

Fiscal Year 2005

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

Jennifer L. Dierker and Lisa M. Leap  
Grand Canyon National Park

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## CHAPTER ONE INTRODUCTION AND CORE ACCOMPLISHMENTS

For over 10 years, Grand Canyon National Park (GRCA) has been working with the Bureau of Reclamation (Reclamation) to implement a monitoring and protection program for cultural resources within the larger Glen Canyon Dam Adaptive Management Program. This program is administered under an interagency acquisition with the Bureau of Reclamation and Grand Canyon National Park (No. 05-AA-40-2292) and is specific to the 1996 Record of Decision on Glen Canyon Dam operations and a National Historic Preservation Act (NHPA) programmatic agreement for compliance with section 106 of the NHPA. This report details the progress made under the acquisition for Fiscal Year (FY) 2005.

Core field tasks completed in FY2005 include archaeological site condition monitoring and impact identification at 106 sites, checkdam monitoring and maintenance at 27 sites, and field checking of spatial locations for the Geographic Information System (GIS) program. The GIS polygon delineation and field ground-truthing project that began in FY04, was completed for all actively monitored sites in FY2005. National Park Service archaeologists (through the River Corridor Monitoring Program, referred to as the RCMP) ground-truthed both site locations and boundaries at over 150 river corridor sites over the FY04 and FY2005 field seasons. Core laboratory accomplishments include digitizing updated polygons and improving and expanding the GIS database. As requested by Reclamation in the interagency acquisition, a contract was awarded to 7K Information Technologies, Flagstaff, Arizona to complete the task of normalizing the monitoring database.

### CORE ACCOMPLISHMENTS

In order to complete the field tasks for FY2005, NPS archaeologists (both RCMP and base GRCA programs) participated on all or portions of five Colorado River trips. Grand Canyon National Park provided funding for logistics and staffing for three river trips. The first trip of the fiscal year was a Grand Canyon Field Institute (GCFI) trip in November 2004. The March 2005 trip consisted of RCMP and GRCA archaeologists and two representatives of the Zuni Conservation Program (ZCP), funded through the Cooperative Resource Program between GRCA and the commercial river outfitters. The bulk of the work was completed on the March trip. Trip logistics were provided by Arizona Raft Adventures (AZRA) personnel. RCMP staff also participated on NPS river patrol trips in May and August. The Grand Canyon Monitoring and Research Center (GCMRC) provided a sport boat on the run-out of a science trip in July in order for RCMP staff to visit eight additional sites below Phantom Ranch.

Preparation for field work follows previously established and documented operating procedures (Dierker and Leap, 2005). The first step is compiling a list of historic properties to be visited and generating the field forms and photographs. All variables collected in the field are entered into the Microsoft Access database or the ArcView version 9.0 GIS database upon completion of field activities. Archeological Sites Management Information System (ASMIS) site condition data were also collected at 101 of the 106 sites visited in FY2005.

### **Monitoring**

Monitoring of the condition of National Register eligible historic properties forms the core of this program. By definition, monitoring requires observation at regular intervals in order to determine status or condition. In this program, monitoring is conducted specifically to identify changes in the condition of archaeological sites or features through active field inspections. These inspections, occurring at scheduled intervals, result in the identification and location of impacts,

any changes to the site since last visited, and a general determination of site condition. Results obtained from monitoring activities lead to management decisions intended to curtail further impact and to retain site integrity.

Photographs and previous site descriptions and maps are used to compare current conditions with those visible during previous monitoring episodes. The processes identified that may be altering site condition have been explicitly defined and used by the RCMP staff over the past 10 years. A copy of the current monitoring form and variable definitions can be found in Appendix A. All monitoring forms are completed on-site identifying both changes observed and any management recommendations for treatment. The monitoring forms are entered into a Microsoft Access database in the lab upon completion of field visits and ASMIS data are entered into the NPS service wide database.

The general location of the 106 historic properties monitored in FY2005 can be seen in Figure 1. Chapter 3 provides site specific monitoring information including site descriptions, previous work implemented and FY2005 monitoring observations and recommendations. Due to the confidential nature of site locational information, specific locations are omitted from this report.

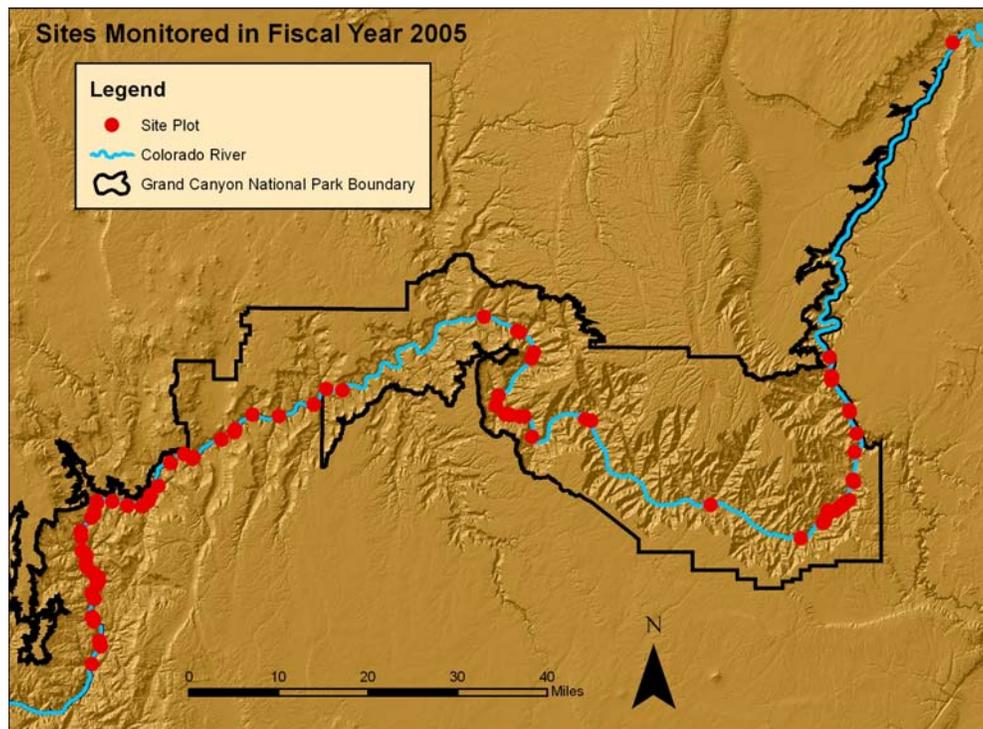


Figure 1. General location of historic properties monitored in FY2005.

**Geographic Information Systems**

Site boundary polygon and UTM location ground-truthing comprised a significant amount of effort for field work in FY2005. All ground-truth boundaries were digitized in GIS and overlain on orthographic imagery of the river corridor. Detailed descriptions of this project and additional GIS work conducted by RCMP archaeologists can be found in Chapter Two.

**Checkdam Monitoring and Maintenance**

A total of 242 checkdams exist at 27 historic properties within the project area, installed at various sites as preservation approaches over the past 10 years. Chapter Four provides both historic property and checkdam specific monitoring and maintenance information. While maintenance work was recommended for completion in the FY04 report (Dierker et al., 2005) at a total of 46 checkdams at ten archaeological sites, work was required at only 37 checkdams. Though fewer checkdams actually required maintenance work than was previously recommended, routine monitoring with the ZCP staff resulted in maintenance at three additional historic properties so that 37 checkdams at 13 sites were maintained. As speculated in the FY04 annual report (Dierker et al., 2005) the extremely wet winter of 2004-2005 seems to have affected the number of checkdams requiring maintenance work. Upon assessment by Zuni Conservation Project (ZCP) members, the wet winter and spring affected them positively, and many checkdams were deemed in good condition due to vegetation growth and sediment deposition.

**ASMIS Site Condition Monitoring**

In addition to site condition monitoring for impacts that may be a result of the operations of Glen Canyon Dam, RCMP archaeologists also assess site condition based on the Department of the Interior guidelines for Archeological Sites Management Information System known as ASMIS. ASMIS derived site condition definitions can be found in Appendix B. Chapter 3, Table 2 lists the historic properties monitored and the most current site condition status.

The following chapters provide a detailed description of the work conducted in FY2005 related to the interagency acquisition between NPS and BOR. Chapter 5 includes recommendations for additional work to be carried out in FY2006.

## CHAPTER TWO GEOGRAPHIC INFORMATION SYSTEM DATA LAYERS

In FY2005, the RCMP staff completed the identified task of ground-truthing the location data for all sites actively monitored by this program. The corrected site location information has been digitized into the GIS layer through a process of manually tracing over features, called *heads-up digitizing*. Heads-up digitizing occurred over the photo imagery. In addition to the boundary data, location point data have also been updated. The location data from the original 1990-1991 cultural resource inventory consisted of plots on the 1984 aerial photographs that were transferred onto 7.5 minute USGS topographic maps in the lab. Upon the completion of the plot transfer, inventory personnel further transferred the plots by using a coordinate grid to obtain Universal Transverse Mercator (UTM) readings. The UTM's were subsequently entered in the original inventory database (IMACs) as locational data. This method of determining site location was an acceptable method for obtaining UTM plots in 1990. With the advent of hand-held technology such as global positioning system (GPS) receiver units, an increase in the number of satellites available to locate ground features, and the introduction of scaled photographs for use as maps, the accuracy of locational data have greatly improved. With the completion of ground-truthed site boundaries, a corrected site plot has been obtained from the center of each historic property site boundary polygon. In this way, all original site plots have been updated with state-of-the-art locational information.

Aligning geographic data to a known coordinate system, known as *georeferencing*, was a recommendation of the Cultural Protocol Evaluation Panel (PEP) in their final report to the GCMRC (Doelle 2000). This project fulfills tasks C(1) and C(2) of the interagency acquisition with the NPS for FY2005 cultural resource data gathering on behalf of Reclamation. Georeferencing will also provide accurate location data for research or monitoring needs identified by the AMP through the strategic planning process.

### **Orthographic Mapping and Ground-truthing**

*Orthophotographs* are aerial photos “from which distortions owing to camera tilt and ground relief have been removed. An orthophotograph has the same scale throughout and can be used as a map.” (ESRI Support Center Web Site). The orthophotographic color imagery collected by GCMRC in May 2002, serves as the base to develop the GIS layer. This imagery has 22 centimeter pixel resolution and 30 centimeter horizontal accuracy. Figure 5 is an example of site boundary polygons on this imagery. Initially, the 1990-1991 river corridor survey location data was transferred to the GIS layer via heads-up digitizing. RCMP archaeologists determined that locational data required updating in order to be compatible with new technology. Field checks, known as ground truthing, of historic properties allowed for additional fine tuning of the locational data for use in the GIS.

The ground-truthing process began with printouts of the imagery including survey boundary or point locations based upon the original topographic map plots. Sites identified as needing updates were visited on river trips to complete the task. RCMP archaeologists visited the sites with the ortho-rectified imagery, site forms, and maps to ensure that all features were included within the identified site boundary. Upon confirmation that staff members were on-site, they identified key topographic or vegetation features visible on the imagery to determine their location on site. Staff members then walked the site boundary, plotting their course on the imagery to insure that the entire site boundary was identified on the imagery.

Upon completion of ground-truthing efforts, the corrected site location boundaries were digitized into a GIS layer via heads up digitizing. Maps of the corrected polygons using the ortho-rectified imagery were printed in color for inclusion in field paperwork for each site. Obtaining accurate geo-referenced boundary lines at historic properties is the first step towards detailed spatial analyses in GIS. The result of this work includes accurate geo-referenced site boundaries available for use with other GIS layers and accurate location information that can be used by project members and others including the BOR and contracted researchers.

### Site Polygons on Orthographic Imagery

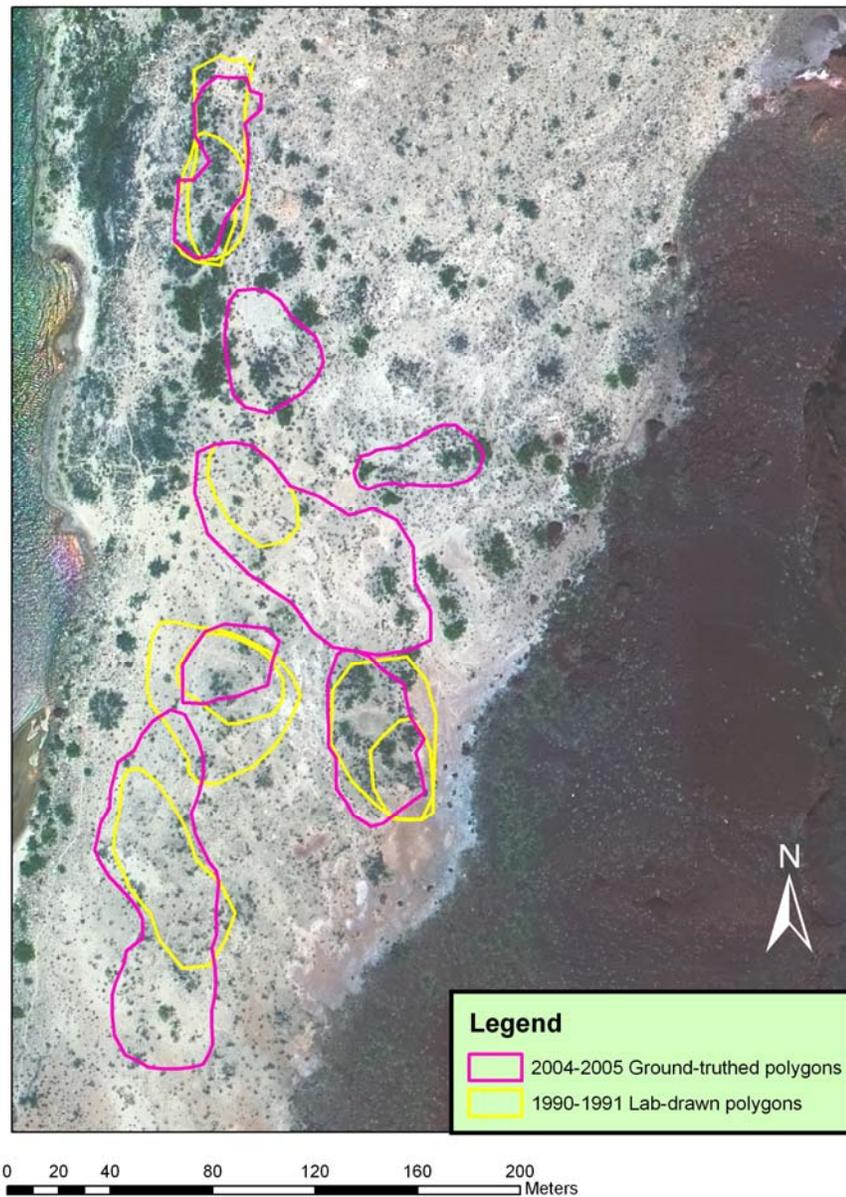


Figure 5. An example of corrected site boundary polygons on the ortho-rectified imagery.

Site plot updates were also deemed necessary as historic property site boundaries were refined. RCMP staff members identified several sites where the plot was not located within the boundary polygon. An extreme example of this can be found below in Figure 6. The original site plot was located well above the site, and is in fact, off the imagery altogether.

Upon completion of site boundary ground-truthing, GIS analysis placed a location point in the center of the polygon as corrected location data for each property. In cases where historic properties contain multiple loci, the Locus A center point was used. These corrected site point data are currently in State Plane coordinates to be used in conjunction with the ortho-rectified imagery provided by the GCMRC. The points have also been converted to Universal Transverse Mercator (UTM) plots for transfer to the GRCA database.

### Survey site plot and corrected site plot

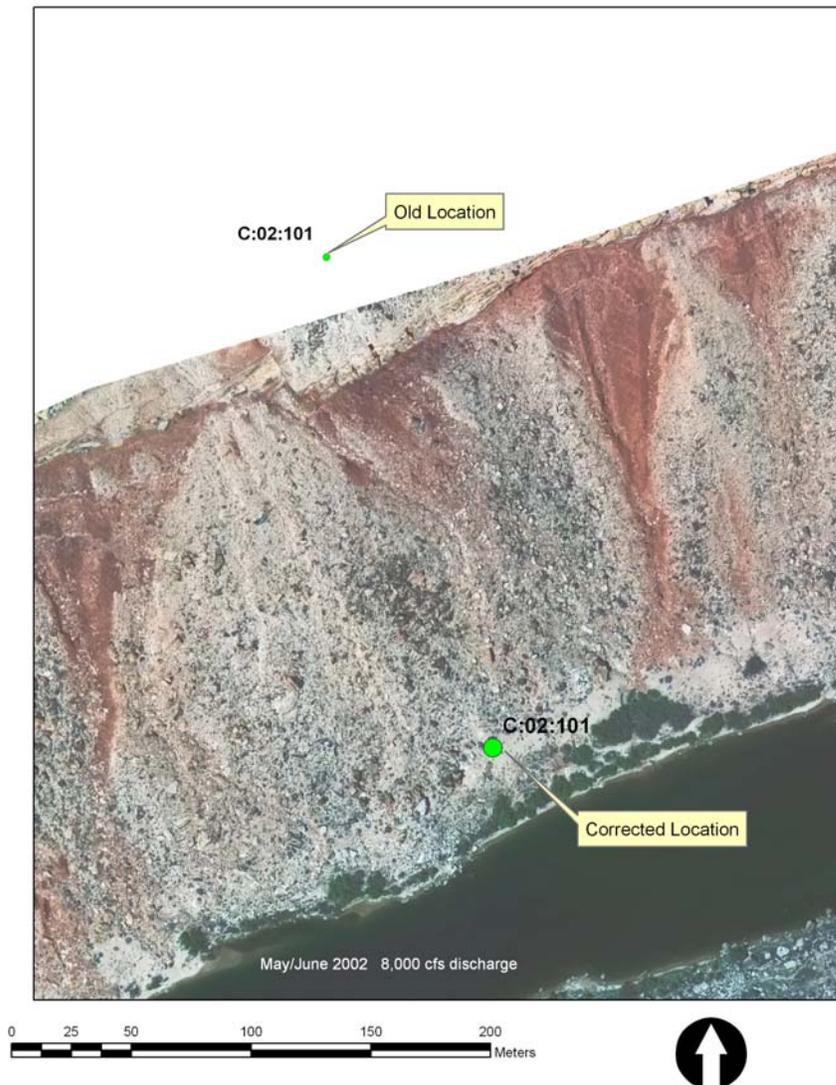


Figure 6. Example of the survey point location and a corrected site location point.

### NPS-sponsored control point total station data update

Between 1996 and present, data collection for total station maps occurred at 81 sites within the project area. The majority of these maps were generated from 1996 through 1998, on NPS river trips, by GCMRC projects, and by the Northern Arizona University Anthropology department during excavation activities.

Because these data are housed with the NPS at Grand Canyon and not part of an on-going cultural program at the GCMRC, they were never subjected to location updates that occurred as the survey department updated control points within the GCMRC control point network. As time passed, the total station maps were no longer compatible with maps drawn currently as the control points had moved or been refined with each additional location update. The result of this incompatibility was that these maps were not being used by researchers because the time and cost was too great to update the control points.

In FY2005, GRCA contracted with a surveyor to update these control points to encourage use of the existing total station maps as baseline for additional research on historic properties along the river corridor. The GRCA Maintenance division provided funding for this project, outside of any AMP program funding. The project has resulted in 62 of the 81 sites being updated using the current control point network. Of these 62 sites, 16 use local coordinates and 46 use state plane coordinates as listed in Table 1. The implications of this are that sites in state plane coordinates can be spatially analyzed both individually and relative to each other using the GIS. Sites in local coordinates cannot be analyzed relative to each other using the GIS until survey control is established for these areas. An additional 19 sites remain tied to the outdated control network. These sites should also be updated using the GCMRC control network.

Table 1. List of historic properties with total station maps in local and state plane coordinates. (n=62)

| <i>State Plane Coordinates</i> |          | <i>Local Coordinates</i> |
|--------------------------------|----------|--------------------------|
| B:11:272                       | C:13:343 | A:15:005                 |
| B:14:107                       | C:13:346 | A:15:017                 |
| B:15:138                       | C:13:347 | A:15:033                 |
| C:02:096                       | C:13:348 | A:15:048                 |
| C:02:098                       | C:13:349 | A:16:149                 |
| C:02:101                       | C:13:371 | A:16:174                 |
| C:09:051                       | C:13:384 | A:16:180                 |
| C:13:006                       | C:13:385 | B:10:236                 |
| C:13:009                       | C:13:386 | B:15:126                 |
| C:13:033                       | G:03:002 | C:13:359                 |
| C:13:069                       | G:03:003 | C:13:381                 |
| C:13:070                       | G:03:024 | G:03:004                 |
| C:13:099                       | G:03:025 | G:03:019                 |
| C:13:100                       | G:03:026 | G:03:020                 |
| C:13:101                       | G:03:027 | G:03:030                 |
| C:13:272                       | G:03:028 | G:03:058                 |
| C:13:273                       | G:03:038 |                          |
| C:13:291                       | G:03:040 |                          |
| C:13:321                       | G:03:041 |                          |
| C:13:327                       | G:03:055 |                          |
| C:13:334                       | G:03:059 |                          |
| C:13:336                       | G:03:064 |                          |
| C:13:339                       | G:03:027 |                          |

The survey data were divided into point and polygon data groups. From this division, historic property features were further delineated into point, line, and polygon classes. Checkdams in both polygon and line features have been further separated from the survey data to aid in additional spatial analysis. Figure 4 illustrates the progression of this project from polygon updates to total station data with the end result being the ability to display different classes of total station data. All original survey data are accessible and have not been altered in anyway. Copies of this data were transformed to enable RCMP staff and other researchers the ability to look at specific types of data within the total station map data.

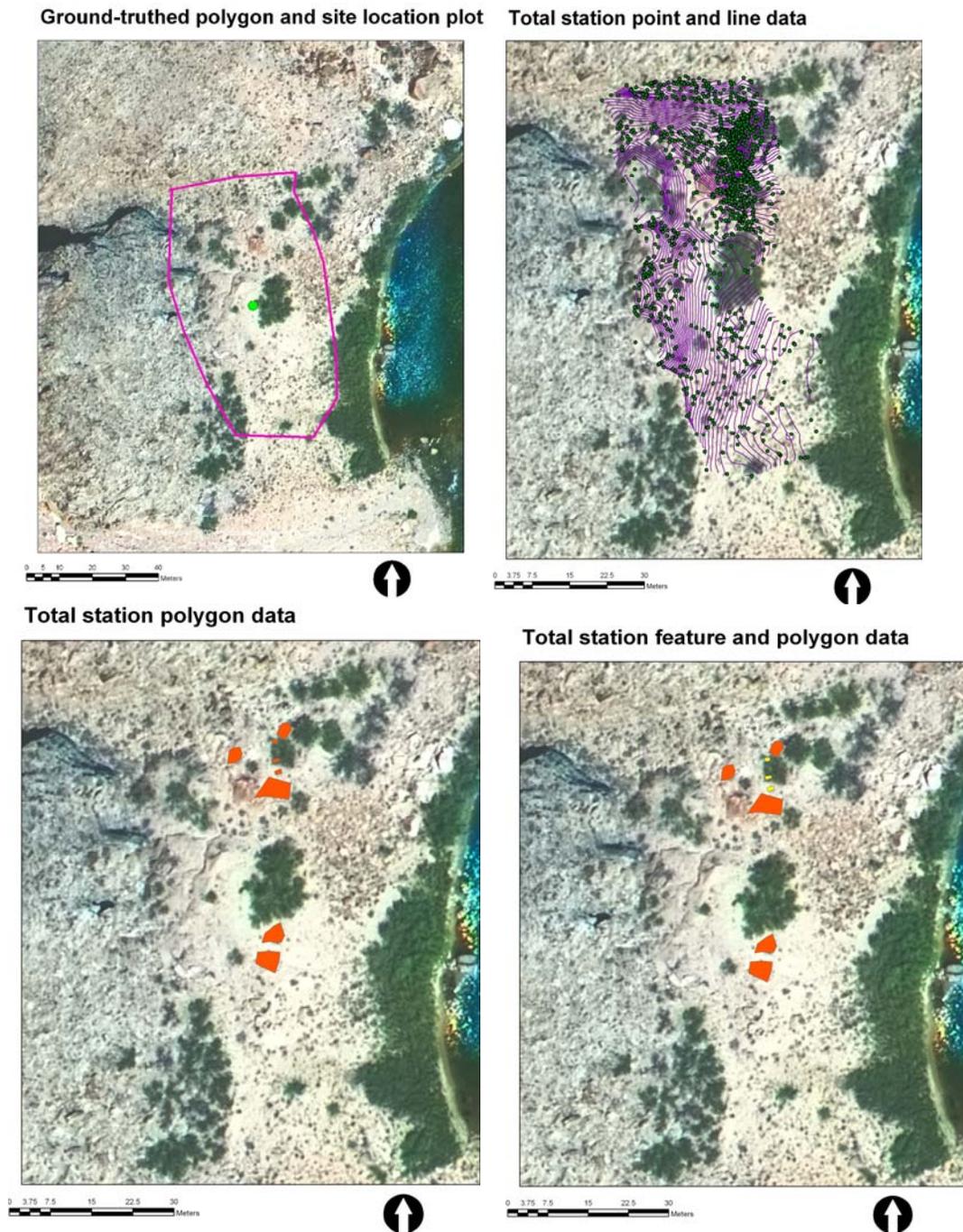


Figure 4. Groups of data including ground truthed boundary polygons, total station points and lines, total station polygon data, and total station checkdams and features.

The RCMP GIS data layers now include the ortho-rectified color imagery as the base for historic property location points, boundary polygons, total station map data, and specific archaeological features and checkdams. Additional layers include Belknap river miles, cross-section profile locations and eolian transport equipment. Figure 5 shows an example of the imagery in ArcMap with several of the data layers.

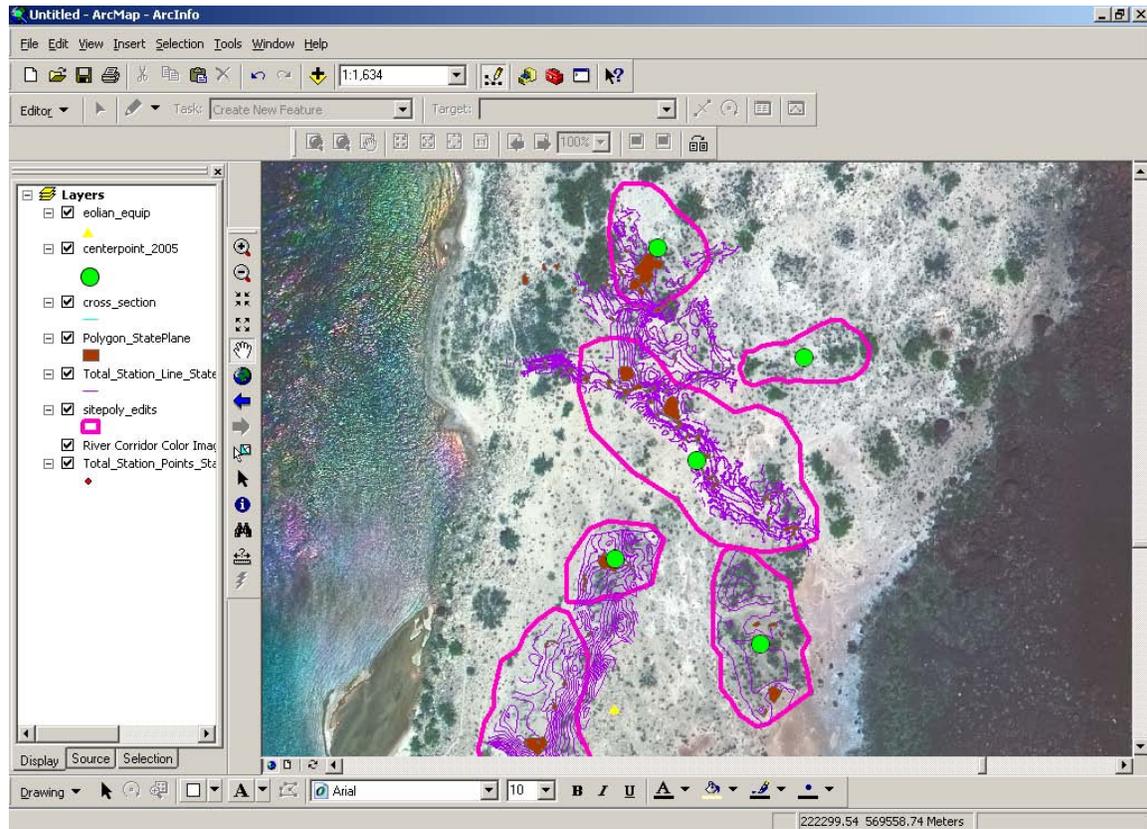


Figure 5. ArcMap version 9.0 view with ortho-rectified imagery and some of the available RCMP data layers.

### Recommendations

While site polygon and location point data are a critical first step towards spatial analysis of historic properties, there are several recommendations for improving the current GIS database. First and foremost, it is recommended that the total station map data from the remaining 19 historic properties be updated to the corrected GCMRC control network. This work should be contracted out to a GIS or survey specialist to complete the conversion.

Additional data cleaning and appending is also recommended for the total station data. As these data are further refined, there is a degree of data cleaning that is required. It is recommended that this process continue.

Lastly, the RCMP staff and GRCA GIS coordinator strongly recommend that the 16 historic properties with total station data in local coordinates be converted to GCMRC control network. This task will require extensive lab preparation to gather location information, field visits to

existing control points, and connecting these point data to the 16 sites with the larger GCMRC control point network. This is a project that could be accomplished through the joint efforts of the RCMP staff and members of the GCMRC survey program. Bringing this data into the control network will enable spatial analysis between features and different historic properties while improving the quality of the total station map data available to project members and other researchers.

## CHAPTER THREE

### SITE CONDITION MONITORING INFORMATION

Monitoring of historic properties in FY2005 focused on ground-truthing site boundaries on orthographic photos (May 2002, supplied by GCMRC). During the course of ground-truthing site polygons, and as time allowed, site visits also included site condition monitoring and ASMIS site condition assessments at 106 historic properties.

FY2005 monitoring activities identified active erosion at 46% (49 unique sites) of the sites visited. Active erosion takes many forms, the most prevalent being surface erosion (at 25%), followed by gullyng (at 21%), then erosion/deposition (at 13%), general physical erosion (13%), arroyo cutting (at 7%), and bank slump (at 3%). Human impacts were observed at 18 historic properties. This type of impact is generally confined to trailing or movement of artifacts on site. Figure 6 shows the occurrence of active impacts by type observed during FY2005 monitoring activities.

**Number and Type Active Impacts Observed during FY2005 Monitoring**

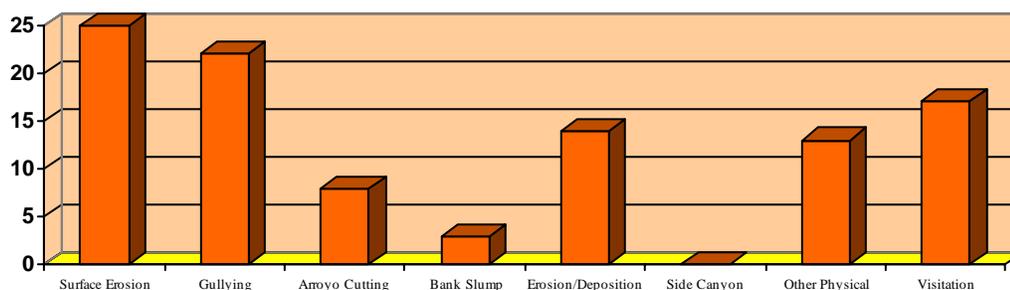


Figure 6. The number and type of active impacts observed at the FY2005 historic properties monitored.

It is important to note that any or all of the eight impacts has the potential to occur at a single location. The type of impact present is correlated to a variety of factors including geomorphic context, vegetation cover, and visitor intensity. For example, locations where no drainage is present will not have active gullyng or arroyo cutting. Figure 6 represents the total number of impacts observed by the *type of impact*, as opposed to the number of historic properties monitored.

#### **Treatment Recommendations**

When impacts threaten the integrity of historic properties, treatment recommendations are made to eliminate or slow down further site deterioration. The treatment recommendations made by RCMP archaeologists are treatment options identified and defined by the original signatories to the NHPA section 106 agreement (1996) and articulated in the 2000 update of the Monitoring and Remedial Action Plan (MRAP). Identified treatments include trail work, planting vegetation, new checkdam construction, other preservation options (additional documentation, obliteration of multiple trails, graffiti removal and vegetation removal), research, data recovery and other recovery options (for example, remap, GCMRC control point documentation). Treatment recommendations were made at 28% or 30 of the 106 historic properties monitored in FY2005. Figure 7 shows the number and types of treatment options recommended during this fiscal year.

### Number of Treatment Recommendations made during FY2005 Monitoring

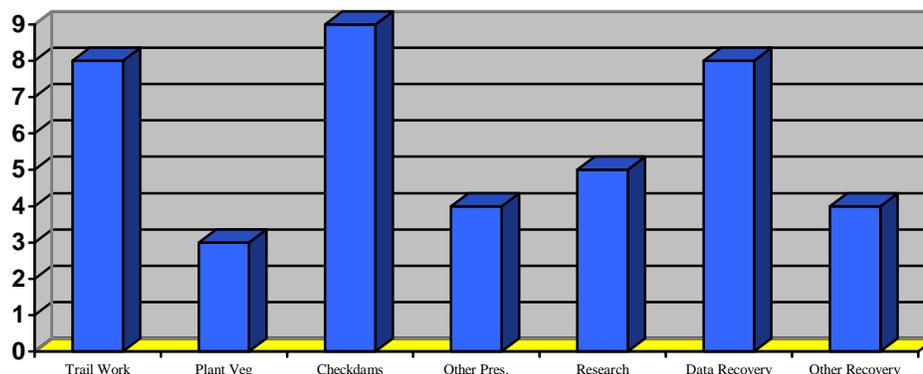


Figure 7. The number of treatment recommendations at FY2005 historic properties monitored.

Depending upon the types of impact observed, RCMP archaeologists may recommend multiple treatment types at one site. Table 2 lists the 30 historic properties receiving treatment recommendations in FY2005 and the specific recommendations. Additional information related to these properties and treatments can be found in the site specific text that follows.

Table 2. 30 historic properties monitored and the recommended treatments for FY2005.

| <i>Site Number</i> | <i>Trail Work</i> | <i>Plant Vegetation</i> | <i>Install Checkdams</i> | <i>Other Preservation</i> | <i>Conduct Research</i> | <i>Data Recovery</i> | <i>Other Recovery</i> |
|--------------------|-------------------|-------------------------|--------------------------|---------------------------|-------------------------|----------------------|-----------------------|
| A:15:003           | X                 | X                       |                          |                           |                         |                      |                       |
| A:15:018           | X                 |                         |                          |                           |                         |                      |                       |
| A:15:028           |                   |                         | X                        |                           |                         |                      |                       |
| A:15:039           |                   |                         | X                        |                           |                         | X                    |                       |
| A:16:160           |                   |                         | X                        |                           |                         |                      |                       |
| B:09:317           | X                 |                         |                          |                           |                         |                      |                       |
| B:11:277           |                   |                         | X                        |                           |                         |                      |                       |
| B:11:281           |                   |                         |                          |                           | X                       |                      |                       |
| B:14:093           |                   |                         |                          |                           |                         |                      | X                     |
| C:02:094           |                   |                         |                          | X                         |                         |                      | X                     |
| C:02:098           | X                 |                         |                          |                           |                         | X                    |                       |
| C:09:068           |                   |                         |                          |                           | X                       |                      |                       |
| C:09:088           |                   |                         |                          | X                         |                         |                      |                       |
| C:13:006           |                   | X                       | X                        |                           |                         |                      |                       |
| C:13:069           |                   |                         |                          |                           |                         | X                    |                       |
| C:13:098           |                   |                         |                          | X                         |                         |                      |                       |
| C:13:099           | X                 |                         |                          |                           | X                       | X                    | X                     |
| C:13:100           | X                 |                         |                          |                           |                         |                      |                       |
| C:13:327           |                   |                         |                          |                           |                         | X                    |                       |
| C:13:336           |                   |                         | X                        |                           |                         |                      |                       |
| C:13:371           |                   |                         |                          |                           |                         | X                    |                       |
| C:13:379           |                   |                         |                          | X                         |                         |                      |                       |
| G:03:003           | X                 | X                       |                          |                           |                         |                      |                       |
| G:03:043           |                   |                         |                          |                           | X                       | X                    |                       |
| G:03:044           |                   |                         | X                        |                           |                         | X                    |                       |
| G:03:055           |                   |                         |                          |                           |                         |                      | X                     |
| G:03:056           |                   |                         | X                        |                           |                         |                      |                       |
| G:03:058           |                   |                         | X                        |                           |                         |                      |                       |
| G:03:080           | X                 |                         |                          |                           |                         |                      |                       |

ASMIS site condition assessments are professional evaluations of site condition focusing on physical stability and threats. Site condition definitions can be found in Appendix B. The ASMIS site condition system includes monitoring and entering the data into an NPS system-wide database that is designed to track documentation, condition, treatments, and management stewardship of cultural resources. The GRCA base program manages the ASMIS program and inputs data into the national database for annual review. Site condition data are then compiled nationally and reported to Congress. Table 3 lists site condition for the 106 historic properties monitored in FY2005. Figure 8 visually displays ASMIS condition for the 106 historic properties monitored in FY2005.

Table 3. ASMIS site condition results for historic properties monitored in FY2005.

| <i>Site Number</i> | <i>ASMIS Condition</i> | <i>Site Number</i> | <i>ASMIS Condition</i> |
|--------------------|------------------------|--------------------|------------------------|
| A:15:003           | Good                   | C:09:062           | Good                   |
| A:15:004           | Good                   | C:09:068           | Good                   |
| A:15:005           | Fair                   | C:09:072           | Good                   |
| A:15:018           | Good                   | C:09:084           | Fair                   |
| A:15:020           | Good                   | C:09:088           | Fair                   |
| A:15:021           | Good                   | C:13:006           | Fair                   |
| A:15:022           | Good                   | C:13:069           | Fair                   |
| A:15:025           | Fair                   | C:13:098           | Fair                   |
| A:15:026           | Fair                   | C:13:099           | Fair                   |
| A:15:027           | Good                   | C:13:100           | Fair                   |
| A:15:028           | Good                   | C:13:323           | Fair                   |
| A:15:029           | Fair                   | C:13:327           | Fair                   |
| A:15:038           | Fair                   | C:13:336           | Fair                   |
| A:15:039           | Fair                   | C:13:340           | Fair                   |
| A:15:047           | Fair                   | C:13:342           | Fair                   |
| A:16:004           | Good                   | C:13:346           | Fair                   |
| A:16:148           | Good                   | C:13:348           | Fair                   |
| A:16:151           | Good                   | C:13:352           | Fair                   |
| A:16:154           | Good                   | C:13:353           | Good                   |
| A:16:158           | Fair                   | C:13:354           | Fair                   |
| A:16:160           | Good                   | C:13:359           | Fair                   |
| A:16:163           | Good                   | C:13:362           | Fair                   |
| A:16:167           | Fair                   | C:13:364           | Good                   |
| A:16:171           | Good                   | C:13:368           | Fair                   |
| A:16:175           | Fair                   | C:13:371           | Fair                   |
| A:16:176           | Good                   | C:13:377           | Fair                   |
| A:16:180           | Fair                   | C:13:379           | Fair                   |
| A:16:185           | Fair                   | C:13:381           | Fair                   |
| B:09:314           | Fair                   | C:13:387           | Fair                   |
| B:09:316           | Fair                   | C:13:393           | Fair                   |
| B:09:317           | Fair                   | G:03:002           | Fair                   |
| B:10:111           | Good                   | G:03:003           | Fair                   |
| B:10:224           | Fair                   | G:03:024           | Fair                   |
| B:10:225           | Good                   | G:03:025           | Fair                   |
| B:10:237           | Fair                   | G:03:026           | Fair                   |
| B:11:275           | Good                   | G:03:029           | Fair                   |
| B:11:277           | Fair                   | G:03:032           | Fair                   |
| B:11:281           | Fair                   | G:03:034           | Good                   |
| B:11:282           | Good                   | G:03:037           | Good                   |
| B:13:001           | Good                   | G:03:041           | Fair                   |
| B:14:093           | Good                   | G:03:043           | Fair                   |
| B:14:095           | Good                   | G:03:044           | Fair                   |
| B:14:105           | Fair                   | G:03:048           | Fair                   |
| B:14:107           | Fair                   | G:03:049           | Good                   |
| B:15:119           | Fair                   | G:03:052           | Fair                   |
| B:15:127           | Good                   | G:03:055           | Good                   |
| B:15:128           | Good                   | G:03:056           | Fair                   |
| B:15:135           | Good                   | G:03:057           | Fair                   |
| B:16:259           | Fair                   | G:03:058           | Fair                   |
| C:02:094           | Fair                   | G:03:065           | Fair                   |
| C:02:098           | Poor                   | G:03:071           | Fair                   |
| C:02:101           | Fair                   | G:03:076           | Good                   |
| C:09:050           | Fair                   | G:03:080           | Good                   |

### Frequency of ASMIS Site Condition determinations for FY2005 sites Monitored

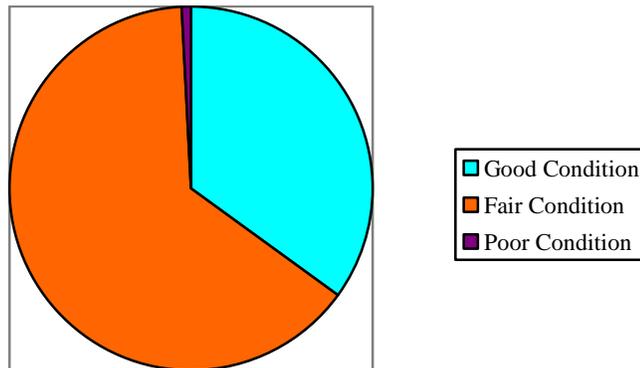


Figure 8. Pie chart representation of ASMIS site condition for 106 sites monitored in FY2005.

Specific site descriptions, work conducted and monitoring observations are provided below. Each site monitored in FY2005 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 and this work is also summarized in the “Summary of Previous Work Implemented” table. The “FY2005 Monitoring Observations” are taken 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. At the request of Reclamation (M. Berry personal communication 2005) radiocarbon dates have been removed from the site specific text and placed into a single table in Appendix C.

#### SITE SPECIFIC MONITORING OBSERVATIONS AND RECOMMENDATIONS

##### **A:15:003 Roaster Complex Three Year Schedule**

This is a multi-component site with a PII Virgin Puebloan occupation, and later Pai or Paiute and late historic affiliations. It consists of two loci (A and B). Locus A occupies a sandy terrace at the base of a Muav cliff face and talus slopes below. There are numerous roasting pits in this area, suggesting that this was a major activity focus. Historic and modern (post-1950s) material is present, and protohistoric (Pai or Paiute) use of the area is suggested by the recent appearance of charcoal on the surface of the ground. Locus B consists of three feature areas. Feature 1 is an overhang shelter at the base of the Muav that was used by PII Virgin Puebloan peoples. A midden downslope contains 1930s-era trash as well as flakes, sherds, and charcoal. Features 2 and 3 are around the bend of the Muav Limestone cliff face. Feature 2 is a cleared area with flakes and charcoal and a boot heel. Feature 3 is another cleared area with stacked rocks.

##### ***Previous Work***

The site was originally recorded by R. Euler in 1978 and incorporated into the river corridor sample in 1990 (Fairley et al., 1994). RCMP archaeologists monitored the site in FY93, FY94, FY96, FY98 and FY01 (Coder et al., 1994b; Coder et al., 1995a; Leap et al., 1996; Leap et al., 1998; Dierker et al. 2001). Allen Gellis (USGS, Albuquerque, NM) termed the erosion at this site as “minor” with “no distinct drainages on slope, colluvium, or talus” (Gellis 1994). Between

1994 and 1998, very distinct drainages have been created. No remedial actions have been implemented at this site.

***FY2005 Monitoring Observations***

Minor sheetwashing was observed among the historic artifacts below the shelter area. Aside from the sheetwash, the site is heavily vegetated and no other physical impacts were observed. Vegetation has increased substantially since the 1997 monitoring pictures. A combination of human and animal trails bisect Features 1, 2 and 3 in Locus A and have increased since 1997 photographs. Trail obliteration is recommended. The site has dense vegetation with the wet year of 2005. Locating Feature 7 was difficult due to the dense vegetation. Other features are also covered with dense vegetation. Recommend assessing the site for trail work. Continue monitoring the site every three years.

**A:15:004 Artifact Scatter  
Five Year Schedule**

The site contains two loci, A and B. Locus A consists of several sparse scatters of fire-cracked rock situated in and around a dense mesquite thicket. Locus B consists of a pot break and lithic scatter along a Muav Limestone bench at the mouth of a major side canyon.

***Previous Work***

The site was first recorded in 1976 with additional features added by the river corridor surveyors in 1991 (Fairley et al., 1994). The RCMP staff have monitored this site in FY93, FY94, FY98, and FY2005 (Coder et al., 1994b; Coder et al., 1995a; Leap et al., 1998). No remedial actions have been conducted at this site.

***FY2005 Monitoring Observations***

The site is heavily vegetated with abundant grasses and shrubs covering the site surface. The mesquite thicket outlined on the site map is now dead and creosote bushes are filling in. No physical impacts were observed. No sign of human visitation was observed. No management recommendations have been made at this time. The terrace-based arroyo within the site may become active, threatening the integrity of the roasting feature. Although data recovery is not recommended, the site does have research potential. Continue monitoring every five years.

**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. Feature 1 is a six meter diameter pit on a ridge in the main drainage and Feature 2 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, FY04, and FY2005 (Coder et al., 1994b; Coder et al., 1995b; Leap et al., 1996; Leap et al., 1997; Leap et al., 1998; Leap et al., 2000; Leap and Kunde 2000; Dierker et al., 2002; Dierker and Leap, 2005). 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. 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's personnel assessed the site for checkdam work and five checkdams were installed in an active gully near Feature 1. This site was also included in the studies conducted by K. Thompson and A. Potochnik (Thompson and Potochnik, 2000). The site was also assessed for revegetation and trail work to deter continued visitation and destruction of the roasting features by trailing. Trail work completed by the GRCA trail crew in FY97 has successfully deterred visitation.

***Summary of Previous Work Implemented***

| <b>Remedial Actions</b> | <b>Date Completed</b> |
|-------------------------|-----------------------|
| 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            |

***FY2005 Monitoring Observations***

There is abundant spring vegetation across the site area and within the drainage with the checkdams. Eolian activity is also inactive due to vegetation. Features 1 and 2 at Locus C have no new physical impacts, and surface erosion and gullying are currently inactive. However, Locus C is will be more vulnerable to erosion after the spring vegetation dies back. It does not appear that the area has received recent visitation. Continue annual checkdam monitoring and maintenance. Continue biennial monitoring.

**A:15:018 Camp with Rock Art  
Biennial Schedule**

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 m deep cliff overhang that extends east-west for about 25 m. 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"). Two flakes and some bone in a packrat midden complete the artifact assemblage. One FCR feature is located below and west of Shelter 1.

***Previous Work***

The site was initially recorded by NPS survey personnel in November, 1990 (Fairley et al., 1994) and monitored in FY96 and FY03 (Leap et al., 1996; Leap et al., 2003). Medium format photographs of the rock art panels were taken in FY97. No other recommendations have been implemented. This location is also visually inspected by the Southern Paiute Consortium's Colorado River Corridor Resource Evaluation Program.

***Summary of Previous Work Implemented***

| <b>Remedial Actions</b> | <b>Date Completed</b> |
|-------------------------|-----------------------|
| MF Photos               | 03/03/1997            |

***FY2005 Monitoring Observations***

General weathering of pictographs was noted. Two social trails lead into the site. The easternmost trail bisects through the dune below the discard rock pile and is beginning to cause erosion. Erosion control is recommended before the trails deepen.

**A:15:020 Roaster Complex  
Four Year Schedule**

A:15:020 is an extensive Puebloan and Protohistoric Pai site with fire features, activity areas, stained soil and associated artifacts. The site consists of 13 distinct roasting features with several concentrations of fire-cracked rock dispersed throughout the site boundary. There is also an overhang rock shelter with a large midden below it. Two Hopi sherds were found on the surface. The site is located on an alluvial terrace. FY98 monitors identified newly exposed chert projectile point tips in the midden and pecked stones at Feature 4.

***Previous Work***

The site was originally recorded during the river corridor survey (Fairley et al., 1994), and monitored in FY93, FY94, FY98, FY02, and FY2005 (Coder et al., 1994b; Coder et al., 1995a; Leap et al., 1998; Dierker et al., 2002). No remedial actions have been recommended or implemented at this site.

***FY2005 Monitoring Observations***

Abundant vegetation covers this site. The gullies are inactive. All features look good, no new physical impacts were observed during this monitoring episode. No sign of human visitation was observed. Subsurface data potential is high at this site. Continue monitoring as the roasters are located on an alluvial terrace that has actively down cut in the past.

**A:15:021 Roasting Feature  
Five Year Schedule**

A:15:021 is a late prehistoric-early historic Paiute site, with a later historic component, consisting of an 80% intact slab/block-lined fire feature with most of its fill still remaining. Nearby is a finely-worked, obsidian Desert Side-Notched point, several sherds from a single Paiute Brown Ware jar, and a recent historic can scatter. The cans are from the latter end of the 1920-1950 period and possibly have a Hualapai affinity. A single bone shirt button is also present. The prehistoric component is centered on the top of a stabilized dune; the cans and sherds are scattered over a limestone bench area adjacent the upstream terminus of the dune.

***Previous Work***

The site was initially recorded in November 1990 by NPS survey personnel (Fairley et al., 1994), and monitored by RCMP staff in FY94, FY95, FY99, FY01, and FY2005 (Coder et al., 1995a; Coder et al., 1995b; Leap et al., 2000; Dierker et al., 2001). No remedial actions have been implemented at this site.

***FY2005 Monitoring Observations***

The site is located on an alluvial terrace overlooking the river. No physical impacts were observed. No sign of human visitation was observed. The site is unchanged since photographed in 1994. Charcoal and other datable remains are present. Recommend reducing the monitoring schedule to every five years.

**A:15:022 Roaster Complex  
Five Year Schedule**

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

***Previous Work***

The site was initially recorded by NPS survey personnel in January, 1991 (Fairley et al., 1994) and monitored in FY96, FY03, and FY2005 (Leap et al., 1996; Leap et al., 2003). No remedial actions have been recommended or implemented at this site.

***FY2005 Monitoring Observations***

Spring vegetation and cryptobiotic crust are currently anchoring the site. No runoff is evident. Surface erosion and eolian processes that have been identified on previous monitoring episodes are currently inactive due to the abundant seasonal vegetation. No sign of human visitation was observed. There is a high potential for additional subsurface cultural remains on this terrace. Currently no visitor-related impacts are present and physical impacts are inactive. . Continue monitoring every five years due to the presence of a terrace-based gully within the site.

**A:15:025 Special Activity Locus  
Five Year Schedule**

A:15:025 is a hematite mine that was the site of prehistoric and late historic mineral procurement. The ancestors of the Hualapai and Paiute people most likely traded the pigment, obtained and processed at this location, all over the region. GRCA archaeologists also recorded a Pueblo I-early Pueblo II Virgin component. It is possible that the fire-cracked rock on the slope below the mine is a result of the lava flow baking the limestone cobbles (F. Nials, personal communication, 2001). Although Native Americans visited the site into late historic times, it has remained dormant most of the 20th century.

***Previous Work***

Archaeologists officially recorded A:15:025 in November 1990 (Fairley et al., 1994). RCMP staff monitored the site in FY93, FY94, FY95, FY01, and FY2005 (Coder et al., 1994b; Coder et al., 1995a; Coder et al., 1995b; Dierker et al., 2001). This site was also included in the studies conducted by K. Thompson and A. Potochnik (Thompson and Potochnik, 2000). It was recommended in FY01 that a carbon sample be taken from the midden area, yet, no remedial actions have been implemented at this site.

***FY2005 Monitoring Observations***

The shelter area is well protected from the elements. The slope below the rockshelter has gullies and rills through the fire-cracked rock. This area is heavily vegetated at this time due to abundant spring vegetation. When this vegetation dies back, the slope will be susceptible to additional erosion. There are piles of hematite and scratching on rocks in the drainage. Visitation to the area appears to be the primary threat. GRCA managers will address this impact through the implementation of the Colorado River Management Plan. Continue monitoring this site every five years.

**A:15:026 Roaster Complex  
Five Year Schedule**

This site consists of two roasting features. No artifacts have been observed on the surface. The site is located on stable dune deposits overlaying high water and colluvial debris. Grasses cover the site, making it virtually unrecognizable at first glance.

***Previous Work***

The site was originally recorded in 1991 (Fairley et al., 1994), and has been monitored in FY92, FY93, FY94, FY98, and FY2005 (Coder et al., 1994a; Coder et al., 1994b; Coder et al., 1995a; Leap et al., 1998). No remedial actions have been recommended or implemented.

***FY2005 Monitoring Observations***

Dense vegetation covers this site. The features are stable and unchanged from the photographs. No physical impacts are present. No sign of human visitation was observed. Continue monitoring every five years as there is the potential for additional cultural material to be exposed.

**A:15:027 Roasting Feature  
Five Year Schedule**

A:15:027 consists of at least one fairly large roasting feature (Feature 1) and a smaller fire-cracked rock mound (Feature 2), with several possible discard scatters around Feature 1. There is also a relatively extensive lithic scatter and a dozen sherds, including a single Jeddito plain ware. This may be a multi-component site with both Late Pueblo I-Early Pueblo II Virgin and late prehistoric-early historic Pai occupation. Debitage at the site indicates that a variety of lithic reduction tasks were performed, including biface reduction and projectile point manufacture. Several groundstone items suggest that plant food processing was also an important activity. The site is located on a dissected terrace remnant adjacent to the river.

***Previous Work***

The site was first recorded in November 1990 (Fairley et al., 1994). The site was monitored at least annually between FY92 and FY95 (Coder et al., 1994a; Coder et al., 1994b; Coder et al., 1995a; Coder et al., 1995b). In FY95, the site was placed on a three to five-year monitoring schedule. It was monitored FY99 and FY2005 (Leap et al., 2000). No remedial actions have been implemented at this site.

***FY2005 Monitoring Observations***

Features 1 and 2 are unchanged. Vegetation including cryptobiotic soil is abundant here. No new physical impacts were observed. Artifact movement was noted with a mano being placed onto a grinding slab, indicating some visitation has occurred even though the site is located away from any camping or attraction areas. . The site is on an inactive dune though there is the potential for physical impacts. Subsurface data potential is high at this site. Continue monitoring every five years

**A:15:028 Roaster Complex  
Five Year Schedule**

This site consists of three overlapping fire pits with scattered fire-cracked rock, ceramics, and groundstone. The artifact assemblage is dominated by groundstone tools, and ceramic evidence suggests a late prehistoric - early historic Pai/Paiute occupation. The site is located on a stabilized dune underlain by locally derived debris flow deposits. Cryptobiotic soil is well developed at this location and virtually covers the site.

***Previous Work***

The site was initially recorded by NPS survey personnel in November, 1990 (Fairley et al., 1994), and monitored in FY96 and FY2005 (Leap et al., 1996). No remedial actions have been implemented at this site.

***FY2005 Monitoring Observations***

Feature 5 is bisected by a terrace-based gully. There is a high potential for subsurface remains becoming exposed at this site. Recommend a checkdam assessment at Feature 5. The features appear stabilized by spring vegetation and abundant cryptobiotic soil. No active physical impacts were observed. No sign of human visitation was observed. Continue monitoring every five years due to the presence of a terrace-based gully through Feature 5.

**A:15:029 Thermal Feature  
Five Year Schedule**

This site consists of a single roasting feature perched on a cutbank. The feature has the likely potential to erode because of this precarious location. A game trail skirts the eastern edge. No artifacts were observed on the surface and cultural affiliation is unknown.

***Previous Work***

The site was initially recorded by NPS survey personnel in February 1991 (Fairley et al., 1994), and monitored in FY96 and FY2005 (Leap et al., 1996). No remedial actions have been recommended or implemented at this site.

***FY2005 Monitoring Observations***

The site is heavily vegetated with various grasses, shrubs, creosote and cactus. The spring vegetation obscures the ground surface and eolian activity is currently inactive. A small channel 30 centimeters in width and 5 centimeters deep runs along the terrace approximately 8-10 meters from the fire-cracked rock area. The main feature is adjacent to a main side canyon but currently activity from this side canyon does not threaten the feature. The site is threatened by slump into the side canyon drainage. The banks are stable due to the abundant vegetation. It is currently difficult to see the site area due to heavy vegetation. No new physical or visitor-related impacts were observed. Continue monitoring every five years.

**A:15:038 Thermal Feature  
Five Year Schedule**

This PI-early PII Virgin and late prehistoric-early historic Pai site consists of an extensive scatter of FCR and associated artifacts on the highest sand dune just below Spring Canyon. The bulk of the FCR and cultural material is found on the downstream slope. Artifacts present include Virgin and Pai sherds, a McKean projectile point, lithic debris, a steatite bead blank, and a couple of flake tools. The McKean point is an Archaic diagnostic and may have been curated and re-used by the inhabitants.

***Previous Work***

The site was initially recorded by NPS survey personnel in April 1991 (Fairley et al., 1994). The site was monitored in FY92, FY96, and FY2005 (Coder et al., 1994a; Leap et al., 1996). No remedial actions have been recommend or implemented at this site.

***FY2005 Monitoring Observations***

The dune appears stable with vegetation and cryptobiotic soils. Abundant vegetation currently anchors the site although the site boundary is not heavily vegetated. Some rodent burrowing is evident adjacent to the FCR scatter. Rodent burrowing may uncover additional cultural remains. A river-based drainage may become active and threaten the site. Continue monitoring every five years.

**A:15:039 Roaster Complex  
Three Year Schedule**

This is a late prehistoric-early historic Pai site that consists of 2-3 roasting features situated in reworked eolian sand. One roasting feature is well defined, with an interior depression surrounded by abundant fire-cracked rock and charcoal stained soil. Two other fire-cracked rock concentrations are more amorphous; one is probably an additional eroded roasting feature, while the other may simply be a refuse area. The features and artifact assemblage, which includes sparse lithics and three non-formalized grinding slabs, suggest brief use of the site as a food processing camp, although occupation may have been repetitive.

***Previous Work***

A:15:039 was initially recorded by NPS survey personnel in January of 1991 (Fairley et al., 1994), and monitored in FY92, FY93, FY94, FY95, FY99, FY01, and FY2005 (Coder et al., 1994a; Coder et al., 1994b; Coder et al., 1995a; Coder et al., 1995b; Leap et al., 2000; Dierker et al., 2001). No remedial actions have been implemented.

***FY2005 Monitoring Observations***

There is minor gully activity in the FCR area north of Feature 2 through the west side of the area. There is also gulying on the east side of the feature, draining to the west of Feature 2. Heavy vegetation obscures the ground surface, but there is evidence of animal burrowing in the feature areas. Grasses in the gully bisecting Feature 1 may be stalling eolian and alluvial erosion. Arroyo and gully activity are active primarily outside of the feature areas and intervention such as data recovery is warranted. The gully north of Feature 2 in the impact area on the map is recommended for checkdam installation. Due to the gentle slope and the amount of vegetation it is believed that checkdams would be very beneficial here, stabilizing the area before impact occurs to Feature 2 and the upslope features. This entire site has research potential. No sign of visitation was observed. Continue site condition monitoring every three years.

**A:15:047 Artifact Scatter  
Five Year Schedule**

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

***Previous Work***

The site was initially recorded by NPS survey personnel in March 1991 (Fairley et al., 1994), and monitored in FY96, FY03, and FY2005 (Leap et al., 1996; Leap et al., 2003). The mortars were mapped and incorporated as part of the site in October 1994. No remedial actions have been recommended or implemented.

***FY2005 Monitoring Observations***

The site is unchanged from the previous photographs. There is abundant vegetation below the shelter. The mortars filled with alluvially-transported sediment during the 41,000 cfs experimental flow. No sign of human visitation was observed. Continue monitoring every five years.

**A:16:004 Structure-Thermal Feature Complex  
Biennial Schedule**

The site consists of numerous roasting pits, shelters with alignments and a diverse and dense scatter of artifacts. Three possible components are indicated: Late Archaic, PI-III Formative, and late prehistoric-early historic Pai and Paiute. Features include: a shelter with lithics, bone, and several manos; a shelter with lithics, a few ceramics, and a grinding slab; a shelter with an extensive roasting pit and abundant sherds, lithics, and some groundstone; a basalt wall on top of a limestone cliff; a shelter with two meter long rock alignments with lithics, sherds, manos, and a burned beam; a large donut-shaped roasting pit about 15 meter in diameter; a roasting pit measuring 5 by 10 meter; a roasting pit 10 meter in diameter; a horseshoe-shaped pit eroding at the base; and a smaller pit eroding into a gully. The site is located on a variety of landforms, including; stabilized dunes, Tapeats Sandstone rock ledges, and a flattened basalt outcrop.

***Previous Work:***

The site was originally recorded by R. Euler in 1975 and was recorded and mapped in more detail by NPS survey personnel in January 1991 (Fairley et al., 1994). The site was monitored in FY92, FY93, FY94, FY96, FY98, FY00, FY02, and FY2005 (Coder et al., 1994a; Coder et al., 1994b; Coder et al., 1995a; Leap et al., 1996; Leap et al., 1998; Leap and Kunde 2000; Dierker et al., 2002). This site was also included in the studies conducted by K. Thompson and A. Potochnik (Thompson and Potochnik, 2000). No remedial actions have been implemented.

***FY2005 Monitoring Observations***

There is abundant vegetation protecting all of the features from eolian activity and slope wash. The vegetation within the drainages also appears to be halting alluvial downcutting. Features 7 and 8 are almost completely covered by vegetation. After the spring vegetation dies off, it is likely that the erosion process will re-start. Trails are present leading to the site area though no recent visitation was observed. It is expected that foot traffic will increase again in the summer after spring vegetation has died back. The site is currently well protected by spring vegetation. Eolian activity is inactive. Runoff, surface erosion, and gullying and arroyo cutting are also inactive due to spring vegetation. Continue biennial monitoring.

**A:16:148 Roasting Feature  
Five Year Schedule**

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

***Previous Work***

The site was originally recorded in 1990 (Fairley et al., 1994), and monitored in FY94, FY96, FY98, FY03, and FY2005 (Coder et al., 1995a; Leap et al., 1996; Leap et al., 1998; Leap et al., 2003). No remedial actions have been recommended or implemented.

***FY2005 Monitoring Observations***

The site appears stabilized by abundant vegetation covering most of the ground surface. Eolian activity is inactive due to the spring vegetation. There are several knickpoints in the terrace-based drainage 10-50 centimeter deep just north of areas 1 and 2. Vegetation currently covers this drainage though it has been active since last observed. No sign of human visitation was observed. If dune deflation continues and additional archaeological materials become exposed then the monitoring frequency may increase. At this time, continue monitoring every five years.

**A:16:151 Artifact Scatter and Roaster  
Five Year Schedule**

This site consists of two separate loci designated A and B that may reflect a late prehistoric-early historic Pai occupation with later historic (late 19th Century) use. Locus A is situated on the upstream side of a canyon mouth and consists of a large roasting feature (F1) and its associated discard pile, ash midden, and debris, plus a ground cobble. F2 is a much smaller fire feature. Between F1 and 2 is a lithic debitage concentration, a ground slick, a single Pai sherd, and a battering device. A worked piece of brass horsetack and a soldered, re-closable lid can were also associated with F1. Locus B is situated on the downstream side of the canyon mouth and consists of several lithics, a single Pai sherd, and a charcoal-rich midden associated with a shallow overhang. There is a lot of charcoal present on the surface of Locus A, and the midden exhibits extensive use.

***Previous Work***

The site was originally recorded in 1990 (Fairley et al., 1994), and monitored in FY93, FY94, FY95, FY98 and FY2005 (Coder et al., 1994b; Coder et al., 1995a; Coder et al., 1995b; Leap et al., 1998). Trail obliteration work was conducted here in FY97.

***Summary of Previous Work Implemented***

| Remedial Actions | Date Completed |
|------------------|----------------|
| Trail Work       | 02/26/1997     |

***FY2005 Monitoring Observations***

Locus A, Feature 1 looks great even with the deflated center of the roaster. Locus B looks good as well. Surface artifacts were all relocated. No active surface erosion or eolian activity was observed. No sign of human visitation was observed. There is a small camp below the site and a new river guide includes this location as a campsite with adjacent water (Martin and Whitis, 2004). Visitation may increase through Locus A if private trips camp here and try to collect water from the drainage. Currently, there is no evidence of the trail previously identified as impacting Locus A. No changes were observed. The drip line at Locus B is not very well defined indicating little active runoff from the cliff above the shelter at this time. Continue monitoring every 5 years.

**A:16:154 Structure with Roaster Complex  
Discontinue Schedule**

This site contains a large southeast-facing rockshelter situated in the Bright Angel Shale. Two distinct fire features and associated activity areas are present. Artifacts include Paiute and Jeddito plainware sherds, a sandstone grinding slab, lithic debris, and an abundance of cracked bone.

***Previous Work***

This site was initially recorded by NPS survey personnel in November, 1990 (Fairley et al., 1994), and monitored in FY96 and FY2005 (Leap et al., 1996). No remedial actions have been recommended or implemented at this site.

***FY2005 Monitoring Observations***

The site has not changed since photographed in 1990. Eolian activity does not appear active as the entire site surface is covered with spalled Bright Angel shale pieces. No recent sign of human visitation was observed though an old beer and pop stash was found just south of the same overhang. The site is well protected from physical impacts. No human impacts were observed. The site is out of the APE for dam effects and it is recommended that monitoring of the site be turned over to the GRCA archaeology base program.

**A:16:158 Artifact Scatter  
Five Year Schedule**

A:16:158 is an aceramic site of unknown cultural affiliation located in a Muav Limestone rockshelter. Artifacts include a Supai Sandstone pecked slab and three chert flakes, along with several possible manos. The pecked slab is flat, river-worn and has a distinct pecked central use surface. The slab measures 40 centimeters long by 30 centimeters wide and is about 6-7 centimeters thick. Floods have inundated the site; the shelter floor is covered by river-deposited sand and there is driftwood jammed in cracks behind the shelter. FY95 monitors discovered an unrecorded bedrock mortar.

***Previous Work***

Archaeologists initially recorded the site in November 1990 (Fairley et al., 1994). RCMP staff monitored A:16:158 in FY92, FY93, FY94, FY95, FY99, and FY2005 (Coder et al., 1994a; Coder et al., 1994b; Coder et al., 1995a; Coder et al., 1995b; Leap et al., 2000). No remedial actions have been implemented.

***FY2005 Monitoring Observations***

Eolian-caused deflation and minor channeling were observed. The grinding stone visible in an earlier photograph and marked on the site map has been moved. There is no other evidence of visitation to the site. To what degree the flows have had is unknown. Eolian activity has resulted in sand covering the shelter floor. Driftwood is also abundant throughout the shelter and between rocks suggesting the site is vulnerable to river flood flows. Due to the abundant deposition of sand, there is a high probability for subsurface cultural materials. Continue monitoring every five years.

**A:16:160 Roasting Feature  
Five-year Schedule**

This site consists of a cluster of six fire features and an artifact concentration including lithics, charcoal, bone, a mano and metate. The site is located on an alluvial terrace adjacent to a major side canyon drainage.

***Previous Work***

The site was originally recorded in 1990 (Fairley et al., 1994), and monitored in FY94, FY98, FY03, and FY2005 (Coder et al., 1995a; Leap et al., 1998; Leap et al., 2003). Trail obliteration work was completed in FY03.

***Summary of RCMP Work Implemented***

| <b>Remedial Action</b> | <b>Date Completed</b> |
|------------------------|-----------------------|
| Trail Work             | 11/22/2002            |

***FY2005 Monitoring Observations***

Four knickpoints within the drainage ranging in depth from five centimeters at the top to 40 centimeters at the bottom are adjacent to the metate. The active drainage will likely continue to move upslope, but at the mouth it has downcut to gravel. All other features appear stable at this time. Since the NPS trail work conducted on a previous cooperative resource trip, there are no trails leading up to or bisecting the site. The trail work has been successful. It is recommended that the metate be moved if the gully continues to grow. It is also recommended that brush checkdams or gravels be installed to deter further headward migration of the drainage. Continue monitoring every five years.

**A:16:163 Small Structures with Rock Art  
Discontinue Schedule**

This site consists of five separate loci. Locus A is located along the base of a Bright Angel Shale cliff and contains several structural elements and pictographs. Locus B consists solely of pictographs along a rock overhang. Locus C is a lithic scatter. Loci D and E are both rock outlined structures. Together, these five loci combine to form a habitation and activity area of unknown cultural affiliation along a major side canyon drainage.

***Previous Work***

The site was originally recorded in 1990 (Fairley et al., 1994), and monitored in FY94, FY98, and FY2005 (Coder et al., 1995a; Leap et al., 1998). Medium format photographs were taken of Locus B in FY97.

***Summary of Previous Work Implemented***

| <b>Remedial Actions</b> | <b>Date Completed</b> |
|-------------------------|-----------------------|
| MF Photos               | 03/03/1997            |

***FY2005 Monitoring Observations***

Spalling and surface erosion have the potential to impact this site, yet, generally, the rock art is well protected from the elements. No changes were observed at the structures. Locus E and F are located below the overhangs on the next terrace down. A GCMRC over-flights panel point is located adjacent to these Loci. Data potential is high at this site. The site is located above the APE for dam operations and will be discontinued from consideration in this program.

**A:16:167 Roaster Complex  
Five Year Schedule**

This site consists of five separate roasting features (Feature 1-5) and a small, partially collapsed, scoured rockshelter with a few artifacts (Feature 6). Artifacts suggest that this is a multi-component site, with both Pueblo I to Pueblo III Virgin and late prehistoric-early historic Pai/Paiute occupations. The roasting features are spread over about a half an acre of stabilized dune surface. Archaeologists identified flakes, a ground slab, and one cobble hand tool on-site. Buried materials are highly probable.

***Previous Work***

The site was initially recorded in 1990 (Fairley et al., 1994), and monitored in FY93, FY94, FY96, FY98, FY03, and FY2005 (Coder et al., 1994b; Coder et al., 1995a; Leap et al., 1996; Leap et al., 1998; Leap et al., 2003). In FY98 re-trailing was recommended. Trail work turned out to be unnecessary because the lush vegetation of 2002 “healed” the trails. No additional RCMP work has been recommended or implemented.

***FY2005 Monitoring Observations***

The site is heavily vegetated, with little ground surface visible. Heavy grass, moss, and cryptobiotic soils cover the sand deposits. There is some evidence of a large mammal using the shelter area of Feature 6. Surface erosion is inactive due to the heavy cover of spring vegetation. Trailing is evident at the site though difficult to see through the heavy spring vegetation. It is postulated that the trails will be more prominent after the summer season. The site has research potential, is stable and in good condition. Continue monitoring every five years.

**A:16:171 Roaster Complex  
Five Year Schedule**

This site consists of two roasting features and artifacts. It consists of some jumbled FCR and some problematic cobble tools. Lithic debris is present at the site, as well as charcoal, animal bone, a single sherd of Polacca Polychrome (dated 1780-1900’s), and a biface fragment. Numerous hand-sized sandstone cobbles are present; they are not burned and may represent expedient use. There is also a broken (50% intact) quartzite mano near F2.

***Previous Work***

This site was originally recorded in 1991 (Fairley et al., 1994), and monitored in FY94, FY98, and FY2005 (Coder et al., 1995a; Leap et al., 1998). No remedial actions have been recommended or implemented at this site.

***FY2005 Monitoring Observations***

No physical impacts were observed. A lot of spring vegetation and cryptobiotic crusts cover this site. No sign of human visitation was observed. The site is located on an alluvial terrace and there is the potential for site degradation. Continue monitoring every five years.

**A:16:175 Thermal Feature  
Three Year Schedule**

A:16:175 is a series of shallow overhangs with associated fire features and a midden with concentrations of sherds, lithics, burned bone, and charcoal. Two Desert Side-Notched points were found at the site. Sherds and projectile points found on the surface indicate a multiple occupation of Virgin Branch and a later Pai/Paiute presence. The site itself is located on the upstream end of a dissected alluvial terrace with on-site gullies and arroyos that drain into the river. This site, with its exceptionally well-developed midden, presents evidence for a more intensive and/or longer-term use of the area.

***Previous Work***

GRCA survey personnel recorded the site in February 1991 (Fairley et al., 1994). RCMP staff monitored the site in FY92, FY93, FY94, FY01, and FY2005 (Coder et al.; 1994a, Coder et al.; 1994b, Coder et al., 1995a; Dierker et al., 2001). Although checkdam installation was recommended in FY01, consultation with ZCP members in FY02 resulted in an “unnecessary” designation for the work because of drainage inactivity. No remedial actions have been implemented at this site.

***FY2005 Monitoring Observations***

The gully bisecting Feature 6 is inactive but has the potential to become active after the die off of the heavy spring vegetation that is present on site at this time. Some minor surface erosion is evident at Features 1, 2, and 3 since the last monitoring episode. No sign of human visitation at this time. The site appears stable, heavy spring vegetation covers the site area making features difficult to access. After the spring vegetation dies off, the site may be more vulnerable to active erosion. Continue monitoring every three years.

**A:16:176 Roasting Feature  
Inactive Schedule**

A:16:176 is an aceramic site with a single roasting feature and scattered lithics. Burned bone is also present. The site is located on a small flattened area at the top of an acacia-covered slope. No gullies or arroyos drain directly into the river from the site, though the site is situated only three meters from the river's edge. Cultural affiliation is unknown.

***Previous Work***

This site was initially recorded by NPS survey personnel in January of 1991 (Fairley et al., 1994), and was monitored FY94, FY01, and FY2005 (Coder et al., 1995a; Dierker et al., 2001). Collecting a charcoal sample was recommended in FY03 though the priority is low. No remedial actions have been implemented at this location.

***FY2005 Monitoring Observations***

Rock spall from the basalt cliff threatens the site. The site is currently very protected by seasonal vegetation and eolian processes are inactive. No sign of human visitation was observed. There is large-sized driftwood, typically indicative of the 1956 flood, on the site indicating that the site is vulnerable to river flood flows. The site is within the historic flood zone and it is recommended that monitoring is not currently necessary unless there is a large flood event.

**A:16:180 Roasting Feature  
Biennial Schedule**

This site contains at least two buried roasting features, fire-cracked rock, and one red chert tertiary flake. Two manos were found as well as a Coconino Sandstone grinding slab. Cultural affiliation remains unknown.

***Previous Work***

Archaeologists recorded the site in 1991 (Fairley et al., 1994). RCMP staff monitored the site in FY96, FY98, FY03, and FY2005 (Leap et al., 1996; Leap et al., 1998; Leap et al., 2003). FY96 monitors recommended installing checkdams at this site. Due to the precarious position of Feature 1 in a river-based drainage, RCMP staff assessed this site in FY96 for checkdams and data recovery. A total station map was completed in FY96. Feature 1 (roasting feature) was excavated in FY97 to curtail further loss of archaeological information (Yeatts, 1998). FY98 archaeologists recommended planting vegetation over a trail that formed as a result of excavations. After assessment by NPS archaeologists, it was determined that this action was not necessary because the trail was slowly healing by itself. After data recovery, Zuni conservators constructed six checkdams in the main drainage to prevent the erosion of Feature 2. All six checkdams needed maintenance in FY99 due to the steep alluvial terrace, heavy run-off through the drainage, and continued drainage downcutting to the Colorado River. Minor checkdam maintenance was required in FY00 and FY01. No checkdam maintenance has been necessary here since FY01.

***Summary of RCMP Work Implemented***

| <b>Remedial Action</b> | <b>Date Completed</b> |
|------------------------|-----------------------|
| Total Station Map      | 06/15/1997            |
| Data Recovery          | 03/01/1997            |
| Checkdam Installation  | 03/02/1997            |
| Checkdam Maintenance   | 11/19/1998            |
| Checkdam Maintenance   | 04/26/2000            |
| Checkdam Maintenance   | 10/24/2000            |

***FY2005 Monitoring Observations***

Vegetation blankets the site and has temporarily halted erosional runoff. The features are well protected by this vegetation. No physical impacts were observed. No sign of human visitation was observed. Continue checkdam monitoring and maintenance. Although spring vegetation is protecting the features, as the vegetation dies off, the terrace will become more susceptible to erosion. Continue biennial monitoring of this fragile and vulnerable site.

**A:16:185 Special Activity Locus  
Three Year Schedule**

A:16:185 is a probable human burial consisting of numerous shell beads from the Pacific coast, a finely worked rhyolite Desert Side-Notched projectile point, a few flakes, some Moapa Gray Ware sherds and a single human metatarsal. The site is located in a stabilized set of riverside dunes. Ceramics suggest a Pueblo II Virgin association, but the Desert Side-Notched point indicates a Pai or Paiute affiliation.

***Previous Work***

This site was recorded in February 1991 (Fairley et al., 1994), and monitored in FY93, FY95, FY99, FY01, and FY2005 (Coder et al., 1994b; Coder et al., 1995b; Leap et al., 2000; Dierker et al., 2001). No remedial actions have been implemented.

***FY2005 Monitoring Observations***

The site contains lush spring vegetation. The dunes have been temporarily stabilized by the spring vegetation growth. Surface erosion is inactive. Eolian activity is also inactive due to heavy vegetation. No change is visible at this time. No sign of human visitation was observed. Recommend monitoring this site in the fall to better determine the activities at this site.

**B:09:314 Structure  
Inactive Schedule**

This site consists of a single-coursed structure built against the base of a Muav Limestone cliff overhang. A core, two limestone flakes and charcoal are present on the surface.

***Previous Work***

The site was originally recorded in 1991 (Fairley et al., 1994). The site was monitored in FY98 and FY2005 Leap et al., 1998). No remedial actions have been recommended or implemented at this site.

***FY2005 Monitoring Observations***

No physical impacts were observed. There has been no observable change to this site since it was recorded and photographed in 1991. No sign of human visitation was observed. The site is well protected from the elements and no change has been observed since the site was originally recorded in 1991. It is recommended that the site be placed on the inactive monitoring schedule based on the lack of any observable change since 1991.

**B:09:316 Small Structure  
Four Year Schedule**

This is a possible Pueblo I-Early Pueblo II Formative habitation area that extends for 17 meters along the base of a Muav cliff. The site consists of five rooms defined by several one-course high rock alignments. In association are two metates, charcoal fragments, lithics and ceramics, and a cluster of burned rock. No formal tools are present. Subsequent RCMP monitors have found additional sherds and lithics. The site is within the 1983 flood zone and was probably flooded during that time.

***Previous Work***

The site was originally recorded in 1991 (Fairley et al., 1994), and has been monitored in FY92, FY93, FY94, FY98, FY01, and FY2005 (Coder et al., 1994a; Coder et al., 1994b; Coder et al., 1995a; Leap et al., 1998; Dierker et al., 2001). The site has been recommended for subsurface testing. No remedial actions have been implemented at this time.

***FY2005 Monitoring Observations***

A few flakes, sherds and grinding implements were observed. It is unclear if the depositional depth is greater than 20 centimeters at this location, however, it might be useful to have a sedimentologist, who is interested in recent flooding events research this area. The site is very close to the river, close enough that it is possible future experimental flows could change the depositional context of the site. Monitoring will continue every 4 years with special monitoring occurring during experimental flows.

**B:09:317 Roasting Feature  
Biennial Schedule**

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

***Previous Work***

J. Balsom originally recorded the site in 1986, and it was re-recorded by NPS personnel in 1990 (Fairley et al., 1994). The site was monitored in FY93, FY94, FY95, FY96, FY98, FY01, FY03, and FY2005 (Coder et al., 1994b; Coder et al., 1995a; Coder et al., 1995b; Leap et al., 1996; Leap et al., 1998; Dierker et al., 2001; Leap et al., 2003). Trail work was completed in FY97 and has successfully deterred visitation. Additional trail work was required in FY01, FY02, FY04, and FY2005.

***Summary of RCMP Work Implemented***

| <b>Remedial Action</b> | <b>Date Completed</b> |
|------------------------|-----------------------|
| Trail Obliteration     | 11/16/1996            |
| Trail Work             | 04/03/2001            |
| Trail Obliteration     | 11/15/2001            |
| Trail Work             | 11/20/2002            |
| Trail Work             | 10/20/2004            |

***FY2005 Monitoring Observations***

Charcoal fragments at the roaster appear more widely distributed since last monitor visit. A small gully is present below and slightly downstream of roaster. Although this gully is not impacting the feature, it appears active. Animal burrowing is not currently active. A partial point and white chert were found near the hammerstone. Previous monitors noted that trash was present within the site indicating visitation and the trail was reopened. We obscured the trail with dead and down brush. Continue biennial monitoring.

**B:10:111 Roaster Complex**  
**Four Year Schedule**

The site consists of three roasting features visible on the surface as clusters of fire-cracked sandstone and limestone. These features are eroding down the toe of a terrace ridge. No other artifacts were observed therefore cultural affiliation is unknown. These roasters are situated below a dolomite outcrop where a room is located.

***Previous Work***

This site was initially recorded by NPS survey personnel in October 1990 (Fairley et al., 1994), and monitored in FY93, FY94, FY96, FY01, and FY2005 (Coder et al., 1994b; Coder et al., 1995a; Leap et al., 1996; Dierker et al., 2001). Checkdams were recommended in FY96 though an assessment deemed them unnecessary. No remedial actions have been implemented.

***FY2005 Monitoring Observations***

The site is stable although located within an active dune area. Abundant spring vegetation and cryptobiotic soil crust are currently preserving the features. No active physical impacts were observed. No sign of visitation was observed. Data potential at this location is high. The site retains considerable integrity of form of features. Continue monitoring every four years.

**B:10:224 Thermal Feature**  
**Four Year Schedule**

B:10:224 consists of two fire features adjacent to a major side canyon. Feature 1 is a 1.5-meter diameter mounded roaster in pristine condition, rising 40+ centimeters above the surface. Feature 2 is the remnants of a burned sandstone slab cist eroding out of the edge of the cutbank into the main drainage. Cultural affiliation is unknown as no diagnostic artifacts were observed.

***Previous Work***

Archaeologists recorded the site in September 1990 (Fairley et al., 1994), and the RCMP monitored it in FY92, FY93, FY94, FY95, FY99, FY03, and FY2005 (Coder et al., 1994a; Coder et al., 1994b; Coder et al., 1995a; Coder et al., 1995b; Leap et al., 2000; Leap et al., 2003). In FY92 and FY93 archaeologists noted that planting vegetation may stabilize Feature 2, located precariously along a bank adjacent to a side canyon. In FY99 an assessment stated that planting vegetation would not stabilize this slope and that data recovery of Feature 2 was necessary before it was lost to further downslope erosion. The May 2003 GCMRC sponsored "FIST" trip

participants evaluated this site for evidence of eolian processes. No remedial actions have been implemented at this site.

***FY2005 Monitoring Observations***

There is abundant vegetation with an increase in the growth of the prickly pear in Feature 1. Feature 2 is unchanged. No sign of visitation was observed. Feature 1 is very stable, though Feature 2 has the potential to erode off the slope into the side canyon drainage due to surface erosion or bank slump. Currently this is not an immediate threat to the feature. Continue monitoring this site every four years.

**B:10:225 Small Structure  
Discontinue Schedule**

This site is located under a shallow overhang and on the face of a steep dune and contains two small structures. A midden associated with the structures contains groundstone fragments, sherds, and lithics. Ceramics indicate 1000 to 1150 AD Virgin occupation.

***Previous Work***

The site was originally recorded in 1990 (Fairley et al., 1994), and monitored in FY93, FY94, FY98, FY03, and FY2005 (Coder et al., 1994b; Coder et al., 1995a; Leap et al., 1998; Leap et al., 2003). FY94 archaeologists J. Balsom and T.J. Ferguson changed the monitoring schedule to every 3 - 5 years because the site was relatively stable, noting minor dune migration. Archaeologists in FY98 also noted minor dune migration and changed the schedule to every 5 years. No remedial actions have been implemented at this site.

***FY2005 Monitoring Observations***

The dune, although vegetated with abundant spring vegetation such as prim rose and sand verbena is at least 45 degree slope and is therefore not very stable. Eolian activity is evident but nothing that would threaten the integrity of the site. No sign of human visitation was observed. No work is recommended at this time. The site is located above the APE for dam operations and will be discontinued from consideration in this program.

**B:10:237 Roaster Complex  
Five-year Schedule**

This site is an open roaster complex with lithic debris and contains sherds indicative of Virgin Series dating 1050-1150 AD. It is situated on a dune-covered debris flow at the mouth of a major side canyon. A route out of the inner canyon originates at this site.

***Previous Work***

The site was initially recorded by NPS personnel in September, 1990 (Fairley et al., 1994), and monitored in FY96, FY03, and FY2005 (Leap et al., 1996; Leap et al., 2003). In FY97, the site was assessed for erosion control measures. The assessment revealed that though there is the potential for future downslope erosion, it is not presently active and no preservation options were warranted. No remedial actions have been implemented at this site.

***FY2005 Monitoring Observations***

Considerable vegetation growth has occurred since the last monitoring episode in FY03. Features 1, 2, and 3 are stable and unchanged. No sign of human visitation was observed. There is a small gully with six knickpoints east of Feature 3 though this gully does not affect the feature integrity. Continue monitoring every five years due to the presence of this terrace-based gully on site.

**B:11:275 Small Structure**  
**Five-year Schedule**

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

**Previous Work**

Archaeologists originally recorded the site in 1991 (Fairley et al., 1994), and the RCMP staff monitored it in FY95, FY98, FY03, and FY2005 (Coder et al., 1995b; Leap et al., 1998; Leap et al., 2003). No remedial actions have been recommended or implemented.

***FY2005 Monitoring Observations***

A gully leading from the drip line is active and could be a future threat to site integrity. No other physical impacts were observed. No sign of visitation was observed. The gully has been active and it has the potential to threaten the site integrity. Continue monitoring this site every five years.

**B:11:277 Thermal Feature**  
**Five Year Schedule**

B:11:277 is an open site situated on sand dunes adjacent to the Colorado River and consists of a large concentration of fire-cracked rock (Feature 1), groundstone, lithics, and plain gray ware sherds indicating a Virgin occupation dating 1050 – 1150 AD. There is a high potential for more materials to be buried in the extensive sand dunes.

***Previous Work***

This site was discovered and initially recorded in January 1991 (Fairley et al., 1994), and was monitored in FY95, FY99, FY01, and FY2005 (Coder et al., 1995b; Leap et al., 2000; Dierker et al., 2001). No remedial actions have been implemented at this site.

***FY2005 Monitoring Observations***

There is active gully downcutting south of Feature 1. Six knickpoints are apparent and treatment is recommended. Although vegetation is abundant on site, gullying will continue. No sign of human visitation was observed. It is recommended that the active gully be assessed for checkdam installation, perhaps brush would be good here as rock materials may be difficult to collect. Continue monitoring every five years.

**B:11:281 Thermal Feature**  
**Biennial Schedule**

This is a scatter of sherds, lithics, and groundstone fragments distributed around the northeast margin of a sand-covered talus bench overlooking the river. A northeast-flowing tributary borders the southeast side of the bench/site area. Artifacts are concentrated in several more or less level areas. The presence of sandstone and limestone cobbles and FCR suggest the likelihood of buried roasting features and possibly one or two structures. Ceramics indicate a PII Formative affiliation. A Parowan projectile point was found and collected, and a cobble chert core, quartz chopper/hammerstone, and grinding slab were recorded.

***Previous Work***

This site was initially recorded in January 1991 (Fairley et al., 1994), and monitored in FY95, FY99, FY01, FY03, and FY2005 (Coder et al., 1995b; Leap et al., 2000; Dierker et al., 2001; Leap et al., 2003). This site was also included in the studies conducted by K. Thompson and A. Potochnik (Thompson and Potochnik, 2000). Placement of a drainage cross section for repeat measurements occurred in FY03 and FY04.

***Summary of RCMP Work Implemented***

| <b>Remedial Action</b> | <b>Date Completed</b> |
|------------------------|-----------------------|
| Cross Section          | 03/25/2003            |
| Cross Section          | 03/20/2004            |

***FY2005 Monitoring Observations***

The site is located on a reworked dune which has been partially stabilized by cryptobiotic soils and vegetation. The site appears more vulnerable during the fall and winter months after the spring vegetation has died back. The gully where the cross-sections are located has at least 4 knickpoints all approximately 10 cm deep but did not give the appearance of being active due to the abundant vegetation. No other physical impacts were observed. No sign of human visitation was observed. The site is in fair condition. Continue measuring the cross-section profiles

**B:11:282 Structure-Thermal Feature Complex  
Inactive Schedule**

The site consists of an eroding roasting feature located at the top of a sand dune at the mouth of a small canyon, with an associated sub-circular rock outline adjacent to the arroyo. Feature 1 is a probable wickiup or brush structure outline of a cobble alignment. Lithics are present. This may be a late prehistoric-early historic Paiute/Pai site.

***Previous Work***

This site was initially recorded by NPS surveyors in 1990 (Fairley et al., 1994), and monitored in FY92, FY93, FY94, FY95, FY97, FY99, and FY2005 (Coder et al., 1994a; Coder et al., 1994b; Coder et al., 1995a; Coder et al., 1995b; Leap et al., 1997; Leap et al., 2000). No remedial actions have been implemented at this site.

***FY2005 Monitoring Observations***

This site is very stable. There is abundant cryptobiotic soils and spring vegetation blanketing the site. No physical impacts were observed. No sign of human visitation was observed. This site is in good condition and appears stable at this time. Recommend changing this site from a four year schedule to the inactive monitoring schedule due to a lack of physical impacts on site as shown through repeat monitoring.

**B:13:001 Small Structure  
Discontinue Schedule**

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

***Previous Work***

The site was originally recorded in 1969 by Euler and Gumerman, recorded again by NPS survey personnel in 1990 (Fairley et al., 1994), and monitored in FY97, FY03, and FY2005 (Leap et al., 1997; Leap et al., 2003). No remedial actions have been implemented.

***FY2005 Monitoring Observations***

At Feature 2 one rock was removed. At Feature 1 one stick was removed. This movement was probably due to visitation. No physical impacts were observed. There is some trailing evident but due to the heavy rains, vegetation has covered these trails. After the summer season the trails will become more prevalent. Visitation is the only impact at this site as evidenced by trailing and artifact movement. It is recommended that this site be monitored by the GRCA base funded program. The site is located above the APE for dame operations and will be discontinued from consideration in this program. Monitoring should occur before and after the summer high-use season to create a comparison data set of before and after high use seasons.

**B:14:093 Roaster Complex  
Biennial Schedule**

This aceramic site is a limited activity area of unknown cultural affiliation. It consists of two roasting features of fire-cracked rock. One of the features is eroding out of an arroyo cutbank.

***Previous Work***

The site was originally recorded in 1990 (Fairley et al., 1994), and monitored in FY92, FY93, FY94, FY98, and FY2005 (Coder et al., 1994a; Coder et al., 1994b; Coder et al., 1995a; Leap et al., 1998). No remedial actions have been implemented at this site.

***FY2005 Monitoring Observations***

The dune is active and deflation continues to occur at Feature 1. At Feature 2 deflation and the downward migration of sediment is apparent since the last monitoring photographs. Both features are located within alluvial terrace deposits reworked by eolian activity. No sign of human visitation was observed. A ram skull was found beneath a Tapeats ledge near Feature 2. Also, there is a GCES control point (#707) 2 meters from Feature 1. We speculate that most of the deflation and loose sands are caused by foot traffic from use of the control point by GCMRC personnel. If there was no foot traffic, perhaps the dune would stabilize similar to the location of Feature 2. Discussions between the NPS and GCMRC will occur regarding the recommendation that this control point be abandoned.

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

The site contains two loci containing roasting features, lithics, and sherds representing a Pueblo I-Pueblo II affiliation. The site is located in an active dune field. There are likely additional cultural features buried in these dunes.

***Previous Work***

This site was recorded in September 1990 (Fairley et al., 1994), and monitored in FY93, FY95, FY99, FY03, and FY2005 (Coder et al., 1994b; Coder et al., 1995b; Leap et al., 2000; Leap et al., 2003). An anemometer was installed adjacent to this site in 2003 as part of the aeolian transport study by A. Draut. No remedial actions have been implemented at this site.

***FY2005 Monitoring Observations***

The surface erosion and eolian activity appear to be inactive at this time. Spring vegetation is abundant even in the dunes and is currently stabilizing the site. No active physical impacts were observed. No sign of human visitation was observed. The dune field is generally active, just not during this monitoring visit so it is recommended that monitoring continue every four years. Previous monitoring has shown a pattern of dune activity. There is the potential that the features between the dunes will become more exposed due to deflation.

**B:14:105 Small Structure  
Biennial Schedule**

This Pueblo II (Cohonia/Pai affiliation) site consists of a small rockshelter and structure formed by a single-coursed wall of undressed, tabular and blocky sandstone elements. Adjacent to the wall is a light scatter of approximately 25 lithics and seven sherds. Three roasting features are present below the shelter as well as a single course wall, two meters long. A new circular hearth/cist feature (Feature 6) was identified in FY00.

***Previous Work***

Archaeologists recorded the site in 1990 (Fairley et al., 1994), and the RCMP staff monitored it in FY92, FY93, FY94, FY96, FY98, FY00, FY02, and FY2005 (Coder et al., 1994a; Coder et al., 1994b; Coder et al., 1995a; Leap et al., 1996; Leap et al., 1998; Leap and Kunde 2000; Dierker et al., 2002). During the 1996 research flow, scientists used the camp below this site and severely trampled the site area (including camping on-site and rearranging artifacts). RCMP staff recommended trail obliteration work in FY96 and completed it in FY98. Planting vegetation was recommended in FY98 because the trails had become small river-based gullies. FY98 monitors also recommended checking the trail work during regularly scheduled visits. FY99 monitors assessed the site for more trail work and determined that none would be done due to heavy on-site vegetation. This site was also included in the studies conducted by K. Thompson and A. Potochnik (Thompson and Potochnik, 2000). FY2000 monitors recommended trail work due to the entrenchment of the trail into a gully from the beach up to the site. NPS personnel completed revegetation work in November, 2001 to block access to the site from the beach below.

***Summary of RCMP Work Implemented***

| <b>Remedial Action</b> | <b>Date Completed</b> |
|------------------------|-----------------------|
| Obliterate Trail       | 10/18/1997            |
| Plant Vegetation       | 11/11/2001            |
| Trail Work             | 11/11/2001            |

***FY2005 Monitoring Observations***

Features 4 and 6 are unchanged. Feature 1 is well protected by the overhang and is unchanged. Feature 2 and Feature 3 roasters are unchanged with abundant vegetation growing on and adjacent to the features. Feature 5 is stable and unchanged. No active physical impacts were observed anywhere in the site boundary. No sign of human visitation was observed. The site area is heavily vegetated with spring growth and erosion is inactive due to this vegetation. After the vegetation dies back, the site may become more vulnerable to erosion. Continue biennial monitoring.

**B:14:107 Small structure and FCR  
Three year Schedule**

This Pueblo II-early Pueblo III site consists of a small rockshelter beneath an overhanging Tapeats sandstone bedrock ledge. A few Redwall chert flakes, a quartzite cobble flake, a

limestone cobble mano, and a large Tusayan Corrugated sherd were found inside the shelter. A one-meter long, 30 centimeters high, wall segment is located at the shelter's east end. There is also a large, five-meter diameter crescent-shaped concentration of FCR limestone and charcoal-stained soil eroding out of a sand-covered slope. This concentration of FCR and ash-stained soil is threatened by a gully.

***Previous Work***

The site was originally recorded in 1990 (Fairley et al., 1994), and monitored in FY95, FY96, FY98, FY01, and FY2005 (Coder et al., 1995b; Leap et al., 1996; Leap et al., 1998; Dierker et al., 2001). A water diversion structure was constructed to divert talus slope runoff away from the Feature 2 FCR concentration in FY97. Aside from minor maintenance to change the shape and size of the diversion bar, no other remedial actions have been recommended or implemented.

***Summary of RCMP Work Implemented***

| Remedial Action       | Date Completed |
|-----------------------|----------------|
| Checkdam Installation | 04/21/1997     |
| Checkdam alteration   | 03/04/1998     |
| Checkdam alteration   | 10/20/2000     |

***FY2005 Monitoring Observations***

The site is very stable, there is a lot of cryptobiotic soils, chicory and brome grasses growing. The gully is inactive at this time. The water diversion bar is successfully redirecting runoff away from the feature. No active physical impacts were observed. No sign of human visitation was observed. Continue annual checkdam monitoring. Monitoring will continue every three years due to the history of gully downcutting at this location. Although the water diversion bar is successfully diverting runoff, the old channel could become active in the future.

**B:15:119 Artifact Scatter  
Discontinue Schedule**

This site consists of an artifact scatter of Redwall Chert tools and debitage, ceramics (Early Formative (BMIII-PI)) and charcoal. The artifacts are concentrated along the drip line of a shallow, sheltered area at the base of the Tapeats Sandstone.

***Previous Work***

The site was originally recorded in 1990 (Fairley et al., 1994), and monitored in FY94, FY98, and FY2005 (Coder et al., 1995a; Leap et al., 1998). No remedial actions have been recommended or implemented.

***FY2005 Monitoring Observations***

The site remains unchanged over the last 10 years but there is the potential for surface erosion. The site area is only somewhat protected from the elements by the Tapeats Sandstone overhang. No sign of human visitation was observed. The site should be monitored by the GRCA base program every 5 to 10 years. The site is in fairly undisturbed condition and located out of the area of potential effect for dam operations. The site is located above the APE for dam operations and will be discontinued from consideration in this program.

**B:15:127 Roasting Feature and Structure**  
**Five-year Schedule**

B:15:127 is a Pueblo II site consisting of a shelter beneath a Tapeats Sandstone overhang at the base of a cliff. It is situated on a sand bench with two features: a roughly circular stone alignment that may be the remains of a granary and a roasting feature eroding out of the western slope of the terrace. A single flake, three North Creek Gray Ware sherds, some scattered charcoal, and animal bone complete the site. Buried artifacts or features could be present, and datable materials are present.

***Previous Work***

This site was discovered and recorded in October 1990 (Fairley et al., 1994), and was monitored in FY95, FY99, and FY2005 (Coder et al., 1995b; Leap et al., 2000). No remedial actions have been recommended or implemented.

***FY2005 Monitoring Observations***

Animal traffic is evident at the roaster. There is trailing from animals and packrat activity on-site. No other physical impacts were observed. No sign of human visitation was observed. Research potential is good at this site. The site appears stable and the only impact is naturally occurring animal disturbance at the roasting feature. Continue monitoring every five years.

**B:15:128 Artifact Scatter**  
**Discontinue Schedule**

This is a multi-component site with a prehistoric (possibly Archaic) lithic scatter and a turn-of-the-century historic scatter. The prehistoric scatter is comprised of three projectile points, 100+ flakes, a broken graver, and two biface fragments. Two of the points are Elko items and the third is a Gypsum style point, but with a wider than usual base. Debitage reflects biface thinning; no groundstone, ceramics, or tools suggestive of core reduction are present. The historic camp includes a drill jack, cartridges, two cans, a black pepper tin, and a railroad spike.

***Previous Work***

Original recording of this site was in 1990 by NPS archaeological surveyors (Fairley et al., 1994). The site was monitored in FY97, FY01, and FY2005 (Leap et al., 1997; Dierker et al., 2001). No remedial actions have been recommended or implemented.

***FY2005 Monitoring Observations***

Surface erosion and eolian activity are currently inactive. Vegetation is abundant at this site. Some historic artifacts could not be relocated. Backcountry trails lead across this upper bench to other sites in the area and visitation does occur here. The site is located above the APE for dam operations and will be removed from consideration in this program.

**B:15:135 Small Structure**  
**Discontinue Schedule**

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

***Previous Work***

This site was initially recorded by NPS survey personnel in October 1990 (Fairley et al., 1994), and monitored in FY93, FY94, FY95, FY96, FY03, and FY2005 (Coder et al., 1994b; Coder et

al., 1995a; Coder et al., 1995b; Leap et al., 1996; Leap et al., 2003). No remedial actions have been implemented.

***FY2005 Monitoring Observations***

Although the dune is heavily stabilized by spring vegetation and cryptobiotic soils, there are a few locations where deflation is evident in front of the rockshelter and in the dune area. These areas were added to the site map. No sign of visitation was observed. The site is fairly protected and impacts are minimal. The site is located above the APE for dam operations and will be removed from consideration in this program.

**B:16:259 Roasting Feature  
Five Year Schedule**

The site is composed of one fire-cracked rock midden/roasting pit with an associated scatter of lithics and sherds. The flakes are of white-tan Redwall chert; less than a dozen were observed. No tools were noted. The roasting pit is two m in diameter, with FCR distributed downslope for about seven meters. Elements are of schist and granite, within a matrix of charcoal-stained soil. This appears to be a PI-III Formative site.

***Previous Work***

This site was initially recorded by NPS survey personnel in February 1991 (Fairley et al., 1994), and monitored in FY92, FY93, FY94, FY95 and FY2005 (Coder et al., 1994a; Coder et al., 1994b; Coder et al., 1995a; Coder et al., 1995b). No remedial actions have been implemented at this location.

***FY2005 Monitoring Observations***

The roaster is very stable with abundant vegetation. The feature is unchanged from the photograph taken in 1994. No physical impacts were observed. No sign of visitation was observed although the site is adjacent to the Bright Angel Trail and there is the potential for visitation. Continue monitoring every five years due to the potential for gullying, surface erosion, and eolian erosion at this feature. Visitation may also be an impact if the site becomes more visible from erosional impacts.

**C:02:094 Historic Panel/Prehistoric Artifact Concentration  
Biennial Schedule**

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

### ***Previous Work***

Portions of the site were originally recorded as part of the Lees Ferry Historic District by P. Geib in the 1980s under site number C:02:011. The 1990-91 survey crew, after recording both right and left bank areas, decided to isolate the lower ferry crossing as a site unto itself, which was designated C:02:094 (Fairley et al., 1994). The site was monitored in FY92, FY93, FY96, FY97, FY98, FY99, FY01, FY03, and FY2005 (Coder et al., 1994a; Coder et al., 1994b; Leap et al., 1996; Leap et al., 1997; Leap et al., 1998; Leap et al., 2000; Dierker et al., 2001; Leap et al., 2003). GRCA and RCMP staff removed graffiti associated with the panel in 1996 and again in 2001, and documented the inscriptions with a medium format camera in FY97.

### ***Summary of RCMP Work Implemented***

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

### ***FY2005 Monitoring Observations***

No apparent physical impacts were observed. The inscriptions are well protected from the elements. The site is located where many people hike down to the river to fish and camp. Overall, a lot of trash including broken glass and plastic ice bags were found throughout the site area. There appears to be new graffiti located above "MAR 26, 1898". New graffiti includes "52704 RAYRAY" and "North Carolina Kid". It is recommended that the prehistoric component of this site be tested and then RCMP monitoring be discontinued if no buried remains exist. Graffiti removal has worked here in the past so that should be done again.

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

The site consists of an overhang with a charcoal scatter, one sherd, one sandstone mano, and a lithic scatter. The terrace at the base of the overhang has been cut by high water, and charcoal is eroding from this cut. In FY95 archaeologists found two sherds in the artifact concentration area: a Moenkopi corrugated sherd (cultural affiliation is Kayenta Puebloan) and a Flagstaff Black-on-White sherd (Pueblo III).

### ***Previous Work***

Archaeologists recorded the site in 1991 (Fairley et al., 1994), and RCMP staff monitored it in FY95, FY97, FY98, FY99, FY00, FY01, FY03, FY04, and FY2005 (Coder et al., 1995b; Leap et al., 1997; Leap et al., 1998; Leap et al., 2000; Leap and Kunde 2000; Dierker et al., 2001; Leap et al., 2003; Dierker and Leap, 2005). 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 overhangs. FY97, FY99 and FY03 monitoring staff observed channel initiation and several knickpoints within the old obliterated trails and in 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 site. A replicated photograph was taken for future comparison by the revegetation crew.

***Summary of Previous Work Implemented***

| <b>Remedial Action</b> | <b>Date Completed</b> |
|------------------------|-----------------------|
| Trail Work             | 11/02/1995            |
| Total Station Map      | 03/31/1998            |

***FY2005 Monitoring Observations***

The arroyos and gullies continue to be good examples of trails that have become unmanageable drainage channels. The drainages remain active and are advancing through the site. Increased bank slump, surface erosion, gullying, and arroyo cutting continue to impact the site. Small gullies are beginning to advance towards the overhang. There was a significant change in erosional advancement since the 2000 photographs. A collection pile of river cobbles was observed in the charcoal concentration area. Numerous pieces of trash were observed throughout the site, such as beer cans, potato chip bags, camera lens cap and tons of micro-trash. Multiple trails lead from the parking lot through the site and to the river. The trails are used by fisherman and recreationalists. The trails have advanced into gullies and arroyos and remain very active. The site continues to be impacted from both visitors and dam flows. Recommend data recovery and that the NPS Trail crew creates and maintains one trail. Continue annual monitoring.

**C:02:101 Isolated Thermal Feature  
Inactive Schedule**

The site is located in dune sand below the bottom of an exposed talus slope. It consists of a two by three meter cluster of FCR with a single chunk of charcoal (about two centimeters in size) in association on the surface. This probable roasting feature is eroding downslope due to deflating dune sand and slope water run-off. Cultural affiliation is unknown.

***Previous Work***

The site was originally recorded in 1990 (Fairley et al., 1994), and monitored in FY92, FY93, FY94, FY97, FY98, and FY2005 (Coder et al., 1994a; Coder et al., 1994b; Coder et al., 1995a; Leap et al., 1997; Leap et al., 1998). In February 1997, 14 checkdams were constructed in two active gullies and a total station map was completed for the entire site. The main gully was remapped in FY98 to identify the rate of erosion.

***Summary of Previous Work Implemented***

| <b>Remedial Action</b> | <b>Date Completed</b> |
|------------------------|-----------------------|
| Checkdam Installation  | 02/19/1997            |
| Total Station Map      | 08/05/1996            |
| Total Station Map      | 09/01/1998            |
| Checkdam Maintenance   | 11/08/1998            |
| Checkdam Maintenance   | 04/15/2000            |
| Checkdam Maintenance   | 10/12/2000            |
| Checkdam Maintenance   | 04/24/2002            |

***FY2005 Monitoring Observations***

The feature looks very good. There is a lot of vegetation in the drainage, some minor alluvial runoff in the drainage is evident but the checkdams are holding well and no maintenance is required. No sign of human visitation was observed. Continue annual monitoring of the checkdams. At this time the drainage is inactive. The grasses have filled the gullies and no checkdam maintenance work was necessary.

**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. 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 collected. The site has been monitored at least annually from FY93 to the present (Coder et al., 1994a; Coder et al., 1994b; Coder et al., 1995a; Coder et al., 1995b; 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; Dierker and Leap, 2005). Medium format photographs of the pot cache location 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 a 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.

***Summary of Previous Work Implemented***

| <b>Remedial Action</b> | <b>Date Completed</b> |
|------------------------|-----------------------|
| MF Photos              | 03/28/1995            |
| Checkdam Installation  | 04/14/1997            |
| Total Station Map      | 04/22/1997            |
| MF Photos              | 04/18/1998            |

***FY2005 Monitoring Observations***

There is no change evident to the side canyon drainage. There is a lot of spring vegetation covering this site. The roaster appears stable due to the heavy blanket of vegetation. No sign of human visitation was observed. Continue monitoring for the appearance of additional cultural material where the pot cache was identified. The site is vulnerable to additional erosion. Continue annual checkdam monitoring.

**C:09:062 Small Structure  
Five Year Schedule**

This site is a concentration of fire-cracked rock, a rock alignment, a scatter of lithics, and sherds indicating a Puebloan affinity (1000 – 1150 A.D.). The site is located on a dune-covered alluvial terrace.

***Previous Work***

The site was initially recorded by NPS survey personnel in October, 1990 (Fairley et al., 1994), and monitored in FY96 and FY2005 (Leap et al., 1996). No remedial actions have been recommended or implemented.

***FY2005 Monitoring Observations***

Features 1 and 2 appear stable. Healthy cryptobiotic soils have increased around these features since previous monitoring. Features in the 1990 and 1995 photographs appeared to be pedestaling out of dune deposits. During this visit, it appears that possible eolian deposits have filled in around the features. We could not relocate the sherds due to the ground cover. No human visitation was observed. This site is stable and well off the trail leading up to Nankoweap granaries. Monitor every five years.

**C:09:068 Artifact Scatter  
Five Year Schedule**

This site consists of an artifact scatter containing sherds and lithics. No obvious architectural features were visible on the surface, but given the nature and depth of alluvial deposits, it is very likely that additional cultural materials are buried beneath the present ground surface. The site surroundings may have offered good agricultural potential. Artifacts suggest a Pueblo II occupation. The site is located on top and along the slope below an alluvial fan.

***Previous Work***

NPS personnel recorded this site in 1990, (Fairley et al., 1994), and monitoring occurred in FY93, FY97, FY01, and FY2005 (Coder et al., 1994b; Leap et al., 1997; Dierker et al., 2001). No remedial actions have been implemented.

***FY2005 Monitoring Observations***

The site is completely covered with cheat/brome grasses and there are no significant threats. The only area showing minor slope erosion is at the artifact concentration but this is very minor and does not threaten integrity at this time. The trails are completely covered with spring grasses. The old trails do not impact the site. Subsurface testing has been recommended as the depressions may be pithouses (Dierker et al., 2001). Continue monitoring every five years.

**C:09:072 Small Structure  
Five Year Schedule**

This site consists of a ceramic scatter with associated rock clusters and alignments. The cluster may be a structure or terracing. Ceramics indicate two separate Puebloan occupations (PI and PII).

***Previous Work***

The site was originally recorded in 1990 (Fairley et al., 1994), and monitored in FY94, FY98, and FY2005 (Coder et al., 1995a; Leap et al., 1998). No remedial actions have been recommended or implemented.

***FY2005 Monitoring Observations***

The site appears stable and is heavily vegetated with spring vegetation. No sign of visitation was observed. Continue five year monitoring schedule.

**C:09:084 Artifact Scatter  
Five-year Schedule**

This site consists of corrugated sherds (1000- 1150 A.D.), manuported cobbles and a single corncob. FY96 monitoring staff identified several large flakes on-site not recorded during the survey. The site is located at the base of a Bright Angel Shale cliff, resulting in a somewhat sheltered location.

***Previous Work***

The site was originally recorded in 1990 (Fairley et al., 1994), and monitored in FY96, FY98, FY03, and FY2005 (Leap et al., 1996; Leap et al., 1998; Leap et al., 2003). In FY98 the site was assessed for checkdam installation. No work was warranted. No other remedial actions have been recommended or implemented.

***FY2005 Monitoring Observations***

No change is evident at this location. Impacts are currently inactive. No sign of human visitation was observed. Continue monitoring every five years due to the location of the site on an alluvial terrace deposit. There is the potential for the erosion of additional cultural material.

**C:09:088 Historic Dam Construction Site  
Biennial Schedule**

This site consists of numerous features and artifacts related to the testing of the alternative Marble Canyon Dam. This project took place from 1949 through 1951. A date on a cliff face by one workman's name gave the year 1963. The site mainly consists of several test shafts and their associated tailings, a loading platform, a ferry boat stacked in another ferry boat, numerous painted letters on the cliff face and rock, and industrial trash (cable, nails, iron plates, ladders, wood planks, barrels, blasting wire, food cans, anchor bolts, and a grease bucket). These are spread over a half-mile length of the river on both banks; the right bank has 13 numbered features (F1-13) and the left bank has three (L1-3).

***Previous Work***

Archaeologists recorded this site in 1990 (Fairley et al., 1994). The RCMP staff monitored C:09:088 in FY92, FY93, FY94, FY95, FY97 and FY99 (Coder et al., 1994a; Coder et al., 1994b; Coder et al., 1995a; Coder et al., 1995b; Leap et al., 1997; Leap et al., 2000b). Monitors have not recommended any remedial actions at this site. A determination of eligibility was forwarded to the Arizona SHPO in FY95 regarding the site's eligibility for the National Register. Although it does not meet the 50-year criteria SHPO concurred with the NPS recommendation. In FY02 a total station map was completed of the entire site.

***Summary of Previous Work Implemented***

| <b>Remedial Action</b> | <b>Date Completed</b> |
|------------------------|-----------------------|
| Total Station Map      | 02/17/2002            |

***FY2005 Monitoring Observations***

A large rock (approximately 1meter by 50 centimeters by 50 centimeters in size) has fallen at the entrance to L3. The rock is about 5 centimeters from the wall but does not appear to have impacted it. At L2 surface erosion has moved one of the boards downslope approximately 2

meters. A gully is beginning to develop in tailings directly in front of L2. The tailing piles in front of L1 and L3 are heavily gullied. At L1, the rocks in entrance of the adit have been partially removed to allow for easy access. The pipe in the wall on downstream side of the adit has been removed since the 1997 photos. A level is on display on a small ledge left of the adit (not in earlier photos and not in site description). On July 26, 2005 – A Hatch River Expeditions guide reported new graffiti on the wall left of adit L1 to Ranger Johnny Janssen. At this time there is a large rubbed area on the cliff wall - approx. 40 cm long and 20 cm tall below "HAYDUKE". L3 has a social trail from it to L1 that is very faint. Ladders inside this adit have been moved. L2 appears to receive little to no visitation. No trail to the feature and no trampling were observed. Recommend an assessment of the area where the graffiti was reported. Continue monitoring due to the occurrence of graffiti and known visitation to this site.

### **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. 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 at least annually from FY92 to the present (Coder et al., 1994a; Coder et al., 1994b; Coder et al., 1995a; Coder et al., 1995b; 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; Dierker and Leap, 2005). In FY95 a stationary camera was placed across from the site, 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 ZCP personnel conducted minor maintenance on some of the original checkdams. 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 (Leap et al., 2000b). NPS personnel planted cacti and grasses in November, 2001. This site was part of Joel Pederson's remote sensing project (Pederson et al., 2003). Checkdam maintenance was required in 2003 due to extremely active gullying at both drainages and the development of a new drainage between FY02 and FY03. Five checkdams required minor maintenance and four new nickpoint treatments were constructed. The FIST trip stopped here to assess eolian processes in May 2003. Additional checkdam maintenance was required in FY2005.

***Summary of Previous Work Implemented***

| <b>Remedial Action</b>      | <b>Date Completed</b> |
|-----------------------------|-----------------------|
| 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            |
| Checkdam Maintenance        | 03/17/2005            |

***FY2005 Monitoring Observations***

The gully systems have been very active and there are several knickpoints present. Maintenance of the checkdams was performed on the original checkdams. New checkdams should be installed in these active drainages. These checkdams should mainly be rock linings. Aside from the channels being active, the vegetation areas look very good and most of the artifacts are well protected by spring vegetation. No sign of human visitation was observed. Also, it would be beneficial to put in some seeds and prickly pear. These actions would help reduce the erosion which is active and extensive in the existing gully networks.

**C:13:069 Small Structures****Annual Schedule**

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

***Previous Work***

R. Euler originally recorded this site in 1972. NPS personnel re-recorded it in 1990 (Fairley et al., 1994), and monitoring occurred in FY93, FY95, FY96, FY97 and annually since FY99 (Coder et al., 1994b; Coder et al., 1995b; Leap et al., 1996; Leap et al., 1997; Leap et al., 2000; Leap and Kunde, 2000; Dierker et al., 2001; Dierker et al., 2002; Leap et al., 2003; Dierker and Leap, 2005). 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. A total station map was also completed in FY97. See Hereford (Hereford et al., 1996) for photogrammetric topography mapping of the immediate area. NPS personnel conducted extensive trail obliteration work in November 2001. Checkdam maintenance occurred at Checkdam 4 in FY02. Checkdam maintenance was required at Checkdams 2 and 4 in FY03. A burned beam was exposed in the drainage in front of Feature

2. The GCMRC sponsored "FIST" trip stopped at this site to assess eolian processes in May 2003. Checkdam maintenance was required in FY2005.

***Summary of Previous Work Implemented***

| <b>Remedial Action</b> | <b>Date Completed</b> |
|------------------------|-----------------------|
| MF Photos              | 02/19/1996            |
| Checkdam Installation  | 02/24/1997            |
| Total Station Map      | 04/24/1997            |
| Trail Work             | 11/08/2001            |
| Checkdam Maintenance   | 04/27/2002            |
| Checkdam Maintenance   | 03/21/2003            |
| Carbon Sample          | 03/21/2003            |
| Trail Work             | 03/19/2005            |
| Checkdam Maintenance   | 03/19/2005            |

***FY2005 Monitoring Observations***

Surface erosion, gullyng and eolian activity are evident throughout the drainage. Features 1 and 2 are still in very poor condition. The poor condition is not due to drainage downcutting but because of their location on the steep slope above the drainage. A trail leading from the camp up to Hilltop Ruin and to the Tanner Trail bisects the site, but people do seem to stay on the trail. Data recovery should occur at Features 1 and 2 due to the fact that their integrity is threatened by slope wash. Recommend annual checkdam maintenance to lessen the likelihood of additional drainage downcutting that could impact Features 3, 4, and 6.

**C:13:098 Historic Structure  
Annual Schedule**

This historic mine and cabin site contains two loci. Locus A consists of two mine adits at the base of the Palisades cliff along the Palisades fault. The main adit (Feature 1A) is situated ca. 10 m above the surrounding terrain with an extensive tailing pile below it. The entrance is 1.25 m wide and 1.35 m high (length is not known). The second adit (Feature 1B) is located ca. 10 m below and 20 m south of F1A. It has similar dimensions, but is only three m deep. Ca. 225 m S/SW is Locus B, which includes a log cabin (Feature 2) constructed of driftwood logs. The cabin measures 2.6 x 4.1 m (interior) and is five courses high. The floor is partially paved with sandstone slabs, with a log/board bed frame in the NE corner. A canvas tent probably formed the upper walls and roof. Ca. four m due south of the cabin door is a driftwood log "fence" (Feat. 3). This structure is made of stacked logs up to four courses high. It may have been a windbreak. Artifacts date from ca. 1900-1920 and mid-1930s.

***Previous Work***

This site was initially recorded by Euler and Jones in 1978 and then re-recorded by NPS personnel in 1990 (Fairley et al., 1994). RCMP staff monitored the site at least annually from FY93 to the present (Coder et al., 1994a; Coder et al., 1994b; Coder et al., 1995b; 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; Dierker and Leap, 2005). See Hereford (Hereford et al., 1993) for a photogrammetric topographic map of the immediate area. In FY95, FY96, and FY98 the cabin and associated artifacts were photographed with a medium format camera. NPS trail crews have maintained the trails in the area. Trail work was completed at this site in FY99. Visitation to this site has resulted in impacts to the adjacent sites and increased gullyng in places where initial trailing exists.

***Summary of RCMP Work Implemented***

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

***FY2005 Monitoring Observations***

The gullies are still well away from the structure and don't appear to be actively downcutting. The gully south of the windbreak isn't on an earlier map but it appears to be well-established with some vegetation and cryptobiotic soils. Natural degradation continues to affect the cabin. The areas around the windbreak and bed frame are overgrown with vegetation from the wet winter of 2005. Social trails to the site and across the east end of windbreak exist. Artifacts inside the cabin have moved since the 2002 photographs. Recommend removal of the vegetation from the structure to prevent further degradation.

**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 and a review of aerial photographs. 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. Ceramics suggest an Early-mid Pueblo II 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.

***Previous Work***

NPS archaeologists originally recorded the site in 1978. Prior to the implementation of the monitoring program (late 1980s) GRCA conducted excavation and collected samples. The RCMP staff monitored C:13:099 at least annually since FY93 (Coder et al., 1994b; Coder et al., 1995a; Coder et al., 1995b; 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; Dierker and Leap, 2005). 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 archaeologists 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 recommendations were for data recovery, planting vegetation and checkdam maintenance. Checkdam maintenance projects were completed in FY97 and FY98 (Leap et al., 1997; Leap et al., 1998). Archaeologists recommended medium format photography and these projects were completed in FY95, FY96 and FY98 and FY01 (Coder et al., 1995b; Leap et al., 1996; Dierker et al., 2001). In 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 FY2000 NPS 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. NPS personnel completed trail obliteration work in the area of the Palisades camp in November 2001. 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 report (Draut et al., 2005). Checkdam maintenance was required in FY2005.

#### *Summary of Previous Work Implemented*

| <b>Remedial Action</b> | <b>Date Completed</b> |
|------------------------|-----------------------|
| 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            |
| Checkdam Maintenance   | 04/14/1997            |
| 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            |
| Cross Section          | 03/16/2004            |
| Checkdam Maintenance   | 03/19/2005            |

### ***FY2005 Monitoring Observations***

The site has been highly active since the monitoring began in 1991. The checkdams appear to be slowing the channel downcutting and expansion process but the site continues to be in poor condition. All features are vulnerable to additional surface erosion, gulying and arroyo cutting. This is a camp for most backpackers and some river runners. The winter season has been good for vegetation and covering up the existing trails at the site. Continue annual checkdam monitoring and maintenance. Data recovery continues to be recommended. The eolian research and photographic work done by K. Brown at the GCMRC should continue. Remapping this site with a total station is also highly recommended. Trail maintenance is routinely conducted by the NPS rehabilitation crew.

### **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 habitation room containing walls two to three courses high. Adjoining Feature 2 is Feature 3, a small 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. Feature 7 is a charcoal lens adjacent to an old trail. South of the dwellings is an eroding drainage two meters across and 50 cm deep. Lithics and ceramics are scattered down the slope directly above the drainage. There is a heavy groundstone concentration near Features 5 and 6. Groundstone/tools include six manos, four metates/slabs, eight hammerstones, and two sandstone knives. Seven ceramic sherds were also found. During the September 1995 erosion control project, archaeologists located a new feature (Feature 9) consisting of upright Dox Sandstone slabs in an arroyo. FY97 monitors discovered two new features. Feature 10 is a charcoal lens north of Feature 7 and Feature 11 is a circular cist/hearth eroding near Features 5 and 6.

### ***Previous Work***

NPS 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., 1994b; Coder et al., 1995a; Coder et al., 1995b; 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; Dierker and Leap, 2005). 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 installation 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 topographic map to plot additional features (Hereford et al., 1996). Monitors recommended medium format photography and photographic documentation 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 Pederson incorporated the river-based drainage at this site into his GCMRC-sponsored remote sensing project (Pederson et al., 2003). NPS 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. Minor checkdam maintenance occurred in FY2005.

***Summary of Previous Work Implemented***

| <b>Remedial Action</b> | <b>Date Completed</b> |
|------------------------|-----------------------|
| Surface Analysis Unit  | 02/26/1994            |
| 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   | 04/18/2000            |
| 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            |
| Checkdam Maintenance   | 03/18/2005            |

***FY2005 Monitoring Observations***

No physical impacts are currently threatening the features. The gully and arroyos show deposition from eolian activity. Eolian activity is active but not threatening any features. Trails are present throughout the site but spring vegetation is filling in over these trails. Trailing is inevitable at this location during the heavy visitation season. Continue checkdam monitoring and maintenance. Continue trail maintenance. Trail work should be conducted by the NPS rehabilitation crew. Because the checkdams are successfully resulting in the deposition of sediment in the drainage, consider reducing the monitoring schedule from annual to biennial.

**C:13:323 Thermal Feature  
Four Year Schedule**

C:13:323 consists of a single eroding hearth and an associated lithic assemblage which includes three bifacial tools and lithic debitage. The site is located on a west-facing dune at the mouth of a major canyon.

***Previous Work***

This site was initially recorded by the Park Archeologist in November of 1989. Radiocarbon samples were taken from the hearth indicate an Archaic occupation (See Appendix C). The hearth was also profiled at the time the carbon sample was taken. NPS personnel did more intensive recording and analysis at this location in April and September of 1990 (Fairley et al., 1994). This site was monitored in FY94, FY98, FY01, and FY2005 (Coder et al., 1995a; Leap et al., 1998; Dierker et al., 2001). The site was also included in the topographic map produced by Hereford et al. of the Tanner region (Hereford et al., 1993).

***Summary of RCMP Work Implemented***

| Remedial Action | Date Completed |
|-----------------|----------------|
| Carbon Sample   | 11/01/1989     |

***FY2005 Monitoring Observations***

The site appears to have continued depletion, deflation and slumping of the sand dunes. The artifact area is deflated with the entire feature area pedestalled. The feature does appear stable but obvious changes are visible by comparing photographs with the current condition. A lack of sediment aggradation is a problem here. Trail obliteration work has successfully deterred visitation. No new trails or camps are visible. The site still retains considerable information potential. Although the site appears stable at this time, features have the potential to erode and artifacts are visible along with ash stained soil and fire cracked rock on the surface. Continue monitoring every four years.

**C:13:327 Roasting Feature  
Biennial Schedule**

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

***Previous Work***

The site was originally recorded in 1990 (Fairley et al., 1994), and monitored in FY96, FY98, FY01, and FY2005 (Leap et al., 1996; Leap et al., 1998; Dierker et al., 2001). Nine carbon samples were taken in 1990 to supplement the geomorphology research conducted by R. Hereford. Carbon was taken from various locations including Features 1 and 3. The dates at these features indicate late Archaic age through the 16<sup>th</sup> century. This site is included in the Hereford et al. topographic map of the Tanner region (Hereford et al., 1993). NPS personnel conducted test excavations in conjunction with trail work in 1992. Retrailing occurred during FY96 and obliteration of the old trail occurred in FY97 (Leap et al., 1996; Leap et al., 1997). Checkdams were recommended in FY96 and an assessment for stabilization was conducted prior to construction of three checkdams and terrace fortification in FY97 (Leap et al., 1997). Total station mapping occurred in FY97 upon completion of stabilization work. In FY99 the Zuni Conservation Project staff performed maintenance on one checkdam. This site was also included in the studies conducted by K. Thompson and A. Potochnik (Thompson and Potochnik, 2000). No checkdam maintenance has been necessary since FY01.

***Summary of RCMP Work Implemented***

| <b>Remedial Action</b> | <b>Date Completed</b> |
|------------------------|-----------------------|
| Carbon Samples         | 09/07/1990            |
| NPS Trail Work         | 02/18/1996            |
| NPS Trail Work         | 11/01/1996            |
| Total Station Map      | 02/22/1997            |
| Checkdam Installation  | 02/24/1997            |
| Trail Work             | 02/18/1996            |
| Checkdam Maintenance   | 11/13/1998            |
| Checkdam Installation  | 10/17/2000            |

***FY2005 Monitoring Observations***

Surface erosion is the main concern at Feature 1 though no recommendations for remedial work are necessary at this time. The arroyo adjacent to and facing off Feature 3 continues to migrate headward. Because samples were taken from Feature 3, information potential is exhausted at Feature 3. No sign of human visitation was observed. Continue biennial monitoring and annual checkdam monitoring and maintenance. Recommend data recovery for Feature 1, and nature and extent testing to re-evaluate National Register significance.

**C:13:336 Thermal Feature  
Biennial Schedule**

This site consists of two concentrations of lithics and sherds, a possible hearth and a roasting feature. A cobble alignment eroding out of a dune may be the remnants of a structure. FY94 monitoring staff recorded a new artifact concentration, Feature 4, not recorded during the survey. C:13:336 is a Puebloan occupation site located within the predam high-water zone adjacent to the Beamer Trail. A veneer of reworked sand covers the surface of the terrace and the site can be seen in the deflated areas between the low dune crests. C:13:336 is within the boundary of multiple USGS geomorphologic studies (Hereford et al., 1993; Pederson et al., 2003; and Draut et al., 2005).

***Previous Work***

The site was originally recorded in 1986 and mapped in 1990 (Fairley et al., 1994). This site has been monitored in FY92, FY94, FY96, FY98, FY03, and FY2005 (Coder et al., 1994a; Coder et al., 1995a; Leap et al., 1996; Leap et al., 1998; Leap et al., 2003). Checkdam installation, recommended in FY96, was assessed by Zuni Conservation personnel in FY98. Five checkdams were constructed in FY98. Trail obliteration work is on going by the GRCA Rehabilitation Trail Crew. A total station map was produced on an NPS river trip in February 2003. No checkdam maintenance has occurred since FY00.

***Summary of RCMP Work Implemented***

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

***FY2005 Monitoring Observations***

Surface erosion, gullying and eolian activity are present and have all been recently active. The gully is the largest threat to the artifacts. No other physical impacts were observed. No sign of human visitation was observed. It is recommended that new checkdams or rock linings be installed in the lower section of the gully. The upper checkdams are all holding sediment.

Continue annual monitoring and maintenance of checkdams. Continue biennial monitoring of the site or consider reducing the frequency due to the successfulness of the checkdams.

**C:13:340 Roasting Feature  
Four-year Schedule**

This is a Pueblo II site with two features and a small scatter of lithics, ceramics, and groundstone. Feature 1 is a one and a half-meter diameter roasting pit with Dox sandstone slabs around its periphery and fire-cracked river cobbles in the center. Feature 2 is a slab-lined cist (50 centimeters in diameter), with at least three remaining upright slabs. Lithic flakes, sherds, and manos litter the slope. The site is situated on a gravel-strewn terrace within the upper mesquite zone.

***Previous Work***

The site was initially recorded by NPS survey personnel in September 1990 (Fairley et al., 1994), and monitored in FY96, FY99, and FY2005 (Leap et al., 1996; Leap et al., 2000). The NPS Trail Rehabilitation Crew completed trail obliteration and retrailing work in 1996 to move the Tanner Trail closer to the rivers edge. Hereford et al. included the site area in their geomorphic map of Eastern Grand Canyon (Hereford et al., 1993).

***Summary of RCMP Work Implemented***

| Remedial Action | Date Completed |
|-----------------|----------------|
| NPS Trail Work  | 02/18/1996     |

***FY2005 Monitoring Observations***

No active impacts were observed. The site is not currently affected by erosion. Since the trail was re-routed, no visitor impacts have occurred in this area. Continue monitoring every four years due to the site being located on an alluvial terrace with the potential to erode.

**C:13:342 Historic Structure  
Five-year Schedule**

The site consists of the deteriorated remains of a historic wooden structure, possibly a storage building or log cabin. The structure is in very poor condition, and its original configuration is difficult to discern. The wood building elements include milled lumber and logs. The milled lumber was probably used for the foundation/basal course, while rough logs were used for walls and possibly rough beams. Square nails were primarily used, although a few large wire nails are also present. Historic trash includes two enamel-ware vessels (a bucket and coffee pot), a cast iron dutch oven lid, and purple glass, suggesting a turn-of-the-century occupation. The structural remains currently occupy a six by nine meter area.

***Previous Work***

This site was initially recorded in 1991 (Fairley et al., 1994), and monitored in FY92, FY93, FY95, FY97, FY99, and FY2005 (Coder et al., 1994a; Coder et al., 1994b; Coder et al., 1995b; Leap et al., 1997; Leap et al., 2000). The 95-2 monitors collected a shell button on the surface, which is curated at GRCA. No other remedial actions have been implemented at this site.

***Summary of RCMP Work Implemented***

| Remedial Action     | Date Completed |
|---------------------|----------------|
| Artifact Collection | 11/10/1994     |

***FY2005 Monitoring Observations***

Only minor physical impacts were noted since the site was last monitored in 1998. The most southern upright post is now leaning over more. The post will likely continue to deteriorate. The enamel vessels have all been moved around and placed on one of the basal cabin foundations. Other items have also been moved since last monitored. No management recommendations are necessary at this time. Continue monitoring the site every five years.

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

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

***Previous Work***

The site was initially recorded by NPS survey personnel in September, 1990 (Fairley et al., 1994), and monitored in FY96, FY99, FY01, FY03 and FY2005 (Leap et al., 1996; Leap et al., 2000; Dierker et al., 2001; Leap et al., 2003). The site was assessed for erosion control in FY96 and FY97. In FY97, nine checkdams were constructed by the ZCP personnel and a total station map was completed (Leap et al., 1997). Minor alteration of four checkdams by the Zuni team occurred in FY99 (Leap et al., 2000). No checkdam maintenance was required in FY00. The site is part of a GCMRC-sponsored checkdam research project (Pederson et al., 2003). Five brush checkdams were rebuilt in FY03. In May 2003 the FIST trip stopped at this location to assess the eolian activity. Checkdam maintenance was required at three checkdams in FY2005.

***Summary of RCMP Work Implemented***

| <b>Remedial Action</b> | <b>Date Completed</b> |
|------------------------|-----------------------|
| Checkdam Installation  | 02/24/1997            |
| Total Station Map      | 02/24/1997            |
| Checkdam Maintenance   | 11/13/1998            |
| GCMRC Map & Research   | 02/19/2002            |
| GCMRC Map & Research   | 09/30/2002            |
| Checkdam Maintenance   | 03/21/2003            |
| Checkdam Maintenance   | 03/19/2005            |

***FY2005 Monitoring Observations***

Gullying and surface erosion are prominent and active though not directly impacting the features. Feature 2 is the most threatened feature. No sign of human visitation was observed. Continue annual checkdam monitoring and maintenance. The gully has been active and maintenance will prevent further downcutting. Continue monitoring the site every three years.

**C:13:348 Artifact Scatter  
Biennial Schedule**

The site consists of a moderate to high-density artifact scatter with jacal fragments suggesting buried, perhaps burned, structures. An estimated 75-100 sherds and 50-75 lithics are eroding out of alluvial deposits, somewhat concentrating into two main areas. The largest concentration contains the jacal fragments. Lithics are primarily medium to coarse-grained materials. A few groundstone items were also noted. A wide variety of sherd types are present suggestive of a

Late Pueblo II-early Pueblo III occupation. The site was evidently used for habitation. According to F. Nials (personal communication, 2001), the site is located on a small alluvial fan of eolian-transported sands on top of gravels. A flood that removed the toe of the fan and alluvial deposits acquired at that time has cut off the distal end. The dunes are changing the course of the gullies and this will likely continue. The dunes are protecting the site but these dunes also continue to migrate and diminish.

#### ***Previous Work***

The site was initially recorded in September, 1990 by NPS survey personnel (Fairley et al., 1994), and monitored in FY96, FY98, FY01, FY03, and FY2005 (Coder Leap et al., 1996; Leap et al., 1998; Dierker et al., 2001; Leap et al., 2003). In FY96 it was recommended that the gullies be stabilized with brush linings to protect the buried remains from eroding down the drainage. Installation of five checkdams was completed in FY97 along with a total station map (Leap et al., 1997). Minor maintenance work was conducted on the checkdams in FY99. No checkdam maintenance was required in FY2000. This site was part of the GCMRC-sponsored checkdam research conducted by Pederson and others (Pederson et al., 2003). Total station maps were made in February and September 2002 as part of the Pederson research project to evaluate the effectiveness of brush checkdams. Checkdam maintenance was required in March 2003. Three brush checkdams were rebuilt and one new brush lining was constructed. In May 2003 the FIST trip stopped at this location to assess the eolian activity. Checkdam maintenance was required at Checkdam 1 in FY2005.

#### ***Summary of RCMP Work Implemented***

| <b>Remedial Action</b> | <b>Date Completed</b> |
|------------------------|-----------------------|
| Checkdam Installation  | 04/16/1997            |
| Total Station Map      | 04/24/1997            |
| GCMRC Map & Research   | 02/19/2002            |
| GCMRC Map & Research   | 09/29/2002            |
| Checkdam Maintenance   | 03/21/2003            |
| Checkdam Maintenance   | 03/19/2005            |

#### ***FY2005 Monitoring Observations***

Surface erosion is evident below checkdam 1. No structure or artifacts were directly impacted by active erosion. No sign of human visitation was observed. The site is in fairly pristine condition. Monitoring should continue as well as annual checkdam monitoring and maintenance. No physical or visitor related impacts currently threaten site integrity.

#### **C:13:352 Special Activity Area Four Year Schedule**

This is an open Puebloan habitation (1050 – 1150 AD) and special activity site with a dense assemblage of sherds, several manos, a grinding slab, and a light scatter of lithic debris. The site is located in an open dune field cut and rearranged by wide shallow seasonal runoff channels and low-volume debris flows originating in the cliffs abutting the dunes to the south.

#### ***Previous Work***

The site was initially recorded in September, 1990 by NPS survey personnel (Fairley et al., 1994), and monitored in FY96 and FY2005 (Leap et al., 1996). No remedial actions have been recommended or implemented at this site.

***FY2005 Monitoring Observations***

Previous monitoring forms listed structures as feature type but because this is only presumed, this feature class was not used during this monitoring episode. Locus A is highly deflated but cryptobiotic soils may be stabilizing the feature. Locus B has deflation and minor bank slump of less than 50 centimeters. Locus C also is showing signs of deflation but is in fair to good condition. No sign of human visitation was observed. Continue monitoring every four years. Surface erosion and eolian activity continue to threaten the condition of the features.

**C:13:353 Small Structure****Five Year Schedule**

This is a single-walled rock structure situated under a ledge in the Tapeats Sandstone at the mouth of an unnamed tributary near the confluence of the Little Colorado River. A corrugated sherd, a flake, and a corn cob fragment were recorded within the structure.

***Previous Work***

The site was initially recorded in September, 1990 by NPS survey personnel (Fairley et al., 1994), and monitored in FY96 and FY2005 (Leap et al., 1996). The archaeological crew observed a second sherd and flake tool within the structure. No remedial actions have been recommended or implemented at this site.

***FY2005 Monitoring Observations***

The Feature 1 granary is well protected from the elements. No new physical impacts were observed. The site is adjacent to a science camp but those people currently are aware of the site and stay away from the cultural materials. The Feature 2 rock wall has changed; it has been built up since it was last photographed. Continue monitoring every five years since some cultural material is no longer visible. The site is protected from the elements, though subject to GCMRC-based visitor impact.

**C:13:354 Storage****Discontinue Schedule**

This site consists of four granaries situated over a 20 meter distance along a Dox Sandstone ledge. Each granary is in a different state of deterioration. No artifacts are present on-site.

***Previous Work***

The site was originally recorded in 1990 (Fairley et al., 1994), and monitored in FY92, FY93, FY94, FY98, and FY2005 (Coder et al., 1994a; Coder et al., 1994b; Coder et al., 1995a; Leap et al., 1998). No remedial actions have been implemented at this site.

***FY2005 Monitoring Observations***

No change was observed at this time. The granaries are well protected from physical impacts. No sign of visitation was observed. The site is located above the APE for dam operations and will be removed from consideration in this program.

**C:13:359 Small Structure****Three Year Schedule**

This site consists of habitation/storage features and associated artifacts. Feature 1 is a small, wet-laid wall that is probably the remains of a granary. It is within a shallow Bass Limestone overhang and is constructed of Dox and Tapeats Sandstone slabs. Feature 2 is a partially exposed structure evidenced by two walls at right angles that are partially buried in the sand. Two meters west, is a single vertical slab that may indicate another structure or feature. Feature 3 is another exposed structure comprised of a linear alignment of Dox Sandstone slabs with associated sherds and lithics. North of Feature 2 is a one meter diameter stain of charcoal flecks and two manuport

stones. Nine sherds suggest an early-mid Pueblo II affiliation. Other artifacts include a biface fragment, a chert pebble tool, and a light scatter of flakes. The site is located on a bedrock fan and terrace. F. Nials, (personal communication, 2001) observed that the alluvial terraces were made via eolian processes before occupation of Features 2 and 3. Currently, the terraces are being eroded by eolian and runoff processes. Several small gullies are present, especially by the steeper terrace riser and these are incised according to F. Nials (personal communication, 2001).

#### ***Previous Work***

Archaeologists recorded the site in 1991 (Fairley et al., 1994). The RCMP staff monitored the site annually from FY92 to FY98 and then in FY01 and FY2005 (Coder et al., 1994a; Coder et al., 1994b; Coder et al., 1995a; Coder et al., 1995b; Leap et al., 1996; Leap et al., 1997; Leap et al., 1998; Dierker et al., 2001). FY94 monitors recommended total station mapping and subsurface testing for cultural deposits. FY95 monitors recommended site stabilization. FY96 monitors recommended excavating the entire site due to intensive erosion. A stationary camera was placed at this site in FY92 and removed in FY96. RCMP staff conducted data recovery at Feature 2 in FY97 (Yeatts, 1998). Prior to excavation work, a total station map and assessment were completed for the site. Upon completion of the excavation work, the RCMP staff and Zuni Conservation Project staff installed checkdams in the gully that bisects Feature 2. Checkdam maintenance was required at Checkdams 1 and 4 in FY99. Checkdam monitoring in FY00 led to maintenance on two checkdams and construction of one new checkdam, no maintenance has occurred since that time.

#### ***Summary of RCMP Work Implemented***

| <b>Remedial Action</b> | <b>Date Completed</b> |
|------------------------|-----------------------|
| Data Recovery          | 04/17/1997            |
| Checkdam Installation  | 04/17/1997            |
| Checkdam Maintenance   | 11/14/1998            |
| Checkdam Maintenance   | 04/20/2000            |

#### ***FY2005 Monitoring Observations***

Surface erosion is evident within the gully due to channel reworking. The vegetation is abundant on site and is likely helping to halt active gully downcutting and expansion. No visitation was observed. Checkdam maintenance should continue annually. No other actions are recommended. No physical or visitor-related impacts were observed during this monitoring episode.

#### **C:13:362 Small Structure Discontinue Schedule**

The site is located on the edge of a delta terrace. It is comprised of one rock wall (F1), four areas of FCR (F2-5), plus an associated scatter of lithics and ceramics. The rock wall is located on the sloping terrace below the FCR areas. It is L-shaped and ca. 2.5 by 4 meters in size. The northeast wall is eroding out of the soil and appears to be two to three courses high. Erosion has undercut the wall to some degree. Features 2-5 are all located along the edge of the terrace and consist of fire-cracked rock eroding out of the soil. Lithic and ceramic material is eroding out of the FCR areas, as well as from areas higher on the delta. A well-defined trail intersects F2-5. A stone pipe/tube fragment was also observed. Ceramics suggest a Late Pueblo II-early Pueblo III affiliation.

#### ***Previous Work***

The site was initially recorded in March, 1991 by NPS survey personnel (Fairley et al., 1994), and monitored in FY96 and FY2005 (Leap et al., 1996). The NPS trail crew obliterated the access to

multiple social trails in FY97. No other remedial actions have been recommended or implemented.

***Summary of RCMP Work Implemented***

| <b>Remedial Action</b> | <b>Date Completed</b> |
|------------------------|-----------------------|
| Trail Work             | 04/17/1997            |

***FY2005 Monitoring Observations***

Trail maintenance should continue annually. No other actions are recommended. No physical impacts were observed during this monitoring episode. Old trails are still present through the site, and collection piles at two locations were dispersed. Continue monitoring for visitor impacts. The site is located above the APE for dam operations and will be removed from consideration in this program.

**C:13:364 Small Structure  
Five Year Schedule**

The site consists of a single room outline of locally available Dox slabs built against a low Dox outcrop; up to four courses are visible. The site is on the north side of a tributary arroyo at its confluence with the river. There was one corrugated sherd in the vicinity. The structure was perhaps a field-house associated with a garden on the outwash alluvium from the adjacent side drainage. The sherd suggests a Pueblo II affiliation.

***Previous Work***

This site was initially recorded by NPS survey personnel in March, 1991 (Fairley et al., 1994), and monitored in FY94, FY96, and FY2005 (Coder et al., 1995a; Leap et al., 1996). No remedial actions have been recommended or implemented.

***FY2005 Monitoring Observations***

The site appears stable and spring vegetation is abundant. No changes are observable from the 1994 photographs. No sign of human visitation was observed. Continue monitoring every five years due to the potential for slope wash. Some rilling has been active during previous monitoring episodes.

**C:13:368 Artifact Scatter  
Five Year Schedule**

C:13:368 is a small rock shelter with a sparse lithic scatter consisting of less than 15 flakes. The site is located in a travertine deposit and laminar alluvial sediments are present on the surface indicating the presence of very high water in the shelter at some point. Cultural affiliation is unknown.

***Previous Work***

This site was initially recorded in October of 1990 (Fairley et al., 1994). It has been monitored in FY92, FY93, FY95, and FY2005 (Coder et al., 1994a; Coder et al., 1994b; Coder et al., 1995b). No remedial actions have been implemented at this site.

***FY2005 Monitoring Observations***

The site is well protected under an overhang. Slight surface erosion is active from the drip line. No other physical impacts were observed. No sign of human visitation was observed. Overall, no change is evident since the 1995 monitoring episode. Consider placing this site on the inactive monitoring schedule due site stability.

**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. It consists of a rockshelter, some with dry-laid masonry walls, 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 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.

***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., 1994a; Coder et al., 1994b; Coder et al., 1995a; Coder et al., 1995b; 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; Dierker and Leap, 2005). Archaeologists have 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 archaeologists collected charcoal from Features 2 and 4. 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. FY00 monitors replicated medium format photographs taken prior to and following the 1996 research flow. No checkdam maintenance was required in FY00 or FY01. Minor checkdam maintenance was completed in FY02. In May 2003 the FIST trip stopped at this location to assess the eolian processes. No checkdam maintenance was required in FY03 or FY2005.

***Summary of Previous Work Implemented***

| <b>Remedial Action</b>        | <b>Date Completed</b> |
|-------------------------------|-----------------------|
| 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            |

***FY2005 Monitoring Observations***

Surface erosion, gulying, and arroyo cutting are all present and active at this site. There are 7 knickpoints in the gully east of Feature 2. These knickpoints are at least 10 centimeters deep. No sign of human visitation was observed. Features 2 and 3 have the most information potential. It is recommended that these two features be excavated. Continue annual site monitoring and annual checkdam monitoring and maintenance.

**C:13:377 Artifact Scatter  
Five Year Schedule**

This is a Pueblo II site consisting of four loci (A-D). Artifacts include flakes, a chopper, the remains of a pot break, a few Dox sandstone slabs, and two groundstone items. No structures or hearth features were observed, but on the north end of the site (Locus A) there is a deflated area with one burned rock, a couple flakes, and a depression that might be the location of a pithouse. Locus B consists of a pot break of corrugated sherds and groundstone fragments. Locus C is a small scatter of sherds and lithics at the south end of the site. Locus D contains an enigmatic rock feature and 2 probable thermal features with groundstone. The rock feature is 1.3 x 1.2 meters and consists of 22 rocks (mainly Dox slabs with a few limestone and sandstone rocks). Thermal Feature 1 is 2.3 x 1.3 meters in size and consists of Dox shale, quartz, sandstone and limestone rocks hand-sized and smaller. Thermal Feature 2 is about 2 m northwest of the rock feature.

***Previous Work***

The site was initially recorded in March, 1991 by NPS survey personnel (Fairley et al., 1994), and monitored in FY96 and FY2005 (Leap et al., 1996). No remedial actions have been recommended or implemented.

***FY2005 Monitoring Observations***

There has been minor eolian activity on site. There is very good vegetation cover at this time due to the wet winter of 2004/2005. No other physical activity was observed. No sign of human visitation was observed. There is the potential for additional cultural material to be exposed due to active eolian transport. Continue monitoring every five years.

**C:13:379 Small Structure  
Five Year Schedule**

The site is comprised of five features exposed in the cutbank of arroyos bisecting an alluvial terrace. Feature 1 is an eroded Dox slab-lined cist ca. 1 meter in diameter. Feature 2 is a wall of a room in a small arroyo. Feature 3 is another wall remnant of upright slabs exposed in a drainage cut. Feature 4 is in a very disturbed area that may have wall remnants of boulders and Dox slabs, with charcoal fragments and a metate blank. Feature 5 is a coursed wall with trough metate fragments. On the north end of the site there is a ceramic scatter next to the deepest arroyo. It is apparent that only a small portion of this site has been recently exposed. Ceramics suggest an Early-mid Pueblo II affiliation.

***Previous Work***

The site was officially recorded in March, 1991 (Fairley et al., 1994). The site was monitored in FY92, FY93, FY94, FY96, and FY2005 (Coder et al., 1994a; Coder et al., 1994b; Coder et al., 1995a; Leap et al., 1996). No remedial actions have been implemented.

***FY2005 Monitoring Observations***

There has been movement of wall rocks due to active gully runoff at Feature 3. The other features have movement of slabs and rocks. The features are located in drainages and will always be vulnerable to runoff and gully erosion. No sign of visitation was observed. Checkdams will

not be successful here because the slope on which the structures are built contains extremely large rocks and boulders with no additional sediment available for deposition. Detailed, structural documentation of the structures by GRCA base archaeologists is recommended. Continue monitoring every five years.

**C:13:381 Thermal Feature  
Five Year Schedule**

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

***Previous Work***

GRCA personnel recorded the site in March 1991 (Fairley et al., 1994). The RCMP staff monitored the site in FY92, FY93, FY94, FY96, FY03, and FY2005 (Coder et al., 1994a; Coder et al., 1994b; Coder et al., 1995a; Leap et al., 1996; Leap et al., 2003). Monitors recommended checkdam installation and stabilization in FY96. A total station map was completed in FY97. The site was assessed in FY97 and ZCP personnel constructed three checkdams in the river-based drainage. Checkdam 1 received minor maintenance in FY98. Checkdams 1 and 2 received maintenance in FY99. Checkdam maintenance was required in FY03 and no other maintenance work has occurred since.

***Summary of RCMP Work Implemented***

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

***FY2005 Monitoring Observations***

There has been very minor surface erosion in the drainage. This is evidenced by movement of sediment and debris downslope. No other physical activity was observed. No sign of human visitation was observed. Continue annual checkdam monitoring and maintenance. The checkdams have slowed the downcutting and expansion of the river-based drainage at this site. Continue monitoring site condition every five years.

**C:13:387 Small Structure  
Biennial Schedule**

The site has six features, including dry-laid walls, cists, sherds, and two metates. Features 1-4 are wall or slab-lined features that are under or in front of Dox Sandstone overhangs. Feature 5 is a collapsed structure of unknown form and function with some burned limestone at the toe of a low dune ridge. Feature 6 is a small Dox Sandstone wall on a terrace remnant. Most sherds were found below Feature 6 on a dune ridge; one large corrugated sherd was on an adjacent ridge slope. The two metates are eroding down the side of a deep arroyo below Features 1 and 2. Generally, the overhang features appear to be storage structures, however, Feature 3 contained remnant mortar. Ceramics suggest a Pueblo II cultural affiliation.

***Previous Work***

Archaeologists recorded the site in October 1991 (Fairley et al., 1994), and the RCMP staff monitored it in FY96, FY97, FY02, and FY2005 (Leap et al., 1996; Leap et al., 1997; Dierker et al., 2002). FY96 monitors recommended checkdam installation, however an assessment by Zuni Conservation Program personnel in FY97 determined that none would be effective. RCMP staff took detailed measurements and photographs of two metates impacted by the active arroyo in FY97. No other remedial actions have been implemented at this site.

***Summary of RCMP Work Implemented***

| Remedial Action                    | Date Completed |
|------------------------------------|----------------|
| Documentation of Eroding Artifacts | 09/14/1997     |

***FY2005 Monitoring Observations***

All features are unchanged from the photographs. No active physical impacts were observed at this time. No sign of human visitation was observed. Consider reducing the schedule to every four years because impacts are not active and monitoring shows that the site is active at larger intervals, and no visitation occurs at this location.

**C:13:393 Artifact Scatter  
Five Year Schedule**

This is an artifact scatter eroding from a high sand dune. Artifacts include PII sherds, lithic debris, groundstone and bone. A green soapstone pendant was collected during the survey.

***Previous Work***

The site was initially recorded by NPS survey personnel in April, 1991 (Fairley et al., 1994), and monitored in FY96 and FY2005 (Leap et al., 1996). The GCMRC sponsored "FIST" trip stopped here to assess eolian processes in May 2003. No remedial actions have been recommended or implemented.

***FY2005 Monitoring Observations***

A large amount of sand has been transported by wind and now covers the artifacts. There does appear to be sand depletion near the side canyon edge. There has been movement of rocks on the surface as well. There may be some camping at this site as evidenced by the movement of small surface rocks. No trailing is evident to the site and no other signs of camping such as garbage was observed. The site is subject to eolian erosion and deposition. Continue monitoring every five years for the exposure of additional cultural materials.

**G:03:002 Roaster Complex  
Four Year Schedule**

The site consists of at least 10 roasting features, an enigmatic rock alignment, and scatters of artifacts and fire-cracked rock. The roasting features are of various configurations and stages of deterioration, and all contain gneiss, schist, and granite rocks plus charcoal. Other ephemeral scatters of fire-cracked rock may represent additional eroding features. Ceramics appear to be mostly representative of late prehistoric through historic Pai and Paiute affiliation. Tools include an obsidian Desert Side-Notched projectile point, various manos, grinding slabs, and metates. A few historic artifacts were noted, possibly from Hualapai use of the area around 1860-1920. These artifacts include brown and purple glass, a metal tinkler, and a knife-opened can.

### ***Previous Work***

The site was first recorded in 1962, revisited in 1972, and re-recorded in 1991 by NPS survey personnel (Fairley et al., 1994). Site monitoring occurred in FY93, FY94, FY95, FY97, FY01, and FY2005 (Coder et al., 1994b; Coder et al., 1995a; Coder et al., 1995b; Leap et al., 1997; Dierker et al., 2001). Thompson and others (Thompson et al., 1996) completed a photogrammetric topographic map in 1995. The features were plotted with a total station in FY96 and overlain over the photogrammetric map. The map identifies the terrace-based and river-based drainages, thus enabling RCMP personnel to direct their attention to the drainages that could impact the site. In FY96, GRCA completed trail obliteration. In FY97, the ZCP personnel conducted an erosion control assessment and five checkdams were constructed in a drainage downstream of the site (Leap et al., 1997). In FY98 the checkdams were stable; however in FY99 maintenance included alterations on three original checkdams and construction of two new checkdams. This site was also included in the studies conducted by K. Thompson and A. Potochnik (Thompson and Potochnik, 2000). Checkdam monitoring in FY00 resulted in maintenance work at two checkdams. Checkdam 1 required maintenance in FY03. Checkdams 1 and 2 required maintenance in FY2005.

### ***Summary of RCMP Work Implemented***

| <b>Remedial Action</b> | <b>Date Completed</b> |
|------------------------|-----------------------|
| Trail Work             | 03/03/1996            |
| Checkdam Installation  | 04/26/1997            |
| Checkdam Maintenance   | 04/27/1999            |
| Checkdam Maintenance   | 04/28/2000            |
| Checkdam Maintenance   | 10/25/2000            |
| Checkdam Maintenance   | 03/28/2003            |
| Checkdam Maintenance   | 03/26/2005            |

### ***FY2005 Monitoring Observations***

Erosion is inactive due to the presence of heavy spring vegetation. All features are unchanged. There may be new erosion as the vegetation dies off since all features are vulnerable. There is a trail adjacent to the site though no visitation was noted during this monitoring episode. Continue annual checkdam monitoring and maintenance. Continue four year monitoring schedule. Monitoring for newly exposed cultural material as a result of active gullying is recommended.

### **G:03:003 Roaster Complex Annual Schedule**

The rockshelter (Feature 1) was originally recorded by G. Gumerman and R. Euler in 1969, and the GRCA survey crew added four roasting features (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 point base, a biface tip, and groundstone fragments. Charcoal, ashy soil and fire-cracked rock are also present. Ceramics suggest both late Pueblo I to early Pueblo II Formative and late prehistoric-early historic Pai affiliations. The remaining features (Features 2-5) are roasters of varying sizes, some with tools, lithics, and ceramics. FY92 monitors noted nails, more projectile points, and sherds, and the FY96 monitors found a projectile point at Feature 2 near the dripline and trail.

### ***Previous Work***

Euler and Gumerman initially recorded this site 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 re-recorded in more detail by NPS survey personnel in January 1991 (Fairley et al., 1994).

River corridor monitoring staff have monitored the site at least annually since FY92 (Coder et al., 1994a; Coder et al., 1994b; Coder et al., 1995a; Coder et al., 1995b; 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; Dierker and Leap, 2005). 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). In FY96 the ZCP personnel assessed the site for checkdam installation and three checkdams were built in the river-based drainage downstream of the site (Leap et al., 1996). A letter was published in the *Boatman's Quarterly* requesting minimal use of this area by researchers and river runners (Jackson and Leap, 1996). From FY96 to FY98 the three checkdams were in good condition with little to no maintenance required. In FY99 the ZCP and RCMP staff constructed ten new checkdams in the river-based drainage, and extensive work was completed on two of the original checkdams. A few large rocks were removed from the third original checkdam to define a central channel (Leap et al., 2000a). 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). Trail obliteration from the drainage to the site by NPS personnel occurred in November 2001. The lower drainage at this site is part of J. Pederson's GCMRC-sponsored remote sensing project (Pederson et al., 2003). Two total station maps were produced during this project. Trail maintenance was required here on the November 2002 NPS river trip. The GCMRC sponsored "FIST" trip stopped here to assess eolian processes in May 2003. No checkdam maintenance was required here in FY02, FY03 or FY2005.

#### ***Summary of Previous Work Implemented***

| <b>Remedial Action</b> | <b>Date Completed</b> |
|------------------------|-----------------------|
| 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   | 10/23/1997            |
| 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 & Research | 10/09/2002 |
| Trail Maintenance    | 11/20/2002 |
| Cross Section        | 03/23/2001 |
| Cross Section        | 03/28/2003 |
| Cross Section        | 03/23/2004 |

### ***FY2005 Monitoring Observations***

Physical impacts to the site are minimal and not threatening the site integrity. Visitor impacts are observed throughout the site mainly in the form of trailing and collection piles. These activities could threaten the integrity of the site. Continue discussions with the Hualapai Tribe regarding trail obliteration and preservation work at this site. Continue annual site condition monitoring and annual checkdam monitoring and maintenance.

### **G:03:024 Roaster Complex Biennial Schedule**

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

### ***Previous Work***

The site was first recorded in 1991 (Fairley et al., 1994), by NPS survey personnel and monitored in FY93, FY94, FY95, FY97, FY98, FY01, FY03, and FY2005 (Coder et al., 1994b; Coder et al., 1995a; Coder et al., 1995b; Leap et al., 1997; Leap et al., 1998; Dierker et al., 2001; Leap et al., 2003). In FY96, GRCA, Hualapai representatives and RCMP personnel completed trail obliteration. A letter was published in the *Boatman's Quarterly* requesting minimal use of this area by researchers and river runners (Jackson and Leap, 1996). A total station map of the features was completed and overlain on a topographic map produced by Thompson et al. (1996). In FY97 the ZCP personnel completed an assessment, and as a result, five checkdams were constructed near Features 2, 3, and 4. In FY99 all checkdams had minor restructuring and an additional nine were installed (Leap et al., 2000b). This site was also included in the studies conducted by K. Thompson and A. Potochnik (Thompson and Potochnik, 2000). FY00 checkdam maintenance required alteration at four checkdams and construction of one new checkdam. Minor checkdam maintenance occurred at Checkdam 4 in March 2003. In May 2003 the FIST trip stopped at this location to assess the eolian processes. Checkdam 4 required minor maintenance in FY2005.

### ***Summary of RCMP Work Implemented***

| <b>Remedial Action</b> | <b>Date Completed</b> |
|------------------------|-----------------------|
| Total Station Map      | 03/03/1996            |
| Trail Work             | 03/03/1996            |
| Checkdam Installation  | 04/27/1997            |
| Checkdam Maintenance   | 11/21/1998            |
| Checkdam Maintenance   | 04/28/2000            |
| Checkdam Maintenance   | 10/25/2000            |

|                      |            |
|----------------------|------------|
| Checkdam Maintenance | 05/04/2002 |
| Checkdam Maintenance | 03/28/2003 |
| Checkdam Maintenance | 03/26/2005 |

### ***FY2005 Monitoring Observations***

Heavy vegetation covers the entire terrace. The features are well anchored and protected by this spring vegetation. Eolian activity is inactive as are surface runoff, gullying, and arroyo cutting. Burrowing is no longer active at Feature 3. No sign of human visitation was observed. Trails are adjacent to the site and visitation has been active in the past. Continue annual checkdam monitoring and maintenance and watch the trail for access and development up to the upper terrace where the site is located. At present the features are stable though vulnerable to erosion.

### **G:03:025 Roaster Complex Three Year Schedule**

The site consists of roasting features with some historic trash. Feature 1 is a fire-cracked rock scatter with a cluster of five partially buried limestone and sandstone slabs at the center. Feature 2 is a fire-cracked rock "ring" with a cleared center. Feature 3 is a "classic" donut-shaped roaster. Feature 4 is a bowl-shaped depression encircled by fire-cracked rock. Feature 5 is a ring of fire-cracked rock cobbles around a depressed, cleared center. Feature 6 is a cluster of five grinding slabs, three manos, purple glass, wire, and 45 Southern Paiute sherds from a pot break. Feature 7 is a jumble of slabs and cobbles with two lithics and a sherd in the vicinity. Feature 8 is a concentration of fire-cracked rock with charcoal. Artifacts include ceramics, a crude biface and 10 or more tertiary flakes of a variety of material types. The historic trash is scattered throughout the site and includes a kerosene lamp base, tin cans, machined wood, and glass. The site assemblage possibly reflects both Paiute and Hualapai use of the area around the turn-of-the-century. In FY95 archaeologists documented two cairns eight meters north of Feature 1.

### ***Previous Work***

This site was initially recorded by NPS personnel in 1991 (Fairley et al., 1994), and monitored in FY93, FY94, FY95, FY97, FY01, and FY2005 (Coder et al., 1994b; Coder et al., 1995a; Coder et al., 1995b; Leap et al., 1997; Dierker et al., 2001). In FY96 the area was assessed for erosion control. As a result, GRCA and RCMP personnel and Hualapai representatives completed trail obliteration, while ZCP staff built three checkdams just outside the site boundary. At this time, the features were plotted with a total station and overlain on a topographic map produced by Thompson and others (Thompson et al., 1996), and a letter was published in the *Boatman's Quarterly* requesting river runners and researchers not to disturb this area (Jackson and Leap, 1996). In FY97 and FY98 minor checkdam maintenance was completed. No maintenance was conducted in FY99. Maintenance work was completed at one checkdam in FY00. Checkdam 1 was enlarged in FY2005.

### ***Summary of RCMP Work Implemented***

| <b>Remedial Action</b> | <b>Date Completed</b> |
|------------------------|-----------------------|
| Trail Work             | 03/03/1996            |
| Checkdam Installation  | 02/28/1996            |
| Checkdam Maintenance   | 04/25/1997            |
| Checkdam Maintenance   | 11/21/1998            |
| Checkdam Maintenance   | 04/28/2000            |
| Checkdam Maintenance   | 10/25/2000            |
| Checkdam Maintenance   | 03/26/2005            |

***FY2005 Monitoring Observations***

The site is currently inactive due to the presence of a heavy carpet of spring grasses. No runoff is evident. No sign of visitation was observed. Trails are adjacent to the site and visitation has been a problem in the past. Continue annual checkdam monitoring and maintenance. Continue site monitoring every four years, as previously active drainages may expose new cultural materials.

**G:03:026 Roaster Complex  
Three Year Schedule**

The site consists of seven roasting pits and two activity areas in various stages of deflation, from pristine to nearly eroded to their original base-level. The ceramics and other artifacts indicate late prehistoric-early historic and mid-historic (1850-1900) Pai use. Some flakes and tools were observed, including two biface items and an obsidian point. Groundstone was also located. Two fragments of pressed purple glass were observed near activity area A.

***Previous Work***

The site was originally recorded in 1991 (Fairley et al., 1994), and monitored at least annually since FY92 (Coder et al., 1994a; Coder et al., 1994b; Coder et al., 1995a; Coder et al., 1995b; 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; Dierker and Leap, 2005). Carbon samples for Hereford's geomorphologic research were collected from Features 2, 3 and 8 prior to the RCMP (Hereford and Thompson, 1994; Thompson et al., 1996). Trail obliteration, retrailing, and vegetation work was conducted in FY96 and FY97 by NPS and RCMP staff. Upon completion of the trail work, the Hualapai and RCMP staff submitted a letter to the *Boatman's Quarterly Review* requesting no more visitation by commercial passengers and a decrease in the research conducted at Granite Park (Jackson and Leap, 1996). In FY96 the features were plotted using a total station instrument and overlain onto a topographic map created by Thompson and others (Thompson et al., 1996). The site was assessed for erosion control in FY96 and as a result, five checkdams were constructed in the side canyon-based drainage. In FY99 four of these checkdams were slightly altered and one new checkdam was built. In FY99 personnel from the Natural Resources Conservation Services (NRCS) conducted some soil sieving and wrote a report on the findings (Lindsey, 1999). This site was also included in the studies conducted by K. Thompson and A. Potochnik (Thompson and Potochnik, 2000). Checkdam maintenance has not been necessary since 2002.

***Summary of RCMP Work Implemented***

| <b>Remedial Action</b> | <b>Date Completed</b> |
|------------------------|-----------------------|
| Carbon Sample          | 01/31/1991            |
| Trail Work             | 03/03/1996            |
| Checkdam Installation  | 03/03/1996            |
| Plant Vegetation       | 03/03/1996            |
| Checkdam Maintenance   | 04/25/1997            |
| Trail Work             | 04/25/1997            |
| Checkdam Maintenance   | 11/21/1998            |
| Checkdam Maintenance   | 04/26/1999            |
| Checkdam Maintenance   | 10/25/2000            |
| Checkdam Maintenance   | 05/04/2002            |
| Trail Work             | 11/24/2002            |
| Plant Vegetation       | 11/24/2002            |

***FY2005 Monitoring Observations***

The features are stable and currently protected from runoff and eolian activity by a heavy growth of spring vegetation. No sign of visitation was observed though trails are adjacent to the site. Continue annual checkdam monitoring and maintenance. Continue monitoring the site every three years because previously active gullies and arroyos are adjacent to features. The likelihood of new exposure of cultural materials is high.

**G:03:029 Roaster Complex  
Five Year Schedule**

The site consists of two separate roasting features. The features are partially intact and protected by clumps of vegetation though they are located within a drainage. A single Cerbat Brown ware sherd and about a dozen lithic items of varying raw material types, including a tool were noted. Ceramics suggest that this is a late prehistoric-early historic Pai site.

***Previous Work***

The site was identified and recorded in February 1991 (Fairley et al., 1994), and was monitored in FY93, FY95, FY01, and FY2005 (Coder et al., 1994b; Coder et al., 1995b; Dierker et al., 2001). FY01 monitoring staff recommended taking a carbon sample from Feature 2 due to its proximity to a gully. No other remedial actions have been recommended or implemented.

***FY2005 Monitoring Observations***

The site appears stable. The gully has not been active. Vegetation hampers eolian activity. No other physical impacts were observed. No sign of visitation was observed. Continue five year monitoring schedule. The site is stable but very exposed. A gully adjacent to Feature 2 could become active and expose more of the feature.

**G:03:032 Roaster Complex  
Three Year Schedule**

G:03:032 is a roaster complex with artifacts. Feature 1 is a large roasting area with fire-cracked rock. Feature 2 consists of fire-cracked rock along the toe of an alluvial terrace. Feature 3 is a three-meter diameter circular depression, 40-50 centimeters deep dug into the terrace. Feature 4 is a large flat area with an associated area of fire-cracked rock. Feature 5 is a circular, hearth-like accumulation of fire-cracked rock. Several flakes, two groundstone tools, an old metal button, and a small wire cotter pin were noted. A circular shell bead was also observed. The site is probably a late historic period Hualapai occupation site.

***Previous Work***

This site was initially recorded in February of 1991 (Fairley et al., 1994), and was monitored in FY95, FY99, FY01, and FY2005 (Coder et al., 1995b; Leap et al., 2000; Dierker et al., 2001). Testing of Feature 4 and 5 has been recommended though no remedial actions have been implemented.

***FY2005 Monitoring Observations***

A very large gully/arroyo between Feature 2 and Feature 3 is present. There is a knickpoint about 1 meter deep and several smaller knickpoints above the larger one. Features 1 and 2 are directly impacted by gullying, though deepening may not occur further because the gullies are full of residual from the talus slope and also because of the general geomorphology of the slope. Features 3, 4, and 5 are situated on a stabilized dune. No sign of visitation was observed. Gullying is evident though the talus slope wash may keep the drainage from downcutting or expanding. Continue monitoring every three years.

**G:03:034 Roaster Complex  
Annual Schedule**

The site is located on both sides of a drainage that bisects a dune-covered alluvial fan. Locus A is on the downstream side of the drainage and Locus B is on the upstream side. Features 1 through 6 and Feature 10 are located in Locus A. All features but Feature 2 are roasting/fire features (one of which, Feature 5, has an associated pot break). Feature 2 is a rock cairn with rebar related to some form of historic activity. Archaeologists discovered a few chert and rhyolite flakes, a biface knife base, and a hammerstone. Features 7 through 9, at Locus B, are all roasting features. This site may be related to G:03:031, a rockshelter located slightly upstream and above this site. Prehistoric artifacts, including ten Shinarump grayware sherds, suggest a Pueblo I-early Pueblo II Virgin affiliation.

***Previous Work***

Archaeologists recorded the site in 1991 (Fairley et al., 1994), and the RCMP staff monitored it in FY94, FY95, FY97, FY99, FY01, FY02, and FY2005 (Coder et al., 1995a; Coder et al., 1995b; Leap et al., 1997; Leap et al., 2000; Dierker et al., 2001; Dierker et al., 2002). FY94 monitors recommended total station mapping and FY95 monitors recommended testing for subsurface cultural materials. This area was assessed in April 1997, and RCMP staff determined that no data recovery was warranted. RCMP staff conducted an assessment for charcoal samples in FY99 and determined that sampling would disturb the stability of the feature. No remedial actions have been implemented.

***FY2005 Monitoring Observations***

Eolian activity is inactive at Locus A. Features 1-6 and 10 are unchanged even though there is a history of previous eolian activity on the dune. Features 7, 8, and 9 are anchored by vegetation including cryptobiotic soil though they are pedestalled by gullies. No sign of human visitation was observed. Subsurface potential is high. Change the schedule from annual to every three years.

**G:03:037 Artifact Scatter  
Five Year Schedule**

The site is located in an outcropping basalt overhang on a Tapeats Sandstone slope. It consists of two loci (A and B), about 10 meters apart, each containing an artifact scatter. Approximately 100-150 flaked lithics were noted, mostly at Locus B. Tools include bifaces, a core/chopper, and projectile point tip. The 50-65 sherds indicate that this is a multi-component site, with late Pueblo I-early Pueblo II Cohonina and late prehistoric-early historic Pai occupations. Locus B also contains several groundstone items, such as a ground/pecked shale slab metate, a basalt slab metate, a Tapeats mano, and a partially polished basalt cobble shaped like a maul. There is also a sparse charcoal scatter and a piece of shaped wood at Locus B.

***Previous Work***

The site was initially recorded by NPS personnel in 1991 (Fairley et al., 1994), and monitored in FY97, FY01, and FY2005 (Leap et al., 1997; Dierker et al., 2001). No remedial actions have been recommended or implemented at this site.

***FY2005 Monitoring Observations***

The loci are well protected by the basalt walls. Vegetation obscures many artifacts. Surface erosion and eolian activity are also currently inactive due to the extensive spring vegetation on the slope. No sign of human visitation was observed. Continue monitoring every five years as the site contains extensive information potential.

**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, FY03, FY04, and FY2005 (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; Dierker and Leap, 2005). 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 (Pederson et al., 2003). No checkdam maintenance was required in FY03. Checkdam 8 required maintenance in FY2005.

***Summary of Previous Work Implemented***

| <b>Remedial Action</b> | <b>Date Completed</b> |
|------------------------|-----------------------|
| Total Station Map      | 06/16/1997            |
| Checkdam Installation  | 04/25/1997            |
| Checkdam Maintenance   | 11/21/1998            |
| Checkdam Maintenance   | 04/28/2000            |
| Checkdam Maintenance   | 10/25/2000            |
| GCMRC Map & Research   | 02/26/2002            |
| GCMRC Map & Reserach   | 10/08/2002            |
| Checkdam Maintenance   | 03/26/2005            |

***FY2005 Monitoring Observations***

Minor surface erosion is present within the drainage containing the checkdams. Newly deposited sediments are visible in the gully adjacent to Feature 2. There is abundant vegetation across the site, hampering active eolian processes that threaten Feature 4. The features are not impacted by physical impacts at this time; however, they are threatened by active gully downcutting and surface erosion although the checkdams have slowed the downcutting process. No sign of visitation was observed. Continue annual monitoring, checkdam monitoring and maintenance.

**G:03:043 Thermal Feature  
Biennial Schedule**

This site consists of several eroded hearths and fire-cracked rock areas. Artifacts identified include lithics, charcoal and groundstone. No ceramics were recorded on the site. One thick biface/scrapper and two pecked-slab metates were recorded. Cultural affiliation is unknown.

***Previous Work***

Archaeologists recorded the site in 1991 (Fairley et al., 1994), and the RCMP staff monitored it in FY94, FY98, FY00, FY02, and FY2005 (Coder et al., 1995a; Leap et al., 1998; Leap and Kunde 2000; Dierker et al., 2002). See Thompson and others (Thompson et al., 1996) for photogrammetric mapping conducted in this area. Hereford also collected charcoal from an isolated hearth located near the site's upstream side (Thompson et al., 1996). Data recovery at Features 4 and 5 has been recommended in FY98, FY00, FY02, and FY2005. No remedial actions have been implemented.

***FY2005 Monitoring Observations***

Although many features are located on high cut banks, no active physical impacts were observed during this monitoring episode. Abundant vegetation currently anchors the site. No sign of human visitation was observed. Active channel widening and surface erosion also threaten the site. Stratigraphy work would be ideal at this site. The features are located on inactive dunes and an alluvial terrace. Datable remains are present and visible in some of the cut banks exposing the features. Continue biennial monitoring as the potential for further physical impacts is high.

**G:03:044 Structure-Thermal Feature Complex  
Biennial Schedule**

This site is a large activity area divided into two loci. Locus A contains five dry-laid walls and a lithic scatter. Locus B contains three roasting features. FY94 monitoring staff identified a .44 cal. cartridge (19<sup>th</sup> century) and two large utility ware sherds below Locus A.

***Previous Work***

Archaeologists recorded the site in 1991 (Fairley et al., 1994), and the RCMP staff monitored the site annually from FY92 through FY98 and then biennially in FY00, FY02, and FY2005 (Coder et al., 1994a; Coder et al., 1994b; Coder et al., 1995a; Coder et al., 1995b; Leap et al., 1996; Leap et al., 1997; Leap et al., 1998; Leap and Kunde 2000; Dierker et al., 2002). FY96 monitoring staff recommended checkdam installation in the Locus B drainages. An assessment for checkdam installation was completed in FY97, checkdams were not necessary. Data recovery has been recommended in FY98, FY02, and FY2005. No remedial actions have been implemented.

***FY2005 Monitoring Observations***

The gully bisecting the roasters is very active with several knickpoints. There are signs of infilling through eolian activity and some cryptobiotic soils growing near the headcut of the gully but these actions will not stabilize this gully. At Locus A there is drip line erosion with the potential to affect Features 1 and 3. No visitor disturbance was observed. Although checkdam installation is recommended, it was determined in 1997 that they were unnecessary as the drainage had remained inactive through two monitoring sessions. At that time while the checkdams were deemed as being beneficial, data recovery was recommended instead by Leap and Kunde. Brush in the drainage now seems to be holding back sediments and therefore a checkdam assessment should be conducted again. Data recovery is still recommended.

**G:03:048 Artifact Scatter  
Five-year Schedule**

G:03:048 is a shallow rock shelter located on Tapeats Sandstone ledges surrounded by steep rocky talus slopes. Artifacts include flakes, numerous groundstone items (fragmented and complete), two Desert Side-Notched points, charcoal and Southern Paiute utility grayware sherds.

***Previous Work***

This site was located and recorded in March of 1991 (Fairley et al., 1994), and was monitored in FY95, FY99, FY03, and FY2005 (Coder et al., 1995b; Leap et al., 2000; Leap et al., 2003). At the time the site was recorded, the projectile points were collected. No remedial action work has been recommended or implemented.

***Summary of RCMP Work Implemented***

| Remedial Action     | Date Completed |
|---------------------|----------------|
| Artifact Collection | 03/04/1991     |

***FY2005 Monitoring Observations***

Packrat activity has slightly altered the floor of the shelter. No eolian activity across the site due to the heavy spring vegetation. No sign of human visitation was observed. The site is well protected from the elements. The only impact currently visible is from packrat or other animal disturbances. Continue the five year monitoring.

**G:03:049 Shelter and Artifacts  
Discontinue Schedule**

The site is located under columnar basalt boulder rockshelters on the first Tapeats Sandstone ledge outcrop above the river. These are multi-component shelters, possibly used temporarily/seasonally during food processing and lithic tool manufacture activities, as indicated by groundstone implements and abundant lithic debitage. There are 80-125 flakes on-site, most of which are located in front of the rockshelter area on the Tapeats ledges. The 15 or so sherds found on-site suggest Pueblo II Virgin occupation and late prehistoric-early historic Pai/Paiute occupations. Two metates, three manos, a grinding slab, and two tools are in or around the shelter. There is a sparse scatter of charcoal fragments in the southeast end of the rockshelter area.

***Previous Work***

This site was first recorded by NPS survey personnel in 1991 (Fairley et al., 1994), and monitored in FY97 and FY2005 (Leap et al., 1997). No remedial actions have been recommended.

***FY2005 Monitoring Observations***

The previous monitoring form has the shelters as "other" and FCR was not considered. During this monitoring visit, features include structures for the shelter areas, artifacts, and roasters for the FCR. The FCR is currently on bedrock, active surface erosion and eolian activity have stripped the soil matrix. The shelters and artifacts are unchanged. Even though the site is adjacent to the diving board rock, no human impacts were observed. The site is located above the APE for dam operations and will be removed from consideration in this program.

**G:03:052 Roaster Complex  
Five-year Schedule**

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

***Previous Work***

Archaeologists recorded the site in 1991 (Fairley et al., 1994), and the RCMP staff monitored the site in FY96, FY98, FY03, and FY2005 (Leap et al., 1996; Leap et al., 1998; Leap et al., 2003). FY96 monitoring staff recommended trail obliteration, and gully stabilization. After an

assessment in FY97, only minor trail obliteration was completed. FY98 monitoring staff recommended planting vegetation though it was determined unnecessary in the spring of 2003 due to heavy concentrations of vegetation.

***Summary of RCMP Work Implemented***

| <b>Remedial Action</b> | <b>Date Completed</b> |
|------------------------|-----------------------|
| Trail Obliteration     | 03/05/1997            |

***FY2005 Monitoring Observations***

The features are unchanged. There is a lot of vegetation and no eolian activity at this time. No active gullying was observed. No sign of human visitation was observed. Continue five year monitoring schedule. The site is in fair condition, there is the potential for trailing and visitation as people walk through the site to get to an interesting geologic feature in this area. The features are very exposed to the elements.

**G:03:055 Thermal Feature  
Five-year Schedule**

This site contains two thermal features with a light lithic scatter and a few hand tools. Archaeologists recorded a single brown undifferentiated Pai/Paiute utility ware during the survey, as well as one cobble mano. The two thermal features may be the same roasting pit.

***Previous Work***

Archaeologists recorded the site in March 1991 (Fairley et al., 1994), and the RCMP staff monitored it in FY96, FY99, and FY2005 (Leap et al., 1996; Leap et al., 2000). FY96 monitors recommended stabilization at this site. Surveyors completed a total station map in FY97. The RCMP staff assessed the site for erosion control work in FY99. The assessors recommended that work be focused on the upstream gully at this site. This site was also included in the studies conducted by K. Thompson and A. Potochnik (Thompson and Potochnik, 2000).

***Summary of RCMP Work Implemented***

| <b>Remedial Action</b> | <b>Date Completed</b> |
|------------------------|-----------------------|
| Total Station Map      | 07/07/1997            |

***FY2005 Monitoring Observations***

The large arroyo does not appear to have down cut or widened since last monitored. No active eolian activity was observed. The features appear unchanged. No sign of human visitation was observed. Recommend remapping the site to use as control for areas without checkdams in drainages. The arroyo has the potential to become active. Subsurface data potential is high at this site. Continue monitoring every five years.

**G:03:056 Roaster Complex  
Five Year Schedule**

G:03:056 contains a group of three roasting features with chipped stone and groundstone tools. Feature 1 consists of a dispersed scatter of fire-cracked rock with lithics, a polishing stone, and a side-notched projectile point in association with the feature. Feature 2 is another dispersed scatter of fire-cracked rock with a laterally ground mano in association. Feature 3 is a much dispersed fire-cracked rock scatter. It is possible the projectile point is a reworked archaic dart point base. No ceramics were observed.

***Previous Work***

This site was initially recorded by NPS survey personnel in March 1991 (Fairley et al., 1994), and monitored in FY94, FY01, and FY2005 (Coder et al., 1995a; Dierker et al., 2001). A recommendation of checkdam installation has been made yet, no work has been conducted.

***FY2005 Monitoring Observations***

The site is heavily vegetated and appears stable at this time. The inactive status will likely change because a gully runs through Feature 1. Grasses are growing within the drainage and no recent runoff is apparent. Old animal trails (burro) crisscross the site area. Feature 2 has a small gully running parallel to the slope. This is probably an old trail that has channeled runoff. Feature 3 also has a small gully that may have been a trail at one time. No sign of visitation was observed. The site is stable due to spring vegetation. Gullies adjacent or through features threaten to expose additional cultural remains. Checkdam installation is recommended to stabilize the small gullies. Preservation efforts will curtail further site deterioration.

**G:03:057 Thermal Feature****Five-year Schedule**

The site consists of a Tapeats Sandstone rockshelter containing a large, eroding fire-cracked rock feature, a charcoal scatter, an ash stain, and a scatter of lithics, sherds, and groundstone. Lithics are densely concentrated along the front edge of the shelter floor, with some eroding downslope. No formal chipped-stone tools were seen. Two pecked and ground slabs, one of Tapeats Sandstone and one of Muav Limestone, were observed near the center of the site. The sherds are found in the north half of the shelter. Ceramics suggest a multi-component occupation of the site including early Pueblo I Formative and late prehistoric-early historic Paiute. The fire-cracked rock feature is composed of angular, cobble-size rocks of sandstone and limestone. The site appears as a limited lithic manufacturing and food processing area based on the artifacts present.

***Previous Work***

The site was initially recorded in 1991 by NPS survey personnel (Fairley et al., 1994), and monitored in FY97, FY99, FY00, FY02, and FY2005 (Leap et al., 1997; Leap et al., 2000; Leap and Kunde 2000; Dierker et al., 2002). No remedial actions have been implemented at this site.

***FY2005 Monitoring Observations***

The site appears stable with little impact noted. There is a considerable amount of vegetation on the slope outside the rockshelter drip line. Two small gullies are present on the site but do not appear active at this time. Minor surface erosion is present. Packrat activity is also apparent. No sign of human visitation was observed. The gullies are currently inactive. Packrats in the area and surface erosion are the only active impacts. Continue monitoring every five years.

**G:03:058 Roasting Feature****Three Year Schedule**

G:03:058 consists of a single roasting feature seven by ten meters in diameter and an associated fragmented mano. The site is located on a dune-covered terrace.

***Previous Work***

The site was originally recorded in 1991 (Fairley et al., 1994), and monitored in FY94, FY96, FY98, and FY2005 (Coder et al., 1995a; Leap et al., 1996; Leap et al., 1998). Checkdams were recommended and an assessment was conducted in FY96. Two rock/brush checkdams were built in FY97 in conjunction with minor trail obliteration and vegetation planting. A total station map was completed in FY98. Four new checkdams were constructed in FY99 by the Zuni Conservation Project staff and RCMP personnel. Monitoring resulted in the maintenance of six

checkdams and construction of two new checkdams in FY00. Between FY01 and FY03 the drainage filled in with alluvial and eolian-transported sediments, almost completely covering all checkdams. In FY2005 the drainage actively downcut and maintenance work was required at four checkdams.

***Summary of RCMP Work Implemented***

| <b>Remedial Action</b> | <b>Date Completed</b> |
|------------------------|-----------------------|
| Trail Work             | 03/04/1997            |
| Checkdam Installation  | 03/04/1997            |
| Total Station Map      | 09/07/1998            |
| Checkdam Maintenance   | 11/22/1998            |
| Checkdam Maintenance   | 04/29/2000            |
| Checkdam Maintenance   | 03/28/2005            |

***FY2005 Monitoring Observations***

The drainage has been active after filling in with eolian and alluvial transported sediments. Plunge pools, knickpoints, and headward migration of the gullies are evident. There is no sign of human visitation at this site even though the site is adjacent to a river camp. Continue annual checkdam monitoring and maintenance. Continue monitoring the site every three years. The gullies adjacent to the feature continue to infill with eolian sand. The checkdams have demonstrated a positive treatment procedure as the gully is neither deepening or widening, nor changing direction.

**G:03:065 Lithic Scatter  
Discontinue Schedule**

This site consists of a rockshelter with charcoal, ceramics and lithics. Hand tools and a worked stick are also present on-site.

***Previous Work***

The site was originally recorded in 1991 (Fairley et al., 1994), and monitored in FY94, FY98, and FY2005 (Coder et al., 1995a; Leap et al., 1998). Eligibility testing was recommended in 1994. When RCMP archaeologists arrived on site to determine NR eligibility, an erosional episode had exposed a sandal fragment and quids. Therefore, the site's data potential was confirmed and no testing was necessary. Additionally, no collections were made.

***FY2005 Monitoring Observations***

The site is at the base of Tapeats Sandstone ledges where residual soils are mixed with eolian transported sands. The only impacts present at this time are from rock fall and packrat activity. No sign of visitation was observed. The site is very stable and mainly affected by sandstone spalling and packrats. The site is located above the APE for dam operations and will be removed from consideration in this program.

**G:03:071 Artifact Scatter  
Discontinue Schedule**

The site consists of a small rockshelter with a triangular opening in a granite outcrop with sherds eroding downslope in front of it. The 15 sherds observed represent at least three different vessels. The interior roof of the shelter is heavily smoke blackened and a packrat nest mostly obscures the rear wall and floor. The ceramic assemblage indicates a multi-component site of Pueblo I-III Cohonina and late prehistoric-early historic Pai.

***Previous Work***

The site was recorded initially in 1991 by NPS personnel (Fairley et al., 1994), and monitored in FY97, FY99, and FY2005 (Leap et al., 1997; Leap et al., 2000). Hereford et al. included the site area in their geomorphic map of Granite Park (Thompson et al., 1996). No remedial actions have been recommended.

***FY2005 Monitoring Observations***

The packrat midden has begun to deteriorate, indicating abandonment. No physical impacts are evident as the site is well protected underneath a granite slab. No sign of visitation was observed. The site is located above the APE for dam operations and will be discontinued from consideration in this program.

**G:03:076 Roasting Feature  
Three Year Schedule**

This site consists of the deflated remains of a single roaster partitioned into three segments by local runoff and vegetation. A single cobble mano is located on the surface. Archaeologists observed no diagnostic materials and cultural affiliation is unknown. The site is situated on the remnant face of a dune, abutting a rock-strewn talus slope.

***Previous Work***

Archaeologists recorded the site in March 1991 (Fairley et al., 1994), and the RCMP staff monitored it in FY96, FY99, FY01, and FY2005 (Leap et al., 1996; Leap et al., 2000; Dierker et al., 2001). FY96 monitors recommended stabilization for this site and it was assessed in FY97. RCMP staff decided that no work would be conducted due to the slope steepness and lack of sediment available for deposition.

***FY2005 Monitoring Observations***

The site has abundant spring vegetation. Eolian activity is currently inactive due to the heavy vegetation cover. The arroyo downstream of the site is also inactive at this time. No sign of human visitation was observed. The site is very stable due to vegetation. Continue monitoring every five years.

**G:03:080 Roaster Complex and Rock Art  
Annual Schedule**

The site is divided into two loci. Locus A contains numerous lithics, sherds, hand tools, and extensive rock art (possibly Hualapai). 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 eight separate structural and fire features on a sand dune on the upstream side of 222-Mile Canyon. Numerous artifacts are present, including 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. Note: the 95-3 monitors located a fire-cracked rock feature, F9, approximately 8 m from F2 at 316 degrees. See Part B and the amended site map. The RCMP has also taken archival medium format photographs of the pictographs.

***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., 1994a; Coder et al., 1994b; Coder et al., 1995b; 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; Dierker and Leap, 2005). 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 river runners and are located on the upstream side of a side canyon drainage which serves as a popular camping location. FY99 monitoring staff recommended that several trails be obliterated by planting vegetation throughout the site. It was noted that visitor-related impacts, in particular trailing, should be addressed and managed by the Hualapai Nation.

***Summary of Previous Work Implemented***

| <b>Remedial Action</b> | <b>Date Completed</b> |
|------------------------|-----------------------|
| MF Photos              | 03/05/1997            |

***FY2005 Monitoring Observations***

Features 3, 4, 5, and 7 have more vegetation (including cryptobiotic soil) than photos from 1992-1996 show. Features 1, 2, and 6 appear stable. Four collection piles were observed in the shelter below pictographs. These collection piles were dispersed. A faint trail bisects Features 6 and 7 but there appears to be only minimal impacts. Trampling and soil compaction in shelter are have increased compared to the 1993 and 1995 photographs. Numerous faint social trails cut across site. Trail work should be completed with Hualapai consultation and participation.

## CHAPTER FOUR CHECKDAM MONITORING AND MAINTENANCE

Erosion control structures in Grand Canyon National Park are intended to be a preservation method for slowing erosion at historic properties. Use of these structures began in 1995 with an experimental program at Palisades Delta. The initial pilot program (Leap and Coder 1995) and subsequent evaluation has resulted in the modification of structure design and has greatly aided the understanding of the appropriate style of structures, soil types and depositional contexts benefiting from the installation of such structures. Zuni-style erosion control structures were deemed most appropriate for reducing erosional processes at historic properties with the desired condition of *in situ* preservation of cultural resources. At present, 242 unique checkdams exist at 27 historic properties. Checkdam sites are generally concentrated between river miles 60 to 75, and from river mile 200 to 223. Figure 9 shows the location of these 27 properties within the project area. Please note that due to the scale of this figure, historic properties adjacent to one another and containing checkdams will appear as a single plot.

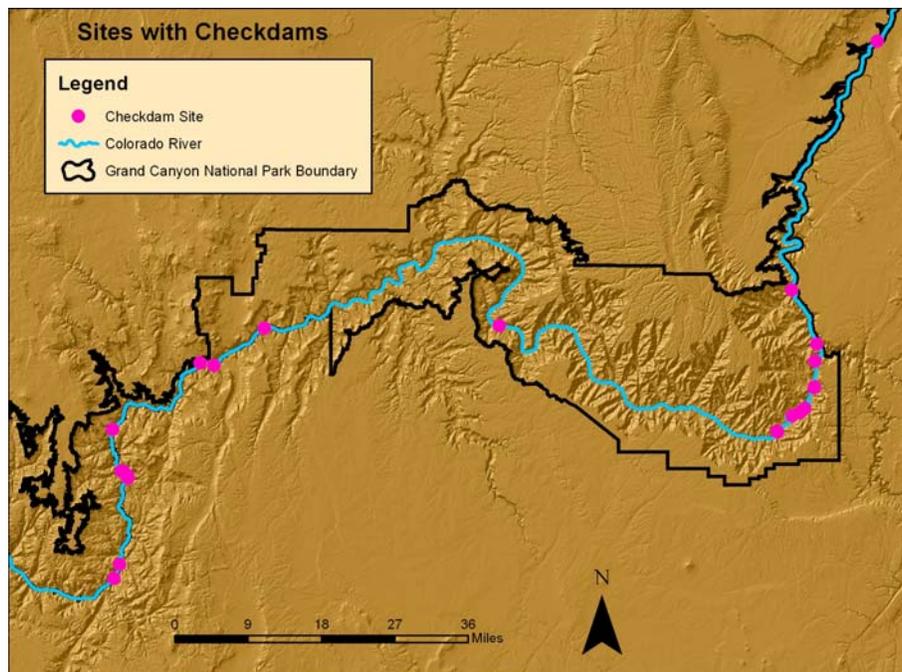


Figure 9. Historic properties with checkdams along the Colorado River.

Since 1995, RCMP staff and Zuni Conservation Program (ZCP) personnel have cooperated jointly in identifying eroding cultural features in need of preservation treatments and assessing the utility of erosion control structures at these locations. Historic properties with checkdams are monitored annually to determine if the erosion control structures are successfully capturing sediment in drainages, or if maintenance work is required. All checkdam monitoring and maintenance information is entered in a Microsoft Access database upon completion of field activities. The goal of erosion control structures in the project area is to slow the erosional process, providing a mechanism for deposition and vegetation growth above these structures, and preventing further exposure of cultural resources. This desired condition is illustrated in Figure 10 where sediment deposition and vegetation growth occurred within a drainage containing two checkdams.

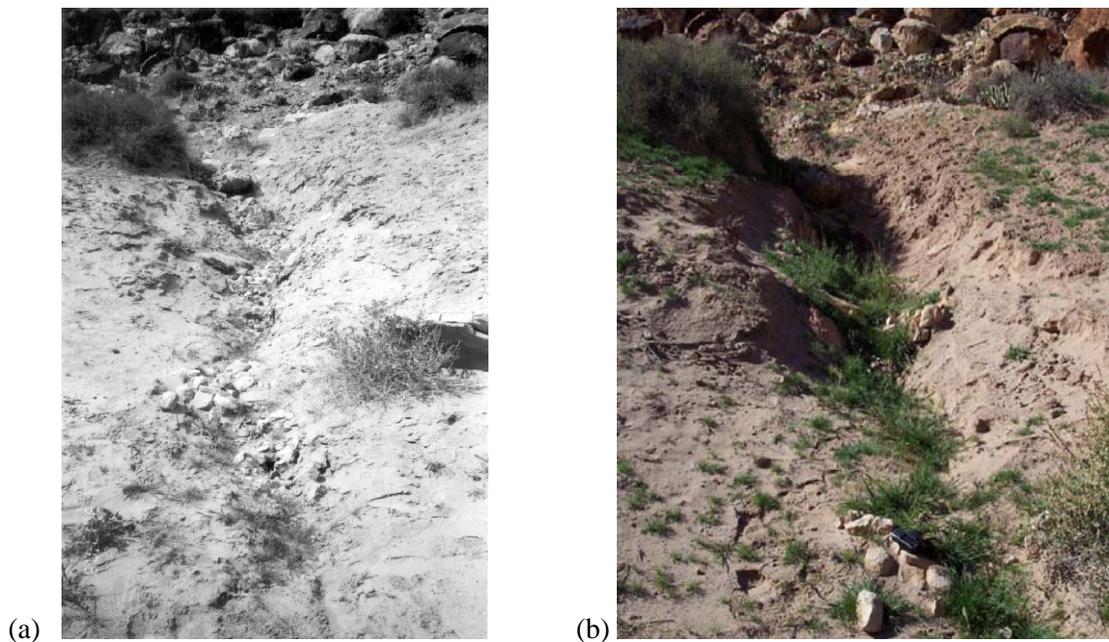


Figure 10. C:02:101 Checkdams 3, 4 and 5 upon completion of construction (a) and during the FY2005 monitoring visit (b). The drainage has filled with sediment and contains abundant vegetation growth.

Small drainages with runoff are considered for erosion control structures. Over the course of this project, specific checkdam types have also been identified as most appropriate to achieve the goals of cultural resource preservation on-site. The total number of each checkdam type currently in existence can be seen in Figure 11.

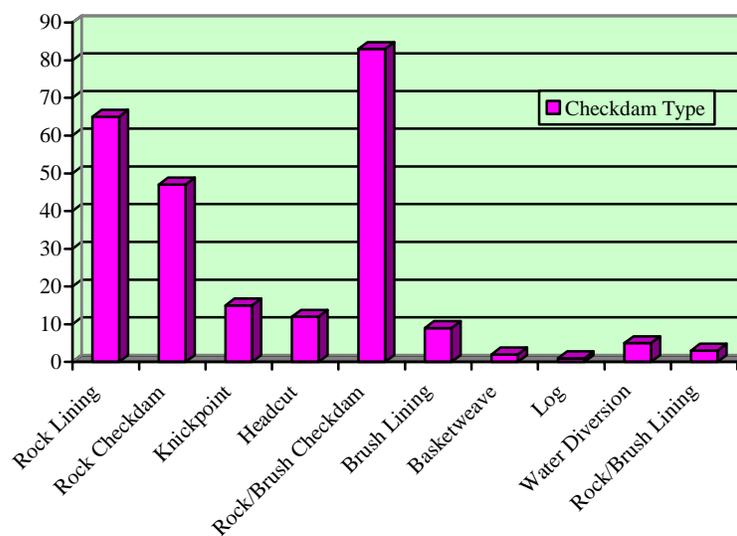
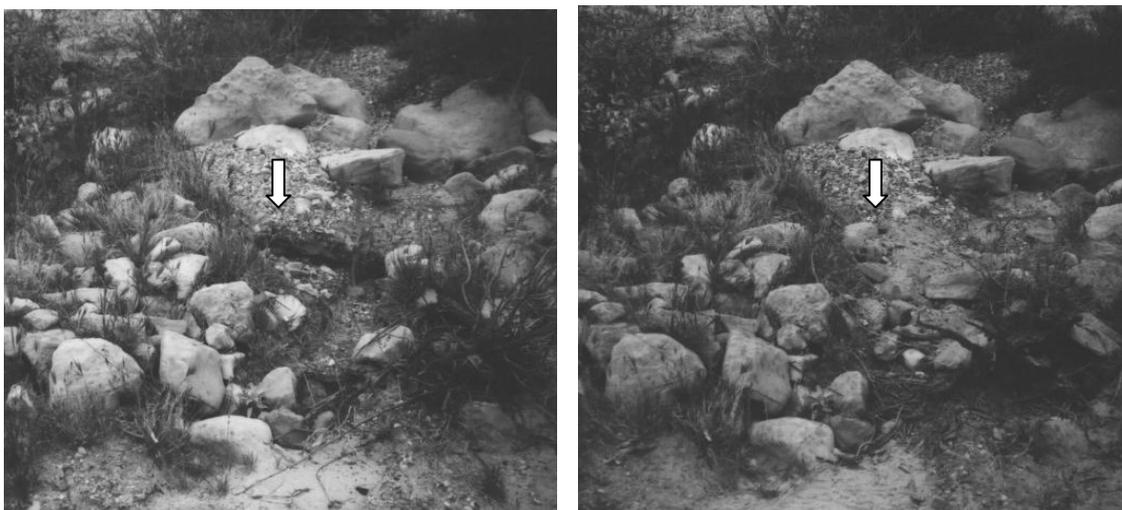


Figure 11. Checkdam frequency by structure type.

As routine site condition monitoring is conducted, RCMP archaeologists observe erosion types on-site and the activity of erosion. Erosion is evidenced by knickpoint development and retreat, and channel widening (Pederson et al., 2003). Local factors such as piping, soil type, and visitation may also influence erosion. Figure 12 shows examples of knickpoint advancement and headward migration with the types of checkdam maintenance used to remedy these erosion types.



(A) Knickpoint advancement at C:13:100 and a knickpoint treatment constructed in FY2005.



(B) Headward advancement at C:13:099 and a headcut treatment constructing in FY2005.

Figure 12. Erosion types typically treated by checkdam construction or maintenance include (A) knickpoint advancement and (B) headward advancement.

Outside research contracted by the GCMRC has also identified that erosion control structures along the Colorado river can and do slow erosion and result in the deposition of sediment behind such structures (Pederson et al., 2003), and encourage vegetation growth. Pederson et al., (2003) also note the importance of regular maintenance to prevent increased erosion.

In FY04, 46 checkdams were recommended for maintenance and 11 obliterated checkdams were recommended for reconstruction, indicating that 24% of the 242 checkdams required maintenance or reconstruction (Dierker and Leap, 2005). During the FY2005 checkdam monitoring and maintenance activities, RCMP staff and ZCP personnel conducted checkdam maintenance at 37 individual checkdams at 13 historic properties. In total, 15% of the existing checkdams actually needed maintenance in FY2005. The reason for the difference between monitoring in FY04 and maintenance work conducted in FY2005 may be attributable to the wet winter of 2004/2005. An exceptional amount of moisture, as evidenced by snowfall levels on the North Rim of over 15 feet, blanketed the southwestern United States and Grand Canyon National Park in particular. Unpublished rainfall data provided by the USGS (A. Draut personal communication, 2005) indicates more than seven inches of rain fell on the Palisades Delta between August 2004 and March 2005. During the period between December and March, rainfall amounts more than doubled from 2003/2004 to 2004/2005. While 20 checkdams were recommended for maintenance work on the Palisades Delta in FY04, maintenance work was conducted at seven checkdams in FY2005. It may be postulated that checkdams that appeared to require maintenance were covered in alluvium as a result of the increased rainfall. Figure 13 contrasts the number of checkdams by structure type with the number requiring maintenance during the FY2005 monitoring and maintenance season.

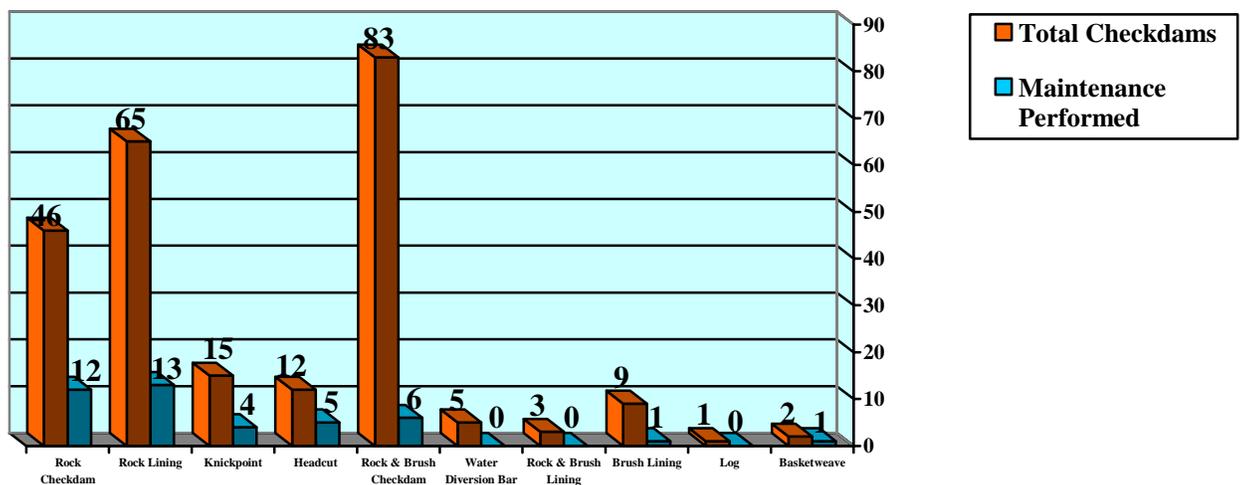


Figure 13. The total number of checkdams by type with the number requiring maintenance work in FY2005.

Monitoring observations and maintenance notes are provided below. Each site with checkdams is monitored for overall drainage activity and individual checkdams are assessed for maintenance. Any maintenance work conducted is also described below and entered into a checkdam maintenance database. Appendix D contains a table describing the depositional context for each site with checkdams, and the maintenance history for all checkdams constructed between 1995 and the present.

***A:15:005 Terrace deposit on a debris fan******5 Checkdams in one River-based drainage***

The drainage has not been active. There is abundant seasonal vegetation growing throughout the site, within the drainage, and around rocks that comprise the rock linings. All checkdams look great and no work is necessary.

***A:16:149 Terrace deposit******7 Checkdams in one River-based drainage***

The drainage has been active with several meter-deep knickpoints. Checkdams were blown out or large plunge pools existed below the checkdams. Checkdams 1, 3, 6, and 7 were all repaired. A total of 30 1/2 sized buckets of rock and lots of brush were used to completely reconstruct these checkdams.

***Checkdam 1***

7 buckets of rock plus deadfall of mesquite were used to fill in a one meter deep plunge pool at the end of this checkdam.

***Checkdam 3***

7 buckets of limestone cobbles, deadfall brush, and seasonal vegetation containing seed pods were used to rebuild this obliterated checkdam.

***Checkdam 6***

8 buckets of limestone cobbles and local seasonal grasses were used to reconstruct this checkdam that had been damaged by a large plunge pool.

***Checkdam 7***

9 buckets of limestone cobbles and local seasonal grasses were used to repair this checkdam damaged by excessive channel downcutting and runoff.

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

The drainage has not been active. There is abundant seasonal grass growing throughout the site and around the rocks comprising the checkdams. No work was necessary.

***A:16:180 Terrace deposit******7 Checkdams in two River-based drainages***

There is so much vegetation growing that it is impossible to see the ground. Gabriel Yuselew of the ZCP walked the drainage and determined that due to the extensive vegetation, no maintenance work was required.

***B:14:107 Terrace deposit on a debris fan******1 Water diversion bar above one Terrace-based drainage***

There has not been any runoff down the talus slope to the water diversion structure. There is no change to the structure. No maintenance work was necessary.

***C:02:101 Terrace deposit******14 Checkdams in two River-based drainages***

There are a lot of grasses in the drainage. The drainage was slightly active evidenced by alluvium deposited behind some of the checkdams, though no maintenance work was required.

Checkdams 1-2 and 13 are completely buried in reworked eolian sediment.

***C:09:050 Terrace deposit on a debris fan****1 Water diversion bar adjacent to a Side Canyon drainage*

No work was necessary. The water diversion bar was unchanged and there was no flooding from the side canyon.

***C:13:006 Terrace deposit****20 Checkdams in two River-based drainages*

The drainage has been very active since last monitored. There were several knickpoints above in the upper section of the drainage that were not treated. Maintenance work was completed at checkdams 1, 2, 4, 5, 7, 8, 9, 15, 16, and 18.

*Checkdam 1*

Filled in 3 meters below the checkdam with gravels and filled in a knickpoint 1 meter above the checkdam.

*Checkdam 2*

Filled in the checkdam with 2 buckets of rock above the checkdam and 1 bucket of rock below the checkdam resulting in an extension of the rock lining.

*Checkdam 4*

Breaching along the west side of the checkdam was filled in with rock and gravel.

*Checkdam 5*

A knickpoint and breaching were filled in with rock and gravels.

*Checkdam 7*

A plunge pool below and a knickpoint above the checkdam were both filled in with larger rocks.

*Checkdam 8*

A knickpoint above and a plunge pool below the checkdam were both were filled in with gravels.

*Checkdam 9*

Breaching on the downstream side of the checkdam was filled in with rock.

*Checkdam 15*

Filled in a knickpoint above the checkdam with gravels.

*Checkdam 16*

A 10 centimeter deep plunge pool was filled in with gravels

*Checkdam 18*

Breaching on the east and west sides of the checkdam was filled with gravels.

***C:13:069 Terrace deposit on a debris fan****7 Checkdams in one Terrace-based drainage*

The drainage has been slightly active, evidenced by a large plunge pool located between checkdams 2 and 3. Instead of filling in the area between the 2 checkdams with a lining, ZCP personnel determined the plunge pool should be filled.

*Checkdam 7*

A plunge pool between Checkdams 2 and 3 was treated with 1 bucket of rock and rabbit brush debris.

***C:13:099 Terrace deposit on a debris fan****48 Checkdams in one River-based drainage*

The drainage has been active, expanding in width in some places with channel expansion, piping and checkdam breaching. Checkdam maintenance was performed at Checkdams 23, 28, 32, 42, and 53.

*Checkdam 9*

A large knickpoint just below the checkdam was filled in with logs and brush.

*Checkdam 23*

Piping on the north side of the checkdam was filled in with gravels.

*Checkdam 28*

Filled in the east bank of the checkdam where breaching occurred with rock and gravels.

*Checkdam 42*

A plunge pool was filled in with gravels on the south side of the checkdam.

*Checkdam 53*

The east bank of the checkdam was built up after being damaged by breaching.

***C:13:100 Terrace deposit on a debris fan****26 Checkdams in one River-based drainage*

The drainage has been active but eolian transported sediments have blown into the drainage in many locations. Minor maintenance work occurred at Checkdam 9 and a new checkdam (28) was constructed in a knickpoint point between checkdams 6 and 7.

*Checkdam 9*

A 30 centimeter knickpoint was filled in with sandstone rocks.

*Checkdam 28*

To prevent further down cutting, a new checkdam was constructed below Checkdam 7 to fill in a 10 centimeter deep and 2 meter long knickpoint.

***C:13:327 Terrace deposit****2 Checkdams in one Terrace-based drainage*

There is minor deposition behind the checkdams from runoff. No maintenance work was necessary.

***C:13:336 Terrace deposit****5 Checkdams in one Terrace-based drainage*

All checkdams are looking good and holding sediment. The sediment is derived from both runoff and eolian transport. No maintenance work was necessary.

***C:13:346 Terrace deposit****9 Checkdams in two Terrace-based drainages*

The drainage has been active and brush linings have been blown out. Checkdams 3, 6, and 7 were rebuilt using brush and rock.

*Checkdam 3*

A 15 centimeter knickpoint below the checkdam was filled in with brush and rock. This extended the size of the checkdam to two meters in length.

*Checkdam 6*

A headcut approximately 10 centimeters deep was filled in with brush and rock.

*Checkdam 7*

A knickpoint directly below the checkdam, approximately 10 centimeters deep, was filled in with rock and brush.

***C:13:348 Terrace deposit***

*5 Checkdams in two Terrace-based drainages*

The drainage has been slightly active with a small knickpoint developing. Checkdam 1 required maintenance.

*Checkdam 1*

A five centimeter deep knickpoint was filled with brush. The maintenance work resulted in the extension of the checkdam.

***C:13:359 Terrace deposit on a debris fan***

*4 Checkdams in one Terrace-based drainage*

No change was evident at the drainage and no maintenance work was required.

***C:13:371 Terrace deposit on a debris fan***

*3 Checkdams in one River-based drainage*

The runoff from the talus slope above the checkdams does not contain any sediment and so no build up has occurred. No maintenance work was required.

***C:13:381 Terrace deposit on a debris fan***

*4 Checkdams in one River-based drainage*

Seasonal vegetation has grown throughout the site, filling in previously visible down cutting. No maintenance work was required.

***G:03:002 Terrace deposit***

*5 Checkdams in one River-based drainage*

Headward migration has occurred. Checkdam 2 was damaged by a large knickpoint. No other activity was noted in the drainage. Rock and brush were added to both checkdams.

*Checkdam 1*

8 buckets of rock and brush were added to the top and bottom portions of the checkdam. Piping and headward migration were filled in.

*Checkdam 2*

25 buckets, large rocks, plus mesquite brush were placed in a 2 meter deep knickpoint.

***G:03:003 Terrace deposit***

*16 Checkdams in one River-based drainage*

The drainage has not been active. No change was observed and no maintenance work was necessary.

***G:03:024 Terrace deposit***

*8 Checkdams in one River-based and one Terrace-based drainage*

The upper drainage has not been active. The lower drainage has been active. Checkdam 4 required maintenance work using rock and brush.

*Checkdam 4*

Brush and gravels, plus 4 buckets of rock were added to the piping at the top of the checkdam and on top of the existing brush.

***G:03:025 Terrace deposit***

*4 Checkdams in one River-based drainage*

The drainage has not been active though the cutbank of the arroyo is vulnerable to collapse.

*Checkdam 1*

3 buckets of rock and brush were added to build up the north side of the checkdam.

***G:03:026 Terrace deposit***

*6 Checkdams in one River-based drainage*

The drainage has not been active. There was so much vegetation growing that it was difficult to relocate the checkdams. No maintenance work was required.

***G:03:040 Terrace deposit***

*2 Brush lining checkdams in one Terrace-based drainage*

No activity was recorded during this monitoring episode. No maintenance work was required.

***G:03:041 Terrace deposit***

*6 Checkdams in two Terrace-based drainages*

The drainage at Feature 3 has been active and the lower checkdams require maintenance work.

*Checkdam 8*

Added brush and 4 buckets of rock plus gravel to the lining and extended it to span the area between the former location of Checkdam 7 and Checkdam 8.

***G:03:058 Terrace deposit***

*9 Checkdams in two Terrace-based drainages*

The drainages have been active, downcutting through sediments and damaging checkdams. Maintenance was performed at Checkdams 3, 6, 8 and 9. The checkdams were damaged by active gully downcutting. The area above Checkdam 1 has split into two separate drainages and headward migration has been active.

*Checkdam 3*

A large knickpoint was filled with deadfall brush and then covered with 3 buckets of rock and 2 buckets of gravel.

*Checkdam 6*

Lined the area with deadfall brush and then added 4 buckets of rock and 2 buckets of gravel. The area was blown out above the checkdam.

*Checkdam 8*

Added deadfall brush to the plunge pool and then covered it with 2 buckets of rock and 1 bucket of gravel below the checkdam.

*Checkdam 9*

A plunge pool below the checkdam was filled in with deadfall brush and then covered by 3 buckets of rock and 2 buckets of gravel.

***G:03:072 Terrace deposit on a debris fan****12 Checkdams in one River-based and two Terrace-based drainages*

The drainage at Feature 14 has been slightly active with 1 knickpoint below Checkdam 10. Vegetation appears to have temporarily stabilized the drainage area. The checkdams near Features 11 and 12 are in good condition. Checkdams 10 and 16 required minor maintenance.

*Checkdam 10*

Brush and 1 bucket of gravel were added to a knickpoint treatment below the checkdam.

*Checkdam 16*

Very large rocks and brush, plus 3 buckets of rock and gravel were added to the downstream portion of the checkdam.

**Checkdam Construction Recommendations for FY2006**

The following information is presented based upon the monitoring and maintenance observations for fiscal year 2005. At the request of the BOR, no new sites had checkdams constructed during the FY2005 checkdam monitoring and maintenance activities. However, three locations containing checkdams have been recommended for additional checkdam construction. Active erosion at these historic properties appears have the potential to damage cultural features.

*C:13:006*

The gully systems have been very active and there are several knickpoints present. The knickpoints are located in portions of the drainage not previously treated with erosion control structures. New checkdams should be installed in these active drainages. Checkdams should mainly be rock linings.

*G:03:058*

The drainage has been active after filling in with eolian transported sediments. The area above Checkdam 1 has split into two separate drainages and headward migration is active. This migration should be monitored closely. It is recommended that two small checkdams be constructed in the arms of the drainage, above Checkdam 1.

*C:13:336*

Surface erosion, gullying and eolian activity are present and have all recently been active. The lower portion of the drainage has channelized and slightly downcut since the last monitoring episode. Because the upper checkdams have successfully trapped and held sediment, it is recommended that new checkdams or rock linings be installed in the lower section of the gully.

**New Checkdam Construction Assessments Recommended**

During the course of FY2005 site condition monitoring activities, six historic properties were recommended for checkdam installation assessments. It is recommended that these locations be visited by ZCP staff members during FY2006 to assess the utility of checkdam construction.

*A:15:028*

Feature 5 is bisected by a gully. There is high potential for subsurface remains becoming exposed at this site, particularly within the Feature 5 roaster. A checkdam installation assessment is recommended at Feature 5.

*A:15:039*

There is minor gully activity along the west side of the FCR area north of Feature 2. This gully is recommended for checkdam installation because active erosion has been recorded here during previous monitoring episodes. Active gully erosion has been consistently observed during the last three monitoring episodes. This active erosion now threatens cultural remains. Due to the gentle slope of the terrace and the amount of vegetation it is believed that checkdams would stabilize the area before impact occurs to Feature 2 and the upslope features.

*A:16:160*

Four knickpoints are adjacent to the metate within the drainage. The depth of the knickpoints in order from the top of the drainage to the bottom are: five centimeters, 20 centimeters, 40 centimeters, and 40 centimeters. The drainage has been noted during the last three monitoring episodes though it has only recently become active. This active drainage will likely continue to move upslope, eroding through headward migration. It is recommended that brush checkdams or gravels be installed to deter further headward migration of the drainage.

*B:11:277*

There is active gully downcutting south of the feature with six knickpoints present. Although vegetation is abundant on site, gullying will continue. It is recommended that the gully be assessed for erosion control structures; perhaps brush would be good.

*G:03:044*

The gully bisecting the roasters is very active with several knickpoints. There are signs of infilling through eolian activity and some cryptobiotic soils growing near the headcut but these actions will not stabilize this drainage. Brush present in the drainage appears to be trapping some sediment so it is recommended that brush checkdams be constructed to encourage additional sediment deposition.

*G:03:056*

Gullying adjacent to and through features threaten to expose additional cultural remains. Checkdam installation is recommended to stabilize the small gullies. From the lower end of the drainage, it is recommended that the gully be lined with rocks or gravels. Preservation efforts conducted now will curtail further site deterioration.

**Conclusions**

Checkdams are successfully slowing the exposure of additional cultural resources within the project area. As stated by independent researchers, it is important to continue the process of routine checkdam monitoring and maintenance to deter additional erosion (Pederson et al., 2003). It is recommended that the 27 historic properties containing checkdams continue to be monitored and physically assessed for additional maintenance. Three sites in this sample have been observed to be currently very active and there is the potential for channel downcutting and widening. It is further recommended that ZCP personnel accompany RCMP staff to visit and assess the six historic properties recommended for checkdam assessments to determine if erosion control structures may reduce the amount of erosion currently observed.

## CHAPTER FIVE RECOMMENDATIONS FOR FUTURE WORK

### RECOMMENDATIONS GENERATED FROM FY2005 SITE CONDITION ASSESSMENTS

Each of the previous chapters has had as its focus one specific aspect of the RCMP program. The recommendations and conclusions from these chapters have been compiled below. Included is a list of the historic properties recommended for site condition monitoring in FY2006. In addition to site condition monitoring, 27 locations with checkdams are recommended for monitoring and maintenance and 31 historic properties were recommended for some type of treatment.

#### *Site Condition Monitoring*

FY2005 marked the final year of PA cultural monitoring as conducted by NPS archaeologists. The monitoring form as seen in Appendix A will no longer be completed. In FY2006, the AMP cultural program focus will be on the development of a long-term cultural resource monitoring program. This will require analysis of previously collected monitoring data, identification of new or additional variables to collect, and testing new methods for data collection.

Site condition assessments as required for the service-wide reporting through the Archeological Sites Management Information System (ASMIS) will continue. It is anticipated that 161 historic properties will be visited as a result of the work conducted by Reclamation for the Treatment Plan Scope and NPS for the proposed excavations by MNA. Review of the RCMP database shows 59 historic properties are currently scheduled for monitoring in FY2006 (See Table 4 for the list of historic properties recommended for monitoring and the current schedule.). These are a subset of the 161 sites. Continued site condition monitoring will provide more fine-tuned historic property condition data for the completion of a treatment plan and the development of a long-term monitoring program.

Table 4. Historic Properties Scheduled for Monitoring in FY2006

| <i>Site Number</i> | <i>Monitoring Schedule</i> |
|--------------------|----------------------------|
| A:15:031           | 5 Year                     |
| A:15:032           | 5 Year                     |
| A:15:033           | 4 Year                     |
| A:15:048           | 3 Year                     |
| A:16:174           | 3 Year                     |
| B:11:272           | 4 Year                     |
| B:15:138           | Annual                     |
| C:02:092           | 3 Year                     |
| C:02:096           | Semiannual                 |
| C:02:098           | Annual                     |
| C:05:031           | 5 Year                     |
| C:06:008           | 5 Year                     |
| C:09:050           | Annual                     |
| C:09:051           | 3 Year                     |
| C:09:052           | Biennial                   |
| C:09:065           | 5 Year                     |
| C:13:006           | Annual                     |
| C:13:009           | Biennial                   |
| C:13:010           | Annual                     |
| C:13:069           | Annual                     |
| C:13:070           | Annual                     |
| C:13:098           | Annual                     |
| C:13:099           | Semiannual                 |
| C:13:100           | Annual                     |
| C:13:101           | 3 Year                     |
| C:13:272           | Biennial                   |

|          |            |
|----------|------------|
| C:13:273 | Annual     |
| C:13:291 | Annual     |
| C:13:321 | Annual     |
| C:13:329 | Biennial   |
| C:13:333 | 4 Year     |
| C:13:334 | 3 Year     |
| C:13:337 | 5 Year     |
| C:13:338 | 4 Year     |
| C:13:339 | Annual     |
| C:13:343 | Biennial   |
| C:13:347 | Annual     |
| C:13:349 | Annual     |
| C:13:355 | 4 Year     |
| C:13:371 | Semiannual |
| C:13:373 | 3 Year     |
| C:13:385 | Biennial   |
| C:13:386 | Annual     |
| C:13:389 | 3 Year     |
| G:02:009 | 5 Year     |
| G:02:100 | 5 Year     |
| G:02:108 | 5 Year     |
| G:03:003 | Annual     |
| G:03:020 | Annual     |
| G:03:028 | Biennial   |
| G:03:030 | Biennial   |
| G:03:038 | Biennial   |
| G:03:040 | Biennial   |
| G:03:041 | Annual     |
| G:03:060 | 5 Year     |
| G:03:064 | Annual     |
| G:03:067 | Biennial   |
| G:03:072 | Annual     |
| G:03:080 | Annual     |

### *Treatment Recommendations*

The treatment recommendations made by RCMP staff during FY2005 monitoring activities are limited to the treatment options identified and defined by PA signatories and described in the Monitoring and Remedial Action Plan (USDOJ 1994; 2000). Identified treatments include trail work, planting vegetation, checkdam construction, other preservation options, research, data recovery, and other recovery options. These recommendations and the previous years recommendations will be reviewed, incorporated, and considered for the final treatment plan completed by Reclamation.

Table 5. 31 Historic Properties with recommendations for treatment.

| <i>Site Number</i> | <i>Trail Work</i> | <i>Plant Vegetation</i> | <i>Install Checkdams</i> | <i>Other Preservation</i> | <i>Research</i> | <i>Date Recovery</i> | <i>Other Recovery</i>  |
|--------------------|-------------------|-------------------------|--------------------------|---------------------------|-----------------|----------------------|------------------------|
| A:15:003           | X                 | X                       |                          |                           |                 |                      |                        |
| A:15:004           |                   |                         |                          |                           | X               |                      |                        |
| A:15:018           | X                 |                         |                          |                           |                 |                      |                        |
| A:15:028           |                   |                         | X                        |                           |                 |                      |                        |
| A:15:039           |                   |                         | X                        |                           | X               | X                    |                        |
| A:15:158           |                   |                         |                          |                           | X               |                      |                        |
| A:16:160           |                   |                         | X                        |                           |                 |                      |                        |
| B:09:317           | X                 |                         |                          |                           |                 |                      |                        |
| B:11:277           |                   |                         | X                        |                           |                 |                      |                        |
| B:11:281           |                   |                         |                          |                           | X               |                      |                        |
| B:14:093           |                   |                         |                          |                           |                 |                      | Special CMRC clearance |
| C:02:094           |                   |                         |                          | Graffiti Removal          |                 |                      | Documentation          |
| C:02:098           | X                 |                         |                          | Trail work                |                 | X                    |                        |
| C:09:068           |                   |                         |                          |                           | X               |                      |                        |
| C:09:088           |                   |                         |                          | Assessment                |                 |                      |                        |
| C:13:006           |                   | X                       | X                        |                           |                 |                      |                        |
| C:13:069           |                   |                         |                          |                           |                 | X                    |                        |

|          |   |   |                   |   |                          |
|----------|---|---|-------------------|---|--------------------------|
| C:13:098 |   |   | Remove Vegetation |   |                          |
| C:13:099 | X |   |                   | X | Remap with total station |
| C:13:100 | X |   |                   |   |                          |
| C:13:327 |   |   |                   | X |                          |
| C:13:336 |   | X |                   |   |                          |
| C:13:371 |   |   |                   | X |                          |
| C:13:379 |   |   | VT documentation  |   |                          |
| G:03:003 | X | X |                   |   |                          |
| G:03:043 |   |   |                   | X | X                        |
| G:03:044 |   | X |                   |   | X                        |
| G:03:055 |   |   |                   |   | Remap with total station |
| G:03:056 |   | X |                   |   |                          |
| G:03:058 |   | X |                   |   |                          |
| G:03:080 | X |   |                   |   |                          |

### *Checkdam Monitoring and Maintenance*

Although an umbrella treatment plan is currently being drafted, we strongly recommend that checkdam monitoring and maintenance continue. Twenty-seven historic properties contain checkdams that should be monitored and maintained. As reported by Pederson and others (Pederson et al., 2003; Pederson et al., 2005; Norton et al., 2000; Gellis et al. 1994) regular checkdam maintenance is an important step for preserving existing site condition. As part of the treatment plan development, contractors and agency archaeologists will be visiting sites to determine the extent and nature of impacts. This document will also formalize treatment recommendations and identify trigger points for data recovery. The original purpose of the checkdam program was to slow, halt, or reverse instability at these eroding sites. The stabilization effort was never intended to be a one-time event; rather, stabilization efforts are routine and must be maintained. If the checkdams fail and maintenance is not conducted, site conditions will worsen, necessitating additional treatments.

### **GIS**

As mentioned previously, NPS funded a project to update 62 of the 81 total station maps into the current GCMRC state plane coordinate system. Sixteen of the 62 sites still have local coordinates and NPS recommends that GCMRC conduct field work to establish survey control for these sites. These data currently reside at GRCA, with copies at the GCMRC.

The final 19 sites not included in the NPS contract should be updated for future monitoring and research projects. As discussed in the GIS chapter, this project will be labor intensive in the lab and may require survey field work to connect these properties to the wider control network. The extent of work required to complete this task should not deter from its importance for integration between both interdisciplinary research and agency participation. NPS archaeologists recommend that GIS survey data projects be accomplished through the joint efforts of the NPS archaeologists and members of the GCMRC survey program. Total station survey data collected by other researchers (Yeatts, 1996; Hazel et. al, 2000; and Pederson et. al., 2003) should also be reviewed to ensure that the data conform to the updated GCMRC control.

### **Statistical Analysis of PA Monitoring Data**

In FY2005 7K Information Technology was awarded a contract to normalize the data tables in the Microsoft Access database to eliminate redundant or poorly implemented columns (fields) and to include indexed, long-integer primary-key/foreign-key relational structures. Additionally, 7K migrated this monitoring data to the GRCA database server and rebuilt the data to operate as a client-server application, incorporating data from the GRCA database server instead of a local database file. RCMP monitoring data is now integrated with the park-wide GRCA

Archaeological Database. Improvements to the database will benefit the work completed by the various contractors.

Dr. Michael Berry, Reclamation archaeologist, conducted some preliminary analyses to evaluate the utility of this database, and to provide recommendations for improvement of the monitoring activity required by the Grand Canyon Protection Act (GCPA). Because the PA monitoring program was created to capture § 106 requirements, it is anticipated that the design of a future cultural monitoring program for GCPA (which should incorporate the § 106 monitoring in addition to evaluations of non-National Register eligible cultural resources) should have a focus similar to the current PA monitoring program (impact agents) to ensure continuity in some of the data collected. Appendix E contains the results of the analysis completed by Dr. Berry.

## TRANSITION TO FUTURE MONITORING AND TREATMENT EFFORTS

Fiscal years 2006 and 2007 are considered to be transition years for monitoring and treatment efforts. Reclamation has contracted out for the development of a treatment plan to address the resolution of effect to 151 properties within the project area. The GCMRC is developing a long-term monitoring plan to address AMP issues, looking at the broader spectrum of cultural resources and the results of the Secretary of the Interior's decisions regarding Glen Canyon Dam operations. NPS will ensure that the information collected will benefit management issues as related to the Colorado River Management Plan and the Backcountry Management Plan.

Field work conducted during FY2006 will be geared towards data collection for the treatment plan and collection of variables with the intent of developing a long-term monitoring protocol. Reclamation, GCMRC, and NPS have agreed to combine field work to minimize duplication of effort and to reduce the amount of visitation to historic properties while developing the respective treatment and monitoring plans.

Field work is scheduled to begin March, 2006. The combined trips will entail collection of geomorphic treatment plan-oriented and monitoring variables. Future trips may also include small "test" projects such as use of data loggers and comparing different methods of remote sensing for site mapping. As NPS archaeologists accompany USU, ZCRE, and GCMRC staff in the field, ASMIS site condition data will also be collected. These data will be included in the annual federal report of historic property condition service-wide, and made available to the GCMRC and Reclamation's contractors.

In addition to development of treatment and monitoring plans, the GCMRC will also conduct statistical analysis of the 14 years of RCMP monitoring data. It is anticipated that this work will be conducted in 2006 with the assistance of NPS archaeologists to aid in the development of the long-term monitoring program.

Reclamation and GCMRC will provide updates and reports to PA members on the status of the development and implementation of the work conducted during the transition to the long-term monitoring program and implementation of treatment recommendations for the 151 sites along the river corridor. NPS has developed a scope of work with each agency to identify combined efforts and involvement during this transition period.

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## APPENDIX A

### RCMP BLANK MONITORING FORM AND VARIABLE DEFINITIONS

## 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 gullies 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 gullies 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 its 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](mailto: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, gulying, 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.

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

## APPENDIX B

### ASMIS SITE CONDITION ASSESSMENT VALUE DESCRIPTIONS

|           |  |
|-----------|--|
| Good      | <p>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.</p>   |
| Fair      | <p>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.<br/>(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.)</p>                              |
| Poor      | <p>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.<br/>(No or insufficient corrective treatment [see Treatment Proposed field] has been taken to protect and preserve the remaining archeological values from their current threats.)</p> |
| Destroyed | <p>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.</p>  |
| Unknown   | <p>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.<br/>(ASMIS 3.00 Data Dictionary February 2005).</p>  |

## APPENDIX C

### CARBON SAMPLE DATA FOR RCMP HISTORIC PROPERTIES

# *Carbon Sample Data for RCMP Historic Properties*

*\* Indicates the sample was taken prior to reporting C13/C12 ratio by the lab.*

*Sample Numbers AA and W were processed at the USGS radio carbon lab, Reston, VA in conjunction with R. Hereford research*

| <i>SiteKey</i>  | <i>Sample Number</i> | <i>C14 Date</i> | <i>Material Type</i> | <i>C13/C12 Ratio</i> | <i>Feature Number</i> | <i>Reference</i>            |
|-----------------|----------------------|-----------------|----------------------|----------------------|-----------------------|-----------------------------|
| <i>A:15:030</i> |                      |                 |                      |                      |                       |                             |
|                 | Beta-106107          | 870+/- 50       | juniper charcoal     | -25.0                |                       | Yeatts, 1998                |
|                 | Beta-106108          | 990+/- 50       | juniper charcoal     | -25.0                |                       | Yeatts, 1998                |
| <i>A:15:048</i> |                      |                 |                      |                      |                       |                             |
|                 | Beta-147221          | 280+/-70        | charred material     | -25.0                | 1                     | Dierker and Downum,<br>2002 |
| <i>A:16:180</i> |                      |                 |                      |                      |                       |                             |
|                 | Beta-106109          | 50+/- 50        | creosote charcoal    | -25.0                | 1                     | Yeatts, 1998                |
|                 | Beta-106110          | 0BP             | creosote charcoal    | -25.0                | 1                     | Yeatts, 1998                |
|                 | Beta-158801          | 100+/-50        | creosote charcoal    | -25.0                | 1                     | Yeatts, 1998                |
| <i>B:13:002</i> |                      |                 |                      |                      |                       |                             |
|                 | Beta-180494          | 890+/-40 BP     | carbon               | -26.2                | 5                     |                             |
| <i>B:16:911</i> |                      |                 |                      |                      |                       |                             |
|                 | Beta-180491          | 2160+/-40BBP    | carbon               | -27.3                | 1                     |                             |
|                 | Beta-180492          | 2370+/-60BP     | carbon               | -25.7                | 4                     |                             |
| <i>C:02:096</i> |                      |                 |                      |                      |                       |                             |
|                 | Beta-147226          | 3560+/-70       | charcoal             | -25.0                | 9                     |                             |
|                 | Beta-147234          | 3220+/-80       | charcoal             | -25.0                | 2                     |                             |

| <i>SiteKey</i>  | <i>Sample Number</i> | <i>C14 Date</i> | <i>Material Type</i> | <i>C13/C12 Ratio</i> | <i>Feature Number</i>                           | <i>Reference</i>      |
|-----------------|----------------------|-----------------|----------------------|----------------------|---|-----------------------|
| <i>C:13:010</i> | Beta-130603          | 990+/-50        | charcoal             | -25.0                | 38, level 5                                     | Miller, 2005          |
|                 | Beta-130605          | 1290+/-70       | charcoal             | -25.0                | 10, Unite 2, level 3                            | Miller, 2005          |
|                 | Beta-130606          | 800+/-50        | charcoal             | -25.0                | Structure 9, Room 2, level 2,<br>unit 2, Beam 2 | Miller, 2005          |
|                 | Beta-130607          | 760+/-70        | charcoal             | -25.0                | Structure 9, Room 2, Level 2,<br>Beam 2         | Miller, 2005          |
|                 | Beta-130608          | 810+/-50        | charcoal             | -25.0                | Structure 9, Room 1, Level 2                    | Miller, 2005          |
|                 | Beta-130609          | 810+/-60        | charcoal             | -25.0                | Structure 9, Room 1, Level 2                    | Miller, 2005          |
|                 | Beta-130610          | 760+/-60        | charcoal             | -25.0                | Structure 9, Room 1, Level 2                    | Miller, 2005          |
|                 | Beta-130611          | 830+/-50        | charcoal             | -25.0                | Structure 9, Room 2, Level 2,<br>no unit        | Miller, 2005          |
|                 | Beta-130612          | 1200+/-50       | charcoal             | -25.0                | 25  | Miller, 2005          |
|                 | Beta-130613          | 1270+/-60       | charcoal             | -25.0                | 26  | Miller, 2005          |
|                 | Beta-130614          | 890+/-50        | charcoal             | -25.0                | Structure 9, Room 1 814.59                      | Miller, 2005          |
|                 | Beta-130615          | 1000+/-50       | charcoal             | -25.0                | Structure 9, Room 2, Level 5                    | Miller, 2005          |
|                 | Beta-147227          | 870+/-60        | Roof beam            | -25.0                | Str 9/Rm 2                                      | Miller, 2005          |
|                 | Beta-180467          | 1210+/-40BP     | carbon               | -25.0                | west of 49                                      | Miller, 2005          |
|                 | W-6259               | 250+/- 100      | Mesquite pith        | *                    |   | Hereford et al., 1993 |
|                 | W-6261               | 300+/- 50       | Mesquite pith        | *                    |   | Hereford et al., 1993 |
|                 | W-6290               | < 200           | Mesquite pith        | *                    |   | Hereford et al., 1993 |

*C:13:069*

| <i>SiteKey</i>  | <i>Sample Number</i> | <i>C14 Date</i> | <i>Material Type</i>   | <i>C13/C12 Ratio</i> | <i>Feature Number</i> | <i>Reference</i>            |
|-----------------|----------------------|-----------------|------------------------|----------------------|-----------------------|-----------------------------|
|                 | Beta-180495          | 1700+/-60<br>BP | carbon                 | 21.3                 | west of 2             |                             |
| <i>C:13:070</i> |                      |                 |                        |                      |                       |                             |
|                 | Beta-147228          | 790+/-60        | burned log             | -25.0                | Locus D               |                             |
|                 | Beta-147229          | 920+/-60        | burned log             | -25.0                | Locus D               |                             |
| <i>C:13:099</i> |                      |                 |                        |                      |                       |                             |
|                 | Beta-158803          | 1440+/-50       | charcoal               | -25.8                | 1                     | Dierker and Downum,<br>2004 |
|                 | Beta-158804          | 880+/-60        | charcoal               | -25.0                | 7                     | Dierker and Downum,<br>2004 |
|                 | Beta-51470           | 1410+/- 120     | charcoal               | *                    | 3                     |                             |
|                 | Beta-51471           | 1380+/- 140     | charcoal               | *                    | 3                     |                             |
|                 | Beta-51472           | 1020+/- 50      | charcoal               | *                    | 3                     |                             |
|                 | Beta-66261           | 970+/- 70       | charcoal               | -26.9                |                       |                             |
|                 | W-6288               | 190+/- 40       | driftwood, outer rings | *                    |                       | Hereford, 1996              |
|                 | W-6289               | 1170+/- 60      | charcoal               | *                    | 3                     | Hereford, 1996              |
|                 | W-6373               | 885+/- 60       | driftwood charcoal     | *                    |                       | Hereford, 1996              |
| <i>C:13:272</i> |                      |                 |                        |                      |                       |                             |
|                 | Beta-51473           | 330+/- 50       | charcoal               | *                    | 5                     |                             |
|                 | Beta-51474           | 40+/- 60        | carbonite food residue | *                    | 5                     |                             |
| <i>C:13:273</i> |                      |                 |                        |                      |                       |                             |
|                 | Beta-106111          | 1360+/- 50      | mesquite charcoal      | -25.0                | 5, 106 cbd            | Yeatts, 1998                |

| <i>SiteKey</i>  | <i>Sample Number</i> | <i>C14 Date</i> | <i>Material Type</i> | <i>C13/C12 Ratio</i> | <i>Feature Number</i> | <i>Reference</i>      |
|-----------------|----------------------|-----------------|----------------------|----------------------|-----------------------|-----------------------|
|                 | Beta-106112          | 1390+/- 60      | mesquite charcoal    | -25.0                | 5, 125 cbd            | Yeatts, 1998          |
|                 | Beta-158805          | 1510+/-70       | charcoal             | -25.0                | 5                     |                       |
|                 | Beta-59766           | 1350+/- 80      | charcoal             | *                    | 5                     |                       |
| <i>C:13:291</i> |                      |                 |                      |                      |                       |                       |
|                 | Beta-180496          | 1070+/-50BP     | carbon               | -24.8                | 7, floor of feature   |                       |
| <i>C:13:323</i> |                      |                 |                      |                      |                       |                       |
|                 | Beta-36123           | 2170+/- 70      | charcoal             | *                    |                       |                       |
| <i>C:13:324</i> |                      |                 |                      |                      |                       |                       |
|                 | Beta-51476           | 1810+/- 60      | charcoal             | *                    |                       |                       |
| <i>C:13:326</i> |                      |                 |                      |                      |                       |                       |
|                 | Beta-51477           | 1220+/- 60      | charcoal             | *                    |                       |                       |
|                 | Beta-51478           | 1300+/- 50      | charcoal             | *                    |                       |                       |
| <i>C:13:327</i> |                      |                 |                      |                      |                       |                       |
|                 | AA-6781              | 1870+/- 70      | charcoal             | *                    |                       | Hereford et al., 1996 |
|                 | AA-6782              | 770+/- 90       | charcoal             | *                    | 5                     | Hereford et al., 1996 |
|                 | AA-6783              | 1250+/- 130     | charcoal             | *                    | 5                     | Hereford et al., 1996 |
|                 | AA-6784              | 400+/- 60       | Mesquite pith        | *                    |                       | Hereford et al., 1996 |
|                 | AA-6785              | 1710+/- 70      | charcoal             | *                    | 3                     | Hereford et al., 1996 |
|                 | Beta-51479           | 90+/- 60        | charcoal             | *                    | 1                     |                       |

| <i>SiteKey</i>  | <i>Sample Number</i> | <i>C14 Date</i> | <i>Material Type</i>     | <i>C13/C12 Ratio</i> | <i>Feature Number</i> | <i>Reference</i>      |
|-----------------|----------------------|-----------------|--------------------------|----------------------|-----------------------|-----------------------|
|                 | Beta-51480           | 2230+/- 100     | charcoal                 | *                    |                       |                       |
|                 | Beta-51481           | 2310+/- 80      | charcoal                 | *                    |                       |                       |
|                 | Beta-59767           | 390+/- 90       | charcoal                 | *                    | 1                     |                       |
|                 | W-6286               | 2160+/- 40      | charcoal                 | *                    | 6                     | Hereford et al., 1996 |
|                 | W-6287               | 2150+/- 50      | charcoal                 | *                    | 6                     | Hereford et al., 1996 |
| <i>C:13:332</i> | Beta-59768           | 1280+/- 60      | charcoal                 | *                    |                       |                       |
| <i>C:13:338</i> | Beta-106113          | 990+/- 60       | mesquite charcoal        | -25.0                | 3 base                | Yeatts, 1998          |
| <i>C:13:349</i> | AA-6789              | 2120+/- 110BP   | charcoal                 | *                    | 5                     | Hereford et al., 1996 |
|                 | Beta-180493          | 1680+/-40BP     | carbon -noncultural lens | -24.8                |                       |                       |
|                 | Beta-45830           | 1840+/- 70      | charcoal                 | *                    | 5                     | Hereford et al., 1996 |
|                 | Beta-51482           | 2270+/- 100     | charcoal                 | *                    | 5                     | Hereford et al., 1996 |
|                 | Beta-51483           | 1610+/- 70      | charcoal                 | *                    | 5                     | Hereford et al., 1996 |
|                 | Beta-51484           | 1780+/- 70      | charcoal                 | *                    | 5                     | Hereford et al., 1996 |
| <i>C:13:350</i> | AA-6790              | 1610+/- 70      | charcoal                 | *                    |                       | Hereford et al., 1996 |
| <i>C:13:355</i> |                      |                 |                          |                      |                       |                       |

| <i>SiteKey</i>  | <i>Sample Number</i> | <i>C14 Date</i> | <i>Material Type</i> | <i>C13/C12 Ratio</i> | <i>Feature Number</i> | <i>Reference</i> |
|-----------------|----------------------|-----------------|----------------------|----------------------|-----------------------|------------------|
|                 | Beta-51485           | 130+/- 50       | charcoal             | *                    | 1                     |                  |
|                 | Beta-51486           | 570 +/- 60      | charcoal             | *                    | 2                     |                  |
|                 | Beta-51487           | 740+/- 80       | charcoal             | *                    | 2                     |                  |
|                 | Beta-51488           | 690+/- 50       | charcoal             | *                    | 3                     |                  |
|                 | Beta-51489           | 880+/- 60       | charcoal             | *                    | 3                     |                  |
|                 | W-6398               | 890+/- 50       | charcoal             | *                    | 3                     | Hereford, 1996   |
|                 | W-6401               | 940+/- 50       | charcoal             | *                    | 2                     | Hereford, 1996   |
|                 | W-6402               | 340+/- 50       | charcoal             | *                    | 1                     | Hereford, 1996   |
| <i>C:13:371</i> |                      |                 |                      |                      |                       |                  |
|                 | Beta-94283           | 350+/- 50       | charcoal             | *                    | 4                     |                  |
|                 | Beta-94284           | 120+/- 50       | charcoal             | *                    | 2                     |                  |
| <i>C:13:384</i> |                      |                 |                      |                      |                       |                  |
|                 | AA-9525              | 240+/- 90       | charcoal             | *                    |                       | Hereford, 1996   |
|                 | AA-9525              | 1390+/- 90      | charcoal             | *                    |                       | Hereford, 1996   |
|                 | Beta-45826           | 1190+/- 90      | charcoal             | *                    |                       |                  |
|                 | Beta-45827           | 950+/- 70       | charcoal             | *                    |                       |                  |
|                 | Beta-45828           | 1490+/- 80      | charcoal             | *                    |                       |                  |
|                 | W-6308               | 900+/- 80       | charcoal             | *                    |                       | Hereford, 1996   |
|                 | W-6309               | 950+/- 80       | charcoal             | *                    |                       | Hereford, 1996   |

| <i>SiteKey</i>  | <i>Sample Number</i> | <i>C14 Date</i> | <i>Material Type</i> | <i>C13/C12 Ratio</i> | <i>Feature Number</i> | <i>Reference</i>               |
|-----------------|----------------------|-----------------|----------------------|----------------------|-----------------------|--------------------------------|
|                 | W-6310               | 560+/- 80       | charcoal             | *                    |                       | Hereford, 1996                 |
|                 | W-6317               | < 200           | charcoal             | *                    |                       | Hereford, 1996                 |
|                 | W-6371               | 635+/- 120      | charcoal             | *                    |                       | Hereford, 1996                 |
|                 | W-6372               | 550+/- 80       | mesquite pith        | *                    |                       | Hereford, 1996                 |
|                 | W-6404               | 840+/- 70       | charcoal             | *                    |                       | Hereford, 1996                 |
| <i>G:03:003</i> | Beta-66254           | 1180+/- 60      | charcoal             | *                    |                       | Hereford and<br>Thompson, 1994 |
| <i>G:03:004</i> | Beta-151156          | 790+/-40        | charcoal             | -25.4                | 1                     | Hubbard et al., 2001           |
|                 | Beta-151157          | 140+/-60        | charcoal             | -25.0                | 2                     | Hubbard et al., 2001           |
|                 | Beta-151158          | 1170+/-60       | charcoal             | -25.0                | 2                     | Hubbard et al., 2001           |
|                 | Beta-151159          | 170+/-50        | charcoal             | -25.0                | 2                     | Hubbard et al., 2001           |
|                 | Beta-151160          | 830+/-60        | charcoal             | -25.0                | 8                     | Hubbard et al., 2001           |
|                 | Beta-151161          | 840+/-60        | charcoal             | -25.0                | 8                     | Hubbard et al., 2001           |
| <i>G:03:020</i> | Beta-158806          | 980+/-70        | charcoal             | -10.8                | 8                     | Dierker and Downum,<br>2002    |
|                 | Beta-158807          | 540+/-50        | charcoal             | -25.0                | 9                     | Dierker and Downum,<br>2002    |
| <i>G:03:026</i> | Beta-59769           | 190+/- 50       | charcoal             | *                    | 2                     | Hereford and<br>Thompson, 1994 |

| <i>SiteKey</i>  | <i>Sample Number</i> | <i>C14 Date</i> | <i>Material Type</i> | <i>C13/C12 Ratio</i> | <i>Feature Number</i> | <i>Reference</i>            |
|-----------------|----------------------|-----------------|----------------------|----------------------|-----------------------|-----------------------------|
|                 | Beta-59770           | 270+/- 50       | charcoal             | *                    | 3                     | Hereford and Thompson, 1994 |
|                 | Beta-59771           | 380+/- 50       | charcoal             | *                    | 3                     | Hereford and Thompson, 1994 |
|                 | Beta-59772           | 360+/- 50       | charcoal             | *                    | 8                     | Hereford and Thompson, 1994 |
|                 | Beta-59773           | 520+/- 50       | charcoal             | *                    | 8                     | Hereford and Thompson, 1994 |
| <i>G:03:064</i> |                      |                 |                      |                      |                       |                             |
|                 | Beta-59774           | 2670+/- 140     | charcoal             | *                    |                       | Hereford and Thompson, 1994 |
|                 | Beta-59775           | 2100+/- 60      | charcoal             | *                    |                       | Hereford and Thompson, 1994 |
|                 | Beta-59776           | 170+/- 50       | charcoal             | *                    |                       | Hereford and Thompson, 1994 |

## APPENDIX D

### CHECKAM CONSTRUCTION AND MAINTENANCE HISTORY

| Site            | Geomorphological Setting | Soil Description  | Drainage Type | Checkdam # | Checkdam Type | Original Construction Date | Maintenance Date         | Maintenance Work Completed             |
|-----------------|--------------------------|---|---------------|------------|---------------|----------------------------|--------------------------|--|
| <b>A:15:005</b> | 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                   | -                        | -                                      |
| <b>A:16:149</b> | Terrace                  | Predam Alluvium/Colluvium Silt-Sand Capped by cryptogamic soils | River         | 1          | Rock Lining   | 4/24/99                    | 3/25/05                  | Filled plunge pool                     |
|                 |                          |   |               | 2          | Rock Lining   | 4/24/99                    | -                        | -                                      |
|                 |                          |   |               | 3          | Rock          | 4/24/99                    | 3/25/05                  | Rebuilt                                |
|                 |                          |   |               | 4          | Rock          | 4/24/99                    | -                        | -                                      |
|                 |                          |   |               | 5          | Knickpoint    | 4/24/99                    | -                        | -                                      |
|                 |                          |   |               | 6          | Knickpoint    | 4/24/99                    | 3/25/05                  | Filled plunge pool                     |
|                 |                          |   |               | 7          | Headcut       | 4/24/99                    | 5/02/02<br>3/25/05       | Headcut Advancement Filled plunge pool |
| <b>A:16:174</b> | Terrace                  | Predam Alluvium/Eolian Sand-silt                                | River         | 1          | Rock          | 11/19/98                   | -                        | -                                      |
|                 |                          |   |               | 2          | Rock          | 11/19/98                   | -                        | -                                      |
|                 |                          |   |               | 3          | Rock Lining   | 11/19/98                   | 10/24/2000<br>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<br>10/24/00      | Knickpoint trt Combined                |

| Site            | Geomorphological Setting | Soil Description                                     | Drainage Type | Checkdam # | Checkdam Type       | Original Construction Date | Maintenance Date      | Maintenance Work Completed                  |
|-----------------|--------------------------|--|---------------|------------|---------------------|----------------------------|-----------------------|---|
|                 |                          |  |               |            |                     |                            |                       | 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                  | -                     | -   |
| <b>A:16:180</b> | Terrace                  | Predam Alluvium Sand-silt                            | River         | 1          | Rock/Brush          | 03/02/97                   | 11/19/98              | Built up sides                              |
|                 |                          |  |               | 2          | Rock/Brush          | 03/02/97                   | 11/19/98<br>10/24/00  | Combined w/ 3<br>Built up sides             |
|                 |                          |  |               | 3          |                     | 03/02/97                   | 11/19/98              | Combined w/ 2                               |
|                 |                          |  |               | 4          | Rock                | 03/02/97                   | 11/19/98<br>10/24/00  | Built up sides<br>Built up sides            |
|                 |                          |  |               | 5          | Rock                | 03/02/97                   | 11/1/9/98<br>10/24/00 | Built up sides<br>Built up sides            |
|                 |                          |  |               | 6          | Rock Lining         | 03/02/97                   | -                     | -   |
|                 |                          |  |               | 7          | Rock Lining         | 04/26/00                   | -                     | -   |
|                 |                          |  |               | 8          | Rock Lining         | 10/24/00                   | -                     | -   |
| <b>B:14:107</b> | Terrace on Debris Fan    | Predam Alluvium Silt-sand and some cryptogamic soils | Terrace       | 1          | Water Diversion Bar | 04/21/97                   | 03/34/98<br>10/20/00  | Extended feature<br>Rearranged rock         |
| <b>C:02:101</b> | Terrace                  | Predam Alluvium/Eolian Sand Medium grained           | River         | 1          | Rock/Brush          | 02/19/97                   | 11/08/98<br>04/15/00  | Added rock to downstream side<br>Added rock |

| Site | Geomorphological Setting | Soil Description | Drainage Type | Checkdam # | Checkdam Type     | Original Construction Date | Maintenance Date     | Maintenance Work Completed               |
|------|--------------------------|------------------|---------------|------------|-------------------|----------------------------|----------------------|--|
|      |                          |                  |               | 2          | Knickpoint        | 02/19/97                   | -                    | Buried in alluvium                       |
|      |                          |                  |               | 3          | Rock/Brush lining | 02/19/97                   | 11/08/98<br>04/15/00 | Knickpoint<br>Extended feature           |
|      |                          |                  |               | 4          | Rock/Brush Lining | 02/19/97                   | 11/08/98<br>04/15/00 | Lined below<br>Extended feature          |
|      |                          |                  |               | 5          | Headcut           | 02/19/97                   | 04/15/00<br>10/12/00 | Extended feature<br>Downstream armorment |
|      |                          |                  |               | 6          | Rock Lining       | 02/19/97                   | 04/15/00<br>10/12/00 | Knickpoint<br>Knickpoint                 |
|      |                          |                  |               | 7          | Rock/Brush        | 02/19/97                   | -                    | -  |
|      |                          |                  |               | 8          | Rock lining       | 02/19/97                   | -                    | -  |
|      |                          |                  |               | 9          | Knickpoint        | 10/12/00                   | 03/13/03             | Added rock                               |
|      |                          |                  |               | 10         |                   | 02/19/97                   | 10/12/00<br>03/17/03 | Added rock<br>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<br>Buried in Alluvium      |
|      |                          |                  |               | 14         |                   | 02/19/97                   | 11/8/98              | Combined w/13                            |
|      |                          |                  |               | 15         | Knickpoint        | 10/12/00                   | -                    | -  |
|      |                          |                  |               | 16         | Knickpoint        | 10/12/00                   | -                    | -  |
|      |                          |                  |               | 17         | Diversion Bar     | 04/24/02                   | -                    | -  |
|      |                          |                  |               | 19         | Rock lining       | 04/15/00                   | -                    | -  |

| Site            | Geomorphological Setting | Soil Description                    | Drainage Type | Checkdam # | Checkdam Type       | Original Construction Date | Maintenance Date     | Maintenance Work Completed                 |
|-----------------|--------------------------|-------------------------------------|---------------|------------|---------------------|----------------------------|----------------------|--|
| <b>C:09:050</b> | 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                   | -                    | -  |
| <b>C:13:005</b> | Terrace on Debris Fan    | Predam Alluvium/Eolian Sand         | Terrace       | 1          | Basketweave         | 02/20/96                   | -                    | -  |
|                 |                          |                                     |               | 2          | Rock                | 02/20/96                   | -                    | -  |
|                 |                          |                                     |               | 3          | Rock                | 02/20/96                   | -                    | -  |
| <b>C:13:006</b> | Terrace on Debris Fan    | Predam Alluvium/Eolian Sand-silt    | River         | 1          | Headcut             | 02/16/96                   | 3/18/05              | -  |
|                 |                          |                                     |               | 2          | Rock Lining         | 02/16/96                   | 04/17/00<br>3/18/05  | Extended lining Filled in knickpoints      |
|                 |                          |                                     |               | 3          | Rock Lining         | 02/16/96                   | 10/15/00<br>03/19/03 | Extended lining Added rock                 |
|                 |                          |                                     |               | 4          | Headcut             | 02/16/96                   | 03/19/03<br>03/18/05 | Rebuilt Breaching filled with rock         |
|                 |                          |                                     |               | 5          | Rock/Brush          | 02/16/96                   | 11/11/98<br>03/18/05 | Change to Rock checkdam Filled knickpoints |

| Site            | Geomorphological Setting | Soil Description            | Drainage Type | Checkdam # | Checkdam Type | Original Construction Date | Maintenance Date        | Maintenance Work Completed                     |
|-----------------|--------------------------|-----------------------------|---------------|------------|---------------|----------------------------|-------------------------|--|
|                 |                          |                             |               | 6          | Rock          | 02/16/96                   | 04/17/00                | Knickpoint                                     |
|                 |                          |                             |               | 7          | Rock lining   | 02/16/96                   | 03/19/03<br>03/18/05    | Added rock<br>Filled<br>pooling/knick<br>point |
|                 |                          |                             |               | 8          | Rock lining   | 02/16/96                   | 03/19/03<br>03/18/05    | Plunge pool<br>Knickpoints<br>filled           |
|                 |                          |                             |               | 9          | Rock lining   | 02/16/96                   | 03/18/05                | Breaching<br>filled with<br>rock               |
|                 |                          |                             |               | 10         | Rock lining   | 02/16/96                   | -                       | -  |
|                 |                          |                             |               | 11         | Headcut       | 02/16/96                   | 03/19/03                | Extended<br>length                             |
|                 |                          |                             |               | 12         | Rock lining   | 02/16/96                   | Obliterated<br>03/15/04 | -  |
|                 |                          |                             |               | 13         | Rock lining   | 02/16/96                   | -                       | -  |
|                 |                          |                             |               | 14         | Rock lining   | 04/17/00                   | -                       | -  |
|                 |                          |                             |               | 15         | Rock lining   | 10/15/00                   | 03/18/05                | Knickpoints<br>filled                          |
|                 |                          |                             |               | 16         | Rock          | 10/15/00                   | 11/11/98<br>03/18/05    | Changed to U<br>shape<br>Plunge pool<br>filled |
|                 |                          |                             |               | 17         | Rock/Brush    | 02/16/96                   | Obliterated<br>03/15/04 | -  |
|                 |                          |                             |               | 18         | Rock lining   | 02/16/96                   | 03/18/05                | Breaching<br>filled with<br>gravels            |
|                 |                          |                             |               | 19         | Rock          | 03/19/03                   | -                       | -  |
|                 |                          |                             |               | 20         | Rock          | 03/19/03                   | -                       | -  |
|                 |                          |                             |               | 21         | Rock Lining   | 03/19/03                   | -                       | -  |
|                 |                          |                             |               | 22         | Knickpoint    | 03/19/03                   | -                       | -  |
| <b>C:13:069</b> | Terrace on Debris Fan    | Predam Alluvium/Eolian Sand | Terrace       | 1          | Headcut       | 02/24/97                   | -                       | -  |

| Site            | Geomorphological Setting | Soil Description  | Drainage Type | Checkdam # | Checkdam Type  | Original Construction Date | Maintenance Date     | Maintenance Work Completed                            |
|-----------------|--------------------------|---|---------------|------------|----------------|----------------------------|----------------------|---|
|                 |                          |   |               | 2          | Rock/Brush     | 02/24/97                   | 03/21/03             | Added rock  |
|                 |                          |   |               | 3          | Rock/Brush     | 02/24/97                   | -                    | -   |
|                 |                          |   |               | 4          | Log/Rock/Brush | 02/24/97                   | 04/27/02<br>03/21/03 | Changed to V shape<br>Added rock to side              |
|                 |                          |   |               | 5          | Rock/Brush     | 02/24/97                   | -                    | -   |
|                 |                          |   |               | 6          | Log/Rock       | 01/01/92                   | 02/24/97             | Rebuilt   |
|                 |                          |   |               | 7          | Rock/brush     | 03/18/05                   | -                    | -   |
| <b>C:13:099</b> | 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<br>02/26/98 | Added brush to sides<br>Removed log and armored sides |
|                 |                          |   |               | 7          | Rock lining    | 09/15/95                   | 02/22/97<br>02/26/98 | Armored sides<br>Merged lining with #6                |
|                 |                          |   |               | 8          | Log/Rock/Brush | 09/15/95                   | -                    | -   |
|                 |                          |   |               | 9          | Log/Rock       | 09/15/95                   | 02/26/98<br>3/19/05  | Armored sides w/more rock<br>Knickpoint trt           |
|                 |                          |   |               | 10         | Basketweave    | 09/15/95                   | 02/26/98             | Lowered posts   |

| Site | Geomorphological Setting | Soil Description | Drainage Type | Checkdam # | Checkdam Type  | Original Construction Date | Maintenance Date                 | Maintenance Work Completed                 |
|------|--------------------------|------------------|---------------|------------|----------------|----------------------------|----------------------------------|--|
|      |                          |                  |               |            |                |                            |                                  | Loosened weave<br>Armored sides            |
|      |                          |                  |               | 11         | Log/Rock/Brush | 09/15/95                   | 02/26/98                         | Armored sides                              |
|      |                          |                  |               | 12         | Horseshoe      | 09/15/95                   | 02/26/98                         | Armored sides<br>Removed center log        |
|      |                          |                  |               | 13         | Horseshoe      | 09/15/95                   | 02/22/97<br>02/26/98<br>03/16/04 | Added rock<br>Armored sides<br>Obliterated |
|      |                          |                  |               | 14         | Horseshoe      | 09/15/95                   | 02/26/98<br>11/12/98             | Lowered center<br>Added gravel             |
|      |                          |                  |               | 15         | Rock           | 09/15/95                   | 02/26/98                         | Removed brush<br>Armored sides             |
|      |                          |                  |               | 16         | Retaining Wall | 09/15/95                   | 02/22/97<br>02/26/98             | Armored sides<br>Created T Shape           |
|      |                          |                  |               | 17         | Retaining Wall | 09/15/95                   | 02/22/97                         | Piping treatment                           |
|      |                          |                  |               | 18         | Log/Rock       | 09/15/95                   | 02/22/97<br>04/15/97<br>10/16/00 | Armored sides<br>Removed log<br>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<br>with gravels        |
|      |                          |                  |               | 21         | Rock/Brush     | 09/15/95                   | 02/26/98<br>11/12/98             | Armored sides<br>Built up sides            |

| Site | Geomorphological Setting | Soil Description | Drainage Type | Checkdam # | Checkdam Type     | Original Construction Date | Maintenance Date                             | Maintenance Work Completed                              |
|------|--------------------------|------------------|---------------|------------|-------------------|----------------------------|--|---|
|      |                          |                  |               | 22         | Rock/Brush        | 09/15/95                   | 02/26/98                                     | Disassembled  |
|      |                          |                  |               | 23         | Rock Lining       | 09/15/95                   | 11/12/98<br>02/26/98<br>03/19/05             | Built up sides<br>Added rock<br>Piping                  |
|      |                          |                  |               | 24         | Rock Lining       | 09/15/95                   | 02/26/98                                     | Armored sides   |
|      |                          |                  |               | 25         | Rock Lining       | 09/15/95                   | 02/26/98<br>02/22/97<br>03/16/04             | Lowered Center<br>Piping<br>Obliterated                 |
|      |                          |                  |               | 26         | Log               | 09/15/95                   | 02/26/98<br>02/22/97<br>10/16/00<br>03/20/03 | Added rock<br>Added rock<br>Added gravel<br>Removed log |
|      |                          |                  |               | 27         | Rock              | 09/15/95                   | 02/26/98                                     | Added rock  |
|      |                          |                  |               | 28         | Rock              | 09/15/95                   | 02/26/98<br>11/12/98<br>03/19/05             | Rearranged rock<br>Built up R bank<br>E. Bank rock      |
|      |                          |                  |               | 29         | Rock/Brush Lining | 09/15/95                   | 03/16/04                                     | Obliterated   |
|      |                          |                  |               | 30         | Rock/Brush Lining | 09/15/95                   | 02/26/98<br>11/12/98                         | Armored sides<br>Added gravel                           |
|      |                          |                  |               | 31         | Rock Lining       | 09/15/95                   | 02/26/98<br>11/12/98                         | Armored sides<br>Added gravel                           |
|      |                          |                  |               | 32         | Rock/Brush        | 09/15/95                   | 02/26/98<br>11/12/98                         | From Checkdam to armorment<br>Built up L bank           |
|      |                          |                  |               | 33         | Headcut           | 09/15/95                   |  |   |
|      |                          |                  |               | 34         | Log/Rock/Brush    | 09/15/95                   | 02/22/97                                     | Rearranged rock   |
|      |                          |                  |               | 35         | Rock Alignment    | 09/15/95                   | 02/22/97                                     | Rearranged  |

| Site | Geomorphological Setting | Soil Description | Drainage Type | Checkdam # | Checkdam Type  | Original Construction Date | Maintenance Date                                | Maintenance Work Completed  |
|------|--------------------------|------------------|---------------|------------|----------------|----------------------------|---|---|
|      |                          |                  |               |            |                |                            | 04/15/97<br>02/26/98                            | rock<br>Extended feature<br>Removed log and armored sides                               |
|      |                          |                  |               | 36         | Log/Rock/Brush | 09/15/95                   | 02/22/97<br>04/15/97<br>02/26/98<br>11/12/98    | Rearranged rock<br>Removed log<br>Armored drainage<br>Added gravel                      |
|      |                          |                  |               | 37         | Log/Rock/Brush | 09/15/95                   | 2/22/97<br>04/15/97<br>02/26/98<br><br>03/20/03 | Added rock<br>Extended feature<br>Lowered Center and built up sides<br>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<br>04/15/97<br>11/12/98                | Rearranged rock<br>Extended feature<br>Added gravel                                     |
|      |                          |                  |               | 42         | Rock           | 09/15/95                   | 02/22/97<br>04/15/97                            | Piping treatment  |

| Site            | Geomorphological Setting | Soil Description  | Drainage Type | Checkdam # | Checkdam Type   | Original Construction Date | Maintenance Date | Maintenance Work Completed                                       |
|-----------------|--------------------------|---|---------------|------------|-----------------|----------------------------|------------------|--|
|                 |                          |   |               |            |                 |                            | 02/26/98         | Built upstream side Armored bank, removed log and lowered center |
|                 |                          |   |               |            |                 |                            | 03/19/05         | Plunge pool  |
|                 |                          |   |               | 43         | Log/Rock        | 09/15/95                   | 03/20/03         | Built up sides   |
|                 |                          |   |               | 44         | Log/Rock        | 09/15/95                   | 04/15/97         | Extended feature   |
|                 |                          |   |               | 45         | Rock Lining     | 10/16/00                   | 03/16/04         | Obliterated  |
|                 |                          |   |               | 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                                    |
|                 |                          |   |               |            |                 |                            | 03/16/04         | Obliterated  |
|                 |                          |   |               | 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 armored bank                                      |
|                 |                          |   |               |            |                 |                            | 03/19/05         | E Bank built up  |
|                 |                          |   |               | 54         | Knickpoint trt  | 11/12/98                   | -                | -  |
| <b>C:13:100</b> | Terrace on Debris Fan    | Predam Alluvium/Eolian Fine sand Capped by salt layer and cryptogamic soils | River         | 1          | Log/Rock        | 09/17/95                   | -                | -  |
|                 |                          |   |               | 2          | Rock            | 09/17/95                   | -                | -  |
|                 |                          |   |               | 3          | Horseshoe       | 09/17/95                   | -                | -  |

| Site | Geomorphological Setting | Soil Description | Drainage Type | Checkdam # | Checkdam Type  | Original Construction Date | Maintenance Date                         | Maintenance Work Completed   |
|------|--------------------------|------------------|---------------|------------|----------------|----------------------------|--|--|
|      |                          |                  |               | 4          | Log/Rock       | 09/17/95                   | 02/27/98                                 | Added gravel   |
|      |                          |                  |               | 5          | Log/Rock/Brush | 09/17/95                   | 02/27/98<br>10/16/00                     | Filled plunge pool<br>Added gravel   |
|      |                          |                  |               | 6          | Log/Rock/Brush | 09/17/95                   | 02/27/98                                 | Removed large rock from center and added gravel                                    |
|      |                          |                  |               | 7          | Rock           | 09/17/95                   | 02/27/98<br><br>04/18/00<br><br>03/16/04 | Removed large rock from center and added gravel<br>Piping treatment<br>Obliterated |
|      |                          |                  |               | 8          | Log/Rock/Brush | 09/17/95                   | 03/20/03                                 | Added rock   |
|      |                          |                  |               | 9          | Rock           | 09/17/95                   | 04/18/00<br><br>03/19/05                 | Piping treatment<br>Knickpoint   |
|      |                          |                  |               | 10         | Log/Rock       | 09/17/95                   | 02/27/98<br><br>03/20/03                 | Removed large rock from center and added gravel<br>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<br><br>04/18/00                 | Removed large rock from center and added gravel<br>Added rock                      |

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

| Site            | Geomorphological Setting | Soil Description   | Drainage Type | Checkdam # | Checkdam Type   | Original Construction Date | Maintenance Date     | Maintenance Work Completed                 |
|-----------------|--------------------------|--|---------------|------------|-----------------|----------------------------|----------------------|--|
|                 |                          |  |               | 23         | Rock/Brush      | 09/17/95                   | -                    | -  |
|                 |                          |  |               | 24         | Rock/Brush      | 09/17/95                   | 02/27/98             | Lowered center added small rock and gravel |
|                 |                          |  |               | 25         | Horseshoe       | 09/17/95                   | -                    | -  |
|                 |                          |  |               | 26         | Horseshoe       | 09/17/95                   | -                    | -  |
|                 |                          |  |               | 27         | Rock            | 02/26/98                   | -                    | -  |
|                 |                          |  |               | 28         | Knickpoint      | 03/19/05                   |                      |  |
| <b>C:13:327</b> | Terrace                  | Predam Alluvium Silt-sand                                    | Terrace       | 1          | Rock/Brush      | 02/24/97                   | 11/13/98<br>03/16/04 | Added rock<br>Obliterated                  |
|                 |                          |  |               | 2          | Headcut         | 02/24/97                   | 10/17/00             | Obliterated                                |
|                 |                          |  |               | 3          | Water diversion | 02/24/97                   | -                    | -  |
|                 |                          |  |               | 4          | Rock/Brush      | 10/17/00                   | 03/16/04             | Obliterated                                |
|                 |                          |  |               | 5          | Rock Lining     | 10/17/00                   | -                    | -  |
| <b>C:13:336</b> | 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                   | -                    | -  |
| <b>C:13:346</b> | 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          |
|                 |                          |  |               | 2          | Rock/Brush      | 02/24/97                   | -                    | -  |
|                 |                          |  |               | 3          | Headcut         | 02/24/97                   | 03/19/05             | Knickpoint                                 |
|                 |                          |  |               | 4          | Rock/Brush      | 02/24/97                   | -                    | -  |
|                 |                          |  |               | 5          | Headcut         | 02/24/97                   | -                    | -  |
|                 |                          |  |               | 6          | Headcut         | 02/24/97                   | 03/19/05             | Headcut                                    |
|                 |                          |  |               | 7          | Rock/Brush      | 02/24/97                   | 11/13/98             | Lowered                                    |

| Site            | Geomorphological Setting | Soil Description   | Drainage Type | Checkdam # | Checkdam Type | Original Construction Date | Maintenance Date | Maintenance Work Completed                  |
|-----------------|--------------------------|--|---------------|------------|---------------|----------------------------|------------------|---|
|                 |                          |  |               |            |               |                            | 03/19/05         | center and built up sides<br>Knickpoint trt |
|                 |                          |  |               | 8          | Rock/Brush    | 02/24/97                   | 11/13/98         | Lowered center and built up sides           |
|                 |                          |  |               | 9          | Rock/Brush    | 02/24/97                   | 11/13/98         | Lowered center and built up sides           |
| <b>C:13:348</b> | Terrace                  | Predam Alluvium/Colluvium Sand capped by cryptogamic soils   | Terrace       | 1          | Brush Lining  | 04/16/97                   | 03/19/05         | Knickpoint trt                              |
|                 |                          |  |               | 2          | Brush Lining  | 04/16/97                   | 03/21/03         | Combined with 4                             |
|                 |                          |  |               | 3          | Brush Lining  | 04/16/97                   | -                | -   |
|                 |                          |  |               | 4          |               | 04/16/97                   | 03/21/03         | Combined with 2                             |
|                 |                          |  |               | 5          | Brush Lining  | 04/16/97                   | -                | -   |
|                 |                          |  |               | 6          | Brush Lining  | 03/21/03                   | -                | -   |
| <b>C:13:359</b> | 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                                 |
|                 |                          |  |               | 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                   | 03/17/04         | Obliterated                                 |
| <b>C:13:371</b> | Terrace on Debris Fan    | Predam Alluvium/Eolian Sand                                  | River         | 1          | Rock/brush    | 02/17/96                   | -                | -   |
|                 |                          |  |               | 2          | Basketweave   | 02/17/96                   | 11/11/98         | Created V                                   |

| Site            | Geomorphological Setting | Soil Description   | Drainage Type | Checkdam # | Checkdam Type     | Original Construction Date | Maintenance Date                             | Maintenance Work Completed                                   |
|-----------------|--------------------------|--|---------------|------------|-------------------|----------------------------|--|--|
|                 |                          |  |               |            |                   |                            | 04/26/02                                     | Shape Lined N side   |
|                 |                          |  |               | 3          | Rock/Brush        | 02/17/96                   | -  | -  |
|                 |                          |  |               | 4          | Rock Lining       | 02/17/96                   | -  | -  |
| <b>C:13:381</b> | Terrace on Debris Fan    | Predam Alluvium Sand   | River         | 1          | Rock Lining       | 02/25/97                   | 04/24/98<br>11/14/98<br>04/20/00             | Re-lined breached area<br>Built up sides<br>Extended feature |
|                 |                          |  |               | 2          | Rock Lining       | 02/25/97                   | 11/14/98<br>04/20/00                         | Built up side<br>Added Rock                                  |
|                 |                          |  |               | 3          | Basketweave       | 02/25/97                   | -  | -  |
|                 |                          |  |               | 4          | Rock              | 10/18/00                   | 03/21/03                                     | Added Rock   |
| <b>G:03:002</b> | Terrace                  | Predam Alluvium/Colluvium Eolian Fine Sand capped by cryptogamic soils | River         | 1          | Rock/Brush        | 04/26/97                   | 04/28/00<br>10/25/00<br>03/28/03<br>03/25/05 | Knickpoint<br>Knickpoint<br>Added Rock<br>Built up           |
|                 |                          |  |               | 2          | Rock/Brush        | 04/26/97                   | 04/27/99<br>04/28/00<br>10/25/00<br>03/25/05 | Knickpoint<br>Knickpoint<br>Knickpoint<br>Knickpoint         |
|                 |                          |  |               | 3          | Rock Lining       | 04/26/97                   | 04/27/99                                     | Obliterated  |
|                 |                          |  |               | 4          | Rock Lining       | 04/26/97                   | 04/27/99                                     | Obliterated  |
|                 |                          |  |               | 5          | Rock/Brush Lining | 04/26/97                   | -  | -  |
|                 |                          |  |               | 6          | Rock Lining       | 04/26/97                   | -  | -  |
|                 |                          |  |               | 7          | Rock Lining       | 04/27/99                   | -  | -  |
| <b>G:03:003</b> | 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                                     | Plunge pool  |

| Site            | Geomorphological Setting | Soil Description            | Drainage Type     | Checkdam # | Checkdam Type | Original Construction Date | Maintenance Date                 | Maintenance Work Completed                                      |
|-----------------|--------------------------|-----------------------------|-------------------|------------|---------------|----------------------------|----------------------------------|---|
|                 |                          |                             |                   |            |               |                            | 10/25/00                         | 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<br>10/25/00             | Knickpoint<br>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,<br>Knickpoint treatment                             |
|                 |                          |                             |                   | 8          | Knickpoint    | 04/26/99                   | 04/28/00                         | Knickpoint  |
|                 |                          |                             |                   | 9          | Knickpoint    | 04/26/99                   | -                                | -   |
|                 |                          |                             |                   | 10         |               | 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                   | -                                | -   |
| <b>G:03:024</b> | Terrace                  | Predam Alluvium/Eolian Sand | Terrace and River | 1          | Brush Lining  | 04/26/97                   | 11/21/98<br>05/04/02<br>03/23/04 | Blown out<br>Rebuilt<br>Obliterated                             |
|                 |                          |                             |                   | 2          | Rock Lining   | 04/26/97                   | 11/21/98<br>03/24/04             | Knickpoint<br>Obliterated                                       |
|                 |                          |                             |                   | 3          |               | 04/26/97                   | 11/21/98<br>10/26/00<br>05/04/02 | Knickpoint<br>Rebuilt<br>Created a V form<br>Combined w/<br>#16 |
|                 |                          |                             |                   | 4          |               | 04/26/97                   | 11/21/98                         | Knickpoint  |

| Site            | Geomorphological Setting | Soil Description                               | Drainage Type | Checkdam # | Checkdam Type | Original Construction Date | Maintenance Date                             | Maintenance Work Completed  |
|-----------------|--------------------------|--|---------------|------------|---------------|----------------------------|--|---|
|                 |                          |  |               |            |               |                            | 10/26/00<br>04/28/00<br><br>03/25/05         | Blown out/rebuilt<br>Knickpoint<br>Combined W/<br>#17<br>Added rock |
|                 |                          |  |               | 5          | Rock Lining   | 04/26/97                   | 11/21/98<br>10/25/00                         | Added rock<br>Obliterated   |
|                 |                          |  |               | 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<br>10/25/00<br>05/04/02             | Knickpoint<br>Rebuilt<br>10/11/15<br>Plunge pool                    |
|                 |                          |  |               | 11         |               | 11/21/98                   | 04/28/00<br>10/25/00<br>05/04/02             | Knickpoint<br>Rebuilt<br>10/11/15<br>Plunge pool                    |
|                 |                          |  |               | 12         | Rock          | 11/21/98                   | 10/25/00                                     | Obliterated   |
|                 |                          |  |               | 13         | Rock          | 11/21/98                   | 10/25/00                                     | Rebuilt   |
|                 |                          |  |               | 14         | Rock          | 11/21/98                   | 04/28/00<br>10/25/00<br>05/04/02             | Headcut<br>Headcut<br>Fill voids<br>w/rock                          |
|                 |                          |  |               | 15         |               | 04/28/00                   | 10/25/00<br>05/04/02                         | Combined<br>10/11/15<br>Plunge pool                                 |
|                 |                          |  |               | 16         | Brush Lining  | 04/28//00                  | -  | -   |
|                 |                          |  |               | 17         | Rock Lining   | 10/25/00                   | -  | -   |
|                 |                          |  |               | 18         | Rock          | 10/26/00                   | -  | -   |
| <b>G:03:025</b> | Terrace                  | Predam<br>Alluvium/Eolian<br>Fine-grained sand | River         | 1          | Basketweave   | 03/02/96                   | 04/25/97<br>11/21/98<br>10/25/00<br>03/26/05 | Alteration<br>Added Gravel<br>Headcut<br>Built up sides             |

| Site            | Geomorphological Setting | Soil Description                      | Drainage Type | Checkdam # | Checkdam Type | Original Construction Date | Maintenance Date                             | Maintenance Work Completed  |
|-----------------|--------------------------|---------------------------------------|---------------|------------|---------------|----------------------------|--|---|
|                 |                          |                                       |               | 2          | Horseshoe     | 03/02/96                   | 11/21/98<br>04/28/00<br>10/25/00             | Added gravel<br>Knickpoint<br>Added rock<br>and gravel                                      |
|                 |                          |                                       |               | 3          | Rock/Brush    | 03/02/96                   | 10/25/00                                     | Built up sides  |
|                 |                          |                                       |               | 4          | Headcut       | 10/25/00                   | -  | -   |
| <b>G:03:026</b> | 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<br>04/26/99<br>10/25/00<br>05/04/02 | Added gravel<br>Added gravel<br>and lowered<br>center<br>Added<br>rock/gravel<br>Added rock |
|                 |                          |                                       |               | 3          | Rock/Brush    | 03/03/96                   | 04/25/97<br>04/26/99<br>10/25/00             | Added gravel<br>Added gravel<br>and lowered<br>center<br>Added<br>rock/gravel               |
|                 |                          |                                       |               | 4          | Rock Lining   | 03/03/96                   | 04/25/97<br>04/26/99<br>10/25/00             | Added gravel<br>Added gravel<br>and lowered<br>center<br>Added<br>rock/gravel               |
|                 |                          |                                       |               | 5          | Rock Lining   | 03/03/96                   | 04/25/97<br>04/26/99<br>10/25/00             | Added gravel<br>Added gravel<br>& moved<br>large rock to<br>sides<br>Added<br>rock/gravel   |
|                 |                          |                                       |               | 6          | Knickpoint    | 04/26/99                   | -  | -   |

| Site            | Geomorphological Setting | Soil Description   | Drainage Type | Checkdam # | Checkdam Type | Original Construction Date | Maintenance Date     | Maintenance Work Completed |
|-----------------|--------------------------|--|---------------|------------|---------------|----------------------------|----------------------|----------------------------|
| <b>G:03:038</b> | 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<br>10/24/00 | Added rock<br>Obliterated  |
|                 |                          |  |               | 15         | Rock          | 11/20/98                   | 04/26/00<br>10/24/00 | Relined bed<br>Obliterated |
|                 |                          |  |               | 16         | Rock          | 11/20/98                   | 04/26/00<br>10/24/00 | Added Rock<br>Obliterated  |
|                 |                          |  |               | 17         | Rock          | 11/20/98                   | 04/26/00<br>10/24/00 | Added Rock<br>Obliterated  |
|                 |                          |  |               | 18         | Rock Lining   | 11/20/98                   | 04/26/00<br>10/24/00 | Knickpoint<br>Obliterated  |
| <b>G:03:040</b> | 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                   | -                    | -                          |
| <b>G:03:041</b> | Terrace                  | Predam Alluvium/Colluvium  | River         | 1          | Rock/Brush    | 04/25/97                   | 11/21/98             | Added gravel               |

| Site            | Geomorphological Setting | Soil Description                         | Drainage Type | Checkdam # | Checkdam Type | Original Construction Date | Maintenance Date     | Maintenance Work Completed |
|-----------------|--------------------------|--|---------------|------------|---------------|----------------------------|----------------------|----------------------------|
|                 |                          | Eolian Sand-silt & cryptogamic soils     |               |            |               |                            |                      |                            |
|                 |                          |  |               | 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   |
|                 |                          |  |               |            |               |                            | 03/23/04             | Obliterated                |
|                 |                          |  |               | 5          | Rock Lining   | 11/21/98                   | 03/23/04             | Buried in alluvium         |
|                 |                          |  |               | 6          | Rock Lining   | 11/21/98                   | 10/25/00             | Obliterated and rebuilt    |
|                 |                          |  |               | 7          | Rock Lining   | 11/21/98                   | 10/25/00             | Obliterated and rebuilt    |
|                 |                          |  |               |            |               |                            | 03/23/04             | Obliterated                |
|                 |                          |  |               | 8          | Rock Lining   | 11/21/98                   | 10/25/00             | Obliterated and rebuilt    |
|                 |                          |  |               |            |               |                            | 03/26/05             | Rebuilt                    |
|                 |                          |  |               | 9          | Rock          | 11/21/98                   | 10/25/00             | Obliterated                |
| <b>G:03:058</b> | Terrace                  | Predam Alluvium/Eolian Fine-grained sand | Terrace       | 1          | Rock Lining   | 03/04/97                   | 11/22/98<br>04/29/00 | Added rock<br>Added rock   |
|                 |                          |  |               | 2          | Rock/Brush    | 03/04/97                   | -                    | -                          |
|                 |                          |  |               | 3          | Rock Lining   | 11/22/98                   | 04/29/00<br>03/28/05 | Added rock<br>Knickpoint   |
|                 |                          |  |               | 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<br>03/28/05 | Extended<br>Rebuilt        |
|                 |                          |  |               | 7          | Knickpoint    | 04/29/00                   | -                    | -                          |
|                 |                          |  |               | 8          | Knickpoint    | 04/29/00                   | 03/28/05             | Plunge pool                |
|                 |                          |  |               | 9          | Knickpoint    | 04/29/00                   | 03/28/05             | Plunge pool                |
| <b>G:03:072</b> | Terrace on Debris Fan    | Predam Alluvium/Eolian Sand capped by    | River         | 1          | Rock/Brush    | 03/05/97                   | -                    | -                          |

| Site | Geomorphological Setting | Soil Description  | Drainage Type | Checkdam # | Checkdam Type | Original Construction Date | Maintenance Date                 | Maintenance Work Completed             |
|------|--------------------------|-------------------|---------------|------------|---------------|----------------------------|----------------------------------|--|
|      |                          | cryptogamic soils |               |            |               |                            |                                  |  |
|      |                          |                   |               | 2          | Rock Lining   | 03/05/97                   | -                                | -                                      |
|      |                          |                   |               | 3          | Rock/Brush    | 03/05/97                   | -                                | -                                      |
|      |                          |                   |               | 4          | Rock/Brush    | 03/05/97                   | -                                | -                                      |
|      |                          |                   |               | 5          | Rock/Brush    | 03/05/97                   | -                                | -                                      |
|      |                          |                   |               | 6          | Rock/Brush    | 03/05/97                   | -                                | -                                      |
|      |                          |                   |               | 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                   | 03/24/05                         | Knickpoint                             |
|      |                          |                   |               | 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                   | 03/24/04                         | Obliterated                            |
|      |                          |                   |               | 15         | Knickpoint    | 03/05/97                   | 11/22/98                         | Added rock and gravel                  |
|      |                          |                   |               | 16         | Knickpoint    | 11/22/98                   | 04/29/00<br>10/26/00<br>03/28/05 | Added rock<br>Added rock<br>Added rock |

## APPENDIX E

### STATISTICAL ANALYSIS OF RCMP DATA BY RECLAMATION

**Grand Canyon Monitoring Database Assessment**  
**Prepared by**  
**Michael S. Berry**  
**Bureau of Reclamation**  
**Upper Colorado Region**

Grand Canyon (GRCA) National Park Service archaeologists have maintained a monitoring database of cultural resources beginning in 1990 and continuing through the end FY2005. Beginning in Fiscal Year 2006, the responsibility for long-term monitoring under the Grand Canyon Protection Act (GCPA) will be shifted to the Grand Canyon Monitoring and Research Center (GCMRC). The number of sites requiring monitoring likely will be reduced over the next few years with the implementation of treatment plans undertaken by NPS and Reclamation. It is critical that GCMRC structure the core monitoring program for cultural resources to track the status and trends of CMIN variables. The current assessment is an attempt to evaluate the utility of the currently recorded variables and make recommendations for improvement of the monitoring activity required by the GCPA.

As is the case of archaeological databases in general, the GRCA example began as a non-relational, flat file database. As such, it lacks master-detail structure, normalization and referential integrity even though it had been ported to Microsoft Access. These features are supported by Access and one of the line item tasks of the GRCA-Reclamation FY2005 IA was a restructuring of the database to bring it up to modern standards. There are numerous advantages to such a restructuring, one of which is database organization. For example, in order to conduct the current analyses, the GRCA tables were organized into master-detail relationships using *Site* as the master table and *ImacsB*, *Imacsc*, *MonitorData* and *ROCKART* as the detail tables (Figure 1). The site number (SiteKey in *Site* table) is used as the primary key. The important relationship here is *Site*-to-*MonitorData* which is a one-to-many relationship. That is, there are a fixed number of sites, each of which has been subject to multiple monitoring visits, the results of which are recorded in the *MonitorData* table. The remaining relationships are one-to-one because the database has not yet been normalized (see below).

The advantages of master-detail organization are 1) automatic ordering by primary key for database display purposes, 2) clarity of relationships for writing multi-table SQL queries (joins), and 3) automatic viewer restriction so that only relevant entries of detail tables are accessible for a selected site in the master table. Establishing master-detail relationship is only the first step in the restructuring that will be accomplished by NPS via subcontract with a database consulting firm. *Normalization* will lead to ease of database management through the creation of multiple detail tables that stand in one-to-many relationship with the master. For example, the *Site* table has 14 columns for impact types. Adding additional types would require modification of the master table; a maintenance issue to be avoided if possible. The solution would be to create a detail

**Figure 1. Initial Restructuring of GRCA Database**

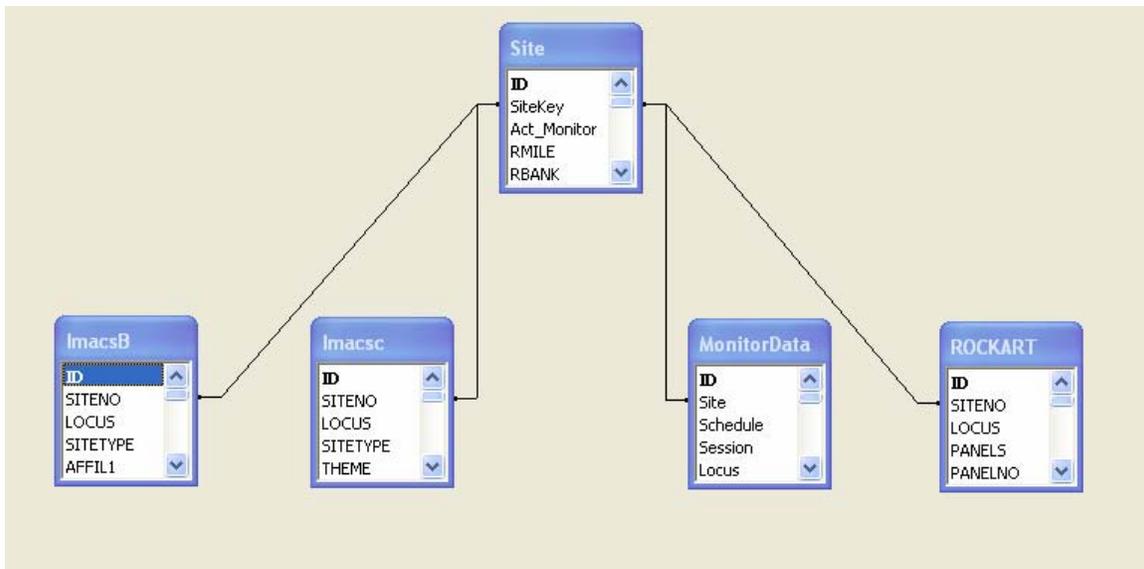


table consisting of two columns, site number and impact type, and create a one-to-many relationship. This would allow the elimination of 14 columns in the master table. As additional impact types are defined, they would simply be appended to the detail table. The same maintenance value would apply to multiple UTM coordinates, multiple USGS map references, multiple cultural affiliation assignments, etc. Once normalization has been accomplished, *referential integrity* can be applied. Referential integrity enforces data entry in accord with the established relationships. It also allows for cascading of updates and deletions, i.e., a change in the master appropriately updates all related detail files so that programmatic (code) or manual maintenance is unnecessary.

These structural changes are critical from an information technology perspective, however the quantitative substance of the database is of greater significance. It is important to note at the outset that no formal probability sampling model has been employed by GRCA. Thus, adherence to parametric as well as non-parametric statistical tests would undoubtedly be misleading because the random sampling requirement has been violated. This assessment, then, is a fairly subjective evaluation of the monitoring variables employed and the consistency with which they have been measured and recorded.

The variables considered are:

- 1) Surface Erosion
- 2) Gullyng
- 3) Arroyo Cutting
- 4) Bank Slumpage
- 5) Erosion or Deposition
- 6) Side Canyon Erosion
- 7) Visitor Impacts

Impacts from these sources are considered for:

- 1) Structural Sites

- 2) Artifact Scatters
- 3) Roasters/Hearths

This results in the impact matrix shown in Table 1. (Also included were perishable midden features, rock art and other. These are excluded from the current analyses).

**Table 1. GRCA Impact Matrix**

|                          | Arroyo       | Surface  | Gullying    | Bank       | Eros/Depos | Side Canyon   | Visitor  |
|--------------------------|--------------|----------|-------------|------------|------------|---------------|----------|
| <b>Sites/Features</b>    |              |          |             |            |            |               |          |
| <b>Structural Sites</b>  | arroyo_struc | se_struc | gully_struc | bank_struc | ed_struc   | sidecan_struc | vi_struc |
| <b>Artifact Scatters</b> | arroyo_arti  | se_arti  | gully_arti  | bank_arti  | ed_arti    | sidecan_arti  | vi_arti  |
| <b>Roasters</b>          | arroyo_roast | se_roast | gully_roast | bank_roast | ed_roast   | sidecan_roast | vi_roast |

These variables have been in use since October 1993. Prior to that, fewer categories were employed and those data are not comparable with the current set of variables. Therefore, the statistical summaries presented here are limited to the period beginning in October 1993 through January 2005.

The current variables were encoded as follows:

- 0 = absent
- 1 = active
- 2 = inactive
- 3 = not applicable

The database documentation refers to these as *ordinal* variables. The ordinal scale of measurement "...refers to measurements where only the comparisons 'greater,' 'less,' or 'equal' between measurements are relevant" (Conover 1980:65). However, *inactive* is not greater than *active*, and *not applicable* is not greater than *inactive*. We can either treat these as *nominal* variables -- a choice that limits analyses to simple matching algorithms -- or as *binary* variables by collapsing *active* and *inactive* into the single category of *present*. The latter option will be employed herein with the *not applicable* category treated as missing data.

## **Data Redundancy**

### ***Structural Sites***

There are 150 sites included in this category for which 364 monitoring records exist in the database. First we will analyze for redundant variables, i.e., variables that may be measuring the same phenomenon. To examine this possibility, R-Mode cluster analyses of the named variables as measured over all site observations will be used to demonstrate the similarities and differences in variable responses. Figure 2 is a dendrogram (i.e., a "tree" diagram that visually demonstrates the numerical distance among the variables considered) of the structural erosion variables for all sites included in the following types

as a group:

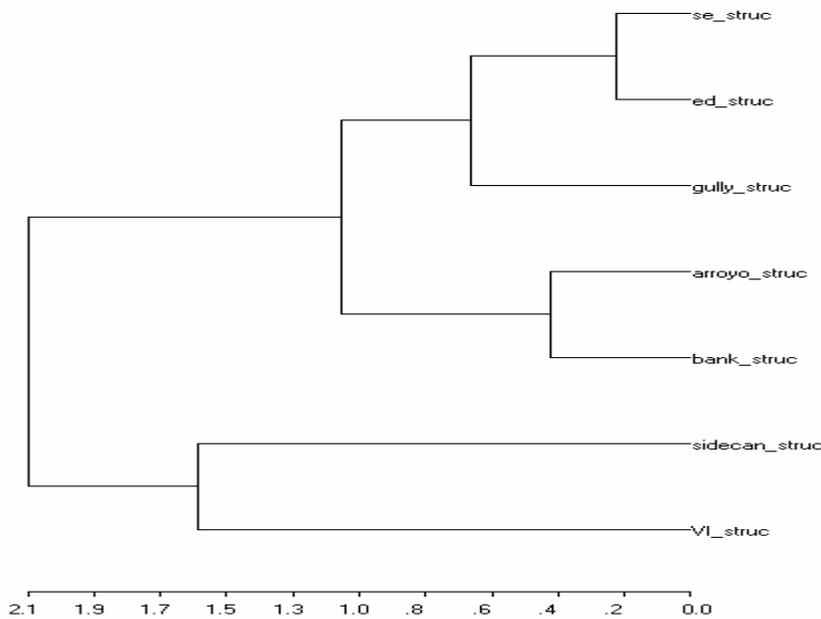
- 1) Pueblo
- 2) Small Structure
- 3) Ephemeral Structure
- 4) Storage Site

Jaccard's binary coefficient was used to generate the initial distance matrix and Ward's minimum variance clustering algorithm to produce the dendrogram (Anderberg 1973). The X-axis represents the Jaccard distance measurement between entities. The smaller the distance, the more closely related are the variables.

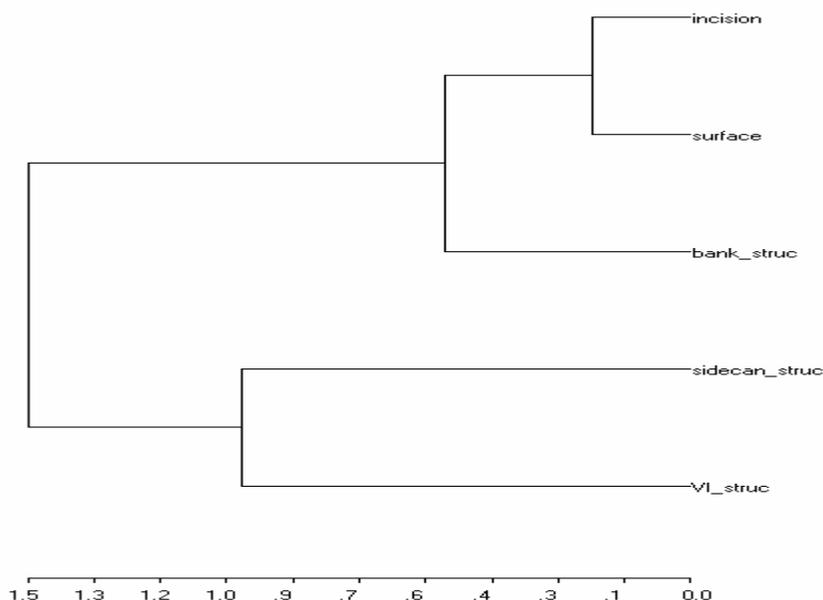
The two most closely related types are surface erosion and erosion/deposition. This may point to a certain level of redundancy because surface erosion and erosion/deposition likely receive the same scores per any given observation given the fact that deposition is less common than erosion in the canyon.

Arroyo cutting is more closely related to bank slumpage than to gullying, which seems unusual. But that may be a factor of observer inconsistency in recording and the necessity of calling an incision *either* a gully *or* an arroyo. Lumping surface erosion and erosion/deposition under the heading of *surface* and arroyo and gully under the heading of *incision* produced Figure 3. Surface erosion and incision are grouped together. This makes intuitive geomorphic sense because sites subject to significant surface erosion are eventually likely to experience incision. There is no good reason to further lump these two together because the former may prove to be a useful predictor of the latter. Therefore, the five-variable data set appears to be appropriate for structural site types.

**Figure 2. Dendrogram of Structural Sites and Associated Erosion Types**



**Figure 3. Same as Figure 2, but with surface erosion and erosion/deposition grouped together as surface and arroyo cutting and gullying grouped together as incision.**



### *Artifact Scatter Sites*

There are 174 sites classified as sherd scatters, lithic scatters or sherd and lithic scatters. No analyses will be presented for these site types because only 19 observations for 15 sites are recorded in the database. This sample size is clearly too small for meaningful inference. This situation underscores the need to formalize a sampling strategy for the long-term monitoring program to prevent underrepresentation of particular site types.

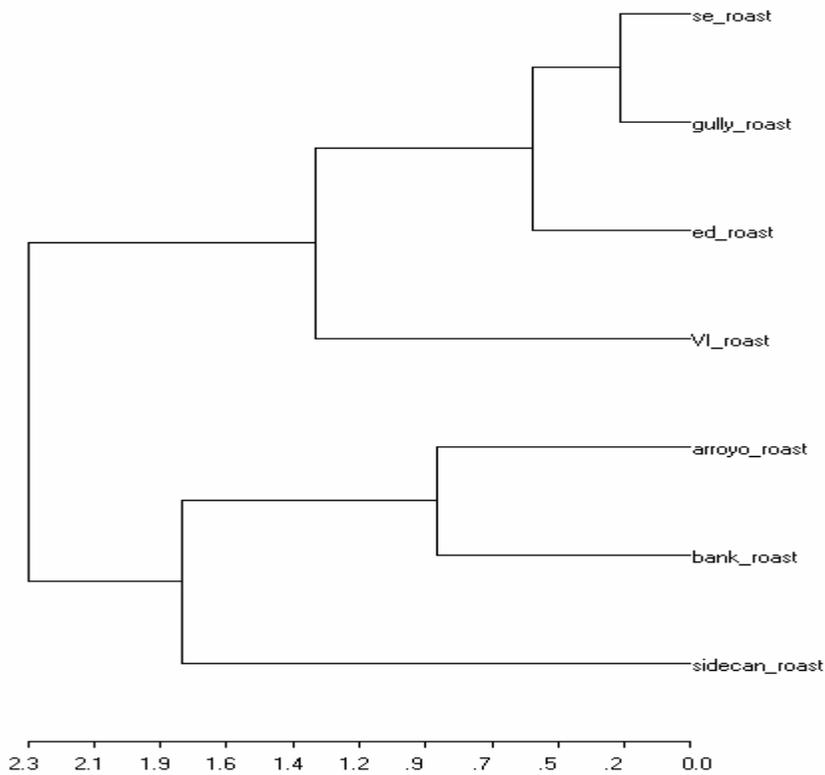
### *Roaster/Thermal Feature Sites*

There are 74 sites included in this group for which 497 visits are recorded in the database. Sites in this category include:

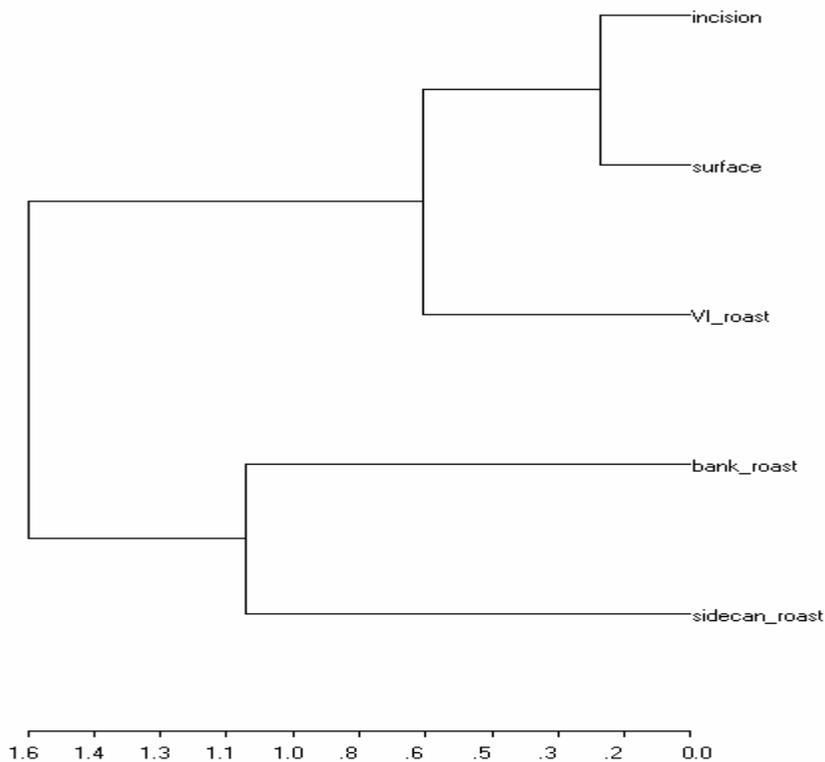
- 1) Thermal Features
- 2) Roaster Complexes
- 3) Camps with Thermal Features

Figure 4 shows some interesting similarities and differences to the data presented for structural sites (Figure 2). Again, surface erosion, gullying and erosion/deposition form a fairly coherent cluster; probably for the same reasons adduced earlier. Regrouping surface erosion, erosion/deposition, gullying and arroyo-cutting as before produced the dendrogram shown in Figure 5.

**Figure 4. Dendrogram of Roaster/Thermal Feature Sites and Associated Erosion Types**



**Figure 5. Same as Figure 4, but with surface erosion and erosion/deposition grouped together as surface and arroyo cutting and gullying grouped together as incision.**



Figures 3 and 5 demonstrate a strong association between surface erosion and incision while the remaining three variables appear to be relatively independent.

### Data Coding Consistency

The significance of consistent data coding cannot be overemphasized. The field recorder must recognize the phenomenon in question, apply standardized criteria to categorize it, and apply the appropriate code. An examination of the GRCA database yields numerous examples of questionable coding. For instance, site C:13:100, a Pueblo II structural site has been visited sixteen times from 1993 through 2003. The narrative description of erosional impacts is as follows:

“Arroyo cutting has apparently exposed additional features (the previous site form from 1978 only mentions two rooms and rubble). There are also gullies forming within the site that are actively eroding the cist features. The site is also located near frequently used river camps. There are several distinct trails in the area.”

Apparently, this is a site being affected by both an arroyo and several gullies. The sixteen sequential sites visit records are shown in Figure 6. First examine the arroyo\_struc history. The arroyo is coded as active in 1993, absent early in 1994, inactive for the next two observations, absent again late in 1996, inactive in 1997 and absent thereafter. What appears to have happened is that some recorders coded the phenomena as an arroyo(s) while others regarded them as gullies. Since 1998, they have consistently been treated as gullies.

**Figure 6. Query of Impacts to Site C:13:100**

| site     | sitetypeid | date       | arroyo_struc | se_struc | gully_struc | bank_struc | ed_struc | sidecan_struc | VI_struc |
|----------|------------|------------|--------------|----------|-------------|------------|----------|---------------|----------|
| C:13:100 | 1          | 10/6/1993  | 1            | 1        | 3           | 0          | 1        | 3             | 0        |
| C:13:100 | 1          | 2/26/1994  | 0            | 0        | 0           | 0          | 0        | 0             | 0        |
| C:13:100 | 1          | 10/9/1994  | 2            | 0        | 2           | 0          | 0        | 0             | 0        |
| C:13:100 | 1          | 3/30/1995  | 2            | 1        | 1           | 0          | 2        | 0             | 0        |
| C:13:100 | 1          | 10/15/1995 | 0            | 1        | 1           | 0          | 1        | 0             | 1        |
| C:13:100 | 1          | 4/28/1996  | 2            | 1        | 2           | 2          | 1        | 0             | 0        |
| C:13:100 | 1          | 10/5/1996  | 0            | 1        | 1           | 0          | 0        | 0             | 1        |
| C:13:100 | 1          | 4/15/1997  | 2            | 2        | 2           | 2          | 1        | 0             | 0        |
| c:13:100 | 1          | 10/12/1997 | 2            | 2        | 2           | 2          | 1        | 0             | 0        |
| c:13:100 | 1          | 4/19/1998  | 0            | 2        | 2           | 0          | 2        | 3             | 0        |
| c:13:100 | 1          | 10/10/1998 | 0            | 2        | 2           | 0          | 2        | 3             | 1        |
| c:13:100 | 1          | 4/18/2000  | 0            | 1        | 1           | 0          | 1        | 0             | 0        |
| c:13:100 | 1          | 9/15/2000  | 0            | 1        | 1           | 0          | 1        | 0             | 1        |
| c:13:100 | 1          | 11/7/2001  | 0            | 1        | 1           | 0          | 1        | 0             | 1        |
| C:13:100 | 1          | 10/1/2002  | 0            | 1        | 1           | 0          | 1        | 0             | 1        |
| C:13:100 | 1          | 11/19/2003 | 0            | 1        | 1           | 0          | 1        | 0             | 0        |

This does lend support to the recommendation that arroyos and gullies be combined under the heading of incision, but it does not foster much confidence in the year-to-year

replicability of data recordation. Also, note that the recorder in early 1994 apparently saw no evidence of erosion whatsoever.

At another site, G:03:003, a shelter with a roasting complex, impacts are described thus:

“One major NW/SE gully runs through the dune separating F5 from the other features, partially exposing F2 and F5. Most of the artifactual debris at the shelter has eroded down slope.”

The history of observations is shown in Figure 7. The gully that figures so prominently in the narrative is shown as active only in 1998. For the majority of the sixteen site visits, the gully vacillates from inactive to absent. And the first 1996 recorder coded *all* categories as not applicable. Also note that surface erosion (se\_roast) is recorded as active for three visits from 2000 to 2002, yet erosion/deposition (ed\_roast) is recorded as absent.

**Figure 7. Query of Impacts to Site G:03:003**

| site     | sitypeid | date       | arroyo_roast | se_roast | gully_roast | bank_roast | ed_roast | sidecan_roast | VI_roast |
|----------|----------|------------|--------------|----------|-------------|------------|----------|---------------|----------|
| G:03:003 | 10       | 10/16/1993 | 0            | 2        | 2           | 0          | 2        | 0             | 1        |
| G:03:003 | 10       | 4/6/1994   | 0            | 1        | 2           | 0          | 2        | 0             | 1        |
| G:03:003 | 10       | 4/4/1995   | 0            | 0        | 0           | 0          | 0        | 0             | 0        |
| G:03:003 | 10       | 10/25/1995 | 0            | 0        | 0           | 0          | 0        | 2             | 1        |
| G:03:003 | 10       | 5/7/1996   | 3            | 3        | 3           | 3          | 3        | 3             | 3        |
| G:03:003 | 10       | 10/16/1996 | 0            | 0        | 0           | 0          | 0        | 0             | 1        |
| G:03:003 | 10       | 4/25/1997  | 0            | 0        | 0           | 0          | 0        | 0             | 1        |
| g:03:003 | 10       | 10/23/1997 | 0            | 0        | 0           | 0          | 0        | 0             | 1        |
| g:03:003 | 10       | 4/30/1998  | 0            | 0        | 0           | 0          | 0        | 0             | 1        |
| G:03:003 | 10       | 10/20/1998 | 0            | 0        | 1           | 0          | 0        | 0             | 1        |
| g:03:003 | 10       | 4/27/1999  | 0            | 0        | 0           | 0          | 0        | 0             | 0        |
| g:03:003 | 10       | 4/28/2000  | 0            | 0        | 0           | 0          | 0        | 0             | 1        |
| g:03:003 | 10       | 10/25/2000 | 0            | 1        | 0           | 0          | 0        | 0             | 0        |
| g:03:003 | 10       | 2/24/2002  | 0            | 1        | 0           | 0          | 0        | 0             | 1        |
| G:03:003 | 10       | 10/10/2002 | 0            | 1        | 0           | 0          | 0        | 0             | 1        |
| G:03:003 | 10       | 3/23/2004  | 0            | 0        | 2           | 0          | 0        | 0             | 1        |

One more example will suffice. Site G:03:064 is large roaster complex, incised by numerous deep arroyos. There is no mention of gullies in the site narrative. But note that both the gully and arroyo columns contain data and, further, they contain the exact same data. This suggests that one of the columns was filled in after the fact or that the recorders were unable to make a consistent distinction between gullies and arroyos during all thirteen site visits. Also note that surface erosion (se\_roast) was inactive for the first two visits, absent for the third visit, then active for the next nine. How can surface erosion transition from present but inactive to absent? Similarly, how is it that side canyon erosion is absent for the first ten visits, inactive for the next two (having never been active?), and absent for the final visit?

**Figure 8. Query of Impacts to Site G:03:064**

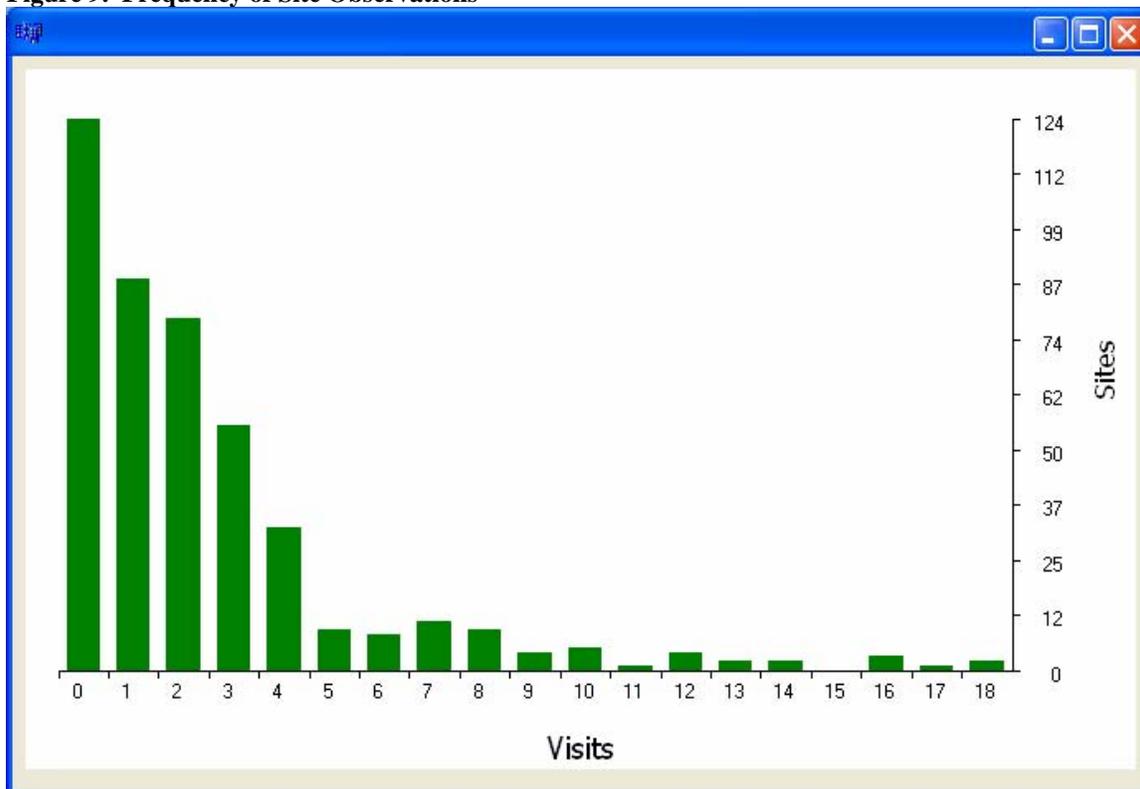
Query Results  
N = 13

| site     | sitetypeid | date       | arroyo_roast | se_roast | gully_roast | bank_roast | ed_roast | sidecan_roast | V_L_roast |
|----------|------------|------------|--------------|----------|-------------|------------|----------|---------------|-----------|
| G:03:064 | 10         | 10/16/1993 | 2            | 2        | 2           | 2          | 2        | 0             | 0         |
| G:03:064 | 10         | 3/9/1994   | 2            | 2        | 2           | 2          | 2        | 0             | 0         |
| G:03:064 | 10         | 10/19/1994 | 1            | 0        | 1           | 2          | 1        | 0             | 0         |
| G:03:064 | 10         | 4/4/1995   | 1            | 1        | 1           | 1          | 0        | 0             | 0         |
| G:03:064 | 10         | 2/29/1996  | 1            | 1        | 1           | 1          | 0        | 0             | 0         |
| G:03:064 | 10         | 10/16/1996 | 1            | 1        | 1           | 1          | 2        | 0             | 0         |
| G:03:064 | 10         | 10/23/1997 | 1            | 1        | 1           | 1          | 2        | 0             | 1         |
| G:03:064 | 10         | 11/21/1998 | 1            | 1        | 1           | 1          | 2        | 0             | 1         |
| G:03:064 | 10         | 4/28/2000  | 1            | 1        | 1           | 1          | 2        | 0             | 0         |
| G:03:064 | 10         | 10/25/2000 | 1            | 1        | 1           | 1          | 0        | 0             | 0         |
| G:03:064 | 10         | 5/4/2002   | 1            | 1        | 1           | 1          | 1        | 2             | 0         |
| G:03:064 | 10         | 3/28/2003  | 1            | 1        | 1           | 1          | 1        | 2             | 0         |
| G:03:064 | 10         | 3/23/2004  | 2            | 2        | 2           | 2          | 2        | 0             | 0         |

Virtually all of the queries conducted on sites with ten or more database records display similar anomalies. It would thus be very difficult to demonstrate data trends in a meaningful way. This underscores the necessity of establishing standardized criteria to ensure that different field observers during long-term monitoring efforts consistently record observed phenomena in an objective manner.

### Periodicity and Frequency of Observation

Further limiting the ability to explore data trends is the irregular timing and frequency of observations. Figure 9 is a histogram depicting the frequencies of observation for the period in question. Short of observing every site on an annual basis, an appropriate means of detecting trends in resource degradation as a whole would be visiting a random sample of sites at fixed temporal intervals (two-year, three-year or even five-year may prove to be adequate for long-term monitoring). This has not been the strategy employed by GRCA archaeologists. Rather, the emphasis has been on increased frequency of observation for actively eroding sites. As a consequence, 124 sites were not observed; 88 sites were seen only once; 79 sites were seen twice. On the other end of the spectrum, two sites were observed 18 times; one site, 17 times, and three sites 16 times. We have no idea what may have happened to the 124 unobserved sites, and three of the frequently seen sites were reviewed in the previous section, the data for which were found to be equivocal. So, has the rate of erosion increased during the 1993-2005 interval? More specifically, has the rate of erosion caused by dam operations increased during that period? The GRCA database does not allow us to formulate a credible answer to these questions.

**Figure 9. Frequency of Site Observations**

## Recommendations

GCMRC should, based on a further, in depth review of the NPS database, clearly define the desired periodicity of monitoring, the means of monitoring (e.g., remote sensing or field observation), the variables to be measured, the appropriate scale of the variables (e.g., nominal, ordinal, interval, binary), and the sampling design that will be utilized. GCMRC should also work closely with NPS and Reclamation to ensure that the monitoring efforts will define and satisfy the compliance responsibilities of the GCPA.

Specific areas to be addressed are:

- 1) Data redundancy: Non-overlapping variables should be selected that relate directly to CMINs. The variables should be subjected to continual querying and statistical tests for redundancy. With appropriate sampling models, techniques such as multiple regression or logistic regression would be applicable for this purpose.
- 2) Data coding consistency: Clear-cut, standardized observation criteria should be developed. A clear, concise glossary of terms should be prepared, preferably by a person trained in the observation of landforms and geomorphic processes. Monitoring personnel should be trained in the observation and analyses of landforms and processes. Frequent database reviews should be conducted to ensure consistency of recording.

- 3) Periodicity/Frequency: It is critical that GCMRC determine the goals of long term monitoring to be achieved. If longitudinal time series analyses are deemed important, then repeat site visits at a set periodicity will be necessary. If the assessment of the condition of the resource as a whole is of interest, then random sampling (sample size to be determined by the precision of estimation required for the defined problem orientation) on an annual basis may be appropriate. It may even be the case that a strategy combining these two approaches may prove useful. If possible, monitoring trips should be scheduled to take place at the same time of year to achieve consistency of seasonality. In addition, site specific monitoring of historic properties stabilized during the treatment plan(s) will be required to assess the efficacy of the applied mitigating measures.
- 4) Database conversion: GCMRC should develop a relational database paralleling the design of the restructured GRCA database that will be available in FY06. Monitoring variables that GCMRC determines to be useful can be incorporated as well as the basic site data recorded in the IMACS detail tables.

## References

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