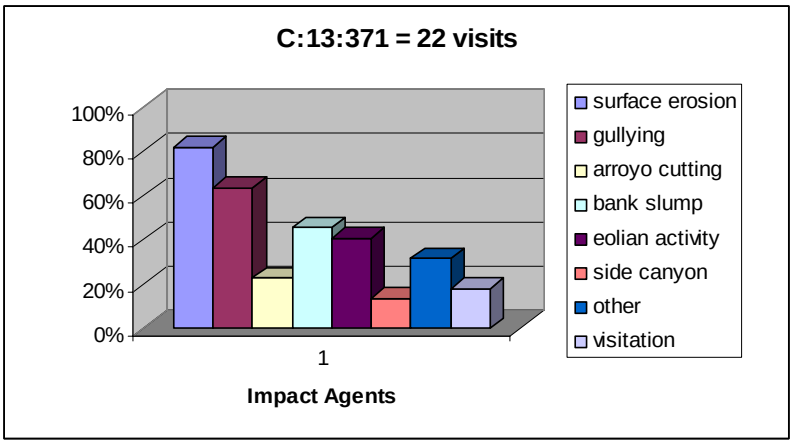
Archaeologists recorded the site in 1990 (Fairley et al., 1994) and the RCMP staff monitored it at least annually since FY92 (Coder et al., 1994; Coder et al., 1995; Leap et al., 1996; Leap et al., 1997; Leap et al., 1998; Leap et al., 2000;

Leap and Kunde, 2000; Dierker et al., 2001; Dierker et al., 2002; Leap et al., 2003). Monitors recommended a combination of data recovery, testing, planting vegetation, and installing checkdams since FY94. 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. 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 (Balsom and Larralde, 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. FY98 monitors replicated medium format photos taken during the 1996 research flow. 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 active here.

Summary of Previous 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
Total Station Remap	01/01/1998
MF Photos	04/18/1998
Checkdam Maintenance	11/11/1998
Checkdam Maintenance	04/26/2002
Polygon	08/21/2003

Summary of Monitoring Observations



Surface erosion is incipient though does not threaten the integrity of any of the features. Increased gully down cutting and expansion threaten the integrity of Features 2, 3, and 5. Data recovery has been recommended for Features 2 and 3.

Checkdam construction in the drainage above Feature 5 appears to be slowing the down cutting of this gully. The gully at Features 2 and 3 continues to down cut and expand. Visitation does not occur at this site.

FY04 Monitoring Observations Summary

Feature 1 had no change observed. Feature 2 has active gullying occurring along the east side of the feature. Feature 3 has surface erosion and gullying along the east side of the feature. Feature 5 shows continued rilling and gullying. Features 6 and 7 have not changed since the last monitoring episode. No sign of visitor-related impacts was observed. This site is in poor condition but still has the potential to yield valuable archaeological information. There is also good potential for eolian transport data here. The drainage containing the checkdams has not been active. All checkdams are unchanged from the photographs and no additional maintenance work is recommended. Continue monitoring this site semiannually.

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. 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. During the survey, archaeologists identified the slab-lined cist as the only feature at this site and cultural affiliation was unknown.

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; Leap et al., 1996; Leap et al., 1998; Leap and Kunde, 2000; Dierker et al., 2001; Dierker et al., 2002; Leap et al., 2003). 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. At the next monitoring episode, 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. Prior to reburial, the vessels were photographed with color slide and black-and-white film with scale.

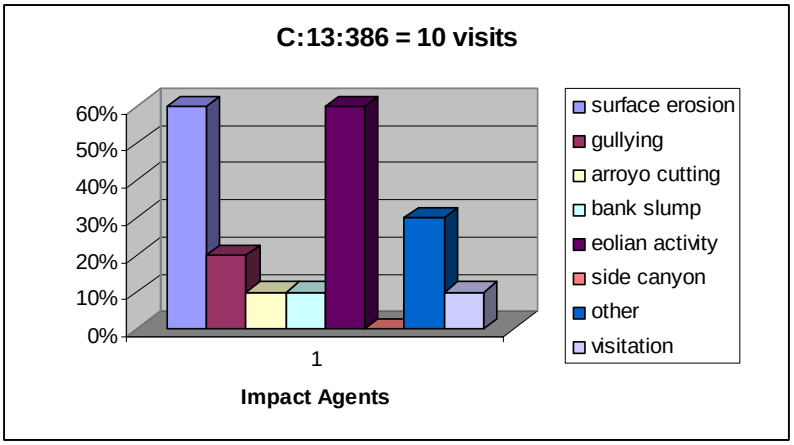
Discovery of the two ceramic vessels has allowed the RCMP to identify cultural affiliation of the site as Kayenta Puebloan and the occupation date to be approximately AD 1050 – 1100. This has contributed greatly to a better understanding of occupations of this terrace along the river corridor. Function 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. In February 2004 a tribal trip stopped here to discuss treatment options.

Summary of Previous Work Implemented

Remedial Action	Date Completed
Stabilized dune	11/08/2001
Stabilized dune	04/28/2002
Total Station Map	02/21/2003
Polygon	11/12/2003

Summary of Monitoring Observations



Surface erosion is incipient and continues to expose more of the features present. Eolian activity is primarily responsible for the exposure of the burial. Active gully down cutting directly threaten the integrity of the storage features and artifacts at Structure 2. Visitation present in 1996 consisted of a single set of footprints across the dune below the site and nothing has been observed since that time.

FY04 Monitoring Observations

The artifact scatter at Structure 2 has minor surface erosion. The gully below it has been active with several knickpoints present. Structure 2 is unchanged. Minor eolian deposition and erosion at the burial are evident. One set of sheep tracks runs along the dune just below the brush stabilization. Grasses and four o'clocks are growing in the brush placed to stabilize the dune. Feature 1 the cist has minor surface erosion. No sign of human visitation was observed. Continue to maintain the brush stabilization. The site looks good with only minor physical impacts. Though due to the sensitive nature of the site, continue semiannual monitoring until the tribal consultation work is completed.

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 drip line and trail.

Previous Work

Euler and 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 visited the site in FY92 and FY93, twice in FY94, once in FY95 and then semiannually beginning in FY96 (Coder et al., 1992; Coder et al., 1993; Coder et al., 1994; Coder et al., 1995; 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; Leap et al., 2003). The schedule was changed to annual in FY00. 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. Three checkdams were built in the river-based drainage downstream of the site. 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. 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.

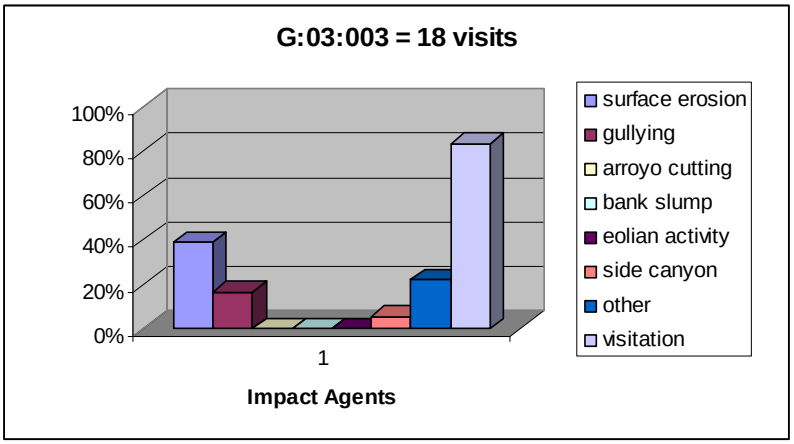
The site receives a great number of visitors, and as a result, multiple trails bisect features and several collection piles exist. Aerial photographs taken over the last 25 years show a geometric increase in the social trailing at Granite Park in general. This trend is enhanced by the local big horn 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 retrailing 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 Summer). 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. The FIST trip stopped here to assess eolian processes in May 2003.

Summary of Previous 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
GCMRC Map & Research	02/27/2002
GCMRC Map & Researcg	10/09/2002
Trail Maintenance	11/2002
Cross Section	03/23/2001
Cross Section	03/28/2003
Polygon	03/13/2004

Summary of Monitoring Observations



Surface erosion is incipient. Gully down cutting has likely been stabilized by the installation of checkdams in the gully below the site in 1996. Continued visitation has resulted in compaction adjacent to Features 2, 3, and 4 and disturbance at Feature 1. The integrity of the features is not threatened at this time. The NPS trail crew maintains trail obliteration work in this area.

FY04 Monitoring Observations

Feature 4 has decreased vegetation, probably because the previous photograph has a bush with leaves on it and the leaves have yet to grow this spring. Feature 3 is unchanged from the photograph. Feature 2 looks good. Feature 1 has minor rock movement. The prickly pear at Feature 5 is beginning to die off. It is uncertain whether the loss of vegetation at this feature will result in increased dune erosion. At Feature 1 on the overhang there was a large collection pile of small

rocks. No pattern to the type or size of the rocks was evident. These rocks were dispersed. The trail leading from the Granite Park drainage through the site to Feature 1 has faded somewhat, probably because of the winter season. Consider transplanting cryptobiotic soils onto the hardened soils of the trail to see if we could promote new growth. This would have to be completed after the tourist season so the soils could grow. Staff collected cross section data at profiles #1, 2, and 3. The drainage containing the checkdams has not been active. All checkdams are in excellent condition and no maintenance work is recommended. Continue annual checkdam monitoring and arroyo profiling. Continue site monitoring due to the fragile nature of Features 1 and 2.

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. Cultural affiliation is unknown, but presumed to be Pai and or Paiute.

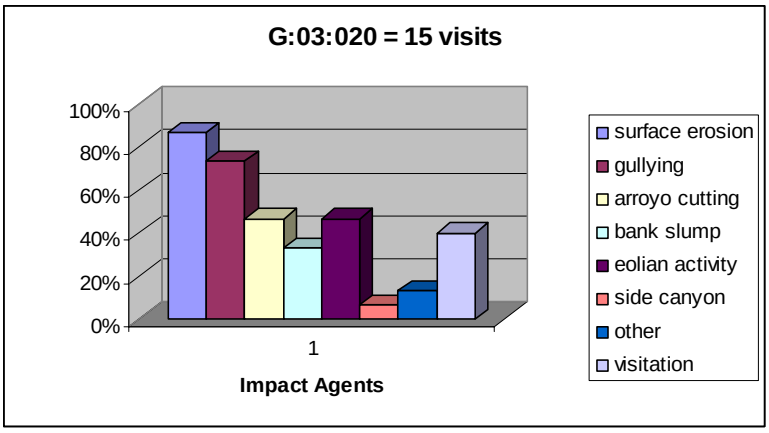
Previous Work

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., 1993; Coder et al., 1994; Coder et al., 1995; 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; Leap et al., 2003). 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. 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, trail were obliterated. Mapping rate, depth and width of these drainages through time could provide excellent data on the progression and rate of erosional processes effecting cultural resources at this location. Cross sections profiles of the small gullies south of Feature 2 have been taken to aid in determining rates of change at this site. Consultations 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 stopped at this location to assess the eolian processes.

Summary of Previous 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	04/06/2001
Cross-Section	05/04/2002
Cross-Section	03/29/2003
Cross-Section	03/24/2004
Polygon	03/24/2004

Summary of Monitoring Observations



Incipient surface erosion and eolian activity has been observed. Active rilling resulted in the establishment of new gullies and existing gullies have actively down cut and expanded, transitioning into arroyos in 1999. Excavation at Features 7, 8 and 9 occurred in 1998. Active arroyo expansion threatens the integrity of Feature 2. Data recovery has been recommended for this feature since 2000. No visitation has been observed here since the NPS conducted trail obliteration work in 1999.

FY04 Monitoring Observations

The gully north of Feature 2 is less pronounced with eolian deposition occurring probably due to drought conditions. No alluvial erosion was observed in this drainage. Feature 2 is the most important and most threatened feature on this site. Gullying and arroyo cutting are threatening this feature. Feature 5 is very stable and encrusted with cryptobiotic soils. Feature 6 is also stable and has not changed. The northeastern section of this fire-cracked rock concentration does not have as much cryptobiotic soil so if anything begins to erode it will occur here first. Feature 1 no longer has visible artifacts on the surface and there has been no change since 1996. No visitation was observed. Cross section data was collected from profiles #1 and 2. Recommend assessment for checkdams or a water diversion structure to divert runoff away from Feature 2. If the Zuni Conservation Project decides checkdams are not feasible, then data recovery is recommended for Feature 2. Continue annual site monitoring due to the fragile nature of Feature 2.

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

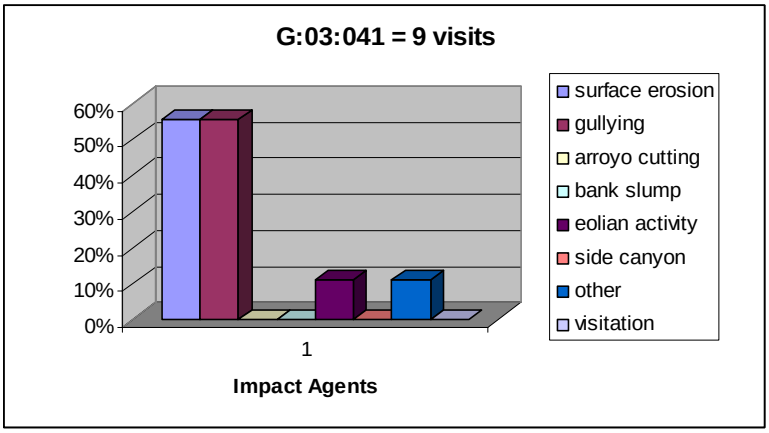
Archaeologists recorded the site in 1991 (Fairley et al., 1994) and the RCMP staff monitored it in FY96, FY98, FY99, FY00, FY01, FY02, and FY03 (Leap et al., 1996; Leap et al., 1998; Leap et al., 2000; Leap and Kunde, 2000; Dierker et al., 2001; Dierker et al., 2002; Leap et al., 2003). The RCMP staff 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 work projects. 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 also 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 Previous Work Implemented

Remedial Action	Date Completed

Total Station Map	06/16/1997
Checkdams	04/25/1997
Checkdam Maintenance	11/21/1998
Trail Work	03/07/1999
Checkdam Maintenance	04/28/2000
Checkdam Maintenance	10/25/2000
GCMRC Map & Research	02/26/2002
GCMRC Map & Reserach	10/08/2002
Polygon	03/13/2004

Summary of Monitoring Observations



Surface erosion and eolian activity are incipient. Active gully downcutting and expansion resulted in the construction of checkdams near Feature 3 in 1997. Continued activity has resulting in occasional checkdam maintenance. The headward advancement of the gullies has the potential to threaten the integrity of Features 2, 3, and 4. Visitation has not been observed at this site.

FY04 Monitoring Observations

Feature 3 has no change since the Feb.1996 photograph, though minor surface erosion on the north side of the feature is evident. The drainage is extremely fragile and walking on or adjacent to it is causing the drainage to widen. Feature 1 has not changed since the Nov. 1997 photograph. Feature 2 has not changed since Oct. 2002. Feature 4 has not changed; however, the feature is in an unstable area where sheet wash could occur with even a small amount of runoff. Good spring growth of grasses and forbs is evident at all features. The drainage is extremely fragile and walking on or adjacent to it will cause the drainage to widen. No visitation was observed. No work is recommended at this time. Continue annual site monitoring because although stable, the features are still fragile.

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.

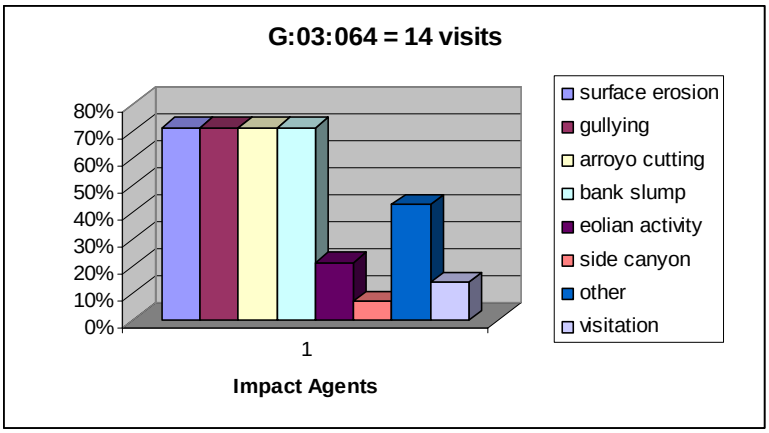
Previous Work

Archaeologists recorded the site in 1991 (Fairley et al., 1994)and RCMP staff monitored it at least annually since FY94 (Coder et al., 1994; Coder et al., 1995; 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; Leap et al., 2003). 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. 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 collections 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. In 2004 stratigraphic analysis occurred in several different locations on-site (see Draut et al., In press).

Summary of Previous Work Implemented

Remedial Action	Date Completed
MF Photos	04/04/1995
Total Station Map	01/01/1998
Carbon Samples	03/06/1999
Trail Work	03/07/1999
Polygon	03/13/2004
Stratigraphy Work	05/20/2004

Summary of Monitoring Observations



Surface erosion and eolian activity are active. Active gully and arroyo down cutting and expansion threaten the integrity of this site. There is evidence of recent alluvial activity in the drainage bottoms and slumping of arroyo walls. The arroyos continue to be active, exposing artifacts, features, and charcoal lenses. Visitation has not been observed since 1999 and does not threaten the integrity of this site.

FY04 Monitoring Observations

Feature 15 has increased vegetation noted since October 2000; however the gully to the east should be monitored. The gully is approximately 50 centimeters deep and the knickpoint is 20 centimeters deep. Feature 1 has increased vegetation since Oct. 2000. Feature 2 has not changed since Oct. 1994. Feature 3 has not changed since Nov. 1998, though the bush on the northeast end of the feature is now dead. Feature 7 has abundant vegetation and is stable. Feature 4 has no change, though the arroyo cut adjacent to this feature is very active. No change at Features 5, 9, 10, 11, or 12. No change at Feature 6 though many piping holes were observed. Feature 8 is very stable. No change at Feature 13 since 2003. Feature 14 could not be relocated, the photograph only showed a knickpoint in the drainage, not the feature. No human visitation was noted or observed. This is a great area to monitor arroyo cuts with aerial photographs. Data recovery is recommended especially at the features adjacent to the arroyo cuts, including Features 1, 4 and 8. The eolian transport research may profile sections of the arroyo wall in May, 2004. Continue annual site monitoring.

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.

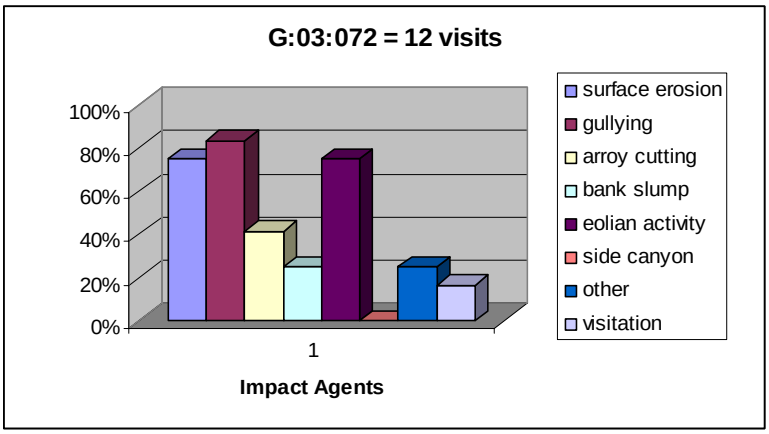
Previous Work

The site was originally recorded in 1991 (Fairley et al., 1994), monitored once in FY93, and monitored annually since FY95 (Coder et al., 1995; 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; Leap et al., 2003). 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. In FY99 checkdam maintenance resulted in building two new checkdams and altering one original checkdam. 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. 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 (Pederson et al., 2003). No checkdam maintenance was required here in FY03. In May 2003 the FIST trip stopped at this location to assess the eolian processes active here.

Summary of Previous Work Implemented

Remedial Action	Date Completed
Checkdams	03/05/1997
Total Station Map	03/05/1997
Total Station Remap	09/01/1998
Checkdam Maintenance	11/22/1998
Checkdam Maintenance	04/29/2000
Checkdam Maintenance	10/26/2000
GCMRC Map & Research	02/28/2002
GCMRC Map & Researcg	10/13/2002
Polygon	03/13/2004

Summary of Monitoring Observations



Surface erosion and eolian activity are active here. Continued gully down cutting and expansion led to the transition into arroyos in 2000. Checkdam construction in 1998 may have slowed the expansion of the gully at Feature 3. Active gullying and continued arroyo cutting have been identified as having the potential to threaten the integrity of Features 5, 9, 10, 11, 14, and 15. Visitation observed in FY04 consisted of a collection pile of four sherds near Feature 9. Monitoring staff noted that no other signs of visitation were observed and the collection pile could be extremely old. Visitation does not currently threaten the integrity of this site.

FY04 Monitoring Observations

Feature 2 has no observable change from the Oct. 2000 photograph. There is minor vegetation loss (the prickly pear in the foreground of the photograph is dying off). Feature 3 has minimal change. The low gradient of the slope where the feature is located indicates a low potential for erosion. Feature 4 is unchanged though the north side of the feature does have the potential for sheetwash. The biface is still present at Feature 4. Feature 5 is stable with minimal change since

1996. There is the potential for arroyo cutting here. Feature 6 has active sheetwash because of its location on a steep slope. Drought conditions have resulted in the feature appearing stable since Nov. 1994, though with less soil and minor displacement of artifacts. Feature 7 has the potential for sheetwash. Cryptobiotic soils are abundant here although there is new and prominent rodent burrowing in the center of the feature. Feature 8 is unchanged. Feature 15 has abundant cryptobiotic soil though no other vegetation. Rodent burrowing is also occurring at Feature 15. The gully below the feature is unstable. Feature 10 has soil loss on the northwest bank of the feature and vegetation loss from bank slump. The edge of the arroyo is very steep at this feature. Rodent burrowing is abundant. Feature 9 has an arroyo forming at the base of the roaster. The slope is steep on the river-side of the feature making it susceptible to increased erosion. A small collection pile of Pai sherds are in the inner portion of the feature. Feature 11 is in danger of complete erosion. The arroyo cut is now 50 centimeters deep on the south side of the feature. There is extreme headward erosion and soft, sandy soil creating a high potential for complete removal of the feature. The fire-cracked rock does not appear to have changed. Feature 12 changes since Oct. 2000 are due to eolian transport of the dune sand over the feature. The checkdam is successful. Feature 14 fire-cracked rock is stable on the west end. The flat surface towards the river (east) has a high potential for erosion. The southeast portion has a gully forming but it is lined with rocks. Most of the feature appears covered in cryptobiotic soil. Some soil loss on the south slope and decrease in vegetation is evident since the last photograph in April 1996. Feature 13 was not relocated. Feature 9 collection pile of 4 Pai sherds on the north side near the center portion of the roaster. This may be a very old collection pile since there are no other signs of visitation at this site. The drainages at this site have the potential to be very active once rainfall begins. No other work is recommended. Continue annual checkdam monitoring and annual site monitoring.

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).

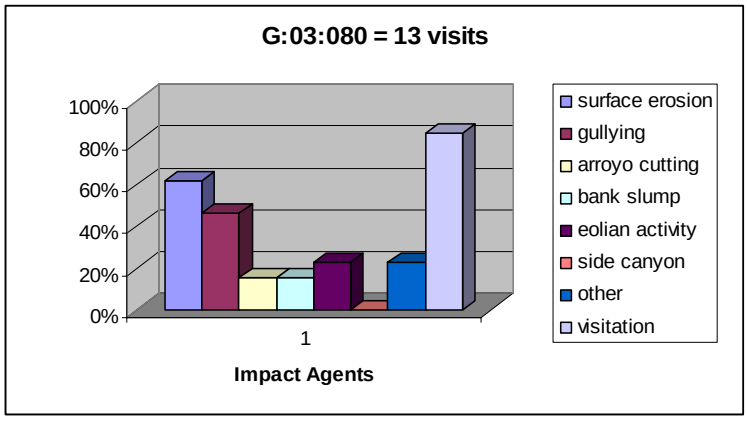
Previous Work

The site was originally recorded in 1991 (Fairley et al., 1994), monitored once in FY92 and FY93, and annually since FY95 (Coder et al., 1992; Coder et al., 1993; Coder et al., 1994; Coder et al., 1995; 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; Leap et al., 2003). In FY97, medium format black-and-white and color prints were taken of Locus A, 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 that make the uprun. FY99 monitoring staff 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.

Summary of Previous Work Implemented

Remedial Action	Date Completed
MF Photos	03/05/1997
Polygon	03/13/2004

Summary of Monitoring Observations



Surface erosion in the form of rills has resulted in the development of a gully in 1999. The integrity of Feature 4 has the potential to be threatened by gully down cutting and expansion. Visitation is present and compaction of trails leading to the development of entrenched drainages does have the potential to threaten feature integrity in the future.

FY04 Monitoring Observations

Active sediment runoff at Feature 5 has filled in the gully some since the last photograph. Feature 4 is unchanged. The drainage at Feature 3 is unchanged with grasses and forbs in the drainage. The feature appears stable. Feature 6 is unchanged. Feature 7 has fewer disturbances from visitation. Feature 2 has had a decrease in vegetation with runoff evident in the trail (could potentially turn into a drainage). Feature 9 has minor downslope rock movement and less vegetation. Feature 1 has less vegetation also. The trail leading from upstream of the basalt outcrop to the rock art runs the length of the basalt outcrop. This is on the map. The trail from the downstream side of the drainage cuts through Features 2, 3, and 7. This section of the trail does appear to have minimal use. A large collection pile was found at Feature 1. This pile was not dispersed. Consult with the Hualapai tribe regarding impacts and treatment of visitor-related impacts at this site. Continue annual monitoring until a site plan can be determined between Hualapai, NPS cultural and the NPS trail crew.

CHAPTER THREE
EROSION CONTROL STRUCTURES IN GRAND CANYON

The first use of erosion control structures by the RCMP to slow erosional processes at unstable sites along the Colorado River occurred in September 1995. This pilot stabilization project identified several different construction types to evaluate the checkdam styles best suited for the environment. This project resulted in the construction of 70 checkdams at two archaeological sites on the Palisades Delta (Leap and Coder, 1995) and assessments for checkdam construction at two additional sites. Routine monitoring and maintenance of checkdams were intended to be part of the overall stabilization program. All checkdams were measured and described, plotted on topographic maps of the sites, and photographed with 35mm (Figure 5) and medium format black-and-white and color film. Information recorded during checkdam construction includes checkdam number, checkdam type, dimensions, construction materials, the amount of materials, and photographs of the drainage before and after checkdam construction (Leap and Coder, 1995).

Figure 5. Location of a checkdam before and after construction on the Palisades Delta in 1995.

Since 1995, the RCMP staff, in coordination with the Zuni Conservation Project (ZCP) has constructed checkdams to curtail additional drainage down cutting and expansion in an effort to preserve *in situ* archaeological remains. Currently 240 checkdams have been installed at 27 sites along the Colorado River corridor (Figure 6).

History of Checkdam Construction along the River Corridor

To identify remedial actions appropriate for use in an area with limited access, proposed as wilderness, and highly sensitive resources from a Tribal perspective, a three-day workshop sponsored by the BOR convened to address methods for treatment of eroding archaeological sites in 1995. Participants included the BOR, NPS, The Havasupai Tribe, Hopi Tribe, Hualapai Tribe, Navajo Nation, San Juan Southern Paiute Tribe, Southern Paiute Consortium, Pueblo of Zuni, USGS, AZ State Historic Preservation Office, Northern Arizona University, Glen Canyon Environmental Studies, Pacific Northwest Laboratory, Bureau of Applied Research in Anthropology, and the Department of Agriculture National Sediment Laboratory. Members from each of these groups presented information on geomorphic processes, treatment methods and options, tribal perspectives on cultural resource preservation, and considerations for management and implementation of a remedial action program. Panel discussions included case studies and a field trip to the Lees Ferry area to view different types of adverse impact. The workshop cumulated in a joint BOR/NPS discussion of proposed work, the selection and prioritization of future projects, and discussions of funding issues and agency participation and responsibilities.

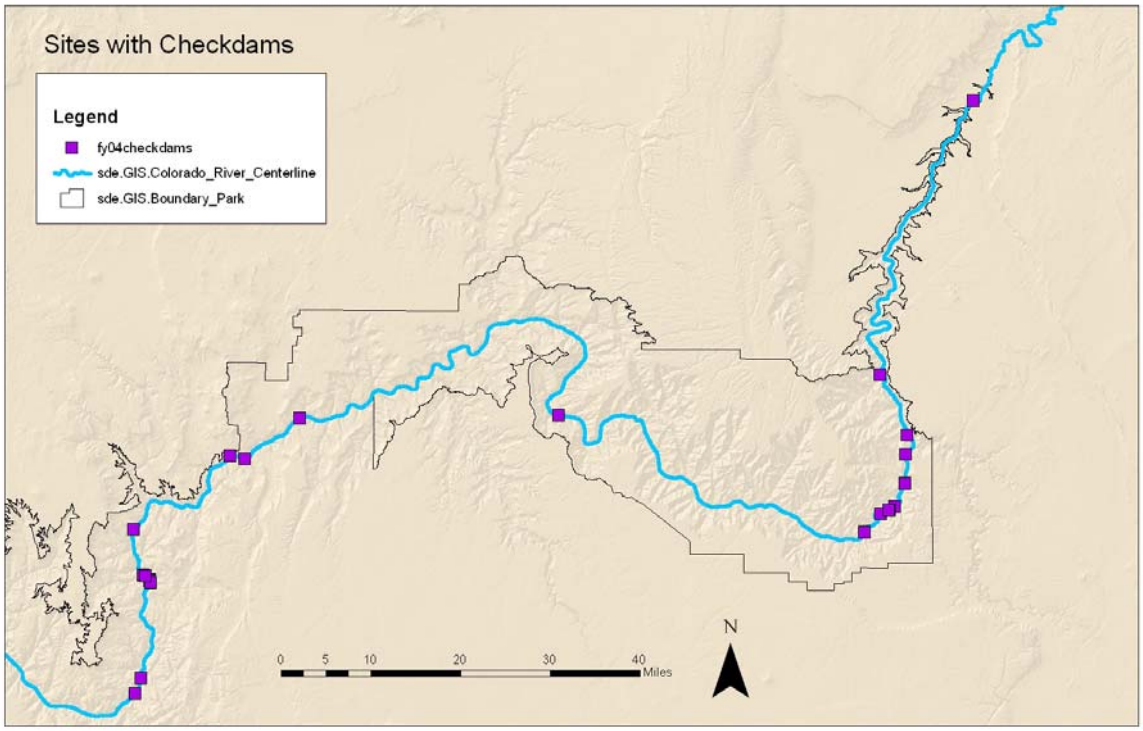


Figure 6. Location of the 27 sites with checkdams.

At the workshop, PA representatives identified Zuni style checkdams as the most appropriate method for slowing the erosion process and preserving cultural resources *in situ*. This was based on previous successes in watershed restoration by the CCC (Heede, 1960 and 1976) and the Pueblo of Zuni (Gellis et al., 1995; Norton et al., 2002). The method also acknowledges that cultural resources have different values to different cultures, the environment in which the resources are deposited is difficult to access, locally derived natural materials should be used for remedial actions, and all the members of the workshop had a say in the choice of appropriate methods. Checkdams have been used prehistorically and historically in Grand Canyon; several sites along the river corridor contain prehistoric structures that appear to have been used to control runoff to agricultural fields (Fairley et al., 1994). Today, the RCMP utilizes traditional tribal checkdam designs to modify erosive runoff that adversely effect National Register eligible historic properties along the river corridor (Figure 7).

Figure 7. A checkdam protecting a cutbank adjacent to an archaeological feature.

Erosion in the Southwestern United States follows a cyclical pattern of deposition and erosion (Leopold, 1951). Aerial photo analysis between 1965 and 1992 shows a dramatic increase in erosion, particularly between the 1973 and 1984 (Thompson and Potochnik, 2000). During this time, new gullies developed and many of the pre-existing gullies developed into arroyos (Thompson and Potochnik, 2000). Hereford et al. (1993) also identified a cycle of erosion along the river corridor beginning about 1973.

High-elevation terrace deposits may be formed by Colorado River flood flows greater than 100,000 cubic feet per second (cfs). These alluvial terrace deposits, periodically inundated by predam flooding, are no longer replenished by flood flows (Topping et al., 2000). The plugging of the mouths of ephemeral drainages by Colorado River flood sediments may also have had the effect of resetting or ameliorating the erosional process (Hazel et al., 2000). While these terraces will always be subject to erosion from runoff and rilling, and aeolian infilling of gullies; specific vegetation types have the potential to temporarily stabilize the terraces. Hereford (et al. 1991) proposed a connection between drainage development and the operations of Glen Canyon Dam. Hereford et al. (1993) hypothesized that erosion may be accelerated by the rivers lowered base-level (or the elevation at which a channel drains into the river) created by the dam, that current operations of the dam have lowered the local effective base-level of the river from its predam level, and the dam obstructs the flow of sediment previously available for deposition in the mouths of ephemeral drainages cutting through archaeological sites. Additional investigations of gullies and checkdams in Grand Canyon indicate that gully activity is associated with knickpoint development and channel widening (Peterson, 2003; Pederson et al., 2003 and In press).

Treatment of the active locations of gullies can result in the maximum amount of erosion control at a minimum of cost (Heede, 1960). If sediment deposition occurs in an upstream pattern at a greater rate than headward migration, established headcuts may be buried (Figure 8) suggesting that checkdams may prevent additional channel erosion (Heede, 1960). The objective of installing checkdams along the river corridor is not to eliminate erosion but rather to slow the erosional process, redirect runoff, and facilitate deposition within gullies containing historic properties. The checkdams stabilize existing drainages, prevent enlargement of rills and gullies, and slow the downstream erosion of sediment.

(a)  (b) 

Figure 8. Checkdams installed in 2000 at G:03:058 (a) and complete sediment infilling of drainage, including headcuts and burying of checkdams by 2003 (b).

Erosion Control Structure Types

The original checkdam project at the Palisades Delta resulted in the construction of over 70 structures in river-based drainages at two sites (Leap and Coder, 1995). Many of the checkdams at the Palisades were constructed using large sandstone and limestone rocks with logs placed perpendicular to the channel bed (spanning crosswise to each bank). Though little or no runoff occurred for the first two years, the third year resulted in the breaching and flanking of checkdams. Once deposition behind checkdams occurred, flows were pushed laterally towards the banks. During the next maintenance event, logs were removed from the majority of the checkdams and gravels were deposited. The centers of rock checkdams were also lowered to create a more channeled pathway for runoff. Much of this maintenance work was done to prevent future problems rather than as a result of structural failure. The construction of rock and brush checkdams was modified to include the use of brushy materials rather than logs.

Checkdam types include rock linings, brush linings, rock checkdams, log and rock checkdams, rock and brush checkdams, and water diversion structures. A majority of the 240 checkdams were constructed using rock and brush, which use brush as a base with rock and gravels laid on top (Figure 10).

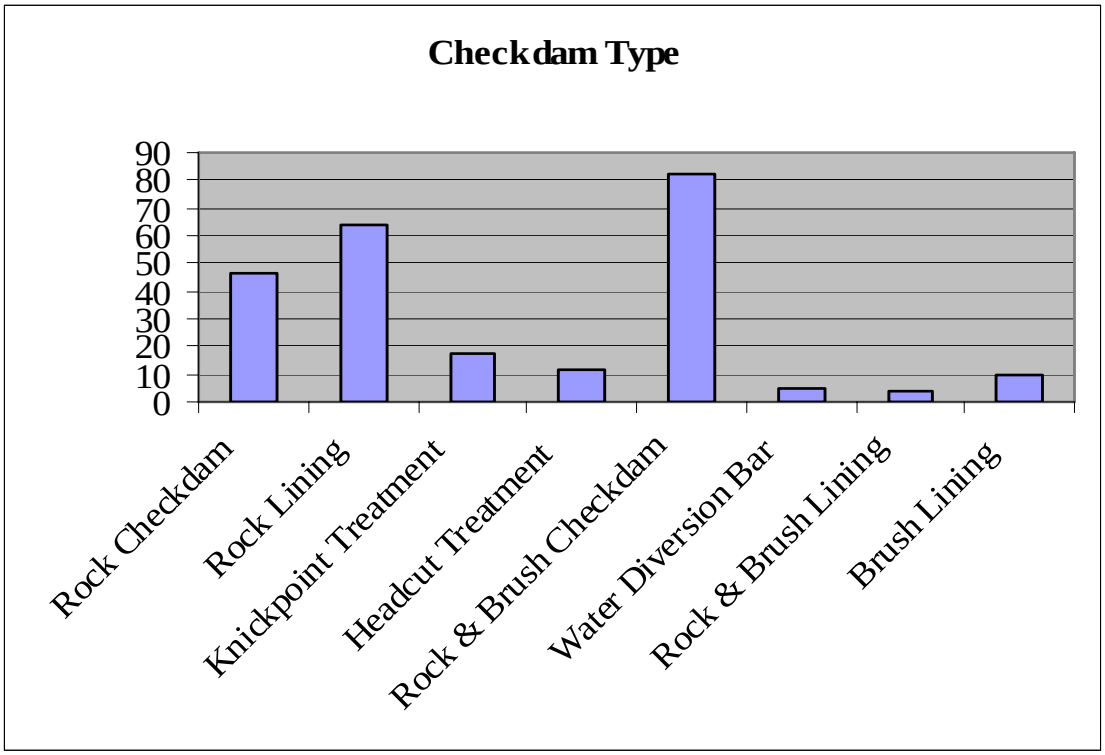


Figure 9. Frequency of the types of checkdams constructed by RCMP and ZCP staff members between 1995 and 2004 in Grand Canyon (n=240).

Figure 10. Checkdam types constructed along the Colorado River corridor. (a) brush and rock lining (b) brush lining (c) brush and rock checkdam (d) rock lining (e) water diversion bar (f) knickpoint treatment (g) headcut and (h) rock checkdam.

Checkdam Monitoring and Maintenance

Checkdams are monitored to identify structural failures and to evaluate various structure types in different geomorphic contexts (Gellis et al., 1995; Pederson et al., 2003). Checkdam maintenance is also necessary because it has been suggested that damaged checkdams may exacerbate erosion (Pederson et al., 2003 and In press).

Checkdam monitoring occurs annually and includes a description of the drainage and checkdam-specific observations. The success or failure of a checkdam is determined by repeat observations and photographic documentation. Structure failure includes flanking (runoff flows around a checkdam resulting in the erosion of one or both sides and a drainage wall), breaching (overflow damage to the top of a checkdam), voids (loss of rock, gravel or brush from within the structure resulting in a hole or blank space), plunge pools (presence of scour immediately downstream of the checkdam resulting in a loss of sediment), headward migration or growth of a drainage upstream, and complete obliteration of the checkdam. Obliteration of a checkdam or a series of checkdams may occur due to a number of factors, including catchment size or drainage steepness (Figure 11). Consultation with geomorphologists and Zuni Conservation Project members (A. Cheama, 2002 personal communication; J. Pederson, 2002 personal communication; F. Nials, 2001 personal communication) confirmed that the catchment area for this site is too large to benefit from additional checkdam construction or maintenance. Figure 12 shows drainage downcutting or expansion where checkdam maintenance would be recommended.

(a)  (b) 

Figure 11. Obliteration of checkdams at G:03:038. (a) immediately following construction in the drainage (b) photographic record of obliterated checkdams. The obliteration of the checkdam at the bottom of the photograph is particularly evident.

(a) 

(b) 

(c) 

(d) 

(e) 

Figure 12. Indicators of active channel downcutting or expansion requiring maintenance work. (a) breaching across the checkdam (b) headward expansion (c) voids present in the rock checkdam requiring infilling and replacement, (d) flanking along the left side of the checkdam and (e) plunge pool.

Checkdam monitoring can also include tracking volumetric changes in drainages. Total station maps exist for all sites with checkdams. Originally, the intent of the RCMP program was to use repeat total station mapping as a method for measuring the amount of sediment being deposited or eroding in drainages to determine the effectiveness of the checkdams. All the total station maps contain detailed (0.25m contour intervals) topographic information of the gullies and surrounding site topography. A sample group of 10 sites were remapped in 1998. In FY05, we anticipate that an NPS-contracted land surveyor will update these maps within the updated GCMRC survey control network. A comparison of total station surveys may provide time-series type sequences of volumetric change in drainage networks.

Another method for monitoring volumetric change began in FY01 with assistance from geoarchaeologist Fred Nials. Cross-section profiles have been established at eight locations (Dierker, 2001). All but one of these profiles is located in drainages containing checkdams. Measurements at these locations will provide data on erosional and depositional changes.

Checkdam maintenance is an essential component of the erosion control process and provides information on checkdam effectiveness. The amount of gully incision was reduced in drainages with checkdams relative to adjacent drainages without checkdams (2-5cm vs ~10cm). At the same time, checkdams damaged by erosion are associated with a greater amount of local sediment scour compared to intact checkdams (Pederson et al., 2003 and In press). Routine maintenance is vital since "damaged structures appear to locally enhance erosion" (Pederson et al., In press:17). Figure 13 is an example of a large plunge pool and knickpoint at an existing checkdam and the subsequent maintenance results. If maintenance had not been performed, research by Pederson et al. (2003 and In press) suggests that the knickpoint could migrate up the drainage scouring additional sediment out of the gully.

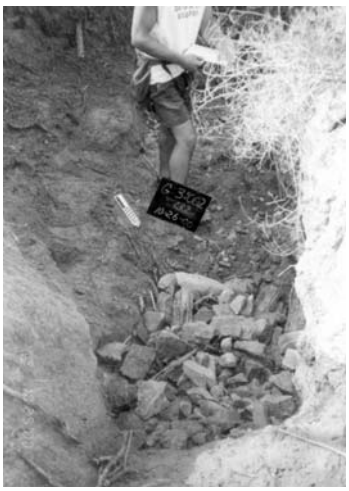
(a)  (b) 

Figure 13. Plunge pool and knickpoint before (a) and after (b) maintenance.

Maintenance work at checkdams includes consultation with Zuni Conservation Project personnel, identification of the types of damage to checkdams (Figure 12) and the types and amount of materials required for the repair. Each checkdam identified for maintenance is flagged with the checkdam number and the type and amount of materials required; field personnel gather and distribute materials. Checkdams are photographed before and after maintenance work (Figure 13).

The sites with erosion control structures share many contextual similarities. Geomorphic settings include alluvial terrace deposits overlaying debris flows at 12 locations and alluvial terrace deposits along the rivers edge at 15 locations. Soil descriptions have been divided into four categories: silt/sand alluvium capped by a cryptobiotic crust (11 sites), silt/sand alluvium (9 sites), silt/sand alluvium with an aeolian component (5 sites), and silt/sand alluvium with some aeolian and some cryptobiotic crust (2 sites). Vegetation types, soil textures, permeability and strength may all play a role in the degree of gully erosion (Peterson, 2003; Pederson et al., 2003 and In press).

At the close of FY04, 240 checkdams exist at 27 archaeological sites (Figure 15). Table 1 in Appendix B summarizes the archaeological setting and drainage type with a history of the checkdams constructed,

maintenance episodes, and the current status of each checkdam. While checkdams were monitored in FY04, no maintenance work was conducted due to funding limitations.

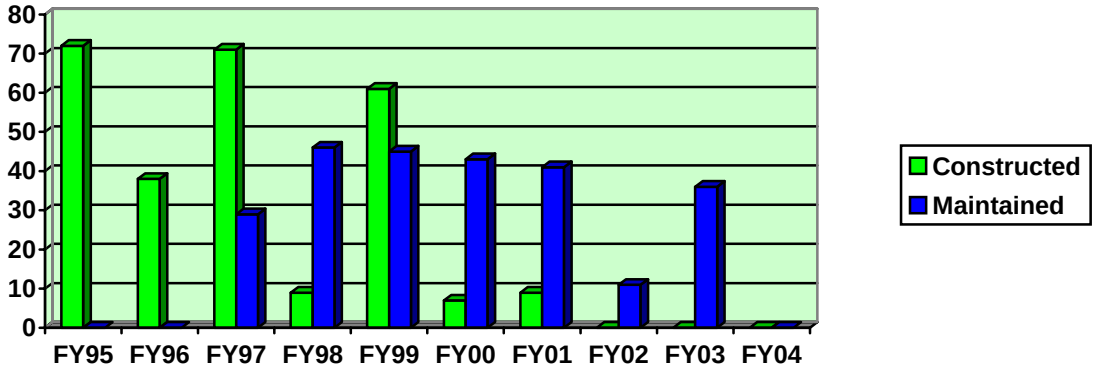


Figure 14. Construction and maintenance of checkdams for fiscal years from 1995 to 2004.

FY04 Checkdam Monitoring Results

During the course of FY04 checkdam monitoring, 46 checkdams were recommended for general maintenance. These checkdams retain their structure but require additional rock or brush (Figure 12). Eleven checkdams were identified as failing and recommended for reconstruction because they no longer retain their original structure. Six checkdams were identified as obliterated but were not recommended for reconstruction because of the advanced stage of the drainage (one checkdam at G:03:041 trapped so much sediment that it is completely buried in alluvium). Maintenance is recommended at 11 of the 27 sites with checkdams. Of the 240 checkdams, 19% are recommended for maintenance. It is possible that the extremely wet winter of 2004-2005 will affect the amount of maintenance work necessary at checkdams in 2005.

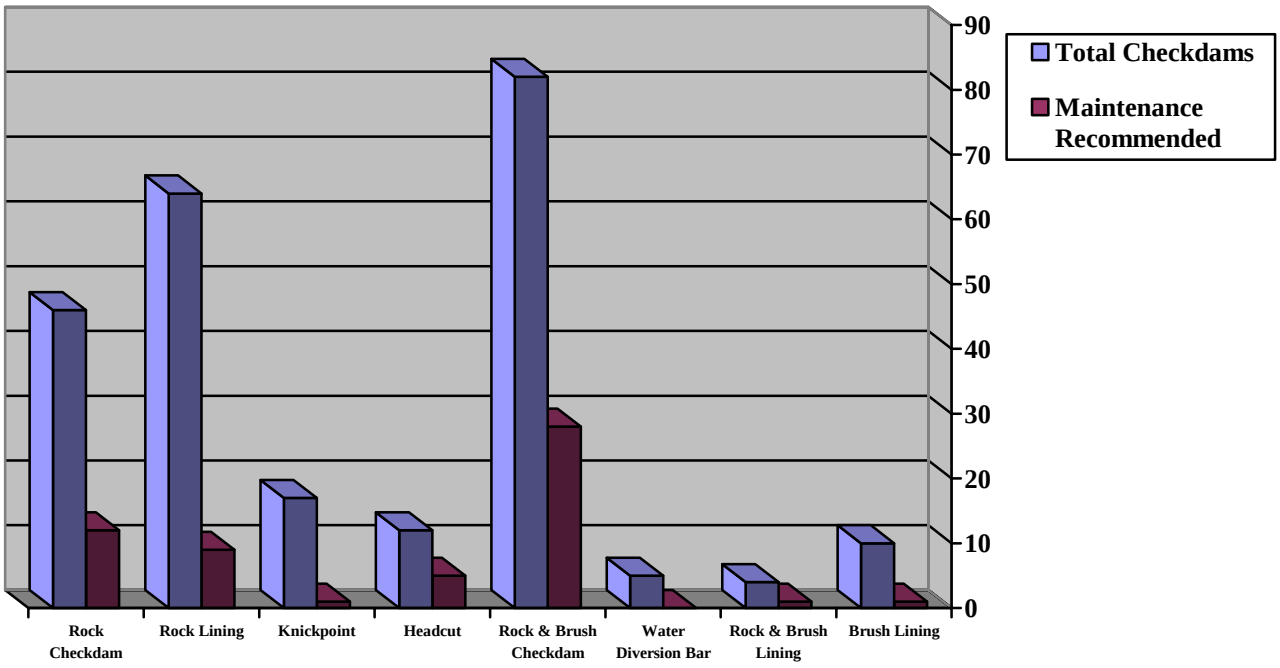


Figure 15. Number of checkdams by type and the number recommended for maintenance.

Monitoring observations are provided below. Each site with checkdams has a drainage assessment to determine activity and individual checkdams are assessed for maintenance needs.

A:15:005 Terrace deposit on a debris fan
5 Checkdams in one River-based drainage
The drainage bisects a broad debris fan adjacent to a side canyon drainage. The site is covered in aeolian, reworked alluvium. Vegetation is abundant on the terrace. Original construction of five checkdams occurred in 1998.

In FY04, no activity was observed in the drainage with the checkdams. Grasses and forbs are growing in the drainage. No checkdam maintenance work is needed.

A:16:149 Terrace deposit
5 Checkdams in one River-based drainage
The drainage is actively downcutting across a deep deposit of alluvium. No aeolian processes are active on this terrace. Vegetation is abundant. Original construction of seven checkdams occurred in 1999.

In FY04 the drainage has been very active, downcutting with lots of one-meter deep and larger plunge pools. Many knickpoints are present. Checkdams 1 and 3 are completely blown out. Checkdams 4, 6, and 7 require additional work. Checkdam 2 has minor shifting of rocks but no breaching. Checkdam 5 is intact though 10cm downstream are big plunge pools and knickpoints. Approximately 4-6 hours of work is needed.

Checkdam 1
The checkdam has been completely removed by a one meter deep knickpoint.

Checkdam 2
Minor shifting of rocks has occurred, though no breaching. Minor maintenance is necessary.

Checkdam 3
The checkdam has been completely blown out by a 1.5 meter deep knickpoint.

Checkdam 4
The western portion of the checkdam has been breached. Approximately 50 centimeters of sediment has been eroded.

Checkdam 5
The checkdam is completely intact but only 10 centimeters downstream of this checkdam there are large knickpoints and plunge pools. Maintenance may be necessary if additional runoff occurs.

Checkdam 6
The upper portion of the checkdam has been removed by a 75 centimeter deep knickpoint. The lower portion of the checkdam is still intact.

Checkdam 7
The checkdam is directly impacted by a meter deep knickpoint. The large boulders from the cobble bar at the bottom of the drainage are impeding this checkdam.

A:16:174 Terrace deposit
6 Checkdams in one River-based drainage

The drainage bisects a narrow alluvial terrace. Aeolian processes are active here with very little vegetation anchoring sediments.

In FY04 the drainage has been active with sediment covering a lot of the rock. No work is needed. All checkdams remain intact.

A:16:180 Terrace deposit
7 Checkdams in two River-based drainages
The drainages are downcutting through a deep deposit of alluvium which has been previously truncated by river flows.

In FY04 there has been activity in the drainage with fresh cuts apparent. Minor maintenance is required.

Checkdam 1
Fresh cuts up to 10 centimeter in dept below the checkdam. Minor maintenance work is required.

Checkdam 4
The top of the checkdam is buried but 15 centimeters below is a cut and minor maintenance work should be completed.

B:14:107 Terrace deposit on a debris fan
1 Water-diversion bar in 1 terrace-based drainage
The drainage is downcutting across a broad alluvial terrace. Vegetation and colluvium anchor the terrace is some locations.

In FY04 there has been no change to this checkdam. No water appears to have flowed down from the talus. No work is needed.

C:02:101 Terrace deposit
16 Checkdams in 2 River-based drainages
The drainages are actively downcutting through a narrow terrace deposit of alluvium. Aeolian processes are active here and little vegetation anchors the sediments.

In FY04 more sand has been deposited in drainage number 1. There is a noticeable increase in deposition from the photographs. Checkdam 4 has lost some sediment due to slumping of the adjacent dune area. Checkdams 5, 6, 7, 8, 9, 12, 13, 14 and 17 have increased deposition. Checkdams 10 and 11 are slightly more exposed. No maintenance work is required.

C:09:050 Terrace deposit on a debris fan
1 Water-diversion structure adjacent to 1 Side Canyon drainage
The structure is atop a deep alluvial deposit that has been truncated by side-canyon flooding. The structure, originally constructed in 1997, is protecting a sensitive cultural site. No maintenance work has been necessary since 1997.

In FY04 the drainage has not been active and no runoff has occurred. There is no observable change to the drainage or the checkdam. No checkdam maintenance work is needed.

C:13:006 Terrace deposit on a debris fan
20 Checkdams in 2 River-based drainages

The drainages are actively downcutting a deep alluvial terrace overlaying a side canyon debris fan. Aeolian processes are active here. Vegetation consists of cacti and annual grasses making the terrace very fragile and the features vulnerable to additional erosion.

In FY04 monitoring staff observed that the erosion along the side drainage was previously stabilized by adding small rocks in the arroyo bottom. These checkdams were very effective. The rock lining has some deposition within the rocks so the lining is now imbedding in the channel. There is no sign of active erosion in this channel, though duff present on both sides of the channel has also curtailed erosion. The active channel on the upper terrace should be assessed for additional checkdam work.

The drainage with Checkdams 1-9 has been more active near the headcut, further downstream the activity is minimal. The drainage with checkdams 10-15 has been minimally active. Overall, the checkdams appear to be in good condition though some maintenance work is required.

Checkdams 1 and 2
These checkdams are in an active portion of the drainage with downcutting occurring between 10 and 30 centimeters in depth.

Checkdam 4
Fresh breaching on the west side requires minor maintenance.

Checkdam 5
Minor maintenance is needed on the northern half of the checkdam

Checkdam 6
Minor maintenance throughout the lining is necessary.

Checkdam 9
Minor breaching on the northern portion, minor maintenance is required.

Checkdam 16
Minor undermining of the western side of the checkdam was observed.

Checkdam 18
Minor breaching has occurred on the southern portion. Minor maintenance is required.

C:13:069 Terrace deposit on a debris fan
6 Checkdams in one Terrace-based drainage
The site is situated on a deep alluvial terrace with several large dunes. All the dunes with the exception of one are inactive and anchored by vegetation. Active aeolian processes provide a source for sediment in the drainage. Checkdams 1-5 were constructed in 1997 and no maintenance work was required until 2002.

No change is visible to the drainage. There is no evidence of runoff. No maintenance work is required.

C:13:099 Terrace deposit on a debris fan
48 Checkdams constructed in 1 River-based drainage.
This site is situated on a broad alluvial terrace overlaying a side-canyon debris flow. Active dunes border the western edge of this site. The original checkdams were constructed in 1995 as part of the erosion control pilot project (Leap and Coder, 1995).

The drainage has been recently active with evidence of alluvial transport in the thalweg is some locations. Checkdams 45, 50, 22, 29 and 25 have been removed by active channeling. Checkdams 42, 9, 10, 11, 12, 14, 15, 21, and 34 require maintenance.

Checkdam 9
A plunge pool below the checkdam requires the addition of rock or gravels.

Checkdam 10
A plunge pool below the checkdam requires infilling.

Checkdam 11
Needs gravels on the downstream end of the lining.

Checkdam 12
A bucket of gravels should be added to the plunge pool below the checkdam.

Checkdam 14
A plunge pool at this checkdam should be filled in with gravels.

Checkdam 15
Buckets of rock should be added to the center of this checkdam.

Checkdam 21
The checkdam has been partially breached but still collected in duff and debris with 2 brittlebushes directly in the middle of the drainage. It is possible that no maintenance work will be needed here.

Checkdam 25
The checkdam was completely blown out.

Checkdam 34
1 bucket of small gravels should be added to the plunge pool below this checkdam.

Checkdam 42
Slight voids at the pour over may require minor maintenance work.

Checkdam 45
This knickpoint treatment has been blown out. The checkdam was located in a small gully adjacent to the main arroyo and is now gone.

Checkdam 50
This checkdam has been completely blown out. Suggest adding gravels to the thalweg instead of rebuilding the checkdam.

C:13:100 Terrace deposit on a debris fan
26 Checkdams in 1 River-based drainage
This site is situated on a broad alluvial terrace overlaying a side-canyon debris flow. Active dunes border one portion of this site. Active aeolian activity is filling in portions of a drainage arm adjacent to Feature 4. The original checkdams were constructed in 1995 as part of the erosion control pilot project (Leap and Coder, 1995).

The drainage has been active. All checkdams located below the Beamer Trail have been breached and require maintenance. Checkdam 7 has been blown out. Checkdam 24 requires maintenance; all other upper checkdams are doing well and holding sediment.

Checkdams 1-6
All lower checkdams have been breached and modified in runoff event that likely occurred in September, 2003.

Checkdam 7
The checkdam has been blown out. Additional work is needed along the edges to strengthen the side walls.

Checkdam 24
The checkdam is no longer functioning. There is a steep cut on the south (left) side of the drainage, a lot of erosion along the bank of the arroyo.

C:13:327 Terrace deposit
2 Checkdams in 1 Terrace-based Drainage
The drainage is actively downcutting through a deep alluvial deposit which has been previously truncated by river flows. Checkdam 2 was obliterated by active downcutting in 2000.

In FY04 it was observed that the large arroyo has been active, Checkdams 1 and 4 were obliterated. No amount of maintenance work is going to fix or fill this giant drainage. Checkdams 3 and 5 are unchanged. No maintenance work is required.

C:13:336 Terrace deposit
5 Checkdams in 1 Terrace-based drainage
This site is situated on a broad alluvial terrace overlaying a side-canyon debris flow. Active dunes border one portion of this site. The five checkdams originally constructed in 1998 have successfully trapped sediments. In 2000 it was determined that if the checkdams were enlarged, potentially more sediments could be trapped in the drainage.

In FY04 minor headward advancement was observed above Checkdam 5. All checkdams have additional sediment deposited on the upstream side of each checkdam. The checkdams look great and no additional maintenance work is necessary.

C:13:346 Terrace deposit
9 Checkdams in 2 Terrace-based drainages
The drainages are downcutting through a thin layer of alluvium that was previously buffered by high elevation active dune activity.

In FY04 the drainage with checkdams 7-9 was observed as in need of minor maintenance work. The drainage with checkdams 1-6 has been active with cuts as deep as 30 centimeter. All these checkdams require maintenance.

Checkdam 1
Nearly nonexistent with a 30 centimeter deep cut along the downstream side of the checkdam

Checkdam 2
Sparse remains left. The deepest channel is on the eastern side and is 30 centimeter deep.

Checkdam 3
30 centimeter deep knickpoint is present below the checkdam. Brush has been completely removed from the checkdam.

Checkdam 4
Breaching is present on the western and downstream end of the checkdam, primarily where the brush was placed.

Checkdam 5
Breaching is occurring along the east side for approximately 30 centimeters.

Checkdam 6
New breaching of 20-30 centimeters is on the east and west sides of the lining.

Checkdam 7
Maintenance is required on the downstream side of the checkdam. A drop of approximately 15 centimeters is present.

Checkdam 8
Minor breaching has occurred on the downstream side of the checkdam though it still looks good.

Checkdam 9
Breaching on the eastern and lower portions of the checkdam.

C:13:348 Terrace deposit
5 Checkdams in 2 Terrace-based drainages.
This site is situated on a thin layer of alluvium covering a gently sloping talus slope. Checkdams 1-5 were originally constructed in 1997 and no additional maintenance work was required until 2003.

In FY04 the drainage with Checkdams 1-6 was observed as needing minor maintenance. Active down cutting is 5 to 10 centimeters deep. The drainage with checkdams 2, 3 and 5 has more activity with 10-20 centimeters cuts. Much of the brush has been moved down the channel. This also makes it difficult to discern where the checkdam originally was since they were constructed of brush originally.

Checkdam 3
Plunge pool below the checkdam approximately 20 centimeters deep.

C:13:359 Terrace deposit on a debris fan
4 Checkdams in 1 Terrace-based drainage
This site is covered with heavy vegetation atop a deep deposit of alluvium.

In FY04, there was increased sediment observed at the top of Checkdam 1. Checkdam 3 has minor rock movement but also increased sediment deposition. Checkdam 2 has a plunge pool at its base though there is a large pile of fine sediment in the hole. No checkdam 4 photograph to monitor. Checkdam 5 at the base of the Talus slope is obliterated though no need to conduct maintenance.

C:13:371 Terrace deposit on a debris fan
3 Checkdams in 1 River-based drainage
This site is situated on a deep alluvial terrace overlaying a side canyon debris flow. Active channel down cutting and aeolian activity have been observed at this location. The three checkdams originally constructed in 1996 have required little maintenance.

In FY04 the drainage was not active. All checkdam are unchanged from the photographs. No maintenance work is required.

C:13:381 Terrace deposit on a debris fan
4 Checkdams in 1 River-based drainage
The site is situated atop a debris flow covered in alluvium. The drainage has continued to actively deepen towards the cultural features.

In FY04, the drainage was minimally active with fine sediment deposited at all four checkdams. No maintenance work is necessary.

G:03:002 Terrace deposit
5 Checkdams in 1 River-based drainage
The site is situated atop a deep alluvial terrace. Vegetation anchors the surface sediments across the site. Once channel initiation occurs, very fine sediments are exposed and subject to active erosion.

In FY04 the drainage actively down cut and Checkdams 2 and 6 were breached. Maintenance work is required.

Checkdam 2
The checkdam has been blown out with a 1+ meter knickpoint below the checkdam.

Checkdam 6
The checkdam has been breached on the upriver side of the drainage.
G:03:003 Terrace deposit
16 Checkdams in one River-based drainage
The broad drainages bisecting this alluvial terrace contain abundant grasses. No active aeolian activity has been observed in this location. In FY03 it was noted that down cutting would be slow and gradual.

In FY04 the drainage did not actively down cut. All checkdams are in excellent condition. No maintenance work is required.

G:03:024 Terrace deposit
7 Checkdams in 1 River-based and 1 Terrace-based drainage
The drainages are actively down cutting through a broad alluvial terrace. Checkdams were originally constructed in the two drainages. The river-based drainage was very active and checkdam maintenance occurred much more frequently than in the Terrace-based drainage.

The lower drainage has been active. Checkdam 4 has been breached on the downriver side with piping evident. The upper drainage has not been active. Maintenance work is required at Checkdam 4 on the lower drainage.

Checkdam 4
The downriver side of the checkdam has been breached. Piping is evident. Maintenance work is required.

G:03:025 Terrace deposit
4 Checkdams in 1 River-based drainage
The site is situated within a broad flat alluvial terrace. The drainage has the potentially to down cut through a deep deposit of alluvium atop a debris flow.

The drainage has not been active. Grasses and forbs are growing in the drainage. There is minor sediment change at checkdam 4 though not maintenance work is required.

G:03:026 Terrace deposit on a debris fan
6 Checkdams in 1 River-based drainage
The site is located next to a major side canyon drainage. The drainage is deep and wide, actively aeolian activity contributes to deposition within the drainage.

FY04 staff observed that the drainage has had only minor activity. Checkdams 4 and 5 are unchanged. Checkdam 3 has had minor wood movement. Checkdam 2 has grasses and leaves in the structure; Checkdam 1 has minor washing out of gravels though lots of deposition of leaves and sediment. No maintenance work is required.

G:03:040 Terrace deposit
2 Checkdams in 1 Terrace-based drainage.
The site is situated on a broad alluvial terrace which is anchored by abundant vegetation. Checkdams 1 and 2 were blown out in a side canyon flood event. Since the brush linings were constructed in 1997, no additional maintenance has been necessary.

FY04 staff observed that the drainage with Checkdams 3 and 4 is unchanged and looks great. More vegetation and sediment are at Checkdam 3. Checkdam 4 has a lot of vegetation and more sediment also. No work is needed.

G:03:041 Terrace deposit
6 Checkdams in 2 Terrace-based drainages
This site is located atop a high alluvial terrace with active and inactive dunes present. One drainage is very active with continued down cutting and channel widening. Some checkdams require regular maintenance.

The FY04 staff observed that the drainage is extremely fragile and walking on or adjacent to it is causing the drainage to widen. Checkdams 1 and 6 require maintenance. Checkdams 4, 7, and 9 were obliterated in 2001. Checkdam 5 has been buried. Minor maintenance work is recommended.

Checkdam 1
Minor work is required on the bottom portion of the checkdam.

Checkdam 4
The checkdam is almost completely gone, with most of the rocks scattered down the drainage.

Checkdam 6
The lower portion of the checkdam has had some erosion. Minor maintenance work is required.

Checkdam 7
The checkdam has been blown out by active channel downcutting. The material from this checkdam has probably been mixed into Checkdam 8.

G:03:058 Terrace deposit
9 Checkdams in 1 Terrace-based Drainage.
The site is located within a deep alluvial deposit with very little vegetation anchoring the terrace. Active aeolian transport has contributed to infilling of the drainage.

In FY04, staff observed that the drainage has not been active. Eolian sand remains deposited in the drainage and almost completely covers the checkdams. Grasses and forbs are also present and growing within the drainage. No maintenance work is required.

G:03:072 Terrace deposit on a debris fan
12 Checkdams 1 River-based and 2 Terrace-based drainages
The site is situated in deep alluvium overtopping a side canyon debris flow. One of the terrace-based drainages has been extremely active obliterating all checkdams. The river-based drainage with checkdams has not been active until 2004.

FY04 staff observed that the drainage with checkdams 1-3 has been moderately active and will need some maintenance work. The drainage with checkdams 4-7 requires maintenance work. The drainage with checkdams 11-14 has completely blown out.

Checkdam 1
A couple of new knickpoints are present in the drainage. Minor maintenance work is necessary.

Checkdam 3
Beginning to wash out and needs minor repair.

Checkdam 4
Minor maintenance work is necessary below the checkdam. At least 10 centimeters has been eroded away.

Checkdam 5
A plunge pool below the checkdam requires maintenance. 15 centimeters deep.

Checkdam 6
15 centimeters below the checkdam is a plunge pool. Minor maintenance is required.

Checkdam 11-13 were obliterated 11/12/1998 and after consultation with the Zuni Conservation Project, it was determined that these 3 checkdams would not be rebuilt.

Checkdam 14
Completely obliterated

Checkdam Recommendations for FY05
The RCMP staff recommends continued checkdam monitoring and maintenance at the 27 sites during fiscal year 2005. The 46 checkdams recommended for maintenance work and the 11 obliterated checkdams recommended for reconstruction should be visited and repaired. It is also recommended that this work be done in coordination with ZCP consultants.

Once the original total station maps have been converted to the updated control, it is recommended that drainages with checkdams are re-surveyed. The two surveys could be compared to determine the degree of long-term gradient change within the drainages containing checkdams relative to sites without treated drainages. This comparison may also aid in determining the threshold beyond which a gradient is too steep to benefit from the construction of checkdams, for example at G:03:038.

Climate data related to rainfall and wind speed and direction has been collected at the Palisades delta as part of an aeolian transport study (Draut et al., In press). It is recommended that these data be combined

with the Pederson et al. (2003) data and the previous topographic surveys to contribute to the data collected suggesting that drainage gradient and discharge (rainfall amounts) are the first-order controls on local erosion (Pederson et al., In press:13).

Conclusions

Attempts to control or reduce erosion in drainages by constructing checkdams along the Colorado River have been successful in the sense that no archaeological features have been lost in drainages where these erosion control structures were constructed. The guidance of the Pueblo of Zuni Conservation Project has been an invaluable resource providing 2,000 years of traditional knowledge (Norton et al., 2002) to an erosion control project with the goal of preserving archaeological sites *in situ*. Working together, we have been able to fine-tune erosion control techniques to fit within the unique context of the Colorado River Corridor. Continued checkdam monitoring and maintenance insures the proper type of construction and may prevent structure failures in the future (Heede, 1960 and 1976; Gellis, 1995; Pederson et al., 2003 and In press).

CHAPTER FOUR
NPS CONTRIBUTIONS

Recognition of the mutual responsibilities of the BOR and NPS has led to the coordination of efforts to manage historic properties and the potential impacts of the operations of Glen Canyon Dam on these properties (USDOI/NPS, 1994). This chapter describes the NPS contributions in the project area.

NPS sponsored river trips

The NPS provided the opportunity for RCMP archaeologists to complete all or portions of the FY04 scope of work. The RCMP staff participated in three river trips and completed field duties including site condition monitoring, ground truthing site location polygons, and checkdam monitoring and maintenance recommendations.

ASMIS

The Archeological Sites Management Information System (ASMIS) is a NPS system-wide standardized database for site documentation and management. Site records contain information including, site location, site condition, threats and disturbances, and recommended treatments. ASMIS is a platform for annual reports related to site condition, site impact, and National Register listings at the national level.

Visitor-related monitoring and treatments

Approximately 22,000 people visit the Colorado River Ecosystem (CRE) annually, with access to the Colorado River by river-running or backpacking (USDOI/NPS, draft 2004). Beaches and high-elevation terraces are campsites for visitors. The evidence of visitation impacts includes campsites in restricted areas, multiple trailing across beaches and terraces, and collection piles and vandalism at cultural resources.

Visitor use impact intensity is influenced by factors including geomorphology, number of visitors, and resources in the immediate area; however some generalizations can be made regarding impacts from visitation. As beaches erode, campsites expand to higher elevations including pre-dam terraces. This results in impacts to the Old High Water Zone vegetation, compaction of soils, including cryptobiotic crusts, and multiple social trailing that may increase runoff and create gullies.

Due to the recent recognition that cumulative human impact can have significant effects on both resources and the quality of recreational experiences (Brown and Foti, 2002), the NPS now conducts biophysical impact monitoring throughout Grand Canyon National Park. The Inner Canyon Vegetation Management Program is responsible for assessing impacts and restoring native vegetation from visitor use (L. Makarick, 2004 personnel communication). The Human Impact Monitoring Program is responsible for identifying and understanding how human impacts change the nature of sites and to determine use limits that will trigger management decisions for maintaining camp and attraction site integrity (Brown, draft 2003). The Vanishing Treasures Program is responsible for minimizing natural and human impacts to architectural sites through monitoring and mitigation. The long-term campsite photographic documentation program has documented change at over 100 camps along the Colorado River for the past 20 years (L. Jalbert, 2004 personal communication). The NPS Trails Rehabilitation Program maintains hiking trails and campsites throughout Grand Canyon National Park, conducting river trips to address river corridor-specific visitation impacts.

Camp site inventories have been conducted in GRCA in 1965, 1973, 1984, 1990 (Kearsley at al., 1994). Trends through time reveal that campsites are disappearing from the river corridor due to erosion and vegetation encroachment. The relationship between visitation and resource impacts, including OHWZ vegetation loss and soil compaction, was demonstrated in Brown (2003). As camp site sizes decrease in

size due to erosion or vegetation encroachment, the number of impacts to the surrounding ecosystem increase (Brown, 2003; USDOI/NPS, draft 2004). Because camps along the Colorado River are a subset of the most stable and often the largest sand bars (Kearsley et al., 1994; Schmidt and Graf, 1990), camps along the river corridor are also subject to the same geomorphic reach controls that alter high-elevation terraces, sediment transport, and aeolian transport (Kearsley et al., 1994; Schmidt and Graf, 1990).

Treatments for Historic Properties

Non-dam related treatment recommendations for historic properties are made by staff members of the Vanishing Treasures or Backcountry Monitoring programs. River Patrol rangers are also charged with monitoring sites impacted from visitation. Any recommendations for treatment are forwarded along to the NPS River Protocols Team that has established guidelines for the identification of impacts and acceptable methods for the treatment of resources by NPS staff. Qualified NPS staff implements treatment recommendations depending upon the timing of trips and available staff. In some cases, treatment may be carried out by RCMP staff, while other circumstances will be addressed by base NPS staff.

The following sites were monitored by NPS archaeologists or law enforcement rangers or had treatment recommendations implemented as a result of previous NPS monitoring. All these sites are within the CRE, though documented impacts do not appear to be related to dam operations.

A:15:018 Rock Art
River Patrol Monitoring

This is an aceramic rockshelter area with several pictograph panels, groundstone, and evidence of fire use; cultural/temporal affiliation is unknown, but this may be a protohistoric site. The site is situated within a 2-3 meter deep cliff overhang that extends east-west for about 25 meter. The shelter contains a metate, a cleared space, and a fire-blackened ceiling overhead. Charcoal fragments extend the length of the overhang. Four panels of red pictographs are located on boulders in one portion of the shelter; another charcoal pictograph is located slightly further west in what has been designated "Shelter 1" (see map). Two flakes and some bone in a packrat midden complete the artifact assemblage. One fire-cracked rock feature is located below and west of Shelter 1.

Previous Work

This site was originally recorded in 1990 (Fairley et al., 1994), and monitored by RCMP staff in FY96 and by NPS River Patrol in FY04 (Leap et al., 1996). Archival medium format photographs were taken of the rock art in FY97.

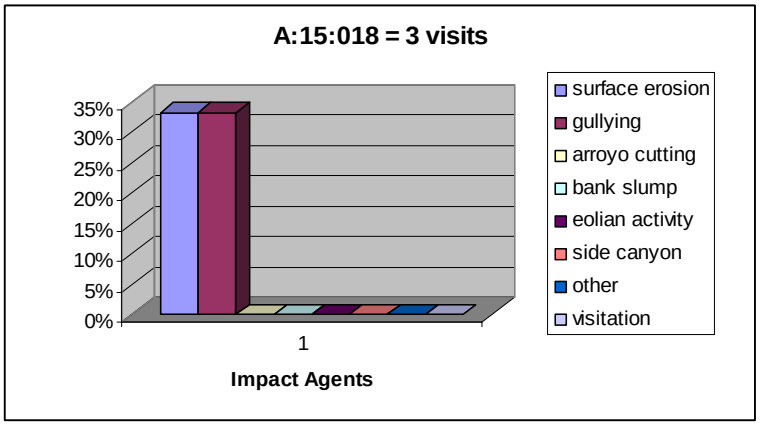
Summary of Previous Work Implemented

Remedial Action	Date Completed
MF Photography	03/03/1997

FY04 Monitoring Observations Summary

This site is monitored by the NPS. River patrol identified the presence of ceramics at an aceramic site, stating that severe erosion had exposed new features and artifacts. The site was visited by RCMP archaeologists in FY04 who changed the schedule back to biennial because RCMP archaeologists did not find any eroding cultural material.

Summary of Monitoring Observations



B:15:096 Special Activity Locus (Boat)
River Patrol Monitoring

The site consists of an isolated metal boat at the base of the Bass Trail. This boat, known as the "Ross Wheeler," was built by Bert Loper in 1914. There is an incredibly long and involved story associated with how the boat came to be built and subsequently wound up abandoned at this spot (Lavender, 1985:51-56). The boat is flat-bottomed and single-hulled of riveted sheet tin construction; it has a V-bow and a square stern. The boat has two patches that cover puncture holes in the hull. The bow was split and repaired. The boat is secured to a rock with a chain. There are bits of tin, a cast iron lid, and a can in the area. Although the boat is well within the historic flood zone of the Colorado River and would be affected by flows over 100,000 cfs, it is not considered to be at risk flows from Glen Canyon Dam. It is not included in the RCMP work plan.

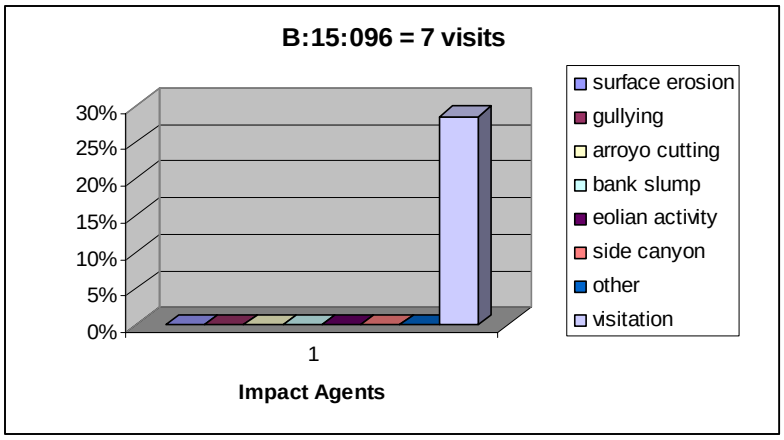
Previous Work

The site has been monitored by RCMP staff annually between FY92 and FY95 and then monitored by NPS River Patrol in FY04 (Coder et al., 1994; Coder et al, 1995). In July 2002, the boat was moved approximately 20 feet towards the river. No new damage was apparent when the boat was removed from its anchor. The boat currently rests in a new position. A lock and new chain were applied by the NPS river patrol. Curators from WACC (Western Archaeological Conservation Center) have assessed the boat for preservation work.

FY04 Monitoring Data Summary

No physical impacts were observed in FY04. River patrol monitoring will continue annually. WACC conservators noted that this is the only surviving example of a metal boat built by Bert Loper. Conservators recommended that the NPS consider placing the boat in the museum collection since environmental problems and the risk of damage by visitors restricts the possibility of adequate on-site preservation.

Summary of Monitoring Observations



B:15:124 Historic Inscription
River Patrol Monitoring

The site consists of a historic inscription "Geo. W. Parkins Washington D.C. 1903." The inscription is on a 70 degree angle to horizontal on a polished schist surface. The entire site takes up an area 30 by 15 centimeters. There is no additional information available on Parkins (Fairley et al. 1994).

Previous Work

This site was recorded in 1990 (Fairley et al., 1994) and monitored annually by RCMP staff between FY92 and FY95, and monitored in FY99 and FY04 (Coder et al., 1994; Coder et al., 1995; Leap et al., 2000) . The site located adjacent to a beach/camp area that is the location of long-term photo points to document deposition and erosion of the adjacent river terrace.

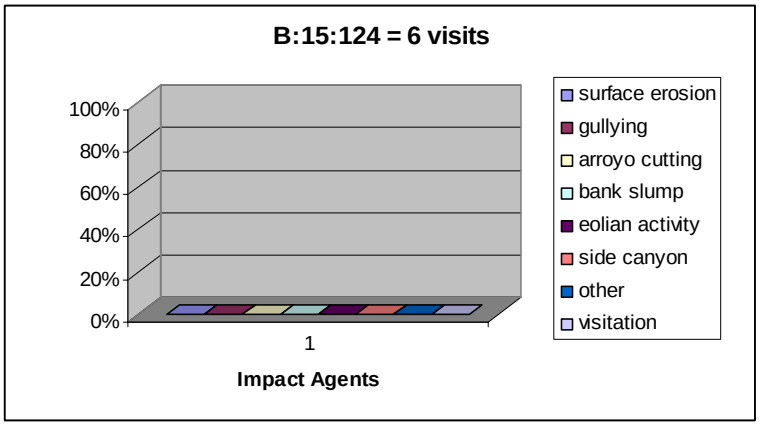
Summary of Previous Work Implemented

Remedial Action	Date Completed
MF Photographs	02/23/1996
MF Photographs	05/02/1996

Monitoring Observations Summary

No physical impacts were noted during this monitoring visit. No visitor-related impacts were observed. River patrol monitoring will continue annually. There is the potential for visitor-related disturbance due to the proximity of the site to a camping beach.

Summary of Monitoring Observations



B:15:138 Thermal Feature
Annual Schedule

RCMP archaeologist identified and recorded this site in April 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 since it was recorded (Leap et al., 1997; Leap et al., 1998; Leap et al., 2000; Leap and Kunde 2000; Dierker et al., 2001; Dierker et al., 2002; Leap et al., 2003). 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 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. FY98 monitors recommended planting vegetation. Additional trail work was completed in FY99. Access was blocked off to the drainage by using dead brush found in the side canyon drainage. RCMP staff placed deadfall in the drainage to block the upper portion of Feature 2. Approximately seven meters of the area was treated and all work was photographed. The GRCA Revegetation crew suggested that four to five people could collect and plant seed and bunch grasses, and place dead brush on top of the newly planted grass to propagate vegetation growth. In November 2001 a crew of CRCP personnel conducted trail obliteration and revegetation.

Summary of Previous 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
Polygon	08/31/2003
NPS Trail Work	09/09/2003

FY04 Remedial Action Summary

Review of the previous site photo indicated that brush placed in the upper trail to the side canyon has been breached. Most of the brush had been trampled or pushed aside. The social trail heads upslope through the site and serves as a primary access route to the side canyon. The trail is moderately compacted and is approximately 50 centimeters wide. The trail had been previously blocked by brush as part of the trail obliteration. This trail has the potential to be a channel for runoff. The brush was replaced so that it was identical to previous trail obliteration photos. Approximate dimensions are 3 meters long, 0.5 meter wide and 0.5 meter deep. The work should be monitored annually after the tourist season.

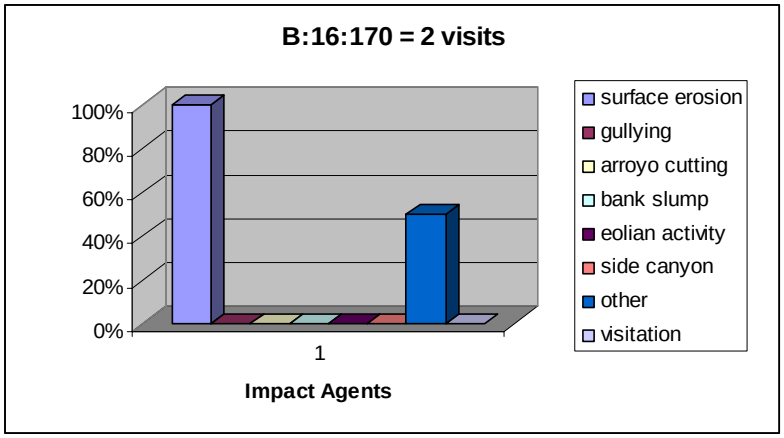
B:16:170 Special Activity Locus (Historic Cache)
River Patrol Monitoring

This is an oar and tool cache apparently left by the Kolb Brothers and dating to the early 1900s. Blasting caps and two pieces of dynamite were also found in 1984 when the site was first recorded; these were subsequently removed by Park officials for safety reasons. The cache is located under a large schist/granite boulder leaning against a cliff wall. There are four pairs of oars, ranging in size from 180 to 210 centimeters in length. Three pairs of oars have fine copper scroll-work and protective tips on the blades. One pair of oars appears to have been homemade, while the remaining ones were probably manufactured. An iron pick axe head and a separated broken handle are also a part of the cache.

Previous Work

The site was re-recorded by in 1991 (Fairley et al., 1994) and monitored by River patrol in FY04.

Summary of Monitoring Observations



FY04 Monitoring Data Summary

Indirect impacts to the oars include rodent burrowing and some minor surface erosion in the form of rilling. Surface erosion has been active at this site. A trail has developed leading from the beach, across a gully to the site. This trail is very faint though it is discernable. Assess the site for trail obliteration. The trail should not be noticeable to other boaters.

C:09:030 Special Activity Locus
NPS Base Monitoring

This site consists of two historic, unrelated graves (Locus A and B). Locus A is the grave of Peter Hansbrough (Stanton-Brown expedition), who died in July 1889. His body was retrieved by the 1890 Stanton expedition and buried here. Visitors have rearranged the rocks delineating his grave. A carved inscription on a vertical face above the grave reads "PMH 1889." Locus B is the grave of a Boy Scout named David Quigley who drowned on June 26, 1951. It consists of an oval arrangement of river and talus cobbles with a taller rock as a headstone.

Previous Work

The site was re-recorded in 1990 (Fairley et al., 1994) and monitored by RCMP staff in FY93, FY97, (Coder et al., 1994; Leap et al., 1997) and in FY04. NPS trail crew members obliterated multiple trails and delineated a main trail in 1995. The inscription was photographed as part of the medium format photo-documentation project in FY97.

Summary of Previous Work Implemented

Remedial Action	Date Completed
NPS Trail Work	11/01/1995
MF Photographs	02/21/1997
Polygon	08/31/2003

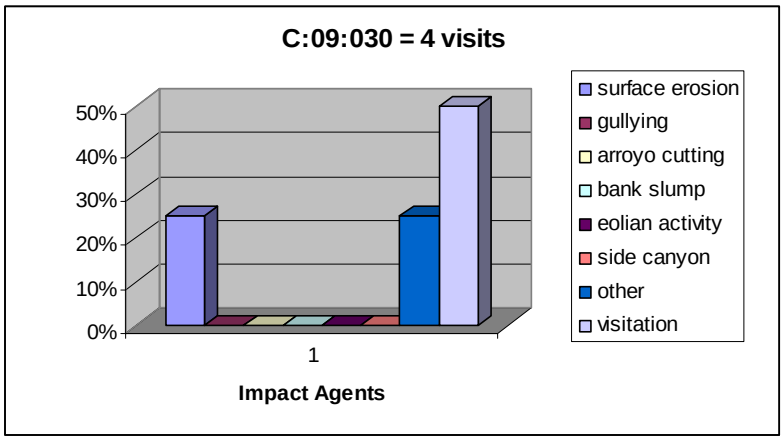
FY04 Remedial Action Assessment Summary

The trail to the gravesite looks like it has been closed off. Mesquite branches have been placed in the trail up the slope to the grave. NPS recreation specialist Linda Jalbert worked to reroute the trail on a past resource trip. This assessment was conducted during an NPS River Patrol trip and forwarded to L. Leap via email.

FY04 Monitoring Observations Summary

There are bone fragments visible on the surface of the grave. These fragments are very tiny. Rocks at the southern end of the grave are absent in the 2002 photograph and definitely different than from the 1973 R. Euler photograph. Ongoing rearrangement of the rocks by visitors has occurred since the site was recorded in 1973. A small crystal has been placed on the rocks outlining the grave. A trail does lead directly to the grave and rocks have been rearranged.

Summary of Monitoring Observations



C:09:034 Bert Loper's Boat
NPS Base Monitoring

The site consists of the remains of Bert Loper's wooden boat, which capsized in 1949 upstream at 24.5 Mile Rapids. Loper did not die as a result of the capsized boat, but from a heart attack that occurred in conjunction with the flip. Don Harris found the boat at this location that same year. The bow remains intact, although the rest of the hull is in various stages of deterioration. A metal plaque commemorating Bert as the "Grand Old Man of the Colorado River" was cemented onto a piece of talus limestone about two meters upslope of the boat.

Previous Work

Archaeologists initially recorded the boat and commemorative plaque in 1972 and re-recorded it in 1990 (Fairley et al., 1994). The Park monitored the boat annually since 1982, and the RCMP staff monitored it in FY95, FY97, and FY99 (Coder et al., 1995; Leap et al., 1997). FY95 monitors recommended trail work and planting vegetation to reduce visitor-related impacts at this site. The site was assessed for planting vegetation in FY97 and the staff determined that none would be planted. RCMP staff conducted trail obliteration and re-trailing in FY97. Due to the boat's location near the river, RCMP staff conducted medium format photography prior to and after the research flow (Balsom and Larralde, 1996). FY98 monitors recommended continued trail maintenance. Curators from the Western Archaeological Conservation Center (WACC) have assessed the boat for preservation work.

Summary of Previous Work Implemented

Remedial Action	Date Completed
MF Photographs	02/15/1996
MF Photographs	04/26/1996
NPS Trail Work	04/14/1997
Polygon	05/08/2004

Monitoring Data Summary

FY95 monitors noted the presence of gullying, surface erosion and eolian erosion. FY97 monitors observed increased eolian erosion and the presence of gullying. A river-based gully adjacent to the boat was filled in with brush by RCMP staff in FY97.
FY99 monitors recorded inactive surface erosion. Monitors noted that the river-based gully is currently stable and that the revegetation work was successful. Monitors consistently recorded visitor disturbance

in the form of missing and moving boat parts. There is a designated trail that leads directly to the site and it is regularly used during the summer months. In FY99 it was determined that because visitation is the primary impact at this site and RCMP staff have descriptively and visually collected all the information at this site, C:09:034 will be placed on the inactive monitoring schedule and monitored annually by GRCA river patrol for ARPA violations. The GRCA trail crew will continue trail maintenance.

WACC Conservation Recommendations

WACC conservators noted that this boat is a memorial to Bert Loper's death and it may be appropriated curatorially to let the boat naturally deteriorate on-site. Preservation of the boat is not possible due to the severity of the deterioration. There is the likelihood for future theft of the remaining forged metal ring and edging on the bow and it was recommended that these should be removed and added to the museum collections as soon as possible.

C:13:007 Small Structure

Four Year Schedule

This is a Mid-late PII-early PIII Puebloan occupation consisting of three, possibly four structural outlines (F1-4). Feature 1 is an L-shaped structure open to the east. Feature 2 is the remains of a rectangular structure outline, also open toward the river. Feature 3 is another L-shaped structure. Feature 4 is the remnant corner of a single-course structure. Some fire-cracked rock is present, sherds, a few flakes, ashy soil, and rodent bones of questionable affinity; no formal tools were recorded.

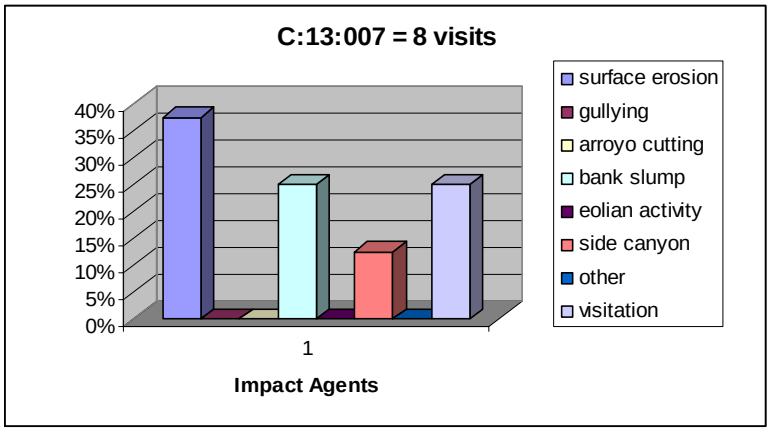
Previous Work

This site was discovered in the early 1960s and recorded in 1965 by Prescott College. GRCA archaeologists re-recorded the site in 1990 (Fairley et al., 1994). RCMP staff monitored the site in FY93, FY94, FY95, FY97 and FY98 (Coder et al., 1994; Coder et al., 1995; Leap et al., 1997; Leap et al., 1998). In 1992 the GRCA trail crew stabilized a portion of the site by constructing a retaining wall and placing jute mat and grass seed across the site's surface. Heavy rains in 1993 obliterated the retaining wall, but the GRCA trail crew repaired the wall in 1994 (Coder and others 1995). No other remedial actions were recommended after the trail project except for maintaining the stabilization work completed in FY92. R. Hereford completed a photogrammetric map in 1993 that includes the site area (Hereford et al., 1993). This site was also included in the studies conducted by K. Thompson and A. Potochnik (Thompson and Potochnik, 2000). Monitors consistently recorded increased visitation and on-site camping. Two access routes from the camp to the site were blocked on 11/6/01 and continue to successfully deter visitation to the site.

Summary of Previous Work Implemented

Remedial Action	Date Completed
NPS Trail Work	11/08/1992
NPS Wall Stabilization	11/08/1992
NPS Wall Stabilization Maintenance	11/04/1994
NPS Trail Maintenance	11/06/2001
Polygon	08/31/2003

Summary of Monitoring Observations



FY04 Monitoring Remedial Action Summary

Trails are being obliterated by NPS personnel today. The trails have not been used recently and no recent camping is apparent on the upper terraces. There are no footprints or other evidence of visitation. Trail maintenance will continue by NPS personnel.

G:03:004 Roaster Complex
NPS Base Monitoring

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 discovered a newly exposed slab-lined feature (Feature 8) between Features 1 and 2. Feature 8 was completely excavated in November 2000. In FY98 archaeologists recorded a chert awl in the midden area that was not previously identified. Although impacts to this site can be traced to sediment depletions in the system, the bulk of impacts have been determined to relate to visitor use. Base NPS programs are responsible for monitoring and mitigation of this site.

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., 1995; 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; Leap et al., 2003).

In FY95 re-trailing 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 (Bulletts, Summer 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 are 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 occurred in 11/2000 on a Colorado River Fund river trip.

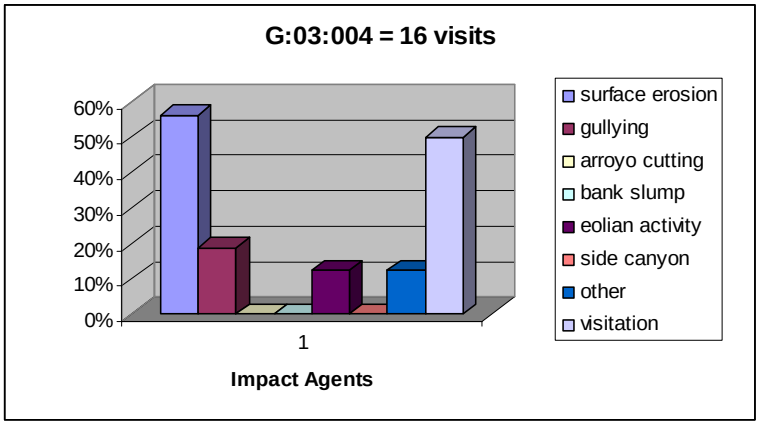
Summary of Previous Work Implemented

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
Polygon	03/13/2004

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.

Summary of Monitoring Observations



FY04 Monitoring Observations

Feature 2 is unchanged though there appears to be a slight increase in vegetation at the feature. Feature 7 seems to have some minor downslope movement of the fire-cracked rock. Features 3, 4, 5 and 6 are stable and unchanged. There are footprints in the trail leading from the camp through the entire site to Feature 1. This is the trail that the NPS has continued to rehabilitate with no success. The Bundy Jars have been rearranged since the last photograph was taken. No collection piles were observed this

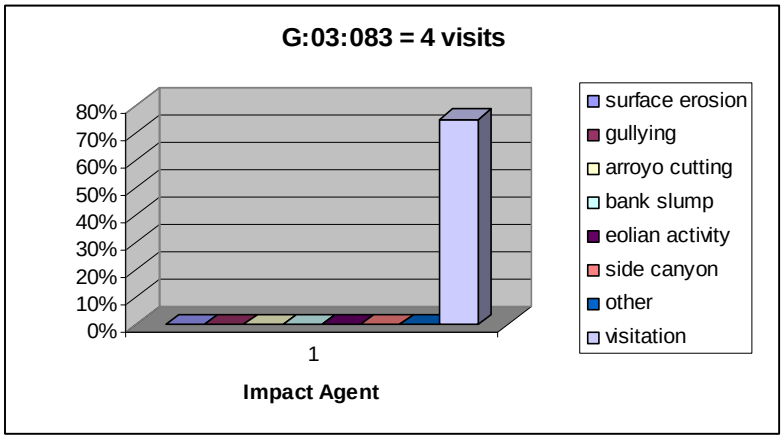
monitoring episode. Feature 1 and the rock art above show no signs of deterioration since the last visit. This site should be monitored annually due to visitor impacts however beginning next fiscal year this site will be turned over to the Backcountry Archaeology Department and no longer monitored by this program. Visitation is the largest threat to this site.

G:03:083 Artifact Scatter
River Patrol Monitoring

The site consists of a historic cache of seven five-gallon "honey cans" for gasoline, several motor oil cans, 25+ food cans, a broken crate, several glass jars--one containing matches, playing cards, and other items. Also present is a first aid kit in a green metal tool box that includes two Reader's Digest magazines dated April, 1945 and July, 1945. The main cache of cans is concentrated in a 2.6 by 1.1 m area adjacent to a Tapeats boulder. The first aid kit is stashed under another boulder 2.2 m at 110 degrees from the can cache. River lore has it that this cache was left by Post-WWII power boats up-running from Lake Mead when the lake was higher and 217-Mile Rapid was washed out.

The site was initially recorded in (Fairley et al., 1994) and monitored by RCMP staff in FY97 and FY99. The site is currently monitored by River Patrol personnel.

Summary of Monitoring Observations



Monitoring Observations Summary

The site appears undisturbed by physical impacts. No sign of visitor-related disturbances were observed. No physical or visitor-related impacts were observed. River patrol will monitor the site annually.

CHAPTER FIVE
RIVER CORRIDOR MONITORING PROGRAM DATA

"Scientific research in the Grand Canyon demonstrates strong linkages between dam operations and the responses of individual resources of the river ecosystem" (Schmidt et al., 1998:746). Numerous studies have noted an overall increase in gully incision, both in the size of ephemeral gullies and in numbers (Hereford et al., 1991 and 1993; Thompson and Potochnik, 2000). A comparison of 1890 historic photographs with more recent aerial photographs shows change in vegetation along the river corridor (Hereford, 1993; Kearsley et al., 1994; Waring, 1996; Webb, 1996; Thompson and Potochnik, 2000; Draut et al., In press). Dam operations may be altering the CRE in such a way that there is very little sand available for redistribution. Daily fluctuations from dam operations can reduce sediment transport, altering sandbar and riverbank structures, vegetation types and density, reduce aeolian transport, and exacerbate erosion of high-elevation alluvial terraces. Dam operations may affect the condition of high-elevation terraces containing archaeological resources.

As stated by Grams and Schmidt, "thorough analysis and integration of existing data is a critical step in formulating future research and monitoring objectives" (Grams and Schmidt, 1999:10). Data collection related to long-term NPS monitoring began in 1978. §106 compliance monitoring related to the operations of Glen Canyon Dam began in 1992 and is the focus of this program. The following chapter compares and integrates NPS monitoring data collected from 1984 to 1990, archaeological inventory data from 1990 and 1991, and the RCMP monitoring data collected from 1992 to the present. The archaeological inventory (Fairley et al., 1994) serves as a baseline for site condition, depositional context, location, and site description. Historic properties recorded and monitored prior to the archaeological inventory are included in this class of data. Archaeological site monitoring data collected from 1992 to the present supplements and refines the baseline data.

Data available for analysis in the RCMP database

The RCMP data can be divided into two distinct categories; baseline and monitoring data. Baseline data refers to all data collected with the intent to document the condition from which change would be assessed, including environmental setting, resource condition, and potential agents of change. Any previously recorded site data was updated to include condition and impact and is included in this data class. Baseline data collection included both a NPS-wide archaeological site recording form and a form designed to record agents of change specific to river-related impacts (Fairley et al., 1994).

RCMP monitoring data collection began in 1992 and includes the systematic collection of physical and visitor-related impacts to both sites in general and at specific features on-site. The impacts, or potential agents of change, have been identified as potential threats to historic property integrity. Management recommendations for treatment to curtail additional damage are also included in the monitoring data.

BASELINE DATA

The baseline data class includes location, site description, photographic and site condition information. Updates to these data classes since the original baseline collection is also described.

Location data includes both Universal Transverse Mercator (UTM –zone 12) point data and site boundary polygons from high elevation aerial photographs and 7.5 minute USGS topographic maps. The point and boundary data have been converted to the State Plane Coordinate System and transferred to a GIS database. As stated in Chapter 1, site point and boundary data are used in conjunction with ortho-rectified aerial imagery with 22 centimeter pixel resolution and 30 centimeter

horizontal accuracy. Figures 1 and 18 provide examples of this imagery. Location data is essential for relocation of historic properties, and required for spatial analyses.

Archaeological site description data relates to the elements that make a cultural resource a historic property. This data includes many variables listed in a Microsoft Access database table, a copy of which can be found in Appendix C. Site documentation involved a considerable amount of time and effort with the intention that future projects would assess changes to historic properties through time starting with the original site forms (Fairley et al., 1994).

Prior to the cultural resource inventory, 796 photographs taken between 1962 and 1988 existed for the documented sites within the project area. The baseline photographic data included an additional 2000 photographs documenting site condition and impact. These 2796 baseline photographs aid in relocation of sites, comparison of condition through time, treatment documentation, and efficacy as shown in Figure 16. The photographic database can be used to query for photographs specific to sites, features, impacts or remedial actions. Photographs include black-and-white 35mm prints, color slides, black-and-white and color medium format images, and digital imagery. The photographs are a representation of work completed and archaeological site change through time.

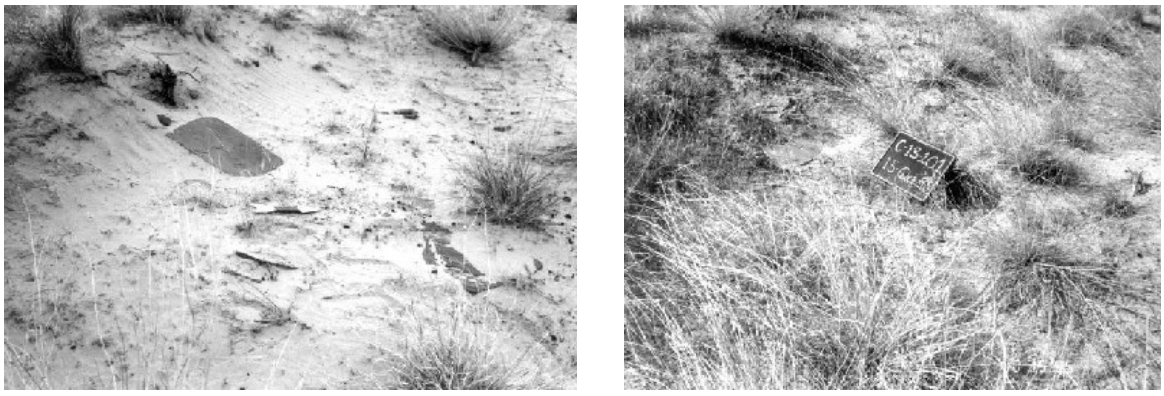


Figure 16. Change through time to a cist at C:13:101 over a 9 year span. Trail re-routing resulted in an absence of visitation and increased grass and cryptobiotic crust growth protecting the site.

Baseline site condition was defined as the percentage of impact on site. From the IMACs user guide (University of Utah 1990), Site Condition variables are defined as follows; Excellent – virtually undisturbed, Good – 75% undisturbed, Fair – 50-75% undisturbed, Poor – greater than 50% disturbed. Figure 17 shows examples of the four condition classes. In order to estimate the percentage of the site area, "survey archeologists estimated the percentage of site area being affected by all types of erosion (e.g., rills and gullies draining into a larger gully or arroyo, not just the immediate area of an incised drainage or a localized impact area near a specific feature)" (H. Fairley, Personnel communication 2005).

Updates and additions to the baseline data result from the discovery of new site features, excavation of features so they are no long physically present on-site, the addition of information necessary for site relocation, or when technology allows for fine-tuning or improvement of the extant data such as is the case with locational data and GIS. All baseline data have been archived in the RCMP database and additions have built upon this data rather than replacing it outright.

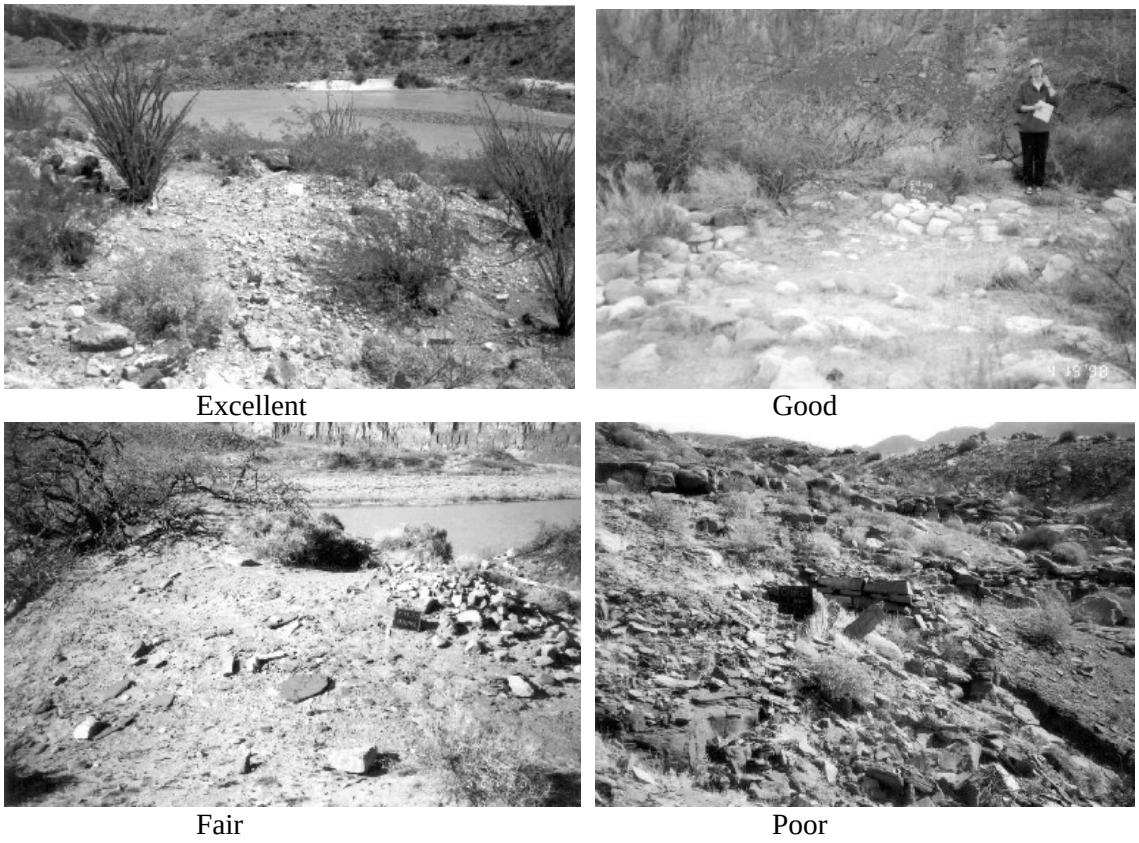


Figure 17. Photos of sites in condition class categories; Excellent G:03:072, Good C:13:100, Fair C:13:070, and Poor C:13:010.

MONITORING DATA

Data collection related to long-term NHPA §106 compliance monitoring for GCD operations began in 1992. The suite of historic properties monitored and the frequency of monitoring has changed over the course of the last 13 years based on the cumulative knowledge gained from repeat observations. Field forms are entered into a Microsoft Access database; the table structure for the monitoring data can be seen in Appendix D. A copy of the blank monitoring form can be found in Appendix A.

Impact documentation builds on the specific agents of change identified as the variables for collection as baseline data (Fairley et al., 1994). Monitoring variables are collected for specific features and comment fields provide for elaboration on specific observations. Management recommendations for treatment are also included with the intent of curtailing additional impact to historic properties.

Photographs document changes observed between monitoring episodes (Figure 16), document treatments conducted (Figure 10), and also provide a record of the success (Figure 8) or failure (Figure 11) of specific treatment types. Photographs, including baseline data photos, locational photos, feature photos, impact photos, and remedial action photos, currently number 9,379 in the RCMP database.

TRENDS THROUGH TIME

Determining trends in the RCMP data requires the comparison of baseline data and monitoring data. The variables one chooses to compare depend on the information necessary to answer specific questions. The following examples are provided for the reader to see how RCMP baseline and monitoring data compare. These questions are intended to provide a base from which additional statistical analyses could be conducted for PA signatories.

Has the presence of erosion changed through time?

The baseline data variable "erosional status" was a result of survey data combined with a review of the impacts at each individual site (N. Andrews, Personal communication 2004). From the baseline data, *erosional status* was classified as (1) actively eroding, (2) incipient erosion, or (3) stable (Mish 2004). The monitoring data collected on physical erosion are currently defined as (1) active, (2) inactive, or (3) stable (Mish, 2004; Appendix A site monitoring form) for surface erosion, gullying, arroyo cutting, bank slump, eolian activity, side canyon, and an "other" category at each feature type on-site.

To compare the variables, the FY04 monitoring data was collapsed so that regardless of the number or types of features present at a site or the impact category, the occurrence of Active, Inactive, or Stable (N/A) is represented once. Table 2 shows the 1991 baseline erosion status and the FY04 sites monitored erosion status. Baseline data indicates 27 actively eroding sites, 5 sites with incipient erosion, and 5 stable sites. The FY04 monitoring data indicates 31 sites are actively eroding, 2 have inactive erosion present, and 4 sites are stable with no erosion. Comparing the two categories shows that 26 sites (70%) originally classified as actively eroding continue to be active. Stable status continues at three sites. A shift from no or incipient erosion to inactive or active erosion has occurred at six sites, indicating the possibility that erosion became more active at 16% of the sites. Two sites (5%) have decreased erosion activity from incipient to no erosion or from active to inactive erosion. In general, sites that were identified in 1991 as actively eroding continue to erode today.

Table 2. Comparison of Baseline Data and FY04 Monitoring Data on Erosion n=37.

Site Number	1991 Baseline Erosion	2004 Monitoring Data Erosion
A:15:005	Actively Eroding	Active
A:15:018	Incipient Erosion	Active
A:16:159	Actively Eroding	Inactive
B:15:096	Stable	Stable
B:15:124	Stable	Stable
B:15:138	Actively Eroding	Active
B:16:170	Stable	Active
C:02:098	Actively Eroding	Active
C:09:030	Incipient Erosion	Stable
C:09:050	Actively Eroding	Active
C:09:082	Actively Eroding	Active
C:13:006	Actively Eroding	Active
C:13:007	Actively Eroding	Active
C:13:010	Actively Eroding	Active
C:13:069	Actively Eroding	Active
C:13:070	Actively Eroding	Active
C:13:092	Incipient Erosion	Active
C:13:098	Stable	Inactive
C:13:099	Actively Eroding	Active
C:13:100	Actively Eroding	Active
C:13:273	Actively Eroding	Active
C:13:291	Actively Eroding	Active
C:13:321	Actively Eroding	Active

C:13:334	Incipient Erosion	Active
C:13:339	Actively Eroding	Active
C:13:347	Actively Eroding	Active
C:13:349	Actively Eroding	Active
C:13:371	Actively Eroding	Active
C:13:386	Incipient Erosion	Active
G:03:003	Actively Eroding	Active
G:03:004	Actively Eroding	Active
G:03:020	Actively Eroding	Active
G:03:041	Actively Eroding	Active
G:03:064	Actively Eroding	Active
G:03:072	Actively Eroding	Active
G:03:080	Actively Eroding	Active
G:03:083	Stable	Stable

Have the types of erosion observed, changed through time?

An additional method of trend detection is to compare the types of impacts occurring through time. Figure 18 shows the relative frequency of impact between 1990 and 2004. The impact monitoring history is presented as a frequency of occurrence relative to all possible observations made for the 37 sites monitored in FY04. In addition to baseline and FY04 monitoring data, one additional monitoring episode between the start and end points was chosen for comparison. For the purposes of this comparison, Baseline data was the first occurrence of impact data recorded between 1990-1993 and is represented as Time 1. The second monitoring data sample, taken between 1995 and 1999, is represented as Time 2. FY04 monitoring data is represented as Time 3.

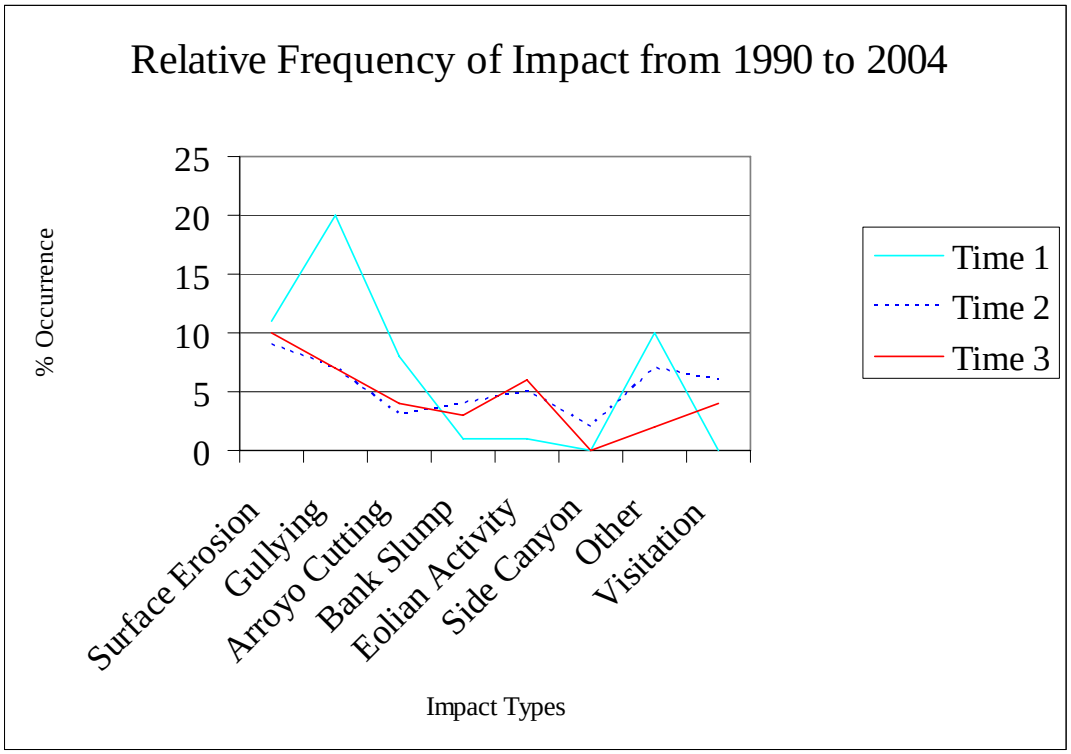


Figure 18. Impact Frequency between 1990 and 2004 at the 37 FY04 sites monitored in FY04.

The raw counts and frequency for these series are presented in Tables 3, 4, and 5 in Appendix F. Comparison of the type of impacts observed and represented in Figure 18 may reveal impact trends in the RCMP data.

Looking at the 37 sites monitored in FY04 through time reveals that surface erosion has been consistently observed and recorded approximately 10% of the time between 1990 and 2004. The observation of gullying decreased from the baseline recording to the Time 2 recording and has since remained relatively constant. Arroyo cutting also decreased initially and has since remained consistently recorded. Bank slump shows an increase through time. Eolian activity has also increased through time.

An increase in the recording of eolian activity may indicate that historic properties are more susceptible to exposure from deflation as dam operations alter CRE vegetation. RCMP archaeologists have also gained an increased understanding of eolian processes due to the collaborative efforts between the NPS, BOR, and GCMRC-contracted geomorphologists.

Side canyon impacts remain consistently low or not present as a physical impact since baseline data was collected. The "Other" category has also decreased through time. Because this category is a catchall, understanding the decrease in this category requires further examination of the individual occurrences identified in the comment fields of the forms. The same argument could be made for understanding visitation to historic properties. In addition to the types of visitation, it is recommended that visitor-related impacts should be understood in terms of accessibility and use areas by conducting spatial analyses.

The impact frequency data have also been collapsed into Figure 19 showing the number of occurrences by impact class (physical or visitor). This shows only the presence of physical or visitor-related impact and the total through the time series described above in Figure 18. Physical impact is consistently the leading impact class threatening the sites monitored in FY04.

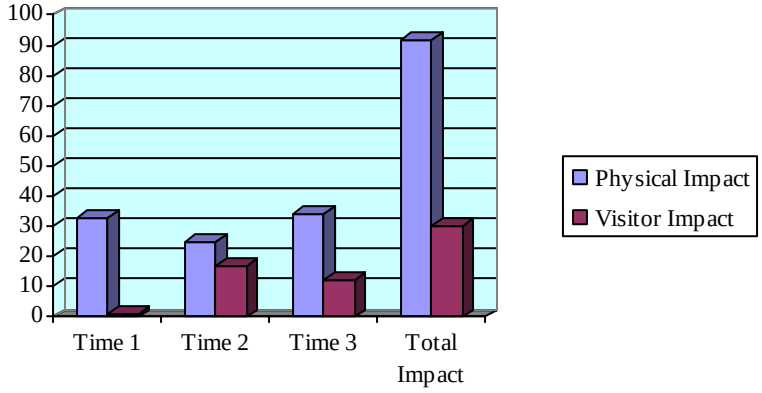


Figure 19. Bar graph representation of the physical and visitor-related impact through time for the 37 sites monitored in FY04.

Another method for looking at impact trends through time is the formulation of a scoring index for erosion types. This requires assigning different erosion types a value and then summing the values to determine perhaps vulnerability indices. This method also requires a statistical analysis of the data to ensure that it accounts for archaeological site-specific considerations. (For example a site with six arroyos bisecting a terrace and one feature that is not impacted by these arroyos has no impact while a site with one feature being bisected by an active arroyo has impact).

Has site condition changed through time?

In order to understand site condition, both the definition and methods need to be standardized. The following examples serve to illustrate the different ways of defining site condition available in the RCMP and GRCA databases.

As stated under the Baseline data description, site condition was defined as the percentage of impact on site. RCMP archaeologists mark impacts on site maps during regular monitoring visits. For a sample of sites, these impact areas were digitized into a GIS layer and an analysis was conducted to determine the percentage of impact within each site boundary using the same site condition parameters as defined during the baseline survey. An example of the result of this analysis is shown in Figure 20.

"Sitepoly_edits" is the GIS layer for the site boundary. Features are outlined in the "features" layer. The impacted areas identified during FY04 monitoring are shaded with diagonal lines. The intersection between the impact areas and the site boundary are shaded in opaque coloring. This impact representation visually displays the impact through or adjacent to a site and also clearly displays areas that while not within the site boundary, may still have the potential to impact sites in the future.

The GIS layer may be an appropriate method to document and measure impact area on site, if the definition of site condition is based upon a % of impact. Repeat total station mapping is another method for quantifying change on site. Comparisons of total station base maps may also show changes in impact locations and size through time. It is anticipated that the total station maps for sites drawn during 1996-1998 will be updated using the GCMRC control network. Once this update is complete, these maps should easily overlay the ortho-rectified imagery and serve as another layer in the GIS.

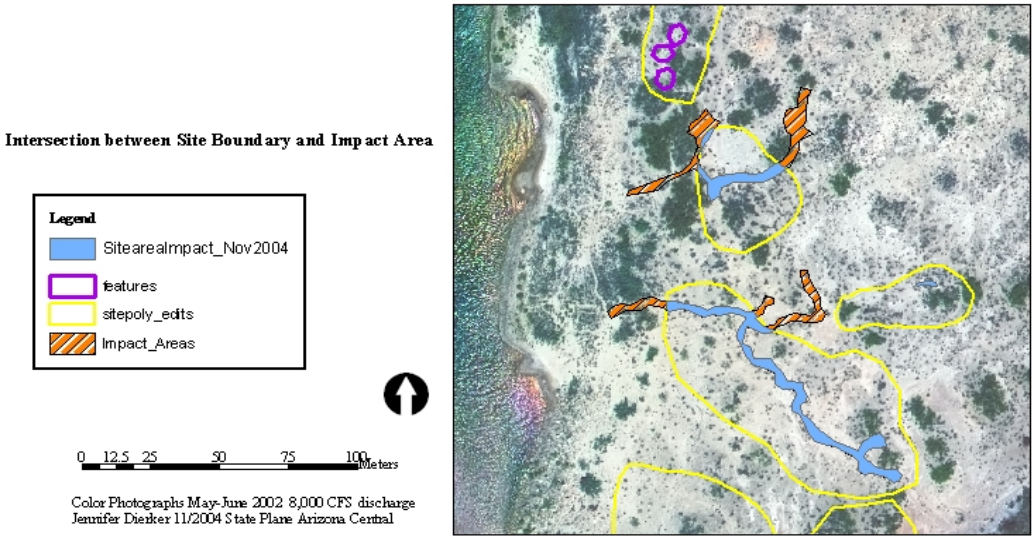


Figure 20. Example of RCMP Spatial Analysis of Site Condition.

The NPS also provides site condition information through the ASMIS (Archaeological Sites Management Information System) database. This standardized database tracks data on historic property condition, threats and disturbances, location, documentation, proposed treatments and actions taken. The ASMIS database is designed for planning and is also tracked and analyzed on a national

level. ASMIS Site condition definitions are provided in Appendix G. Table 6 lists the baseline data site condition with the current ASMIS site condition for all sites monitored in FY04.

Table 6. Site Condition from Baseline Data and ASMIS Data for the 37 Sites Monitored in FY04.

Site Number	Baseline Condition	2004 Current ASMIS Condition
A:15:005	Fair	Fair
A:15:018	Good	Fair
A:16:159	Fair	Fair
B:15:096	Good	Good
B:15:124	Excellent	Good
B:15:138	Fair	Fair
B:16:170	Excellent	Good
C:02:098	Fair	Poor
C:09:030	Good	Good
C:09:050	Good	Fair
C:09:082	Fair	Good
C:13:006	Fair	Fair
C:13:007	Fair	Fair
C:13:010	Poor	Poor
C:13:069	Fair	Fair
C:13:070	Fair	Fair
C:13:092	Fair	Fair
C:13:098	Good	Fair
C:13:099	Fair	Fair
C:13:100	Good	Fair
C:13:273	Good	Fair
C:13:291	Good	Poor
C:13:321	Fair	Fair
C:13:334	Good	Good
C:13:339	Good	Good
C:13:347	Good	Fair
C:13:349	Good	Fair
C:13:371	Good	Fair
C:13:386	Good	Fair
G:03:003	Good	Fair
G:03:004	Good	Good
G:03:020	Fair	Fair
G:03:041	Excellent	Fair
G:03:064	Good	Poor
G:03:072	Excellent	Fair
G:03:080	Good	Fair
G:03:083	Excellent	Good

The three different methods for defining condition can not be compared to each other due to the differences in variable definitions and methods of collection. The comparison of site condition through time requires use of the monitoring data to determine what impacts have occurred, where the impacts are occurring and whether or not any mitigation strategies have reduced the magnitude of identified impacts.

Can the condition of an archaeological site be understood by quantifying erosion? Quantification of erosion, based on the percentage of area impacted can be accomplished by digitizing the impacted

areas within a GIS layer. However, quantifying the area of impact within a site does not provide information related to archaeological significance. As King points out, "analysis of impacts on cultural resources is usually, at base, non-quantitative. The value of cultural resources, and hence the severity of impacts on them lies largely in people's perception, and is seldom amenable to rigorous quantification. Attempts to quantify, in fact, often obscure the real character of effects" (King, 2004:300).

Quantification of erosion cannot answer questions related to archaeological site information potential, integrity, or significance. These determinations can only be made by professional archaeologists on a site-by-site basis. While quantification is an important tool for change assessment, location of impact and the types of features impacted within an archaeological site are just as important as the amount of impact. As RCMP archaeologists expand the GIS database, it will be possible to analyze archaeological feature types and their relationship to different types of impacts within a site. This type of analysis would consider the amount and type of impact, where it is located on site and which archaeological features were being impacted to determine a condition assessment or "score". In this instance, a measurement of the amount of impact would be one in a series of variables used to determine site condition.

Which AMP Cultural Resource Information Needs can be answered using RCMP data?

RIN 11.1.2: What are the historic properties within the area of potential effects?
The primary objective of the original baseline cultural resource survey was to provide documentation for all archaeological sites located in the affected environment (Fairley et al., 1994). The affected environment included "all traversable terrain from the river up to and including predam river terraces" (USDOI BOR, 1995:140). A total of 323 sites located from Glen Canyon Dam to Separation Canyon at river mile 239.5 have been determined eligible for inclusion on the National Register of Historic Places as contributing elements to the Grand Canyon River Corridor Historic District (USDOI BOR, 1995:140). Each historic property has been fully recorded with photographs, maps to scale, and documented on archaeological site forms.

RIN 11.1.1: What are the sources of impacts to historic properties?
As previously noted, documenting the physical condition of archaeological sites as the baseline for additional monitoring activities was one objective during the original baseline inventory survey (Fairley et al., 1994). The survey gathered site specific information on impacts and threats related to the Colorado River environment (Fairley et al., 1994). A main purpose and monitoring goal of the RCMP is to collect additional data to identify potential and ongoing impacts at archaeological sites located in the area from the Colorado River "between the river and the pre-dam flood zone at approximately 300,000 cfs line" (USDOI, 1994; 2000:2). The impacts identified include both visitor-related and physical erosion and are compiled for each archaeological site in the RCMP database.

As the GCMRC and AMP research continues to identify impacts within the CRE, it is important that these impacts be related back to the historic property data. The RCMP has identified and documented impacts in both the baseline and monitoring data but the overall AMP program should also provide data on impacts identified though continuing research for use with cultural resource data.

RIN 11.1.2.b: How do specific sites meet National Register Criteria for Evaluation?
Initiation of the §106 process began in 1991as a result of the Environmental Assessment for interim dam flows. The NPS provided eligibility information including site forms and maps and summary tables and eligibility criterion justification for each site. All eligibility data was reviewed by the AZSHPO. By 1994, the BOR was responsible for submitting eligibility determinations as the lead agency. Since this time, the RCMP has provided summary information related to the sites monitored

each fiscal year (Coder et al., 1994; 1994; 1995; 1995; Leap et al., 1996; 1997; 1998; 2000; 2000; Dierker et al., 2001; 2002, Leap et al., 2003).

Specific information maintained in the RCMP database includes whether or not a site is significant, the Criteria which the site is significant under and a brief justification for that Criterion. Each site also has detailed feature and artifact descriptions which can be used to identify specific features that relate to specific research questions. Regular site condition monitoring observations provide supplemental information which can both enhance or refute eligibility status. If the eligibility of a site is questioned, this should trigger a re-evaluation.

CMIN 11.1.1: Determine the status of historic properties under ROD operations.

The ROD recognizes that some historic properties within the project area "may erode in the future under any EIS alternative" (USDOI, 1996:§VI). The BOR and NPS in consultation with tribal representatives were directed to develop and implement a long-term monitoring program for these sites. The RCMP is a program specific to National Register eligible properties located within the affected environment. In addition to monitoring, the resolution of effect for historic properties "will be carried out according to a programmatic agreement written in compliance with the National Historic Preservation Act "(USDOI, 1996:9).

The RCMP database currently shows 34 sites with recommendations for data recovery. Because preservation in place is a fundamental goal for the NPS and signatories to the PA, a data recovery recommendation is made as a last attempt to obtain information before a site is destroyed. Of the 34 sites, 14 have been recommended for immediate excavation (Leap, 1999). These 14 sites are extremely threatened and in danger of losing the elements that make them eligible for the National Register of Historic Places.

Which AMP Cultural Resource Information Needs require an interdisciplinary approach?

SIN 8.5.9: How are sandbar textures related to cultural site stability?

Both coarse sand and fine grained sediment studies are being conducted by the GCMRC for aquatic and terrestrial zone resources. The aeolian transport study being conducted by A. Draut (Draut et al., In press) may provide some information related to this Information Need (IN). Additional research could be directed towards sandbars adjacent to historic properties to connect the current study with sandbar texture studies. Further study is necessary because the current sediment program already has a sample of sandbars that have been monitored and most of these sandbars are not located adjacent to eroding archaeological sites. A new sample of eroding archaeological sites and sandbars could be identified for testing while incorporating sediment studies from both the aquatic and terrestrial programs already in existence. The RCMP archaeologists can provide information related to cultural sites, depositional context, erosion activity, impacts present, and any mitigation measures conducted or recommended.

EIN 11.1.1: Determine the effects of experimental flows on historic properties.

The 1996 beach habitat building flow was an opportunity to determine if sediment deposited above the peak power-plant discharge could directly infill the mouths of ephemeral drainages and slow the erosion occurring at these drainages. Total station mapping of select sites by Yeatts (1996;1997) and Hazel et al., (2000) showed that sediment accumulated above the peak flood level and was transported by aeolian processes. This recognition was the impetus for the aeolian transport study currently being conducted (see Draut et al., In press). While additional experimental flows have been conducted, the cumulative effects have not been fully researched or understood in relation to historic properties.

CMIN 11.1.2: Determine the efficacy of treatments for mitigation of adverse effects to historic properties.

Potential treatment options for archaeological sites have been identified in the MRAP (USDOI, 1994; 2000). The RCMP data on these treatments includes initial treatment recommendations and assessments from RCMP staff, Zuni Conservation Project members, and NPS specialists. Once treatment work is conducted, additional information includes the location of the work conducted, (in some instances this includes total station maps), the type of work and material types used. Treatments performed are often monitored for their efficacy and this information is also included in the RCMP database.

J. Pederson and others (2003) conducted a study of 25 drainages at nine sites within the CRE to better understand erosion and the effectiveness of checkdams. Preliminary results showed that erosion causes varied across a site and within catchment systems though checkdams reduced erosion compared to areas without checkdams. The project did show that regular maintenance of the erosion control structures was critical to reducing erosion. The RCMP archaeologists would like to expand the work conducted by Pederson (2003) by using the total station maps made during or immediately following the construction of checkdams between 1996 and 1998. Use of the older total station maps would provide a longer time span for quantitative analysis. The RCMP data can provide data related to depositional context, erosion potential, and erosion activity in places that may be selected for testing the geomorphic model proposed by Thompson & Potochnik (2000).

What kinds of RCMP archaeological site data can be used in interdisciplinary studies related to dam operations?

Many researchers working with the CRE stress the importance of not making generalizations about processes in the canyon as a whole (Draut et al., In press; Grams & Schmidt, 1999; Hazel et al., 2000). Geomorphologists in particular emphasize that processes related to deposition and erosion are influenced by many factors and thus any analysis must be conducted on a site by site basis. Data collected during archaeological site recording and subsequent monitoring is an ideal starting point for determining locations of geomorphologic interest in the Colorado River corridor. The RCMP database contains location information related to landforms, depositional context, sediment descriptions, and types of impact.

In addition to the collected data, archaeological sites in general may provide valuable information pertaining to other research. Examples include tree-ring data for dating debris and river flows, and datable remains within cultural deposits aiding in the reconstruction to terrace chronologies and flood frequencies. Profiles of paleo-gullys at archaeological sites may provide information related to pre-dam terrace erosion rates. Draut et al., (In press) proposed a series of questions to determine sites appropriate for research related to aeolian transport. Some of the questions pertaining to depositional context can be answered using the RCMP data.

How does the RCMP address historic property integrity?

Integrity, as defined in National Register Bulletin 15, is the ability of a property to convey its significance (Little, et al., 2000). For a property to be eligible for listing on the National Register, a historic property must be significant and have integrity. Integrity is based on how the physical features of a property relate to significance. In other words, are the features that make a site significant present?

As outlined in Dierker and Leap (2001:11-19) each site has been judged to have any of the four criteria of significance. The seven aspects of integrity were judged present or absent by the observation of significance combined with the physical features of each historic property. Table 7 shows the FY04 sites monitored with criterion for eligibility and aspects of integrity. Determinations

of the appropriate "aspects of integrity for river corridor sites were based on definitions outlined in the National Register Bulletin 15 (Little et al., 2000), consultation with the AZ SHPO, river corridor baseline data and supplemental monitoring data" (Dierker and Leap, 2001:17). Continual review of the integrity of the historic properties within the RCMP project area shows the properties have retained many, if not all, of the aspects of integrity as defined in National Register Bulletin 15 (Little et al., 2000). This long-term approach allows for the continuous review of site condition and the ability to insure that each site contributes to the overall understanding of human use along the Colorado River corridor. This level of information shows how the RCMP data directly informs us of National Register eligibility, including both significance and integrity.

Although impacts do occur to historic properties within the project area, none of the historic properties monitored in FY04 have had a loss of site integrity. In some instances, additional cultural material was identified (in three instances during mapping activities), leading to the addition of some aspects of integrity.

Findings and Recommendations

Investigation of dam effects and historic properties must use the CRE approach to understand dam operations and its effect on downstream resources. Research focusing specifically on quantification and prediction of change does not address the value of cultural resources to various groups and individuals. The destruction of cultural resources not only results in a loss of our link to the past, but results in a loss of data for other research related to the CRE. Cultural resources are nonrenewable resources. The RCMP project area is the last remaining vestige of a thriving community along the Colorado River in the west. It is a federal mandate for agencies to preserve these resources as representative our cultural heritage for future generations.

Table 7. FY04 Sites Monitored with National Register Criterion and Aspects of Integrity

Site	NR Criterion	Location	Design	Setting	Materials	Workmanship	Feeling	Association	Data Yield
A:15:005	A, D	Present	Present	Present	Present	Present	Present	Present	Present
A:15:018	A, D	Present	Present	Present	Present	Present	Present	Present	Present
A:16:159	D	Present	Present	Present	Present	Present	Present	Present	Present
B:15:096	A, B, C	Present	Present	Present	Present	Present	Present	Present	Absent
B:15:124	A, B	Present	Present	Present	N/A	Present	Present	Present	Absent
B:15:138	D	Present	Present	Present	Present	Present	Present	Present	Present
B:16:170	A, B, C	Present	Present	Present	Present	Present	Present	Present	Absent
C:02:098	D	Present	Present	Present	Present	Present	Present	Present	Present
C:09:030	A, B	Present	N/A	Present	N/A	N/A	Present	Present	Absent
C:09:050	A,D	Present	Present	Present	Present	Present	Present	Present	Present
C:09:082	A,D	Present	Present	Present	Present	Present	Present	Present	Present
C:13:006	A,D	Present	Present	Present	Present	Present	Present	Present	Present
C:13:007	A,D	Present	Present	Present	Present	Present	Present	Present	Present
C:13:010	A,D	Present	Present	Present	Present	Present	Present	Present	Present
C:13:069	A,D	Present	Present	Present	Present	Present	Present	Present	Present
C:13:070	A,D	Present	Present	Present	Present	Present	Present	Present	Present
C:13:092	A,D	Present	Present	Present	Present	Present	Present	Present	Present
C:13:098	A,D	Present	Present	Present	Present	Present	Present	Present	Present
C:13:099	A,D	Present	Present	Present	Present	Present	Present	Present	Present
C:13:100	A,D	Present	Present	Present	Present	Present	Present	Present	Present
C:13:273	A,D	Present	Present	Present	Present	Present	Present	Present	Present
C:13:291	A,D	Present	Present	Present	Present	Present	Present	Present	Present
C:13:321	A,D	Present	Present	Present	Present	Present	Present	Present	Present
C:13:334	A,D	Present	Present	Present	Present	Present	Present	Present	Present
C:13:339	A,D	Present	Present	Present	Present	Present	Present	Present	Present
C:13:347	A,D	Present	Present	Present	Present	Present	Present	Present	Present
C:13:349	A,D	Present	Present	Present	Present	Present	Present	Present	Present
C:13:371	A,D	Present	Present	Present	Present	Present	Present	Present	Present
C:13:386	A,D	Present	Present	Present	Present	Present	Present	Present	Present
G:03:003	A,D	Present	Present	Present	Present	Present	Present	Present	Present
:03:004	A,B,D	Present	Present	Present	Present	Present	Present	Present	Present

G:03:020	D	Present	Present	Present	Present	Present	Present	Present	Present
G:03:041	A,D	Present	Present	Present	Present	Present	Present	Present	Present
G:03:064	A,D	Present	Present	Present	Present	Present	Present	Present	Present
G:03:072	A,D	Present	Present	Present	Present	Present	Present	Present	Present
G:03:080	A,D	Present	Present	Present	Present	Present	Present	Present	Present

CHAPTER SIX

INTERAGENCY ACQUISITION NO. 05-AA-40-2292 INTERAGENCY ACQUISITION WITH THE NATIONAL PARK SERVICE, GRAND CANYON NATIONAL PARK FOR FISCAL YEAR 2005 RIVER CORRIDOR CULTURAL RESOURCE DATA GATHERING ON BEHALF OF THE BUREAU OF RECLAMATION

PROGRAM NARRATIVE

1. BACKGROUND AND PURPOSE. In Fiscal Years 2005 and 2006, Reclamation will contract for a treatment plan to mitigate adverse impacts of Glen Canyon Dam operations on historic properties downstream from Glen Canyon Dam and above Lake Mead. To further this compliance effort, Reclamation needs specific map products and documentation that it shall provide to the contractor(s), the Grand Canyon Monitoring and Research Center (GCMRC), and consulting parties to Reclamation's compliance efforts, possibly including the Keeper of the National Register of Historic Places. The information and documentation provided by the National Park Service must be compliant with the Federal Geographic Data Committee (FGDC) metadata standards, and the Reclamation's Information Quality Guidelines (IQG) that implement OMB's published guidelines (67 FR 8452), and with the National Park Service's policies for registration and nomination of National Register properties in Bulletins 15 and 16 and with the documentation standards specified at 36 CFR 800.11.

This Interagency Acquisition is entered into between the US Bureau of Reclamation, Upper Colorado Region and the National Park Service, Grand Canyon National Park for the purpose of obtaining specific data and electronic information that will assist Reclamation in its compliance with Section 106 of the National Historic Preservation Act. In particular the purpose is to allow Reclamation to proceed with the resolution of adverse effects in the public interest and for the benefit of the people of the United States.

2. AUTHORITY. This Acquisition is entered into under the authority of the National Historic Preservation Act and the Economy Act, 31 U.S.C. 1535 as amended.

3. RESPONSIBILITIES. For a period as hereinafter set forth, the Bureau of Reclamation and Grand Canyon National Park shall furnish all necessary personnel, equipment, and facilities, and otherwise perform all things necessary for or incident to their performance of work set forth herein.

A. The Bureau of Reclamation agrees to:

(1) Based upon the compliance responsibilities and data needs of Reclamation (see below) and a quarterly work schedule submitted by Grand Canyon National Park and approved by Reclamation, provide funds for work efforts with respect to this Acquisition, subject to availability of funds as stated in the *Contingent Upon Appropriation* clause, and subject to approval by Reclamation.

(2) Ensure that work and deliverables under this Acquisition and agreed to in the approved work schedule meet applicable standards and guidelines.

(3) Consider the views of Grand Canyon National Park concerning effects of dam operations (36 CFR 800.5).

(4) Provide relevant data and information to consulting parties and the public, as necessary for Reclamation's compliance with Section 106 of the NHPA and other relevant laws, regulations and guidelines.

B. Grand Canyon National Park agrees to:

(1) Supply the necessary personnel and facilities to carry out the work or tasks specified by Reclamation.

(2) Permit Reclamation or their designated representative to inspect the work or the progress made under this Acquisition at mutually convenient times.

(3) Submit deliverables as specified here and in the written approved work plan.

(4) Include in final reports, deliverables or products resulting from this Agreement, a statement that the work was a cooperative project between Grand Canyon National Park and Reclamation conducted under this Agreement.

(5) Share information produced under this agreement with Reclamation and signatories to the Programmatic Agreement on Cultural Resources Regarding the Operations of Glen Canyon Dam, 1995 and as amended and with stakeholders in the Glen Canyon Dam Adaptive Management Program, as appropriate.

C. Work to be accomplished under the Agreement is limited to the following tasks:

(1) Complete orthophotographic mapping and ground-truthing of not less than 100 and, preferably, as many as 166 archaeological sites. This entails field verification of the location of known archaeological sites and high resolution mapping of all site boundaries.

(2) Conduct electronic digitization of the boundaries and datums of the 100 to 166 ground-truthed sites and add them to the Grand Canyon geographic information system (GIS); the existing ArcView or ArcGIS database. Boundaries of each site or historic property shall be carefully selected to encompass the full extent of the significant resources and land area making up the property and other factors specified in National Register Bulletins and according to professional archeological standards. In particular, following Bulletin 16, the boundaries should be drawn to leave out peripheral areas of the property that no longer retain integrity.

(3) Prior to beginning this work, meet with Reclamation's regional archeologist (point of contact for this Acquisition) and with staff of the GCMRC and Arizona State Historic Preservation Office to determine the coordinate system that will be used. It is anticipated that all data will be submitted in Universal Transverse Mercator reference using the NAD-83

projection; although this will be negotatiated and the final decision made by Reclamation.

(4) Conduct checkdam monitoring and maintenance at 27 archaeological sites to assess the efficacy of these structures for erosion control, in consultation with Reclamation. The construction of additional checkdams is not supported under this agreement.

(5) Conduct a statistical analysis of the Grand Canyon Microsoft Access relational database to examine trends, detect redundant variables, remove uninformative variables, and determine which variables will be of greatest utility in future monitoring.

(6) Restructure the Grand Canyon Microsoft Access relational database to reflect current information technology standards (e.g., normalize the database, establish master and detail table relationships, employ referential integrity, identify redundant variables, document the structure, etc.).

(7) Add the archaeological site data available for that portion of the Glen Canyon National Recreation Area that may be affected by Glen Canyon Dam operations to the database.

(8) Prepare a comprehensive report of Fiscal Year 2005 activities to include budget expenditure accounting.

D. Grand Canyon National Park shall prepare and Reclamation shall review the following reports, documents and deliverables. Reclamation's review and comment shall be accomplished within 30 days; Grand Canyon National Park shall make any necessary revisions and return the final product within an additional 30 days.

A. An annual report, which shall include a discussion of all findings or results related to and funded by this Acquisition, as specified in the approved work plan.

B. An electronic copy of the completed Grand Canyon GIS database and associated metadata will be transferred to Reclamation and the Grand Canyon Monitoring and Research Center.

C. An electronic copy of the Microsoft Access archaeological database, the program interface and detailed documentation will be transferred to Reclamation and the Grand Canyon Monitoring and Research Center.

D. Invoices as specified in this acquisition and any subsequent program modifications.

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APPENDIX A

RCMP SOPs AND A BLANK MONITORING FORM

Standard Operating Procedures for RCMP Field Monitoring
Version 2.1 (February 12, 2003)

At the start of each day, the lead monitor will assign field duties to all personnel. It is up to each person to retrieve and return the appropriate, completed, paperwork from the field binders in the archaeology ammo cans at the end of each day.

Monitoring

Supplies and Access

Monitoring supplies include site paperwork, the camera box and photo board. A clipboard and writing utensil should also be included.

Using the Belknap river guide, the monitor and boatman choose the most appropriate and least conspicuous method for accessing the site to be monitored. It is important to keep in mind that the least amount of impact should be made getting to a site. Accessing the site should be done by boulder hopping if possible, leaving no footprints. The least amount of people possible should visit and monitor each site to prevent the development of trails.

The IMACs A *Location and Access* field form provides information on locating the site relative to the river. Locational and overview photographs provide topographic feature markers visible from the site to enable the relocation of the site to be monitored.

Use the site map to orient oneself across the site.

Monitoring Forms

Compare the blank and previous monitoring forms. Using the previous form as a guide, place a 3 (N/A) in the column of the *physical impacts* and *visitor-related impacts* matrices where features are not included at the site to be monitored. For example if you are monitoring a site with rock art and a roasting feature, the features *Structures/Storage*, *Artifacts*, *Perishable/Midden* and *Other* will be marked with a 3.

Read the comments sections (questions 17, 26, and 30) to review observations made during the last monitoring episode.

Fill in the Management Section, questions 2- 7 (Monitor Session, Date, Monitors, and PA Signatories)

Using photographs for each feature or impact, begin monitoring. Compare the feature photo to the current condition of the feature. Are there any significant

changes? Are the same impacts observed during the previous monitoring episode present now? Have these impacts been active? Do these impacts appear to be increasing or decreasing? These are the things to consider during monitoring. The matrix is intended to cover the presence or absence of impacts and whether or not present impacts are active or inactive. Use the comment field to discuss observations made at each individual feature. Question 17 should include information about all features on-site and the impacts observed both at features and within the site boundary. If a 1 or 2 appears in the matrix be sure to discuss it in the comment field, question 17.

Physical Impacts

Surface Erosion is erosion that occurs on the top surface only (0-10 centimeters in depth). This type of erosion may or may not lead to the development of a gully or arroyo. Surface erosion includes the removal of thin layers of surface material more or less evenly from an area of gently sloping land, by broad continuous sheets of running water rather than by streams. This type of erosion occurs when the amount of runoff at a location is not sufficient enough to promote the development of actual channels. Rills or small channels (less than 10 centimeters deep) may develop into channels with continued runoff. Things to look for include the condition of the vegetation on-site; is it upright or batted down? Are bits of debris such as sediment, twigs, or other vegetation piled up on the backside of plants, rocks, or features? Have artifacts, rocks, or vegetation moved downslope from how it appears in previous photographs?

The reason for documenting the presence or development of surface erosion is the potential for the development of gullys and/or arroyos. As monitoring documents long-term trends at cultural sites, the development of full-fledged arroyos should follow a trend beginning with the presence and increase in surface erosion. Flash flooding is an exception to this.

Gullying is a small channel 10 centimeters to 1 meter deep, produced by running water (or initially due to trailing). An **Arroyo** is defined for the project as a channel deeper than one meter. Both gullies and arroyos exist within depositional contexts and contain stream deposits of silt or silty clay and gravels, called alluvium.

Water is only present in a channel during or just after a runoff event. Runoff flowing through a channel continuously alters the appearance of the channel by moving sediments from the drainage, and debris from one place to another. Sediments eroded from one part of a channel may be deposited in a different location. Through active runoff, channels deepen and banks get steeper. Factors that effect a channel include the amount of water flowing, the size and shape of the channel, the amount of debris (sediment, rocks, vegetation) flowing in the runoff, and the speed at which the runoff travels.

Things to consider when monitoring gullys and arroyos include; the location of the deepest portion of the channel (called the thalweg), and changes in the

thalweg. The condition of the channel banks (either upright or sloped) should be observed for the presence of cultural material eroding from the bottom or sides of the channel. The movement of the channel towards or away from cultural materials may have occurred as well as increases or decreases in deposition or erosion of alluvium. A nickpoint is any change in elevation within a channel. Nickpoints signal that a channel is actively downcutting. The presence or movement of nickpoints should be observed and noted in the comments section.

Bank slump refers to the loss of the overhanging slope within a drainage produced by the lateral erosion of a stream. Channels that are actively downcutting will have upright banks, channels that have reached equilibrium with the conditions that alter channels will be sloped. The *angle of repose* is the maximum slope at which loose material remains stable.

An important aspect to monitoring channel banks is that banks that continue to calve or slump into the channel are active and will continue to develop both laterally and horizontally. As slump occurs, there is the potential for the exposure of cultural material. Debris that is slumped into channels may also be deposited within the channel itself rather than eroding away.

Eolian/Alluvial Erosion/Deposition refers to several different types of impacts that often occur in cycles. Eolian pertains to wind. Alluvial pertains to running water. Erosion is the net loss of sediments or depositional context. Deposition is the net gain of sediments within a context.

Eolian erosion and deposition is becoming an important indicator of the presence or absence of post-dam flood deposits. Sediment deposited through alluvial deposition during the 1983 and 1996 high flows is being transported through eolian processes across terrace surfaces. In some instances this eolian transport has resulted in the development or movement of sand dunes. In other instances eolian erosion has resulted in a complete loss of previously deposited sediments.

Alluvial erosion and deposition is important in understanding the developmental stages of channels and aids in predicting which channels will continue to be actively downcutting and widening. A lot of the same information in gullying/arroyo cutting will pertain. For instance, the presence of nickpoints means active alluvial erosion. But this removed sediment may have been deposited downstream meaning active alluvial deposition.

Side Canyon Erosion refers to the widening and/or deepening of side canyon tributaries. Archaeological sites or features located along the banks of side canyons may be vulnerable to catastrophic events such as flash floods that widen side canyons.

Other Physical Impacts is intended to cover a wide range of impacts caused by animals or vegetation that could lead to additional impacts to cultural remains. A good example of this is when rodents or lizards burrow on sites. The burrows have the potential to funnel runoff, creating a piping hole. Piping can be very damaging when runoff is diverted under the ground surface, leading to the collapse of the surface context and possible exposure of subsurface remains.

Questions 8 – 14
These questions should be answered with a 0, 1, 2, or 3. Every box in the matrix is required to have a value. If a previous monitoring form records a 1 or 2 in a box, the next monitoring form should have either a 1 or 2 for it's value. For example, gullying cannot be active one episode and absent the next.

Question 15
This variable has been determined through consultation with several geomorphologists. The only time this variable would be changed is when new gullies or arroyos develop in places that did not previously have river or terrace-based drainages. At times, terrace-based drainages may increase in length and become river-based. Check with the lead monitors if you feel reclassification is necessary.

Question 16
If a 1 appears in any of the boxes in the matrix, then the answer to this question must be a 1.

Question 17
Please describe any changes observed to each specific feature on-site. Describe the site condition overall, including drainages that do not directly impact features or other changes observed in the general site area. When no impacts are observed, it is important to note this in the comments section as well. Whenever a 1 or 2 occurs in the matrix, additional comments are required in this section. Describe the overall condition of the site based on the physical impacts observed.

Visitor Impacts

Question 18
The visitor impacts matrix should be filled out in the manner as the physical impacts matrix. A 3 (N/A) should be placed in the features not found at the site being monitored. A 0 or 1 should be placed in the box representing features on-site.

Questions 19 - 25
For any of the questions given a value of 1, comments regarding what was observed should be made in question 26.

Collection piles are a pile of more than three artifacts collected from within the site boundary and usually placed where other visitors will see them. Note the

location on the map and describe the collection piles identified. Collection piles found within site boundaries should always be dispersed after documentation. The presence of one or more collection piles should be noted in the comments section. Even though a pile is dispersed, a value of 1 should be given to this question if a collection pile was observed.

Trails on-site refer to human-caused trails. Sometimes it is possible to observe footprints within trails. Some sites are located adjacent to main hiking trails (such as the Tanner-Beamer Trail), other sites have trails on them as a direct result of visitation from backpackers and river-runners. Describe in question 26 the number of trails, length and depth. Be sure to locate the trails on the site map.

Camping on-site occurs when river-runners or backpackers spread out beyond established camps. Campsites are noticeable primarily by observing the presence of a ring of rocks *not* anchored into the ground. These rocks are used to secure tents or sleeping tarps. Cleared or smoothed areas also indicate modern sleeping locations. Rocks in a ring, firmly entrenched in the surrounding soil with cryptogamic soil or lichen on them may be an archaeological feature such as a wickiup ring.

ARPA violations are any intentional vandalism, pot hunting, graffiti, or defacing of cultural remains. Photograph any possible ARPA violations, describe the impacts and upon returning to the laboratory, report these violations to the NPS ARPA Ranger.

Question 23
Any other visitor-related impact not directly addressed in the previous questions should be noted as a 1.

Question 24
If any of the values in the visitor impacts matrix is a 1 then question 24 should also be a 1.

Question 25
Visitor-related impacts directly related to river fluctuations or dam operations refers to changes to the landscape, caused by visitation, as a result of the flow of the Colorado River. This could be raised water levels causing river-runners to scout rapids not usually scouted creating a new trail through a cultural site, or hiking at higher elevations from one place to another. Typically, changes to sites occur when the river level increases.

Question 26
Please describe any changes observed to each specific feature. Describe the site condition overall, including visitor impacts that do not directly impact features or other changes observed in the general site area. When no impacts are observed, it is important to note this in the comments section as well.

Notify NPS Special Agent

As of Sept. 2002, NPS Special Agent Joseph Sumner would like to be notified when any visitor impacts occur to archaeological sites. He is trying to build a case for additional ARPA funding in Grand Canyon National Park. He can be reached at P.O. Box 1729, Grand Canyon, AZ 86023; email joe_sumner@nps.gov; phone 928-638-7972; fax 928-638-7979.

Recommendations

Question 27
The monitoring schedule has been determined by long-term observation since 1992. The schedule should only be recommended for a change if there is a sudden increase in specific impacts or drastic change that threatens site integrity. If through time there has been a steady condition, the monitoring schedule could be reduced in frequency.

Question 28
Preservation options are treatments to a site that would result in preservation in place of an archaeological feature. These options do not involve any ground disturbances. Recommendations made in the field are reviewed in the lab. Prior to the completion of any recommended work, specialists make field assessments.

Trail work should be considered when any trails are present. These trail could be obliterated, multiple trailing could be funneled into one trail, an existing trail could be better outlined, or a completely new trail could be constructed.

Plant vegetation should be considered in conjunction with a member of the revegetation crew from GRCA. Vegetation work can supplement trail rehabilitation, anchor eroding dunes or slopes, or block access to cultural remains.

Install checkdams should be considered in places where cultural remains are being impacted through surface erosion, gullying, or alluvial erosion. Once a recommendation for checkdams has been made, an assessment will be performed with a member of the Zuni Conservation Program. The final decision to construct checkdams is based on a number of factors including the type of impact, the depositional context, the type of drainage present, and the materials available.

Other Preservation Options refers to methods for preserving cultural remains not previously listed. An example of this would be removing graffiti from a rock art panel.

Question 29
Recovery options are treatments to a site that would result in the disturbance of an archaeological feature. These options are chosen as a last resort or salvage situation when valuable information is being lost.

Research is a general term given to a form of data collection. Examples currently in place are cross-section profiles, total station mapping, carbon samples and subsurface testing for *in-situ* cultural remains.

Data Recovery refers to the full-scale excavation of an entire feature or multiple features on-site. Data recovery is rarely conducted through the RCMP though it has been recommended for 31 sites for a number of years. A finalized research design may change this trend. Sites previously recommended for data recovery should continue to be recommended for data recovery.

Other Recovery Options refers to methods for data recovery not previously listed.

Question 30

Comments
Please summarize observations made across the site. Discuss both physical and visitor-related impacts, recommendations made, and any future work that should be completed. If recommendations have been made on the previous form be sure to comment on why you did not make the same recommendations or why you feel the recommendation should be carried over and completed.

Site Maps

The site maps should be updated in the field to show all areas of identified impact. Observations in the field should be located on the site map. If preservation work is completed, the area where work occurred should be noted on the map. The date should be included on the map itself for ease in updating in the lab.

IMACs Updates

The IMACs form is the original recording and site documentation form. This information is retained in the database in the RCMP lab. Updates are made to the comment fields or in other appropriate fields. Updates that should be noted on the IMACs form include the discovery of diagnostic artifacts, the loss of feature integrity, GPS coordinates, results of testing or data recovery projects, etc. The IMACs is not updated with monitoring information but rather with archaeological information that will enable us to better interpret the site.

Photographs

Photos are one of the most important tools for long term monitoring. Monitoring a site is not possible without previous photographs because changes would be undetectable. It is important to note that when changes occur to a site, a

duplicate photograph may be warranted. Consider the time of year, compared to the existing photograph, the time of day, shadows and light, and how visible the changes will actually be in a black and white photograph.

If the most recent feature photograph is more than five years old (for sites monitored on a schedule from biennial to every five years), or more than two years old (for sites monitored on an annual schedule), the photograph should be duplicated. This will ensure that the photographs taken in the field will be relatively current even if no changes are occurring to a site.

Some sites may have photographs of specific impacts such as trailing or erosion. It is up to the person monitoring to decide if these photographs should be duplicated. If recommendations are made on the monitoring form, it is important to photograph the area where the work recommended is to be conducted. Be sure to include this in the description on the photo log. That way when an assessment for a remedial action is completed, the photograph can aid in determining additional change. When preservation work is being conducted, it is important to always take a before and after photograph for comparison.

Photo Log

Photo logs help to track photographs taken in the field and provide a place for detailed descriptions of the photographs. A lot of information is contained in the photo log, all of which is entered in the Access database.

Include the camera type and whether the film is black and white, color slide or digital.

Roll numbers are assigned in the lab.

Exposure numbers track the photographs taken. If a discrepancy is noted between what the log says and what the camera says, move leave the lines blank on the photo log and begin recording information according to the exposure noted on the camera.

Enter the site number

If the photograph is a duplicate of an existing photograph, enter the three digit photo number (.001) located after the site number (A:15:005.098)

Enter in the type of photograph you are taking. There is a specific list and it can only be one of these options:
A (Artifact)
F (Feature)
IO (Isolated Occurrence)
LT (Long-term Replica)
O (Overview/Location)

RA (Remedial Action)
RI (Rock Image)
S (Structure)
SF (Spike Flow)
TF (Thermal Feature)
VT (Vanishing Treasures)

Indicate the Feature number

Describe in detail the subject of the photograph. What are you trying to show? It is a good idea to include the names of people in the photograph or notable geographic features in the background. If the photograph is an overview of where work should be conducted, include this information in the description.

View is the compass bearing in degrees from the location of the photograph to the subject.

Photographer is the initials of the person taking the picture.
Date is the specific date the photograph was taken.

Standard Operating Procedures for RCMP Medium Format

Photographic Replication
Version 1.1 (February 13, 2003)

Medium format replication began in 1996 prior to the 45,000 cfs beach habitat building flow. Photographic documentation at pre-selected sites before and after the high flow is intended to be used as a tool for illustrating the deposition and subsequent loss of sediments that once were transported across alluvial terraces, covering up archaeological remains. Today, flows that do deposit sediment are insufficient to produce the amount of deposition needed to preserve cultural remains in-situ. The RCMP maintains a long-term record of conditions prior to and after scheduled “flood” events as determined by the Grand Canyon Monitoring and Research Center.

Prior to a river trip, contact Mike Quinn at Collections to be sure the Mamiya camera and film are available. He will provide a case for the camera though it should be transported on the river inside a dry bag for extra protection. The tripod and a dry bag for the tripod are located in the Flagstaff office. Previous photographs and tripod locations should be pulled for the sites to be replicated and placed in a separate Medium Format binder. Be sure to include medium format photo logs in the binder.

Mamiya

The camera consists of a camera body, lens, and film magazine. Familiarize yourself with all the components of the camera prior to going into the field. The tripod has a release plate on the top, and the camera should have a plate mounted on it's bottom so the two pieces fit together without any additional adjustment.

Loading Film

Place the empty spool on the right side of the magazine. The unexposed film goes on the left spool. Carefully remove the paper tab from the new roll. Roll a small portion of the film (black side goes on the outside part of the magazine) onto the empty spool. Roll until the arrows line up with the white arrow on the magazine.

Place the magazine back on the camera body. Advance the film to almost exposure 1 (in the view window) and then advance ½ a turn more. Also advance the lower lever on the camera body (cash register lever).

Taking a Picture

Advance the film to the next exposure, both the lever on the magazine and the lever on the camera must be advanced.
Remove the lens cap.
Remove the silver slide between the magazine and the camera body from the right side of the camera.
Lift the top of the camera, push in the gray button to release the magnifier.
Focus using the knobs on the sides of the camera or by the lens.
Use the light meter to determine setting with F16. Take two photographs at different settings.
Shutter release is located on the front bottom right of the camera body.
Place silver slide back between the camera and the magazine.
Push down to set magnifier and collapse the top of the camera viewfinder.

At the last photograph, advance 5 to 6 times until tension changes. Release the door on the magazine and remove exposed film. Fold back the loose tab on the film and lick band of the sticker. Transfer empty spool to the other side.

Light meter Cheat Sheet:

Bright sun, all sand (snow blind bright) 250 and 125 @ F22
Bright sun, no clouds 250 and 125 @ F16
Soft shadows, 125 and 60 @ F16
Bright overcast, no shadows 60 and 30 @ F16
Heavy overcast, open shade 30 and 15 @ F16
Dawn/Dusk 1 and ¼ @ F16

Standard Operating Procedures for RCMP Monitor Data Entry

Version 1.3 (June 16, 2003)

Post-Field Procedures

Take the field notebook(s) out of the ammo can.
Keep the paperwork organized by site until the monitor forms are checked over by the crew chief and project manager.
Crew chief checks the monitor forms for legibility and completeness.
Project manager reviews and approves monitor schedule and recommendations.
Enter monitoring data into the *Site Manager* database and print the monitor forms.
Database manager edits the monitoring forms.
Make any corrections and print a paper copy.
Xerox 2 two-sided copies of the monitor form: 1 for the S. Rim Arch Lab files and 1 for the Field folder. File the original in the Monitor folder. The hand-written field copies are sent up to Collections at the end of the fiscal year.

Other items found in the field notebook are IMACS updates and map changes. The IMACS updates are usually written on the field copy of the site form or on the map. IMACS updates are made in the Site Table, usually in the site description field or in the ImacsB Table.

Map changes are usually written on the field copy of the site map. Sometimes, though, this information is buried within the monitor form comments. Map changes go to the NAU graphic specialist for revisions , along with a Map Approval Form (see Maps SOP).

Shred the field copy of the previous monitoring form in the office shredder. Do not simply throw it away because there is site location information on it.

Take the photos out of their sleeves and file them back in the photo drawer. Put the plastic sleeves back in the photo sleeve 3-ring notebook.

Data Entry Procedures

Open *Site Manager*
Click on *Schedule* to bring up the list of trips on the *Sessions Form*.
Double-click on the appropriate trip (*Field Session*). This brings up the *Session Manager Form.*
Verify that you have monitor forms for all the sites that were monitored.
Remove any sites from the list that weren't monitored.
Change the *Status* to Complete.
Close *Session Manager* and open *Site Manager*.
Order the sites by site number.
Select the sites that are on your list. Click on *Show Selected*.

The *Site Master Form* appears. For each site, click on the *Monitoring* tab.
Add a record and begin data entry.

Session: the first two digits are the last two digits of the fiscal year. The next digit is the consecutively numbered river trip for that fiscal year.
Locus: usually a letter designation. Fill it in only if a single locus of a multiple loci site was monitored.
Monitor date: this is the date the site was monitored in the field. If the date was left blank in the field, look on the trip itinerary for the date the site was scheduled to be monitored.
Monitors: we only list archaeologists affiliated with the river corridor monitoring project. Monitor #1 is the lead monitor (the person who filled out the form or provided most of the information/observations. Do not list boatmen or VIPs.
PA Signatories: if tribal, state, or federal government signatories to the Programmatic Agreement accompany us to the site, then they are listed here. If you need to add a name to the list, see the database manager.

Physical Impacts section: this is set up like the matrix on the monitor form, except that the computer fills in the summary column. For easier data entry, select the numeric display next to physical impact comments. For physical impacts, we indicate whether erosion is active or inactive. The comments should agree with what's in the matrix and vice versa. If not, see the person who filled out the form.

The drainage type should already be pre-printed on the monitor form. Have Lisa or Jen approve any changes to drainage type.

If there are new impacts since the last monitoring, these should be explained in the comments and reflected in the matrix.

Visitor Impacts: notice that we only record the presence or absence of visitor impacts, not whether they are active or inactive. Leave the summary box blank (the computer fills it in). If a visitor impact is indicated in the matrix (Q. 18) the type of impact should be indicated (in "Piles" through "Other") and explained in the comments.

Management recommendations: check the box for all recommendations and elaborate in the comments section.

Schedule: indicate the new or continued monitor schedule and calculate the NextDate and fill it in. Any schedule changes should be explained in the comments sections also.

Pay special attention to the Management Recommendations and Monitor Schedule.
Based upon the recommended schedule, fill in the *Next Date*. This is very important because it is the next date that the site is due to be monitored, and our site scheduling and trip logistics depend on this date.
If you don't know when the Next Date should be, ask someone!
If there is a schedule change, the reason for the change goes in the *Schedule Comments* box. If the monitor did not give an explanation of why the schedule is being changed, hunt them down and get an answer!

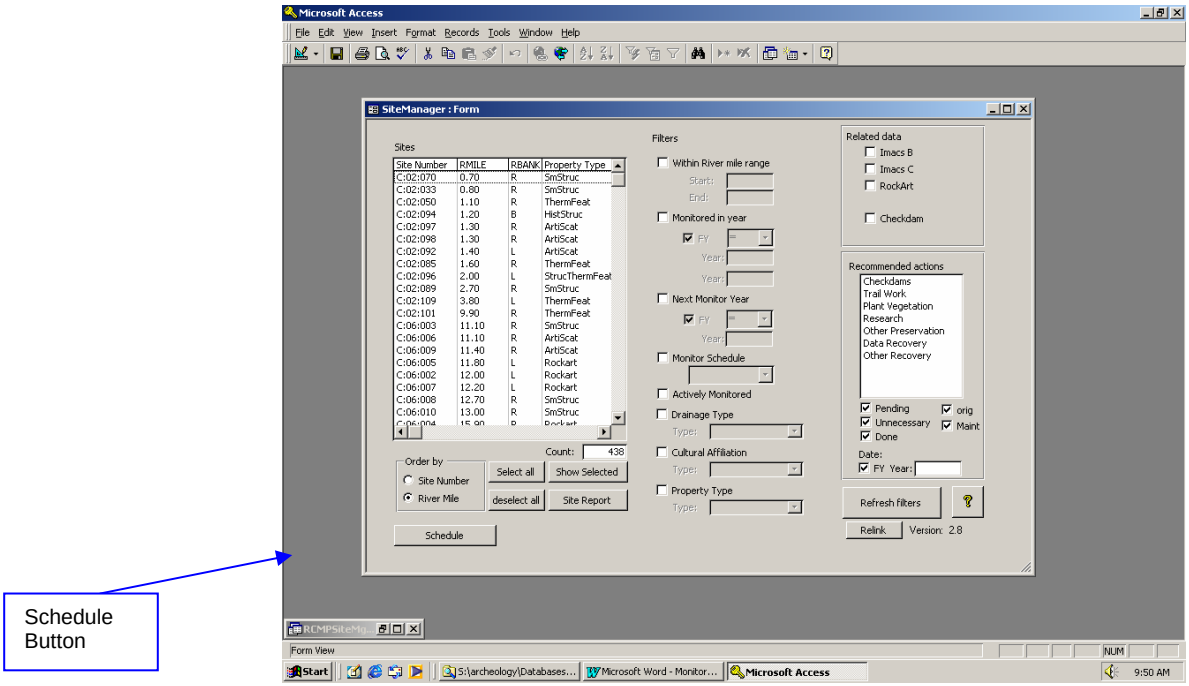
From the *Site Master* form, click on the *Report* button on the right to print a copy of the monitor form. Give these forms to the database manager for editing.
After monitor data entry, manually enter the recommended actions in the *Actions* table.
There are several ways to do this. Either enter in all the monitor forms, and then all the actions OR enter monitor data for one site, followed by recommended actions for that site. Then move on to the next site. It is probably best to enter actions immediately after entering the monitor form so that the particulars about that site are fresh in your mind. Whichever way you do it, it is very important that the recommended actions from the monitoring form get entered in the *Actions* table. This is how we track preservation and recovery projects. If you forget to enter the recommended actions, they are lost down the black hole!

From *Site Master Form*, click on the *Actions* tab.
If this is a new recommendation from the monitor form, click on *Add* record.
If this is a follow-up to a previous action (such as checkdam maintenance), click on *Follow Up*.

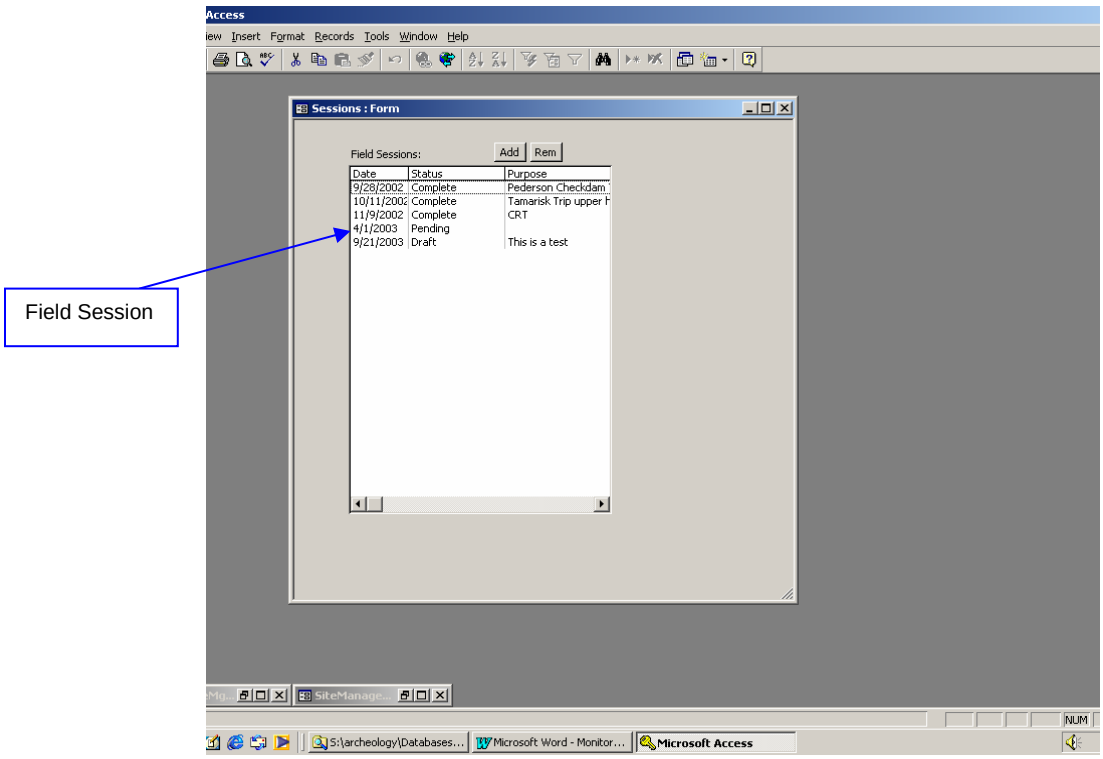
The Recommended Action Form appears. Site number is already filled in, and the computer assigns an automatic ID number (project number) to that action.
Click in the CRF box if the river trip was a Colorado River Fund trip. Ask the crew chief if you don't know.
Click in the Action drop down box, and select what type of action was recommended.
A record is completed for each action. So, if there are multiple recommendations on the monitor form, then you will complete multiple action records.
Your choices for actions are: Checkdams, Close Site, MF Photos, Other1, Plant Vegetation, Data Recovery, Test, Other2, Trail Work, and Map.
Fill in the date that the recommendation was made (monitor date).
Check with the project manager about what priority this action should be and the suggested due date.
Fill in who made the recommendation (lead monitor/archaeologist).
Type in or cut and paste the comments from the recommendations section of the monitor form. If there is no explanation for why a particular preservation or recovery action was recommended, ask the lead monitor/archaeologist.
Ignore the Assessment and Completion sections of the Recommended Action Form because these will be filled in at a later date.

Sometimes recommended actions are made in the office and not while a site is being monitored. If this is the case, be sure and say so in the comments section.

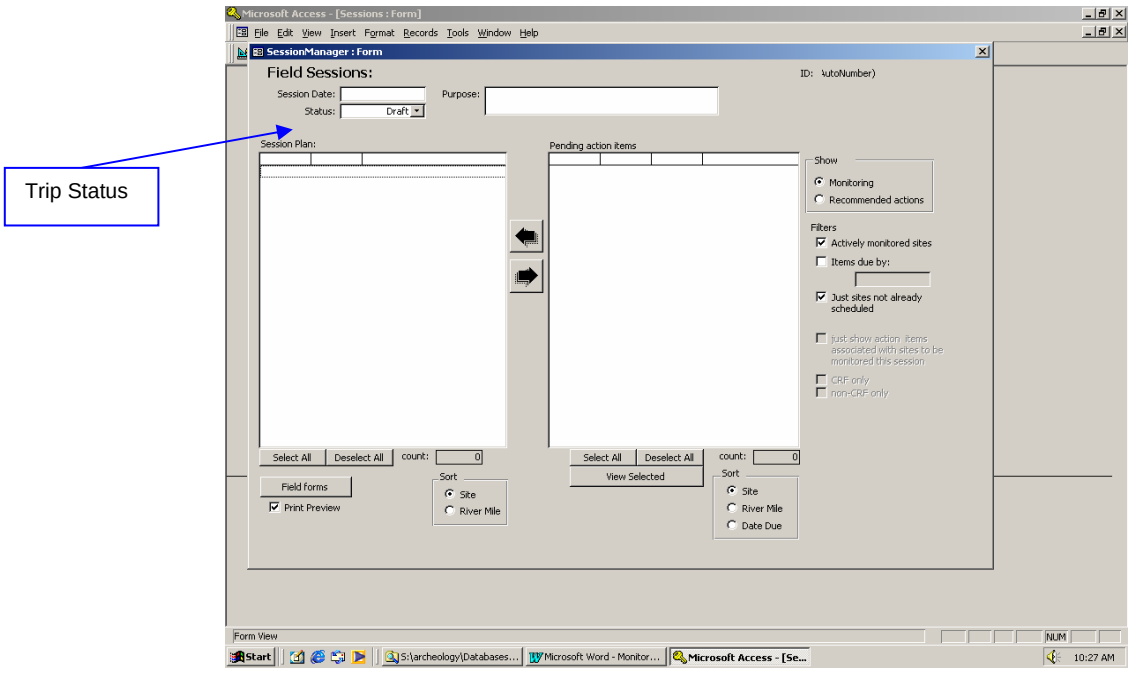
Site Manager Form



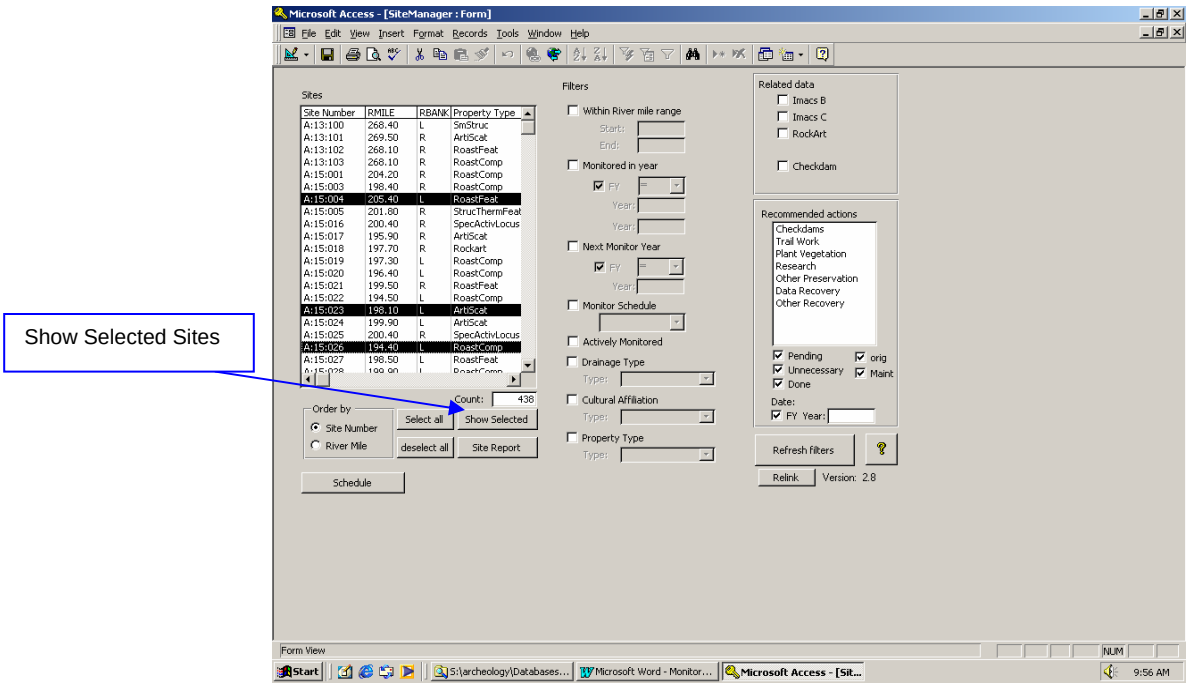
Sessions Form



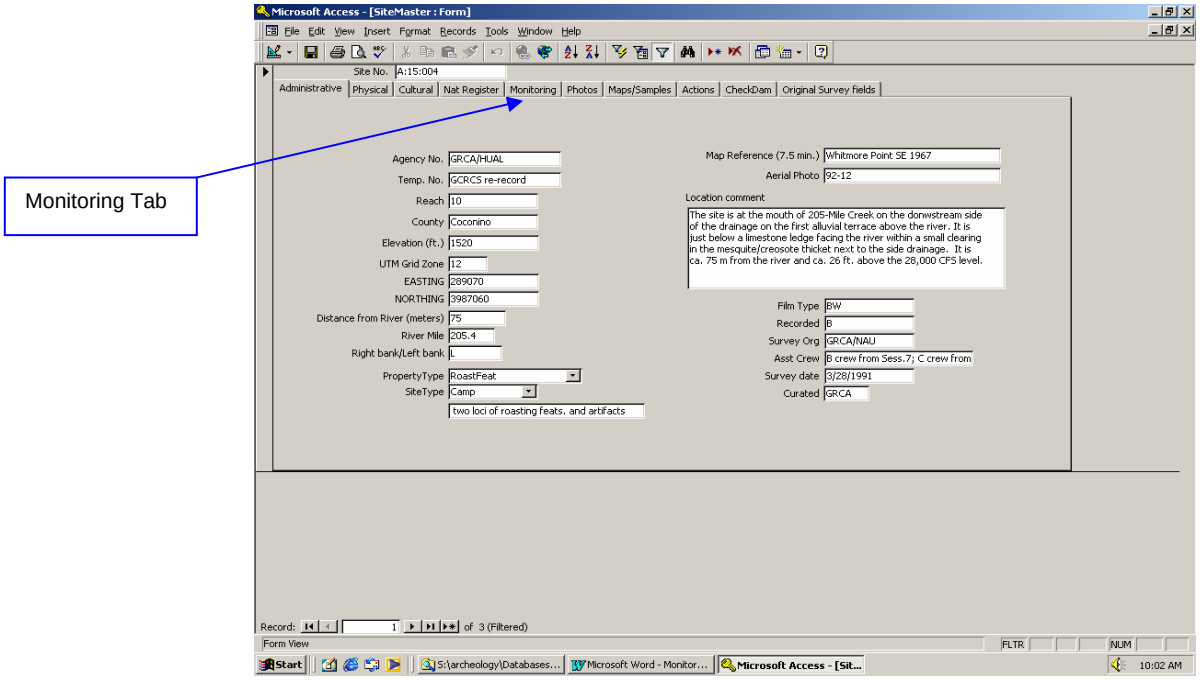
Session Manager Form



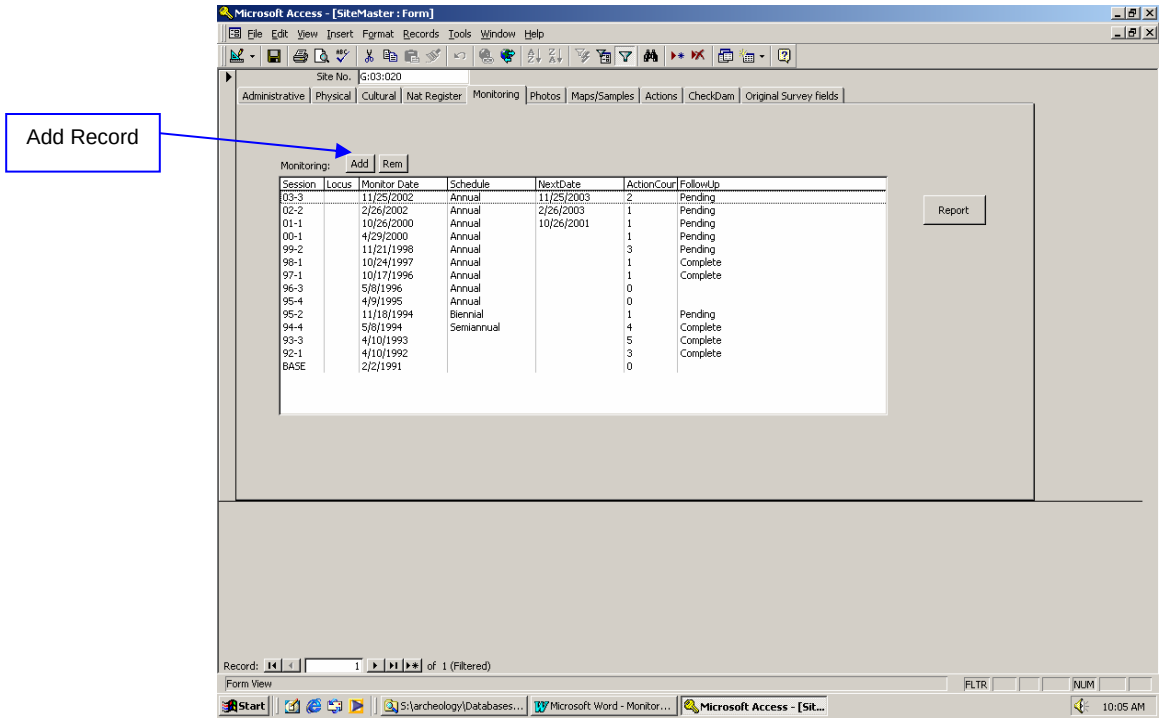
Site Manager Form



Site Master Form



Monitoring Detail



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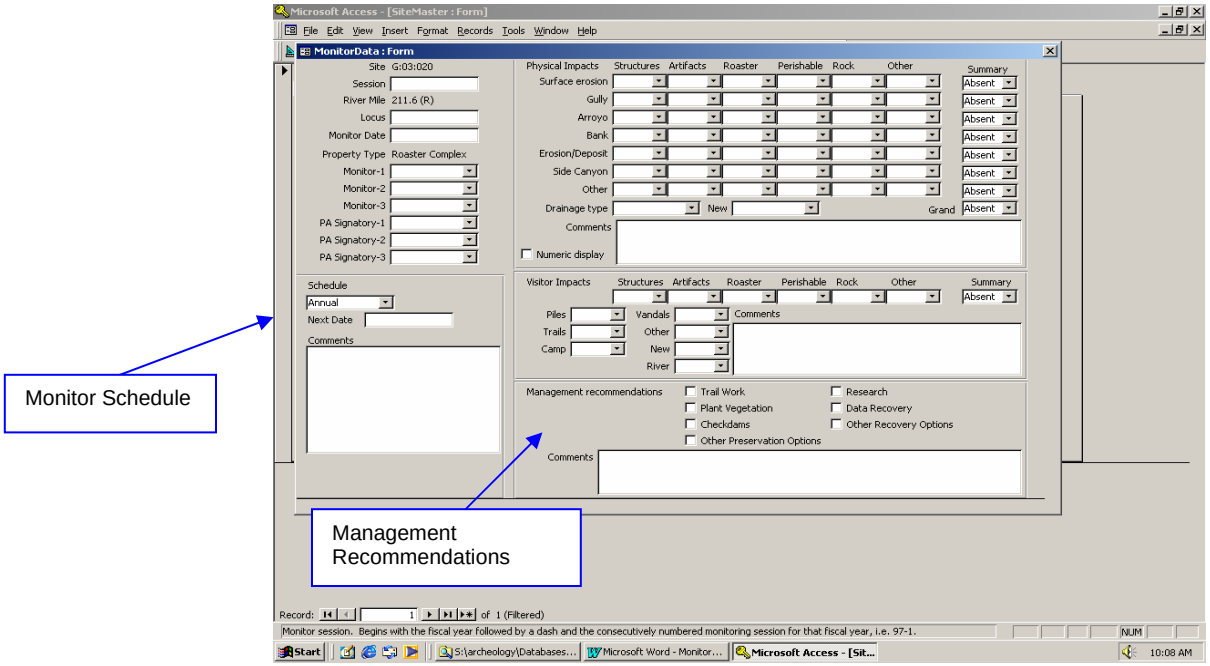
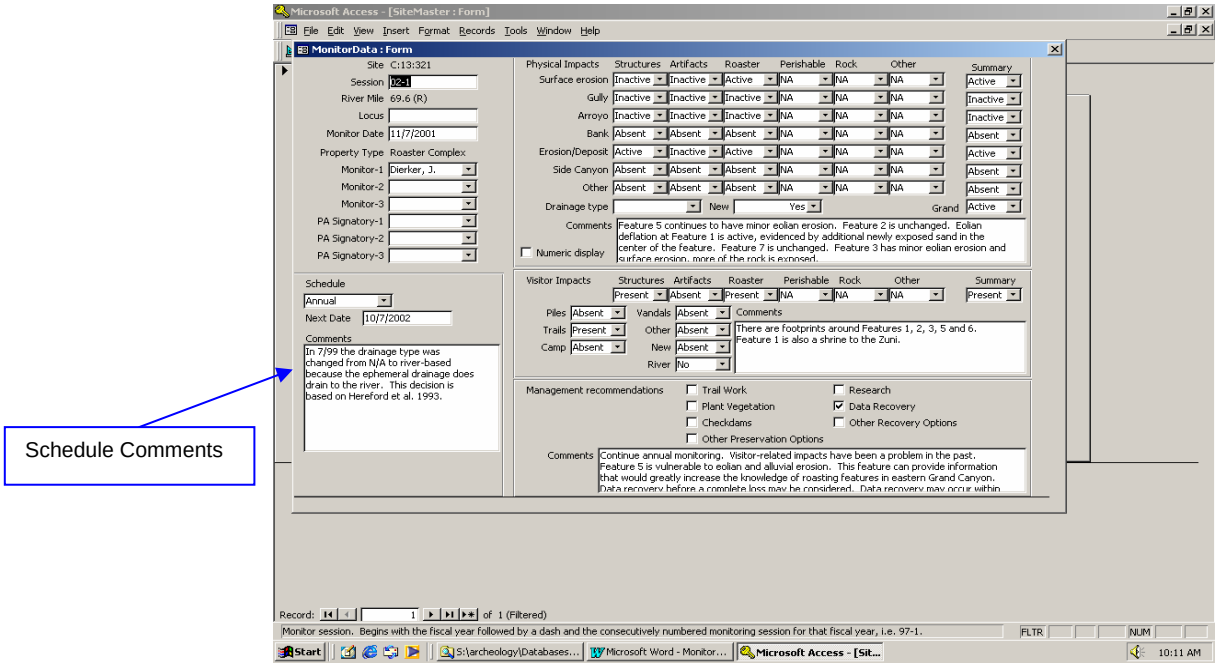
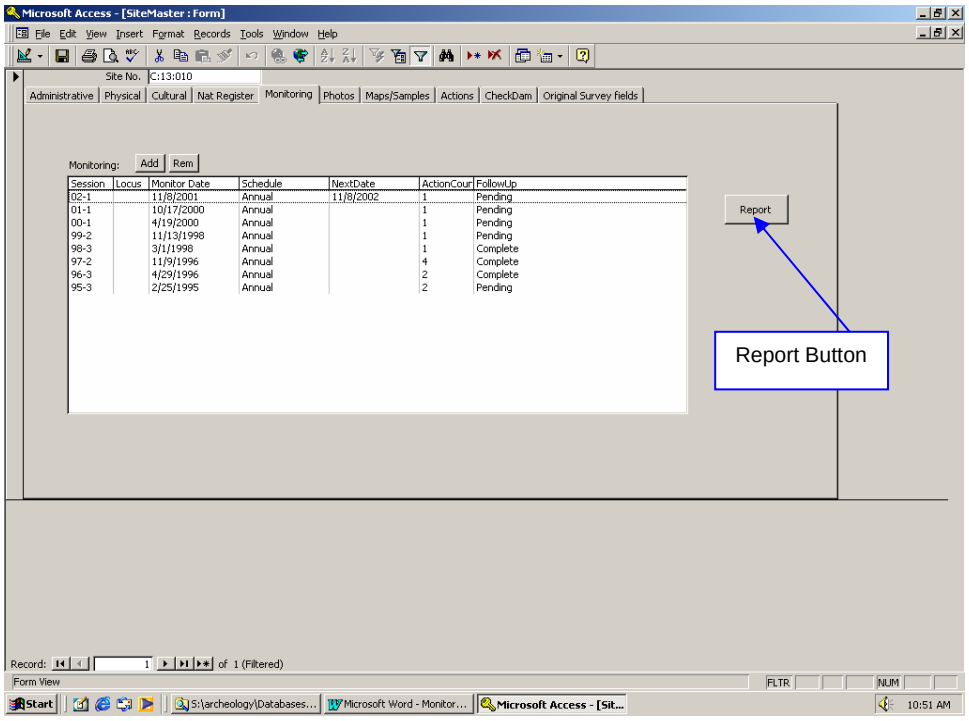


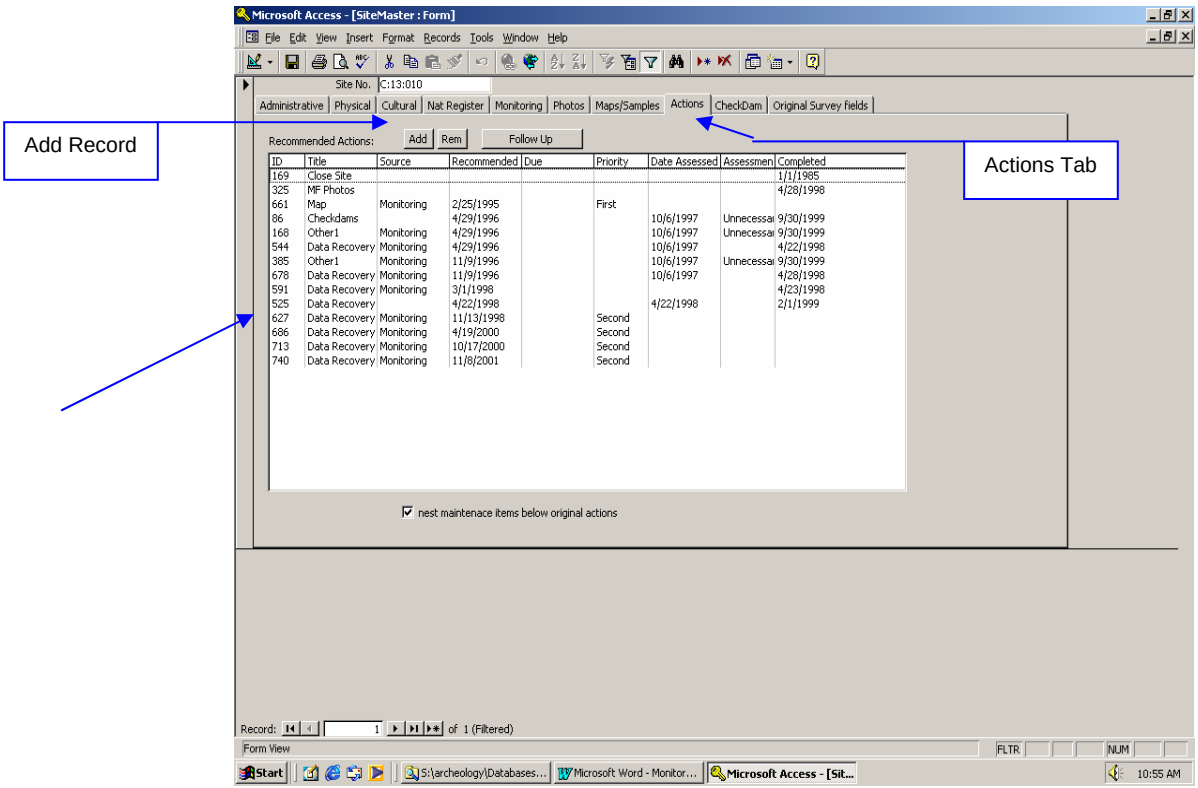
Complete Monitor Data Form

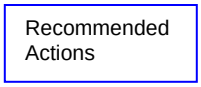


Site Master Form: Print Monitor Form



Site Master Form: Actions Tab




Recommended
Actions

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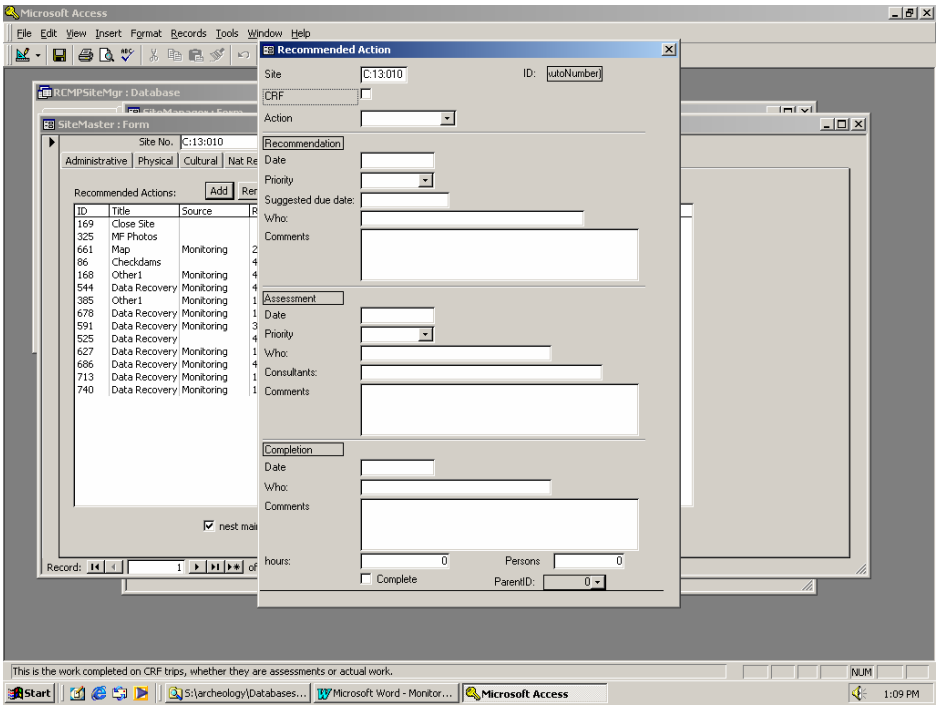
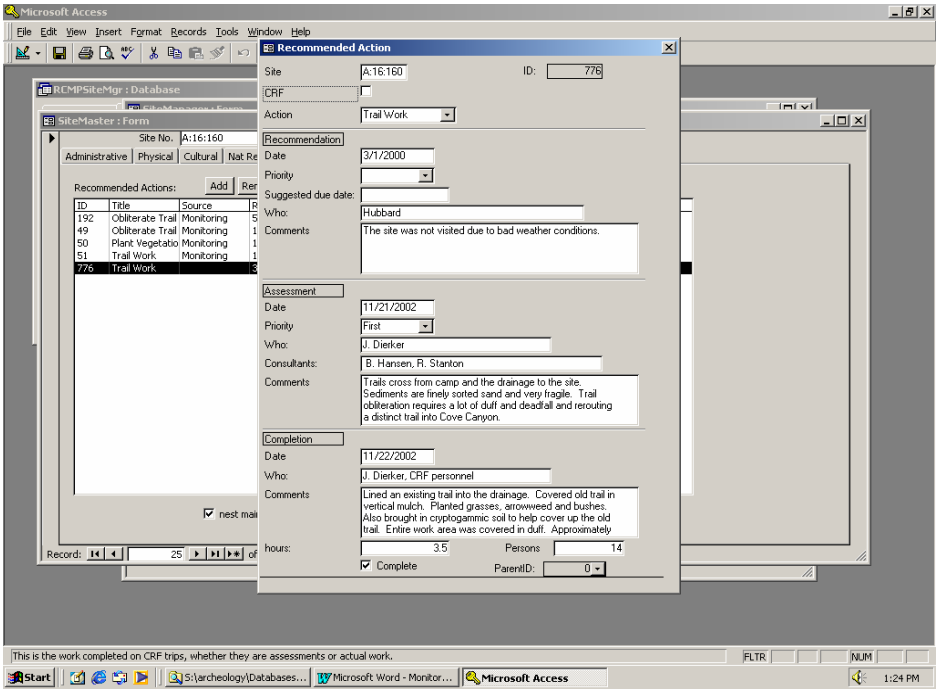


Complete Recommended Actions Form



STANDARD OPERATING PROCEDURES FOR RCMP REMEDIAL ACTIONS

Version 1.1 (February 13, 2003)

Remedial action field forms should be generated in the lab and included in the field notebooks. All work recommended for either assessment or completion will have a form detailing the initial recommendation. Remedial action projects (both assessments and work) will be listed in the trip schedule and included in the yearly work plan.

Assessments

At times, specific work recommended may require consultation with a representative from trails, revegetation, or the Zuni Conservation Project. When this is the case, it should be made known at least a day before the scheduled stop so that others on the trip know that their expertise is needed. Some sites may have more than one recommended action.

Information provided in the Recommended Action Field Form includes:
Recommended Action
Comments from the previous monitoring form when the recommendation was made
Date recommended
Priority

Review this information and the site map. Discuss the recommendations with the consultants.
Enter the date, the names of the consultants and notes on the feasibility of completing the recommended work.

Things to consider and include in your notes when making an assessment:
Number of people needed to complete a project
Amount of time needed to complete a project
Supplies or tools that are needed to complete a project
Are materials readily available?
Will the recommended work be successful in the long-term or is it a Band-Aid approach?
What is the appropriate river trip for completing the work recommended? (CRF, Archaeology, Trails)

Are there any mitigating circumstances that will determine when the project is completed? For example is it the appropriate time of year to transplant vegetation? Do plant seeds need to be collected for broadcasting on-site prior to the project completion? Are special materials needed to complete a project?

In some instances, particularly on CRF trips, the number of people and expertise immediately available warrants on the spot completion of a project. In other cases, an assessment is used to confirm a previous recommendation and the work will be completed based on the priority assigned.

Remedial Action Work

Once you get to this stage, the information provided on the Recommended Action Field Form should be adequate enough to be able to complete the project. Take some "before" photographs of the work area prior to beginning the project.

Things to include in your notes when completing a remedial action:
Enter the date, the names of those involved in the project and a description of the project completed.
Include the amount of time it took to complete the project.
Be sure to include all the different things that were completed. (For example trail rehabilitation may involve obliterating a trail by using both deadfall and planting vegetation. If this trail is obliterated, a new trail may be outlined to redirect visitor traffic).
Planting vegetation may involve planting more than one species type. Be sure to include the different types of vegetation planted.
When documenting checkdams, keep a tally of the number of buckets of rock based on material size (gravel, fist-sized, baseball-sized rock).
Photograph the project after it's completion from the same location as the "before" shots.

Where to document New Features and C14 Samples (check the boxes):

Site No.	Site Table (Imacs)	New Feature Table	Remedial Actions Table	C14 Samples Table

APPENDIX B

CHECKDAM CONSTRUCTION AND MAINTENANCE HISTORY

Site	Geomorphological Setting	Soil Description	Drainage Type	Checkdam #	Checkdam Type	Original Construction Date	Maintenance Date	Maintenance Work Completed	Status Shading indicates work necessary
A:15:005	Terrace on Debris Fan	Predam Alluvium/Eolian Capped by cryptogamic soil	River	1	Rock	11/20/98	-	-	
				2	Rock	11/20/98	-	-	
				3	Rock Lining	11/20/98	-	-	
				4	Rock Lining	11/20/98	-	-	
				5	Rock Lining	11/20/98	-	-	
A:16:149	Terrace	Predam Alluvium/Colluvium Silt-Sand Capped by cryptogamic soils	River	1	Rock Lining	4/24/99	-	-	Obliterated 3/21/2004
				2	Rock Lining	4/24/99	-	-	
				3	Rock	4/24/99	-	-	Obliterated 3/21/2004
				4	Rock	4/24/99	-	-	Requires Maintenance 3/21/2004
				5	Knickpoint	4/24/99	-	-	
				6	Knickpoint	4/24/99	-	-	Requires Maintenance 3/21/2004
				7	Headcut	4/24/99	5/02/02	Headcut Advancement	Requires Maintenance 3/21/2004
A:16:174	Terrace	Predam Alluvium/Eolian	River	1	Rock	11/19/98	-	-	

Site	Geomorphological Setting	Soil Description	Drainage Type	Checkdam #	Checkdam Type	Original Construction Date	Maintenance Date	Maintenance Work Completed	Status Shading indicates work necessary
		Sand-silt							
				2	Rock	11/19/98	-	-	
				3	Rock Lining	11/19/98	10/24/2000 05/02/2002	Combined with 4 Knickpoint trt	
				4		11/19/98	05/02/02	Combined with 3	
				5	Rock	11/19/98	-	-	
				6	Rock Lining	11/19/98	4/26/00 10/24/00	Knickpoint trt Combined 6,7,8	
				7		11/19/98	10/24/00	Combined with 6	
				8		11/19/98	10/24/00	Combined with 6	
				9	Rock Lining	4/26/2000	-	-	
A:16:180	Terrace	Predam Alluvium Sand-silt	River	1	Rock/Brush	03/02/97	11/19/98	Built up sides	Requires Maintenance 3/22/2004
				2	Rock/Brush	03/02/97	11/19/98 10/24/00	Combined w/ 3 Built up sides	
				3		03/02/97	11/19/98	Combined w/ 2	
				4	Rock	03/02/97	11/19/98 10/24/00	Built up sides Built up sides	Requires Maintenance 3/22/2004
				5	Rock	03/02/97	11/1/9/98 10/24/00	Built up sides Built up sides	
				6	Rock Lining	03/02/97	-	-	
				7	Rock Lining	04/26/00	-	-	
				8	Rock Lining	10/24/00	-	-	
B:14:107	Terrace on Debris	Predam	Terrace	1	Water Diversion	04/21/97	03/34/98	Extended	

Site	Geomorphological Setting	Soil Description	Drainage Type	Checkdam #	Checkdam Type	Original Construction Date	Maintenance Date	Maintenance Work Completed	Status Shading indicates work necessary
	Fan	Alluvium Silt-sand and some cryptogamic soils			Bar		10/20/00	feature Rearranged rock	
C:02:101	Terrace	Predam Alluvium/Eolian Sand Medium grained	River	1	Rock/Brush	02/19/97	11/08/98 04/15/00	Added rock to downstream side Added rock	
				2	Knickpoint	02/19/97	-	-	
				3	Rock/Brush lining	02/19/97	11/08/98 04/15/00	Knickpoint Extended feature	
				4	Rock/Brush Lining	02/19/97	11/08/98 04/15/00	Lined below Extended feature	
				5	Headcut	02/19/97	04/15/00 10/12/00	Extended feature Downstream armorment	
				6	Rock Lining	02/19/97	04/15/00 10/12/00	Knickpoint Knickpoint	
				7	Rock/Brush	02/19/97	-		
				8	Rock lining	02/19/97	-		
				9	Knickpoint	10/12/00	03/13/03	Added rock	
				10	Rock/Brush	02/19/97	10/12/00 03/17/03	Added rock Combined w/11	
				11	Rock lining	02/19/97	03/17/03	Combined w/10	
				12	Rock/Brush	02/19/97	03/17/03	Added rock	
				13	Headcut	02/19/97	11/8/98	Combined w/14	
				14	Rock/Brush	02/19/97	11/8/98	Combined w/13	

Site	Geomorphological Setting	Soil Description	Drainage Type	Checkdam #	Checkdam Type	Original Construction Date	Maintenance Date	Maintenance Work Completed	Status Shading indicates work necessary
				15	Knickpoint	10/12/00	-	-	
				16	Knickpoint	10/12/00	-	-	
				17	Diversion Bar	04/24/02	-	-	
				19	Rock lining	04/15/00	-	-	
C:09:050	Terrace on Debris Fan	Predam Alluvium/Colluvium Silt-sand	Side Canyon	1	Water Diversion Bar	04/14/97	-	-	
				2	Water Diversion Arm	04/14/97	-	-	
				3	Water Diversion Arm	04/14/97	-	-	
				4	Water Diversion Arm	04/14/97	-	-	
				5	Water Diversion Arm	04/14/97	-	-	
C:13:005	Terrace on Debris Fan	Predam Alluvium/Eolian Sand	Terrace	1	Basketweave	02/20/96	-	-	
				2	Rock	02/20/96	-	-	
				3	Rock	02/20/96	-	-	
C:13:006	Terrace on Debris Fan	Predam Alluvium/Eolian Sand-silt	River	1	Headcut	02/16/96	-	-	
				2	Rock Lining	02/16/96	04/17/00	Extended lining	
				3	Rock Lining	02/16/96	10/15/00 03/19/03	Extended lining Added rock	
				4	Headcut	02/16/96	03/19/03	Rebuilt	Requires Maintenance 3/15/04
				5	Rock/Brush	02/16/96	11/11/98	Change to	Requires

Site	Geomorphological Setting	Soil Description	Drainage Type	Checkdam #	Checkdam Type	Original Construction Date	Maintenance Date	Maintenance Work Completed	Status Shading indicates work necessary
								Rock checkdam	Maintenance 3/15/04
				6	Rock	02/16/96	04/17/00	Knickpoint	Requires Maintenance 3/15/04
				7	Rock lining	02/16/96	03/19/03	Added rock	
				8	Rock lining	02/16/96	03/19/03	Plunge pool	
				9	Rock lining	02/16/96	-	-	Requires Maintenance 03/15/04
				10	Rock lining	02/16/96	-	-	
				11	Headcut	02/16/96	03/19/03	Extended length	
				12	Rock lining	02/16/96	-	-	Obliterated 03/15/04
				13	Rock lining	02/16/96	-	-	
				14	Rock lining	04/17/00	-	-	
				15	Rock lining	10/15/00	-	-	
				16	Rock	10/15/00	11/11/98	Changed to U shape	Requires Maintenance 03/15/04
				17	Rock/Brush	02/16/96	-	-	Obliterated 03/15/04
				18	Rock lining	02/16/96	-	-	Requires Maintenance 03/15/04
				19	Rock Checkdam	03/19/03			
				20	Rock Checkdam	03/19/03			
				21	Rock Lining	03/19/03			
				22	Knickpoint	03/19/03			
C:13:069	Terrace on Debris Fan	Predam Alluvium/Eolian Sand	Terrace	1	Headcut	02/24/97	-	-	
				2	Rock/Brush	02/24/97	03/21/03	Added rock	
				3	Rock/Brush	02/24/97	-	-	

Site	Geomorphological Setting	Soil Description	Drainage Type	Checkdam #	Checkdam Type	Original Construction Date	Maintenance Date	Maintenance Work Completed	Status Shading indicates work necessary
				4	Log/Rock/Brush	02/24/97	04/27/02 03/21/03	Changed to V shape Added rock to side	
				5	Rock/Brush	02/24/97	-	-	
				6	Log/Rock	01/01/92	02/24/97	Rebuilt	
C:13:099	Terrace on Debris Fan	Predam Alluvium/Eolian Silt-sand Capped by salt layer and cryptogamic soils	River	1	Rock/Log	09/15/95	-	-	
				2	Rock/Brush	09/15/95	-	-	
				3	Rock/Brush	09/15/95	-	-	
				4	Rock/Brush	09/15/95	2/22/97	Combined with 3	
				5	Headcut	09/15/95	-	-	
				6	Rock/Brush	09/15/95	02/22/97 02/26/98	Added brush to sides Removed log and armored sides	
				7	Rock lining	09/15/95	02/22/97 02/26/98	Armored sides Merged lining with #6	
				8	Log/Rock/Brush	09/15/95			
				9	Log/Rock	09/15/95	02/26/98	Armored sides with additional rock	Requires Maintenance 03/16/04
				10	Basketweave	09/15/95	02/26/98	Lowered posts Loosened weave Armored	Requires Maintenance 03/16/04

Site	Geomorphological Setting	Soil Description	Drainage Type	Checkdam #	Checkdam Type	Original Construction Date	Maintenance Date	Maintenance Work Completed	Status Shading indicates work necessary
								sides	
				11	Log/Rock/Brush	09/15/95	02/26/98	Armored sides	Requires Maintenance 03/16/04
				12	Horseshoe	09/15/95	02/26/98	Armored sides Removed center log	Requires Maintenance 03/16/04
				13	Horseshoe	09/15/95	02/22/97 02/26/98	Added rock Armored sides	Obliterated 03/16/04
				14	Horseshoe	09/15/95	02/26/98 11/12/98	Lowered center Added gravel	Requires Maintenance 03/16/04
				15	Rock	09/15/95	02/26/98	Removed brush Armored sides	Requires Maintenance 03/16/04
				16	Retaining Wall	09/15/95	02/22/97 02/26/98	Armored sides Created T Shape	
				17	Retaining Wall	09/15/95	02/22/97	Piping treatment	
				18	Log/Rock	09/15/95	02/22/97 04/15/97 10/16/00	Armored sides Removed log Added rock	
				19	Retaining Wall	09/15/95	02/22/97	Added rock	
				20	Retaining Wall	09/15/95	11/12/98	Replaced large rock with gravels	
				21	Rock/Brush	09/15/95	02/26/98 11/12/98	Armored sides Built up sides	Requires Maintenance 03/16/04
				22	Rock/Brush	09/15/95	02/26/98	Disassembled	Obliterated 03/16/04

Site	Geomorphological Setting	Soil Description	Drainage Type	Checkdam #	Checkdam Type	Original Construction Date	Maintenance Date	Maintenance Work Completed	Status Shading indicates work necessary
				23	Rock Lining	09/15/95	11/12/98 02/26/98	Built up sides Added rock	
				24	Rock Lining	09/15/95	02/26/98	Armored sides	
				25	Rock Lining	09/15/95	02/26/98 02/22/97	Lowered Center Piping	Obliterated 03/16/04
				26	Log	09/15/95	02/26/98 02/22/97 10/16/00 03/20/03	Added rock Added rock Added gravel Removed log	
				27	Rock	09/15/95	02/26/98	Added rock	
				28	Rock	09/15/95	02/26/98 11/12/98	Rearranged rock Built up R bank	
				29	Rock/Brush Lining	09/15/95	-	-	Obliterated 03/16/04
				30	Rock/Brush Lining	09/15/95	02/26/98 11/12/98	Armored sides Added gravel	
				31	Rock Lining	09/15/95	02/26/98 11/12/98	Armored sides Added gravel	
				32	Rock/Brush	09/15/95	02/26/98 11/12/98	From Checkdam to armorment Built up L bank	
				33	Headcut	09/15/95			
				34	Log/Rock/Brush	09/15/95	02/22/97	Rearranged rock	Requires Maintenance 03/16/04
				35	Rock Alignment	09/15/95	02/22/97 04/15/97 02/26/98	Rearranged rock Extended feature	

Site	Geomorphological Setting	Soil Description	Drainage Type	Checkdam #	Checkdam Type	Original Construction Date	Maintenance Date	Maintenance Work Completed	Status Shading indicates work necessary
								Removed log and armored sides	
				36	Log/Rock/Brush	09/15/95	02/22/97 04/15/97 02/26/98 11/12/98	Rearranged rock Removed log Armored drainage Added gravel	
				37	Log/Rock/Brush	09/15/95	2/22/97 04/15/97 02/26/98 03/20/03	Added rock Extended feature Lowered Center and built up sides Flattened Center	
				38	Rock/Brush	09/15/95	02/26/98	Removed log and armored sides	
				39	Rock/Brush	09/15/95	02/26/98	Removed log and armored sides	
				40	Rock/Brush	09/15/95	02/26/98	Removed log and armored sides and lowered center	
				41	Log/Rock/Brush	09/15/95	02/22/97 04/15/97 11/12/98	Rearranged rock Extended feature Added gravel	
				42	Rock	09/15/95	02/22/97 04/15/97 02/26/98	Piping treatment Built upstream side	

Site	Geomorphological Setting	Soil Description	Drainage Type	Checkdam #	Checkdam Type	Original Construction Date	Maintenance Date	Maintenance Work Completed	Status Shading indicates work necessary
								Armored bank, removed log and lowered center	
				43	Log/Rock	09/15/95	-	-	
				44	Log/Rock	09/15/95	04/15/97	Extended feature	
				45	Rock Lining	10/16/00	-	-	
				46	Retaining Wall	09/15/95	-	-	
				47	Rock Alignment	02/26/98	-	-	
				48	Log/Rock/Brush	09/15/95	-	-	
				49	Water Diversion	02/26/98	-	-	
				50	Rock	02/26/98	11/12/98	Filled channeling with gravel	
				51	Bank Armorment	02/26/98	-	-	
				52	Rock Lining	02/26/98	11/12/98	Removed log	
				53	Rock Lining	02/26/98	11/12/98	Lowered center and armored banks	
				54	Knickpoint trt	11/12/98	-	-	
C:13:100	Terrace on Debris Fan	Predam Alluvium/Eolian Fine sand Capped by salt layer and cryptogamic soils	River	1	Log/Rock	09/17/95	-	-	Requires Maintenance 03/16/04
				2	Rock	09/17/95	-	-	Requires Maintenance 03/16/04
				3	Horseshoe	09/17/95	-	-	Requires Maintenance 03/16/04
				4	Log/Rock	09/17/95	02/27/98	Added gravel	Requires

Site	Geomorphological Setting	Soil Description	Drainage Type	Checkdam #	Checkdam Type	Original Construction Date	Maintenance Date	Maintenance Work Completed	Status Shading indicates work necessary
									Maintenance 03/16/04
				5	Log/Rock/Brush	09/17/95	02/27/98 10/16/00	Filled plunge pool Added gravel	Requires Maintenance 03/16/04
				6	Log/Rock/Brush	09/17/95	02/2798	Removed large rock from center and added gravel	Requires Maintenance 03/16/04
				7	Rock	09/17/95	02/27/98 04/18/00	Removed large rock from center and added gravel Piping treatment	Obliterated 03/16/04
				8	Log/Rock/Brush	09/17/95	03/20/03	Added rock	
				9	Rock	09/17/95	04/18/00	Piping treatment	
				10	Log/Rock	09/17/95	02/27/98 03/20/03	Removed large rock from center and added gravel Added rock	
				11	Rock/Brush	09/17/95	02/27/98	Removed large rock from center and added gravel	
				12	Rock/Brush	09/17/95	02/27/98 04/18/00	Removed large rock from center and added gravel Added rock	

Site	Geomorphological Setting	Soil Description	Drainage Type	Checkdam #	Checkdam Type	Original Construction Date	Maintenance Date	Maintenance Work Completed	Status Shading indicates work necessary
							03/20/03	and sand Added rock	
				13	Rock	09/17/95	04/18/00 03/20/03	Piping treatment Added rock	
				14	Rock/Brush	09/17/95	02/27/98 04/18/00	Added small rock Filled piping holes	
				15	Rock/Brush	09/17/95	02/27/98	Removed large rock from center and added gravel	
				16	Rock/Brush	09/17/95	-	-	
				17	Rock/Brush	09/17/95	02/27/98	Added small rock	
				18	Log/Rock/Brush	09/17/95	-	-	
				19	Rock/Brush	09/17/95	02/27/98	Removed large rock from center	
				20	Rock/Brush	09/17/95	02/27/98	Removed large rock from center	
				21	Rock/Brush	09/17/95	02/27/98 10/10/98	Removed large rock from center and added gravel Removed 1 large boulder	Buried by alluvium 03/16/04
				22	Rock/Brush	09/17/95	02/27/98	Removed large rock from center and added gravel	
				23	Rock/Brush	09/17/95	-	-	

Site	Geomorphological Setting	Soil Description	Drainage Type	Checkdam #	Checkdam Type	Original Construction Date	Maintenance Date	Maintenance Work Completed	Status Shading indicates work necessary
				24	Rock/Brush	09/17/95	02/27/98	Lowered center added small rock and gravel	Requires Maintenance 03/16/04
				25	Horseshoe	09/17/95	-	-	
				26	Horseshoe	09/17/95	-	-	
				27	Rock	02/26/98	-	-	
C:13:327	Terrace	Predam Alluvium Silt-sand	Terrace	1	Rock/Brush	02/24/97	11/13/98	Added rock	Obliterated 03/16/04
				2	Headcut	02/24/97	-	-	Obliterated 10/17/00
				3	Water diversion	02/24/97	-	-	
				4	Rock/Brush	10/17/00	-	-	Obliterated 03/16/04
				5	Rock Lining	10/17/00	-	-	
C:13:336	Terrace	Predam Alluvium Fine sand	Terrace	1	Rock	11/12/98	10/16/00	Enlarged	
				2	Rock	11/12/98	10/16/00	Enlarged	
				3	Rock	11/12/98	10/16/00	Enlarged	
				4	Rock	11/12/98	10/16/00	Enlarged	
				5	Rock	11/12/98	10/16/00	Enlarged	
C:13:346	Terrace	Predam Alluvium/Colluvium Sand Capped with cryptogamic soils	Terrace	1	Rock/Brush	02/24/97	11/13/98	Lowered center and built up sides	Requires Maintenance 03/16/04
				2	Rock/Brush	02/24/97	-	-	Requires Maintenance 03/16/04
				3	Headcut	02/24/97	-	-	Requires Maintenance 03/16/04
				4	Rock/Brush	02/24/97	-	-	Requires

Site	Geomorphological Setting	Soil Description	Drainage Type	Checkdam #	Checkdam Type	Original Construction Date	Maintenance Date	Maintenance Work Completed	Status Shading indicates work necessary
									Maintenance 03/16/04
				5	Headcut	02/24/97	-	-	Requires Maintenance 03/16/04
				6	Headcut	02/24/97	-	-	Requires Maintenance 03/16/04
				7	Rock/Brush	02/24/97	11/13/98	Lowered center and built up sides	Requires Maintenance 03/16/04
				8	Rock/Brush	02/24/97	11/13/98	Lowered center and built up sides	Requires Maintenance 03/16/04
				9	Rock/Brush	02/24/97	11/13/98	Lowered center and built up sides	Requires Maintenance 03/16/04
C:13:348	Terrace	Predam Alluvium/Colluvium Sand capped by cryptogamic soils	Terrace	1	Brush Lining	04/16/97	-	-	
				2	Brush Lining	04/16/97	03/21/03	Combined with 4	
				3	Brush Lining	04/16/97	-	-	Requires Maintenance 03/16/04
				4	Brush Lining	04/16/97	03/21/03	Combined with 2	
				5	Brush Lining	04/16/97	-	-	
				6	Brush Lining	03/21/03	-	-	
C:13:359	Terrace on Debris Fan	Predam Alluvium/Colluvium/ Eolian capped by cryptogamic soils	River	1	Rock/Brush	04/17/97	11/14/98	Lowered center and built up sides	
				2	Rock Lining	04/17/97	04/20/00	Plunge pool	

Site	Geomorphological Setting	Soil Description	Drainage Type	Checkdam #	Checkdam Type	Original Construction Date	Maintenance Date	Maintenance Work Completed	Status Shading indicates work necessary
				3	Rock Lining	04/17/97	04/20/00	Plunge pool	
				4	Rock/Brush	04/17/97	04/14/98	Lowered center	
				5	Rock Lining	04/20/00	-	-	Obliterated 03/17/04
C:13:371	Terrace on Debris Fan	Predam Alluvium/Eolian Sand	River	1	Rock/brush	02/17/96	-	-	
				2	Basketweave	02/17/96	11/11/98 04/26/02	Created V Shape Lined N side	
				3	Rock/Brush	02/17/96	-	-	
				4	Rock Lining	02/17/96	-	-	
C:13:381	Terrace on Debris Fan	Predam Alluvium Sand	River	1	Rock Lining	02/25/97	04/24/98 11/14/98 04/20/00	Re-lined breached area Built up sides Extended feature	
				2	Rock Lining	02/25/97	11/14/98 04/20/00	Built up side Added Rock	
				3	Basketweave	02/25/97	-	-	
				4	Rock	10/18/00	03/21/03	Added Rock	
G:03:002	Terrace	Predam Alluvium/Colluvium Eolian Fine Sand capped by cryptogamic soils	River	1	Rock/Brush	04/26/97	04/28/00 10/25/00 03/28/03	Knickpoint Knickpoint Added Rock	
				2	Rock/Brush	04/26/97	04/27/99 04/28/00 10/25/00	Knickpoint Knickpoint Knickpoint	Requires Maintenance 03/23/04
				3	Rock Lining	04/26/97	04/27/99	Obliterated	
				4	Rock Lining	04/26/97	04/27/99	Obliterated	
				5	Rock/Brush	04/26/97	-	-	

Site	Geomorphological Setting	Soil Description	Drainage Type	Checkdam #	Checkdam Type	Original Construction Date	Maintenance Date	Maintenance Work Completed	Status Shading indicates work necessary
					Lining				
				6	Rock Lining	04/26/97	-	-	Requires Maintenance 03/23/04
				7	Rock Lining	04/27/99	-	-	
G:03:003	Terrace	Predam Alluvium/Eolian Sand capped by cryptogamic soils	River	1	Rock/Brush	03/03/96	-	-	
				2	Rock Lining	03/03/96	04/28/99 10/25/00	Plunge pool Combined with #10	
				3	Rock/Brush	03/03/96	04/28/99	Removed large rock from center	
				4	Rock Lining	03/03/96	04/28/99 10/25/00	Knickpoint Added gravel	
				5	Rock Lining	04/26/99	-	-	
				6	Rock Lining	04/26/99	-	-	
				7	Rock Lining	04/26/99	04/28/00	Added rock, Knickpoint treatment	
				8	Knickpoint	04/26/99	04/28/00	Knickpoint	
				9	Knickpoint	04/26/99	-	-	
				10	Rock Lining	04/26/99	10/25/00	Combined with #2	
				11	Rock Lining	04/26/99	-	-	
				12	Rock	04/26/99	10/25/00	Added rock	
				13	Rock Lining	04/26/99	04/28/00	Added rock to center	
				14	Rock Lining	10/25/00	-	-	
				15	Knickpoint	10/25/00	-	-	
				16	Rock/Brush	10/25/00	-	-	
				17	Rock/Brush	03/03/96	-	-	

G:03:024	Terrace	Predam Alluvium/Eolian Sand	Terrace and River	1	Brush Lining	04/26/97	11/21/98 05/04/02	Blown out Rebuilt	Obliterated 03/23/04
				2	Rock Lining	04/26/97	11/21/98	Knickpoint	Obliterated 03/23/04
				3	Brush Lining	04/26/97	11/21/98 10/26/00 05/04/02	Knickpoint Rebuilt Created a V form Combined w/ #16	
				4	Rock Lining	04/26/97	11/21/98 10/26/00 04/28/00	Knickpoint Blown out/rebuilt Knickpoint Combined W/ #17	Requires Maintenance 03/23/04
				5	Rock Lining	04/26/97	11/21/98	Added rock	
				6	Rock Lining	11/21/98	10/25/00	Obliterated	
				7	Rock Lining	11/21/98	11/21/98	Obliterated	
				8	Rock Lining	11/21/98	11/21/98	Obliterated	
				9	Rock Lining	11/21/98	11/21/98	Obliterated	
				10	Rock Lining	11/21/98	04/28/00 10/25/00 05/04/02	Knickpoint Rebuilt 10/11/15 Plunge pool	
				11	Rock Lining	11/21/98	04/28/00 10/25/00 05/04/02	Knickpoint Rebuilt 10/11/15 Plunge pool	
				12	Rock	11/21/98	10/25/00	Rebuilt	
				13	Rock	11/21/98	10/25/00	Rebuilt	
				14	Rock	11/21/98	04/28/00 10/25/00 05/04/02	Headcut Headcut Fill voids w/rock	
				15	Rock Lining	04/28/00	10/25/00 05/04/02	Combined 10/11/15 Plunge pool	

				16	Brush Lining	04/28//00	05/04/02	Combined w/17	
				17	Rock Lining	04/28/00	05/04/02	Combined w/16	
				18	Rock	10/26/00	-	-	
G:03:025	Terrace	Predam Alluvium/Eolian Fine-grained sand	River	1	Basketweave	03/02/96	04/25/97 11/21/98 10/25/00	Alteration Added Gravel Headcut	
				2	Horseshoe	03/02/96	11/21/98 04/28/00 10/25/00	Added gravel Knickpoint Added rock and gravel	
				3	Rock/Brush	03/02/96	10/25/00	Built up sides	
				4	Headcut	10/25/00	-	-	
G:03:026	Terrace on Debris Fan	Predam Alluvium/Colluvium Eolian Sand	Terrace	1	Rock/Brush	03/03/96	10/25/00	Rearranged rock	
				2	Rock	03/03/96	04/25/97 04/26/99 10/25/00 05/04/02	Added gravel Added gravel and lowered center Added rock/gravel Added rock	
				3	Rock/Brush	03/03/96	04/25/97 04/26/99 10/25/00	Added gravel Added gravel and lowered center Added rock/gravel	
				4	Rock Lining	03/03/96	04/25/97 04/26/99 10/25/00	Added gravel Added gravel and lowered center Added rock/gravel	
				5	Rock Lining	03/03/96	04/25/97 04/26/99	Added gravel Added gravel & moved	

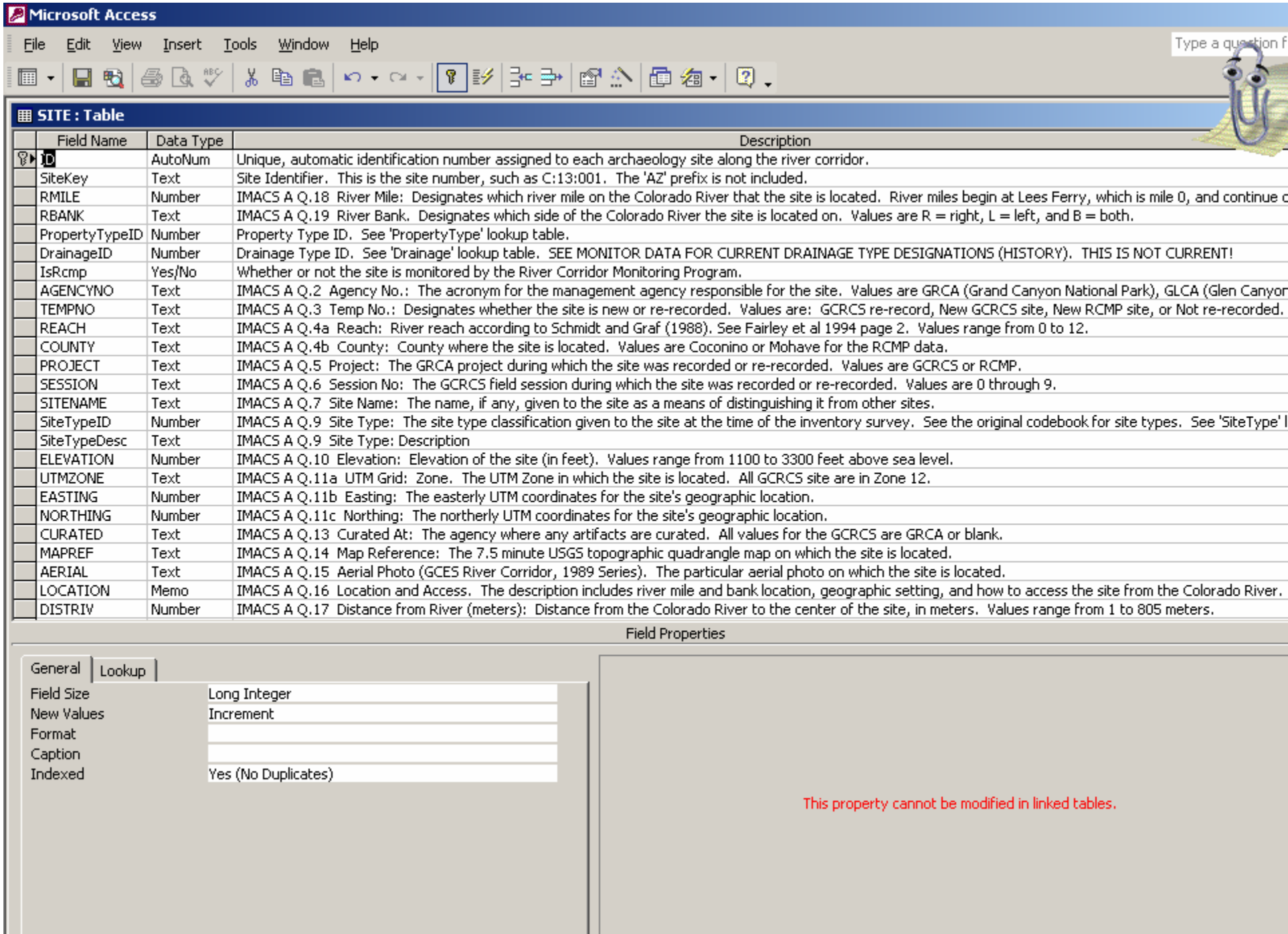
							10/25/00	large rock to sides Added rock/gravel	
				6	Knickpoint	04/26/99	-	-	
G:03:038	Terrace	Predam Alluvium/Eolian Sand	River	1	Brush Lining	04/24/97	11/20/98	Obliterated	
				2	Brush Lining	04/24/97	11/20/98	Obliterated	
				3	Brush Lining	04/24/97	11/20/98	Obliterated	
				4	Rock	04/24/97	11/20/98	Obliterated	
				5	Brush Lining	04/24/97	11/20/98	Obliterated	
				6	Rock	04/24/97	11/20/98	Obliterated	
				7	Rock	11/20/98	10/24/00	Obliterated	
				8	Rock	11/20/98	10/24/00	Obliterated	
				9	Rock	11/20/98	10/24/00	Obliterated	
				10	Plunge pool	11/20/98	10/24/00	Obliterated	
				11	Rock	11/20/98	10/24/00	Obliterated	
				12	Rock	11/20/98	10/24/00	Obliterated	
				13	Rock	11/20/98	10/24/00	Obliterated	
				14	Rock	11/20/98	04/26/00 10/24/00	Added rock Obliterated	
				15	Rock	11/20/98	04/26/00 10/24/00	Relined bed Obliterated	
				16	Rock	11/20/98	04/26/00 10/24/00	Added Rock Obliterated	
				17	Rock	11/20/98	04/26/00 10/24/00	Added Rock Obliterated	
				18	Rock Lining	11/20/98	04/26/00 10/24/00	Knickpoint Obliterated	
G:03:040	Terrace	Predam Alluvium/Eolian Fine grained sand capped by cryptogamic soils	Terrace	1	Rock/Brush	04/25/97	04/28/00	Obliterated	
				2	Rock Lining	04/25/97	04/28/00	Obliterated	
				3	Brush Lining	04/25/97	-	-	
				4	Brush Lining	04/25/97	-	-	

G:03:041	Terrace	Predam Alluvium/Colluvium Eolian Sand-silt & cryptogamic soils	River	1	Rock/Brush	04/25/97	11/21/98	Added gravel	Requires Maintenance 03/23/04
				2	Rock/Brush	04/25/97	-	-	
				3	Rock	04/25/97	04/28/00	Added rock	
				4	Rock	11/21/98	04/28/00	Added rock armored sides	Obliterated 03/23/04
				5	Rock Lining	11/21/98	-	-	Buried 03/23/04
				6	Rock Lining	11/21/98	10/25/00	Obliterated and rebuilt	Requires Maintenance 03/23/04
				7	Rock Lining	11/21/98	10/25/00	Obliterated and rebuilt	Obliterated 03/23/04
				8	Rock Lining	11/21/98	10/25/00	Obliterated and rebuilt	
				9	Rock	11/21/98	10/25/00	Obliterated	
G:03:058	Terrace	Predam Alluvium/Eolian Fine-grained sand	Terrace	1	Rock Lining	03/04/97	11/22/98 04/29/00	Added rock Added rock	
				2	Rock/Brush	03/04/97	-	-	
				3	Rock Lining	11/22/98	04/29/00	Added rock	
				4	Rock	11/22/98	04/29/00	Rebuilt	
				5	Rock Lining	11/22/98	04/29/00	Rebuilt	
				6	Rock Lining	11/22/98	04/29/00	Extended	
				7	Knickpoint	04/29/00	-	-	
				8	Knickpoint	04/29/00	-	-	
				9	Knickpoint	04/29/00	-	-	
G:03:072	Terrace on Debris Fan	Predam Alluvium/Eolian Sand capped by cryptogamic soils	River	1	Rock/Brush	03/05/97	-	-	Requires Maintenance 03/24/04
				2	Rock Lining	03/05/97	-	-	
				3	Rock/Brush	03/05/97	-	-	Requires Maintenance

									03/24/04
				4	Rock/Brush	03/05/97	-	-	Requires Maintenance 03/24/04
				5	Rock/Brush	03/05/97	-	-	Requires Maintenance 03/24/04
				6	Rock/Brush	03/05/97	-	-	Requires Maintenance 03/24/04
				7	Rock/Brush	03/05/97	-	-	
				8	Rock/Brush	03/05/97	-	-	
				9	Rock Lining	03/05/97	04/29/00	Added gravel	
				10	Rock/Brush	03/05/97	-	-	
				11	Rock Lining	03/05/97	11/22/98	Obliterated	
				12	Rock Lining	03/05/97	11/22/98	Obliterated	
				13	Rock Lining	03/05/97	11/22/98	Obliterated	
				14	Rock/Brush	03/05/97	-	-	Obliterated 03/24/04
				15	Knickpoint	03/05/97	11/22/98	Added rock and gravel	
				16	Knickpoint	11/22/98	04/29/00 10/26/00	Added rock Added rock	

APPENDIX C

MICROSOFT ACCESS DATABASE “SITE” TABLE DESIGN



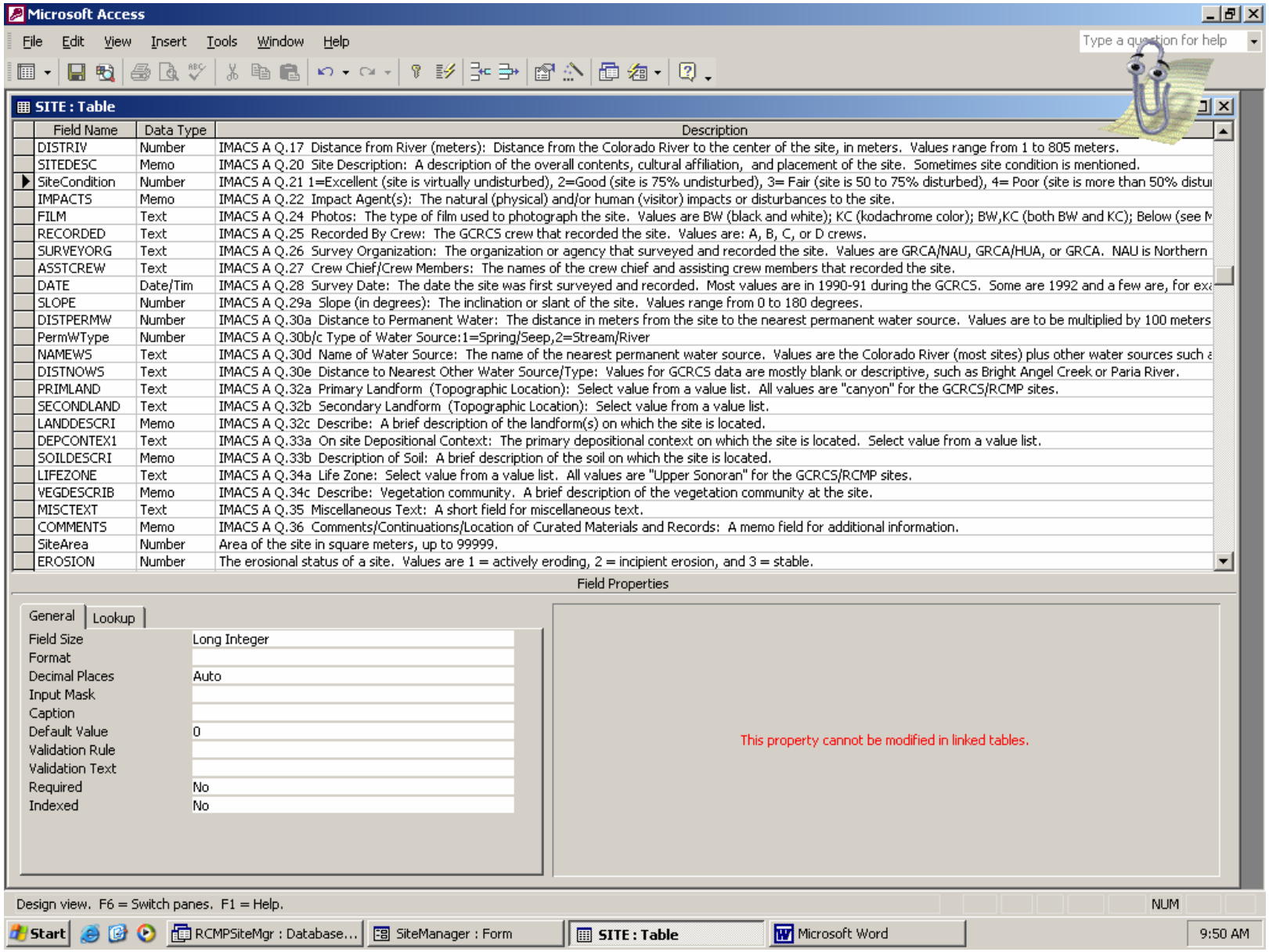
Field Name	Data Type	Description
ID	AutoNum	Unique, automatic identification number assigned to each archaeology site along the river corridor.
SiteKey	Text	Site Identifier. This is the site number, such as C:13:001. The 'AZ' prefix is not included.
RMILE	Number	IMACS A Q.18 River Mile: Designates which river mile on the Colorado River that the site is located. River miles begin at Lees Ferry, which is mile 0, and continue c
RBANK	Text	IMACS A Q.19 River Bank. Designates which side of the Colorado River the site is located on. Values are R = right, L = left, and B = both.
PropertyTypeID	Number	Property Type ID. See 'PropertyType' lookup table.
DrainageID	Number	Drainage Type ID. See 'Drainage' lookup table. SEE MONITOR DATA FOR CURRENT DRAINAGE TYPE DESIGNATIONS (HISTORY). THIS IS NOT CURRENT!
IsRcmp	Yes/No	Whether or not the site is monitored by the River Corridor Monitoring Program.
AGENCYNO	Text	IMACS A Q.2 Agency No.: The acronym for the management agency responsible for the site. Values are GRCA (Grand Canyon National Park), GLCA (Glen Canyor
TEMPNO	Text	IMACS A Q.3 Temp No.: Designates whether the site is new or re-recorded. Values are: GCRCS re-record, New GCRCS site, New RCMP site, or Not re-recorded.
REACH	Text	IMACS A Q.4a Reach: River reach according to Schmidt and Graf (1988). See Fairley et al 1994 page 2. Values range from 0 to 12.
COUNTY	Text	IMACS A Q.4b County: County where the site is located. Values are Coconino or Mohave for the RCMP data.
PROJECT	Text	IMACS A Q.5 Project: The GRCA project during which the site was recorded or re-recorded. Values are GCRCS or RCMP.
SESSION	Text	IMACS A Q.6 Session No: The GCRCS field session during which the site was recorded or re-recorded. Values are 0 through 9.
SITENAME	Text	IMACS A Q.7 Site Name: The name, if any, given to the site as a means of distinguishing it from other sites.
SiteTypeID	Number	IMACS A Q.9 Site Type: The site type classification given to the site at the time of the inventory survey. See the original codebook for site types. See 'SiteType' l
SiteTypeDesc	Text	IMACS A Q.9 Site Type: Description
ELEVATION	Number	IMACS A Q.10 Elevation: Elevation of the site (in feet). Values range from 1100 to 3300 feet above sea level.
UTMZONE	Text	IMACS A Q.11a UTM Grid: Zone. The UTM Zone in which the site is located. All GCRCS site are in Zone 12.
EASTING	Number	IMACS A Q.11b Easting: The easterly UTM coordinates for the site's geographic location.
NORTHING	Number	IMACS A Q.11c Northing: The northerly UTM coordinates for the site's geographic location.
CURATED	Text	IMACS A Q.13 Curated At: The agency where any artifacts are curated. All values for the GCRCS are GRCA or blank.
MAPREF	Text	IMACS A Q.14 Map Reference: The 7.5 minute USGS topographic quadrangle map on which the site is located.
AERIAL	Text	IMACS A Q.15 Aerial Photo (GCES River Corridor, 1989 Series). The particular aerial photo on which the site is located.
LOCATION	Memo	IMACS A Q.16 Location and Access. The description includes river mile and bank location, geographic setting, and how to access the site from the Colorado River.
DISTRIV	Number	IMACS A Q.17 Distance from River (meters): Distance from the Colorado River to the center of the site, in meters. Values range from 1 to 805 meters.

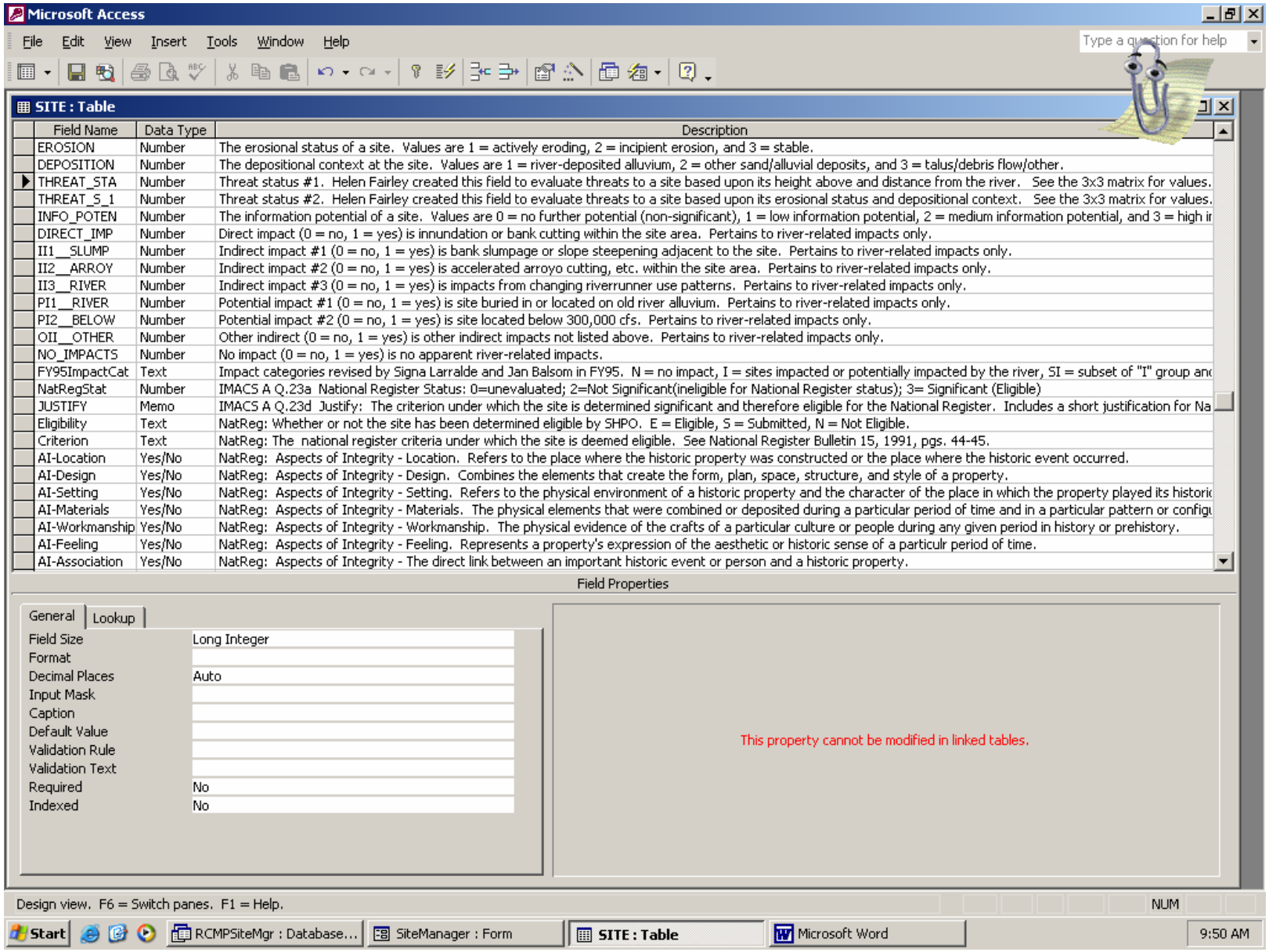
Field Properties

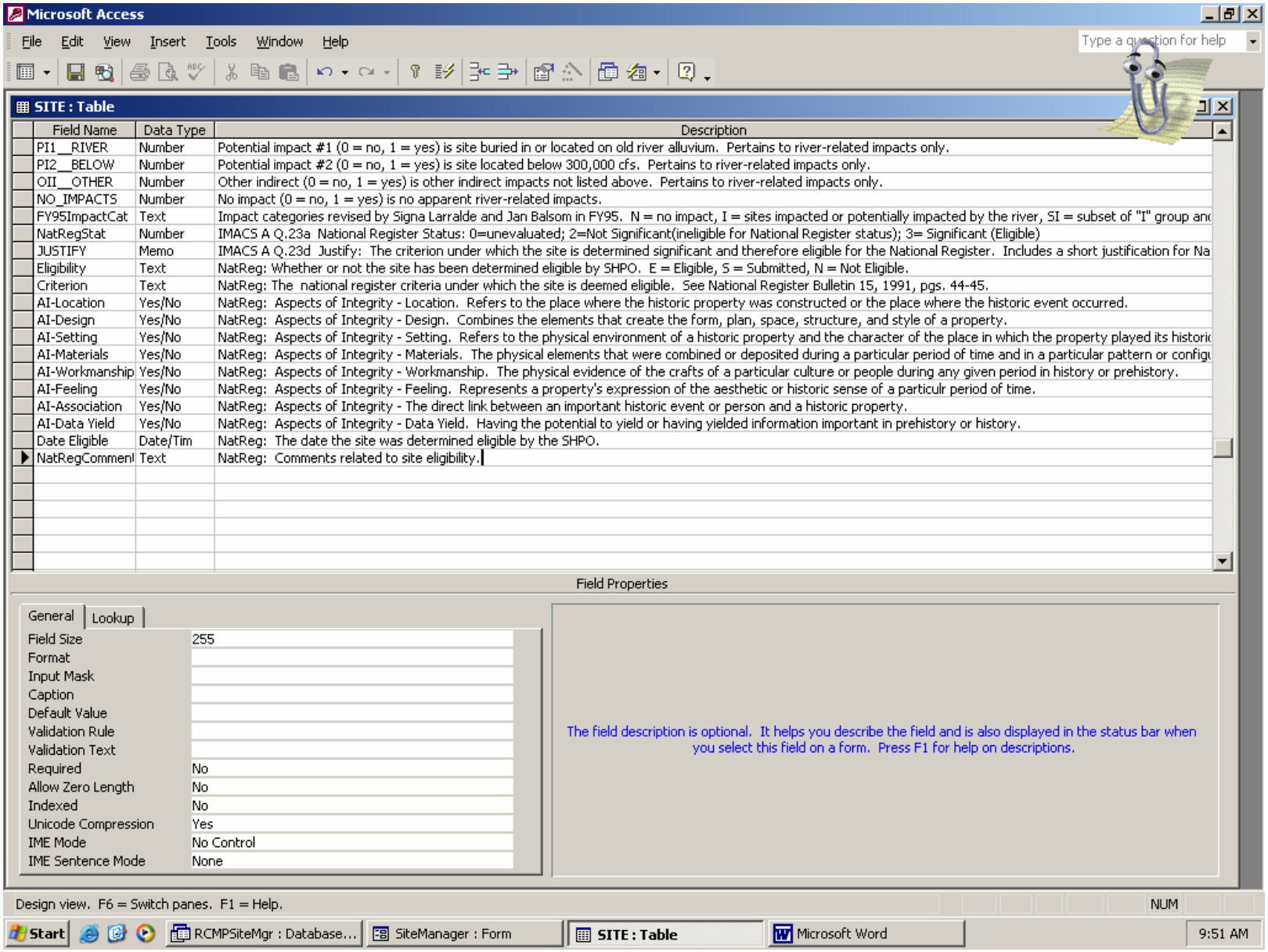
General | Lookup

Field Size	Long Integer
New Values	Increment
Format	
Caption	
Indexed	Yes (No Duplicates)

This property cannot be modified in linked tables.

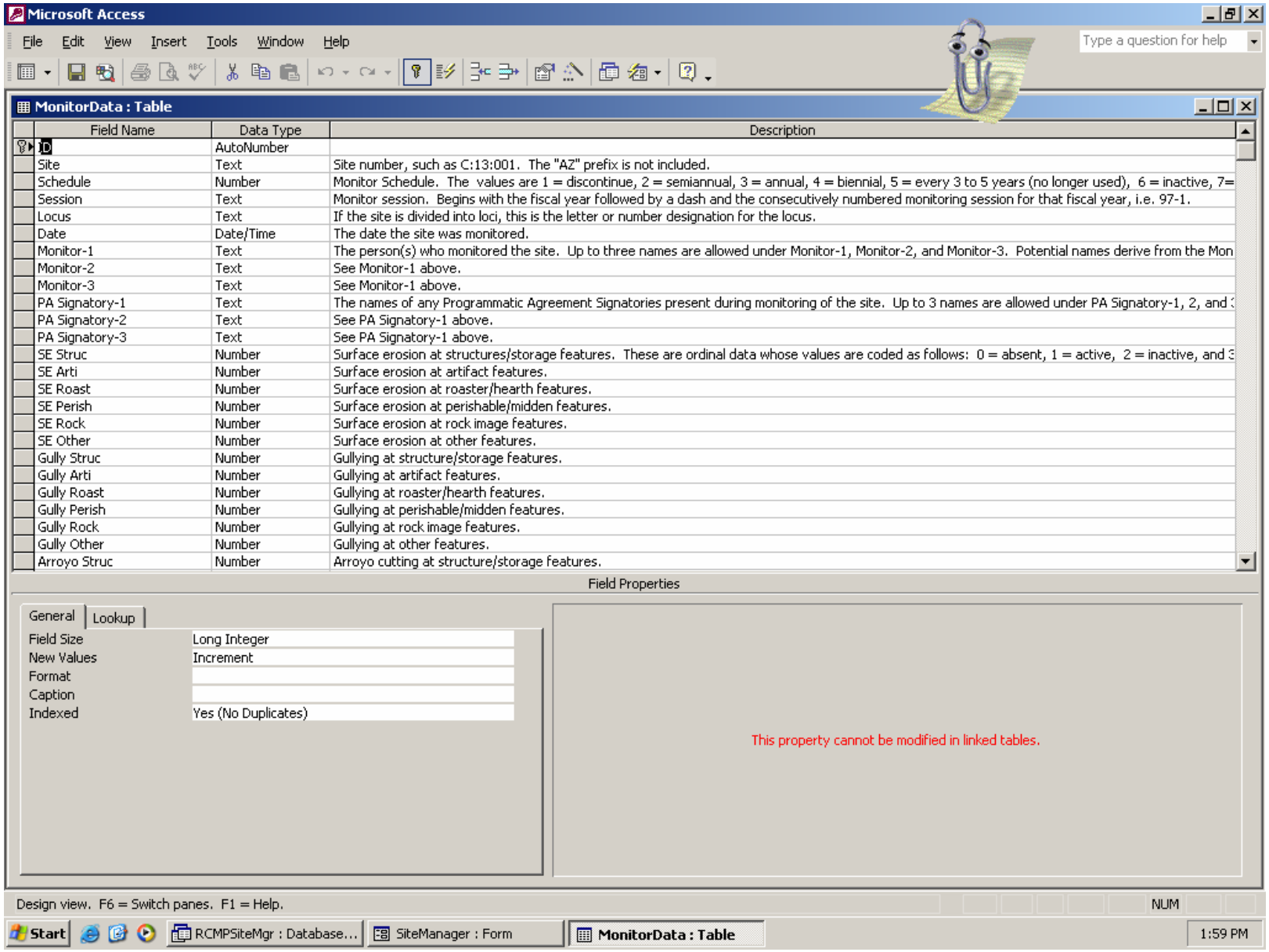

Microsoft Access
File Edit View Insert Tools Window Help
Type a question for help
SITE : Table
Field Name | Data Type | Description
DISTRIV | Number | IMACS A Q.17 Distance from River (meters): Distance from the Colorado River to the center of the site, in meters. Values range from 1 to 805 meters.
SITEDESC | Memo | IMACS A Q.20 Site Description: A description of the overall contents, cultural affiliation, and placement of the site. Sometimes site condition is mentioned.
SiteCondition | Number | IMACS A Q.21 1=Excellent (site is virtually undisturbed), 2=Good (site is 75% undisturbed), 3= Fair (site is 50 to 75% disturbed), 4= Poor (site is more than 50% distu
IMPACTS | Memo | IMACS A Q.22 Impact Agent(s): The natural (physical) and/or human (visitor) impacts or disturbances to the site.
FILM | Text | IMACS A Q.24 Photos: The type of film used to photograph the site. Values are BW (black and white); KC (kodachrome color); BW,KC (both BW and KC); Below (see M
RECORDED | Text | IMACS A Q.25 Recorded By Crew: The GCRCS crew that recorded the site. Values are: A, B, C, or D crews.
SURVEYORG | Text | IMACS A Q.26 Survey Organization: The organization or agency that surveyed and recorded the site. Values are GRCA/NAU, GRCA/HUA, or GRCA. NAU is Northern
ASSTCREW | Text | IMACS A Q.27 Crew Chief/Crew Members: The names of the crew chief and assisting crew members that recorded the site.
DATE | Date/Tim | IMACS A Q.28 Survey Date: The date the site was first surveyed and recorded. Most values are in 1990-91 during the GCRCS. Some are 1992 and a few are, for exa
SLOPE | Number | IMACS A Q.29a Slope (in degrees): The inclination or slant of the site. Values range from 0 to 180 degrees.
DISTPERMW | Number | IMACS A Q.30a Distance to Permanent Water: The distance in meters from the site to the nearest permanent water source. Values are to be multiplied by 100 meters
PermWType | Number | IMACS A Q.30b/c Type of Water Source:1=Spring/Seep,2=Stream/River
NAMEWS | Text | IMACS A Q.30d Name of Water Source: The name of the nearest permanent water source. Values are the Colorado River (most sites) plus other water sources such a
DISTNOWS | Text | IMACS A Q.30e Distance to Nearest Other Water Source/Type: Values for GCRCS data are mostly blank or descriptive, such as Bright Angel Creek or Paria River.
PRIMLAND | Text | IMACS A Q.32a Primary Landform (Topographic Location): Select value from a value list. All values are "canyon" for the GCRCS/RCMP sites.
SECONDLAND | Text | IMACS A Q.32b Secondary Landform (Topographic Location): Select value from a value list.
LANDDESCRI | Memo | IMACS A Q.32c Describe: A brief description of the landform(s) on which the site is located.
DEPCONTEX1 | Text | IMACS A Q.33a On site Depositional Context: The primary depositional context on which the site is located. Select value from a value list.
SOILDESCRI | Memo | IMACS A Q.33b Description of Soil: A brief description of the soil on which the site is located.
LIFEZONE | Text | IMACS A Q.34a Life Zone: Select value from a value list. All values are "Upper Sonoran" for the GCRCS/RCMP sites.
VEGDESCRIB | Memo | IMACS A Q.34c Describe: Vegetation community. A brief description of the vegetation community at the site.
MISCTEXT | Text | IMACS A Q.35 Miscellaneous Text: A short field for miscellaneous text.
COMMENTS | Memo | IMACS A Q.36 Comments/Continuations/Location of Curated Materials and Records: A memo field for additional information.
SiteArea | Number | Area of the site in square meters, up to 99999.
EROSION | Number | The erosional status of a site. Values are 1 = actively eroding, 2 = incipient erosion, and 3 = stable.
Field Properties
General Lookup
Field Size Long Integer
Format
Decimal Places Auto
Input Mask
Caption
Default Value 0
Validation Rule
Validation Text
Required No
Indexed No
This property cannot be modified in linked tables.
Design view. F6 = Switch panes. F1 = Help.
NUM
Start
RCMPSiteMgr : Database...
SiteManager : Form
SITE : Table
Microsoft Word
9:50 AM

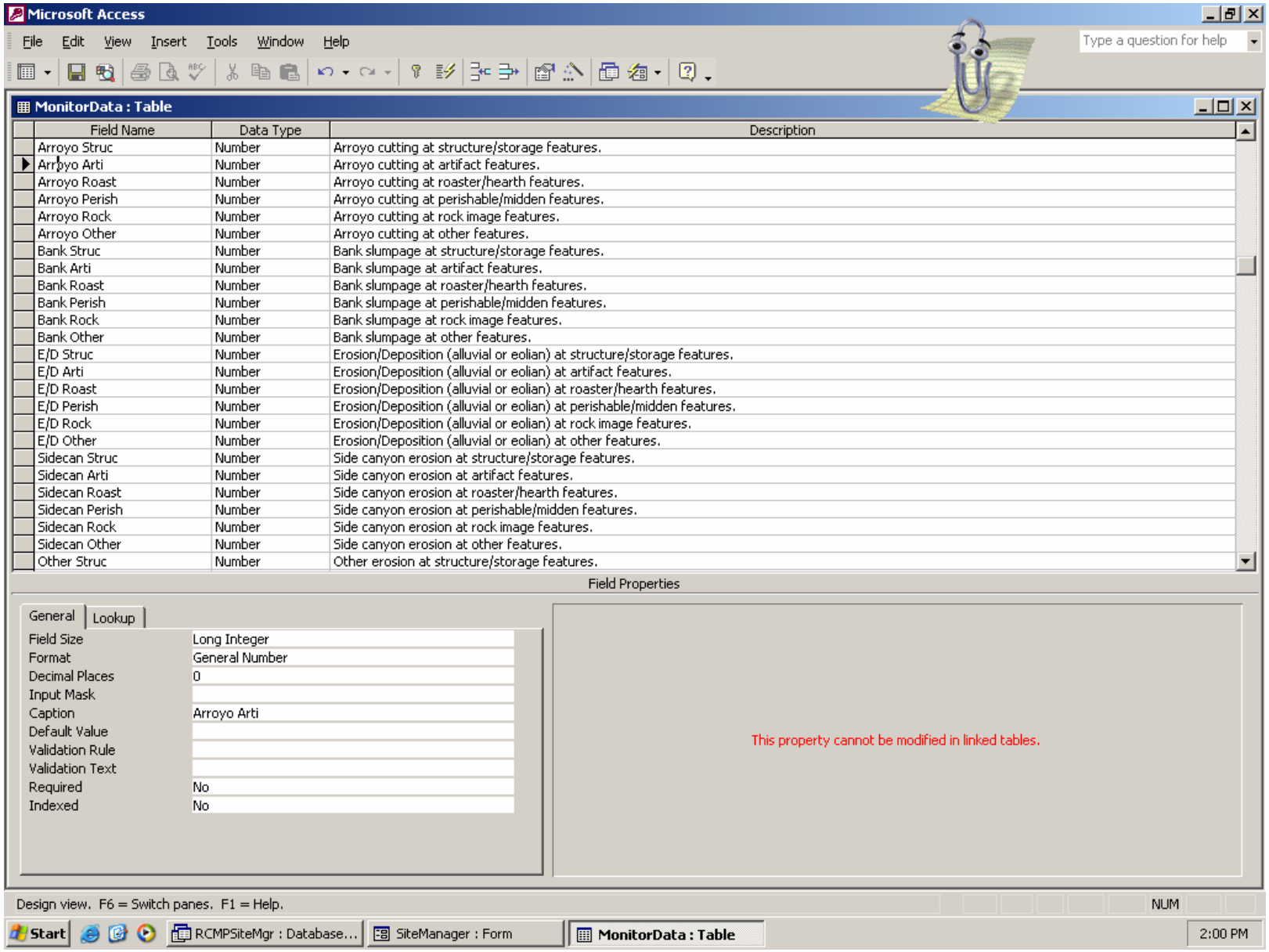

Microsoft Access
File Edit View Insert Tools Window Help
Type a question for help
SITE : Table
Field Name | Data Type | Description
EROSION | Number | The erosional status of a site. Values are 1 = actively eroding, 2 = incipient erosion, and 3 = stable.
DEPOSITION | Number | The depositional context at the site. Values are 1 = river-deposited alluvium, 2 = other sand/alluvial deposits, and 3 = talus/debris flow/other.
THREAT_STA | Number | Threat status #1. Helen Fairley created this field to evaluate threats to a site based upon its height above and distance from the river. See the 3x3 matrix for values.
THREAT_S_1 | Number | Threat status #2. Helen Fairley created this field to evaluate threats to a site based upon its erosional status and depositional context. See the 3x3 matrix for values.
INFO_POTEN | Number | The information potential of a site. Values are 0 = no further potential (non-significant), 1 = low information potential, 2 = medium information potential, and 3 = high ir
DIRECT_IMP | Number | Direct impact (0 = no, 1 = yes) is innundation or bank cutting within the site area. Pertains to river-related impacts only.
II1__SLUMP | Number | Indirect impact #1 (0 = no, 1 = yes) is bank slumpage or slope steepening adjacent to the site. Pertains to river-related impacts only.
II2__ARROY | Number | Indirect impact #2 (0 = no, 1 = yes) is accelerated arroyo cutting, etc. within the site area. Pertains to river-related impacts only.
II3__RIVER | Number | Indirect impact #3 (0 = no, 1 = yes) is impacts from changing riverrunner use patterns. Pertains to river-related impacts only.
PI1__RIVER | Number | Potential impact #1 (0 = no, 1 = yes) is site buried in or located on old river alluvium. Pertains to river-related impacts only.
PI2__BELOW | Number | Potential impact #2 (0 = no, 1 = yes) is site located below 300,000 cfs. Pertains to river-related impacts only.
OII__OTHER | Number | Other indirect (0 = no, 1 = yes) is other indirect impacts not listed above. Pertains to river-related impacts only.
NO_IMPACTS | Number | No impact (0 = no, 1 = yes) is no apparent river-related impacts.
FY95ImpactCat | Text | Impact categories revised by Signa Larralde and Jan Balsom in FY95. N = no impact, I = sites impacted or potentially impacted by the river, SI = subset of "I" group an
NatRegStat | Number | IMACS A Q.23a National Register Status: 0=unevaluated; 2=Not Significant(ineligible for National Register status); 3= Significant (Eligible)
JUSTIFY | Memo | IMACS A Q.23d Justify: The criterion under which the site is determined significant and therefore eligible for the National Register. Includes a short justification for Na
Eligibility | Text | NatReg: Whether or not the site has been determined eligible by SHPO. E = Eligible, S = Submitted, N = Not Eligible.
Criterion | Text | NatReg: The national register criteria under which the site is deemed eligible. See National Register Bulletin 15, 1991, pgs. 44-45.
AI-Location | Yes/No | NatReg: Aspects of Integrity - Location. Refers to the place where the historic property was constructed or the place where the historic event occurred.
AI-Design | Yes/No | NatReg: Aspects of Integrity - Design. Combines the elements that create the form, plan, space, structure, and style of a property.
AI-Setting | Yes/No | NatReg: Aspects of Integrity - Setting. Refers to the physical environment of a historic property and the character of the place in which the property played its historic
AI-Materials | Yes/No | NatReg: Aspects of Integrity - Materials. The physical elements that were combined or deposited during a particular period of time and in a particular pattern or configu
AI-Workmanship | Yes/No | NatReg: Aspects of Integrity - Workmanship. The physical evidence of the crafts of a particular culture or people during any given period in history or prehistory.
AI-Feeling | Yes/No | NatReg: Aspects of Integrity - Feeling. Represents a property's expression of the aesthetic or historic sense of a particulr period of time.
AI-Association | Yes/No | NatReg: Aspects of Integrity - The direct link between an important historic event or person and a historic property.
Field Properties
General Lookup
Field Size Long Integer
Format
Decimal Places Auto
Input Mask
Caption
Default Value
Validation Rule
Validation Text
Required No
Indexed No
This property cannot be modified in linked tables.
Design view. F6 = Switch panes. F1 = Help.
NUM
Start
RCMPSiteMgr : Database...
SiteManager : Form
SITE : Table
Microsoft Word
9:50 AM

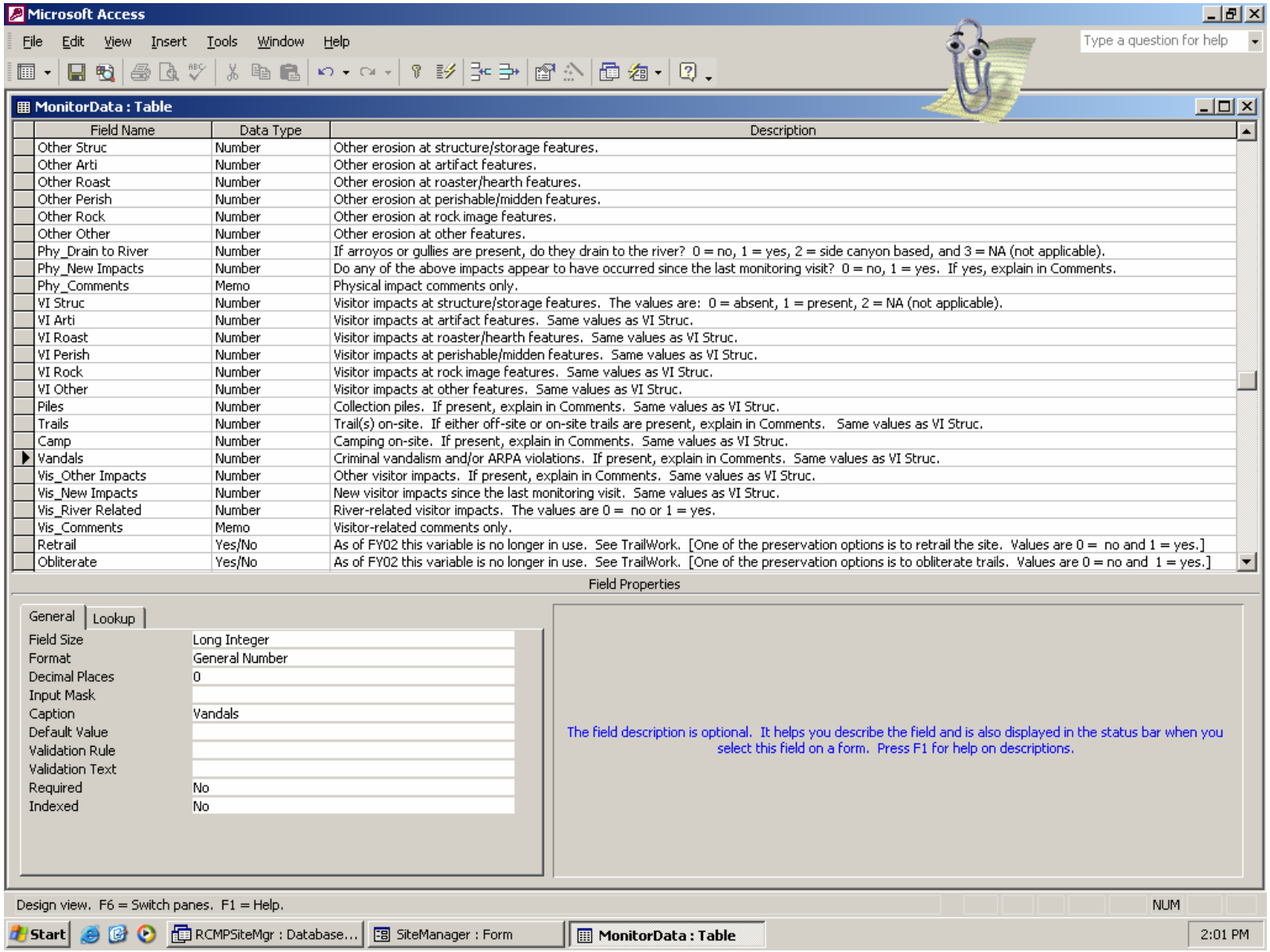

Microsoft Access
File Edit View Insert Tools Window Help
Type a question for help
SITE : Table
Field Name | Data Type | Description
PI1__RIVER | Number | Potential impact #1 (0 = no, 1 = yes) is site buried in or located on old river alluvium. Pertains to river-related impacts only.
PI2__BELOW | Number | Potential impact #2 (0 = no, 1 = yes) is site located below 300,000 cfs. Pertains to river-related impacts only.
OII__OTHER | Number | Other indirect (0 = no, 1 = yes) is other indirect impacts not listed above. Pertains to river-related impacts only.
NO_IMPACTS | Number | No impact (0 = no, 1 = yes) is no apparent river-related impacts.
FY95ImpactCat | Text | Impact categories revised by Signa Larralde and Jan Balsom in FY95. N = no impact, I = sites impacted or potentially impacted by the river, SI = subset of "I" group an
NatRegStat | Number | IMACS A Q.23a National Register Status: 0=unevaluated; 2=Not Significant(ineligible for National Register status); 3= Significant (Eligible)
JUSTIFY | Memo | IMACS A Q.23d Justify: The criterion under which the site is determined significant and therefore eligible for the National Register. Includes a short justification for Na
Eligibility | Text | NatReg: Whether or not the site has been determined eligible by SHPO. E = Eligible, S = Submitted, N = Not Eligible.
Criterion | Text | NatReg: The national register criteria under which the site is deemed eligible. See National Register Bulletin 15, 1991, pgs. 44-45.
AI-Location | Yes/No | NatReg: Aspects of Integrity - Location. Refers to the place where the historic property was constructed or the place where the historic event occurred.
AI-Design | Yes/No | NatReg: Aspects of Integrity - Design. Combines the elements that create the form, plan, space, structure, and style of a property.
AI-Setting | Yes/No | NatReg: Aspects of Integrity - Setting. Refers to the physical environment of a historic property and the character of the place in which the property played its historic
AI-Materials | Yes/No | NatReg: Aspects of Integrity - Materials. The physical elements that were combined or deposited during a particular period of time and in a particular pattern or config
AI-Workmanship | Yes/No | NatReg: Aspects of Integrity - Workmanship. The physical evidence of the crafts of a particular culture or people during any given period in history or prehistory.
AI-Feeling | Yes/No | NatReg: Aspects of Integrity - Feeling. Represents a property's expression of the aesthetic or historic sense of a particulr period of time.
AI-Association | Yes/No | NatReg: Aspects of Integrity - The direct link between an important historic event or person and a historic property.
AI-Data Yield | Yes/No | NatReg: Aspects of Integrity - Data Yield. Having the potential to yield or having yielded information important in prehistory or history.
Date Eligible | Date/Tim | NatReg: The date the site was determined eligible by the SHPO.
NatRegCommenl | Text | NatReg: Comments related to site eligibility.
Field Properties
General Lookup
Field Size 255
Format
Input Mask
Caption
Default Value
Validation Rule
Validation Text
Required No
Allow Zero Length No
Indexed No
Unicode Compression Yes
IME Mode No Control
IME Sentence Mode None
The field description is optional. It helps you describe the field and is also displayed in the status bar when you select this field on a form. Press F1 for help on descriptions.
Design view. F6 = Switch panes. F1 = Help.
NUM
Start
RCMPSiteMgr : Database...
SiteManager : Form
SITE : Table
Microsoft Word
9:51 AM

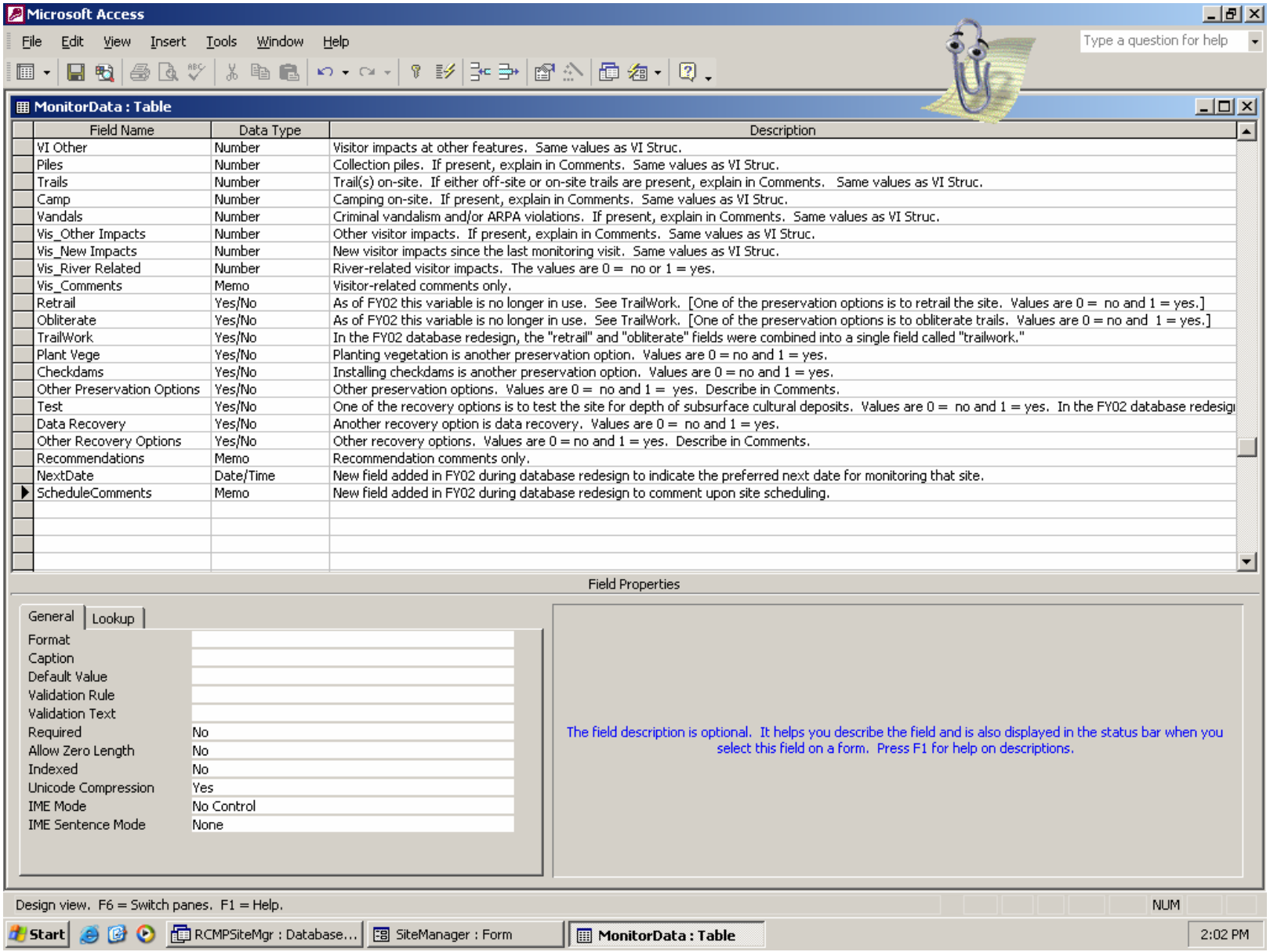
APPENDIX D

MICROSOFT ACCESS DATABASE “MONITOR DATA” TABLE DESIGN


Microsoft Access
File Edit View Insert Tools Window Help
Type a question for help
MonitorData : Table
Field Name | Data Type | Description
ID | AutoNumber |
Site | Text | Site number, such as C:13:001. The "AZ" prefix is not included.
Schedule | Number | Monitor Schedule. The values are 1 = discontinue, 2 = semiannual, 3 = annual, 4 = biennial, 5 = every 3 to 5 years (no longer used), 6 = inactive, 7=
Session | Text | Monitor session. Begins with the fiscal year followed by a dash and the consecutively numbered monitoring session for that fiscal year, i.e. 97-1.
Locus | Text | If the site is divided into loci, this is the letter or number designation for the locus.
Date | Date/Time | The date the site was monitored.
Monitor-1 | Text | The person(s) who monitored the site. Up to three names are allowed under Monitor-1, Monitor-2, and Monitor-3. Potential names derive from the Mon
Monitor-2 | Text | See Monitor-1 above.
Monitor-3 | Text | See Monitor-1 above.
PA Signatory-1 | Text | The names of any Programmatic Agreement Signatories present during monitoring of the site. Up to 3 names are allowed under PA Signatory-1, 2, and
PA Signatory-2 | Text | See PA Signatory-1 above.
PA Signatory-3 | Text | See PA Signatory-1 above.
SE Struc | Number | Surface erosion at structures/storage features. These are ordinal data whose values are coded as follows: 0 = absent, 1 = active, 2 = inactive, and
SE Arti | Number | Surface erosion at artifact features.
SE Roast | Number | Surface erosion at roaster/hearth features.
SE Perish | Number | Surface erosion at perishable/midden features.
SE Rock | Number | Surface erosion at rock image features.
SE Other | Number | Surface erosion at other features.
Gully Struc | Number | Gullying at structure/storage features.
Gully Arti | Number | Gullying at artifact features.
Gully Roast | Number | Gullying at roaster/hearth features.
Gully Perish | Number | Gullying at perishable/midden features.
Gully Rock | Number | Gullying at rock image features.
Gully Other | Number | Gullying at other features.
Arroyo Struc | Number | Arroyo cutting at structure/storage features.
Field Properties
General Lookup
Field Size Long Integer
New Values Increment
Format
Caption
Indexed Yes (No Duplicates)
This property cannot be modified in linked tables.
Design view. F6 = Switch panes. F1 = Help.
NUM
Start
RCMPSiteMgr : Database...
SiteManager : Form
MonitorData : Table
1:59 PM

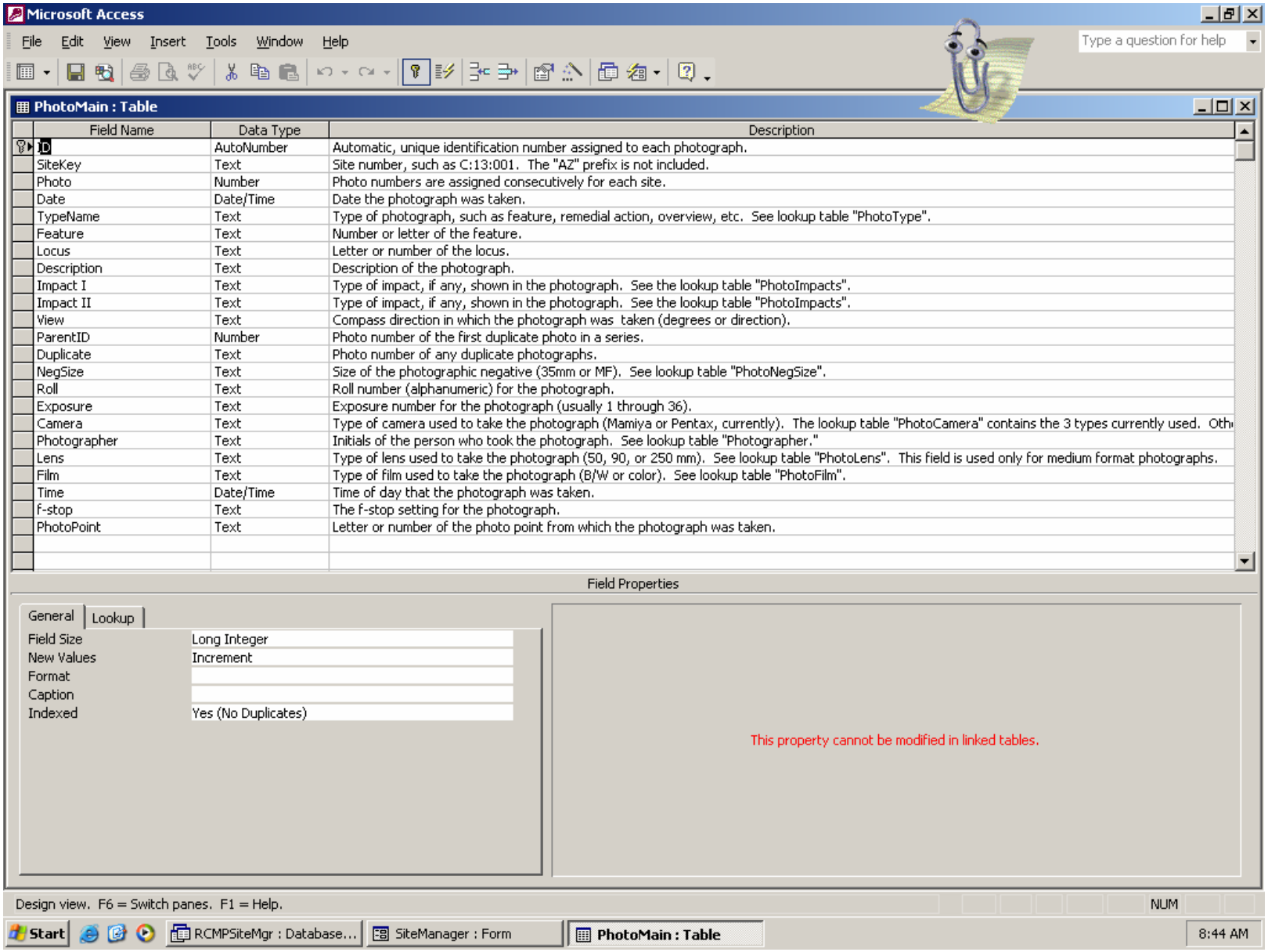

Microsoft Access
File Edit View Insert Tools Window Help
Type a question for help
MonitorData : Table
Field Name | Data Type | Description
Arroyo Struc | Number | Arroyo cutting at structure/storage features.
Arroyo Arti | Number | Arroyo cutting at artifact features.
Arroyo Roast | Number | Arroyo cutting at roaster/hearth features.
Arroyo Perish | Number | Arroyo cutting at perishable/midden features.
Arroyo Rock | Number | Arroyo cutting at rock image features.
Arroyo Other | Number | Arroyo cutting at other features.
Bank Struc | Number | Bank slumpage at structure/storage features.
Bank Arti | Number | Bank slumpage at artifact features.
Bank Roast | Number | Bank slumpage at roaster/hearth features.
Bank Perish | Number | Bank slumpage at perishable/midden features.
Bank Rock | Number | Bank slumpage at rock image features.
Bank Other | Number | Bank slumpage at other features.
E/D Struc | Number | Erosion/Deposition (alluvial or eolian) at structure/storage features.
E/D Arti | Number | Erosion/Deposition (alluvial or eolian) at artifact features.
E/D Roast | Number | Erosion/Deposition (alluvial or eolian) at roaster/hearth features.
E/D Perish | Number | Erosion/Deposition (alluvial or eolian) at perishable/midden features.
E/D Rock | Number | Erosion/Deposition (alluvial or eolian) at rock image features.
E/D Other | Number | Erosion/Deposition (alluvial or eolian) at other features.
Sidecan Struc | Number | Side canyon erosion at structure/storage features.
Sidecan Arti | Number | Side canyon erosion at artifact features.
Sidecan Roast | Number | Side canyon erosion at roaster/hearth features.
Sidecan Perish | Number | Side canyon erosion at perishable/midden features.
Sidecan Rock | Number | Side canyon erosion at rock image features.
Sidecan Other | Number | Side canyon erosion at other features.
Other Struc | Number | Other erosion at structure/storage features.
Field Properties
General Lookup
Field Size Long Integer
Format General Number
Decimal Places 0
Input Mask
Caption Arroyo Arti
Default Value
Validation Rule
Validation Text
Required No
Indexed No
This property cannot be modified in linked tables.
Design view. F6 = Switch panes. F1 = Help.
NUM
Start
RCMPSiteMgr : Database...
SiteManager : Form
MonitorData : Table
2:00 PM


Microsoft Access
File Edit View Insert Tools Window Help
Type a question for help
MonitorData : Table
Field Name | Data Type | Description
Other Struc | Number | Other erosion at structure/storage features.
Other Arti | Number | Other erosion at artifact features.
Other Roast | Number | Other erosion at roaster/hearth features.
Other Perish | Number | Other erosion at perishable/midden features.
Other Rock | Number | Other erosion at rock image features.
Other Other | Number | Other erosion at other features.
Phy_Drain to River | Number | If arroyos or gullies are present, do they drain to the river? 0 = no, 1 = yes, 2 = side canyon based, and 3 = NA (not applicable).
Phy_New Impacts | Number | Do any of the above impacts appear to have occurred since the last monitoring visit? 0 = no, 1 = yes. If yes, explain in Comments.
Phy_Comments | Memo | Physical impact comments only.
VI Struc | Number | Visitor impacts at structure/storage features. The values are: 0 = absent, 1 = present, 2 = NA (not applicable).
VI Arti | Number | Visitor impacts at artifact features. Same values as VI Struc.
VI Roast | Number | Visitor impacts at roaster/hearth features. Same values as VI Struc.
VI Perish | Number | Visitor impacts at perishable/midden features. Same values as VI Struc.
VI Rock | Number | Visitor impacts at rock image features. Same values as VI Struc.
VI Other | Number | Visitor impacts at other features. Same values as VI Struc.
Piles | Number | Collection piles. If present, explain in Comments. Same values as VI Struc.
Trails | Number | Trail(s) on-site. If either off-site or on-site trails are present, explain in Comments. Same values as VI Struc.
Camp | Number | Camping on-site. If present, explain in Comments. Same values as VI Struc.
Vandals | Number | Criminal vandalism and/or ARPA violations. If present, explain in Comments. Same values as VI Struc.
Vis_Other Impacts | Number | Other visitor impacts. If present, explain in Comments. Same values as VI Struc.
Vis_New Impacts | Number | New visitor impacts since the last monitoring visit. Same values as VI Struc.
Vis_River Related | Number | River-related visitor impacts. The values are 0 = no or 1 = yes.
Vis_Comments | Memo | Visitor-related comments only.
Retrail | Yes/No | As of FY02 this variable is no longer in use. See TrailWork. [One of the preservation options is to retrail the site. Values are 0 = no and 1 = yes.]
Obliterate | Yes/No | As of FY02 this variable is no longer in use. See TrailWork. [One of the preservation options is to obliterate trails. Values are 0 = no and 1 = yes.]
Field Properties
General Lookup
Field Size Long Integer
Format General Number
Decimal Places 0
Input Mask
Caption Vandals
Default Value
Validation Rule
Validation Text
Required No
Indexed No
The field description is optional. It helps you describe the field and is also displayed in the status bar when you select this field on a form. Press F1 for help on descriptions.
Design view. F6 = Switch panes. F1 = Help.
NUM
Start
RCMPSiteMgr : Database...
SiteManager : Form
MonitorData : Table
2:01 PM


Microsoft Access
File Edit View Insert Tools Window Help
Type a question for help
MonitorData : Table
Field Name | Data Type | Description
VI Other | Number | Visitor impacts at other features. Same values as VI Struc.
Piles | Number | Collection piles. If present, explain in Comments. Same values as VI Struc.
Trails | Number | Trail(s) on-site. If either off-site or on-site trails are present, explain in Comments. Same values as VI Struc.
Camp | Number | Camping on-site. If present, explain in Comments. Same values as VI Struc.
Vandals | Number | Criminal vandalism and/or ARPA violations. If present, explain in Comments. Same values as VI Struc.
Vis_Other Impacts | Number | Other visitor impacts. If present, explain in Comments. Same values as VI Struc.
Vis_New Impacts | Number | New visitor impacts since the last monitoring visit. Same values as VI Struc.
Vis_River Related | Number | River-related visitor impacts. The values are 0 = no or 1 = yes.
Vis_Comments | Memo | Visitor-related comments only.
Retrail | Yes/No | As of FY02 this variable is no longer in use. See TrailWork. [One of the preservation options is to retrail the site. Values are 0 = no and 1 = yes.]
Obliterate | Yes/No | As of FY02 this variable is no longer in use. See TrailWork. [One of the preservation options is to obliterate trails. Values are 0 = no and 1 = yes.]
TrailWork | Yes/No | In the FY02 database redesign, the "retrail" and "obliterate" fields were combined into a single field called "trailwork."
Plant Vege | Yes/No | Planting vegetation is another preservation option. Values are 0 = no and 1 = yes.
Checkdams | Yes/No | Installing checkdams is another preservation option. Values are 0 = no and 1 = yes.
Other Preservation Options | Yes/No | Other preservation options. Values are 0 = no and 1 = yes. Describe in Comments.
Test | Yes/No | One of the recovery options is to test the site for depth of subsurface cultural deposits. Values are 0 = no and 1 = yes. In the FY02 database redesig
Data Recovery | Yes/No | Another recovery option is data recovery. Values are 0 = no and 1 = yes.
Other Recovery Options | Yes/No | Other recovery options. Values are 0 = no and 1 = yes. Describe in Comments.
Recommendations | Memo | Recommendation comments only.
NextDate | Date/Time | New field added in FY02 during database redesign to indicate the preferred next date for monitoring that site.
ScheduleComments | Memo | New field added in FY02 during database redesign to comment upon site scheduling.
Field Properties
General Lookup
Format
Caption
Default Value
Validation Rule
Validation Text
Required No
Allow Zero Length No
Indexed No
Unicode Compression Yes
IME Mode No Control
IME Sentence Mode None
The field description is optional. It helps you describe the field and is also displayed in the status bar when you select this field on a form. Press F1 for help on descriptions.
Design view. F6 = Switch panes. F1 = Help.
NUM
Start
RCMPSiteMgr : Database...
SiteManager : Form
MonitorData : Table
2:02 PM

APPENDIX E

MICROSOFT ACCESS DATABASE “PHOTO” TABLE DESIGN


Microsoft Access
File Edit View Insert Tools Window Help
Type a question for help
PhotoMain : Table
Field Name | Data Type | Description
ID | AutoNumber | Automatic, unique identification number assigned to each photograph.
SiteKey | Text | Site number, such as C:13:001. The "AZ" prefix is not included.
Photo | Number | Photo numbers are assigned consecutively for each site.
Date | Date/Time | Date the photograph was taken.
TypeName | Text | Type of photograph, such as feature, remedial action, overview, etc. See lookup table "PhotoType".
Feature | Text | Number or letter of the feature.
Locus | Text | Letter or number of the locus.
Description | Text | Description of the photograph.
Impact I | Text | Type of impact, if any, shown in the photograph. See the lookup table "PhotoImpacts".
Impact II | Text | Type of impact, if any, shown in the photograph. See the lookup table "PhotoImpacts".
View | Text | Compass direction in which the photograph was taken (degrees or direction).
ParentID | Number | Photo number of the first duplicate photo in a series.
Duplicate | Text | Photo number of any duplicate photographs.
NegSize | Text | Size of the photographic negative (35mm or MF). See lookup table "PhotoNegSize".
Roll | Text | Roll number (alphanumeric) for the photograph.
Exposure | Text | Exposure number for the photograph (usually 1 through 36).
Camera | Text | Type of camera used to take the photograph (Mamiya or Pentax, currently). The lookup table "PhotoCamera" contains the 3 types currently used. Oth
Photographer | Text | Initials of the person who took the photograph. See lookup table "Photographer."
Lens | Text | Type of lens used to take the photograph (50, 90, or 250 mm). See lookup table "PhotoLens". This field is used only for medium format photographs.
Film | Text | Type of film used to take the photograph (B/W or color). See lookup table "PhotoFilm".
Time | Date/Time | Time of day that the photograph was taken.
f-stop | Text | The f-stop setting for the photograph.
PhotoPoint | Text | Letter or number of the photo point from which the photograph was taken.
Field Properties
General Lookup
Field Size Long Integer
New Values Increment
Format
Caption
Indexed Yes (No Duplicates)
This property cannot be modified in linked tables.
Design view. F6 = Switch panes. F1 = Help.
NUM
Start
RCMPSiteMgr : Database...
SiteManager : Form
PhotoMain : Table
8:44 AM

APPENDIX F

RAW DATA COUNTS AND FREQUENCY FOR IMPACT SERIES

During the process of baseline data collection, 139 impacts were observed out of a possible 272 occurrences. Of the 139 impacts, 28 were categorized as "other" or undetermined. Because these undetermined impacts do not provide information on impact type, they were removed from the sample. A total of 111 impact occurrences were then divided into type –either physical impact or visitation impact. Table 3 shows the counts and the frequency of impact for the baseline data.

Table 3. Baseline Data Impact Counts and Frequency

Impact Type	*Total Count*	*%*
Surface Erosion	30	11%
Gullying	54	20%
Arroyo Cutting	21	8%
Bank Slump	2	1%
Eolian Activity	3	1%
Side Canyon	0	0
Other	28	10%
Visitation	1	0
Total Physical Impact	110	99%
Total Visitation	1	1%

Time 2 data collection resulted in 124 impacts observed out of a possible 288 occurrences. Of the 124 impacts, 19 were categorized as "other" and removed from the sample. A total of 105 impact occurrences were then divided into type. Table 4 shows the counts and the frequency of impact for the baseline data.

Table 4. Time 2 Impact Counts and Frequency

Impact Type	*Total Count*	*%*
Surface Erosion	25	9%
Gullying	21	7%
Arroyo Cutting	10	3%
Bank Slump	11	4%
Eolian Activity	15	5%
Side Canyon	6	2%
Other	19	7%
Visitation	17	6%
Total Physical Impact	88	84%

Total Visitation	17	16%

FY04 monitor data collection resulted in 109 impacts observed out of a possible 296 occurrences. Of the 109 impacts, 5 were categorized as "other" and removed from the sample. A total of 104 impact occurrences were then divided into type. Table 5 shows the counts and the frequency of impact for the FY04 monitor data.

Table 5. FY04 Monitor Data Impact Counts and Frequency

Impact Type	***Total Count***	***%***
Surface Erosion	29	10%
Gullying	22	7%
Arroyo Cutting	12	4%
Bank Slump	10	3%
Eolian Activity	19	6%
Side Canyon	0	0
Other	5	2%
Visitation	12	4%
Total Physical Impact	92	88%
Total Visitation	12	12%

APPENDIX G

ASMIS SITE CONDITION ASSESSMENT VALUE DESCRIPTIONS

Good	The site, at the first condition assessment or during the time interval since its last condition assessment, shows no evidence of noticeable deterioration by natural forces and/or human activities. The site is considered currently stable and its present archeological values are not threatened. No adjustments to the currently prescribed site treatments are required in the near future to maintain the site's present condition.
Fair	The site, at the first condition assessment or during the time interval since its last condition assessment, shows evidence of deterioration by natural forces and/or human activities. If the identified threats continue without the appropriate corrective treatment, the site will degrade to a poor condition. (In order to improve site condition, a corrective treatment should be identified [see Treatment Proposed field] and taken in the near future to remove the potential threats and to stabilize the site to prevent further harm to its archeological values.)
Poor	The site, at the first condition assessment or during the time interval since its last condition assessment, shows evidence of severe deterioration by natural forces and/or human activities. If the identified threats continue without the appropriate corrective treatment, the site is likely to undergo further degradation and the site's data potential for historical or scientific research will be completely lost. (No or insufficient corrective treatment [see Treatment Proposed field] has been taken to protect and preserve the remaining archeological values from their current threats.)
Destroyed	The site's formal condition assessment resulted in a professional determination that the site was destroyed or so severely damaged that the data potential/scientific research value was deemed insufficient to warrant further archeological monitoring or investigation. A destroyed site is excluded from Government Performance and Results Act (GPRA) reporting requirements.
Unknown	The current condition of the site is not known, or available information is not sufficient to professionally evaluate the site's condition, or the validity of the assessment is questionable. (ASMIS 3.00 Data Dictionary February 2005).

3/00

Grand Canyon National Park and Glen Canyon National Recreation Area

RIVER CORRIDOR ARCHAEOLOGICAL SITE MONITORING FORM

MANAGEMENT

1. Site Number AZ _____ 2. Monitor Session _____
3. River Mile _____ Bank (L/R/B) _____ 4. Date _____
5. Property Type: _____
6. Monitor(s) _____
7. PA Signatories _____

PHYSICAL IMPACTS

Coding: 0 = Absent, 1 = Active, 2 = Inactive, 3 = NA (for items 8 - 14)

		Structures / Storage	Artifacts	Roasters / Hearths	Perishables / Midden	Rock Images	Other
8.	Surface Erosion (0 - 10 cm)						
9.	Gullying (10 - 100 cm)						
10.	Arroyo Cuttin (> 1 m)						
11.	Bank Slump						
12.	Eolian/Alluvial Erosion/Deposition						
13.	Side Canyon Erosion						
14.	Other Physical Impacts (animals spalling, roots)						

15. Drainage Type (river, terrace, or side canyon-based or no drainages): _____

16. Do any of the above impacts appear to have occurred since the last monitoring episode 0 = No, 1 = Yes. If yes, explain in Question # 17. _____

17. Comments:

Grand Canyon National Park and Glen Canyon National Recreation Area

RIVER CORRIDOR ARCHAEOLOGICAL SITE MONITORING FORM

VISITOR-RELATED IMPACTS

Site Number:

Monitor Session:

Coding: 0 = Absent, 1 = Present, 3 = NA (for items 18 - 2

		Structures / Storage	Artifacts	Roasters / Hearths	Perishables / Midden	Rock Images	Other
18.	Visitor Impacts						

19. Collection Piles: If present, explain in Question # 2 _____

20. Trails On-Site: If present, explain in Question # 26. Explain any off-site trails als _____

21. Camping On-Site: If present, explain in Question # 26 _____

22. Criminal vandalism/ARPA violations: If present, explain in Question # 2 _____

23. Other visitor impacts: If present, explain in Question # 2 _____

24. Visitor-related impacts since last monitoring: _____

25. Are any visitor-related impacts directly related to river fluctuations and/or dam operations, i.e. development of new trails to avoid high water, availability of new beaches in proximity of site 0 = No, 1 = Yes. If yes, explain in Question # 26 _____

26. Comments:

RECOMMENDATIONS

27. Monitor Schedule: 1) Discontinue 2) Semiannual 3) Annual 4) Biennial 5) Every three to five years 6) Inactive 7) Control Group _____

28. Preservation Options: 0 = No, 1 = Yes

Trail Work _____ Plant vegetation _____ Other Preservation Options _____

Install checkdams _____

29. Recovery Options: 0 = No, 1 = Yes

Research _____ Data Recovery _____ Other Recovery Options _____

30. Comments: