SUMMARY REPORT FOR 1992 GCES MONITORING OF ARCHAEOLOGICAL SITES FROM LEES FERRY TO SEPARATION CANYON, GRAND CANYON NATIONAL PARK

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ABSTRACT

As part of the ongoing GCES archaeological river corridor monitoring program at Grand Canyon National Park, this report has been developed to summarize the results of fiscal year 1992 monitoring. Eighty-one sites were monitored, two of which were monitored twice. The site specific actions and recommendations suggested in this report will serve as guidelines for future monitoring efforts.

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INTRODUCTION

From August, 1990 through May, 1991 an archaeological survey was carried out along the Colorado River Corridor between Glen Canyon Dam and Separation Canyon. This cultural inventory covered a total of 255 linear miles along both banks of the river. The area surveyed consisted of a swath of terrain beginning at the water's edge up to the theoretical 300,000 cfs level.[1]

A total of 475 prehistoric and historic archaeological sites was recorded.[2] A total of 336 sites with potential impact (within 300,000 cfs and on pre-dam alluvium) was found to be impacted to a greater or lesser extent by the Colorado River.[3] These sites were to be monitored on a scheduled basis. This monitoring phase of archaeological work is intended to document, as well as better understand, the changes occurring to the cultural properties along the river corridor with particular reference to the operations of Glen Canyon Dam.

SCOPE OF WORK

Selected sites in the Grand Canyon have been monitored since the 1960s, but the process was informal and discontinuous. Since 1982, however, a formal annual monitoring trip has been conducted by the Park Archaeologist between Lees Ferry and Diamond Creek. Some overlap exists between the sites monitored on the annual Park trip and the Glen Canyon Dam–EIS project; however, these boundaries will remain separate in scope based on the Park's management needs and the parameters of the EIS.

For fiscal year 1992, monitoring the selected sites consisted of photo documentation, completion of experimental monitoring forms, and entering the acquired data on a computer database. The monitoring form (Appendix I) is a compilation of quantitative and observational judgments designed to rank each site individually with regard to its stability, state of erosion, and priority for further work. Additionally, the form is designed to facilitate transferring the data into a database file. Appendix II is a complete compilation of the data that were collected during the 1992 fiscal year.

From April 1 through September 1992, three separate monitoring trips were launched. The first trip (April 1–11) utilized two motorized snout rigs. Each boat carried two archaeologists and a Park Service boatman. Two Paiute tribal representatives, Gevine Savala and Verdell Jake, accompanied the trip as guests of the Park Service.

Thirty-four archaeological sites were monitored during this trip. Fortunately, the weather was good, making actual monitoring easier to accomplish. Due to the wet winter, grasses and low vegetation were growing in profusion throughout the river corridor, obscuring many of the sites and, at the same time, protecting them.

Three of the four archaeologists on this initial trip were crew chiefs during the survey phase of 1990–1991. This element is crucial for locating sites expediently as the trip moved down river. Geographic experience is a critical element on the river. Without some geographic expertise in the corridor either by the archaeologist or the boatman, much valuable work time can be lost searching for sites.

The second trip (June 11–20) consisted of a single motorized snout rig with two archaeologists, a Park Service boatman, and a guest of the Park Service, William Morris, Arizona Department of Public Safety. Twenty-five sites were monitored during this trip. Surface vegetation was beginning to dry up, presenting a slightly better view of the surface than in April. However, tourist traffic was much greater and the temptation was high for many to stop and observe what the archaeologists were doing. These were generally positive encounters. Unfortunately, even for the well intentioned, the more people who know about a site, the more likely a site will be visited, revisited and adversely impacted.

The third trip (September 4–13) was also a single motorized boat trip, consisting of three archaeologists and a Park Service boatman. Twenty-four sites were monitored, totaling 81 monitored sites for

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[1] The 300,000 cfs level remains a floating and judgmental contour dependent on width of the river and the observer's ability to discern vegetation lines combined with knowledge of historic high water flows.

[2] This includes 45 GLCA and 116 already in the GRCA database.

[3] The parameters of this process are spelled out in the EIS statement of January 1992. The process is ongoing and the monitoring phase is subject to change dependent on new and better information obtained from current studies.

1992.[4] During September, the site surfaces were visible as the bulk of the vegetation had succumbed to the summer heat. Many people were still present in the corridor and often curious about the archaeology. Once again, these encounters were positive. What we would like to stress is this: some of the sites we work with are more sensitive than others regarding content and affiliation. It remains up to the good judgment of the field crew when to be discreet and when to do interpretive work for the public.

In addition to the scheduled monitoring of sites by boat and crew, there are currently five archaeological sites between Lees Ferry and Diamond Creek being monitored by stationary cameras: C:13:371, C:13:003, C:13:359, B:10:229, and A:16:180. These cameras were tactically placed in March, 1991. Each camera[5] is anchored in a specially designed ammo box that is silicone glued to an appropriate rock. The camera automatically takes a single photograph each day at the same time. The film cannot be stacked; thus, it must be changed every 36 days in order to avoid unsightly gaps in the record. This monthly procedure is completed by the GCES beach erosion study team as a component of Brian Clure's work. The study team may use the data, and we are saved monthly trips to change the film in five cameras. The slides are digitized, catalogued, and stored at the Geography Department on the Northern Arizona University campus in Flagstaff. We have open access to this collection.

LABORATORY METHODS

The lab staff prepared "site packets" containing a blank monitoring form to be completed in the field, copies of the IMACS site form, site map, and the prior monitoring form. Previous photographs of the site were put into a pocket taped to the inside of the site packet folder. There was one folder for each site, arranged into groups by river mile. The grouped folders were put into large plastic ziplock baggies for waterproofing, and stored on the boat in 50 mm ammo cans.

At the end of the 1992 monitoring year, it was decided that the site packets took up too much space, used too much paper, and the photographs were difficult to move in and out of the pockets, and then were loose after they were removed from the pocket. Therefore, a different system was devised for the 1993 monitoring year that will be described in that annual report.

Upon returning from the field, river gear, field equipment, rolls of film, and site packets were returned to the lab. The gear and field equipment were cleaned and inspected for any needed repairs.

Film was sent in for processing, photographic information was entered into a computer database, and photographs were mounted onto archival cards and filed in the lab. Completed monitoring forms were also entered into a computer database. (See the Laboratory Manual for specific lab procedures.) Site packets were dismantled and the photos were refiled

NATURAL AND HUMAN IMPACTS

Eighty-one sites were monitored in 1992; however, 83 monitoring episodes occurred because two sites were monitored twice (B:16:262 and C:13:371). Although many variables are recorded on the form, precedence is placed on natural and human impacts that hinder site stability and preservation. These impacts produced the majority of the data, and in many cases, more than one impact was used to describe a site's condition.

Natural Erosion

The natural impact section includes the following categories: surficial sheet washing, gullying, arroyo cutting, animal erosion (e.g., trampling, trailing, and burrowing), and other. This section was completed by choosing the types of erosion present at a site and interpreting the level of impact; e.g., minor, moderate, extensive, or nonexistent. Overall, sites were mainly recorded as having moderate (33, 40%) or high (28, 34%) impacts, while sites with minor impacts only occurred 12 times (14%). Nine sites (11%) showed no sign of natural erosion.

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[4] Two sites (B:16:262 and C:13:371) were monitored twice in 1992.

[5] Pentax Zoom 105 R Data models.

Several sites were characterized as having incipient erosion (37%) or active erosion (36%), and 22 sites (27%) were recorded as stable. Almost half of the time (55%) these impacts were considered not related to dam operations, where as 45 percent of these impacts were believed to be dam related.

The main form of erosion was gullying, which was recorded 60 times. Sheet washing was observed 47 times, and arroyo cutting was noted 34 times. Animal trailing occurred 27 times; however, this may not represent the actual occurrence because 43 sites had missing data for this variable. The erosional categories and their frequencies are in Figure 1.

Human Disturbances

Human impacts were divided into trailing, collection piles, on site camping, and vandalism. Generally, human disturbances were not of great concern. For example, only three sites received a high degree of human impact. Overall, 79 percent of the sites received minor or no human disturbances, while moderate human impacts accumulated at only 17 percent of the sites. Most (81%) monitors thought these impacts were not caused by dam operations.

The leading cause of site damage by humans is trailing, which was noted at 33 sites, and on-site camping was observed at 12 sites. Deliberate site vandalism was only noted twice. See Figure 2 for the categories and frequencies of human disturbances.

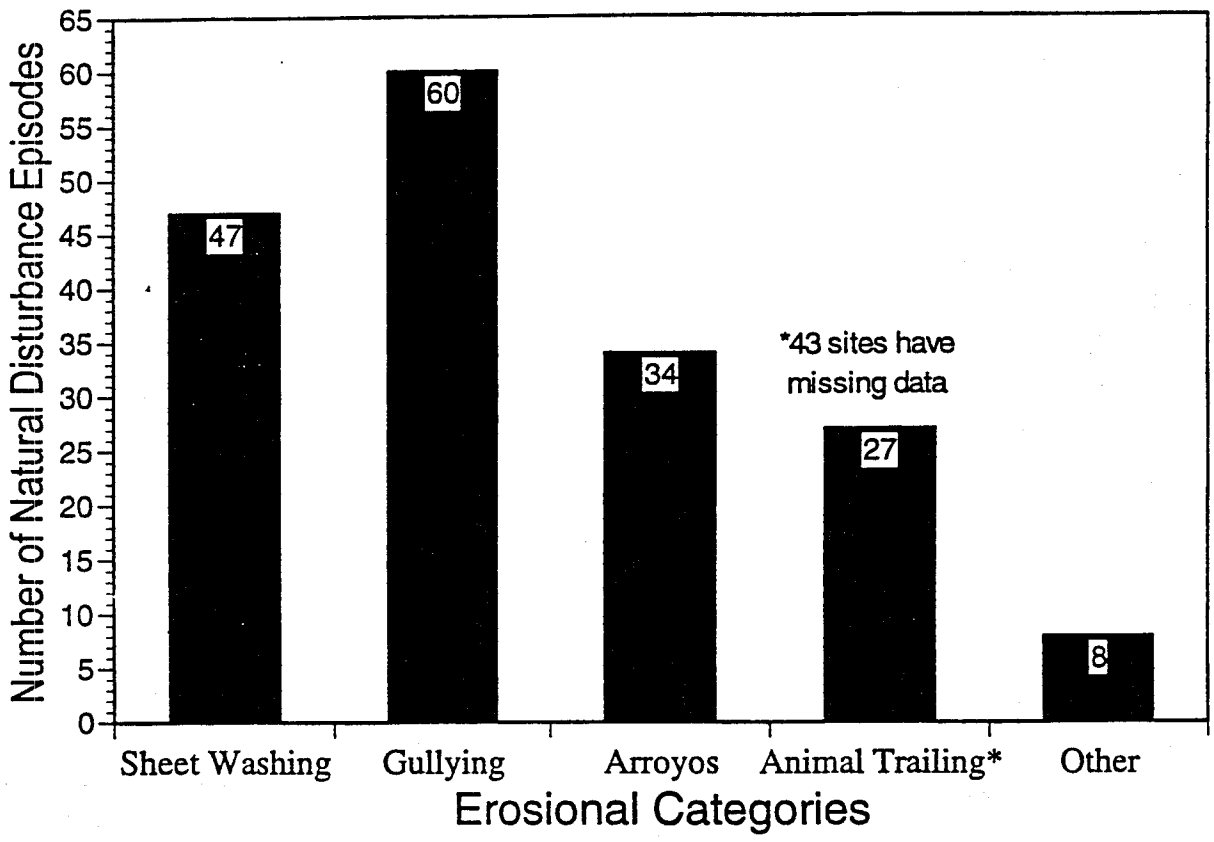


Figure 1. Erosional categories and frequencies for fiscal 1992 monitoring.

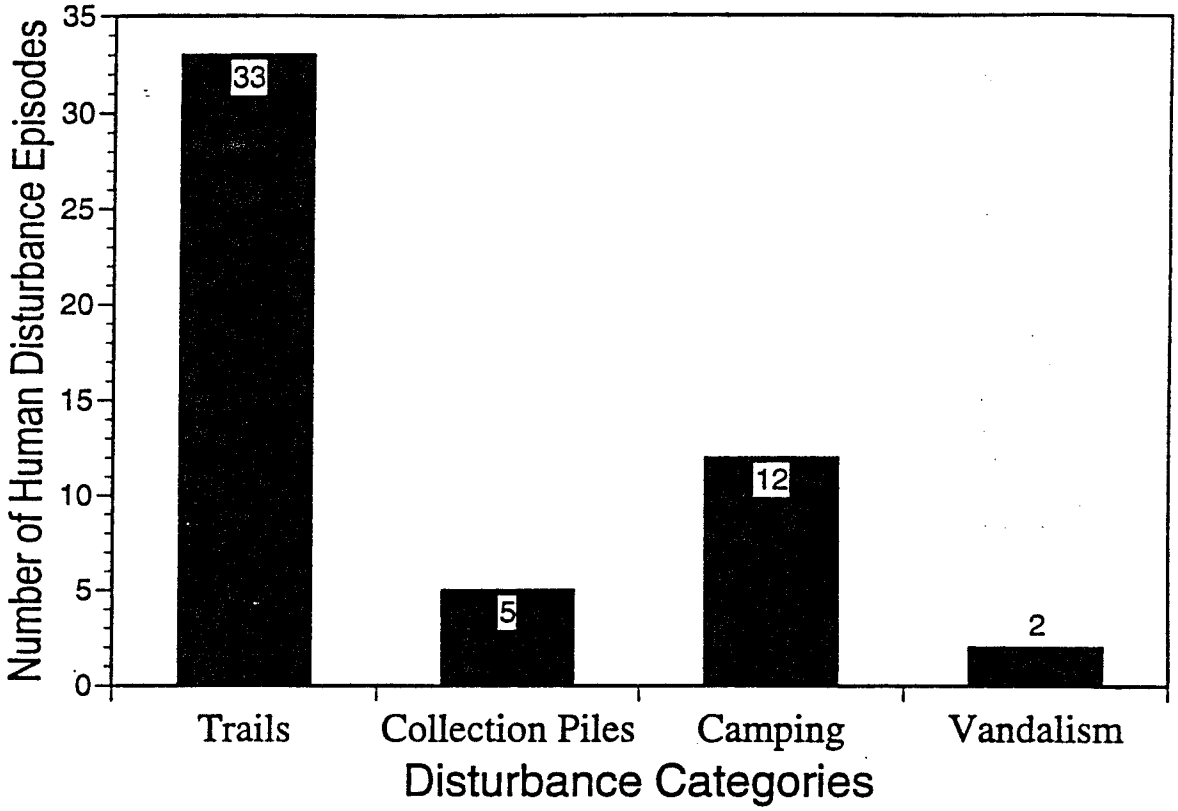
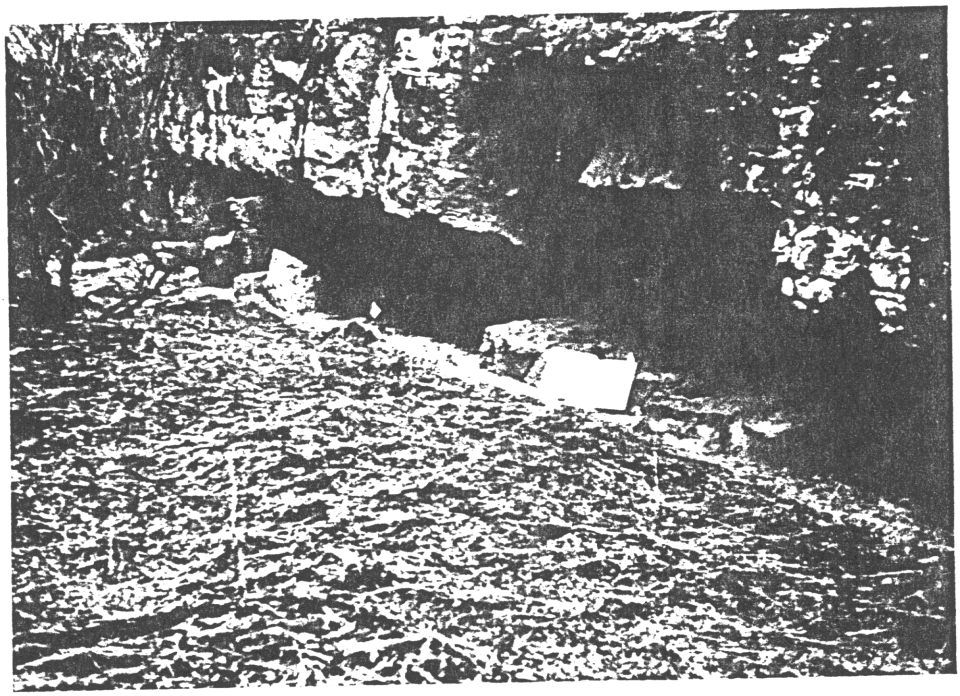


Figure 2. Human disturbance categories and frequencies for fiscal 1992 monitoring.

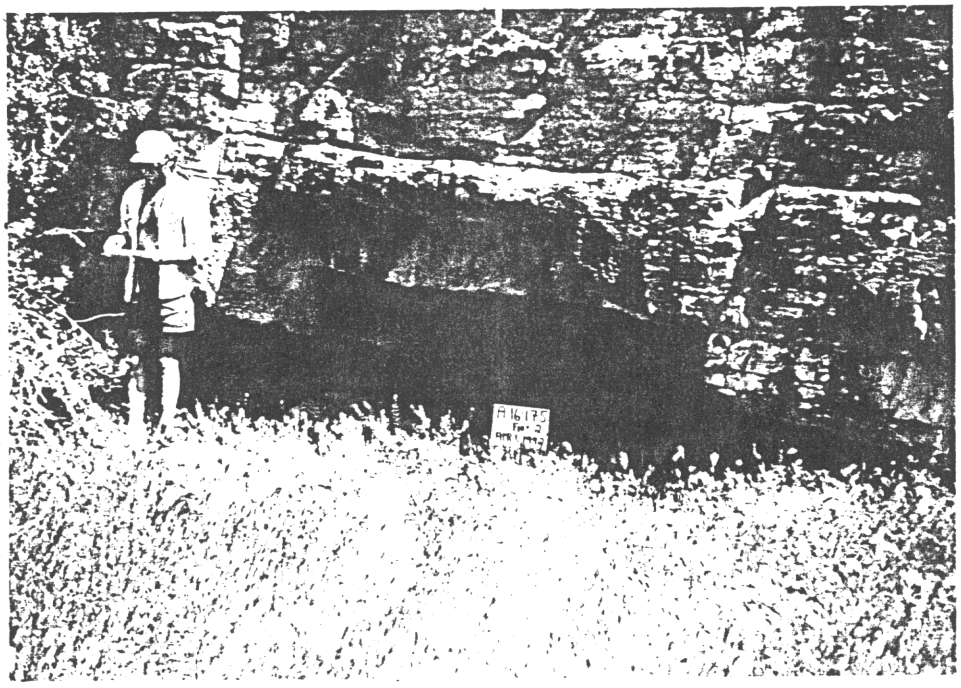
PHOTO ILLUSTRATIONS

The photocard library is a valuable resource for tracking human and natural impacts on archaeological sites through time. It is perhaps the most valuable resource established by this project as it provides objective data by documenting change. Furthermore, annual incorporation of new photographs increases archival research.

Duplicate photos are taken in accordance to monitoring importance. For example, several sites along the river corridor exhibit moderate to high erosion. In these cases, several duplicate photographs have been/are taken to document this erosion. Other duplicate photos reflect basic environmental changes that occur during different seasons. This is important because it documents when to monitor or not monitor a site due to heavy grass cover. Figures 3-10 illustrate various erosional and environmental changes that have been documented by taking duplicate photographs.

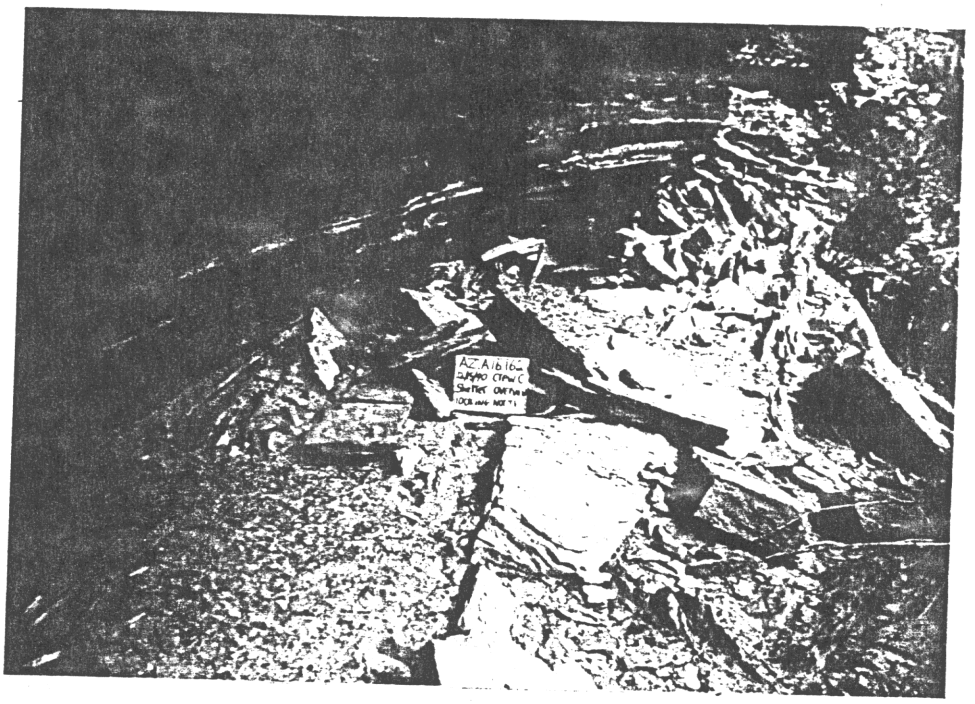


2-28-91

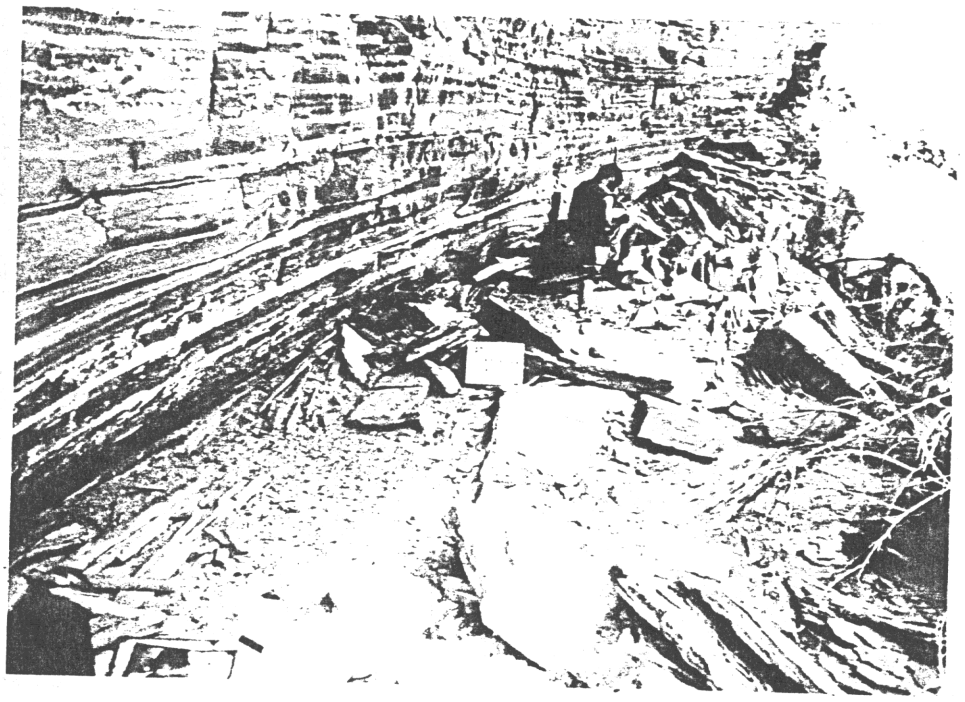


4-8-92

Figure 3. Photo comparison of ground cover at different times of the year at A:16:175A. These photographs are taken at the same locality, but from a different angle, and they illustrate the differences that occur in ground cover during late winter.



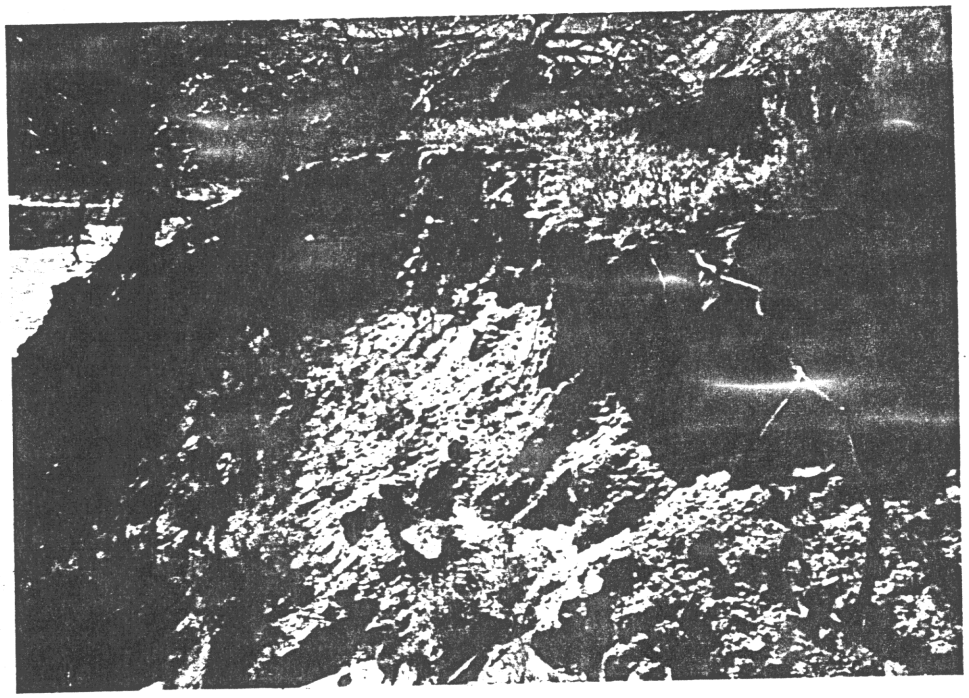
12-15-90



9-11-92

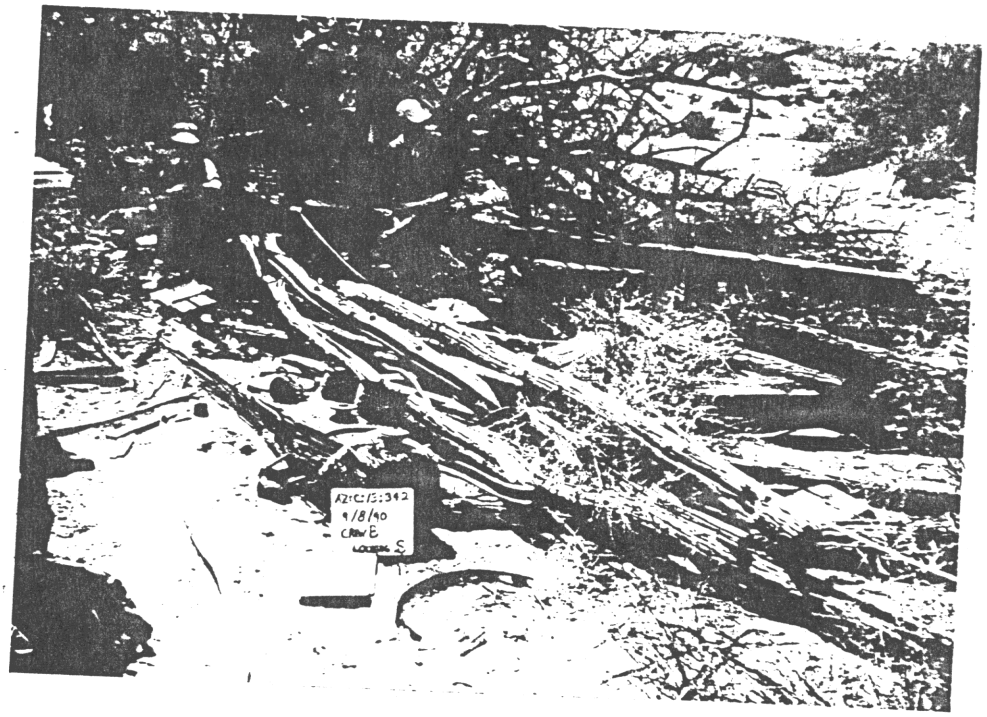
Figure 4. Photographs of the types of erosion at A:16:162A, which are common to bench and rockshelter sites. Virtually no change took place on the surface through time.

10-13-90

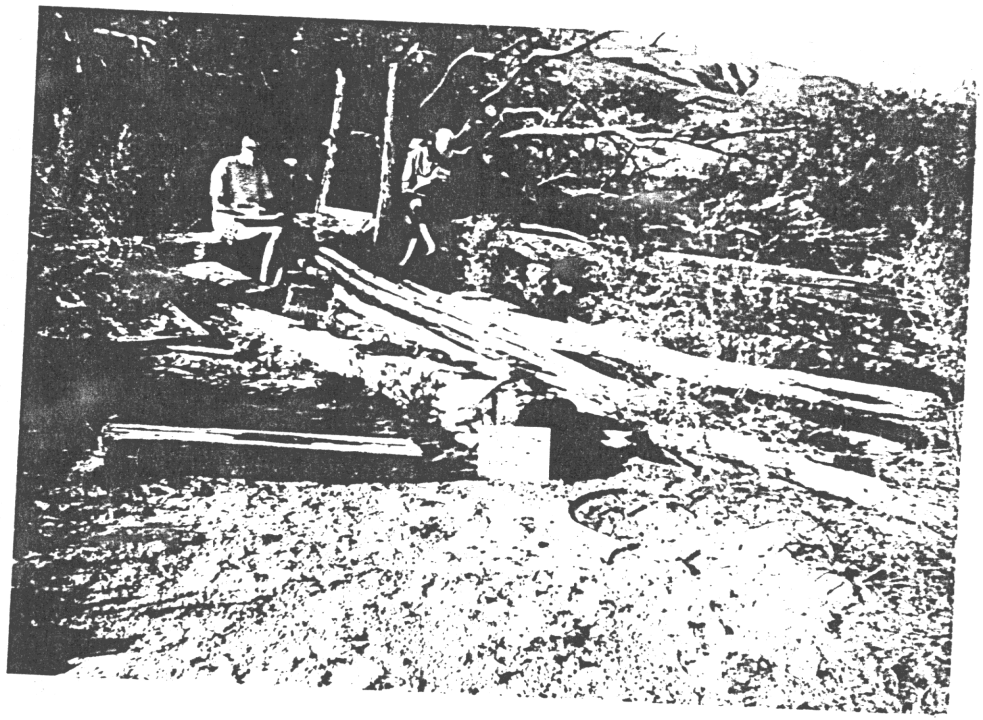


4-3-92

Figure 5. Photo comparison of surface vegetation and side canyon flooding at C:13:291. The cutbank in these photographs was caused by a side canyon flood in 1989. The slope has adjusted and come to an angle of repose in the later photograph. Feature 2 on this particular site is a charcoal lens exposed in the face of a cutbank. Note the difference in surface vegetation between April and October.

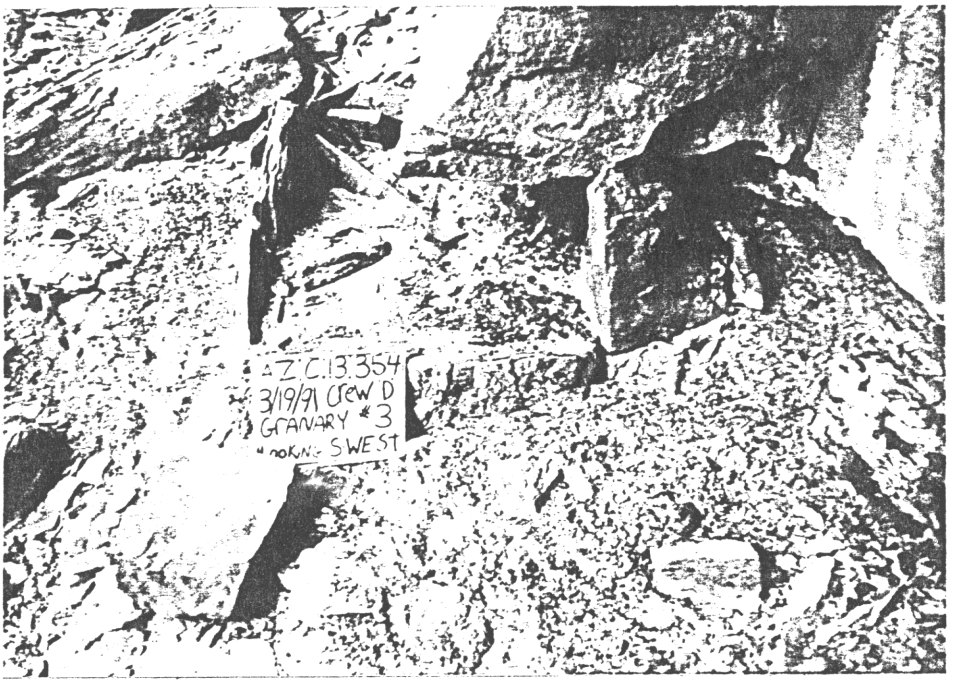


9-8-90

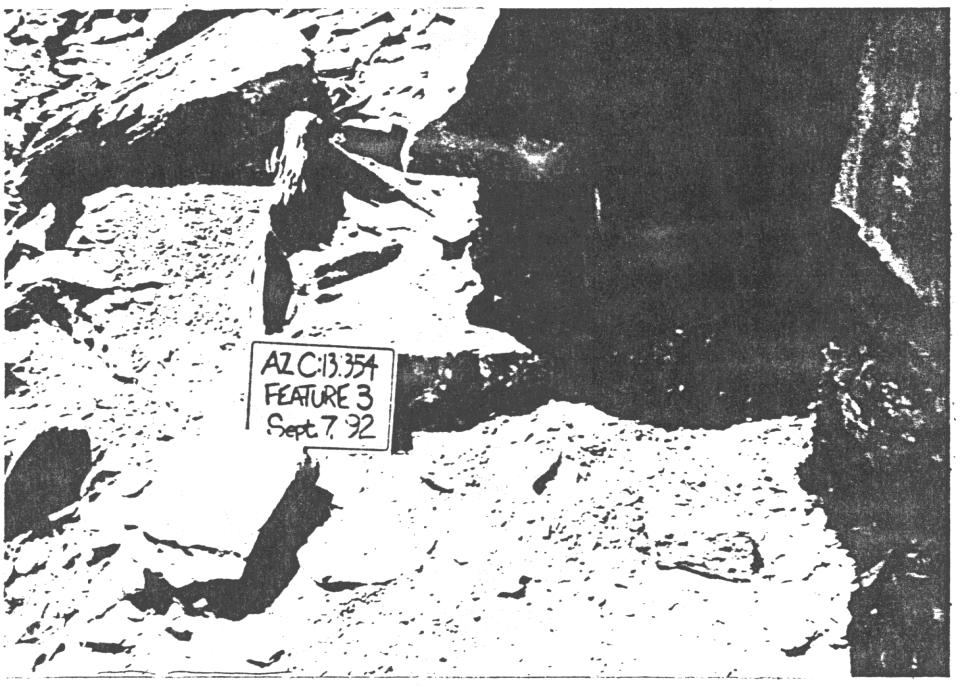


9-7-92

Figure 6. Photo comparison showing minor changes at historic site C:13:342. The site dates to turn-of-the-century prospecting along the river corridor. These photographs were taken approximately 2 years apart and show no significant changes. Minor rearrangement of artifacts on the wood beam indicates that some visitation is taking place.

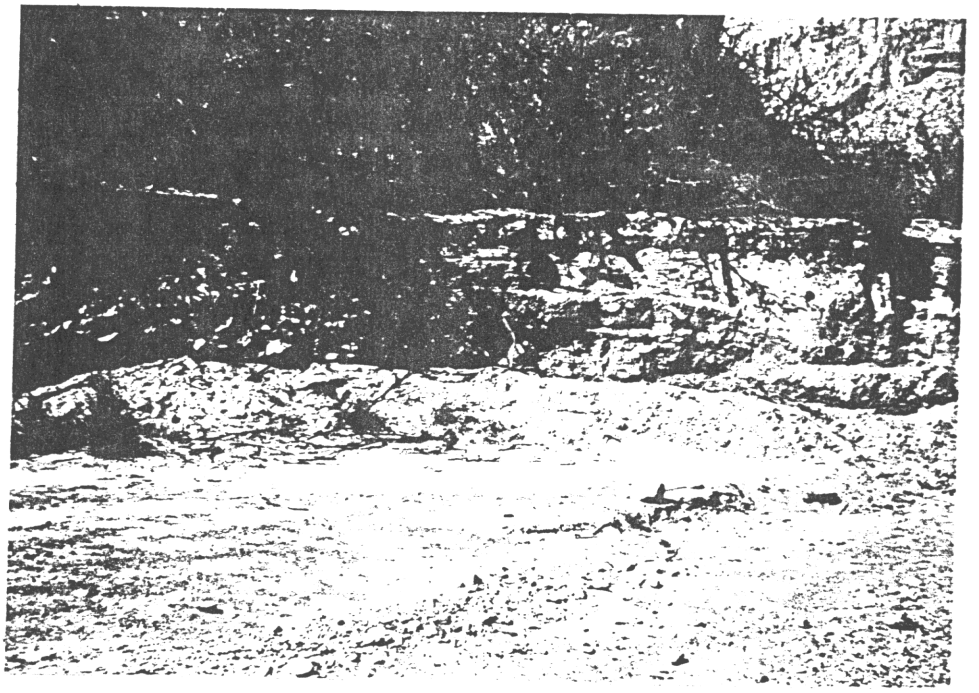


3-19-91

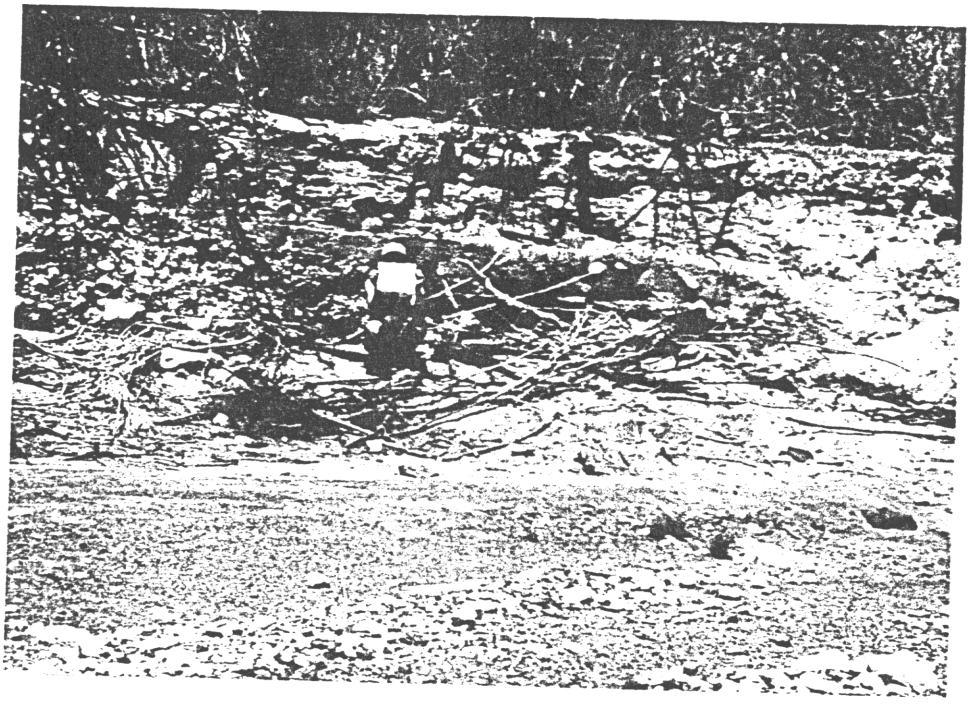


9-7-92

Figure 7. Photo comparison of several deteriorating granaries at C:13:354. Feature 3 makes use of a partial overhang and retains most of its original base outline. No changes took place between March 1991 and September 1992. The top photo was taken in late winter at about 9:00 a.m. and the bottom photo was taken at noon in late summer.

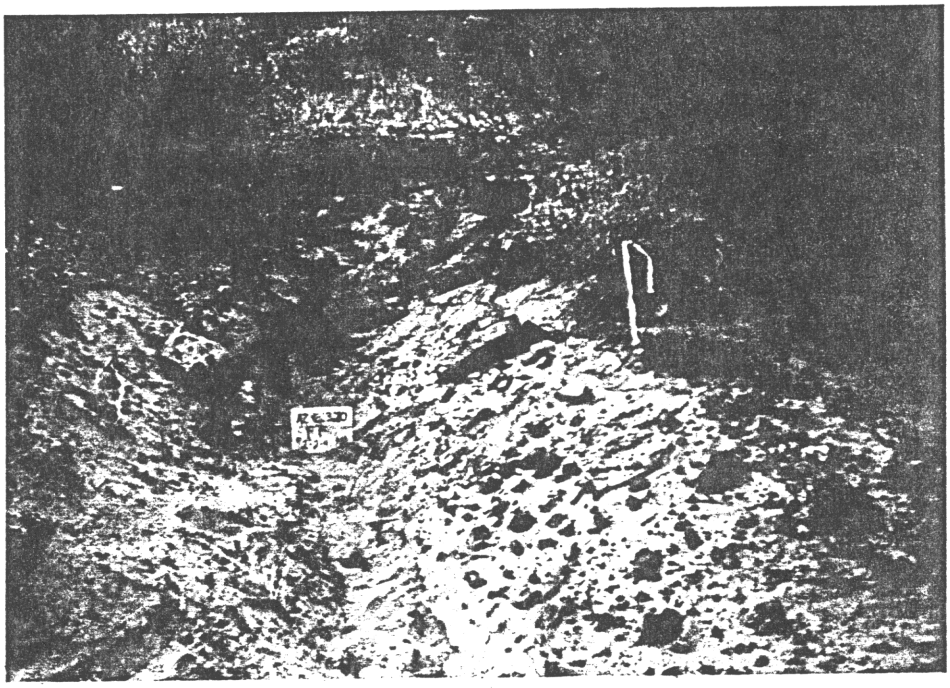


4-17-91

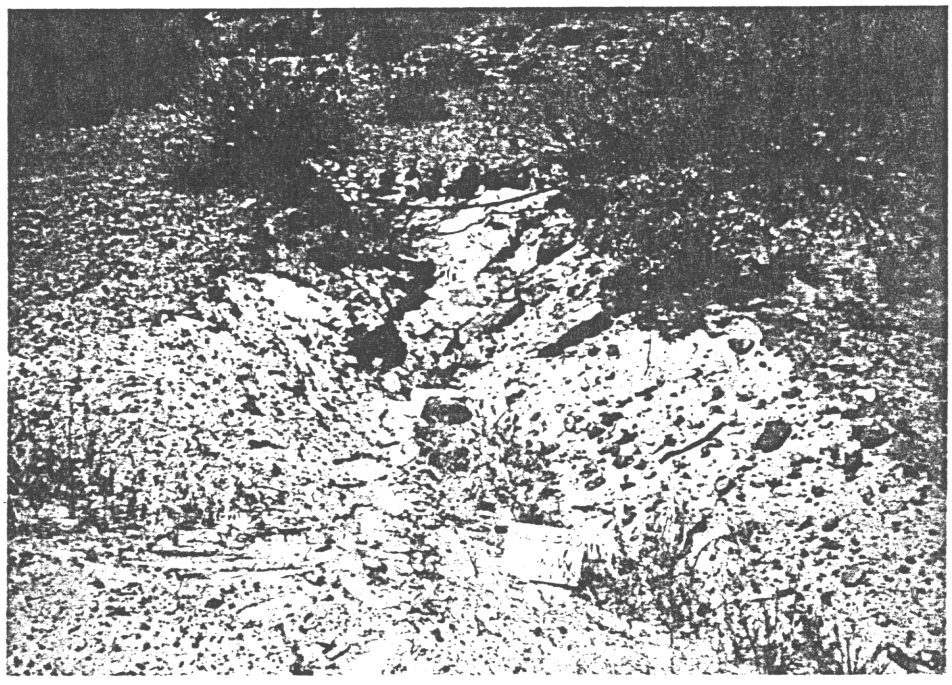


4-3-92

Figure 8. Photo comparison of side canyon flooding at C:13:384. This cutbank, which contains cultural materials, is subject to annual and sporadic side canyon flooding. Eventually the cultural materials will be undercut by these floods. The sticks and brush seen in the bottom photograph were placed by the USGS research trip in the late winter of 1991–1992.

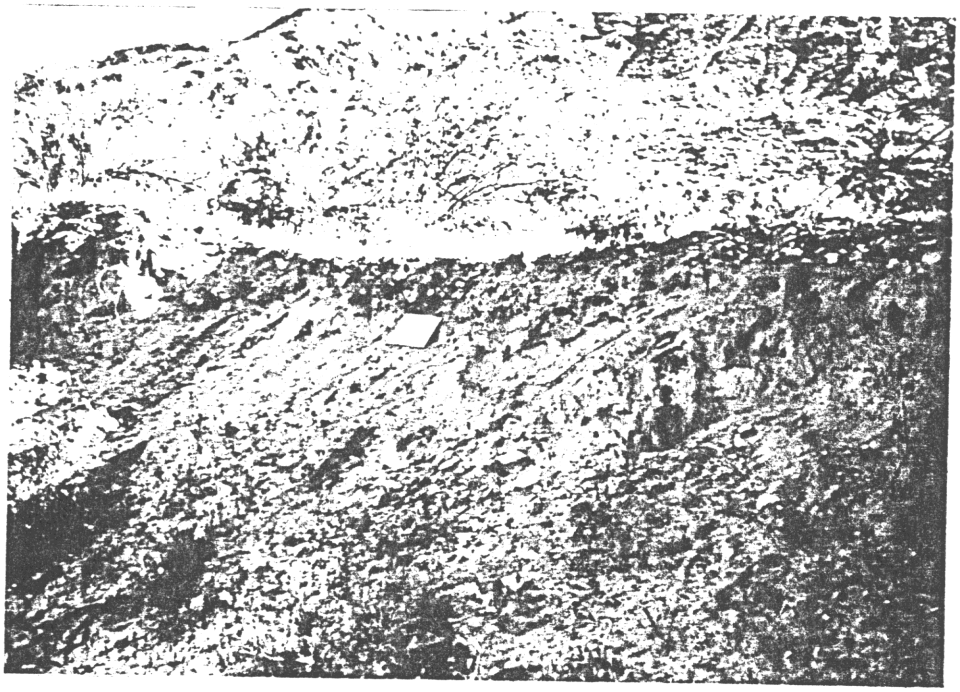


2-2-91

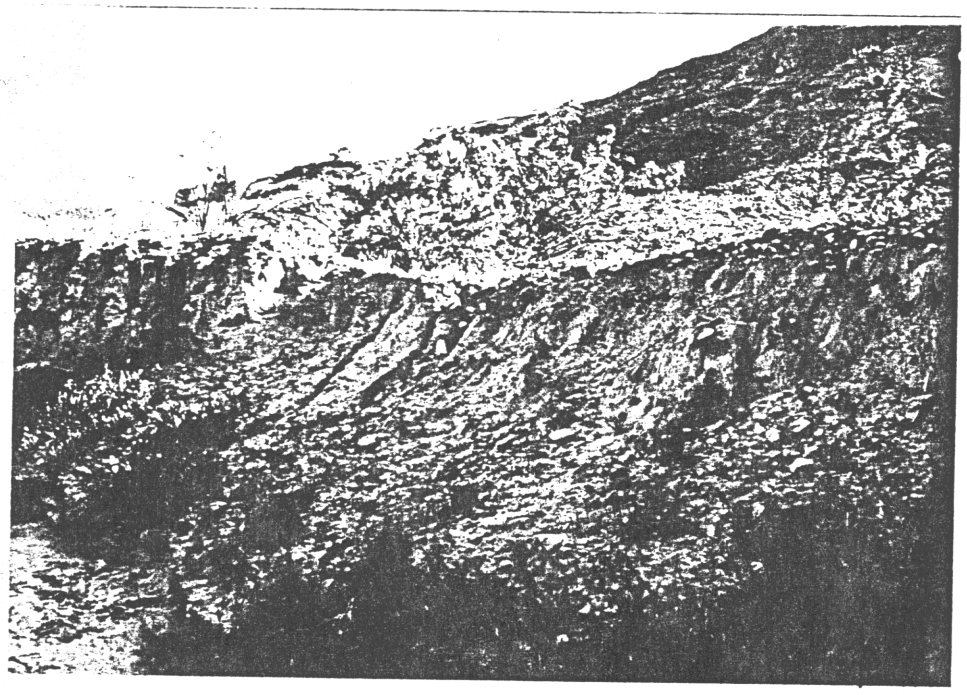


4-10-92

Figure 9. Photo comparison of an arroyo cutting toward a roasting feature at G:03:020. This recent arroyo is encroaching on a roaster feature at the left side of the photograph. During the 14 months between photographs the rock and sand have adjusted. Note that the Acacia root is still present across the channel.



4-27-91



4-4-92

Figure 10. Photo comparison of a roaster at G:03:064. These photographs illustrate the demise of a large roaster. The arroyo has cut the feature in half and the concave surface reflects the configuration of the original pit. Charcoal and fire-cracked rock are continuously moved from the depression down the slope. Note that the seasonal channels began in April 1991 and are entrenched by April 1992.

MONITOR PRIORITY RANKINGS

Question No. 45 of the 1992 monitor form refers to the monitoring priority of each site. Sites are ranked according to four values: 1 = highest priority (quarterly or bi-annual monitoring); 2 = annual monitoring; 3 = monitor every 2–3 years; and 4 = monitor every 3–5 years. The results are summarized in the pie chart (Figure 1), and Table 1 lists the monitor priority rankings given for each site by field crews. These recommendations may be slightly different from the final recommendations presented in the following section.

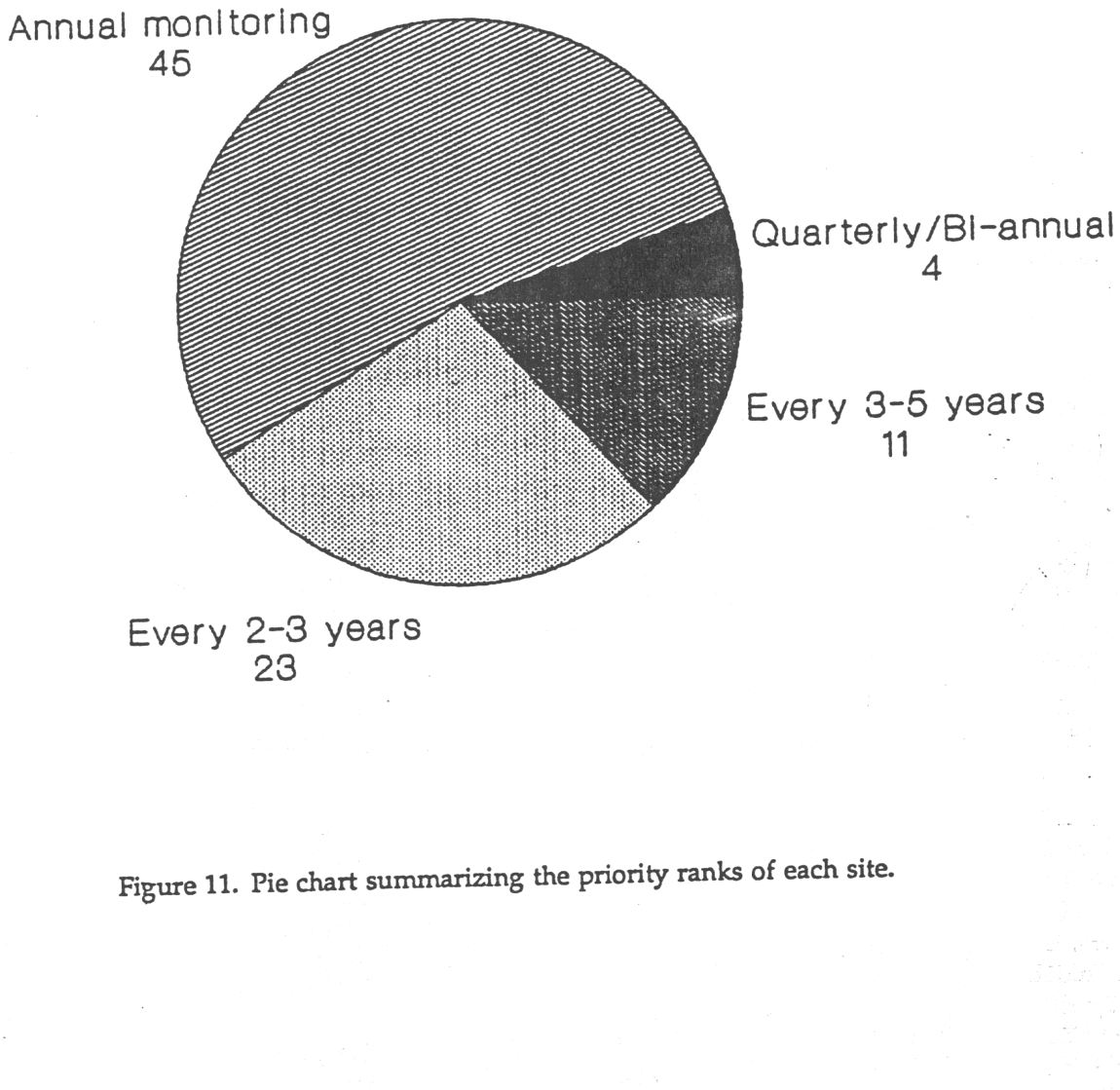


Figure 11. Pie chart summarizing the priority ranks of each site.

Table 1. 1992 Priority Rankings for Monitoring at Each Site.

Site Nos.	River Reach	Session	Site Type	Priority Ranking
A:15:026	10	92-1	RoastComp	3
A:15:027	10	92-1	Camp	2
A:15:039	10	92-1	RoastComp	2
A:15:040	10	92-3	Camp	3
A:15:042	10	92-2	Camp	3
A:16:004	10	92-1	RoastComp	2
A:16:158	10	92-3	ArtiScat	4
A:16:159	10	92-2	Camp	2
A:16:162	10	92-3	Camp	4
A:16:175	10	92-1	RoastComp	3
B:09:316	10	92-2	SmStruc	4
B:10:224	7	92-2	ThermFeat	2
B:10:227	9	92-1	Camp	2
B:10:261	7	92-1	RoastComp	2
B:11:272	8	92-1	ThermFeat	2
B:11:282	8	92-1	Camp	2
B:13:002	10	92-2	RoastComp	2
B:14:093	7	92-1	RoastComp	2
B:14:105	7	92-2	EphStruc	2
B:14:108	7	92-2	Metate	4
B:15:001	6	92-2	SmStruc	2
B:15:096	6	92-2	Other	3
B:15:120	6	92-1	Other	4
B:15:123	6	92-1	IsoPot	4
B:15:124	6	92-2	Inscript	3
B:15:131	7	92-3	ThermFeat	4
B:16:256	6	92-2	Burial	2
B:16:259	6	92-1	Camp	2
B:16:262 *	6	92-2, 92-3	HistStruc	2, 3
C:02:092	1	92-3	Camp	3
C:02:094	1	92-3	Other	2
C:02:101	1	92-3	ThermFeat	3
C:05:004	3	92-2	OtherCache	2
C:05:031	3	92-3	EphStruc	2
C:05:037	3	92-2	Camp	2
C:06:002	2	92-2	Inscript	2
C:06:004	2	92-2	Inscript	3
C:06:006	1	92-3	ArtiScat	3
C:06:008	2	92-3	SmStruc	4
C:09:001E	4	92-1	DeltaComp	2
C:09:050	4	92-2	IsoPot	2
C:09:051	4	92-2	Pueblo	1
C:09:052	4	92-1	SmStruc	2
C:09:069	4	92-1	roastComp	4
C:09:082	4	92-2	Camp	2
C:09:088	4	92-3	Other	2
C:13:006	4	92-1	SmStruc	2
C:13:008	5	92-3	SmStruc	2
C:13:100	5	92-1	Pueblo	2

Table 1 (continued)

Site Nos.	River Reach	Session	Site Type	Priority Ranking
C:13:131	5	92-2	HistStruc	1
C:13:272	5	92-1	SmStruc	2
C:13:291	5	92-1	SmStruc	2
C:13:329	4	92-2	EnigFeat	3
C:13:333	5	92-3	Camp	3
C:13:336	5	92-1	Camp	2
C:13:342	5	92-3	HistStruc	2
C:13:343	5	92-3	SmStruc	3
C:13:347	5	92-3	SmStruc	3
C:13:350	5	92-3	ThermFeat	4
C:13:354	5	92-3	Storage	3
C:13:359	5	92-1	SmStruc	2
C:13:365	4	92-3	EphStruc	3
C:13:368	4	92-3	LithicScat	3
C:13:371 *	5	92-1, 92-3	SmStruc	2, 2
C:13:374	4	92-1	Camp	2
C:13:379	5	92-1	SmStruc	2
C:13:381	5	92-3	Camp	2
C:13:384	5	92-1	Other	2
G:03:003	10	92-1	RoastComp	2
G:03:020	10	92-1	RoastComp	2
G:03:026	10	92-1	RoastComp	2
G:03:027	10	92-3	BedMortar	3
G:03:042	10	92-2	BedMortar	4
G:03:044	10	92-1	RoastComp	2
G:03:061	11	92-2	Camp	3
G:03:066	11	92-1	Camp	3
G:03:067	11	92-2	RoastComp	1
G:03:079	11	92-1	EphStruc	4
G:03:080	11	92-1	RoastComp	1
G:03:082	11	92-2	EphStruc	3
G:03:085	11	92-1	ArtiScat	3

* Site monitored twice

MONITORED SITES AND FINAL RECOMMENDATIONS

This section briefly describes the sites monitored and the priority rankings, and gives a recommended action. In many cases, additional suggestions made on the monitoring forms are in brackets.

AZ A:15:026

April 1992

This site is located on reworked sand deposits overlying colluvial debris. The site is virtually invisible due to thick grass cover. No change has occurred since recorded on 1-29-91, and there was no sign of visitation. Recommend monitoring every 3–5 years.

AZ A:15:027

April 1992

This site is located on an alluvial terrace overlying talus slope. No changes were observed since recorded on 11-10-90, and there was no evidence of visitation. Arroyos are adjacent to both the up- and downstream sides of the site. They are presently encroaching on the site and determine the north and south boundaries. Monitor every other year to check arroyo expansion, or as otherwise indicated. [Obliterate trails, install stationary camera, test]

AZ A:15:039

April 1992

This site is located above the mesquite zone on a reworked dune. Active erosion is occurring. Local drainage is encroaching on the southeast margin of site impacting Features 1 and 2. Bank slumpage is evident on the site. Monitor annually, test eroding features, and stabilize.

AZ A:15:040

September 1992

The site is situated on an alluvial terrace where it makes contact with the local cliff face about 50 m from the river. The cliff overhangs the site, creating a shelter, and intense vegetation and steep alluvial banks make access to the site difficult. The difficult access is the site's best defense against visitation. The fine sediment on which the site rests is highly dissected in both directions up and down the terrace. The runoff is directed by the cliff rising above it. A lower base level in the main channel could be responsible for the aggravated erosion. Owing to the fragile nature of the site, monitoring on a yearly basis would have an adverse affect on the surface as well as on the approaches to it. It is recommended that the site be monitored on a 3-year cycle and after flows exceeding 50,000 cfs. It is further recommended that an arroyo/gully on the same terrace in the vicinity of the site be monitored in a quantitative fashion on a bi-annual basis. This information should include any dimensional change of that particular drainage (L x W x H) and any pertinent information including recent local weather events, odd flows and side canyon flooding. Methodology for this procedure should be based on the accurate measurement of cross-sectional change in the associated drainage chosen for that purpose.

AZ A:15:042

June 1992

This site is situated in a drainage at the base of a basalt outcrop. The shade and permanent water in the vicinity make this an attractive stop for the boating public. In the 1980s Emory Kolb's name was found at this site and since that time a wel-developed trail has emerged connecting the boat beach to the name. Although the site itself would not warrant yearly monitoring, the recent heavy visitation suggests that the trail, the inscription and the prehistoric site be checked yearly. The possibility of side canyon flooding always remains a threat to the prehistoric component. [Develop for interpretation, scale map for entire area, and formally develop trail]

AZ A:16:004

April 1992

This site is located on dune-covered talus as well as a rising talus slope and bedrock ledges. Trampling and trailing occurs across the site due to increased visitation. Trailing increases channeling of surface water insuring erosion. It is recommended that this site be monitored yearly. [Install stationary camera, obliterate trail, close to the public]

AZ A:16:158

September 1992

This site is located in a riverside Muav overhang 2.5 m above the 28,000 cfs mark. A:16:158 was inundated by the 93,000 cfs flows of 1983–84. The location presupposes that it has been under water an incredible number of times since its creation; there is not much remaining. The site should be tested to

determine integrity. If there are subsurface remains the site should be monitored every 3–5 years. If there are no cultural remains the site could be deleted from the schedule.

AZ A:16:159

June 1992

The site contains numerous tools plus pictographs. This previously unknown site was recorded in November, 1990. Some boatmen from the survey project have subsequently taken people to the location. Trailing, however, is not a problem as the approach from the river to this site is jumbled rock. This year a plastic coffee mug and an article of clothing were found on the site. A Moapa spindle whorl found during the survey is missing at this time and some of the hand tools have been moved onto an anvil stone. The pictographs remain unchanged. It is recommended that this site be monitored on a yearly basis as well as occasionally spot checked. It is probably not wise to monitor the site if a group is camped nearby. [Install remote sensing device, test]

AZ A:16:162

September 1992

This site is located in an overhang of Bright Angel Shale 9.7 m above 28,000 cfs. Sand is present on the floor, and the origin is probably eolian. However, some wood is present and if it is driftwood, not manuported, the sand could be from a high-water flood prior to 1960. Spalling of the cliff face is the primary adverse impact, followed by monitoring. It is recommended that the site be monitored on the slow end of the 3–5 year cycle or following a water flow in excess of 100,000 cfs.

AZ A:16:175

April 1992

This site is situated on vegetation-covered dunes abutting the base of low cliffs. The bulk of the site is stable; however, bank slumpage is actively occurring in the cutbank closest to the river where artifacts are present. High flows in excess of 50,000 cfs would affect this trend to some unknown degree. There is no evidence of visitation other than archaeology stops. Loretta Jackson of the Hualapai Tribe has requested that we stop monitoring the two sites on this delta because A:16:185, a human burial, is located in the vicinity. A highly used camp is located here, but the thick vegetation generally confines people to the beach. Recommend stop monitoring A:16:185 and relegate A:16:175 to a 2–3 year cycle after conferring with Jackson. [Stabilize cutbank]

AZ B:09:316

June 1992

This site is situated along a narrow bench where the local Muav cliff makes contact with a talus slope. No change was noted since first recorded in February, 1991. The site has been inundated by high water prior to the construction of Glen Canyon Dam and is subject to flooding at flows exceeding 120,000 cfs. B:09:316 has received the lowest priority ranking and needs to be monitored on a 3–5 year schedule.

AZ B:10:224

June 1992

This site is situated on the downstream cutbank of a primary side canyon drainage 80 m from the river. The location is a reworked dune field overlying a debris fan resulting from side canyon flooding. The site consists of a small pristine roasting feature and an associated cist. The cist is 50 percent gone as a result of cutbank erosion from the drainage. Annual monitoring is recommended. [Profile cist, plant vegetation to stabilize]

AZ B:10:227

April 1992

This site is located in an obscure overhang and is an historical site belonging to the Powell era of exploration in the Grand Canyon. The materials are in pristine condition and are therefore significant. The site is considered off limits except for limited monitoring activity. An agenda concerning the site

will be determined by the Park Archaeologist. B:10:227 is a non-corridor site. [Close to public, monitor with remote camera, surface collect]

AZ B:10:261

April 1992

The site is located on a series of reworked sand dunes in the upper contours of the mesquite zone. Shallow seasonal drainages affect all the features to a degree, as does continual wind deflation and accumulation. The roasting features are reworked in mirror image to the dunes on which they are found. No visitation observed. Annual monitoring is unnecessary and would impact the site to a greater degree than the normal regimen of erosion and deposition. Recommend monitoring every 2–3 years.

AZ B:11:272

April 1992

This site is situated on a diabase bench with a veneer of eolian sand overlooking the river. Surface runoff, gullying, and active arroyo development exist on 50 percent of the site. Two distinct trails pass through the site due to the proximity to and the popularity of the camp, and the traditional hiking by boaters. Monitor on a yearly basis to check trailing. [Reroute trail from site, test/profile arroyos]

AZ B:11:282

April 1992

This site is located on an alluvially cut terrace in a side canyon drainage and a rocky slope above the drainage. The site consists of an intact roaster on the slope and a loose elliptical stone outline on the small terrace. Although no change has occurred since the initial recording (2-23-91), the stone outline (Feature 1) is at the mercy of any side canyon flooding. It could also be adversely affected by base level lowering. No visitation was evident. It is recommended that this unique site be monitored yearly. [Test]

AZ B:13:002

June 1992

This site is located up a large side canyon drainage at the contact of the cliff face and talus slope. It is recommended that the site be monitored on a 2–3 year schedule.

AZ B:14:093

April 1992

The site is located on a set of reworked dunes bisected by the drainage at 122.2 mile. Feature 2 is highly eroded and Feature 1 shows evidence of ongoing erosion. Wind deflation and encroachment of arroyos are the immediate threats to the site. This low-profile site acts as a barometer for rates of surface change in this reach, and it is recommended that the site be monitored annually. Profiling features, arroyo monitoring, and planting vegetation are also recommended. [Test]

AZ B:14:105

June 1992

This site is situated on the upstream side of a major side canyon delta. The cultural materials are found from the bedrock ledges at the cliff/slope contact, down the dune-covered talus and on the bedrock ledges above the main drainage. The site is impacted by normal exposure to the elements and increased visitation from the boating community and the archaeologists. No trails eroded below ground surface have developed but distinct compaction and incipient trails are noticeable. A major camping beach is located on the downstream side of this delta. It is recommended that the site be monitored yearly. B:14:105 is a non-corridor site. [Retrail, plant vegetation, develop for interpretation, install check dams, test]

AZ B:14:108

June 1992

This site is located along a flat narrow ledge caused by spalling of the local cliff face. The overhang is 120 m from the river but would be inundated in extreme high water (200,000+ cfs). The large eddy caused by big flows at this location has deposited sand as well as driftwood. B:14:108 has a priority rank of four and it is recommended that this site be monitored every 5 years.

AZ B:15:001

June 1992

The site is situated on a large granite bench overlooking the river. The actual prehistoric site (B:15:001) was recorded by Dr. R. Euler in 1962. The site has been monitored by Jan Balsom (Park Archaeologist) since 1982. Light trailing is present on the surface and much of the artifact scatter has disappeared from continuous visitation. The site is within 70 m of the popular camping beach. The structures have remained intact and are in good condition. It is recommended that B:15:001 continue to be monitored on at least a yearly basis. This site has excellent potential for a public awareness display, official walk, or mini-tour type of presentation. B:15:001 is a non-corridor site. [Develop for interpretation, define trails, obliterate multiple trails]

AZ B:15:096

June 1992

This site consists solely of the celebrated *Ross Wheeler*, a boat constructed by Bert Loper and used in the Quist, Tadje disaster trip of 1915. The boat was abandoned but has endured as a physical reminder in the river corridor of the hair-raising trips of the pre-dam era. In 1984 Kim Crumbo of the National Park Service chained the boat to the rocks to prevent theft, 6.5 vertical meters above the 28,000 cfs level. The boat can be seen clearly from the river and a monitoring stop for this site is a 10 to 15 minute affair. It is recommended that the *Ross Wheeler* be monitored yearly. Stops can always be made quite easily if anything looks dramatically different. evelop for interpretation]

AZ B:15:120

April 1992

This "site" is located on a bench 55 vertical feet above the 28,000 cfs level just above Bass Rapid. The site is an enigmatic cleared area 4 m in diameter. The area does not appear to represent a cultural manifestation and will be removed from the database.

AZ B:15:123

April 1992

This site is located on a talus slope overlooking a secondary drainage. The entire site consists of a single fragmented vessel above ground obscured by rock. The site should be monitored for any evidence of trailing, rock movement, etc. This can be done from river level every year by one person. Spot check immediately if trails or rock movement is observed. [Surface collect]

AZ B:15:124

June 1992

This site consists solely of the historic inscription: George W. Parkins Washington, D.C. 1903. The name is carved into water-polished granite 2 m above the 28,000 cfs level at an old ferry crossing. This inscription is one of the most beautifully executed works along the entire river corridor and should be checked as often as is convenient. Like B:15:096, this inscription need not be more than a 15 to 20 minute stop. It is suggested that it be officially monitored yearly. Threats include vandalism from visitors and water in excess of 70,000 to 80,000 cfs. [Develop for interpretation, plant vegetation to stabilize beach]

AZ B:15:131

September 1992

This modern site is located on a Tapeats Sandstone ledge 10 m directly above the river. It consists of some vertical sandstone slabs in a configuration suggesting a fire ring, yet there are no charcoal remains. Sand and driftwood are present indicating inundation in 1983. The feature probably dates from 1970 to 1982. This non-site was given a four, or lowest priority. It is recommended however that the site not be monitored at all. It could be used as a cfs reference guide in the advent of any future flows exceeding the 1983–84 flows.

AZ B:16:259

April 1992

This site is located on a sand-covered talus slope adjacent to the river trail near Pipe Creek. A roasting feature is presently eroding and represents the only site of this type in this section of the corridor. A network of social trails are developing at this location due to increased day hiking to and from Pipe Creek. Obliteration of these secondary trails is recommended. Monitor annually. [Obliterate trails]

AZ B:16:262

June and September 1992

B:16:262 is the USGS gauging station located 0.2 mi above the Kaibab suspension bridge. The station was constructed in the early 1920s and is clearly visible from the river. The priority rank is two; however, this stable structure should be officially monitored every 3–5 years. It may be appropriate to erect a small interpretive sign explaining the function and historic nature of the station since it is such a visible landmark. [Interpret]

AZ B:16:365

June 1992

This site consists solely of the maintained grave of Rees Griffiths. The burial is located at the base of the granite cliffs between Bright Angel Pueblo and Phantom Ranch. A bronze plaque commemorates his life and his untimely death in the line of work along the Kaibab Trail "not far from" his final resting place. It is recommended that monitoring of the site be stopped. However, a casual visit to the grave to see if any vandalism has occurred may be appropriate.

AZ C:02:092

September 1992

AZ C:02:092 is situated in a shallow overhang of Kaibab Limestone below the Paria Riffle. It consists of two groundstone slabs, a cobble tool and a few flakes. Day-use trash associated with hikers and fishermen is usually found on the surface (cans, cigarette butts). No criminal vandalism is evident. An erosional scar is developing from a pourover on the upstream side of the site which is removing alluvium from the terrace with each episode of rain. This erosion is not directly effecting the site but will eventually. Monitor yearly.

AZ C:02:094

September 1992

This site is the old lower ferry crossing below the Paria Riffle. For monitoring purposes, the official work is done on the left bank at the riverside bedrock ledges. This area contains Mormon pioneer names and dates from the late nineteenth century placed on the rock face with axle grease and/or tar. The biggest threat to the site presently is high day use by fishermen and hikers. A large amount of trash can be removed from this location on each trip: cans and bottles, charcoal, food items, fishing tackle, plastics and paper products. It is also still fashionable to put one's name and date on the wall. Someone scratched Danny Ray Horning's name on a rock last summer. It is recommended that this site be monitored each spring and each fall, possibly by the Lees Ferry Ranger. [Develop for interpretation, put up Do Not Litter and No Fires signs]

AZ C:02:101

September 1992

This site is a small, highly eroded fire feature located on the uppermost alluvial terrace within view of 10-Mile Rock. A talus slope begins less than 1 m above the fire-cracked rock. 1983 high water worked the base of the slope adjacent to the site. Surface erosion in the vicinity is currently high. The local bench is so dissected that there is more drainage than terrace. This is also a clue to why sites are rare in this stretch at lower levels. Archaeological monitoring on a yearly basis could pose a long-term threat to the feature as cryptogamic soil is common. It is recommended that erosion in the vicinity be casually observed when passing by and that monitoring be conducted in alternate years; what remains could be excavated, with complete geomorphological work. [Stabilize with a check dam or vegetation]

AZ C:05:004

June 1992

This site is situated in a small cave overlooking one of the numerous rapids in the Roaring 20s. It consists of the meager remnants of a nineteenth century prospector/trapper's cache. When the USGS trip of 1923 worked their way down the canyon, the crew stopped at this spot and took their pictures with the gear. A year later one of those pictures appeared in *National Geographic*. Since then most of the artifacts have disappeared. Modern offerings are also present in the form of a wood carving, a candle and some incense. The cave is only 2–3 m above the 28,000 cfs level and it has been inundated numerous times between 1923 and 1983. The priority rank of C:05:004 has been rated as two; however, it is only necessary to monitor C:05:004 every 3–5 years or after the release of flows in excess of 50,000 cfs.

AZ C:05:031

September 1992

The site is located on a reworked, dune-covered side canyon debris fan and associated bedrock ledges. The largest erosional element on the site is an arroyo cutting the slope at the southern margin of Locus A. The site is essentially open and constantly exposed to the positive and negative effects of wind. A camping beach is located on the upstream side of this same delta. Visitation to the site was documented by a pair of underwear in the arroyo adjacent to Locus A. C:05:031 has a priority rank of two and it is recommended that it be monitored yearly. If it appears that archaeological monitoring causes an adverse impact, the schedule should change to alternate years. [Install check dams]

AZ C:05:037

June 1992

This site is located on a reworked dune system overlying a talus slope and debris fan. This particular site is in poor condition. Paiute pottery was found as well as datable charcoal, but much of the cultural material has been weathered into eternity. A popular camp is situated less than 100 m downstream from the site. C:05:037 has been given a priority rank of two, suggesting annual monitoring. However, a 2–3 year cycle would be acceptable. [Retrail, plant vegetation, test]

AZ C:06:002

June 1992

This site consists of the inscription commemorating the death of Frank Brown. He died in the river corridor during the survey expedition of 1890. The inscription was done by boatman Peter Hansbrough, who also drowned several days later downriver. The inscription is placed on the water-worn surface of the Coconino Sandstone 5 m above the 28,000 cfs level. The high-profile location is in no present danger; however, it could be adversely impacted by vandalism or high flows (90,000+ cfs). C:06:002 was given a priority rank of two but frequent monitoring is probably not necessary; a photograph should be taken once a year. [Develop for interpretation]

AZ C:06:004

June 1992

This site is situated on the back wall of a small alcove in the Supai Formation. The site consists of a rock hammer outline and the letters USGS pecked into the rock surface, which was done by the USGS team on their 1923 work trip. The inscription is only 1 m above the 28,000 cfs level. The position of the hammer looks like it goes under the water somewhere around 50,000 cfs, placing it below the surface several times between 1923 and 1960 and again in the 1983 flood. C:06:004 has been given a priority rank of three, suggesting a monitoring cycle of 2–3 years. However, annual inspections are suggested.

AZ C:06:006

September 1992

This site is located on a sandy alluvial terrace mantled with pea-sized gravels derived from the Hermit Shale. A few large boulders are also present. The site is bracketed by two arroyos that drain the talus slope behind the site. Runoff from a recent storm has moved a small boulder in a seasonal channel running through the feature. Evidence of new surficial erosion is apparent as incipient channeling and dispersed gravels. No evidence of visitation was observed. C:06:006 has a priority rank of three and it is recommended that it be monitored in alternate years.

AZ C:09:001E

April 1992

This site is located on a reworked, dune-covered, alluvially cut terrace among the mesquite. Trailing from the camps to the main trail on a major delta is prevalent. High water from the 1983 flood encroached on the area closest to the river. Monitor every other year and in years when cfs exceeds 90,000. [Retrail or obliterate trails, plant vegetation to stabilize, test]

AZ C:09:050

June 1992

The site is located in a cutbank on a major delta. It is unusual in that complete prehistoric puebloan vessels were found eroding from the sediment during the initial GCRCS survey in September, 1990. These vessels were removed and are curated on the South Rim. No other artifacts are currently eroding from the cutbank. This location has a priority rank of two and should be monitored at least annually. Further stops could be made to spot check the arroyo as dictated by weather, runoff and schedule. [Retrailing, plant vegetation to stabilize]

AZ C:09:051

June 1992

This site is located on reworked dunes overlying a debris fan up a side canyon 90 m from the confluence with the Colorado. The surface exhibits a high degree of impact, including accelerated cutbank erosion due to lowering of the base level, obvious trailing, wind deflation, and localized gullying. Cutbank erosion is particularly invasive all along Locus D which parallels the creek bed and has caused Feature 3 to be bisected. Three large collection piles exist on this site (one has developed where a branch hiking trail drops into the creek at Locus D). Retrailing will be helpful at the site by redirecting the foot traffic. An extensive prickly pear field already protects much of the surface at this site, but retrailing is suggested because there are visible features at Loci A and D. C:9:051 has a priority rank of one and should be monitored twice a year by two crew members. It is also suggested that the site be professionally mapped—total station/OPS. [Retrail or obliterate trails, stabilization]

AZ C:09:052

April 1992

This site is located in an open area of reworked dunes between mesquite thickets. The site is impacted in a minor way by wind; however, the primary impact is trailing by hikers and river runners. Collection piles of over 50 sherds are common on this site and the artifact-rich site adjacent to it. Recent retrailing should reduce human impact. Recommend monitoring on a yearly basis.

AZ C:09:069

April 1992

This site is located on an old river terrace equivalent to the upper mesquite level. No changes have been noted since the initial recording (9-2-90). The grass and low vegetation is currently prolific on the site, covering and protecting features that are visible in the fall and winter. Recent retrailing by the Park Service has been noted. Monitor annually for the next fiscal year.

AZ C:09:082

June 1992

The site is located in eolian dunes above the mesquite terrace within 70 m to the river. Wind deflation and trailing have the largest adverse impacts. Two distinct activity areas emerge from the dunes containing both PII Anasazi and later Paiute ceramics. Due to the fragile nature of the site, any visitation has an adverse effect. This year at least three "show me" trips and a monitoring trip have visited the site plus untold backpackers. C:09:082 has a priority rank of two and it is recommended that the site be velvet-glove monitored annually by two archaeologists. Also, "show me" trips should be kept to a minimum. [Retrail or obliterate trail, excavate]

AZ C:09:088

September 1992

This site is the Bureau of Reclamation's Marble Canyon Dam location situated on both sides of the river in the steep narrow recesses of that canyon. The site stretches for a half-mile downriver. Remnants include test adits and associated debris fans, broken loading docks, cable, bolts, gauges, abandoned barges, retaining structures, walls, trails, cans, glass, and domestic garbage. This was also the location of a cable system erected to bring in men and supplies from the rim. The project lasted over a year and was abandoned in 1951, when the cable system was also destroyed. It is recommended that C:09:088 be monitored yearly with particular emphasis placed on the erosion of the debris fans and the sediment-filled barges. [Develop for interpretation, professionally map]

AZ C:13:006

April 1992

This site is eroding out of redeposited sand on the upstream side of a major canyon. The site is rich in ceramics, lithic tools and debris, ground stone and structural outlines. Three types of adverse impacts are present: (1) continual erosion of the local secondary drainage due to seasonal flooding, causing further cutting of the slope on which the site is perched; (2) wind deflation and; (3) archaeological intervention. Monitor annually by a single person. [Plant vegetation to stabilize, test]

AZ C:13:008

September 1992

C:13:008 is one of the best photo-documented archaeological sites in the Grand Canyon. It was originally recorded and photographed in 1965, and Park Archaeologist Jan Balsom has monitored it since 1982. Because it is located over 150 m from the river, the site will be deleted from the schedule unless a really big flood occurs.

AZ C:13:100

April 1992

This site, located on a reworked sand dune on the lower mesquite terrace, was originally recorded by Park personnel in July, 1978. Gullying is impacting the majority of the site, particularly Feature 4. There is also a major hiking trail that runs through the site. A cobble tool in the drainage associated with Features 5 and 6 has moved 1.5 m since the archaeological survey in September, 1990. C:13:100 dovetails with the USGS (Hereford) geomorphological work and should be watched closely. Monitor yearly. [Retrail, install check dams, plant vegetation to stabilize, test]

AZ C:13:368

September 1992

This site is located under a rockshelter in a travertine deposit. Alluvial deposits are present in the shelter as fine-grained, laminated sediment. A new gully has formed on the surface due to a structural alteration in the dripline of the overhang. No visitation is evident. C:13:368 has a priority rank of three, and it is recommended that the site be monitored every 2–3 years.

AZ C:13:371

April and September 1992

This site is located at the mouth of an unnamed drainage below the Little Colorado River. Features and artifacts are situated on a debris fan near the river, reworked sand-covered terraces and the upper bedrock ledges. A side canyon flood in the early fall of 1990 had a high adverse impact on the site, particularly Features 2, 3, 4, and 5, located in the sand nearest the canyon mouth. The lowest portion of the site (Feature 7) is susceptible to flooding with cfs levels over 40,000. Presently the site is monitored on a daily basis by a camera located on the above ledges. C:13:371 has a rank of two on the monitoring form. It is recommended that the site be monitored twice a year by a crew of no more than two archaeologists. It is also suggested that the site be professionally mapped to scale, and tested to determine integrity of the lowest feature. [Remote sensing program, check dam, test]

AZ C:13:379

April 1992

This site is situated on a chain of high sand dunes and their reworked terrace segments at the downstream end of a major delta. The site is on old river alluvium and even though it is 190 m from the main river channel, it remains only 6.5 m above the 28,000 cfs level. Over-bank channels from the high annual flows occurring prior to the construction of Glen Canyon Dam exist adjacent to and below the site. These old flows would have brought huge amounts of sediment in to settle out in front of the village site. Today there is no balance between sediment accumulation and removal on the site. Hence the perpendicular gullying that now dominates the terrace goes unchecked. It is recommended that the site be monitored annually and mapped professionally. Gullying also suggests the need to install check dams before major erosion occurs. [Plant vegetation, stabilize banks, stabilize structures]

AZ C:13:381

September 1992

This highly eroded site is located on the first sandy terrace above a local side canyon debris fan. The site is bounded by a major hiking trail and is also adjacent to a backpackers' camp. No erosional changes were observed. C:13:381 has a priority rank of two, suggesting a yearly monitoring schedule. It is recommended that this site be monitored next year and at that time we will decide if this rank is appropriate. [Retrail]

AZ C:13:384

April 1992

This is a buried site in a cutbank up a major side canyon. The deposition shows an alternating regime of overbank flooding from the Colorado River and the seasonal side canyon flooding of Lava-Chuar. Late nineteenth century material has been recovered from the top 0.10 m of soil development. Two meters down at the base of the cutbank there is a vertical slab-lined hearth. The USGS and Helen Fairley (NPS archaeologist) did some work in 1991; on completion they did some expedient shoring up of the base of the cutbank with dirt and dead vegetation. This effort will protect the feature from a single side canyon flood which at the latest will occur next spring. Further episodes of runoff down Lava-Chuar will continue to erode or destroy the site. It is recommended that this site be physically monitored at least once a year and spot checked two to three times. [Stabilize banks, test]

AZ G:03:003

April 1992

This multi-component rockshelter with associated roasting features rests on large sand dunes that have evolved over an alluvial terrace on the downstream side of Granite Park. A minor trail which was established in the 1960s has been enhanced by archaeological work and increased visitation from the river-running community. Aerial photographs taken over the last 25 years show a geometric increase in the social trailing at Granite Park. This trend is furthered by the local bighorn sheep herd which in the last 2 years has spent considerable time in this area due to the lush grass growth that accompanied the wet winters. Wind deflation and channeled runoff due to trailing are secondary impacts at this time. G:03:003 has a monitor rank of two and should be monitored at least annually. Spot checks should be made two to three times a year to note any further encroachment of the trail from Granite Park drainage to the rockshelter. This trail should be obliterated.

AZ G:03:020

April 1992

This site is located on reworked sand dunes occupying both sides of a side canyon drainage as it enters the Colorado. Headward erosion of the local arroyo and gully system are the main adverse impacts to the site. Feature 7 is nearly gone due to this process. Extreme high water (80,000+ cfs) could back up this canyon and further undercut the sandy bank upon which Feature 5 rests. G:03:020 has a priority rank of two and it is recommended that it be monitored on a yearly basis for the present. Profiles and testing is also suggested. [Install check dams, plant vegetation, stabilize banks]

AZ G:03:026

April 1992

This site is located on reworked sand derived from older alluvial terrace overlying debris flow deposits. Social trailing, bighorn sheep grazing, and minor wind deflation are the adverse impacts. The monitoring form suggests a rank of two, with a yearly monitoring schedule. It may be better for the site to be monitored every 2–3 years and check the progress of the trails by aerial photographs. Retrailing or obliterating many of the trails at Granite Park may be warranted.

AZ G:03:027

September 1992

This site consists of a group of bedrock mortars located in the boulder debris adjacent to the river at Upper Granite Park Wash. The best example of the mortars is visited by many modern river-running trips and a prominent trail has developed. These lovely and unique artifacts are as nearly indestructible as they are uncollectible, putting them at low impact risk. G:03:027 has a priority rank of three and it is recommended that it be monitored on a 2–3 year cycle. [Develop for interpretation]

AZ G:03:042

June 1992

This unique site consists of a group of beautiful bedrock mortars sunk into riverside ledges of Tapeats Sandstone. These labor-intensive features are intrinsic to Yuman and Numic culture in the western reaches of the river corridor downstream all the way to Yuma. Human impact is not a problem nor is erosion of the actual mortars. G:03:042 was given a priority rank of three. It is recommended however that due to the unique nature and pristine condition of the site, it should be checked annually.

AZ G:03:044

April 1992

This site is situated in rockshelters at the base of a Bright Angel cliff as well as on the talus slope beneath it. The site extends onto a sandy reworked alluvial terrace closer to the river. Locus A is the upper level and Locus B is on the terrace. Headward migration of a local arroyo at Locus B is compromising the roaster. The bulk of the site is removed from any river impact and the biggest threat to the site is too much visitation from archaeologists. G:03:044 attained a priority ranking of two, indicating

annual monitoring. We are recommending however that only Locus B be monitored for expansion of the arroyo and the erosion of the roaster. A detailed map, testing, and profiling is also recommended at Locus B. Locus A can be left alone unless otherwise indicated by radical changes on the terrace. [Obliterate trail]

AZ G:03:061

June 1992

This site is located in a Tapeats Sandstone rockshelter overlooking a small side drainage and its associated debris fan. This site harbors datable materials, has good depth, and other than monitoring is free of human impact. Access is across an unfriendly boulder field and it is unlikely that anyone would stop here barring incredibly foul weather or a random boat disaster. Large cat dung, coyote scat, and owl pellets are all present. G:03:061 has been given a priority rank of three, suggesting monitoring on a 2–3 year cycle. It is recommended that this site be monitored once every 3 years to minimize compacting the loose, carbon-rich surface.

AZ G:03:066

April 1992

This site is located at the base of a talus slope on an eolian sand covered bench overlooking the local side canyon drainage. It consists of a small intact roasting feature and a bedrock grinding slick, but no artifacts are present on the surface. The site is in excellent condition. Oddly enough, in a small gully meters from the roaster, a large amount of modern trash was found. This was apparently an abandoned food cache deteriorating in place that consisted of powdered soup, hot chocolate packets, food cans, ketchup, coffee, and opened Budweiser beer cans. Rodents and insects made the most of it and we removed a large garbage bag full of the debris, leaving no trace. It is recommended that this site be monitored every year. [Date feature]

AZ G:03:067

June 1992

G:03:067 is located on a major delta on a low dune-covered debris fan. It is situated between two major river camps and is adversely impacted from extensive social trailing. The roasting features are highly eroded and surface artifacts are scarce. Feature 1 is only 50 m from the river and could be impacted by extreme high water (90,000+ cfs). G:03:67 has received a priority rank of one. However, annual monitoring will be sufficient. [Retrail]

AZ G:03:079

April 1992

This site is located in a Tapeats Sandstone rockshelter. The shelter is well protected by a large mesquite thicket and boulder field. It is also 12 m above the 28,000 cfs level. There has been no observable change since recorded (4-28-91). Recommend monitoring on a 3–5 year cycle.

AZ G:03:080

April 1992

The entire site is located on the upstream side of a major side canyon. This extensive site is situated on a dune-covered debris fan as well as on the base of a cliff of locally occurring basalt. On the downstream side of the delta there is a popular camping beach. The rock art (pictographs) draw visitors. Side canyon flooding is always a potential danger to the features adjacent to the drainage (Features 4, 5, 6, and 7). Spalling is a continuous impact to the rock art. There is no permanent trailing, but visitation is obvious from footprints, a gum wrapper, and a cigarette butt. Recommend monitoring at least annually with spot checks as appropriate, and checking lower features for any arroyo development.

AZ G:03:082

June 1992

This site is located in a series of Tapeats ledges and overhangs adjacent to a steep narrow side drainage. It is in poor condition due to runoff from local pourovers. No depth remains to test. This site has a priority rank of three. It is recommended that G:03:82 be monitored on a 2–3 year cycle.

AZ G:03:085

April 1992

This site is located on a dissected, reworked dune and associated bench. Cultural materials are represented by a brownware pot drop and several flakes. Fluvially caused erosion on the surface is high, but visitation is nonexistent. It is recommended that this site be monitored every 2–3 years.

CONCLUSIONS

Since the Grand Canyon and Colorado River comprise one of the world's greatest erosive systems, we must be prepared for radical changes at specific localities that have, during the project's short tenure, appeared to be stable. Intense local impacts occurring in the canyon due to rain, runoff, wind, and mass wasting are common. The recommendations concerning site monitoring schedules should remain flexible. For example, if a monitoring crew observes recent side canyon flooding in Reach 8, it may be prudent to stop and spot check a particular site even though it was relegated to a 3–5 year work cycle.

The 1992 monitoring season was a learning experience for all those involved. This experience will help us better understand what works and what does not. The following list illustrates some of what we have learned.

- There is a problem with the priority ranking system to the extent that some sites receive a high rank that do not need to be monitored more than every 3 to 5 years and vice versa.
- Too much of the photographic work is redundant. All photo points *do not* need to be repeated every year.
- Some of the larger and more complex sites would be easier to deal with and would provide better quantitative information if we had more sophisticated site maps.
- The monitor forms are too convoluted. There are too many subjective options which get translated into a number for the computer. The form needs fine tuning.
- A smal-scale program should be designed to quantify actual change on specific sites regarding downcutting, arroyo and gully widening, slope creep, and removal of sand from the surface.
- Certain sites (e.g., G:03:044, G:03:66), while needing monitoring, are too fragile to visit on a yearly basis. Thus, sites of this type should be looked at in alternate years to allow recovery and minimal impact. The concern in these cases is to not allow the monitoring project to become a bigger adverse impact than the natural course of events.
- So far, the cameras have documented little change. In this regard we must remain flexible and patient. The ability to change location of the cameras should remain an option after another year of use in the current positions.
- Mixed business trips are inefficient. If we go down the river to monitor, we should monitor. Guests (to a limit) are fine, provided they are interested in the project and they participate in the team-sport nature of the trips.

- Concerning row versus motor trips, both have their positive and negative aspects. Instead of determining to use one or the other, we would like to recommend making use of both—possibly two row trips of 14–19 days as well as two motor trips (one 10 days and one 7–8 days).

In conclusion, it is suggested that no major methodological changes be adopted until the end of the 1993 season in order to afford some continuity to the observations and information gathered this past year. It is important to go down the river on each monitoring trip with an agenda and a pace; it is also equally important to be flexible and act on opportunity as it arises. Oftentimes changes occur spontaneously in the canyon and if the crew is paying attention, then that change can be documented on the spot. The work done in 1993 will establish a more efficient methodology for the future. At this time, recommendations made on our experiences of 1992 should be considered part of a changing scenario in an ongoing process.

Appendix I

1992 SITE MONITOR FORM

ARCHAEOLOGICAL RIVER SITE MONITORING FORM

MANAGEMENT INFORMATION

1. Site # AZ Z:00:000A 2. Monitor session #

3. Monitor(s)_____

4. Date __/__/_____

5. USGS Quad map 7.5'_____ 6. Use Area Name_____

7. Date of first visit / /

8. UTM location (Zone 12)_____East_____North

9. General location description

10. Does this site have any visible structures? 0 = no, 1 = yes ___

11. River mile _____ River bank (L=left, R=right, B=both) ___

12. Is this site located in or on Colorado River fluvial deposits?
    0=no, 1=yes ___
    If yes, describe the setting specifically:

13. Distance/direction from and height above current high water (approx. 30,000 cfs) to lowest boundary of site area:
    Distance _____ mtrs Direction _____ degrees Height _____ mtrs Slope ____ degrees

14. Distance/direction from and height above current high water to a central site datum
    Distance _____ mtrs Direction _____ degrees Height _____ mtrs Slope ____ degrees

ENVIRONMENTAL SITUATION

15. PRIMARY physiographic setting: 1. Riverside beach/dunes 2. Alluvial terrace 3. Talus slope 4. Base of cliff 5. Bedrock Ledges 6. Non-riverside dunes 7. Other _____ ___

16. Degree of shelter: 1. Open 2. Overhang/cave 3. Combination ___

17. DOMINANT soil type: 1. Alluvium/Aeolian 2. Colluvium 3. Bedrock 4. Residual ___

18. DOMINANT soil texture: 0. Not sandy or gravelly 1. Gravelly 2. Sandy 3. Gravelly and Sandy ___

NATURAL IMPACTS (use the following scores: 0=none, 1=minor (<10% of site area affected), 2=moderate (>10% but less than 50% of site area affected), 3=extensive (50% of site area affected)

19. Evidence of surficial sheet washing? ___

20. Evidence of gullying (cuts 10-100 cm deep)? ___

21. Active arroyo cutting (cuts >100cm)? ___

22. Evidence of animal-caused erosion? (Sum of items below) ___
    (a) general trampling ___
    (b) trailing through site ___
    (c) burrowing ___
    (d) Other ___

23. Evidence of other erosion? (Sum of items below) ___
    (a) wind deflation ___
    (b) bank slumpage ___
    (c) dune migration ___
    (d) Other ___

TOTAL NATURAL IMPACT

24. First method: if score for items 18-23 is greater than zero, item # = 1. (Sum total - maximum total = 5). First Method Total ____

25. Second method: sum actual scores for all items. Maximum score for items 19-21 equals 3 each; maximum score for items 22 and 23 equals 12 each. (Maximum possible for all items combined is 33.) Second Method Total ____

26. Characterize the stability of the site: 0=stable (no active erosion) 1=incipient erosion, 2=active erosion ___

27. Do any of the above impacts appear to be related to river/dam operation? 0=no, 1=yes ___

    Indicate with a '1' any that apply:
    (a) direct inundation within past 30 years (post-dam) ___
    (b) bank slumpage/steepening adjacent to current highwater zone ___
    (c) headward migration of arroyos due to lowered base level ___
    (d) Other ___ ___

28. If arroyos or gullies are present, do they drain all the way to the river? (Note: Some drainages die out in dune fields or on terraces before reaching the river.) 0=no, 1=yes, 2=N/A ___

29. Comments: (Explain/describe river-related impacts in more detail; any new features or structures exposed by erosion; changes in types or degree of erosion; imminent threats; what to look at on next visit, etc.):

HUMAN IMPACTS EVALUATION

30. Collection Piles: 0= None 1= 1 pile 2= > 1 pile ___
If more than one pile, list total number:_____

31. Trails: 0 = No distinct trails 2 = 1-2 distinct trails
4 = >2 distinct trails ___

32. Trails eroded >5 cm below ground level? 0=no, 1=Yes ___
(Show all distinct trails on site map.)

33. Evidence of on site camping? 0=None; 2=minimal (1 of the below);
4=Considerable (2 or more of the below) ___

Indicate with a '1' what kinds of evidence are present?
a. Fire scars, fire pits, recent charcoal: ___
b. Rearrangement/clearing of rocks: ___
c. Recent camper trash: ___
d. Obvious concentrated soil compaction (tent site): ___
e. Other:_____

Does this evidence appear to be recent (< 5 years old)? ___

Did evidence appear since last visit? ___

34. Evidence of deliberate vandalism? ___
0= None
1= Surficial disturbance only (e.g., grafitti)
2= Slight amount of subsurface disturbance(<1 m2 excavated)
3= Substantial subsurface disturbance (>1 m2 area excavated)

Does this evidence appear to be recent (<5 years old)? ___

Did evidence appear since last visit? ___

35. Any other evidence of visitation other than above (e.g. obvious erosion/compaction from human trampling, scattered surface trash, etc)
0=no, 1=yes ___
If yes, describe:

TOTAL HUMAN IMPACT RATING _____

36. Human Impact Condition Class (see rating system below) ___
Condition Class 1: No human impacts (Impact rating = 0)
Condition Class 2: Minimal impact (Impact rating 1-3)
Condition Class 3: Moderate impact (Impact rating 4-6)
Condition Class 4: High impact (Impact rating 7-9)
Condition Class 5: Very high impact (Impact rating 10-12)
Condition Class 6: Extreme impact (Impact rating 13-15)

37. Describe changes/new human impacts since last visit:

RIVER-RELATED HUMAN IMPACTS

38. How close is the nearest rivercamp to this site?
1=>1 km; 2=<1 km but >500 m; 3=<500 m but >100 m; 4=<100 m ___

39. Are any of the human impacts directly related to river fluctuations and/or dam operations? 0=no, 1=yes ___
If yes, indicate with a '1' any that apply)
(a) development of new trailing to avoid highwater ___
(b) availability of new beaches in proximity to site ___
(c) other: ___
_____

40. Any human impacts directly related to recent recording/monitoring activities? 0=no, 1=yes ___

If yes, indicate with a '1' any that apply
(a) development of new trails ___
(b) damage to cryptogamic crust ___
(c) other: ___
_____

MANAGEMENT ASSESSMENT AND RECOMMENDATION

41. What types of impacts threaten this site? (i.e. what to watch out for)
Rank each threat according to the criteria listed below:

0: Not a threat now or in the foreseeable future
1: Possible threat
3: Definite threat
5: Actively occurring at the present time

a) bank slumpage from river/dam related processes ___
b) development of new gullies and/or headward migration of arroyos due to river/dam related base level lowering ___
c) bank slumpage from non-river related processes ___
d) deepening/widening of arroyos from non-river related natural processes (i.e. side canyon flooding) ___
e) exposure/destabilization of features due to a or b ___
f) exposure/destabilization of features due to c, d, or weathering ___
g) exposure/destabilization of features due to visitation ___
h) impacts from human visitation (other than g) ___
i) burial or exposure of features due to dune migration ___
j) other _____ ___

42. Recommended Actions: 0=never/not necessary or applicable; 1=eventually (>3 years from now); 2=soon (within 1-3 years) 3=immediately (within 1 year/less if possible); 4=action currently in progress

Discontinue monitoring	___
Monitor visitation with remote sensing devices	___
Monitor erosion with stationary cameras	___
Retrail or define existing trails	___
Obliterate trails	___
Install check dams	___
Plant vegetation to stabilize site surface	___
Stabilize banks with rock armor or similar technique	___
Stabilize structures	___
Surface collect entire site	___
Test for presence/depth of subsurface cultural deposits	___
Map as a form of data recovery (excavation not warranted)	___
Full data recovery (excavation)	___
Close site to all public visitation	___
Develop for public interpretation	___

43. Justify your recommendation:

44. Ranking - See MONITORING PRIORITY RANKING CRITERIA

Stability	___
Accessibility	___
Visibility	___
Natural Impacts	___
Human Visitation	___

45. What is the monitoring priority rank of this site. ___

46. Has this value changed from previous visit? 0=no, 1=yes ___
If yes, explain below.

47. Additional comments/continuations

Monitoring Priority Scores

Circle one value within each category:

Stability

1 Stable—no exposed fragile features such as rock art, standing masonry, middens, etc.

2 Moderately stable—fragile features present but not deteriorating (protected by overhang, etc.)

3 Moderately unstable—fragile features present with definite potential for deterioration

4 Unstable—fragile features exposed and deteriorating

Accessibility

1 Protected—located more than 1 km from road/trail/camp or difficult access (technical climbing)

2 Moderately protected—located 1 to 1/2 km from road/trail/camp with moderate to difficult access (exposure)

3 Moderately unprotected—located 1 to 1/2 km from road/trail/camp with easy access, or 500-100 m with moderately difficult access (exposure but no technical climbing)

4 Unprotected—located less than 100 m from road/trail/camp with easy access

Visibility

1 Low profile—site difficult to recognize, few or no artifacts, subtle features

2 Moderately low profile—site not readily apparent, sparse scattered artifacts, features not obvious

3 Moderately high profile—site is easily recognized from close proximity, abundant surface artifacts, features obvious

4 High profile—site sticks out, attracts attention from a distance, lots of artifacts, well-defined features

Natural Impacts

1 None—natural impact score (Method 1) equals 0

2 Slight—natural impact score equals 1

3 Moderate—natural impact score equals 2-3

4 High—natural impact score > 4

Human Impacts/Visitation

1 None—human impact condition class equals 1 (no impact)

2 Slight—human impact condition class equals 2 (minimal)

3 Moderate—human impact condition class equals 3

4 High—human impact condition class equals 4 or more

Rank	Total Score	
1	20-17	Sites with these scores require monitoring biannually or quarterly; high priority
2	16-13	Sites with these scores require at least annual monitoring; second-highest priority
3	12-9	Sites with these scores require a longer monitoring cycle, perhaps every 2 to 3 years
4	8-5	Sites with these scores should be monitored every 3-5 years; lowest priority

Appendix II

1992 MONITOR DATA

SECTION I: RAW DATA

Eighty-one sites were monitored in 1992. Two sites (B:16:262 and C:13:371) were monitored twice, for a total of 83 monitoring episodes. The breakdown by session is as follows:

Session	No. of Sites Monitored
92-1	34
92-2	25
92-3	24

The following summary analysis covers most of the variables from the 1992 Archaeological River Site Monitoring Form. The form was five pages long, with a total of 124 variables entered into a customized Dbase III database file. The first page, containing locational and environmental data, will not be summarized here.

Variables were grouped into *Natural Impacts, Human Impacts, River-Related Human Impacts,* and *Management Assessment and Recommendation.* These categories are listed below, followed by the corresponding questions from the monitor form. In parentheses are the database field number and field name for reference. The values of the variable, frequencies, and percentages are in columnar form.

Natural Impacts

Q. 19. Evidence of surficial sheet washing? (Field No. 35, SURFSHEWAS)

Values	Frequency	Percent
0 = none	36	43
1 = minor	13	16
2 = moderate	16	19
3 = extensive	18	22

Q. 20. Evidence of gullying? (Field No. 36, GULLY)

Values	Frequency	Percent
0 = none	33	40
1 = minor	13	16
2 = moderate	30	36
3 = extensive	7	8

Q. 21. Active arroyo cutting? (Field No. 37, ARROYO)

Values	Frequency	Percent
0 = none	49	60
1 = minor	7	8
2 = moderate	16	19
3 = extensive	11	13

Q. 22. Evidence of animal-caused erosion? Sum of items below. (Field No. 44, ANIMALTRAM). Values can range from 0 to 12.

Values	Frequency	Percent
0	46	56
1	17	21
2	6	7
3	6	7
4	5	6
5	2	2
6	1	1

a. general trampling (Field No. 45, TRAMP)

Values	Frequency	Percent
0 = none	26	31
1 = minor	9	11
2 = moderate	4	5
3 = extensive	0	0
. = missing data	44	53

b. trailing through site (Field No. 46, TRAILING)

Values	Frequency	Percent
0 = none	13	16
1 = minor	22	26
2 = moderate	3	4
3 = extensive	2	2
. = missing data	43	52

c. burrowing (Field No. 47, BURROW)

Values	Frequency	Percent
0 = none	26	31
1 = minor	10	12
2 = moderate	4	5
3 = extensive	0	0
. = missing data	43	52

d.1. other (Field No. 48, ANIM_YN)

Values	Frequency	Percent
0 = none	32	38
1 = minor	4	5
2 = moderate	4	5
3 = extensive	0	0
. = missing data	43	52

d.2. other (open-ended, Field No. 49, O_ANIMAL). There were responses for nine sites:

Site	Comment
A:15:042	Past (not recent) burro presence and packrats.
A:16:159	Coyote dung/trail
B:09:316	Ant lions in sand/ants
B:10:224	Grazing area
B:13:002	Trailing by sheep & coyote
B:14:108	Evidence of burros (dung)
B:16:262	Fish disturbance
G:03:061	Owl, cat, coyote dung
G:03:082	Pack rats

Q. 23. Evidence of other erosion? Sum of items below. (Field No. 38, EROSION)
Values can range from 0 to 12.

Values	Frequency	Percent
0	16	19
1	16	19
2	9	11
3	14	17
4	9	11
5	11	13
6	8	10

a. wind deflation (Field No. 39, WIND)

Values	Frequency	Percent
0 = none	31	37
1 = minor	16	19
2 = moderate	17	21
3 = extensive	4	5
. = missing data	15	18

b. bank slumpage (Field No. 40, BANK)

Values	Frequency	Percent
0 = none	39	47
1 = minor	13	16
2 = moderate	12	14
3 = extensive	4	5
. = missing data	15	18

c. dune migration (Field No. 41, DUNE)

Values	Frequency	Percent
0 = none	37	45
1 = minor	11	13
2 = moderate	12	14
3 = extensive	8	10
. = missing data	15	18

d.1. other (Field No. 42, EROS_YN)

Values	Frequency	Percent
0 = none	40	48
1 = minor	14	17
2 = moderate	5	6
3 = extensive	9	11
. = missing data	15	18

d.2. other (open-ended, Field No. 43, O_EROS). There were responses for 27 sites:

Site	Comment
A:15:040	Spall
A:15:042	Spalling from cliff face
A:16:158	Spall
A:16:159	Spalling from cliff face
A:16:162	Wall fall and spall
B:09:316	High water and cliff spall
B:10:227	Runoff from cliff face
B:13:002	Cliff spall, colluvial creep
B:14:108	Spalling/gravity
B:15:001	Colluvial decrepitude
B:15:120	Prickly pear
B:15:124	Eventual surficial weathering
B:15:131	Spall and flood
B:16:365	Spall
B:16:262	River hydraulics
C:05:004	Cave spalling, high water inundation
C:06:002	High water flood zone scars
C:06:004	High water inundation at 40,000 cfs
C:13:329	Spall and runoff at Feature 1
C:13:347	Extensive root disturbance
C:13:350	Localized runoff is less than 6 cm deep
C:13:354	Cliff spall and high water
C:13:381	Roots
G:03:027	Side canyon flooding
G:03:042	Exfoliation of surface
G:03:061	Cliff spalling
G:03:082	Mass wasting, spalling

Q. 24. Total Natural Impact: First Method (Field No. 50, FSTNATIM)
Values can range from 0 to 5.

Values	Frequency	Percent
0	6	7
1	10	12
2	19	23
3	18	22
4	17	20
5	13	16

Q. 25. Total Natural Impact: Second Method (Field No. 51, SECNATIM)
Values can range from 0 to 33.

Values	Frequency	Percent
0	6	7
1	4	5
2	5	6
3	9	11
4	3	4
5	4	5
6	6	7
7	4	5
8	10	12
9	10	12
10	5	6
11	5	6
12	6	7
13	1	1
14	3	4
15	2	2

Q. 26. Characterize the stability of the site. (Field No. 52, STABILITY)

Values	Frequency	Percent
0 = stable	22	27
1 = incipient erosion	31	37
2 = active erosion	30	36

Q. 27. Do any of the above impacts appear to be related to river/dam operation?
(Field No. 53, DAM_OPS)

Values	Frequency	Percent
0 = no	46	55
1 = yes	37	45

Indicate with a "1" any that apply:

a. direct inundation within past 30 years, post-dam. (Field No. 54, POST_DAM)

Values	Frequency	Percent
0 = no	29	35
1 = yes	8	10
. = missing data	46	55

b. bank slumpage/steepening adjacent to current highwater zone (Field No. 55, SLUMPAGE)

Values	Frequency	Percent
0 = no	21	25
1 = yes	16	19
. = missing data	46	56

c. headward migration of arroyos due to lowered base level (Field No. 56, MIGRATION)

Values	Frequency	Percent
0 = no	18	22
1 = yes	19	23
. = missing data	46	55

d.1. other (Field No. 58, OTH_IMPT)

Values	Frequency	Percent
0 = no	30	36
1 = yes	7	8
. = missing data	46	56

d.2. other (open-ended, Field No. 57, IMPACTS)

There were responses for seven sites:

Site	Comment
A:16:159	Undercutting of ledge
A:16:162	Inundation over 30 yrs. ago
B:09:316	High water, pre-dam flooding
B:14:108	Possible increased spall due to high water eddy
C:05:004	Increased visitation, pre-dam flooding
C:06:002	Boat paint scar from high water visit
G:03:042	Pre-dam high water

Q. 28. If arroyos or gullies are present, do they drain all the way to the river? Note: Some drainages die out in dune fields or on terraces before reaching the river. (Field No. 59, DRAIN)

Values	Frequency	Percent
0 = no	16	19
1 = yes	51	62
2 = N/A	15	18
. = missing data	1	1

Q. 29. Comments: Explain/describe river-related impacts in more detail; any new features or structures exposed by erosion; changes in types or degree of erosion; imminent threats; what to look at on next visit, etc. (Field 25, IMP_COM)

There were comments for 66 sites. See the attached sheet.

Human Impacts

Q. 30.A. Collection piles. (Field No. 60, COLLTPILES)

Values	Frequency	Percent
0 = none	78	94
1 = 1 pile	2	2
2 = > 1 pile	3	4

B. If more than one pile list total number. (Field No. 61, COL_NUM) Values range from 2 upward.

Values	Frequency	Percent
1	1	1
2	1	1
3	1	1
15	1	1
. = missing data	79	96

[Note: this question was answered incorrectly. Two sites had one collection pile according to part A.]

Q. 31. Trails. (Field No. 62, TRAILS)

Values	Frequency	Percent
0 = none	50	60
2 = 1-2 trails	32	39
4 = > 2 trails	1	1

Q. 32. Trails eroded >5 cm below ground level? (Field No. 63, TRAILSNUMB)

Values	Frequency	Percent
0 = no	66	80
1 = yes	17	20

Q. 33. Evidence of on-site camping? (Field No. 64, CAMPONSITE)

Values	Frequency	Percent
0 = none	71	86
2 = minimal (1 of the below)	7	8
4 = considerable (2 or more)	5	6

Indicate with a "1" what kinds of evidence are present.

a. fire scars, fire pits, recent charcoal. (Field No. 65, EVIDFIRESC)

Values	Frequency	Percent
0 = no	10	12
1 = yes	4	5
. = missing data	69	83

b. rearrangement/clearing of rocks (Field No. 66, REARANROCK)

Values	Frequency	Percent
0 = no	6	7
1 = yes	8	10
. = missing data	69	83

c. recent camper trash (Field No. 67, TRASH)

Values	Frequency	Percent
0 = no	10	12
1 = yes	4	5
. = missing data	69	83

d. obvious concentrated soil compaction, i.e. tent site (Field No. 68, SOILCOMP)

Values	Frequency	Percent
0 = no	8	10
1 = yes	6	7
. = missing data	69	83

e. other (open-ended, Field No. 69, OTHER). There were responses for four sites:

Site	Comment
B:15:124	Historic pictographs
C:02:094	Scratched graffiti
C:06:008	Recent camp is the "site"
C:13:374	Graffiti

Does this evidence appear to be recent, < 5 yrs. old? (Field No. 70, EVIDRECENT)

Values	Frequency	Percent
0 = no	2	2
1 = yes	7	8
. = missing data	74	90

Did evidence appear since last visit? (Field No. 71, LASTVISIT)

Values	Frequency	Percent
0 = no	6	7
1 = yes	3	4
. = missing data	74	89

Q. 34. Evidence of deliberate vandalism? (Field No. 72, VANDALISM)

Values	Frequency	Percent
0 = none	81	98
1 = surficial disturb. only, i.e. graffiti	2	2
2 = slight amount of subsurface, < 1 m^2 excavated	0	0
3 = substantial subsurface, > 1 m^2 excavated	0	0

Does this evidence appear to be recent, < 5 yrs. old? (Field No. 73, RECVANDAL)

Values	Frequency	Percent
0 = no	2	2
1 = yes	1	1
. = missing data	80	97

Did evidence appear since last visit? (Field No. 74, VANDAL)

Values	Frequency	Percent
0 = no	2	2
1 = yes	1	1
. = missing data	80	97

Q. 35.A. Any other evidence of visitation other than above, such as obvious erosion/compaction from human trampling, scattered surface trash, etc? (Field No. 75, EROSCOMP)

Values	Frequency	Percent
0 = no	60	72
1 = yes	23	28

If yes, describe. (open-ended, Field No. 76, EROSDESC). There were no responses to this question.

Q. 35.B. Total Human Impact Rating (Field No. 77, TOTHUMIN)

Values	Frequency	Percent
0	38	46
1	9	11
2	8	10
3	13	16
4	7	8
5	2	2
6	3	4
8	2	2
9	1	1

Q. 36. Human Impact Condition Class. See rating system below. (Field No. 78, HUMIMPACT)

Values	Frequency	Percent
1 = none (0)	40	48
2 = minimal (1-3)	25	30
3 = moderate (4-6)	13	16
4 = high (7-9)	3	4
5 = very high (10-12)	0	0
6 = extreme (13-15)	0	0
. = missing data	2	2

Q. 37. Describe changes/new human impacts since last visit (open-ended, Field No. 27, IMIN_THREA)There were responses for 29 sites:

Site	Description of Changes
A:16:004	There has been recent trailing and compacting of trails when wet. The trails lead to and from ledge overhangs and around roasting features.
A:16:159	During a March visit, camper trash (coffee mug and pair of underwear) were found on the site.
A:16:175	Archaeologist trails, trampling in and around the site.
B:10:227	This site was visited by Park Service employees anda Dept. of the Interior trip. There was trampling and movement of artifacts.
B:11:282	Archaeologists walking on cryptogamic soil.
B:15:120	Chopper skid impression on surface.
B:16:262	The trails are a part of the site. USGS and NPS employees use the trail to access the station.
C:02:092	There is recent trash (cans) below the site. One rock has been flipped over next to the incipient grinding slabs (see duplicate photo).
C:02:094	More camper trash (fish hooks, cans). The fire pits are still in use. New names are scratched on Coconino sandstone including "Max 8/92" and "Danny Ray Horning."
C:05:004	Despite the low human impact score, this site receives high visitation and has been heavily impacted. It is a common stop on boat trips because of the cache of historic artifacts.
C:05:031	There is recent visitation evidenced by women's underwear in arroyo, but no evidence of on-site camping. One sherd cannot be located, but it may have washed away in the arroyo.
C:05:037	There are more hikers, camper trash, and an arranged pile of rocks. The rock pile was removed.
C:06:002	Despite the low human impact rating, impact from visitation is evidenced by boat paint on the inscription. This impact appears to be recent, within the last seven or eight years.
C:06:006	A rock alignment about 3 m. long, dry laid, and up to two courses of naturally-shaped boulders (perpendicular to the main slope) was observed. This was added to the site map on 9/4/92.
C:09:069	Trails have been revegetated and obliterated.
C:09:088	No new changes. There appears to be more visitation on the left bank than the right. A well-developed trail runs from L1 to L3. There is a very faint trail on the right bank that connects with Feature 6 and runs to Feature 10.
C:13:008	The metate next to Feature 2 has been rotated 90 degrees.
C:13:100	At Feature 4 the rocks have moved and there appears to be more wood. At Features 5 and 6 some rocks appear to have moved down the drainage. A cobble tool has moved down the same drainage.
C:13:131	There is evidence of more camping. Camping gear was observed left behind at the site.
C:13:272	Feature 5 at Locus B was tested for charcoal/depth in November, 1992. The surface was restored after testing to approximate original appearance.

Q. 37 (continued)

Site	Description of Changes
C:13:342	The enamelware was moved since the last visit by a boatman or researcher. This was just a slight move.
C:13:365	No change. The trail next to Feature 3 has grown over somewhat but is still distinctly visible.
C:13:371	The foot trails are still faint at this point and probably are left over from the original recording.
C:13:381	Backpackers may have caused some rearrangement of rocks.
C:13:384	Additional sections of the arroyo wall were cut back in November 1992. Nails were put in to mark locations of C-14 samples.
G:03:020	Only the recorders' footprints were noted on the dunes and along Feature 2.
G:03:026	There are no new impacts. The site looks good. The local sheep herd is contributing most to the demise of the site compared to humans or the river.
G:03:027	A more distinct trail is forming adjacent to the best of the mortars. Luckily this feature is nearly as indestructible as it is accessible.
G:03:066	A garbage bag of trash from someone's deteriorating food cache was removed.

River-Related Human Impacts

Q. 38. How close is the nearest river camp to this site? (Field No. 79, RIVER_CAMP)

Values	Frequency	Percent
1 = > 1 km	25	30
2 = < 1 km but > 500 m	16	19
3 = < 500 m but > 100 m	23	28
4 = < 100 m	17	21
. = missing data	2	2

Q. 39. Are any of the human impacts directly related to river fluctuations and/or dam operations? (Field No. 80, HRD_IMP)

Values	Frequency	Percent
0 = no	67	81
1 = yes	16	19

If yes, indicate with a "1" any that apply.

a. development of new trailing to avoid highwater (Field No. 81, NEW_TRAILS)

Values	Frequency	Percent
0 = no	15	18
1 = yes	1	1
. = missing data	67	81

b. availability of new beaches in proximity to site (Field No. 82, BEACHES)

Values	Frequency	Percent
0 = no	14	17
1 = yes	2	2
. = missing data	67	81

c.1. other (Field No. 84, OTH_RIV)

Values	Frequency	Percent
0 = no	1	1
1 = yes	14	17
. = missing data	68	82

c.2. other (open-ended, Field No. 83, 0_RIVER)
There were responses for 14 sites:

Site	Comment
A:15:042	Increased use and trail to Kolb inscription, Feature 2
B:15:120	Chopper landing
B:15:124	Availability of old beach
B:16:262	Worker's access to tower
B:16:365	Increased visitation
C:02:094	Sports fishing
C:05:004	Increased visitation
C:05:037	Increased use and awareness of site by visitors
C:06:002	High water level boat tie up
C:09:051	Increased use of the area
C:09:082	Increased use of the area
C:13:131	Demographics has led to increased use
G:03:027	Commercial boating trail
G:03:066	Maybe someone camped here in 1983, but not regularly

Management Assessment and Recommendation

Q. 41. What types of impacts threaten this site?
a. bank slumpage from river/dam related processes (Field No. 90, BANK_FAIL)

Values	Frequency	Percent
0 = not a threat	59	71
1 = possible threat	7	8
3 = definite threat	13	16
5 = actively occurring now	4	5

b. development of new gullies and/or headward migration of arroyos due to river/dam related base level lowering (Field No. 91, NEW_GULLY)

Values	Frequency	Percent
0 = not a threat	45	54
1 = possible threat	10	12
3 = definite threat	14	17
5 = actively occurring now	12	15
. = missing data	2	2

c. bank slumpage from non-river related processes (Field No. 92, FAILURES)

Values	Frequency	Percent
0 = not a threat	50	60
1 = possible threat	6	7
3 = definite threat	14	17
5 = actively occurring now	12	15
. = missing data	1	1

d. deepening/widening of arroyos from non-river related natural processes, side canyon flooding (Field No. 93, DW_ARROYO)

Values	Frequency	Percent
0 = not a threat	35	42
1 = possible threat	7	9
3 = definite threat	19	23
5 = actively occurring now	21	25
. = missing data	1	1

e. exposure/destabilization of features due to a or b (Field No. 94, ABCD)

Values	Frequency	Percent
0 = not a threat	34	41
1 = possible threat	6	7
3 = definite threat	25	30
5 = actively occurring now	18	22

f. exposure/destabilization of features due to c, d, or weathering (Field No. 95, WEATHERING)

Values	Frequency	Percent
0 = not a threat	10	12
1 = possible threat	10	12
3 = definite threat	39	47
5 = actively occurring now	20	25
. = missing data	4	4

g. exposure/destabilization of features due to visitation (Field No. 96, VISITATION)

Values	Frequency	Percent
0 = not a threat	45	54
1 = possible threat	5	6
3 = definite threat	23	28
5 = actively occurring now	7	8
. = missing data	3	4

h. impacts from human visitation, other than g (Field No. 97, IMP_HV)

Values	Frequency	Percent
0 = not a threat	38	46
1 = possible threat	8	10
3 = definite threat	22	27
5 = actively occurring now	11	13
2 = missing data	4	4

i. burial or exposure of features due to dune migration (Field No. 98, DUNE_MIGR)

Values	Frequency	Percent
0 = not a threat	49	59
1 = possible threat	7	9
3 = definite threat	21	25
5 = actively occurring now	4	5
. = missing data	2	2

j.1. other (Field No. 100, OTH_THRT)

Values	Frequency	Percent
0 = not a threat	63	76
1 = possible threat	1	1
3 = definite threat	16	20
5 = actively occurring now	2	2
. = missing data	1	1

j.2. other (open-ended, Field No. 99, O_THREAT)

There were responses for 18 sites:

Site	Comment
A:15:040	Spall
A:16:158	High water
A:16:159	Spall
A:16:162	Spalling and wall fall
B:09:316	Inundation from high water
B:10:224	Bighorn sheep trails/trampling
B:15:124	Recurrent high water over 60,000 cfs
B:15:131	High flooding
B:16:262	High sustained water flow with logs and debris
B:16:365	Mass wasting of granite
C:02:094	Spalling of cliff
C:05:004	High water inundation
C:06:002	Boat dock at high water
C:06:004	High water, active water, solutional weathering
C:13:342	Vegetation growth
C:13:354	Cliff spall
G:03:027	High water rearranging boulders
G:03:082	Mass wasting, pack rats

Q. 42. Recommended Actions

a. discontinue monitoring (Field No. 101, DISCONTU)

Values	Frequency	Percent
0 = never/not necessary or applicable	49	59
1 = eventually (> 3 yrs)	22	26
2 = soon (within 1-3 yrs)	4	5
3 = immediately (within 1 yr)	8	10
4 = currently in progress	0	0

b. monitor visitation with remote sensing devices (Field No. 102, REMOTE)

Values	Frequency	Percent
0 = never/not necessary or applicable	80	97
1 = eventually (> 3 yrs)	1	1
2 = soon (within 1-3 yrs)	2	2
3 = immediately (within 1 yr)	0	0
4 = currently in progress	0	0

c. monitor erosion with stationary cameras (Field No. 103, STATIONARY)

Values	Frequency	Percent
0 = never/not necessary or applicable	67	81
1 = eventually (> 3 yrs)	3	4
2 = soon (within 1-3 yrs)	3	4
3 = immediately (within 1 yr)	8	9
4 = currently in progress	2	2

d. retrail or define existing trails (Field No. 104, RETRAIL)

Values	Frequency	Percent
0 = never/not necessary or applicable	66	80
1 = eventually (> 3 yrs)	4	5
2 = soon (within 1-3 yrs)	8	9
3 = immediately (within 1 yr)	5	6
4 = currently in progress	0	0

e. obliterate trails (Field No. 105, OBLITERATE)

Values	Frequency	Percent
0 = never/not necessary or applicable	61	73
1 = eventually (> 3 yrs)	3	4
2 = soon (within 1-3 yrs)	8	10
3 = immediately (within 1 yr)	11	13
4 = currently in progress	0	0

f. install check dams (Field No. 106, INSTALL)

Values	Frequency	Percent
0 = never/not necessary or applicable	71	86
1 = eventually (> 3 yrs)	3	4
2 = soon (within 1-3 yrs)	7	8
3 = immediately (within 1 yr)	2	2
4 = currently in progress	0	0

g. plant vegetation to stabilize site surface (Field No. 107, PLANT)

Values	Frequency	Percent
0 = never/not necessary or applicable	71	86
1 = eventually (> 3 yrs)	3	4
2 = soon (within 1-3 yrs)	7	8
3 = immediately (within 1 yr)	2	2
4 = currently in progress	0	0

h. stabilize banks with rock armor or similar technique (Field No. 108, STAB_BANKS)

Values	Frequency	Percent
0 = never/not necessary or applicable	77	93
1 = eventually (> 3 yrs)	2	2
2 = soon (within 1-3 yrs)	3	4
3 = immediately (within 1 yr)	1	1
4 = currently in progress	0	0

i. stabilize structures (Field No. 109, STAB_STRUC)

Values	Frequency	Percent
0 = never/not necessary or applicable	73	88
1 = eventually (> 3 yrs)	4	4
2 = soon (within 1-3 yrs)	3	4
3 = immediately (within 1 yr)	3	4
4 = currently in progress	0	0

j. surface collect entire site (Field No. 110, SURFACE)

Values	Frequency	Percent
0 = never/not necessary or applicable	81	98
1 = eventually (> 3 yrs)	2	2
2 = soon (within 1-3 yrs)	0	0
3 = immediately (within 1 yr)	0	0
4 = currently in progress	0	0

k. test for presence/depth of subsurface cultural deposits (Field No. 111, TEST)

Values	Frequency	Percent
0 = never/not necessary or applicable	83	100
1 = eventually (> 3 yrs)	0	0
2 = soon (within 1-3 yrs)	0	0
3 = immediately (within 1 yr)	0	0
4 = currently in progress	0	0

l. map as a form of data recovery, excavation not warranted (Field No. 112, MAP)

Values	Frequency	Percent
0 = never/not necessary or applicable	77	93
1 = eventually (> 3 yrs)	3	4
2 = soon (within 1-3 yrs)	2	2
3 = immediately (within 1 yr)	1	1
4 = currently in progress	0	0

m. full data recovery, excavation (Field No. 113, FULL_DATA)

Values	Frequency	Percent
0 = never/not necessary or applicable	50	60
1 = eventually (> 3 yrs)	18	22
2 = soon (within 1-3 yrs)	8	10
3 = immediately (within 1 yr)	7	8
4 = currently in progress	0	0

n. close site to all public visitation (Field No. 114, CLOSE)

Values	Frequency	Percent
0 = never/not necessary or applicable	81	98
1 = eventually (> 3 yrs)	0	0
2 = soon (within 1-3 yrs)	0	0
3 = immediately (within 1 yr)	2	2
4 = currently in progress	0	0

o. develop for public interpretation (Field No. 115, INTERP)

Values	Frequency	Percent
0 = never/not necessary or applicable	61	73
1 = eventually (> 3 yrs)	12	15
2 = soon (within 1-3 yrs)	10	12
3 = immediately (within 1 yr)	0	0
4 = currently in progress	0	0

Q. 43. Justify your recommendation. (open-ended, Field No. 116, JUSTIFY)

There were comments for 79 sites.

Q. 44. Ranking. See Monitor Priority Ranking Criteria.

a. stability (Field No. 117, R_STABLTY)

Values	Frequency	Percent
1 = stable	15	18
2 = moderately stable	21	25
3 = moderately unstable	30	36
4 = unstable	17	21

b. accessibility (Field No. 118, R_ACCESS)

Values	Frequency	Percent
1 = protected	6	7
2 = moderately protected	22	27
3 = moderately unprotected	30	36
4 = unprotected	25	30

c. visibility (Field No. 119, R_VISIB)

Values	Frequency	Percent
1 = low profile	34	41
2 = moderately low profile	22	27
3 = moderately high profile	19	23
4 = high profile	8	9

d. natural impacts (Field No. 120, NAT_IMPCT)

Values	Frequency	Percent
1 = none	9	11
2 = slight	12	14
3 = moderate	33	40
4 = high	28	34
. = missing data	1	1

e. human visitation (Field No. 121, HUMAN_VIST)

Values	Frequency	Percent
1 = none	39	47
2 = slight	27	32
3 = moderate	14	17
4 = high	3	4

Q. 45. What is the monitoring priority rank of this site? (Field No. 122, TOTAL_RANK)

Values	Frequency	Percent
1 = biannual monitoring	4	5
2 = annual monitoring	45	53
3 = every 2-3 years	23	28
4 = every 3-5 years	11	14

Q. 46. Has this value changed from previous visit? (Field No. 123, VALUE)

Values	Frequency	Percent
0 = no	2	2
1 = yes	0	0
. = missing data	81	98

Q. 47. Additional comments/continuation (open-ended, Field No. 124, COMMENTS)
There were responses for nine sites:

Site	Comments
B:15:120	This site does not need to be monitored.
B:16:262	The natural impact score reflects the potential effect of high water floods.
C:02:092	This site needs to be mapped in more detail to show location of artifacts, etc.
C:02:094	This was the first monitoring of the site.
C:06:002	This site does have a high profile. Every guide on the river knows its location.
C:13:333	Site was not previously ranked.
C:13:347	This site has a high level of active erosion. Considering its location and condition it should be monitored annually.
C:13:354	Even though the rank of this site is 3, it warrants annual monitoring due to the nature of Feature 1. Access from the boat is easy.
C:13:365	The cultural origin of Feature 1 and associated groundstone items is highly questionable (it looks natural). However, there are a couple of chert flakes nearby that are clearly artifacts.

SECTION II: CONDENSED SUMMARY

In this section, data are reduced to presence/absence variables and graphed for easy visual interpretation. It is my opinion that the ordinal-scaled variables on the 1992 Monitor Form are not reliable, but that we can reduce the responses to nominal presence/absence categories with greater reliability. I have more confidence in archaeologists agreeing whether gullies are present or absent than I do in their consistency in discerning the degree of gullying (minor, moderate, extensive). What seems minor to one archaeologist may seem moderate to another and hence the replicability of our data are in question.

Several questions on the 1992 Monitor Form turned out to be pretty useless in the sense that they are too difficult to interpret. Those questions are not included in this section (Question Nos. 24 and 25—Natural Impact Scoring Methods, and Nos. 35 and 3—Human Impact Scores).

Natural Impacts

Q. 19. Surficial Sheet Washing: 57% present, 43% absent.

Q. 20. Gullying: 60% present, 40% absent.

Q. 21. Arroyo Cutting: 40% present, 60% absent.

Q. 22. Animal-Caused Erosion: 44% present, 56% absent. Trailing was the most common type of animal-caused erosion.

Q. 23. Other Erosion: 81% present, 19% absent. Wind deflation was the most common type of other erosion.

Q. 26. Site Stability: 27% stable, 37% incipient erosion, 36% active erosion.

Q. 27. Are Impacts Related to River? 55% no, 45% yes.
Direct Impacts:
a. direct inundation at 8 sites.
b. bank slumpage at 16 sites.
c. headward migration of arroyos at 19 sites.

Q. 28. Do arroyos/gullies drain all the way to the river? 19% no, 62% yes.

Human Impacts

Q. 30. Collection piles: 6% present, 94% absent.

Q. 31. Trails: 40% present, 60% absent.

Q. 33. On-Site Camping: 14% present, 86% absent. Rearrangement/clearing of rocks was the most common evidence.

Q. 34. Vandalism: 2% present, 98% absent.

River-Related Human Impacts

Q. 38. How close is the nearest river camp to this site?
49% had camps 500 meters or less from the site.
49% had camps more than 500 meters from the site.
2% had missing data.

Q. 39. Are human impacts directly related to river fluctuations and/or dam operations? 19% yes, 81% no. Increased visitation is the most common reason.

[Note: I don't think we should interpret these results at face value. It is my opinion that the mere presence of the dam and hence the increase in river rafting as a form of recreation have contributed to increased site visitation—not river fluctuation or the direct operations of the dam.]

Management Assessment and Recommendation

Some of the responses here seem to contradict answers given earlier. Take a close look at this.

Q. 41. What types of impacts threaten this site?

a. Bank slumpage from river/dam related processes? 71% not a threat, 29% is a threat.

b. Development of new gullies and/or headward migration of arroyos due to river/dam related base level lowering? 54% not a threat, 44% is a threat, 2% missing data.

c. Bank slumpage from non-river related processes? 60% not a threat, 39% is a threat, 1% missing data.

d. Deepening/widening of arroyos from non-river related natural processes, side canyon flooding? 42% not a threat, 57% is a threat, 1% missing data.

e. Exposure/destabilization of features due to a or b? 41% not a threat, 59% is a threat.

f. Exposure/destabilization of features due to c, d, or weathering? 12% not a threat, 84% is a threat, 4% missing data.

g. Exposure/destabilization of features due to visitation? 54% not a threat, 42% is a threat, 4% missing data.

h. Impacts from human visitation, other than g? 46% not a threat, 50% is a threat, 4% missing data.

i. Burial or exposure of features due to dune migration? 59% not a threat, 39% is a threat, 2% missing data.

Q. 42. Recommended Actions

Q. 44. Ranking.

a. Stability
43% stable, 57% unstable.

b. Accessibility
34% protected, 66% unprotected.

c. Visibility
68% low profile, 32% high profile.

d. Natural Impacts
25% none or slight, 74% moderate or high, 1% missing data.

e. Human Visitation
79% none or slight, 21% moderate or high

Q. 45. Monitor Priority Ranking