The Grand Canyon River Corridor Survey Project: Archaeological Survey along the Colorado River between Glen Canyon Dam and Separation Canyon

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Peter W. Bungart
Christopher M. Coder
Jim Huffman
Terry L. Samples
Janet R. Balsom

Cooperative Agreement No. 9AA-40-07920

Prepared in Cooperation with the Glen Canyon Environmental Studies

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by

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Submitted by
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Preface

The archaeology of the Grand Canyon—much has been written on the subject, yet the more research we conduct, the more we realize how limited our view has been. For more than 100 years, Anglo-Americans have recognized the archaeological resources of the Colorado River corridor within the Grand Canyon. Initially, John Wesley Powell noted "moqui" ruins along the banks of the river in 1869. Although not described in a scientific manner, the ruins he noted were the remains of houses inhabited by the ancestors of the Pueblo people he had visited on the mesas nearby. In 1889, Robert Brewer Stanton photographed some of these same dwellings as a side-note to his quest to construct a railroad along the mighty Colorado. These initial findings of prehistoric remains set the backdrop for the work to follow.

In 1953, the first professional archaeologist ventured down the Colorado as part of a scientific outing sponsored by the Museum of Northern Arizona. In a quick trip down the river, Walter Taylor found a dozen or so dwelling sites, primarily identified as Puebloan in origin. When the trip was over, there was little prospect in his mind of finding more evidence of occupation along the river corridor. In the early 1960s, Robert Euler began his work to locate sites along the river which would be lost due to the construction of a dam planned for Marble Canyon. He located more than 100 sites in the river corridor, providing important information concerning the use of the river corridor by prehistoric peoples. He found evidence not only of Puebloan ancestry, but also Pai and Paiute. As with the work done by Euler, important work was conducted by Douglas Schwartz which expanded our knowledge of the archaeology of the Grand Canyon and provided the first information derived from the excavation of open sites along the river in Grand Canyon.

It was not until 1983 that common threads began to emerge from all of the above work that suggested the possibility of additional sites along the river corridor. There were sites eroding from the sand, a kiva flooded during occupation of a site, and driftwood stratigraphically placed above cultural remains. These facts provided some important clues to site location along the river, clues that had yet to be explored.

The first clear water flood from Glen Canyon Dam occurred in July 1983, an event which heralded a change in the way the dam was operated. Shortly after the flood, Grand Canyon National Park (GRCA) archaeologists discovered a large village site eroding from the sand dunes in an area that had previously contained no indication of buried remains. Other sites, too, exhibited erosion and with it increasing evidence of more sites buried in pre-dam flood deposits.

The Bureau of Reclamation (Reclamation) had begun the Glen Canyon Environmental Studies (GCES) to evaluate the effects of dam operations on the downstream resources of Glen and Grand canyons in 1982. The studies were directed at natural resources, notably sediment, hydrology, and fish. Cultural resources were not included in the initial studies. The prevailing theory of site location was that people did not live in the flood plain; therefore, archaeological remains would not be affected by dam operations.

What about the erosion which began to be documented after the 1983 flood? After six years of documenting continuing erosion, a pilot study was funded to examine the cause of the erosion and determine if there was a connection to the dam. At the same time, Reclamation, through the Secretary of Interior, was ordered to complete an environmental impact statement (EIS) on the operation of Glen Canyon Dam. The EIS and the results of the pilot study provided the impetus for the 100% inventory of the river corridor.

The survey design was based upon knowledge of the environment, archaeological remains, geomorphology, and physical limitations of people working in a harsh land. The crew was hardworking, toughing out eight months of extreme conditions and topography to accomplish a pedestrian survey of the river corridor which had never before been attempted. Previous work along the river was primarily supported by helicopter. This time, the survey would be ground based with river raft support.

The river guides who provided the transportation did an excellent job of insuring safety during the project and assisting when possible with the research. The cook kept spirits high; everyone was well fed throughout the project. A well-deserved thanks goes to all of the field personnel.

Behind the scenes, National Park Service, Northern Arizona University, and Reclamation support staff did what was needed to accomplish the task. Special thanks go to Peter Rowlands, initially Chief, Division of Resources Management at GRCA, and later Research Scientist with the Colorado Plateau Research Station, for his support of the initial pilot study and the inventory survey. Thanks also to former GRCA Superintendent Jack Davis for initially supporting the

archaeological studies to the Executive Review Committee and later to the cooperating agencies. Former Northern Arizona University Anthropology Laboratory Director Shirley Powell provided the academic setting where the field and lab work took place. Reclamation support for the project came from former Upper Colorado Regional Archaeologist Wayne Prokopetz and GCES Manager Dave Wegner. A heartfelt thanks is extended to all for the help and encouragement you provided.

Additional review and guidance was provided by the Arizona State Preservation Officer, Shereen Lerner and her staff, and staff archaeologist Alan Stanfill of the Advisory Council on Historic Preservation. Tribal review and comment was provided from the onset of this project from the cultural resources offices of the Hopi and Hualapai tribes, and the Navajo Nation. Additional guidance and comment was received from the Pueblo of Zuni, the Southern Paiute Consortium, and the San Juan Southern Paiute Tribe after the field work was completed. Thank you for the time spent on review and providing comments which were incorporated into this report.

We were asked to complete the field work and report in much less time than would typically be allotted to a project of this complexity. The EIS had a deadline, and the archaeological survey needed to be completed for inclusion in the development and evaluation of alternatives for dam operations. Many were skeptical that the National Park Service could complete the task on schedule and within the parameters required by Reclamation for the EIS. The crew was up to the challenge, completing the field work one day ahead of schedule and producing the draft report only seven months after field work was completed. The draft report was one of the first completed as part of GCES Phase II.

This report is the culmination of many people's hard work and dedication to the Grand Canyon and the Colorado River. We hope we have done justice to all the canyon has taught us and look forward to the lessons still to come.

Janet R. Balsom
Park Archaeologist
Grand Canyon National Park

Chapter 1
Introduction

Between August 30, 1990 and May 10, 1991, an archaeological inventory was completed along a 255-mile-long segment of the Colorado River corridor from the base of Glen Canyon Dam to Separation Canyon. This survey was undertaken by the National Park Service (NPS) in Grand Canyon National Park (GRCA) and Glen Canyon National Recreation Area (GLCA) to provide baseline cultural resource information to the Bureau of Reclamation (BOR) for inclusion in the Glen Canyon Dam Environmental Impact Statement (GCD-EIS). This Class I (100% intensive) archaeological inventory gathered basic information on the numbers, types, location, National Register eligibility, and physical condition of all cultural resources within the area that have been or potentially could be affected by the operations of Glen Canyon Dam. The Grand Canyon River Corridor Survey (GCRCS) (including the survey of the 15-mile stretch of Glen Canyon below the dam) was carried out by NPS-GRCA archaeologists, working in cooperation with archaeological staff from the Department of Anthropology at Northern Arizona University (NAU), Flagstaff.

Overview

Until 1985, it was generally thought that cultural resources were not affected by the operation of Glen Canyon Dam and the flowing of the river through Grand Canyon. For years it had been presumed that prehistoric remains would not be found below the historic high-water mark for two reasons: first, the belief that prehistoric people were cognizant of the river's flood potential and would therefore build above the floodplain; and second, the assumption that any remains that were close to the river would have been washed away over the thousands of years since occupation. In recent years, however, several sites that exhibited evidence of direct and indirect river effects were recorded below the historic high-water zone of the river (Balsom 1989).

In October of 1989, GRCA, in conjunction with the United States Geological Survey (USGS), conducted a pilot research project to evaluate archaeological site erosion at one site along the Colorado River (Balsom et al. 1989). Analysis of the information from the project suggested that the operation of Glen Canyon Dam might be a contributing factor to ongoing site erosion, not only at the study site but at numerous other sites in the canyon. Because of the possible connection between site erosion and the operation of the dam, further evaluation of impacts to cultural resources located along the river was warranted as part of the EIS process.

Although Section 110 of the National Historic Preservation Act (NHPA) and other federal legislation (e.g., Executive Order 11593, 1971; NHPA, as amended in 1992, and the Archaeological Resources Protection Act of 1979 as amended by PL-100-535) mandate that all federal lands have complete archaeological inventories, most land-managing agencies do not have adequate funding to accomplish the task. Hence, surveys are done on an "as needed" basis, usually only in areas slated to be involved in a federal undertaking. Prior to the work reported here, the only portion of the project area to be examined in a systematic manner was the 15-mile stretch between Glen Canyon Dam and Lees Ferry (Geib 1990); the directive given to the BOR to prepare an EIS for the operation of Glen Canyon Dam required the initiation of a complete cultural sites inventory for the entire river corridor downstream of Glen Canyon Dam.

Objectives

The primary objective of the survey was to provide an inventory of all cultural resources located within the Colorado River corridor affected by the operation of Glen Canyon Dam. Specific objectives were stated as follows (Balsom and Fairley 1990):

1. Provide an inventory of all sites located within the affected environment of the river corridor.
2. Evaluate site condition and impacts as they relate to the environmental situation created by Glen Canyon Dam.
3. Identify site settings that would provide information for further study as to the problems of site erosion and sedimentation.
4. Evaluate site significance and eligibility for inclusion on the National Register of Historic Places.
5. Provide management recommendations for river flow regimes for Glen Canyon Dam.

Affected Environment

The Colorado River environment is unique and diverse. Elevational and geological variability in the 255-mile stretch produces variations in vegetation and topography from Glen Canyon Dam, at an elevation of 3107 feet above sea level, to the end of the free-flowing river at Separation Canyon at 1240 feet above sea level. Archaeological field methods were specifically designed to meet the unique environmental conditions of Grand Canyon.

Usually, a linear survey involves the examination of a set corridor width along the entire length of the project. Designation of a standard width corridor was impractical for this survey project, however, because the area affected by historic river flows varies considerably along the length of the river depending on local topographic factors. For example, in the Palisades/Tanner area (miles 65-69), historic river-deposited terraces extend more than 200 m back from the edge of the main river channel, whereas in the Upper Granite Gorge (miles 77.4–117.8), broad terraces are absent and sheer canyon walls confine the river to a much narrower corridor.

For the purposes of this survey, the project area was broadly defined as the 255-mile stretch of river corridor between Glen Canyon Dam (mile +15) and Separation Canyon (mile 239.4), including all areas up to the estimated 300,000 cubic feet per second (cfs) level and all sand-covered areas above that level. The affected zone includes all riverine environments, especially those that contain river-derived sediments, whether alluvial, fluvial, or eolian. This zone encompasses the present beach up to and including the farthest extent of the old high-water zone marked by high dunes and mesquite. All flood terraces and eolian sand areas are included. The eolian sand areas are often above the historic high-water zone but contain sediments that were ultimately derived from the river. All areas that contained sediment originally derived from the river were included within the project area boundaries.

In the original research design, the river corridor was divided into management units or "reaches" (Balsom and Fairley 1990:5). These reaches were assigned a priority rating based on logistical considerations, archaeological erosion potential, and suitability for study of the sedimentology and geomorphology (Balsom and Fairley 1990:8 and Figure 1). After initiating the fieldwork, it became clear that logistical factors related to moving the archaeological crews through the canyon in mid-winter precluded strict adherence to this plan. Subsequently, the team of researchers involved in the preparation of the GCD-EIS determined that all GCES Phase II researchers should relate their studies to a standardized system of reaches loosely based on the geomorphological breakdown developed by Schmidt and Graf (1988:8). All references to "reaches" in this report follow this new system (Figure 1 and Table 1).

It should be noted that the river miles in this report correspond to the mileage system used in the Belknap (1989) river guide rather than the mileages shown in the currently popular Stevens (1983) guide. This distinction is important because the two guides use different reference points for river mile 0. The Belknap guide starts at the Lees Ferry launch ramp, whereas Stevens's guide correctly places the zero point at the Lees Ferry gaging station a short distance downstream. The Belknap guide was selected over the Stevens guide as the primary reference for this project because site locations could be more accurately plotted on Belknap's detailed topographic maps. A drawback of the Belknap guide is that it does not cover the river upstream from Lees Ferry. Sites in Reach 0 were referenced to mile points on a newly published map of lower Glen Canyon (English 1990). Like the Belknap guide, this map is a compilation of USGS 7.5 minute topographic maps, and river mile 0 is located at the Lees Ferry launch ramp.

Staffing

Staffing requirements for this project were jointly managed through GRCA and the Cooperative Park Study Unit (CPSU) at NAU. The fieldwork was coordinated by Helen Fairley, GRCA Project Archaeologist, who reported to Janet Balsom, GRCA Park Archaeologist. All supervisory staff members, including the project field director, three crew chiefs (P. Bungart, C. Coder, and T. Samples), and the lab director, were NPS employees, while non-supervisory positions were filled by NAU employees. Jim Huffman, the NPS laboratory director, managed the analysis and data base operations at the Bilby Research Center on the NAU campus in Flagstaff.

Previous Research

A number of articles and books summarize the history of archaeological research in the Grand Canyon and adjacent areas (Ahlstrom et al. 1993; Altschul and Fairley 1989; Schwartz 1966; Walker 1974). The following pages present a synoptic overview of previous archaeological research focusing specifically on the Colorado River corridor in Grand Canyon. Readers interested in a more general overview should consult the publications cited above.

The earliest references to archaeological remains along the Colorado River in Grand Canyon are found in the journals kept by John Wesley Powell and his men during their pioneering explorations in 1869 and 1871-1872 (Darrah 1947; Darrah et al. 1948-1949; Dellenbaugh 1962; Fowler et al. 1969:9-18; Fowler 1972; Powell 1961). Powell was the first explorer to demonstrate a professional interest in the area's prehistoric inhabitants. In his original 1869 field journal, Powell attributed the ruins encountered along the river to Moqui (Hopi) Indians (Darrah 1947:130). Later, he speculated that one well-preserved ruin at the mouth of Bright Angel Creek may have been created by historic Hopi refugees escaping Spanish domination during

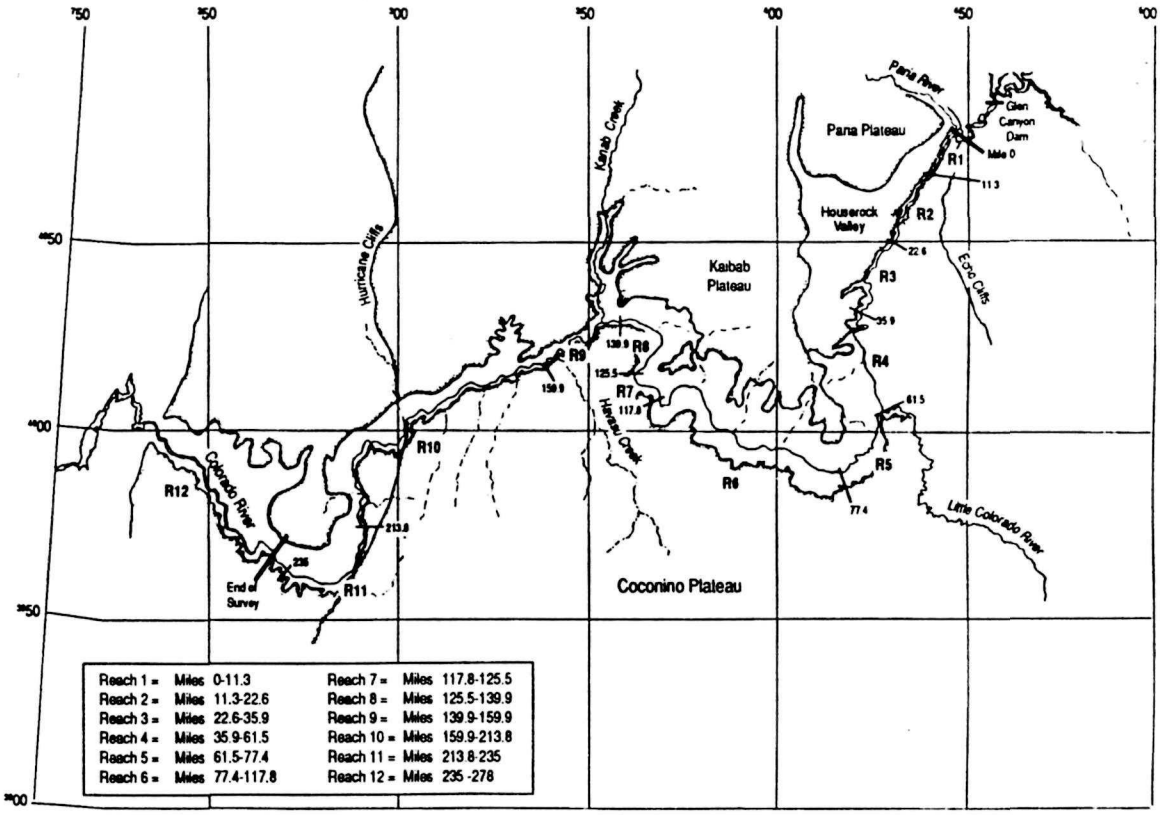

Figure 1. Map of project area, divided by reach.

Table 1. Designated Reaches for all GCD-EIS Studies

Reach	Name	Mileage
0 =	Glen Canyon	- 15.5 to 0
1 =	Permian Section	> 0 to 11.3
2 =	Supai Gorge	> 11.3 to 22.6
3 =	Redwall Gorge	> 22.6 to 35.9
4 =	Lower Marble Canyon	> 35.9 to 61.5
5 =	Furnace Flats	> 61.5 to 77.4
6 =	Upper Granite Gorge	> 77.4 to 117.8
7 =	Aisles	>117.8 to 125.5
8 =	Middle Granite Gorge	>125.5 to 139.9
9 =	Muav Gorge	>139.9 to 159.9
10 =	Lower Canyon	>159.9 to 213.8
11 =	Lower Granite Gorge	>213.8 to 235.0
12 =	Lake Mead	>235.0 to 278.0

the seventeenth and eighteenth centuries (Powell 1961:260).

Although the reports of Powell and other early adventurers helped focus public attention on the prehistoric remains of the Grand Canyon, they contributed little to our overall understanding of regional prehistory. Professional archaeological research in Grand Canyon National Park did not get underway until the 1920s, and for several succeeding decades, most efforts concentrated on plateau areas north and south of the canyon (Hall 1942; Haury n.d., 1931). The only professional expeditions to deal with the cultural resources of the inner Grand Canyon prior to 1950 were Neil M. Judd's brief foray down Bright Angel Creek in 1920 (Judd 1921, 1926) and a brief reconnaissance and testing expedition by the Milwaukee Public Museum in the same area three years later (West 1925). In the intervening decades, archaeological sites within Grand Canyon remained unexplored by professional archaeologists, although park rangers and river boatmen occasionally reported the presence of Pueblo-like ruins and artifact caches encountered along canyon trails and the river corridor (Count 1930; McKee 1933; Soper 1930; Sturdevant 1928).

Downstream from Grand Canyon, Edward T. Schenk conducted surveys in 1935 and 1937 along the Colorado River from the junction of the Virgin River upstream to Last Chance Rapids, a distance of approximately 34 miles. He documented sites in the Grand Wash-God's Pocket area, around Columbine Falls, Travertine Warm Springs, and Quartermaster Canyon. The sites included rockshelters, open camps, petroglyphs, artifact scatters, and mescal pits. Several of the rockshelters threatened by the rising water of Lake Mead were tested. At least two of the shelters contained stratified deposits over two feet deep, and produced fragments of basketry, sandals, fibers, and quids. Schenk (1937) prepared a preliminary report on the work, but no final publication was forthcoming.

Gordon Baldwin's subsequent work in the Lake Mead area during the 1940s and early 1950s (Baldwin 1942a, 1942b, 1945, 1946, 1948, 1950a, 1978) contributed indirectly to the growing data base on Grand Canyon archaeology. Although the potential of Baldwin's work was greatly diminished by his failure to publish detailed reports, the few articles that were disseminated had significant impacts on later research in the area. For example, Baldwin was the first to describe the occurrence of olivine temper in ceramics from the Moapa Valley and recognize its value for tracing prehistoric ceramic exchange among the ancestral Puebloan people of the Virgin River area (Baldwin 1945). Another brief but informative article on Southern Paiute ceramics (Baldwin 1950b) is still a primary reference for archaeologists.

In 1953, the first professional attempt at an archaeological inventory along the Colorado River in Grand Canyon was initiated by Walter W. Taylor of the U.S. National Museum (Taylor 1958). This seven-day reconnaissance between Lees Ferry and Lake Mead was undertaken at the request of the National Park Service to assess the archaeological potential of the river corridor, particularly the portion downstream from Kanab Canyon that would be inundated by the proposed Bridge Canyon Dam (Taylor 1958:18). During his "brief and hurried" survey, Taylor documented sites at the mouths of South Canyon, Nankoweap, Unkar, and Bright Angel creeks on the north side of the river and opposite Deer Creek on the south side. From this limited evidence, Taylor (1958:29) concluded that there had been only a sparse occupation of the inner canyon, primarily between A.D. 1000 and 1150, by Kayenta Anasazi-affiliated populations from the North Rim. Subsequent work in the area has shown many of his preliminary conclusions to have been erroneous (Jett 1968:342). One important contribution of this survey, however, was the documentation of ceramic variability which Taylor attributed to local ceramic production techniques and the use of locally available clays and temper. His observations foreshadowed later discussions on this topic (e.g., Marshall 1980:329; Wilson 1985; Balsom 1984; Samples, this volume).

A rapid succession of more intensive surveys along the river commenced during the late 1950s and early 1960s. Investigations centered on the river corridor from Lees Ferry to the Marble Canyon dam site, between Nankoweap and Unkar, and from Kanab Creek to the proposed Bridge Canyon Dam site at mile 237 (Schwartz 1965; Euler 1967a; Euler and Taylor 1966). Schwartz's reconnaissance between Nankoweap and Unkar was funded by the National Science Foundation, while Euler's work was primarily sponsored by the Arizona Power Authority and National Park Service in anticipation of dam developments in Marble and Bridge canyons. In addition to the river surveys, Euler conducted an extensive helicopter reconnaissance of the less accessible areas of inner Grand Canyon, recording approximately 200 previously undocumented sites (Euler 1967b, 1967c). None of these surveys was intensive by current standards, although they were more thorough than any previous reconnaissances in the area. The surveys revealed a canyon-wide Pueblo II settlement pattern characterized by small dispersed habitations concentrated along arable portions of spring-fed tributaries, as well as sporadic use by later Southern Paiute and ancestral Pai peoples

(Euler 1967a, 1967b). Ceramics indicated that the prehistoric Puebloan occupation spanned a 300-year period between A.D. 900 and 1200, with the period of greatest population density centered between A.D. 1050 and 1150.

In 1954, spelunkers reported the discovery of split-twig figurines from four caves within the inner Grand Canyon south of the river (Farmer and De Saussure 1955). Similar figurines had been found at Etna Cave in southeastern Nevada in purported association with Basketmaker III materials (Wheeler 1942). On this basis, a Puebloan period affiliation was initially suggested for the Grand Canyon specimens (Farmer and De Saussure 1955:22). When Douglas W. Schwartz excavated the four Grand Canyon figurine caves in 1957 (Schwartz et al. 1958), he obtained additional specimens, two of which were radiocarbon dated at 3530 ± 300 B.P. and 3100 ± 110 B.P. These dates provided the first firm evidence of an Archaic presence in the Grand Canyon. Subsequent dating of a figurine from Stanton's Cave on the north bank of the river in Marble Canyon pushed the date for figurine manufacture and Archaic occupation of the Grand Canyon back to 4095 ± 100 B.P. (Euler and Olson 1965). None of the figurines were recovered from stratigraphic contexts, and no other cultural materials were directly associated with them. Schwartz et al. (1958) suggested that the figurines had been deposited by Desert Culture hunter-gatherers as part of a ritual involving imitative hunting magic. Euler and Olson (1965:369) concurred with this hypothesis and further suggested that the figurine makers may have been affiliated with the Great Basin Pinto complex, since artifacts diagnostic of this complex had been found on the South Rim of Grand Canyon (McNutt and Euler 1966).

In 1969, Euler conducted excavations at Stanton's Cave in hopes of finding cultural materials in stratigraphic association with figurines. Abundant paleoclimate, faunal, and sedimentological data were recovered in addition to numerous figurines, but no further light was shed on the material correlates of the Grand Canyon figurine complex (Euler 1984). The temporal placement of the Pinto complex and cultural affiliation of the Grand Canyon figurine complex continues to be debated by archaeologists (Schroedl 1977; cf. Euler 1984); however, the dating of the figurines to the late Archaic period is undisputed.

Beginning in 1967, an ambitious archaeological research project was undertaken by the School of American Research (SAR) in the eastern sector of Grand Canyon National Park. This multiyear project was designed to address questions raised by earlier surveys, particularly regarding Puebloan adaptation to the canyon environment. The first season of fieldwork involved intensive survey and mapping of Unkar Delta. Fifty-two loci of human activity were identified on the delta. Seventeen of these were tested, and one seven-room pueblo with an associated kiva was fully excavated. The 1968 season was devoted to the complete or extensive excavation of 20 sites and the testing of three others.

Schwartz interpreted the ceramic evidence collected from the surveys and excavations to indicate that the first occupants of the delta had been affiliated with the Cohonina occupation on the South Rim (Schwartz et al. 1980:9). After this initial short-lived occupation around A.D. 900, there appeared to be an occupational hiatus of a century and a half, followed by a migration of Puebloan horticulturalists from the Kayenta region around A.D. 1050. Evidence of their horticultural activities included architectural and artifactual remains (e.g., check dams, terraces, trough metates) as well as macrobotanical remains of corn, squash, and cotton bolls (Cutler and Blake 1980). On the basis of survey and excavation data, Schwartz identified three occupational phases between A.D. 1050 and 1150, which he attributed in part to periodic abandonment and resettlement of the delta (Schwartz et al. 1980). Each occupational phase was distinguished by changes in site layouts, settlement locations, and ceramic assemblages.

In 1969, the SAR project shifted its focus to the Walhalla Glades, an extension of the Kaibab Plateau north of Unkar Delta. Survey and excavation in this highland area were designed to provide detailed data comparable to that from Unkar Delta and complementary to Hall's earlier work (Schwartz et al. 1981:9). In addition to the work on Walhalla, a three-person crew spent the 1969 season excavating a six-room pueblo at the mouth of Bright Angel Creek (Schwartz et al. 1979). The 1970 season focused on additional survey of three small areas on the plateau and intensive survey of Unkar Canyon. Four sites were completely excavated, and 21 were tested with varying degrees of intensity.

The 1969-1970 SAR surveys and excavations revealed an occupational history basically similar to that of Unkar Delta. Schwartz postulated that the Unkar and Walhalla Plateau sites constituted a single settlement-subsistence system involving seasonal movements between uplands and lowlands. Sites on the Walhalla Plateau reflected summertime occupations by Puebloan farmers from Unkar Delta and other inner canyon settlements. He based this interpretation on several lines of circumstantial evidence: 1) paucity of artifacts and lack of kivas at the Walhalla sites, 2) abundance of agricultural features on the

plateau, 3) contemporaneity and overall similarity of ceramic assemblages in both areas, 4) severity of winters on the plateau, and 5) accessibility of the plateau from the inner canyon (Schwartz et al. 1981:130-131). Schwartz's initial conclusions about the interrelatedness of Unkar Delta and Walhalla Plateau populations have been supported by subsequent ceramic analyses (Balsom 1984).

The information generated by the SAR Grand Canyon Project provides the most detailed and comprehensive data set available from Grand Canyon. In many respects, however, the project fell short of its intended goals. One of the main objectives of the project was to investigate the factors responsible for cultural change, but only one factor, climate change, was discussed in the final report. This discussion relied on tree-ring data collected from areas outside the Grand Canyon region because no suitable dendrochronological specimens were recovered from the excavations (Dean and Robinson 1977). Although pollen samples were collected, they were not analyzed for evidence of climate change or seasonality of site occupation. Therefore, the hypothesized summer occupation of Walhalla sites and complementary winter use of Unkar Delta could not be fully tested. Nevertheless, the project did produce a series of detailed descriptive reports documenting the architectural and artifactual characteristics of Puebloan period occupation in the eastern Grand Canyon.

In 1974, Robert C. Euler became the first official Grand Canyon National Park Anthropologist. In his new capacity as the cultural resource manager for the park, Euler continued to record sites along the river as time allowed. By the time he left the park in 1984, more than 100 sites had been documented along the river corridor.

In 1978, Euler and Chandler published a study of site distributions within Grand Canyon National Park, based on a compilation of data from various surveys completed up to that time. Their study was part of the Southwestern Anthropological Research Group (SARG) project, a cooperative research endeavor undertaken in the early 1970s by a group of Southwestern archaeologists interested in developing a regional approach to the study of human settlement behavior. The SARG research design was specifically oriented towards answering the question: "Why did prehistoric populations locate sites where they did?" (Plog and Hill 1971:8). The participants selected a number of variables (mostly environmental) that they felt were relevant to the selection of site locations and set out to test the importance of these various factors using a structured "deductive" approach.

Euler and Chandler's study synthesized data from a variety of sources, including Euler's surveys during the mid-1960s (Euler 1967a-c) and a number of previously unreported cultural resource surveys (Euler 1979; Euler et al. 1980). Pueblo II period sites were the focus of their study. The primary hypotheses to be tested included the following: 1) domestic water was the most critical resource for habitation site location; 2) access to the canyon along trails was the second most critical resource; 3) protection from the elements was the third most critical resource; and 4) food resources, except agave, were not critical to site location. These "hypotheses" mirrored empirical observations of site distributions within the canyon, which in turn reflected the areas where the most intensive investigations had been performed, i.e., along the canyon rims, trails, and the river, and in tributary canyons with permanent water. Euler and Chandler's study provides a valuable synthesis and discussion of Pueblo II settlement patterns in the Grand Canyon.

In 1980, NPS archaeologists from the Rocky Mountain Regional Office conducted a systematic, intensive inventory of a 15-mile long stretch of river corridor between Glen Canyon Dam and Lees Ferry. This inventory was sponsored by the BOR as part of the GCES Phase I studies. Although no final report was written, the surveyors did record 24 sites and 23 isolated occurrences. The results of this survey were later incorporated into a comprehensive summary of archaeological resources in the Lees Ferry area (Geib 1990), as well as this inventory (Clark 1991).

Perhaps the most significant archaeological project conducted along the river in recent years was an NPS-sponsored testing and stabilization program initiated in 1984 under the direction of A. Trinkle Jones (Jones 1986). This project focused on five stratified sites that were being actively eroded by tributary runoff, arroyo cutting, and visitation. The five sites included the Beamer's Cabin locality near the mouth of the Little Colorado River (AZ C:13:4), a large Pueblo II structural complex known as Furnace Flats (AZ C:13:10), a stratified sheltered midden in Tuna Creek (AZ B:15:7), a sheltered structure opposite Deer Creek Falls (AZ B:10:4), and another sheltered midden site near Whitmore Wash (AZ A:16:1). An integral component of the stabilization strategy involved excavating a vertical surface against which a stabilizing rock wall could be constructed. This approach afforded an unparalleled opportunity to study the subsurface stratigraphy of these sites and to collect carefully controlled samples for botanical analysis and radiocarbon dating.

Prior to excavation, surface evidence indicated that all of these sites had been used by prehistoric puebloan people sometime between A.D. 1000 and 1200, and all except the Deer Creek site had surface ceramics indicating later use by Paiute and/or Hopi visitors. The Deer Creek and the Furnace

Flats sites were considered unusual because both exhibited a small number of ceramics from the poorly represented Pueblo I period (Jones 1986:52). Upon excavation, it was discovered that all of the sites contained at least a few sherds of pre-Pueblo II ceramic types such as Floyd B/G, Kana'a B/W, Lino Gray and Kana'a Gray, and furthermore, all except for the Furnace Flats and Beamer's Cabin sites contained buried features or midden deposits that predated the earliest ceramic assemblages by several hundred years or more. Calibrated ^{14}C dates ranging between 1365–905 B.C. and 380 B.C.–A.D. 210 were recovered from aceramic roasting features at Whitmore Wash and Deer Creek, respectively. An aceramic level at Tuna Creek produced a calibrated date of A.D. 245-585, while an aceramic deposit at Beamers Cabin produced a slightly later date of A.D. 440-795 (Jones 1986:105). Although the absolute ages of these features may be exaggerated, due to the use of old wood for fuel (Jones 1986:104), the stratigraphic position of the dated remains and the lack of associated ceramics clearly indicated that these four sites were in use centuries before the Pueblo II occupation of the inner canyon.

The only tested site that did not have a well-stratified midden was the large structural site at Furnace Flats. This site had been included in the project at the last minute because heavy summer rains in 1983 had caused massive gullying at the site and uncovered a series of previously unrecorded masonry structures buried in the dunes. Emergency data recovery measures were necessary to preserve information from this site before it was lost to erosion (Jones 1986:73).

The approach followed at the Furnace Flats site (AZ:C:13:10) was more along the lines of a traditional salvage excavation, because natural erosion was too severe to be halted by stabilization. Although only a small portion of the site was actually excavated, a considerable amount of information was recovered. The excavations revealed a complex of slab-lined storage structures, a deep, masonry-lined kiva, and several masonry rooms buried in fluvial deposits. The fill of one large room contained over 50 pieces of groundstone, plus pendant fragments of travertine and several fragments of unfired pottery vessels indicative of local manufacturing activities. Ceramics indicated that the site had been occupied from Pueblo I through early Pueblo III times, with the principal occupation during Pueblo II. Ceramic dating of the deposits was supported by a carbon sample from the kiva ash box, which yielded a corrected date of A.D. 775-1260 (Jones 1986:105). Two other radiocarbon dates from the site suggested that a post-A.D. 1300 occupation may also have occurred. A principal contribution of this excavation was the recovery of numerous flotation and pollen samples. The pollen and macrobotanical analyses supplemented the previous SAR studies at Unkar Delta and supported the conclusion that in addition to the traditional domesticated food crops of corn and squash, wild foods such as mesquite, cacti, and weedy annuals were important components in the local Puebloan diet.

Since 1989, additional limited testing and ^{14}C dating have been carried out at selected sites along the river corridor in conjunction with geomorphological research aimed at unraveling the complex interrelationship between river flood action and associated deposition and erosion at archaeological sites along the river banks. This ongoing cooperative research effort between GRCA archaeologists and USGS researchers has contributed additional evidence regarding prehistoric use of the inner canyon, particularly for the period preceding the extensive Pueblo II occupation.

Initial geomorphological research efforts focused on the Furnace Flats site because it appeared that the extensive erosion observed in 1983 may have been exacerbated by exceptionally high river flows in 1983 and 1984. Before this possibility could be pursued, it was necessary to obtain a sedimentological history of the site. This was accomplished through profiling and sampling sediments exposed in trenches and arroyo cuts. In the course of profiling one arroyo wall, a buried fluvial deposit containing a pure assemblage of diagnostic Pueblo I ceramics was uncovered. This deposit, which dated between A.D. 800 and 900 on the basis of the ceramics, is overlain by almost two meters of colluvial and fluvial sediments representing alternating river flood and slopewash episodes.

Recent testing of hearth sites in the Tanner delta region have produced even earlier dates. In 1989 and 1990, several buried hearths were discovered eroding from fluvial sand deposits along the south side of the delta. One of the hearths produced a radiocarbon date of 2170 ± 70 B.P., which is similar to dates Jones recovered from the aceramic roasting feature at Deer Creek. This date, in conjunction with the lack of associated ceramics and the abundance of bifacial thinning flakes at the hearth, is consistent with an early Basketmaker II or terminal Archaic temporal assignment. A second buried hearth without any associated artifacts, located approximately 200 m south of the first one at approximately the same stratigraphic level, produced an almost identical date of 2100 B.P. These dates, in conjunction with Jones's excavation data and information recently collected from other localities along the river corridor (Hereford et al. 1993), suggest that the pre-Pueblo II occupation of the inner canyon is largely obscured from view by later deposits and was far more extensive than previously thought.

Methods

In order to accomplish the survey required for this project, an 8.3-month fieldwork schedule involving a team of 12 archaeologists was identified in the project proposal (Balsom and Fairley 1990). It was estimated that approximately 165 "team days" would be required to accomplish the estimated 9775-acre survey. Included within this total was an estimate of 40 team days spent in transit. Final tallies indicate that 164 team days (ca. 1968 person days) were spent surveying 10,506 acres. Included within the total were 33 pure transit days (including travel days back to Flagstaff from Diamond Creek) and another 20 partial transit days. Excluding transit time, this averages out to 7.9 acres and 0.35 sites per person day or approximately 24 acres and 1 site per crew day. Transit time on the river was minimized as much as possible by having crews hike in or out at Phantom Ranch during the second, third, fifth and sixth field sessions.

The fieldwork phase of this project commenced on August 30, 1990, following four days of orientation training and preparation at the Bilby Research Center, Northern Arizona University, Flagstaff. The bulk of the survey work was confined to the off-season river months, September through April. The off-season months were selected in order to minimize the surveyors' exposure to heat, rattlesnakes, and venomous insects, and to avoid competition with commercial trips for camps. Rafts were the primary means used to transport the crews. The first trip was supported by a motorized raft contracted by BCR through OARS, Inc., a commercial outfitter. All subsequent trips were supported by five oar-powered rafts operated by National Park Service personnel.

Survey Procedures

The survey attempted to examine 100 percent of the project area, but this does not necessarily mean that 100 percent of the sites were found. This discrepancy is due to several factors, principally surface exposure, ground visibility, accessibility, and changing environmental conditions. Past monitoring efforts along the river have demonstrated that changing environmental conditions, such as dune migration and arroyo cutting, have uncovered sites in areas where no evidence of sites previously existed, while simultaneously eliminating cultural remains in other areas. Some stretches along the river are densely vegetated by impenetrable thickets of tamarisk and mesquite, precluding full ground coverage of those areas. Furthermore, because of physical limitations placed upon surveyors by the topography, it was not possible to physically access all riverfront areas. A concerted effort was made to examine all likely locations, along with areas that were not so likely, but safety considerations precluded 100 percent coverage of the entire river corridor. In other words, the survey zone included all areas below the 300,000 cfs level that could be physically surveyed without the aid of technical climbing gear and machetes.

Ground coverage was generally accomplished by having the survey crew walk parallel transects. Transects were spaced 10 to 50 meters apart, depending on the terrain. In most areas, it was not possible to maintain set spacings due to the steepness and instability of the slopes. Ledge areas obviously could not be surveyed with a set crew spacing; instead, surveyors took individual levels of ledges and zig-zagged up and down across the slope as needed. Each segment of the canyon required a specialized approach; however, virtually every area that was physically possible to access below the 300,000 cfs level was included in the survey.

Overall, the terrain was extremely demanding, and the vegetation, particularly the mesquite, was difficult to work through. Care was taken to avoid unnecessary trampling, since it was apparent that human impacts caused by the survey crews could potentially be more detrimental to the fragile desert environment than the effects of the dam. Crews attempted to minimize impacts to the fragile environment by consciously avoiding the creation of new or multiple trails and taking care not to trample the vegetation and cryptogamic soils. Nevertheless, it was not possible to avoid impacting the environment to some degree.

Recording Method

Sites are broadly defined as one or more human-made features or a cluster of artifacts representing a former locus of human activity. No minimum number of artifacts or areal extents were delimited, since the survey aimed to record evidence of past human activity in the canyon, and many activities do not result in the deposition of numerous or extensive remains. The cut-off date for recording a site was approximately A.D. 1960.

Isolated artifacts and other remains that could be indicative of past human activity but did not warrant the time investment of a full recording (e.g., isolated charcoal stains without associated artifacts, possible wall alignments, or cleared areas under an overhang) were plotted on aerial photos and designated as isolated occurrences or "IOs."

Once a site was located, it was recorded, mapped to scale, and photographed. All site locations were plotted on both USGS 7.5 minute topographic maps and the GCES 1989 series of black-and-white aerial photographs. Height above the current high-water line (approximately 28,000

cfs) was measured using a hand-held abney level, while distance and angle from the high-water line was measured with a compass and 30 m tape. A unique site number was assigned to each site based on the GRCA site numbering system. Each site was tagged with a metal tag identifying the site number and date the site was recorded. Site information was recorded on a modified version of the Intermountain Archaeological Computer System (IMACS) form. The IMACS form was adopted because a dBASE III program had already been developed by NPS personnel in the Rocky Mountain Region for managing archaeological site information, and this system was already being used in the Glen Canyon National Recreation Area for recording archaeological information.

Because one objective of this survey was to provide baseline information on the physical condition of sites for incorporation into the ongoing GRCA monitoring program, it was imperative that the recording procedures be sufficiently detailed to evaluate changes in site condition over time. This required detailed photographic documentation, detailed and accurate maps of sites in relation to topography, comprehensive assessments of site condition and impacts, and detailed information on the quantity, density, and variability of surface artifacts. In addition to the IMACS form, two other forms were created for recording baseline monitoring information, including information on impacts/threats specifically related to the river environment. Site maps, including a scale and north arrow indicating true north, were drawn for each site. Black-and-white prints were taken of every site, and color slides were taken at many sites.

Analysis of artifacts for the purpose of establishing temporal and cultural affiliations and interpreting site function was undertaken at each site. In general, a policy of in-field analysis and in situ preservation was emphasized over collection; however, when artifacts were problematic, diagnostic, or in danger of disappearing due to the site's proximity to a popular tourist attraction or camping beach, point-provenienced collections were taken at the discretion of the crew chief.

The in-field analysis strategy employed a mixed judgmental-random procedure for selecting artifacts for analysis. At sites with less than 100 artifacts, all artifacts were analyzed. At sites with more than 100 artifacts, one or more circular analysis units with a one-meter radius were judgmentally placed across the site, to encompass at least 1 percent of the site area. In cases where an individual analysis unit encompassed more than 100 artifacts, a random sample of 40-50 lithic items and all ceramics were analyzed per sample unit. All analysis units were point provenienced on a scaled plan map of the site.

Analyzed ceramic attributes included ware/type, form, and post-firing modification. For lithic debitage, recorded information included material type, amount of cortex cover, and platform characteristics. For lithic tools, material type and technological tool type were recorded. Standard measurements and morphological descriptions were taken on groundstone implements. These minimal in-field analysis procedures provided the basic data necessary for interpreting site age, cultural affiliation, and function, and allowed comparisons with data collected from other areas of Grand Canyon National Park.

The amount of time required to record, map, and photograph the sites and conduct in-field analyses varied considerably according to the size, complexity, and surficial visibility of the archaeological remains. For small and fairly simple sites, 45 minutes to an hour was generally required to record and map each site, with another 30 minutes to one hour for analysis (mapping of the site had to be more or less complete before selection of analysis areas could take place). At larger and more complex sites with numerous features, up to six hours were sometimes required to document a site. Obviously, the time required for in-field analysis varied considerably according to the number and variability of the artifacts encountered, with low density/low diversity assemblages requiring considerably less time than high density/high diversity assemblages.

Quality Control and Quality Assurance

Consistency in recording methods was critical for gathering the necessary quality of information required for this project. Several methods were proposed at the outset of the project to develop and maintain consistency in recording procedures: 1) use a standardized recording format with specific, well-defined categories of information; 2) hire as few people as necessary to get the job done within the specified time frame; and 3) retain the same personnel for the duration of the project.

All information was recorded on the IMACS form and two supplementary monitoring forms. These forms were reviewed by the entire crew prior to the commencement of the first field session. One monitoring form and the lithic analysis form was modified after the third field session to improve the quality of information and reduce redundancy. Otherwise, the same forms were used consistently throughout the course of the fieldwork.

From the outset, the survey team was limited to no more than 13 individuals (four crews of three people each, plus the field director). During the first field session, the field director "floated" between the four crews to assess progress, answer

questions, and ensure that each crew employed similar survey and recording procedures. Following the first session, the field director took over supervision of one crew, and the "extra" crew chief retired from the field to begin organizing and implementing the data compilation phase of this project. During subsequent field sessions, crew members alternated between the four crews (designated A, B, C, and D). Although the crew chiefs never had an opportunity to work with one another, the constant shifting of crew members helped to ensure that consistent recording methods were maintained. Periodic input from the lab director, who sorted through and edited site forms after each field session, in conjunction with frequent meetings between the crew chiefs in the field, also helped to ensure that consistent information was collected throughout the course of the project.

As might be expected, there was a certain amount of confusion and inconsistency in recording procedures during the first few weeks of fieldwork. Initial inconsistencies were corrected over the course of the project by revisiting sites and re-recording specific categories of information as needed.

Analysis and Report Preparation

Upon completion of each field session, all materials were brought into the laboratory at Northern Arizona University for preliminary processing and computer data entry. After each field session, the field director prepared a status report detailing the number of river miles surveyed, the number of sites recorded, and any problems that surfaced while in the field.

Data compilation commenced following the first field session and continued throughout the winter and spring, with editing and computer entry of basic site information being the primary focus. All locational and site-specific data were entered into protected files, because site information is not included within the public domain and is specifically excluded from Freedom of Information Act requests. A summary of the types of information included in the site data file is discussed in the following chapter.

Chapter 2
Site Data

In order to facilitate synthesis and comparison of site information, site data were compiled, encoded, and entered into a computerized data base. The creation of a data file with all 475 sites was a relatively straightforward process, because many categories of information were pre-coded in the field, and field forms were entered directly into a dBASE III computer file. Nevertheless, there were several categories of information that were not systematized prior to fieldwork, and these had to be streamlined and coded for computer entry. After coding, compiling, and entering the data, they were analyzed using the SYSTAT 4.0 program (Wilkinson 1989).

Three separate but interactive data files were compiled from the original field forms: 1) site data, 2) ceramic data, and 3) lithic data. The site data file included temporal-cultural information, general architectural and artifactual categories, environmental characteristics, and management-related variables such as human and natural impacts and current threats. The ceramic and lithic data files included specific information about each of these artifact classes from each site. These files are discussed in greater detail in the lithics and ceramics chapters of this report.

Definitions and descriptions of the variables encoded in the site data file are included below. This section is followed by a discussion of site type distributions through time and space. A discussion of the impacts and threat variables is included in the cultural resource management discussion in the last chapter of this report.

Site Number

This is a six-digit alphanumeric nominal variable based on the GRCA Arizona quad numbering system. These site numbers were either pre-existing designations for previously recorded sites or newly assigned to sites discovered in the course of the GCRCS fieldwork.

Although sites could, and often did, contain more than one temporal component or spatial locus of activity, only one case line was entered per site number. The only exceptions to this rule were the previously recorded site complexes near the mouths of Nankoweap (C:9:1), Kwagunt (C:9:28), and Unkar (C:13:1) creeks, each of which encompassed numerous structures and temporal components under a single site number. The grouping of numerous spatially and temporally discrete activity areas under a single site number was inconsistent with standard GCRCS recording methods; however, these numbers had been entered in the GRCA site record system for many years prior to the start of the GCRCS and had been assigned to files, photographs, and related site documents. To maintain consistency with previous documentation, these site numbers were retained, but in the site data file they were further subdivided into site-equivalent subunits to correspond more closely with the standard GCRCS site definition.

Number of Loci

This single-digit variable refers to the number of spatially discrete concentrations of artifacts and features encompassed within a single site, up to nine. For example, it was fairly common for a site to consist of a rockshelter at the base of the cliffs with a food processing activity area on the open terrace below the talus slope. When these two areas were separated by a considerable distance (generally > 50 m) or the artifactual assemblages represented distinctly separate time periods, they were treated as separate sites; otherwise, they were considered to be two loci of the same site. Approximately 21 percent of the sites contained two or more loci.

Number of Temporal Components

This single-digit interval variable specified the number of temporally discrete components, up to nine. A site was considered to have multiple temporal components when the artifactual assemblage revealed two or more temporally discrete clusters of diagnostic remains. Ceramics were the primary diagnostic artifact class used to define temporal components, although projectile points and historic artifacts also provided temporally sensitive information. In cases where the artifactual assemblage appeared to span several centuries, but there were no obvious chronological breaks in the assemblage, the site was coded as a single component. Many sites were interpreted to be seasonally reoccupied food processing base camps, but again, unless the artifact assemblage revealed a distinct hiatus, these were considered to be single-component sites.

Cultural and Temporal Affiliation (Component Nos. 1, 2, and 3)

A total of three cultural-temporal components could be defined for any one site. Each component was assigned a two-digit cultural code and a two-digit temporal code. Possible cultural affiliations included Paleoindian, Archaic, Kayenta, Virgin, Puebloan (undifferentiated, Virgin-Kayenta), Cohonina, Formative (undifferentiated Virgin, Kayenta or Cohonina), Pai, Southern Paiute, Pai/Paiute (undifferentiated), Hopi, Navajo, Euroamerican, plus aceramic/unknown, prehistoric

ceramic/unknown, and historic/unknown. The 475 recorded sites included 593 cultural-temporal components. There were 373 single-component sites, while 88 sites had two components, and 12 had three components. Two sites had four or more occupational components.

A few comments on the terminology employed in this report are required here. Archaeologists have traditionally used the terms "Anasazi" and "Cohonina" to refer to the two main prehistoric cultures that occupied the Grand Canyon region between A.D. 500 and A.D. 1200. This time span on the Colorado Plateau is sometimes referred to as the Formative period (Geib et al. 1985; Fairley 1989:100) and is characterized by widespread reliance on corn, beans and squash horticulture and pottery production. The Anasazi culture is often further subdivided into two regional variants or branches: the Virgin Anasazi occupying the Arizona Strip north of the Colorado River and east of the Kaibab Plateau and the Kayenta Anasazi centered on the plateau to the east of Marble Canyon. These cultural entities are distinguished on the basis of various material traits, pottery being the most obvious one.

During the 1930s, the study of Southwestern prehistory was still in its infancy, and archaeological data were too meager to establish firm linkages between prehistoric and historic cultures. Therefore, archaeologists deliberately avoided the use of terms that might imply an assumed relationship between past and living peoples. The term "Anasazi," a Navajo word referring to the prehistoric Pueblo inhabitants of the Four Corners area, was initially proposed by A.V. Kidder (1936) to distinguish the prehistoric cultures of the northern Southwest from other contemporary Southwestern traditions. Hargrave (1937, 1938) and Colton (1939a) later introduced the terms "Cohonina" and "Cerbat" to distinguish the prehistoric pottery-making peoples of the Coconino Plateau and uplands of west-central Arizona from contemporary cultures to the south and east.

In recent years, with the increasing participation of Native Americans in cultural resource studies, the traditional terminology employed by Southwestern archaeologists has become a focus of concern. Some Native Americans interpret the archaeological terminology as a deliberate attempt on the part of academic scholars to separate living people from their prehistoric heritage. For example, despite the fact that archaeological studies have firmly established that the Cerbat culture is directly ancestral to the historic Pai people of northwestern Arizona (Euler and Dobyns 1956; Dobyns and Euler 1956), many archaeologists continue to talk about the Cerbat culture of northwestern Arizona as though it had no relation to the people currently living there.

Another objection raised by modern Native Americans concerns the traditional meaning of some of the terms employed by archaeologists. For example, the Navajo word "Anasazi" was originally thought by archaeologists to mean "old ones," but a closer translation is "enemy ancestors." For the modern-day Pueblo people of northern Arizona, this is a derogatory and inappropriate appellation for the remains of people they consider to be their direct ancestors. The Hopi Tribe would prefer that archaeologists substitute a Hopi word, *Hisatsinom*, meaning "people of long ago," when referring to the prehistoric Puebloan inhabitants of the region.

The main drawback to making this simple substitution is that the word "Anasazi" has come to embody a specific set of attributes in the field of archaeology which the word *Hisatsinom* does not convey. In addition, there is the problem of where to draw the line in the application of the term. Should *Hisatsinom* be substituted for all prehistoric Pueblo cultures, or should it be restricted to what archaeologists formerly called the Kayenta branch of the Anasazi? Some Hopi people believe that the Cohonina were ancestral to certain Hopi clans. Should the Cohonina be called *Hisatsinom* also? To further complicate the issue, several Zuni clans claim ancestral ties to the Grand Canyon, and the Zunis employ a different term to refer to their ancestors. This report is not the appropriate forum to settle the debate. For the remainder of this report, we follow a policy of using the term "prehistoric Puebloan" whenever the term "Anasazi" would have been used, unless a specific cultural branch is identified (e.g., Kayenta or Virgin).

Temporal Affiliation (Component Nos. 1, 2, and 3)

Forty possible temporal designations were assigned two-digit numeric codes. Temporal spans ranged from as few as 50 years (e.g., mid Pueblo II, A.D. 1050-1100) to several millenium (late Archaic/Basketmaker II, 2000 B.C.-A.D. 500). Codes were not mutually exclusive (i.e., one site might be assigned to mid-Pueblo II, based on the presence of numerous diagnostic ceramics, while another might only be assignable to the general Pueblo II time span, A.D. 1000-1150).

Site Type

This two-digit numeric code categorizes sites based on type and preponderance of artifacts and features. Site types were recognized and defined as follows:

1. Pueblo: Habitation site of four or more contiguous rooms.

2. Small structure(s): 1-3 room structure, which may be small habitations, fieldhouses, etc. This

category includes single-course room outlines and walled-in spaces utilizing boulders, outcrops, etc.

3. Temporary structure(s): Stacked rocks or vague wall alignments, windbreaks, or cleared spaces outlined by rocks, for which a temporary habitation function is presumed. This category was used for sites that had possible, but not definitive, architectural elements associated.

4. Storage site: Site with granaries (isolated room or rooms, or natural cavities enclosed by walls for which a storage function is presumed) or cists (unburned, slab-lined, partially subterranean pit, presumably used for storage purposes).

5. Enigmatic feature: Surface or subsurface feature of unknown type or function (e.g., C-shaped wall, fishhook, or circular enclosures, stacked rocks, stone piles, rock alignments).

6. Sherd scatter: Scatter or concentration of ceramic sherds without associated tools or features.

7. Lithic scatter: Scatter or concentration of lithic debris, with or without groundstone, but lacking associated ceramics or features.

8. Artifact scatter: Scatter or concentration of ceramic and lithic debris or flaked or groundstone tools, without associated features. Artifact scatters may include a mix of sherds and lithics without associated tools or just sherds with associated tools such as manos, metates, scrapers, etc.

9. Isolated thermal feature: Hearth or scatter of firecracked rock or a single roaster (i.e., burned rock midden) without associated artifacts.

10. Roaster complex: Two or more well-defined circular burned rock middens with or without associated discard piles, often but not necessarily associated with artifacts scatters.

11. Artifact scatter with thermal feature(s) (a.k.a. "camp"): Agglomeration of prehistoric or historic artifacts in direct association with hearths, animal husbandry features, or other evidence of temporary use, but without associated habitation structures. (Note: A site with two or more obvious roasting features was typed as a "roaster complex.")

12. Isolated pot/pot cache: Isolated complete ceramic vessel(s), either intact or broken.

13. Burial: Interred human remains or other evidence suggesting the presence of a human burial.

14. Groundstone cache: One or more grinding slabs, possibly accompanied by manos, but without other associated artifacts or features.

15. Other tool cache: One or more complete artifacts (other than ceramic vessels or metates) which appear to have been deliberately placed in a sheltered location not directly associated with other features.

16. Water/soil control: Check dams, ditches, headgates, diversion walls, terraces, grid gardens, or other features used to control runoff.

17. Bedrock mortar: Deeply ground or pecked depressions in large boulders or bedrock.

18. Trail: Narrow foot paths marked by cleared stones, linear sherd scatters, cairns, wood and/or masonry retaining walls, steps, hand-and-toe holds, etc.

19. Rock art: Isolated pecked, incised, scratched, or painted designs, symbols, or figures on rock.

20. Inscription: Historic names or dates inscribed or painted on rock or other surface (if both rock art and historic inscriptions were present, site was coded as "rock art").

21. Historic trash scatter: Scatter or concentration of several (3+) historic items pre-dating 1960, without associated features.

22. Historic structure: Historic building analogous to pueblos or small structures.

23. Other: Catch-all category for rarely occurring or unforeseen site types.

24. Delta complex: Complex of numerous scattered rooms and agricultural features distributed over a broad alluvial fan at the mouth of a side canyon (e.g., Nankoweap, Kwagunt, and Unkar).

99. Unknown: Sites of indeterminate type.

It should be noted that some site types, such as pueblos, small structures, and camps, could and often did include features that, in isolated contexts, would be considered a seperate site type (e.g., thermal features such as hearths and fire-cracked rock, artifact scatters, burials, rock art, etc.). If

architectural remains were present, however, one of the architectural site codes—1, 2, 3, or 4—was selected over other possible categories.

Site Area

This five-digit interval variable gives an approximate measure of the area (length x width) covered by the site in square meters, up to 99,999 square meters.

Degree of Shelter

This single-digit numeric code reflects the degree to which the site area is sheltered: 0 = open/unsheltered, 1 = partial shelter (most of site is located under an overhang), 2 = complete shelter (site is inside a cave), 3 = combination open/shelter (site has multiple loci, at least one of which is sheltered). Approximately 55 percent (260 sites) were situated in unsheltered locations. Rock-shelters were present at 203 sites, and in most cases (74%, 151 sites), the shelter protected most of the site area. Only 12 sites were situated in caves, cracks, or deep alcoves.

Artifact Types

Variables 15-23 refer to classes of artifacts at each site: lithic debitage, projectile points, other flaked tools, grinding slabs and metates, manos, other grinding implements, ceramics, perishables (including corncobs), and shell. The same coding system was employed for all artifact classes: 0 = not present, 1 = present/collection taken, 2 = present/no collection.

- V15 Debitage
- V16 Projectile points
- V17 Other flake tools
- V18 Metates or grinding slabs
- V19 Manos
- V20 Other groundstone (includes used river cobbles)
- V21 Ceramics
- V22 Perishables (basketry, quids, corncobs, etc.)
- V23 Shell

Each of these artifact classes is discussed in greater detail elsewhere in this report.

Artifact Density

This single-digit numeric code refers to the density of artifacts on a site, as reflected in the values obtained from field analysis units and general observations: 0 = no artifacts present, 1 = low (<1 per sq m or <25 total), 2 = medium (2-5 per sq m or 26-500 total), 3 = high (>5 per sq m or >500 total).

Site Features

Variables 25-30 refer to the non-architectural features present at each site. These single-digit interval variables allowed up to nine features of each type to be coded per site.

- V25 Hearth (a formalized fire feature)
- V26 Fire-cracked rock (FCR)/charcoal scatter (not a definite hearth or roaster)
- V27 Roaster (mescal pit/concentrated burned rock midden)
- V28 Water/soil control feature (check dams, ditches, etc.)
- V29 Other rock alignments/enigmatic features (not obvious structural remains)
- V30 Human burial

Rock Art/Inscription

This single-digit nominal variable refers to the presence of various type(s) or combinations of prehistoric rock art and/or historic inscriptions at sites, as follows: 0 = no rock art present, 1 = petroglyphs only, 2 = pictographs only, 3 = combination of petroglyphs and pictographs, 4 = historic inscription or symbols, 5 = combination of historic and prehistoric rock art.

Forty-two sites had rock art and/or historic inscriptions. Thirteen sites contained petroglyphs only, 10 sites contained pictographs only, and one site exhibited a combination of petroglyphs and pictographs. Of the nine sites with combinations of prehistoric and historic graphics, six had pre-historic petroglyphs and three had pictographs. In 14 cases, prehistoric pictographs and/or petro-glyphs comprised the only cultural remains at a site.

Architectural Features

Variables 32-36 refer to architectural features that may provide an indirect measure of permanency of occupation. For V32-34 and V36, number of rooms were entered, while V35 listed number of separate shelters.

- V32 Coursed masonry structures
- V33 Single-course room outlines
- V34 Granaries/cists
- V35 Enhanced shelters (indicated by crude wall alignments or cleared spaces under overhangs; not obvious rooms or granaries)
- V36 Other ephemeral structures (*not* variables 28-29 or 32-35)

Other Variables

The remainder of the variables in the site data file concern categories of information related to location (e.g., river mile, right or left bank, height above and distance from current high-water zone), impacts and threats from river flows, natural processes, and human visitation (inundation, gullying, trailing, etc.), and environmental characteristics of the site's location. The impact/threat variables are discussed in the cultural resource management chapter of this report.

Chapter 3

Site Distributions

The division of the Colorado River into 13 segments or "reaches" provides a convenient means for discussing the distribution of sites and other archaeological patterns within the study area. The reach system employed in this report was originally devised by Schmidt and Graf (1988:3) based on geomorphological characteristics of the river channel such as average channel width, average channel shape, reach slope, and relation to major tributaries. Differences in the topographic characteristics of the river channel reflect changes in river-level geological strata, and by extension, apply to the topographic characteristics of the river corridor as a whole. Although archaeological criteria were not considered in the formulation of this scheme, the reach system developed by Schmidt and Graf does have archaeological validity, because geologic and topographic characteristics affect resource availability and accessibility, thereby influencing human use patterns.

Tables 2 and 3 provide a summary of site distributions and site type by reach. The number of cultural affiliations exceeds the 475 site total because many sites contained more than one cultural component. Figure 2 depicts changes in average site density per reach relative to average density for the river corridor as a whole. These density figures are approximations because they do not take into account the area surveyed within each reach, just the linear distance. Nevertheless, they provide a relative measure of site frequency per reach that can be compared against the average for the entire project area.

The following discussion of site distribution by reach includes brief characterizations of each reach in relation to factors important to prehistoric and historic inhabitants of the canyon. Previous studies by Euler and Chandler (1978:76-77) suggest that these factors include, but are not restricted to, availability of access routes, arable lands, geologic and biologic resources, and exposure to and protection from the elements. In contrast to other areas of the canyon, availability of water is not considered to be a critical factor, due to the presence of the river, although the availability of perennial streams and springs would have influenced long-term settlement choices. A discussion of site distributions in relation to all of these factors is included with each reach description.

Reach 0 (miles -15.5 to 0)

This reach extends from the base of Glen Canyon Dam to Lees Ferry, a distance of 15.5 miles. The Echo Cliffs Monocline crosscuts this reach at approximately mile -1 and divides it into two contrasting topographic districts. Upstream of the monocline, the river is confined between sheer cliffs of Navajo Sandstone. Broad alluvial sand and gravel terraces and steep talus slopes separate the river and canyon walls in most places, but in a few stretches the river flows directly against the base of the sheer sandstone cliffs, preventing continuous pedestrian travel on either side of the canyon. After the river cuts through the Echo Cliffs Monocline where the Kayenta, Moenave, and Wingate Formations are exposed in quick succession, it breaks out of the sheer-walled canyon. From this point to mile -1, undercutting of the relatively soft and easily eroded Chinle Formation has caused the cliffs to retreat from the river's edge, resulting in a more open terrain.

Access upstream from the historic ferry crossing is possible on both sides of the river as far as mile -3. Beyond this point, several precarious routes provide access from the canyon rims to the gravel bars and alluvial terraces within the canyon. For prehistoric visitors, the broad, alluviated meander lobes provided level camping sites and potentially arable land, while the elevated Pleistocene gravel bars offered abundant lithic resources suitable for stone tool production. (In historic times, these same gravels were exploited for gold.) In addition, the smooth, well-patinated cliff walls provided ideal slates for creative expression by both prehistoric and historic visitors.

The distribution of sites within Reach O is primarily tied to travel routes, and secondarily linked to geologic resource areas. Small structural sites, artifact scatters, and camps are scattered across the broad alluvial terraces across the river and upstream from Lees Ferry. The lithic scatters are mainly associated with the high Pleistocene gravel terraces, while the rock art sites are confined to cliff faces and boulders of Navajo Sandstone. Historic sites (inscriptions, trash, and structures) are widely scattered throughout this reach and relate to a variety of activities including mining, dam site explorations, ferry travel, and USGS gaging work.

Reach 1 (miles 0 to 11.3)

The southward-flowing Paria River parallels the Echo Cliffs Monocline and debouches into the Colorado River at mile 1. This tributary provided an easy access route to the river from the highlands to the north and east, and it contains abundant irrigable farmland near its mouth that was intensively exploited in prehistoric and historic times (Geib 1990). Prehistorically, it was possible to cross the river above the mouth of the Paria River during

Table 2. Site Distribution by Reach

Reach	Miles	Total Sites	Left Bank Sites	Right Bank Sites	Both Banks	Ratio (RB to LB)	Average Sites per Mile
0	15.5	45	29	14	2	.5	2.9
1	11.3	18	5	12	1	2.4	1.6
2	11.3	9	5	4	0	.8	.8
3	13.3	16	7	8	1	1.1	1.2
4	25.6	50	15	34	1	2.3	2.0
5	15.9	85	60	25	0	.4	5.3
6	40.4	35	14	19	2	1.4	.9
7	7.7	17	12	5	0	.4	2.2
8	14.4	29	15	14	0	.9	2.0
9	20.0	13	2	11	0	5.5	.6
10	53.9	128	61	67	0	1.1	2.4
11	21.2	24	8	16	0	2.0	1.1
12	4.9	6	3	3	0	1.0	1.2
Total	255.4	475	236	232	7	1.0	1.9

Table 3. Site Type by Reach

	Reach													
Site Type	0	1	2	3	4	5	6	7	8	9	10	11	12	Total
Pueblo					1	3	1							5
Small Structure	6		2	4	17	28	5	3	10	1	9	1		89
Ephemeral Structure	3	3		3	6	7	4	2	4	5	14	2		53
Storage Structure		1		1	1	7			1					11
Enigmatic Feature					2				1			1		4
Sherd Scatter					1						1			2
Lithic Scatter	6			1	1		3				2	1		14
Artifact Scatter	2	4				3					3	2		14
Isolated T.F.		2				3		2	1		6			14
Roaster Complex					1	4		4	1	1	45	6		62
"Camp"	8	5	1	1	6	16	7	5	8	3	38	1		105
Isolated Pot Cache				1	3		1			1	1			7
Burial			1		2		1				1			5
Groundstone Cache								1	1		1			3
Other Tool Cache			1	1	1		1				1	1		6
Water/Soil Control					2	1			1					4
Bedrock Mortar										1	2	1		4
Trail	3	1			1									5
Rock Art	8		1			2					2			13
Inscription	3		3	1			2							9
Historic Trash	2				1				1		1	2		7
Historic Structure	2	1			1	7	3			1			5	20
Other	2	1		3	1	3	4				1		1	16
Delta Complex					2	1								3
Total	48	18	9	16	50	85	35	17	29	13	128	24	6	475

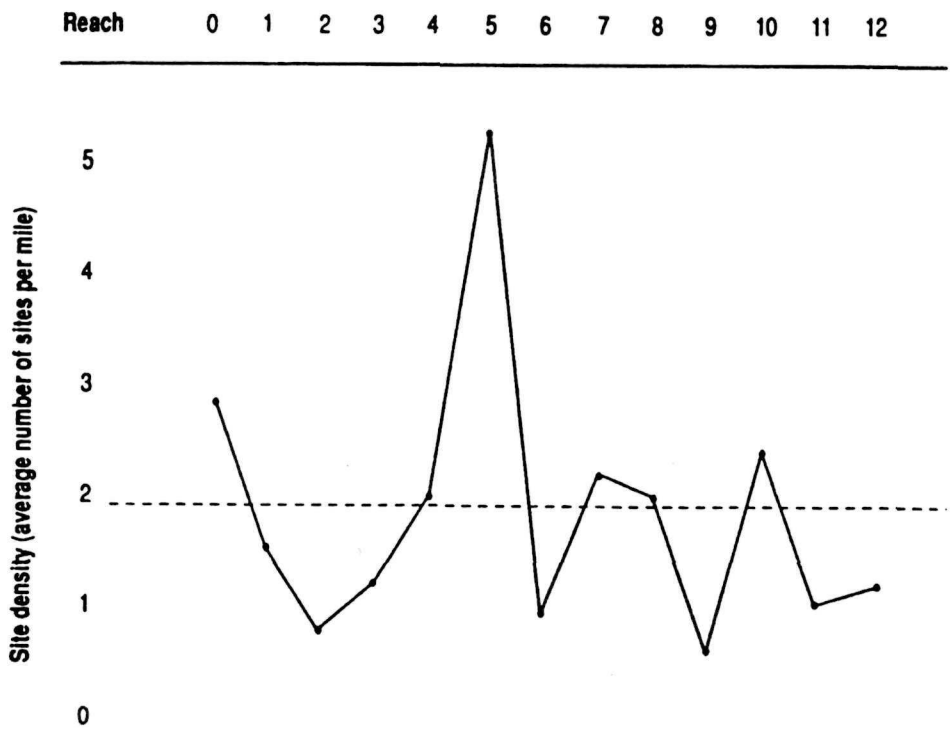

Figure 2. Site density by reach.

low-water periods or on those rare occasions when the river froze over, but it was not until the late nineteenth century with the development of John D. Lee's ferry service that regular cross-river travel became a reality.

In addition to travel routes and arable land, the Lees Ferry area offered ready access to the Chinle Formation, which provided a warehouse of mineral resources to prehistoric inhabitants of the area: silicified petrified wood for stone tools, coarse-grained sandstone for grinding implements, ceramic-quality clays, and manganese, azurite, and hematite for paint (Geib 1990). In the early twentieth century, entrepreneurs prospected the formation for gold without success. Fifty years later, commercial quantities of uranium were extracted from the Chinle Formation near Lees Ferry.

Approximately a mile below Lees Ferry, the river reenters a gorge defined by cliffs of the Kaibab, Toroweap and Coconino Sandstone formations. Throughout this stretch of the canyon, the river banks are bordered by narrow alluvial benches overlapping steep talus slopes that become progressively higher as one proceeds downstream. At approximately mile 5.5, the river widens slightly as it cuts through the softer underlying Hermit Shale, but by this point, the canyon rims are approximately 150 m (500 ft) above river level. Several side canyons provide steep access routes to the river along this reach, the main ones being Cathedral Wash, Five-Mile Wash, Jackass Canyon, and Soap Creek. The general paucity of exploitable resources, coupled with the narrow, confined topography and shortage of habitable shelters (except in the first mile below the mouth of the Paria) discouraged intensive use of this reach. Two main clusters of sites occur in Reach 1, one at the mouth of the Paria River and the other in the vicinity of Soap Creek. The former cluster includes prehistoric Puebloan structural sites and historic Anglo and Navajo camps and features associated with the lower ferry crossing, while the latter consists of short-term camps, artifact scatters, and ephemeral structures primarily dating to the Pueblo II period (A.D. 1000–1150).

Reach 2 (miles 11.3 to 22.6)

Salt Water Wash provides access to the left bank, and a cross-canyon route via Soap Creek is feasible in this stretch of the river. Most of the sites in Reach 2, which included prehistoric petroglyphs, historic inscriptions, a historic cache, and small sheltered camps with structural remnants, are clustered in the vicinity of Salt Water Wash. A prehistoric pot cache was formerly located in this area but was removed by river runners before it could be documented by archaeologists.

Below Salt Water Wash, the river enters the Supai gorge. For the next 11 miles, the river is confined to a narrow corridor between sheer

canyon walls. Except for short stretches of talus and bedrock ledges, the river corridor is virtually impassible to pedestrians. The only exception to this general rule occurs between miles 16.5 and 19, where more or less continuous talus slopes permit hikers to pass along the east bank of the river. This passable stretch also contains the three main rim-to-river access routes: Rider Canyon and 19-Mile Canyon on the west side, and 18-Mile Canyon on the east. A cross-canyon traverse via the 19-Mile and 18-Mile canyon routes is possible and was apparently used prehistorically, as evidenced by a slight clustering of sites in this stretch.

Reach 3 (miles 22.6 to 35.9)

At approximately mile 23, the river begins cutting into the Redwall Limestone. The combination of this resistant stratum and the presence of numerous constricting debris fans at the mouths of short, steep tributary drainages accounts for a succession of rapids through the upper five miles of this reach. Although no inner canyon access routes have been documented in the upper part of Reach 3, the presence of several prehistoric sites on the east bank suggests that at least one route existed. With the exception of this east bank cluster, all sites in the upper half of Reach 3 reflect the activities of late nineteenth-century explorers and miners.

At approximately mile 30.5, the Fence Fault cuts across the river. Dowmstream from this point, the rapids diminish and several cross-canyon routes are possible. Prehistoric sites occur wherever these routes reach the river, as well as at several other locations accessible via the river banks from these ingress points. With the exception of a site complex at the mouth of South Canyon, most of the prehistoric sites appear to reflect short-term, transient use of the corridor. A complex of historic sites (listed as "Other" in Table 2) is associated with exploratory activities for Marble Canyon Dam.

Reach 4 (miles 35.9 to 61.5)

This stretch of the river crosses several geological formations, resulting in a more variable inner canyon topography. The Muav Limestone appears at river level at approximately mile 34, followed by the Bright Angel Shale at mile 50, and the Tapeats Sandstone around mile 59. The canyon remains sheer walled and constricted down to approximately mile 40. Below this point, erosion along the Eminence Break faultline and undercutting of the Bright Angel shale has caused the canyon to widen. This factor, plus the presence of broad, alluviated debris fans at the mouths of Nankoweap, Kwagunt, and several other North Rim drainages, creates a setting more conducive to seasonal and long-term human habitation.

Several faults cross the canyon in this reach, the main ones being the Eminence Break at President Harding Rapid (mile 43.6) and "Dinosaur Canyon" (mile 50), and the Blue Moon Graben at Kwagunt. Prehistoric cross-canyon routes were present in the vicinity of both of these faults. Additional routes into the canyon were possible via Nankoweap Canyon, Little Nankoweap, and the Little Colorado River via the Hopi Salt Trail.

Below Nankoweap, the Butte Fault parallels the west side of the river. The valley created along this fault offered prehistoric and historic inhabitants an easy travel corridor between Nankoweap Creek and the numerous North Rim tributaries downstream as far as Lava Canyon; with a little more effort, pedestrian travel as far as Unkar Canyon was possible. Therefore, it is not surprising to find that the majority (68%) of archaeological sites in this reach (and all Reach 4 sites with substantial architecture) occur below President Harding rapid on the right bank of the river at the mouths of these tributary canyons, while the intervening areas are almost devoid of archaeological remains; in contrast, the east side had relatively few but more evenly distributed sites, most of which reflect limited transient use of the corridor.

Reach 5 (miles 61.5 to 77.4)

This reach extends from the mouth of the Little Colorado River to Red Canyon, a distance of 16 miles. The river corridor between the mouth of Lava Canyon at mile 65 and lower Unkar Delta near mile 73 encompasses the most open and alluviated stretch of the entire canyon, and the channel is correspondingly broader and shallower than elsewhere (Schmidt and Graf 1988:8). The openness of the terrain correlates with the presence of the Precambrian Dox Formation, a silty shale that weathers into rounded hills and gentle slopes.

Several routes descend to the river from both sides of the canyon in this reach, and the left bank can be traversed for most of its length, so cross-canyon and linear traverses are readily available. In addition, there are broad alluvial terraces and debris fans suitable for farming and settlement throughout the central portion of this reach. Thus, it is not surprising that 17.9 percent of all recorded sites and 36 percent of structural sites (pueblos, small structures, and storage sites) occurred in this reach, which comprises only 6.2 percent of the project area. Historic structural sites were also common in this reach.

Reach 6 (miles 77.4 to 117.8)

Between Red Canyon and the Monument Fault at mile 117.8, the river flows between sheer walls of Precambrian schist and granite. This is the steepest, swiftest, and second-narrowest stretch of canyon,

and along with Reaches 8 and 11, it is one of the least conducive to human habitation. Several prehistoric routes descend to the river in Reach 6, but only the ones which allowed cross-canyon travel appear to have been used regularly, since continuous travel along the river banks is impossible through this stretch of the canyon. Cross-canyon routes occur at the mouth of Bright Angel Creek, at mile 93, at Crystal Rapid, at Bass Rapid, at Copper Canyon, and in the vicinity of the Monument Fault. Most sites recorded in this reach occurred in the vicinity of these cross-canyon routes. The only exceptions were historic Euro-American sites associated with nineteenth-century mining and early river-running activities and one prehistoric lithic scatter near the mouth of Monument Creek (another river access route).

Perennial streams enter the Colorado River from Clear Creek, Cottonwood Creek, Bright Angel Creek, Pipe Creek, Monument Creek, Hermit Creek, Crystal Creek, Tuna Creek, Shinumo, Hakatai, Elves Chasm, and several lesser canyons. Most of these drainages were inhabited prehistorically in their upper reaches, but long-term riverside settlements were apparently confined to drainages with well-developed alluvial fans *and* cross-canyon travel routes such as at Bright Angel delta (Schwartz et al. 1979). Historic sites tend to cluster in these same areas, particularly in the vicinity of Bright Angel and between Hotautau and Hakatai canyons where prehistoric routes were enhanced for use by mule-packing miners and tourists.

Reach 7 (miles 117.8 to 125.5)

At the Monument Fault, the Tapeats Sandstone drops abruptly to river level. In the upper 22 miles of this reach, the Tapeats forms a ledgy and impassable cliff along both sides of the river, but below Blacktail Canyon (mile 120) the cliffs become progressively lower until they give way to open, sand-covered benches in the vicinity of 122-Mile Canyon. From this point downstream to Fossil Canyon, the river corridor remains relatively broad and open, especially on the left bank. A least two access routes descend from the Great Thumb area on the south rim to this relatively open stretch of the corridor. The combination of the open topography and rim-river routes undoubtedly accounts for a concentration of sites in this segment of Reach 7.

Reach 8 (miles 125.5 to 139.9)

Across from Fossil Creek, the Tapeats Sandstone begins rising above river level again and the corridor becomes narrower. About a mile further downstream, the river starts entrenching the underlying schist, and from this point on down to approximately mile 140, the river flows in the Middle Granite Gorge. The generally constricted topography of this reach is broken in two places: between miles 130.5 and 135 and between miles 136 and 137.5. All but 9 of the 29 sites recorded in Reach 8 occur in these more open portions of the corridor. Thus, although site density averages two sites per mile over the whole reach, the density climbs to 2.9 sites per mile between miles 130.5 and 137.5.

There are several known rim-to-river access routes in this part of the canyon. All documented routes occur on the north (right) bank of the corridor and follow perennial streams down Stone, Tapeats, and Deer creeks. Although no cross-canyon routes have been documented in this part of the canyon, the presence of site clusters near mile 127 and 135 suggest that at least two routes descend from the Great Thumb on the south rim to the river.

Reach 9 (miles 139.9 to 159.9)

In the 20-mile stretch below Fishtail Canyon, the river flows between steep, confining walls of the Muav Formation. This inhospitable, narrow stretch of canyon is baking hot in the summer months and shady in the winter; habitable locations are few and far between. With the exception of a few small debris fans at the mouths of side canyons upstream of Kanab Creek and a moderate-sized fan at Kanab Creek itself, alluviated areas are nonexistent. Most of the potentially habitable areas near river level consist of level bedrock ledges that would have been subjected to repeated flooding in pre-dam times.

Primary access routes to the river include 140-Mile Canyon, Matkatamiba, and Havasu canyons on the left bank, and Kanab Creek and 150-Mile Canyon on the right, but continuous travel at river level is impossible. Pedestrian travel via the river corridor requires considerable technical climbing and narrow traverses along exposed ledges well above river level. Thus, a paucity of habitation sites and overall low site density is expectable for this reach of the river.

Despite the forbidding terrain, Reach 9 contained a total of 13 sites, including camps, structural remains, a bedrock mortar, a vessel cache, and a roaster complex. Cultural-temporal affiliations of the sites included prehistoric Pueblo, Pai/Paiute, Anglo, unclassified Formative, and unknown. Most of these sites occurred on ledges well above the mean high-water level, but one site occurred in close proximity to the river. This anomalous site consisted of a series of room outlines in an overhang with a slab metate and a mix of Pueblo and Cohonina ceramics. This site had been subject to flooding in historic times and was largely obscured by recent sand deposits. Its presence in the flood zone, in an obscure area far from any known travel routes, suggests that other sites could have been

present in the Muav gorge at one time, but repeated flooding has since obliterated their evidence.

Reach 10 (miles 159.9 to 213.8)

A few miles above Tuckup Canyon, the corridor begins to widen slightly, although the Muav Formation continues to hem the river between steep, stair-stepped walls down to Lava Falls. Alluviated debris fans at the mouths of tributary canyons reappear once again in this reach. Pliocene and Pleistocene damming of the river by basalt flows forced the river to detour and cut new channels around the plugs, resulting in a much wider canyon below Lava Falls. These factors, plus the presence of numerous faults cross-cutting the corridor, creates an environment more conducive to human occupation. This is reflected in the average site density of 2.4 sites per mile.

Primary access routes to the river include Tuckup, National, Mohawk, and Stairway canyons in the upper portion of the reach, the Redslide route below Cove Canyon near mile 175, the Toroweap Point-Prospect Canyon route at Lava Falls, the Bundy Trail above Whitmore Canyon, the 209 Mile-Granite Park cross-canyon route, plus numerous lesser-known routes throughout the lower portion of the corridor. Sites occur at the mouths of virtually every tributary canyon with an alluviated debris fan. Site types are dominated by roaster complexes (n = 45) and camps (n = 38), which together comprise 64.8 percent of the sites in this reach.

Reach 11 (miles 213.8 to 235.0)

Below mile 214, the river becomes re-entrenched in a progressively narrower canyon. Initially it flows through Tapeats Sandstone, but by mile 217, it re-enters the Precambrian Schist. Still, the canyon remains relatively open through much of this reach, although continuous travel along the river banks is impossible below 217-Mile Rapid. A number of routes descend from the rim on both sides of the canyon, allowing ready access to the river along most of this reach. Like Reach 10, sites are mainly confined to the alluviate debris fans at the mouths of tributary canyons, and site types are dominated by roaster complexes (n = 6) and camps (n = 7), which together comprise 54.2 percent of the sites in this reach.

Reach 12 (miles 235 to 278)

Reach 12 includes the lower end of the schist gorge which is now inundated by Lake Mead. Only the upper 5 miles of this reach were included in the survey. All six sites recorded in Reach 12 are Euro-American historic sites, and all but one are associated with engineering work at the proposed Bridge Canyon Dam site. The sixth site is a cenotaph at the mouth of Separation Canyon commemorating the departure of Dunn and the Howland brothers from Powell's 1869 expedition.

Discussion

As depicted in Figure 2 and Table 2, the distribution of sites along the river corridor is highly variable. The uneven distribution is largely a reflection of geomorphic factors which in turn relate to the structure and composition of the surrounding geologic formations. Elevation and exposure may also play a significant role in controlling site distributions through their influence on the biotic communities within the river corridor. Nevertheless, geomorphic variables—particularly the availability of alluviated debris fans, terraces, and fault-controlled access routes—appear to have been the primary factors influencing human settlement in the canyon.

Preliminary analysis of the site type variables reveals significant patterning in terms of spatial and temporal distributions (Figure 3). For example, 6 of the 24 site types occurred only in the eastern half of the canyon (i.e, upstream of 140 mile), while one site type was confined to the western canyon below 140 mile. Site types found only in the eastern canyon included pueblos (n = 7), storage sites (n = 11), water/soil control features (n = 8), developed trails (n = 5), isolated historic inscriptions (n = 9), and delta farming communities (n = 3). Isolated bedrock mortar sites were the only type restricted to the western canyon. Rock art, both isolated and in association with living areas, was found in both segments of the canyon, but the types of rock art were spatially discrete: all but one petroglyph sites occurred upstream of Kanab Creek, and all but one site with pictographs occurred below Kanab Creek (mile 145).

Other site types demonstrated a marked tendency to occur in one part of the canyon over the other. For example, 87.6 percent of all small structural sites occurred upstream from river mile 140, while 83.9 percent of the roaster complexes occurred downstream of this point. When compared with the total numbers of sites recorded in each half of the canyon, small structural sites comprise 25.6 percent of all sites in the eastern area (n = 304), but only 6.4 percent of the total sites recorded in the western area (n = 171). Conversely, roaster complexes comprised 30 percent of all sites found in the western reaches of the canyon, but only 3.3 percent of all sites recorded in the eastern reaches. Other site types with skewed distributions included ephemeral structures (n = 5, 80% in the east vs. 20% in the west), lithic scatters (n = 14, 78.6% east vs. 21.4% west), isolated thermal features (n = 14, 92.9% east vs. 7.1% west), vessel caches (n = 7, 83.3% east vs. 16.7% west), and isolated rock art sites (n = 14, 78.6% east vs. 22.4% west).

Chapter 4

Ceramics

by Terry Samples

During the 1990-1991 survey, 348 sites were recorded that contained one or more ceramic sherds. The ceramic-bearing sites comprise 73 percent of the total 475 sites which were recorded or re-recorded in the Grand Canyon river corridor survey area.

Ceramics are widely distributed in time and space and have a relatively imperishable quality. Therefore ceramic materials serve as a constant source of information for analytical studies and contribute to archaeological research in a variety of ways. Perhaps most importantly, they provide information on cultural-temporal affiliation, site function, and intra- and inter-regional patterns of exchange. Because many types of sherds have known temporal ranges, sites with ceramic assemblages can be relatively dated, providing information that is essential for the development of regional chronologies, culture histories, settlement pattern analysis and observations of changes in patterns through time. Besides having defined temporal ranges, many ceramic wares are known to have been produced within certain geographic areas or ceramic production zones. Therefore, locally produced materials can be distinguished from "intrusive" trade wares. Distinguishing between local and non-local ceramics is essential to understanding prehistoric trade and exchange relations. This distinction is also important for the assignment of cultural affiliation.

Prehistoric material distribution studies are relevant to current ethnographic research and past archaeological debates in the Grand Canyon region (Colton 1939; Dobyns and Euler 1985; Euler 1958, 1981; Kroeber 1935; Schroeder 1957, 1960; and others). One controversy centers around the relationships of late prehistoric cultures to the protohistoric and historic occupants of the western Grand Canyon. Some of the arguments are largely supported by ceramics and ceramic distribution studies.

Ceramic studies can also contribute to inferences of site function. Because vessel form is associated, in part, with vessel function, domestic activities that took place on sites can be inferred. Functional analyses of ceramic assemblages can also contribute to knowledge of subsistence and related studies of prehistoric economics, an important focus of archaeological research in the project area.

Field Analysis

Field analysis of sherds was primarily directed towards gaining initial information concerning the cultural-temporal affiliation of sites and site function. A ceramic analysis form was designed to record ware, type, vessel form, presence or absence of rim, and post-firing modification for each sherd analyzed.

Sherds were analyzed on every site that contained them. The strategy employed a mixed judgmental-random procedure for selecting sherds for analyses. At sites with fewer than 100 artifacts (sherds and lithics combined), all artifacts were analyzed. At sites with more than 100 artifacts, one or more 1 m radius units encompassing at least 1 percent of the site area were judgmentally placed over areas encompassing the maximum artifact densities. In the event that an analytical unit encompassed more than 100 artifacts, a sample of 40 to 50 lithics and all sherds were analyzed per sample unit. In the rare event that an analytical unit contained more than 100 sherds, the unit was bisected and all sherds in half of the analysis unit were analyzed.

Sherd "nips" were taken from all analyzed sherds. After design styles were determined or recorded, a corner or edge of the larger sherd was broken off, numbered, and collected. These small nips, generally less than 1 cm sq, served several purposes. The sherd nip has as much information potential as the whole sherd for lab analyses of paste and temper ingredients, petrographic studies, and for refiring studies (see discussion below under Lab Analysis). Furthermore, the field analyses conducted by several different analysts could be re-checked in the lab by a single analyst. This provided a means of controlling analytic variability in the field and provided the lab analyst with an opportunity to look at sherd pastes and temper ingredients beneath a binocular microscope, an advantage not available during field recording.

Because collections of sherds were already made at many of the previously recorded sites, and because the project policy favored non-collection, sherd nipping offered a low-impact method of preserving the integrity of low-density artifactual sites while maximizing information potential of ceramic materials.

Sherd Identification

The Grand Canyon river corridor contains ceramic materials from many previously defined ceramic traditions. Ceramics produced by these various traditions were identified on the basis of raw materials, manufacturing techniques, and decorative treatments (Table 4). Other attributes

such as rim curves, vessel morphology, and surface treatments, became increasingly important when assemblages contained few decorated wares or only plain gray or brown wares. Such was the case at many sites, particularly in the western portion of the survey area.

Traditional typological classification (Colton 1952, 1956, 1958) was employed for the majority of the ceramics recognized in the project area. These are briefly described below. Exceptions to the traditional typology are discussed by ware and/or type.

Unclassified sherds do not fit traditional typologies, are simply aberrant, or in some cases appear to be local variants or imitations of classic types. For example, many corrugated sherds exhibit surface treatment similar to Tusayan Corrugated, but in temper, paste, and surface color cannot be classified to existing corrugated types. Sherds that do not meet criteria for inclusion within an existing typology are noted as possible variants or possible locally produced specimens. To isolate subregions of production based on variations in temper inclusion and clay, defining the variation is a more appropriate strategy than lumping variants into existing categories. Variants may be recognized which form subsets of wares if meaningful distinguishing characteristics are present that set them apart from traditional ware-type categories.

Tusayan Gray Ware, Tsegi Series (Colton 1952)

Tusayan Gray Ware was commonly recognized and separable from Virgin Series Gray Wares on the basis of temper, which is consistently clear angular to subangular quartz sand, quite homogeneous, and medium to coarse grained. Classic examples of this ware commonly occur throughout the river corridor, especially in the eastern portion of the Grand Canyon.

Tusayan White Ware, Kayenta Series (Colton 1952)

This ware was also easily separable from other white wares occurring in the project area because of its relative homogeneity in paste, temper ingredients, surface color, and overall ware consistency as traditionally defined (Colton 1952:33).

Tusayan Gray and White Ware, Virgin Series (Colton 1952, Thompson 1986)

Colton (1952) did not separate Virgin Series White and Gray Ware, but following the lead of recent researchers (Fairley 1989; Thompson 1986), Tusayan Gray Ware and Tusayan White Ware, Virgin Series are separated. Sherds placed in the Virgin Series were identifiable in contrast to Tusayan Gray Ware, Tsegi Series, and Tusayan White Ware, Kayenta Series by their heterogeneous range of surface colors, variable temper size, and occurrences of multilithic inclusions. The unsorted quartz sands with other inclusions, combined with variable surface colors, distinguish Virgin Series ceramics. Decorated wares in the Virgin Series exhibit characteristics very similar to the gray utility wares except the temper is somewhat finer. Subregional variants within the Virgin Series have been identified elsewhere (Thompson 1986), but for the purposes of this report, only Virgin Series ceramics were separated.

Moapa Gray Ware and White Ware (Colton 1952)

For the purposes of this report and in keeping with recent researchers (Fairley 1989; Thompson 1986), Moapa Gray Ware and White Ware are separated, even though Colton (1952) did not separate decorated and utility wares. The presence of olivine temper readily distinguishes Moapa Gray and White Wares from others. Sherds included in this series have variable amounts and colors of olivine derived from "crushed green clino pyroxene (CPX) nodules" (Lyneis 1988:4). Shivwits Plain, a newly defined type (Lyneis 1991), also has olivine in the temper but was distinguished from Moapa Wares by also having crushed sherd temper (the presumed source of the olivine).

Shinarump Gray and White Ware (Colton 1952)

Shinarump Series ceramics were originally defined as produced from an iron-rich, dark gray or brown-fired clay, tempered with abundant angular fragments of multilithic material. Shinarump White Ware is a companion ware, similar in paste and temper, but with the addition of a thick white slip. The above is the "classic" description of the Shinarump Wares defined by Colton (1952). (See Fairley 1986:17-19 for a detailed discussion.) Shinarump ceramics are particularly difficult to discuss because of a general lack of consensus concerning what various analysts are referring to when sherds are typed as Shinarump. Among other attributes that distinguish the wares, vitrification of the surface and paste is variably used by researchers as a criterion for inclusion or exclusion within Colton's traditional Shinarump classification. For the purposes of this project, Shinarump sherds were identified by a dark gray to purplish-brown firing clay that is often, but not always, subvitrified and may have either multilithic temper or crushed sandstone with a white matrix around individual opaque quartz grains. Vitrification is not required as a critical attribute but was frequently present. Because independent factors or combinations of factors can result in vitrification of ceramics (for example, the chemical composition of the clay or over-firing), this attribute is not considered the overriding one for inclusion in the Shinarump Wares.

Table 4. Ceramic Ware Attributes.

Attribute	Firing Atmosphere	Thinning Method	Primary Temper	Secondary Temper	Temper Size	Paste Color	Paste Texture	Surface Color	Surface Features
Tusayan White Ware Kayenta Series	reduced	coil & scrape	quartz sand	absent	fine to medium	light-medium gray	fine to very fine	white to bluish-gray	well smoothed sometimes light slip
Tusayan Gray Ware Tsegi Series	reduced	coil & scrape	clear quartz sand	absent	medium to coarse grained	light to dark gray	homogeneous, medium to coarse	light to medium gray	plain or corrugated
Tusayan Gray Ware Virgin Series (Decorated)	reduced or variable	coil & scrape	fine quartz sand	multi-lithic inclusions	fine to medium	light to dark gray	fine to medium	light to dark gray—tan to pinkish	smoothed-well smoothed rarely slipped
Tusayan Gray Ware Virgin Series (Utility)	reduced or variable	coil & scrape	fine to med. grain quartz	multi-lithic inclusions	fine to medium	light to dark gray	medium to coarse	light to dark gray—tan to pink	plain and corrugated
Shinarump White Ware	reduced	coil & scrape	crushed sandstone-quartz sand	multilithic sand inclusions—sherd	fine to medium	dark gray purplish brown	fine to medium some vit.	white to light gray	smoothed, slipped, thick white
Shinarump Gray Ware	reduced	coil & scrape	crushed sandstone-quartz sand	multilithic sand inclusions—sherd	medium coarse	dark gray purplish brown	medium coarse some vit.	dark gray-brown, purplish brown	plain and corrugated
Walhalla White Ware	reduced-variable	coil & scrape	quartz sand-crushed sandstone	"other" mineral inclusions-sherd	fine to coarse	light gray to medium	fine to med.-sub vit.-vitrified	white to gray	smoothed thin white slip
Walhalla Gray Ware	reduced-variable	coil & scrape	quartz sand-crushed sandstone	other mineral inclusions-sherd	fine to coarse	light gray to medium	fine to med. coarse; subvit.-vitrified	light to dark gray—tan to orange	plain-corrugated
Moapa Gray Ware (Decorated)	reduced	coil & scrape	olivine-variable amounts	quartz and other sands	fine to medium	light to medium gray	fine to medium	white to medium gray	smoothed

Table 4 (continued)

Attribute	Firing Atmosphere	Thinning Method	Primary Temper	Secondary Temper	Temper Size	Paste Color	Paste Texture	Surface Color	Surface Features
Moapa Gray Ware (Utility)	reduced	coil & scrape	olivine-variable amounts	quartz and other sands	medium to coarse	light to dark gray-brown	medium to coarse	medium to dark gray	plain-corrugated
Jeddito Yellow Ware (Decorated)	oxidized	coil & scrape	occasional sparse quartz sand	none	fine to medium to absent	light to medium yellow	medium to very fine	yellow-brown to light yellow	smoothed to highly polished
Awatobi Yellow Ware (Utility)	oxidized	coil & scrape	quartz sand	none	medium to coarse	light to medium yellow	medium to coarse	light to medium yellow	plain-rough corrugated
Little Colorado White Ware	reduced	coil & scrape	crushed sherd	occasional quartz grains	fine to medium	light to dark gray	fine to medium	white to light gray	well smoothed to polished thin to med. white slip
Navajo Utility Ware	mainly reduced-oxidized	coil & scrape	quartz sand-crushed sherd	occasional mica, sand	fine to medium coarse	gray to black tan-buff	fine to medium	light gray to black-tan-pink	smoothed-scraped-indented-applique
Tsegi Orange Ware	oxidized	coil & scrape	crushed sherd	quartz sand	medium to coarse	light orange	homogeneous medium coarse	orange-red	smoothed-red slip
San Juan Red Ware (San Juan Series)	oxidized	coil & scrape	quartz sand	diorite-andesite	fine	gray to orange	fine	red	smoothed-polished at times—thin red slip
San Juan Red Ware (Little Colorado Series)	oxidized	coil & scrape	fine sand crushed sandstone	sparse angular dark fragments	fine to medium	medium to dark red	fine to medium vitrification	dark-brick red	smoothed-polished slip rare
Shivwits Plain	neutral to oxidized	coil & scrape	crushed sherd (with olivine temper)	occasional quartz & feldspar grains	fine	dark gray to black	grainy	reddish brown to black	plain-corrugated

Table 4 (concluded)

Attribute	Firing Atmosphere	Thinning Method	Primary Temper	Secondary Temper	Temper Size	Paste Color	Paste Texture	Surface Color	Surface Features
Tizon Brown Ware	oxidized	paddle & anvil	opaque quartz-feldspar	occasional mica particles	fine to coarse	light to dark brown	fine to coarse	tan-brown, reddish-brown	smoothed-bumpy-wiped
Lower Colorado Buff Ware	oxidized	paddle & anvil	rounded quartz sands	mica-hornblende, feldspar	fine-medium to absent	light tan to buff—red-gray-black	very fine to medium coarse	tan or buff to gray	smoothed-polished-stucco-slipped
Southern Paiute Brown Ware	oxidized	paddle & anvil	unsorted sands multilithic	variable multilithic rock frags.	coarse to very coarse	brown to black	medium to coarse	tan-brown reddish brown to black	uneven-rough bumpy
Prescott Gray Ware	reduced-oxidized	paddle & anvil	quartz-sand crushed rock	mica feldspar	coarse to very coarse	light gray to reddish orange	coarse to very coarse	light gray to orange	uneven bumpy to smoothed
San Francisco Mountain Gray Ware	variable reduced-oxidized	paddle-anvil-scraped	fine quartz sands	feldspar and micaceous particles	fine to medium	light to medium gray	fine to medium coarse	light gray to bluish gray, tan-brown	smoothed-fugitive red wash at times

Walhalla Gray Ware and White Ware (Marshall 1979)

Walhalla Wares were also recognized in the project area. In contrast to Shinarump, Walhalla Wares are by definition (Marshall 1979) always vitrified, similar to Shinarump in many characteristics but separable from Shinarump by differences in temper ingredients. These wares were originally defined by Marshall (1979) during his analysis of ceramics from the School of American Research excavations at Unkar delta and the Bright Angel site. He distinguished these wares by temper material that included crushed sandstone and abundant fine to coarse rounded to subangular quartz grains surrounded by a white matrix, and by the paste, which was characteristically vitrified to subvitrified. Surface color had a shiny purplish-gray cast, or varied to orange or a reddish-gray color. Vitrification or subvitrification was noted on the surfaces as well as within the core on a fresh break of the sherd.

In the GCRCS study area, the sherds typed as Walhalla commonly had crushed sandstone temper that occurred in small clusters of fine grains within a white matrix, as opposed to larger individual grains of quartz surrounded by white matrix in Shinarump. The paste was often light gray, and the crushed sandstone temper appeared as white flecking within the paste. Crushed sherd, in trace amounts, was occasionally present, as well as a variety of multilithic mineral inclusions, including quartz sands. In general, the Walhalla Wares were separated from Shinarump by having a lighter paste, a more brittle fracture, and a more vitrified appearance. It is important to note that most GRCA researchers, notably Erler, Jones and Balsom, have not separated Walhalla Wares in their analyses of ceramic assemblages (Balsom 1984; Jones 1986), even though it is appropriate to at least investigate the possible variable distribution of these ceramics since the different paste and temper characteristics may point to definable, separate areas of production.

Little Colorado White Ware and Gray Ware (Colton 1952)

Abundant, fine to medium fragments of angular sherd temper in a medium to dark gray paste distinguish the Little Colorado White and Gray Wares. Additionally, the White Wares have a distinctive white or light oyster gray slip on bowl interiors and jar exteriors, and a thin watery white slip on bowl exteriors. The presence of sherd temper in the characteristic gray core make this ware easily recognizable and separable from the other white and gray wares that occur in the project area.

San Francisco Mountain Gray Ware (Colton 1958)

Although originally defined as a gray ware, San Francisco Mountain Gray Ware sherds are often oxidized a tan or brown color, indicating that the firing atmosphere was generally uncontrolled (Cartledge 1979:303; McGregor 1967:123). Temper material is fine quartz and feldspar sand that often produces a sparkling effect on well-smoothed surfaces. Other mineral inclusions such as micaceous particles may also contribute to the sparkling appearance. Platey muscovite mica is commonly found in Kirkland Gray, a coarser tempered version of Deadman's Gray. Reduced examples of San Francisco Mountain Gray Ware have a light gray to bluish-gray surface color. Although vessels of this ware were constructed by the paddle-and-anvil technique, scraping marks on jar interiors are common. Surfaces may be well smoothed, but are not typically highly polished.

It should be noted that even though traditionally defined San Francisco Mountain Gray Ware has been recognized in the Grand Canyon (Marshall 1979, 1980), its range of variability has not been adequately investigated. For example, the oxidized variant of Deadman's Gray may look similar to Tizon Brown Ware in general surface treatment, color, and construction technique. However, the rather regular and consistent fine quartz sand, the relative abundance of temper to paste, and sparkling surfaces, as well as occurrences of a fugitive red wash on some vessel exteriors and decorated types, set San Francisco Mountain Gray Ware apart from Tizon Brown Ware. Understanding the variability of San Francisco Mountain Gray Ware has important implications for archaeological understanding of the poorly known and vast geographic area to the west of the Coconino Plateau, north to the Grand Canyon, west to the Lower Colorado River and south to the Big Sandy River.

Tsegi Orange Ware (Colton 1958)

The Tsegi Orange Wares are relatively easy to recognize because of their consistency in paste, sherd temper, distinctive orange color, and red slip. Surfaces are often exfoliated, making type classification impossible, but the ware is still easily recognizable. Sherds classified to this ware did not deviate from Colton's traditional definition.

San Juan Red Ware, San Juan Series (Colton 1952; Breternitz et al. 1974)

This series was distinguished by a bright red-firing clay, well-smoothed and polished surfaces, and fine andesite or diorite temper. Sherds classified to this ware did not deviate from traditional definition.

San Juan Red Ware, Little Colorado Series (Abel 1955)

Redwares in the Little Colorado Series may exhibit vitrification or subvitrification and have fine sand temper or crushed sandstone. Slipping is uncommon and the clays fire to a dark brick-red color. The crushed sandstone temper and absence of diorite and/or andesite as tempering material, combined with the darker firing clay, separate the Little Colorado Series from the San Juan Series.

Tizon Brown Ware (Dobyns and Euler 1958)

Tizon Brown Wares are recognized by several attributes. In general, the types appear to be consistently tempered with materials derived from decomposed granitic rock (feldspars, quartz, and mica). Tizon Brown Wares are produced by the paddle and anvil technique, and paddle marks are often noticeable on larger sherds. Sherd surfaces are often smoothed but not highly polished. Surfaces range in color from dark brown to light brown or reddish-brown. The interior paste is often similar to the surface color but may be darker, with feldspars contrasting to the darker paste. Temper varies from coarse in Aquarius Brown to medium-coarse or fine in Cerbat Brown. Cerbat Brown, by definition, has similar but finer paste and temper ingredients than Aquarius Brown. Tizon Wiped is distinguished by surface treatment that displays distinct wiping marks.

Several attributes separate Tizon Brown Wares from San Francisco Mountain Gray Wares. For example, Tizon Brown Wares are not commonly scraped on vessel interiors as are many San Francisco Mountain Gray Wares. The presence of multilithic granitic sands in Tizon Brown Wares contrast to the fine-grained quartz and feldspar sands in San Francisco Mountain Gray Ware. Additionally, the relative abundance of tempering material to paste distinguishes San Francisco Mountain Gray Ware. Lower Colorado Buff Ware, also produced by the paddle and anvil process, is distinguished from Tizon Brown Wares on the basis of temper, surface treatment, color, and in some cases, rim curve and construction technique.

Lower Colorado Buff Ware (Schroeder 1958; Waters 1982)

The most notable characteristic of this ware is the light tan or buff-firing clays used in its production. Vessels are thinned by the paddle and anvil technique and are generally fired in an oxidizing atmosphere. The Lower Colorado Buff Wares commonly have smoothed, sometimes polished surfaces, and have riverine rounded quartz sands for temper. Material derived from granitic sources such as feldspars and micaceous particles may also be present. In several cases a stucco finish occurs on sherds that are unmistakably Lower Colorado Buff Ware. No other ware found in the project area exhibited this kind of surface treatment. All ceramics identified as Lower Colorado Buff Wares conformed to published descriptions.

During field analysis of ceramics, only the general Lower Colorado Buff Ware category was used. During lab analysis, several types were recognized within the ware. These types and their chronological associations will be discussed below.

Southern Paiute Brown Wares (Baldwin 1950b; Euler 1964; Fowler and Matley 1978)

Paiute Brown Ware was found to be quite variable in many respects. Tempering material was predominantly unsorted quartz sands, but a variety of other inclusions occurred, including crushed sherd, possibly crushed igneous rock, olivine, and crushed sherd with olivine.

Most sherds are poorly fired at low temperatures in an oxidizing atmosphere. All apparently are thinned by the paddle and anvil technique, commonly resulting in a bumpy, uneven surface. Surface colors range from black to reddish-brown, and often have a dark carbonized core. If any surface decoration occurs, it is commonly found slightly below the rim of the vessel as rows of fingernail impressions or indentations arranged in a horizontal band or bands.

Because Paiute Brown Ware is variable and is often found in the western area of the Grand Canyon associated with other brown wares (such as Tizon Brown Ware), its recognition was problematical at times. This was especially true when only small sherds were present, or sherds lacked definitive diagnostic attributes.

Prescott Gray Ware (Colton 1958)

The relative abundance of coarse micaceous quartz sands and temper material derived from granitic rock distinguishes Prescott Gray Ware. Surface color of sherds can range from orange to light gray. Firing atmosphere is quite variable and poorly controlled. Vessels are thinned by the paddle and anvil technique, leaving a bumpy surface that is rough at times, but varies to somewhat smoothed on sherd exteriors.

Jeddito Yellow Wares (Colton 1956; Adams 1979, 1980)

The well-fired Hopi ceramics are recognized by their distinctive decorated styles, fine yellow-firing clays, and relative lack of temper. Bowl sherds are often highly polished, while utility wares, in contrast, have rough surfaces, are sometimes corrugated, and have abundant quartz sands in a yellowish paste similar in color to the decorated ware.

Shivwits Plain (Lyneis 1988, 1991)

This coiled and scraped brown ware is characterized by crushed sherd temper occurring in a dark gray to brown paste. Olivine is present within the crushed sherd temper and can also be found free in the paste. Both plain and corrugated variants occur in the project area.

Navajo Utility Ware (Brugge 1981)

This ware ranges in surface color from light gray, buff, pink to dark gray, or black. Surfaces may be roughly wiped, smoothed, or occasionally lightly polished. Temper consists of fine to medium fragments of crushed sherd. Sometimes quartz sands and crushed rock are present. Micaceous varieties are also known.

Lab Analysis

The primary objectives of ceramic lab analyses were (1) to integrate GCRCS data with previously recorded ceramic information, and (2) to control for analyst variability by examining the collected sherd nips under a 30x binocular microscope. A third objective was to select sherds from "problem areas" for refiring and petrographic analyses. Research-oriented problems related to local production and exchange of ceramics (Arnold 1985; Bishop 1980; Earle and Ericson 1977) can be addressed on a gross level by conducting refiring tests on sherd samples. More discriminating analyses such as petrographic studies can be used to confirm identifications of particular temper inclusions and by extension, as a means of identifying potential source areas. Petrographic analyses are particularly relevant in the western Grand Canyon region, where plain brown wares dominate sherd assemblages.

In the past, Grand Canyon National Park archaeologists have made limited sample collections (random and nonrandom) of diagnostic sherds from sites they recorded. These collections, and those made by casual visitors, have reduced the numbers of in situ decorated sherds on many sites. For this reason, the Grand Canyon National Park study collection was visited, where artifacts were reexamined for the purpose of merging previously recorded site information with current recording forms. It was also interesting and informative, for comparative purposes, to see how sherds were typed by former park anthropologist/archaeologists and researchers. If types had been previously noted on sites, but not recorded during the most recent recording, these previously recorded types were considered in the overall ceramic assemblage analysis. In some cases, the additional information required modification of the temporal and/or cultural affiliation assignment of sites. In other cases, the additional information matched the data collected during the GCRCS recording.

As an additional reference for identifying sherds, the type collection at the Museum of Northern Arizona served as a valuable resource. For comparative purposes, it is necessary to be certain that the wares and types recognized in the project area were within an acceptable range of variation for wares and types as they have been traditionally defined.

Re-firing (Oxidation) Tests

Surface colors of ceramics can be attributed to several factors. Ceramics are typically classified as being fired in either an oxidizing or reducing atmosphere. In general, oxidizing atmospheres produce warm colors (brown, yellow, or buff), while reducing atmospheres produce cool colors (grays). However, pottery color is conditioned by clay composition and impurities, as well as by firing conditions—two independent variables (Shepard 1954:105). In order to make inferences regarding one, the other must be controlled.

Refiring, or oxidizing, controls for the variable of firing atmosphere. When sherds are totally oxidized, the color reflects the impurities and common iron compounds of the clay. This method of standardizing makes qualitative comparisons possible (Shepard 1954:103). On a gross level, one can determine whether compositionally similar or different clays were used in the production of ceramics. This information is useful as a first step in defining subregions of production in areas where ceramics superficially appear to be homogeneous. Assuming that local production was common prehistorically, it follows that suitable local clays and tempering materials were used. The use of local resources will to some extent reflect the geology of the source area. Refiring tests are a preliminary step to distinguishing between local and non-local production.

Petrographic Studies

Because ceramic materials reflect natural resource availability (Arnold 1985:20), variations in clays and temper used in pottery production can be correlated with macro- and micro-geographic production areas. Petrographic studies can identify transparent minerals in sherd specimens that may differentiate pottery made in very distant localities from locally made pottery that is similar in outward appearance. For example, in the western portion of the Grand Canyon, Tizon Brown Ware, Southern Paiute Brown Ware, Deadman's Gray (or oxidized Deadman's Gray), and Lower Colorado Buff Ware may co-occur on sites with few or no decorated types in the assemblage. In outward appearance, small sherds that are constructed by

paddle and anvil technology may be difficult to distinguish. Therefore, variations in temper inclusions are often the most useful attributes to consider in defining the area of production and by extension, the cultural association. Additionally, inferences of prehistoric trade and exchange relations depend on first establishing at least general areas of production before distributions of pottery from these general production zones can be considered.

Current methods of sourcing archaeological materials through trace element analysis and other techniques can lead to positive identification of material sources (Weigand et al. 1977; Bishop 1980). Petrographic studies may not define actual source areas of raw material but can help to identify variability of temper inclusions from general macro- and micro-production areas. This at least strengthens interpretations regarding prehistoric economics and exchange systems by verifying the movement of archaeological materials from one point to another.

Problems: Cultural-Temporal Affiliation of Sites

Ceramic materials are traditionally assumed to be the most reliable archaeological determinants of both cultural and temporal affiliation of sites. However, correlations between the presence of diagnostic materials on sites and assignment of sites to a particular time period or cultural affiliation are indirect at best, requiring certain assumptions before interpretations can be offered. Even though information derived from ceramic materials may be the only evidence to consider, several factors affect the reliability of cultural-temporal affiliation assessments based primarily on ceramic evidence.

At the most general level, traditional ware categories (e.g., Colton 1952, 1956, 1958) can be used to infer general production areas for ceramic materials. Ceramic traditions and constellations of cultural traits have traditionally been used to define culture areas that are often closely related to ceramic material production and distribution zones. Ceramics known to have been produced within defined areas may then be associated with cultures that are known to have occupied the region prehistorically. If ceramic materials are found distant from their production area, they are assumed to be intrusive trade wares. If the majority of a ceramic assemblage was produced within a culture area (i.e., (indigenous), inferences may attribute a site's occupation to activities of the local prehistoric culture. The inference assumes that most prehistoric groups produced ceramics locally and that local production will be reflected by a majority of indigenous or "local" wares in ceramic assemblages.

Individual site ceramic assemblages are relatively small in the project survey area. Without including previous collections, on-site assemblages generally contained few sherds, with just over half the sites having less than 10 sherds for analysis purposes. Approximately 30 percent of the sites contained between 11 and 29 sherds, and 20 percent had greater than 30 sherds. In the majority of the sites with fewer than 10 sherds, the analyzed sherds represented the total ceramic assemblage on the site. Clearly, the reliability of assigning cultural and temporal affiliations based on the presence of one or a few sherds must be viewed cautiously. It is entirely possible that small assemblages, or even one sherd, may be representative of a particular group's presence at a particular time period, but alternative explanations could be equally viable. For example, a Jeddito Yellow Ware sherd located on a site in the western end of the Grand Canyon (the traditional Cerbat and Southern Numic culture areas) could probably be better explained as evidence of trade with Pai or Paiute groups, than as direct evidence of Hopi occupation and use of the area (Schaeffer 1969). Prehistoric exchange relationships must be considered when assessing cultural affiliation of sites, because people move objects great distances, independent of the cultures that produced them.

Another problem is that sherd assemblages may not be representative of a site's total occupation span because of a variety of erosional or depositional processes. This problem is not unique to the project area, but is an inherent limitation of surface survey when observations of a site's components are restricted to visible surface debris. An important consideration therefore, is critical assessment of the depositional context of the site and artifact assemblage. Field recording of the erosional and depositional context of sites has a direct bearing on determinations of the reliability of small samples. Thus, single or small sherd assemblages may carry more weight as informational items in certain situations, especially when it seems likely that no or few subsurface deposits are present.

Artifact curation and site reuse also create problems for cultural-temporal assessment of sites. Many of the larger delta areas at the mouths of side canyon drainages were ideal locations for a variety of subsistence activities. As a result, prehistoric occupants of the Grand Canyon corridor exploited resources at the same location, in very similar ways, through hundreds of years of time, causing artifact assemblages to become mixed. Needless to say, archaeological identification of particular cultural groups and specific temporal periods is difficult to determine when artifact assemblages are affected by site reuse and probably curation as well.

Cultural Affiliation of Sites

Ceramic-bearing sites were assigned to one or more cultural categories on the basis of ceramic assemblage composition. Very few sites contained ceramics from a single culture area. Because prehistoric exchange networks may have resulted in ceramic materials being distributed widely from their original production area, and since several overlapping culture areas are cross-cut by the river corridor, some mixing is to be expected. Therefore, predominant percentages of indigenous wares were used as the primary criterion for cultural affiliation assignment (Table 5).

Sites identified as ancestral Puebloan (Kayenta) cultural affiliation were defined by sherd assemblages that primarily included Tusayan White Wares (Kayenta Series), Tusayan Gray Ware (Tsegi Series), and Tsegi Orange Ware. Sites with ancestral Puebloan (Virgin) cultural affiliation had assemblages that included Tusayan Gray and White Wares (Virgin Series), Moapa Gray and White Ware, and Shivwits Plain. Sites with assemblages that included San Juan Red Ware, Shinarump Series Gray and White Ware, and Walhalla Gray and White Ware were classified as undifferentiated Puebloan, when Virgin as opposed to Kayenta branches could not be distinguished.

Cohonina cultural affiliation was identified by the dominant presence of San Francisco Mountain Gray Ware, plain and decorated types. A general Formative category was used as a cultural affiliation if ceramics exhibited corrugation or design style(s) indicative of the Pueblo period but were otherwise unclassifiable, or if the assemblage exhibited a mixture of Cohonina and various ancestral Puebloan types so that cultural categories could not be distinguished.

Tizon Brown Ware was the primary diagnostic cultural indicator of Pai sites, while Southern Paiute sites were identified primarily by Southern Paiute Utility Wares. Hopi sites were identified by the exclusive presence of Jeddito Yellow Wares, both decorated and utility types.

Temporal Affiliation of Sites

Decorated ceramic types provide the most reliable information for assessing the temporal placement of sites in the project area. Particularly useful are decorated and plain Kayenta pottery types that have been directly dated in the Kayenta area by association with tree-ring data from reliable contexts (Ambler 1985:28-68; Breternitz 1966; Colton 1952). Because many adjacent culture areas do not have accurately developed ceramic chronologies, stylistic analogs that occur in adjacent areas (Virgin Series, for example) have traditionally been cross-dated with reliably dated ceramics from the Kayenta area. Even though cross-dating is commonly used in the absence of more reliable dating techniques, the method must be regarded cautiously. When similar design styles occur, they may not be absolutely contemporaneous and may not be strictly analogous or comparable in terms of temporal duration or overlap with sequential design styles. Additionally, stylistic changes do not necessarily follow the same developmental sequences at the same rates in different areas. Therefore, distance from the source areas of the well-dated types and the analogous cross-dated types must be considered when distinguishing temporal components and occupation spans based on cross-dated ceramic assemblages.

An additional problem is that even well-dated ceramic types may not be representative of a site's temporal use due to artifact curation or other patterns of reuse. For example, some pots may have been heirlooms and could have been used for generations before being broken and eventually discarded. Furthermore, sherds may have been placed on some earlier sites by later groups, indicating ancestral or possibly religious ties with certain culturally significant areas. This may be the case with some sites in the project area that have Jeddito Yellow Wares present.

Sites were assigned temporal affiliation (Table 6) based on ceramic assemblage composition that considered temporally sensitive ceramic types. More specific chronological information pertinent to ceramic wares/types occurring in the project area was taken from previous research by Ambler (1985), Breternitz (1966), Fairley (1989), and Thompson (1986).

Summary and Discussion of Ceramic Data

The following summary will focus first on the ceramics that occurred in the project area as a whole and consider the cultural-temporal and functional information potential of the ceramic assemblage. Even though sites in the Grand Canyon river corridor represent a segment of the range of prehistoric activities, some general trends are quite obvious as one moves from east to west. The fact that sites are not evenly distributed in time and space results in patterns that reflect the differing uses of the river corridor, which in turn reflect constraints imposed by the canyon's variable topography.

Conceptually, it is possible to think of the river corridor as a continuous environment; however, because prehistoric people responded to the constraints imposed by the topography in the river corridor, it is appropriate to analyze ceramics by the "reaches" which are defined by naturally occurring geographic and geologic features (see Chapter 3). Cultural and temporal developments appear to coincide with the divisions or breaks as they are geographically defined.

Table 5. Cultural Affiliation of Ceramic Sites by Reach.

		Reach											
Code	**Cultural Affiliation**	**00**	**01**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**Total**
03	Anasazi	16	10	6	42	47	5	4	3	1	1		135
05	Virgin								2	1	25	5	33
06	Cohonina					3		1			4		8
07	Formative			1	1	4	5	1	7	1	14	4	38
08	Pai						2	2	1		35	5	45
09	Paiute			2	3	2				1	9	2	19
10	Pai-Paiute									1	21	4	26
11	Hopi	1	1		2	4							8
12	Navajo	1											1
13	Euro Am	3	2		2	4	2				3		16
15	Historic			1							5	1	7
98	Ceramic unknown		1				2		1		1		5
99	Unknown	1											1
Total		22	14	10	50	64	16	8	14	5	118	342	348

Table 6. All Components of Sites Containing Ceramics.*

Code	Temporal Affiliation	Reach											Total
		0	1	3	4	5	6	7	8	9	10	11	
02	Late Archaic										1		1
03	2500 AD-400					1			1		2		4
05	400-1000				1		1	1	1	1		1	6
06	800-1000		1		1	3							5
07	800-1050	1		1	2		1	1	1		14		21
08	950-1050	2			3	6					4	4	19
09	1000-1050			1									1
10	1000-1100	1			4	3				1	1		10
11	1050-1100					2							2
12	1050-1150	3			13	9			1				26
14	1000-1150	9	6	3	14	12	5	3	4		14	3	73
15	1000-1200		2		4	5		1	2		1		15
16	1050-1200			1	1	3	1						6
17	1100-1200		1			7							8
18	1-1200						1		1				2
19	400-1200	1				4	3		3		10	1	22
25	1200-1600				1	1							2
27	1200-1775					2					3	1	6
29	1200-1850	1	1	3	4	3	2	2	1	2	54	10	83
30	1775-1960					1					3		4
32	1775-1900										1		1
33	1850-1900		1								2		3
34	1885-1915	2				1					1		4
35	1900-1935		1		1	1	1				1		5
36	1900-1945	1				1	1				2	1	6
37	1915-1945	1									2		3
38	1900-1960										1		1
39	Post WWI				1						2		3
97	Aceramic unknown							7			1		2
98	Ceramic unknown		1	1						1	1		4
Total		22	14	10	50	65	16	9	15	5	121	21	348

*Includes non-ceramic components from multicomponent sites (e.g. code numbers 02, 03, 05 and greater than 33-97).

Several sites were located and recorded which contained single or multiple whole and partial vessels. These were not included in the sherd analysis but are reflected in the ceramic site statistics (Table 7).

The second part of the ceramic data summary focuses on developments as they occurred within the reaches. Some general conclusions can be drawn from similarities and differences that occurred both temporally and spatially within the project area.

Nearly 3,000 sherds provide the basis for the following summary (Tables 8, 9, and 10). Decorated sherds comprise only 11 percent of the total assemblage. Jar forms comprise 82 percent of the total assemblage while bowls are represented by 16 percent. The remaining forms are either seed jars (2), pitchers (1), or unknown. Of the decorated wares, Tusayan White Wares are dominant (7.4% of the total sherds). Of the other decorated white wares, only Virgin Series ceramics represent more than 1 percent of the total assemblage (1.4%). Moapa White Ware, Shinarump White Ware, Little Colorado White Ware and decorated Walhalla types are present in trace amounts.

Tsegi Orange Ware is relatively abundant (5.5%), while San Juan Red Wares, Little Colorado Series and San Juan Series combined, make up less than 1 percent of the total sherd assemblage.

San Francisco Mountain Gray Ware comprises 5.5 percent of the total assemblage. Less than 20 sherds are decorated, and decoration occurs only on bowls. Deadman's Fugitive Red is relatively rare.

Paiute Brown Ware sherds account for 5.1 percent of the total assemblage, while Tizon Brown Ware comprises 11.4 percent of the total. Miscellaneous brown wares (unclassified, 2.7%) may belong to one of the above brown wares or could be locally produced variants of other wares.

Shivwits Plain occurs in minor amounts (1.3%), as does Lower Colorado Buff Ware (0.8%). Both of these wares are confined to the western end of the project area. Jeddito Yellow Ware (1.2%) is also most abundant in the western end of the project area, commonly associated with Paiute Brown Ware or Tizon Brown ware.

Tusayan Gray Ware (Tsegi Series) is by far the most abundant ware in the river corridor, comprising nearly 25 percent of the total assemblage. Forty-four percent of all the sherds are corrugated. The great majority of these exhibit Tusayan-style corrugation. This evidence alone suggests a very strong Pueblo II component in the project area.

Of the gray wares, Shinarump Gray followed Tusayan Gray Ware, Tsegi Series, in abundance (9.1%), with the great majority of these sherds exhibiting corrugation. Virgin Series Gray Ware followed with 6 percent, San Francisco Mountain Gray Ware (non-decorated types) 5.0 percent, Moapa 3.9 percent, and Walhalla 2.6 percent of the total assemblage.

The above tabulations are not particularly provocative—they merely indicate that there was a considerable amount of prehistoric activity in the project area during the general Pueblo II time period (A.D. 1000-1150). The great majority of pottery in the project area was produced by the Kayenta branch. Additionally, the jar-to-bowl ratio (5:1) suggests that ceramic containers suitable for storage were more important than serving vessels.

Many sites in the project area appear to be the product of temporary, sporadic (perhaps seasonal) use rather than permanent habitation. The abundance of small sites with small artifact assemblages supports this overall impression. For example, nearly 150 of the ceramic-bearing sites (well over half) contained fewer than 10 sherds. If the lack of ceramic density is any indication of site function, intensity of use and occupa–tional duration, then many sites in the project area reflect either temporary or sporadic use or are the product of activities or cultures that did not emphasize the use of ceramic vessels. An alternative interpretation is

Table 7. Whole and Partial Ceramic Vessels.

Reach	Site Type	Ware and Vessel Type	Status
3	Isolated cache	North Creek Corrugated jar	In place
4	Multiple cache*	1 Tsegi OW pitcher; 1 Tsegi OW ladle; 1 Deadmans GW pitcher; 1 Medicine B/r seed jar; 1 Deadmans B/g bowl; 1 Black Mesa B/w bowl	Collected
4	Isolated cache	Tusayan Corrugated jar	In place
4	Lithic scatter	North Creek Grayware jar	In place
6	Isolated cache	Undetermined grayware jar	In place
9	Isolated cache	Shivwits plainware jar	Collected
10	Habitation/burial	Undetermined redware bowl	Moved
10	Isolated cache	Shinarump Corrugated jar	Missing

*OW = orangeware; GW = grayware; B/r = Black-on-red; B/g = Black-on-gray

Table 8. Frequency and Percentages of Ceramic Types.

Ware		N	%
TUSAYAN WHITE WARE, Kayenta Series			
Unclassified		106	3.3
Lino Black/Gray		2	.1
Kana-a Black/White		15	.5
Wepo Black/White		5	.2
Black Mesa, dots		7	.2
Black Mesa, lines		32	1.0
Black Mesa, Sosi		10	.3
Sosi Black/White		22	.7
Dogoszhi Black/White		11	.3
Flagstaff Black/White		26	.8
	Total	236	7.4
TUSAYAN WHITE WARE, Virgin Series			
Unclassified		13	.4
Mesquite Black/Gray		1	.0
Washington Black/White		1	.0
Washington-St. George Black/White		1	.0
St. George Black/Gray, dots		2	.1
St. George Black/Gray, solids		4	.1
PII solids, lines		10	.3
North Creek Black/Gray		13	.4
Hilldale Black/Gray		1	.0
Glendale Black/Gray		4	.1
	Total	50	1.4
SHINARUMP WHITE WARE			
Unclassified		15	.5
PII solid lines		6	.2
Wygaret Black/Gray (Sosi style)		1	.0
	Total	22	.7
MOAPA WHITE WARE			
Unclassified		14	.4
Boulder Black/Gray		1	.0
Boysag Black/Gray		2	.1
Boysag-Trumbull Black/Gray		1	.0
Trumbull Black/Gray		2	.1
Trumbull Black/Gray, solids-lines		1	.0
PII solids-lines		3	.1
Moapa Black/Gray		7	.2
Poverty Mountain Black/Gray		1	.0
	Total	32	.9
LITTLE COLORADO WHITE WARE			
Unclassified		4	.1
Holbrook A		3	.1
Holbrook A-B		1	.0
Walnut A		7	.2
Walnut A-B		1	.0
Padre Black/White		1	.0
	Total	17	.4

Table 8 (continued)

Ware		N	%
MISCELLANEOUS WHITE WARES, Unclassified			
Unclassified white ware		3	.1
Unclassified decorated		2	.1
	Total	5	.2
TUSAYAN GRAY WARE, Tsegi Series			
Unclassified		157	4.9
Lino Gray		3	.1
Kana-a Gray		9	.3
Lino Tradition		33	1.0
Medicine Gray		2	.1
Coconino Gray		10	.3
Tusayan Corrugated		384	12.1
Moenkopi Corrugated		158	5.0
Kiet Siel Gray		2	.1
	Total	758	23.9
TUSAYAN GRAY WARE, Virgin Series			
Unclassified		27	.8
North Creek Gray		48	1.5
North Creek Corrugated, clapboard		4	.1
North Creek Corrugated, indented		108	3.4
Washington Corrugated		7	.2
	Total	194	6.0
SAN FRANCISCO MOUNTAIN GRAY WARE			
Unclassified, Deadman's Gray		134	4.2
Floyd Gray		6	.2
Floyd Black/Gray		4	.1
Deadman's Black/Gray		13	.4
Deadman's Fugitive Red		7	.2
Kirkland Gray		14	.4
	Total	178	5.5
SHINARUMP GRAY WARE			
Unclassified		46	1.4
Shinarump, Plain-Gray		2	.1
Shinarump, Plain-Brown		4	.2
Shinarump corrugated, indented		216	6.8
Shinarump corrugated, obliterated (buckskin)		19	.6
	Total	290	9.1
MOAPA GRAY WARE			
Unclassified		66	2.1
Boulder Gray		10	.3
Moapa Brown		16	.5
Neck-banded		1	.0
Moapa corrugated, indented		30	.9
Moapa corrugated, obliterated		4	.1
	Total	127	3.9

Table 8 (continued)

Ware		N	%
WALHALLA GRAY WARE			
Unclassified		3	.1
Plain Gray		2	.1
Corrugated		76	2.4
Black/white		6	.2
	Total	87	2.6
MISCELLANEOUS GRAY WARE, Unclassified			
Unclassified		109	3.4
Prescott Gray		5	.2
Unclassified decorated		3	.1
Rainbow Gray		8	.3
Unclassified, corrugated		80	2.5
	Total	205	6.5
TSEGI ORANGE WARE			
Unclassified		115	3.6
Medicine Black/Red		12	.4
Tusayan Black/Red		30	.9
Cameron Polychrome		2	.1
Citadel Polychrome		8	.3
Tusayan Polychrome		5	.2
	Total	172	5.5
SAN JUAN REDWARE, San Juan Series			
Unclassified		31	.1
Deadman's Black/Red		31	.1
	Total	62	.2
SAN JUAN REDWARE, Little Colorado Series			
Unclassified		4	.1
Middleton Red		11	.3
Middleton Black/Red		11	.3
	Total	26	.7
JEDDITO-AWATOVI YELLOW WARES			
Unclassified		5	.2
Jeddito Plain		8	.3
Jeddito Black/Yellow		14	.4
Jeddito Corrugated		6	.2
Sikyatki Polychrome		2	.1
Polacca Polychrome		1	.0
	Total	36	1.2
PAIUTE BROWN WARES			
Unclassified		60	1.9
Finger indented		82	2.6
Corrugated		20	.6
	Total	162	5.1

Table 8 (concluded)

Ware		N	%
MISCELLANEOUS BROWN WARE, Unclassified			
Unclassified		44	1.4
Indented		1	.0
Corrugated		17	.5
Furnace Flats Brown Ware		23	.7
Unclassified corrugated		2	.1
	Total	87	2.7
TIZON BROWN WARE			
Unclassified		41	1.3
Cerbat Brown		134	4.2
Aquarius Brown		154	4.8
Tizon Wiped		37	1.2
Corrugated		3	.1
	Total	369	11.4
SHIVWITS PLAIN			
Unclassified		38	1.2
Shivwits Plain Corrugated		4	.1
	Total	42	1.3
MISCELLANEOUS WARES			
Unclassified		4	.1
Lower Colorado Buffware		21	.7
	Total	25	.8

that surface accumulations do not accurately represent the total artifact assemblage due to post-occupation alluviation and collection by visitors.

To proceed from generalities to more specific observations, temporal and spatial considerations add considerable insight to ceramic distribution in the river corridor. Not all sites are small, and sites are not evenly distributed through time or space. To consider the Grand Canyon corridor as a unit of analysis, it is interesting to divide the study area in half by looking at each bank of the river separately. A relevant question concerns the degree to which the river acted as a natural boundary or barrier to cultural movements and developments. Ceramic materials can at least generally indicate whether they are removed from or indigenous to their area of production. Traditionally, the Virgin and Southern Paiute area is assumed to be on the north side of the river, the Cohonina and Pai (Cerbat culture) area on the south side of the Colorado River. With these assumptions in mind, it is interesting to see how ceramic materials are distributed in terms of cultural affiliation (Table 11).

The overall number of cultural components is nearly equal on both sides of the river. Ancestral Puebloan components are equally distributed on either side, but there are twice as many Virgin components on the north side of the river as on the south, as might be expected if the river acted as a cultural boundary or barrier. There are five times as many Paiute components on the north side of the river as the south, and over four times as many Pai components on the south as on the north bank. Interestingly, undifferentiated Pai/Paiute components are evenly distributed on both sides of the river.

Cohonina and Formative components are nearly twice as frequent on the south side. Formative refers to sites with mixed ceramic assemblages, often including both Cohonina and ancestral Puebloan types. It is possible that some of the components in this category are Cohonina but were not distinguishable as such.

The uneven distribution of cultural material across the river suggests that there is some validity to the assumption that the river did represent a cultural boundary to some degree. Perhaps it is more accurate to think of the river as an obstruction to the movement of cultural materials. Considerable mixing of cultural materials is evident in

Table 9 Ware Distribution by Reach (Column Percent).

River Mile Reach	-15-0 00		0-11.3 01		22.6-35.9 03		35.9-61.5 04		61.5-77.4 05		77.4-117.8 06		117.8-125.5 07		125.5-139.9 08		139.9-159.9 09		159.9-213.8 10		213.8-235 11	
Wares	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Tusayan W/W Kayenta	24	13.1	8	7.7	5	12.2	74	9.0	94	11.6	18	17.8	1	3.3	2	2.4			9	1.0	1	.6
Tusayan G/W Tsegi	81	44.2	24	23.2	9	21.9	275	33.5	327	39.9	19	18.8	5	16.6	5	6.0			9	1.0	4	2.4
Tusayan W/W/ Virgin	3	1.5	4	3.8			13	1.5	10	1.2	3	3.0	1	3.3	1	1.2			13	1.5	2	1.2
Tusayan G/W Virgin	17	9.2	15	14.4	2	4.8	39	4.6	55	6.7	20	19.8	4	13.3	19	23.2	1	9.1	15	1.8	7	4.2
Shinarump W/W	2	1.0	1	1.0			4	.5	13	1.6					1	1.2			1	.1		
Shinarump G/W	28	15.3	35	33.6	9	21.8	160	19.4	38	4.6			3	10.0	10	12.2			7	.8		
Moapa White Ware											1	1.0							24	2.8	7	4.2
Moapa Gray Ware	1	.5							5	.5			1	3.3	1	1.2	2	18.2	106	12.8	11	6.6
Walhalla Gray Ware			4	3.8	6	14.6	67	8.0	7	.8					2	2.4			1	.1		
San Francisco Mtn. G/W					1	2.4	6	.7	52	6.3	5	5.0	8	26.6	18	21.9			83	10.0	5	3.0
Little Colorado W/W							4	.4	13	1.5												
Tsegi Orange Ware	7	4.1	3	2.9	4	9.8	75	9.2	59	7.2	12	11.8	2	6.7	2	2.4	2	18.2	5	.6	1	.6
San Juan R/W SJ Series			2	1.9	1	2.4	30	3.6	19	2.4	5	5.0			1	1.2			4	.4		
San Juan R/W LC Series			1	1.0			17	2.1	2	.2	2	2.0			2	2.4			2	.2		
Tizon Brown Ware											3	3.0	3	10.0	11	13.4	2	18.2	268	32.6	82	49.4
Palute Brown Ware					2	4.8	1	.1	3	.4	1	1.0					2	18.2	138	16.7	15	9.0
Lower Colorado Buff Ware																			18	2.2	3	1.8
Jeddito Yellow Ware	1	.5	4	3.8			3	.3	6	.7									19	2.2	3	1.8
Prescott Gray Ware																			4	.5	1	.6
Shivwits Plain											1	1.0					1	9.1	31	3.8	9	5.4
Miscellaneous White Ware	2	1.0					1	.1											2	.2		
Miscellaneous Gray Ware	13	7.1	1	1.0	1	2.4	50	6.1	68	8.3	8	7.9	2	6.7	7	8.5	1	9.1	37	4.5	12	7.2
Miscellaneous Brown Ware	4	2.2	2	1.9	1	2.4	4	.5	45	5.5	3	3.0							25	3.0	3	1.8
Miscellaneous Ware																			4	.5		
Total	183	99.7	104	100.	41	99.5	823	99.6	816	99.4	101	100.1	30	99.8	82	99.6	11	100.1	825	99.4	166	99.8

Table 10. Ware Distribution by Reach Throughout Entire River Corridor.

River Mile Reach	-15-0 00		0-11.3 01		22.6-35.9 03		35.9-61.5 04		61.5-77.4 05		77.4-117.8 06		117.8-125.5 07		125.5-139.9 08		139.9-159.9 09		159.9-213.8 10		213.8-235 11		Total	
Wares	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Tusayan W/W Kayenta	24	10	8	3.4	5	2.1	74	31	94	40	18	7.6	1	.4	2	.8			9	3.8	1	.4	236	99.5
Tusayan G/W Tsegi	81	10.7	24	3.2	9	1.2	275	36.3	327	43.1	19	2.5	5	.7	5	.7			9	1.2	4	.5	758	100.1
Tusayan W/W/ Virgin	3	6	4	8			13	26	10	20	3	6	1	2	1	2			13	26	2	4	50	100
Tusayan G/W Virgin	17	8.8	15	7.7	2	1.0	39	20	55	28.3	20	10.3	4	2.1	19	9.8	1	1.5	15	7.7	7	3.6	194	99.8
Shinarump W/W	2	9.1	1	4.5			4	18.2	13	59.1					1	4.5			1	4.5			22	99.9
Shinarump G/W	28	9.6	35	12	9	3.1	160	55.1	38	13.1			3	1.0	10	3.4			7	2.4			290	99.7
Moapa White Ware											1	3.1							24	75	7	21.9	32	100
Moapa Gray Ware	1	.8							5	4.0			1	.8	1	.8	2	1.6	106	83.4	11	8.6	127	100
Walhalla Gray Ware			4	4.6	6	6.9	67	77.0	7	8.0					2	2.3			1	1.2			87	100
San Francisco Mtn. G/W					1	.6	6	3.4	52	29.2	5	2.8	8	4.5	18	10.1			83	46.6	5	2.8	178	100
Little Colorado W/W							4	23.5	13	76.5													17	100
Tsegi Orange Ware	7	4.1	3	1.7	4	2.3	75	43.6	59	34.3	12	7.0	2	1.1	2	1.1	2	1.1	5	2.9	1	.6	172	99.8
San Juan R/W SJ Series			2	3.2	1	1.6	30	48.4	19	30.6	5	8.0			1	1.6			4	6.4			62	99.8
San Juan R/W LC Series			1	3.8			17	65.4	2	7.7	2	7.7			2	7.7			2	7.7			26	100
Tizon Brown Ware											3	.8	3	.8	11	3.0	2	.5	268	72.6	82	22.2	369	99.9
Palute Brown Ware					2	1.2	1	.6	3	1.8	1	.6					2	1.2	138	85.2	15	9.3	162	99.9
Lower Colorado Buff Ware																			18	85.7	3	14.3	21	100
Jeddito Yellow Ware	1	2.8	4	11.1			3	8.3	6	16.6									19	52.7	3	8.3	36	99.8
Prescott Gray Ware																			4	80	1	20	5	100
Shivwits Plain											1	2.4					1	2.4	31	73.8	9	21.4	42	100
Miscellaneous White Ware	2	40					1	20											2	40			5	100
Miscellaneous Gray Ware	13	6.5	1	.5	1	.5	50	25	68	34	8	4	2	1.0	7	3.5	1	.5	37	18.5	12	6	200	100
Miscellaneous Brown Ware	4	4.6	2	2.3	1	1.1	4	4.6	45	51.7	3	3.4							25	28.7	3	3.4	87	99.8
Miscellaneous Ware																			4	100			4	100
Total	N = 183		N = 104		N = 41		N = 823		N = 816		N = 101		N = 30		N = 82		N = 11		N = 825		N = 166		N = 3182	

Table 11. Cultural Affiliation of Ceramic-bearing Sites Tabulated by River Bank.

Cultural Affiliation	Right Bank				Left Bank				L and R
	CA1	CA2	CA3	Total	CA1	CA2	CA3	Total	Total
Anasazi	65	4	-	69	62	4	-	66	135
Virgin Anasazi	20	2	-	22	11	-	-	11	33
Cohonina	3	-	-	3	5	-	-	5	8
Formative	14	-	-	14	23	1	-	24	38
Late pre/proto/historic Pai	2	8	-	10	17	18	-	35	45
Late pre/proto/historic Southern Paiute	8	7	1	16	2	1	-	3	19
Late pre/proto/historic Pai/Paiute	3	10	1	14	3	7	2	12	26
Late pre/proto/historic Hopi	-	1	1	2	3	3	-	6	8
Historic Navajo	-	-	-	0	-	-	1	1	1
Historic Euro-American	1	2	2	5	2	8	1	11	16
Historic unknown	-	2	5	7	-	-	-	0	7
Other	-	-	-	0	-	-	-	0	0
Ceramic unknown	1	-	-	1	4	-	-	4	5
Unknown	-	-	-	0	1	-	-	1	1
Total	117	36	10	163	133	42	4	179	342

any case, which strongly suggests that the corridor was an area where exchange took place or many different people moved through. It is impossible to determine whether ethnically distinct people occupied separate sides of the river in the corridor. The study of frontiers and boundaries as represented by cultural materials is an exciting avenue of research (e.g., Green and Perlman 1985:3-12) that warrants further investigation. Other cultural attributes and constellations of traits may help in consideration of the problem of defining ethnicity archaeologically. Additionally, in the western portion of the Grand Canyon (the Cerbat and Southern Paiute culture areas), ethnographic evidence that documents traditional use areas may confirm the distribution of material culture that coincides with ancestral use areas.

Summary and Discussion of Ceramic Data by Reach

In the following section, ceramics will be discussed by reach divisions. Data relevant to the discussion are presented in Tables 5 through 10.

Reach 0

In the reach extending from the base of Glen Canyon dam, 15.5 river miles downstream to Lees Ferry, the decorated ceramic assemblage is dominated by Tusayan White Ware, Kayenta Series (13.1%) and nearly half of the total ceramic assemblage (44.2%) is comprised of Tusayan Gray Ware, Tsegi Series. Shinarump Gray Ware (15.3%) is followed by Tusayan Gray Ware, Virgin Series (9.2%), and Tsegi Orange Ware (4.1%). All other wares are represented by minor percentages (slightly over 2% or less), with the exception of Miscellaneous Gray Ware which comprises 7.1 percent of the total sherd assemblage. It is likely that the unclassifiable sherds belong to Shinarump or Virgin Series, but are variants that do not meet criteria for inclusion within either ware.

Approximately 73 percent of the cultural affiliation components in Reach 0 are Kayenta Anasazi. The remaining 27 percent are either unknown or multicomponent sites that had a few sherds recorded. No Virgin branch components are recognized. A strong Pueblo II occupation is represented: nearly 50 percent of the temporal components occur during the A.D. 1000-1150 time period. A few earlier components are recorded, but little ceramic period activity is evident before A.D. 800.

Considering the abundance of Kayenta branch ceramics during the Pueblo II time period, it is interesting to note the relative abundance of Shinarump Gray Ware in Reach 0. A question among researchers (Fairley et al. 1986:15-16; see also Schwartz et al. 1979, 1980) has been whether to ascribe the production of Shinarump Gray Ware to Virgin or Kayenta branch ceramicists living west of

the Kayenta area. Two contrasting alternatives exist: either the Kayenta were importing a good deal of Virgin-produced Shinarump Gray Ware, or they were producing the ware themselves from materials that occur locally. The latter possibility seems most likely considering the low frequencies of Virgin Series ceramics and high percentages of Tusayan Gray Ware (Tsegi Series) and other Kayenta Wares. Another alternative is that both Virgin and Kayenta ceramicists were producing what archaeologists identify as Shinarump Gray Ware (Balsom 1984). Cultural distinctions may not be evident if both groups were using similar raw materials to produce the ware.

Reach 1

From river mile 0 to mile 11.3, Shinarump Gray Ware is most abundant (33.6%) followed by Tusayan Gray Ware, Tsegi Series (23.2%), and Tusayan Gray Ware, Virgin Series (14.4%). Decorated wares are again dominated by Tusayan White Ware, Kayenta Series (7.7%). All other wares are represented by minor amounts (less than 4%). Seven ancestral Puebloan components were assigned to this reach but there is a wider temporal range than was evident in Reach 0, spanning from A.D. 800 to 1100. It should be noted that 104 sherds were analyzed for the entire reach, and sites were relatively sparse in this section of the corridor. It is interesting to note (if the small sample size is not skewing the data) that the percentages of Shinarump Series Gray Ware increase as Tusayan Gray Ware decreases, yet Tusayan White Ware remains the dominate decorated ware.

Reach 2

The river corridor from mile 11.3 to mile 22.6 did not contain sites with ceramics.

Reach 3

The Redwall Gorge reach extends from river mile 22.6 to mile 35.9. Of the ten cultural components occurring in this area, six are Pueblo II, one is a historic component associated with a ceramic period component, two are Paiute, and one is unclassified Formative. Tusayan Gray Ware, Tsegi Series dominates the ceramic assemblage (21.9%), followed by Shinarump Gray Ware (21.8%), Tusayan White Ware, Kayenta Series (12.2%), and Tsegi Orange Ware (9.8%). Not much else can be said about this reach considering the paucity of ceramics (n = 41).

Reach 4

Prehistoric remains occurring between river miles 35.9 and 61.5 contrast sharply with upstream reaches in terms of site density and sheer number of sherds (n = 823). The reach includes more than 25 river miles as well as the large prehistoric settlement areas at Nankoweap and Kwagunt.

Tusayan White Ware, Kayenta Series (9.0%) is slightly less abundant than Tsegi Orange Ware (9.2%). Virgin Series White Wares represent only 1.5 percent of the total assemblage while Moapa Gray and White Ware is absent. Shinarump decorated types are relatively rare (0.5%). San Juan Red Ware, San Juan Series (4.0%) is nearly twice as abundant as Little Colorado Series (1.9%). Little Colorado White Ware (0.4%) only occurs within this reach and Reach 5.

Tusayan Gray Ware, Tsegi Series, is overwhelmingly dominant (33.5%) and nearly twice as frequent as Shinarump Gray Ware (19.4%). Walhalla Gray Ware represents 8.0 percent of the total sherd assemblage and Tusayan Gray Ware, Virgin Series represents 4.6 percent of the assemblage. San Francisco Mountain Gray Ware is present in trace amounts (0.7%), while Jeddito Yellow Ware represents 0.3 percent of the total sherd assemblage. Miscellaneous Gray Wares comprise 6.1 percent of the total assemblage and are probably variants of Shinarump Series, Virgin Series, or Walhalla Gray Ware.

Cultural affiliation components are almost exclusively Kayentan (84%). The preponderance of Kayentan ceramics and a lack of Virgin Series and Moapa sherds warrant this classification. Over half of the temporal components (31) date to the Pueblo II period between A.D. 1000 and 1150. Four earlier components occur that may indicate a Pueblo I occupation in Reach 4, while five components may date as late as A.D. 1200. Three Paiute, two Hopi, and two Euro-American components were also recorded in this reach.

Reach 5

This reach extends from river mile 61.5 at the mouth of the Little Colorado River to river mile 77.4, a distance of nearly 16 river miles. Reach 5 includes several prehistoric settlement areas located on broad alluvial fans at the mouth of tributaries, including the well-known site complex at Unkar Delta.

Once again, Kayenta ceramics dominate the assemblage. Tusayan Gray Ware, Tsegi Series (39.9%), combined with Tusayan White Ware, Kayenta Series (11.6%), comprise more than half of all the ceramics in the reach. Tsegi Orange Ware (7.2%) is followed by Tusayan Gray Ware, Virgin Series (6.7%), San Francisco Mountain Gray Ware (6.3%), and Shinarump Gray Ware (4.6%).

Miscellaneous gray and brown wares comprise 13.8 percent of the total assemblage. The use of local clay and temper materials for ceramic production could account for many of the 113 unclassifiable sherds. At the Furnace Flats site, AZ C:13:10 (Jones 1986:128-135), and at Unkar Delta (Warren 1980a:124-133), plainware ceramics, both gray and brown, exhibit an enormous degree of variability in temper ingredients and firing atmosphere. Warren and Jones concluded that much of the variability

could be due to the use of locally available clay and temper.

Although not abundant, the 13 sherds of Shinarump White Ware found in Reach 5 comprise 59.1 percent of all Shinarump White Ware identified in the project area. This is interesting considering that Shinarump Gray Ware is relatively scarce (38 sherds) compared to Reach 4 (160 sherds).

On the basis of ceramics, 72 percent of the cultural affiliation components are classified as Kayenta. Virgin branch components do not occur in this reach. Fifty-four temporal components occur before A.D. 1200, and nearly half of these components cluster in the period between A.D. 1000 and A.D. 1150 (Pueblo II); however, Pueblo I components and late Pueblo I-early Pueblo II components are more frequent in Reach 5 than any other section of the river corridor.

Reach 6

This reach extends from river mile 77.4 to 117.8, a distance of slightly over 40 river miles. Only 16 cultural components occur in this section of the river corridor. The steep-walled topography in the Upper Granite Gorge no doubt contributes to the low frequency of prehistoric remains in this area.

The most notable change in ceramic frequencies is that Tusayan Gray Ware, Virgin Series is slightly more abundant (19.8%) than Tusayan Gray Ware, Tsegi Series (18.8%). Tusayan White Ware, Kayenta Series is represented by 17.8 percent of the total assemblage, followed by Tsegi Orange Ware (11.8%), Miscellaneous Gray Ware (7.9%), and San Francisco Mountain Gray Ware (5.0%). It should also be noted however, that the total sherd assemblage or Reach 6 is relatively small (n = 101), so interpretations may be skewed.

Temporal affiliation is dominated by the general Pueblo II time period, with an equal number of Kayenta branch (5) and unclassified Formative components. One Cohonina component is present. The two Pai components represent the first and most easterly representation of this culture's presence.

Reach 7

This reach extends from river mile 117.8 to mile 125.5, a distance of only 7.7 river miles. This stretch of the river corridor is characterized by a narrow river aisle with notable side drainage intersections such as Blacktail, Forster, and Fossil canyons. Only nine cultural components are recognized in the reach—four Kayenta branch, one Cohonina, two Pai, and two ceramic-bearing components of unknown cultural affiliation. Thirty sherds are included in the total ceramic assemblage. Of these, San Francisco Mountain Gray Ware is dominant (26.6%). Tusayan Gray Ware, Tsegi Series (16.6%) is followed by Tusayan Gray Ware, Virgin Series (13.3%). The olivine-tempered Moapa Series first occurs in Reach 7 (one sherd of Moapa White Ware).

Reach 8

This reach (Middle Granite Gorge) extends from river mile 125.5 to mile 139.9. Tusayan Gray Ware, Virgin Series is dominant (23.2%) while Tusayan Gray Ware, Tsegi Series has decreased to only 6 percent. San Francisco Mountain Gray Ware comprises 21.9 percent and is followed by Tizon Brown Ware (13.4%) in relative frequency. Two Virgin branch components are first recognized in Reach 8. Seven mixed Formative assemblages, three Kayenta, and one Pai component are also recorded. Temporally, the components recorded in Reach 8 span from Archaic to protohistoric with the majority falling in the general Pueblo II time period.

Reach 9

This reach (Muav Gorge) extends from river mile 139.9 to 159.9. Eleven sherds comprise the entire ceramic assemblage. The five cultural-temporal components are evenly distributed between Puebloan, Virgin, Formative, Pai, and Pai-Paiute affiliations.

Reach 10

This reach (the lower canyon) extends nearly 54 miles from river mile 159.9 to mile 213.8 and includes more cultural components than the previous upper four reaches combined. Included in this reach, which begins about 3 miles below Havasu Canyon, are numerous side canyons. Many of these provide access to the river corridor from the rim on either side of the river.

Notable changes occur in ceramic assemblages, both culturally, temporally, and in manufacturing technique. For example, previous reaches have been characterized by a predominance of Pueblo II Kayenta Anasazi components. In this reach only one was recorded, while Virgin Anasazi components (25) increased to 20 percent of the total. Pai components (29%) dominate the reach (n = 35), followed by Pai-Paiute (n = 21), Formative components (n = 14), Paiute (n = 9), and Cohonina (n = 4).

Paddle and anvil brown ware comprises the majority of ceramics in Reach 10. Tizon Brown Ware is dominant (32.6%), followed by Paiute Brown Ware (16.7%). San Francisco Mountain Gray Ware, also produced by the paddle and anvil technique, represents 10 percent of the total assemblage Moapa Gray Ware comprises 12.8 percent of the total, while Moapa White Ware is the only decorated ware that comprises more than 2 percent of the total (2.8%). Tusayan Gray Ware, Tsegi Series (1.0%) and Tusayan White Ware, Kayenta Series (1.0%) are slightly less frequent than Virgin Series Gray (1.8%) and White Ware (1.5%). Shinarump Gray and White Ware combined comprise less than 1 percent of the total assemblage. Tsegi Orange Ware, San Juan Red Ware, San Juan Series, and Little Colorado Series are represented by trace amounts. Lower Colorado Buff Ware (2.2%) and

Prescott Gray Ware (0.5%) first occur in Reach 10. Shivwits Plain comprises 3.8 percent of the total assemblage, and 73.8 percent of all Shivwits Plain occurs in this reach.

Reach 10 is unique with regard to temporal affiliations in that 60 percent of all components occur after A.D. 1200. Additionally, 14 of the 21 components classified as Pueblo I-Early Pueblo II are located here, as well as three of the five multicomponent sites with Archaic components. Thus Reach 10 has more temporal depth as well as twice as many components as any reach in the project area (35% of all components occur in Reach 10).

Reach 11

This reach, the Lower Granite Gorge, extends from river mile 213.8 to mile 235, the intersection of the Bridge Canyon side drainage 9 miles below Diamond Creek. In contrast to Reach 10, Reach 11 exhibits a sharp decline in site density. Only 21 cultural-temporal affiliations are recorded as opposed to 121 in Reach 10. Virgin branch and Pai components are most frequent (five each), followed by Formative and Pai-Paiute (four each). Two Paiute and one Historic component are also recorded.

Nearly half of the total assemblage is Tizon Brown Ware (49.4%), followed by Paiute Brown Ware (9%). Tusayan White Ware, Kayenta Series (0.6%) and Tusayan Gray Ware, Tsegi Series (2.4%) are represented by trace amounts. Tusayan White Ware, Virgin Series (1.2%) and Gray Ware (4.2%) are also poorly represented but nearly twice as frequent as Kayenta branch wares. Shinarump ceramics are absent while Moapa White Ware (4.2%) and Gray Ware (6.6%) are the most abundant coil-and-scrape wares in the reach. Miscellaneous Gray Ware (7.2%) may include aberrant San Francisco Mountain Gray Ware, Shinarump Gray Ware, or Tusayan Gray Ware, Virgin Series. Shivwits Plain (5.4%) is followed by San Francisco Mountain Gray Ware (3.0%) in frequency. Tsegi Orange Ware, Lower Colorado Buff Ware, Jeddito Yellow Ware, and Prescott Gray Ware are present but only in trace amounts (each ware comprises less than 2% of the total assemblage).

Nearly half (10) of the 21 temporal components in the reach are late prehistoric-protohistoric. The four Late Pueblo I-Early Pueblo II components and three Pueblo II components demonstrate that the reach was visited or used through time but was more intensively exploited by later protohistoric populations.

Reach 12

This reach extends from river mile 235 to Pierces Ferry, mile 278, although the GCRCS survey ended at Separation Canyon, mile 239.9. No ceramic-bearing sites were recorded in the upper 5 miles of this reach.

Discussion: Vessel Form Related to Site Type and Site Function

Vessel form was recorded for all sherds analyzed. Bowl as opposed to jar forms are relatively easy to distinguish when sherds are large enough to exhibit curvature and/or differing interior-exterior surface characteristics. An indeterminate category was used when sherds were too small to classify. Aside from bowls and jars, three seed jar sherds, one pitcher, and one handle were recorded.

Pottery is produced to serve a variety of utilitarian purposes. Based primarily on ethnographic studies, vessel morphology can be related to a variety of vessel functions such as cooking, storage, or serving food (Braun 1980; Shepard 1954:224-224). If the range of domestic activities can be inferred from an assemblage of vessel forms, then site function may also be inferred. Pottery may also serve non-utilitarian functions, however, such as burial offerings, and potsherds can be modified and used as tools other than containers. Ethnographic evidence suggests that vessel morphology classifications do not necessarily have a direct correlation with vessel function (Linton 1944; Shepard 1954:224). In other words, the same or similar function may be served by vessels with a wide range of morphological variation.

It is assumed in this report that bowls functioned as food serving/preparing vessels and that jar forms were used for cooking and storage purposes. Different ratios of bowls to jars in assemblages is assumed to be meaningful when viewed in different site type contexts.

With the exception of the seed jar, handle fragment, and pitcher sherds mentioned above, all sherds in the project area can be classified either as jar (82%), bowl (16%), or indeterminate (2%) forms. Size class variations within these forms occur but this variable was not documented in the project field analyses.

The overall ratio of bowl to jar sherds for the entire project assemblage is 1:5 (Table 12). This ratio is interesting when compared to bowl-to-jar ratios on sites that occur in other areas. On the Kanab Plateau, for example, vessel form analyses of 43 ceramic-bearing sites dominated by late Pueblo I-Pueblo II assemblages indicate a bowl-to-jar ratio of 1:2 (Burchett 1990). In the Navajo Mountain area, bowl-to-jar ratios from late Pueblo II and late Pueblo III habitation sites range from 1.2 to 1.4 (Geib et al. 1985). The above examples indicate that the river corridor assemblage is skewed toward a higher frequency of jar forms relative to bowl forms. Functional differences in sites (temporary camps as opposed to more permanent habitations) may account for the higher frequency of jar sherds.

Other factors that may skew sherd assemblages toward higher frequencies of jar forms relate to

Table 12. Vessel Form (Bowl–Jar) Tabulated by Reach.

Reach	Bowl		Jar		Bowl:Jar Ratio	Indeterminate		Other	
	N	%	N	%		N	%	N	%
00	23	12.6	156	85	1:7	4	2.19		
01	10	10.5	84	88.4	1:8	9	1.1		
03	8	21	28	73.7	1:3.5	2	5.2		
04	158	19.8	623	78	1:4	15	1.9	3	0.4
05	133	19	554	77.4	1:4	27	3.8		
06	13	21	18	79	1:4				
07	4	13	26	87	1:6.5				
08	10	12	42	88	1:7				
09			4	87.5		1	12.5		
10	76	11	621	88	1:8	10	1.0		
11	16	11	128	87	1:8	3	2.0		
Total	451		2347		1:5.2	71		3	

prehistoric ceramic production strategies and modern collection activities. Locally produced pottery in the river corridor seems to be restricted to jar forms, often imitations of Tusayan Corrugated and Moenkopi-style vessels (Jones 1986:131-135). Additionally, artifact collection behavior by both archaeologists and visitors to the river corridor may have skewed the assemblages to some degree by emphasizing the collection of decorated bowl sherds. Decorated sherds are not only the most highly visible but are also the most desirable souvenirs. Collector piles at frequently visited sites often include a large percentage of decorated bowl sherds.

When bowl-to-jar ratios are calculated for the site type categories (Table 13), it is interesting to see how ratios vary. For all sites that had architecture of some kind, ranging from coursed masonry structures to ephemeral rock outlines beneath overhang shelters, the bowl-to-jar ratio was 1:5 or less (1:3 on delta complexes). For site types without architecture, such as roasting pit complexes or water/soil control sites, ratios range from 1:5.4 to 1:12. This information suggests that higher frequencies of bowls are correlated with more permanent sites. This inference is reasonable if one assumes that bowls were used as serving vessels and a greater range of domestic activities took place at sites with architectural features. Assuming that the non-architectural sites had specialized functions other than habitation, it is expected that jars would have been utilized for storage of goods during periods of short-term use and for storage of surplus items during periods of absence.

Table 12 shows vessel form and bowl-to-jar ratios by reach divisions. The most dramatic differences in bowl-to-jar ratios occur in the eastern sites (above mile 140) and the far western canyon (below mile 140). Jars are twice as frequent in Reaches 10 and 11 (bowl to jar ratio is 1:8) as in Reaches 4 and 5 where bowl-to-jar ratios are 1:4. These differences parallel temporal, cultural, and apparent functional differences in sites found in the eastern and western ends of the river corridor. For example, in Reaches 4 and 5, cultural affiliation components are dominated by Pueblo II, Kayenta components (84% and 72% respectively), while in Reaches 10 and 11 only one Kayenta component is recorded. Furthermore, the great majority of roaster complexes (83.9%) occur below mile 140 where Reach 9 begins, whereas the majority of structural sites occur above mile 140.

The western reaches are dominated by protohistoric and Virgin components and by paddle and anvil-produced (Tizon and Paiute) brown ware. Local production of plain wares may have created an abundance of jars relative to white ware bowls which could not be produced from locally available clays. Although brown ware bowls could have been locally produced, the form was uncommon.

It is apparent that proportions of bowls to jars vary temporally, spatially, and with site types. It

Table 13. Bowl to Jar Ratios by Site Type.

Site Type	Bowl:Jar Ratio	Percent Total	Number of Sherds
Trail	1:1	1.6	46
Historic Structure	1:2	1.0	29
Delta Complex	1:3	5.6	158
Enigmatic Feature	1:4	0.1	5
Small Structure	1:4.5	36.6	1053
Ephemeral Structure	1:4.7	4.5	127
Pueblo	1:4.8	5.4	157
Storage Site	1:5.4	1.5	45
Camp	1:6.3	15.9	454
Roaster Complex	1:9	18.9	540
Water/Soil Control	1:10.5	0.8	23
Artifact Scatter	1:12	5.0	144
Other		3.1	86
Total		100.0	2867

appears that higher proportions of jars are functionally linked with particular behaviors or specific activities at particular site types, and that the needs for ceramic vessels as utilitarian objects differed because of different cultural preferences and subsistence techniques. On a general level, it is suggested that a relationship exists between the closer ratio of bowls to jars in architectural sites and the higher frequency of jars in non-architectural sites which in turn suggests that the western, non-structural sites are functionally different, and involved shorter occupation spans, than the eastern sites that have architecture.

Conclusions

Ceramics provide critical information for interpreting cultural-temporal affiliation, site function, and intra- and inter-regional patterns of exchange. These issues have been discussed above in some detail and will not be reiterated.

Deriving meaning from mixed ceramic assemblages is perhaps the major problem confronting archaeologists. Multicomponent sites with several possible cultural affiliations are common in the project area, yet difficult to characterize in terms of cultural, temporal, and spatial developments. Rather than dwell on the question of cultural affiliation, it seems more reasonable to view ceramics as material evidence of interaction across regions and through time; thus, they provide a means to understand how people were socially connected.

Much more research needs to be done to define production zones and distribution areas. Clearly, variable ceramic distributions demonstrate the complexity of prehistoric trade and exchange networks and the degree to which direction and intensity of interaction varies through time. To discover factors that contribute to changes in exchange relations in the river corridor, external developments must be considered and integrated with developments in the project area corridor. Hopefully, this chapter will serve as a foundation for comparative studies with regions outside the Grand Canyon river corridor.[1]

[1]For information concerning refiring and thin-section analysis, refer to Appendix III.

Chapter 5

Chipped Stone Artifacts

by Peter Bungart

Chipped stone artifacts, which include flaked tools, cores, and debitage, were common occurrences at sites recorded during the survey. A total of 307 sites contained lithic artifacts. In some cases, sites consisted exclusively of lithic scatters. The distribution of these sites is illustrated by river reach in Table 14.

Although not particularly striking as a major source of data, lithic assemblages can contribute important information on site function, cultural or temporal affiliation, and mobility or exchange networks. Studying lithic assemblages on a regional scale may provide insights into how particular cultures used chipped stone in overall techno-subsistence strategies, as well as other interactions with their environments and neighboring cultures. In cases where lithic assemblages are the sole source of archaeological information, they present special challenges to glean the most information from them.

Field Lithic Analysis: Objectives and Analytical Approach

The Grand Canyon River Corridor Survey provides a 255-mile transect through varied geological and biological zones. Although transect survey has its limitations, it also affords many benefits. The ability to view a cross section of several different cultures over several different time periods in various environmental contexts is the most important benefit. Culturally, the river corridor could be at various places either a boundary or a travel route, and this phenomenon may be reflected in the chipped stone assemblages in different ways. For example, in some areas the availability of certain raw materials might have been restricted by the canyon's topography, and this would subsequently influence behaviors surrounding lithic technology and conservation.

Toward the goal of establishing a baseline for discussing the chipped stone technology in the river corridor, several specific, but overlapping research issues were formulated: (1) How do the lithic assemblages found at sites along the river corridor reflect possible adaptive and behavioral strategies employed by the people who produced these assemblages? (2) What do the lithic remains tell us about the relationships between cultural groups and the canyon itself? In other words, what were the relationships between the availability of various types of lithic raw materials and settlement, subsistence, and technological patterns throughout the canyon? (3) How do the lithic assemblages reflect continuity or change through time and between the various cultural groups that occupied the river corridor? and (4) How do the data collected during this survey compare with data collected from surrounding areas?

These research issues were approached in the field by striving for the following analytical objectives: (1) the delineation and description of raw materials and their source areas, (2) the distribution of these raw materials as artifacts, and (3) attribute analysis of individual items, including both debitage and tools.

As discussed in Chapter 1, in accordance with project parameters, we adopted the philosophy that artifact collection for lab analysis should be kept to

Table 14. Distribution of Sites with Lithic Artifacts by River Reach

Count*	Percent	Reach
24	7.8	0
12	3.9	1
8	2.6	3
33	10.7	4
60	19.5	5
19	6.2	6
13	4.2	7
13	4.2	8
7	2.3	9
101	32.9	10
17	5.5	11

* n = 307

a minimum. Therefore, as part of standard site recording during the survey, analyses of selected debitage and tool attributes were performed in the field.

The routine schedule of the survey and methodologies employed in conducting the fieldwork, which strived to address both research and management issues, limited the time and energy available for in-field analysis, as well as limiting the structure of the analytical methodology. Therefore, we focused on what we believed to be a few key variables that could be expediently recorded in the field, and that would also yield important, if only general, information about the behaviors and technological strategies that produced the lithic assemblages found during the survey.

Critics of this approach may argue that the methodology employed is inadequate to address more specific, fine-grained issues of lithic technology, as has been done in other areas of the Southwest (e.g., Simmons 1982). However, with the exception of a few recent localized projects (e.g., Jones 1986; Schroedl 1988), little previous work addressing these issues had been performed in the immediate Grand Canyon area. The lack of debitage-based data in particular is a void that needs to be filled. Thus, there was only a rough baseline of information from which more detailed questions could have been formulated for this survey. Even such basic information as the definition and distribution of available raw material types had been discussed only cursorily by most previous researchers (Brown 1988a; Geib et al. 1986). Therefore, this project offers a tentative working foundation for future research.

Another potential problem concerns the replicability of in-field analysis, which is especially relevant to this project because several individuals performed the analyses at different times within the various crews. As previously discussed in the section on quality control, the frequent interchange of crew members probably alleviated some of the problems of inconsistency through constant feedback as analysts passed from one crew to the next. However, the fact remains that in all probability, not all analysts saw things the same way, and there is no way to definitively replicate the results in a formal laboratory setting. Using a brief and relatively unambiguous analysis routine was an advantage in this regard, in that the opportunity for error was minimized.

Limitations of survey data in general also justified an expedient approach. Research in surrounding areas has shown that the interpretation of surface artifacts from multicomponent sites is suspect due to the likelihood of stratigraphic mixing and the lack of demonstrable associations with any particular occupation or cultural group. This problem is especially applicable to the river corridor, where multicomponent sites are common, and alluvial and colluvial processes as well as other natural and human-caused disturbances have reduced sites to a semblance of their original condition. Centuries of cut and fill along the river bank and at the mouths of tributary drainages have had the most pronounced impacts; in addition, talus erosion, bioturbation, and artifact collection by visitors and previous researchers have all contributed to blurring the present archaeological record. Recognizing these limitations, we believe that we may still confidently discuss some general patterns of lithic reduction behavior.

Identification of Lithic Raw Material Types and Source Areas

The identification of discrete lithic raw material types, their source locations, and mechanisms for their procurement are important for several reasons. Lithic raw materials on the southern and central Colorado Plateau may be found in a number of contexts and may possess varying qualities, each of which may be especially suitable for different uses. For example, microcrystalline and cryptocrystalline cherts and glassy obsidians were more commonly utilized in biface reduction, whereas more coarse-grained materials such as quartzites, basalt, and grainy cherts are 'tougher' and make longer lasting flake tools, scrapers, battering tools, and other expedient implements.

Procurement of lithic materials by Grand Canyon populations probably occurred in at least three different ways: 1) direct procurement from primary source areas, i.e., original geologic contexts; 2) direct procurement from secondary source areas, e.g., riverine terraces containing cobbles deposited by alluvial processes, or nodules found in drainages or slopes below primary source areas; 3) and through exchange. Following are descriptions of the various raw material types found during the survey. It is noteworthy that most of these materials are not actually procurable within the river corridor.

Kaibab Chert

This material is widespread throughout the southern and central Colorado Plateau wherever Kaibab Limestone is exposed (McKee 1938), and was the most commonly used material in these areas, except where obsidian was readily accessible. Overall, it was the second most common material type found along the river corridor, constituting 17 percent of the total assemblage. Kaibab chert occurs in a variety of textures, and so was suitable for use in a variety of tool forms. It ranges from a relatively grainy microcrystalline material to a brittle cryptocrystalline structure, and

it was frequently heat-treated to improve its fracturing properties. Its color ranges from white to tan to a pinkish-salmon color, often mottled in appearance. It may be noteworthy that in forested areas where wildfires have swept through, surface occurrences of non-artifactual Kaibab chert nodules often are of the pinkish color, and it may be that artifacts of this color have been heat-treated. The cortex on this material is often well developed, having a rough, grainy brown texture, although cortical flakes along the river were relatively uncommon.

Redwall Chert

This material occurs as a grainy, white to grayish microcrystalline chert. It is largely unsuitable for biface reduction. Although some bifacial artifacts, including projectile points, were documented, these items tended to be thick relative to length and width. It was much more commonly used in unstaged core reduction for the purpose of obtaining larger usable flakes for use as expedient tools, especially in the eastern canyon at Formative period sites. Little evidence of heat treatment of this material was found during the survey. It typically occurs in larger tabular and blocky chunks and was probably procured from talus slopes below the Redwall Formation. Because this chert fractures readily as it erodes down active talus slopes, it seldom possessed any well-developed cortex, usually only planar, unworked surfaces. Redwall chert was the most common material type encountered, comprising over 40 percent of the total assemblage.

Government Mountain-RS Hill Obsidian

This material is a generally opaque black obsidian with small phenocrysts that are sometimes prevalent enough to interfere with controlled flaking. Nevertheless, this material is often pure enough to allow manufacture of well-thinned tools, although phenocrysts are occasionally found embedded in finished items. It is found in the Government Mountain and RS Hill vicinities near Flagstaff, procurable from talus slopes and drainages adjacent to these mountains (Shackley 1988:755-756). Cortex on this material is usually well-developed, although artifacts recorded along the river rarely have more than a little cortex remaining.

Black Rhyolite

This is a black, slightly grainy, microcrystalline material found in the Presley Wash area northeast of Seligman (Lesko 1989:389). This material was most commonly found at sites in the western canyon, although never in substantial quantities. It was often found in the form of small bifacial tools, with debitage and flake tools occurring less commonly, suggesting that it was often curated in reduced forms.

Partridge Creek Obsidian

This is a glassy, translucent black obsidian from the Mt. Floyd volcanic area northeast of Seligman (Lesko 1989:388; Shackley 1988:754-755). In very thin flakes, this material is sometimes mottled, almost smoky in appearance. This resource was one of the highest quality materials available in the region, and was undoubtedly prized by aboriginal groups, as suggested by the small, terminally reduced tools and debitage. Even very small flakes often showed evidence of retouch and/or use-wear. It was quite common at sites in the western canyon, but usually only a few items were present at any given site.

Presley Wash Obsidian

This is a brittle, opaque obsidian from the Presley Wash area northeast of Seligman. This material is typically gray or greenish gray, often with black bands, and flawed by quartz phenocrysts (Lesko 1989:389). Texturally, it is inferior to Partridge Creek obsidian, but tends to occur in much larger nodules. Presley Wash obsidian was fairly common at sites in the western canyon, but not abundant. Like other obsidians found at sites along the river, it was probably a curated resource, occurring as small finished or reworked tools and retouched flakes.

River Cobble Cherts

This category refers to a variety of cherts of different textures and colors found among cobbles deposited along the river and on adjacent terraces. These cobbles were probably originally deposited on terraces of the Colorado River and San Juan drainage systems during the Pleistocene, and are gradually eroding into the current flood zone, where they continue to be redeposited. Because they have been mixed and redeposited for millenia, specific sourcing is impossible; therefore, the procurement area for these materials should be viewed as a zone occurring along certain sections of the river corridor. Although commonly found at sites throughout the canyon, they tend to occur in greater numbers in areas where cobble-covered terraces are present. The presence of water-worn cortex was usually necessary for identifying this material.

Chinle Chert/Silicified Wood

This category consists of a group of siliceous materials from various members of the Chinle Formation. The uppermost member, the Shinarump Conglomerate, contains numerous small

cobbles and pebbles of cryptocrystalline chert encased in a sandstone matrix. The Petrified Forest Member contains chunks of siliceous petrified wood of microcrystalline and cryptocrystalline structure. Although homogeneous in composition, it often exhibits characteristics, such as woodgrain bands, that identify it as petrified wood. The Owl Rock Member of the Chinle Formation also contains chert. It is a mottled dull green to purple color, usually quite grainy, and most suitable for expedient flake tool production or crude biface reduction. Even so, outcrops of Owl Rock chert in the Kayenta area were frequently exploited Puebloan groups (Green 1984).

Of the various lithic resources found in the Chinle Formation, the Shinarump cobbles and silicified wood are typically the most homogeneous, and therefore best suited for biface reduction, although the size and shape of Shinarump cobbles limit the potential morphology of tools. All of these materials are more commonly found in the eastern canyon, closer to raw material procurement areas.

Quartzite

These macrocrystalline river cobbles are found abundantly in generally the same deposits as river cobble chert. This material is only suited for crude chopping and battering tools, hammerstones, and for expedient flake tools. Nevertheless, it was common at sites throughout the river corridor, typically in small numbers.

Chalcedony

This is a catch-all category for translucent, clear to white cryptocrystalline chert with a waxy texture and appearance. This category may include items of exceptionally homogeneous petrified wood, interior flakes of river cobble chert, and perhaps chert from the Summerville Formation in Utah, all of which are difficult to distinguish macroscopically in the field. It was most commonly found as small interior flakes and finished tools, suggesting a nonlocal source area.

Other Cherts

This is another catch-all category of miscellaneous cherts that could not be further specified as to source areas. Some of these cherts may be riverine, but lacked cortex or other attributes to identify them conclusively. Still others are probably exotic materials brought in from areas outside of the immediate Grand Canyon area, or from source areas perhaps relatively nearby, but which have not been specifically identified. This is particularly the case in the western canyon, where lithic materials may be transported from the lower Colorado River area, the Arizona Strip country, or even the Great Basin.

Information Potential of Debitage

Debitage, defined as the waste flakes and shatter resulting from lithic reduction, holds a great deal of information about the kinds of activities conducted at sites. While chipped stone tools manufactured at sites are often transported for use elsewhere, most debitage is simply left behind, except in the case of some flakes that are themselves used as simple tools. The bulk of debitage therefore remains as a sort of three-dimensional "template," however fragmented, of the tools that were produced. By analyzing certain characteristics of individual items in the context of assemblages, we may infer the general types of tools manufactured.

Ethnoarchaeological (e.g., Binford 1986; Gould et al. 1971) and experimental (e.g., Geib 1981; Magne and Pokotylo 1981) studies have demonstrated that different kinds of reduction activities result in different types of debitage assemblages, and similar differences in assemblage composition have been noted empirically in the archaeological record (Sullivan and Rozen 1981). Debitage attributes vary according to reduction behaviors and strategies (Geib 1982; Sullivan and Rozen 1985); therefore, their analysis is a key method in identifying these phenomena, especially when actual tools are not discovered at sites, as is frequently the case. This is particularly true in situations where tool production may have been a primary site function, but where finished tools were used and discarded elsewhere. Alternatively, tools found at a specific site may have been manufactured elsewhere and bear no relation to the debitage found there. Analysis of both tools and debitage become complementary in these instances.

Based on replicative experimental studies, and tested on archaeological assemblages, Geib (1982: 30-37) proposed that lithic reduction variability can be generally approached as follows. Simple flake tool production, involving an unstaged strategy using hard or soft hammer percussion, "usually results in a moderately high ratio of whole to fragmentary flakes." In this situation, the end product is the flake itself, and minimal, if any, core preparation is required before flake removal. These types of flakes are typically larger and thicker than those removed in more advanced staged reduction of higher input tools, and are less likely to split during removal. In reduction strategies involving the production of high-input tools using percussion flaking, "a low or inverse ratio of whole to fragmentary flakes" results (Geib 1982:37). This is primarily due to the necessity of highly controlled removal of thin flakes, which are more likely to shatter when struck from the core. In addition, "there is a large decrease in the amount of angular shatter after the decortication and initial reduction

stage" (Geib 1982:37), again owing to the highly controlled nature of the the flaking process.

Sullivan and Rozen (1985) interpreted archaeological debitage assemblages using similar criteria, but have lately been criticized for not independently testing their inferences with experimental or other solidly empirically based data (Amick and Mauldin 1989:167). In a rebuttal, Rozen and Sullivan (1989: 173) dispel Amick and Mauldin's criticisms by arguing that their approach was in fact strongly empirical, drawing on "experimental, replication, and ethnoarchaeological studies." Sullivan and Rozen may have been at fault by not bolstering their original article with more empirical evidence in the first place, but their general argument seems valid.

Discussion of Debitage Variables

Cortex

Examination of the occurrence of cortex on debitage items may be useful in several respects. For example, the amount of cortex cover is often considered a key variable in inferring reduction stages and strategies (Magne and Pokotylo 1981:38-40; Sullivan and Rozen 1985:764), based on empirically derived assumptions that as reduction progresses, the amount of cortex on the reduced core (and hence, debitage) decreases, and that higher input tools are less likely to exhibit cortex than low-input tools. As one component of a study on the Kayenta Anasazi of Black Mesa, Green (1984:181-182) successfully predicted that the further lithic artifacts were transported from raw material source areas, the less cortex they should possess, reflecting behavior wherein the removal of cortical waste flakes occurs relatively near procurement areas. In this case, an energy efficiency model was applied to infer resource conservation.

The occurrence and characteristics of cortex must be considered discretely between different raw material types. For example, Kaibab chert and river cobble materials typically possess relatively well-developed cortex due to exposure to weathering over long time periods. Redwall chert, however, occurs in tabular chunks that often exhibit relatively fresh fracture planes on their exterior surface, resulting in cortex that may be difficult to identify. Comparison of debitage between these groups based on cortex would be misleading if cortex alone is used to infer reduction technology or intensity (Sullivan and Rozen 1985:756, 759). This is a major inadequacy of the IMACS site record, which uses the variables 'primary-secondary-tertiary' as debitage categories.

Item Type

Chipped stone lithic items were recorded on the basis of whether they were debitage, cores, or tools. Except for cores, each of these categories was further separated based on morphology and condition.

Condition

Debitage items received further analysis in terms of item completeness (whole flake, proximal flake fragments, distal flake fragments, and angular shatter). Bipolar flakes and sheared flakes were also coded as such, as each of these debitage types may be used to infer certain characteristics about flaking properties of raw materials as well as inferences about possible reduction strategies or technologies. For instance, sheared flakes often occur with very brittle raw materials, such as obsidian, and particularly when hard-hammer percussion is involved. Bipolar flakes may be the result of the use of very small cores, where an anvil is used to split the pebble into two or more pieces, with resulting flake margins used as expedient tools. Bipolar flaking may also indicate the maximization of scarce lithic raw materials, such as obsidian. However, neither sheared flakes nor bipolar flakes were numerous at any sites recorded during survey.

Dorsal Scars

The number of dorsal flake scars were recorded during the first three field sessions as an indicator of reduction stages. For this variable to be reliable, however, only whole flakes should be considered since there is no way of knowing how many dorsal flake scars were missing on fragmentary items. Because platform condition was a more informative attribute in inferring reduction behavior, this variable was used in lieu of dorsal scars during the last five sessions.

Platform Condition

The number of platform scars was recorded on whole and proximal flakes after the third field session. Platform condition was recorded as follows: 1 = cortical platform; 2 = one to two platform scars; 3 = three or more scars; 4 = partially crushed platforms; and 9 = indeterminate. This attribute, when considered with size and item condition, can be very useful for inferring reduction stages and strategies. For instance, cortical platforms would have a tendency to be present during earlier reduction stages, especially when found on larger flakes. Conversely, smaller flakes with multiple platform scars or partially crushed platforms are more likely to occur during more advanced flaking stages.

Strategically, simple core reduction does not require well-controlled flaking to produce the desired product, a flake with a sharp usable edge. However, biface reduction does require a great deal of control, and platform preparation (usually

through abrasion) strengthens it, reducing the likelihood of stepped and hinged flakes and increasing the predictability of flake removal. It should be noted that such inferences should not be made independent of the nature of the lithic raw materials (core attributes). For example, large tabular cores with little cortex would require a significantly different strategy to produce bifacial tools than would small alluvial cobbles.

Size

This variable was recorded on the basis of size "classes," (6, 10, 14, 18, 22, 26, 32, 39, and 39+ mm average diameters). Items were assigned to these categories based on a best-fit decision by the analyst.

Information Potential of Chipped Stone Tools

The analysis of chipped stone tools may provide direct, if only general, information about the types of activities performed at sites. The presence of well-thinned bifacial tools with extremely acute margins, for example, implies that a sharp implement was necessary to execute certain tasks. Conversely, items with steep-angled margins are more suitable for stripping or scraping materials such as wood, bone, or hide. Although in a general, abstract sense such distinctions may seem empirically obvious, more specific determinations of tool function can be very difficult. Contemporary experimental studies of stone tool use in well-controlled laboratory studies (e.g., Lawrence 1979; Newcomer and Keeley 1979) have demonstrated that not only is the inference of specific functions of stone tools tenuous, but a single type of tool used for different purposes may result in similar wear patterns, and only roughly similar tool types may be suitable for a single type of task.

A number of recent studies have been undertaken to determine the relationship between lithic raw material procurement and the curation of chipped stone tools (e.g., Gramly 1980; Green 1984; Wiant and Hassen 1984; Bamforth 1986). Common interests in these studies are the availability of suitable raw material, organizational factors governing the production, maintenance, and use of tools, and evident behaviors regarding eventual discard, as inferred from the archaeological record. In a study on Black Mesa, Arizona, Margerie Green tested the hypothesis that "the degree to which chipped stone raw material types were used and conserved is related to the distance between the source of the material and the site at which it is found" (Green 1984:174). The concept of conservation, as Green uses it, is derived from Binford's (1983:262f) discussion of curation.

Binford conceptualized a technological continuum between "expedient" and "curated" tools. Expedient tools are those which exhibit little or no production input, are often simply handy implements used for immediate tasks, and are expendable. Curated tools have relatively greater production input, are maintained and/or repaired during their use-life, and hence tend to be saved, or conserved. This sort of framework envisions an efficiency model involving a minimum effort/maximum gain rationale. The degree of production input is viewed as playing a critical role in the evaluation of expediency and curation. The greater effort involved in producing high-input tools gives them a higher "cost," or replacement value. This may, in addition, be related to restricted access to replacement raw materials (Bamforth 1986; Wiant and Hassen 1984). Hammerstones, other unmodified "rocks," used flakes, unidirectionally and bidirectionally edged tools, and unifaces are considered expedient. Cores are also included, but are not necessarily tools per se. Bifacially flaked items in various stages of manufacture are more likely to be curated due to their relatively higher production input.

Lithic assemblages at sites along the river corridor are particularly well suited for studying curation behavior, but also present special challenges to doing such a study. Because of the diversity of lithic materials from various source areas, we may learn a great deal about mobility and/or exchange networks, as well as technological patterns involved in exploiting these various resources. Change through different time periods may also be addressed, but only cautiously given the potential for mixing of surface remains.

Discussion of Tool Variables

In conducting our field analysis, an attempt was made to classify each item as a techno-morphological type as well as an inferred functional type. The techno-morphological classification is based on a simple empirical approach where item shape and the type and amount of production input were considered. For example, an item with flake scars invading the midsection of both surfaces and thin cross-section, relative to length and width, was classified as a thin biface. An item with flake scars invading only a short distance across one surface and thick cross-section was classified as a thick uni-edge (a unidirectionally edged tool). These two tool types form the extremes of the production input spectrum. Other tool types occur as intermediate combinations of thick or thin, edged or facially worked tools. Used flakes, conservatively identified on the basis of patterned edge damage or retouch on otherwise unmodified items, were coded as such, usually without further specification.

The delineation of functional tool types relied primarily on considerations of an item's suitability

to perform particular tasks, based on techno-morphological attributes, and on inferences derived from macroscopically visible use-wear patterns. Such evidence may consist of micro-flaking along the utilized edge of a scraper, or pronounced wear polish or serrations along biface margins that may indicate use as a knife. These determinations should be considered only tentative, and in many cases our lithic analysts cautiously chose to code this category as unknown. Even projectile points, which are often relatively easy to identify as such, may have served as multi-purpose tools, particularly in contexts where they are curated items.

Analytical Results

Raw Material Types

Nearly 5000 lithic artifacts were analyzed during the survey. The following section discusses the distribution and occurrence of various raw materials used in lithic manufacture, as illustrated in Table 15.

Cherts. Redwall and Kaibab cherts combined accounted for nearly 60 percent of the lithic artifacts. The most common raw material type found during the survey was Redwall chert, accounting for over 40 percent of the total lithic artifacts (n = 2061). At the same time, Redwall chert was the most easily accessible raw material, procurable in the immediate vicinity of the river corridor in many reaches of the canyon. It had a tendency to predominate more on the left bank of the corridor, accounting for slightly more than 46 percent of the total lithics (1259 of 2713 left bank lithics), compared with about 37 percent of the lithics on the right bank (762 of 2060 right bank lithics).

Kaibab chert was the second most common raw material found along the river corridor, accounting for approximately 17.4 percent (n = 862) of the total lithics. It accounted for a slightly higher percentage of lithics on the right bank (18.5%, n = 395) than the left (15.6%, n = 425), although more Kaibab chert items were recorded on the left. The vast majority of Kaibab chert artifacts (n = 703, 86%) were found in Reaches 10 and 11, but small quantities were scattered throughout the river corridor. The preponderance of this chert in the western canyon is interesting in that it does not outcrop near the river, but is available at sources accessible by relatively easily traversed side canyons.

Following Redwall and Kaibab cherts, 315 items (6.4%) were classified as chalcedony. About 7.3 percent (n = 150) of right bank lithics and 6 percent of left bank lithics were of this material. Closely following chalcedony were river cobble cherts (n = 296, 6.0%). Approximately 7.5 percent (n = 155) of right bank lithics and 5 percent of left bank lithics (n = 134) were of this material. Smaller numbers of Chinle cherts and silicified wood (n = 131), limey gray cherts (n = 138), and multi-colored Redwall cherts (n = 85) were also analyzed. Four hundred twenty-five items were classified as other cherts.

Chalcedony, river cobble cherts, and Chinle silicified wood are better discussed as a group, as there is probably some overlap due to inconsistencies between analysts. For example, classification as a river cobble chert usually required the presence of cortex, and given that some of these riverine "cherts" are in fact chalcedony, the presence or absence of cortex would determine in which category a particular item would be placed. Chinle silicified wood sometimes occurs as a translucent chalcedony-like material and also has potential to be misclassified, particularly the smaller items. Cherts from the Shinarump Conglomerate member of the Chinle Formation, which typically occur as small river gravels and cobbles, might sometimes have been classified as river cobble chert, considering that both often possessed alluvial cortex. In fact, some river cobble cherts are undoubtedly derived from eroded Shinarump Conglomerate bedrock that subsequently was redeposited downriver. It is also quite likely that some items of chalcedony, particularly those with opaque cherts intergraded, were classified as "other chert." It is probable that the miscellaneous category "other chert" is predominantly comprised of river cobble cherts that lacked diagnostic cortex (only 20 of 315 "other chert" items possessed >50% cortex).

Obsidians. Small amounts of various types of obsidian were analyzed, but since these are distinct materials with relatively specific source areas, they are useful for inferring mobility and/or exchange patterns. Except for Utah obsidian, all of these occur at source areas south of the canyon, either from the Mount Floyd volcanic field or the Government Mountain area (see discussion of material types). The most common was Presley Wash obsidian (n = 38), which was recorded at sites in Reaches 5, 7, 10, and 11. Thirty-four items were recorded in Reaches 10 and 11 (n = 16 and 18, respectively), and all but four were found on the left bank.

The second most common obsidian is from the Partridge Creek source (n = 28). This type was found in Reaches 3 (one item only), 10 (n = 25), and 11 (n = 2). Twenty-two out of 28 artifacts (79%) were found on the left bank. Eighteen items of Government Mountain obsidian were analyzed from Reaches 4, 5, 6, 7, 10, and 11; all but four occurred on the left bank. Four Black Tank obsidian artifacts, all from Reach 10, were documented on the left bank. The distribution of obsidians from south of the canyon is interesting because it appears that these materials were only infrequently transported across the river.

Table 15. Distribution of Chipped Stone Raw Material Types by River Reach

Material Type	0	1	3	4	5	6	7	8	9	10	11	Total
Black Rhyolite	3	3	0	0	11	0	0	2	0	3	1	51
Black Tank Obsidian	0	0	0	0	0	0	0	0	0	4	0	4
Cardenas Basalt	0	0	0	0	16	0	0	0	0	0	0	16
Chalcedony	58	17	14	12	51	1	10	25	0	114	13	315
Chinele Cherts	44	77	0	2	2	0	0	0	0	6	0	131
Govt. Mtn./RS Hill Obs.	0	0	0	4	3	1	3	0	0	6	1	18
Kaibab Chert	26	20	0	23	41	29	6	11	1	505	200	862
Limestone	0	0	0	6	17	1	5	3	7	4	0	43
Limey Gray Chert	2	6	1	10	14	40	0	0	1	57	7	138
Multicolored Redwall	0	0	0	2	4	2	0	12	1	48	16	85
Other Non-Chert	32	12	0	8	18	4	1	8	1	9	0	93
Other Chert	70	30	18	23	44	6	20	22	3	166	23	425
Other Obsidian	0	1	0	0	1	0	1	1	0	2	0	6
Partridge Ck. Obs.	0	0	1	0	0	0	0	0	0	25	2	28
Presley Wash Obs.	0	0	0	0	3	0	1	0	0	16	18	38
Quartzite	93	38	0	28	32	3	8	5	0	74	7	288
Redwall Chert	6	5	56	328	573	126	122	65	7	680	93	2061
Cobble Chert	166	23	0	18	40	2	1	8	0	36	2	296
Unknown	0	1	0	8	8	0	0	1	0	7	0	25
Utah Obsidian	0	1	0	0	1	0	1	1	5	9	6	24
Total	**500**	**234**	**90**	**472**	**879**	**215**	**179**	**164**	**26**	**1799**	**389**	**4947**

The same tendency is not true with Utah obsidian (n = 24), in that nearly 46 percent (n = 11) were recorded on the left bank, across the river and a considerable distance from its source area. This suggests that Utah obsidian was a prized resource, perhaps traded to left bank inhabitants, whereas obsidians from the south apparently were not valued so highly, especially considering that they are procurable in closer proximity to the canyon. Utah obsidian artifacts were documented at sites in Reaches 1, 5, and 7 through 11, although 20 of 24 were found in Reaches 9-11 (one each in the others).

Coarse-grained Materials. This class of materials includes quartzites, basalts, and limestones, which were typically used for crude core tools, such as choppers and hammerstones, or were used for production of expedient unstaged flake tools (used flakes, low-input unifaces, etc). Quartzites were relatively more common in the upper reaches of the canyon, where they occurred in raw material form more abundantly than elsewhere. Over 40 percent (131 of 288) were recorded in Reaches 0 and 1. They were found in smaller numbers elsewhere throughout the river corridor. Sparse occurrences of other coarse-grained materials were fairly evenly distributed throughout the canyon. Although these materials were unsuitable for staged intensive reduction, they were well-suited for certain tasks requiring tough, if not sharp, implements.

Debitage

As previously discussed, surface assemblages are subject to a variety of depositional and post-depositional factors that could introduce biases to the archaeological record. This is especially true at sites with evidence of multiple occupations. To help alleviate at least some of these biases, it seems wise to rely primarily on assemblages from single-component sites. This approach is essential for distinguishing variability between different cultural groups and temporal periods. In short, there is no way to reliably distinguish intra-site assemblages produced by different cultures from surface remains of multicomponent sites. Even at sites that appear to be single component, it is possible that multiple occupations occurred, but no diagnostic remains were left behind, or at least are not visible on the surface.

Considering only single-component sites, several striking patterns are apparent in the debitage assemblages. Looking at the use of various lithic raw materials (Table 16), for instance, there was virtually no obsidian or other igneous rock found at Archaic/Basketmaker II period sites. The vast majority of debitage at these sites is derived from Kaibab and Redwall cherts, and six other material types occur in small amounts. Compared to most later time periods, this reflects relatively little material type diversity. In general, it appears that later groups increasingly utilized a greater number of raw materials, including a higher incidence of locally available coarse-grained materials.

Archaic groups used proportionately more Kaibab chert than other groups, except the Pai and Virgin Anasazi. This is probably not so much an indicator of cultural preference, however, as it is an indicator of the availability of this raw material, since most Archaic, Virgin Anasazi, and Pai sites are located in the western canyon where Kaibab chert is generally more readily procurable from sources accessible via easily traveled tributary drainages. In the Lees Ferry area, where Kaibab chert is available at river level, alternative and presumably more desirable materials from river cobbles and the Shinarump and Petrified Forest members of the Chinle Formation were more frequently exploited.

Looking at general material type groups organized into four categories by texture (glassy to coarse-grained), there is a marked tendency for Archaic assemblages to consist predominantly of fine-grained cherts (Table 17). Conversely, Puebloan sites have proportionately more coarse-grained materials, although cherts are still the dominant category.

Obsidians, given the restricted nature of their source areas in the general region, are possibly the best indicators of mobility and exchange networks. However, due to the relatively small sample sizes of the various obsidians at single-component sites, the data should be considered tentative. Still, a striking majority of obsidian debitage occurred at Pai sites. Only one Presley Wash obsidian flake was found at a site assigned a Paiute affiliation, and only two pieces of obsidian debitage, one Utah obsidian and one Government Mountain obsidian, were found at sites assigned an undifferentiated Pai/Paiute affiliation. It should be noted, however, that obsidian and other fine-grained igneous materials were evident in the Paiute tool assemblages, as discussed later. One implication of this is that higher input tools were conserved or curated, but flakes and low-input flake tools were not.

Small amounts of obsidian debitage were also found at Kayenta and Virgin Anasazi sites. Obsidian from Kayenta sites tended to be from the Government Mountain/RS Hill source area, while the single piece of obsidian debitage from a Virgin site was from a Utah source. This distribution would be expected given the respective territories of these cultural groups.

The lack of obsidian at sites assigned an Archaic affiliation could imply several things. It could be evidence that obsidian was not directly procurable during seasonal mobility cycles. This is not to say that residential or logistical mobility was

Table 16. Distribution of Debitage Material Types by Cultural Affiliation

Material Type	Aceramic	Preceramic	Unknown	Pueblo	Cohonina	Formative	Hopi
Black Rhyolite	2	0	0	4	0	0	6
Black Tank Obsidian	0	0	0	0	0	0	0
Cardenas Basalt	0	2	0	13	0	0	0
Chalcedony	27	4	1	50	0	16	0
Chinle Cherts	22	2	0	35	0	0	0
Govt. Mtn./RS Hill Obs	4	0	0	3	0	0	0
Kaibab Chert	78	62	0	67	0	6	0
Limestone 22	0	0	13	0	0	0	
Limey Gray Chert	44	3	0	17	0	1	0
Multicolored Redwall	4	1	0	2	0	13	0
Other Non-chert	14	0	0	29	0	8	0
Other Chert	50	10	10	65	0	17	1
Other Obsidian	1	0	0	1	0	0	0
Partridge Ck. Obs.	0	0	0	0	0	0	0
Presley Wash Obs	1	0	0	1	0	0	0
Quartzite 34	1	0	81	0	3	0	
Redwall Chert	266	101	15	528	25	162	2
Cobble Chert	51	2	4	120	0	5	0
Utah Obsidian	8	0	0	1	0	0	0
Total	628	188	30	1030	25	231	9

Material Type	Pai/Paiute	Pai	Paiute	Unknown	Virgin Anasazi	Western Kayenta	Total
Black Rhyolite	1	2	1	0	0	1	17
Black Tank Obsidian	0	2	0	0	0	0	2
Cardenas Basalt	0	0	0	0	0	0	15
Chalcedony	3	11	3	11	4	4	134
Chinle Cherts	0	0	0	0	0	3	62
Govt. Mtn./RS Hill Obs	1	1	0	0	0	0	9
Kaibab Chert	4	53	2	0	50	3	325
Limestone 0	1	0	0	0	0	36	
Limey Gray Chert	2	3	2	0	7	0	79
Multicolored Redwall	2	3	3	0	10	0	38
Other Non-chert	0	0	0	0	0	10	61
Other Chert	1	21	3	4	6	12	200
Other Obsidian	0	0	0	0	0	0	2
Partridge Ck. Obs.	0	6	0	0	0	0	6
Presley Wash Obs	0	18	0	0	0	0	20
Quartzite	16	2	0	7	2	17	163
Redwall Chert	17	46	42	11	37	2	1254
Cobble Chert	2	3	1	8	8	10	214
Utah Obsidian	1	4	0	0	1	0	15
Total	50	176	57	41	125	62	2652

Table 17. Distribution of General Debitage Material Textures by Cultural Affiliation

Cultural Affiliation	Cherts	Coarse-Grained	Medium-Grained	Obsidian	Total
Aceramic	498	114	2	14	628
Preceramic	182	4	2	0	188
Ceramic Unknown	30	0	0	0	30
Puebloan	901	167	18	6	1030
Cohonina	25	0	0	0	25
Virgin Anasazi	115	9	0	1	125
Formative	219	12	0	0	231
Hopi	3	0	6	0	9
Pai/Paiute	29	18	1	2	50
Pai 137	6	2	31	176	
Paiute	54	2	1	0	57
Unknown	34	7	0	0	41
Total	2227	339	32	54	2652

in any way restricted, for it is possible to cover a great deal of territory encompassing several ecological zones without encountering any obsidian raw material source areas. In any case, it indicates that logistical mobility strategies involving special trips to obsidian-rich areas were not practiced. Barring cultural preferences based on factors not related to the suitability of the raw materials, it seems likely that obsidian would have been exploited whenever encountered.

Alternatively, it is possible that obsidians *were* used by Archaic groups, but curation of raw materials through conservation or maintenance of high-input tools was simply not important to highly mobile Archaic groups, especially considering the abundance of various high-quality cherts throughout much of the region. Obsidian use during the Archaic has been documented at sites in areas immediately surrounding the canyon (e.g., Euler 1983; Schroedl 1988). Relevant data was recently recovered from the Kaibab Plateau (Brown 1988b), where obsidian debitage and tools, including Gypsum series and other Archaic point types, were recovered from excavated open sites. Although we are presently in no position to confidently discuss the relationship of these occupations to those along the river corridor, it appears that Archaic curation practices were a factor in the distribution of obsidian.

As an indicator of chipped stone reduction stages and, to an extent, the intensity of reduction (i.e., low-input vs. high input), the number of platform scars on platform-bearing flakes was tabulated by cultural affiliation (Table 18). If we assume that multiple platform scars are evidence of platform preparation, and hence, biface reduction (Geib 1982), it is readily apparent that this strategy was practiced frequently by Archaic groups occupying the canyon. Over 45 percent of platform-bearing flakes exhibited multiple platform scars at sites assigned to this cultural group, compared with roughly 20 percent of the assemblages of all cultural groups combined. Archaic period reliance on extensive biface use is well documented throughout the Colorado Plateau and Great Basin (e.g., Jennings 1978; Jennings et al. 1980; Thomas 1983), and so this statistic is not surprising.

In contrast to the Archaic, less than 15 percent of platform-bearing flakes exhibited multiple scars at Kayenta sites. In fact, over 35 percent of whole flakes at these sites possessed cortical platforms, compared to barely over 5 percent at the Archaic sites. Again, figures along these lines are to be expected, as demonstrated elsewhere in the region (e.g., Geib 1982; Sullivan and Rozen 1985).

An interesting finding among sites with a Virgin Anasazi affiliation is a relatively high incidence of multiple platform scars (30% of whole flakes). This may reflect a relatively greater reliance on bifacial tools, perhaps related to hunting and meat processing activities. The incidence of cortical platforms (approximately 5%) is more similar to Archaic sites than to Kayenta sites.

The incidence of multiple platform scars among both Pai and Paiute groups is not particularly noteable when compared to all assemblages combined. Neither deviates more than a couple of percentage points either way. One aspect of the Pai assemblages that is worth mentioning, however, is a high proportion of whole flakes with partially crushed platforms (30%, compared to a mean of 13% for all assemblages). This may indicate that bifacial tools were produced, but without well-controlled techniques involving platform preparation, as is the case with the Archaic assemblages.

Table 18. Crosstabulation of Platform Scars on Platform-Bearing Flakes by Cultural Affiliation

Cultural Affiliation	Cortex	1-2 Scars	Multiple Scars	Partially Crushed	Total
Aceramic	72	99	54	24	249
Preceramic	3	20	26	6	55
Ceramic Unknown	7	7	1	0	15
Puebloan	123	105	42	46	276
Virgin Anasazi	3	30	19	11	63
Formative	13	35	18	2	68
Hopi	3	4	0	0	7
Pai/Paiute	9	15	5	0	29
Pai	23	25	23	30	101
Paiute	10	12	6	4	32
Unknown	7	13	0	3	23
Total	273	365	194	126	958

Chipped Stone Tools

As with the previous discussion, the following section focuses on tools from single-component sites, which includes a total of 212 items analyzed in terms of technological type (Table 19).

The sample size for the preceramic period is meager, consisting of a few bifacial tools (all projectile points), a bidirectional edge, two unidirectional edges (scrapers), and two used flakes. The low number of tools associated with the single-component, preceramic sites indicates an unintensive occupation during this period. None of the tools except the projectile points are high input, despite debitage assemblages that indicate biface reduction activity. It appears that brief hunting-oriented trips into the canyon during the preceramic period took place, which also included replenishment of tool kits that were apparently used and discarded elsewhere. As noted for the debitage discussion, a limited diversity of material types in the tool assemblages was found, consisting primarily of local, and occasionally exotic, cherts (Table 20).

The quantity and diversity of tools from prehistoric Puebloan sites indicate considerably more intensive occupation involving various techno-subsistence activities, as expected (based on all other lines of cultural evidence). These assemblages reflect hunting and plant food processing, utilizing a combination of high- and low-input tools suitable for these tasks. Similarly mixed assemblages for Puebloan sites were previously recovered during recent test excavations (Jones 1986). The survey results would seem to support Jones's interpretation of broad based subsistence strategies during the formative period.

Although the sample size of tools is small (n = 11), Virgin tool assemblages appear to be an exception to the general Puebloan trend. Instead, as with the debitage, Virgin tool assemblages more closely resemble those at preceramic sites. Nearly 50 percent of tools are high-input bifacial items, indicating a greater reliance on hunting in the canyon. The scarcity of expedient tools that characterize most Puebloan assemblages suggests that agricultural pursuits were conducted elsewhere, probably on surrounding plateaus to the north.

The tool assemblages at protohistoric sites also exhibit a mixture of high- and low-input items, but with a relatively higher proportion of bifacial tools than at Puebloan sites. This again probably reflects a substantial reliance on hunting. The fact that several tools, particularly projectile points, were made from non-local obsidians indicates that these materials were prized and conserved for use as specialized implements.

At aceramic sites, overall proportions of various tool types most closely resemble Kayenta assemblages, in that a good mix of high- and low-input items is apparent. This evidence would imply that aceramic sites may have a tendency to be affiliated with Puebloan occupations, but some are undoubtedly from earlier and later time periods.

Projectile Points

The use of projectile points as indicators of ethnicity and/or temporal placement should be approached with caution. In spite of several methodologically rigorous efforts to establish objective point typologies (e.g., Holmer 1978, 1986; Thomas 1981), a cursory examination of any number of field reports will reveal inconsistencies and confusion in classification, whether intuitive or statistical. It is clear that some point styles have greater utility than others in assigning cultural and temporal affiliation. The main problem is that there are many side- and corner-notched varieties

Table 19. Distribution of Technological Tool Types by Cultural Affiliation at Single-Component Sites

Cultural Affiliation	Biface Thin	Biface Thick	Bi-Edge Thin	Bi-Edge Thick	Uniface Thin	Uniface Thick
Aceramic	6	7	1	2	1	0
Archaic	3	0	1	0	0	0
Ceramic Unknown	1	0	0	0	0	
Puebloan	6	10	1	3	0	1
Virgin	4	1	1	0	1	0
Formative	7	1	0	2	0	6
Hopi	0	0	0	0		
Pai/Paiute	1	2	0	0	0	
Pai	10	12	5	4	0	2
Paiute	3	2	2	0	0	0
Unknown	1	0	0	0	0	
Total	42	35	11	11	2	9

Table 19 (concluded)

Cultural Affiliation	Uni-edge Thin	Uni-edge Thick	Other	Used/Retouch Flake	Indeter-minate	Total
Aceramic	1	4	6	9	0	37
Archaic	1	1	1	2	0	9
Ceramic Unknown	0	1	0	2	0	4
Puebloan	1	13	14	8	1	58
Virgin	0	2	0	2	0	11
Formative	0	5	2	4	0	27
Hopi	0	0	2	0	0	2
Pai/Paiute	0	0	0	2	0	5
Pai 3	1	4	5	0	46	
Paiute	0	0	3	1	0	11
Unknown	0	0	0	1	0	2
Total	6	27	32	36	1	212

from the Archaic and later periods that overlap morphologically, and are simply not distinctive enough to make confident inferences about who made them and when. The following section discusses the points found during the survey that do seem to be valid cultural-temporal indicators, as well as those that cause headache and confusion.

Sixty-three diagnostic projectile points were recorded during the survey (Table 21). Fifty-nine were found at sites and five were isolated occurrences. Thirty-nine were collected for further lab examination and fourteen were inventoried and sketched in the field. The various point styles, independent of other lines of evidence, indicate occupations from the Late Archaic period up through protohistoric times.

Three sites, A:16:178, A:16:4, and A:15:38, had McKean Concave Base lanceolate points (Figure 3a). Points from this type were found in Late Archaic strata at Sudden Shelter in central Utah (Holmer 1978, 1980), and at several other sites throughout the Great Basin (e.g., Thomas 1983, 1985). Chronometric data from these sites suggest a date range of approximately 3000-1000 B.C. for these points (Holmer 1986:100-101), tending to be somewhat earlier but overlapping the date range for Gypsum Contracting Stem points.

Gypsum Contracting Stem points were found at two sites and as two isolated occurrences (Figure 3b, k-l). This point style is common at well-dated Late Archaic contexts throughout the eastern Great Basin and northern Colorado Plateau (e.g., Fowler et al. 1973; Jennings 1980). Although these points have been occasionally recovered from strata dated to as late as A.D. 1080 (Fowler et al. 1973: Tables 1 and 4), the great majority have been found in contexts dating much earlier, and Berry and Berry (1986: 309-310) have provided compelling arguments that discredit the more recent dates. For example, at O'Malley Shelter in southeastern Nevada, 93 Gypsum points (referred to as Gypsum Type A) were recovered, all but 18 of which occurred in

Table 20. Distribution of Material Types Used in Chipped Stone Tools, by Cultural Affiliation.

Material Type	Aceramic	Puebloan	Archaic	Ceramic Unknown	Formative	Hopi	Pai/ Paiute	Pai	Paiute	Unknown	Virgin	Total
Black Rhyolite	0	0	0	0	1	1	0	1	0	0	1	4
Black Tank Obsidian	0	0	0	0	0	0	0	1	0	0	0	1
Cardenas Basalt	0	1	0	0	0	0	0	0	0	0	0	1
Chalcedony	2	1	0	0	0	0	0	1	1	0	0	5
Chinle Cherts	0	2	0	0	0	0	0	0	0	0	0	2
Govt. Mtn./RS Hill Obs.	0	0	0	0	0	0	0	2	0	0	0	2
Kaibab Chert	4	2	2	1	6	0	0	16	1	0	3	35
Limestone	0	1	0	0	0	0	0	0	0	0	0	1
Multicolored Redwall	1	1	1	0	1	0	1	1	0	0	1	7
Other Non-chert	0	4	0	0	3	1	0	1	0	0	0	9
Other Chert	5	5	1	0	0	0	1	8	4	0	1	25
Partridge Ck. Obs.	0	0	0	0	0	0	0	3	0	0	0	3
Presley Wash Obs.	0	1	0	0	0	0	0	2	1	1	0	5
Quartzite	4	10	0	0	2	0	0	0	0	0	0	16
Redwall Chert	17	17	4	3	12	0	3	7	2	1	4	70
Cobble Chert	3	12	1	0	2	0	0	1	2	0	1	22
Utah Obsidian	1	1	0	0	0	0	0	2	0	0	0	4
Total	37	58	9	4	27	2	5	46	11	2	11	212

Table 21. Diagnostic Projectile Points Inventoried During Survey.

Site No.	Reach	Point Type
IFA15	.	Elko C-N
IFC06	.	Gypsum
IFB09	.	Parowan
IFC06	.	Side-notched
IFC06	.	Elko S-N
C09056	4.	Elko S-N
C09061	4.	Parowan
C09071	4.	Parowan
C13368	4.	Elko S-N
C13324	5.	Side-notched
C13352	5.	Triangular
C13371	5.	Elko C-N
B15001	6.	Rosegate C-S
B15128	6.	Shallow C-N
B15128	6.	Elko S-N
B15128	6.	Elko C-N
B16003	6.	Elko C-N
B14095	7.	Rosegate C-S
B14095	7.	Rosegate C-S
B11279	8.	Elko C-N
B11279	8.	Shallow C-N
B11279	8.	Gypsum
B11281	8.	Parowan
B10251	9.	Gypsum
A15001	10.	Elko C-N
A15021	10.	Desert S-N
A15022	10.	Pai
A15024	10.	Elko S-N
A15027	10.	Triangular
A15037	10.	Triangular
A15038	10.	McKean
A15039	10.	Basal Notch
A15055	10.	Triangular
A15055	10.	Triangular

Table 21(concluded)

Site No.	Reach	Point Type
A15055	10.	Elko C-N
A16003	10.	Rosegate C-S
A16003	10.	Triangular
A16004	10.	McKean
A16004	10.	Pai
A16163	10.	Rosegate C-S
A16168	10.	Desert S-N
A16175	10.	Desert S-N
A16175	10.	Basal Notch
A16178	10.	McKean
A16185	10.	Desert S-N
B09317	10.	Desert S-N
G03002	10.	Rose Spr C-N
G03002	10.	Desert S-N
G03003	10.	Rosegate C-S
G03004	10.	Desert S-N
G03026	10.	Desert S-N
G03028	10.	Desert S-N
G03036	10.	Pai
G03036	10.	Triangular
G03050	10.	Elko S-N
G03056	10.	Elko S-N
G03068	10.	Desert S-N
G03070	10.	Basal Notch
G03019	11.	Parowan
G03019	11.	Elko S-N
G03019	11.	Triangular
G03080	11.	Triangular
G03080	11.	Desert S-N

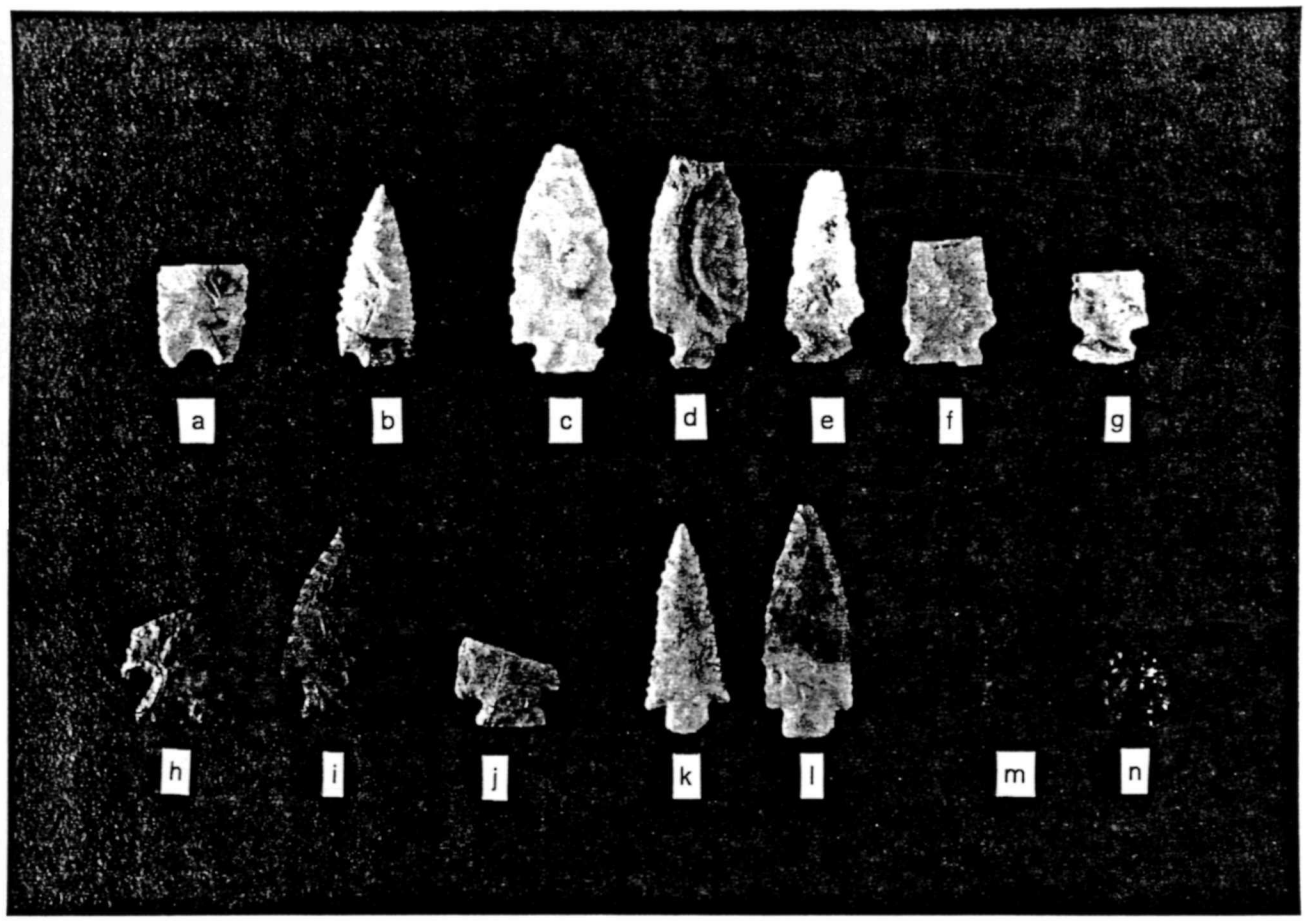

Figure 3. Collected projectile points. (a) A:16:4; (b) C:6:1; (c) C:13:368; (d) C:9:56; (e) IF:C:6; (f) B:15:128; (g) A:15:24; (h) C:13:371; (i) A:15:1; (j) B:11:279; (k) B:11:279; (l) B:10:251; (m) B:15:128; (n) B:11:279 (all numbers prefixed by AZ). Scale = 60 percent of actual size.

strata dating between 2680 and 1020 B.C. (Fowler et al. 1973:20, Figure 9, Tables 1 and 4). Fifty-four of these were found in a single cultural unit dated to 1790 B.C. The cultural stratigraphy at O'Malley Shelter was complex, and was characterized by numerous storage pits and hearths, and it is quite possible that Gypsum points recovered from the upper levels were displaced from lower strata during the site's long occupational history. A similar situation existed at Cowboy Cave (Jennings 1980) in southern Utah, where numerous pit features may have disrupted the stratigraphic occurrence of Gypsum points (see Berry and Berry 1986: 309-310). Interestingly, no Gypsum points were recovered at Conaway Shelter, near O'Malley Shelter, where the earliest cultural unit dated to 30 B.C.

Closer to the project area, Gypsum points were found at Bighorn Cave in the Black Mountains of Arizona approximately 10 miles east of the Colorado River below Lake Mead (Geib and Keller 1987: 2.8-2.11) in deposits that provided a tight Late Archaic date cluster between 1000 and 600 B.C. These deposits also produced a split-twig figurine (Gypsum points were also associated with split-twig figurines at Etna Cave in southeast Nevada [Wheeler 1942] and at Cowboy Cave). Excavations along the Utah-Arizona border (Moffitt et al. 1978) yielded numerous Gypsum points at several sites, usually in aceramic contexts; however, no chronometric dates were obtained.

Although no Gypsum points have been previously reported for the inner canyon, they have been found along the adjacent plateaus (Huffman et al. 1990:38, Figures 4.12 and 4.13; Brown 1988b:236-237; Teague and McClellan 1978:170-173). The distribution of Gypsum points in the general Grand Canyon area is interesting in that they are far more common north of the river, and those found south of the river occur in far western Arizona, such as at Bighorn Cave. This pattern suggests cultural affinities with groups rooted in the southeastern Great Basin, where the best-known sites with

Gypsum points occur, as opposed to an unrelated but parallel in situ development of this point style on the Colorado Plateau. This distribution, taking into consideration the dearth of evidence for Middle Archaic occupation, further suggests that an eastward population expansion occurred during the Late Archaic into largely unoccupied territory.

Projectile points from the Elko series (Figure 3e-j) were found in several reaches of the canyon. Although their typical size would indicate use as a dart point, and hence would suggest preceramic affiliations, their presence in diverse temporal and geographic contexts have rendered them notoriously undependable diagnostics. What we do know is that they first occur around 6500 B.C. (Holmer 1986:101-104), but are found at sites as late as the protohistoric period. In essence, Elko points resemble what most people think of as a generic arrowhead, found everywhere from the rockshelters of the Great Basin to the neon motel signs of Tucumcari, New Mexico. It is for this reason that only a tentative preceramic assignment is given for sites where this point type occurs.

Dart-sized projectile points found at sites C:9:56 and C:13:368 (Figure 3c-d) resemble points found in Basketmaker II contexts in the Four Corners region. Both sites are located in Reach 4 and consist of shallow rockshelters with sparse lithics and possible hearth remains. Site C:9:56 also contained burned bone fragments, and it is likely that both sites were limited activity loci related to hunting pursuits.

Moving on to arrow points, several points classified as Parowan Basal-notched were documented (Figure 4a-d). These are commonly found at Fremont sites to the north (e.g., Holmer 1986), but are also frequently recorded at Virgin Anasazi sites (e.g., Huffman 1990; Moffitt et al. 1978). It seems that this point style was favored by both groups, and may be useful largely as an indicator of Formative period occupation. The absence of any Fremont materials found during survey suggests that Parowan style points in the canyon are probably affiliated with Virgin Anasazi utilization.

Rosegate Contracting Stem points (Figure 4e-h) were also found during survey. This point type was abundant in Formative period deposits at Gatecliff Shelter (Thomas 1981), but was also used by the Southern Paiute as late as the 1860s (see Fowler and Matley 1979: Figures 52 and 53). As with many Elko points, Rosegate points may be too generic to be very useful in assigning cultural affiliation in survey contexts. The same can probably be said for Cottonwood Triangular (Figure 4k-m), which has also been found in both Formative and protohistoric contexts.

One of the best cultural-temporal indicators is Desert Side-notched points (Figure 4n-q). One reason they make such great diagnostics is that dozens of them were collected from Southern Paiutes by John Wesley Powell during overland expeditions into northern Arizona and southern Utah in the 1870s (Fowler and Matley 1979). Use of these points by Southern Paiutes and other Numic-speaking groups is also well documented archaeologically (e.g., Thomas 1983, 1985). Eleven Desert Side-notched points were documented during the survey, all but one in Reach 10. This corresponds well with the distribution of Southern Paiute Utility Ware ceramics.

Another point style similar to Desert Side-notched points was found exclusively in the western canyon. A subtle difference exists in that, unlike the sharply defined basal notch of Desert Side-notched points, the look-alikes have a distinctly deeper and wider concavity on the base (Figure 4u). These types strongly resemble what have been classified as "Pai points" at sites considered to be ancestral Yuman (Pilles 1981). An additional Yuman point style that also resembles Desert Side-notched has two distinct notches along its lateral margin (Figure 4r-t). Considering past affinities between Hualapai and other Yuman-speaking groups in northwestern Arizona (see Kroeber [1935] for discussion of Hualapai oral histories linking these groups), Pai points may be useful in distinguishing late prehistoric and protohistoric Yuman occupations from Numic sites with affinities farther north.

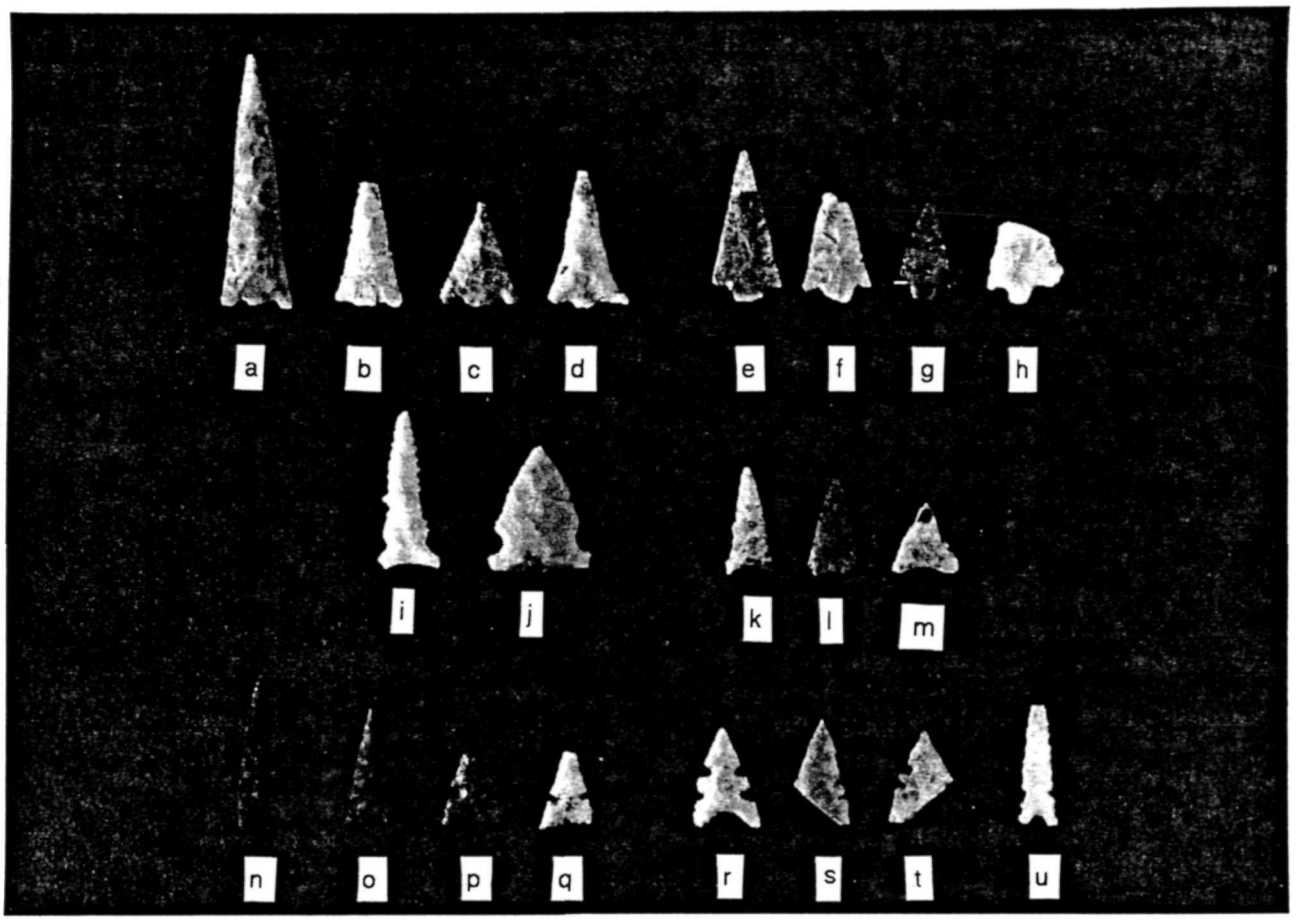

Figure 4. Collected projectile points. (a) IF:B:9; (b) C:9:71; (c) C:9:61; (d) B:11:281; (e) B:14:95; (f) B:14:95; (g) B:15:1; (h) A:16:3; (i) IF:C:6; (j) C:13:324; (k) A:16:3; (l) C:13:352; (m) A:15:27; (n) A:16:185; (o) G:3:2; (p) A:16:168; (q) G:3:28; (r) G:3:36; (s) A:15:22; (t) A:16:4; (u) A:15:39 (all numbers prefixed by AZ). Scale = 60 percent of actual size.

Chapter 6

Groundstone

by Christopher Coder

Groundstone tools are so intrinsic to aboriginal life and so common on archaeological sites that they often take on a mundane aspect when the time comes for analysis. One of the reasons that groundstone implements have not received the same kind of analytical attention that ceramics and chipped stone tools do is because of their inherent bulk. Essentially groundstone is impractical to collect and until recently has defied scientific scrutiny other than basic description and subjective functional assignments. It is ironic that groundstone tools, which are common to New World cultures and are counted among the most practical devices in the aboriginal tool kit, have become for the archaeologist the most impractical to study.

Within the project area groundstone artifacts were observed on 113 of the total 475 sites. This amounts to 29 percent of the 395 prehistoric sites recorded by the archaeological crews. Due to limitations of time and space, groundstone artifacts were noted and described when encountered but neither systematically analyzed nor collected (see Tables 22 and 23).

Terminology

During this project, groundstone artifacts were divided into three descriptive categories: (1) manos, (2) metates, and (3) other. Manos consist of hand tools used in various processing tasks. Metates are the ground surfaces on which these processes can be effected (including bedrock slicks). The "other" category consists of groundstone beads and pendants, multipurpose hand tools with polished facets or laterally ground edges, pestles, anvil stones, bedrock mortars, and ground tools whose purposes remain enigmatic. Hammerstones are not included in this category.

Table 22. Distribution of Groundstone by Reach.

Reach No.— River Mile	Manos		Other Metates		Groundstone
	Formal/ Modified	Expedient/ Unifacial Cobble	Formal/ Modified	Grind. Slab/ Bedrock Slick	Unique or Multipurpose
0— Dam to Lees Ferry	10	7	2	4/1	1
1—Lees Ferry to 11.3	4	1	2	3/0	2
2—Mile 11.3 to 22.6	0	0	1	0/0	0
3—22.6 to 35.9	0	1	0	0/0	0
4—35.9 to 61.5	38	4	11	11/0	2
5—61.5 to 77.4	41	37	17	18/4	11
6—77.4 to 117.8	3	3	1	4/0	1
7—117.8 to 125.5	4	2	2	2/0	1
8—125.5 to 140.0	2	4	2	3/0	1
9—140.0 to 160.0	1	3	0	0/0	1
10—160.0 to 213.9	22	129	10	62/21	32
11—213.9 to 235.0	2	18	2	12/8	6
12—235.0 to 278.0	Not surveyed below Mile 240	NS	NS	NS	NS

Table 23. Summary of Groundstone by Site.

Site No.	Manos	Metates/Grinding Slabs	Unique or Other GS	Ground-stone*
A:15:001	-	1 vesicular basalt trough	-	x
003	-	-	-	x
005	3 basalt cobble manos 1 ss mano fragment	1 rectangular ss slab (25 x 36 x 10) 1 irregular ss slab w/polish (50 x 30 x 7)	1 ovate hand palette 8 x 4 x .8 1 utilized granite cobble	
017	several expedient river cobble manos occur on this site	-	-	
018	-	a "metate" on the surface	-	x
020	several expedient ss, basalt and granite manos occur on this site	1 basalt trough metate 1 fragmented ss grinding slab	6 boulders with pecked or ground surfaces (Supai Fm)	
023	2 vesicular basalt cobble manos; both are unifacial	1 limestone slab with incipient use	-	
024	4 complete cobble manos; ss & basalt numerous fragments present	2 unshaped Supai ss slabs with unifacially ground surfaces	-	
025	2 ss cobble manos; 1 unifacial, 1 bifacial; both utilized as hammers and stained red	-	-	
027	a circular unifacial ss cobble mano a rectangular bifacial ss cobble mano	an irregular unshaped ground ss slab	a ss boulder with a ground surface	
028	9+ ovate manos on the surface 6 vesicular basalt; 3 ss	a "broken" metate	-	
031	2 complete manos resting on a large boulder	3 grinding slabs	25+ ground cobble fragments; basalt, limestone, quartzite, ss	

Table 23 (continued)

Site No.	Manos	Metates/Grinding Slabs	Unique or Other GS	Ground-stone*
034	a unifacially ground basalt cobble resting on a large boulder	-	-	
036	a spheroidal unifacially ground ss cobble	-	-	
038	a coarse-grained ss abrader	-	-	
A:15:039	-	3 irregular unshaped ss grinding slabs; dimensions on site form	-	
040	a unifacially ground quartzite cobble	a pecked and ground limestone slab metate (36 x 26 x 4)	-	
042	3 basalt cobbles exhibiting incipient unifacial wear	a ground sandstone slab	-	
043	4 basalt & quartzite cobbles with incipient unifacial wear	2 pecked and ground Supai ss slabs (50 x 30 x 15) and (50 x 35 x 10)	-	
044	a single ovate ss mano (12 x 10 x 4.5)	a Supai ss grinding slab (30 x 32 x 18)	-	
047	2 unifacial ss cobble manos; pecked and battered	1 ground ss slab; 1 large basalt cobble with a ground surface	-	
048	a rectangular basalt mano (11 x 7.5 x 2.9)	-	-	
052	a single cobble mano	3 grinding slabs exhibiting incipient use	2 anvil stones; 2 cobble hammers	
055	a shaped bifacial quartzite mano a unifacial basalt cobble mano	-	-	

Table 23 (continued)

Site No.	Manos	Metates/Grinding Slabs	Unique or Other GS	Ground-stone*
057	a unifacial basalt cobble mano	-	-	
A:16:003	3 unifacial basalt cobble manos exhibiting incipient use	2 oval grinding basins in a Tapeats ss boulder (30 x 17 x 1.0) & (29 x 20 x 3.5)	-	
004	"numerous" ss and limestone manos present on the surface	-	-	
149	a flattened unifacial limestone mano with striations (10 x 7.5 x 3)	an unshaped ss slab, pecked and ground	-	2 fragments
151	bifacial ss mano (7 x 12 x 2)	a ground surface on a partially buried limestone boulder (25 x 17)	a limestone pecking stone (13 x 11 x 8)	
152	a unifacial ss mano	-	-	
A:16:153	10+ unifacial cobble manos ss, limestone and basalt	3 unshaped ss grinding slabs and several fragments	-	
154	4 cobble manos; 2 exhibiting striations	Coconino ss grinding slab: (55 x 42 x 9) (use area = 35 x 15)	several multiuse cobble tools	
157	5 manos	3 polished grinding slicks; 2 ss 1 limestone; dimensions on site forms	-	
158	-	-	Supai ss mortar (40 x 30 x 7) deeply pecked in the center	
159	-	a basalt lapstone exhibiting polish from use	a ground Moapa spindle whorl	
160	a shaped and pecked ss mano	a "thick" ss metate, pecked	-	

Table 23 (continued)

Site No.	Manos	Metates/Grinding Slabs	Unique or Other GS	Ground-stone*
161	-	-	2 probable mortars in Muav boulders	
162	-	-	a quartzite pestle	
163	-	-	a multipurpose schist cobble tool	
165	a basalt cobble mano exhibiting 3 use surfaces	unmodified basalt grinding stone	-	
166	-	-	battered ovate limestone cobble with ground facet	
167	-	a ss grinding slab (57 x 40 x 8)	-	
168	2 limestone manos	a fragmented Supai ss grinding slab	-	
169	-	A fine-grained ss grinding slab (40 x 31 x 11)	-	
171	a unifacial quartzite cobble mano 5 ss cobbles with incipient unifacial use	-	-	
172	-	a shallow basin metate with a pecked surface	-	
A:16:174	1 ss mano/pecking tool 1 modified granite mano and chopper	1 pecked limestone slab 1 pecked and ground basalt slab	-	
178	-	an unmodified basalt metate (30 x 16 x 11)	-	
181	-	4 grinding slicks on boulders	2 mortars in basalt boulders	

Table 23 (continued)

Site No.	Manos	Metates/Grinding Slabs	Unique or Other GS	Ground-stone*
182	-	a limestone slab with probable ground surface	-	
B:09:316	-	2 limestone metates in 1983 flood zone usewear = 7 mm and 23 mm trough	-	
317	-	2 pecked and battered anvil stones	-	
B:10:004	Site has been excavated and a description of the groundstone is contained in the report.			
225		-	-	
230	-	-	a unifacially polished diorite cobble tool (8 x 6 x 1.5)	
251	2 unifacial pecked ss manos	-	-	
252	1 mano	-	-	
261	a bifacially used mano fragment	a single grinding slab fragment	-	
264	a coarse-grained ss mano	-	-	
265	an ovate bifacial ss mano, striations visible	-	-	
B:11:002	a unifacial granite cobble mano	a stream-worn small granite boulder metate (44 x 30 x 14)	-	
273	-	a very fine-grained burned grinding slab (17 x 9.5 x 7)	-	

Table 23 (continued)

Site No.	Manos	Metates/Grinding Slabs	Unique or Other GS	Ground-stone*
276	a limestone mano (11 x 15 x 8)	-	-	fragments
277	a "complete" mano and a mano fragment (on map)	a metate fragment (on map	-	groundstone fragments
279	a single fractured mano	-	-	
280	-	a fractured granite "anvil" slab	-	
281	-	a partial grinding slab	-	groundstone fragments
B:13:001	a fractured ss mano with shaped edges	-	a granite cobble with a ground facet	
002	a "two-handed" ss mano and several expedient ss and cobble manos	-	-	
B:14:095	-	a tabular ss metate with a ground shallow basin	-	
107	an ovate bifacial limestone cobble mano with one side highly pecked			
108	2 "one-hand" ss cobble manos one is highly pecked	2 roughly shaped ss grinding slabs one has a pecked area		
B:15:001	-	-		
125	a "loaf"-shaped diorite mano, broken in two	a ground facet on a Tapeats ss slab	-	
B:15:126	-	3 Tapeats ss grinding slabs—2 show early trough wear	-	

Table 23 (continued)

Site No.	Manos	Metates/Grinding Slabs	Unique or Other GS	Ground-stone*
132	an odd-shaped Tapeats ss cobble mano (12 x 8.5 x 7) pecked	a shaped ss (Tapeats) metate (42 x 37 x 13); an oval use surface of 23 x 17	-	
133	a unifacial ss cobble mano (10 x 8 x 5.5)	-	-	
139	a bifacial granite cobble mano	-	-	
B:16:001	Has been excavated and a description of the groundstone is contained in the report.			
003	a shaped ovate ss mano	-	-	
261	-	a ground circular facet on an angled ss boulder; 18 cm in diameter	-	
C:02:013	mano fragment in midden	Navajo ss grinding slab; pecked	-	
035	-	a ss basin metate; fragmented	-	fragments
074	a cobble mano	-	-	
078	a bifacial quartzite cobble mano	-	a worked quartzite cobble of enigmatic function	fragments
080	4 bifacial cobble manos; 2 unifacial fragments (ss & quartzite)	a Navajo ss grinding slab (30 x 23 x 7) a Navajo ss oval basin metate (50 x 30 x 10)	-	
082	a Navajo ss bifacial mano	-	-	
084	6 ss manos; 3 bifacial, 3 unifacial descriptions on site form	-	-	
088	-	a Navajo ss grinding slab (50 x 25 x 5) use surface = 30 x 10	-	

Table 23 (continued)

Site No.	Manos	Metates/Grinding Slabs	Unique or Other GS	Ground-stone*
092	1 unifacial Moenkopi ss mano 1 limestone cobble mano	2 Moenkopi ss grinding slabs (50 x 37 x 2) and (53 x 40 x 2)	a flaked quartzite cobble chopper	
C:02:096	-	-	a pestle-shaped quartzite cobble unifacially ground and bifacially pecked (22 x 5 x 4)	
097	2 pecked and shaped subrectangular ss manos	-	-	
098	a bifacial ss mano with "pecked edges"	-	-	
099	-	2 shallow basin metates on tabular ss blocks, pecked centers	-	
C:03:010	-	a partially buried Navajo ss grinding slab; use surface = 40 x 10		
C:05:001	a unifacial ss mano	-	-	
031	-	a ss grinding slab with a shallow basin (15 x 10)	-	
C:06:003	-	a pecked and ground fragment of a Supai ss slab	-	
C:09:028(A)	a fragmented beveled ss mano	-	-	
(B)	a fragmented bifacial ss cobble mano with an oblique facet	-	-	

Table 23 (continued)

Site No.	Manos	Metates/Grinding Slabs	Unique or Other GS	Ground-stone*
(M,N,L,K)	2 ss mano fragments, one of which is beveled	-	-	
051	5 fragmented ss manos—2 are beveled 2 are unifacial	a fragmented ss grinding slab	a flat plum colored polishing stone	
052	7 unifacial ss and conglomerate manos 6 are complete	3 partial ss grinding slabs	-	
C:09:059	"at least one" broken ovate ss mano	-	-	
061	1 quartzite mano/chopper and "numerous" spent and fragmented manos	several fragmented metates	-	x
066	-	a pecked and shaped shallow trough ss metate	-	
067	-	an 8 cm thick ss grinding slab fragment	-	
069	1 beveled ss cobble mano; 1 bifacial ss mano; 1 expedient unifacial ss cobble mano	a Tapeats ss slab (39 x 26 x 4) a large fragmented Tapeats ss metate	-	x
072	a unifacial ss mano	-	-	
073	an ovate ss mano (10 x 10 x 5)	-	-	
082	1 slightly beveled ss cobble mano (a lovely tool); 2 fragmented beveled ss manos	a ss grinding slab	-	
087	a slightly beveled ss mano, pecked and shaped (10 x 9.5 x 3.4) broken & reused	-	-	

Table 23 (continued)

Site No.	Manos	Metates/Grinding Slabs	Unique or Other GS	Ground-stone*
C:13:003	-	4 ground slicks on boulders in conjunction with hematite glyphs	-	
005	a ss mano (7 x 8 x 4)	a ss grinding slab	-	
006	5 ss manos; 3 beveled, 2 rectangular	-	-	fragments
008	-	a ss trough metate	-	
009	10+ fragmented ss manos, mostly beveled	a ss slab metate	ground sherds, faceted cobbles, ground hematite pebbles	
010	Site excavated. See report by A. Jones for groundstone description.			
011	-	-	shaped and ground jar lid; cobble with ground edge	
C:13:070	unifacial ss cobble mano	a Dox ss grinding slab	-	
099	2 beveled ss manos	-	-	
100	6 ss "one-hand" manos 2 ss beveled manos with flaked edges	4 ss metates and grinding slabs		
101	"numerous" grinding implements, mostly Tapeats ss	expedient slabs and formal basin mettes "noted"	-	fragments
272	2 beveled ss manos with edge wear a rectangular Tapeats ss mano	a partially buried ss metate shallow trough wear	-	
273	-	-		

Table 23 (continued)

Site No.	Manos	Metates/Grinding Slabs	Unique or Other GS	Ground-stone*
291	-	a tabular ss shallow basin metate	a tabular schist cobble with lateral edge wear	
321	3 ss manos and a fragmented quartzite mano	-	a cobble with a ground facet	
324	-	a large ss grinding slab with a pecked central basin; half in dune sand	-	
325	a unifacial ss cobble mano	-	-	
332	2 unifacial ss manos; Tapeats	-	-	fragments
333	-	-	-	possible fragments
334	Tapeats ss mano	-	-	
336	-		-	
340	4 unifacial ss manos; 3 are shaped, 1 is a cobble	-	-	
341	4 manos indicated on the map	4-5 metates indicated on the map	-	fragments noted
348	a unifacial ss cobble mano and mano fragments	a fragmented ss grinding slab 1 cm thick	-	
C:13:349	-	a trough metate exposed in a cut bank	-	
352	7+ unifacial ss manos	-	-	
357	2 bifacial ss manos (15 x 9 x 3.5) and (13 x 8.5 x 3.5)	-	-	

Table 23 (continued)

Site No.	Manos	Metates/Grinding Slabs	Unique or Other GS	Ground-stone*
359	-	-	a pebble tool with a ground facet	
362	-	-	stone pipe or tube fragment	
363	-	-	-	fragments
365	a bifacial ss mano fragment	a quartzite metate fragment	-	
370	a unifacial quartzite cobble with striations	a "well used" ss trough metate (45 x 35 x 20) and a shaped and pecked ss metate blank (44 x 33 x 10)	-	
371	several unifacial ss and quartzite mano fragments	3 "dished" ss grinding slabs	-	plus fragments
374	a unifacial ss mano	-	-	
376	2 unifacial cobble manos 1 quartzite and 1 ss	irregular-shaped unmodified ss grinding slab (46 x 25 x 10)	-	
377	a unifacial ss mano	a ss grinding slab with a ground lateral edge (20 x 10 x 5)	-	
379	-	a fragmented trough metate a complete shaped metate blank	-	
383	-	2 limestone slabs with pecking and an incipiently ground surface	-	
385	mano noted on the map	-	-	
389	-	a fragmented Dox ss metate	-	fragments

Table 23 (continued)

Site No.	Manos	Metates/Grinding Slabs	Unique or Other GS	Ground-stone*
C:13:391	mano noted on the map	-	-	
393	a unifacial ss mano	a fragment of a ss grinding slab	-	
G:03:002	"various" manos	"various" metates and grinding slabs	-	fragments
003	a unifacial basalt cobble mano fragmented granite mano	a ss grinding slab a fragmented granite metate	-	
004	numerous ss mano fragments	-	-	fragments
006	-	a ss shallow basin metate	-	
019	-	a Tapeats ss metate	-	
020	4 manos noted on the map	a metate on the map grinding slicks and pecked areas on boulders	-	
024	several unifacial unmodified cobble manos	ss grinding slabs with shallow pecked central basins	-	
025	3 manos; 2 ss and 1 basalt cobble	5 grinding slabs from different raw materials; redwall, Muav and Supai	worked basalt cobbles	
026	-	a ss grinding slab	-	
027	-	-	bedrock mortar 26 cm deep	
028	a unifacial ss cobble mano	-	-	
031	2 Tapeats ss cobble manos; 1 Redwall mano, a fragmented limestone mano	several grinding slabs noted on the map (Tapeats and Redwall)	a polishing stone	

Table 23 (continued)

Site No.	Manos	Metates/Grinding Slabs	Unique or Other GS	Ground-stone*
032	-	-	a flat ss cobble with unifacial polish	
033	a unifacial quartzite cobble mano (14 x 7 x 4.7)	a groundstone slab with a pecked central basin; Bright Angel shale	-	
034	-	-	?	
G:03:035	-	a trapezoidal Tapeats ss grinding slab (41 x 26 x 7)	-	
036	-	-	a unifacially ground limestone cobble used as a palette	
037	a unifacial Tapeats ss mano (10 x 9 x 3)	a Bright Angel shale grinding slab (45 x 25 x 10) and a basalt grinding slab	a polished basalt cobble with battered ends	
040	several ss mano fragments	a fragmented ss grinding slab	-	
042	-	probable ground slicks on boulders	3 bedrock mortars	
043	-	a limestone grinding slab a ss grinding slab	-	
045	an ovate unifacial basalt cobble mano with striations (11 x 7.5 x 3)	-	-	
048	a shaped unifacial ss mano and a cobble mano midsection	a Tapeats ss grinding slab	-	2 ground granite fragments
049	3 unifacial Tapeats ss manos (12 x 8 x 1.8), (11 x 10 x 4.8), and (12 x 10 x 4)	2 large Tapeats ss metates (46 x 35 x 17) and (70 x 33 x 16)	-	

Table 23 (continued)

Site No.	Manos	Metates/Grinding Slabs	Unique or Other GS	Ground-stone*
053	a unifacial limestone cobble mano	a Tapeats ss metate with slightly dished use wear (38 x 27 x 8)	-	
054	a discoid basalt cobble with a single ground surface	-	a ground limestone cobble showing battering	
G:03:055	a unifacial loaf-shaped cobble mano	-	-	
056	a ss cobble mano; caliche encrusted (13 x 9 x 5)	-	-	
057	-	2 grinding slabs: 1 Tapeats (38 x 35 x 7), 1 Muav (38 x 36 x 11)	-	
058	several ss mano fragments	-	-	
G:03:059	2 cobbles with incipient unifacial use	-	-	
060	2 manos noted on the map	a ss and a limestone grinding slab	-	
064	-	-	-	"present"
066	-	a grinding slick on a Tapeats ss boulder (30 x 15)	-	
068	a cobble with incipient unifacial wear	a basalt grinding slab	-	
069	-	-	2 limestone anvils with pecked surfaces	
070	5 unifacial cobble manos; 1 ss, 2 quartzite, 3 basalt	2 unshaped basalt grinding slabs	-	

Table 23 (concluded)

Site No.	Manos	Metates/Grinding Slabs	Unique or Other GS	Ground-stone*
072	several basalt and ss cobble manos	ground surfaces on boulders	-	fragments
073	2 cobble manos: 1 ss and 1 basalt	a Tapeats ss grinding slab	a serpentine bead	
076	a "lovely" ss mano	-	-	
077	-	2 oval grinding slicks (28 x 34) and (21 x 30)	-	
080	3 unifacial cobble manos: 1 basalt, 1 ss, 1 limestone	2 grinding slabs: 1 granite, 1 basalt	2 flattened limestone cobbles with divets on the distal ends: 1 ss palette, 1 ss abrader	several

Notes:
*more groundstone mentioned but not described
all measurements in centimeters
ss = sandstone
Supai, Tapeats, Bright Angel, Muav, Navajo, Moenkopi = geologic formations

Manos and metates also fall into the further descriptive categorization of "formal" and "expedient." Both terms are subjective and create a gray area of their own; however, they are useful field descriptors. A formal designation indicates a greater concern for selection of rock type and infers modification to suit a task with continued maintenance as warranted through time. Expedient indicates a more casual concern with the tool. An expedient tool may be selected for material type but may not need modification to suit a task. Informal tools are generally waterworn cobbles or unmodified slabs, procured proximal to the place where they are to be used, then utilized without significant or even noticeable alteration.

The difference between formal and expedient tools is not a reflection of the level of sophistication of the people using them so much as it is a function of task and group mobility (Figures 5-10). For example, prehistoric Puebloan horticulturalists who occupied the upper reaches of the project area presumably required more formalized groundstone tools due to their reliance on farming. The groundstone they developed was necessarily formal, because it was heavily used to process large quantities of corn and was constantly resharpened to maintain efficient grinding surfaces. In opposition to this, later and more transient peoples living primarily in western Grand Canyon, such as the Pai groups and Southern Paiute, depended on a more diverse assortment of seasonally available plant foods, which is reflected in their more expedient groundstone assemblages. Unlike the Anasazi, these groups placed their confidence in mobility and employed locally available cobbles and unmodified slabs for processing many of the requirements of daily life. This is not to say there is not overlap: The Pueblo people used expedient tools when appropriate and the Pai and Paiutes made use of formal ones when they were available. It is not a matter of strict dichotomy but of general practice. The relatively high ratio of formalized to expedient tools in the upper reaches of the river corridor, compared to the relative predominance of expedient tools in the lower reaches, reflects these different subsistence orientations.

Figure 5. Grinding basins in blocks of Tapeats Sandstone (NPS project photo 1990).

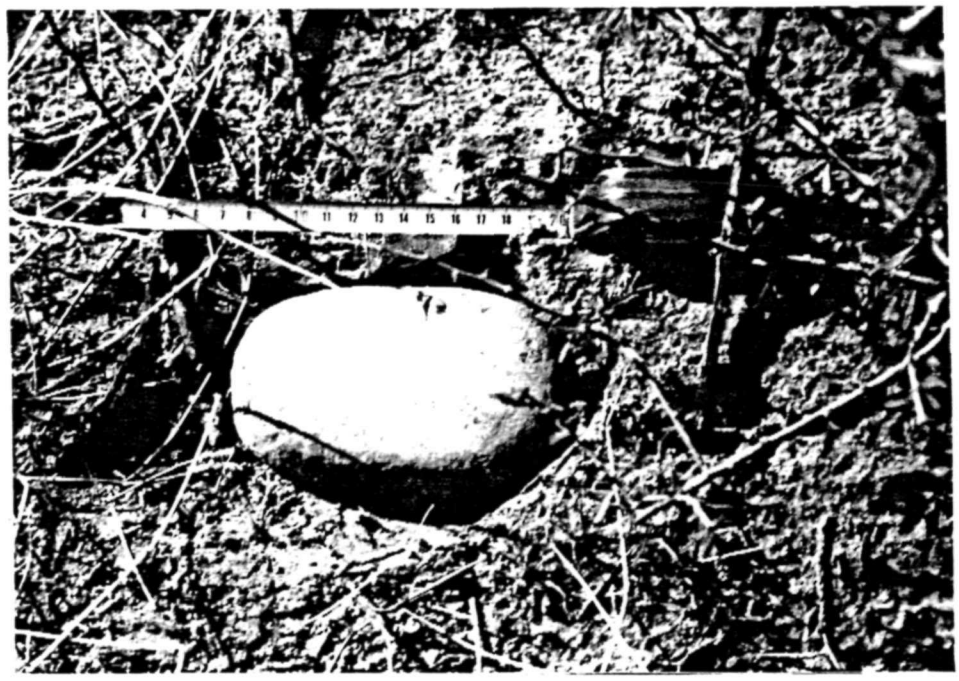

Figure 6. A formally pecked and shaped sandstone mano (NPS project photo 1991).

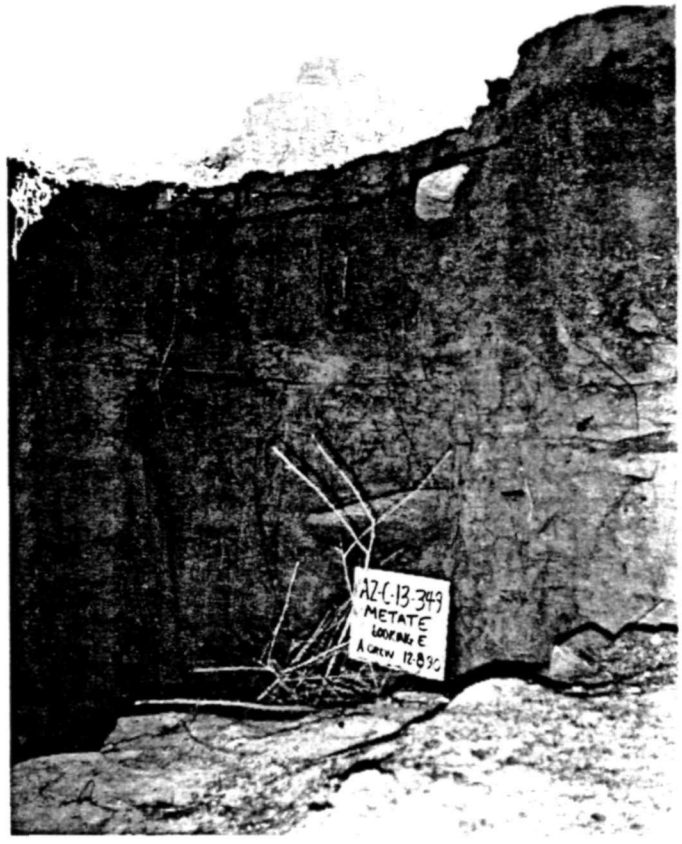

Figure 7. Metate in cut bank (NPS project photo 1990).

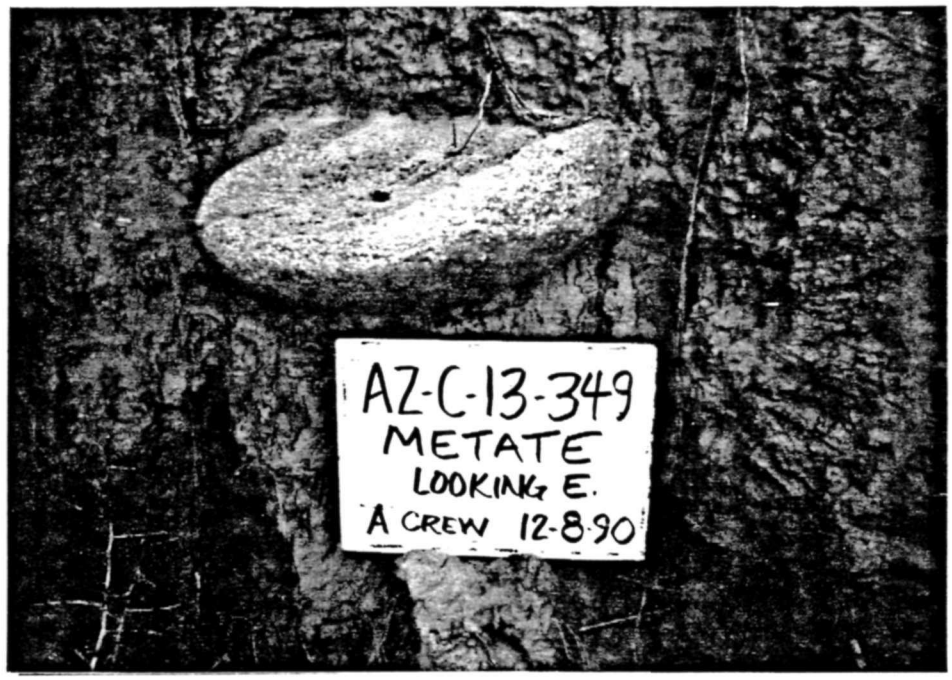

Figure 8. Close-up of the same metate (see Figure 7) in cutbank. Note the clay skins forming on the face of the eolian sand (NPS project photo 1990).

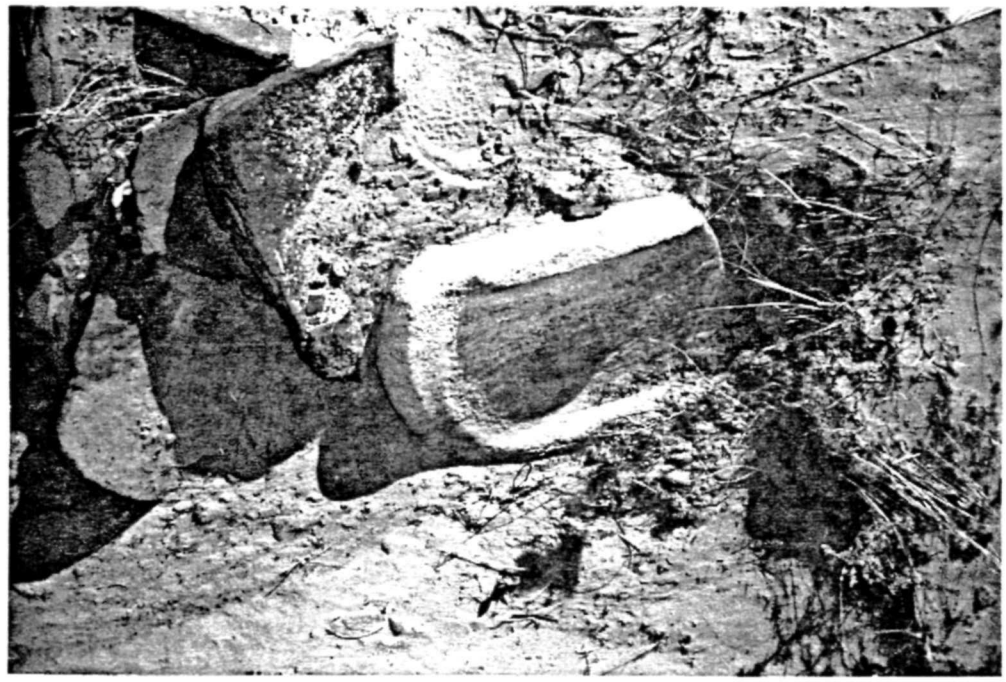

Figure 9. A formal trough metate weathering out of a dune (NPS project photo 1991).

Figure 10. Two sandstone metates in different stages of reduction (NPS project photo 1990).

Examples by Site

AZ:C:13:6, located in Reach 4, is a classic example of a PII Kayenta habitation and processing site. It also contains one of the best surface assemblages of formal manos in the project area. Five individual bifacial sandstone manos were observed. None of these tools were complete; however, enough remained to discern that three were beveled and two were rectangular. The site had been recorded twice previously, in 1965 and in 1984, and on one of these visits a complete elongate rectangular quartzite mano exhibiting a single use surface was collected and curated on the South Rim, where it resides today. Also present were numerous fragments of groundstone weathering out of the midden, possibly representing a generational accumulation of utilized, expired, and discarded manos. None of the fragments were large enough to be remnants of metates, and no complete metates were observed on the site.

Several other sites in the project area have groundstone assemblages dominated by formal manos (see Figure 9). These include C:2:80, C:2:84, C:9:51, C:9:52, C:9:69, C:9:82, C:13:9, C:13:10, C:13:99, C:13:101, C:13:272, and C:13:40. The formal groundstone assemblage from site C:13:10 at Furnace Flats in Reach 5 has been described by Jones (1986).

The vast majority of shaped and modified (trough) metates are found in Reaches 4 and 5 in association with sites (Figures 7, 8, and 9). Sites on which formal trough or basin metates occur are B:09:316, B:11:02, C:02:35, C:02:99, C:13:08, C:13:10, C:13:100, C:13:101, C:13:341, C:13:370, C:13:379, and C:13:387.

Although expedient groundstone tools (cobbles and grinding slabs) are located the entire length of the Grand Canyon, they dominate the groundstone assemblages in Reaches 10 and 11 in association with Cerbat (Pai) and Southern Paiute sites. It has been commonly accepted that these tools were used exclusively in processing various seeds by crushing and grinding (Euler and Dobyns 1983). Piñon nuts, mesquite pods, and hackberry seeds could be roughly mashed and then ground to the proper consistency. More recent research, however, has broadened the concept of groundstone tool use to include crushing reptile vertebrae and breaking long bones, as grinding tools to reduce ochre and hematite, as impromptu hammers, as mashing devices used to pulp whole rodents, and as hide-working stones (Adams 1988; Cane in Harris and Hillman 1989; Yohe et al. 1991).

When modern Hualapai women prepare piñon nuts, a handful of the raw seeds with the shells still on are placed on a grinding slab and lightly crushed to keep them from rolling off of the metate. The mass is then ground until the meat and shell is reduced to the desired consistency. In one instance observed by the author, a particular mano being used by one of the women was an Archaic tool that had been "picked up" by her grandmother and kept in the family for three generations (Coder, personal observation 1986).

The tool itself showed no additional wear since being curated. This was due in part to the tribological processes at work on the surface of the grinding slab and mano. Tribology is the study of friction, lubrication, and the resultant wear on structures from dynamic use (Adams 1988, 1989),

in this case, the processes occurring on the curated mano. The oil from the piñon nuts working in tandem with the friction induced by the grinding created a polish that actually prolonged the life of the tool. Other women present were using fist-sized basalt cobbles to perform the same task. None of the basalt tools observed manifested any ground facets or apparent wear other than stain from the oil.

Site A:16:153 in Reach 10 has at least 10 unmodified cobble manos exhibiting incipient unifacial wear. The tools include basalt, sandstone, and limestone cobbles, all of which could be procured proximal to the site along the river or in side drainages. In conjunction with these hand tools were three unshaped sandstone grinding slabs with surface polish. Examples of other sites in the project area with expedient hand tools are A:15:05, A:15:20, A:15:24, A:15:28, A:15:42, A:16:09, A:16:157, G:03:24, G:03:02, and G:03:31.

Expedient grinding slabs and bedrock slicks are found throughout the project area, but as with their cobble mano counterparts, are found in the greatest numbers in the western reaches, particularly in Reach 10. Although there is little or no modification of the raw material, some concern for material type is evident from the groundstone assemblages found on various sites. For example, site A:16:174 has two grinding slabs present, one basalt and one limestone; site A:15:47 also has two slab metates, one sandstone and one basalt; and G:03:31 has several slabs present ranging in texture from very coarse Tapeats sandstone to fine-grained Redwall limestone. G:03:37 also has two grinding slabs of differing material types, a very smooth Bright Angel shale and a vesicular basalt. Evidently there was a technological advantage in processing strategies that involved using a dichotomy of surface textures, coarse and fine, either in a simple two-step reduction method or for two separate tasks requiring two distinct surfaces (Figure 10).

The bedrock slicks recorded during the project are often and suspiciously associated with hematite pictographs. Site C:13:03 (the Hopi Salt Mine) located in Reach 5 has at least four slicks situated on large Tapeats sandstone boulders within 20 meters of a hematite pictograph panel. C:13:03 is the only site recorded upstream from Kanab Creek that had pictographs or multiple bedrock slicks. Over 150 miles downstream in Reach 11, sites G:03:77 and G:03:80 both have slicks on boulders in association with pictographs. The high angle of repose of many of these slicks makes them inherently poor surfaces for processing foodstuffs. Their function may be reducing hematite into pigment. More work is needed before any conclusions can be drawn. Residue studies may or may not be effective as the surfaces have been open to the elements for generations and in many cases centuries. However, microscopic analysis of wear patterns could provide a clue to the specific task for which these surfaces were used.

As already mentioned, the catch-all category of "other" groundstone includes numerous unique and enigmatic groundstone tools that are not definable as manos or metates. Some specific occurrences of these are a ground soapstone pendant at C:13:393; an ovate hand palette at A:15:05; deeply pecked and ground bedrock mortars at A:15:161, A:15:181, G:03:27 (Figures 11 and 12), and G:03:42; a flattened plum-colored polishing stone at C:09:51; a faceted hematite pebble at C:13:09; a stone tube or pipe fragment at C:13:362; a serpentine bead at G:03:73; enigmatic flattened limestone cobbles with a ground flake scar on the distal end (possible hide-working tools) at G:03:80; and anvil stones at A:15:52, A:16:159, B:9:317, and G:03:69. Anvil stones are typically unshaped, flattened, water-worn boulders of a portable size used as a base or 'anvil' for a task requiring intense battering. Occasionally they exhibit an area of secondary grinding. The example found at A:16:159 was a water-smoothed, flattened basalt boulder selected from the river for its shape, which fit perfectly into the lap while in the sitting position.

Conclusion

Within the last few years, increased interest in groundstone tools among researchers combined with new methods of analysis have allowed archaeologists to determine with a greater degree of confidence the multiple and diverse functions of groundstone artifacts. Because of the range of forms and purposes, from processing food to personal adornment, the artifacts represent a correspondingly broad spectrum of behaviors. Simple groundstone tools are often the only clues that are left to decipher complex processes, including seasonal scheduling of activities, weaning children, storing surplus, division of labor, detoxification, fermentation, and on and on. As Adams (1989:270) points out, analyzing ground-stone is still at the stage where "more questions are generated than answered."

Recent ethnographic work has contributed a significant start to this endeavor through studies of manufacture, use, maintenance, and cultural preference (Adams 1988, 1989; Cane 1989; Dodd 1979; Harris 1989; Hayden 1987; Hillman 1989; Stahl 1989; Bullock et al. 1990; Yohe et al. 1991). These studies include work done with indigenous populations using groundstone technologies in Africa, Australia, Central America, and the American Southwest.

Adams's (1988, 1989) application of tribological science to groundstone is a methodology that has significantly increased the potential return for ground-stone research. A more detailed picture of aboriginal subsistence strategies in Grand Canyon National Park would emerge if select assemblages occurring in the project area were subject to the formal scrutiny of surface wear analysis.

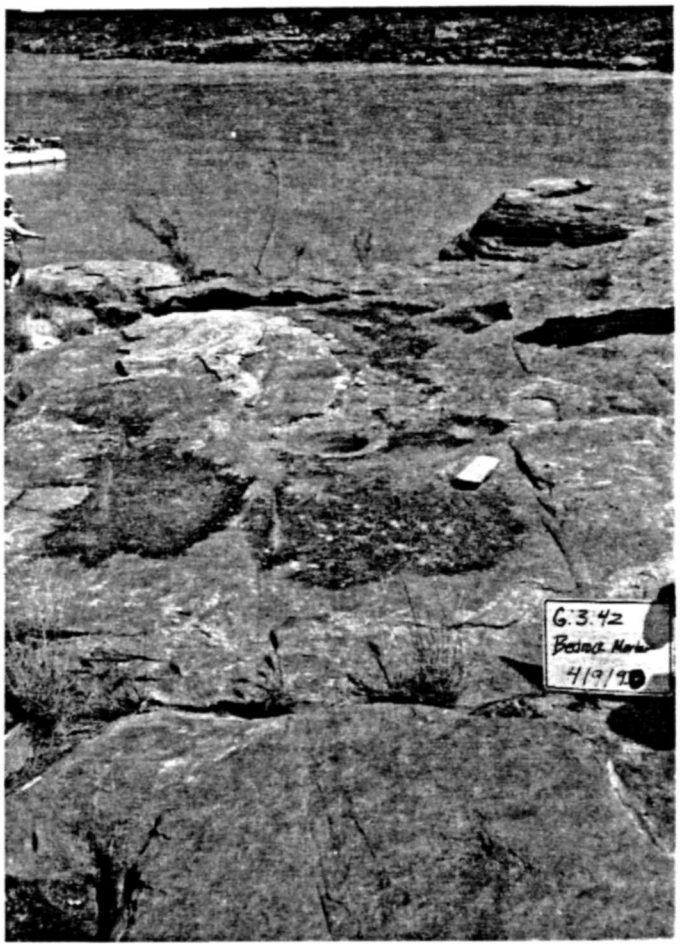

Figure 11. Bedrock mortar in Tapeats sandstone (NPS project photo 1991).

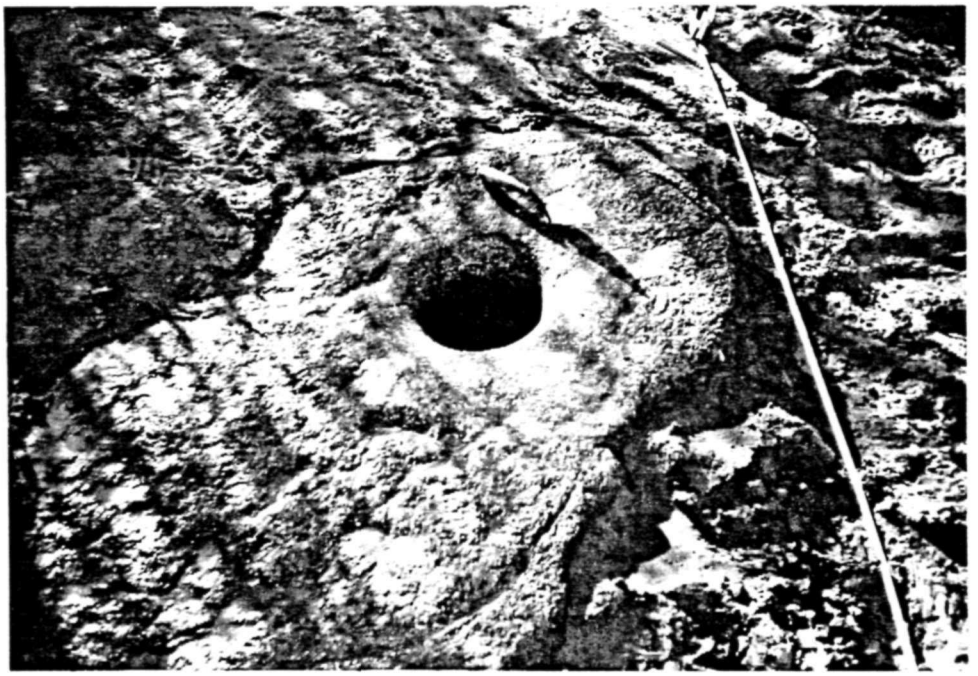

Figure 12. Close-up of bedrock mortar in limestone boulder (NPS project photo 1991).

Chapter 7

Rock Art

by Peter Bungart

Forty-four sites with rock art or historic inscriptions were recorded during the survey. These include 18 in Reach 0 (upriver from Lees Ferry), one in Reach 1, four in Reach 2, two each in Reaches 3 and 4, three in Reach 5, two in Reach 6, ten in Reach 10, and two in Reach 11 (Table 24). The 41 sites included 10 petroglyph sites, 10 pictograph sites and 14 sites that consisted exclusively of historic inscriptions. In addition, 10 prehistoric rock art sites were accompanied by historic graffiti. The historic inscriptions are discussed in Chapter 10 of this volume.

Several rock art styles are represented, possibly reflecting occupation from Archaic times through the late protohistoric/early historic periods. These diverse styles are also indicative of the various cultural groups that occupied the canyon, as evidenced by other types of remains found during the survey.

In Reach 0, Glen Canyon Linear Style (Figure 13) and Kayenta Representational Style (Schaafsma 1980) were the most common design styles. The former is believed to have been affiliated with Late Archaic hunter-gatherers (Schaafsma 1980:72-76) and the latter (Figure 14) affiliated with Kayenta Anasazi Pueblo II and III groups (Schaafsma 1980:134-153). Common motifs among both styles are anthropomorphs and zoomorphs, as well as curvilinear and rectilinear elements. All of the rock art in Reach 0 consisted of petroglyphs, to the total exclusion of pictographs.

In Reach 1, a notable rock art site is located at the mouth of Salt Water Wash. It consists of a single anthropomorphic figure, probably of Kayenta origin, situated on flat Supai Sandstone bedrock and facing upward. Salt Water Wash is an easily negotiated route into the river corridor, and the presence of this figure may be related to prehistoric use of this route. A cache of corrugated vessels was found in the general vicinity of this glyph by river runners in the mid-1980s, but little other prehistoric evidence was found on the left bank in this reach of the river.

Rock art in Reach 3 includes several petroglyphs pecked into large patinated Redwall limestone talus boulders on the right bank at the mouth of South Canyon. These panels are associated with a masonry habitation site primarily affiliated with a Kayenta PII occupation, although some Virgin and Cohonina ceramics are also present. Design motifs include spirals, and bear and eagle "tracks," which may represent clan symbols. South Canyon is also a travel route into the canyon.

Rock art sites in Reach 5 include pictographs at the Hopi Salt Mines, several petroglyphs on two basalt boulders on the right bank above Tanner Rapids, and a single petroglyph under a Dox overhang near Cardenas Creek. The pictographs in this reach are the only ones recorded during the survey upstream of Kanab Creek, although at least one other pictograph site is known to occur in the Little Colorado drainage beyond the limits of this survey. The occurrence of pictographs at the Hopi Salt Mines is a sensitive issue and will not be further discussed. Petroglyph elements above Tanner Rapids include maze-like motifs interspersed with scrolls and anthropomorphs, while the single petroglyph near Cardenas Creek consists of a clockwise spiral with a zoomorphic figure perched on top.

Table 24. Distribution of Rock Art Sites by River Reach.

Reach	Petroglyphs	Pictographs	Historic Inscription	Historic and Prehistoric	Total
0	7	0	5	6	18
1	0	0	1	0	1
2	1	0	3	0	4
3	1	0	1	0	2
4	0	0	2	0	2
5	1	1	0	1	3
6	0	0	2	0	2
10	0	7	0	3	10
11	0	2	0	0	2
Total	10	10	14	10	44

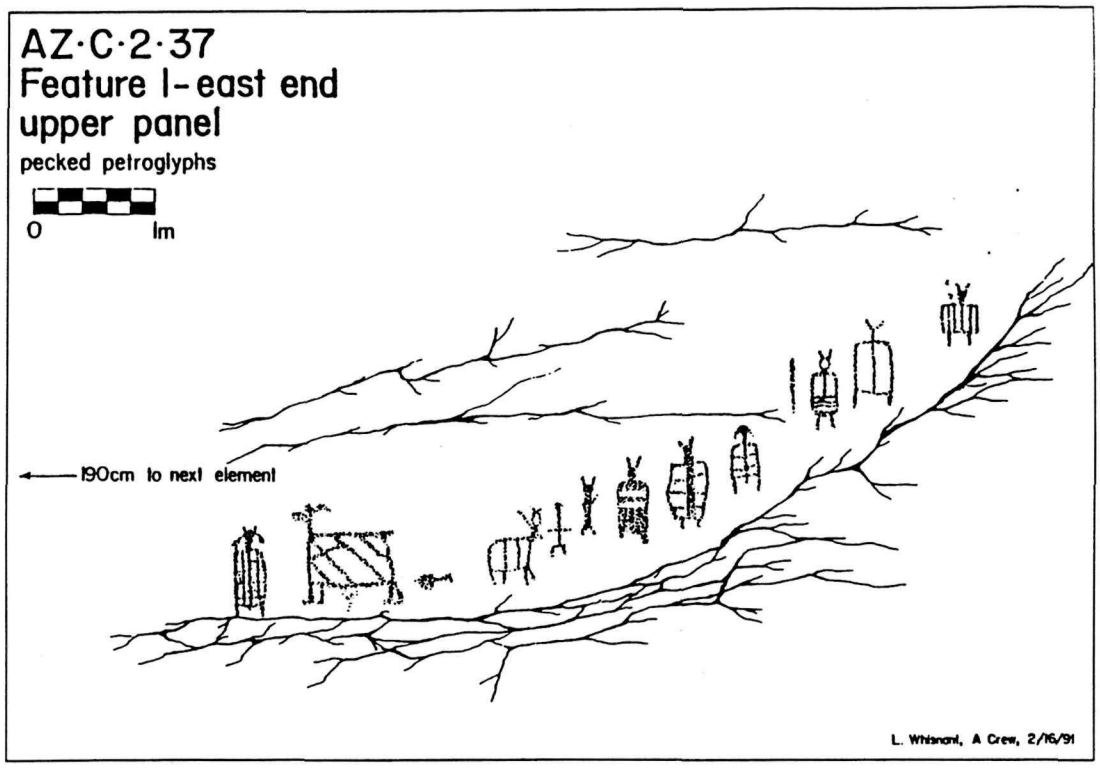

Figure 13. Glen Canyon Linear Style petroglyphs upriver from Lees Ferry.

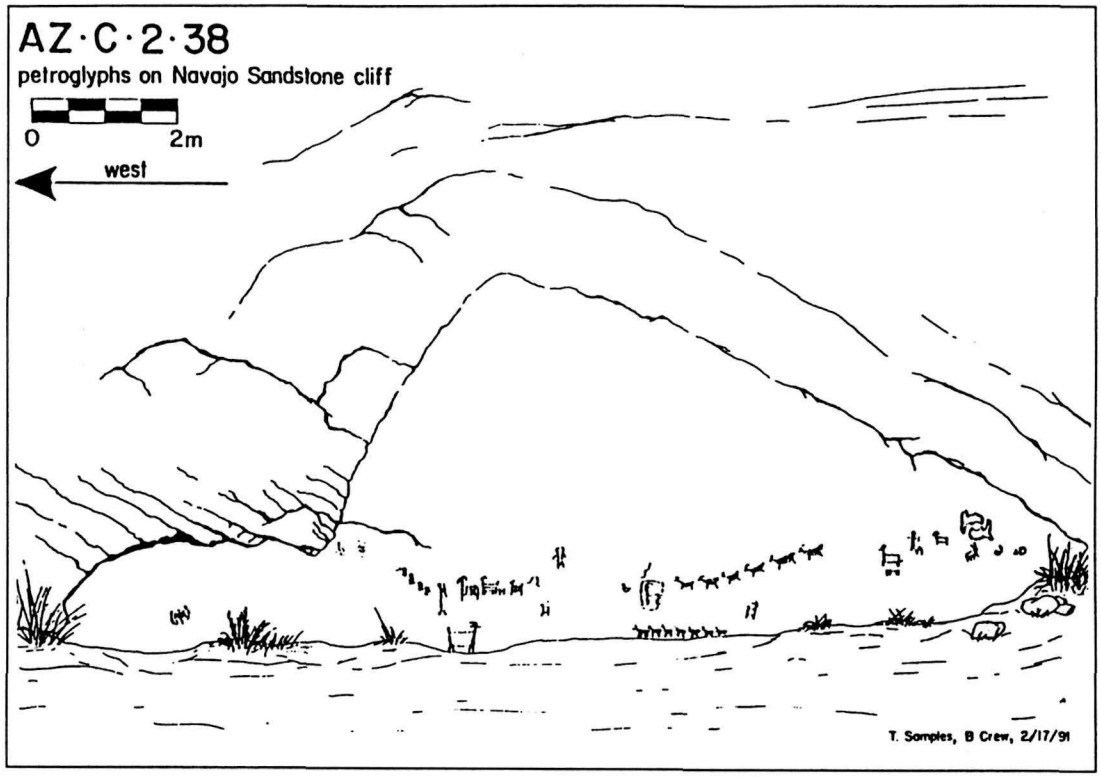

Figure 14. Glen Canyon Linear and Kayenta Representational style petrographs.

Notable rock art sites in Reach 10 include pictographs at the mouth of Prospect Canyon and an extensive panel at AZ A:16:1, a frequently visited site near the mouth of Whitmore Wash. The Prospect Canyon elements include a few small anthropomorphs of unknown affiliation associated with masonry features and ceramics. These elements resemble figures recorded at Snake Gulch, a tributary of Kanab Creek; however, the cultural and temporal affiliation of these panels has not yet been determined.

The pictographs at Whitmore Wash do not appear to be of Puebloan origin, but probably represent one of the protohistoric cultures that occupied the area, such as Southern Paiute. Common elements at this site include anthropomorphs, lizards, and geometric or abstract figures (see Jones 1986:45-48 for more detailed descriptions).

One of the most challenging aspects of rock art sites in the western canyon is that many design styles do not conform well to other styles documented in the literature (see Figures 15, 16 and 17). This is complicated by the fact that virtually all panels consist exclusively of hematite pictographs that were executed on eroding rock surfaces. Even in relatively well protected contexts, fading and blurring of painted elements is a problem. The result of this is that many elements are very faint or are only partially intact. In addition, most of the rock art in the western river corridor is not elaborate, and diagnostic traits are difficult to ascertain. Future research on this aspect of western Grand Canyon archaeology will require describing these sites in greater detail than was possible during this survey.

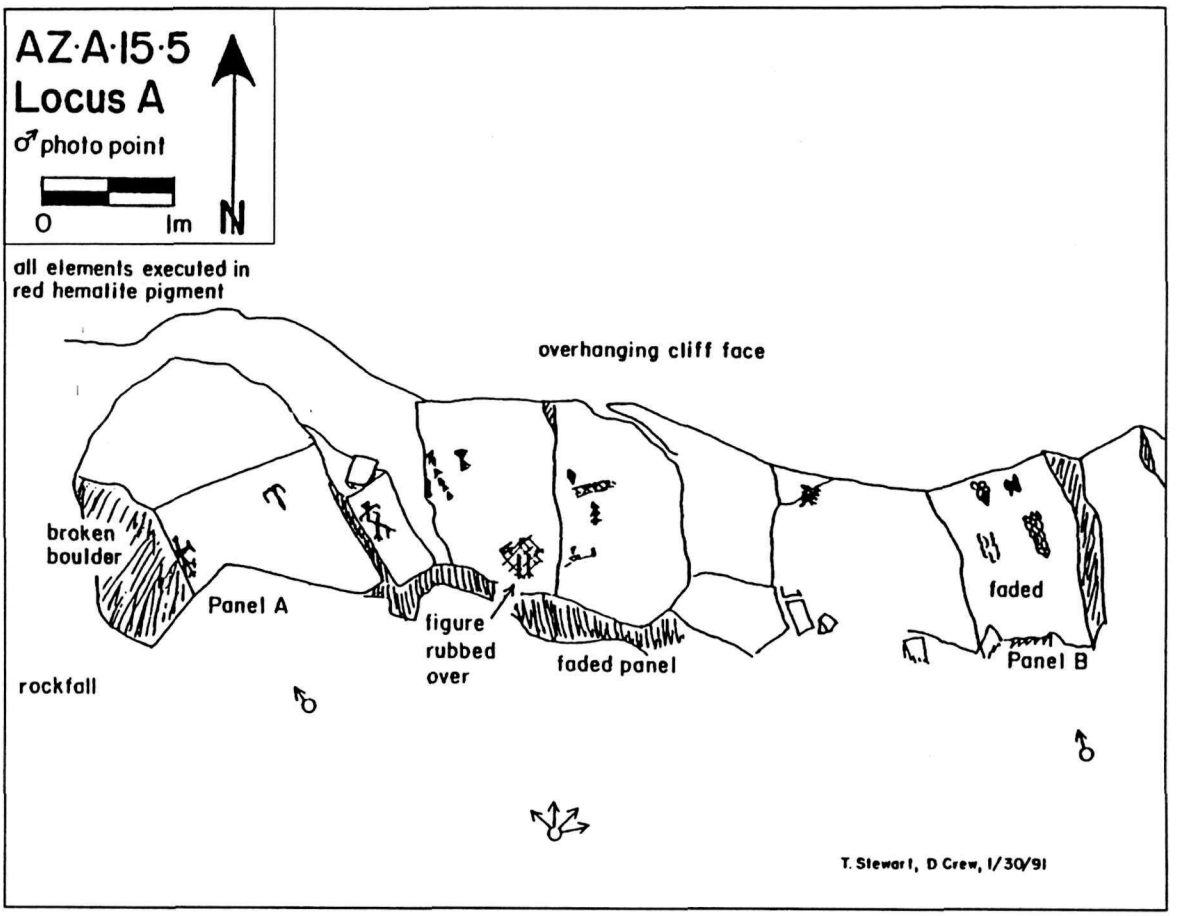

Figure 15. Pictographs in western Grand Canyon.

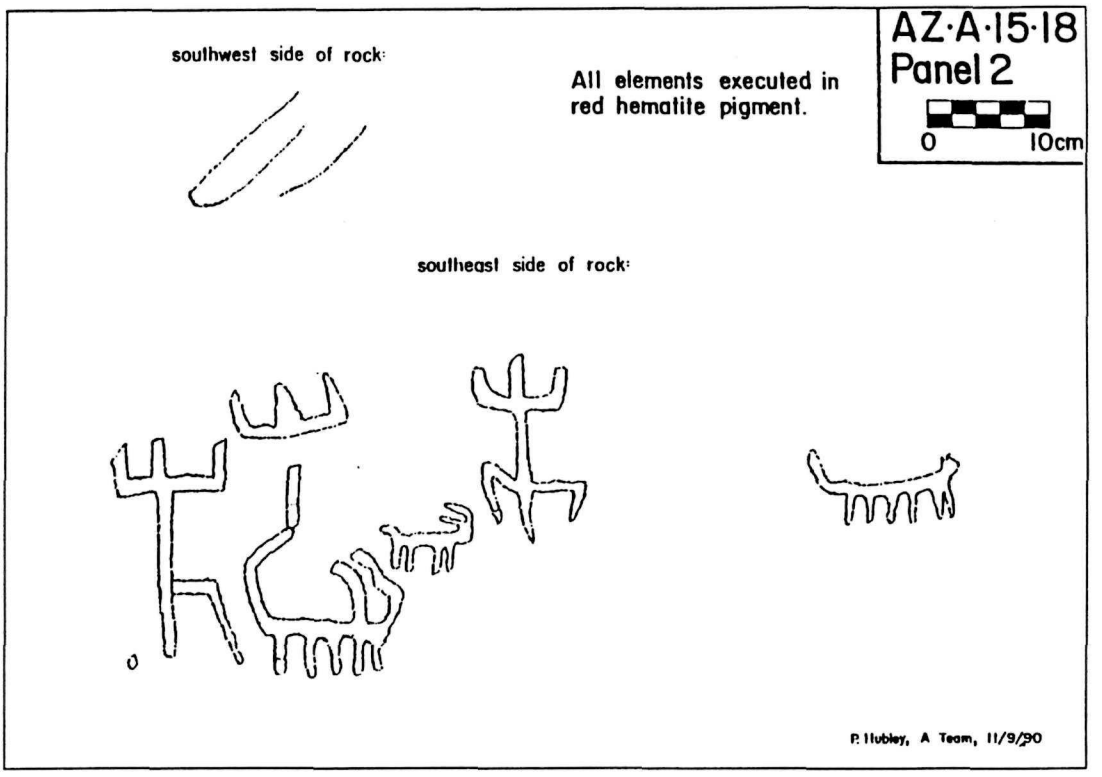

Figure 16. Pictographs in western Grand Canyon.

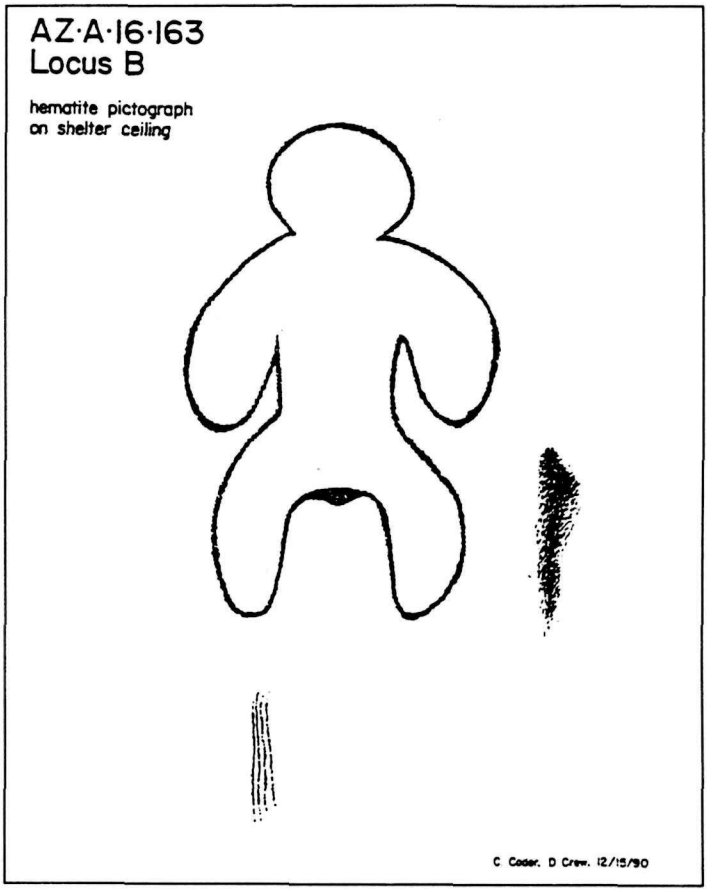

Figure 17. Pictographs is western Grand Canyon above Lava Falls.

Chapter 8

Prehistoric Archaeology

with contributions by Peter Bungart

A variety of cultural-temporal frameworks have been developed over the years to organize archaeological manifestations in northwestern Arizona (Figures 18 and 19). In the following section, these various frameworks are discussed as they relate to the archaeological remains along the Colorado River in lower Glen Canyon and Grand Canyon.

Preceramic Sites

In the context of this report, preceramic includes both Archaic and Anasazi Basketmaker II remains. Although Basketmaker II sites have been well documented in surrounding areas on the Colorado Plateau, the Archaic period in this portion of the Colorado Plateau is much less understood. Aside from the excavation of a few dry rockshelter sites (Janetski and Wilde 1989; Euler 1984; Geib and Keller 1987), most data indicative of Archaic occupation of the region comes from surface surveys of upland areas, where these sites occur mostly in open contexts (Fairley et al. 1984; Huffman et al. 1990). These projects have contributed to understanding general localized settlement patterns and provide preliminary technological data, primarily with regard to lithic artifacts, inasmuch as can be confidently inferred from surface remains. While the data base for Archaic period sites is increasing at a relatively rapid rate as more of these surveys are undertaken, a great deal has yet to be learned about the variability in subsistence and mobility strategies during this long time period.

Even though there were clearly material differences between many aspects of Archaic and Basketmaker life, particularly in the realms of subsistence and basketry and textile technology, direct evidence for these kinds of inferences is usually only obtained from excavated dry deposits. Surface indications in open contexts usually consist primarily of chipped stone lithic artifacts, but it is here that there is probably the greatest overlap between the two groups. Both emphasized biface reduction and relied on atlatl and dart hunting equipment, resulting in assemblages that may be remarkably similar. It is because of this that we do not usually distinguish between Archaic and Basketmaker II sites in this report, although in a few cases certain projectile point styles are distinctive to one group or another.

Recent testing projects on the Arizona Strip (Janetski and Wilde 1989) have revealed stratified deposits with both Late Archaic and Basketmaker II materials. Late Archaic remains included a variety of wild plant foods, projectile points, and large and small mammal bone. The Basketmaker II strata contained multiple-warp, square-toed sandals, corn, and mostly small mammal bone. The delineation of distinct Archaic and Basketmaker II layers at excavated sites is rare, and perhaps more subtle nuances between their lithic technologies (as yet to be reported in detail) will be defined, although perhaps valid for only a localized area.

Southwest of the project area, recent test excavations at Bighorn Cave revealed stratified Late Archaic, Formative period, and protohistoric deposits (Geib and Keller 1987). The Late Archaic lithic assemblage, as expected, demonstrated an emphasis on intensive biface reduction and exploitation of wild plant and animal foods. Diagnostic dart points included several Gypsum Contracting Stem.

In the Grand Canyon, the best known evidence for Archaic occupation is at Stanton's Cave, where more than 200 split-twig figurines have been recovered over several years, in the almost total absence of other cultural remains (Euler 1984). These artifacts apparently represent bighorn sheep or other ungulates. The presence of small twigs resembling spears impaled into bodies of some figurines, along with the scarcity of associated cultural remains found in the cave, led to the proposition that the figurines were the result of hunting-related ceremonialism (Farmer and DeSaussure 1955). Split-twig figurines have also been found in several other dry cave sites scattered throughout the Colorado Plateau and Great Basin (Wheeler 1942; Jennings 1980), including several other caves in the Grand Canyon (Farmer and DeSaussure (1955). Although in the Grand Canyon they are usually found exclusive of other cultural remains, they also occur in sites where evidence of domestic activities was also present, such as Bighorn Cave in western Arizona (Geib and Keller 1987), Cowboy Cave in southeastern Utah (Jennings 1980:87-94), and Etna Cave in southeastern Nevada (Wheeler 1942).

A number of split-twig figurines from Stanton's Cave have been radiocarbon dated. The suite of dates falls quite consistently between 4000 and 2000 yrs BP, or within the Late Archaic period. So far, however, relatively little chronometrically dated evidence for additional Late Archaic use of the Grand Canyon area has been reported, and even less is known about localized settlement and subsistence patterns. Evidence is increasing, however, albeit in excruciating piecemeal fashion. This is largely due to recent testing projects directed by Jones (1986) and ongoing geomorphological studies by Hereford et al. (1991).

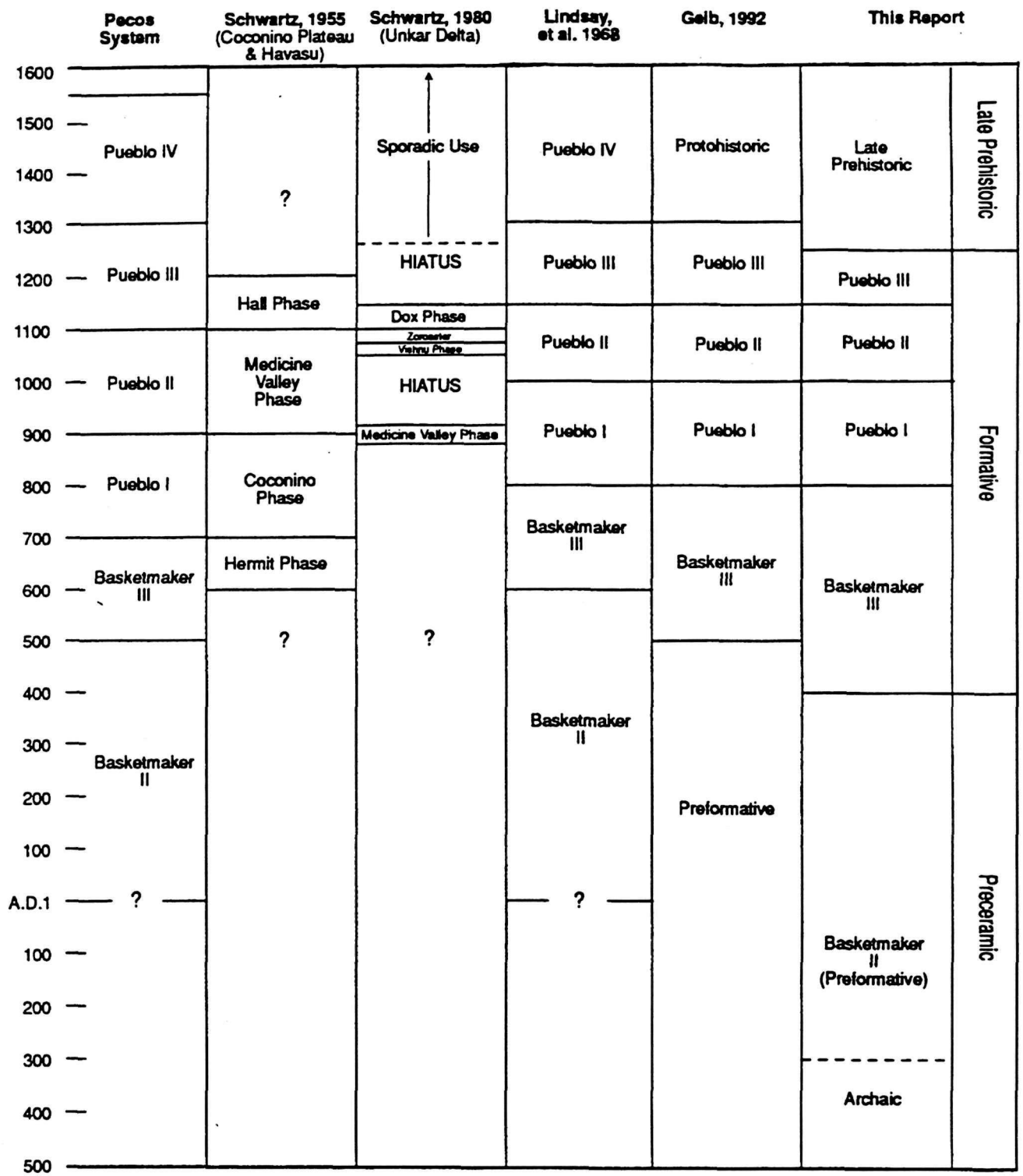

Figure 18. Formative and late prehistoric-protohistoric divisions for the eastern canyon.

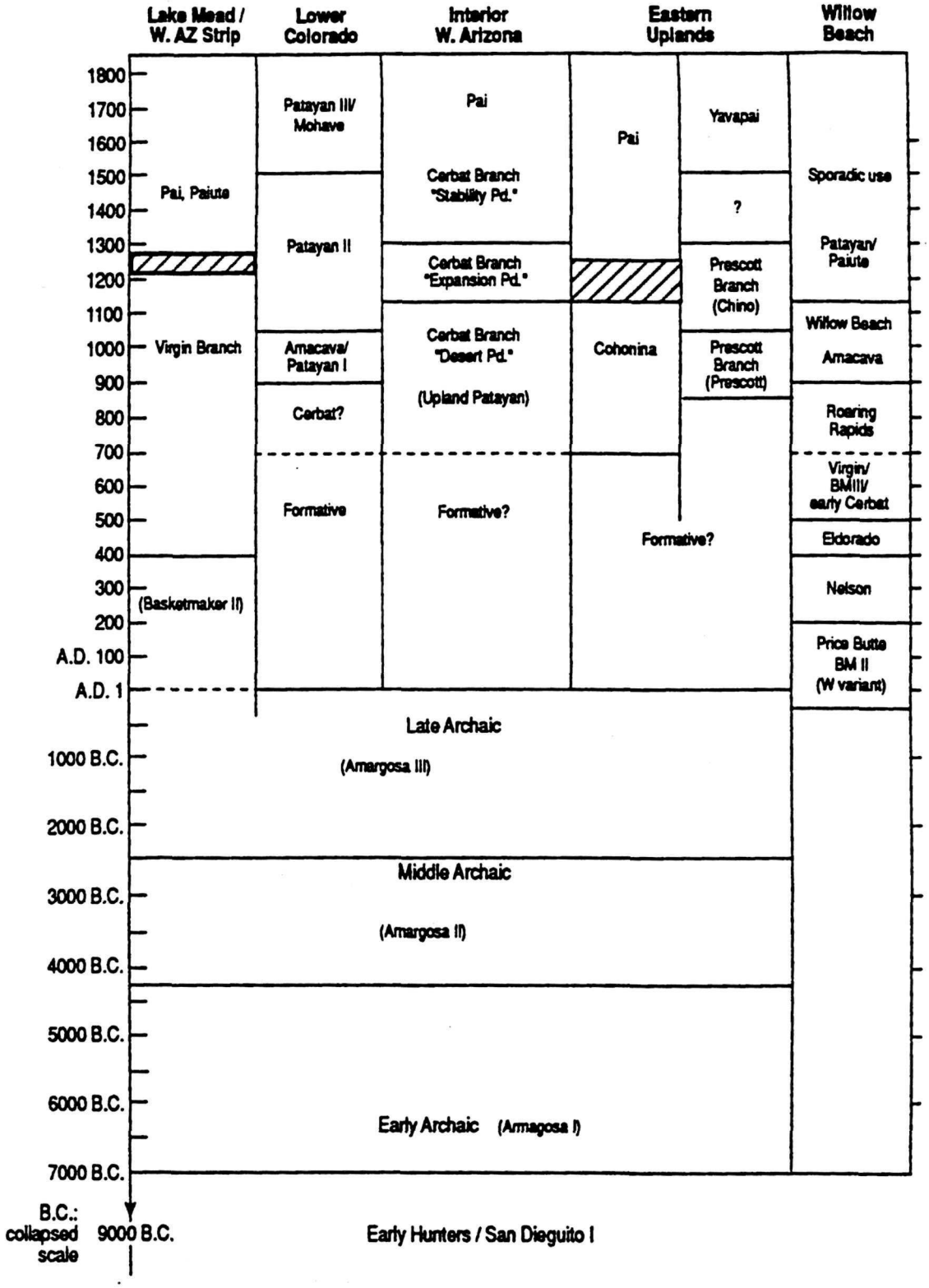

Figure 19. Cultural-temporal subdivisions for western Arizona.

Some evidence for additional preceramic occupation along the river corridor was found during the present survey, although indications were usually meager or ambiguous. Efforts to identify specific preceramic components based on surface evidence were often hampered by the mixing of these materials with later components.

The designation of preceramic components was inferred primarily from the presence of dart points, although in a few instances geomorphological contexts provided additional, if tentative, evidence. As an example of the latter, at AZ C:13:327 deeply buried aceramic strata exposed in eroded drainage cuts below Tanner Creek appear to represent an Archaic or Basketmaker occupation; this is based on the position of the stratigraphic unit relative to a hearth dated to approximately 220 B.C. (Fairley et al. 1991).

Overall, the most frequent occurrences of Archaic type projectile points were found in the western section of the project area, in areas where the canyon is more open and access routes more easily traversed. Probably the most reliable diagnostics were McKean Concave Base points, found at three sites. In the case of other points, such as Elko Side- and Corner-notched, a preceramic assignment can only be tentative, since these projectile point types are often associated with later Formative period and protohistoric remains.

It is unclear whether these later groups actually manufactured Elko-like points or whether they were simply curated items manufactured during Archaic times and reused by later occupants. The latter is probably most commonly true, considering the frequency that preceramic sites are reoccupied. However, a logical question would be why Elko points were particularly favored over other dart points. One possible reason that Elko points were favored concerns hafting technology and the suitability of Elko points for reuse. Most later stone points are side or corner-notched, and it may be that, conceptually, stemmed and other unnotched points were regarded as unsuitable for reuse. Additionally, if we assume that most dart points are too large for use as arrow tips, and so were primarily reused as hafted knives, then notched dart points would have been much easier to haft to knife handles and would also have been considerably stronger and more dependable during use. This explanation has even more credibility if we assume that the use of sinew was a primary component of hafting, as opposed to the use of pitch only, as is the case with most stemmed points.

Summary of Preceramic Sites

Seventeen sites were recorded during the survey that were designated preceramic or possessed artifactual evidence of a preceramic component. Most of these assignments were based on the presence of diagnostic dart points, although a few sites had rock art elements that are believed to date to the Archaic period (Schaafsma 1980). In addition to these 17 sites, 117 aceramic sites were recorded that lacked any diagnostic artifacts. Some of these may date to the Archaic or Basketmaker II period, but many are likely to date to later time periods.

Three preceramic sites were recorded in Reach 0, all based on the presence of the Glen Canyon Linear rock art style (Schaafsma 1980:72-76), also known as Glen Canyon Style 5 (Turner 1971, 1973). Although no indisputable evidence has dated this petroglyph style to preceramic times, it is inferred to date earlier than Formative period rock art based on differential patination and superimpositioning of later elements that are commonly associated with ceramic sites. Turner, in particular, believed the earlier style may have been affiliated with Basketmaker II groups; however, the resemblance of some zoomorphic elements with the well-dated split-twig figurines suggests that a Late Archaic designation may be more in order. All of the rock art containing Glen Canyon Linear Style elements recorded during the survey were found in Reach 0 upriver from Lees Ferry.

Aside from the sites designated as preceramic based on rock art styles in Reach 0, two preceramic sites were recorded in Reach 4, three in Reach 5, one each in Reaches 6 and 8, and six in Reach 10.

Dart-sized projectile points found at sites C:9:56 and C:13:368, the two sites in Reach 4, resemble points found in Basketmaker II contexts in the Four Corners region (Guernsey and Kidder 1921; Lindsay et al. 1968:45-48). Both sites consist of shallow rockshelters with sparse lithics and possible hearth remains. Site C:9:56 also contained burned bone fragments, and it is likely that both sites were limited activity loci related to hunting pursuits.

Three sites, A:16:178, A:16:4, and A:15:38, had McKean Concave Base lanceolate points. Points from this type were found in Late Archaic strata at Sudden Shelter in central Utah (Holmer 1978, 1980), and at several other sites throughout the Great Basin (e.g., Thomas 1983, 1985). Chronometric data from these sites suggest a date range from approximately 3000-1000 B.C. for these points (Holmer 1986:100-101), tending to be somewhat earlier but overlapping the date range for Gypsum Contracting Stem points. Other sites were assigned preceramic affiliation based on dart-sized projectile points from the Elko Series.

Overall, there is a striking scarcity of preceramic evidence, at least in the way of diagnostics, presently visible on the surface along the river corridor. One explanation for this might be the depositional and aggradational history of canyon alluvium. In other words, most of the sites have either been flushed out or are deeply buried.

This appears likely given the fact that much of the survey was conducted on talus and alluvial contexts that reflect active geomorphological processes. However, even at rockshelter sites with relatively stable deposits, few Archaic projectile points were recorded. Appealing to a 'flush and fill' explanation alone might therefore be considered an 'easy out,' and more detailed study analyzing geomorphological factors is needed.

The Basketmaker II Problem

The term Basketmaker II, as originally conceived, refers to the preceramic phase of the Puebloan horticultural tradition (Kidder 1928). Over the years, archeological usage has diverged from the original meaning, so that the term is often used in a temporal sense to refer to the time period from roughly 300 B.C. to A.D. 500. Ambler and others (1985; Geib et al. 1986; Geib 1992) have argued that the term "Preformative" is more appropriate as a general temporal division, because it acknowledges the introduction of maize horticultural while avoiding the implication that all groups occupying the Colorado Plateau during this period were Puebloan corn producers.

The argument for using a generic term divested of specific cultural association is appropriate in light of Matson's (1992) recent work. Matson uses the term Basketmaker II in a very specific sense to designate a distinctive cultural assemblage and mixed horticultural foraging adaptation that was directly antecedent to the Puebloan (Anasazi) culture. Building on the work of Berry and Berry (1986), he convincingly argues that a unique assemblage of material cultural traits and subsistence-related evidence clearly sets Basketmaker II apart from earlier Archaic traditions and contemporaneous remains to the west and north of the present Arizona boundary. Recent work by Geib et al. (1986; Geib 1992) in the Glen Canyon region substantiates this position.

In this report, we have opted for using yet another term—preceramic—that lumps late Archaic and Basketmaker II manifestations under a single heading. This term acknowledges the possibility that contemporaneous non-Anasazi populations may have occupied portions of the Grand Canyon region during the Basketmaker II time span, and it also acknowledges the present lack of information which would allow us to differentiate aceramic cultural traditions during this important transistional stage of Southwestern prehistory. As more and more sites dating to this poorly understood period are uncovered, however, confusion over this issue will undoubtedly increase unless some semantic and subsistence issues are explicitly defined. Hence, the need for this discussion.

In the Virgin Anasazi area, the phase name Moapa (Shutler 1961:64) has commonly been used to designate the period when horticulture was first practiced on the western Colorado Plateaus, but prior to the development of pottery and sedentary villages. Shutler dated this phase from 300 B.C. to A.D. 500. Shutler's beginning date was based on the 250 B.C. radiocarbon date from a preceramic level at Willow Beach, which Schroeder designated Basketmaker II based on point typology. The terminal A.D. 500 date reflected Colton's estimated dates for the beginning of pottery production on the Colorado Plateau.

No evidence of cultigens was recovered from the preceramic level at Willow Beach which Schroeder ascribed to Basketmaker II; yet the initiation of the Formative period, and by extension Basketmaker II, is dependent on dating the introduction of domesticates. Berry's (1982:15-33) thorough analysis of the problem reveals that the earliest directly dated maize on the northern Colorado Plateau, from Cowboy Cave, dates just after 200 B.C. Recent radiocarbon dates on corn from aceramic levels in Glen Canyon has pushed the earliest dated corn in Utah back to 380 B.C. (Geib 1992). Meanwhile, radiocarbon dating of corn from several classic Basketmaker II sites in the Marsh Pass-Black Mesa region of northeastern Arizona (Kidder and Guernsey 1919; Guernsey and Kidder 1921) indicates that corn was present on the southern Colorado Plateau by 560 B.C. (Smiley et al. 1986). Currently, the earliest dated corn from the Arizona Strip falls just prior to A.D. 1 (James Wilde, personal communication 1988). As yet, no corn has been recovered from preceramic contexts in Grand Canyon.

In addition to corn and squash, the ancestral Puebloan culture during the Basketmaker II period is known for its extensive array of sandals, coiled baskets, rabbit fur blankets, human hair cordage, fiber and hide bags, dart foreshafts, atlatls, snares, nets, and other paraphenalia common to hunter-gatherers. The specific manufacturing techniques employed in the production of many of these items is distinct from those of preceding Archaic cultures on the Colorado Plateaus (Adovasio 1980; Jennings 1980; Matson 1992). In terms of specific distinguishing characteristics of Basketmaker II Anasazi material culture, two forms of sandal construction are diagnostic: four-warp wickerwork and multi-warp cord with square, fringed toes. Twined apocynum bags decorated with red and black designs and S-curved "rabbit sticks" are other characteristic Basketmaker II Anasazi traits. Typical coiled baskets have two-rod and bundle foundations with non-interlocking stitches. This technique continues into the Pueblo III period (Lindsay et al. 1968:99; Adovasio and Gunn 1986), and thus is not

diagnostic of the Basketmaker II time period per se. Nevertheless, since this basketry technique is not characteristic of Great Basin Archaic technologies (Adovasio 1980:39), its occurence on aceramic sites with dart-sized points is a strong indication of Basketmaker II Anasazi.

In the absence of perishable items, the distinction between Archaic and Basketmaker II material culture is difficult to establish. Slab-lined cists, basin milling stones and one-hand cobble manos, and Elko-like side- and corner-notched projectile points are often associated with Basketmaker II, as well as with earlier and later hunting and gathering groups. Recent studies by Matson (1992) indicate that there may be a number of characteristics distinctive of Basketmaker II lithic tool assemblages. These characteristics include a lack of side and end scrapers; frequent occurrence of large triangular "knives" with square bases; "snapped denticulates"; thin, well-made triangular projectile points with deep side notches or open corner-notches parallel to the blade edge; and less well-made points with shallow, open side-notches. As yet, no one has applied a formal analytical approach, such as those developed by Ritter and Matson (1972) and Holmer (1978), to test whether perceived morphological distinctions in projectile points are valid criteria for distinguishing Basketmaker II types from similar styled Elko points.

The recognition of Basketmaker II occupations on the basis of material items tells us little about the fundamental cultural characteristics of this tradition. For example, the degree of reliance on horticulture during this period is of paramount importance for evaluating changes in preceramic adaptive patterns, but data specifically pertaining to Basketmaker II subsistence in Grand Canyon are entirely lacking. Most models of Basketmaker II adaptation (e.g., Aikens 1966) have relied on extrapolation from settlement pattern data and from uncritical acceptance of the Pecos model of Anasazi cultural evolution. The normative evolutionary model of Puebloan cultural development views Basketmaker II as a transitional stage intermediate between the hunting-gathering Archaic lifeway and the sedentary, village dwelling horticultural pattern of the following Basketmaker III period. Accordingly, Basketmaker II subsistence is assumed to be primarily focused on wild food resources, with cultivated foods providing a supplementary addition to the diet (Aikens 1966; Jennings 1966).

Recent studies by Matson and Chisholm (1986) challenge this traditional view. Review of the coprolite, carbon isotope, and midden evidence from Basketmaker II sites on Cedar Mesa in southeastern Utah indicate that maize comprised the bulk of the Basketmaker II diet, and that there was no significant difference in the amount of corn consumption between Basketmaker II people and later Puebloan peoples.

The apparent lack of antecedents for the classic Basketmaker II assemblage on the Colorado Plateau led Morris and Burgh (1954) and others more recently (Berry 1982; Geib et al. 1985; Matson 1992) to argue for an intrusion of southern horticulturalists onto the Colorado Plateaus at the start of this period, rather than an in situ development out of a pre-existing late Archaic population. This view contrasts with the alternative model of evolutionary progression out of an Archaic hunting-gathering subsistence system to one incorporating horticulture as an additional component of the hunting-foraging subsistence cycle (e.g., Irwin-Williams 1973).

Although material culture evidence demonstrates that ancestral Pueblo peoples clearly were present east of Grand Canyon and in the eastern portion of the Arizona Strip during Basketmaker II times (Janetski and Hall 1983; Janetski and Wilde 1989; Judd 1926; Nusbaum 1922), it has not yet been conclusively determined whether the contemporaneous occupation in the Grand Canyon (Jones 1986) is an extension of the Basketmaker II culture or part of another, unrelated tradition. Euler (1962:115) and R.G. Matson (personal communication 1987) question Schroeder's designation of the preceramic level at Willow Beach as a western variant of the Basketmaker II Anasazi culture. Euler suggests that it may be an expression of the contemporary Amargosa II tradition defined by Rogers (1945). The main obstacle to resolving this issue is that, in the absence of perishable artifacts and cultigens, Basketmaker II remains are not readily separated from those of other preceramic cultural groups.

As previously noted, evidence for a Basketmaker II Anasazi occupation in Grand Canyon is currently limited to a few aceramic roasting features with radiocarbon dates placing them in the 500 B.C.-A.D. 500 time range. For example, Jones (1986b:324) attributed a preceramic roasting pit at AZ:B:10:4, a rockshelter site in the inner Grand Canyon across the river from Deer Creek Falls, to Basketmaker II Anasazi based on two corrected radiocarbon determinations of A.D. 230 ± 610 and 380 B.C.-A.D. 210. Similarly early dates have recently been recovered from aceramic contexts near Tanner delta (Fairley et al. 1991; Hereford et al. 1991). An aceramic hearth at AZ C:13:323 produced a calibrated two-sigma date range of 390-40 B.C.; other cultural deposits at AZ C:13:327 have produced dates ranging between 220 B.C. and A.D. 100.

The correlation of some of these early formative dates with late Archaic point types, in combination

with the frequent occurrence of roasting pits and the location of sites away from arable land, argues for the persistence of the Archaic cultural tradition contemporaneous with the Basketmaker II Anasazi occupation to the east. Alternatively, inner canyon hearth sites could represent one portion of a Basketmaker II subsistence cycle involving inner canyon hunting and gathering and nonagricultural food processing activities. Although future studies may bear out Schroeder's hypothesis (1961:90) of a variant Basketmaker II tradition encompassing the western Grand Canyon region as far west as Willow Beach and the Moapa Valley, it seems prudent to reserve judgement until more complete assemblages and specific subsistence data from these areas are available for study.

Formative Period

As originally conceived (Willey and Phillips 1955:765), the term Formative refers to an evolutionary stage of New World cultural development. This stage is recognized in the archaeological record by "the presence of agriculture, or any other subsistence economy of comparable effectiveness, and by the successful intergration of such an economy into well-established, sedentary life" (Willey and Phillips 1958:146). Although the culture-specific terms "Puebloan and Anasazi" are commonly used to designate the period between A.D. 500 and A.D. 1200 when a semi-sedentary horticultural pattern dominated the southern Colorado Plateau, we have followed the lead of other researchers (Ambler et al. 1985; Geib 1992) in using the generic term Formative for this time period, to acknowledge the co-existence of Anasazi horticulturalists and contemporary, non-Anasazi peoples in the Grand Canyon region during this period.

Several different temporal schemes have been used to subdivide the Formative period in Grand Canyon (Figures 18 and 19). Most rely on information from outside the Grand Canyon area and are not specific to the canyon interior. The one exception is Schwartz's phase system from eastern Grand Canyon (Schwartz et al. 1980:8).

Based primarily on information from excavations at Unkar Delta, Schwartz et al. (1980:8) defined a discontinuous occupational sequence spanning a 250-year period from A.D 900 to 1150. For convenience in organizing and analyzing the data, he assigned labels to four occupational intervals: Medicine Valley (ca. A.D. 900), Vishnu (A.D. 1050-1070), Zoroaster (A.D. 1075-1100), and Dox (A.D. 1100- 1150). Each of these phases was said to be characterized by distinct shifts in site location and architectural plans, as well as in ceramic assemblages. Schwartz argued that each phase represented discrete periods of settlement and abandonment brought about by climatic changes. Schwartz's phase system has been criticized for creating an artificial sense of discontinuity in the archaeological record to support his model of climatically induced settlement shifts (Janet R. Balsom, personal communication 1984). Certainly a five-year occupational hiatus between the Vishnu and Zoraster phase could not be recognized on the basis of ceramic assemblages alone, and it is doubtful that any other dating technique could detect such a short break in the occupational sequence. Perhaps because of these criticisms and the fact that the phase divisions were based on data from a single, geographically restricted locality, Schwartz's phase system has not gained widespread acceptance as a scheme for organizing the occupational history of the Grand Canyon in general.

Phase systems may be useful for organizing archaeological data on a local level; however, problems inevitably arise when the scheme is applied to a broader region, since cultural patterns do not necessarily occur synchronically on a regional scale. For this reason, temporally defined Pecos period designations are used in this report to organize data into a coherent regional temporal framework. Technically, the Pecos system only applies to the Anasazi tradition, yet it is clear that non-anasazi groups, specifically the Cohonina and perhaps the ancestral Pai and Paiute peoples also made use of the Grand Canyon area during the Formative period. Thus in the following discussion, the Pecos period classifications are divested of cultural implications and are used only to designate specific intervals of time.

The temporal scheme employed here is closely tied to the one developed for neighboring Glen Canyon (Jennings 1966; Lindsay et al. 1968; Geib et al. 1985:) and the Arizona Strip (Altschul and Fairley 1989:105). Justifications for using the Glen Canyon scheme has been published elsewhere (Altschul and Fairley 1989:107), but basically it rests on the following points: 1) the Glen Canyon temporal scheme is based on estimated time spans of several widely occurring ceramic types; 2) the temporal spans assigned to these diagnostic ceramic types are supported by dendrochronological dates; 3) northern Kayenta ceramic analogs and trade wares provide the primary temporal diagnostics of Formative period sites in Grand Canyon; and 4) the Glen Canyon region is adjoins Grand Canyon, and interaction between these two areas appears to have occurred on a regular basis throughout most of the Formative period.

Salient differences between the temporal divisions of the Glen Canyon system and the one used here require further explanation. The beginning date of the Basketmaker III period is extended to A.D. 400 to take into account early radiometric dates from ceramic-bearing sites in the Tuweep

area (Thompson and Thompson 1978; Walling et al. 1986:355,448). As in Glen Canyon, Pueblo I spans the period between A.D. 800 and 1000, followed by Pueblo II at A.D. 100O to 1150. (The interval between ca. A.D. 900 and 1000, which some Virgin Anasazi archaeologists refer to as "early Pueblo II," is considered here to be late Pueblo I.) The Pueblo III period (A.D. 1150-1300) appears to be poorly represented in Grand Canyon and in northwestern Arizona generally (Euler 1981), but at least a few sites dating to the late 1100s are known to exist in eastern Grand Canyon (Jones 1986) and on the Paria Plateau (Mueller et al. 1968), and several sites on the Kanab Plateau have produced radiometric dates in the early to mid-1200s (Thompson and Thompson 1974; Westfall 1987; Huffman 1991). Thus, A.D. 1225 is suggested as the terminal date for Pueblo III in Grand Canyon (Altschul and Fairley 1989:107).

Formative Cultural Traditions in Grand Canyon

The vast majority of sites recorded in Grand Canyon are attributed to the prehistoric Pueblo people ("Anasazi"), based on the presence of their distinctive ceramics and to a lesser degree, architectural forms (Schwartz 1965; Euler and Taylor 1966; Euler et al. 1980; Euler 1988). The Cohonina cultural tradition is also represented, particularly in the western reaches (Effland et al. 1983). These two traditions apparently overlapped in the eastern canyon, particularly during early Pueblo II times.

Two ancestral Pueblo branches, or regional variants, are commonly recognized in the Grand Canyon region: Kayenta and Virgin. These branches are distingished primarily on the basis of geographic variations in ceramics and architecture, with other material culture characteristics being of secondary importance in most classifications (cf., Aikens 1966). Traditional summaries of Southwestern prehistory (e.g., Colton 1943; McGregor 1941) depict the Kayenta occupying the region south and east of the Colorado River and north of the Little Colorado River as far east as Chinle Wash.Virgin territory is usually defined as the region north and west of the Colorado from Paria Canyon to the Muddy River, and as far north as the Pink Cliffs in Utah.

Most archaeologists are in general agreement with these territorial distinctions prior to ca. A.D. 1000 or 1050. The picture becomes more muddled during the Pueblo II period, with some scholars arguing for an extension of Virgin territory north of the Colorado River as far east as the Kaiparowits–Escalante area (Hauck 1979; Gunnerson 1959; Thompson et al. 1983; Westfall 1986) whereas others maintain that these areas were occupied by Kayenta (Lister 1964). Furthermore, several scholars (Effland et al. 1981; Euler 1967a, 1979; Jones 1986) maintain that the Kayentan cultural expression, if not actual populations, encompassed eastern Grand Canyon and extended as far west as Kanab Creek during Pueblo II times.

The Cohonina culture of northwestern Arizona centers on the Coconino Plateau westward to the Aubry cliffs (Cartledge 1979; McGregor 1967). Schwartz and others (1980) identified a Medicine Valley phase occupation at Unkar Delta based on the predominance of San Francisco Mountain Gray Ware in association with late Pueblo I-early Pueblo II Anasazi tradewares at one site. Similar ceramic assemblages have since been found at several other sites in the eastern canyon (e.g., AZ C:13:10, C:13:101; C:13:334) and along the south rim (Pilles 1973), suggesting that Cohonina peoples made frequent, if not exclusive, use of the eastern canyon prior to Pueblo II times. After A.D. 1050, ceramic assemblages dominated by San Francisco Mountain Grayware are largely confined to the western canyon, while ceramic assemblages in the eastern canyon are typically dominated by Kayenta Anasazi tradewares or locally produced equivalents. Minor amounts of San Francisco Mountain Gray Ware occur on many Pueblo II eastern canyon sites, but their low frequencies relative to Kayenta wares suggest that they were tradewares.

Euler and others have consistently maintained that a population movement into the eastern Grand Canyon occurred around A.D. 1000-1050, although Euler also maintains that Anasazi peoples were already present in the canyon as early as A.D. 700 (Effland et al. 1981:13). Supporting evidence for these arguments will be explored in greater detail below. A brief chronological summary of Formative period archaeology in and around the Grand Canyon precedes the discussion on population movements and subsistence.

Basketmaker III Period, ca. A.D. 400-800

The Basketmaker III stage is generally considered to be a direct outgrowth of the preceding Basketmaker II lifeway (Aikens 1966). Two-handed manos and trough metates came into use, the bow and arrow replaced the atlatl and spear, and plain gray sand-tempered pottery, occasionally decorated with black carbon paint, was manufactured for the first time. The addition of ceramics and the bow and arrow to the existing Basketmaker II cultural inventory are the primary technological developments that set this period apart from the preceding one. These developments undoubtedly had important ramifications in terms of storage and hunting behavior, as well as in terms of the functional role of certain classes of artifacts. With respect to fundamental cultural patterns, however, the distinction between the Basketmaker II and III periods is relatively insignificant, at least in the region north

and east of the Grand Canyon where Basketmaker II and III Pueblo remains have been positively identified. In the Grand Canyon, the relationship between the preceding occupation and the Basketmaker III period occupation is still uncertain. Likewise, the nature of preceramic and early ceramic cultural traditions on the Coconino Plateau south of the canyon remains essentially unknown.

The introduction of pottery and trough metates, coupled with the aggregation of scattered habitations into small pithouse clusters with associated storage cists, is generally interpreted as evidence for a greater reliance on horticulture and increased sedentism. This model of increasing dependence on a horticultural subsistence base during the Basketmaker to Pueblo transition is founded more on faith than on hard data. As discussed previously, the recent studies by Matson and Chisholm (1986) in the Cedar Mesa region of southeastern Utah indicate that the degree of reliance on cultivated foods did not change dramatically from the Basketmaker II to the Basketmaker III period.

The introduction of ceramics on the Colorado Plateau marks the beginning of the Basketmaker III period. The timing of this event is traditionally placed at A.D. 500. This date has been called into question by a suite of early (pre-A.D. 400) charcoal dates recovered by Thompson and Thompson (1974, 1978) at the Little Jug site south of Mount Trumbull. Six dates ranging between 1850 ± 90 and 1630 ± 90 B.P. were obtained from pithouses with associated plain gray ceramics. Although the dates themselves are not questioned, the suggestion that they represent the initial date of pottery manufacture in this area (Thompson and Thompson 1974; Thompson et al. 1983:124) remains controversial. Once again, the "Old Wood Issue" (Hobler and Hobler 1978:38; Smiley 1985) raises its gnarly head. Given the degree of uncertainty inherent in radiocarbon dating wood charcoal, the Little Jug pithouses and associated ceramics may well date several centuries later than the radiocarbon determinations suggest.

The ceramic diagnostics for this period include plain gray pottery, and gray wares painted with simple, open designs executed in carbon paint. In terms of trade wares, Lino Gray and Lino Black-on-gray are the main "eastern" ceramic types likely to have been imported to Grand Canyon prior to A.D. 800. Red wares are not present in the area at this time (Dalley and McFadden 1985:42), although they were manufactured in the Kayenta and Mesa Verde area as early as A.D. 700 (Breternitz et al. 1974). Deadmans Gray and Fugitive Red presumably were manufactured by the Cohonina during this period, although specific chronological information about these types is not yet available from the Cohonina heartland. Projectile point types that commonly occur on Basketmaker III sites include Eastgate Expanding Stem and Rose Spring Side-notched and Corner-notched. Neither of these types occurs exclusively in Basketmaker III contexts, but in conjunction with ceramics, they can provide corroborative evidence of a site's Basketmaker III temporal placement (Altschul and Fairley 1989:113).

Although Basketmaker III habitation sites have been identified in a wide variety of upland areas north of the Grand Canyon (Altschul and Fairley 1989), the evidence for a Basketmaker III occupation within Grand Canyon is virtually nonexistent (Robert C. Euler, 1987, personal communication). The paucity of evidence may be due in part to the shortage of distinctive temporal diagnostics for this period, which hinders recognition of these remains in survey situations. For example, on small sites exhibiting plain gray ceramics, it may be difficult to judge whether a site is Basketmaker III or later, since plain gray pottery (i.e., Deadmans Gray) dominates local ceramic assemblages well into the eleventh century A.D. For the same reason, it is virtually impossible to distinguish Basketmaker III components at multicomponent sites without radiocarbon dating. This situation may partially account for the low numbers of Basketmaker III sites currently recognized in the Grand Canyon region, and the apparent lack of single-component Basketmaker III sites along the river corridor.

Pueblo I Period, ca. A.D. 800-1000

The standard model of ancestral Pueblo ("Anasazi") cultural development depicts the Pueblo I period as a continuation and elaboration of trends initiated during the preceding Basketmaker III period: aggregation of sites into larger pithouse villages, the development of contiguous masonry and jacal semi-subterranean structures for storage and habitation, and the refinement of ceramic production techniques. Although there is some general validity to this model, it has been criticized for overemphasizings change at the expense of continuity (Altschul and Fairley 1989:118).

Diagnostic ceramic wares from surrounding areas provide the most visible means of distinguishing Pueblo I sites in Grand Canyon.The decorated types diagnostic of the early Pueblo I period (ca. A.D. 800-950) include Deadmans Black-on-red, Floyd Black-on-gray, Kana-a Black-on-white, Washington Black-on-gray and Boysag Black-on-gray (Walling et al. 1986:352). Ceramics manufactured by the Kayenta at this time include neckbanded Kana-a Gray jars and vessels decorated with the distinctive Kana-a and Wepo Black-on-white design styles. Floyd Black-on-gray came

from the Cohonina region west and north of the San Francisco Mountains (Hall 1942; Schwartz et al. 1981). San Juan Red ware, which first appeared in the Mesa Verde area during late Basketmaker III, was widely traded among neighboring Anasazi groups during the Pueblo I period, but it apparently did not reach the Grand Canyon area until sometime after A.D. 800. The remaining types are products of the Virgin tradition.

Overall, the similarities between Basketmaker III and Pueblo I sites in terms of settlement distributions and technology seem more pronounced than the differences. Many ceramic and projectile point types are common to both periods. Eastgate Expanding Stem and Rose Spring projectile points are typically found in both Basketmaker III and Pueblo I assemblages, along with the ubiquitous Elko points, and ceramic assemblages continue to be dominated by plain gray pottery in the form of large, long-necked ollas and hemispherical bowls. Consequently, in the absence of temporally sensitive decorated ceramics, Pueblo I manifestations in Grand Canyon are often difficult to distinguish from the preceding Basketmaker III period.

Pueblo I sites are relatively common on the uplands surrounding Grand Canyon, but few have been detected in the canyon interior. Several factors may account for the paucity of Pueblo I remains. One factor concerns the cultural affiliation of Pueblo I sites in the canyon. Although Euler and others (Effland et al. 1981) maintain that Anasazi entered the canyon during Basketmaker II times, or at least by Basketmaker III times, Puebloan ceramics are not dominant in most early Formative ceramic assemblages. Instead, non-Anasazi ceramic types, particularly San Francisco Mountain grayware, are more common. At Unkar Delta, for example, the earliest sites were dominated by San Francisco Mountain Grayware types, such as Deadmans Gray, Floyd Gray, and Floyd Black-on-gray; Pueblo I decorated Anasazi types were present in smaller quantities. Consequently, Schwartz et al. (1980:174) attributed these sites to the Medicine Valley phase of the Cohonina occupation sequence, ca. A.D. 900.

Recent testing at AZ C:13:10, upstream from Unkar delta, provides support for Schwartz's hypothesis concerning Cohonina use of the inner canyon prior to the Pueblo II Anasazi occupation. In the course of profiling an arroyo wall, a buried fluvial deposit containing a pure Pueblo I ceramic assemblage was uncovered (Fairley et al. 1991; Hereford et al. 1993). The assemblage was dominated by San Francisco Mountain Grayware types: Deadmans Gray, Deadmans Fugitive Red, and Floyd Black-on-Gray. One sherd each of Kana-a Black-on-white and Deadmans Black-on-red was also recovered. This deposit, which we dated to A.D. 850-950 on the basis of the ceramics, is overlain by almost two meters of colluvial and fluvial sediments representing alternating river and slope wash episodes. Encased within the upper deposits are numerous masonry rooms and other features associated with the Pueblo II occupation of this site (Euler and Taylor 1966; Jones 1986).

The stratigraphic location of the Pueblo I remains at AZ C:13:10 point out another factor that may be responsible for the paucity of pre-Pueblo II remains along the river corridor: burial by flood deposits. Recent geopmorphological studies by Hereford et al. (1993) demonstrate that the high terrace boarding the river in Reach 5 is composed of sediments that were laid down over a 1400-1500 year period, beginning around 200 B.C. and continuing, with interruptions until ca. A.D. 1150-1200. The dating of this alluvial sequence hinges on radiocarbon determinations, many of them from buried cultural deposits. At Lava-Chuar creek, for example, a series of five radiocarbon determinations were taken from a hearth and associated deposits buried under more than two meters of fluvial and colluvial sediments. The uncalibarated two sigma values range from 900 ± 160 BP to 1490 ± 180.

Burial by younger cultural deposits is yet another factor contributing to the paucity of Pueblo I evidence in the canyon. Pre-pueblo II remains were found at all five sites tested by Jones (1986). These sites had been specifically selected for testing because their ceramic assemblages suggested use by both ancestral Pueblo and later Paiute peoples, but only two of them had surface remains indicating possible pre-Pueblo II usage. Upon excavation, however, all of the sites were found to contain at least a few sherds of pre-Pueblo II ceramics, such as Floyd Black-on-gray, Kana-a Black-on-gray, Lino Gray and Kana-a Gray. Deadmans Gray was present at all of the sites, although specific association with Pueblo I levels was not established.

Although Schwartz and his colleagues may be correct in assigning the earliest Formative use of Unkar Delta to intermittent occupation by the Cohonina, an alternative scenario in which the Cohonina and Anasazi used the eastern canyon as a neutral meeting ground for the exchange of goods can not be ruled out at this time. Certainly, the standard association of Kayenta ceramics with the dominant San Francisco Gray Wares demonstrates that Cohonina and Kayenta groups were in regular contact with one another during this period. Along the east slope of the Kaibab Plateau and on the Walhalla Plateau (Hall 1942; Schwartz et al. 1981), a few campsites with a mixture of Pueblo I–early Pueblo II Tusayan White and Gray Ware types and San Francisco Mountain Gray Ware also co-occur. The occurrence of Cohonina ceramics on

the north rim of the Grand Canyon is probably indicative of trade contacts between the Virgin and the Cohonina, rather than of an indigenous Cohonina presence. In a similar vein, many of the Cohonina plain wares recovered from the eastern canyon could have served as containers for traded commodities such as seeds, paints, or salt.

Most of the Pueblo I components identified within the Grand Canyon lack structural remains and appear to represent short term occupations or specialized activities, rather than habitations. At the present time, there is too little information available to permit a detailed reconstruction of Pueblo I settlement and subsistence regimes. The little evidence available suggests that Pueblo I occupation was seasonal and limited to a few favorable locations in the canyon.

Pueblo II Period, ca. A.D. 1000-1150

Pueblo II is the most thoroughly documented and best known period in Grand Canyon prehistory. More site components date to this period than any other. In large measure, this increase in components may be due to increased utilization of the inner canyon and adjoining uplands, perhaps in response to improved climatic conditions, which made dry farming feasible in previously unproductive areas (Euler et al. 1979). Certainly, the appearance of scattered terraced garden plots, check dams, and other agricultural features during the latter part of this period (Schwartz et al. 1981; Jones 1986b; Westfall 1987) indicates that dry farming was an important activity in both the uplands and inner canyon. Other factors that have been suggested to account for the apparent increase in sites during this period include in situ population growth (Aikens 1966; Mueller 1972) and migration from the neighboring Kayenta region into the eastern portion of the Grand Canyon (Plog 1979; Effland et al. 1981). Changes in settlement- subsistence strategies, which resulted in the creation of more structural sites over a relatively short period of time might also account for this phenomenon.

During the Pueblo II period, the Pueblo peoples expanded into every potentially arable location. In general, areas that were occupied during the Pueblo I period continued to be occupied during the following Pueblo II period. In addition, a number of upland and inner Grand Canyon areas only sparsely occupied prior to Pueblo II times show a dramatic increase in site numbers beginning around A.D. 1050. Pueblo II site concentrations are found on the Paria, Walhalla, and Powell Plateaus, the eastern and western flanks of the Kaibab Plateau, the southern and eastern rims of the Kanab Plateau (particularly around the heads of tributary drainages feeding into Kanab Creek), around Mount Trumbull, and in virtually every tributary canyon of the Colorado River with perennial water and patches of arable land.

Both within and outside of the canyon, Pueblo II sites typically contain one to three small masonry surface living rooms and associated storage structures. Habitation rooms may be either fully subterranean, semi-subterranean, or surficial, and may occur either as isolated units or as extensions of the contiguous storage structures. Storage and habitation rooms are often characterized by different construction techniques; for example, full height masonry walls and slab floors are typical of storage rooms, while jacal superstructures and clay floors are generally associated with habitation structures. The more substantial storage feature construction indicates a continuing concern for the protection of stored produce.

In the surrounding uplands, large sites containing a dozen or more rooms are relatively common during this period, although never as numerous as the one to four room habitation sites. These larger sites have been interpreted as intraregional redistribution centers (Effland et al. 1981; Heid 1982; Westfall 1986), based on relatively high ratios of storage to habitation rooms and greater density and diversity of artifacts relative to smaller structural sites. In contrast, Pueblo II structural sites within the canyon are consistently small, rarely exceeding more than half a dozen contiguous rooms at any locality and typically containing only one to three rooms per site.

The presence or absence of kivas at Virgin habitation sites has been an ongoing debate among archaeologists (Schroeder 1955; Aikens 1965; Effland et al. 1981). There is no question, however, that kivas were constructed in the eastern Grand Canyon during the late Pueblo II period. Two kivas were excavated at Unkar Delta, and one was uncovered at the Bright Angel site (Schwartz et al. 1979, 1980). None of these kivas exhibited the keyhole shape or formal arrangement of floor features common to many late Pueblo II kivas in the Kayenta region, but they were clearly distinguished from other structures at the sites by being fully subterranean and masonry-lined. In addition, one kiva at Unkar Delta contained loom anchor holes (Aikens 1965:28; Schwartz et al. 1980:294), a feature that is common to many late Pueblo II and Pueblo III Kayenta kivas.

Anasazi Population Movements and Subsistence Models in the Grand Canyon

Archaeologists have documented a diverse assortment of Puebloan site types and settlement patterns in the Grand Canyon region. Some of this apparent diversity may be temporal and some may be a reflection of sociocultural factors, but much of it appears to reflect the Pueblo people's adaptive

flexibility in the face of an ecologically diverse and climatically unpredictable environment.

As traditionally conceived, both the Virgin and Kayenta lifeways were primarily oriented towards a horticultural subsistence base. This primary orientation is reflected in the occurrence of permanent architecture accompanied by extensive storage facilities, ceramic production, horticultural implements such as hoes and digging sticks, grinding implements suitable for processing large quantities of grain, as well as by the abundant macrobotanical and palyonological evidence indicating that corn, squash, sunflowers, and other cultigens were grown, stored, and consumed at these sites. Further support for a horticultural subsistence focus is indicated by habitation site concentrations situated in proximity to arable land (e.g., AZ C:9:1, AZ C:13:1).

Over the years, there has been considerable discussion among archaeologists concerning the relative importance of hunting and gathering in the Anasazi economy (e.g.,Powell 1983). A mixed horticultural-foraging model involving seasonal mobility has become popular in recent years (Moffitt et al. 1978; Teague and McClellan 1978; Powell 1983; Westfall 1987). Although the hypothesis that wild and weedy plant species constituted an important component of the Puebloan diet is supportable on both empirical and logical grounds, the logistical strategies employed in subsistence activities remain open to debate.

A seasonal settlement strategy is logical from the standpoint of horticulturalists attempting to subsist in an agriculturally marginal, topographically diverse environment (Powell 1983). Geib et al. (1987; Geib 1992) proposes a seasonal settlement model for the Pueblo II occupation of the Glen Canyon region which may be applicable to eastern Grand Canyon as well. Geib's model posits the movement of people to the resource base, rather than the movement of resources to the consuming population as proposed by Lightfoot (1978) and others (e.g., Effland et al. 1981:48; Rafferty and Blair 1984). As pointed out by Geib et al. (1987:32), an early spring planting in the lowlands would have allowed the Anasazi to harvest green corn by early summer, while crops planted in the uplands after the danger of frost had passed would mature in the fall. The early summer lowland harvest would have provided a resource base to tide the Anasazi over through the fall, while the upland harvest could have been stored for winter consumption and the following year's seed.

This model avoids the problems associated with moving bulky subsistence resources between uplands and lowlands. Instead, populations move in tandem with the seasonal availability of resources. Spring greens, agave, and seed plants, such as Indian rice grass (*Oryzopsis*), could be harvested in the lowlands prior to maturation of the early summer crop, while pinyon nuts, berries, and other late maturing foods could be gathered in conjunction with the early fall upland harvest. In other words, a semi-mobile strategy involving biannual settlement shifts and double cropping may have developed as a strategy for dealing with spring-summer subsistence resource shortages (Geib et al. 1987:33).

Swarthout (1981) has proposed an alternative model based on ethnographic accounts of Southern Paiute settlement-subsistence strategies to account for Virgin settlement distributions in the western Grand Canyon and lower Virgin River region. This model would have the Anasazi hunting and gathering in the desert canyon environments during the spring, farming in the river valleys during the summer, and hunting and gathering in the uplands during the fall and winter (Swarthout 1981). According to this model, horticultural activities were restricted to valley bottom environments. Following a late summer harvest, the Virgin moved up on the plateaus to hunt deer and gather pinyon nuts. They remained in the uplands subsisting on wild foods and stored crops until early spring.

Swarthout's model of a seasonally transhumant settlement-subsistence system is not well supported by the archaeological record. Although there are numerous examples of Pueblo period roasting pits and other nonstructural sites along the below Kanab Creek, few sites could be construed as farmsteads. In contrast, the upland areas bordering the north rim of the canyon west of Kanab Creek contain numerous Pueblo II structural sites, several with check dams and related agricultural features, and many sites exhibit a high density and diversity of artifacts normally associated with a habitation function (Huffman et al. 1990; Wells 1991). One excavated site on the Kanab Plateau contained unequivocal evidence of local horticultural activity in the form of *Zea* pollen and pollen from chenoams, *Cleome*, and other weedy species that are commonly associated with disturbed garden soils (Scott 1987). This evidence suggests that Virgin horticultural activities took place in the upland zones away from the river bottoms, and that the inner canyon west of Kanab Creek was seasonally exploited for agave and other wild food resources.

None of the aforementioned seasonal settlement-subsistence models necessarily contradict the summer upland, winter lowland settlement strategy proposed by Schwartz et al. (1981:129) for the A.D. 1050-1150 period in the eastern Grand Canyon region. Schwartz's proposed biseasonal settlement model for the eastern Grand Canyon region specifically involved the Walhalla Plateau and Unkar Delta. According to this model, the inhabitants of these areas constituted a single population that

moved between winter-spring settlements on Unkar Delta to summer-fall farmsteads on the Walhalla Plateau. The idea of a single population occupying both areas is supported by heavy mineral ceramic analyses that demonstrate the existence of a single ceramic assemblage common to both areas (Balsom 1984). The extensive trail system linking the primary population centers in both areas offers additional circumstantial support for a single interacting population (Euler and Chandler 1978).

Seasonal movement between the inner canyon and plateau is also supported by architectural data. The infrequent occurrence of hearths at the Walhalla Plateau sites and their association with an extensive system of check dams, terraces, and waffle gardens implies a summer occupation of the uplands centered on horticultural pursuits. As Schwartz et al. (1981) and Euler (1979) point out, it seems highly unlikely that any population would choose to live at 8,000+ ft. elevation where winter snowfalls currently average 150 in., when a well-watered, warm, lowland area with an abundant driftwood fuel supply was located less than a days' walking distance away. Agricultural features are also present at Unkar Delta, suggesting that a double-cropping strategy may have been followed (early spring planting in the lowlands, late spring-early planting in the uplands).

Changing patterns of land use over time may contribute to the apparent diversity in Puebloan settlement strategies. For example, Effland et al. (1981:37) noted changes in the numbers of seasonally occupied rooms on the Powell Plateau over time, with greater room numbers associated with Black Mesa and Sosi Black-on-white ceramics and fewer seasonal rooms associated with Flagstaff Black-on-white ceramics. Effland et al. (1981:37) interpret this pattern to reflect decreased use of seasonally occupied sites during the last phase of occupation. An alternative explanation would have the Puebloans occupying seasonal sites off the Powell Plateau during this later time period. In support of this hypothesis, ceramic assemblages collected by Schwartz (1960) from Shinumo Canyon, immediately below the Powell Plateau, indicate primary use of this area after A.D. 1100. These various lines of evidence indicate that the co-existence of large and small sites within the confines of Powell Plateau was primarily an early and middle Pueblo II phenomenon, and that a multiple cropping, upland-lowland strategy became more prevalent during the late Pueblo II and early Pueblo III periods.

Within the eastern canyon, intensive occupation of arable lands seems to have been primarily confined to the late Pueblo II-early Pueblo III period. Schwartz (1965) and others (e.g., Euler and Chandler 1978; Effland et al. 1981; Schwartz et al. 1980) have consistently placed the primary occupation of the inner canyon deltas between A.D. 1050 and 1150 (mid-late PII), but new information on the dating of ceramic types from the Kayenta region (Ambler 1985; Dean 1982) require these dates to be slightly revised. According to Schwartz's ceramic data, most of the occupation on Unkar Delta occurred during the Zoroaster (A.D. 1075-1100) and Dox (1100-1150) phases (the earlier Vishnu phase, A.D. 1050-1070, was defined on the basis of a single site). The key diagnostics for the Zoroaster phase include Sosi and Dogoszhi Black-on-white, Tusayan Black-on-red, and Citadel and Cameron Polychrome ceramics, while the Dox phase is marked by the appearance of Flagstaff Black-on-white and small amounts of Tusayan Polychrome. Ambler's (1985:51) analysis of securely dated single component ceramic assemblages from the northern Kayenta region indicates that sites exhibiting high frequencies of Sosi and Dogoszhi Black-on-white and Tusayan Black-on-red with minor percentages of Medicine Black-on-red, Black Mesa Black-on-white, and polychromes date around A.D. 1100, while sites with Flagstaff Black-on-white and Tusayan Polychrome post-date A.D. 1150. In combination, the ceramic data from Unkar Delta suggest that the main period of intensive occupation spanned a period from about A.D. 1075 to 1200. If so, the summer upland-winter lowland strategy postulated by Schwartz and others is primarily a late Pueblo II development that continued into the following early Pueblo III period.

One question that naturally arises concerning the extensive use of upland environments during late Pueblo II is why this pattern was apparently restricted to the post-A.D. 1050 period. Two factors commonly cited to account for this settlement shift include climate change and the introduction of new crops. Evidence for a period of increased moisture and warmer temperatures across the central Colorado Plateau between ca. A.D. 1050 and 1150 is well established (Dean et al. 1985; Euler et al. 1979; Petersen 1983); recent studies of alluvial deposits along river corridor support the model of increased run-off during the 11th and early 12th centuries A.D. (Fairley et al. 1991; Hereford et al. 1993). The introduction of new strains of maize specifically adapted to more arid conditions with shorter growing seasons could have contributed to the Pueblo II expansion (e.g., Martin and Plog 1973: 277). Increased rainfall coupled with the introduction of new strains of dought-resistant corn would permit dry-farming in previously unsuitable areas. Although these factors could account for Pueblo II expansion in the uplands, they do not adequately account for the simultaneous expansion into lowland canyon environments.

The introduction of cotton is one factor that could have provided a catalyst for the colonization of previously underutilized lowland areas such as the inner Grand and Glen Canyons. The incorporation of cotton into the Puebloan horticultural system may have contributed to the development of a seasonally mobile settlement strategy, because cotton grows best in relatively hot, well-watered areas with long growing seasons, while other crops such as beans do better in cooler environments. Cotton cultivation would have necessitated continued use of lowland environments, even after improved climatic conditions permitted dry farming in previously unproductive environments such as the Walhalla Plateau.

The timing of the introduction of cotton cultivation on the Colorado Plateau is crucial for interpreting the role of this commodity in the development of western Pueblo socioeconomic systems. In the Glen Canyon region, cottonseed and bolls indicative of local cultivation appear sometime during the Pueblo II period (Cutler 1966). Dating of cotton from the Virgin area has not yet been attempted, although a Pueblo II date is generally assumed. Cotton bolls have been recovered from a Pueblo II granary (AZ C:13:11) below Unkar Delta (Cutler and Blake 1980:211), indicating that the cultivation of cotton occurred in the eastern Grand Canyon during this period. Kent (1983:28) suggests an A.D. 1100 date for the beginning of cotton cultivation on the Colorado Plateau, while Hall and Dennis (1986:111) propose a post-A.D. 1100 introduction date.

The initiation of cotton cultivation in the canyon lowlands sometime during the late Pueblo II period may be tied to the concurrent influx of Kayenta tradewares and other Kayenta traits in eastern Grand Canyon. As noted by Altschul and Fairley (1987:) and substantiated by recent analyses (see ceramics chapter, this report), Kayenta trade wares and locally produced analogs are common in the canyon after ca. A.D. 1050, and Kayenta style kivas make their first appearance in the Grand Canyon around this time. This influx of Kayentan traits has been interpreted as evidence for a Pueblo II migration of Kayenta people into the eastern Arizona Strip (Hall 1942; Effland et al. 1981). This hypothesis, although never subjected to rigorous testing, has gained considerable acceptance in recent years (e.g., Effland et al. 1981; Plog 1979). The context in which this hypothesized expansion occurred has never been elucidated. It is suggested here that the appearance of cotton cultivation on the Colorado Plateau during Pueblo II times was a "prime mover" for the demographic expansion into the canyon lowlands.

Pueblo III Period, ca. A.D. 1150-1200/1225

There is a notable lack of consensus in the archaeological literature concerning the nature and extent of prehistoric Pueblo occupation in Grand Canyon after A.D. 1150 (Altschul and Fairley 1989). Many investigators maintain that the region was abandoned by A.D. 1150 (Aikens 1966; Effland et al. 1981; Euler and Chandler 1978; Euler et al. 1979; Schwartz et al. 1980, 1981; and others).

The principal diagnostic for this period is Flagstaff Black-on-white, a Kayenta ceramic type. This type usually co-occurs with Sosi and Dogoszhi Black-on-white, Tusayan and Moenkopi Corrugated, or the Virgin equivalents (Walling et al. 1986:352). Breternitz (1966) placed the beginning date for Flagstaff Black-on-white at ca. A.D. 1100, but Dean's (1982) more recent analysis of tree-ring data indicates that the type was not manufactured prior to A.D. 1150.

Although uncommon, sites with Flagstaff Black-on-white occur in eastern Grand Canyon (Jones 1986b; Schwartz et al. 1980; Schwartz et al. 1981), as well as on the Paria Plateau (Haskell 1978; Mueller et al. 1968), in the Houserock Valley area (Judd 1926; USFS Kaibab National Forest site files), and south of the canyon in the Coconino Basin and Desertview area (Rice 1980; NPS Grand Canyon site files). In eastern Grand Canyon along the Colorado River, Jones (1986) obtained two late charcoal dates—A.D.1360 ±140 and A.D.1250 ± 90—from AZ:C:13:10, a multicomponent habitation site. Although somewhat late, these radiocarbon determinations generally support the A.D. 1150 to 1220 occupation dates suggested by the presence of Flagstaff Black-on-white and Tusayan Polychrome sherds. Jones (1986:110) placed the abandonment of this site at around A.D. 1200.

Further evidence for continued occupation into the early thirteenth century comes from excavated and tested sites on the Kanab Plateau (Thompson and Thompson 1974; Huffman 1991; Westfall 1987). Radiocarbon determinations from four widely separated sites range from the late A.D. 1100s to early 1500s. At GC-671 in the Tuweep area, the Thompsons obtained a suite of four dates ranging from A.D. 1110 ± 110 to A.D. 1320 ± 100. This site had been specifically selected for excavation because the ceramics indicated it to be a single component occupation dating to the latest period of Pueblo occupation in the area, and it was hoped that dates from the site would shed some light on the dating of the Puebloan emigration from the region. Although the ceramics at GC-671 suggested an occupation during late Pueblo II, Thompson and Thompson (1974:20) were inclined to accept the overlapping dates as evidence of an occupation terminating around A.D. 1250. More recently, Westfall (1987) reported a series of thirteenth and fourteenth century radiocarbon dates from the Pinenut site. Once again, the ceramic assemblage indicated a predominantly Pueblo II occupation

date, but a tight cluster of five dates ranging from A.D. 1235 ± 55 to A.D. 1360 ± 85 argued for an ending date around A.D. 1250 or 1275 (Westfall 1987:90).

Termination of the Formative Pueblo Occupation

The Pueblo emigration from Grand Canyon during the thirteenth century is commonly attributed to one of two causal agents: prolonged drought (Schwartz et al. 1981; Euler and Chandler 1978; Euler et al. 1979) or Numic population expansion (Euler 1964; Madsen 1975; Schroeder 1961; Steward 1933). The pros and cons of these various arguments have been discussed in detail elsewhere (Altschul and Fairley 1989:139-144). The river corridor survey did not uncover new evidence that would refute a specific argument, although the geomorphological studies of Hereford et al. (1993) support arguments for climate induced environmental change during the late 1100s A.D.

Schwartz's data from Unkar Delta suggested that between A.D. 1100 and 1150, settlements shifted from the river terraces to talus slope and dune locations. These locational adjustments were interpreted as evidence that arable land was in shorter supply during this period relative to the preceding period (Effland et al. 1981:44). Settlement data showed that the population size was roughly comparable to that of the preceding phase, therefore reduction of the area's carrying capacity must have occurred (Schwartz et al. 1980:186). Climate change accompanied by widespread erosion is cited as the primary causal agent responsible for settlement shifts during this period (Dean et al. 1985; Schwartz et al. 1980). The climate change hypothesis is supported by ongoing geomorphological studies in eastern Grand Canyon which show that aggradation of the Pueblo II river terrace ceased around A.D. 1150-1200 and was followed by a depositional hiatus that lasted for several centuries (Hereford et al. 1993).

With regard to the Numic expansion hypothesis, aggression and resource competition from hunter-gatherers have been frequently suggested as factors influencing the Puebloan abandonment of the Grand Canyon region. Although hunter-gatherer aggression has been repeatedly cited as a causal agent (e.g., Euler 1964:380; Schroeder 1961:113; Steward 1933:20; Ambler and Sutton 1986), this position has never gained wide acceptance due to the lack of supporting data. Euler, a former proponent of the Numic aggression hypothesis (Euler 1964:380) is now of the opinion that the Puebloan abandonment was largely a response to adverse climatic conditions. Euler et al. (1979; Dean et al. 1985) postulate that a mid-twelfth century drought forced large scale settlement shifts over broad areas of the Colorado Plateaus, which led to a disruption of exchange networks and subsequent systemic collapse. Only in those areas most favorable to horticulture were Pueblo people able to maintain or re-establish their cultural system in a somewhat modified form. Euler currently sees no causal relationship between the Anasazi abandonment and later Pai and Paiute occupation of Grand Canyon. He maintains that abandonment occurred by A.D. 1150, followed by a 150-year-long occupational hiatus. An entry date for the Southern Paiutes around A.D. 1300 is postulated (Robert C. Euler, personal communication 1986).

Euler's position is partially supported by testing results from two stratified midden sites in western Grand Canyon (Jones 1986). At AZ:A:16:1 near Whitmore Wash, Paiute ceramics and sandals overlay strata containing Moapa Gray ware. A charcoal sample from a roasting pit in the Paiute level produced an uncorrected date of A.D. 1245 ± 75; regrettably, comparative dating of the Virgin levels was not attempted. Nevertheless, a distinct break in the stratigraphy was readily discernible between the Virgin and Paiute levels. At the Tuna Creek site, AZ B:15:7 (ASM), a 20 to 50-cm-thick band of sterile, waterlaid sediment separated a lower stratum containing Virgin ceramics from an overlying stratum with Paiute brownware and Jeddito Black-on- yellow ceramics. Sedimentological analyses indicated that the sterile band could have been deposited by a single flash flood event (Karlstrom 1986:30), but the lack of overlap in the artifactual materials from the two cultural strata suggested that there had been a significant hiatus between the two occupations. Unfortunately, the radiocarbon dates from the upper and lower levels were inconclusive regarding the duration of this hiatus (Jones 1986b:106). Although the data recovered from these two sites are equivocal in many respects, the stratigraphic separation of the Paiute and Virgin materials, in conjunction with the late thirteenth and fourteenth century dates from the Paiute levels at both sites, lend support to Euler's argument that an occupational hiatus during the 1200s preceded the Paiute entry in the Grand Canyon region.

The Late Prehistoric-Historic Transition

In this report, the period following the Pueblo emigration from the Grand Canyon through the mid-nineteenth century is referred to as the Late Prehistoric-Historic Transition. Elsewhere (Thompson et al. 1983:131; Walling et al. 1986; Altschul and Fairley 1989), the term "Neo-archaic" has been used to refer to this same temporal interval. The term Neo-archaic has been criticized for its regressive evolutionary implications; hence, the substitution of a strictly chronological term.

This period can be dividied into three temporal subdivision: Late Prehistoric, Protohistoric, and Historic (Altschul and Fairley 1989:147) . The Late Prehistoric period begins after A.D. 1200 and lasts until ca. A.D. 1600, when indirect influences from the Spanish presence in New Mexico presumably first reached the inhabitants of the Grand Canyon region. The Protohistoric spans the period between A.D. 1600 and 1776. During this period, the aboriginal inhabitants of the Grand Canyon region experienced indirect effects from the presence of European colonies in New Mexico and California, but had yet to be subjected to direct Anglo contact. The pioneering explorations of the Spanish friars Dominguez and Escalante during the late autumn of 1776 (Bolton 1950; Warner and Chavez 1976) marks the dividing point between the Protohistoric and Historic periods. Early in the Historic period, limited contacts with Spanish explorers and traders and Anglo American trappers occurred on a sporadic basis, slave raiding began, and fur trapping became an important impetus for an increasingly strong Anglo-American presence in the region. Until the mid-nineteenth century, however, very little historical documentation is available for the area, hence most of our knowledge about this period comes from archaeological studies. The dividing point between the early and late Historic period is placed at A.D. 1850, when military explorers and Mormon settlers effectively penetrated aboriginal territorial frontiers in northern Arizona.

The archaeological remains of the late prehistoric-historic transistion can be linked directly to several modern Native American tribes. Artifacts attributable to ancestral Hopi, Paiute, and Pai peoples were located in the river corridor. Hopi ceramics occurred in Reaches 0, 1, 4, 5, 10, and 11. Paiute sherds occurred in Reaches 3-6 and 9-11, while Pai sherds occurred in Reaches 6-11. Although the Navajo Tribe also maintains ancestral claims to the Grand Canyon, no unequivocal Navajo sites or diagnostic artifacts predating the late nineteenth century were identified during the course of this project. This does not preclude the possibility that some of the sites listed as "cultural affiliation unknown" were in fact the product of Navajo occupation.

The non-perishable artifacts associated with ancestral Pai and Paiute sites show little stylistic change over time (Euler 1981). The seasonal mobility of Pai and Paiute subsistence systems precluded the development of an extensive or elaborate material culture or permanent architecture. Instead, their material culture emphasized functionality and portability. Items constructed of lightweight perishable materials (principally plant fibers, wood, horn, and hides) comprised the bulk of material goods. Basketry was probably the most highly developed technology in terms of investment of production time and creativity. Unfortunately, these perishable artifacts are rarely preserved or recovered in survey situations. Hunting-related implements made of chipped stone were also an important aspect of the technology, but little specific information pertaining to this aspect of protohistoric technology is currently are available. The Desert Side-notched projectile point is considered to be diagnostic of this general time period but is not a reliable cultural indicator (Altschul and Fairley 1989; Fowler and Matley 1979; Holmer and Weder 1980). In southeastern Nevada and southwestern Utah, these points have been recovered from stratified shelter deposits radiocarbon dated to A.D. 1150-1300 (Fowler et al. 1973), but farther to the south and east, this point apparently is restricted to the post A.D. 1300 period. In the case of non-perishable and non-portable items such as metates, ceramic vessels, and dwellings, it appears that both Pai and Paiute peoples made opportunistic use of readily available materials, including pre-existing Puebloan artifacts and structures (Stewart 1941; Fowler and Matley 1979; Fowler and Fowler 1981:141, 145).

On open sites, occasional finds of pottery and distinctive projectile points provide the most conclusive evidence of Pai or Paiute utilization. Of the two artifact classes, pottery provides the most reliable indication of cultural affiliation. Southern Paiute Utility Ware was originally described by Baldwin (1950b) with subsequent revisions by Euler (1964), Hunt (1960), and Fowler and Matley (1978), while Tizon Brown Ware, the indigenous pottery of the Hualapai and Havasupai, was defined by Euler and Dobyns (1958).

The perishable nature of most late prehistoric-protohistoric artifacts, the lack of stylistic development in nonportable goods, the opportunistic use of raw materials and Puebloan artifacts, and the transiency of most site occupations make the identification of temporally specific subdivisions of Pai and Paiute occupations in Grand Canyon difficult. Because of the general lack of temporally sensitive artifacts, the dating of Pai and Paiute sites in Grand Canyon largely depends on the presence of aboriginal and Euro-American trade items. The primary diagnostic artifacts for the late prehistoric period are Hopi ceramic types, Awatovi Black-on-yellow, Jeddito Black-on-yellow, and Jeddito utility wares. Hopi tradewares such as Sitkyatki Polychrome, European trade beads, and various other historic artifacts are indicative of the protohistoric and early historic period. Hopi ceramics are by far the most common temporally diagnsotic artifacts recovered from Pai and Paiute sites. In the western canyon, the presence of these widely traded ceramic types can not be taken as direct evidence of a

late prehistoric-protohistoric Hopi occupation (Baldwin 1944; Schaefer 1969), but they do provide evidence that Hopi influences were felt far to the west of the Hopi's historic territorial domain.

There has been considerable discussion and disagreement among anthropologists concerning the sociopolitical structure of Great Basin hunter-gatherers, including the Southern Paiute (Kelly 1934; Manners 1959; Owen 1965; Service 1962; Steward 1933, 1965, 1970) and Pai peoples (Dobyns 1957; Dobyns and Euler 1970; Stone 1987). Most scholars are in agreement with Kelly (1934) that the term "Paiute" had little meaning as a tribal designation to the people so named; however, this may not have been equally true for contemporary Pai groups (Dobyns and Euler 1970).

Kelly identified fifteen historic Southern Paiute bands. Four of these bands claimed ranges that overlapped with the Colorado River corridor. From east to west, they are San Juan, Kaibab, Uinkaret, and Shivwits. According to Kelly, the San Juan claimed the area south and east of Glen and Marble Canyon to the base of Black Mesa as far east as Monument Valley. The Kaibab territory extended from Kanab Creek to the Paria River and north from the Colorado River to the Pink Cliffs. The Uinkarets ranged between Kanab Canyon and the Hurricane Cliffs as far north as the Virgin River. Shivwits territory included the area between the Hurricane and Grand Wash Cliffs south from the Virgin Mountains to the Colorado River. Ethnographic information on Pai band territories is less complete than for the Southern Paiute (Kroeber 1935; Euler and Dobyns 1970). This is due in part to historical factors related to mineral exploitation which caused massive disruptions to the aboriginal Pai lifestyle (Dobyns and Euler 1969) several decades before Southern Paiutes experienced similar effects north of the Colorado River. In addition, no ethnographic studies comparable to those carried out among the Southern Paiutes were ever undertaken among the Pai bands. (The earliest ethnographic study of the Pai [Kroeber 1935] is actually a haphazard compilation of students' notes collected over a few weeks as part of a summer field school program.) By default, most information on aboriginal Pai culture is derived from historical records (Dobyns 1957; Dobyns and Euler 1969, 1970), supplemented by archaeological studies (Euler 1958; Euler and Dobyns 1958).

What little ethnographic information is available suggests that at least seven bands used the territory bordering the Colorado River in historic times. Their Anglo names reflect their primary residences: Red Rock, Clay Springs, Grass Springs, Milweed Springs, Peach Springs, Pine Springs, and Cataract Canyon (Havasupai) (see McGuire [1983] and Stone [1987:28] for more detailed discussion of these bands and their territories).

Kelly documented the Kaibab Paiute pattern of seasonal mobility in considerable detail, noting the locations of base camps, important water sources, favored areas for gathering specific plant resources, and communal hunting grounds. Less information is available on the other Southern Paiute groups whose ranges bordered on or included portions of the Colorado River corridor, but the Kaibab model is probably applicable to these other bands as well. From Kelly's study, we know that nineteenth century Southern Paiutes practiced a subsistence strategy based on seasonal transhumance. Highland areas such as the Kaibab Plateau were occupied during late summer and fall for berry, seeds, and pinyon nut gathering and deer hunting. Extended family groups aggregated into larger units at this time of year. Rabbit drives were conducted in the valley bottoms and some large game, such as bighorn sheep and antelope, were hunted communally. Surplus food was cached in sheltered granaries for later use. As winter drew near, small extended family groups split off and moved to base camps in the lower elevation pinyon juniper zone where winter fuel wood was plentiful. Proximity to springs (probably 1 to 3 km distant) was the primary factor controlling the selection of base camp sites. During the winter, periodic trips were made to the food caches that were usually situated in rockshelters. As winter abated and autumn food stores dwindled, the family groups moved to lower elevations in and adjacent to the Colorado River gorge where agave, cacti, and early spring greens could be gathered. During the summer, the scattered families moved back to their base camps and gathered and hunted in the vicinity. Small irrigated patches of corn and squash were casually cultivated by some band members, and periodic foraging trips to higher elevations were also undertaken. As summer waned, small groups abandoned their base camps and moved on to the plateaus once again.

This model of the annual settlement-subsistence round should not be construed as a rigid pattern of seasonal movements. In fact, the Southern Paiute settlement-subsistence system was characterized by flexibility (Bettinger and Baumhoff 1982; Fowler 1982). The seasonal availabilty of key plant resources and the overall abundance of food resources influenced yearly mobility patterns. During periods of abundance, fewer moves were required, whereas during lean years, individual family groups might forage over considerable distances, sometimes well outside their traditional use areas. There were usually a variety of options to choose from, and the final decision was often based on social considerations

in addition to subsistence needs (Fowler 1982). Although abundant archaeological remains testify to the Pai's extensive use of the inner canyon, particularly in Reaches 10 and 11, there is little ethnographic documentation pertaining to their specific activities in this area. It is generally assumed that Pai bands followed an annual cycle similar to that of their Paiute neighbors (Kelly 1964). According to this model, occupation of the inner canyon would have occurred primarily during the late winter-early spring, when stored resources on the plateau had been exhausted and agave plants concentrated starches in their basal stalks in preparation for blooming. Large crater-shaped masses of burned rock, commonly termed mescal pits or roastesr, are abundant throughout the western reaches of the river corridor. Although these features may have been used for a variety of roasting activities, agave processing was the primary function (Weber and Seaman 1985).

Kelly's (1964) description of nineteeth century Kaibab Paiute settlement-subsistence systems provides a useful model for interpreting prehistoric Pai and Paiute archaeological remains from Grand Canyon. Nevertheless, one must remember that this is a reconstruction of aboriginal Paiute culture after the time of white contact. None of Kelly's informants had direct first hand knowledge of the initial contact period. Furthermore, dramatic changes could have resulted from the introduction of Old World diseases and technology and historically induced patterns of slave raiding by neighboring groups. All of these factors could have profoundly altered aborginal culture patterns prior to European contact (Crosby 1972; Fowler and Fowler 1981:150).

Chapter 9

Historical Archaeology

by Christopher Coder

The history of the Grand Canyon is a story of water. Although the canyon owes its existence to the persistence of water, the region into which it is carved is characterized by a general lack of it. Paradoxically, early exploration was thwarted by a dichotomy of water; there was too little in the country surrounding the canyon to penetrate it effectively and too much in the river to make it negotiable. The problem is manifested again today by an almost daily polarity of water flowing down the river: too little and too much.

Three aspects of the canyon—the river, the rims, and the angular broken ground lying in between—formed in unison a great physical barrier for the entire region. The severe topography of the province acted as a baffle to the Spanish and Anglo-Americans that tried to explore it for over three centuries. In 1869 these obstacles were finally surmounted and since that time the Grand Canyon of the Colorado has seen an accelerated and nearly continuous parade of explorers, miners, engineers, capitalists, thrill seekers, tourists, and scientists. This has resulted in an overlay of historical and modern cultural material throughout Grand Canyon.

The current project has documented 82 Euro-American historical sites between Glen Canyon Dam and Separation Canyon. These resources will be discussed below in a thematic framework based on categories derived from the National Register of Historic Places. The bulk of the historic sites fall under the headings of mining, engineering, recreation, transportation, and the stock industry.

Historical Background 1540-1870

For the prehistoric populations in the region the grandeur of the canyon acted as sacred ground, grocery store, farm, school, office, and simply home. Yet for the Spaniards who saw it in the late summer of 1540, the view was off the European scale.

The first formal expedition by the Spanish into the present-day southwestern United States was led by the young governor of New Galica, Francisco Coronado. The expedition consisted of over 500 persons, including "300 gentlemen on horseback" representing several European nations (Webb 1959:102), thousands of horses, cattle and sheep, and a wagon train over a half-mile long. The entire project was funded on the basis of a rumor that seven cities of gold known as Cibola were believed to exist in the American Southwest (Winship 1964; Hallenbeck 1950).

When the Spaniards reached Cibola (Zuni) in the early summer of 1540, it was apparent from the adobe walls that gold was not the material used in construction. Pursuing every avenue of potential for treasure, Coronado sent Pedro de Tovar to the northwest to investigate the province of Tusayan (Hopi). Tovar returned from Hopi with no gold but with the story of a large river running off to the west. Coronado then dispatched Maestro de Camp Juan de Cardenas and 12 men to cover the ground and search out the river. Guides were obtained at Hopi, and in early September of 1540, Europeans peered over the rim of the Grand Canyon for the first time (Winship 1964).

Somewhere near Desert View the three most agile men in the company, Captain Melagosa, Juan Galenos, and an anonymous soldier, descended about a third of the way to the river. Overcome by the formidable terrain and lack of water, they returned the afternoon of the same day to report that the rocks that looked to be the size of a man from the rim were taller than the Tower of Seville, and the river that looked only a few feet wide was a raging torrent (Winship 1964). The Spaniards were astounded by what they saw.

The Hopi guides told Cardenas that when they traveled through this country, they brought along women carrying extra gourds filled with water to bury at a halfway point for the return trip (Babbitt 1978). What they knew perfectly well and did not tell the Spaniards was how to get to the river. After four days of fruitless attempts, the Spaniards in their heavy armor on their thirsty horses retired for lack of water.

Meanwhile another captain of the expedition, Melchior Diaz, was sent westward for a rendezvous with the two supply ships sailing up the Gulf of California. These support ships, lead by Hernando Alarcon, entered the mouth of the Colorado River the same week Cardenas left Hopi for the Grand Canyon. Alarcon ascended the Colorado in a small boat for 80 miles, naming it the Buenaguia River, then returned to his worm-eaten ships and sailed back to Mexico. Diaz and his party arrived two weeks too late. They found a cross and a message, but Alarcon and the supplies were gone. Unwittingly Diaz named the river again for the firebrands carried by the Mojave Indians, Rio Tizon (Winship 1964; Verkamp 1940).

The Colorado had now been named twice in the same month, in the same place, by two officers from the same expedition. To compound the confusion, the very capable Diaz impaled himself through the groin on his own lance in a freak accident. He died on the lower Colorado in January 1541, 250 years before the Bill of Rights was signed

(Hammond 1940). Melchior Diaz thus had the triple distinction of being one of the first Europeans to see the Colorado River, one of the few to misname it, and the first, and possibly the only man to die by his own lance in Arizona.

After Coronado returned to Mexico in 1542, there was a hiatus of over 200 years for the Spanish at the Grand Canyon. Oñate visited Hopi and the Verde Valley as the sixteenth century turned over, but by then the lack of gold, natives, and water was transferring Spanish colonial interests to the more densely populated, better-watered region of northern New Mexico. It was after Oñate's travels that Colorado became the commonly used name for the river (Coues 1900; Hallenbeck 1950; Webb 1959).

The legacy of the Spanish has not gone altogether unnoticed at the Grand Canyon. Pedro Tovar has a lovely hotel named for him at the south rim, where getting a cool glass of water on a hot afternoon is never a problem. Maestro de Camp Cardenas, butcher of Tiguex Pueblo and leader of the first expedition to the Grand Canyon, has a butte and a creek named after him. The creek occasionally flows into the Colorado near mile 71.

On Valentine's Day, 1776, Father Francisco de Garces left San Xavier del Bac in southern Arizona for the Hopi mesas. En route, he spent five days with the Havasupai in Cataract Canyon and observed the horrible abyss of the Grand Canyon, which he called the "Puerto de Bacareli" in honor of the viceroy of New Spain. From his vantage he could see the smoke of fires on the north rim, which the Supai attributed to the Payuces (Paiute). On June 26, 1776, he entered in his journal the following: "I am astonished at the roughness of the country." He was the first European to see the Grand Canyon from a western approach (Coues 1900:348-349).

Seventeen seventy-six was a banner year in the United States. In the summer after Garces left San Xavier del Bac, two Spanish priests, Dominguez and Escalante, moved out of Santa Fe on a trip to glean new souls for Mother Church. Their travels took them through western Colorado into north-central Utah and back by way of northern Arizona and, unavoidably, the Grand Canyon of the Colorado River. By late October of the same year, the hungry and humble party reached the mouth of the Paria River, which would become Lees Ferry a century later. Here two men swam the river, losing their clothes in the process. They returned to the friendly shore exhausted, naked, and freezing. In a moment of ecclesiastical humor the padres named this camp "San Benito Salsipuedes," vernacular for "get out if you can" (Verkamp 1940; Warner 1976).

On the first of November, the priests, men, and uneaten horses moved upstream and after a week of arduous travel, forded the Colorado River. The location, known as the Crossing of the Fathers, is now under the waters of Lake Powell. The only discovery they made was that the vast area of desolation encountered by Coronado's men was vaster and more desolate than previously realized.

Anglo-European events at the Grand Canyon were to wait for three more generations and the coming of the white Americans. During this lapse the political map of the United States changed radically. From 1800 to 1845 the government in Washington more than doubled in size from lands acquired in the Louisiana Purchase and the Mexican-American War. The war with Mexico brought the Arizona Territory into the American political sphere and with it the Grand Canyon of the Colorado. With this new ownership came the Army expeditions of the 1850s.

Prior to this, American involvement in the Grand Canyon country was limited to infrequent visits by American frontiersmen as individuals and in small groups trespassing on Mexican ground. For these men the river was unmanageable, and like the Spaniards before them, they skirted the rim country and rarely, if ever, ventured into the canyon itself. The scanty information they were to provide later was a mix of fact and fiction. Nevertheless, these men were true wilderness figures and deserve to be mentioned: Jedediah Smith, William Sublette, Bill Williams, Christopher "Kit" Carson, James "Ohio" Patty, and Ewing Young, to name a few (Young 1969; Batman 1988; Verkamp 1940).

Between 1850 and 1859, the region was crossed by several Army expeditions: Derby in 1850, Sitgreaves in 1851, Whipple in 1853, Ives in 1858, and Beal with his camels also in 1858. The Ives expedition worked north from Yuma up the Colorado River, moved overland from Black Canyon, and descended Diamond Creek in early April. At this point John Strong Newberry drafted the first geologic column of the Grand Canyon. Newberry was the first white to envision the vast scale of erosion occurring in the province and described Arizona as being "overdrained." This notion was put to use later by two of the giants of early American geology, Karl Grove Gilbert and Captain C.E. Dutton (Ives 1861; Pyne 1982; Hinton 1878).

A major interruption was to occur in 1861, when the American Civil War effectively halted westward expansion for four years. For the lands and native peoples of the American West it was the calm before the storm. White people returned east to participate in the struggle. The army relinquished its tenuous hold on numerous rivers and mountainsides, and the West temporarily returned to the days of differential anarchy it had enjoyed before the Anglo-Americans came. Denver was cut off from the outside world for over a year, homesteads were abandoned, and from the Pecos to the

Milk rivers the various tribes of the plains and plateaus were resurgent.

After four bloody years, the Federal Government emerged from the struggle victorious with the realization that the United States was now an industrial power. Federal muscle had been flexed and could now be put to good use. The war had sobered American culture and caused it to believe itself righteous as well as mighty. The government and private citizen alike boxed up their cameras, transits, and chronometers, strapped on their repeating rifles and cast iron skillets, and proceeded back across the 98th meridian with a vengeance and a mission: the subjugation of the West.

The Colorado River and its labyrinth of canyons was not a high priority on the government's postwar agenda. Its initial in-depth exploration was organized and carried out by a small group of men, funded by their own means with some money from a small Methodist college in Illinois. Commissary provisions sanctioned by President Grant were to be procured at various frontier Army posts.

The driving force behind the expedition was a one-armed Civil War veteran turned school teacher, John Wesley Powell. Powell was born in 1834 to an itinerant Methodist preacher and his wife in New York State. The family moved to Ohio, then Wisconsin, and finally Illinois. During his childhood John Wesley developed a passion for scientific knowledge that he cultivated his entire life. The year before the war broke out, he won an award at the Illinois State Fair for his mollusk collection (Young 1969).

In 1861 Powell joined the Union forces and proceeded south with his Illinois regiment. Intelligent men rose quickly in that bloody arena. He went from Corporal to Major in six months, lost an arm in the carnage at Shiloh, Tennessee, and served out his tenure on Grant's staff in the artillery service. In a situation unique to the Army before and since, Powell's wife, Emma Dean, was allowed to accompany him on campaign throughout the war as his "right arm" (Young 1969).

Powell was to later comment in his journal that the Colorado River held little terror compared to the horror of a Civil War field hospital (Powell 1957).

After the war he secured a job as Professor of Geology at Wesleyan College in Bloomington, Illinois. In 1867 his drive and field orientation to knowledge found him in Middle Park, Colorado, at the camp of Jack Sumner. It was here that the plan to go down the Colorado River was conceived.

Initially Powell had planned a trip to the badlands in the Dakota territory to do geological and paleontological work. He was dissuaded in this by Sumner as the northern Plains were too dangerous for a small scientific party due to hostile Sioux. Sumner suggested the unknown canyons of the Colorado as a better alternative to which Powell agreed (Stanton 1982:169).

Sumner was born in Illinois in 1840 and, like the Major, was a Civil War veteran. He had served as a sharpshooter and scout with the 32nd Iowa and when the war ended he moved west. He was successful as a hunter, a trapper, and a trader to the Utes. When Major Powell encountered him in 1867, he was well outfitted and highly regarded (Stanton 1982). If Powell was the man most responsible for the success of the expedition, then Sumner was the man responsible for the success of Powell.

Powell returned to Illinois to have the boats constructed and make further arrangements. Sumner, who had designed the boats, remained in the West to collect supplies and fill out the crew. By the Spring of 1869 the boats, nine men, and provisions were in Green River, Wyoming, ready to depart. On May 24 the boats put on the water and headed down into "the great unknown" (Powell 1957; Stanton 1982).

The trip that ensued is much written about and well known. The next two months were marked by exhilarating rapids, arduous work, beautiful scenery, intense personal friction, and meager rations. After losing their saleratus (baking soda) at Bright Angel Creek, dinner consisted of rancid flour mixed with river water and baked into what the crew called "dough-gods." All of their sugar had melted into the river. There was however plenty of coffee (Stanton 1982).

Through journals and diaries kept by men of this expedition, it can often be determined where Powell's men actually camped and/or did specific tasks. Floods in excess of 120,000 cfs since 1869 have removed any evidence of these camps and, like their sugar, whatever remained after their passing melted into the river. There is, however, an enigmatic historic camp near river level in Reach 7 (AZ B:X:X) that fits nicely with Sgt. Bradley's description of a specific camp site used by the crew during a rain layover. Hand-laid stone steps lead to a shallow overhang where Bradley may have waited out the storm. The stones are now encrusted by cryptogammic soil and tell us nothing conclusive about the person that placed them. Besides the steps, nothing remains (personal communication Jan Balsom 1991, and Dick Clark 1992).

The end of the trip was marked by an unfortunate event that is still the source of controversy. Below Diamond Creek at a place now called Separation Canyon, the Howland brothers and William Dunn decided to abandon the river and take their chances on foot. They left due to irreconcilable differences with the Major and his brother Clemet Powell. The three men were killed on the Kaibab Plateau within days of leaving the river. It was commonly accepted that Paiutes did the

killing, but major players on the expedition, including Sumner and the cook Hawkins, insisted until their dying days that the dirty deed was done by renegade Mormon militia (Stanton 1982; Powell 1957).

At this juncture the trip was essentially over. The Powell brothers hiked out the Virgin River to the Mormon settlements, Hawkins and Sgt. Bradley continued to the camp at Callville, now under Lake Mead, and the indefatigable Sumner with Andy Hall floated all the way to the Gulf of California, making them the first two men to run the entire river (Powell 1957; Stanton 1982). The expedition, which cost not one ten-thousandth the amount of Coronado's excursion, would manifest itself a hundredfold.

None of the men ever got the $1000 Powell promised them. Sumner writes in his journal at the trip's end, that after two years of exploring with Powell, "... I find myself penniless and disgusted with the whole thing, sitting here under a mesquite bush, in the sand, writing this journal" (Stanton 1982: 166). Hawkins complained that all he received was $60 and a handful of worthless notes signed by Powell.

Powell, on the other hand, emerged from the trip a hero. He immediately made plans for a second trip that took place in 1871-1872. The second trip, which was much better planned and designed to gather scientific data, did not include any of the original members other than Powell. Powell and his men used the new colony at Kanab, Utah as a base of operations in the winter of 1871-1872 (Kelly 1948-49; Robinson 1970).

Major Powell became the driving force in establishing the Geological Survey and later the Bureau of Ethnography. Always a populist, his strength resided in his energy and ability to see the large picture. His brilliant ideas for management of the arid lands of the American West, which were decades ahead of their time, were shelved by the politicians and the Bureau of Reclamation that inherited his legacy (Powell 1957; Stegner 1987). He died in 1902, the same year the Reclamation Service, precursor of the Bureau of Reclamation, was sanctioned. This changing of the guard made official the transition from scientific exploration to economic exploitation of the Grand Canyon and the Colorado River.

Mining

To a large extent, the history of the American West is a series of extractions: furs, gold, bison, lead, copper, silver, uranium, timber, grass, and water. As the last frontier in the lower 48 states to fall, the Grand Canyon and vicinity attracted its share of fortune seekers. All the evidence indicated that the Grand Canyon would be rich in gold and other metals: a large sediment-laden river draining more than 240,000 square miles of mountains and uplands, cutting through eons of strata, winding along for hundreds of miles, would surely be awash in wealth. Fortunately for the canyon, and unfortunately for the prospectors, the minerals were spotty and initially the geography was stacked against human endeavors.

Due to the fluctuations in the water level of the river, natural and contrived, there is a skewed representation of historic materials present at or near the river level. The Colorado has always acted without bias with regard to any material left along the shoreline. The river has created an environment in constant transition that is continuously moving everything it touches downstream. As a result, any activity occurring near the river, such as short-lived placer operations 120 years ago, have vanished. Nevertheless, the archaeological record in the project area from 1872 through the 1920s is dotted by the small camps and workings of men in search of metal. The first wave of prospectors came in conjunction with Powell's second expedition.

Nothing travels quite so fast as the word "gold." In March of 1872, three men that had been hired by Major Powell as packers on the second expedition decided to try their luck on the Colorado River. The men, Riley, Stewart, and Stevenson, headed down Kanab Canyon and worked the river for several days. They panned some very fine dust, but the return was not worth the effort. Nevertheless, word got out to the remote outpost of Kanab, and within weeks hundreds of miners flocked to the vicinity of the Grand Wash Cliffs, Kanab Canyon, and Lees Ferry. Gold dust was selling for $20 per ounce at the time (Hinton 1878; Kelly 1948-49; Robinson 1970).

Very little is known of this small rush other than it lasted about four months, April through August of 1872, and not enough gold was recovered to allow anyone to stay (Robinson 1970). The Mormon settlers in Kanab did a brisk business in goods, as did John Lee at his ferry. Major Powell's equipment caches on the Paria were looted and strewn about the landscape. One anonymous yet courageous group constructed a raft and headed down river from Lees Ferry only to be capsized below Badger Rapid (Kelly 1948-49). No one drowned but the climb out and hike back to the Ferry was an ordeal. In the meantime, gold had been discovered somewhere else, and the Grand Canyon gold rush ended as abruptly as it had begun.

One of the difficulties in tracing mining history is the anonymous nature of the men who create it (Verkamp 1940). They are classic American Isolados. Louis Boucher, the Hermit of the Grand Canyon, left for Utah in 1912 because the canyon was becoming too crowded (Billingsly 1976). There

were, however, men that came and stayed. Some, like John Hance, stayed because of the beauty of the place, using prospecting as an excuse to remain. Others, such as William Bass, the Camerons, Peter Berry, Charles Spencer, and Robert Stanton, believed that they could make millions with enough effort. Although millions were poured in, only biscuit money ever came out.

To get to their claims, prospectors built trails down from the south rim: Hance, Tanner, Bright Angel, Grandview, Hermit, Boucher, and Bass. These trails often followed older aboriginal routes. Generally named for the men that reestablished them, the hiking or pack train trails connected the remote workings in the canyon to the rim where base camps were located and where supplies could be brought in by wagon, and later by train.

By 1901 there were 16 claims along the Bright Angel Trail alone, and the canyon was pocked with one-man camps, miner's caches, test holes, and several working mines. Frontier mining is essentially a culture of single men and the sites in the canyon reflect this by the sparse and basic nature of the artifacts found on them (Hardesty 1988) (Figure 20). For example, site AZ C:05:004, a cache belonging to the trapper/prospector Frederic Berry, now consists of an enamel pot, a boot heel, a shovel, snap-jaw traps, and a whetstone. A picture of the 1923 USGS crew that was taken at this spot holding the artifacts appears in the May 1924 *National Geographic* (Free-man 1924:486). Another example is AZ C:06:009, a cache of goods probably belonging to the Mindenhall brothers circa 1894 (Eddy 1929), which included food cans, spoons, a knife, metal buckets, a bubble level, and fragments of metal, glass, and leather.

Site AZ B:10:227 provides an excellent example of a small placer mining operation from the late-middle nineteenth century. The condition of the site is so good that upon discovery, its appearance resembled a movie set (Jonathan Till, personal communication 1990). It consists of artifacts pertaining solely to mining and sustenance. Not only is the site in pristine condition, but it has been established to whom the camp belonged. In the world of historical archaeology, this amounts to a coup. This particular prospect was established by the men that had worked for Major Powell out of Kanab, the previously mentioned Riley, Stewart and/or Stevenson.[1] Two of the men who worked here left with the intention of coming back someday. Two homemade rocker boxes were hauled up and placed in the overhang for future use, along with other vernacular equipment: scoop buckets with sapling handles, a hand-carved scraper used in brushing gold from fabric or fleece, perforated copper sheeting, square nails, a standard store-bought gold pan, and a reworked metal file with a homemade wooden handle (Figures 21 and 22).

[1] "1872 April 15, Colorado River.... The day after our arrival I visited a mining camp, of which one John Riley was chief, [*location deleted*]. Expecting to find them hard at work 'panning out', we were somewhat surprised to find only one person in camp, Riley having gone up the river a week previous with a small rocker to work up a newly discovered flat, and the others of the company being absent on a 'prospecting trip'" (Beaman 1874:591).

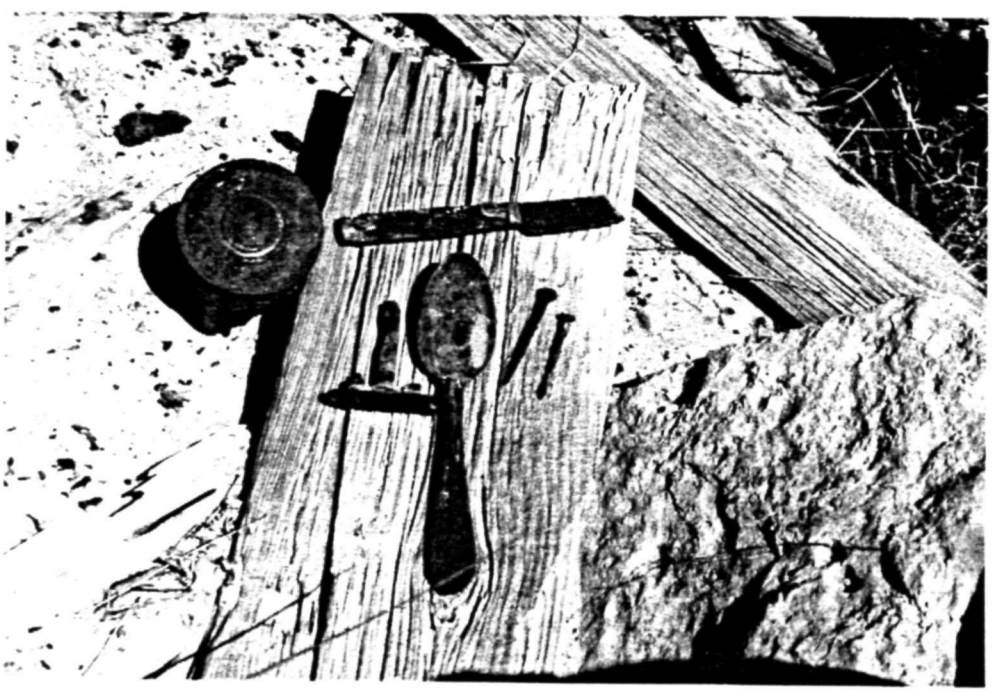

Figure 20. Historical artifacts and broken wooden crate in Marble Canyon possibly belonging to the Mindenhall brothers, ca. 1894 (NPS project photo 1991).

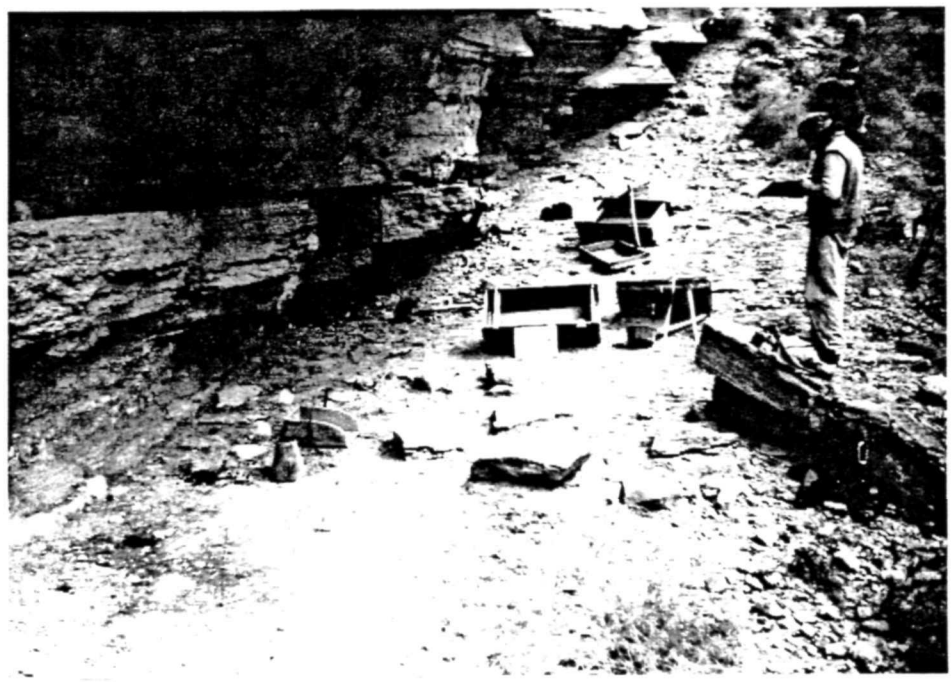

Figure 21. The NPS archaeological team recording a gold mining camp. Note the homemade rocker boxes, dippers, and scoops (NPS project photo 1990).

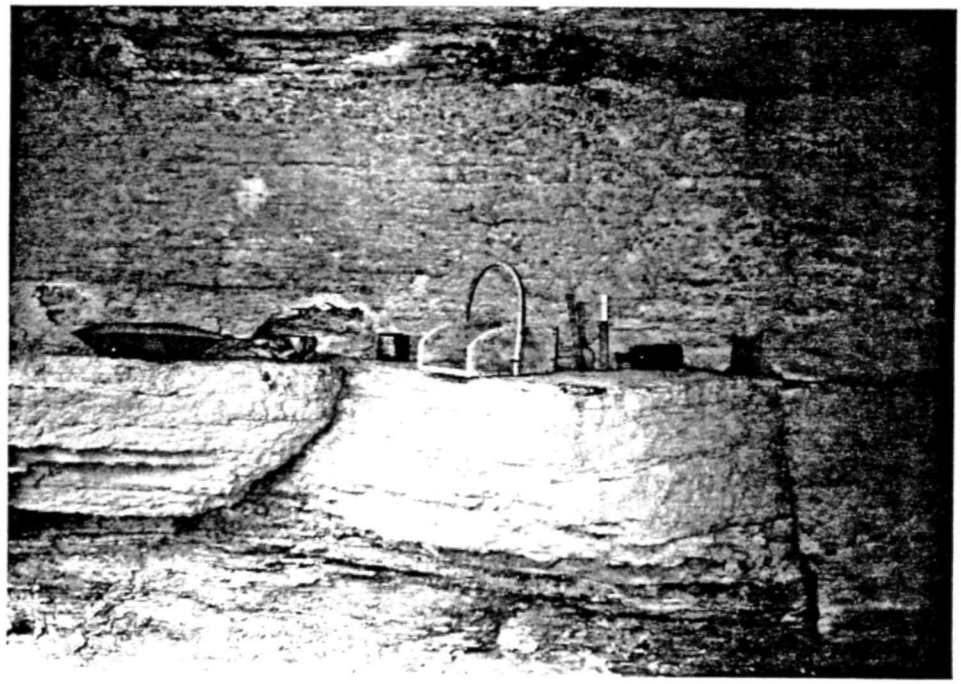

Figure 22. Close-up of ledge.

Domestic items present include a metal coffee pot, metal spoons, a bone-handled eating knife, a wooden-handled eating knife, two cups made from cans, two metal pans with driftwood handles, a rubberized canvas sheet, a baking powder tin converted into a shaker, two bottles, a complete cobalt blue bottle with no maker's mark, and a partial brown/amber quart bottle typical of liquor bottles of the period.[2] During this time blue bottles often held medicinal or chemical substances (Toulouse 1971).

Also present were twigs stuck in cracks serving as clothes pegs, woven fabric, charcoal, fragments of longbone (probably big horn), a rubber boot heel, and half-inch wooden slats with the same green paint found on the rocker boxes. A horseshoe was found on the rocky slope below the overhang. Much of the artifactual evidence left on the site is homemade or constructed of re-used materials; in a remote metal-free environment, nothing would be wasted, not even an old horseshoe.

The absence of forks is typical, because at the time most people ate with large spoons and wide, flat-bladed knives. The site was occupied before tobacco tins were manufactured, and if the men smoked it was tobacco from a plug or personal pouch. Cans were not common in the West yet, and in keeping with the tradition of wasting nothing, the two present on the site had been turned into coffee cups. The absence of cartridges is problematic. If a Dutch-oven was present, it was taken along when the occupants left. Any picks were also removed.

Retaining walls and holes dug into the slope below the overhang and just downstream indicate a serious effort to locate gold aside from panning the sand in the river. The wood used to make the two rocker boxes was painted green and was probably scavenged in Kanab. The presence of two rockers, two cups, two spoons, two knives, and two scoop buckets would suggest that in the end two men were working the placer.

It is possible that AZ B:10:227 was operated by these men for a short spell after the initial 1872 rush petered out. The placing of the rocker boxes in the overhang further suggests that small amounts of gold were recovered, or at least enough to warrant further work; however, enough to place a legal claim or to otherwise find its way into the record was apparently never accumulated. If gold had been extracted in anything but the smallest quantity, word would have leaked out. If the horseshoe was brought to the site for good luck, it did not work, and at some point in the 1870s the workings were abandoned for good. This site was observed by Park Naturalist Edwin McKee in 1937. (Pers. comm. R. Quartaroli).

AZ C:13:388 is a pristine miner's camp much like AZ B:10:227, although AZ B:10:227 represents placer mining and is older, while AZ C:13:388 represents hardrock prospecting and is closer to the turn of the century in age. The location is nearly inaccessible, making detection from the river almost impossible. Unlike most historic sites in the Grand Canyon, the condition is excellent. Materials on the surface indicate an occupation from 1890 to 1910. Artifacts present include food and milk cans dating from the late nineteenth century, a fuel can, a cotton net, milled axe handles, two pick-axes, two pair of wool pants, a pair of cotton Levi pants, a paint brush, a paint can with blue paint, sheep shears, milled lumber, rolled and drawn metal, copper ore samples, a homemade drying rack, rope, a .44 caliber cartridge, and a small enigmatic rock feature possibly used for storage. AZ C:13:388 is a classic example of a frontier hardrock miner's camp and is probably the work of John Hance and his men.

John Hance was born in Tennessee in 1839, He supposedly served on both sides during the Civil War and moved to the West in 1868 with his brother and several others. By the late 1870s, eight of the original party had been killed by Apaches, and Hance, a.k.a. "The Captain," had moved into northern Arizona as a wrangler for the Hull Ranch near the Grand Canyon. The earliest he can be placed at the south rim is 1883 (Hance 1931; Huffman 1989).

By 1890 the Captain had built a trail to his workings in the inner gorge. In 1894 heavy rains washed it out and a "New Hance Trail" was established through Red Canyon leading directly to his camp and tourist retreat on the bench above the rapids that now bear his name. This camp, AZ C:13:131, which still exists in an ephemeral fashion, was used from 1890 to 1912 by the Captain as a base camp for his asbestos mine across the river and as quarters for the people he entertained in his tourist business. A Mrs. Ayers, the first known Caucasian woman to hike the Grand Canyon, stayed there in 1891 (Hughes 1978:49; Huffman 1989).

All that remains of AZ C:13:131 on the surface are partial structural outlines, a segment of collapsed corral, and more fragments of the past, such as nails, food cans, sections of pipe, broken plates, purple glass, cut wood, stove parts, and charcoal.

Higher up and across the river from AZ C:13:131 is Hance's asbestos mine. The tailings can still be seen from the river. It was here that William Henry Ashurst, father of U.S. Senator Ashurst, was pinned alive under a large boulder in February of 1901 (Austin n.d.). He survived the initial fall, but eventually died alone, his legs crushed, unable to move the rock. He wrote in his journal until he

[2]At an encounter in Kanab Canyon in March of 1872, Riley procured a bottle of alcohol from Clemet Powell. Clemet was the major's younger cousin from Illinois.

expired (McClintock 1916). Pete Cameron carried his body out the following year (Austin n.d.).

Hance eventually sold his interests to various "capitalists," but maintained a foreman's role at his asbestos mine. After 1900 he spent most of his time on the south rim telling stories to tourists as the employee of Fred Harvey. He died at a hospital for the indigent in Flagstaff in 1919 (Austin n.d.; Huffman 1989).

Another man seriously involved in early mining as well as tourism was William Wallace Bass. His concerns were located downstream from Captain Hance, although still in the gorge. These sites, AZ B:15:097, 128, 122, 139, and 100, include camps and cable crossing locations.

In many respects Bass was more sophisticated than his chief rival Hance. He had a geological understanding of the canyon, was a benefactor to the Supai, understood the machinations of politics and government, and in general just thought on a larger scale (Madsen 1980).

Bass was born in Indiana in 1849, and moved west from New York for reasons of deteriorating health in 1883. He lived another 50 years, and in that time remarried and with his new wife, Ada, had four children, built cisterns, roads and trails, bred horses, worked two mines, and ran a very profitable tourist trade until 1923, when the Bass family was bought out by the Santa Fe railroad (Madsen 1980; Maurer 1983) (Figure 23).

Bass arrived at the south rim on the heels of John Hance, centering his operations several miles west of today's Grand Canyon Village. His initial interest was mining, and actually remained so even though it was never profitable enough to make Bass and his family wealthy as he had envisioned. This was standard at the canyon. The men that came to extract mineral wealth were forced to enter the tourist business if they wanted to stay. Nevertheless, dreams die hard, and in 1904, an act of the 58th Congress sanctioned a cable crossing for Bass (House Report 10411, No. 1957, 1904). He had already established a ferry service, but this was unusable during high water. A cable-way would enhance his tourist business and expedite his mining concern on the north side of the river (Maurer 1983).

Figure 23. Picnic on the rim about 1915. Bass is on the far right. Note the Navajo blanket and the hob nail boots on the wrangler (courtesy of the Arizona Historical Society, Tucson, Bass Collection).

The Congressional Report (No. 1957) allowed for a tramway to be constructed within two years of the act, specifying that it must be operated and maintained for public use, and authorized Bass to collect reasonable fees for his services. Furthermore, free use by the government for its "officers, employees, supplies and their means of conveyance" was stipulated (Congressional Report No. 1957, p. 2). The government was totally in favor of Bass' labor, since, as Director Walcott of the USGS pointed out, the cable would facilitate government control of the Forest Service lands on the north rim and USGS projects in that vicinity. The first cable (AZ B:15:097) was strung in 1906 (Figure 24) with another to follow in 1908 at Hakatai (AZ B:15:100). In addition, David Rust constructed a cable system at Bright Angel in 1907 (Madsen 1980); so, by 1909, three tramways connected the north and south

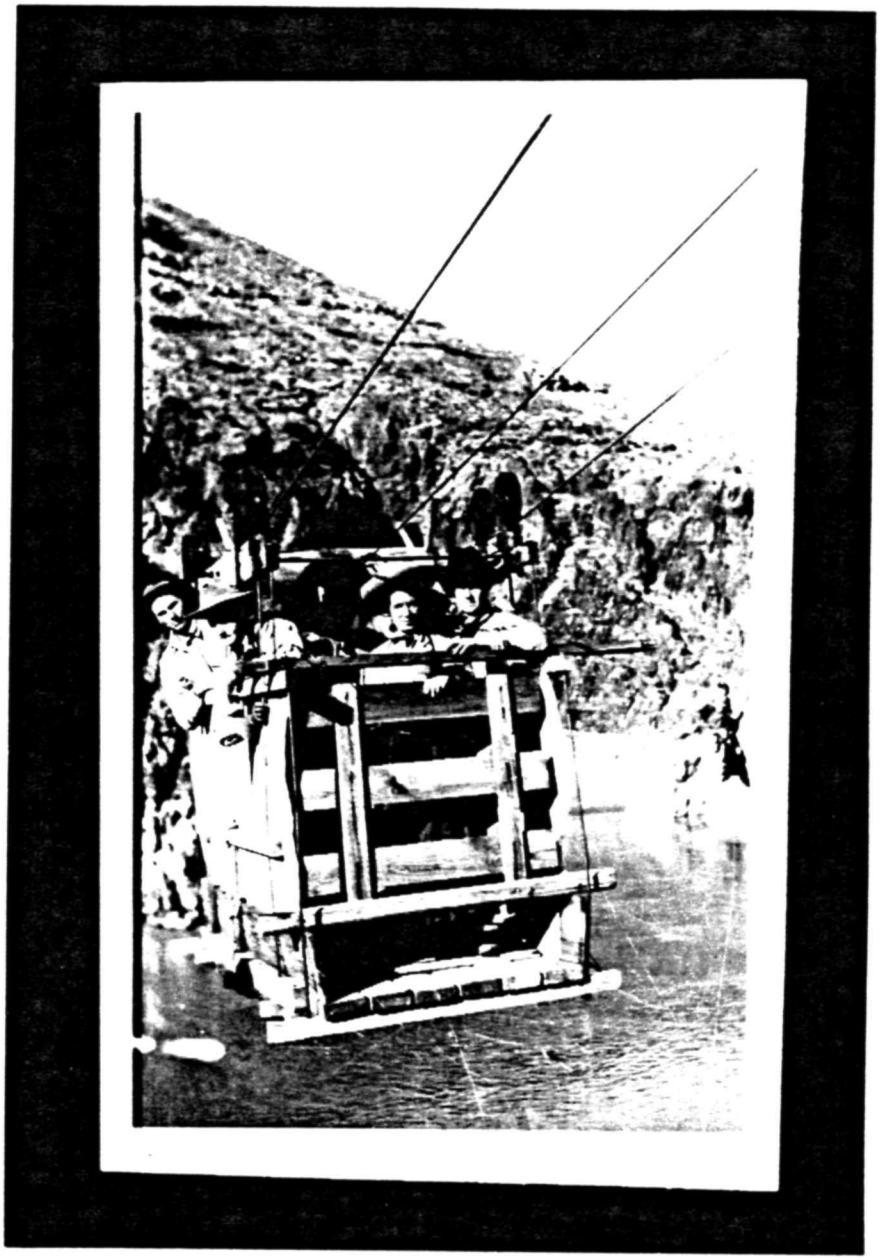

Figure 24. Bass Cable in service, ca. 1915. From right to left are Bert Lauzon, Edith Bass Lauzon, William Bass (in shadow), and the Kolb brothers (courtesy of the Arizona Historical Society, Tucson, Bass Collection).

rims year round. Arizona was now physically tethered to the Strip country north of the river that the Utah legislature wanted so badly (Austin n.d.).

In 1908, Bass transported 25 tons of high-grade copper ore across the cableway at Hakatai and hauled it out of the canyon on the backs of 50 mules he had purchased in Laguna, New Mexico. The "four-legged elevators" (Harbin 1939:17) were never cost effective, but the mining went on. The mules paid their way by moonlighting in the tourist trade as well. In 1917, the military demands of World War I created a market for asbestos, and Bass shipped the ore east at $15 per ton (Madsen 1980; Harbin 1939; Billingsley 1976).

The remains of Bass's cable crossing (AZ B:15:097) and the lower set (AZ B:15:100), called Hakatai, were recorded by the GCRCS archaeological team during the 1990-1991 field season. The remains at AZ B:15:100 consist of metal, cut wood, food cans, a metal box containing matches, frying pans, a coffee pot, enamelware, pieces of leather, and rubber. At AZ B:15:097 are the shattered remnants of the cable car, icluding pulleys, cable, anchor bolts, constructed platforms, drill holes, a stacked rock ramp, and some scattered cans.

Another smaller site on the north side of the river in the project area may have belonged to the Bass family of employees, possibly John Waltenburg. AZ B:15:128 is a small camp with a prehistoric component. Historic artifacts include food cans, a railroad spike, a hardrock jack, a .30 caliber WRA and .45 caliber Colt ammunition. The camp directly overlooks the river and dates to the late nineteenth and early twentieth centuries.

Located just upstream from AZ B:15:128 at the bottom of Bass Rapids was the north beach for the ferry crossing. At this spot in 1903 George W. Parkins from Washington, D.C. meticulously carved his name in block print, presumably while waiting for a ride across the river. At this point Mr. Parkins disappears from the historical record. A few years earlier lumbermen from Maine slept on the same beach. The inscription was placed to the right of the gentleman's walking stick (Figures 25, 26, and 27).

In general, the mining operations in Grand Canyon are outside the project area. There are,

Figure 25. Maine lumbermen sleeping on the beach at the foot of Bass Rapids about 1900. George W. Parkins inscribed his name a few meters to the right of the towel on the walking stick in 1903 (courtesy of the Arizona Historical Society, Tucson, Bass Collection).

Figure 26. The same location in October of 1990 (NPS project photo).

however, notable exceptions: a twentieth-century placer operation in Glen Canyon, Charles Spencer's project at Lees Ferry, the Copper Grant, and the Tanner-McCormick mines near Lava-Chuar Creek. A hematite mine was used by Native Americans in the west end of the canyon into historic times. The Hopi salt mines, which continue to be used, remain religious ground to members of that tribe today.

Charles Spencer spent millions of dollars on projects at Lee's Ferry in an effort to strike it rich. He dredged the river and scoured the shales of the Chinle Formation for gold with a hydraulic hose, all to no avail. He began his prospecting in lower Cataract Canyon in the 1890s below Supai, and continued his work at Lees Ferry in the early twentieth century. He was responsible for placing the largest steamboat on the Upper Colorado (AZ C:2:11, Feature 12). It was designed to bring coal to the boilers at the ferry, but unfortunately, the mining operation was a dry hole and the energy cost of coal transportation was so high that the boat was useless. It now rests on the right bank, sunk on the shore a few hundred yards above the modern launch ramp. It is the only boat on the National Register of Historic Places in Arizona (Rusho and Crampton 1975:96).

Spencer's hydraulic operation (AZ C:2:11, Feature 11) was designed to wash the Chinle shales into a slurry, then through a sluiceway, and ultimately through a mercury amalgam process. The remnants of this operation can still be seen on the slopes above the beached boiler (Figure 28). The shales turned into an uncompromising mud, the gold was too fine, the operation too expensive, and supplies too scarce for the dream to succeed. The pumps ran for a week before the capitalists behind the plan shut it down as a grand waste of money. Spencer periodically returned to the area. His name is carved in the cliff face below Glen Canyon Dam (AZ C:2:34) with a 1925 date. In the 1960s Mr. Spencer was over 90 years old and still doing occasional prospecting in southern Utah (Rusho and Crampton 1981).

The mines at Lava-Chuar Creek were operated for a very short time at the turn of the century. AZ C:13:275, known as both the Morning Star and Copper Grant Mine, can still be seen today near a camp that is a common stop for boat tours (Crumbo 1985). AZ C:13:275 is an L-shaped, horizontal shaft sunk 30 m into the bedrock with a right-angle bend continuing another 20 m. Most of the artifacts have been removed by collectors although a box lid and some nails are still present. The cribbing placed near the entrance is an excellent example of vernacular construction and makes extensive use of adze-cut lap joints instead of spikes to hold it together. Typically, the mine was abandoned after a lot of work, as it produced no capital and served only as a money pit.

Across the river from AZ C:13:275 is the Tanner-McCormick Mine and associated living quarters (AZ C:13:98), an unfinished cribbed structure. Today, two horizontal shafts, the tailing piles, and an artifact scatter remain on the surface. As with many historic sites in the park, artifacts that were present 20 years ago have been picked

Geo. W. Parkins
Washington
D.C.
1903

Figure 27. The George W. Parkins inscription below Bass Rapids.

up and carried off. Mormon pioneer Seth Tanner and others worked these mines sporadically from the turn of the century through 1920.

A shining moment for Grand Canyon mining occurred in 1893 at the Columbian Exposition of the Chicago World's Fair when copper ore from the mines at Grandview was assayed at 70 percent and took first prize (Billingsley 1976). Excepting Bass's copper shipment and some asbestos sales during World War I, mining the canyon was an experience in hard work and diminishing returns on a shrinking frontier. The prospectors came for gold; lacking that, they scraped for copper and asbestos; and failing again, switched to tourism or sold out and fled.

By 1920, mining had essentially ended in the canyon, although bat guano was being extracted in the west end until the 1950s and uranium ore was being mined below Maricopa Point and is currently being mined just outside of the park on the north rim on tributaries of Kanab Canyon (Billingsley 1976).

Figure 28. A fossil of failure. Charlie Spencer's boiler after 80 years at Lees Ferry (NPS project photo 1991).

Engineering and the Bureau of Reclamation

The search for economic wealth at Grand Canyon has never been confined to minerals. The first large-scale capitalist venture came in the form of a railroad survey in 1889. The two main players behind the scheme were Frank Brown, president of the Denver, Colorado Canyon and Pacific Railroad Company, and his chief engineer, Robert Brewster Stanton. The planned route ran from Colorado's western slope through the Grand Canyon and across the desert of southern California to Los Angeles.

The trip was poorly conceived and there were problems from the outset. By the time the expedition reached Hite, Utah, food was so scarce, the boats so battered, and morale so low that one of the lawyer/capitalists backing the project and two boatmen left the trip. Harry MacDonald, an outdoorsman, prospector, and carpenter, was hired at this point (Smith and Crampton 1987). Sometime later he carved his initials into the base of a rare juniper tree in Marble Canyon (AZ C:05:007) (Figure 29).

Although the trip was poorly conceived, it was splendidly appointed at the outset. In true Victorian fashion, there was a dichotomy between the educated men and the hired hands. Stanton brought along his personal servants, George Gibson and Henry Richards, and the poor fellows had the responsibility of towing the overloaded supply boat behind their dory. Fortunately, it split apart above Glen Canyon and the two men were unchained from their death anchor (Smith and Crampton 1987).

Below Hite things got worse. Lunch consisted of weak coffee with sugar and a little milk, "with as much of the River water" as you wished (Stanton 1965:65). At Lees Ferry another lawyer/capitalist quit, a wagon of supplies was brought in from Kanab, MacDonald fixed up the boats to finish out the trip, and the remaining eight men set out.

On the morning of July 10th, camped at Soap Creek, Brown remarked to Stanton that he had experienced bad dreams about the rapids for the first time. Within an hour, President Brown and MacDonald were thrown from their boat just below Soap Creek. MacDonald made it to shore, but Brown went down. His diary popped up where he was last seen alive (Lavender 1985; Smith and Crampton 1987). The men saw his body floating on the water a few days later, but they could not reach it, and like his dreams of a railroad, Mr. Brown's body floated on down the river. An inscription (AZ C:06:002) can be seen today carved in the rock by boatman Peter Hansbrough commemorating the unhappy event. The site is in the high-water zone at the base of Soap Creek Rapid. The erosive effects of high flows are in evidence on the surface of the panel (Figure 30).

Stanton and *his* dream were still alive, however, and with the unenthusiastic support of the men, he continued downstream. Disaster struck again on

Figure 29. Boatman and prospector Harry McDonald carved his initials on this rare juniper tree in Marble Canyon sometime in the 1890s (NPS project photo).

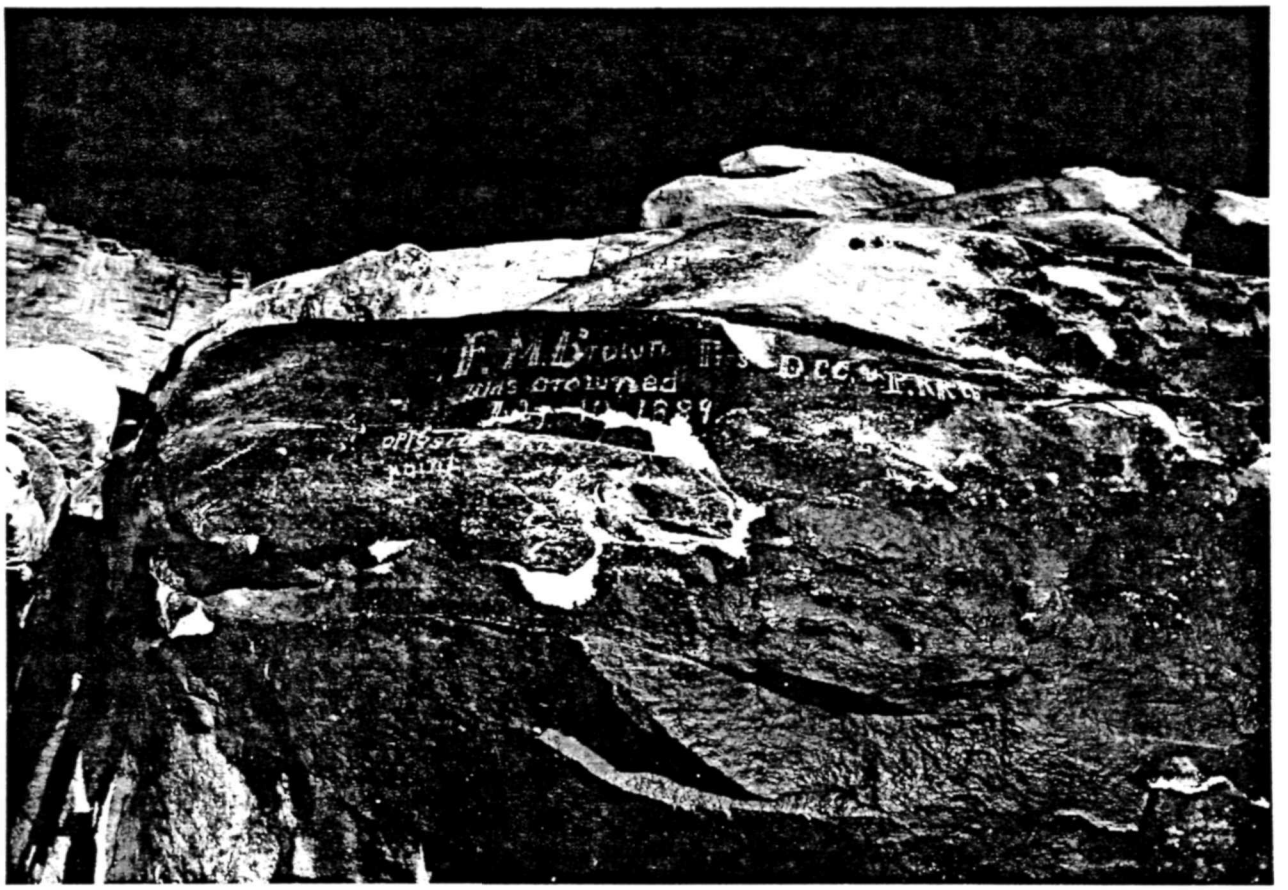

Figure 30. Inscription marking the location where President Brown drowned. Note the spalling caused by high water (NPS project photo 1990).

July 15 when the boat containing Hansbrough and Richards was pinned under a ledge and flipped in 25 Mile Rapid (Stanton 1965). Both men drowned. Hansbrough's body, left high and dry on a rock by the receding water, was discovered the following January and buried. His plot is now recorded as AZ C:09:030. Henry Richards' body was never found, but he retains the dubious distinction of being the first valet to drown in the Grand Canyon. In 1951, David Quigley, a Boy Scout who had drowned upriver near Rincon, was buried nearby (Reilly 1969).

The three men probably would not have died if they had been wearing life jackets. Stanton maintains that Brown had visited Major Powell in Washington prior to the trip for the purpose of obtaining advice, and Powell had said life jackets were not necessary (Stanton 1965). Powell did not even admit to his own use of one. Doc Marston is severe in his judgment of Powell, and contends that the Major was culpable for the deaths of Brown, Hansbrough, and Richards (Marston 1976).

At this point, the expedition ended. Food and equipment were cached in a cave that now bears Stanton's name (AZ C:05:003) and the survivors hiked out South Canyon. Stanton intended to return, better equipped, and finish the job.

The second effort began in December of 1889. A sumptuous Christmas feast was held at Lees Ferry, then off they went. When the boats passed the places where the three men had drowned at high water, they recovered Hansbrough's body. The expedition retrieved the supplies cached the previous summer from Stanton's Cave and once again proceeded downstream.

The trip was over in April of 1890. The only disaster happened early on in Marble Canyon when Nims, the photographer, broke his leg in a fall. Getting him out and back to Lees Ferry is a story all its own. Other than that, the biggest problems were ones of personal friction. Although Stanton considered this a successful expedition, the information retrieved was shelved by the capitalist backers.

The railroad never did go through, but there was still talk of it in 1904. An article in the April 2 edition of the *Coconino Sun* indicates a revival of the railroad scheme by some "optimistic men" who had organized venture capital, but the project was still "on paper only and may go no further." As Wallace Stegner (1987:75) writes in his classic essay, *Living Dry: The American West*, "habits persist."

Robert Brewster Stanton gave up the railroad idea, but persisted in trying to making the canyon pay; with the backing of Ohio millionaire Julius Stone, he ended up dredging the Colorado River above Lees Ferry for gold. Bushels of dollars and thousands of man hours later, less than $70 in gold had been obtained, and once again the capitalists yanked their support. Stanton's Road (AZ C:02:060) above and opposite Lees Ferry is all that remains today from his dredging operation. The road was built to prove up claims for Stone's and Stanton's Hoskinini Mining Company and never served any practical purpose. To his credit, Stanton turned to writing and achieved some minor success as a historian.

For all his failings, Stanton had captured the public's imagination. Stephen Pyne (1982) observed in his cerebral work *Dutton's Point* that Stanton's exploits marked the return of the engineer as hero in America. This is a logical progression in the domestication of the West; the politician follows the cavalry officer, and the engineer follows the prospector. Events at the Grand Canyon were becoming more complicated than just looking for gold. Politics had arrived and in 1893, the same year that the first mining district was organized in Grand Canyon, Major Powell was booed from the podium (at the Irrigation Congress held in Los Angeles) when he warned the audience that they were "laying up a heritage of litigation and failure" with their current agenda for water use in the arid American West (Stegner 1987, p. 12).

Powell had lobbied long and hard for the territories to base their boundaries on the natural dimensions of watersheds, as well as conducting a new survey of the West in order to allocate water equitably with irrigated homesteads of 80 acres and grazing homesteads of 2560 acres (four sections), instead of the rectangular method used in the well-watered midwestern states by the government survey of 1787 (Powell 1879). These ecologically sound and populist ideas were buried in Congress by the powerful William "Big Bill" Stewart and his Senate committee. Stewart has been described as "the first of a long line of incomparably bad Nevada senators" (Stegner 1987, p. 11). The public lands of the West were being served up to engineers and cattle. Major Powell's influence in these matters continued to wane until his death in 1902.

As interest in mining declined, the idea of harnessing the river gained popularity and seemed to gain a momentum of its own. An article appeared in the May 25, 1901 edition of the *Coconino Sun* describing "a scheme to get power from the waters that run through the mighty gorge.... The promoters of the scheme have strenuously endeavored to keep secret its operations as arrangements must be made with the government before work commences." The following year Francis Newland's Act was passed and the Reclamation Service, sanctioned by Congress on June 17, 1902, began developing plans of their own for the Colorado River Basin and the Grand Canyon. In August 1903, Charles McClain and P.T. McGonigle drowned below Hance Rapid doing an engineering survey for the fetal Grand Canyon Electric Company (unpublished manuscript, Glenton Sykes 1967).

The federal government was now chartered to undertake water projects. This had the effect of loosing a weasel in a hen house. These projects were to be funded by fees charged to newly established irrigation districts. The period for actual payoff was initially set at 10 years, then was extended to 20, and later to 40. As costs increased and payments became impracticable, the burden of repayment shifted from the sale of water for agricultural use to the production and sale of hydropower to urban centers (Stegner 1987; Terrell 1952). Ultimately, the Bureau of Reclamation found wealth where the prospectors had failed. They discovered that electricity was the currency spawned by water and joined forces with it.

The reclamation laws "have for their object the creation of a maximum number of prosperous homes in the arid regions of the United States" (Bureau of Reclamation Annual Report for 1916-17 and 1924). This mandate, which sounds good on paper, helped to create such ecological disasters as Phoenix and Los Angeles.

The Eighth Annual Report of the Reclamation Service (1908-09) states that "these projects are to be irrigated with water from the Colorado River, but there is an insufficient normal supply in the river for their proper irrigation. The success of the projects depends, therefore, on the storage of water in the drainage areas of the Grand and Green river systems forming the Colorado River." In this report over 50 projects are listed, indicating that the Bureau was not in the business of adapting to the desert, but in the process of wrestling every drop of water in the American West into some type of containment and delivery system.

Serious planning for the lower basin of the Colorado took place in 1918-1922. The Colorado River Compact divided the drainage network into an upper and lower basin for easier administration. Lees Ferry separates the two entities and in an effort to accurately monitor flows, the Southern California Edison Company established a gauging station there in 1921. In 1922-1923 the USGS upgraded and took over the facility (Feature 14, AZ C:2:11). An article in the July 21, 1922 issue of *Science* entitled "Conservation of the waters of the Colorado River from the standpoint of the Reclamation Service" tells the public that "the time has at last arrived when the development of power on the lower Colorado River has become feasible at such points as are most accessible and nearest to adequate markets." The markets referred to are Los Angeles and southern California; the City of Los Angeles was itself applying for dam sites all along the Lower Colorado, including locations in the Grand Canyon. The city did actual work at the Bridge Canyon site as early as 1926 and the stone walls still stand today at AZ G:02:102. This prompted Arizonans to form their own Colorado River Commission to counter Los Angeles's every stroke (First Report of the Colorado River Commission of Arizona 1927 and Bureau of Reclamation Report 1924).

In an effort to legitimize their own state's claims, the Arizona Commission incorporated a charter. Plank number one in the Arizona platform, read in the Senate on October 27, 1927, declared that damming the Colorado "ultimately will insure the utilization of all of the river's flow for irrigation or domestic uses and every foot of the river's fall for the creation of hydro-electric power."

In 1923 the USGS established a gauging station (AZ B:16:262) on the river at Bright Angel Creek. The first operator (1923-1924) was a young man named Glenton Sykes, who was born in Flagstaff and spent most of his youth there. His 14-month stay a "mile down" was highlighted by dinner with the poet Edna St. Vincent Millay, as well as swimming the river for the delight of the Fred Harvey tourists, witnessing an avalanche, and upstream excursions in his homemade boat (Figure 31) (unpublished manuscript, Glenton Sykes 1967).

Also in 1923, the USGS expedition headed by Claude Birdseye with R.C. Moore, geologist, and E.C. La Rue, hydraulic engineer, directed the first complete and accurate survey of the river. They studied 21 potential dam locations. This historic journey was outfitted with radios, was on the river when President Harding died, named a rapid after him, and experienced a 21-foot flood while camped at Lava Rapid. Several notable river personalities were on this trip, including Emory Kolb, Leigh Lint, L.R. Freeman, and Frank Dodge (Freeman 1924). Site AZ C:06:004, consisting of the outline of a rock hammer and 'USGS' pecked in the rock near water level under an overhang in Marble Canyon, are believed to be from this trip, possibly the work of geologist Moore. Frank Dodge left his name in an overhang at site AZ B:15:118 on September 5 during this expedition. Along with Nat Galloway, Dodge is considered to be the best oarsman to have rowed the river. Fittingly, Galloway had left his name at this same site in 1899.

By the mid-1920s numerous dam sites were being researched, including Glen Canyon, Marble Canyon, Prospect Canyon, Diamond Creek, Bridge Canyon, Spencer Canyon, Devil's Slide, Pearce Ferry, Boulder and Black canyons, Bulls Head, Mohave, and Laguna (Kelly 1925; Trot 1925).

After completion of Hoover Dam in 1936, the Bureau turned its sights on the Grand Canyon. Engineer La Rue's recommendation for a structure above Lees Ferry was temporarily ignored, and two locations below the Ferry got priority: a site in Marble Canyon with a tunnel to Kanab Creek at a projected cost of $382 million and a site at Bridge

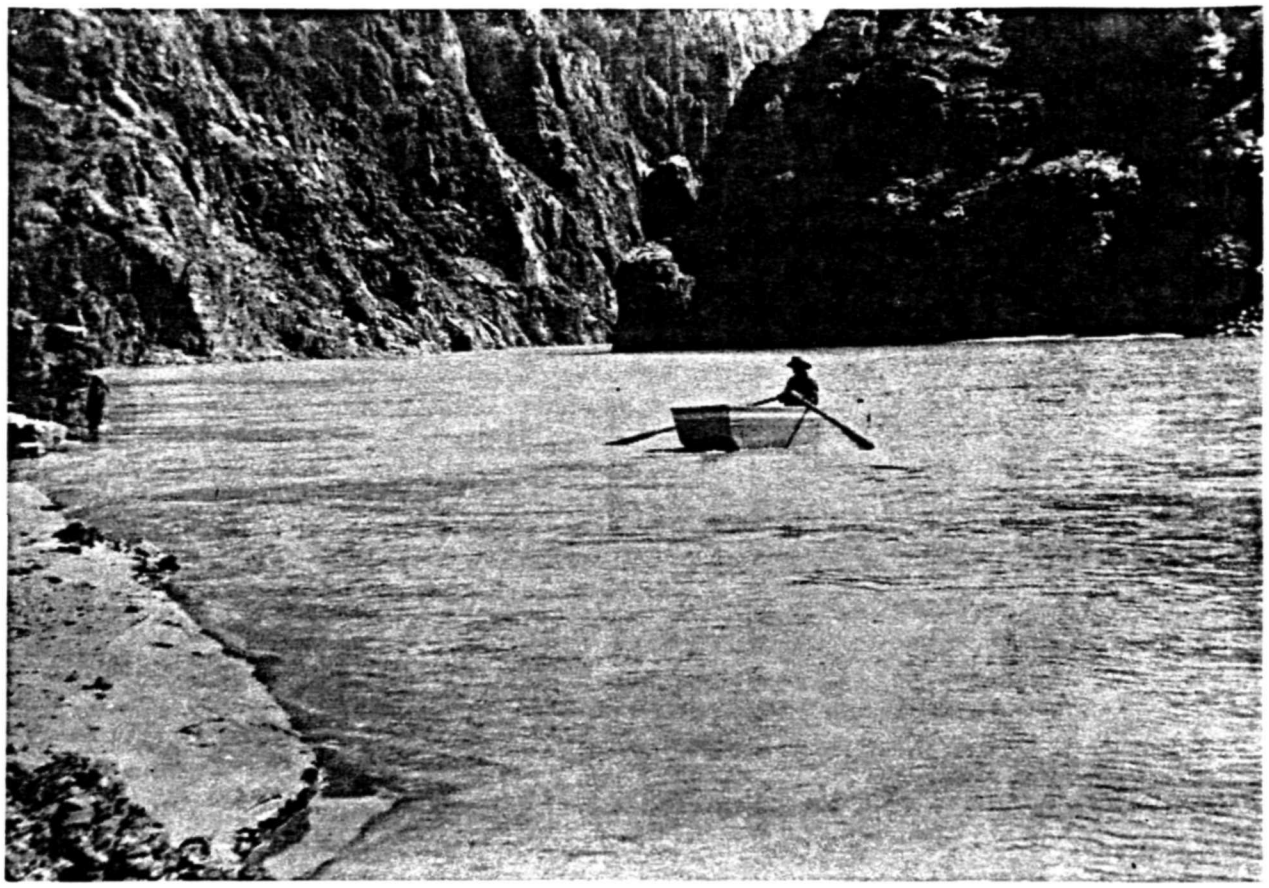

Figure 31. Glenton Sykes in his boat above Bright Angel Creek, 1923 (photo courtesy of Diane Grua).

Canyon below Diamond Creek with a projected cost of $2 billion. These costs included the price of recreational development, maintenance, a tunnel and pipeline from Bridge Canyon to Granite Reef above Phoenix, as well as two other sediment trap reservoirs created by dams on the Little Colorado and on the San Juan below Bluff, Utah (Department of Interior Report 1946; Terrell 1952).

Several historic sites pertaining to these engineering projects are located within the current survey area. They include camps and test sites. Eight sites attributed to Bureau of Reclamation activity were recorded during the archaeological survey. Not included on the list of recorded sites is the largest cultural manifestation in the region, Glen Canyon Dam itself. Although several of these modern localities do not fit the criterion for a historical site due to their appearance since 1940, their impact on Grand Canyon and American history is unquestionable. Their location alone makes them significant cultural resources and worthy of documentation.

The eight Bureau of Reclamation sites are found in two quadrants: three in C:09 and five in G:02. The sites in C:09 are associated with the proposed Marble Canyon Dam. These sites consist of a base camp for the surveyors, engineers, geologists, and drillers while working in the canyon (AZ C:09:083), as well as the actual test sites (AZ C:09:65 and AZ C:09:88). The test sites can still be seen from the river as tunnels (adits; see Figure 33) drilled into the canyon walls and their associated debris fans running down to the river's edge, along with cable anchors, rebar, platform remnants, and survey benchmarks. The remainder of a ferry boat used in shuttling the men to their various assignments is beached on the right bank at AZ C:09:88.[3] Other cultural materials still present include cable, blasting wire, food cans, anchor bolts, milled lumber, grease buckets, barrels, iron plate, homemade tables, and tent platforms. Engineering code numbers and the names of men and dates have been painted on and carved in the cliff faces throughout the project area.

[3]These barges were filled with sediment when they were overtopped by the 124,000+ cfs floods of 1952 and 1957 (USGS records). A mature cryptogammic crust has formed on the surface of the fill in the 40 years since the high water.

Work on the Marble Canyon Dam project was initiated in 1942 with geological investigations (Murdock 1944). Survey and engineering studies were developed throughout the 1940s, with aerial photography occurring in 1948. A contract for a rim-to-river cableway was let by the government in 1949. By 1950, the Bureau of Reclamation had established the cable, placed a drilling barge on the river, built camps for the men, and was closing in on an appropriate dam site (see Figures 32-38). The cable was removed in 1951 and another phase of work took place in Marble Canyon from 1959 to 1963 (Bureau of Reclamation Archives, Boulder City, Nevada).

The more extensive and better-preserved reclamation sites are located in the western end of the project area above Separation Canyon in conjunction with Bridge Canyon Dam. These include sites AZ G:02:100, 101, 102, 105 and 106, and represent distinct episodes of work. The City

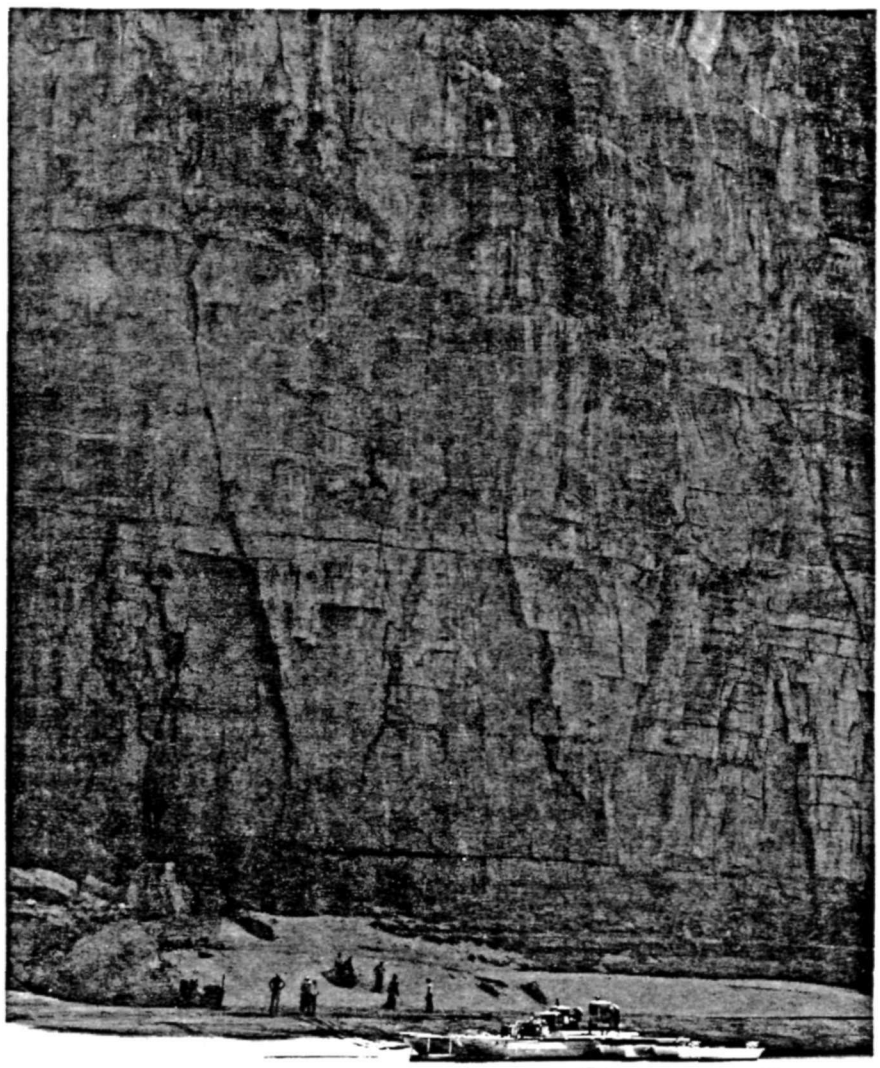

Figure 32. The Bureau of Reclamation drilling barge at mile 39.5 in Marble Canyon, August 1951 (photo courtesy of the Bureau of Reclamation, Boulder City, Nevada).

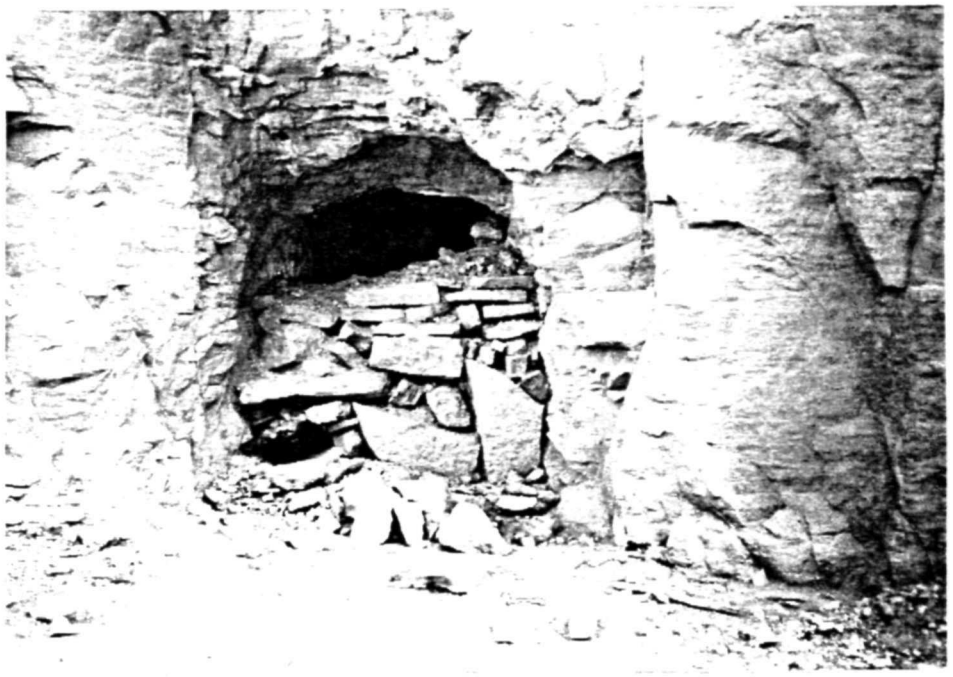

Figure 33. Test adit in Marble Canyon (NPS project photo 1990).

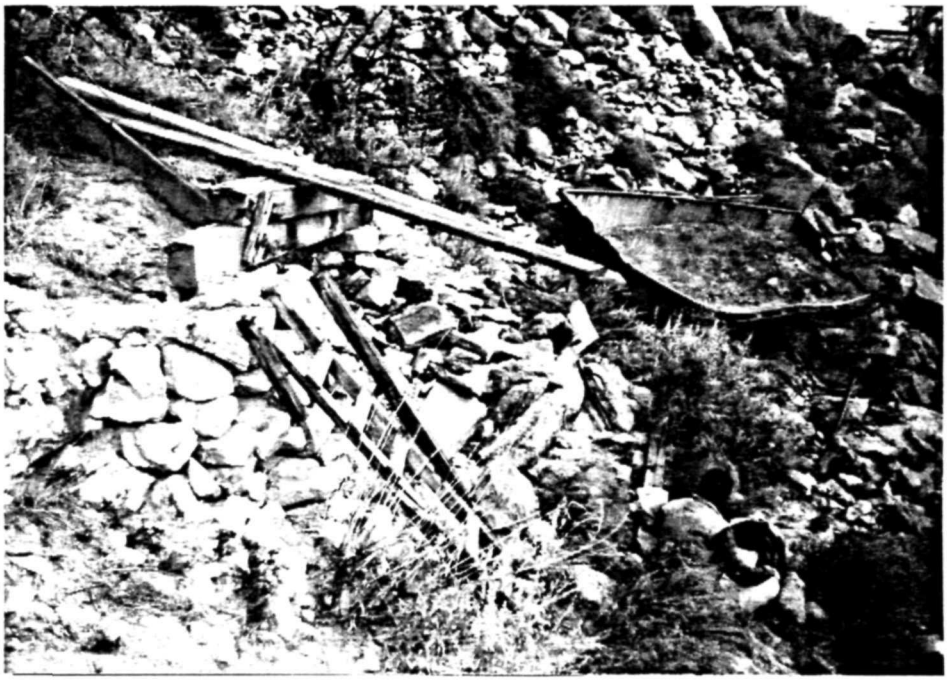

Figure 34. Bureau of Reclamation barge and equipment dock in Marble Canyon (NPS project photo 1990).

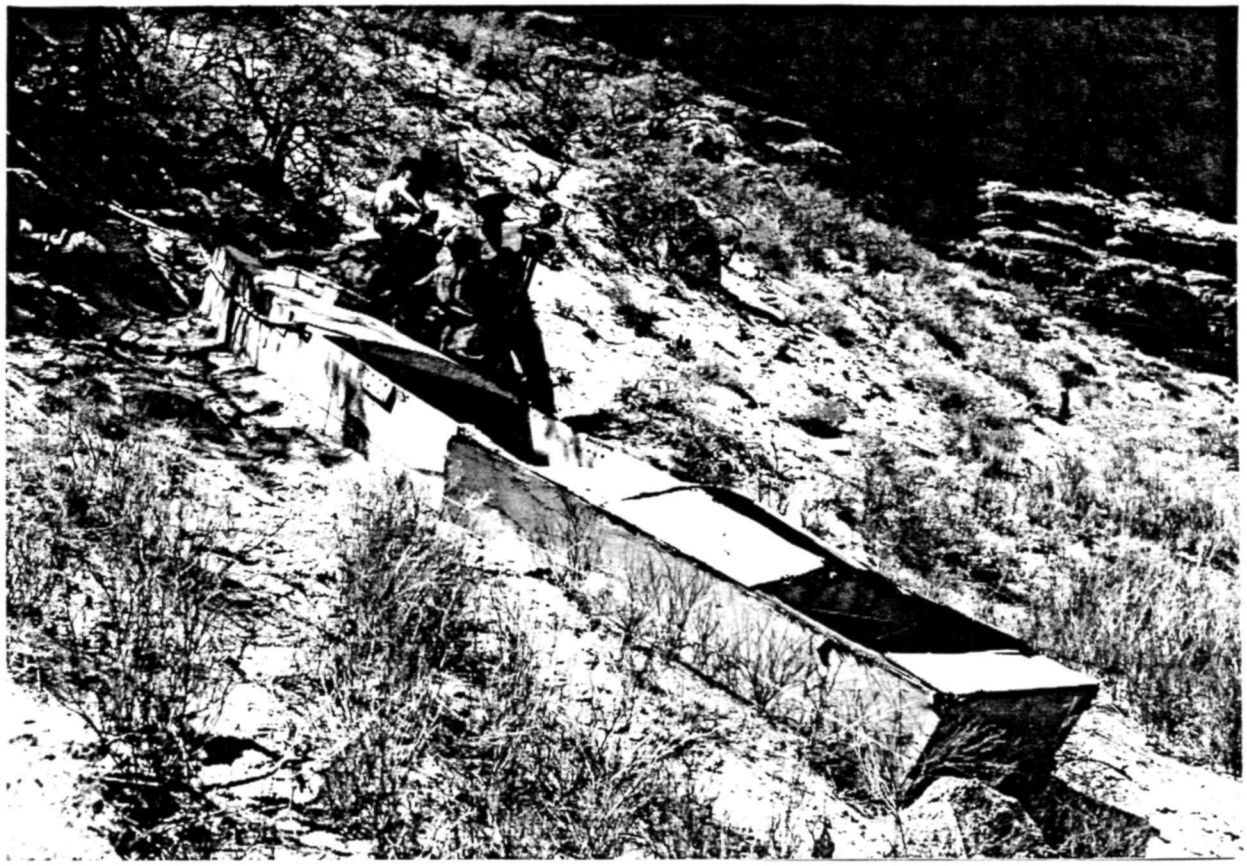

Figure 35. Reclamation engineers at Bert Loper's boat in August of 1951 (photo courtesy of Bureau of Reclamation, Boulder City, Nevada).

Figure 36. Bert Loper's boat (AZ C:09:034) 40 years later. This is the craft used in Loper's fatal trip of 1949. Note the loss of sediment since 1951 (NPS project photo 1990).

Figure 37. Powder house for Bridge Canyon Dam, 1939-1940 (NPS project photo 1991).

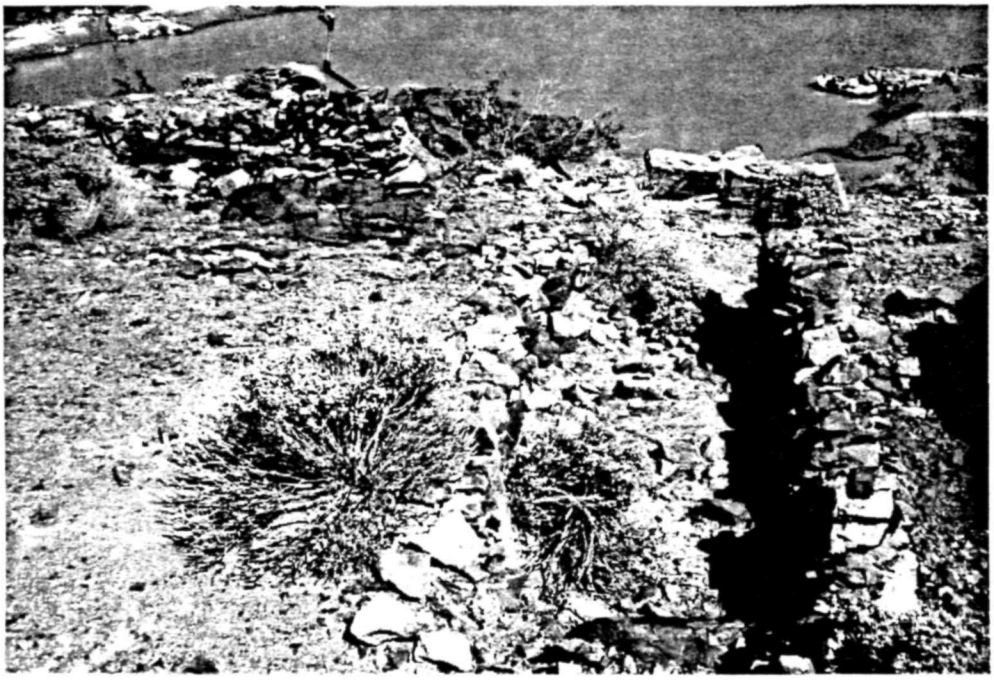

Figure 38. Stone walls at Bridge Canyon City, 1939-1965 (NPS project photo 1991).

of Los Angeles did extensive work in the vicinity of Bridge Canyon in 1926. As previously mentioned, AZ G:02:102 represents a part of this effort. Bureau of Reclamation activity began in 1938 with filing a proposal for work to begin, which it did the following year. Work continued steadily through the early 1950s and then intermittently until the mid-1960s (Bureau of Reclamation Archives, Boulder City, Nevada; Wilson Austin, personal communication 1991).

The main reclamation base camp, known as Bridge Canyon City (AZ G:02:100), was at its peak in 1939-1941, an active and bustling place. The site consists of numerous foundations for bunkhouses, showers, an office, a cookhouse, pipelines, walkways, a fuel depot, and an extensive artifact scatter representing the periods of occupation (Bureau of Reclamation Archives, Boulder City, Nevada; Wilbur Rusho, personal communication).

The other sites, AZ G:02:101, 102, 105, and 106, are actual test locations, smaller camps, and special-use structures, such as AZ G:02:101, which is the powder house for the project. This site consists primarily of a well-crafted wooden door blocking a natural vug in the rock near river level (see Figure 37). A light scatter of modern trash is present on the slopes, as well as an anchor bolt in the bedrock and a blasted test hole 7 m deep. A cable across the river connected this site with AZ G:02:106.

The Bridge Canyon sites are the legacy of the combined effort of the Central Arizona Project and the Bureau of Reclamation. The foundations, trash, drill holes, and structures that remain today are the skeletons of a dark episode in the history of reclamation projects in the Colorado River Basin.

The 2-billion-dollar Bridge Canyon Dam project acquired a momentum of its own. By 1950 it embroiled not only Arizona, California, and the Bureau of Reclamation, but Congress, the voting public east of the 100th meridian, and virtually every small newspaper in the country (Terrell 1952).

The Central Arizona Project, in conjunction with the Bureau, launched a propaganda campaign of imperial proportions, releasing a publication in 1946 advocating further domestication of the Colorado River, entitled *A Natural Menace Becomes a National Resource*. Chapter titles include "Claiming the Basin," "Dividing the Water," and "Wealth from Water," revealing a mining mentality. The publication goes so far as to assert that the building of a dam would attract more tourist dollars as the construction process would be a greater wonder than the natural splendor of the Grand Canyon itself. The public and Congress did not buy it.

In *The Western Web*, John Terrell's classic work on power politics and the Bureau's attempt at hydraulic despotism in the West, Terrell submits that Commissioner Michael Strauss of the Bureau of Reclamation and Interior Secretary Julius Krug were "dictators in the making." The attempt to integrate all the water resources and electric power in the American West amounted to nothing more than a planned fiscal economy that would have had the effect of stripping the personal freedom of every farmer and rancher in the West and placing it in the hands of a water bureaucrat (Terrell 1952; Wittfogel 1957).

By 1952 the project had been temporarily crushed under its own weight. Strauss and new Interior Secretary Chapman resigned with the coming of the Eisenhower administration. "The Western Web as they had conceived and spun it had been swept away" (Terrell 1952:612). However the project would not rest in peace. Fiscal and engineering reports continued to be produced until the mid-1960s, when the project apparently died from a combination of ecologically minded support from the public and an apathetic bureaucracy (Nash 1982).

The Bureau has maintained a working presence in the Grand Canyon for nearly three-quarters of a century. During this time the mission of the agency has become inextricably intertwined with the river. This involvement, represented by the engineering sites in the project area, constitutes an important chapter in American history at the Grand Canyon.

Lees Ferry

John D. Lee appeared at the mouth of the Paria in November of 1871, about a month after Powell's second expedition had arrived and cached their equipment before moving overland to Kanab (Measeles 1981). Lee, a Mormon pioneer, had been placed at that location by Jacob Hamblin, a Mormon organizer, missionary, and patriarch of southern Utah and northern Arizona. Hamblin crossed there on his seventh expedition to Hopi in 1869 and kept the spot in mind for future use. This remote location was to become the conduit through which Mormon colonizers bound for northern Arizona funneled southward. Lee was on the lam from federal authorities for his part in the Mountain Meadows Massacre of 1857. For the capable and faithful Lee it was the perfect place to hide out and serve the church at the same time (Tanner and Richards 1977; Little 1909).

The ferry site was the only place for nearly 300 miles that a wagon could cross the river between Utah and the Arizona territories, and was the focal point for Mormon hegemony and an anchor for the church's desire to annex the Arizona Strip. Brigham Young sent 50 men in 1871-1872 to aid Lee (his adopted son) in building a road to and from the river at the ferry site (Kelly 1948-49).

The first ferry service took place in January of 1872. Lee and wife Rachel used Powell's boats to

pole a small group of Navajos across the river in return for blankets. This informal service was improved upon in October of 1873 when a ferry barge was built by John Blythe and Tom Smith. This ferry was capable of carrying two loaded wagons with teams and figured prominently in the Mormon Church's expansion into northern Arizona (Measeles 1981).

In 1978-1979, a lower ferry crossing was established in the relatively calm water at the foot of the Paria riffle for use in low water, with the object of avoiding the formidable obstacle of Lee's Backbone on the south side of the river. Two large, upright posts on river right and the names of Mormon pioneers slapped on the cliff with axle grease on river left mark this location (AZ C:02:094) (Rusho and Crampton 1975, 1981).

The Powell expedition relied heavily on the hospitality and hard work of the citizens of the new colony at Kanab, as well as John Lee at the ferry in the following year (Robinson 1970). Most of Powell's men were from east of the Mississippi, and this remote location was not only inhospitable, but could be spectacularly boring. For these men occasionally stationed at Lees Ferry, the Lee residence was as close to a home as they got. Here they were supplied with fresh vegetables, fruit, and even beer. Walter Clemet Powell, the major's young cousin, entered in his diary on July 2, 1872, that Lee "boasts of having 18 wives and 62 children. He found my [Navajo] blanket shortly after he left us a week ago today. Rained most of the afternoon. Think Lee is a little crazy" (Kelly 1948-49).

In November of 1874, Lee was arrested in Panguitch, Utah for his part in the Mountain Meadows Massacre, and his role at the ferry came to an end. The Lees had the concession, but the church owned the boats, and the dependable Warren Johnson was dispatched to the scene to ensure the continuation of a Mormon presence (Measeles 1981). The church had staked a claim to the location by use, and the hierarchy in Salt Lake City did not want to lose it to Texas cattlemen or the federal government.

In 1874, 100 wagons "well fitted out" with Mormon settlers crossed the river. The first 10 were escorted by Jacob Hamblin as far as "Moancoppy" [Moenkopi]. An initial attempt to colonize along the Little Colorado River in 1873 had failed; however, after 1874, as Mormon settlements were established in northern Arizona, a constant flow of travelers moved back and forth across the frontier created by the river. Mormon fugitives fleeing from the federal government on charges of polygamy would filter down through Utah into Arizona by way of the ferry. This "underground railroad" ran from the crossing to Snowflake, Mesa, the Superstition Mountains, Deming, New Mexico, and into Old Mexico (Verkamp 1940; Little 1909; Robinson 1919).

It was also known conversely as the Honeymoon Trail by the people of the communities on the Little Colorado. Typically the honeymoon couples would travel in small wagon trains to St. George, Utah, to have their marriages sealed in the newly erected temple, sanctified in 1877. They would leave in November, winter in Dixie,[4] and return to Arizona the following spring (Crampton 1965; Tanner and Richards 1977). The names of many of these pioneers remain today at historical sites AZ C:02:012 (Feature 5) and AZ C:02:094, pecked in the rock or painted on with axle grease (Figures 39 and 40).

The road over Lee's Backbone was an extremely difficult route to negotiate for horse-drawn wagons. The original road was probably constructed by Blythe in 1873. Teamsters considered this route to be one of the most treacherous sections of ground in the entire West, and immigrants feared it with as much anticipation as the river. This was the main reason the lower ferry site got so much use from 1879 to 1898. Between 1885 and 1888 ferryman Johnson labored on an upper bypass across the softer formations above the original backbone. The new section had the advantage of a slightly smoother surface, but was by no means a cakewalk. It is assumed that it became the preferred route (Rusho and Crampton 1975:48). After 20 years of faithful service, Johnson was recalled by the church and James Emmett took over operation of the ferry. Up until 1898, the ferry service was relatively primitive, but in that year a heavy track cable (AZ C:02:011, Feature 4) was installed at the upper crossing. By 1910 the dugway was installed and Charles Spencer had his Thomas Royal Flyer brought down the new road and across the river by way of the upper ferry (Measeles 1981; Rusho and Crampton 1975, 1981; Tanner and Richards 1977).

The final ferry crossing took place on June 7, 1928, and it ended in tragedy. Two passengers and ferryman Adolph Johnson were drowned when their boat was torqued and flipped in a whirlpool. Mr. Johnson had already jumped onto the shore with rope in hand when the trouble happened. He died attempting a rescue as his wife watched from the opposite bank. The Navajo bridge spanning the Grand Canyon was dedicated the following year, and the ferry service as well as Mr. Johnson were no longer required (Rusho and Crampton 1981).[5]

[4]Due to the warm winters, cotton crops, and successful vineyards, the area around St. George has been known provincially as Dixie since the early days of the Anglo frontier.

[5]In September of 1992 Mr. Henry Lane, a Navajo elder, accompanied a Park Service archaeological trip down the river. As the boats passed under the bridge, he told the crew how he had been present at the "big picnic" for the dedication in 1929 at the age of 13 or 14 with his family. Mr. Lane believed that he was currently 77 years of age (personal communication with Chris Coder, NPS Archaeologist, September 1992).

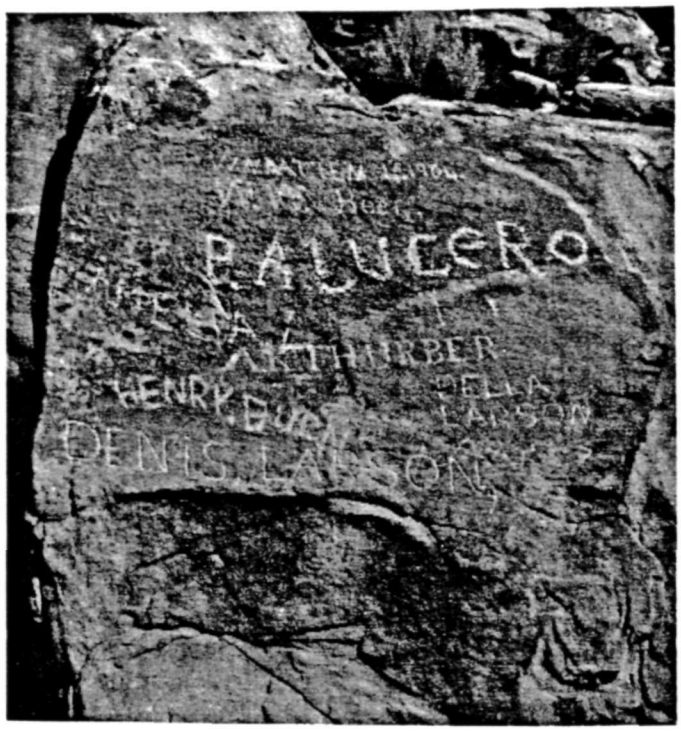

Figure 39. Historical inscriptions at USGS cableway, Lees Ferry, Arizona (NPS project photo 1991).

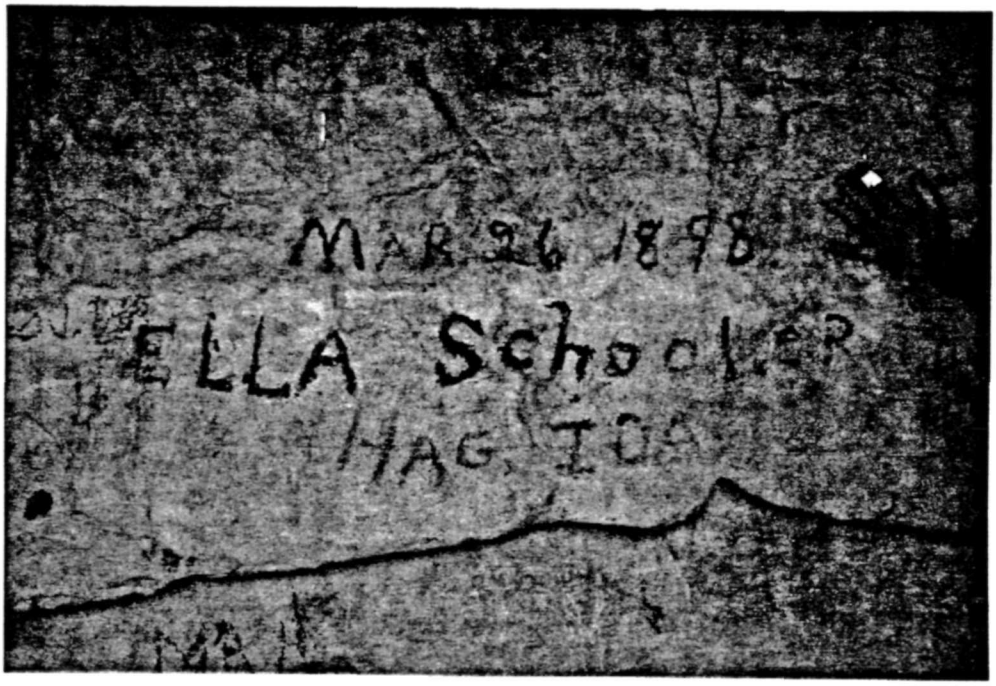

Figure 40. Historical names and date in axle grease at lower ferry crossing, Lees Ferry, Arizona (NPS project photo 1991).

Today Lees Ferry is an Historic District containing several documented sites, including Charles Spencer's mining operations, Lee's original settlement at Lonely Dell, the stone fort/trading post (1874), the post office (1879), and U.S. Geological Survey buildings. The district is well documented and widely written about in numerous government and private publications. Presently, Lees Ferry remains a focal point for fishermen and people embarking on river trips through the Grand Canyon (Figure 41).

The Stock Industry

In 1869, the year of Powell's first expedition, cattle in the Arizona Territory were worth $4,006,500. Virtually all of this stock was south of a line from Prescott through Camp Verde. By 1900 there were 848,000 beeves in the territory worth $14,368,000 (Martin 1963). Much of this growth was due to the opening of northern Arizona and the strip country north of the Grand Canyon.

Ranching was established in the vicinity of the Grand Canyon in the early 1870s. The first cattleman north of the Colorado River in Arizona was a woman. Rachel Hamblin kept 40 head at Jacobs Pools above Lees Ferry as early as 1871. Her husband Jacob was the driving force behind Mormon expansion in the region and running cattle worked hand-in-hand with establishing a claim to the land. Also in 1871-1872, Levi Stewart[6] and his son, working out of Kanab, established a small ranch near Big Springs on the West Kaibab Plateau. The second Powell expedition observed Stewart's corrals and slept in a half-finished cabin there in 1871 (Altschul and Fairley 1989:187). Throughout the 1870s and 1880s, numerous small stock operations sprang up and disappeared in the vicinity of the Grand Canyon. One must remember that John Hance worked on the Hull sheep ranch before coming to the south rim prior to 1883 (Hughes 1978). The first large-scale use of the Kaibab Plateau by stockmen was during the years 1885-1886, when a cooperative group out of Orderville, Utah, associated with the Mormon church, began running 2000 head of cattle. This group sold out to John Young, Brigham's son, in 1887. The stock went through two more owners, and eventually passed to the Grand Canyon Cattle Company (Forest Service correspondence to P. T. Reilly 1967).

Preston Nutter was one of the great cattle barons of the West. Born in 1850 in West Virginia, he was orphaned young, and came west when he was barely 13. He bought his first horse in 1863, and "63" became his stock brand, a brand that is still used today on the horses of the Preston Nutter Corporation. He traveled a short time with the convicted man-eater, Alfred E. Packer, and was the prosecution's chief witness at Packer's trial.[7] Nutter became a representative for the Colorado Territory, ran a freight company, and when the railroad came

[6]This is probably the same Stewart who prospected with John Riley in the river corridor (AZ:B:10:227).

[7]Mr. Packer has attained cult status in Colorado. A dining facility at the university in Boulder has been named in his honor (personal communication with Dr. Mark Taylor, Northern Arizona University, 1986).

Figure 41. Vernacular sandstone structure opposite Lees Ferry (NPS project photo 1991).

through, moved to Utah in 1886. In 1893 he began operations on the Arizona Strip, and dominated the cattle industry until after World War I (Price and Darby 1964). His name appears on the lid of a dynamite box in the bottom of the Grand Canyon (AZ A:16:177), along with Jeff Button's (1922) and Jon Bundy's (1926). Nutter's name was not associated with a date and is presumed to be earlier.

Nutter died in 1936, a few years after William Wallace Bass. They were men of the same make and mold. Both believed in hard work and free enterprise and both were stockmen, although for Bass it was a sideline and his interests were in breeding horses, not raising cattle.

Bass had an interesting livestock encounter in March of 1886. While traveling down the Tanner Trail with two companions, they came upon a recently abandoned camp with five rifles, five pistols, five saddles, and a fire ring. Moving on to a place called Rock Tanks in the gorge, they encountered five men watering 18 horses that had just had their brands changed. A Frenchman with the horse thieves claimed he knew the canyon well and had been down the river with Powell (James 1911:245; Steve Maurer personal communication).[8]

Bass and company moved on, crossed the river on a raft, and did some prospecting. They returned to find their horses gone. Two days later they learned that 18 valuable horses had been stolen in Albuquerque. The horses were trailed as far as the Little Colorado by authorities from New Mexico before being lost (James 1911:244-246). This episode may have been the basis for the legend of a horsethief trail crossing the Grand Canyon in the vicinity of Palisades/Lava Chuar and Nankoweap.

The stock business, which never amounted to anything in the Grand Canyon itself, was important to the region (Altschul and Fairley 1989). Lees Ferry was an active location for transporting large numbers of cattle and horses back and forth across the river. By 1889, there were over 200,000 sheep and 20,000 cattle destroying the range on the north side of the Grand Canyon. As was the case everywhere in the West during this period, sheepmen and cattlemen, their respective animals and lifestyles, were not compatible.

In 1909 large numbers of sheep were moving through the high ground on the north side of the river. In an effort to make sure they didn't stay, the cattlemen cut the tanks and reservoirs throughout the countryside, depriving the herders and their animals of the necessary water (Rider and Paulsen 1985). Rowland Rider, a young cowboy working out of Lees Ferry for the Grand Canyon Cattle Company, tells an incredible story of this sabotage. As the sheep moved through House Rock Valley, they became crazy with thirst. Nearing the rim, the lead animals could smell the water of the Colorado River. Desperate, and lacking options, the sheep—all 10,000 of them—poured over the lip of the canyon in a lemming-like frenzy. It is said they dammed up the river for a short time (Rider and Paulsen 1985:67; Stone 1932).

As tragic as the event was, some economic advantage came out of it. Emmett, the man who was at that time running the ferry, had several daughters, and two of these young women rowed down to the scene and skinned sheep until the stench forced them to return home. They traded the wool and hides to the Navajo for silver bracelets and turquoise (Rider and Paulsen 1985:67). The concentration of bleached bones found along the river below Cathedral Wash by the archaeological survey testify to this event.

An article in the September 13, 1912 *Coconino Sun* illustrates the magnitude of concern by local stockmen over the proposal to turn thousands of acres of good grazing land into a national park, "as it would do great injury to the cattle and sheep industries in that section of the country....The range is already becoming overcrowded and when the price of beef is beyond any but the rich on account of there being so little public range left to raise beef on.... That's the thing, more sight seers...only a hanker for more tourists, which spells more dollars for the park agitators. Do we want to stay in the cattle and sheep raising business or be lackies for big brewers, soap makers, and stock gamblers and their wives for the wages a tourist agency would pay?"

This angry little article written nearly 80 years ago in Flagstaff encapsulates the roots of today's problems in the American West with regard to public land and the regulation of water use, mineral extraction, and the traditional misuse of range for the benefit of livestock.

Recreation and Adventure

In such an incredible place as the Grand Canyon it is hard not to have a recreational experience, even when one is hard at work. Conversely, it is nearly impossible to avoid working if you are there for only recreation. In this setting the two often work in tandem and become intertwined. The first tourists in the canyon paid John Hance and William Bass, yet they worked as well—the women helping with the food and the men helping with the animals and everyone setting up and breaking camp. Even today if one pays $2000 to run the river, it takes considerable skill to avoid doing any work—unless, of course, in the tradition of Robert Brewster Stanton, one can afford to bring along a brace of personal servants.[9]

[8]James's account (1911:245) chimes of Victorian melodrama without the ring of complete truth usually associated with good history.

[9]In recent years, trips whose passengers originate in Hollywood have contracted river trips which include a chef, personal spiritual advisors, and a masseuse (personal communication Audria Smith-Morse, September 1992).

Historically, recreation began with the early miners as a sideline business to generate cash. Hance, Bass, Cameron, Berry, and others realized that the human market was more lucrative than the mineral deposits and tapped into that resource while proceeding with their mining plans. John Hance advertised regularly in the *Flagstaff Sun*, and William Bass built a road that intercepted the Santa Fe Railroad four miles south of the rim to divert paying customers to his camp west of the village (Austin n.d.; Maurer 1983; Madsen 1980) (Figure 42).

For Victorian America, the Grand Canyon took on an other-worldly aspect that was explainable to the engineers through numbers, but to the public through sentimental and religious metaphor such as "sermons in stone" (Sante Fe Passenger Department Publication 1906:39), "the cathedrals of the canyon," "a gash in Nature's bared breast" (p. 38), "the world's sublimest tragedy" (p. 91), and the canyon as a "living, moving, pulsating being ... the very spirit of the living god himself" (Dellenbaugh 1908:49). This sort of rhetoric brought Americans to

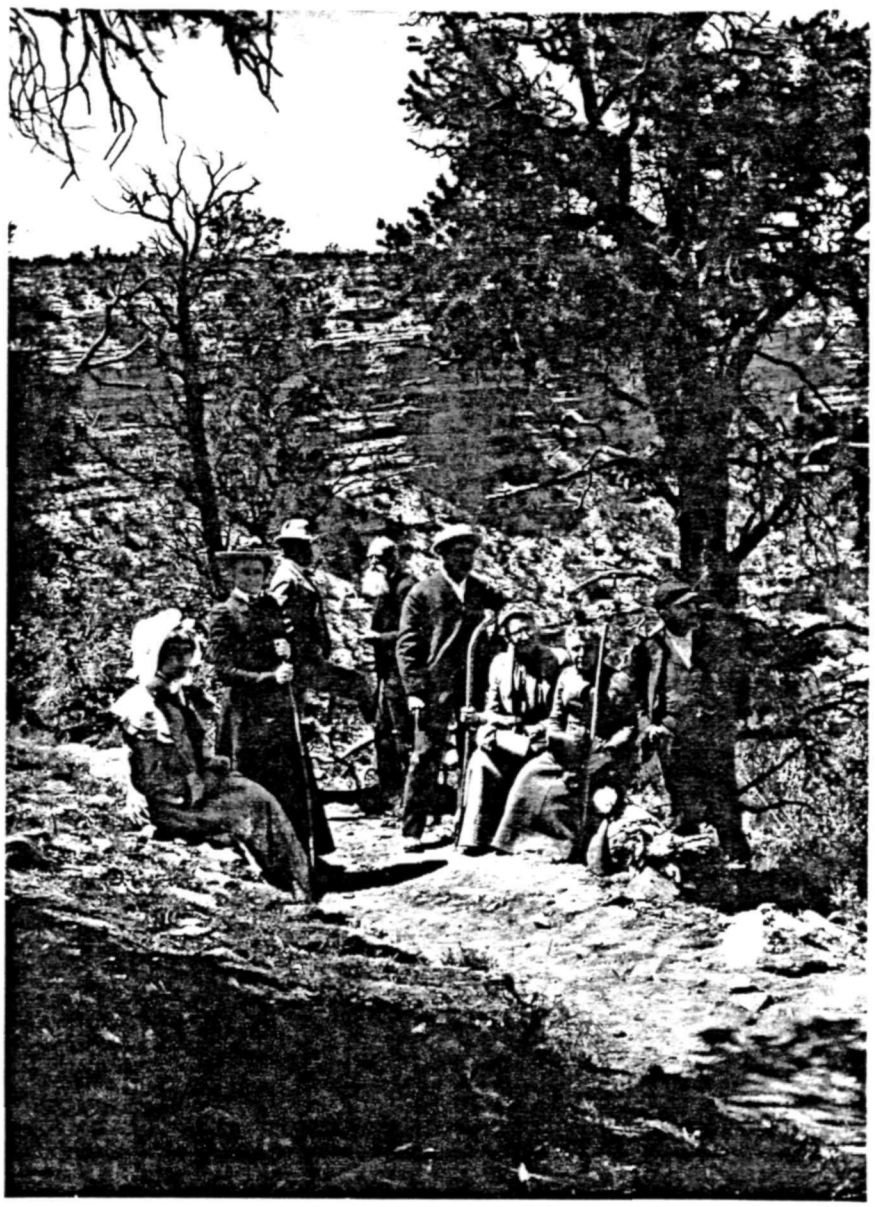

Figure 42. Rimming out in high fashion. Thomas Moran, the famous painter (white beard), with party on the south rim, 1917 (courtesy of the Arizona Historical Society, Tucson, Bass Collection).

the Grand Canyon in increasing numbers (see also Woods 1899).

In 1895 a Methodist Episcopalian conference was held on the South Rim. In that same year, 58 people signed Bass's guest register. In 1899, 900 visitors arrived at the canyon by stage. The Santa Fe Railroad had established train service to the canyon in 1901, and in 1902 the first automobile struggled to the South Rim from Flagstaff. Also in 1902, the Territory of Arizona filed suit against R.H. Cameron for charging tolls on the Bright Angel Trail, and that litigation went on for years (Austin n.d.). In 1904 parts of Grand Canyon were added to the National Reserve.

By 1905, the Santa Fe Railroad finished building the El Tovar Hotel and tourism at the Grand Canyon was entrenched. It was still primarily a terrestrial adventure; except for those who saw the river at Hance's camp or crossed it on Rust's and Bass's cables, very few people were interfacing with the Colorado.

The Flavell-Montez (1896), Galloway-Richmond (1897), and Hum Woolley (1903) trips were two- and three-man private trips concerned with fur markets and gold prospecting. The Russell-Monett trip of 1907-1908 was basically for adventure. The 1909 trip of Julius Stone was the first paid private trip in the record. Julius Stone, who was one of the richest men in the United States, hoped to dredge the Colorado for gold. Wanting to see the region first-hand, he hired Nathaniel Galloway to take him through the canyon. Galloway was a first-class oarsman and pioneered the stern-first method of boating on the Colorado (Lavender 1985; Marston 1976). Luckily, when food ran low Stone's trip was sustained by killing and drying the meat of several sheep which had survived the mass suicide at Cathedral Wash (Rider and Paulsen 1985).

By 1949 only 100 persons had been down the river. Following is a list of known trips on the water below Lees Ferry before 1940. Included are trips of all types: exploration, adventure, recreation, and engineering (Lavender 1985; Marston 1976; Measeles 1981; Nash 1982; Stanton 1982; Kolb 1989; Freeman 1924; Stone 1932; Eddy 1929; Cook 1987; Reilly 1962).

Powell 1 and 2	1869 and 1871-1872
Brown and Stanton	1889 (aborted), 1890 (completed by Stanton)
Flavell and Montez	1896
Galloway and Richmond	1897 (first of Galloway's several trips)
Elias Benjamin "Hum" Woolley and Co.	1903
Russell and Monett	1907-1908
Stone, Galloway, Dubendorf, Cogswell & Sharp	1909 (first paid private trip)
The Kolb Brothers	1911 (first motion pictures)
The Russell-Quist-Loper-Tadje fiasco	1914 (see Figure 43)
USGS, Birdseye, and LaRue	1923 (survey for dam sites)
Clyde Eddy	1927 (Eddy brought along a bear for publicity)
Glenn and Bessie Hyde	1928 (probably drowned, boat found at mile 232.5)
Frazier and Eddy	1934
Cal Tech with Frank Dodge	1937
Buzz Holmstrom	1937 (first solo trip)
Nevills and Clover	1938 (first women to complete the canyon & Nevills' first complete trip)
Holmstrom, Burg, and Johnson	1938 (Burg in the first inflatable boat down the canyon)
The de Colmonts and de Seyre	1939 (from Paris, Mrs. de Colmont was the first woman to pilot her own boat)

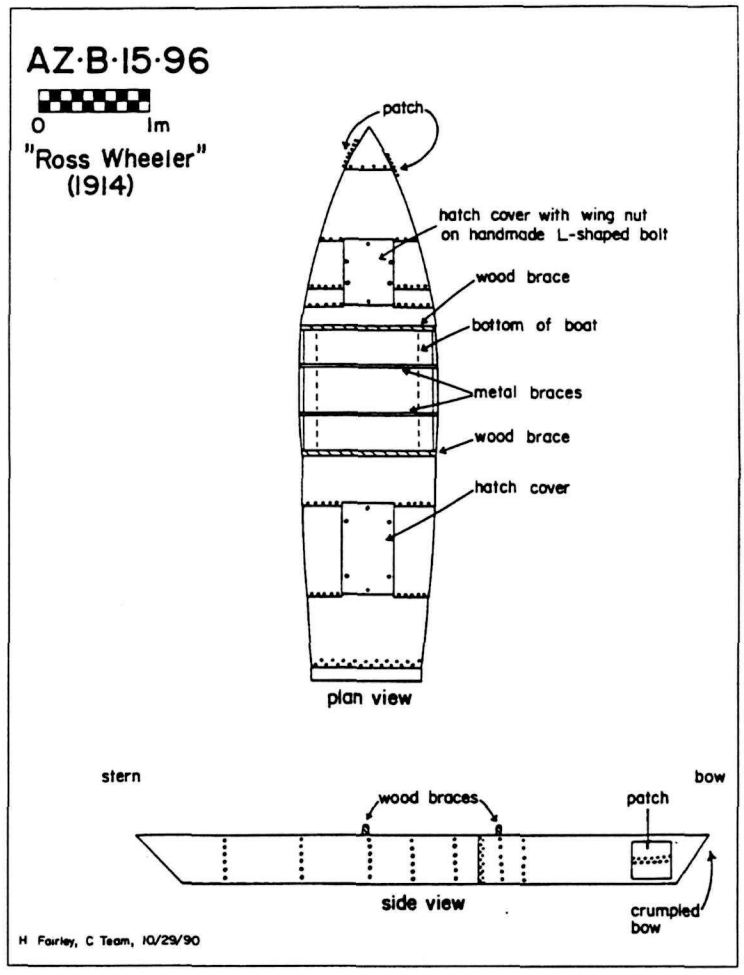

Figure 43. Built by Bert Loper in 1914, the boat was appropriated by Russell, Quist and Tadje in Glen Canyon and subsequently abandoned at the base of the Bass Trail. This is a different craft than the one pictured in Figures 36 and 37.

Stephen Pyne calls the Kolb Brothers' trip of 1911 an adventure that was a threshold event, representing "everyman as explorer" in the Grand Canyon. The brothers took the first moving pictures of the Colorado on this trip and showed them on July 5, 1912 at the Majestic Theater in Flagstaff. Emory Kolb went east in 1914 to expound the wonders of the Grand Canyon. He made over 100 presentations to various clubs and societies. On his return to Flagstaff, he commented that "people are coming west in droves during the next summer to see some of the things I told them about" (Austin n.d.; Kolb 1989).

In 1913 Zane Grey and two cousins visited the south rim, and in that same year the Harvey girls went on strike at the El Tovar Hotel on the Fourth of July (Austin n.d.). With the strike, Grand Canyon's introduction to the twentieth century was sanctified.

Kolb was right. America was on the move. The automobile and rail service were bringing the public west, and in 1914 the national parks were poorly run and in a state of disarray. The wealthy borax magnate Stephen Mather brought this to the attention of Frank Lane, Secretary of the Interior (Figure 44). Lane chartered the millionaire and his young assistant Horace Albright to fix the problem. By 1916 the two men pushed the Act through congress that established the National Park Service. The vision of Mather and Albright created a park system that truly was "for the benefit and enjoyment of the people" (Utley in Tyler 1973, p. 22). This is particularly true at Grand Canyon. Without the intervention of these men, the national parks may still have been run by the Army, as Yellowstone was before World War I.

In 1919 during Mather's renaissance in the park system, Congress elevated the Grand Canyon to the status of National Park, allowing for the unique resources within its boundaries to be protected and preserved. This was a noble and visionary act. The Grand Canyon is casually

Figure 44. William Wallace Bass and Interior Secretary Lane (with cigar) at the Grand Canyon train station, ca. 1919 (courtesy Arizona Historical Society, Tucson, Bass Collection).

known as the 'crown jewel' in the Park system. Most of the people who have looked into, walked over, or floated through it would agree that not only has the canyon remained a national treasure, it has become a mecca for the whole world. It is in fact an ordained World Heritage Site.

In 1927 Clyde Eddy, a World War I veteran from back east, sought fame and adventure on the river as a basis for joining the lecture circuit. He even brought a bear along for publicity (Lavender 1985). He placed his name alongside other river runners at AZ B:15:118.

The first true commercial river runner on the Colorado was Norm Nevills, operating out of Mexican Hat, Utah. His first complete trip through the canyon was in 1938, with Dr. Elzada Clover, a botanist from the University of Michigan. Dr. Clover and her graduate assistant, Lois Jotter, became the first two women to boat the entire Grand Canyon (Marston 1976; Cook 1987). Bessie Hyde would have been the first, but as far as we know, she and her husband did not make it past 232 mile rapid.

Nevills and his wife, Doris Drown, ran trips until 1949 when they were killed in a plane crash at Mexican Hat, Utah. Nevills pioneered the use of marine plywood construction, and Doris organized provisions on a day-by-day basis so trips would never get caught short of rations, a technique commonly employed today on commercial raft trips (Marston 1976). Mr. Nevills left his mark in the canyon at site AZ C:06:007, with the inscription "NN No 1, 7-12-47."

The first inflatable raft down the Grand Canyon was piloted by Amos Burg on a trip with noted boatman Buzz Holmstrom in 1938. The first motor trip was in 1949 by Otis "Dock" Marston, river historian and boatman (Lavender 1985). Georgie White, who passed away in 1992, ran the river commercially from 1952 to 1991, an accomplishment worth mentioning.[10]

Very few purely recreational historic sites occur in the project area. This is due to the proximity of the camps to water level and their propensity to be swept away in high water. Exceptions to this include sites AZ A:16:184, AZ G:03:004, AZ G:03:083, and AZ C:13:131. AZ A:16:184 is the camp spot of a Latter Day Saints church group from St. George, Utah. Food cans, jars, and fire rings are still present on the surface. A note left in one of the jars lists the names of the individuals on the trip and dates the event to April 23, 1948.

AZ G:03:004, a well-known location with the boating community referred to as the "Bundy jars" site, consists of several 1-quart and half-gallon glass jars, a coffee tin, and a fuel bottle under an overhang. The Bundys were pioneers on the Arizona Strip and became a vital logistical link to the river in the west end of the canyon, supplying early commercial boaters with fuel and provisions. One of the sons, Ivan Bundy, drowned at Whitmore Wash in 1931 (Reilly 1969; Cox 1982; Marston 1976; Wilson Austin personal communication 1991).

AZ G:03:083 is a supply cache, probably associated with an early up-river motor run from Lake Mead. Objects in the cache include gas, food and oil cans, jars, matches, and a *Reader's Digest* dating to the summer of 1945 (Figure 45).

AZ C:13:131 is John Hance's camp above the rapid bearing his name. This location was the base of the Captain's operations in the tourist business (1890-1912) and is well known. The site is bisected by a major trail, and very little diagnostic material remains on the surface (see Mining section).

An almost incomprehensible amount of material has been written about the Grand Canyon, and numerous persons have contributed to the modern perspective of the place with their architectural accomplishments, scientific work, photographs, and paintings. Although not physically represented in the project area, their work is derived from the canyon as a whole and produced for it, and they deserve mention in this section. Foremost among the dozens are Mary Jane Colter, Thomas Moran (Figure 46), Jack Hillers, Ben Wittick, Clarence Dutton, and Francois Mathes.

In 1990 the Grand Canyon was visited by 3,765,804 people, 400 search-and-rescue missions were conducted by the Park Service, and 15 people died. In 1991 there were 14 fatalities, 413 search-and-rescue missions, and 4.2 million visitors. In 1992 there were 20 fatalities, 421 search-and-rescue missions, and visition rose to 4.5 million (personal communication Tom Farrell, November 1993). The trend is obvious—more people, more problems. Herein lies part of the romance and mystique that make the Grand Canyon so very popular. It is vast and beautiful but also dangerous. Surely it is not as dangerous as heavy traffic in Los Angeles, or an evening's stroll in the nation's capitol, but it manifests an appealing kind of danger that links the modern American public to an out-of-doors and robust lifestyle that has essentially passed away. In 1911 Arizona historian Sharlot Hall crossed the river at Lees Ferry and wrote in her diary, "Death sits mighty close to the bank here." It was an astute observation. As long as it remains true, people will come to test its validity (Hall 1975:53).

[10]Ms. White traditionally wore a fake leopard-skin bikini while plying the waters of the Colorado not to be controversial but to hide motor oil, food and blackberry liquor stains (personal communication Karen Underhill, September 1991).

Figure 45. A boater's cache found above Diamond Creek. The *Reader's Digest* is from 1945 (NPS project photo 1991).

Figure 46. Thomas Moran (with white beard) at Bass Camp on his last trip to the Grand Canyon in 1917 (courtesy of the Arizona Historical Society, Tucson, Bass Collection).

Conclusion

The Grand Canyon and the river that defines it have become greater than the sum of their parts. Human beings have made it so. From the solo kayaker to the entire river-running community; from the individual prospector to the Bureau of Reclamation; from retired fishermen to the Sierra Club—everyone has an agenda.

All of these individuals and groups look at the Grand Canyon as a resource. This is where the polarity emerges—whether to exploit or preserve the resource. The two philosophies have evolved together since the turn of the century and their relationship is not symbiotic by nature. The engineers would, if they could, raze all of the rapids and the ecologists would, if they could, raze all of the dams. The outcome is a hybrid: some dams, some rapids. Before the Grand Canyon National Park was made official in 1919, the tradition was for exploitation. Without Park status to protect its natural grandeur, the Grand Canyon from Lees Ferry to Lake Mead would be a series of artificial pools, dams, and mines.

Even without the accelerated deterioration caused by human actions, the historic properties located in the project area are in flux. The high relief and variable runoff found in Grand Canyon National Park are not generally conducive to excellent preservation. Any further hydraulically engineered conditions imposed on the natural scheme of erosion and deposition in the canyon only serve to increase the dissolution of historical properties and our cultural heritage. See Table 25 for a complete listing of historic sites and their National Register status.

Table 25. Euro-American Historic Sites.

Site No.	Significance*	Description
A:15:001		Can scatter 1935-45 (5 cans).
003	A	Historic and modern trash; metal spikes, clear glass, cans, belt buckle, .22 cal.
A:16:165	A	Historic camp associated with mining claim 1900-30; cans, cut wood, nails.
172	A	Inscription and trash scatter, 1933-34; modified handle, cans, spikes, wood.
177	A,B	Cache in overhang and signatures, 1922-26; explosives box, cord, cans.
184	A	Camp; LDS group from St. George April 1948; jars, cans, note, fire rings.
B:10:227	A,C,D	Pristine miner's camp 1870-85; mining and domestic gear.
231		Enigmatic cut wood and metal fragments amongst rocks (boat?).
228	A	Historic short-term use camp; fire ring and deflector, cairns; no artifacts.
249	A	Trash in overhang; rusted bowl, wood, wire.
B:13:001		Camp 1940-60; mayonnaise jar, fruit juice, coffee can.
B:15:096	A,B,C,D	The Ross Wheeler, abandoned by Russell and Tadje.
097	A,B,C,D	Original Bass cable car crossing 1905-06.
100a,b	A,B,C,D	Bass's Hakatai cable crossing 1907.
118	A,B,D	Historic inscriptions 1899-1927; Galloway, Dodge, Eddy, Oliver.
120		Enigmatic cleared platform; possible transit or camera station.
122		Crude wall in boulder field, saw-cut bone present.
124	A,B,D	Historic inscription, 1903, George W. Parkins, Washington D.C.
128	A,B,D	Historic camp 1883-1920; cans, railroad spike, a drill, .30 and .44 cal cartridges.
132		Can scatter, 1940-1965.
139	A,D	Historic camp with trash, 1900-20; cans, leather, metal, cowbell.
B:16:170	A,B,D	Oar cache, 1905-1920; oars, rock pick, dynamite.
256	D	Grave of Rees B. Griffiths, 1873-1922.
258	A,D	Historic structure and camp 1890-1920; rubber, wire, cut wood.
262	A,D	Phantom Ranch gauging station.
C:02:011	A,B,C,D	Lees Ferry Historic District 1869-1991; structures and cables.
012	A,D	The Dugway at Lees Ferry.
036	A,D	Mining camp 1900-1930; clear glass, rubber, wire, .30 cal cartridge.
037	A,D	Inscriptions, Nov. 16, 1892; G.M. Wright; F.G. Faatz.
048	A,D	Lees Backbone, historic road 1870-1898; inscription 1878.
057	A,C,D	Historic ranch 1900-40; glass, cans, metal, nails, wood, .38 cal.
059	A,D	USGS gauging station, 1920s.
060	A	Stanton's Road 1890s.
072	A	Trash scatter 1890-1910; glass, cans, crockery.
073		Inscription: "Cope 55" (1955).

Table 25 (continued)

Site No.	Significance*	Description
087	A	Trash scatter 1920-60; glass, cans, metal, nails, wood, bone.
094	A,B,C,D	Lower ferry crossing; Honeymoon Trail names, anchor posts.
099		Ephemeral road connecting C:02:057 to upper ferry crossing.
102	A,B	Inscription: I.C. SPENCER 1925.
103	A,B	Inscription: CS 1925, SUJ 2022025.
105	A,B	Inscription: 1889 Hislop.
C:03:003	A	Trail for proposed marina below Glen Canyon Dam, late 1950s.
C:05:004	A,D	Frederick Berry's cache, 1888; traps, shovel, boot heel, wood, brass.
007	A,B,D	Inscription in base of rare juniper, 1890s: "H.M." = Harry MacDonald.
C:06:002	A,B,D	Inscription: Frank Brown, July 1889.
004	A	Inscription: 1923, pecked rock hammer and USGS.
007	A,B	Inscription: N.N. no. 1, 7-12-47 (Norm Nevills).
009	A,D	Cache 1894; cans, leather, wood, glass, spoon, knife, a level, personal items.
C:09:030	A,B	Graves; Peter Hansbrough July 1889, David Quigley BSA, June 1951.
031		Grave of Willie Taylor, heart attack victim on the river 1956.
033	A,D	Boat and oar cache.
034		Bert Loper's boat, 1949.
065	A	Proposed Marble Canyon Dam test site, 1948-63.
C:09:083	A	Modern camp, Bureau of Reclamation 1948-63; tables, trails, fire ring.
088	A	Marble Canyon Dam test site, 1948-63; shafts, ferry boat, industrial trash.
C:13:092	A,D	Historic camp 1890-1910; aqua glass, wire nails, rebar, cans, stove.
098	A,D	Mine and cabin 1890-1910; wire nails, canvas, cans, frying pan.
131	A,B,D	John Hance's camp 1890-1912; pipe, nails, wine, sheet metal, purple glass, wood, stove parts, ceramic plate.
275	A,D	Mine shaft 1903-05; wooden box, burlap, cans, modified cribbing, lap joints.
322		Recent initials on prehistoric petroglyph panel.
325	A,D	Trash and collapsed corral, 1900-10; cans, barbed wire, wood, corrugated tin.
332	D	Enigmatic posts burned to ground level; prehistoric artifacts.
342	A,D	Camp with structure, 1890-1920; cans, pulley wheels, enamel bucket, square nails, purple glass, dutch oven, coffee pot.
349	A,D	Structure, 1890-1910; milled pine cabin/dugout.
374	A,D	Camp in overhang; inscription "H.S. Wallace, Oct. 14, 1929"; cans.
383	A	Cleared platforms and retaining walls along the Hance Trail.
384	A,D	Artifacts in cut bank, 1890-1910; collapsible metal cup, ceramic plate.
388	A,B,C,D	Pristine miner's camp 1890-1900; probably Hance; complete gear.
G:02:100	A	Bridge Canyon City 1939; Numerous features, high artifact density.
101	A	Powder house for Bridge Canyon Dam project, 1939–1945.
102		Base camp 1926-60; cans, tobacco tins, wire nails, saw, metal box lid.
103		The Cenotaph; the plaque at Separation Canyon.
105		Base camp 1926-60; 3 tent platforms; tobacco tins, cans, glass, wire, metal buckle, boot heel.
106		Base camp 1926-60; tent platforms and walls, cans, tobacco tins, glass, files, fan blade, sawblades, drill bits, pipe fittings.
G:03:004	A,B	Camp/cache 1920-60; the much celebrated Bundy jars, coffee tin, fuel can.
023	A,D	Camp 1900-32; domestics, cut wood, three-tined fork, 1927 Pasadena newspaper, wire nails, purple glass, cans, metal bar, lard, gunpowder, food cans.
039	A,D	Camp 1915-45; cans, tobacco tin, clear glass bottle, boot.
047	A	Camp 1935-45; cans, wood, metal, clear glass, wire nails, domestics.
062	A,D	Camp 1890-32; cans, metal, wire, wire nails, wood, three-tined fork, carriage bolts.
083		Modern cache 1945; gas, food, and oil cans, jars, matches, 1945 *Readers Digest*.

*Based on criteria set forth in 36 Code of Federal Regulations 60.4.

Chapter 10

Cultural Resource Management Issues

Because the development of an environmental impact statement requires detailed knowledge about the numbers, types, significance, condition, and threats to cultural and natural resources within the affected environment, a Class I inventory of archaeological sites is a standard requirement of any EIS process. Detailed information about the extent and types of archaeological remains is essential for evaluating the significance of these remains, but it is the information concerning site condition and threats that have the greatest potential for influencing the development of EIS alternatives and the choice of a preferred alternative in the final analysis. Consequently, a considerable amount of effort was devoted to gathering information on the environmental setting, current condition, and potential threats at each of the sites recorded during the GCRCS survey. These data will be monitored and evaluated over the next 2 years, and changes in condition and threats will undoubtedly occur. Nevertheless, some initial observations and preliminary recommendations are possible.

This chapter outlines the procedures followed in the field for gathering baseline monitoring information and assessing changes in site condition through time. The monitoring section is followed by a discussion of observed impacts, their apparent relationship to pre- and post-dam river flows, and evaluation of effects. Recommendations for managing these sites in the future conclude the chapter.

Monitoring Procedures

Barely one-quarter of the sites recorded during the GCRCS survey had been previously documented and of these sites, less than half had been systematically described and monitored during the past 10 years. Consequently, a major portion of the GCRCS recording effort was devoted to gathering baseline monitoring information suitable for evaluating changes in site condition through time. Information on the condition of sites was documented on two separate monitoring forms as well as in numerous black-and-white photographs and color slides. The monitoring forms included a computer formatted two-page sheet that was developed for park-wide use in 1989, plus a second one-page sheet specifically designed for gathering information on river-related impacts for the GCRCS project. The second form was added after the third field session to include additional information lacking on the existing form. All of the sites have sufficient information to categorize them in terms of whether they exhibit direct or indirect impacts from post-dam river flows and the general nature of those impacts.

The original GRCA monitoring form includes categories of information related to human and naturally induced impacts. Possible human impacts include artifact movement, trailing, compaction of deposits due to trampling, on-site camping, and deliberate vandalism. Natural impacts may include surficial sheetwashing, gullying and active arroyo cutting, other forms of erosion (wind deflation, bank slumpage, etc.), and animal trampling. As already noted, these impacts are being recorded for all Grand Canyon sites and are not necessarily tied to river operations. This form is designed to produce a numerical rating, with low values indicating little or no impact and high values indicating greater impacts. Theoretically, changes in these values over time will reveal whether impacts are increasing or decreasing and in what ways.

The second monitoring form relies on verbal information to evaluate present site condition in the context of the river corridor environment. Categories of information include distance and direction from and height above the current high-water zone (28,000-31,500 cfs) and site location in relation to prehistoric or modern fluvial deposits. Persons completing the monitoring forms were asked to describe current site impacts in general terms and assess their probable relation to river dynamics. Other questions concerned the availability of past monitoring information for evaluating changes in site condition through time and qualitative evaluations of imminent and long-term threats.

The frequent lack of comparable monitoring information made certain types of evaluation difficult. For example, we know from discussions with river runners and from previous monitoring observations that some archaeological sites were heavily impacted by pedestrian traffic during the high-water years of 1983-1984 because some river companies required their passengers to hike around particularly bad rapids and also because high flows allowed considerable more time for off-river activities than in "normal" years. In most cases, however, the extent to which increased visitation reflected changing patterns of river runner usage due to modified flows could not be assessed due to the unavailability of earlier comparative information. Likewise, the extent to which gullying was due to bank steepening by the river or to other erosional processes could not be consistently evaluated. The paucity of consistent baseline monitoring information from previously recorded sites prevented monitors from tying specific

impacts to river flows. Because monitors tended to be conservative in their assessments and assume that most impacts were not related to dam-controlled river flows, it is likely that more sites are affected by accelerated erosion and changing patterns of visitation due to dam operations than the present data actually reveal.

Site Impacts

To assess site condition and impacts as they relate to the operation of Glen Canyon Dam, it was necessary to evaluate each site based on defined criteria for impacts. The impact analysis relied upon field observations. Assumptions about potential impacts were based on our current understanding of erosion processes along the river. Four generalized categories were used to classify impacts: direct, indirect, potential, and no impact. Within the four categories, additional indirect and potential impact subcategories were identified. The definitions used in the analysis are as follows.

- Direct Impact (DI): there has been inundation or bank cutting within the site area in recent years.
- Indirect Impact 1 (II1): there is bank slumpage or slope steepening adjacent to the site.
- Indirect Impact 2 (II2): there is evidence of arroyo cutting or other erosion exacerbated by base level lowering or proximity to river-eroded sediments within the site.
- Indirect Impact 3 (II3): there is evidence that changes in recreational use patterns have affected visitor impacts at the site (e.g., walking passengers around sites to avoid dangerous rapids, the creation of new camps to replace camps that eroded away).
- Potential Impact 1 (PI1): the site is buried in or is located on old river alluvium and is below the 300,000 cfs river flow zone.
- Potential Impact 2 (PI2): the site is located below the 300,000 cfs river flow zone and is not situated in or on river alluvium.
- No Impact: there is no apparent impact occurring on the site.

In assessing impacts, an approach was used that would look at the worst possible flow scenario. Therefore, all sites were evaluated for potential impacts if they fell within the flood zone that represented the maximum released possible from Glen Canyon Dam. Bureau of Reclamation figures indicate that by using all generators, spillways, and bypass tubes, upward of 278,000 cfs can be released from Glen Canyon Dam. Although unlikely, the possibility does exist that a flood of that magnitude could occur. Floods similar to those of 1983-1986 are more likely to occur, with flows between 40,000 and 100,000 cfs.

For the purposes of this study, all sites located below the maximum potential flood release level from the dam were considered to have a potential impact from operations. The historic high-water flood zone was identified in the field by examining the pre-dam vegetation, river deposits, and scour lines along the banks. The upper limit of the historic flood zone is assumed to be approximately 275,000-300,000 cfs, and thus comparable to the 278,000 figure discussed above. Sand areas with a dune-like morphology were assumed to represent eolian processes rather than fluvial action even though the origin of the sand was ultimately river sediments. Nevertheless, field observations could not confidently distinguish surficially reworked fluvial deposits from wind-deposited dunes. Additional geomorphic work is necessary to address the sand dune formation situation relative to site location and erosion processes.

Many sites were located within river-deposited sediments and therefore vulnerable to erosion of the margin deposits. Potential impact from accelerated arroyo cutting was, in many instances, difficult to assess. The assessment of arroyo cutting relative to base level lowering is being addressed in the geomorphic studies conducted by Richard Hereford of the USGS (Hereford et al. 1991). Hereford's results should provide a more detailed understanding of the erosion process as it relates to on-site conditions. Additional evaluation of certain sites will be necessary based on the information forthcoming from Hereford. It does appear, however, that effective base level lowering may be a significant factor in current erosion and potential erosion of archaeological remains.

Impacts were identified for 336 of the 475 sites recorded along the Colorado River between Glen Canyon Dam and Separation Canyon (Appendix II). In evaluating impacts, it was apparent that some sites exhibited impacts in more than one category. Thirty-three sites (7%) evidenced direct impact, either obvious inundation or erosion of banks within the boundaries of the site. Indirect impacts from bank slumpage or slope steepening adjacent to the site area were noted at 81 sites. Indirect impacts in the form of accelerated arroyo cutting within the defined limits of the site were noted at 39 sites. Four sites exhibited evidence of impacts related to changes in visitor use patterns due to modified river flows. Principally these changes involve trailing through sites as passengers were walked around rapids that become too dangerous during high flows and the development of new camp locations to replace camps that were eroded away. Potential impacts were identified at 238 sites (50%) because of their placement in or on river-deposited sediments. Any site in river alluvium is considered at risk due to the continual erosion of the margin deposits along the river, which provide stability and context for archaeological materials.

Seventy-three sites (15%) lacked direct or indirect impacts and were not situated on river alluvium, but were considered as having a potential for impact by virtue of their location below the 300,000 cfs zone. The remaining 139 sites (29%) were considered unaffected, either directly or indirectly, by flows from Glen Canyon Dam.

Evaluation of Effects

Evaluation of impacts must be considered in relation to the criteria of effect set forth in 36 CFR 800. "An undertaking shall be considered to have an effect whenever any condition of the undertaking causes or may cause any change, beneficial or adverse, in the quality of the historical, architectural, archaeological, or cultural characteristics that qualify the property to meet the criteria of the National Register (36 CFR 800.3)." These criteria are established for all sites that are either on the National Register of Historic Places or considered eligible for inclusion on the register. The Arizona State Historic Preservation Office (SHPO) has evaluated the 336 sites that are considered to have direct, indirect, or potential impacts from river flows. Of the 336 sites considered for eligibility, 313 have been determined eligible, 14 sites not eligible, and 9 sites are unevaluated until a testing program is completed. The remaining 139 sites have not been evaluated for National Register eligibility.

Given the determinations of eligibility and the impacts defined above, it is suggested that all sites within the affected environment of this project be considered to have an "adverse effect" determination based upon the possibility of "... destruction or alteration of all or part of the property" (36 CFR 800.3b1). "An effect may be direct or indirect. Direct effects are caused by the undertaking and occur at the same time and place. Indirect effects include those caused by the undertaking that are later in time or farther removed in distance, but are still reasonably foreseeable" (36 CFR 800.3a). The likelihood of impacts, whether they be direct, indirect, or potential, exists for all 336 sites, with 322 of them considered eligible or potentially eligible for inclusion on the National Register.

An "adverse effect" determination is recommended for the project given the current condition of the sites evaluated within the project area and the continued threat to the integrity of the sites. However, it is possible that a determination of "no adverse effect" could be issued given adequate mitigation measures.

Recommendations

Direction given to federal agencies by the Advisory Council on Historic Preservation concerning treatment of archaeological properties is that the preferred treatment for these properties is preservation in place. If preservation in place is not practical, appropriate mitigation measures may be developed through consultation with the State Historic Preservation Officer and the Council. Many avenues exist which could preserve the sites in a relatively undisturbed fashion. Consideration of mitigation measures must take into account that the Colorado River within Grand Canyon is within a proposed wilderness area. Any mitigation measures must be consistent with Wilderness Act requirements.

The greatest risks to site integrity along the Colorado River are flood scouring and sediment loss resulting in calving of deposits and accelerated arroyo cutting through cultural deposits. These risks—direct, indirect, and potential—could adversely affect the sites along the river. In order to address these risks, mitigation measures should be initiated for all 322 eligible sites that could potentially be impacted. The design of these measures must be site-specific, with a range of options appropriate for the varying site conditions. In all cases, monitoring of the conditions of the sites should be instituted.

The potential for future impacts to sites was identified at all sites located below the 300,000 cfs river flow zone. A primary factor contributing to site erosion is the lack of sediment replacement, resulting in base level lowering and headward migration of arroyos through cultural deposits. Methods for the mitigation of these impacts must be tied to stabilizing the sediment deposits. A variety of stabilization methods could be employed that would be appropriate to the specific location and setting of the sites and that would not lessen the integrity of the deposits. Replacement of sediment through controlled flooding may mitigate the loss and destabilization that has occurred at some sites. Likewise, stabilization of bank areas may be appropriate given on-site conditions. Revegetation of bank areas may provide additional stability to the deposits by adding root systems that would hold sediments in place. Minor log or root checks could provide arroyo-specific solutions to downcutting in certain areas.

The above mitigation measures are all very specific to site conditions, but the issue of continued loss must be considered relative to the whole system. If a major potential loss factor relates to the lowering of the effective base level of drainages within the system (Hereford 1991), raising the base level could mitigate the potential impacts to many of the sites within the affected environment. Raising the base level would require system-wide sediment replenishment, which could be achieved through flow modification to transport and redeposit sediment in much the same way the river did

prior to the construction of Glen Canyon Dam. Additional research on this area of potential mitigation is necessary.

A reduction in the risk of clear-water flooding would provide additional protection to sites. Clear-water flooding not only causes inundation of sites but also contributes to depletion of the sediment resource. This sediment provides the stability for the archaeological deposits. The information collected during this survey suggests that clear-water floods have had a negative effect on cultural resources. Likewise, flows that contribute to the depletion of sediment from the margin deposits or that exacerbate arroyo cutting have negative effects on the sediment deposits that contain cultural remains. Mitigation of potential impacts in the form of flow modification should be considered. Although controlled flows alone cannot mitigate the impacts that have occurred, they can lessen the threat of additional impacts leading to site destruction.

Preservation in place is the preferred alternative to any other mitigation measure. However, it is recognized that in situ preservation is not always possible. When all avenues of nondestructive mitigation have been exhausted, data recovery through excavation must be considered as a mitigation measure. As with any other mitigation plan, data recovery programs must be site-specific and must conform to professional and legal guidelines.

Establishment of a long-term monitoring program for all sites found during the survey is recommended to evaluate changes in condition, status, and threats to the sites. Baseline information was collected for each site recorded during the survey. With this baseline information, changes in site condition can be assessed based on established criteria. With the number of sites found in varying states of erosion, it is recommended that a long-term monitoring program be developed in conjunction with ongoing geomorphic studies to determine the status of the sites, the integrity of the deposits, and the likelihood of additional impacts. Changes in site stability would prompt actions for additional mitigation measures.

Conclusion

With the recommendation of an "adverse effect" determination, the Bureau of Reclamation, the National Park Service, the Advisory Council, and the State Historic Preservation Office must develop a Memorandum of Agreement (PA) to address the effects to cultural resources from the federal undertaking—in this case, the operation of Glen Canyon Dam. Appropriate mitigation plans must be developed that will reduce or eliminate the impacts to cultural sites. Recommended actions will be developed by the agreement. It is suggested that the PA contain a mitigation program that includes an expanded monitoring program in combination with site-specific actions that could alleviate additional impacts to sites. Preservation of original site context will be the preferred alternative. Excavation will be considered only when alternative in situ preservation options are unavailable.

Chapter 11

Summary of Results and Conclusion

At the onset of the project, five objectives were outlined. Each objective was achieved, with more information gathered for some and data needs identified for others.

The primary objective of the project was to provide an inventory of all sites located within the Colorado River corridor which could be affected by the operation of Glen Canyon Dam (Balsom and Fairley 1989). Four hundred seventy-five archaeological sites and 489 isolated occurrences were recorded within 10,506 acres as a result of this survey (Appendix I). The site total includes 118 sites previously located and recorded to some degree prior to this survey, plus 357 previously undocumented sites.

The second objective was to evaluate site condition relative to the environmental impact created by Glen Canyon Dam. As discussed in the previous chapter, all sites were evaluated for river flow impacts. Three hundred thirty-six sites were identified that either have been impacted or have the potential to be impacted from flows through Glen Canyon Dam. An additional 139 sites were recorded that did not exhibit impacts or potential impacts from river flows.

The third objective was to identify site settings that would provide information for further study regarding the problems of site erosion and sedimentation. As discussed in the previous chapter, it is apparent that depositional context, arroyo cutting, and sediment depletion are critical variables in understanding site erosion. The hypothesis of base level lowering and its relation to arroyo cutting through sites (Hereford et al. 1991) is an avenue that will require additional research and testing. The issue of dune formation is another factor that requires more detailed analysis from a geomorphic perspective. Additional research into these areas is continuing through a joint project between the USGS and the NPS.

The fourth objective was to evaluate site significance and eligibility for inclusion on the National Register of Historic Places. Determinations of eligibility have been made for 336 of the 475 sites located during this project. At this time, 322 sites have been determined eligible or potentially eligible for inclusion on the National Register. The remaining 139 sites have not been evaluated by the SHPO, although the NPS considers most of them to be significant and therefore eligible for inclusion on the Register.

The last objective of the project was to offer management recommendations for flow regimes from Glen Canyon Dam. The survey provided information indicating that post-dam flooding directly impacted 33 sites and was detrimental to site integrity. Not only was inundation an impact, but the continual loss of sediment along the margin deposits poses a threat to the integrity of numerous other cultural resources along the river.

This survey provides baseline information concerning 475 archaeological sites located along the Colorado River in Grand Canyon National Park and Glen Canyon National Recreation Area. In total, 10,506 acres, encompassing all portions of the river corridor containing river-derived sediments or situated below the historic high water zone (ca. 300,000 cfs level), were included in the survey area.

These survey results do not represent a static data set. Intensive survey of an actively eroding environment such as Grand Canyon cannot guarantee that all sites within the project area have been located. As the annual GRCA archaeological site monitoring program has demonstrated, sites appear and disappear in previously surveyed areas as dunes shift and arroyos cut into deposits. Areas within the survey zone that are particularly prone to this occurrence have been documented at Nankoweap, Palisades, Tanner, Basalt, Unkar, and upper Granite Park, to name just a few. Follow-up field monitoring and survey must be performed in areas prone to sediment shifts and erosion.

This data base has provided the foundation for developing recommendations and guidelines for preserving the archaeological resources along the Colorado River. Based on survey information, along with information gathered as part of the geomorphic and sediment studies, it appears that river flows need to be moderated so that clear-water floods do not occur and that sediment loss is lessened or eliminated. Flows that cause continued erosion of the margin deposits have the potential to destabilize banks containing cultural deposits. As the lower beaches and sediment deposits are eroded away, the likelihood of impacts into the older deposits increases. As sand deposits in the current fluctuating flow zone are removed, the old flood zone becomes increasingly susceptible to erosion. Continued erosion will impact cultural deposits, causing irreparable damage. These cultural deposits represent a nonrenewable resource, a resource very significant to the canyon, the river, and the descendants of the people who called it their home.

Recommendations have been discussed for mitigation measures that could preserve the archaeological remains along the river. Potential mitigation measures include site-specific approaches such as check dam construction or data

recovery, as well as systemic approaches involving modified river flow regimes. A reduction in sediment erosion due to reduced flow variation could slow or halt site erosion in certain areas. Reduced flows in combination with other tactics, such as sediment replacement to raise effective base levels of drainages, could benefit the resources along the river. Regardless of the future flow regimes, impacts to sites have occurred over the last 28 years of dam operations that cannot be corrected. The damage done is irretrievable. The information loss is unknown. We do know that the breadth of archaeological information housed in the deposits along the river spans at least 4000 years of human history.

Any change in flow regime or mitigation measure that is approved must be accompanied by an effective monitoring program. The program must be able to evaluate changes in site situation and must be linked to actions developed as part of the compliance required by the National Historic Preservation Act. A dynamic monitoring program—a program that is adaptive, creative, and linked to actions—is crucial to the preservation of the cultural resources of the river corridor. With preservation of the sites in place as the overall goal, managers must develop mitigation measures that will ensure that the resources located along the Colorado River are maintained in as pristine a condition as possible.

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Appendix I

Site Descriptions

SITE DESCRIPTIONS

AZ:A:15:1
This is a roaster complex consisting of six features—primarily FCR middens/roasting pits—and a light scatter of artifacts, including sherds, lithics, groundstone, and lithic tools. Ceramics suggest PII Formative and late prehistoric-early protohistoric Pai occupations, with a possible late historic component. The site is divided into two loci (A and 1A); Locus A includes F1-6. Feature 1 is a small cluster of stacked rocks above large boulders overlooking the river. It is a circular array 56 cm in diameter; looks like a small hearth, although no charcoal was seen. F2 is an area of FCR with a vesicular basalt trough metate (27 x 45 cm), a thin biface tool from a flake, charcoal fragments, and two sherds. F3 is an eroded roasting pit (10 m downslope) with charcoal fragments at the top and burned soil. F4 is a cluster of rocks above F3; some appear to be fire-cracked. There is a quartz hammerstone in this cluster. F5 is another roasting feature with eroded FCR, soil stains, and charcoal fragments. F6 is a roasting feature or FCR midden; no charcoal noted. Also observed in the area were three milk cans dating from between 1935-45 and two knife-opened fruit cans clustered around a charcoal scatter (Locus 1A).

AZ:A:15:3
This is a multi-component site with a PII Virgin Anasazi occupation, and later Pai or Paiute and late historic affiliations. It consists of two loci (A and B). Locus A occupies a sandy terrace at the base of a Muav cliff face and talus slopes below. There are numerous roasting pits in this area, suggesting that this was a major activity focus. Historic and recent (post-1950s) material is present and protohistoric (Pai or Paiute) use of the area is suggested by the recent appearance of charcoal on the surface of the ground. Locus B consists of three feature areas. Feature 1 is an overhang shelter at the base of the Muav that was used by PII Virgin Anasazi peoples. A midden downslope contains 1930s-era trash as well as flakes, sherds, and charcoal. Features 2 and 3 are around the bend of the Muav cliff face. Feature 2 is a cleared area with flakes and charcoal and a boot heel. Feature 3 is another cleared area with stacked rocks.

AZ:A:15:4
This possible historic Pai site is divided into Loci A and B. Locus A consists of a small roasting feature and a light scatter of historic artifacts on the first alluvial terrace above the river on the downstream side of the local canyon. The roasting feature is indicated by a roughly circular pit 2 m in diameter and ca. 20 cm deep, with fire-cracked limestone and sandstone rocks exposed. Two small mounds of FCR and charcoal pieces are located 2-3 m north of the pit; probable discard piles. Historic artifacts, including a tin can, two pieces of badly deteriorated lumber, and a probable canteen, are located ca. 15 m east of the roasting feature, and are quite possibly associated with it. The roasting feature appears relatively recent (nineteenth/twentieth century) and the terrace itself seems to be recent. It is possible that this locus was used as a food processing camp by historic Hualapais. Locus B is ca. 42 m northeast and consists of 10 flakes of two different materials (Kaibab chert and a grainy, purplish chert), plus a pot bust of ca. eight sherds. The two loci may represent different activity areas of a single occupation; but testing/additional study is needed to determine this.

AZ:A:15:5
This site consists of previously recorded pictograph panels and the GCRCS additions of a habitation/special activity area against the base of a cliff and two roasting features on a terrace below adjacent to the drainage. The site may be associated with late prehistoric-early historic Pai or Paiute use. In an effort to avoid confusion, the original site area was designated Locus A, the activity area around the corner was designated Locus B, and the roasters were labeled Locus C. Locus A consists of red (hematite) pictograph panels on fallen, angular, limestone boulders. Locus B contains two expedient single-course stone walls against a cliff base with lithics, groundstone, and charcoal. Locus C consists of two roasting features: F1 is a 6 m diameter pit on a finger ridge in the main drainage; F2 is a deflating fire feature with flakes, charcoal, groundstone, and several brown ware sherds. The portion of the site at loci B and C gets the first morning light in the winter.

AZ:A:15:16
This site number was assigned to a pot cache that once consisted of a what was believed to be a single, whole Shinarump Corrugated vessel that was located in a horizontal crack ca. 50 m downstream from the hematite mine (AZ:A:15:25). The vessel apparently was stolen in May of 1990.

AZ:A:15:17
The site consists of a rockshelter with associated lithics, sherds, and groundstone that may reflect both PII Virgin Anasazi and late prehistoric-early historic Southern Paiute occupations, as well as

twentieth century historic use. Numerous lithics, some sherds, river cobble manos, and several imported sandstone slabs are scattered along a level, partially sheltered area at the base of a lava cliff. A cavelet, ca. 5 m x 7 m x 1 m high, is located at the east end of the overhang area. The cave has a level floor covered with fine silt; driftwood is visible at the rear wall of the shelter. A pile of driftwood and a smaller pile of kindling are located to the west of the cave entrance. Various lithic materials are present, including red, pink, and yellow chert, chalcedony, and quartzite; some flakes are utilized. The site has several sandstone river cobble manos. Sherds and lithics are eroding down a basalt talus slope in front of shelter for at least 30 m. This site probably was used seasonally by both Anasazi and Paiute. The presence of a Jeddito B/Y sherd suggests a possible Paiute trade connection with the Hopi.

AZ:A:15:18
This is an aceramic rockshelter area with several pictograph panels, groundstone, and evidence of fire use; cultural/temporal affiliation is unknown, but this may be a protohistoric site. The site is situated within a 2-3 m deep cliff overhang that extends east-west for about 25 m. The shelter contains a metate, a cleared space, and a fire-blackened ceiling overhead. Charcoal fragments extend the length of the overhang. Four panels of red pictographs are located on boulders in one portion of the shelter; another charcoal pictograph is located slightly further west in what has been designated "Shelter 1" (see map). Two flakes and some bone in a packrat midden complete the artifact assemblage. One FCR feature is located below and west of Shelter 1.

AZ:A:15:19
This is an aceramic site consisting of two roasting features and a lithic scatter at the base of a slightly overhanging Bright Angel cliff face, along a relatively level area at the crest of a talus slope; cultural/temporal affiliation is unknown. The roasting features are low mounds of primarily limestone FCR with charcoal-stained soil piles adjacent. Lithic debitage is relatively abundant, reflecting intensive biface reduction activity. Two fragments of a one-rod foundation coiled basketry tray were also found. No groundstone or ceramics were noted. The site may have served as a temporary camp, probably related to hunting and gathering activities in the lower canyon; alternatively, it could be associated with the harvesting of hackberries from the grove in front of the site.

AZ:A:15:20
This is an extensive PI-early PII Formative and late prehistoric-early historic Pai site with numerous FCR features, including two donut-shaped mescal pits, and a rockshelter under a large basalt boulder with a large midden in front of it. The rockshelter faces west and northwest and overlooks an alluvial terrace measuring 130 x 50 m where the many FCR features are located. The largest roasting pit (F1) is a 25 m in diameter feature ca. 25 m west of the rockshelter; nearby are numerous smaller FCR concentrations. The rockshelter habitation area measures ca. 9 x 3 m. Directly W/NW of the shelter is a steeply sloping midden area containing dense lithics, sherds, ashy soil, FCR, and charcoal. Along the base of the terrace, ca. 50 m west of the shelter, are seven-plus dense concentrations of FCR spaced 8-10 m apart (perhaps the remains of sweatlodge activities?). Two Hopi Jeddito Yellow Ware sherds and a Jeddito Corrugated were found on the site.

AZ:A:15:21
This late prehistoric-early historic Paiute site, with a later historic component, consists of an 80 percent intact slab/block-lined fire feature with most of its fill still remaining. In association, or nearby, is a finely worked, obsidian Desert Side-Notched point, several sherds from a single Paiute Brown Ware jar, and a recent historic can scatter. The cans are from the latter end of the 1920-1950 period and possibly have a Haulapai affinity. A single bone shirt button was also observed. The prehistoric component is centered on the top of a stabilized dune; the cans and sherds are scattered over a limestone bench area adjacent the upstream terminus of the dune. The slab feature, which is presently in very good shape, should be tested before it disappears.

AZ:A:15:22
The site is located on a delta/terrace and includes three roasting pits (F1-3), all of which are eroding out of silt and sand deposits in the terrace, less discernable FCR scatters, and sherd/lithic concentrations. The site is the result of two possible occupations: P1-Early PII Formative and late prehistoric-early historic Pai or Paiute. F1 is a roasting pit on the southernmost boundary of the site high on the dune terrace. No artifacts were found in the immediate vicinity. F2 is a roasting pit eroding out of a large dune downslope from F1; ceramics and lithics are present. F3 is a depressed roasting pit with a separate area of FCR a few meters upslope. There are several areas of just FCR in addition, plus three areas of high sherd/lithic concentrations. Most of the artifacts are associated with the features.

AZ:A:15:23
This PII-early PIII Formative site consists of a shallow rockshelter with two vesicular basalt cobble manos and a single large corrugated sherd. Both manos are one-handed types; expedient, unmodified

river cobbles with low-to-moderate use-wear. Charcoal pieces on the surface of a cleared area at the shelter back may indicate a hearth, although no distinct feature was found. The cleared area was probably the main activity area of the site. The lack of artifactual quantity and diversity suggests the site was only used on a transient basis.

AZ:A:15:24
This site consists of a partially sheltered talus top area at the base of a Muav cliff with numerous expedient groundstone implements (sandstone slabs, cobble manos), several sherds (including a single Sikyatki Polychrome bowl sherd), semi-formal and informal flaked lithic tools, chert and obsidian debitage, and charcoal. Artifacts suggest PI-III Cohonina and late prehistoric-early historic Pai occupations. On the slope directly in front of the main artifact concentration is a midden of FCR, charcoal, sherds, and lithics, which extends at least 15 m downslope. The single historic/Anglo artifact at the site is a wooden crate plank (dynamite box?) with two enigmatic holes bored into it. AZ:A:15:28, an open food processing area with roasting pits, metates, and sherds, located on the alluvial terrace below this site, is probably associated with AZ:A:15:24.

AZ:A:15:25
This is the well-known hematite mine with artifacts that is currently associated with Hualapai use but may also be affiliated with late PI-early PII Virgin Anasazi and late prehistoric-early historic Pai/Paiute cultures. The hematite is occurring in stratified sediment as well as in large, amorphous concentrations in solutional cavities above a bench. There are several hand tools present, which have been used as percussion/grinding devices; no metates were visible. There is a lot of charcoal present on the surface, but no apparent formal fire rings. Ceramics were also observed. The best source for the material is located 20 m up a side canyon and 15 m above the bench, although it now appears difficult to access. The hematite itself is the result of infusion from the mafic rocks that flowed over the sediment.

AZ:A:15:26
The site consists of two roasting features (F1 and 2), a few lithics, and a sherd that indicates late prehistoric-early historic Pai use. Feature 1 is a 7 m diameter donut-shaped roasting pit with limestone and sandstone FCR, abundant charcoal, and the Pai sherd. Feature 2 is a smaller, highly deflated and eroded FCR/ashy soil concentration about 50 m north/northwest of F1; it is currently 3 x 6 m in size. A few (<10) Redwall chert flakes were observed in the area.

AZ:A:15:27
This site consists of at least one fairly large roasting feature (F1) and a smaller FCR mound (F2), with several possible discard scatters around F1. There is also a relatively extensive lithic scatter and a dozen or so sherds, including a single Jeddito plainware. This may be a multi-component site with both late PI-Early PII Virgin Anasazi and late prehistoric-early historic Pai occupations. The large roasting feature resembles the large feature at AZ:A:16:151 in general morphology and estimated age (within the last few hundred years). Debitage at the site indicates that a variety of lithic reduction tasks were performed, including biface reduction and projectile point manufacture. Several groundstone items suggest that plant food processing was also an important activity. The site is somewhat distinctive in terms of the diversity and quantity of remains. It may have served as a base camp where various domestic activities occurred for a fairly extensive period of time (when compared with other western Grand Canyon sites).

AZ:A:15:28
The site consists of three successive roasting pits (collectively called F1) built one atop each other, several FCR scatters/concentrations (F2-5), and associated artifacts. The latter suggest a late prehistoric-early historic Pai affiliation. The base of the F1 mound measures ca. 15 x 20 m. The middle midden area is ca. 10 m in diameter and is generally donut-shaped. The top layer consists of a concentration of FCR eroding out of the south side of the dune; it is 5 m in diameter. There is charcoal present in all three layers, with sand and vegetation covering 50 percent of the area. On the lower, west-facing terrace/dune edge, ca. 2 m below the top feature, is a suspected processing area. Here there is a 1 m diameter FCR feature (F2), several sandstone and basalt manos (all 15-20 cm in size and oval-shaped), a broken metate, and a few sherds. To the southwest is another small FCR concentration with two manos; there are two other FCR scatters (F4 and 5) further west.

AZ:A:15:29
The site consists solely of a mounded concentration of fire-cracked rock and altered cobbles on a steeply cut drainage overlooking the river. The feature is being deflated on all sides, particularly the cutbank facing the river, which is eroding the entire width of the roasting pit, causing it to erode down the cutbank. The west side of the feature is cut by a game trail; sheep and burro dung are present on the trail. The feature elements range from gravels to cobble fragments over 15 cm in diameter. Charcoal is present on the surface. No artifacts were observed and affiliation is unknown, although it may be late prehistoric-early historic Pai or Paiute.

AZ:A:15:30
This is an aceramic site consisting of only one fire-cracked rock midden/roaster with charcoal fragments and burned limestone. The feature is interesting because erosion has exposed the construction technique. The feature appears to have a broad, dish shape (ca. 2 m in diameter), with a layer of large limestone blocks on the bottom of the pit; smaller burned limestone/sandstone rocks and charcoal pieces make up the rest. Inside are upright slabs of unknown function; they seem to partition the feature. Heavy erosion has removed much of the interior fill, however the "floor" or bottom of the pit is intact and clearly recognizable. No artifacts were found in association and cultural affiliation is unknown.

AZ:A:15:31
The site consists of at least three concentrations of fire-cracked rock (FCR areas 1-3), an activity area with sherds and lithics (activity area 1), an activity area with a circular stone alignment (2), and an activity area defined by the presence of several metates (3). The site area is generally littered with manos (many of which are fire-cracked). There is also a smattering of ceramics across the site; mostly Moapa Gray Ware, suggesting a PI-early PII Virgin Anasazi affiliation. The 50 cm diameter alignment at activity area 2 did not appear to have been oxidized. Hundreds of charcoal chunks are scattered across the site, with a particularly dense concentration in the southeast portion of the site, "collected" against a Muav boulder by sheetwash. A few bone fragments, probably artiodactyl, were noted below the activity/FCR areas. One tool was observed, a thick secondary blank fragment with a biface edge.

AZ:A:15:32
The site consists of a concentration of fire-cracked rock and charcoal chunks on the edge of an alluvial terrace, an adjacent depression, and several sherds from at least two plain ware jars located 10-15 m south of the FCR feature. Ceramics suggest a late prehistoric-early historic Pai occupation. The FCR feature is next to a 5-meter diameter depression in the alluvium, which might have been a living space (i.e., wickiup), but there are no architectural remains visible. There is an unshaped sandstone slab adjacent the FCR feature, which may have been used as a pot rest, but no grinding implements or other lithic tools are present on the surface. The FCR concentration measures ca. 90 cm in diameter and is eroding 1.5 m downslope to the N/NW. It contains fist-to-gravel-size chunks of limestone (and a few pieces of sandstone). Ca. 15 m to the south is another clearing in the mesquites where the sherds are located, along with a large (50 cm in diameter) limestone slab.

AZ:A:15:33
This is a multi-component site reflecting PII Virgin Anasazi and late prehistoric-early historic Pai use, with a later early twentieth century historic occupation. It is divided into two loci (A and B). Five features were observed on the surface of the dune. F1-3 are fire features located at the top of the dune and F4 and 5 are further down the dune slope closer to the river. F1-3 are the more recent protohistoric features of the site and are designated Locus A. F4 and 5 are features associated with the Anasazi occupation and are designated Locus B. Ceramics, lithics, charcoal, burned bone, and historic trash (cans) are present on the site. Locus A has Pai-type ceramic wares; Locus B is considered Anasazi due to the presence of a buried structure and a Virgin-type sherd. The historic artifacts include an evaporated milk can, a lid, and a coffee can; they possibly date between 1917 and 1929.

AZ:A:15:34
The site is comprised of a small cleared area (about 1 x 4.5 m in size) at the base of a Muav cliff with sparse associated artifacts. One utility ware sherd and a flake with bidirectional edge flaking were found in the vicinity; the sherd indicates a late prehistoric-early historic Southern Paiute occupation. Approximately 17 m downslope was a mano—a cobble with a ground surface. This site may have had more integrity before being trampled and disturbed by burros.

AZ:A:15:35
This aceramic site consists of a concentration of fire-cracked rock and charcoal-stained soil eroding out of a sandy talus slope. The feature was probably a roasting pit. The FCR area extends ca. 4 m down the slope and is ca. 2 m wide. No artifacts were found associated with the roasting feature, which may be a food processing station related to site AZ:A:15:31, which is located just downstream.

AZ:A:15:36
This is an aceramic site consisting of a FCR concentration (F1) under a creosote bush with a red sandstone cobble mano 7 m away on the slope below it, and an oxidized scatter (F2) of small sandstone fragments and limestone FCR 6 m upslope of F1. F1 is mostly buried in riverine silt/sand; the exposed portion measures 1.75 x 2.1 m and consists of 30+ pieces of small limestone FCR. F2 measures 2.5 x 4 m and contains associated charcoal fragments. Cultural affiliation is unknown.

AZ:A:15:37
This is a PI-early PII Virgin Anasazi and late prehistoric-early historic Pai/Paiute site consisting of four roasting features, a possible wickiup outline,

sherds, minimal lithics, and some crude tools. The site was divided into two loci (A and B) to expedite recording. Locus A is situated in such a place as to buffer the wind. The roasting feature at Locus A (F1) is mounded and eroding into a wash. Roasting features 2-4 are at Locus B; they are not highly mounded and exhibit a lot of surface erosion. Locus B also contains a slightly protected boulder shadow that had a biface midsection and some deposition worthy of testing. Other tools included an obsidian drill and a chert projectile point. The lithic debitage is primarily located at F2.

AZ:A:15:38
This PI-early PII Virgin Anasazi and late prehistoric-early historic Pai site consists of an extensive scatter of FCR and associated artifacts on the highest sand dune downstream of the local canyon. The bulk of the FCR and cultural material is found on the downstream slope. The FCR does not appear to be in situ, but apparently has been transported from one or two central locations that are highly eroded. Artifacts present include Virgin and Pai sherds, a McKean series projectile point, lithic debris, a steatite bead blank, and a couple of flake tools. The McKean point is an Archaic diagnostic and may have been curated and re-used by the Pueblo or Pai inhabitants.

AZ:A:15:39
A late prehistoric-early historic Pai site that consists of 2-3 roasting features situated in reworked aeolian sand that overlies a small delta at the mouth of an unnamed tributary drainage. One roasting feature is very well defined, with an interior depression surrounded by abundant FCR and charcoal-stained soil. Two other FCR concentrations are more amorphous; one is probably an additional eroded roasting feature, while the other may simply be a refuse area. The features and artifact assemblage, which includes sparse lithics and three unformalized grinding slabs, suggest brief use of the site as a food processing camp, although occupation may have been repetitive.

AZ:A:15:40
This aceramic site is located in a rockshelter under a Muav cliff overhang; the only observed artifacts were groundstone items, including a pecked and ground limestone slab metate, a quartzite cobble mano, and a quartzite cobble that may or may not be cultural. Limestone FCR is eroding from the horizon of the shelter floor down a gullied slope. The shelter faces northwest toward the river (the view of the river is currently obscured by arroweed and tamarisk, but probably would have been more open prehistorically). The sheltered area is 9 m long, 1.25 m wide, and 1.72 m high. Cultural affiliation is unknown.

AZ:A:15:42
This is an early-middle PII Virgin Anasazi and late prehistoric-early historic Pai/Paiute site that consists of five shelter and artifact scatter features. F1 is an overhang shelter with a sandstone grinding slab and three slightly ground basalt cobble stones. The shelter is dry and no additional deposits appear to remain in the shallow fill. F2 is a boulder overhang with charcoal fragments, a few sherds, and a core. A square nail was also found (this area may be related to the historic use at site AZ:A:15: 1A). F3 is a large artifact scatter associated with a small rockshelter. The shelter contains lithics, ceramics, FCR, and groundstone. F4 is a downslope slump of ceramics and lithics; this area was chosen for placement of the ceramic analysis unit due to its diversity and density of sherds. F5 is an FCR scatter that contains a couple of groundstone fragments.

AZ:A:15:43
A late prehistoric-protohistoric Pai or Paiute site that consists of one, perhaps two roasting features with associated flakes, tools, and groundstone. Feature 1 is about 6 m in diameter and is located at the very edge of a terrace bank and partially eroding down it. Visible is an arc-shaped FCR deposit with a fairly cleared center; soil is dark and charcoal-stained and there are numerous charcoal chunks. Sandstone slab metates are a few meters north of the feature, plus a possible cobble mano. The only other artifacts in associated were a couple of flakes. There is a second area of FCR and charcoal about 8 m east/southeast of F1 that may be the remains of another roasting feature. There were a few flakes (including a possible Presley Wash obsidian item) around this feature, plus a core with possible use-wear, and several basalt and quartzite cobbles that may have polished or striated surfaces. A polished black stone—what appears to be patinated obsidian—was found near here and collected. No ceramics were noted.

AZ:A:15:44
This Pueblo I-III Virgin Anasazi site consists of a shallow Muav overhang with an informal Supai sandstone grinding slab and sandstone mano beneath it, and a circular roasting feature on the Muav bench in front of the shelter. The roasting feature is about 1.5 m in diameter and is comprised of oxidized Muav slabs and small charcoal chunks. One sherd and a white chert biface fragment (possibly a projectile point) occur on the slope below the shelter area.

AZ:A:15:47
An aceramic site situated in a west-facing shelter 3.5 m long and 2.5 m deep in a deposit of consolidated river cobbles beneath a basalt cliff. The

shelter contains a sparse lithic scatter of mostly Kaibab chert flakes; lithics and groundstone reflect an expedient technology. A biface, two one-handed sandstone manos, and 2-3 grinding slabs were observed. The biface is a preform/secondary blank of Kaibab chert. There was smoke-blackening on the shelter ceiling. No ceramics were seen and cultural affiliation is unknown.

AZ:A:15:48
The site consists of one probable and three possible roasting features; cultural affiliation is unknown. The most apparent roasting feature is F1, exposed on the slope of the highest alluvial terrace; there are whitened limestone cobbles and a few chunks of charcoal in a 4-meter diameter area on and at the base of the terrace slope. The other three possible roasting features (F2-4) are low, mound-like clusters of limestone and sandstone cobbles in 1 to 1.5 m diameter areas arrayed along the edge of the debris fan; these are mostly buried within the terrace alluvium. There is no charcoal evident on the surfaces of F2-4, and the rocks are similar to those found in the debris fan, but they are sorted by size (10-15 cm diameter rocks). Only one artifact—a rectangular basalt mano (7.5 x 11 x 2.9 cm)—was found, plus one recent/ historic food can. This is probably a specialized activity area associated with the rockshelter 50 m upslope (AZ:A:15:52).

AZ:A:15:51
This is a PII Virgin Anasazi site consisting of a roasting feature eroding out of a slope at the contact between an alluvial terrace and a talus slope at the mouth of the local canyon. A few lithic tools, flakes, and sherds (including a possible pot break) were associated. The pot break was situated at the perimeter of a cleared area about 3+ m in diameter ringed with small boulders. This may have been a focus of domestic activities, but was probably never part of a structure, although it may have supported a shade. Two obsidian tools were found: a small point or biface of Utah obsidian, and a small uniedge fragment of Government Mountain obsidian (scraper/stripper?) associated with the pot break. This area possibly served as a food processing camp.

AZ:A:15:52
The site consists of three adjacent, south-facing rockshelters with charcoal, cobble groundstone implements, flakes, and ceramics inside the shelters and eroding down the talus slope in front of them. This is a multi-component site with both PI-early PII Formative and late prehistoric-early historic Pai/ Paiute occupations. The easternmost shelter is 4.7 m wide at the mouth, 3.5+ m deep, and 1.55 m high. It has a soot-blackened ceiling, charcoal, sherds, and lithics; artifacts are concentrated along the dripline in front of the shelter. The central shelter is 5.1 m wide, 6.3 m deep, and 2.1 m high. It contains one cobble mano, three expedient grinding slabs, three river cobbles used for pounding, lithic debitage, and some FCR, but no sherds. The westernmost shelter also contains lithics and two anvil slabs with central abrasions, but no sherds; it measures 6.8 x 4.0 x 6.0 m. Flakes, sherds, and one biface were found about 15 m downslope from the shelters on the talus slope.

AZ:A:15:55
This late prehistoric-early historic Pai site is a complex assemblage of possible habitation features, a prehistoric trail, a roasting pit, a large, enigmatic cleared area, a row of four rock piles, and a sparse scatter of lithics and ceramics. There are 15 identified features. The habitation features are generally rectangular and circular cleared areas with rock-outlined perimeters that are one and occasionally two courses high. These features are generally 2-3 m in diameter, but some are larger. One of the features (F8) contains two basalt cobble manos. Chert, obsidian, rhyolite, and basalt flakes are scattered across the site in small, sparse concentrations, sometimes near the habitation features. The remains of four bifaces are within 4 m of each other, 3 m northeast of F6. Two of the bifaces are broken rhyolite projectile point fragments; one is a broad-based whole biface of possible Presley Wash obsidian; the fourth is similar but of white Kaibab chert. The roasting pit (F3) has two concentric rings of FCR, seven and 2.5 m in diameter respectively. The best trail remnant is just downslope of the pit. Ten meters downslope of the trail is a large, cleared area; function unknown. One Jeddito Corrugated was observed, suggesting a Hopi connection of some type.

AZ:A:15:56
A late prehistoric-early historic Paiute site that consists of a small scattering of sherds and lithics and two small charcoal concentrations; no formalized tools were observed. Ten sherds of Paiute Brown Ware and one basalt mano were observed, but no rock alignments or attempts at a structure were seen. The lithics are sparse—no more than half a dozen—although a variety of materials were noted, including Kaibab and Redwall cherts and a tannish chert that may have been heat-treated. The sherds probably represent a single vessel. Several thumb-size charcoal pieces were scattered around the site. Nearby sites include three good shelters ca. 100 m to the northeast across the canyon drainage at the same level (AZ:A:15:52), and roasting features on a dunal delta area (AZ:A:15:48).

AZ:A:16:1
The site consists of two extremely shallow rockshelters at the base of a Tapeats sandstone cliff about 30 m from the river with associated perishable artifacts and nearby pictographs. This is a possible multi-component site with Late Archaic-Basketmaker II, PI-III Virgin Anasazi, and late prehistoric-protohistoric Paiute occupations, followed by a historic visitation in the late 1950s (see below). The pictographs are located southwest of the shelters along the cliff face. There is one main group of hematite pictographs, and several smaller groups which are partially obliterated, some in white. The main shelter area consists of a deeply stratified midden exposed by a small gully about 1 m deep. Considerable amounts of charcoal, animal bone, cordage, corn cobs, and matting are visible; some pothunting has occurred. The site was recorded and recommended for excavation by R. Euler in 1960. The midden (Locus A) was partially excavated in May and June, 1984, and a rock retaining wall built to stop erosion. A prominent, recent historic addition to the site were the words "Wilson Austin - Surveyors, Casa Grande, Ariz.," which were painted in white at the cliff face on the downstream side of the site. The letters are 25 cm high and the panel occupies a 6.75 x 0.6 m area. These were painted by surveyors working on the Prospect Canyon Dam survey in 1958 or 1959 (Wilson Austin, personal communication, August 1991).

AZ:A:16:2
The site consists of a rockshelter with only one artifact: a sherd that suggested late prehistoric-early historic Pai use (other sherds were present, however, when R. Euler first recorded the site). No other cultural material was found. The shelter is 23 m wide, 11 m deep, and 1.8 m high at the opening. The site has been heavily impacted by river runner use; there is evidence of recent trash and charcoal, etc. (it's a good place to get out of the weather).

AZ:A:16:3
The site consists of a long (ca. 5 x 0.40 m), shallow, northeast-facing rockshelter under a 4-meter-high overhang with an extensive midden in front. Artifacts suggest three possible components: Late Archaic-BMIII, PI-III Virgin Anasazi, and late prehistoric-early historic Pai or Paiute. The midden contains abundant charcoal, lithics, and a few sherds. There are at least two, possibly three, grinding basins in large blocks of Tapeats sandstone under the overhang, plus several informal basalt cobble manos. Most of the artifacts and charcoal are concentrated on the slope in front of the area where the grinding slabs occur, but a light scatter continues along the entire length of the shelter (up-canyon to the southwest).

AZ:A:16:4
The site consists of numerous roasting pits, shelters with alignments and/or artifacts and a diverse and dense scatter of artifacts. Three possible components are indicated: Late Archaic, PI-III Formative, and late prehistoric-early historic Pai/Paiute. Features include: F1: shelter with lithics, bone, and several manos; F2: shelter with lithics, a few ceramics, and a grinding slab; F3: shelter with an extensive roasting pit and abundant sherds/lithics and some groundstone; F4: ephemeral basalt wall on top of limestone cliff; F5: shelter with 2-meter-long rock alignment and lithics, sherds, manos, and a burned beam; F6: large, donut-shaped roasting pit about 15 m in diameter; F7: 5 x 10 m roasting pit; F8: roasting pit 10 m in diameter; F9: horseshoe-shaped pit eroding at its base; F10: smaller pit eroding into a gully. The heaviest concentrations of artifacts are near the shelters. Ceramics are very diverse and support the Formative and Pai/Paiute affiliations. The Humboldt and Side-Notched projectile points suggest Archaic and protohistoric use, respectively. Jeddito sherds suggest a Hopi affiliation or trade connection.

AZ:A:16:148
This aceramic site consists of a FCR/roasting pit activity area of unknown cultural affiliation. The site covers a broad area measuring 100 m N/S by 60 m E/W and contains three FCR/charcoal areas and a small number of lithics. Area 1 is highest on the terrace and measures 15 x 10 m. It consists of FCR concentrations, charcoal, a wide-spread ash lens, a diffuse bone scatter, and a few flakes. Area 2 is 6 m in diameter and contains FCR and charcoal. Area 3 is at the base of the terrace and contains two FCR concentrations, some charcoal, and sparse lithics. No groundstone, ceramics, or architecture are present on the surface; one biface fragment was observed. The site is on an alluvial terrace where soil deposition is extensive. For this reason the site probably has good overall integrity, and additional cultural material may be buried below the surface.

AZ:A:16:149
An aceramic site that consists of ca. five roasting features eroding out of an eroding alluvial terrace grouped into two loci (A and B); cultural affiliation is unknown. Locus A contains Features 1 and 2; Locus B contains Features 3-5. It appears that these features may be largely buried by alluvium and have just recently begun to erode. They tend to be much smaller on the surface than other typical roasting features, however, it is also possible that they were small to begin with. A few expedient grinding tools—three manos/mano fragments and one grinding slab—were the only associated artifacts noted on the surface, although others may be present subsurface.

AZ:A:16:150
The site consists of a single semi-circular concentration of fire-cracked limestone cobbles and charcoal occupying a 5.2-meter diameter area on the southern slope of a sandy alluvial terrace. The roasting pit is partially buried in the terrace; the semi-circular area is what is currently exposed along the eroding terrace slope. Cultural affiliation is unknown.

AZ:A:16:151
This site consists of two separate loci designated A and B that may reflect a late prehistoric-early historic Pai occupation with later historic (late nineteenth century) use. Locus A is situated on the downstream side of a canyon mouth and consists of a large roasting feature (F1) and its associated discard pile, ash midden, and debris, plus a ground cobble. A good date could be procured at this feature. F2 is a very highly deflated and much smaller fire feature. Between F1 and 2 is a lithic debitage concentration, a ground slick, a Pai sherd, and a battering device. A worked piece of brass horsetack and a soldered, reclosable lid can were also associated with F1 (see map). Locus B is situated on the downstream side of the canyon mouth; it consists of several lithics, a single Pai sherd, and a charcoal-rich midden associated with a shallow overhang. There is a lot of charcoal present on the surface of Locus A, and the midden exhibits extensive use.

AZ:A:16:152
This site consists of two small rockshelters (designated A and B) with an associated artifact scatter eroding downslope from them. Artifacts suggest an occupation by PI-early PII Formative peoples, and late prehistoric-early historic Pai. Within the "A" shelter, and on the slope below, are flaked lithics, ceramics, charcoal, and one piece of groundstone. Shelter "B" also had a scatter of charcoal, plus a cluster of possibly stacked rocks. Two biface fragments were observed on the site, and smoke-blackening was noted on the ceiling in one area. The site is in fairly good condition despite impacts from pack rats, sheet erosion, and possible rockfall.

AZ:A:16:153
This is an open site with 5-6 roasting features eroding out of an alluvial terrace, plus 3-4 structure outlines. It appears to have had both PII Formative and late prehistoric-early historic Pai occupations. An unusually high number of grinding tools and sherds (mostly protohistoric) were noted, as well as a sparse lithic scatter. At least one of the roasting features (F1) appears to have been used relatively recently (within the past few hundred years), as evidenced by abundant charcoal on the surface and the presence of Pai-type ceramics. Other roasting features are in various states of preservation; common characteristics include limestone FCR with charcoal and charcoal-stained soil. Structures are suggested by crude, oval-shaped masonry configurations, usually with grinding tools in association.

AZ:A:16:154
This site contains two roasting features, a habitation area, and associated artifacts located in a rockshelter measuring 35 m long x 4 m wide x 6 m high. Ceramics indicate that this is a late prehistoric-early historic Pai site. At its northeast end are at least two distinct, but overlapping roasting features. The smaller (1 m diameter) more recent feature sits directly atop the larger (1.75 m diameter) older feature. In the southwest end of the site is a habitation area with a primary blank biface, chert debitage, a Jeddito Plain sherd, and a Coconino sandstone grinding slab. There is charcoal concentrated around the roasting features and downslope to the southeast, but pieces can be found across the entire site. Cracked bone fragments are also abundant. The debitage is concentrated in a 3-meter diameter area in the south-central portion of the shelter adjacent the blank; raw material is the same for both the blank and the flakes. There is a clear and distinct separation of activity areas at this site, with all of the artifacts occurring in the southwest half of the shelter, 13+ m south of the roasting features.

AZ:A:16:155
The site is located in a small rockshelter and contains a slab rock alignment, sherds, flakes, and charcoal. The shelter is about 2.5 m deep and 9 m across. The remnants of a vertical slab alignment (1.25 m long) still exist on the upstream side of the shelter (see map), consisting of three sandstone pieces in a 1.25 m alignment. Five brown ware sherds, including one rim sherd, were observed on the site, but could not be identified as to ware and type; therefore cultural affiliation is unknown. Charcoal fragments up to 1.5 cm in size were also noted (a good C-14 sample could be obtained from the fill of the site if tested). There is the possibility of additional buried material.

AZ:A:16:156
This is an aceramic site consisting of a small, temporary-use rockshelter/activity area along the base of a volcanic columnar outcrop. It consists of two rock overhangs, two wall features, a lithic scatter, and a charcoal area. The two overhangs have been cleared of rock debris; one of them contains Feature 1, a basalt rock wall. Feature 2 is a small, stacked basalt wall near the lithic/charcoal area. Lithics consist of 100-150 flakes of Redwall and Kaibab chert; no tools were observed. The site

has been impacted mostly by natural agents. Cultural affiliation is unknown.

AZ:A:16:157
The site consists of a small rockshelter (ca. 4 x 8 m in size) at the base of a Muav/Bright Angel cliff face with associated artifacts and roasting features. This is a multi-component site, with both PII Virgin Anasazi and late prehistoric-early historic Pai occupations. Light concentrations of lithics, bone, charcoal, and charcoal-stained soil are located within the shelter, and lithics and ceramics are present on the talus slope below. Several grinding tools are also in the vicinity of the shelter. Two roasting features (F1 and 2) are located on more gentle sections of the talus slope. Both are indicated by dense concentrations of FCR and charcoal-stained soil eroding down the talus. Feature 1 measures 7 x 9 m, and F2 measures 4 x 8 m. The site apparently served as a food processing station as well as for brief domestic activities.

AZ:A:16:158
The site consists of a Muav rockshelter (30 m long x 3 m wide x 6 m high) with a Supai river boulder grinding slab and three chert flakes. This is an aceramic site; cultural affiliation is unknown. The site area has been inundated by floods; the shelter floor is covered by river-deposited sand and there is driftwood jammed in cracks at the back of the shelter. The three flakes are embedded with river-reworked cobbles in the shelter floor, but are clearly cultural. The grinding slab (or anvil?) is a flatish, river-rounded item with a distinct pecked central use surface. It measures 40 cm long by 30 cm wide and is ca. 6-7 cm thick. The roughly circular use surface is ca. 15 cm in diameter and deeply pecked. Several possible manos were also observed.

AZ:A:16:159
This site consists of an overhang with sherds, lithics, tools, and pictographs; the shelter has experienced a lot of post-occupational wall and ledge fall. Artifacts include both Virgin Anasazi and Pai ceramics (including a Moapa spindle whorl), lithic debris dominated by large pieces of shatter, an Acheulean-like chopper with two use surfaces, a locally procured basalt lapstone (grinding slab) with incipient use wear, and a small cobble pecking stone. Three broken cores and an apparent battered cobble round out the assemblage. The most interesting cultural item at the site is a two-figure pictograph in red pigment 3 m above the bench. It depicts two small anthropomorphs leaping/dancing or making some sort of commotion. More elements were present, but have deteriorated, leaving only small pigment remnants. As the ceramics indicate, the site is multi-component, with PII Virgin and late prehistoric-early historic Pai occupations.

AZ:A:16:160
This is a small FCR/roasting pit area on the river-side beach dunes at the mouth of the local canyon. No diagnostic artifacts were located, therefore cultural affiliation is unknown. The site measures 40 x 50 m and consists of six FCR areas and a light artifact scatter that included flakes, charcoal, bone, a uni-edge tool, a slab metate, and a mano. The local canyon drainage cuts near the west edge of the site and may have already eroded away a portion of the site.

AZ:A:16:161
This is an open aceramic site consisting of two rock alignments, two loosely associated flaked lithic tools, and two possible bedrock grinding features. Feature 1 is a semi-rectangular alignment of small, unshaped stones forming a small enclosure measuring 2.2 x 2.3 m. Feature 2 is a straight alignment 2.3 m long located 12 m east of Feature 1. Two biface fragments were found on the second terrace 28 m northeast of Feature 1, but their association is questionable. Two Muav limestone blocks with apparent mortar depressions are located 25 m S/SW of Feature 1. There is little remaining in good context at this site from which to infer behavior, but it was probably used for food processing activities. Cultural affiliation is unknown.

AZ:A:16:162
This aceramic site is located in the Bright Angel Shale Formation under a shallow overhang. It contains three distinct flat/possible activity areas with B.A. shale slabs "defining" each area. It is not known whether these alignments are man-made or simply debris from the eroding overhang. Feature A is 1.8 x 4 m, Feature B measures 2.5 x 4.2 m, and Feature C is 2.8 x 7 m in size. Features A and C both have scattered charcoal remains. One of the features contained a battered cobble of solidified sandstone. The site is ca. 2.5 m in width and 17.3 m in length. It may be the result of a Paiute occupation.

AZ:A:16:163
The site consists of five separate loci (A-E). The loci combine habitation and lithic activity areas on a finger ridge and associated slopes, and an adjacent cliff base. This is a multi-component site indicative of PI-III Virgin Anasazi and late prehistoric-early historic Pai use. Locus A contains 2-3 structures situated against a Bright Angel shale cliff, constructed of sandstone and shale blocks and slabs. This locus also contains a rock art panel of yellow, red, and white figures. A whole pot was found in a crack above Locus A. There are also lithics associated with this locus. Locus B is a shallow

rockshelter with a sheet midden on the talus slope consisting of ceramics and lithics (including Partridge Creek obsidian), and a red anthropomorph pictograph. Mammal bone was observed at both locus A and B. Locus C is a lithic scatter with minimal ceramics and ashy soil. A single projectile point was found in the lithic analysis unit at this locus. Locus D is a single rock-outlined structure with a cobble tool. Locus E is a small rock alignment on a drainage.

AZ:A:16:164
The site is composed of three cleared spaces (Features 1-3) against a cliff face that are partially outlined by boulders and a few stacked rocks. In and around these clearings are concentrations of charcoal and broken bone. These may be severely eroded hearths without any apparent rock linings. F1 is the largest cleared area, ca. 3 x 2 m. One corn cob was seen at Feature 2, which is on the western end of the site. F3 is fairly contiguous with F1. There is a pack rat midden nearby in the cliff face wall. The site gives the impression of a Pai or Paiute association, but since no diagnostic artifacts were found true cultural affiliation is unknown.

AZ:A:16:165
The site consists of three loci: A, B, and C. Locus A consists of two wall features that enclose separate shelters at the base of a Tapeats cliff face. These are low, crude, dry-laid features of Tapeats sandstone and basalt elements. One has a vegetation mat that may have been used by proto- or historic folk to sleep on. Downslope from the shelters, amongst a grouping of massive Tapeats boulders, is Locus B, where there are lithics and a historic component of cans and milled lumber. On the southwest side of the boulders is Locus C, where there are additional cans and lithic flakes on a pink granite upthrust. Prehistoric artifacts include a broken projectile point, a cobble mano, and a grinding slab; no ceramics. The historic trash may date from between 1900 and the 1930s and includes evaporated milk cans, syrup cans, a cocoa tin, a baking soda lid, lathe, a beam, and nails; may have been a miner's camp. Prehistoric cultural affiliation is unknown.

AZ:A:16:166
This is a marginal site in that the only obvious cultural material is one gray limestone river cobble with moderate battering around the margins and two charcoal areas. The charcoal concentrations are both partially buried under Bright Angel-derived spalls from the cliff wall above the site. The charcoal concentration at the northwest end of the shelter may be part of a slab-lined roasting feature that is now largely obscured by cliff spalls and is therefore difficult to define with certainty (however, it bears a general resemblance to the partially slab-lined feature at site AZ:A:16:158 one mile upstream). No diagnostic artifacts were located; cultural affiliation is unknown.

AZ:A:16:167
This site consists of five roasting features (F1-5) and a small, collapsed, scoured rockshelter with a few artifacts (F6). Artifacts suggest that this is a multicomponent site, with both PI-III Virgin Anasazi and late prehistoric-early historic Pai/Paiute occupations. The roasting pits are spread over about half an acre on a gentle dune slope that is heavily covered with acacia and prickly pear. These five features are at least partly intact; others could remain buried or have already been removed. The roasting features are in various stages of disintegration. Very few artifacts were observed on the site; a few flakes, a sandstone grinding slab, and a pounding/bashing cobble hand tool with no ground surfaces. Feature 6, the rockshelter, contains several flakes and a single sherd. Carbon-stained soil is present but is not extensive and displays a lot of erosion.

AZ:A:16:168
The site is composed of four cleared spaces (F1-4) with ephemeral rock outlines against a cliff face. All of the features have associated charcoal. The artifact assemblage includes groundstone, manos, a Desert Side-Notched projectile point, corrugaated Paiute Utility Ware, a fire-hardened stick, and lithic tools and flakes. The ceramics and DSN point strongly suggest a late prehistoric-early historic Southern Paiute affiliation.

AZ:A:16:169
The site is situated within a long Muav shelter and extends for about 96 m along the base of this formation on a rough 20-200 degree axis. Starting from the north end of the site, the initial 11 m (Locus A) contains a lithic scatter along the talus slope against the Muav. About 73.5 m from the north end of the site is the start of Locus B, containing two features. F1 is a 2 m diameter rock alignment with associated charcoal. F2 is comprised of two walls abutting the back of the shelter that enclose a rectangular space. Both features are composed of dry-laid, single course stones. Tools included a biface preform and a hammerstone; no ceramics were observed. Judging from the expedient nature of the lithics and architecture this may be a Paiute site.

AZ:A:16:170
The site consists of two shallow Muav overhangs (an upper and a lower), each with associated lithic items of Kaibab and Redwall chert. The lower,

southeast-facing overhang, measuring 2 x 6 m, has about 25 flakes, two expedient flake scrapers, and a biface fragment. Flakes extend downslope from it for ca. 10 m. Around the corner and ca. 5 m above this shelter is a second, south-facing shelter, measuring 4 x 6 m, with several additional flakes; these appear to be primarily the result of biface-thinning. The upper shelter measures approximately 4 x 6 m. Cultural affiliation is unknown.

AZ:A:16:171
This is an early-mid historic Pai or Paiute site that consists of two circular burned rock features (F1 and 2), presumably used as roasting/cooking pits, and artifacts. Feature 1 is about 7 m in diameter and slightly mounded, with a depressed center. Feature 2 has similar morphology, is 6 m in diameter, and has more charcoal than F1. F2 also has two smaller depressions free of FCR adjacent to it. The two features are located in open areas in the creosote and are 30-35 m apart. There is a possible activity/processing area between F1 and 2, but no number was assigned to it. It consists of some jumbled FCR and some problematic cobble tools. Lithic debris is present at the site, as well as charcoal, animal bone, a single sherd of Polacca Polychrome, and a biface fragment. The sherd dates to between 1780-1900s, and is a Hopi copy of a Zuni style. Numerous hand-sized sandstone cobbles are present; they are not burned and may represent expedient use. There is also a broken (50% intact) quartzite mano near F2. The site catches a longer period of winter sun than most other locations in the vicinity and may reflect seasonal, non-summer use.

AZ:A:16:172
This site has two components: a prehistoric rock art panel (Locus A) and a historic inscription and camp (Locus B). The prehistoric locus contains a panel with three pecked figures and an associated pecked sandstone grinding slab. Locus B is comprised of a boulder with three historic inscriptions: "F.I. Dec. 17, 1933," "E.B. Jan. 1, 1934," and "D.B. Jan. 1, 1934." Associated with this locus is one Carnation milk can that dates to the 1930s with crimped seams, and a can that has been modified with a wire handle and is burned at the bottom from cooking or boiling water; "Canco" is stamped on the bottom. A few pieces of milled lumber with nails and burned wood/charcoal fragments make up the rest of the component. The Locus A rock art may have a Western Anasazi stylistic association, however diagnostic artifacts are lacking and cultural affiliation is tentative.

AZ:A:16:173
The site consists of three loci of FCR concentrations spread across a steep dunal area; the features in each loci may or may not be related. Locus A is 1.5 m diameter concentration of limestone and basalt cobble FCR. There are few FCR elements; the feature appears to be ephemeral. Locus B is another FCR concentration located on an extremely steep (>30°) part of the dune, consisting mainly of limestone cobbles extending 2.5 m downslope. Locus C is the final FCR concentration on a particularly steep slope. The FCR—primarily limestone cobbles—extends about 5 m downslope and 1 m across-slope. Six flakes suggestive of expedient percussion reduction were noted in association with the Locus C FCR. No formal tools or ceramics were observed; cultural affiliation is unknown.

AZ:A:16:174
This is a late prehistoric-early historic Pai site located on an alluvial terrace where it meets the base of a conglomerate formation; a shallow overhang provides shelter. The rockshelter is ca. 6.2 m long and 2.3 m wide. The site contains two artifact concentrations (A and B), a large roasting pit (F1), a small FCR concentration (F2), and a small rock FCR "alignment" (F3). About twelve Redwall chert lithics and three brown ware sherds were located between 7.4 and 13.4 m below the rockshelter on a talus slope in Artifact Concentration A. Artifact Concentration B is ca. 10 m SE of A; Feature 1 is ca. 34 m at 130° from the shelter on a river-deposited alluvial terrace. Artifact Concentration B and Feature 1 contained such tools as a granite mano/chopper, uni- and bidirectionally worked flakes, a pecked limestone slab, a one-handed sandstone mano, and a basalt grinding slab. F1 is about 4.6 m in length; width is unknown due to concealing sand/silt deposits. Feature 2 is a small concentration of FCR ca. 16 m at 100° from F1; both F1 and F2 contain charcoal. Feature 3 is a small, exposed "alignment" of FCR 5 m from F2 at 24°; it measures 70 cm E/W.

AZ:A:16:175
This site consists of shallow alcove/overhang shelters (F1-3) associated with charcoal and artifact scatters/middens, plus three areas of fire-cracked rock and charcoal (F4-6) on a flat terrace. F1 has a well-developed midden and is the area of highest artifact density. It contains ash, charcoal-stained soil, FCR, burned bone, and artifacts. The midden is exceptional in comparison to many sites in this area, suggesting more intensive as well as longer-term use of the delta area. F1 also has sticks jammed in a crack beneath the ceiling, which, along with the walls, are fire-blackened. Artifacts are also associated with F2 and 3, and are eroding from a cutbank west of these features. Two Desert Side-Notched projectile points were recorded. Ceramics and lithics indicate that this is a multi-component site

with PII Virgin Anasazi and late prehistoric-early historic Pai or Paiute occupations.

AZ:A:16:176
This aceramic site comprises at least one roasting pit with a scatter of flakes and burned bone. The pit is slightly mounded and up to 2 m in diameter. Three meters south of this mound is a heavy charcoal scatter that is either the location of a hearth or just associated with the pit. The total FCR/charcoal area measures 7 x 3 m. The FCR is comprised of basalt and well-rounded river cobbles that appear to be selected and uniform in size, i.e., fist-sized to slightly larger. Some sandstone cobbles of a similar size are also present. Many of the flakes appear burned or heat-treated. Cultural affiliation is unknown.

AZ:A:16:177
This historic site is in a small overhang comprised of conglomeritic Pleistocene sediments overlying basalt. The overhang is shaped vaguely like a kidney and measures 7.2 m N/S and three m E/W. In the eastern "lobe" of the "kidney" is a wooden dynamite box and scattered pieces of fuse/primer. In the other "lobe" is a packrat midden. The box is constructed of wood slats and is 44.5 cm long, 29.5 cm wide, and 18 cm deep. The box is labeled: "50 lbs.% N.G. Hercules Powder, The California Works Manufacturers, San Francisco, California." The box is signed by five or six individuals, with associated dates from the early 1920s. There is the potential for buried prehistoric remains in the rear of the overhang, but none were visible on the surface.

AZ:A:16:178
The site consists of a moderately dense lithic scatter concentrated on a level 5.3 m x 2.5 m area at the base of a south-facing basalt cliff. Several hundred flakes have eroded about 17 m down a basalt talus slope from the main activity area. The lithic debitage is dominated by biface thinning flakes of Kaibab chert (creamy-white, pink, and translucent varieties). There are several primary-stage biface fragments, a steeply edged unifacial scraper fashioned from a thick secondary flake, and the base of a thick, concave-based possible projectile point. Several of the flakes appear to be heat-treated, although the majority are not. An unmodified basalt boulder with a ground and pecked surface was also found. There are no distinct features or structures within the defined site boundaries. Two partially buried roasting features on the sandy terrace below the site (AZ:A:16:180) may or may not be associated with this site. Based on the projectile point and debitage characteristics, this may be an Archaic site.

AZ:A:16:179
The site consists of red and yellow pictographs painted on the W/SW-facing vertical face of a Muav cliff, and a low, shallow, smoke-blackened overhang upslope. No artifacts were visible in association with the pictographs, or the shelter area; however, the ground surface adjacent to the cliff is covered by rocks and gravel from a recent debris flow, and the rest of the ground surface outside of the sheltered area is thickly vegetated. The pictographs are 2-3 m above the present ground surface and are of hematite and limonite. It cannot be determined what kind of figures were originally represented. Cultural affiliation is unknown.

AZ:A:16:180
The site consists of at least two buried roasting features of unknown cultural affiliation. Feature 1 is exposed in cross-section ca. 80 cm below the sand terrace surface along the eroding terrace face, which is adjacent to and approximately 35-40 ft. above the river's edge. In profile it is ca. 1.9 m in diameter and 25 cm thick, and composed of gray-white FCR and charcoal. Feature 2 is located ca. 13 m upslope from F1. It is still largely buried, and only a few cobble-sized FCR pieces and charcoal chunks in a 1 by 1.5 m area indicate its presence beneath the surface. One tertiary flake of translucent red (possible Redwall?) chert was noted on the slope below F1. Probably other artifacts are present but buried beneath the surface.

AZ:A:16:181
The site is composed of an overhang shelter (F1 and 2) and F3, a large, conical-shaped roasting pit with two concentric depressions in the interior, as well as four boulder grinding slicks (F4), sherds, and flakes. This is a multi-component site with both PI-early PII Virgin Anasazi and late prehistoric-early historic Pai occupations. F1 is a 2.4 m-long rock wall that is perpendicular to the base of the overhang. It may be a structure that has been filled in with slope wash and boulder debris. Hematite has been rubbed on two boulders at the base of the overhang wall. F2 is an open space 4 x 10 m in size along the overhang. Again, two boulders appear to have hematite stains. Charcoal is concentrated at the north end of F2 in a low area where it has eroded from the roasting pit (F3) above. F3 is a 5-meter diameter conical-shaped roasting pit with a smaller 1-meter diameter depression in the center. Recent-looking charcoal is in the center and around the edges of the feature, and eroding down a small side drainage. The soil is very ashy and black on top of F3 and down its sides. F4 consists of grinding slicks on boulders across the small drainage from F1-3.

AZ:A:16:182
The site consists of a basalt boulder overhang with a small, cleared, level area underneath and another possible cleared space nearby, plus a few associated

artifacts. Artifacts indicate that this is a late prehistoric-early historic Pai site. The artifacts include six flakes and two sherds, suggesting brief, unintensive use of the site. It is most likely that the overhang was simply used as a transient shelter, perhaps selected because of its shady, N/NW exposure. The cleared area in the shelter is 2 x 2 m in size; the other is 2 x 3 m. The cleared areas may have associated one-course-high rock alignments; some of the alignments may be natural. The open cleared space has a possible rock outline that may have served to support a brush structure. There is a possible limestone slab metate upslope of the shelter and a charcoal scatter under the overhang. A helicopter pad lies just north of the site.

AZ:A:16:184
This is an historic camp dating to 1948. It contains a single campfire ring (Feature 1) with nine original stone elements (one has eroded downslope); interior diameter is 45 cm and exterior diameter is 75 cm. The feature elements are of angular limestone cobbles. Approximately 3 m south is a concentration of tin cans (Feature 2), including five milk cans dating between 1935-1945; there are a total of 11 cans. About 12 m southwest and upslope of the campfire ring, under a limestone boulder, is a pickle jar (F3) with a note inside that explains that this was the camp of a St. George LDS church group from April 23, 1948.

AZ:A:16:185
This is a possible burial consisting of an artifact scatter eroding from a stabilized dune face on the upstream side of the local canyon. Artifacts include lithic debris, ceramics, a finely worked rhyolite Desert Side-Notched projectile point, numerous shell beads, and a single distal phalange of a human left foot. The site is adjacent the drainage and is thickly covered with creosote. Ceramics suggest a PII Virgin Anasazi association, but the DSN point indicates a Pai or Paiute affiliation.

AZ:B:9:192
The site consists of a single-room structure with three multiple-course, dry-laid masonry walls. Ceramics suggest a late prehistoric-early historic Pai or Paiute affiliation. The room is constructed of limestone slabs averaging less than 40 cm/side and less than 10 cm thick. The structure incorporates two limestone boulders (1-2 m/side) as portions of the walls. Three brown ware sherds and one flake were discovered within 10 m of the structure. A single whole Shivwits Brown vessel was previously found near this site in the limestone ledges within 20 m of the structure. The vessel was recorded as site AZ:B:9:196 and removed. When R. Euler first recorded AZ:B:9:192 in 1983, he stated that the structure "was probably constructed by some unknown early river runner"; however, he did not locate the sherds and flake noted during the GCRCS visit.

AZ:B:9:196
This Formative-era site used to consist of a single whole Shivwits Plain vessel discovered by Charlie Peterson in a small alcove in the Muav ledges. Since the site was recorded the vessel was removed, thereby negating the integrity (and existence) of the site. The "site" is near AZ:B:9:192, but they may or may not be related (sherds at AZ:B:9:192 were from a different vessel).

AZ:B:9:314
This aceramic site consists of a single structure built against the base of a cliff face with a high overhang. The structure is comprised of two masonry walls extending from the cliff face to two large boulders. The boulders are incorporated into the walls forming an enclosure ca. 3 x 2.5 m in size. The masonry has apparently fallen to grade; currently one course remains on the west wall, and the east wall is simply a line of stone elements. The cliff wall has no marks to indicate original wall height, but remaining debris suggests that the walls were low to begin with. The floor of the structure is sandy with limestone gravels. A core, two flakes of limestone, and some charcoal are scattered across the site area. Cultural/temporal affiliation are unknown.

AZ:B:9:315
This aceramic site consists of a curving dry-laid wall of Muav limestone elements partly enclosing a narrow ledge shelter. The wall uses several larger boulders as basal elements. It is open on its east end and open at the top (i.e., does not reach the shelter ceiling). The interior is of light aeolian sediment and appears to have been partly dug by people/critters. There was no visible remnant mortar on the wall elements or ceiling. No artifacts were noted except for one large flake ca. 5-10 m west of the wall at a lower level, which displayed possible wear/microflaking. A few charcoal chunks/flecks were seen within and around the feature. This may have been a granary, but currently appears more suitable as a windbreak. Cultural affiliation is unknown.

AZ:B:9:316
This is a possible PI-early PII Formative habitation area that extends for 17 m along the base of a Muav cliff. The site consists of five rooms defined by several one-course high rock alignments; in association are two metates, a few charcoal fragments, a sparse number of lithics and ceramics, and a cluster of burned rock. Room 1 contains a charcoal scatter

(possibly a hearth). Room 2 has two trough metates, burned rocks, and charcoal fragments that may represent a hearth. Rooms 3 and 4 each contain a flake. Room 5 has two flakes and a sherd. No formal tools were observed. The site is within the 1983 flood zone and was flooded at that time. It is presumed that many of the artifacts washed away during the high water.

AZ:B:9:317
This late prehistoric-early historic Pai or Paiute site consists of two loci (A and B). Locus A is a large, intact roasting pit with an associated discard area, several flakes, a scraper, and a protohistoric projectile point. It is situated on a partially protected level area (5 x 15 m) against the base of a cliff. Locus A also has an anvil stone and hammer/percussion stone, plus a rock cairn marking a benchmark. The Locus A roasting feature is slightly mounded, and although charcoal is scattered about the surface surrounding the pit, it remains in good condition. Spalls from the cliff face are falling on the feature. The pit should be tested for a carbon sample. Locus B is situated across the mouth of the canyon and consists only of an anvil stone and some scattered charcoal. There is also a modern/historic fire feature downslope from the site near the river.

AZ:B:9:319
This aceramic site consists of three masonry-type features (F1-3) and a very sparse lithic and tool scatter. F1 is a wall constructed of six upright slabs braced against one another and against two larger talus boulders. It abuts a vertical limestone face and is 2.1 m long and up to 45 cm high. F2 is a wall comprising seven-plus slabs, with the north end of the wall abutting the upright face of a talus boulder. It is up to three courses high (30 cm) and 1.25 cm long. F3 is a stone semi-circle of six talus slabs spaced 5 to 20 cm apart; function is unknown. Four flakes of Redwall chert and quartzite were found; one displayed possible "scraper-like" edge wear. Two cobble hammerstones were also observed; near one of these was a cobble manuport that may have been burned. Cultural/temporal affiliation are not known.

AZ:B:9:320
The site consists of a shallow bedrock mortar and a possible associated rockshelter living area 35 m to the southwest. The mortar is a bowl-shaped, circular depression, 25 cm in diameter (narrowing to 20 cm) and nine cm deep, worn into a Muav bedrock ledge. No artifacts or other cultural features are associated with it; cultural affiliation is unknown. Its definition as a mortar (as opposed to a hydrofact) is based on its circular symmetry, smooth interior, slightly pecked margins, and the fact that nothing remotely similar occurs in the vicinity. The rockshelter offers a level, protected area 2.5 x 9 m in size in the Muav cliffs ca. 12 m above the mortar. Although no charcoal, artifacts, or cultural features were present in the shelter, this may reflect the long and frequent use of this location by commercial boatmen escaping the heat with their passengers during the summer tourist season.

AZ:B:10:1
This is a PI-early PII Formative storage area consisting of seven granaries, a few sherds, and pieces of twine/cordage (found in Structure 1). The site is in a shallow overhang and is visible from the river. The granaries vary in size, construction, and integrity. They are generally built of both wet-laid and dry-laid Tapeats sandstone slabs, with walls often 4-5 or 6-7 courses high. In some cases it appears that river runners/visitors have relayed or newly layed additional elements as topmost courses. In fact, a large, rectangular structure 6 m W/NW of Structure 6 appears to be an attempt by recent folk to duplicate the adjacent prehistoric structures. A few upright slabs are also located near the edge of the site where it drops off steeply; the slabs may have associated mortar. Adjacent one of the slabs is a short, arcing rock alignment of unknown function.

AZ:B:10:4
The site consists of two masonry structures in shelters about 40 m apart that reflect possible Late Archaic-BMII and PI-III Anasazi occupations. Structure 1 consists of two contiguous slab-lined rooms with groundstone, ceramics, and lithics. Upon excavation by Park officials in 1984 two additional features were found in Room 1: a roasting pit and a firepit. During an earlier recording of the site, burned mescal fibers and a corn cob were found. Structure 2 is a rectangular, coursed masonry room. This site was partially excavated under the direction of A.T. Jones and reported in "A Cross-Section of Grand Canyon Archaeology" by Jones (1986:52-58).

AZ:B:10:111
The site consists of three eroding roasting pits, visible on the surface as clusters of FCR sandstone and limestone. Feature 1 is ca. 10 x 8 m in diameter (it was obviously once more well-defined, but slope erosion has dispersed the rocks down the talus slope). Feature 2 is ca. 30 m upslope from F1, and measures 3 x 4 m. Feature 3 is ca. 8 m upslope from F2, and consists of a badly eroded FCR concentration currently 5 x 3 m in diameter. No artifacts, bone, or other cultural material was noted, although charcoal-stained soil was evident. Agave, Opuntia, and acacia grow in the vicinity, and the area is also a

good habitat for bighorn sheep. Cultural affiliation is unknown.

AZ:B:10:121
This PII-early PIII Virgin Anasazi site consists of the remains of three eroded/displaced cobble and slab-coursed walls that define a room enclosing a 3 x 4 m space. These walls make use of a large, split angular sandstone boulder on one side. There is an entryway in the south wall. The building material is not worked or shaped and was procured on the spot and used expediently; it consists of limestone and sandstone cobbles and slabs averaging 25-30 cm in size. The only observed artifacts were a Redwall chert flake and a single corrugated sherd. Although this drainage had water during the GCRCS recording in September of 1990, it may not in the summer; the Colorado would have been used as the permanent water source. This is also a great location to ambush game (sheep, deer) coming up and down the drainage.

AZ:B:10:132
The site consists of the remains of one dry-laid masonry room and one small, wet-laid masonry granary beneath a shallow overhang at the base of the Tapeats sandstone. Although no artifacts were found in association, the site is inferred to be of PII-early PIII Anasazi origin. Both features are constructed of undressed local Tapeats sandstone slabs and were obviously expediently built. A little mortar remains in the granary. No artifacts were evident on the site, although they may have eroded down the steep slope below. The site probably functioned as a temporary lay-over and storage facility related to nearby agricultural pursuits. The masonry room (F1) measures 2 x 1.9 m with 1-3 courses up to 40 cm in height. The granary (F2) measures 70 x 60 cm, with upright slab walls up to 55 cm in height, set with light brown, grainy mortar.

AZ:B:10:133
A PII Anasazi site consisting of at least two and probably three remnant granaries distributed along a 30 m band at the Tapeats/granite contact. Granaries 1 and 3 have visible walls, while granary 2 is defined by patches of crumbly mortar where the base of the granary walls used to be. Granary 1 is situated on an east-facing ledge under a Tapeats overhang at the granite contact. Two-three courses of mortared sandstone slabs (with tan-colored mortar) define the east wall, while an upright slab held in place with red mortar forms the north wall. Granary 2 is ca. 20 m northwest under a Tapeats ledge. Only patches of mortar define where the north and east walls used to be. This granary would have measured 85 by 65 cm. Granary 3 is under a slanting Tapeats boulder ca. 5 m downslope from #2. The N/NE wall is ca. 1.5 m long with 4-5 courses of mortared slabs visible; an upright slab boulder is incorporated into the middle of it. The E/SE wall is only delineated by a few scattered rocks. When originally recorded a Black Mesa/Sosi B/W sherd was found between granaries 2 and 3.

AZ:B:10:223
This is a large, prominent mescal roasting pit measuring ca. 15 m in diameter. The pit is up to 2.5-3.0 m high with a distinct cleared spot ca. 3 m in diameter near its center. There are two possible walls built against Muav ledges about 5 m south of the edge of the mound. The camp affords a level area for living purposes which is hard to come by along this stretch of the river. Resources at the nearby spring must have influenced this choice of site location. When originally recorded several sherds were present and a chert biface fragment ("mescal knife"). Artifacts suggest an early Formative (BMIII-PI) Virgin Anasazi affiliation.

AZ:B:10:224
This site consists of two features. One is a ca. 2 m diameter mound of limestone, sandstone, and cobble FCR rising to approximately 40 cm above the present ground surface. About 1 m south is the second feature, consisting of 4-5 burned sandstone slabs—some upright—and 10+ pieces of FCR. This feature is eroding down the cutbank and appears to have been impacted by a bighorn sheep trail. The FCR mound may have been a discard area for the slab feature. No artifacts were observed in association and cultural affiliation is unknown. About 29 m northwest of these features, outside of the site boundary, is another small FCR scatter.

AZ:B:10:225
The site is located under a shallow overhang and on an adjacent dune-covered slope and consists of a rock alignment and an artifact scatter/midden with sherds, lithics, groundstone, FCR, and bone. The overhang runs for over 100 m and varies in depth from 20 to 220 cm. Only an ca. 25 m section of the overhang is associated with the habitation area. The overhang shelters a partially intact 1-2 course arcing block and slab alignment with a single vertical element on the downstream side of the feature. Most of the wall is gone, but sediment deposits remain intact. Although a lot of the deposition is modern sand, the potential for undisturbed fill is high considering the protected nature of the wall. The ceramics point to a PII Formative occupation. Groundstone was observed, but lithic debris is negligible. FCR is also present in quantity on the slope.

AZ:B:10:226
This PI-III Formative site consists of a rockshelter in a shaley bed of the Tapeats with one sherd. The

shelter measures 6 x 2.25 x 1.5 m. Abundant charcoal is scattered across the floor, but no formal fire feature was seen. A single gray ware sherd was the only artifact found on-site, but there is an undetermined amount of fill and sand in the shelter that may contain other artifacts.

AZ:B:10:227
This is a pristine nineteenth century miner's camp/equipment cache. The site is situated under an overhang on a narrow bench overlooking a river. The site consists of numerous articles of everyday use: a coffee pot, spoons, knives, nails, bottles, and milled wood, as well as vernacular mining equipment made with available odds and ends. The latter artifacts include two rocker boxes, wooden scoops, a baking powder tin turned into a salt/pepper shaker, and buckets made of tin pans with homemade handles (see artifact descriptions on attached sheet). Evidence of minimal fire use is present. The condition of the materials on the site is excellent; however, no makers marks were seen or tobacco tins, food cans, or cartridges. The materials present seem to have been left with the intention to be used again upon the owner's return. There is a possible structure—alignments, re-arranged rocks—about 25 m downslope.

AZ:B:10:228
The site consists of a hearth with an associated masonry wind deflector (F1) and, lying adjacent, a small cleared terrace area with an L-shaped, dry-laid masonry retaining wall (F2). The hearth is 1 m in diameter with an arc of three upright slabs with oxidized interior faces; the slabs are supported by numerous talus rocks. The cleared area is 2 m southwest of the hearth. It is about 2 m square with a wall constructed of tabular stones of Muav talus. The leveled space may have been used to support surveying equipment or could have been used as a tent platform. No artifacts were noted, but the site may be historic.

AZ:B:10:229
The site consists of several areas (designated A-I) of rock alignments and other features situated along a talus slope above the right (southwest-facing) bank of the river. Areas A and D-H appear to be agricultural features, primarily terraces and check dams. Area C is a possible small room outline that may have been a foundation for a ramada-like structure. Area B is an L-shaped wall that encloses a narrow area that may be related to water diversion. Area E is distinct in that it is more of a rectangular garden plot. Area I, found upstream from Area A, consists of two ephemeral wall alignments that seem to be more like sections of a trail than terrace alignments. No artifacts or other cultural remains were found. Although the context of this site presently appears unsuitable for agri-pursuits, considerable erosion has occurred since the site was in use. Even considering the initial energy expenditure of establishing the system, maintenance was probably reasonable. Few farmable areas exist around here, and though this area appears marginal, it was possibly the only choice. Cultural affiliation is unknown, but it is presumed to be prehistoric.

AZ:B:10:230
This site consists of a slight overhang used as a rock shelter, a slightly bermed midden, and a small artifact scatter eroding down the adjacent slope. Ceramics suggest two components: Early-Mid PII Anasazi and late prehistoric-early historic Paiute. There is burned stone in the midden/discard fan, plus bone fragments (including the distal end of a bighorn sheep humerus), charcoal, and ash. Tools included a couple of cobble groundstone items, a chopper, a flake-scraper, a projectile point tip, and a core. There is also a jumbled pile of Muav talus about 40 cm long, 30 cm wide, and 25 cm high that might pass for a wall that projects from the back of the overhang. The site has been impacted by colluvial movement and channel runoff through the rockshelter.

AZ:B:10:231
This historic site consists of a scatter of wood fragments and metal pieces in a 2 x 3 m area. The sparse remains are situated on a steep, rocky slope in Area C of site AZ:B:10:229. The artifacts present include copper sheeting, hand-cut iron sheeting, 3/4-inch wood screws, machine-cut, galvanized square nails, 3/8 x 6-inch iron rods, and a few 1/2-inch thick fragments of wood. Some of this could be the remains of two oarlocks that were yanked off when the screws and nails holding it popped out. The items on the slope are apparently a part or fragment of something (i.e., not the whole thing). It appears to be of vernacular manufacture; it is not a very sophisticated design. Our best educated guess is that these are boat parts, but it could easily be something else. The site probably dates between 1900 and 1945.

AZ:B:10:236
An aceramic site that consists of light-density lithic scatters at two loci and several FCR and charcoal-stained soil features within a small, north-facing drainage. The drainage area is sloping and rocky, but less rocky than the surrounding talus slopes. The surface is eroded and deflated, and may have been more level when occupied prehistorically. Feature 1 is the most obvious of the hearth/roasting features—an area of dark, ashy soil surrounded by limestone (some may be FCR). F2 is similar, but

smaller, and is being more actively eroded by a small gully. The lithic scatters are separated into two loci: Locus A near F1 in the gully, and Locus B on the ridge slope to the east. A small number of tools were observed within these two scatters. The lack of ceramics and flake/tool attributes suggest an Archaic affiliation, but this needs to be tested.

AZ:B:10:237
This site is comprised of three roasting features and a very light scatter of associated sherds and lithics. Ceramics suggest a Mid-late PII Virgin Anasazi association. Feature 1 is a roasting pit eroding down a short slope on the edge of a stream embankment. A few sherds, lithics, and unburned bone (which may not be cultural), were in association. Feature 2 is a small burned rock scatter to the east with no discernable artifacts. Further east is F3, a roasting feature displaying some FCR and a heavy charcoal concentration. It is eroding into an ephemeral drainage. All of the features are on the same approximate level. No structures or groundstone were observed on-site, although a large metate was seen nearby below AZ:B:10:238 (see site form for that site).

AZ:B:10:238
The site consists of a single masonry room constructed beneath a sheltering boulder. The structure's wet-laid limestone wall arcs in a semicircle, with a possible opening on the southwest side. The wall is two to seven courses high. The room is semi-subterranean, and there is little apparent wall fall. It measures 3 m E/W x 2.2 m N/S. It has a good view of the Colorado River below. No artifacts were observed on-site and cultural affiliation is unknown.

AZ:B:10:248
The site is located within a rockshelter at the base of the Tapeats formation. Several large roof-fall slabs appear to have been moved to the front of the shelter, creating a small living space. There is a small wall segment at the east end of the shelter comprised of three-four courses of unshaped tabular slabs. The inhabitable area below the shelter measures ca. 1.5 x 4 m. No artifacts or evidence of a hearth were observed; cultural affiliation is unknown. An active seep ca. 20-25 m from the shelter would have provided dependable, clean water.

AZ:B:10:249
The site consists of a small rockshelter that contains the remains of a low, crude, masonry structure. It is probably of turn-of-the-century historic Anglo affiliation. The structure measures 2.9 x 2.3 m, and consists of two perpendicular single-course upright slab walls. The walls form a small enclosure around the back of the shelter. There is a sparse amount of historic trash, including a rusted enamel ware bowl fragment, wire, and a hole-in-the-top can lid. More recent use is indicated by a firewood cache and bits of aluminum.

AZ:B:10:250
This probable Formative site consists of a single sandstone masonry room built against the base of a slightly overhanging Tapeats sandstone cliff. The room measures roughly 3.5 x 4 m (see map; the walls are not constructed at right angles), and contains elements of mostly tabular and blocky Tapeats sandstone slabs. The amount of rubble suggests that the structure once had nearly full-height masonry walls. The east wall is single-stone wide; the other two (south and west walls) may have had double-stone construction based on rubble quantity. The south and west walls also have abundant small rubble rocks, indicating that a different construction style was used for them as opposed to the east wall. The entry was probably in the southeast corner of the east wall. An enigmatic mesquite or acacia post is stuck upright in the east half of the room. Although the room appears to have been used for habitation, no artifacts were found. Perhaps it served a more specific purpose.

AZ:B:10:251
The site consists of several hearths/roasting features and sparse lithics on an alluvial terrace. The features are typically eroding out of a sandy slope adjacent to ephemeral drainages, and consist of four areas of FCR and charcoal-stained soil. Two of the features are quite small (< 1 m in diameter), but one, exposed in an arroyo, is closer to 2 m in diameter, maybe more. Another feature (F3) is a slab-lined hearth or storage cist ca. 75 cm in diameter. There is a sparse scatter of lithics over the site. These are mostly small interior Redwall chert flakes, possibly the result of bifacial thinning. The site would have been suitable for small-scale horticulture; however, the lack of artifacts and artifactual diversity (including ceramics) argues against habitation, although much may be buried. A possible Elko Corner-Notched point suggests a late Archaic or Basketmaker affiliation.

AZ:B:10:252
This aceramic site is located in a Tapeats overhang at the contact point between the Tapeats and a talus slope. The overhang is about 40 m in length and 7-8 m in width. The site has an expansive view both up and down the river. It consists of one formalized hearth (a buried, semi-circular arrangement of FCR and charcoal), designated F1, and a charcoal stained soil area (F2) with associated charcoal pieces. Fingernail-size charcoal chunks are scattered

throughout the site. Five pieces of driftwood were also scattered about the overhang floor. A single "weather-polished" long bone fragment was noted (probably artiodactyl) and a mano. Lithics consisted of some bifacial thinning flakes of Utah obsidian, chalcedony, and Redwall chert. Cultural affiliation is unknown.

AZ:B:10:253
This open site consists of two hearths or roasting features with sparse lithics on a level section of a talus ridge slope. The features are comprised of small (ca. 1 m diameter) concentrations of charcoal-stained soil and FCR. A few flakes are scattered downslope and appear to be the result of unstaged, unintensive reduction. A small, well-thinned projectile point or biface tip of white translucent chert was found ca. 20 m downslope from the hearths. This site apparently served a very limited purpose for a short period of time. Cultural affiliation is unknown.

AZ:B:10:260
This site is a small, limited activity area containing a FCR/hearth feature and a lithic scatter. Cultural affiliation cannot be determined due to the lack of diagnostics. The site is on a colluvial terrace overlain by aeolian sands. The west end of the site, where the FCR is, has some depositional context, whereas the east end appears to be surficial and exposed. The latter is where the lithics are concentrated. The lithics scatter is sparse, but concentrated, of mostly tertiary chert and obsidian flakes. No tools were noted. The FCR/hearth feature consists of a few fragments of fire-cracked limestone with a sparse number of flakes in association. About 100 m separates the FCR feature from the lithic scatter.

AZ:B:10:261
This is a large Early Formative (BMIII-PI) roasting pit area with four extensive FCR midden concentrations. The FCR middens are eroding from and being exposed in shallow sandy terrace drainages that run downslope to the east towards the Colorado River. Associated with each FCR midden is an artifact scatter consisting mainly of flaked lithics. Over the entire site ca. 500-800 flakes are visible; cherts mostly, although Presley Wash obsidian was also seen. Three Lino gray ware sherds, a mano, and a metate fragment were found at FCR midden #1. Unburned bone was located at FCR area #1 and 2. A few chipped stone tools were found, including a knife base, a drill tip, and a biface fragment.

AZ:B:10:262
This PI-III Anasazi site consists of a few courses of masonry that have been partially buried by river deposition. The wall has been disturbed; some of the wall fall has apparently been moved to create sleeping spaces by campers. The structure has about 2-3 courses of masonry remaining under the sand deposits. The cliff face forms the back of the structure area. Six to seven lithic items (including a bidirectionally worked tool) and one sherd were observed.

AZ:B:10:263
The site is comprised of a masonry room ca. 1.8 x 2.2 m in size (interior dimensions). The back of the room is formed by the Tapeats cliff face; side walls are still three to four courses high at their highest points. Only two or three flakes were noted in the site area, but numerous FCR middens occur below the site on sandy terraces affiliated with AZ:B:10:261. The two sites may be related. Approximately 40 m to the south, at the same level and also at the base of the Tapeats, is another possible ephemeral feature. This "feature," which appears to be outlined with rocks, may be natural rockfall. It was not mapped. Cultural affiliation is unknown (although if it is associated with AZ:B:10:261 it may be an early Formative site).

AZ:B:10:264
The site consists of a rock alignment and burned stone scatter of unknown cultural affiliation. The rock alignment is 3.2 m long and runs N/W-S/E. It is 1 m out from a Muav cliff wall, and composed of sandstone and limestone rocks. The site contains a few charcoal fragments and burned rock, one groundstone artifact, and a flake. No chipped stone tools were observed.

AZ:B:10:265
The site consists of a possible masonry structure on the flat part of a ledge at the base of the Muav cliff face. Associated with the feature is a scatter of dispersed flakes and charcoal, plus burned bone fragments and an oval mano. The "structure" consists of some slabs oriented at right angles to a cliff face. This appears to be a limited activity site oriented toward short-term hunting and gathering. Cultural affiliation is unknown.

AZ:B:10:266
The site comprises two masonry-outlined cleared spaces, a few flakes, and some charcoal fragments. Three walls (two to three stacked rocks high) that are perpendicular to the cliff face define the cleared spaces, which are both 3 x 2 m ; they share a middle wall. Four flakes of Redwall chert were present and fragments of charcoal were observed in both cleared areas. Cultural affiliation is unknown.

AZ:B:11:2
The site consists of three to five small habitation/ storage rooms and a retaining wall perched on a

narrow bench at the base of the Tapeats Formation. It is believed to be of PII Anasazi affiliation. The architectural features are designated A through D: A is a two to five course wall with a right angle bend locaated at the west end of the site abutting a cliff base; B is a single course remnant wall paralleling wall A further east; C is a retaining wall paralleling the cliff face; D is the remains of a single C-shaped unit downslope from the bench measuring 3 x 5 m, with up to four courses—D appears to have been constructed for erosion control/soil retention purposes and may not be a habitation structure. There are also two features: F1 is a charcoal/FCR concentration at the west end of the site; F2 is the remains of an octagonal cist with four upright slabs on the far east end of the site. A heavy (25+ lbs.) pecked and ground metate and cobble mano were observed; a number of sherds of several varieties were collected and analyzed during one of the previous GRCA visits to this site, but none were seen during this recording.

AZ:B:11:79
The site consists of a slab-lined hearth that is eroding out of a sandy substrate on a large (100 m sq) bench below the Tapeats Formation; there is a possible second hearth a few meters northwest near some vegetation. A single sherd and one quartz cobble hammerstone were observed that may or may not be in association. Cultural affiliation of the hearths is problematic; they may be either Archaic or Formative.

AZ:B:11:271
The site consists of a rockshelter at the base of the Bass Limestone Formation with artifacts eroding below it, and an eroding roasting feature downslope in sandy alluvial deposits. Ceramics and lithics are present in the scatter below the shelter and at the FCR feature; sherds suggest a PII-early PII Formative association. One scraper and one probable mano were observed. There is an ill-defined concentration of charcoal fragments in the east end of the shelter.

AZ:B:11:272
The site consists entirely of a 5 m diameter leveled sandy area with a downslope fan of FCR extending south, east, and west. Some gray, ashy, stained soil is present at the top of the FCR fan. The feature is interpreted as a roasting pit, although no artifacts were observed in association. The FCR elements are of limestone, sandstone, schist, and granite cobbles. Cultural and temporal affiliation is unknown, but the feature may be related to AZ:B:11:276 upslope, which had a PII Formative cultural/temporal affiliation.

AZ:B:11:273
The site is located in a deep rockshelter at the base of the Tapeats Formation; a corn cob and a grinding stone were the only observed cultural materials. The shelter is 1.75 m high at its opening, tapering to nothing at the back; it is 27 m wide. The shelter floor is a fine, tan, sandy silt encrusted with salt deposits. An amorphous packrat midden contained the corn cob and a lot of twigs and branches. At the approximate center of the shelter is a piece of burned, fine-grained Tapeats sandstone that exhibits grinding on one surface. The sandstone fragment is 17 cm long, 9.5 cm wide, and 7 cm thick. Although few artifactual remains were noted, the site may contain additional buried material as there has been a fair amount of deposition; the floor of the shelter undulates in a dune-like fashion. Cultural affiliation is unknown.

AZ:B:11:274
This is a possible protohistoric site consisting of an 8-meter diameter FCR roasting feature with a sparse amount of flaked lithics. The feature consists of several hundred whole and fire-fractured cobbles and small stones, predominantly limestone, but including schist and Tapeats sandstone material. The flakes were observed on a narrow deposit on the south side of the canyon and southeast of the burned rock area, down on another level sandy area. No other artifacts were noted.

AZ:B:11:275
The site consists of a rockshelter at the base of the Bass Limestone Formation where two rock alignments/walls extend from the back of the overhang, defining at least one cleared activity area. The east wall is 1.8 m in length; the west wall is 1 m in length. The structure has been partially filled-in with debris from the overlying formation and silt/sand from alluvial river deposits. No artifacts were found on-site. A small, steep drainage under the eastern end of the overhang cuts below the site, and has possibly carried away the artifacts, although none were observed downslope. Some charcoal is present, and there is a large packrat midden under the overhang. Cultural affiliation is unknown.

AZ:B:11:276
The site consists of two overhang shelters with use areas and artifacts within detached monoliths on a Tapeats sandstone boulder field/slope. This is a possible multi-component site with PII Formative and late prehistoric-early historic Pai occupations. The Locus A shelter is on the northwest side of a boulder where an arc of sandstone and limestone wall elements enclose a level floor and appear to act as a retaining wall to stabilize sediments in the

"room" interior. The wall is dry-laid and three to four courses high of both stacked and upright limestone, sandstone, and schist cobbles and slabs. The ends of the wall abut the back of the shelter. There is a possible grinding slab fragment in the rear center of the room. Artifacts in the vicinity included a couple flakes—one possible used, and three sherds. The artifacts are eroding downslope of the shelter along a gully. Atop the boulder is a single Tapeats mano. Locus B is another, smaller boulder shelter 20 m from Locus A at 220°. A single driftwood (?) log lies in the middle of the shelter floor. No wall alignments were observed. Sherds and lithics are sparsely scattered downslope for 15+ m. Artifacts included a variety of raw material flake types, a uni-edge flake tool, a roughly polished, partially buried schist slab, sherds, bone fragments, and charcoal chunks (which may be a hearth).

AZ:B:11:277
This is an open site on and in aeolian sand dunes overlooking the Colorado River. The most obvious feature (F1) is a large (2 m high) mound of FCR eroding out of the side of the dune slope. Artifacts are concentrated in the immediate vicinity of F1 and in blowout pockets directly upslope from it. Artifacts include a sandstone slab metate, mano fragments, sherds, and numerous lithics representing a variety of material sources. No diagnostic tools or decorated ceramics were observed, but the plain gray sherds and lithic assemblage appear to be Early Formative, i.e., BMIII-PI. There are undoubtedly additional features and cultural deposits buried in the sand dunes, which may eventually be exposed through wind action and gullying; should be monitored.

AZ:B:11:278
The site consists of a single semi-circular wall set against a Bass limestone outcrop. It is one to two courses high and averages 50 cm in height. The wall is partially protected by an overhanging rock. There is an entryway in the northeast portion of the structure. The structure diameter (taken at its widest where it contacts the cliff wall) is 3.6 m. The distance between the "floor" and the shelter ceiling is 1.4 m. No artifacts were found and cultural affiliation is unknown.

AZ:B:11:279
The site consists of four loci of structures and artifact scatters that are associated with a PII Formative occupation: Locus A is comprised of a well-defined, coursed masonry structure (F1), a possible granary (F2), an ephemeral wall or room outline (F3), and a sherd and lithic scatter; Locus B is a lithic scatter with a small basalt arrow point, an Elko Corner-Notched point base, and 5-6 brown ware corrugated sherds; Locus C consists of a large tabular slab with rock walls three-four courses high enclosing the space beneath it; and Locus D is a masonry-outlined structure approximately 3 x 4 m filled with fluvial sands and containing two sherds and a few flakes—there is a rock alignment with sparse flakes a few meters south. Other observed points included a possible Rose Spring and a small, nondescript basalt arrow point.

AZ:B:11:280
The site is in a small overhang measuring 4 m (L) by 1.5 m (W) by 1.75 (H). The rockshelter is located at the base of a Tapeats boulder outcrop on the northern edge of a debris flow. It contains a broken granite "anvil" stone, a cobble hammerstone, a Tapeats sandstone slab, and a possible collapsed wall. No diagnostic artifacts were located, therefore cultural affiliation is unknown. The site is within the high-water level and has been heavily scoured by flooding and erosion. However, some silting has occurred at the site, which may have buried cultural deposits.

AZ:B:11:281
This is a light-to-moderate-density scatter of sherds, lithics, and groundstone fragments distributed around the northeast margin of a sand-covered talus bench overlooking the river. A northeast-flowing tributary borders the southeast side of the bench/site area. Artifacts are concentrated in several more or less level areas. There are no distinct features or structures, but the presence of sandstone and limestone cobbles and FCR suggest the likelihood of buried roasting features and possibly one or two structures. Ceramics indicate a PII Formative affiliation. A Parowan projectile point was found and collected, and a cobble chert core, quartz chopper/hammerstone, and grinding slab were seen.

AZ:B:11:282
The site consists of an eroding 8-meter diameter roasting feature (F2) located at the top of a sand dune at the mouth of a small canyon, with an associated sub-circular rock outline (F1) about 1.5 x 3 m in size adjacent to the arroyo. F1 is a probable wickiup or brush structure; the organic superstructure is gone and all that remains is a cobble surface alignment. F1 lies between two sheep trails and could be easily taken out by a single flash flood. Lithics are present—one heat-treated flake—but no ceramics were observed. This may be a late prehistoric-early historic Paiute/Pai site.

AZ:B:11:283
The site, which is at the juncture of a schist cliff base and a talus slope, contains two wall features and a

few charcoal fragments. Each wall is constructed of dry-laid Tapeats sandstone; they are 30 m apart. Talus has possibly buried additional cultural material. It is difficult to interpret the function of the site and a lack of diagnostics precludes assigning cultural/temporal affiliations.

AZ:B:11:284
The site consists entirely of two rock walls that are perpendicular to the cliff base, which form a rectangular space ca. 3 x 2 m in size. No artifacts were observed in association. A small pour-over has eroded or covered up part of the architecture and possibly washed away any artifacts that would have been present. Up to three courses are currently visible in the structure walls; material is of local Bass limestone. Cultural affiliation is unknown.

AZ:B:13:1
This is a small multi-component site consisting of remnant wall features (F1 and 3) dividing probable activity areas against a Bright Angel shale cliff. Both walls are dry-laid and only 1-2 courses high. Associated with the walls is a small hearth/roasting feature (F2) with bone, charcoal, and a couple of slabs. Very few other prehistoric artifacts were present, but they included a few Redwall chert and river cobble flakes, a mano, and a polished cobble. The site's historic component includes a small trash pile of glass and tin cans dating from the 1940s and 1950s. About 70 m away at 100° is a 3-m diameter roasting pit (F4) with no associated artifacts. Cultural/temporal association for the prehistoric component is unknown.

AZ:B:13:2
Is a multi-component roasting feature complex. There are three or possibly four roasting features and/or middens (Features A through D) with artifacts affiliated with PII Formative, late prehistoric-early historic Pai, and Euro-American cultures. When originally recorded four sherds of Hopi "Utility Ware" were noted. The roasting features are comprised of limestone FCR and have no particular shape and little mounding, but abundant material. Artifactual material is associated with A-C and possibly D, including sherds, lithics, charcoal, and groundstone. Lithic material includes both chert and obsidian. A Desert Side-Notched projectile point was also seen. The historic component is suggested by several milled lumber boards with square-tapering nails at Feature A. A knife-opened can and four large metal bolts were observed on the terrace below Feature A.

AZ:B:14:93
This aceramic site is a limited activity area of unknown cultural affiliation. It consists of an FCR feature (F1) and a single lithic flake, and another large FCR midden (F2). F2 is 103° E/SE of F1 on a high dune at the base of the Tapeats across a drainage from F1. F1 is located on a short, narrow ridge on the west side of the drainage. F1 is in generally good condition with minor erosional impacts; F2 is eroding out of an arroyo cutbank.

AZ:B:14:94
This aceramic site consists of two FCR features and four lithic items of unknown cultural affiliation. F1 is an eroded roasting feature 1.5 m in diameter with charcoal. F2 is a dense FCR concentration 4-5 x 1.5 m in diameter with some unburned bone but no charcoal. One flake had some edge retouch.

AZ:B:14:95
This site, which consists of roasting features and sherds and lithics, was divided into Loci A and B. Locus A comprises mainly FCR middens/roasting pits separated into Areas 1-3. Area 1 consists of three FCR loci with some flakes. Area 2 includes three FCR concentrations, flakes, and sherds. Area 3 has a large roasting feature. Cultural affiliation for this locus was judged to be PI-early PII Anasazi. Debitage comprised all reduction stages; two corner-notched arrow points were collected. No structures were visible. Locus B is a lithic scatter displaying bifacial thinning flakes associated with some FCR. Cultural affiliation for this locus is unknown. Both loci are located in and eroding out of sand deposits which overlay a Forster Canyon debris flow.

AZ:B:14:105
The site consists of a shallow overhang sheltering a crude single-room structure (F1) of PII Cohonina affiliation. The room was constructed of a single course of undressed tabular and blocky sandstone elements. A light sherd and lithic scatter is eroding downslope. Three roasting features (F2-4), visible on the surface as clusters of FCR sandstone and limestone, are also located downslope below the artifact scatter. At the base of the slope is a single-course wall 2 m in length of unknown function. The site's primary function was probably that of a temporary camp focused on food processing.

AZ:B:14:107
This PII-early PIII Anasazi site consists of a small rockshelter beneath an overhanging Tapeats sandstone bedrock ledge. A few Redwall chert flakes, a quartzite cobble flake, a limestone cobble mano, and a large Tusayan Corrugated sherd were found inside the shelter. A crude, 1-meter long wall segment is located at the shelter's east end; it is 30 cm in height. There is also a large, 5-meter diameter crescent-shaped concentration of FCR limestone

and charcoal-stained soil eroding out of a sand-covered gentle slope. The site apparently was only occupied for a brief time, possibly for the purpose of food processing via the roasting pit.

AZ:B:14:108
This aceramic site consists of a relatively long, but shallow, Tapeats sandstone rockshelter with several grinding tools inside; the site is divided into two loci (A and B). Two large Tapeats sandstone slabs show obvious grinding wear, with pecking on a single surface and shaped margins. Two other Tapeats slab fragments appeared smooth on one surface, but may not be grinding tools (i.e., they are naturally smooth). Two sandstone river cobble manos were also present. Locus B contained one of the manos and a grinding slab; all of the other artifacts were at Locus A. No features or other artifacts were observed. None of the grinding tools show much production input. The site was probably only occupied on a transient basis, possibly focused on plant food gathering and processing. Cultural affiliation is unknown.

AZ:B:15:1
This site was originally recorded by R. Euler in the summer of 1962 and is comprised of three separate loci: A, B, and C. Locus A is a set of habitation features constructed from stone materials collected in the vicinity and incorporating natural bedrock outcrops. Of the five features at Locus A two are mysteriously excavated, one is naturally deflated, one remains buried, and another (previously called Room 5) is a collapsed cist or storage space. Locus B consists of a single arced rock wall under a shallow overhang on a bench 40 m above Room 4 at Locus A. It appears to have been a storage space that has fallen and eroded since Euler's initial visit. Locus C consists of a structure in a smoke-blackened overhang and a possible wall alignment 10 m east; few artifacts remain. Euler's ceramic analysis revealed a mix of Virgin and Kayenta Anasazi wares/types, dominated by Moenkopi Corrugated. A schist cobble tool with a used edge and a possible Rose Spring projectile point (collected) were found. The site has a nice view of the river and maximizes the morning light; the rock ledges radiate heat even as the sun is going down. This is considered a PI-III Anasazi site.

AZ:B:15:73
This is a multi-component site consisting of three separate loci that reflects both PII Formative and late prehistoric-early historic Pai occupations. Locus A comprises three rooms and a granary. The rooms are under a low 1-2 m high overhang. The granary is located atop a sandstone boulder to the northeast. Room #1 measures 5 x 1.5 m; its northern wall is seven courses high. There is a 1-meter square entryway. The south wall has collapsed; it forms the north wall of Room #2. Rooms #2 and 3 ar e also adjoining and together measure ca. 1 x 6 m. The southernmost wall is one course high and mostly collapsed. The oval-shaped, wet-laid granary is 1 m x 0.5 m in size. The back half is three courses high; the front is missing. Fingerprints can be seen in the granary's mortar. Locus A's total dimensions are ca. 16 m E/W x 5 m N/S. Locus B is located 20 m east of Locus A, and consists of a single course of sandstone and limestone rocks under a sloping Tapeats boulder. The room measures 3 m x 1.5 m and is badly eroded. No descriptive information is available for Locus C.

AZ:B:15:91
The site consists of two masonry rooms and five granaries that are believed to be of PI-III Formative affiliation, although no diagnostic artifacts were present to validate this assumption. Room 1 measures 3 x 1.3 m with dry-laid, one-course-high walls. Room 2 is 3 m east of Room 1 and contains two of the five granaries. Room 2 measures 3 x 2 m and has low, eroded, dry-laid walls. In addition to the two granaries at Room 2, there are three other wet-laid granaries in the vicinity in various stages of repair. No artifacts were associated with the structures. The site may have functioned primarily as a storage area, with the smaller granaries used to store selected goods and the larger room-like structure also used for general storage.

AZ:B:15:96
The site consists of an isolated metal boat at the base of the Bass Trail. This boat, known as the "Ross Wheeler," was built by Bert Loper in 1914. There is an incredibly long and involved story associated with how the boat came to be built and subsequently wound up abandoned at this spot (see David Lavender's "River Runners of the Grand Canyon," pages 51-56). The boat is flat-bottomed and single-hulled of riveted sheet tin construction; it has a V-bow and a square stern. The boat has two patches that cover puncture holes in the hull. The bow was split and repaired. The boat is secured to a rock with a chain. There are bits of tin, a cast iron lid, and a can in the area.

AZ:B:15:97
This site consists of the remains of the William Bass cable car system. The cables (cut by Park officials on the right bank in 1971) extend from the river upslope 30 m to a schist outcrop, where they pass through drilled holes. The cable car is located 7 m downslope from the outcrop. Locus A includes several cables of varying widths and the cable car. Locus B consists of related historic artifacts (wood,

bailing wire, scrap metal, cans, bolts, spikes, nails, glass, etc.) campfire remnants, rock features, a platform, and a constructed trail. The cable system was used during the early decades of the twentieth century.

AZ:B:15:100
This historic site is on both sides of the river and consists of three loci of remains related to an historic cable crossing system. Locus A consists of several historic artifacts and a trail related to an early twentieth century cable system built by W. Bass and J. Waltenburg. The trail consists of a schist wall that supports a walking platform on a talus slope; wall height varies from one to six courses. Parts of the trail on the north side of the ridge are highly eroded. The platform below the cable hookup at the top of the ridge where the trail ends is 3 m long and varies in width from 1 m at the west end to 70 cm at the east end where the trail comes in. Artifacts include wire, cut logs, tin cans, pickaxe heads, and tent grommets. Locus B consists of a tool cache, a cached sleeping cot, and a platform-like area. Locus C consists of a cache of kitchen items, including pots, pans, tin cans, and other domestic items. The kitchen cache is quite well-preserved, with portions of paper labels still intact and legible. Two sections of apparently galvanized steel cable are located between Loci B and C.

AZ:B:15:117
The site is situated at the base of the Tapeats Formation along a ledge running parallel to the Tapeats. It consists of a lithic scatter and two areas of eroding charcoal (possibly hearths). Lithics are scattered for approximately 40 m along the ledge. There are a number of lithic material types present; predominantly white-to-tan Redwall chert. Many well-controlled biface thinning flakes and some biface fragments were seen, but the abundance of cores indicate that core reduction was the primary activity on the site. The flake reduction technology suggests a pre-ceramic affiliation, but no diagnostic lithics were observed. No ceramics were noted either. Ledges in the Tapeats at the west end of the site could have been used as shelters. Cultural affiliation is unknown.

AZ:B:15:118
The site consists of a large rockshelter at the base of the Tapeats Formation with two panels of historic inscriptions, including those of Clyde Eddy, F.E. Dodge, and Norman Oliver. The Eddy and Oliver inscriptions date from possibly July of 1927 and the Dodge inscription is dated Sept. 5, 1923; these inscriptions are on Panel 1. Panel 2 contains one or two names with an affiliated date of Jan. 24, 1899. A single, white Redwall chert flake was the only visible evidence of prehistoric use of the shelter.

AZ:B:15:119
This is an Early Formative (BMIII-PI) site consisting of a sparse scatter of chunky Redwall chert lithic tools and debitage, two plain gray sherds, and several small charcoal chunks. The artifacts are concentrated along the dripline of a shallow sheltered area at the base of the Tapeats. There are at least seven large unifacial chopper/scraper-like tools, a couple of battered cores, and some large used flakes. These tools may have been used to extract and pulverize salt. The assemblage is clearly geared to a specialized activity because several of the unifacial tools are morphologically similar to one another.

AZ:B:15:120
The site consists of a small 4 x 5 m "platform," which juts from a rocky slope. This enigmatic flat space is surrounded by broken and rocky terrain. The slopes of the feature are covered with what could be construed as FCR, and is rimmed by some larger (30-50 cm) flattened boulders; apparently these were inten-tionally placed to keep the flat surface from eroding away. The site is circumvented by two game trails. Several crew members brainstormed the nature of this feature; possible functions include a large, eroding mescal pit, a tent platform, a helicopter pad, a hunting blind, or photographer's/surveyor's platform. The bottom line is that this "feature" needs to be tested. No artifacts were present.

AZ:B:15:121
The site consists of about 40-50 flakes of local materials (Redwall chert and limestone) associated with a cluster of charcoal fragments eroding out of a ledge that abuts the base of a Tapeats cliff face. The majority of the flakes are below the ledge and appear to have been washed down from an upper level. The charcoal fragments are covered by about 50 cm of eroded, residual Tapeats material; it is assumed that this is the aboriginal surface. Flakes occur with this charcoal deposit. The only observed tool was a core that may have been used as a chopper. This is a possible pre-ceramic site, but cultural affiliation is unknown.

AZ:B:15:122
The site consists of three partial walls located among the large boulders downstream from the lower Bass camp. The walls appear crude and expedient and reach a maximum height of 40 cm. The walls are well hidden and generally protected from the elements. The main reason the site is

construed as historic is because the only observed artifact was a piece of saw-cut bone.

AZ:B:15:123
This site consists of a single plain-ware ceramic jar, originally cached in a small crevice between two limestone boulders. At least one boulder apparently shifted since the pot was left in place, crushing the jar into several pieces. The jar was probably used for storage; however, it is doubtful that recoverable stored remains have survived. The cache may be related to a small rockshelter site located nearby. The jar dates somewhere in the PI-III range.

AZ:B:15:124
The site consists solely of a historic inscription in concise block print that says "Geo. W. Parkins Washington D.C. 1903." The inscription is on a 70 degree angle to horizontal on a polished schist surface. The entire site takes up an area 30 by 15 cm. The GCRCS was unable to identify Parkins through archival research following the survey.

AZ:B:15:125
The site consists of a grinding slick on a Tapeats slab, two cores, one loaf-shaped diorite mano that is broken in half, and six flakes of limestone and Redwall chert. The site lies at the base of a Tapeats cliff face on a narrow ledge atop a talus and debris slope; this fits the location pattern of two other sites within a two-mile stretch of the right bank (AZ:B:15:121 and 117). All three share similar locations (at the Tapeats base), are aceramic, and contain local lithic materials; they may all be of Archaic affiliation, however no datable artifacts were seen at any of these sites.

AZ:B:15:126
This site, which contains numerous granaries, a structure, and diverse artifacts, is located in a 24-meter long Tapeats ledge shelter that averages 3 m wide. At the north end of the shelter are the remains of four granaries (F1-4) of wet-laid Tapeats elements built on a ledge of Tapeats. F1 and 2 are adjacent each other, as are F3 and 4. About 7.8 m from the north end of the shelter is F5, another granary with several bone fragments (including possible Artiodactyl bones). F6, another granary, is a little over a meter south, and is much like F5. Between F6 and F7, another granary, there is charcoal-stained soil with several long bone and rib fragments. On the south-facing wall of the shelter, where the back wall of the shelter angles to west, is a walled, room-like structure (F8) with a bighorn sheep horn. Artifacts included 15-20 expediently produced Redwall chert flakes, a single sherd, two pieces of driftwood (one burned), three Tapeats grinding slabs, and a chopper. The cultural/temporal affiliation for this site could not be accurately determined.

AZ:B:15:127
A PII Anasazi site that consists of a shelter beneath a Tapeats sandstone overhang at the base of an east-west-trending cliff. It is situated on a 3 m wide and 9 m long sand bench with two features: a 50 cm-wide circular rock alignment against the cliff wall that may be the remains of a granary, and a 2 x 2.5 m diameter roasting pit eroding out of the western slope of the terrace. Charcoal is eroding out of the northwest side of the roasting pit. Fire-cracked rock makes up the remainder of the roasting pit feature. One flake, three sherds, and the distal epiphysis of a coyote-size femur were observed.

AZ:B:15:128
This is a multi-component site with a prehistoric—possibly Archaic—lithic scatter and a turn-of-the-century historic trash scatter. The prehistoric component is comprised of a lithic scatter with three projectile points, 100+ flakes, a broken graver, and a couple of biface fragments. Two of the points were Elko items and the third was a Gypsum-like point, but with a wider than usual base. Debitage reflected biface thinning; no groundstone, ceramics, or tools suggestive of core reduction were seen. The historic camp includes a drill jack, cartridges, cans, a black pepper tin, and a railroad spike. The multiple use of this area suggests that it was a favorable location for various cultures and activities.

AZ:B:15:129
This PI-early PII Formative site consists of a two-room roomblock, the remains of three granaries, the possible remains of a fourth granary, and a small artifact scatter in the roomblock. Feature 1 is the possible roomblock. The easternmost room of this feature is situated beneath a rock ledge that has since fallen and buried most of the room with rubble. The west wall of the room is partially exposed. A basal wall extending west of this room may be the remains of another room or retaining wall. Several sherds, some burned bone (of a large mammal), a flake, and a biface were found in F1; these may have been visible due to animal activity in the northwest corner of the eastern room. Feature 2 is the remains of a possible granary, manifested by several out-of-context rocks and some bits of mortar. Features 3 and 4 are adjacent granary structures with two different types of mortar, indicating some remodeling or different source areas of mortar material. Feature 5 is another granary, the easternmost wall of which still contains mortar. Ceramics and lithics were sparse.

AZ:B:15:131
The site consists of a single hearth outline of stacked, unshaped Tapeats sandstone slabs two courses high on the east and west sides with upright slabs on the south side (it is open on the north side), forming a rough pentagonal shape. The hearth has been inundated by the Colorado River, which has removed all interior fill. Interior dimensions are 25 by 45 cm. No artifacts are associated. There is a driftwood log jammed horizontally in the Tapeats ledges ca. 2 m above the hearth. The shape of the hearth is similar to many prehistoric examples, but the condition/position suggests more recent use (1960s-1970s?).

AZ:B:15:132
This site contains several structures that may range in age from late prehistoric to early historic. The main structure is a partial C-shaped wall of upright schist slabs under a reddish schist boulder with several 1940-1950s cans 4 m downslope to the northeast. The structure intuitively seems older than the cans, but this needs to be verified through testing. There is another single-course rock alignment 2.2 m long that adjoins the southeast margin of the C-shaped wall (see map). On the north side of the boulder is a cleared space rimmed by schist boulders ca. 3 m in diameter. These structures constitute Feature 1. Feature 2 is ca. 20 m southeast of F1; it is slightly upslope under another schist boulder. It is a semi-circular "walled" structure of unmodified upright schist slabs ca. 80 cm in diameter. A possible groundstone item was noted west of F1, and a grinding slab and a mano were observed on a schist bench ca. 30 m downslope and slightly upstream of the site.

AZ:B:15:133
This is a PII Anasazi site consisting of two boulder shelters with artifacts divided into Loci A and B. Locus A is a large travertine boulder overhang that contains a dry-laid wall of travertine elements enclosing the sheltered area. The wall is up to five courses high and incorporates in situ travertine boulders. A few pieces of charcoal were scattered about the shelter floor, but no fire features were apparent. Flaked lithics are scattered from the shelter "entrance" downslope. Two sherds, a core, and an expedient sandstone mano were found in or around the shelter. A partially buried humerus was also found in the shelter. Locus B is ca. 75 m south of Locus A and is another large travertine boulder with a sheltering overhang. Six stones and an upright slab appear to form a one-course "wall" across the northwest side of the shelter. There is a possible hearth area adjacent the wall. Artifacts included several varieties of ceramics, burned stone, a core, a pecked/smoothed limestone slab fragment, and a sparse variety of flake material types.

AZ:B:15:134
The site consists of a crude, single-course wall under a large travertine boulder with a chunk of charcoal in front of the wall. The boulder provides a dry, well-sheltered space just large enough for one, and possibly two, people. The ground surface slopes steeply up underneath the boulder; only the riverside part of the sheltered area is inhabitable. The wall alignment is of unshaped travertine boulders. It is generally one-course high, but three courses are visible at the west end of the wall. It is 2.4 m long. There is a second possible alignment of five boulders roughly parallel to the "main" alignment at the rear of the shelter (see map). The main wall probably functioned as a retaining device to create a level sleeping space behind it. The site could be historic, but it is definitely not recent.

AZ:B:15:135
This site is in an overhang rockshelter in the Tapeats sandstone, with upright sandstone slabs walls outlining a habitation area. This area is situated on a Tapeats ledge that is 2.5 m wide and 5 m long. It is sheltered by another sandstone ledge 1.5 m above the floor. The southeast wall consists of one upright slab (1 m x 0.4 m) and two loose rocks (0.4 x 0.3 m), plus several smaller rocks. The northwest wall consists of two fallen Tapeats slabs (0.4 m thick x 1.5 m long) lying flat on the floor. The northeast (outer) wall consists of two sandstone slabs (0.8 x 0.8 m); one on either end of the wall at a 45 degree angle to the back of the shelter. The remainder of the wall consists of three small upright slabs (0.4 m x 0.3 m) extending halfway from the northwest 45 degree slab to the southeast 45 degree slab (see map). One meter east of the southeast 45 degree slab is a circular mound (0.8 m diameter) of FCR. On a 1 m diameter sandstone ledge 1 m above the southeast wall are three stacks of small (hand-size) slabs; one is four rocks high, the other two are two rocks high. These may be partly natural, built by modern visitors, or the remains of a granary. A few flakes, several lithic tools, and a sherd were found. Artifacts suggest a late prehistoric-early historic Pai association.

AZ:B:15:139
The site consists of two flat areas sheltered by shallow overhangs at the base of a cliff with historic and prehistoric artifacts. Two components are indicated: PII Anasazi and early twentieth century (1900-1930) Euro-American. Shelter A is a 2.5 x 1.7 m area with historic debris (cans), one sherd, a granite cobble mano, and a bone (large mammal—burro?) scatter. Shelter B is 2.75 x 1.6 m in size and

contains a schist rock alignment, two metal plates, and one metal can. Approximately 2.2 m northwest of Shelter A is the remnants of a rubber shoe along the cliff wall. Shelters A and B are ca. 13 m apart along the cliff base. The historic artifacts may be related to trail building/mining activities by W. Bass.

AZ:B:15:143
This site contains charcoal concentrations and a lithic scatter in two different elevational levels. The site is located where the base of the Tapeats meets colluvial deposits; the Tapeats creates a shallow overhang over the entire site, which is ca. 30 m long and 7 m wide. The upper level of the site is situated on clay-like, residual Tapeats sandstone and contains two charcoal concentrations (F1 and 2). Feature 1 is somewhat scattered, while Feature 2, about 2.4 m away, is concentrated into a 1.1 m diam. area. The lower level of the site is composed of coarse colluvial gravels exposed along the dripline of the Tapeats cliff. This level contains randomly scattered lithics, including a retouched flake tool, a hammerstone, and six Redwall chert flakes. Cultural affiliation is unknown.

AZ:B:16:1
This is a well-known, excavated Mid-late PII-early PIII Kayenta Anasazi site consisting of a use area/plaza (F1), a roomblock of four contiguous rooms (F3-6) and a single room (F2) on the northeast end of the block abutting and partially sharing a wall with the northeasternmost room of the roomblock, and a detached kiva (F8) with an attached room-like feature (F7). Three of these rooms have firepits; the fourth is smaller—probably used for storage. The single room on the northeast corner also has a firepit. Southeast of the roomblock is a deep, square kiva with an L-shaped wall attached to its northeast end that forms another room with a firepit. All rooms appear to have been dug into the terrace. The walls are of unshaped local schist, blocky and tabular in form, and wet-laid. A light gray chert projectile point tip was seen adjacent the roomblock; not very well-thinned—could be a knife or preform.

AZ:B:16:3
The site consists of five well-defined masonry structures (F1-5) aligned along the base of a schist slope at the intersection of a terrace overlooking the river. The structures are all multi-coursed of tabular schist. Sherds and lithics are lightly dispersed on the terrace, but are definitely concentrated in front of Feature 3 at the present time. A side canyon flood severely eroded the terrace where the site is situated, creating a steep, vertical slope ca. 10 m south of the structures. Any other prehistoric remains, trash deposits, etc., have certainly been washed/eroded away. Ceramics (see the original site report for type frequencies) indicate a PII Anasazi affiliation. The GCRCS crew reported an Elko Corner-Notched projectile point and a mano.

AZ:B:16:170
This is an oar and pick cache, apparently left by the Kolb Brothers, dating to the early 1900s. Blasting caps and two pieces of dynamite were also found in 1984 when the site was first recorded; these were subsequently removed by Park officials for safety reasons. The cache is located under a large schist/granite boulder leaning against a cliff wall. There are four pairs of oars (eight in all), ranging in size from 180 to 210 cm in length. Three pairs of oars have fine copper scrollwork and protective tips on the blades (see sketches). One pair of oars appears to have been homemade, while the remaining ones were probably manufactured. An iron pickaxe head and a separated broken handle are also part of the cache.

AZ:B:16:255
This is a marginal aceramic site consisting entirely of a sparse and somewhat dispersed scatter of lithics in an area measuring 15 x 20 m. The site is within an alluvial/colluvial debris flow/fan. All of the artifacts are of the same material: white/gray Redwall chert; perhaps representative of a single reduction episode. The flakes appear to be the result of unintensive core reduction. No formal tools were observed, but one flake with a battered dorsal surface was noted. No ceramics or features were seen. Much of the site has been trampled by visitors, although it is currently in a revegetation area. It may also have been impacted by creek or high river flows. Cultural affiliation is unknown.

AZ:B:16:256
The site consists of the historic grave of Rees B. Griffiths, which is marked by a semirectangular mound of rock cobbles and fragments. The grave is located between two outcroppings of granite/schist with facing, parallel walls to the east and west. Spanning the area in between are two constructed boulder walls, enclosing a cleared, rectangular area on the north and south side. There is a memorial plaque on the vertical face of the west outcrop that states Griffiths was born Oct. 26, 1873, and died Feb. 6, 1922 in an accident while he was working on the Kaibab Trail.

AZ:B:16:257
This site consists of two probably unrelated loci (A and B)—a partially sheltered room and a dry-laid wall. Locus A is a PII Formative room at the base of a granite/schist outcrop partially protected by an overhang. A wet-laid wall forms a semi-circle on the south/southeast side of the room, completely enclosing the "shelter"; there is a possible entrance

on its south side. The wall is up to five courses high and encased in earth on its exterior. The room may have been partly dug into a low terrace slope prehistorically; historically, it may been excavated/pothunted up to 50 cm below present ground surface. Two sherds were observed, plus a few Redwall chert flakes; no formal tools (site has probably been picked over). There is also a scattering of historic trash, including porcelain, nails, a galvanized cable guide, tobacco tin, metal clamps/shims, and metal fragments. Locus B, 33 m due north, is a dry-laid rock wall of schist slabs retaining a cleared space 2 x 3 m in size; this may be an historic construction.

AZ:B:16:258

The site consists primarily of two historic masonry features. Feature 1 is an L-shaped alignment of rock adjacent a trail measuring 3.2 x 2.1 m. It is constructed of limestone, schist, and granite elements. One to two courses remain, with a maximum height of 35 cm. F2 consists of a leveled spot on the downstream side of a granite boulder with schist walls of 7 to 12 courses. There are two other rock alignments above F2 that act as water/slope creep diversions, plus two possible tent platforms. Artifacts include a friable piece of saw-cut wood, bailing wire, and rubber fragments. The site may date to the turn of the century.

AZ:B:16:259

The site is composed of one fire-cracked rock midden/roasting pit with an associated scatter of lithics and sherds. The flakes are of white-tan Redwall chert; less than a dozen were observed. No tools were noted. The roasting pit is 2 m in diameter with FCR distributed downslope for about 7 m. Elements are of schist and granite, within a matrix of charcoal-stained soil. This appears to be a PI-III Formative site.

AZ:B:16:260

This is a sparse, aceramic lithic scatter of eight Redwall chert flakes with no diagnostic items or associated features. The site, which measures only 4 x 8 m, apparently reflects a single episode of biface reduction. It would have been an excellent station for scouting game coming down to the river. This location receives heavy visitation from backpackers and boaters. Cultural affiliation is unknown.

AZ:B:16:261

The site consists of a dry-laid, masonry room abutting a schist outcrop and an association of lithics and groundstone. The site is situated on a terrace adjacent to and cut by a major side canyon. The room is about 2 m sq., comprised of tabular schist that has mostly fallen to grade. The walls form a U shape with a possible entrance on the south side; the outcrop acts as the back wall. There is some evidence for both coursed and upright slab construction. Just south of the room is a possible sheet midden and/or artifact concentration with an ashy soil stain, flakes, and biface fragment (dart tip?). Nearby is a boulder with a smoothed, circular surface and, lying adjacent, a unifacially ground cobble. No sherds were found (the site may have been picked over), but the site may be affiliated with the puebloan structures across Crystal Creek (AZ:B:16:3).

AZ:B:16:262

This site is the Phantom Ranch USGS gauging station, which was established in October, 1922, by the U.S. Geologic Survey.

AZ:C:2:11

Is the Lees Ferry Historic District, which encompasses some of the following re-recorded features (with additions by the GCRCS): (F1) Lee's Fort; (F3) main ferry—left and right bank; (F4) corral; (F5) cable crossing inscriptions; (F6) walls on cable crossing hill; (F11) staging area for hydraulic mining operations and Spencer's boiler; (F12) Spencer's steamboat; (F13) USGS guesthouse; (F14) USGS cableway (right and left bank); (F17) steamboat inscriptions; (F18) gate holders; (F19) post office; (F20) root cellar; and (F21) hogans. The GCRCS expanded the scope of F11 to include features related to Spencer's mining operation in addition to the boiler, plus a root cellar and a trash scatter. Lee's Lookout (F2) and Spencer's trail (F10) were outside of the GCRCS project area and not included. F7 (cabins and outbuildings) was reassigned as site AZ:C:2:57; F8 (cairn and inscriptions) and F9 (cairn and sledgehammer) are considered GCRCS I.O. #57 and I.O. #50, r espectively; F15 (USGS gauging station) was reassigned as site AZ:C:2:59; and F16 (Bureau of Reclamation cableway) was reassigned as site AZ:C:2:58. F17 through 21 were added by the GCRCS.

AZ:C:2:12

The "Dugway" is the common name given to a road constructed in 1898 as a way of avoiding the Lee's Backbone road. It is located on the left bank of the river along the slopes of the Moenkopi Formation. The upstream end is located near the water's edge at the present site of the USGS gauging station. The downstream end leaves the cliff face (after a 300-foot ascent) and comes out in the open ca. a half-mile below the lower ferry crossing. The road is "shored up" by retaining walls of local sandstone along nearly its entire length; in many places these walls have eroded away or are in the process of disintegration. When in use (until 1928) the road was wide enough for one-way wagon and automobile traffic; today some stretches are no

more than unmaintained trails, with a few exposed portions that can be hazardous to cross.

AZ:C:2:13
The site consists of a rockshelter 3 x 3.5 m in plan dimension (and ca. 1 m high) with a low, dry-laid wall enclosing the front, creating a probable habitation room (F1). A moderate number of sherds and lithics are scattered along the talus slope below; artifacts indicate a PII Kayenta Anasazi association. A small petroglyph panel is located along the cliff face 15 m to the east, and an additional petroglyph element is located ca. 45 m east. A small, slab-lined storage feature (F3) is situated below a small overhanging Kayenta sandstone outcrop ca. 20 m N/NE of the lone glyph. F2 is an enigmatic rock alignment that may be historic. Lithics suggest only non-intensive, unstaged reduction activity. Tools included a chert bi-edge and a utilized chert flake. A large, unformalized grinding slab and a fragment of an apparently well-shaped mano round out the assemblage. The shelter was possibly used as a fieldhouse related to agricultural pursuits on the adjacent alluvial terrace.

AZ:C:2:32
When initially recorded on 1/22/84 the site consisted of 15 charcoal lenses eroding from a high cutbank adjacent the river, ranging from "concentrated ... black" features with "chunks of charcoal" to "long thin lenses of grey-black soil." When re-recorded by the GCRCS the multiple lenses were no longer visible as such, nor were the separate lenses (designated A and B) described by P. Bungart from a 1986 visit. Instead, it appeared that there was one continuous lens approx. 60 cm thick and ca. 24.4 m long that occurred between 1.4 and 2.0 m below the present top of the terrace above. A second narrow charcoal band was visible above the main lens, ca. 50 cm below the terrace surface. Unlike the main lens, which appeared to be ash-stained silt, the upper lens contained chunks of charcoal. The cultural origin of the lenses cannot be determined without subsurface testing; no associated artifacts are visible at the present time.

AZ:C:2:33
The site consists of a small rockshelter with the remains of a crude, wet-laid granary (F2), an associated sherd and lithic scatter, and a probable "niche" storage space in a low bedrock shelf. Artifacts indicate a PII Anasazi cultural affiliation. The granary was roughly D-shaped originally, enclosing an area ca. 2.2 x 1 m against the back of a Kaibab limestone overhang. Currently only a single wall segment remains, constructed of expedient, locally available masonry elements and brown clay mortar. Artifacts scattered downslope consist of a light lithic scatter and about 12 sherds of several types. At the northeast end of the site a small shelf was walled-off on one side with a single rock mortared to the bedrock (F1). No other construction evidence was present; the shelf was probably used as a windbreak for storage. It is likely that some site materials were buried or destroyed during construction of the river drive; however, no evidence of habitation is now visible. The site possibly served as a storage and processing locus related to farming on the nearby alluvium.

AZ:C:2:35
During the 1986 recording of this PII Anasazi site it was reported that: "The site consists of an extremely sparse scatter of lithic and ceramic material, along with a low wall or blind, a single piece of groundstone (basin metate fragment), and two projectile point fragments. Artifacts are concentrated near the low wall segment, which is located near the edge of the talus and may have served as a hunting blind. Projectile point found 8/3/86 was small, associated with [pueblo] occupation episodes. Point found in 1980 was much larger." The GCRCS crew relocated the metate and sherds, but not the point found in 1986. The structure had not been disturbed or seriously eroded since Bungart's visit. A patch of dark soil was seen 50 cm south of the structure that may reflect charcoal staining. There were a couple gray ware sherds observed in this activity area. Ca. 30 m at 340° from the structure is a gully coming down the talus slope beneath two monoliths. Eroding down this gully were six to eight gray ware corrugated sherds—perhaps from two vessels. The sherds appear to have originated from the westernmost boulder; possibly an old pot cache. A cobble with possible use wear was also noted here.

AZ:C:2:36
This is an historic mining camp—with a small prehistoric lithic component—comprised of a rock alignment, a sandstone hearth/fireplace, a cleared, leveled "living area," several placer pits, and two sets of pecked hand/toe holds that provide access up from the river. The GCRCS crew added another feature to what had previously been recorded: two squarish, level "pads" excavated in bedrock near the water's edge with a shallow connecting trough and another trough leading down to the water. The site is thought to be associated with turn-of-the-century mining activities on the river. Artifacts were collected during the original Anderson/Madden survey in 1981. The 1986 re-visit reported spools with copper wire, sheet rubber, a tobacco can, a bundle of metal rods, clear plate glass, and expended cartridges The GCRCS crew also added a prehistoric component; the remains of cobble

testing activity, including three cores. The cultural affiliation of this component is unknown.

AZ:C:2:37
The site consists of two prehistoric rock art panels and one panel of historic inscriptions situated at the base of a Navajo sandstone cliff. Feature 1 is the lower prehistoric panel consisting of ca. 25 anthropomorphs, sheep, and abstract elements. Feature 2 is the upper prehistoric panel consisting of 13 anthropomorphs and sheep. All of the prehistoric elements appear to be Glen Canyon Style 5 of the Late Archaic era. The historic panel includes inscriptions by F.G. Faatz (1892), which is believed to be authentic. An 1892 inscription by G.M. Wright was believed to be unauthentic and post-date 1972 by Glen Canyon ranger Tom Workman, but G. Foster recorded this inscription in 1956, and Wright also inscribed his name during the same month and year, but a day earlier, at Lees Ferry, so it appears Workman is mistaken.

AZ:C:2:38
The site consists of a petroglyph panel situated at the base of a vertical Navajo sandstone cliff face. The panel is ca. 11 m long (horizontally) and 1.75 m in height. It has 35+ elements, including "smiley" and rectangular sheep, abstract geometrics, and anthropomorphic figures. Also present are several historic/modern inscriptions (names and letters). The prehistoric figures are all pecked; some stippled and some solid. There is evidence of superimposition of figures and repatination. Additional sheep figures had recently been uncovered at the bottom of the panel, having been buried by terrace sediment; consequently, it is suspected that more elements may remain buried under existing fluvial deposits. Previous site reports mentioned the presence of nondiagnostic white wares and a mano; lithics were observed during the GCRCS survey in the vicinity (but recorded as AZ:C:2:81). There are two possible prehistoric components at this site: Late Archaic and PI-III Anasazi.

AZ:C:2:39
This is a lithic reduction and procurement area on two large, prominent terraces atop Navajo sandstone slickrock. The terraces are littered with a variety of river cobble lithic materials; wherever cobbles occur there is evidence of lithic reduction activity. Mainly decortication flakes and shattered cobbles are present, as well as smaller concentrations of secondary flakes. The main area of later-stage reduction (without cobbles present) is at the base of the Navajo sandstone cliff. Here are many secondary and tertiary flakes that are further reduced than the majority of flaked materials found in areas of cobbles, where cobble-testing was the primary activity. Raw materials include assorted river cobble cherts, basalt, chalcedony, jasper, and quartzite. No structures or tools were found, although a projectile point fragment was collected during an earlier survey. The site may be Archaic, but actual cultural affiliation is uncertain.

AZ:C:2:40
The site primarily consists of ca. 25 flakes, several cores, and a chert cobble hammerstone on an old alluvial terrace at the base of the Navajo sandstone where a slight bedrock indentation creates a degree of shelter from weather out of the north and northwest (however, this is not an overhang). However, there has been extensive exploitation of cobbles and gravels on the terrace and bench deposits. This expedient and practical resource was utilized in an informal matter; broken and shattered rock is everywhere. Some of these are naturally fractured and some are obviously cultural; there is a big gray area in between. Chalcedony, red chert, Chinle materials, and numerous nondiagnostic varieties of chert were observed. No tools or bifaces of any kind were found at any of the quarry locations themselves. These quarried areas exist downstream from and above the actual location of AZ:C:2:40. Cultural affiliation is unknown.

AZ:C:2:41
This site consists of a wall, a small rock art panel, and various artifacts. The arc-shaped wall is 3.8 m long and encloses a 3 x 3.2 m area below an overhang created by large Wingate sandstone boulders. The wall is dry-laid, 2-4 courses high (up to 60 cm), and is comprised of irregular and tabular sandstone slabs. There is a small petroglyph panel consisting of three small "sandal" tracks ascending a patinated sandstone boulder. Artifacts include a light-density lithic scatter that reflects generally unintensive, unstaged reduction. Raw materials include local river cobble chert, petrified wood, and Shinarump chert, plus a coarser-grained quartzite. Some uncontrolled heat treatment (crazing) was evident. A mano and a projectile point fragment had been earlier collected from this site. A variety of ceramics were analyzed; they suggested a PII Anasazi affiliation. A single Jeddito Plain Ware sherd was seen, indicating some direct or indirect link with the Hopi.

AZ:C:2:48
This historic road was constructed across the Shinarump Conglomerate bench on the left side of the Colorado River in the early 1870s to access the original and upper ferry crossings. It was built by hand by laborers working for the LDS church. It was used continually between 1873-1878, mainly by early Mormon colonists to Arizona, and occasionally

between 1878-1898 during periods of high water. It is severely eroded and often difficult to follow. Occasional remnants of rock work bordering the road can be discerned. Also, wagon wheel ruts are incised into the Shinarump bedrock at one spot. One notable feature of the road is Sentinel Rock, which contains an incised 1878 inscription recording the passing of the "First Mesa Company" under the command of Hyrum S. Phelps.

AZ:C:2:50
This multi-component site consists of an elongated sherd and lithic scatter divided into two loci (A and B) situated on the narrow remnant of an alluvial terrace. The site also contains fire features that have been highly altered by sheetwashing and historic impacts. (Locus A) F1 is an FCR concentration with charcoal and nails; and F2 is a cobble concentration cut by a tire rut with another nearby hearth/cist feature. (Locus B) F3 is a possible cist; F4 is a linear FCR concentration with ash, flakes, and tin can; F5 is another FCR concentration; F6 may be the remains of an eroded structure (perhaps a cist) with sherds, lithics, ash, charcoal, and bone; and F7 is an FCR concentration with ashy soil. The ceramic assemblage is a mix of Virgin and Kayenta types, and suggests a PII-early PIII Anasazi occupation. Historic trash suggests use from the late nineteenth century through the early twentieth century. Two large posts downstream from the site are part of AZ:C:2:94, the lower ferry crossing.

AZ:C:2:53
This PII Anasazi site consists of a ceramic and lithic scatter in a flat, fairly denuded area that used to be a plowed alfalfa field; site is about 25 x 35 m in size. Abundant small sherds were observed, probably broken and dispersed during plowing episodes. During the GCRCS visit two cobble cores and a mano fragment were observed; previous surveys reported seeing a scraper, a biface, and a metate/grinding slab fragment. The trash suggests that this was once a habitation locus; additional artifacts and features could still be buried in the alluvium.

AZ:C:2:56
The site consists of two petroglyphs on the southwest face of a large, slab-like boulder. Both figures resemble Navajo face masks used in healing and other ceremonies. One glyph has almost vanished, and the second is faint but distinct; the petroglyphs are most visible in shadow. The glyphs were made by scraping/abrasion rather than pecking. The boulder is of Wingate sandstone with no patina. It is 1.85 m high and 2.4 m across, with a second boulder lying against it. The boulders are right at the bottom of a Chinle talus slope, adjacent to an ephemeral wash. No artifacts were observed in the vicinity. The glyphs are presumed to be of historic Navajo affiliation.

AZ:C:2:57
This historic site consists of six distinguishable structures and associated trash that may be related to any number of activities (e.g., sheep herding, ferry/road operations, mining). The main structure is a dugout (F2), which still retains a quantity of trash and appears to be the main habitation quarters. F1 is a rock outline that may have been a tent foundation. F3 is a long stone wall with a possible attached lambing pen, and F4 is another possible pen. F5 appears as a stone corral, while F6 may have been used for storage. An earlier survey found glass bottles with marks dating to 1920-1964 and 1926 to present. Milk cans found during this survey dated to between 1917-1929. The site is close to the end of the Lee's Backbone trail and is near the beginning of Stanton's Road. The outlet for the Dugout road is also nearby. In addition to its Euro-American historic component, it appears to include a Navajo re-occupation, and a possible Late PI-early PII Anasazi affiliation.

AZ:C:2:58
This site, known as the Bureau of Reclamation cableway, includes not only features associated with the cableway on the left bank and pre-cableway inscriptions dating between the 1920s and 1930s (Locus A), but ephemeral masonry rooms that may or may not be associated with the cable system (Locus B), a concrete slab with trash downstream from Locus A (Locus C), and the right bank portion of the cableway (Locus D). The latter three loci were added by GCRCS crews to the original Locus A documentation by Anderson and Madden. Locus A is the main focus of the left bank portion of the cableway, and includes a cable anchor/cement block complex with a 1959 B of R benchmark, a terracing system with walls, and a series of historic inscriptions. Locus B consists of two enigmatic masonry rooms of dry-laid sandstone incorporating in situ boulders; they appear Anglo or Navajo, although a single sherd was found in the doorway of one. Locus C consists of a slab with milled lumber and iron bolts 100+ m downstream from Locus A; it is suspected to be associated with the cableway, perhaps as a cable/wire anchor. Locus D is the right bank portion of the cableway and includes an iron anchor, trash, and painted letters/symbols. A 1936 inscription by D.P. Monroe, once designated F9 of AZ:C:2:60 (Stanton's Road) was reassigned to this site as part of the Locus A complex by the GCRCS.

AZ:C:2:59
The site consists of a concrete, tower-like river gauging station, water well, and associated cableway across the river. The tower, which is 1.8 m square and ca. 7 m high, was built in the mid-1930s. It is has poured concrete walls and roof. The gauging instruments in the top of the structure were originally reached by means of iron ladder rungs embedded in the south wall. At some later time, rocks from the retaining wall along the dugway (AZ:C:2:12) were scavenged and piled up between the tower and adjacent cliff up to the level of the doorway platform leading to the instrument room. East of the tower is a metal ladder leading up to a cable car platform; the car can be run out along the cable that spans the river. The right bank terminus of the cableway consists of a metal tower.

AZ:C:2:60
This road was built in 1899 by crews working for R.B. Stanton, who was attempting to mine gold in this part of the Canyon at the turn of the century. Mining law at that time required that a certain sum of money be spent each year on every mining claim in order to hold the claim. The road was constructed to meet this requirement, an "improvement" that linked several of Stanton's claims (see E.B. Measeles's book *Lees Ferry*). It was subsequently abandoned and later reused by other Anglos and Navajos. Currently eight features are associated with the road (F1-8), including (F1) a forge with inscriptions and prehistoric petroglyphs; (F2) a remnant masonry structure of unknown function; (F3) a remnant wood structure (which GCRCS crews could not relocate); (F4) a Navajo stock gate; (F5) a feature previously described as a cairn by P. Bungart, but defined as another stock gate by the GCRCS; (F6) remains of a wood and masonry structure; (F7) a stone corral and stock pens; and (F8) a petroglyph. What used to be F9—an historic inscription—was reassigned as part of the Bureau of Reclamation cableway (AZ:C:2:58).

AZ:C:2:70
The site consists of a small Kaibab limestone rockshelter with a light scatter of lithics and sherds on the talus slope below. The artifact assemblage is dominated by ca. 40-50 flakes of mostly locally available cherts, quartzites, and coarse igneous rocks from river cobbles and the Shinarump Conglomerate. Flake attributes indicate that some late-stage biface manufacturing occurred here, as well as unintensive, unstaged reduction (either flake tool production or simple raw material sampling). Sparse decorated and utility ware ceramics suggest that small level areas below the overhang were occupied; however, no evidence of architecture is present. The site may have served as a small field camp related to farming on alluvium below the site. Several mammal long bones were found in the shelter, but except for one burned bone, these may not be cultural. A complete corn cob and another fragment were found on the site. Ceramics suggested a PII-early III Anasazi affiliation.

AZ:C:2:71
The site contains two loci (A and B) and includes an artifact scatter and a petroglyph panel. Locus A surrounds a Navajo sandstone boulder and consists of an artifact scatter, with many sherds and lithics placed in a collector's pile. Locus B is situated on a Navajo sandstone cliff face and consists of a petroglyph panel; there is a 1959 brass cap benchmark nearby. In addition to the 32 sherds and ca. 60 flakes in the collector's pile, Locus A has a light lithic scatter, a Navajo sandstone mano fragment, and one rim sherd. There is also a pothole in the vicinity. The sherds indicate a mid-to-late PII Kayenta Anasazi affiliation. The Locus B glyph may be a Style 5 element. It is very faded and on a lightly patinated Navajo sandstone surface; it may not be related to the artifact scatter.

AZ:C:2:72
The site consists of a scatter of ca. 30 Late PI-early PII Western/Kayenta Anasazi sherds and 25 lithics, plus a couple of probable buried hearth features. The site is dispersed across a 30 x 60 m area along the north edge of the highest alluvial terrace. The site is apparently buried in the alluvium. There is also a sparse scatter of historic trash and a (early 1900s?) historic hearth in the eastern half of the site area. Both the prehistoric and historic components appear to represent temporary campsites.

AZ:C:2:73
The site consists of one Late Archaic sheep petroglyph (Style 5) and the historic inscription "Cope 55." The historic inscription is the most obvious and can be seen from 40+ m away. It is ca. 1.2 m above the top of the alluvial terrace on a well-patinated surface on a slightly overhanging cliff face. The sheep glyph is ca. 2.5 m upstream (east) of the inscription. The bottom of the sheep's belly is 38 cm above the present ground surface. There may have been additional petroglyphs on this cliff face at one time but the only indication of their former presence are amorphous pecked blobs and blotches on the sandstone surface near the sheep.

AZ:C:2:74
The site consists of an alcove shelter ca. 1 m high, 1.8 m deep, and 14 m long. It contains a scatter of six flakes and a broken cobble mano. These are located in a 3 x 7 m area in front of the west half of

the shelter. No diagnostic artifacts were found and cultural affiliation is unknown.

AZ:C:2:75
The site consists of a lithic scatter eroding out of an alluvial terrace cutbank, which is divided into two loci (A and B). Locus A consists of ca. 30 flakes in an area measuring 20 x 12 m. Locus B consists of a small concentration of FCR, an associated ash stain, and a scatter of about 25-30 flakes eroding down the cutbank. A 12-foot deep, 24-foot wide arroyo has cut through the site. The lithics are more concentrated and diverse at Locus B. The lithic assemblage reflects early stage reduction and comprises a variety of material types. No ceramics or diagnostic tools were seen; cultural affiliation is unknown.

AZ:C:2:76
The site consists of a single slab-lined hearth with a few crude lithic flakes. The hearth is a roughly circular feature ca. 85 cm in diameter and lined with thin sandstone slabs along its sides and at least partially on the bottom. The hearth had been filled with charcoal-stained soil, but apparently vandals have cleaned out much of the fill, leaving dark backdirt piles around its perimeter. A pin flag probe indicated the hearth was originally ca. 50 cm deep down to the slab bottom. Flakes consisted of four quartzite and one coarse-grained igneous item, suggesting only very limited, unintensive reduction. The site probably functioned as a brief food-processing location/campsite. Cultural affiliation is unknown.

AZ:C:2:77
The site consists of a large, dispersed lithic scatter measuring 25 x 40 m. The site contains 60-70 visible flaked lithics, which are concentrated on the first alluvial terrace above the river, and are eroding along a 40 m cutbank section of the second terrace. A few FCR fragments were observed at the south end of the first terrace with a some heat-treated flakes. A quartzite river cobble hammerstone was also seen eroding from the second terrace cutbank. No diagnostic artifacts were seen; cultural affiliation is unknown.

AZ:C:2:78
The site is situated within a shallow Navajo sandstone rockshelter. Artifacts are eroding out of the floor and down a loose soil slope below the shelter, which is 7.5 m long and 1.75 m deep. There is a sparse concentration of lithic tools in the shelter, although the ratio of tools to flakes is quite high. Tools are mostly of local cobble material and include a chopper/core, a nondiagnostic projectile point, a worked cobble, and a mano fragment. No ceramics were observed. The slope in front of the shelter is active and steep and a good portion of the site may have already disappeared. Cultural affiliation is unknown.

AZ:C:2:79
This is an Early-mid PII Anasazi rockshelter with sparse sherds and lithics and a slab wall. The 1.8-m long wall is of dry-laid Navajo sandstone slabs, and is partially collapsed (it may have been 2-3 courses high). Two sherds and 24 flakes of various raw material types were observed; no tools or groundstone were noted. The flakes are mostly scattered downslope of the shelter and are mainly secondary items.

AZ:C:2:80
The site consists of a lithic scatter at the base of the Navajo sandstone slickrock on a terrace system N/NW of 3-Mile Bar. The artifacts occupy a 40 x 30 m area, having been dispersed by runoff from the slickrock. A variety of materials are present, all procured locally from the wealth of cobbles on the surrounding benches. Cores, hammerstones, a biface fragment and eight groundstone pieces are present. No diagnostic artifacts were observed, except for a single sherd that suggested a PII Anasazi affiliation. Based on the weathered surface and present position of the cultural debris, it appears that at some point in the past the lower cliff face was buried to some degree along its front by a sand dune that has subsequently deflated, leaving the artifacts as a residual component on the ever-eroding surface.

AZ:C:2:81
The site consists of a lithic scatter with one observed sherd eroding out of a trail cut. There are 50+ secondary and tertiary thinning flakes exposed along the trail leading from the beach to the rock art panel at AZ:C:2:38 in a 10 x 5 m area. The sherd suggested a PII Anasazi affiliation.

AZ:C:2:82
This site, which contains a rock alignment and artifact scatter, is located in a shallow 9 x 2 m overhang of Navajo sandstone at the base of a sandstone outcrop. There is a single, coursed rock alignment extending 1 m out from the base of the overhang on the south end of the shelter. Lithics extend from the shelter downslope ca. 14 m to the edge of the terrace. The heaviest concentration of lithics is found along the terrace edge. Lithics are composed of Kaibab and river cobble chert and quartzite. Three sherds were found, two of which are off the edge of the terrace directly above the wash. A couple of charcoal pieces were seen in the shelter, but no hearth feature. A sandstone mano midsection—probably originally a two-handed

item—was also observed. Artifacts indicate a PI-III Anasazi affiliation.

AZ:C:2:83
This is a small PII Anasazi sherd and lithic scatter with a possible hearth feature. The artifacts consist of a few corrugated sherds and several lithic flakes. A small, 1-meter diameter ash stain is present on the sloping terrace with several associated charcoal fragments. No bone or burned sandstone was found. The artifacts appear to be eroding from the base of the Shinarump; no obvious concentrations. This may be the remains of a short-term camp.

AZ:C:2:84
The site consists of a shallow overhang with a collapsed wall, a surficial midden, and artifacts. The artifacts include numerous hand tools, manos, hammerstones, cores, biface fragments, lithic debris, ceramics, and charcoal. Fragments of mammal bone were also present on the surface. A lithic analysis unit was placed at the base of the sheet midden. About 150+ flakes were noted, mainly primary/secondary items of local river cobble chert. However, some biface thinning flakes were noted, and several biface "preforms" and fragments were observed, plus a couple hammerstones. All ceramics were analyzed; they suggested a Mid-late PII Anasazi affiliation. A wall of Navajo sandstone elements abuts the back of the shelter; it is 1.7 m long. There was a highly polished mano within the rubble. A small collector's pile of five flakes was also observed.

AZ:C:2:85
The site consists entirely of a charcoal stain with bits of charcoal and a few associated pieces of animal bone. The stain is a circular area about a meter below the present terrace surface. It may be the remains of a buried hearth. No associated artifacts were seen. Cultural affiliation is unknown.

AZ:C:2:86
This site, which contains a cist, wall, burned rock, and artifact scatters, is divided into three loci: A, B, and C. Locus A has one feature (F1) that appears as a large, slab-lined cist. Only part of the feature is exposed; mostly the north half. The structure is ca. 3.5 x 4 m in diameter and is constructed with long, rectangular slabs. Locus B is ca. 50 m W/SW of F1. Feature 2 is located here at the base of the outcropping sandstone, which functions as a rockshelter. F2 consists of a small sandstone wall that probably stood 2-3 courses high and measures 2 m in length; it is slightly arced. A couple of sherds and flakes are in close proximity to F2. Feature 3 is also a part of Locus B; it lies ca. 23 m W/SW of F2 and consists of some burned sandstone in a 2 m diameter area. Just above F2, on the terrace overlying the sandstone bedrock, is Locus C (ca. 25 m east and southeast of F3). It contains a lithic scatter covering an area ca. 30 x 60 m; essentially the entire bedrock bench/terrace overlooking the lower sandy beach on the delta. The heaviest concentration, however, is on the westernmost portion of the bench. Locus C may have functioned as a quarry site, as it appears that quartzite cobbles occur naturally here; most of the flakes originated from these cobbles. Ceramics indicate that this is a PII Anasazi site.

AZ:C:2:87
The site consists mainly of historic trash possibly dating between the 1920s and 1950s. There are both historic and modern artifacts present. The site may be what NAU recorded as IF C:2:35, a collapsed wooden tower; however, no such tower was in evidence. Historic artifacts are scattered across the site, although there is somewhat of a concentration near a level area on the site's south side. They include purple and clear glass, an old toothpaste tube, large wire-cut nails, Prince Albert-type tobacco cans (the most common can type), saw-cut wood (including plywood), milk can with sanitary solder top, a knife-opened can, etc. Some of the trash (plywood) seems more recent than the rest (e.g., purple glass). Also seen were two U-shaped "anchor" bars imbedded in the sandstone cliff base—similar to others found along this stretch. A flat boulder downslope may have served as another anchor—there appears to be a metal rod buried in it. If this is the "tower" site, perhaps these "anchors" were used to secure the structure. The site is probably associated with Bureau of Reclamation activities related to exploration for an alternative dam site in 1922.

AZ:C:2:88
The site is within an overhang shelter located at the contact between a Navajo sandstone cliff face and a talus slope of the same material. The shelter contains a Navajo sandstone grinding slab enclosed by two expedient parallel walls extending from the back of the overhang. A single sherd was found in the talus just below (south of) the shelter area, suggesting a possible PII Anasazi affiliation. The walls are dry-laid and constructed of Navajo sandstone elements; they run NW/SE, are 1.25 m apart, and are 1 to 2 m long.

AZ:C:2:89
The site consists of an overhang shelter with a 2 x 3 m cleared space defined by two walls perpendicular to the cliff face wall. Charcoal is eroding out of the interior, which is in a dry area behind the dripline. Adjacent to this feature is an open area about 3 x 4 m in size where charcoal and a few flakes are located. Burned bone fragments were

also seen at this site. No diagnostic artifacts were found and cultural affiliation is unknown.

AZ:C:2:90
The site consists of a group of massive sandstone boulders with the remains of a dry-laid structure and a few crude petroglyphs. The structure was built against the west side of the southernmost and largest boulder. It is an expedient feature, only slightly protected from the elements, with 1-3 masonry courses. It possibly served as a fieldhouse or transient camp. The petroglyphs consist of seven elements on three separate boulders. Designs include sheep, probable yucca elements, a meandering line, and an unidentified element. No chipped or groundstone artifacts were observed. A light ceramic scatter suggests a Mid-late PII Anasazi occupation.

AZ:C:2:91
The site consists of two loci of charcoal lenses/stains, which may or may not be related. Locus A was discovered first; B was found in the waning moments of the day and quickly added. Locus A consists entirely of a charcoal lens eroding from the side of an arroyo. It is about 20 cm below present ground surface and is 35 cm long and 11 cm thick; some burned rock is associated. No artifacts were found in association and cultural affiliation is unknown. Across the arroyo (at 330°) ca. 30 m away is Locus B. It contained one sherd and three small ash/charcoal stains all in a 5 m diameter area; could be part of the same feature. These are about 4 m from the arroyo. This locus may have a PII Anasazi cultural affiliation.

AZ:C:2:92
This aceramic site is under an overhang in the Kaibab limestone that contains two Moenkopi sandstone grinding slabs, two manos, a chopping tool, and a scatter of charcoal. The manos are unifacially ground; one is of Moenkopi sandstone, the other is made of river cobble limestone. The only other chipped stone tool was a quartzite cobble with a 10-cm long area of flake scars that appear to represent a "chopping" edge. Three fragments of unidentifiable bone were also observed. Cultural affiliation is unknown.

AZ:C:2:94
The recorded portions of this site consist of a dugway that accessed the lower ferry on the left bank, numerous historic inscriptions associated with the dugway/ferry crossing, and large wooden posts on the right bank that were also associated with the crossing. The ferry was established in 1873 and used until 1898; it was built as a means of avoiding the Lee's Backbone road. There are many historic names and dates done in tar on a rock surface plus four carved initials at the base of the dugway; others are located at the top of the dugway, but were not re-recorded by GCRCS crews. There is a very ephemeral rock wall at the panel between the upstream and downstream portions of the panel. There is also a lot of modern graffiti present. The historic dates seem to clump between 1892 and 1898. The wooden posts on the right bank are thought to be mooring posts.

AZ:C:2:95
The site consists of a small rockshelter at the base of a low Shinarump Conglomerate cliff. A light sherd and lithic scatter is eroding down an ephemeral drainage below the shelter, which measures 4 by 2.5 m with a ceiling height of 1.7 m. Lithics at the site are dominated by coarse cobble material of quartzite, basalt, and other igneous rocks. The primary technological strategy was probably cobble tool production, such as in making hammerstones and choppers. Some smaller chert flakes from locally available cherts were also noted. A variety of PII Western Anasazi ceramics were found. Although some site materials may have been buried or destroyed by construction of the road below the site, it appears that occupation was limited in duration and range of activities. It perhaps served as a transient camp or work station related to nearby farming on the flood plain.

AZ:C:2:96
This aceramic site consists of 1-3 possible walls and a few lithic flakes and tools. The most obvious feature is an ephemeral wall ca. 1 m long, with wall elements of small, local limestone rocks, that abuts a talus boulder at the back of an overhang. Four other spaced stones in a line are at a right angle to the wall; these may or may not be cultural. To the south is a "natural" roofed overhang created by a large limestone slab that has flaked off and is resting on some stone uprights. The front of this shelter ledge might exhibit some alignment construction and leveling preparation. Downslope of the site area is a boulder overhang that looks like a good shelter but did not have any observed artifacts; it is frequently flooded by high river levels. Artifacts included a single tertiary thinning flake of Kaibab chert, two river cobble quartzite "chopping" tools, and a pestle-shaped stone with ground and pecked surfaces. Cultural affiliation is unknown but inferred to be protohistoric.

AZ:C:2:97
The site consists of two Kaibab limestone rockshelters with a sparse, but diverse collection of artifacts within the shelters and the slopes below them. Shelter area #1 has a mostly bedrock floor (there is old alluvial sediment at the back of the

shelter) and contains lithic tools, bones, groundstone, flakes and a sherd on the slope below. It also has a historic/modern firepit with rusted cans, plastic, and tattered underwear. Shelter area #2 is smaller, but has more interior fill and a possible one-course-high wall en-closure. A core and flake were on the slope below it. Between the two shelter areas were several poorly fired corrugated sherds of probable local manufacture. At the last minute a large bowl sherd was found below the first shelter that appeared to be a Mesquite B/G. Ceramics, then, suggest two possible Anasazi occupations: PI and Late PII-early PIII. Tools ranged from expedient flake tools to bifaces and manos. The artifact assemblage is suggestive of more than just overnight or single activity use.

AZ:C:2:98
The site consists of an overhang with a charcoal scatter, one sherd, and lithic flakes. The sandy river terrace at the base of the overhang has been cut by high water and charcoal is eroding from the uppermost level of this bank cut. Around some large boulders at the downstream end of the overhang is another concentration of charcoal associated with recent trash. Both areas have been impacted by pothunting and subsurface digging, moving of rocks, etc. The site had several sherds when first located during a previous session a month before, but only one was found during this visit; either we could not relocate them or they were removed. Besides flakes, the only other artifact observed was a broken sandstone mano. Cultural affiliation is unknown.

AZ:C:2:99
This site has both a prehistoric and probable historic component; the former consists of a very dispersed scatter of artifacts, including 4-5 sherds, two pecked basin metates, a projectile point base, broken river cobbles, and a few flakes exposed in deflated areas. A few sandstone slabs occur here and there, suggesting that this is a buried site beginning to be exposed. A possible hearth was also observed. The wind was particularly strong during recording and it is likely that artifacts/features appear and disappear with rapidity around here. The possible historic component consists of a very ephemeral "road" that appears to cross the site from east to west, along with a rock alignment by an ephemeral drainage that may have acted to retain soil and keep the road from washing out here. The road probably linked the ferry crossing with the dugway road (AZ:C:2:12), Lee's Backbone, and/or the historic complex of AZ:C:2:57 about 250 m away. The prehistoric component appears to be PI-early PII Anasazi, while the historic component may date to the turn of the century.

AZ:C:2:100
The site consists of two ephemeral, surficial hearths defined as small concentrations of flat-lying tabu-lar sandstone; one (F1) has an associated charcoal stain and a sparse sherd scatter, the other (F2) has two associated petrified wood manuports. The ceramics place the site squarely in the PII Anasazi camp. Additionally, there is a charcoal lens in an arroyo cutbank ca. 25 m northeast of the hearths. The lens is 75 cm below ground surface and is suspected to be a cultural feature; it may or may not be associated with F1 and 2..

AZ:C:2:101
The site is located in dune sand just below the bottom of an exposed talus slope. It consists of a 2 x 3 m cluster of FCR with a single chunk of charcoal (about 2 cm in size) in association on the surface. This probable roasting feature is eroding downslope due to deflating dune sand and slope water runoff. Cultural affiliation is unknown.

AZ:C:2:102
The site consists of the following historic, dated inscription on a cliff face: "I.C. Spencer 1925."

AZ:C:2:103
The site consists of two historic inscriptions probably related in some way—perhaps inscribed by the same individual or party. They have been solid and stipple-pecked into the Navajo sandstone cliff face. One reads: "S.V.J. 2-22-25" (the middle initial is either a "U" or "V"). The other looks like an S within a circle with the date 1925.

AZ:C:2:104
This possible "multi-component" site consists of a sandstone boulder about a meter cubed in size with three pecked petroglyphs: a circle or zero, a circle with a tangent line (maybe a 9 or a 6), and a sheep. The panel faces south toward the river. The two circular elements may be historic—they appear more recently pecked than the sheep (which is clearly prehistoric)—and could represent the numbers 90 or 06. The boulder does not seem to be in its original position, as it would have been awkward to peck the sheep glyph in its present position (it is on a vertical face only 35 cm above the present ground surface with its rear end pointing to the ground—see sketch). The boulder may have been displaced by a road grader during construction of the adjacent road bed.

AZ:C:2:105
This is a large Navajo sandstone alcove that contains the inscription "1889 Hislop," which is deeply pecked into a slanting 3 x 2 m slab that spalled off of the ceiling of the alcove. The inscription consists of large block letters 10 cm wide and 20 cm high, occupying an 85 x 50 cm area. The slab tilts downward to the east; the inscription is upside down to someone standing in the center of the alcove looking west. The alcove opening is 48 m wide and 20 m high, with a depth of 16.5 m. There is no evidence of prehistoric use. There is a cleared area in the east half of the alcove and a piled rock/dry-laid wall at the far east side that were apparently constructed in the late 1960s by a resident hippie. There are modern slab-lined hearths near the opening on the east side also.

AZ:C:2:106
This site consists of a roasting feature, two sherds of unknown brown ware, a couple flakes, and a biface fragment on a dune/terrace slope beneath a Navajo sandstone outcrop/cliff. The roasting feature is ca. 2.5 m in diameter, and consists of cobble-size sandstone FCR oxidized to a dark gray and gray-white. No charcoal was seen, although some of the soil is slightly gray in appearance. Artifacts were sparse and eroding out of the sand; they included a Navajo sandstone chert flake, a nicely thinned biface dart point/knife tip midsection, also of Navajo chert, a cortical flake of river chert, and two brown ware sherds that may either be Navajo or Southern Paiute.

AZ:C:2:108
The site consists of a large sandstone boulder located on a dune-covered talus slope, with several stipple-pecked petroglyph elements on its south face. The rock art elements include seven sheep, a cross-like figure, an elongated anthropomorph, an amorphous blob, and a linear figure (11 figures total). The 1.5-meter wide panel is near the bottom of the boulder; the highest figure is ca. 60-70 cm above the present ground surface. The figures are somewhat faint, eroded, and repatinated. The sheep appear to be Glen Canyon Style 5, which has a Late Archaic temporal affiliation.

AZ:C:3:3
The site consists of a modern trail built during the time of the initial construction of Glen Canyon Dam. It runs for about 1/4 mile along the river corridor. For much of its length retaining walls have been built of sandstone masonry and backfilled with earth to create a level path averaging 3.3 m in width. At the southern terminus a series of masonry steps were constructed, which provide access to a broad flat area of slickrock. At the far end of this slickrock platform is a wooden electric pole, part of the Lees Ferry power line.. The trailing was done as part of the development for a proposed marina below the dam site, a project that never came to pass.

AZ:C:3:4
The site consists of a prehistoric petroglyph panel ca. 10 m long and 1 m in height at the base of a Navajo sandstone cliff atop a talus slope. The 15 figures probably represent Glen Canyon Style 5, a Late Archaic rock art type. The figures are solid-pecked and stippled, and consist of sheep and anthropomorphs and other stylized elements. There is light to medium repatination, with spalling occurring at the top of the panel, possibly obliterating previous glyphs. No associated artifacts were found. Many of the figures appear to have been "re-worked," with vague outlines that are difficult to discern. There are better rock art examples downstream.

AZ:C:3:6
The site consists of a large, southeast-facing sandstone cliff face petroglyph panel with 23 prehistoric elements and three historic inscriptions. The prehistoric elements include 10 anthropomorphs, seven sheep, one so-called elk (probably a deer), one handprint, one circle with rays, two unidentified mammals, and one line with vertical hatching. Historic inscriptions include "A.M.," "A," and "H. Smith." The panel is in fair condition, having been vandalized by abrasive scratchings, new "fake" elements, and bullet holes (impacting two sheep), plus erosion. There are several recent names as well. All prehistoric elements are pecked Glen Canyon Style 5, a Late Archaic representation.

AZ:C:3:10
The site consists of a charcoal-stained area with some fire-cracked rock eroding from the top of a stream terrace/dune that is being actively impacted by big, deep arroyos. There is a large, partially buried Navajo sandstone grinding slab about 1 m north of the stain, plus a single cobble flake 2 m southwest of the feature, and another chalcedony flake in the vicinity. FCR elements are mostly of Navajo sandstone fragments and fractured quartzite cobbles. No ceramics were observed. Cultural affiliation is unknown.

AZ:C:5:1
The site consists of a masonry habitation complex with 12 defined structures situated mostly along an open area on a bench within the Redwall limestone formation, with two contiguous structures located at the mouth of a small solution cave ca. 25-30 m above. On the lower terrace structures are more or

less grouped into three areas. On the downstream end are two structures (F1 and 12) with plaza-like walls on either end (F9 and 11). The middle section includes a large masonry structure (F3) associated with a petroglyph boulder. The upstream section consists of habitation rooms and a possible storage room (F4, 5, and 10). Overall, ceramic type diversity makes the site difficult to place culturally, although Kayenta Anasazi ceramics tend to dominate the assemblage, suggesting a PII affiliation. Two roasting features, one below Feature 11 and one below Feature 7, may be the result of re-use of the site by Paiutes (see site AZ:C:5:3 nearby). The massive size of some of the structures and quantity of trash indicate substantial occupation; the south room complex may be a kiva/plaza.

AZ:C:5:2
The site presently consists of a dry-laid masonry structure abutting a Redwall Formation ledge. The structure is two courses high and 1.6 x 2.1 m in size. When originally recorded the site contained 53 Southern Paiute utility ware sherds (all from the same vessel), several other Paiute utility sherds, a sherd of Moenkopi Corrugated, and a chert flake; all of these are now gone. The site was excavated by the Stanton Cave expedition and apparently was backfilled with wall fall.

AZ:C:5:3
The site is within a Redwall Formation solution cave that was investigated by a team of archaeologists, geologists, and biologists under the direction of R. Euler, primarily during 1969 and 1970 field sessions. Archaeologically, the site—known as Stanton's Cave—is associated with split-twig figurines, i.e., split willow representations probably of deer and/or bighorn sheep that were placed or cached in the cave, perhaps as some form of imitative magic ceremony. The figurines generally date to the Late Archaic, ca. 3-4,000 years B.P. The cave was excavated and, in addition to more figurines, some cordage, a possible spindle whorl, shell beads, a scraper, and a mano were found, although none were in association with the figurines. For additional details see "The Archaeology, Geology, and Paleobiology of Stanton's Cave," a 1984 volume produced by the Grand Canyon Natural History Association and edited by Euler.

AZ:C:5:4
The site consists of an equipment cache from Frederik Barry's 1888 canyon trip in a small (3 x 3 m) Redwall cave directly overlooking. The cave currently contains a handful of historic artifacts that have survived floods and visitors since first deposited (see R. Euler's 1975 site form for a comparative list of artifacts). Present artifacts include an enamel ware pot, rubber boot heel, saw-cut wood, four snap-jaw animal traps, a broken whetstone, brass, a shovel blade, and tin container piece.

AZ:C:5:5
The site consists of a north-facing rockshelter with one small, dry-laid wall six courses (60 cm) high and 1.1 m long, an associated firepit, and organic remains. Rockfall occludes most of the site. A variety of organic material is present underneath the rockfall, including several corn cobs, yucca fibers (some twisted and split), bone fragments, and charcoal. A previously recorded wood (yucca?) flute has been hidden under a rock. This aceramic site is of unknown cultural affiliation.

AZ:C:5:6
The site consists of human bone fragments scattered against a rockfall under a shallow, north-facing overhang in the Supai Formation at the top of a ca. 40 degree talus slope. The shelter is ca. 15 m long and 5 m wide and is covered by rockfall. Packrats have scattered skeletal fragments (long bone fragments, tibia, part of radius, four ribs, and a partial upper right mandible) along the sheltered ledge amongst talus boulders. A portion of the pelvis is visible, suggesting that this is the remains of a female Native American; possibly a young adult (ca. 15 years old). Cultural affiliation is unknown.

AZ:C:5:7
The site consists of a rare juniper tree (perhaps 300 years old) with an historic inscription comprised of Harry McDonald's initials. McDonald was a member of the 1889-1890 Stanton expedition. Stanton found McDonald at Cataract Canyon, where he was possibly working a mine. Harry was a "handy" person who proved useful for Stanton's purposes. McDonald hiked out at Crystal and later returned the same winter with mules to Chuar. Driftwood accumulated around the tree is probably the result of the 1957 high water flow of ca. 120,000 CFS.

AZ:C:5:8
This site consists of an alcove with a possible granary, burned sticks, and a packrat midden with perishable items; cultural affiliation is unknown. The alcove is ca. 40 ft. long and 9 ft. deep at its widest point. Feature 1—the granary—is located at the south end of the alcove. It is ca. 1.2 m deep and 2.5 m wide and is situated under a shallow lip of the alcove. The north wall of the granary is comprised of tabular sandstone; a few elements are coursed. The sandstone elements are imported; they do not appear to be associated with the raw

material that makes up the alcove. In the wall and behind it are two burned sticks. In the deepest part of the alcove is a beaver-cut burned stick and a few other burned sticks. In the extreme northeast end of the alcove is a packrat midden that contains corn cobs, animal bone, and burned sticks, along with a few pieces of charcoal.

AZ:C:5:9
This is a small, temporary-use rockshelter of Formative affiliation that contains a collapsed wall, a sparse lithic scatter, a concentration of charcoal, and three sherds. The site is located on a short, narrow ledge along the Redwall Limestone Formation that measures 7 m N/S x 2 m E/W. The wall is dry-laid, 1-2 courses high, and ca. 1.5 m long; function is unknown. The charcoal scatter may be the remains of a hearth, but it does not appear to have any depth.

AZ:C:5:31
The site consists of two loci (A and B) with two structural features (F1 and 2) and three areas of FCR concentrations (F3-5). F1 is located at the base of the Redwall limestone outcrop on a flat, southwest-facing ledge. It consists of a collapsed dry-laid limestone slab wall 3 x 4 m in size. One meter north of the wall is a sandstone slab metate. F2 is 25 m east of F1 at the base of the outcrop. It is a wall of boulders and smaller rocks that is perpendicular to the outcrop. F3 is a 1-meter diameter cluster of FCR eroding out of the sand and scattering downslope; it is 10 m southwest of F1. F4 is a similar FCR feature also eroding out of the sand; associated is a Tusayan White Ware sherd. F4 is 25 m west of F1. F5 (Locus B) is another FCR feature located on the north side of the outcrop, 35 m west and 15 m north of F1. Artifacts indicate a PI-early PII Anasazi affiliation.

AZ:C:5:33
The site consists of an open lithic scatter on a talus ridge/slope on the downstream edge of an 8-10 m deep side drainage. Part of the scatter is located on the top of the talus slope and part has filtered down onto the side wall of the drainage underneath a large talus boulder. The site consists of ca. 15 flakes of Redwall chert that probably represent a single episode of biface manufacture. Cultural affiliation is unknown.

AZ:C:5:35
This site consists of a wall and a few lithic items under a 1 m high Redwall overhang that is 3 m long and ca. 1 m deep. A single course rock alignment of unshaped chunks of Redwall limestone ca. 3-m-long curves around the front of the shelter defining a sleeping and/or storage space under the overhang. Two flakes and a possible core of Redwall chert occur on the Redwall ledge ca. 1 m in front (northwest) of the center of the overhang. No other artifacts or features were noted; cultural affiliation is unknown.

AZ:C:5:37
This is the remains of a PII Anasazi and late prehistoric-early historic Paiute camp on an eroding slope surface on the downstream side of Fence Fault overlooking the river. The site consists of two partially exposed fire hearth/FCR clusters, three sherds, and several flakes. Considering the depositional context of the site, there could be considerable more cultural material still buried in the sand.

AZ:C:5:39
The site consists of a single North Creek Corrugated jar cached in a 1-meter high Redwall limestone solution "cavern." The jar was toppled and broken by a large chunk of fallen limestone so that the vessel is now in four large pieces that are currently nested inside each other on their sides. The GCRCS crew made no attempt to move either the sherds or the rock to see what might be underneath them. The ceramic type indicates a PII Virgin Anasazi affiliation.

AZ:C:6:2
This site consists of an historic inscription that reads: F.M. Brown, Pres - D.C.C. + PRR Co was drowned July 10, 1889 opposite this point The inscription was carved by Peter Hansbrough, who drowned a few days later himself and is buried at mile 43.5. In 1982 it was noted that the inscription had faded considerably due to high water erosion; a year later it was observed as "abraded and faded badly." In 1984 it was considered faint, but readable. Apparently there has been some discussion about attaching a plaque in this spot after the inscription erodes. The "D.C.C. + PRR Co" refers to the Denver Colorado Canyon + Pacific Railroad Company. Brown was a member of one of the Stanton expeditions.

AZ:C:6:3
This site, which is divided into two loci (A and B), consists of a dispersed sherd and lithic scatter and the remains of two possible wall alignments eroding from the fourth terrace above the river. Artifacts are somewhat concentrated into three small areas at Locus A and two small areas at Locus B. Locus A artifacts include flakes and formal and expedient tools, shell, and ceramics. One rock alignment was observed eroding out of a dune face. Locus B contained flakes, groundstone, sherds, and an ashy lens. A crude alignment of Supai cobbles and a slab may be the remains of a structure. Artifacts indicate

that this is a PII Anasazi occupation. Hopi ceramics were noted during the original recording of the site and during the GCRCS re-record.

AZ:C:6:4
The site consists entirely of a pecked Estwing geologist's rock hammer and—immediately below the hammer—the acronym "USGS." The petroglyph is pecked into a blackened face of the Supai Formation in an alcove. It was done by a member of the 1923 USGS river mapping party.

AZ:C:6:5
The site consists of a sandstone bedrock petroglyph panel with three pecked figures. The panel is ca. 1.6 m square. The petroglyph elements are in excellent shape, with minimal wind/water erosion. The figures include an anthropomorph, a pecked line, and an abstract element shaped like a flying "U." Cultural affiliation is unknown.

AZ:C:6:6
A PII Anasazi site that consists of a sparse sherd and lithic scatter on an alluvial terrace. Three corrugated sherds (two from one vessel) and two decortication flakes from coarse-grained cobbles were the only artifacts observed. Other remains may be buried (or have been collected, as the site is at a popular camping area). Based on surface evidence, this was probably a limited activity site associated with AZ:C:6:3 nearby.

AZ:C:6:7
The site consists of an historic inscription on a Supai Formation cliff face. The inscription is 74 cm long and 47 cm high. It reads: "NN NO 1, 7-12-47." There is a small "HI" scratched into the panel just above "NN NO 1." The inscription is from one of Norm Neville's later river trips through the Canyon; it may refer to the notion that Neville was considered by some the "No. 1" river runner of his time. It is in excellent shape, with only minor erosional impacts.

AZ:C:6:8
The site consists of two structures situated on adjacent ledges ascending from the river. Feature 1 is a D-shaped wall outline abutting the back of a small overhanging rockshelter. Feature 2 is a possible rectangular wall outline surrounding the base of a low slumped Hermit shale ledge ca. 1 m above F1. No artifacts or other features were found associated, although both ledges have obviously been inundated historically. It is possible that this site is historic, but the general impression is that it is of prehistoric age. At any rate, neither structure exhibits much energy input, and the site was probably only occupied on a transient basis. Cultural affiliation is unknown.

AZ:C:6:9
The site consists of a concentration of historic trash suggestive of the remains of a wooden container—described as a trunk below—that was apparently found by Clyde Eddy and related in a publication by Eddy detailing his 1920s expedition. Two letters dating to 1894 were found by Eddy addressed to the Mendenhall brothers in the trunk. The trunk no longer existed intact at the time of the GCRCS visit, but wood and metal debris scattered on the slope suggest that the trunk was subjected to weathering processes. Tin cans, boot fragments, nails, and other trash were also found at the site. The brothers were supposedly prospectors, however no specific mining-related remains were found. It appears to be a cache of domestic personal items. These remains are probably near the 300,000 CFS level, but were surely cached here as opposed to being washed up during flooding.

AZ:C:6:10
The site consists of a shallow overhang with the remains of a crude, low, dry-laid wall outline that creates an enclosure measuring 1.75 x 3.25 m in plan. Two parallel walls, each perpendicular to the shelter back, are comprised of a single course of undressed sandstone, except for one small section in the north wall that has four to five courses of thin slabs. The maximum wall height is 30 cm. There is a third vague outline across the front of the room. No additional rubble was observed and no artifacts were seen. The structure was evidently used on a transient basis only. Cultural affiliation is unknown.

AZ:C:9:1
AZ:C:9:1 consists of several loci of alignments, artifacts, and other features that were originally recorded by R. Euler and re-recorded in various ways by GCRCS crews. Loci A-C were out of the project zone and not re-recorded. What is probably Locus G was re-recorded as sites AZ:C:9:51 and 52. The area that is likely Locus H was re-recorded as site AZ:C:9:53, and what was probably formerly Locus D was re-recorded as site AZ:C:9:80. Loci E, F, I, and J were re-recorded using their original loci designations and are described here. Locus F consists of two granaries in a Muav cliff face. Locus E consists of a sparse artifact scatter, primarily lithics with a few Paiute sherds, associated with an ephemeral charcoal-stained lens. Locus I consists of a ridge slope with numerous rock alignments oriented perpendicular to the slope and a few PII Anasazi sherds. Locus J consists of several rock alignments that form terrace-like areas. Locus E is considered a Paiute use area; Locus F is defined as a PI-III Anasazi focus; and Loci I and J are deemed Mid-late PII Anasazi occupations.

AZ:C:9:4
This site consists of a possible habitation area and two granaries with associated alignments. Four rock alignments of dry-laid Redwall limestone (one to two courses high) extend perpendicularly from the vertical face of a Redwall overhang. The two southeasternmost alignments extend 3 m from the Redwall face and appear to form the side walls of a habitation area. Two meters northwest is another alignment extending 2 m from the Redwall; it appears to be a haphazard rearrangement of rocks removed from a granary, the remains of which are situated at the Redwall end of the rock alignment. The granary consists of four courses of dry-laid limestone slabs extending 40 cm from the Redwall face and two to three courses of slabs extending southwest another 40 cm, joining in a haphazard alignment. The rocks of this alignment look like they would just complete the granary walls up to the Redwall overhang. Four to six meters northwest of the granary is another short (1 m) rock alignment, perhaps in association with a small granary next to it. The granary is about 40 x 60 cm and consists of small rock pieces set with mud to fill in the rock walls up to the overhang. Artifacts included chert flakes (no tools) and three sherds; there is a possible firepit in front of the site. This is considered an Early PII Anasazi site.

AZ:C:9:5
The site consists of at least three, and possibly four or five, rooms of unshaped, dry-laid Redwall limestone slabs and blocks built directly against a Redwall cliff face. The features face east toward the river. No cultural debris was observed at the site, but a PI-III Anasazi affiliation is inferred. Feature 1 is a wall segment 2.1 m long and up to three courses high. F2 is the most obvious room and consists of a curved 4.5 m long wall of slabs abutting the shelter wall enclosing a habitation/use area. F3 is a cleared space adjacent to F2, delineated by several blocks on its east and south sides, ca. 2 m in diameter. F4 is another wall partially enclosing a space.

AZ:C:9:28
This site is far too complex to adequately summarize here; for additional details refer to the original IMACS A forms and the attached printed B forms. Loci A through N were re-recorded by the GCRCS crews during Session 4 (December, 1990). Locus A contains 6-7 rooms in two connected roomblocks, check dams, and a depression. Locus B consists of three rockshelter features with walls. Locus C is an open site with structures, agricultural features, and associated artifacts. Locus D consists entirely of several check dams. Loci E-J include numerous water control and soil retention features and a few sherds. Loci K-N consists of at least five roomblocks and a network of agricultural features with numerous sherds and light lithics/groundstone.

AZ:C:9:30
This site consists of two historic but completely unrelated graves, recorded as two separate loci (A and B). Locus A is the grave of Peter Hansbrough of the 1889 Stanton-Brown expedition, who died in July of that year. His body was retrieved by the 1890 Stanton expedition and buried here. The rocks delineating his grave have been rearranged by visitors over the years. The grave is currently defined by a linear arrangement of Muav blocks and slabs one course high and one to three courses wide (1.85 by .65 m max.), with a large Muav block (65 x 25 x 45 cm) at the north end. A carved inscription on a vertical face above the grave reads "PMH 1889." Locus B is the grave of a Boy Scout named David Quigly drowned on June 26, 1951. It consists of an oval arrangement of river and talus cobbles with a taller rock (ca. 30 cm high) serving as a headstone on the southern side of the oval.

AZ:C:9:31
This is the site of Wilson B. Taylor's grave, which includes a bronze plaque that reads:

WILLIE
Wilson Beigle Taylor
December 27, 1896 - June 6, 1956
He loved the mighty rock and water
structures of the Grand Canyon and
all the creatures that lived there
GRAND CANYONEER
1949 1950 1951 1954.

AZ:C:9:32 This site is divided into three loci of masonry structures and granaries (A, B, and C). All of the loci are situated near the Redwall/Muav contact at the top of a talus slope. Locus A is a two-room masonry structure, with another possible room to the west. Locus B consists of two discreet granaries. Locus C contains one large, possible habitation room, and an attached granary. No artifacts were observed in association with the features either by this or previous survey crews, although when originally discovered by Harvey Butchart in 1970 he found five whole vessels, three of which were later stolen. He recovered a Sosi B/W and a Tusayan B/R bowl. The site is along the prehistoric trail that came down the Eminence Break; it is directly across from the Anasazi Bridge. Based on recovered ceramics, the site is considered to have been a Mid-late PII Western Kayenta Anasazi occupation.

AZ:C:9:33
This multicomponent site consists of two loci: the remains of a historic boat (A); and (B) the remains

of a possible granary. The boat is under a Muav overhang, which is just larger than the boat itself. The boat may have originally been cached here, and was subsequently "attached" to the shelter floor by posts on either end of the keel. It is currently in poor condition, consisting of various boat frame pieces that may have once been covered with canvas, although there is no evidence of such. Remains include the gunwales, the keel, at least one rib, and several hull elements, plus two paddles. Locus B is mostly suggested by patches of reddish mortar on the ceiling of a small pocket or shelter in the Muav. It appears to have been completely destroyed and may have been pothunted in the past. The boat may date between 1900 and 1945; cultural affiliation of the possible granary is unknown.

AZ:C:9:34
The site consists of the remains of Bert Loper's wooden boat. The boat was found here and carried above the tamarisk line after his death in 1949 in 24.5-Mile Rapids upstream. The bow is still intact, although the rest of the hull is in various stages of deterioration. A metal plaque commemorating Bert as the "Grand Old Man of the Colorado River" has been cemented onto a piece of talus limestone about 2 m upslope (west) of the boat (a large mesquite shadows the plaque).

AZ:C:9:50
The site originally consisted of a single complete Tusayan B/R mug/pitcher eroding out of a cutbank, and nine enigmatic rock rectangular cobbles in an alignment adjacent to Little Nankoweap Creek. The alignment may or may not be cultural. After its discovery, the vessel was stabilized with local cobbles and boulders, then covered with sand. Park Archaeologist J. Balsom subsequently collected the vessel, and several others that she uncovered in the same locale, on a later visit. This is considered a Late PI-early PII Formative site.

AZ:C:9:51
Is a large PII Anasazi camp area on theNankoweap delta. The site was recorded in 1989 by J. Balsom as three separate loci—A, B, and C. The GRCA crew retained this scheme and added a fourth locus (D) on the bank of the creek to the north and northwest. Locus A is the dominant area of the site. It contains a soft L-shaped roomblock of four to six rooms consisting of discernable cobble alignments, wall fall, clay daub, ash, scattered rock, ceramics, and a midden. Locus has two features: the roomblock (F1), and an activity area with FCR, carbon, and artifacts (F2). Locus B is an 8-m-diameter area of FCR, a broken mano, and a few sherds; no feature designations were assigned. Locus C is similar to B in that it is an amorphous lag of shattered cobbles, a few ceramics and flakes, and no definable features. Locus D is situated on an active cutbank NW of Locus A. It consists of a poorly defined roomblock (F3), carbon, sherds, and FCR eroding from the bank. A large San Juan Redware sherd was collected eroding out of the cutbank; the possibility of intact vessels is high and some stabilization is warranted.

AZ:C:9:52
The prehistoric component of this site consists of a high-density ceramic scatter, pockets of fire-cracked rock, a few lithics, fragmented groundstone tools, and three structures/activity-related features (F1-3) spread over a cacti-encrusted dune between the river and the toe slope of a Pleistocene finger ridge. The base of the ridge is 215° from the central portion of the site. The sherds suggest an Early-mid PII Anasazi affiliation. No bifacial or complete tools of any type were found. Seven sandstone manos were noted; six were 50 percent intact and one was complete. A fragment of a brown siltstone pendant was seen near Feature 2. Three hammerstone/percussion tools were also observed. The historic component consists of a circular cobble fire ring (F4) with charcoal in the interior; no historic or recent artifacts were seen in association. The site has excellent potential for buried remains.

AZ:C:9:53
This is a previously recorded site consisting of three artifact concentrations and a rock alignment. Artifacts consist of sherds, lithics, and bone, mostly concentrated on the east and south slopes of a dune. Artifact density is fairly heavy, with 200-300 sherds and 100-150 lithics. No groundstone or chipped stone tools were seen, however. The rock alignment is 3 m long with possible corners at either end; it may be the foundation of a habitation unit or room of some kind. Cultural affiliation is considered Mid-late PII Anasazi.

AZ:C:9:54
The site consists of a large complex of probable habitation structures and agricultural features designated Features 1-6 situated near the interface of talus slope deposits and alluvial terraces. Structural remains of two-three rooms are visible on the surface as room foundations eroding out of the base of the talus slopes. Several apparent agricultural terraces and check dams are situated perpendicular to the slope, mostly to the north of the habitation rooms. F1 is a possible habitation area consisting of a wall alignment with a possible corner to a second wall; F2 is a wall segment or check dam; F3 is another possible habitation room; F4 is similar to F3; F5 is a long wall that may be

subdivided into 2-3 rooms; and F6 is an oval outline of rocks. Generally dispersed ceramics and lithics are scattered throughout the site area, indicating a Mid-late PII Anasazi occupation.

AZ:C:9:56
This possible Late Archaic-BMII site consists of two artifact concentrations, a charcoal scatter, and upright slabs against a rock outcrop that offers two overhangs, designated A and B (see map). Artifacts include flakes, a side-notched chert projectile point, four bone fragments (two of them burned), and a charcoal scatter. The slabs may have served as windbreaks, but their true function is unknown.

AZ:C:9:57
This site, which consists entirely of ceramics, is centered around a small rockshelter created by a large fall rock on a talus slope. It appears to be a special use area represented by the remains of various ceramic vessels. Several chunks of limonite stone were observed and collected. The sherd scatter marks a route along the fault that runs out of the canyon. Ceramic types suggest a PII Anasazi affiliation, and some form of late prehistoric-early historic Hopi connection.

AZ:C:9:58
The site consists of three cleared areas (A, B, and C) beneath two large Redwall limestone erratic boulders with some charcoal and fragmented river cobbles; culture affiliation is unknown. Each area has a scatter of charcoal; in addition, Area B has a pile of uncoarsed rockfall and Area C has two broken river cobbles and four to five angular lithic fragments that derived from the cobbles. It is not known whether the cobbles are cultural or not, but they are out of context. No other artifacts were located. The site is in good condition with minimal erosional impacts.

AZ:C:9:59
The site consists of a dispersed and sparse scatter of lithics and sherds. The scatter overlaps with that of AZ:C:9:60, directly downslope on the delta. Within the artifact scatter are a minimum of three agricultural check dam-type rock alignments (F1, 2, and 3), and six or more possible cultural rock alignments (based on their position with regard to the delta slope and size of their construction elements). F1 is a semicircular alignment ca. 4 x 5 m in diameter 3 m northeast of the site tag. F2 is a 7 m long boulder alignment that crosses a drainage in a NW/SE direction. F3 consists of two parallel alignments about nine and 4 m long and 2 m apart, with a 4 m diameter circular feature attached. Cultural affiliation is believed to be PII Anasazi.

AZ:C:9:60
This site, consisting of a granary and two rooms, is situated next to a 5 x 7 m limestone boulder; the upper half of the boulder creates a 3 m overhang. In the northeast end of the boulder, on a 2 x 0.4 m ledge, is a small (< 1 m in size) granary consisting of one remaining wet-laid wall five courses high, with hand-size limestone elements. On the west end of the boulder are three rock alignments enclosing two rooms. The floor here is basically flat and covered with sand and small limestone rocks. There is a lithic and sherd scatter in front of the shelter laid out in a fan shape. There are a few (<10) sherds/lithics in the shelter itself. The fan begins 2 m below the lip of the shelter and extends for 20 m, with a high concentration of items 8 m in front of the shelter at 340°. A packrat nest covers most of the base of the boulder. In it are large charcoal pieces; probably from recent fires in this area. This is a Mid-late PII Anasazi site.

AZ:C:9:61
The site consists of Feature 1—a recognizable two-room structure—and several other probable architectural features associated with numerous fire-cracked rock middens and artifact concentrations (including groundstone). F1 is a large, rectangular unit subdivided into two rooms; F2 is a vague alignment of boulders; F3 may or may not be a cultural alignment; F4 is an apparent wall; F5 is another wall; and F6 is an alignment that may be architectural. Tools included broken metates and manos, a Parowan point, and a mano-chopper. The site is probably related to sites AZ:C:9:51, 52, 59 and 60, all of which are in the same general vicinity. The site function may have been oriented toward agricultural pursuits and seasonal activities such as hunting and gathering. There are granaries nearby, suggesting surplus foods were stored. There appears to be a Mid-late PII-early PIII Anasazi association.

AZ:C:9:62
The site consists of four Redwall chert flakes, several plain ware and corrugated sherds, a fire-cracked rock concentration (F1), and a rock alignment (F2). The alignment is circular and ca. 1.5 m in diameter, composed of limestone and sandstone cobbles; it may or may not be cultural. The flakes are dispersed, while the sherds were found clustered in the FCR area, which is 1 m in diameter. The cultural material is just beginning to erode out of a dune; ceramics suggest a PII Anasazi occupation.

AZ:C:9:64
The site is located in a Redwall limestone solution cave 2.5 m high, 4.5 m wide, and 8 m deep, which contains a single 12-row corn cob and numerous

bone fragments. The bone is not burned and could have been introduced by packrats; may be noncultural. There are no ceramic or lithic artifacts. The cave is half-filled with aeolian sand, so the possibility of buried cultural material is high. There has been a lot of rodent activity.

AZ:C:9:65
The site consists of a number of related features and artifacts associated with the testing of a Marble Canyon Dam site in the 1950s. There are a total of 16 numbered features; F1-11 are on the right bank of the river, and F12-16 are on the left bank. Features include: stakes with guidewires, looped rebar and anchors cemented into the Redwall, adits, cable, masonry platforms, painted inscriptions, and related artifacts.

AZ:C:9:66
This site, which contains a wall, sherds, flakes, FCR, and groundstone, is situated in a Redwall limestone cave about 6 m deep, 4 m wide, and 2 m high, with an entrance protected by a large Redwall boulder. There is one dry-laid wall of limestone elements on the northern edge of the cave; it is ca. 70 cm high and 1.10 m long. The site extends onto the rock ledges in front of the cave, where there is a ceramic scatter of Late PI-early II Anasazi sherds, an area of FCR, and a few flakes and tools, including a metate, a projectile point, and a core. There is extensive fire blackening within the cave, and a large packrat midden.

AZ:C:9:67
The site consists of two structures that appear to be fieldhouses as suggested by their location in the delta and proximity to water control features. Feature 1 appears as a circular, collapsed mound of rocks, primarily Supai sandstone and local limestone collected from a nearby creekbed. The mound is on the edge of a north-facing terrace and is ca. 1.5 m high. Feature 2 is about 3 m square and perhaps two courses high. There are also two one-course high retaining walls on the northeast corner of the terrace. Ceramics are lightly scattered throughout the site, and appear to reflect a Mid-late PII Anasazi association. A couple flakes and a metate round out the assemblage.

AZ:C:9:68
This site consists of a sparse sherd and lithic scatter, with about 10 sherds and as many lithic items. No obvious architectural features were visible on the surface, but given the nature and depth of alluvial deposits, it is very likely that structures are buried beneath the present ground surface. The site surroundings may have offered good agricultural potential. Artifacts suggest that this was a PII Anasazi occupation.

AZ:C:9:69
This is an open artifact scatter with roasting pit and alignment features divided into three loci (A-C) with sparse sherds and lithics scattered over the entire site. The site is situated on a gently sloping terrace amidst saltbush and prickly pear and is almost completely surrounded by mesquite and acacia. There is a large roasting pit (Locus B) in the north-central portion of the site. Several metates and manos are clustered under mesquite trees in the northwest corner of the site (Locus C). To the south, on the slope of a small hill, are several rock alignments (Locus A). The latter may be agricultural features; they follow the hill contours, creating small terraces. Near these alignments is a circular stone feature ca. 75 cm in diameter; possibly a storage pit/cist. No artifacts or charcoal were observed in association with this feature. A charcoal-stained area in Locus A may be the remains of a hearth. This may be a multicomponent site, with both Late PI-early PII Anasazi and late prehistoric-early historic Paiute occupations.

AZ:C:9:70
The site consists of a large, overhanging limestone boulder with crude, dray-laid structures (F1 and 2) situated below the northwest and west sides. Both structures utilize in situ boulder elements. F1 is a D-shaped structure abutting the boulder with walls enclosing a 3 x 2 m area; F2 is an arc-shaped, 2-m-long wall abutting the boulder that encloses a 1.8 x 2 m area. No other associated features, such as hearths, were noted. A total of four sherds (three from one vessel) and two flakes were found on the slope immediately below the boulder. The site was obviously only used for very limited, probably transient, activities. Ceramics suggest a PI-early PII Anasazi affiliation.

AZ:C:9:71
This Mid-late PII Anasazi site consists of a moderate-density sherd and lithic scatter and the remains of a single structure, situated in an open context on an eroding alluvial terrace. The structure is indicated by three partially exposed wall alignments forming three walls of a roughly rectangular room ca. 4 m by some indeterminate length (at least 4 m). Masonry elements include undressed, irregular limestone rocks with an occasional sandstone element. Artifacts are generally quite dispersed over the site area, although three to four "pockets" of concentrated artifacts were noted. The diversity of ceramic types and the structure indicate that at least limited intensive habitation took place; however, the quantity of artifacts presently on the surface argues against long-term permanent habitation. No hearths or other features were noted, although large limestone boulders may have served as expedient shade.

AZ:C:9:72
The site is primarily a ceramic scatter with associated rock cluster/alignments that may have been structures or terraces. One of the possible structures (F1) is situated near the top of the dune and measures 1.75 x 2 m, as defined by two vague perpendicular walls. Below, on the slope, is a larger rock cluster (F2), with several forming an arc-shaped alignment that may indicate a buried habitation structure or perhaps a farm-plot terrace. The ceramics at the site indicate separate PI-early PII and PII Anasazi occupations, most likely both related to horticultural pursuits, but probably not permanent habitation.

AZ:C:9:73
The site consists of three areas of dense limestone rock clusters that are possibly the remains of structures (perhaps fieldhouses). Feature 1 may be the remains of two perpendicular walls, currently indicated as rubble piles, defining a space 2 x 2.25 m in size. Feature 2 is a small, circular configuration of limestone rocks 1 m in diameter; may have served as a storage feature. Feature 3 is an amorphous rock cluster 2 m in diameter with an associated sandstone one-handed mano. The mano was the only artifact found at the site, although other sites are located nearby. Cultural affiliation is suspected to be PI-III Anasazi.

AZ:C:9:74
This presumed Anasazi site consists of a slab cist and a lithic scatter. The cist is 70-75 cm in diameter and is roughly hexagonal shaped. It is lined with limestone slabs. The bottom of the cist is now 35 cm below present ground level. The cist is located beneath a 2 x 2.5 x 1.7 m limestone boulder leaning against a somewhat larger boulder. The lithic scatter is 5 x 8 m in size and appears to be entirely within a deflated area that is denuded of cryptogams and five cm lower than the surrounding surface. This seems to be caused by erosion of the surface soil due to the slope change between the terrace top and the eastern slope face of the terrace. Only about 10 flakes were observed, mostly Redwall chert items. They reflect an unintensive flake production strategy, with a few displaying use wear. No formal tools were found.

AZ:C:9:75
The site consists of a series of check dams in two adjacent drainages on slopes above a major delta. Unshaped limestone and sandstone blocks have been placed in alignments at more or less regular intervals along two parallel drainages ca. 50 m south of site AZ:C:9:28, Locus A. These check dams are spaced 3-5 m apart on average, and vary between 2 and 5 m in length. They incorporate naturally occurring boulders, with one to three courses of cobbles laid up between the larger boulders. They tend to be spaced at closer intervals (and become harder to discern) as one moves upslope and the drainages steepen. The best-preserved walls are at the lower ends of the drainages just before the drainages debouch onto the more or less level terrace at the base of the slope. These dams probably served to catch moisture and sediment, with areas behind the walls serving as terraced garden plots. Cultural affiliation is suspected to be PI-III Anasazi.

AZ:C:9:76
The site consists of a rockshelter with a small wall remnant, a chert knapping station, and a boulder overhang with possible cist remains. The main shelter is situated beneath a very large Redwall limestone boulder. The shelter has a sparse amount of artifacts, a smoke-blackened ceiling, several pieces of driftwood, some charcoal, and a crude, dry-laid wall 1.35 m long and 45 cm high. About 20 m E/SE of the shelter is a tight concentration of ca. 50 Redwall chert flakes, very likely from a single reduction episode. Approximately 15 m northeast of the main shelter is a small, badly deteriorated rock alignment, which may be the remains of a small cist. It is under an overhanging Redwall limestone boulder. A jar rim sherd was found, suggesting a PI Anasazi affiliation.

AZ:C:9:80
The site consists of two shallow overhangs at the base of Bright Angel shale cliffs with a light scatter of 25-30 Early-mid PII Anasazi sherds eroding downslope to the north and on to the alluvial terrace below. There is a possibility that structures—possibly granaries—once existed at the base of the Bright Angel, as there are a couple of enigmatic rock alignments in two different areas, as well as what appears to be red clay mortar adhering to a horizontal shelf on the B.A. cliff.

AZ:C:9:82
This site consists of an activity area (Feature 1) with groundstone, ceramics and lithic debris eroding from a dune face, and a roasting/fire feature (F2) in a lower, deflated area of the dune. Feature 2 is 45 m northwest of F1; it has few associated artifacts. Artifact density is light overall, with the bulk of the artifacts on a sandy, cactus-covered slope on the southwest side of the site facing AZ:C:9:52. They include three manos and a grinding slab. This appears to be a Mid-late PII Anasazi occupation.

AZ:C:9:83
The site consists of the remains of a modern/historic camp (late 1940s to early 1950s) represented by two to

three tent platforms and two (still standing) vernacular wooden camp tables constructed to endure the out-of-doors. The main trail here is crossed by small wood beams to prevent erosion. A small fire pit is associated with the upper table and contains nails and charcoal. A single upright post and five 4-foot-plus lengths of 8 x 10-inch shipbeam are laying about the ground. Hearsay has it that the camp was associated with engineering crews for the proposed Marble Canyon dam sites and has since been used and kept up by river runners and outfitters in the 1950s and 1960s. No trash and no datable artifacts were present except for the wire-cut nails.

AZ:C:9:84
This is a marginal PII Anasazi site consisting of two corrugated sherds from two different vessels and a corn cob scattered at the base of a Bright Angel-travertine conglomerate cliff. The cliff is slightly concave at its base, forming a partial shelter. The sheltered area is ca. 20 m long and 2.5 m wide. There are several Pleistocene cobbles derived from the conglomerate that are scattered about this area, some of which appear slightly abraded as though from human use, but there are no flakes, tools, or other groundstone.

AZ:C:9:85
The site consists of a single expedient fire hearth set against a large boulder used as a screen from the elements, and seven associated sherds from the same vessel. From inside the angled boulder, by the hearth, one has a direct view of the river (though no downstream panorama is available). This appears to be a "pass-through" site; a place on the way to somewhere else, or just a place to get out of the weather (or wait for the river to drop when crossing to the opposite bank). The sherds suggest a PII Anasazi affiliation.

AZ:C:9:87
The site consists of a rockshelter containing a single red ware sherd, a broken mano, and a single, partially collapsed rubble wall perpendicular to the back of the overhang. The view from here is stupendous and it catches the early morning light; a good summer spot. The wall is about 2 m long and was originally three courses high and from 25 to 40 cm in height. This is a possible PII Anasazi site.

AZ:C:9:88
This site consists of numerous features and artifacts related to the testing of the alternative Marble Canyon Dam. This project took place in the early 1960s. A date on a cliff face by one workman's name gave the year 1963. The site mainly consists of several test shafts and their associated tailings, a loading platform, a ferry boat stacked in another ferry boat, numerous painted letters on the cliff face and rock, and industrial trash (cable, nails, iron plates, ladders, wood planks, barrels, blasting wire, food cans, anchor bolts, and a grease bucket). These are spread over a half-mile length of the river on both banks; the right bank has 13 numbered features (F1-13) and the left bank has three (L1-3).

AZ:C:9:89
The site consists of the remains of a rock wall and a single sherd in a shelter created by a large Redwall limestone boulder. The boulder provides a 2 x 2 m "pocket" that faces the river at about 52° and has a good view of the delta below. A small pile of rocks on the right side of the shelter mouth are all that remain of a rock wall. One corrugated sherd was found in the shelter. A small alcove is located adjacent and to the southeast of the shelter. It is 1 m wide and high and 1.5 m deep. This area may have been used as storage by the occupants. The site has a possible PII Anasazi affiliation.

AZ:C:13:1
This is a large delta complex with numerous habitation, storage, and agricultural features that was partly excavated by Douglas Schwartz and others with the School of American Research in 1967 and 1968. The two seasons of fieldwork revealed 52 sites and two major occupations: an early Cohonina presence about A.D. 900, and a later Western Anasazi occupation between A.D. 1050 and 1150. For further details see the volume "Unkar Delta" by Schwartz, Chapman, and Kepp (1980). The GCRCS crews added three additional sites in the area.

AZ:C:13:3
The site consists of two main areas (referred to here as adits) where abundant salt within shallow alcoves has been mined by the Hopi and perhaps the Havasupai. The largest of these areas is 4 m in depth, 1.5 m in height, and 8 m in length. The second is 7 m in length, 1-2 m in depth, and less than a meter in height. Salt is forming in many areas along the Tapeats cliff, but appears to have been actively removed from these two areas. The adit to the north has 25-30 red hematite pictograph elements above it. Below this same source area, towards the river's edge, is a long Tapeats slab with four ground, shallow basins along the top of it. No other artifacts were observed.

AZ:C:13:5
This roasting feature complex was originally recorded by R. Euler in 1962, with periodic updates in 1976 and 1988. It has been extensively impacted by hikers and river runners; the latter use part of the site as a scouting location. There is a trail

running through four of the site's roasting features that was stabilized by K. Crumbo sometime in the last few years. The current survey identified nine features on the site; all but one small rockshelter are FCR middens with associated charcoal stains. The four features along the edge of the terrace are eroding downslope and are in generally poor condition. The remaining features on top of the bluff are in an area traditionally used by campers. There were few lithics overall, but tools included large core scrapers, a hammerstone, a "pounding" tool, and utilized flakes. A broken sandstone mano was also seen. Ceramics suggest a PII-early PIII Anasazi affiliation, with a possible late prehistoric-early historic Hopi connection.

AZ:C:13:6
This site consists of a ceramic and lithic scatter eroding from a dune face with an FCR, cobble-strewn, ashy midden. Four to five possible rooms are also present in fair to poor condition (testing is needed to determine their extent). The site has been previously recorded three times, and presently seems to be more extensive than originally considered. However, erosion here is active and one or two episodes of side canyon flooding could quickly and easily remove the bulk of the site. The site is dominated by Mid-late PII Anasazi sherds. Groundstone is present, but no formal chipped stone tools were observed. There is good potential for excavation, but not preservation, unless something is done very soon.

AZ:C:13:7
This is a Mid-late PII-early PIII Anasazi occupation consisting of three, possibly four structural outlines (F1-4). F1 is an L-shaped outline, F2 is the remains of a rectangular structure, F3 is another L-shaped structural outline, and F4 is the remnant corner of a structure. The more rectangular structural outlines have been looted by campers for stones to hold down tents and the site has apparently gone through a phase of deterioration since its original recording. Many sherds have disappeared and Features 3 and 4 have come to the surface since the previous investigations. Some FCR is present, a few flakes, ashy soil, and rodent bones of questionable affinity; no formal tools were seen. Testing, stabilizing, and/or monitoring are recommended.

AZ:C:13:8
This PII-early PIII Anasazi site consists of a series of habitation-size rooms and smaller, ill-defined structures, along with several probable cists, roasting pits, and hearths. F1 and 3 are probable roasting pits, and F9 is a hearth. F4, 11 and 12 may be possible cists. F2 is a small structure; F5 is a subrectangular room; F6 is a three-walled room; F7 is an ill-defined, walled structure; F8 is a room that shares a wall with F6; and F10 is a possible cobble wall. Also observed was a chipping station on a ridge to the south and some FCR. Artifacts included a metate, 4-5 manos/mano fragments, two grinding slabs, and other groundstone fragments. The substantial nature of the site, variety of structural and feature types, and high artifact density (when first recorded) suggest that this was a residential site oriented toward local resource procurement. Most of the "habitation" rooms are on the east end of the site, while the pits and cists are located mainly on the lower western slope.

AZ:C:13:9
Portions of this site have been previously recorded several times. The site was originally designated AZ:C:13:9 and 9A by R. Euler and W. Taylor in 1965. AZ:C:13:9A corresponds to the GCRCS Locus A, while AZ:C:13:9 corresponds with the GCRCS Locus B. The site consists of numerous (24) nonarchitectural and structural features situated on an old reworked terrace and a dune-covered slope bisected by a major side canyon; there are too many features to adequately summarize here. The artifact assemblage is dominated by PII-early PIII Anasazi ceramic debris. Numerous tools used as percussion items and abraders were observed, but there is a curious lack of metates and metate fragments; chipped stone tools are nonexistent (not a single biface or biface fragment was seen). People have obviously visited the site as seven distinct sherd collection piles were observed; there is a high probability that decorated sherds, projectile points, and complete manos have been high-graded.

AZ:C:13:10
This is a large, multicomponent habitation site that was divided into three "locales" by A.T. Jones, who supervised the testing at this location in 1984. Locale 1 had been previously recorded by R. Euler and W. Taylor in 1965; Locales 2 and 3 were added after being discovered on a 1983 monitoring trip. Five structures and 21 features were assigned to Locale 1, including a pithouse, several 1-2 room masonry structures, a pueblo, cists/hearths, and rubble/wall alignments. Four structures and 16 features were noted at Locale 2, including rooms and rubble piles. Locale 3 contained two structures and five features, including a shelter, cists, wall/room remains. Results from testing suggested that the site may have had from 2-3 occupations, including use by PI Cohonina and PII Anasazi; ceramics also suggest a late prehistoric-early historic Hopi connection. For details consult "A Cross-Section of Grand Canyon Archaeology: Excavations at Five Sites Along the Colorado River" by Jones (1986), Publication in Anthropology No. 28

by the Western Archaeological and Conservation Center, Tucson.

AZ:C:13:11
This is a trio of granaries in various stages of deterioration. Granary 1 has three walls (it shares one with Granary 2) and abuts the back of the cave. The walls are of wet-laid tabular pieces of Dox sandstone. The granary is currently 1.75 m wide and 1.55 m high. There is an opening in the front and the granary door rests inside the feature. The inside is filled with rubble and some wood fragments (probably used in construction); from the door to the back of the feature is 80 cm. Granary 2 also abuts the cave with two main walls that meet at right angles; same construction technique as 1. It measures 1.8 m sq. and is up to 1.25 m in height. There is an opening in the east wall and the door rests on top of the wall. The interior of the feature contains rubble, wood, corn cobs, a sherd, and a jar lid. Granary 3 is very fragmentary and is mainly suggested by traces of mortar. It appears to have shared a wall with 2 and was probably built at the same time and was about the same size. Granaries 1 and 2 were stabilized by GRCA crews. Artifacts included sherds (suggesting a PII Anasazi affiliation), a biface fragment, and a hammerstone.

AZ:C:13:33
This is an open site with the remains of a subrectangular three-sided structure open to the south. Six flakes are located 15 m west-northwest of the structure. No other artifacts have previously been found on this site (although some minor ash staining was noted in the southeast corner of the structure). The site was observed and recorded twice previously. It is a probable PI-III Anasazi habitation site, inferred from other sites found in the area. The tower at Desert View is outlined on the south rim at 180°.

AZ:C:13:69
This is a large site "complex" consisting of several cists and masonry structures, for the most part eroding out of surrounding dunes. Many of the features are on the same vertical level, but their cultural/temporal relationship is unknown. Features include slab-lined cists, architectural walls, habitation rooms, charcoal-stained soil, and a light scatter of sherds and lithics. F1 is a slab-lined cist remnant; F2 may be a masonry room/midden; F3 is a masonry wall; F4 consists of eroding slabs where additional architecture may be present; F5 is a well-preserved cist; F6 is a masonry room; and F6B is another masonry room outside of the main dunal area. Ceramics suggest a PII-early PIII Anasazi affiliation. Lithics are sparse. The site is near the Tanner-Hance Trail. A collector's pile was observed; the site may have been picked over many times.

AZ:C:13:70
The site consists of four loci (A-D) of artifact concentrations and features situated along the edge of a terrace overlooking the river at the mouth of an unnamed tributary. Locus A consists of three artifact concentrations; the largest overlooks the drainage mouth; two other, smaller concentrations are along the terrace edge to the NE. An expedient grinding slab is located at the northeasternmost concentration; an expedient one-handed cobble mano was upslope adjacent an ephemeral drainage with a few charcoal pieces eroding out of it. Locus B is a rubble mound that suggests a small masonry structure, about 1.3 m in diameter and probably circular. Abundant sherds/lithics are located around the structure and upslope. Locus C consists of artifact concentrations, primarily ceramics, scattered over the surface. Locus D includes 3-4 charred logs exposed in an arroyo that may be the remains of a structure. The logs may be part of a roof. Quantity/diversity of artifacts suggests that this is a habitation site; however, few architectural features found. Testing is needed to fully understand the site's function. Artifacts indicate a PII-early PIII Anasazi occupation.

AZ:C:13:71
The site consists of the remains of two storage features in the last stages of deterioration. These features make use of two separate overhangs about 15-20 m apart. Feature 1 is comprised of coursed Dox slabs of which two to three levels at the upstream end remain. Feature 2 has two vertical slabs still in place and some driftwood. No artifacts were observed, but a PII Anasazi cultural affiliation is inferred.

AZ:C:13:92
This multicomponent site consists of an historic habitation camp, and a prehistoric artifact scatter. The main historic feature is the remains of a small, rectangular foundation/tent platform constructed of driftwood and 2-3 inch thick hard-hewn pine planks. About 5 m to the east of this is another possible foundation of beams and driftwood. There is a possible sandstone outhouse foundation about 50 m east. There is little historic artifactual debris on the site. Remains include the bulk of a small, cast-iron stove; a three-inch-long piece of half-inch rod with a threaded end; numerous wire-cut nails; and a single fragment of opaque, aqua bottle glass. To the north, on a talus slope, is a small, sparse, prehistoric artifact scatter of sherds and lithics. The historic component is probably turn of the century; the prehistoric component appears to be Late PI-early PII Anasazi.

AZ:C:13:98
This historic mine and cabin site contains two loci. Locus A consists of two mine adits at the base of the cliff along the Palisades fault. The main adit (Feature 1A) is situated ca. 10 m above the surrounding terrain with an extensive tailing pile below it. The entrance is 1.25 m wide and 1.35 m high (length is not known). The second adit (Feature 1B) is located ca. 10 m below and 20 m south of F1A. It has similar dimensions, but is only 3 m deep. Ca. 225 m S/SW is Locus B, which includes a log cabin (Feature 2) constructed of driftwood logs. The cabin measures 2.6 x 4.1 m (interior) and is five courses high. The floor is partially paved with sandstone slabs, with a log/board bed frame in the NE corner. A canvas tent probably formed the upper walls and roof. Ca. 4 m due south of the cabin door is a driftwood log "fence" (Feature 3). This structure is made of stacked logs up to four courses high. It may have been a windbreak. Artifacts date from ca. 1900-1920 and mid-1930s.

AZ:C:13:99
The site consists of two loci (A and B) of FCR features, buried/collapsed structures, and artifacts extending over an area of ca. 25 x 40 m. Locus A includes several charcoal lens/burned rock features, and an artifact concentration. Many of the features are eroding out of a dune-like area being cut by an arroyo. Several sherds and Redwall chert flakes were present; ceramics suggested an Early-mid PII Anasazi occupation. Locus B consists of at least one masonry structure constructed of undressed sandstone and limestone river rocks. Another possible structure/roasting feature is being heavily eroded just a few meters south. The site was tested and C-14 samples were taken during prior investigations.

AZ:C:13:100
An open PII Anasazi habitation site which extends 30 m N/S and 25 m E/W. F1 is a rectangular 4 x 3.5 m room with one course-high walls; it is a probable habitation room. F2 is another probable habitation room with a possible south entrance; it still has standing walls 2-3 courses high. Adjoining F2 is F3, a small, more difficult to define structure; there may be another room attached to the southwest wall of F3. F4 and F8 are possible associated rooms exposed in an arroyo, with walls 2-3 courses high. F5 and 6 are the remains of slablined cists of Dox sandstone. F7 is evidenced by a charcoal stain in a trail and bits of charcoal eroding from the dune. South of the dwellings is an eroding drainage 2 m across and 50 cm deep. Lithics and ceramics are scattered down the slope directly above the drainage in a 1 x 6 m area. There is also a heavy groundstone concentration near the cists; groundstone/tools include manos, metates/slabs, hammerstones, and sandstone knives.

AZ:C:13:101
This is an open, multiple-feature site consisting of roasting pits, a room, cists, and artifacts eroding out of prosopis-covered dunes. It is divided into two loci (A and B). The Locus A features include one to five or more slab-lined cists comprised of sandstone slabs. Since the site was first recorded, some of the cist elements have fallen due to erosion and are now not as easily distinguished or identifiable. Water-rounded blocks of Tapeats material and sandstone slabs are scattered about the area. Locus A features and artifacts are concentrated in a triangular-shaped area ca. 7 m on a side. A metate and several manos are present within this concentration. Ceramics are present, but in small quantities. Lithic flakes are abundant and scattered evenly over the area. About 35-40 m from A is Locus B. It primarily consists of a masonry room and a cluster of grinding implements. Two roasting pits, each about 5 m in diameter, are located ca. 75 m southeast of the site. About 40 m south of the site are additional artifacts eroding from the dune base. Ceramics indicate a Late PI-early PII Anasazi occupation.

AZ:C:13:131
This is a previously recorded site (Euler 7/12/78) that consists of the remains of a cabin/camp used by John Hance during his asbestos mining and tourist-guiding enterprises. The primary remains are that of a corral and remnant floor boards and wooden foundation that may have been a frame for a tent structure (according to Euler). The site is in extremely poor condition; the only thing still standing is a solitary post. Historic trash is scattered over a 15 x 25 m area and includes: nails, bailing wire, white glaze china, bone, purple glass, tin cans, stove parts, machined planks, fabric with grommets, metal piping, and galvanized metal sheeting. The site dates to the turn of the century.

AZ:C:13:132
The site consists of a single rock alignment/wall on a small bench and nearby boulders with rock art. The wall is 3 m long, 45-70 cm wide, and 45 cm high, and constructed of local cobbles and boulders, utilizing in situ rock. About 10-15 m southwest of the wall are several Supai boulders with pecked petroglyphs that have been described as anthropomorphs, people and maze-like figures, a lightning bolt, an airplane-like figure, emergence symbols, and geomorphs. The 1987 recording team noted ca. 25 glyphs on three boulders; the GCRCS crew added one more boulder with many more glyphs. A single Moenkopi Corrugated sherd was found in the area when recorded in 1978. This is considered a Mid-late PII Anasazi site. The wall and the set of petroglyphs were originally recorded as two separate sites in 1978 and 1987.

AZ:C:13:272
This PII Anasazi site consists of 1-2 masonry structures with a sparse scatter of artifacts, rubble eroding from the dunes, and two probable hearths. One well-defined structure (Feature 1) is probably being exposed by dune erosion. It measures 2.4 x 2.05 m, and is roughly rectangular in plan view. It is constructed of mostly sandstone river rocks and is currently only one course high, although assoc. rubble suggests somewhat higher walls originally (but not full height). Three meters east and upslope of F1 is F2. It consists of a curving linear wall ca. 4-5 m in length with substantial sediment fill and mesquite in the interior. It may be a buried structure. Ca. 6-7 m north of F1 is a curving cluster of mostly small sandstone rocks eroding out of a deflated area. These seem too small for building elements, but they do not look fire-cracked either. Two .75 m diameter sandstone features about 35 m northeast of F1 are probable hearths. F5 contains pieces of charcoal and a few distinct upright slabs. F4 consists only of small jumbled sandstone rocks. Artifacts are generally sparse, but include sherds, lithics, a metate, a two-handed mano, and a small mano with a bevelled face that may have also been used as a knife; similar objects were found at AZ:C:13:99A.

AZ:C:13:273
This site is a Late PI-early PII Formative special use area consisting of five features and two artifact concentrations. Features 1, 3, 4, and 5 are roasting pits with charcoal staining and fire-cracked rock. Feat-ure 2 is a possible slab-lined cist. The two arti-fact concentrations consist of lithics and ceramics, and there is a light artifact scatter over the general site area.

AZ:C:13:274
This is a possible agricultural complex of unknown cultural affiliation. The site measures 40 x 50 m and consists of several rock alignments or room outlines composed of one-course high water-worn cobbles. It was suggested in previous site forms that this is a habitation area, but it could also be a complex of agricultural features. An associated roasting pit is located 27 m south of these features. Very few artifacts were present, just a scattering of flakes.

AZ:C:13:275
This site is known as the "Morning Star Mine," and was probably operated by George McCormick around 1904 as the Copper Grant Mine. It consists of an L-shaped, partially cribbed mine shaft and several artifacts just inside the mouth of the shaft. The shaft consists of three parts: the entryway, the main shaft, and a side shaft at the end of and perpendicular to the main shaft (forming an "L"). Artifacts include wire cut nails, a burlap bag, and a wooden box lid. Although the mine receives heavy visitation, it appears in good shape, with cribbing still dry (rot-free) and intact.

AZ:C:13:291
The site consists of the exposed standing walls of several structures (more obviously exist). Several Dox sandstone-lined cists were also noted (see map). Feature 1 is a two-meter long wall and juniper post eroded downslope; F2 is a slab-lined cist with a possible room exposed in a cutbank; F3 is a wall exposed in a gully; F4 is an exposed hearth or cist; and F5 is a cluster of Dox slabs that may be coursed, i.e., architectural. Artifacts include sherds and lithics, including a chopper, a hammerstone, and a bi-edge tool. The site is located on a steep bank that slopes off of a Dox talus slope. Sands and slope wash cover the site to a depth of more than a meter in some areas. Apparently the site was constructed on a terrace, and has since been covered periodically by slope wash and fluvial sand deposits and cut by slope erosion. Artifacts indicate that this was a Mid-late PII Anasazi occupation.

AZ:C:13:321
This aceramic site consists of an enigmatic rubble mound (F1) of angular Dox sandstone slabs (probably historic), and four roasting pits/hearths (F2-5) in various stages of decomposition, along with their associated discard piles. The best preserved of the pits, and the only one with potential carbon, is F5. The rubble mound may be a feature associated with an historic cabin to the south (AZ:C:13:92). No ceramic items or chipped stone tools were associated with the site, although several groundstone tools were found. The latter includes cobbles with ground facets and sub-rectangular sandstone manos. The features are scattered throughout a dune field in an area measuring 35 x 40 m ca.. Cultural affiliation is unknown.

AZ:C:13:322
The site consists of a petroglyph panel on a south-west-facing vertical Dox cliff face. The panel measures 5.2 x .65 m. The main and most visible element is a counter-clockwise spiral with a critter (either an anthropomorph or lizard) perched on top. The spiral is ca. 10 cm in diameter. There are at least two other unidentifiable "zoomorphs" to the left of the spiral, plus three unidentifiable pecked elements 25 to 100 cm right of the spiral. Historic (recent?) initials occur ca. 25 cm above and to the right of the spiral: A (pecked) S G (scratched). This is considered a PI-III Anasazi site.

AZ:C:13:323
This Late Archaic-BMII site consists of an eroding hearth (charcoal and FCR) and a lithic scatter.

Artifacts and FCR are scattered and eroding down the dune slope. The hearth is exposed in cross-section as a result of dune face slumpage due to the trail. It measures ca. 50 cm across and 15 cm high. A C-14 sample was taken from the central portion of the hearth fill by an earlier 1989 survey. There was no evidence of slab-lining. The blown-out dune face contains numerous lithics and additional FCR eroding downslope from 1-2 m above the level of the hearth. No structural remains were visible.

AZ:C:13:324
The site consists primarily of at least three areas of FCR and charcoal, which are eroding out of a north-facing dune slope. The best preserved feature (F1) is at the west end of the site about 1.5 m above the present trail level. It consists of two slabs of Dox sandstone perched on a small hummock of sand, surrounded by charcoal and FCR. Two other features (F2 and 3) are just amorphous concentrations of charcoal and FCR. Above and to the south of these features is F4, a lithic concentration in a level area between dune mounds. A large grinding slab with a pecked basin is eroding out of the dune slope ca. 23 m south of F1. This appears to be a Late Archaic site.

AZ:C:13:325
This multicomponent site consists of an historic encampment and a probable prehistoric roasting feature with artifacts. Scattered driftwood planks and poles and several upright posts appear to be the collapsed remains of a small corral (F2). A rectangular outline of planks and poles may indicate the former location of a temporary (tent?) shelter (F1). Several milk and food cans, and strands of cable wire and barbed wire are scattered about the area. The milk cans suggest an early 1900s date (ca. 1915-1930). There is a bench made of driftwood planks and beams at the center of the site that may post-date the other remains. Four meters west of the site tag is a cluster of rocks that is probably the remains of a prehistoric roasting pit. Within the rock cluster was a single plain ware sherd and a one-handed sandstone cobble mano, worked on one face. The prehistoric component appears to reflect a PI-III Formative occupation.

AZ:C:13:326
The site consists of an eroded hearth and light density lithic scatter along the eolian sand-covered slope of an eroding alluvial terrace. The hearth, which consisted of a shallow basin with charcoal and ashy fill, was tested in April of 1990. Associated artifacts include an estimated 15 debitage items of mostly Redwall and river cobble cherts, some of which appear heat treated. Two unidentified, badly deteriorated bone fragments were noted down slope. Cultural affiliation is unknown.

AZ:C:13:327
The site consists of a dense concentration of chert secondary reduction flakes ca. 4 m in diameter, and an eroding roasting feature with associated burned rocks, charcoal, bone fragments, and a single corrugated sherd. The site seems unusual, compared to what has been observed upstream, in that the lithic assemblage reflects more of an intensive, staged reduction sequence, probably directed toward bifacial tool production. The lithics are primarily situated in an area of deflated sand, while the eroded roasting feature is located near the cutbank just overlying the more red Dox-derived deposits, but still within the tan sand. The lithic concentration and roasting feature appear to be within the same stratigraphic layer, which is sloping WNW to the cutbank edge. Several charcoal-stained and organic soil layers are exposed in the cutbank ca. 20-25 m upstream from the site tag. No artifacts were in association and they appear to be natural, although two probable artiodactyl bones were found on the slope adjacent to the len-ses. One of these was a scapula fragment with evidence of having been burned (this was collected). Scattered Dox slabs in the deflated area may indicate the former presence of other slab-lined features. These features possibly reflect a Late Archaic occupation.

AZ:C:13:328
This site consists of a single rock cairn ca. 80 cm high and ca. 60 cm in diameter of unshaped travertine blocks. It is situated on a travertine outcrop on a steep slope below the heavy vegetation line marking the location of an old spring. The cairn is seven courses high and basically columnar in shape, tapering slightly toward the top. No artifacts were located in the vicinity. It may be an Anasazi/Hopi religious shrine, or some kind of old survey marker.

AZ:C:13:329
This is a PII Anasazi site consisting of a small rock shelter with a charcoal/bone scatter (Feature 1), an artifact cluster (Feature 2), and a small circular rock feature (Feature 3). F1 is in the shelter, while F2 and 3 are on a dune to the west. F2 consists only of a few flakes and one sherd. F3 is 66 cm in diameter and consists of eight sandstone and limestone elements (one upright); function unknown. Only a small portion of the site may be visible, with the remainder buried under dunal deposits.

AZ:C:13:330
This site consists of a pot cached in a rock crack, and a surrounding scatter of lithic flakes. The flake

scatter can be found on the ridge of a talus slope. At the base of the scatter is a large limestone block which has fallen from upslope. It is cracked into several closely clustered sections. In a crack in the rock is a complete pot, probably a Tusayan Gray Ware "Lino Tradition" type, indicating an Early Formative (BMIII-PI) affiliation. It has a spherical base and a slightly flaring neck and is ca. 25 cm in diameter. It is situated upside down in the crack with the lip resting on a ridge of limestone. The pot was probably originally placed in an upright position in the crack (which is 1 m long and 1 m deep). The pot may have had vegetative material packed around it to hold it in place; when this material deteriorated, the pot rolled gently into its current position. At the base of the "pot rock" is a flake tool with a semi-circular concave edge ca. two cm in diameter. It may be a shaft working tool.

AZ:C:13:331
This is a probable Hopi campsite that may have a ceremonial function. The site consists of two use areas about 20 m apart. The area at the south end of the site consists of one lithic flake, a core, a piece of milled lumber, and a charcoal scatter (see map). There is a possible upright surface slab leaning against another rock next to the charcoal scatter. The area at the north end of the site consists of several sherds of Sikyatki Polychrome—all from one vessel—and an animal skull. North of the skull is a stick that appears to have been purposefully lodged between two stones. The site tag is located on the northwest side of the charcoal scatter attached to a small rock.

AZ:C:13:332
This site consists of a structure with sherds and lithics within a rockshelter at the base of a Dox sandstone cliff. The flakes and sherds are found within the shelter and on the talus slope below it. In the shelter is a U-shaped single room structure comprised of Dox sandstone elements. The structure wall creates an enclosure which abuts the back of the shelter. A two-meter long slab makes up part of the north wall. A minimum of four wood posts were observed on the west and southwest sides of the structure. They are arranged in a curve outside of the structure walls and follow the contour of the talus slope edge. All of the supposed posts are cut off or burned at ground level. These suggest a combined prehistoric and historic use of the shelter: Mid-PII Anasazi and late historic (1900-1945). There is a light scatter of historic trash at the site.

AZ:C:13:333
This PII Anasazi site consists of a FCR concentration (F1) with a light lithic scatter, a sherd, and tools/ manuports. F1 is a 2 m diameter area of FCR/burned rock with charcoal about 50 percent eroded. The lithic scatter consists of ca. 15 flakes on the southeast end of the site. The sherd was found near the center of the site. FCR is scattered randomly across the site. Tools include two travertine fragments with possible polish, a mano, and a basalt cobble chopper. The site is exposed in a narrow interdune area which runs NW-SE. The dunes on either side of the site are steep-sided, ca. 10-15 ft. in height, and covered with mesquite. Much of this mesquite is dead or dying and a good amount has been burned. Younger mesquite occupies the river side of the southwestern dune, at a lower elevation. Cultural materials cannot be placed stratigraphically, but appear to be eroding from about 1-2 m above the bottom of the interdune area.

AZ:C:13:334
This is an open, multiple-feature site with three features and an artifact scatter. The northernmost feature (F3) is a roasting pit composed of Dox sandstone elements. It is ca. 4 m in diameter and is eroding out of the terrace. Ten meters south of the roasting pit is a three-sided possible habitation structure (F1) with sandstone foundation elements in slightly upright positions. It is ca. 3 m square. Fifteen meters southeast of F1 is a lithic/sherd scatter (F2) 3-4 m in diameter. About 4 m south of the scatter is a circular cist (F4). An amorphous group of Dox sandstone rocks lies 4 m west of the roasting feature. Artifacts suggest a Late PI-early PII Cohonina affiliation.

AZ:C:13:335
The site consists of a few FCR/burned rocks with a scatter of burned bone fragments (some of the larger fragments were collected). It is located in a small clearing/blow-out on top of a large, mesquite-covered dune. Cultural affiliation is unknown.

AZ:C:13:336
This is a Mid-late PII Anasazi site with several features, including a possible hearth, a rock alignment, a cluster of FCR, and two lithic/sherds scatters. The hearth (F1) is the northernmost feature of the site. It is ca. 1 m in diameter and is situated above the dunes on the uppermost terrace. Ten meters south is a drainage that flows between dunes with a 4 x 8 m scatter of sherds and lithics. Nearly 20 m further south, in the dunes, is a cluster of heat-treated rocks (F3) less than 1 m in diameter. Along the lower face of the dune, between the scatter and F3, is a cobble alignment (F2) that could be part of a structure eroding out of the dune. Five meters south of F3 is another small drainage between dunes with more eroding lithics and

ceramics in a 3 x 20 m area. A metate lies west of Beamer's Trail.

AZ:C:13:337
The site consists of a circular distribution of FCR, some of which are spalls, and most of which are fist-sized or smaller. This assemblage is assumed to be the remains of a roasting pit, or perhaps an earth oven. No charcoal-stained soil or charcoal fragments were associated with this feature. A few lithic flakes co-occur with the FCR scatter. Cultural affiliation is unknown.

AZ:C:13:338
This is an open, multiple-feature site primarily consisting of roasting features, a possible hearth/cist, and a light scattering of lithics. No ceramics were observed; cultural affiliation is unknown. Feature 1 is a U-shaped arrangement of rock at the south edge of the site. It may be a roasting feature. One meter north of this is F2, an elongated rubble pile of sandstone, limestone, and some FCR. This may also be a roasting feature. Twenty meters north, along the trail, is F3, another roasting feature up to 3 m in diameter of sandstone, limestone and cobble FCR, and abundant charcoal. Three meters north of this is F4, a slab-lined feature about half a meter in dia-meter. Both F3 and 4 are near or on the edge of a slopewash terrace. F4 is being impacted by a nearby trail; it will soon become disarticulated and fall downslope. F5 is about 8 m north of F2 and 9 m from the trail. It is a one-meter diameter concentration of charcoal-stained soil, and Dox sandstone, limestone, and cobble elements. This feature is actively eroding from the terrace, although it is not associated with a footpath.

AZ:C:13:339
The site consists of several features. There is a burned rock midden with sparse lithics and ceramics on the north side of the site eroding out of a cutbank. Feature 2 is a two-meter diameter rock alignment/structure, possibly storage related, with elements aligned and imbricated in a semi-circle open toward the cliff (upslope) side. Feature 6 is a rock alignment visible in the arroyo wall. There are also at least two or three cists (perhaps as many as five total). Artifacts indicate that this was a Mid-late PII Anasazi occupation.

AZ:C:13:340
This is a PII Anasazi site with two features and a small scatter of lithics, ceramics, and groundstone. Feature 1 is a 1.5-meter diameter roasting pit with Dox sandstone slabs around its periphery and heat-cracked river cobbles in the center. The feature is situated on the north end of the site about 3 m from the edge of the Dox sandstone-covered terrace. Feature 2 is 1.5 m south of F1. It is a slab-lined cist (50 cm in diameter), with at least three remaining upright slabs. Lithic flakes, sherds, and manos litter the slope to the south.

AZ:C:13:341
This is a possible PII Anasazi habitation site consisting of two cobble rubble features (F1 and F2), 10 or more FCR concentrations, and several rock alignments. Some of the FCR concentrations contain charcoal and/or bone. The majority of the rock alignments are 2-3 m long; some may not be cultural—a great deal of the stones in the area have been moved by campers. F1 is a 5 m diameter semi-circular arrangement of rock one course high. F2 is a rectangular outline of rock measuring 2.5 x 6 m. The two features are constructed of uncoursed cobbles, sandstone, and Dox slabs. Very few lithic items and only one sherd were observed at this site. The site is in fair to poor condition due to heavy human and natural impacts.

AZ:C:13:342
The site consists of the deteriorated remains of a historic wooden structure, possibly a storage building or log cabin. The structure is in very poor condition, and its original configuration is difficult to discern. The wood building elements include 12 x 12 and 6 x 8 inch milled lumber, as well as logs averaging ca. six inches in diameter. The milled lumber was probably used for the foundation/ basal course, while rough logs were used for walls and possibly rough beams. It is obvious that many elements have been salvaged for use elsewhere. Square nails were primarily used, although a few large wire nails were also present. Historic trash included two enamel-ware vessels (a bucket and coffee pot), a cast iron dutch oven lid, and purple glass, suggesting a turn-of-the-century occupation. The structural remains currently occupy a 6 x 9 m area, but the structure was obviously smaller when intact.

AZ:C:13:343
This is a PII Anasazi limited activity area with three slab-lined features, a small artifact/FCR scatter, and a rock alignment. F1-3 are small, circular, Dox slab-lined features ca, 2 to 2.5 m in diameter. At the top of a dune are two rock alignments; one measures 4 m long and the other consists of just two Dox slabs and is ca. 2 m long. Artifacts are mostly sparse, consisting of sherds, lithics, and FCR; one chert scraper was noted.

AZ:C:13:344
This is an open site with a probable roasting feature, a possible collapsed cist, and a sparse artifact scatter eroding from a low, deflated terrace. The roasting feature consists of fire-cracked and

oxidized rocks about 2 x 3 m in diameter. A concentration of Dox sandstone slabs eroding down a gentle slope may be the remains of a collapsed cist. The lithics—primarily Redwall chert flakes—appear to reflect unintensive, unstaged reduction. This was probably a limited activity site of unknown cultural affiliation.

AZ:C:13:345
The site consists of a rock alignment eroding from a small dune, two burned rock areas, and two possible Dox sandstone cists in two different areas. The alignment consists of four linear rocks spaced out over 3 m in the dune sand. There is a low-density scatter of burned and/or fire-cracked rock and white chert flakes over the severely eroding dune area. No tools were noted, but some cores were observed. Cultural affiliation is unknown.

AZ:C:13:346
The site consists of at least four slab-lined cists (F1-4) and relatively abundant sherds and lithics scattered along an eroding, sandy river terrace slope. Three of the four cists (F1-3) are situated along an ephemeral drainage and are suffering from erosion. The other (F4) is completely buried except for one exposed slab. The cists utilize Dox sandstone slabs. An estimated 100-150 sherds are visible on the surface, mostly concentrated at the base of an eroding slope below the cists. Lithics suggest unintensive, unstaged reduction. A few small, deteriorated bone fragments were also observed. The only recorded tool was a small chert uniface with a polished projection. It is very likely that additional deposits are buried beneath the slope. Although no habitation structures were visible on the surface, they are suggested by the quantity of artifacts. Artifacts suggest a Late PII-early PII Anasazi occupation.

AZ:C:13:347
This site consists solely of a Dox sandstone slab wall eroding out of a shallow arroyo cutbank. The wall consists of 8-10 Dox sandstone slabs. No artifacts or other cultural material was evident at the site. Cultural affiliation is unknown.

AZ:C:13:348
The site consists of a moderate-to-high-density artifact scatter 15 x 20 m in plan dimension, with jacal fragments suggesting buried, perhaps burned, structures. An estimated 75-100 sherds and 50-75 lithics are eroding out of alluvial deposits, somewhat concentrating into two main areas. The largest concentration also contains the jacal fragments. Lithics reflect an unintensive, unstaged reduction strategy, using primarily medium to coarse-grained materials. A few groundstone items were also noted. A wide variety of sherd types are present suggestive of a Late PII-early PIII Anasazi occupation. The site was evidently used for habitation.

AZ:C:13:349
This multicomponent site is located in a dune terrace and consists of a historic cabin/dugout (F1), and FCR/artifact middens (F2-4). The historic structure overlooks the river and a flat, deflated area just above the river. No artifacts indicating function were found in association with the structure. Charcoal fragments were observed below the structure in a drainage but appear to pre-date its use. The structure measures 3 x 4 m with a probable north-facing entrance. There are about eight remaining wood pieces to this feature. The back of the structure—consisting now of just one foundation pine plank—is "banked" against a dune. Only one vertical corner post remains upright—a forked item of either driftwood or mesquite with wall cribbing still hanging from the fork. Some elements are axe-cut and some are milled. The prehistoric FCR midden/roasting pits have good assemblages of sherds and lithics, but no formal tools were noted. The prehistoric component is Late PI-early PII Anasazi, while the historic component is of unknown temporal affiliation.

AZ:C:13:350
The site consists of a roasting feature eroding out of a deflating, alluvial, silty sand deposit. The feature is ca. 3.5 x 1.5 m in diameter, and is comprised of sandstone, limestone, and basalt rocks mixed with charcoal-stained soil. No artifacts were found in association. Cultural affiliation is unknown.

AZ:C:13:351
This is a Late PII-early PIII Anasazi limited activity area consisting of a small but dense scatter of sherds and lithics. The scatter covers a 5 x 1.5 m area. Ceramics dominate, lithics are few in number, and no groundstone was seen or any type of features.

AZ:C:13:352
The site consists of three loci (A-C) of artifact concentrations situated along eroded alluvial terrace remnants. Locus A has the greatest density and diversity of remains, including over 100 sherds, several manos, a light lithic scatter, and a grinding slab. There is a particularly dense concentration of corrugated sherds from two vessels; these are associated with a few collapsed sandstone slabs near the base of the slope. This may be the remains of a slab-lined cist that held two storage jars. Locus B consists of light-density sherds and lithics, and eroded slabs along a slope ca. 25 m west of Locus A. Locus C consists mainly of a small sherd concentration

SSE of Locus A. Although no direct structural evidence was observed, the quantity and diversity of cultural remains, including scattered bone and charcoal, suggests that the site probably served as an Anasazi habitation area during Mid-late PII times.

AZ:C:13:353
This site consists of a one-room Mid-late PII Anasazi structure (Feature 1) with a corner storage bin/cist under a Tapeats sandstone ledge on an unnamed tributary of the river. A single sherd, flake, and corn cob tip were seen within the walls of the structure. No artifacts were observed outside of or proximal to the room. It is doubtful that any original fill or material remains within the structure. An historic wall (F2) is situated in an overhang across the drainage to the south. It is a three-course wall that may have been used as a windbreak or rain shelter.

AZ:C:13:354
The site consists of a series of four granaries spread over 20 m of broken ledges. The granaries, designated F1-4, are in poor condition. F1 is furthest upstream and is in the best condition; F2-4 are in the final stages of deterioration, with only fragments of stone outlines and walls remaining. The granaries are inferred to be PI-III Anasazi, but no artifacts were found in association.

AZ:C:13:355
The site consists of three roasting/fire features (F1-3) and a few Paiute sherds. F1 is a surface feature that measures 130 cm N/S by 140 cm E/W. The pit is lined with small sandstone slabs (ca. 10-30 cm in diam.) and several limestone rocks (with similar dimensions) and rises up to 10 cm above the surrounding ground surface. It is eroded on its northwest corner, and charcoal is apparent in the southeast corner. Some of the rocks exhibit fire alteration. No artifacts were observed near the feature. F2 and 3 have been newly exposed by gullying in the general vicinity of F1. F2 is an eroding hearth buried by 1-2 cm of debris fan colluvium and bisected by a shallow gully 10-15 cm deep. A Paiute Brown Ware pot bust is mixed with the ash and charcoal fill. F3 is a buried hearth exposed in profile in an arroyo wall ca. 55 cm below present ground surface. It has a basin-shaped cross-section, 90 cm wide at the top and 20 cm thick. This is considered a late prehistoric (A.D. 1200-1600) Paiute site.

AZ:C:13:356
This site consists of the remnants of a quickly eroding prehistoric wall. Although the exposed wall is in poor condition, there is a burned beam in association that could yield a date. A maximum of seven courses can be seen in profile, but generally only 2-3 courses are visible. Only 10-12 elements remain in their original positions; another dozen lie on the slope where they have eroded out. There is also the potential for an intact room/rooms existing behind the wall buried in the dune itself. This is inferred to be a PI-III Anasazi site.

AZ:C:13:357
The site consists of a buried cist, a possible burned rock feature, and associated sherds, lithics, and groundstone. The cist is about 1 m in diameter with upright Dox sandstone slabs. Several ceramic types were noted, but lithics amounted to only eight flakes (primarily Redwall chert secondary flakes), and a knife made of Presley Wash obsidian. Groundstone included two manos, one of which is split in two. The knife and a complete mano were found ca. 15 m from the main site locus. The site is located on a low, sandy terrace just above the river, at the upslope boundary of the mesquite zone. Artifacts indicate that this was a Mid-late PII Anasazi occupation.

AZ:C:13:358
The site consists of an essentially destroyed cist/roasting feature. The feature has been altered and partially uplifted by generational mesquite growth along the front of the primary flood zone. There are 31 rocks present; five partial or complete upright slabs, several heat-altered sandstone boulders, a thick fallen slab, and several fragments and spalls. Three sherds were also found, suggesting a Mid-PII Anasazi affiliation.

AZ:C:13:359
This site consists of possible habitation and storage features and associated artifacts. Feature 1 is a small, wet-laid wall that is probably the remains of a granary. It is within a shallow Bass limestone overhang and is constructed of Dox and Tapeats slabs. Feature 2 is a partially exposed structure evidenced by two walls at right angles that are partially buried in the sand. Two meters west is a single vertical slab that may indicate another structure or feature. Feature 3 is another exposed structure comprised of a linear alignment of Dox slabs with associated sherds and lithics. Approximately 1.5 m north of F2 is a one-meter diameter stain of charcoal flecks and two manuport stones. Sherds suggest an Early-mid PII Anasazi affiliation. Other artifacts include a biface fragment, a chert pebble tool, and some lithic debris. The site is only beginning to erode at the present. However, F1 has been 95 percent eliminated due to a water channel off of the cliff face, and F2 is in a modern seasonal drainage that could be completely destroyed by one or two fluvial events.

AZ:C:13:360
The site consists of the remnants of a wall, two red ware sherds, and some mineralized charcoal at the base of a Tapeats cliff. The wall is of dry-laid Tapeats sandstone and currently consists of five in-place elements with three more wall fall elements. The wall is one course wide, up to three courses high, and 95 cm long. There is so much salt percolating through the bedrock that the sediment and surface of the rock is permeated with it. It is in poor shape. Possible Late PI-early II Formative association.

AZ:C:13:361
The site consists of an isolated granary wall remnant and some corn kernels. The granary is located in a small cave in the Shinumo quartzite. The cave mouth is "blocked" by a 1.7 m length of wall of stacked tabular quartzite elements. The wall is dry-laid with stone chinking. 50+ corn kernel "shells" (no interior germ remaining) were noted on the granary floor; five were collected. Cultural affiliation is unknown but is possibly PI-III Anasazi based on similarity with nearby dated sites.

AZ:C:13:362
The site is located on the edge of a delta terrace. It is comprised of one rock wall (F1) and four areas of FCR (F2-5), plus an associated scatter of lithics and ceramics. The rock wall is located on the sloping terrace below the FCR areas. It is L-shaped and ca. 2.5 x 4 m in size. The northeast wall is eroding out of the soil and appears to be two to three courses high. Erosion has undercut the wall to some degree. Features 2-5 are all located along the edge of the terrace and all contain FCR eroding out of the soil. F3-5 also have lithics and sherds. It appears that lithic and ceramic material is eroding out of the FCR areas, as well as from sites located higher on the delta. A well-defined trail intersects F2-5. A stone pipe/tube fragment was also observed. Ceramics suggest a Late PII-early PIII Anasazi affiliation.

AZ:C:13:363
This site is in a rockshelter at the base of the exposed Shinumu quartzite. It contains the remains of two small, standing, side walls that are 4-5 courses high and dry-laid. The large amount of rock fall in front of the shelter probably functioned as another "wall." A large corrugated sherd and a single one-handed sandstone mano were the only cultural artifacts on the site. A small piece of wood in the corner of the shelter was obviously imported. The walls enclose a space about 2 x 2.3 m in size. The single sherd suggests a Late PII-early PIII Anasazi affiliation.

AZ:C:13:364
The site consists of a single room outline of locally available Dox slabs built against a low Dox outcrop; up to four courses are visible. The site is on the north side of a tributary arroyo at its confluence with the river. There was one corrugated sherd in the vicinity; other artifacts have probably been washed away by river floods. This site seems to be an outlier to AZ:C:13:10, which covers the dune ridge south of the drainage adjacent to this site. The room was perhaps a fieldhouse associated with a garden on the outwash alluvium from the adjacent side drainage. The sherd suggests a PII Anasazi affiliation.

AZ:C:13:365
This is a small, limited activity area of unknown cultural affiliation that consists of a semi-rectangular rock alignment (F1), a sparse artifact scatter, and two FCR concentrations (F2 and 3), which are eroding from a dune bank. Feature 1 is at the north end of the site and measures 2.7 x 3 m. It is a single course high, with elements of unshaped limestone and sandstone cobble boulders; function unknown. The few artifacts include tertiary flakes, and a metate and mano fragment. The FCR concentrations each have 10-15 burned stone fragments but no discernable charcoal staining.

AZ:C:13:366
The site consists entirely of an intact Tusayan Corrugated jar that was cached in a small niche within a large, split limestone boulder. The jar was probably used for storage purposes and may be related to site AZ:C:13:368 below. The ceramic type suggests that the vessel had a PII Anasazi affiliation.

AZ:C:13:367
Beneath a huge boulder there is an overhang that provides a dry area in which a masonry-outlined room has been built. It measures ca. 2 x 4 m and occupies a relatively flat area on an otherwise steep talus slope. Some charcoal fragments were found in the structure; these are eroding out the downslope side. Only two flakes were seen, but shattered Redwall chert is common beneath the overhang. Fracturing and inclusions within the shatter suggest that it may be the residual material of prehistorically tested nodules. Cultural affiliation is unknown.

AZ:C:13:368
The site consists of a rockshelter with a lithic scatter. The sparse flake scatter includes a concentration of 12 flakes adjacent a small travertine-cemented boulder that was probably a knapping station. Five to 10 additional flakes are dispersed across the shelter floor. A single dart-sized, side-notched projectile point was found, suggesting a

Late Archaic-BMII temporal association. Two modern-surface charcoal areas may have been left by boaters, but the possibility that they might be of prehistoric origin cannot be discarded. The site probably functioned as a shelter relating to hunting activities.

AZ:C:13:369
The site consists of a small, south-facing rock overhang with a coursed, stacked rock wall on its east-northeast side. The wall is ca. 1.6 m long and up to 60 cm high. Salts are leaching out of the back wall. One early black-on-white bowl sherd was observed a few centimeters from the wall. The sherd suggests a PI Anasazi association.

AZ:C:13:370
The site consists of a small rockshelter within which a crude walled enclosure was constructed measuring 3 x 2 m. The wall is 1-2 courses high and utilizes in situ rocks. A trough metate, an additional metate blank, and a cobble mano are associated. No hearth features were visible on the surface; however, smoke blackening on the shelter ceiling indicates a hearth may be buried in the fill. The site obviously served a limited function, possibly related to plant food processing. This is inferred to be a PI-III Anasazi site.

AZ:C:13:371
This is a Mid-late PII Anasazi habitation area on an alluvial/colluvial debris fan at the mouth of an unnamed side canyon. The site is on both sides of the side canyon drainage. It consists of several rockshelter overhangs—some with dry-laid masonry walls, possible room rubble, several FCR concentrations, and a lithic/ceramic scatter. F1 consists of two small rock overhangs each with short 2-3 course dry-laid masonry walls, possibly the remains of storage features. F2 is an FCR concentration 2 x 2.4 m in size. F3 is an FCR feature measuring 2.4 x 2.8 m. F4 is a large, concentrated area of FCR measuring 4.1 x 2.6 m with numerous artifacts. F5 is an architectural unit consisting of two rooms, one of which may be a kiva. F6 consists of two FCR concentrations, one 3 m in diameter and the other 3 x 5 m, with artifacts. F7 is a semi-concentrated FCR scatter with a few artifacts. In general, each FCR area has at least some artifacts associated with it.

AZ:C:13:372
The site consists of a semi-circular roasting feature lined with unshaped 10-15 cm diameter Muav limestone cobbles. There is an associated discard pile slightly downslope to the southwest. It consists of fire-cracked limestone and sandstone rocks and charcoal chunks in a 2.5 x 1.5 m area. The site is located on a more or less level part of an alluvial terrace. A few white Redwall chert tertiary flakes were located ca. 4 m northeast of the roasting feature in a 2 m area. Cultural affiliation is unknown.

AZ:C:13:373
The site consists of a large, concentrated amount of charcoal, fire-cracked rock, Hopi sherds and animal bone. This material is eroding out of the west side of a dune just below the top of the dune. The charcoal is fairly recent-looking. All of the sherds were severely refired in the "hearth" area. The site could be evidence of late prehistoric-early historic Hopi use of the area.

AZ:C:13:374
The site is in a shallow rockshelter under which a cleared area was prepared for a campsite. A concentration of surface charcoal near the front of the cleared area was probably a campfire contemporaneous with a historic inscription that reads "H.S. Wallace, Oct. 14, 1929." The use of the site was probably related to mining activities in the area. Sparse, rusty tin can trash was noted on the slope below the shelter. About 11 m east, under a continuation of the same ledge, is a small prehistoric artifact scatter with vegetal remains and a burned hearth exposed in a drainage cutbank. Artifacts include two flakes, a core, a mano fragment, two corn cobs, and a B/W bowl sherd. Most of the remains here are buried; surface artifacts are only exposed through erosion. The prehistoric component probably reflects an Early PII Anasazi occupation.

AZ:C:13:375
The site is comprised of nine Mid-late PII Anasazi features. Two are possible granaries, two are rock shelters, and three are cleared spaces defined by Tapeats boulders or slabs. The other two features (F8 and 9) are on the south side of the canyon drainage among the Tapeats ledges (these were not mapped with the north side features). F1 is a two-wall structure abutting a cliff wall; F2 is a cleared area defined by upright slabs under an overhang; F3 is a low wall perpendicular to the cliff; F4 is a small, collapsed granary; F5 is another cleared space outlined by rocks; F6 is a wall between a boulder and a cliff face with a cleared space; F7 is a stack of step-like rocks; F8 is an area defined by upright slabs beneath an overhang; and F9 is a space enclosed by walls. This was probably a short-term layover spot, as evidenced by the sparse amount of artifacts. The granaries could have been used to store excess goods.

AZ:C:13:376
The site consists of a small, well-protected rockshelter within the Tapeats sandstone ledges, under which a crude sandstone wall alignment was

constructed forming a level enclosure 3 x 2.5 m in size. The only associated artifacts were an expedient grinding slab with an unmodified small cobble mano placed on top. An additional one-handed mano was found downslope. The site was obviously only occupied briefly for limited purposes, perhaps simply as a transient camp. Cultural affiliation is unknown.

AZ:C:13:377
This is a PII Anasazi site in a 15 m E/W x 45 m N/S area, consisting of three loci (A-C) of flakes, a chopper, the remains of a pot break, a few Dox sandstone slabs—possibly used as building material, and two groundstone items. No structures or hearth features were observed, but on the north end of the site (Locus A) there is a deflated area with one burned rock, a couple flakes, and a depression that might be the location of a pithouse. Locus B consists of a pot break of corrugated sherds and groundstone fragments. Locus C is a small scatter of sherds and lithics at the south end of the site, ca. 20 m east of site UN-2. A sandstone slab with a ground lateral edge was found near the pot break, and a small sandstone mano fragment was observed on the south end of the site; one rhyolite chopper was also noted. The bulk of this site may remain buried beneath the dune deposit.

AZ:C:13:378
The site consists of a long, narrow, overhanging ledge of Tapeats sandstone beneath which are two small areas cleared of rocks. One of the cleared areas (Feature 2) includes the remains of a single low crude wall alignment, which defines one side of an enclosure 2 x 2.5 m in size. Feature 1 measures 2 x 3 m. The only associated artifacts were three sherds—all from one vessel, and two flakes. The site apparently was only used on a transient basis. Artifacts suggested a mid-PII Anasazi affiliation.

AZ:C:13:379
The site is comprised of five features (F1-5) that are exposed in the side of slopewash arroyos that cut an alluvial terrace. F1 is an eroded Dox slab-lined cist ca. 1 m in diameter; F2 appears to be the wall of a room in a small arroyo; F3 is another wall remnant of upright slabs exposed in a drainage cut; F4 is in a very disturbed area that may have wall remnants of boulders and Dox slabs, with charcoal fragments and a metate blank; and F5 is a coursed wall with trough metate fragments. On the north end of the site there is a ceramic scatter not associated with any visible architecture next to the deepest arroyo. It is apparent that only a small portion of this site has been recently exposed. Ceramics suggest an Early-mid PII Anasazi affiliation.

AZ:C:13:380
This site, which consists of a crude wall and sherds and flakes, is within a rockshelter situated below an overhanging Tapeats sandstone ledge. The shelter is 6.5 m long, 1.5 m deep, and 1.3 m high. A minimum of 5-10 cm of sandy fill covers the floor. At the northwest end of the shelter a block of sandstone (150 x 30 x 45 cm) rests at a 45-degree angle to the back wall of the shelter. Up to three courses of dry-laid sandstone rest on this block, creating a crude windbreak. It is possible that this wall was built during modern times by backpackers using the nearby Beamer Trail; however, several flakes and sherds were found at the shelter, indicating a probable transient use of the site during prehistoric times (PII Anasazi). A core with some use wear was observed, but no formal tools.

AZ:C:13:381
The site consists of an eroded fire hearth associated with a projectile point tip, fire-cracked rock, charcoal fragments, a few lithics, and burned long bone fragments of an artiodactyl. The site was originally reported in 1981, when a couple of individuals thought they had found ceramic pipe fragments. The GCRCS crew found burned, cracked bone that is very similar in appearance to the fragments originally photographed, but no actual pipe artifacts were found. The hearth appears all but destroyed by the trail. Cultural affiliation is unknown.

AZ:C:13:382
The site consists of a shallow rockshelter at the base of a Shinumu quartzite cliff with a dry-laid habitation structure and lithic scatter. The structure consists of two arc-shaped walls perpendicular to and abutting the cliff wall, forming an enclosure 3 x 2.5 m in size. Although now largely collapsed, the quantity of rubble indicates that 4-6 courses (up to 75 cm) were once present. A light scatter of primarily fine-grained chert flakes is located within the structure and on the adjacent talus slope. Flake attributes suggest that some minor mid- to late-stage reduction occurred. The low quantity of artifacts suggests that very limited occupation of the site occurred and that very limited activities took place here. A light scatter of large mammal bone and a large branch were also noted on the site. Cultural affiliation is unknown.

AZ:C:13:383
This multicomponent site consists of two loci (A and B). Locus A is just above the Hance Trail beneath an overhang. Included are three features (F1-3). F1 is a platform or cleared area immediately off the Hance Trail approximately 4 m in diameter. F2 is another platform built up by a retaining wall

(2 m in width) just below the overhang shelter. F3 is the overhang, which has smoke-blackening on the ceiling. Associated with F2 and 3 are abundant charcoal, burro dung, corn cobs, and two pecked grinding slabs. Locus B is behind a huge slab approximately 30 m downstream from Locus A. It contains a sheltered flat area with a semi-circular alignment of rocks with charcoal and another area of stacked rocks; function unknown. Other artifacts observed at the site include artiodactyl bone and yucca quills. Because of the presence of corn cobs and grinding slabs the site must have a prehistoric component, although no sherds or lithics were found. The burro dung may be related to use of the Hance Trail; again, no historic artifacts were noted.

AZ:C:13:384
This site was originally found by GCES geomorphologists (R. Hereford et al.) in October of 1990 while they were facing off a cutbank to do a strat column. The profile they exposed is comprised of (from bottom to top): a basal prehistoric upright slab-lined hearth inset in and overlain by gravel lenses; an episode of overbank flooding; a level of intermediate fine-grained sediment with another episode of expedient fire hearths; and a surface unit of sand and gravels containing historic artifacts. The lowest slab-lined hearth (F1) produced a C-14 date indicating an early PII (or possibly late PI) temporal affiliation. The C-14 date from F3 indicated a protohistoric temporal affiliation. A single flake of purple chert was found in F3. In general, this site is suggestive of three components: Late PI-Early PII Anasazi; protohistoric Pai or Paiute; and turn-of-the-century Euro-American.

AZ:C:13:385
This is a twelfth century (A.D. 1100-1175) Kayenta Anasazi site situated on the lip of a sand-covered terrace. The site measures approximately 20 x 15 m. It consists of two slab features eroding out of a sandy slope, and an artifact scatter dominated by late PII-early PIII ceramics, with several chipped stone and grinding tools. Feature 1 is a possible slab-lined cist eroding from a terrace bank defined by two upright slabs and two other adjacent Dox slabs. It is exposed 2 m below the top of the terrace in the slope facing the river, but is still largely buried. Numerous sherds were observed concentrated in a 5 m diameter area due south of the cist. Feature 2 is a small, rectangular fire feature with two upright slabs still in place. Tools included a Utah obsidian uniface with a retouched margin, mano fragments, a "Kanab-style" projectile point, a polishing stone, palette, cobble abrader/bashers, and a sandstone slab.

AZ:C:13:386
The site consists of a single, isolated, slab-lined cist on a dune slope. No artifacts were observed in association, although two possible cobble manos were observed near the Dox outcrops upslope. The cist is in good condition, with 6-7 upright Dox sandstone slabs remaining. The feature also contains two slabs on its south side that project at right angles from the cist, forming a "wing wall" that may be the remains of another feature. The cist is roughly oval in plan, measuring 130 by 80 cm, with slabs 25-30 cm above the present ground surface; the cist has up to 30 cm of sand fill. The upslope side of the cist is buried in aeolian sands. Cultural affiliation is unknown.

AZ:C:13:387
The site consists of six features (F1-6), including dry-laid walls/alignments and cists, a handful of sherds, and two trough metates. F1-4 are wall or slab-lined features/remnants that are either under or in front of Dox overhangs. F5 is a possible collapsed structure of unknown form and function with some probable burned limestone at the toe of a low dune/terrace "ridge." F6 is a small Dox wall on a terrace remnant that may be recent or historic. The majority of the sherds were congregated in a small scatter below F6 on a dune/terrace ridge; one large corrugated sherd was observed on an adjacent ridge slope. The two metates are eroding out of and down the side of a deep arroyo below F1 and 2. Generally, the overhang features appear to be storage structures, e.g., cists and granaries; one, F3, contained remnant mortar. Ceramics suggest a PII Anasazi cultural affiliation.

AZ:C:13:388
This is a pristine mining camp from the historic frontier period (probably late nineteenth century). It is located in a spacious (13 x 9 x 5 m) south-facing cave barely visible from the river. Numerous historic artifacts are on the surface: solder-dot cans, pick handles, a pick axe, a hand-woven string net, sheep shears, worked wood, a drying rack with nails, rope, a square fuel can, bighorn sheep bone, charcoal, spikes, discarded pants, a paint can and brush, and a Western Arms Co. 44 cal. center fire cartridge. There are also three features: Feature A consists of four parallel rock alignments with piles of copper ore; Feature B is a three-sided stone structure built into the eastern side of the shelter with trash; Feature C appears to be a wood rack. The site is mostly surficial; there is the possibility of pockets of buried materials up to 10 cm in depth due to local transport by the small runoff channel paralleling the front half of the cave. A bighorn sheep horn is located in the cave near Feature A, suggesting the miners were eating mutton.

AZ:C:13:389
The site consists of an overhang shelter (F1) and two roasting features (F2 and 3). F1 is a Dox overhang ledge about 30 m long (N/S). At its southern end is a structure of stacked Dox slabs ca. 2 x 4 m in size. The structure may be both prehistoric and the result of river runner rebuilding/additions; match sticks and recent-looking charcoal are in this end of the shelter. A drainage at the base of the overhang has cut through charcoal and the stained living surface of the prehistoric occupation; burned bone, lithics, a biface, and charcoal fragments are eroding out of this surface. North of the structure is an open area with a small retaining wall downslope; the area is ca. 4 m sq. and has lithic material eroding out downslope. F2 is a large roasting feature ca. 6 m in diameter north of F1. A soil stain is at the top of the feature in river-deposited sands. Boulders and cobbles are mounded around the feature, and stacked rocks appear to stabilize or act like a retaining wall for the roaster on the north side. Flakes are downslope and on the feature itself. F3 is a smaller roasting feature or FCR midden downslope of F1. The site has two possible components: PII Anasazi and late prehistoric-early historic Paiute.

AZ:C:13:390
The site consists of two small granaries and one rock overhang with three upright Dox sandstone slabs within it. F1 is a 2 x 1 x 1 m high granary protected by a Dox ledge with a collapsed wall of dry-laid Dox slabs. F2 is a 1 x 1.5 x .75 m high granary defined by an outline of Dox rocks under a ledge. F3 is within a 3 m square Dox overhang and consists of three upright slabs in a sandy, cleared area. All three features are in disrepair and are most likely associated with AZ:C:13:389 nearby. No artifacts were found at this site and cultural affiliation is unknown.

AZ:C:13:391
The site consists of a rock overhang (8 x 2 x 3 m high) with a possible rock wall (covered with sediment), a small charcoal scatter, a variety of lithics, and several Jeddito B/Y sherds; the latter were found 8 m downslope of the shelter. Tools included two river cobble choppers and a mano. The charcoal is associated with a possible deflated hearth; a few small Dox slabs are nearby. The possible wall is on the northern edge of the shelter, but it is difficult to discern because it is covered with slope wash debris. This is may be a late prehistoric-protohistoric Hopi site.

AZ:C:13:392
The site consists primarily of two roasting features. The first, designated F1, is approximately 3 m in diameter. It is slightly mounded, but has begun to erode and deflate. It has fist-sized FCR of Shinumo quartzite and limestone and dark, ashy soil—no charcoal. The southwest periphery of the roasting feature/flat has an accumulation of sherds that indicate a late PII-early PIII Kayenta Anasazi affiliation. A scattering of lithics suggest biface reduction; material is mostly Kaibab chert, with one flake of Utah obsidian. Small fragments of unidentifiable bone are also present. Approximately 35 m southeast of F1 is another collection of FCR—F2—that has been "washed over"—no ash-stained soil or charcoal. In addition, there is a 2-meter diameter concentration of lithics and bone fragments 15 m west of F2, suggesting possible occupation of the entire terrace area; the material is buried. Artifacts indicate that this is a Mid-late PII-early PIII Anasazi site.

AZ:C:13:393
The site is described as an extensive artifact scatter eroding out of a steep dune slope. Artifacts include 100+ lithics, 50+ sherds, groundstone and bone. Several pieces of tabular Dox sandstone seen in the midst of the scatter are suspected to be structural remains. Lithics are dominated by primary flakes of Kaibab/Redwall/cobble cherts; tools included a cobble chert scraper, a used Presley Wash obsidian flake, manos, and a pecked sandstone slab. Ceramics suggested a Mid-late PII-early PIII Anasazi affiliation. A single soapstone pendent was also found amongst the general artifact assemblage. Considering the "domestic" nature of the assemblage and its extent, buried architecture is considered highly probable in the immediate vicinity.

AZ:G:2:100
This is the "Bridge Canyon City" work center, created when work was underway in the area for a proposed dam site between 1939-41, 1943-47, and the late 1950s to early 1960s. The GCRCS crew defined 12 features, briefly described as follows: F1, a terraced platform with a retaining wall; F2, a water pipeline system; F3, a poured concrete slab; F4, a cable anchored into bedrock; F5 (A-C), a complex of masonry structures that make up the kitchen/activity area; F6, a series of tent spaces or habitation quarters; F7, a feature interpreted as an outhouse; F8, a poured concrete slab that may have been a shower/bath facility; F9, a trash disposal area; F10, another platform; F11, another poured concrete slab that may have been the foundation for a generator; and F12, possible tent platforms. Wire nails dominate the artifact assemblage, fol-lowed by water and stove piping, food and tobacco cans, bottles, and miscellaneous metal items.

AZ:G:2:101
The site consists of a small rockshelter with a wooden plank wall constructed across the opening, creating a protected enclosure that reportedly was used for storing explosives that were used in activities related to the proposed construction of Bridge Canyon Dam. A small rock quarry area is located on the talus slope nearby, and a trail leads from the quarry upslope ca. 25 m to a blasted test hole ca. 7 m deep. Light historic trash is scattered across the talus, including a few tin cans, steel cable, glass, and lathe. Ca. 60 m W/NW of the powder house is a small iron ring driven into the gravelly ground surface, a steel spike driven into rock, and a few feet of rusted steel wire. The exact function of these items is unknown, but were probably related to anchoring some apparatus. Archival research revealed that Bridge Canyon fieldwork took place intermittently from 1939 to the early 1960s.

AZ:G:2:102
This is a possible historic base camp and associated (pack?) trail (F1) with two possible tent platforms (F2-3), a crescent-shaped wall (F4), and another wall feature (F5) with charcoal and trash. Numerous tobacco cans, wire nails, a broken bottle, and misc. scrap metal are distributed over 45 vertical ft. of slope. Features 2 and 3 are at the upper end of the slope, about 100 ft. above the lake level; F4 is lower down. A vague trail delineated by single or double-course rock alignments and stacked walls switchbacks down the crest of the slope to the lower crescent-shaped wall (F4), which is possibly also part of a trail. The light historic trash scatter extends from the uppermost platform and downslope ca. 20 m. The trash and archival research date the site between 1926 and the 1950s.

AZ:G:2:103
The site consists of a plaque commemorating three men from John Wesley Powell's first Grand Canyon river expedition in 1869 who broke ranks with Powell and left at Separation Canyon. The men—Bill Dunn and Oramel and Seneca Howland—reportedly struggled out of the canyon and were then killed by Shivwits (Southern Paiute) Indians.

AZ:G:2:105
The site consists of three level platform areas constructed near the upper portions of a talus slope. The platforms are constructed of rough rock foundations in arc-shaped configurations against the slope, filled in with dirt to create level areas. A small pit near Feature 1 may have been the result of digging fill for F1 (or it may have been a domestic refuse pit). The functions of these platforms are uncertain, but they may have served as tent platforms or sighting platforms related to dam site exploration activities. This site was apparently used between 1926 and 1964, based on archival research and historic trash.

AZ:G:2:106
This is a historic/recent activity area associated with the proposed Bridge Canyon Dam. It has been divided into four areas and contains several numbered features (see map), including platforms stabilized by dry-laid rock walls with unshaped elements of locally available granite slabs. Associated with the platforms is scattered trash. Area 1 consists of a coursed platform 4.4 x 4.5 m in size with a plank table and various hand tools, glass, lumber, and other items. Area 2 contains two platform areas, a cable, an I-bolt, and a can and lid. Area 3 consists of long, narrow, stepped terraces of varying dimensions, plus a can dump, pipe, a forge area, and other items. Area 4 has a level, rock-stabilized area measuring 4 x 2 m with a trail leading to the lake, tool parts, pipe, wood, glass, and other trash. This site was apparently used between 1926 and the early 1960s, based on archival research and historic trash.

AZ:G:3:1
The site consists of two ephemeral and dispersed FCR areas and a third area of flakes and sherds. F1 is a FCR locus with ca. 10 flakes 4 m to the south; F2 is another ephemeral FCR feature with one flake. No charcoal, ash, or oxidized stains were associated with these features. Sherds observed suggested a Pai/Paiute affiliation, but when originally recorded (in 1957 and again in 1967) Western Anasazi ceramics were also noted; together they suggest both PII Formative and late prehistoric-early historic Pai/Paiute occupations. The site has been partially bulldozed and suffers greatly from ongoing human use of the area (this is the traditional river trip takeout). Recent use is evidenced by four recent hearths, a ramada, and general trampling and trash. Human activity here has virtually destroyed the integrity of the site.

AZ:G:3:2
The site consists of at least 10 roasting features, an enigmatic rock alignment, and scatters of artifacts and FCR. The terrace has a battleship-like shape measuring 100 m (N/S) x 40 m (E/W). The site is delimited by a lower river terrace and the river on the west side, a steep schist and granite ridge on the east side, and shallow drainages on the north and south sides. The roasting features are of various configurations and stages of deterioration, and all have gneiss, schist, and granite elements and charcoal. Other ephemeral scatters of FCR may represent additional eroding features. Ceramics

appear to be mostly representative of late prehistoric through historic Pai/Paiute affiliation. Tools included an obsidian Desert Side-Notched projectile point, and various manos, grinding slabs, and metates. A few historic artifacts were noted, possibly from Hualapai use of the area ca. 1860-1920. These included brown and purple glass, a metal Indian tinkler, and a knife-opened can.

AZ:G:3:3
The rockshelter (Feature 1) portion of this site was originally recorded by G. Gumerman and R. Euler on 9/4/69. The GCRCS crew added four additional roasting features (Features 2 through 5), including them as part of the original site. Feature 1 consists of a shallow overhang/rockshelter and its associated midden on an adjacent slope in front of the shelter. There is a lot of lithic debris here, including obsidian flakes, an Elko base, a biface tip, and groundstone fragments. Charcoal, ashy soil, and FCR are also present, but no formal fire features or structures. Ceramics at the shelter suggest both Late PI-early PII Formative and late prehistoric-early historic Pai affiliations. The remaining features (F2-5) are roasting/burned rock concentrations of varying size and caliber, some with tools and/or flakes, ceramics, etc.

AZ:G:3:4
This is a large, multi-component site consisting of several roasting features, a rockshelter with a midden, rock art, and historic remains. F1 is actually two multi-component rockshelters with a midden in front. The midden contains charcoal, burned soil, and FCR, plus lots of artifacts (sherds, grinding implements). One shelter has several historic mason jars and other trash that may have dated to the 1930s, plus the inscriptions "M BUNDY." On the ceiling of this shelter, below the inscription, are some faint hematite figures. The remaining features are roasting pits. In addition to the historic component, the site may be affiliated with both PI-III Anasazi and late prehistoric-early historic Pai/Paiute. A concentration of FCR with no artifacts was located on the downstream side of the side canyon. It was not given a feature number, but was probably affiliated with the main site.

AZ:G:3:6
The site consists of an overhang shelter (F5) and four roasting pits (F1-4) on the upper river terrace below. Sherds and lithics are associated with both areas of the site. Feature 1 is a roasting pit 5 m in diameter; a smaller, one-meter diameter interior pit is centered within the larger. Charcoal is abundant on the surface within and just outside of this feature. Limestone cobbles were used and most have been burned white. Just outside are FCR clusters that appear to be discard piles, with large charcoal fragments and angular, fractured rocks. A few flakes and some charcoal have eroded downslope into six shallow arroyos. Features 2 and 3 are side-by-side roasting features. F2 has a circular depression and may have been placed in the former discard pile of F3. F3 is 5 m in diameter and has a smaller interior pit within it like F1. Charcoal is associated with both features. F4 is another five-meter diameter roasting pit with a shallow, conical-shaped interior depression with charcoal fragments. F5, the shelter, is 7 m long, 2 m wide, and of variable height. Four sherds were noted outside the shelter as well as lithics. Very few artifacts and charcoal here; may have been used only minimally. Ceramics suggest both PI-III Formative and late prehistoric-protohistoric Pai occupations.

AZ:G:3:19
The site consists of a rockshelter with several activity areas, a large trash midden in front of the shelter, and a large roasting pit. The westernmost habitation area is marked by a single wall 2.5 m long. It is constructed of limestone slabs and stands a meter high at its contact with the cliff. The sheltered area here measures 5.5 x 4 m. A large roasting features lies just west of this shelter. The roasting feature is 6 m in diameter, although FCR—mostly basalt—extends 20+ ft. downslope. The two other "activity" areas exist as small, cleared spaces east of the main "room." The first activity area measures 2.5 x 3 m; further east is a smaller cleared area about 2 m square. These areas have been cleared of basalt rock and contain mostly lithic artifacts. A large midden, containing lithic materials of many types and ceramics, extends from the cliff face down the slope. The amount of lithic material is especially impressive. One large sandstone metate and eight bifaces were also found. A variety of ceramic types were present, indicating multicomponent PII Formative and late prehistoric-early historic Pai/Paiute occupations; several Jeddito sherds suggest a Hopi connection.

AZ:G:3:20
The site is comprised of seven main features divided into two loci: A and B, each on opposite sides of the local side canyon. Locus A contains Features 1, 2, 5, 6, and 7. Locus B contains Features 3 and 4. Feature 1: originally described by R. Euler as being two charcoal lenses eroding from a high dune—fragments of burned bone are associated; Feature 2: a large "classic" donut-shaped roasting pit about 6 m in diameter with a number of manos, charcoal, and a few flakes; Feature 3: an eroding roasting pit about 4 x 7 m in size with a discernable rock "outline" (see map) on top; Feature 4: a diffuse (12 x 30 m) scatter of FCR; Feature 5: a disturbed

area of FCR at the edge of the drainage; Feature 6: another eroding FCR area with bone; Feature 7: a roasting feature that is just beginning to be exposed by a small arroyo. No ceramics were found in association; cultural affiliation is unknown. Two lithic tools, including a projectile point with a snapped base, were found.

AZ:G:3:23
The site consists of a small shelter (6.2 m wide, 4.9 m deep and 2.8 m high) at the base of a block of columnar basalt that contains mostly historic trash, but also has a minor prehistoric component in the form of a lithic scatter. Datable artifacts found when originally recorded (by A.T. Jones and J. Balsom in 1982) include: a lard can manufactured in the 1930s; a bottle dated to between 1903-1915; and a newspaper from Pasadena dated Sept. 27, 1932. Other historic artifacts recorded during the GCRCS survey include milk, powder, and kerosene cans, metal bars, mesh screen, iron pipe, enamel pot handle, axe head, enamel metal plate, wire nails, leather, galvanized wire, milled wood, and a three-tined fork. Cultural affiliation of the prehistoric component is unknown.

AZ:G:3:24
The site consists of five roasting features with associated ceramics and lithics. The artifacts are concentrated around the FCR middens as well as dispersed downslope. Tools include tabular grinding slabs, cobble manos, a drill/perforator, and a cobble chopper. Raw material types include Kaibab and Redwall chert, chalcedony, and Partridge Creek obsidian. Burned bone was also observed. The ceramic assemblage suggests use by PII Anasazi, late prehistoric-protohistoric Pai, and historic Pai/Paiute, the latter suggested by a few broken brown glass fragments and a metal artifact.

AZ:G:3:25
The site consists of a complex of roasting and other types of features and some historic trash. F1 is a five-meter diameter FCR scatter with a cluster of five partially buried limestone/sandstone slabs at the center; F2 is a 6.5 m diameter FCR "ring" with a cleared center; F3 is a "classic" donut-shaped roaster about 7 m in diameter with abundant charcoal fragments; F4 is a 4 m diameter bowl-shaped depression encircled by FCR; F5 is a 1.4 m diameter ring of FCR cobbles around a depressed, cleared center; F6 is a cluster of five grinding slabs, three manos, purple glass, wire, and 45 Southern Paiute sherds from a pot bust; F7 is a 1.5 m diameter jumble of slabs and cobbles with two lithics and a sherd in the vicinity; F8 is a probable surface hearth—a jumbled concentration of FCR with charcoal. Artifacts, except for the SPUW sherds, are few, and include a crude biface and 10+ tertiary flakes of a variety of material types. The historic trash is scattered throughout the site and includes a kerosene lamp base, tin cans, machined wood, and glass. The site assemblage possibly reflects both Paiute and Hualapai use of the area around the turn-of-the-century.

AZ:G:3:26
The site consists of a series of roasting pits exhibiting several different phases of use and existing in various stages of deflation, from pristine to nearly eroded to their original base level. A total of seven features and two activity areas were designated and appear on the site map. The site is dominated by roasting/cooking activity, with FCR present across the site. Also present are a variety of sherds (and other artifacts) indicative of late prehistoric-early historic and mid-historic (1850-1900) Pai use. Some flakes and tools were observed, including two biface items and an obsidian point. The bifaces were at activity area A, and the point, a Utah obsidian Desert Side-Notched, was in activity area B near Feature 6. Groundstone was located between Features 4 and 5. Two fragments of pressed purple glass were observed near activity area A; perhaps pieces of a small candy or relish dish.

AZ:G:3:27
The site consists of an isolated bedrock mortar in a large (1.45 x .84 m) Redwall limestone boulder. The upper surface is almost flush with the ground surface. The mortar is in the center of the boulder and is 25 cm in diameter and 28 cm deep. There is obvious use wear around the rim of the opening and pecked divots at the bottom of the mortar. This item may have been a "hydrofact" originally that was subsequently adopted for cultural use. There are two other "incipient mortars" in river-worn boulders 50 m at 215° away in a more active (i.e., more subject to erosion by river action) part of the beach/boulder zone. However, these do not display the use wear patterns indicative of cultural use.

AZ:G:3:28
The site was divided into six loci of activity (A-F). Locus A consists of two roasting features with FCR, ash, and charcoal, and a lithic concentration and smattering of ceramics; Locus B is a light scatter of lithic debitage, including a point base, and a sherd; Locus C is a tight concentration of ca. 20 flakes and a sherd; Locus D contains three "blow-out" or "dug-out" areas that may be wickiup depressions with associated flakes and FCR, plus additional FCR and lithic concentrations and a grouping of buried slabs; Locus E is an area of possible domestic activity, represented by four possible wickiup depressions—some with encircling stone "foundations,"

and associated lithics, sherds, groundstone, and FCR; Locus F has one well-defined roaster, and other FCR concentrations that may represent more roasting features. Lithic debitage consisted of a wide variety of cherts and obsidian, and reflected expedient reduction. PII Formative sherds dominated at loci A, B, and E, while late prehistoric-early historic Pai sherds were seen at loci C, D, and E. The site is likely multi-component and reflects both PII and proto/historic use.

AZ:G:3:29
The site consists of two apparently separate, but overlapping roasting features located in a modern drainage. The features are partially intact and protected by clumps of vegetation. They lay side by side, and their eroded nature has resulted in overlap, making it difficult to define the boundaries of each. Together they measure an area 10 m N/S x 20 m E/W. A single sherd and about a dozen lithic items of varying raw material types, including a nondescript uni-edge tool, were noted. One correctly-placed fluvial event would erase the site. Ceramics suggest that this is a late prehistoric-early historic Pai site.

AZ:G:3:30
The site consists of two loci: A on the north side of the side drainage and B on the south side. Locus A has three features: F1 is a large conical-shaped roasting pit with FCR eroding downslope for 6-8 m—no artifacts associated, but contains charcoal fragments and stained soil; F2 is a small roaster or hearth with limestone blocks at its base filled with FCR—the feature is exposed and "pedestaled" by basal erosion; F3 is a low, circular wall beneath a large Tapeats boulder. The only artifact observed was a nice heat-treated scraper/biface of chocolate brown chert. No ceramics at this locus. Locus B has four features: F4 is a fan of FCR eroding 15 m downslope with a biface tip and used flake in association; F5 consists of two adjacent piles of FCR, each about 1 m in diameter, with a couple of chert flakes; F6 is a scattered concentration of FCR eroding downslope; and F7 is a tight, two-meter diameter FCR cluster that is partly eroding into F6. There is also a "possible" Feature 8, a cluster of FCR located between the dune/talus contact point. No ceramics at this locus; cultural affiliation is unknown.

AZ:G:3:31
The site is situated within and around a Tapeats overhang and is divided into two loci. The main locus (A) occupies an area 25 m N/S and 2.5 m E/W. This locus contains several complete and fragmented manos, several chert flakes, a chopper/hammerstone, and a scraper. There is one rock alignment of Tapeats slabs, ca. 2.25 m long; its function is unknown. Additionally, Locus A contains a two-meter long post at its north end, suggesting some form of historic activity at this locus. Locus B is located 50 m to the north along the overhang and occupies an area 14 m N/S x 3 m E/W. At the north end of this locus are several quids. Other artifacts include one sherd, a possible cobble mano, a grinding slab, a core, and a couple flakes (one used). Ceramics indicate that this is a PI-early PII Virgin Anasazi site.

AZ:G:3:32
The site consists of several roasting/fire features: F1 is a large (3.5 m diameter) roasting area on a terrace, with FCR eroding down the terrace slope for several meters; F2 consists of FCR emerging from the erosional toe of a terrace; F3 is a three-meter diameter circular depression, 40-50 cm deep, dug into the top of the terrace, with an associated FCR concentration; F4 is a flat area ca. 5 m to a side above the stream terrace at the base of a talus slope with an associated area of FCR; F5 is a circular, hearth-like accumulation of stones about 1.3 m in diameter. A circular metal button, three cm in diameter, with a cotter-pin-like wire loop for attaching to clothing was observed, as was a circular shell bead. Groundstone consisted of a pecked Bright Angel shale grinding slab and a quartzite river cobble mano. The character of the artifacts suggest a possible historic Pai/Paiute association, possibly late 1800s/early 1900s.

AZ:G:3:33
The site consists entirely of one feature, a circular array of rocks 2 m in diameter. No artifacts were associated with the feature, however it is cultural and not a natural phenomena. The rocks of the feature are imbedded in sandy soil and some appear to be stacked. The feature seems to have some depth as well. Function is unknown; perhaps it is the beginning of a rock-lined roasting pit that does not yet have a FCR component? Cultural affiliation is unknown.

AZ:G:3:34
The site is located on both sides of a drainage that cuts through a dune-covered alluvial fan; Locus A is on the downstream (southeast) side of the drainage and Locus B is on the upstream (northwest) side. Features 1 through 6 and F10 are located in Locus A; all but F2 are roasting/fire features (one of which, F5, has an associated pot bust). Feature 2 is a cairn of rock and rebar that attests to some form of historic activity on-site. All of the site's artifacts were observed at this locus, including a few chert and rhyolite flakes, a biface knife base, and a hammerstone. Features 7 through 9

were located at Locus B; all roasting features. This site may be related to AZ:G:3:31, a rockshelter located slightly upstream and above this site. Prehistoric artifacts suggest a PI-early PII Virgin Anasazi affiliation.

AZ:G:3:35
The site consists of a single Tapeats sandstone grinding slab under a 4 m high Muav boulder. The northeast-facing sheltered area is ca. 2 m deep, 3 m long, and 1 m wide; it has a high front overhang that slants to the rear. No charcoal or other cultural materials are visible within the shelter or downslope from it; it seems unlikely (although not impossible) that significant cultural deposits exist beneath the surface (however, this should be verified through testing). The grinding slab is trapezoidal in shape and is ca. 41 cm on its longest side, 21 cm on the shorter parallel side, 26 cm wide, and ca. seven cm thick. The central area is lightly pecked and ground. The orientation and dampness of the overhang suggests a late spring/summer use. Cultural affiliation is unknown.

AZ:G:3:36
The site consists of several (four) diffuse roasting features, of which two are in very poor condition. All four exhibit a lot of deflation and alteration due to erosion, etc. Artifacts included sherds, a single "Little Man" projectile point, lithic debris, a fractured Cottonwood Triangular projectile point, an obsidian flake, and a ground, flattened cobble used as a small palette. An enigmatic cobble was found that may have been used as a percussion tool. Charcoal is also present on the surface. Artifacts indicate that this was a Late prehistoric-early historic Pai occupation.

AZ:G:3:37
The site is located in an outcropping basalt overhang on a Tapeats slope. It consists of two loci (A and B), about 10 m apart, each containing an artifact scatter. Between 100-150 flaked lithics were noted, mostly at Locus B. Tools included bifaces, a core/chopper, and projectile point tip. The 50-65 sherds suggest that this is a multicomponent site, with Late PI-early PII Cohonina and late prehistoric-early historic Pai occupations. Locus B also contained several groundstone items, such as a ground/pecked shale slab metate, a basalt slab metate, a Tapeats mano, and a partially polished basalt cobble shaped like a maul. There was also a sparse charcoal scatter at this locus, and a piece of shaped wood, function unknown.

AZ:G:3:38
The site consists of three surface features and three sherds in a stabilized dune. Feature 1 is a scatter of FCR that is about 90 percent destroyed, with three associated sherds. F3 is another fire feature in the final stage of erosion. F2 is the possible outline of an expedient structure or small shelter, such as a wickiup, that consists of four cobbles; others could be buried or missing. The dunes are deep at this site; there could easily be earlier, deeper buried sites here. No lithics, groundstone, or other tools were observed. Sherds indicate that this is a multicomponent site, with PI-early PII Virgin Anasazi and late prehistoric-early historic Paiute occupations. A metal can lid and some saw-cut wood fragments were found on the dune surface above F3.

AZ:G:3:39
This site is composed of a scatter of historic trash: six Carnation milk cans dating between 1917-1945, two horseshoes, three Prince Albert tobacco cans, one glass bottle with a screw-on lid, and parts of an old boot or shoe. There is also a small scatter of charcoal that may be the remains of a hearth area.

AZ:G:3:40
The site consists of two loci of activity that represent at least two and possibly 6-7 roasting features, with associated debitage and many formal tools. Many of the features are hard to define. Locus A may be one large roasting feature that has been eroded by a wash, or more than one feature with elements eroding together. FCR elements at both loci are of predominately limestone cobbles, with a variety of Kaibab and/or Redwall chert flakes in association. At least part of Locus A (the FCR on the southern edge of the locus) forms a semi-circle that is half blown-out by the wash. Locus B contains a much more obvious circular FCR feature measuring about 5 m square, with additional, smaller FCR concentrations around it. The main feature may be slightly mounded and has a clear center. Many tertiary flakes, including biface thinning items, were observed. Tools included a sandstone slab metate fragment, flakes with retouch and use wear—some possibly used as scrapers, bifaces/preforms, and cores. This is an aceramic site; cultural affiliation is unknown.

AZ:G:3:41
The site is located on a riverside sand terrace carpeted by cryptogams. It measures 40 m NW/SE x 25 m SW/NE and consists of three FCR/roasting features (F1-3) , a concentrated area of charcoal, bone, and burned stone eroding out of a west-facing terrace slope, a sparse lithic assemblage, and one sherd. The latter suggests a late prehistoric-early historic Pai affiliation. The site appears to have been a temporary hunting camp, based on the

absence of grinding implements and the abundance of bone. Tools included cores and a chopper/core.

AZ:G:3:42
This site consists entirely of several bedrock mortars. When originally visited on 3/28/91 only one bedrock mortar was recorded. Two more mortars were identified on a subsequent visit on 4/27/91, plus five more problematic slicks. Mortar 1, the first recorded feature, is a conical-shaped ground hole 24 cm deep and 25 cm in diameter, with a nine cm-wide pecked lip about the rim. This mortar is situated on the horizontal face of a Tapeats sandstone bedrock ledge at the river's edge. Mortar 2 is 18 m N/NE of 1 and is 12 ft. lower. It is 12 cm deep and 18 cm wide. Mortar 3 is 15 m E/SE of 1 and is 16 cm deep and 22 cm wide. There are also five problematic slicks that appear polished to the touch in the immediate vicinity. The "ground" areas are worn; whether they are fluvially carved, completely cultural, or were "enhanced" by the inhabitants is the question.

AZ:G:3:43
The site consists of five areas of burned rock with scattered lithics and additional burned/fire-cracked rock. The burned rock/FCR concentrations are generally small (2-4 m in diameter) and are located in sandy alluvium overlying debris flows. F1 is a dense FCR concentration eroded by a gully with a few lithics; F2 is a FCR scatter that is mostly blown-out with a few flakes and a slab; F3 is a small FCR area; F4 is similar to F3, but located on a sheer arroyo cutbank and half gone—between F3 and 4 are scattered lithics and a slab; F5 is exposed about a half meter below ground surface, with charcoal. No ceramics were observed on the site. One thick biface/scraper was noted, and two pecked, slab metates were recorded. Cultural/temporal affiliation are unknown (possibly Archaic).

AZ:G:3:44
The site is divided into two loci (A and B). Locus A is a series of five cleared habitation/activity areas (Features 1-5) sheltered by Bright Angel shale ledges at the top of a talus slope. The features extend for 75-80 m along the base of an L-shaped shale cliff, one side of which faces a side drainage. F1 and 2 face north-northwest toward the drainage, while F3-5 face due west toward the river. All of the features have varying degrees of dry-laid, expedient walls, none of which are very substantial. A large lithic scatter with flakes and several tools extends downslope of F3 and 4. The greatest concentration is below F3 and extends 60 m downslope to the south side of Locus B. Ceramics were sparse, but included two very large sherds from the same gray ware vessel. Tools included various projectile point and biface fragments. Locus B consists of two to three roasting pits downslope of the shelters, each 2-5 m in diameter. An arroyo is cutting through Locus B and severely eroding the features. Ceramics indicate that this is a late prehistoric-early historic Pai site.

AZ:G:3:45
This is a marginal site consisting of a sparse FCR scatter in a 2.5 x 1 m oblong area, a single chert flake, and a basalt cobble mano. The flake occurs in a sandy blowout ca. 5 m downslope from the FCR scatter, while the mano is 8 m west of the FCR. There is a slight possibility of additional buried artifacts. Cultural affiliation is unknown.

AZ:G:3:46
The site consists of a handful (15) of FCR fragments (3-8 cm in size), a single sherd, and two flakes. The entire site takes up a 2 x 3 m area. The brush is so thick above the site and up and downstream that more cultural material could be buried throughout the immediate area. Such remains are bound to weather out differentially as the steep, rocky talus slopes above the site erode, changing the incised drainages that move through the dunes down to the river. The sherd suggests that this was a late prehistoric-early historic Paiute occupation.

AZ:G:3:47
This is a multi-component site consisting of an historic camp and prehistoric FCR middens with lithics. The historic portion (F1) consists of a scatter of trash, including saw-cut wood, milk cans (dating between 1935-1945), Prince Albert tobacco cans, lard can lids, a can opener, charcoal, cobalt glass, and nails, plus a cleared area that may have been a tent space. This may have been a temporary camp related to exploration/mining in the western Grand Canyon. AZ:G:3:39, a historic camp, had cans dating to the same general period and there may be connecting trails between the two sites. The prehistoric component includes two fire-cracked rock middens (F2 and 3) and a lithic scatter (F4). There are flakes associated with both F2 and 3, as well as a light scatter across the upper terrace. A sheared chalcedony biface was observed, but no ceramics. This component may be Archaic.

AZ:G:3:48
The site extends for about 30 m along the base of a Tapeats cliff face utilizing a slightly sheltered overhang 1-3 m wide. Charcoal, "manuport" driftwood, two Desert Side-Notched projectile points, and a grinding slick on an upright monolith were recorded under the overhang. Spilling downslope for ca. 15 m are numerous lithics, flakes,

groundstone items, tools, more charcoal, and a couple sherds. Nearly all flakes are of a creamy or gray/white Redwall chert; one tool of Utah obsidian was noted. Groundstone, of which there are numerous fragments and whole items, consists primarily of expedient and shaped manos. There are few artifacts under the overhang itself; most are eroding downslope from it. Two Southern Paiute Utility Ware sherds from the same vessel were found downslope of the overhang. No structures or features were observed. Artifacts indicate that this was a late prehistoric-early historic Paiute site.

AZ:G:3:49
The site is located under columnar basalt boulder rockshelters on the first Tapeats ledge outcrop above the river. These are multi-component shelters, possibly used temporarily/seasonally during food processing and lithic tool manufacture activities, as indicated by groundstone implements and abundant lithic debitage. The rockshelter area is 15 m long and 4 m at its widest to the dripline. There are 80-125 flakes on site, most of which are located in front of the rockshelter area on the Tapeats ledges. Nearly all of the flakes in the shelter area have been placed in a collector's pile. The 15 or so sherds found on the site suggest PII Virgin Anasazi and late prehistoric-early historic Pai/Paiute occupations. Some of these had also been collected in the shelter. Two metates, three manos, a grinding slab, and two tools were also found in or around the shelter. There is a sparse scatter of charcoal fragments in the southeast end of the rockshelter area.

AZ:G:3:50
The site consists of a small (1.5 x 1.8 m) east-facing shelter under a Tapeats boulder with two crude, stacked rock walls on the north and south ends of the sheltered area and two lithic tools downslope to the south and southeast. One tool is a non-diagnostic uniface scraper; the other is an Elko Corner-notched projectile point base. There are no lithic debitage or ceramics associated with the site, suggesting that both tools were produced and collected from elsewhere.

AZ:G:3:51
The site is comprised of a rockshelter in a cliff of Muav limestone directly above a large terrace. The rockshelter is ca. 5 x 2 m in size and has three "units" of rock alignments within it and one unit 1 m below the shelter. There are seven flaked lithics of Kaibab and Redwall chert and quartzite approximately 10 m downslope of the shelter. Two more lithic items were found about 20 m south of the shelter along the same cliff formation. Three deadfalls—possible rodent traps—were found ca. 50-65 m north along the cliff formation tucked up into packrat midden areas. No charcoal or ceramics were observed.

AZ:G:3:52
The site is composed of three roasting pit features and one large area of FCR and a lithic scatter. All features, and the general scatter area, are eroding out of dune deposits and are being carried downslope into the side drainage and off of the edge of the Tapeats terrace. F1 is a well-defined roasting pit ca. 10 x 5 m. Its outer perimeter is eroding out of the edge of the dune terrace and FCR debris is being carried downslope into the drainage. F2 is not as well-defined as F1 but is also eroding out of the dune deposits into the same side drainage. F3 is a small mound of FCR. A large general scatter of FCR and lithic debitage is located between F1 and 3. The scatter area is situated close to F3 and extends from that elevation downslope to the edge of the terrace. Lithic materials found include Kaibab chert, multi-colored Redwall chert, Utah obsidian, and brown obsidian. One sherd was seen, suggesting a Late PI-early PII Virgin Anasazi association.

AZ:G:3:53
The site is located on the first Tapeats sandstone ledge outcrop above the river. It is 35 m long and 15 m wide, and consists strictly of lithic items, which are divided into two concentrations. There are between 100-150 flakes; no formal or diagnostic tools were observed. A limestone river cobble—only slightly used—was found at the south edge of the main lithic concentration. There is a Tapeats sandstone slab metate about 30 m upstream of the site. It was stashed for unknown reasons—possibly to protect it from the elements. Cultural affiliation is suspected to be Late Archaic-BMII, based on the observance of some bifacial thinning flakes.

AZ:G:3:54
The site consists of an eroding roasting feature between two granite outcrops with associated flakes and groundstone. The feature is comprised of a flat, circular, depressed area 2 m in diameter with a fan of FCR extending downslope from it for 10 m. Lithics consist of just three chert flakes. Groundstone in-cludes a basalt cobble with smooth facets and a pecked margin, and a limestone cobble with slight "bashing" damage on one end. Charcoal-stained soil is present in the middle of the FCR fan. Cultural affiliation is unknown.

AZ:G:3:55
The main part of the site is composed of two clusters of fire-cracked rock with one loaf-shaped river cobble mano. The two FCR areas may be the same roasting pit, which has eroded into what

appears to be two features. There is charcoal on the ground surface and charcoal-stained soil in the midden matrix. About 15 m northeast of the site, across a deeply cut arroyo, is more FCR, which is eroding out of dunes along with river cobbles that have been flaked or bashed. There is a good deal of creosote growth in the middens, so it is difficult to describe their morphology with certainty. One Pai/Paiute utility ware sherd was seen during survey, but not relocated during the recording of the site.

AZ:G:3:56
The site consists of three roasting pits and a possible fourth roasting feature that has not eroded heavily enough for positive identification. Feature 1 is a dispersed scatter of FCR moving downslope in a dune blow-out cut by a gully; ca. five flakes and a projectile point were noted amongst the FCR. F2 is another dispersed FCR scatter with a single laterally-ground mano in association. F3 is a small, dispersed FCR scatter with a single flake that barely qualifies as a feature. FCR elements are mostly Muav limestone, with a few sandstone fragments; little or no charcoal or ash was seen. The point was side-notched and may be a retouched Late Archaic-BMII dart point.

AZ:G:3:57
The site consists of a Tapeats Formation rockshelter containing a large, eroding FCR feature, a charcoal scatter, an ash stain, and a scatter of lithics, sherds, and groundstone. Lithics are densely concentrated along the front edge of the shelter floor, with some eroding downslope. The sherds are found in the northern half of the shelter. No formal lithic tools were seen. Two pecked and ground slabs, one of Tapeats sandstone and one of Muav limestone, were observed near the center of the site. Ceramics suggested a multicomponent occupation of the site, possibly Early Formative (BMIII-PI) and late prehistoric-early historic Paiute. The FCR feature measures 8 m in diameter and is composed of angular, cobble-size rocks of Tapeats and limestone. The site appears to have been a limited lithic manufacturing and food processing area based on artifacts present.

AZ:G:3:58
The site consists of a single roasting feature about 7 x 10 m in diameter that is eroding out of the uppermost sand terrace, with an associated mano 17 m east visible on the surface. A deep gully cuts through the southwest edge of the feature. The groundstone item is a probable two-handed sandstone mano broken in two pieces. No other artifacts were observed at this site, limiting the ability to assign a cultural affiliation.

AZ:G:3:59
The site is composed of dispersed fragments of FCR, three flakes, and 2-4 river cobble manos that seem to be slightly ground. This site appears to be well covered by river sediment, but it may also be the scant remains of an ephemeral, temporary camp. No ceramics were observed and cultural/temporal affiliation is not known.

AZ:G:3:60
The site is comprised of 13 features, primarily roasting features and FCR accumulations that are either roasting features or discard piles. There are very few artifacts associated with these features; a few sherds and dispersed lithic flakes. There is charcoal on the surface of some roasting pits that may indicate historic use. No architectural features could be discerned in the area of the features. Overhang shelters are located at the base of basalt cliffs above the terrace and may be associated with this site. Tools include a flake chopper and two biface tips, plus some lightly-pecked and ground slabs. The only ceramics observed were five Moapa Grayware sherds from the same vessel; cultural affiliation is identified as PI-early PII Virgin Anasazi.

AZ:G:3:61
This site, comprised of lithics and a hearth, is in a sheltered floor/ledge area measuring approximately 2 x 7 m. The overhang is a prominent projection of Tapeats that extends beyond the ledge. Approximately 20+ lithics were noted; mostly secondary flakes, but some the result of decortication. The majority of the flakes are large, with some dorsal cortex. A large, partial preform of gray Kaibab chert was also seen. The preform and all of the flakes appear to have been heat-treated. The lithics were concentrated in a rock rubble pile downslope. A deflated, one-meter diameter hearth with FCR, charcoal, and burned bone occupies the middle of the ledge. Four quids were also seen.

AZ:G:3:62
The site consists of a small collection of historic trash, including flat wood slats, twisted wire (possibly from a small box or crate), square and wire nails, a Levi button, clothespin spring, a three-tined metal fork, a metal can, iron ring, and plastic comb. The fork was identical to one found at AZ:G:3:23 1.8 miles downstream; the two sites may be related. This site appears to be the scene of a mule "wreck." Either a pannier fell off a mule and was smashed or the mule tripped and part of the pannier's contents fell out. Site AZ:G:3:23 probably post-dated 1910 and had a newspaper dated 1932; by inference, this site may date to the same period.

AZ:G:3:63
The site consists entirely of a dispersed scatter of fire-cracked rock eroding out of a high dune/terrace. No artifacts were observed in association. The eroded materials are being exposed in shallow arroyo run-off drainages; these probably are the remains of an FCR midden/roasting pit. Temporal and cultural affiliation are unknown.

AZ:G:3:64
The site consists of 13 features (F1-13), at least nine of which are surficially recognizable roasting pits with conical shapes and depressions in the center. Most important, though, are the cultural deposits (labeled CL1-25) revealed by severe arroyo cutting through many of the upper features; in places as many as three lenses are recognizable. The lowest deposits are about 3 m below the present ground surface; these contain charcoal and artifacts and there are 50-60 cm of fill between the deposits. Feature 6 is an area of artifact concentration downslope from F3. All artifacts appear to be associated closely with FCR middens that are eroded and exposed. Lithic tools included a flake drill and a reworked Elko Corner-Notched projectile point. The ceramic assemblage suggests that the site is multi-component: PI-III Formative and late prehistoric-early historic Pai/Paiute. This could be one of the most informative sites in the Western Grand Canyon as far as potential for dating and chronology-building. There are deep, stratified cultural deposits with datable charcoal.

AZ:G:3:65
The site consists of a naturally sheltered alcove within the Tapeats ledges with lithic artifacts. A ledge protects a 3 x 5 m flat area that has a small number of lithics, including a hammerstone, chopper, and core. No formal structures or fire features were noted, however there is a 10 cm long stick jutting from beneath a rock on a shelf above the alcove; its purpose is unknown. No other artifacts were observed, including charcoal or FCR. There is a packrat midden along the southern edge of the site. Cultural affiliation is unknown.

AZ:G:3:66
The site consists of a partially buried ring of FCR measuring 1.4 m in diameter that is suggested to be a small roasting feature in pristine condition. Also present is a grinding slick on the face of a large (1.8 x 1 x 6 m) talus boulder ca. 6 m north of the roasting feature.The features are located in a dune area bordered by a talus slope of Tapeats sandstone and the local cutbank. There is also a modern food cache in the vicinity. Cultural affiliation is unknown.

AZ:G:3:67
The site consists of five features (F1-5)—all fire-cracked rock middens with associated lithics, among which are fine biface thinning flakes. Concentrations of artifacts were noted in the area of the FCR middens. One of these features (F2) appears to be of the "classic" conical, donut-shaped variety, but others are more dispersed piles of burned and cracked limestone with high densities of flakes. The latter may be local materials or cherts from the Redwall or Muav Formations. Two thin bifaces were observed and one Moapa Brown Ware sherd was found upslope of F1, suggestive of a Late PI-early PII Virgin Anasazi affiliation.

AZ:G:3:68
The site consists of a basalt cliff overhang that creates a shallow rockshelter area with three wall alignment features. F1 is the largest shelter. It is ca. 11 x 2 m in size and contains rock alignments along the shelter dripline. There is a basalt grinding slab, one Kaibab chert flake, and a Desert Side-notched point located in the west corner of the shelter. F2 is southwest of F1 and consists of a 3 x 1 m circular rock alignment adjacent the cliff base. F3 is further southwest; it is a 1.5 x 1 m cleared area with a rock alignment that contains a river cobble groundstone item. The DSN point indicates that this is probably a late prehistoric-early historic Pai/Paiute site. From this site there is easy access to the side drainage and dune terraces below.

AZ:G:3:69
The site consists of a rockshelter containing several rock alignments, a sparse scatter of lithics and ceramics, the remains of seven possible arrow shafts, two anvil stones, and a small bone scatter. The site is 25 m in length and 5 m wide. The rock alignments might be foundations for three possible "rooms" or activity areas. "Room" 3 is the best candidate as a room or shelter foundation. "Rooms" 1 and 2 appear to have been areas cleared of rock and then used as activity areas. Most of the artifacts on the site are contained within Rooms 2 and 3. A whole chalcedony projectile point and a Kaibab chert projectile point tip were found. Ceramics suggested that the site was multi-component: PI-early PII Cohonina and late prehistoric-early historic Pai/Paiute. The most unusual artifacts on the site are the seven possible arrow shafts. These are made of large phragmite reeds. Five of these have broken and tattered ends, but one appears cut and another appears cut and notched.

AZ:G:3:70
The site consists of a rockshelter at the base of a basalt outcrop with associated groundstone and lithic artifacts. The shelter measures 6 x 2 m and

offers only slight protection from the elements. The ceiling is ca. 2.5 m high at its maximum. Artifacts include two expedient basalt grinding slabs, five one-handed cobble manos, expedient tools, and sparse lithics. A small, triangular, basal-notched point, a projectile point tip, and a few flakes constitute the chipped-stone assemblage. No evidence of a hearth or architectural features were found. It is likely the shelter was simply used as a work station for plant food processing purposes. This may be a late prehistoric-early historic Pai/Paiute site.

AZ:G:3:71
The site consists of a small rockshelter with a triangular opening in a granite outcrop open to the S/SE, with sherds eroding downslope in front of it. A faint trail contours along the slope 10.5 m below the shelter opening, and the sherd scatter extends down to it. At least three different vessels are represented by the 15 sherds observed. The interior roof of the shelter is heavily smoke blackened; the rear wall and floor is mostly obscured by a packrat nest. The ceramic assemblage indicates that this was a multi-component site: PI-III Cohonina and late prehistoric-early historic Pai.

AZ:G:3:72
This is an extensive roasting feature complex that includes an overhang shelter previously recorded as historic site AZ:G:3:23. The prehistoric component of that site is described here as AZ:G:3:72. Fourteen features (F1-14) were defined; it would be redundant to summarize them all here. Suffice to say that all but F1 are roasting features or hearth/FCR scatters of various shapes and sizes, some with associated groundstone items, lithics, and sherds. F1 is the overhang shelter, which, in addition to the historic component described as site AZ:G:3:23, has a prehistoric component consisting of a lithic scatter downslope of the shelter and in the shelter fill. Ceramics observed indicate that this may be a multi-component site, with both Late Pueblo I-early PII Virgin Anasazi and late prehistoric-early historic Pai/Paiute occupations.

AZ:G:3:73
This multi-component site has two loci. Locus A consists of a roasting pit, a lithic scatter, a historic trash scatter, and three sherds. Locus B consists of a deflated roasting pit and a very sparse lithic scatter. The roasting feature at Locus A is in the process of eroding out of a small, sandy slope. The rock is mostly of basalt, limestone, and a little sandstone. The center ring of the feature is 3 m in diameter. FCR has eroded 5 m downslope of the feature. A possible discard pile lies just south of the pit; it is also eroding downslope. The lithic scatter is mostly downslope (to the east/southeast) of these features. The historic trash here consists of a few pieces of lathe-like wood, an old, flaked bottle neck, a wire nail, a screw-top metal cap—possibly for the bottle, and a piece of flat tin, perhaps from a can or bucket. This trash is also downslope of the roasting features at Locus A. The roasting pit in Locus B is badly deflated. The FCR covers a 6-8 m diameter area. There are less than ten pieces of lithic debitage in this area. A grinding slab, some expedient manos, a stone bead, and a biface were observed across the site. Components include PII Virgin Anasazi, late prehistoric-early historic Pai, and late historic (1900-1945) Euro-American (?) occupations.

AZ:G:3:76
The site consists of the remains of a deflating roasting pit with a light charcoal scatter and a one-handed sandstone mano. The FCR scatter measures about 8 x 11 m; most of the rock is limestone. Several limestone and shale slabs were found of unknown function. No diagnostic artifacts were found and cultural affiliation is not known.

AZ:G:3:77
The site consists of a single pictograph panel with four hematite figures on a vertical face under a shallow Tapeats overhang. The vertical face is ca. 80 cm in height by 160 cm wide, but the four figures are confined to a 40 by 60 cm area. They include (from south to north) a corn plant, a corn plant/anthropomorph, an indistinguishable faded blob of hematite, and a V-like figure that is probably a remnant of a Cave Valley-style anthropomorph. Other cultural remains associated with this site are two oval grinding slicks in the Tapeats sandstone bedrock ledge ca. 3 m E/SE of the panel. The slicks are parallel/adjacent to each other (28 x 34 cm and 22 x 30 cm in size), and 1-2 cm deep. They are very smooth, but obviously pecked. An unmodified, irregular chunk of grano-diorite with one flat, well-smoothed surface lies next to the grinding slicks. It measures 10 x 15 x 4 cm. A third possible grinding basin was noted on a vertical slab of Tapeats W/NW of the panel. Presumably, this slab has rotated 90° since the grinding basin was originally used. Cultural affiliation is unknown.

AZ:G:3:78
This is an extensive light to moderate-density open lithic scatter of 1,000+ flakes, three sherds, and some circular rock alignments that may represent wickiup outlines. The site is on a level expanse of Tapeats adjacent the Colorado River and the south side of Three Springs Canyon. The lithic debitage is almost entirely comprised of heat-treated tertiary thinning flakes, dominated by white-cream-pink Kaibab chert, but including some other (yellow/red/brown) cherts, plus black rhyolite and

Partridge Creek(?) obsidian. Several cores were present but no bifaces or formalized flake tools or groundstone implements were observed on the surface. The three sherds suggest that this is a late prehistoric-early historic Pai site.

AZ:G:3:79
The site consists of three small walls, one of which may be natural, on a Tapeats Formation ledge. Above the walls is a sheltering ledge that creates an overhang about a meter in height. The average depth of the shelter is 2 m. There is a trace of sand on the floor, but no artifacts of any kind. A few pieces of charcoal were noted on the ledge above this one, although no structures or artifacts were noted there. Cultural/temporal affiliation is unknown.

AZ:G:3:80
The site is divided into two loci. Locus A contains numerous lithics, sherds, hand tools, and extensive rock art. This locus is on a sheltered bench at the base of a basalt cliff, just upstream from the dune that Locus B is located on. Locus B consists of eight separate structural and fire features on a sand dune on the upstream side of a major side canyon. Numerous artifacts are present, including lithics, ceramics, groundstone, tools, shell fragments, and charcoal. This site has excellent potential for buried materials and datable features. Ceramics suggest a late prehistoric-early historic Pai affiliation.

AZ:G:3:82
The site consists of three main rockshelters in the Tapeats ledges, each designated one of three loci (A, B, and C). Locus A, the lowest shelter, contains a concentration of ca. 20 white Kaibab chert flakes in a three-meter diameter area. Locus B is a shelter that is 5 m long, 1.5 m deep, and 1.45 m high. It has a collection pile of ca. 15 sherds, plus 150-200 flakes, core fragments, and a smoke-blackened ceiling. Lithic debitage and a few sherds extend downslope 30 m to the southwest. Two smaller shelters, one with a single-course rock alignment 2.5 m long across the front opening, occur directly above the west end of the Locus B shelter. This shelter appears to have been the main habitation focus. Locus C, 20 m W/SW of Locus B, is 8 m long, 2 m wide, and 2 m high. It contains a single wall 1.9 m long and 35 cm high of stacked and upright Tapeats slabs. This is a possible multi-component site, with both Late PI-early PII Virgin Anasazi and late prehistoric-early historic Pai/Paiute occupations.

AZ:G:3:83
The site consists of a historic cache of seven 5-gallon "honey cans" for gasoline, several motor oil cans, 25+ food cans, a broken crate, several glass jars—one containing matches, playing cards, and other items. Also present is a first aid kit in a green metal tool box that includes two *Reader's Digest* magazines dated April, 1945 and July, 1945. The main cache of cans is concentrated in a 2.6 x 1.1 m area adjacent to a Tapeats boulder. The first aid kit is stashed under another boulder 2.2 m at 110° from the can cache. River lore has it that this cache was left by Post-WWII power boaters up-running from Lake Mead when the lake was higher and 217-Mile Rapid was washed out.

AZ:G:3:85
The site consists of two artifact areas separated by a narrow, entrenched drainage. One area is marked by a Cerbat Brown Ware pot break of ca. 14 sherds and 5+ lithics exposed in a dune blow-out. The second area has a biface knife base, a projectile point base fragment, an utilized flake, 10+ microflakes (pressure-flaked), and several larger tertiary flakes. This area is also located in a dune blow-out. A rusted tin can fragment was also observed. This may be a late prehistoric-early historic Pai site.

Appendix II

Summary of Site Impacts and Potential Impacts

Appendix II. Summary of Site Impacts and Potential Impacts

Site Number	DI: Inundated	II1: Bank Slumpage	II2: Arroyo Cutting	II3: Human Uses	PI1: River Sediments	PI2: Below 300K	No Impacts
A15001	0	0	0	0	1	1	0
A15003	0	0	0	0	1	1	0
A15004	0	0	0	0	1	1	0
A15005	0	0	1	0	0	1	0
A15016	0	0	0	0	0	0	1
A15017	0	0	0	0	0	0	1
A15018	0	0	0	0	0	1	0
A15019	0	0	0	0	0	0	1
A15020	0	0	0	0	1	1	0
A15021	0	1	1	0	1	1	0
A15022	0	0	0	0	1	1	0
A15023	0	0	0	0	0	0	1
A15024	0	0	0	0	0	0	1
A15025	0	0	0	0	0	1	0
A15026	0	1	1	0	1	1	0
A15027	0	1	0	0	1	1	0
A15028	0	0	0	0	1	1	0
A15029	0	0	0	0	1	1	0
A15030	0	0	1	0	1	1	0
A15031	0	1	1	0	1	1	0
A15032	0	0	0	0	1	1	0
A15033	0	1	1	0	1	1	0
A15034	0	0	0	0	0	0	1
A15035	0	0	1	0	1	1	0
A15036	0	0	0	0	1	1	0
A15037	0	0	1	0	0	1	0
A15038	0	0	0	0	1	1	0
A15039	0	0	1	0	1	1	0
A15040	0	0	0	0	1	1	0
A15042	0	0	0	0	1	1	0
A15043	0	1	1	0	1	1	0
A15044	0	0	0	0	1	1	0
A15047	0	0	1	0	1	1	0
A15048	0	0	0	0	1	1	0
A15051	0	0	1	0	1	1	0
A15052	0	0	0	0	0	0	1
A15055	0	0	0	0	0	0	1
A15056	0	0	0	0	0	0	1
A16001	0	0	0	0	1	1	0
A16002	0	0	0	0	0	0	1
A16003	0	0	0	0	1	1	0
A16004	0	0	0	0	1	1	0
A16148	0	0	1	0	1	1	0
A16149	0	1	1	0	1	1	0
A16150	0	0	0	0	1	1	0
A16151	0	0	1	0	0	1	0
A16152	0	0	0	0	0	0	1
A16153	0	1	1	0	1	1	0
A16154	0	1	0	0	1	1	0
A16155	0	0	0	0	0	1	0

Site Number	DI: Inundated	II1: Bank Slumpage	II2: Arroyo Cutting	II3: Human Uses	PI1: River Sediments	PI2: Below 300K	No Impacts
A16156	0	0	0	0	0	0	1
A16157	0	0	0	0	1	1	0
A16158	1	0	1	0	1	1	0
A16159	1	1	0	0	1	1	0
A16160	0	0	0	0	1	1	0
A16161	0	1	1	0	1	1	0
A16162	1	0	0	0	1	1	0
A16163	0	0	0	0	1	1	0
A16164	0	0	0	0	0	0	1
A16165	0	0	0	0	0	0	1
A16166	0	0	0	0	0	0	1
A16167	0	0	0	0	0	1	0
A16168	0	0	0	0	0	0	1
A16169	0	0	0	0	0	0	1
A16170	0	0	0	0	0	0	1
A16171	0	1	0	0	1	1	0
A16172	0	0	0	0	1	1	0
A16173	0	0	0	0	1	1	0
A16174	0	1	1	0	1	1	0
A16175	0	1	1	0	1	1	0
A16176	0	1	0	0	1	1	0
A16177	0	0	0	0	0	0	1
A16178	0	0	0	0	0	0	1
A16179	0	0	0	0	0	1	0
A16180	0	1	1	0	1	1	0
A16181	0	0	0	0	0	0	1
A16182	0	0	0	0	0	0	1
A16184	0	0	0	0	1	1	0
A16185	0	0	0	0	1	1	0
B09192	0	0	0	0	0	0	1
B09196	0	0	0	0	0	0	1
B09314	0	0	0	0	0	0	1
B09315	0	0	0	0	0	1	0
B09316	1	1	1	0	1	1	0
B09317	0	0	0	0	0	0	1
B09319	0	0	0	0	0	1	0
B09320	0	0	0	0	0	1	0
B10001	0	0	0	0	0	0	1
B10004	0	0	0	0	0	0	1
B10111	0	1	1	0	1	1	0
B10121	0	0	0	0	0	0	1
B10132	0	0	0	0	0	0	1
B10133	0	0	0	0	0	0	1
B10223	0	0	0	0	0	0	1
B10224	0	0	0	0	0	1	0
B10225	0	0	0	0	0	0	1
B10226	0	0	0	0	0	0	1
B10227	0	0	0	0	0	0	1
B10228	0	0	0	0	0	0	1
B10229	0	0	1	0	1	1	0
B10230	0	0	0	0	0	0	1
B10231	0	0	1	0	0	1	0
B10236	0	0	0	0	0	0	1
B10237	0	0	0	0	1	1	0

Site Number	DI: Inundated	II1: Bank Slumpage	II2: Arroyo Cutting	II3: Human Uses	PI1: River Sediments	PI2: Below 300K	No Impacts
B10238	0	0	0	0	0	0	1
B10248	0	0	0	0	0	1	0
B10249	0	0	0	0	0	1	0
B10250	0	0	0	0	0	0	1
B10251	0	0	0	0	0	0	1
B10252	0	0	0	0	0	0	1
B10253	0	0	0	0	0	0	1
B10260	0	0	0	0	0	0	1
B10261	0	0	0	0	1	1	0
B10262	0	0	0	0	1	1	0
B10263	0	0	0	0	0	0	1
B10264	0	0	0	0	0	0	1
B10265	0	0	0	0	0	0	1
B10266	0	0	0	0	0	0	1
B11002	0	0	0	0	0	0	1
B11079	0	0	0	0	0	0	1
B11271	0	0	0	0	1	1	0
B11272	0	1	1	0	1	1	0
B11273	0	0	0	0	0	0	1
B11274	0	0	0	0	0	0	1
B11275	0	1	0	0	1	1	0
B11276	0	0	0	0	0	0	1
B11277	0	0	0	0	0	1	0
B11278	0	0	0	0	1	1	0
B11279	0	0	0	0	1	1	0
B11280	0	0	0	0	1	1	0
B11281	0	0	0	0	0	1	0
B11282	0	1	1	0	1	1	0
B11283	0	1	0	0	0	1	0
B11284	0	0	0	0	0	1	0
B13001	0	0	0	0	0	1	0
B13002	0	1	0	0	1	1	0
B14093	0	0	0	0	1	1	0
B14094	0	0	0	0	0	0	1
B14095	0	0	0	0	0	1	0
B14105	0	0	0	0	0	0	1
B14107	0	1	1	0	1	1	0
B14108	1	0	0	0	1	1	0
B15001	0	0	0	0	0	0	1
B15073	0	0	0	0	0	0	1
B15091	0	0	0	0	0	0	1
B15096	0	0	0	0	0	1	0
B15097	0	0	0	0	0	1	0
B15100	0	0	0	0	0	0	1
B15117	0	0	0	0	0	0	1
B15118	0	0	0	0	0	0	1
B15119	0	0	0	0	0	1	0
B15120	0	0	1	0	0	1	0
B15121	0	0	0	0	0	0	1
B15122	0	0	0	0	0	1	0
B15123	0	0	1	0	0	1	0
B15124	1	0	0	0	0	1	0
B15125	0	0	0	0	0	0	1
B15126	0	0	0	0	0	0	1

Site Number	DI: Inundated	II1: Bank Slumpage	II2: Arroyo Cutting	II3: Human Uses	PI1: River Sediments	PI2: Below 300K	No Impacts
B15127	0	0	0	0	0	1	0
B15128	0	0	0	0	0	1	0
B15129	0	0	0	0	0	0	1
B15131	1	0	0	0	0	1	0
B15132	0	0	0	0	0	0	1
B15133	0	0	0	0	0	0	1
B15134	0	0	0	0	0	1	0
B15135	0	0	0	0	0	1	0
B15139	0	0	0	0	0	1	0
B15143	0	0	0	0	0	0	1
B16001	0	1	1	0	1	1	0
B16003	0	1	0	1	0	1	0
B16170	0	0	0	0	0	0	1
B16255	0	1	1	0	1	1	0
B16256	0	0	0	0	0	1	0
B16257	0	0	1	0	1	1	0
B16258	0	0	0	0	0	1	0
B16259	0	1	0	0	1	1	0
B16260	0	0	0	0	0	0	1
B16261	0	1	1	1	1	1	0
B16262	1	0	0	0	0	1	0
C02011	1	1	1	0	1	1	0
C02012	1	1	1	0	0	1	0
C02013	0	1	1	0	1	1	0
C02032	1	1	0	0	1	1	0
C02033	0	0	0	0	1	1	0
C02035	0	1	1	0	1	1	0
C02036	0	0	0	0	1	1	0
C02037	0	0	0	0	0	1	0
C02038	0	0	0	1	1	1	0
C02039	0	0	0	0	0	0	1
C02040	0	0	0	0	0	1	0
C02041	0	0	0	0	0	1	0
C02048	0	0	0	0	1	1	0
C02050	1	1	1	0	1	1	0
C02053	0	0	0	0	1	1	0
C02056	0	0	0	0	0	1	0
C02057	0	0	0	0	1	1	0
C02058	1	1	1	0	0	1	0
C02059	1	0	0	0	0	1	0
C02060	0	1	1	0	1	1	0
C02070	0	0	0	0	0	0	1
C02071	0	0	0	0	1	1	0
C02072	0	1	1	0	1	1	0
C02073	0	0	0	0	1	1	0
C02074	0	0	1	0	1	1	0
C02075	0	1	1	0	1	1	0
C02076	0	1	1	0	1	1	0
C02077	0	1	0	0	1	1	0
C02078	0	0	0	0	0	1	0
C02079	0	0	0	0	0	0	1
C02080	0	0	0	0	0	1	0
C02081	0	0	0	1	1	1	0
C02082	0	0	0	0	1	1	0

Site Number	DI: Inundated	II1: Bank Slumpage	II2: Arroyo Cutting	II3: Human Uses	PI1: River Sediments	PI2: Below 300K	No Impacts
C02083	0	1	1	0	1	1	0
C02084	0	1	1	0	0	1	0
C02085	1	1	1	0	1	1	0
C02086	0	1	1	0	1	1	0
C02087	0	0	0	0	1	1	0
C02088	0	0	0	0	0	0	1
C02089	0	0	0	0	0	1	0
C02090	0	1	1	0	1	1	0
C02091	0	0	1	0	1	1	0
C02092	0	0	1	0	1	1	0
C02094	1	0	0	0	0	1	0
C02095	0	0	0	0	0	0	1
C02096	0	1	1	0	1	1	0
C02097	0	1	1	0	1	1	0
C02098	0	1	1	1	1	1	0
C02099	0	0	0	0	1	1	0
C02100	0	1	1	0	1	1	0
C02101	0	1	1	0	1	1	0
C02102	0	0	0	0	0	1	0
C02103	0	0	0	0	0	1	0
C02104	0	0	0	0	0	0	1
C02105	0	0	0	0	0	0	1
C02106	1	1	1	1	1	1	0
C02108	0	0	0	0	0	0	1
C03003	1	1	1	0	0	1	0
C03004	0	0	0	0	0	0	1
C03006	0	0	0	0	0	0	1
C03010	0	1	1	0	1	1	0
C05001	0	0	0	0	0	0	1
C05002	0	0	0	0	0	0	1
C05003	0	0	0	0	0	0	1
C05004	1	1	0	0	1	1	0
C05005	0	0	0	0	0	0	1
C05006	0	0	0	0	0	0	1
C05007	0	0	0	0	0	1	0
C05008	0	0	0	0	0	0	1
C05009	0	0	0	0	1	1	0
C05031	0	0	1	0	1	1	0
C05033	0	0	0	0	0	0	1
C05035	0	0	0	0	0	1	0
C05037	0	0	1	0	1	1	0
C05039	0	0	0	0	0	1	0
C06002	1	0	0	0	0	1	0
C06003	0	0	0	0	1	1	0
C06004	1	0	0	0	0	1	0
C06005	0	0	0	0	0	1	0
C06006	0	1	1	0	1	1	0
C06007	0	0	0	0	0	0	1
C06008	1	0	0	0	1	1	0
C06009	0	0	0	0	0	0	1
C06010	0	0	0	0	1	1	0
C09001	0	1	0	0	1	1	0
C09004	0	0	0	0	0	1	0
C09005	0	0	0	0	0	1	0

Site Number	DI: Inundated	II1: Bank Slumpage	II2: Arroyo Cutting	II3: Human Uses	PI1: River Sediments	PI2: Below 300K	No Impacts
C09028	0	0	1	0	1	1	0
C09030	0	0	0	0	1	1	0
C09031	0	0	0	0	1	1	0
C09032	0	0	0	0	0	0	1
C09033	0	0	0	0	0	0	1
C09034	0	1	0	0	0	1	0
C09050	0	0	0	0	1	1	0
C09051	0	0	0	0	1	1	0
C09052	0	0	0	0	1	1	0
C09053	0	0	0	0	1	1	0
C09054	0	0	0	0	1	1	0
C09056	0	0	0	0	0	1	0
C09057	0	0	0	0	0	0	1
C09058	0	0	0	0	1	1	0
C09059	0	0	0	0	1	1	0
C09060	0	0	0	0	0	0	1
C09061	0	0	0	0	1	1	0
C09062	0	0	1	0	1	1	0
C09064	0	0	0	0	0	0	1
C09065	0	0	0	0	0	1	0
C09066	0	0	0	0	0	0	1
C09067	0	0	0	0	1	1	0
C09068	0	0	0	0	1	1	0
C09069	0	0	0	0	1	1	0
C09070	0	0	0	0	0	0	1
C09071	0	0	0	0	1	1	0
C09072	0	0	0	0	1	1	0
C09073	0	0	0	0	1	1	0
C09074	0	0	0	0	0	0	1
C09075	0	0	0	0	0	0	1
C09076	0	0	0	0	0	0	1
C09080	0	0	0	0	0	0	1
C09082	0	0	0	0	1	1	0
C09083	0	0	0	0	0	1	0
C09084	0	0	1	0	1	1	0
C09085	0	0	0	0	0	0	1
C09087	0	0	0	0	0	0	1
C09088	1	0	0	0	0	1	0
C09089	0	0	0	0	0	0	1
C13001	0	1	1	0	1	1	0
C13003	0	1	1	0	1	1	0
C13005	0	1	1	1	1	1	0
C13006	0	1	1	0	1	1	0
C13007	0	0	0	1	1	1	0
C13008	0	0	0	0	1	1	0
C13009	1	1	1	0	1	1	0
C13010	0	1	1	0	1	1	0
C13011	0	0	0	0	0	0	1
C13033	0	0	1	0	0	1	0
C13069	0	0	1	0	1	1	0
C13070	0	1	1	0	1	1	0
C13071	0	0	0	0	0	0	1
C13092	0	1	0	0	1	1	0
C13098	0	0	0	0	1	1	0

Site Number	DI: Inundated	II1: Bank Slumpage	II2: Arroyo Cutting	II3: Human Uses	PI1: River Sediments	PI2: Below 300K	No Impacts
C13099	0	1	1	0	1	1	0
C13100	0	1	1	0	1	1	0
C13101	0	0	1	0	1	1	0
C13131	0	0	0	0	1	1	0
C13132	0	0	0	0	0	0	1
C13272	0	1	1	0	1	1	0
C13273	0	0	1	0	1	1	0
C13274	0	0	0	0	0	0	1
C13275	0	0	0	0	0	0	1
C13291	0	1	1	1	1	1	0
C13321	0	0	1	1	1	1	0
C13322	0	1	0	0	0	1	0
C13323	0	1	1	1	1	1	0
C13324	0	0	0	1	1	1	0
C13325	0	0	0	0	1	1	0
C13326	0	1	1	1	1	1	0
C13327	0	0	1	0	1	1	0
C13328	0	0	0	0	0	0	1
C13329	0	0	0	0	1	1	0
C13330	0	0	0	0	0	0	1
C13331	0	0	0	0	0	0	1
C13332	0	0	0	0	0	0	1
C13333	0	0	0	0	1	1	0
C13334	0	0	0	0	1	1	0
C13335	0	0	0	0	0	1	0
C13336	0	0	1	0	1	1	0
C13337	0	0	0	0	0	1	0
C13338	0	1	1	0	1	1	0
C13339	0	1	1	0	1	1	0
C13340	0	1	0	0	1	1	0
C13341	0	0	0	0	0	0	1
C13342	0	0	0	0	1	1	0
C13343	0	0	0	0	1	1	0
C13344	0	0	0	0	1	1	0
C13345	0	0	0	0	1	1	0
C13346	0	0	0	0	1	1	0
C13347	1	1	1	0	1	1	0
C13348	0	0	0	0	1	1	0
C13349	0	1	1	0	1	1	0
C13350	0	0	0	0	1	1	0
C13351	0	0	0	0	1	1	0
C13352	0	0	0	0	1	1	0
C13353	0	0	0	0	1	1	0
C13354	1	0	0	0	0	1	0
C13355	0	0	1	0	1	1	0
C13356	0	1	1	0	1	1	0
C13357	0	0	1	0	1	1	0
C13358	0	1	1	0	1	1	0
C13359	1	1	1	0	1	1	0
C13360	0	0	0	0	0	1	0
C13361	0	0	0	0	0	1	0
C13362	0	1	1	0	1	1	0
C13363	0	0	0	0	0	1	0
C13364	0	0	0	0	0	1	0

Site Number	DI: Inundated	II1: Bank Slumpage	II2: Arroyo Cutting	II3: Human Uses	PI1: River Sediments	PI2: Below 300K	No Impacts
C13365	1	0	0	0	1	1	0
C13366	0	0	0	0	0	0	1
C13367	0	0	0	0	0	0	1
C13368	1	1	1	0	1	1	0
C13369	0	0	0	0	0	0	1
C13370	0	0	0	0	1	1	0
C13371	1	1	1	0	1	1	0
C13372	0	0	0	0	1	1	0
C13373	0	0	0	0	0	1	0
C13374	0	1	1	0	1	1	0
C13375	0	0	0	0	0	0	1
C13376	0	0	0	0	0	0	1
C13377	0	0	0	0	1	1	0
C13378	0	0	0	0	0	0	1
C13379	0	1	1	0	1	1	0
C13380	0	0	0	0	0	0	1
C13381	1	1	1	0	1	1	0
C13382	0	0	0	0	0	0	1
C13383	0	0	0	0	0	0	1
C13384	0	1	1	0	1	1	0
C13385	0	1	1	0	1	1	0
C13386	0	0	1	0	1	1	0
C13387	0	0	1	0	1	1	0
C13388	0	0	0	0	0	0	1
C13389	0	0	0	0	1	1	0
C13390	0	0	0	0	0	0	1
C13391	0	0	0	0	0	0	1
C13392	0	0	0	0	1	1	0
C13393	0	0	1	1	1	1	0
G02100	0	0	0	0	0	1	0
G02101	0	0	0	0	0	1	0
G02102	0	0	0	0	0	1	0
G02103	0	0	0	0	0	1	0
G02105	0	0	0	0	0	1	0
G02106	0	0	0	0	0	1	0
G03001	0	0	0	0	1	1	0
G03002	0	0	0	0	1	1	0
G03003	0	0	0	0	1	1	0
G03004	0	0	0	0	1	1	0
G03006	0	0	0	0	1	1	0
G03019	0	0	0	0	0	0	1
G03020	0	0	0	0	1	1	0
G03023	0	0	0	0	0	0	1
G03024	0	0	0	0	1	1	0
G03025	0	0	1	0	1	1	0
G03026	0	1	1	0	1	1	0
G03027	0	0	0	0	1	1	0
G03028	0	0	1	0	1	1	0
G03029	0	0	0	0	0	0	1
G03030	0	1	1	0	1	1	0
G03031	0	0	0	0	0	0	1
G03032	0	0	0	0	0	1	0
G03033	0	0	0	0	1	1	0
G03034	0	0	0	0	0	1	0

Site Number	DI: Inundated	II1: Bank Slumpage	II2: Arroyo Cutting	II3: Human Uses	PI1: River Sediments	PI2: Below 300K	No Impacts
G03035	0	0	0	0	0	0	1
G03036	0	0	0	0	0	0	1
G03037	0	0	0	0	0	1	0
G03038	0	1	1	0	1	1	0
G03039	0	0	0	0	0	0	1
G03040	0	0	1	0	1	1	0
G03041	0	1	1	0	1	1	0
G03042	1	0	0	0	0	1	0
G03043	0	0	1	0	1	1	0
G03044	0	0	0	0	1	1	0
G03045	0	0	0	0	0	0	1
G03046	0	1	1	0	1	1	0
G03047	0	0	0	0	0	0	1
G03048	0	0	0	0	1	1	0
G03049	0	0	0	0	0	1	0
G03050	0	0	0	0	0	0	1
G03051	0	0	0	0	0	0	1
G03052	0	0	0	0	1	1	0
G03053	0	0	0	0	0	1	0
G03054	0	1	1	0	1	1	0
G03055	0	1	1	0	1	1	0
G03056	0	0	0	0	0	1	0
G03057	0	0	0	0	0	1	0
G03058	0	0	0	0	1	1	0
G03059	0	1	1	0	1	1	0
G03060	0	0	1	0	1	1	0
G03061	0	0	0	0	0	1	0
G03062	0	0	0	0	1	1	0
G03063	0	0	0	0	1	1	0
G03064	0	1	1	0	1	1	0
G03065	0	0	0	0	0	1	0
G03066	0	0	0	0	1	1	0
G03067	1	1	1	0	1	1	0
G03068	0	0	0	0	0	0	1
G03069	0	0	0	0	0	0	1
G03070	0	0	0	0	0	0	1
G03071	0	0	0	0	0	1	0
G03072	0	1	1	0	1	1	0
G03073	0	0	0	0	1	1	0
G03076	0	1	1	0	1	1	0
G03077	0	0	0	0	0	1	0
G03078	0	0	0	0	0	1	0
G03079	0	0	0	0	0	1	0
G03080	0	1	1	0	1	1	0
G03082	0	0	0	0	0	1	0
G03083	0	0	0	0	0	1	0
G03085	0	0	0	0	1	1	0

Appendix III

Ceramic Refiring and Thin Section Data

APPENDIX III. CERAMIC REFIRING AND THIN SECTION DATA

Refiring (Oxidation) Tests

After analyzing the spatial and temporal distribution of ceramic wares, sherd nips were refired and analyzed from selected reaches. All sherd nips from Reaches 0, 4, 5, and 10 were refired (n = 1,742). The judgmental sample of sherd nips comprises over half of the total number of sherd nips collected during the course of the project.

Sherd nips from sites in Reaches 0 and 10 were chosen because these reaches had relatively large ceramic assemblages (n = 84 and 626 respectively) and because they occur on the extreme eastern and western end of the river corridor. Reach 0 extends from the base of Glen Canyon Dam, 15 miles downstream to Lees Ferry. Thus, Reach 0 is adjacent to the Kayenta heartland or, as is traditionally accepted, Tusayan White Ware (Kayenta Series) and Tusayan Gray Ware (Tsegi Series) production areas (Geib and Callahan 1987; Kojo 1991). Reach 10 is beyond the major distribution area of Kayenta pottery and contrasts with Reach 0 in this regard. Because distinguishing between Virgin Series and Tsegi Series Tusayan Gray Ware and Shinarump Gray Ware is problematical, defining differences in clays used in the production of these wares will be useful in distinguishing separate or similar production areas.

Sherd nips from Reaches 4 and 5 were chosen because there are also large samples available (n = 573 and 481 respectively) that include a diverse assemblage of wares and types. The two reaches are contiguous sections of the river corridor, centering near the mouth of the Little Colorado. Both reaches contain broad alluvial fans at the mouth of tributaries where large site complexes occur. Ceramic studies have previously been conducted in some of these areas (Balsom 1984; Jones 1986; Schwartz et al. 1980), providing a context and database for further ceramic analysis discussion. These studies suggest that ceramics were produced at some of the site complexes and that locally available clays were used.

Refiring tests were conducted to determine whether compositionally similar or very different clays were used in the production of ceramics that occur in the river corridor. As mentioned previously, refiring, or oxidizing the sherd specimens (nips) controls for variability in firing atmosphere, allowing quantitative comparisons with standardized color values to be made (Shepard 1954:103). Sherds that superficially appear to be homogeneous in terms of surface color and temper ingredients may display a wide range of color variability when refired. When sherds are totally oxidized, the refired color reflects the impurities and common iron compounds of the clay. Different colors reflect the use of clays that are derived from different geologic sources.

Sherd nips were refired in an electric kiln at 1,000° C for 45 minutes. They were then compared to Munsell soil color charts and placed within analytical color groups (Table 1).

Ceramic materials reflect natural resource availability (Arnold 1985:20); therefore, variations in clays and temper ingredients can define macro and micro-geographic areas that can be correlated with ceramic production zones. If there is a great deal of color variability within oxidized sherds of the same ware, it is quite likely that different clays were being used to produce the ware. Unfortunately, the unknown factor is the range of variability of suitable clays that could have been used to produce ceramics within any given geographic-culture area. Ceramic distribution studies that aim to infer prehistoric trade and exchange relations are obviously less informative if the production areas are only vaguely defined or completely unknown.

As a means of creating a preliminary database, an ancillary clay collection study was carried out during the course of the corridor survey under permit from the Grand Canyon National Park. Alluvial clay samples suitable for pottery production were judgmentally collected from deposits in side drainages wherever they occurred (Table 2). No suitable sedimentary clay deposits were identified. The clay samples were prepared and subjected to oxidation along with sherd nips, making comparison of the refired colors possible. It is assumed that prehistoric potters had access to the same or compositionally similar clays as those collected for this study. If ceramics were being produced in the project area from locally available clays, a close match between the oxidized color of the local clay and the oxidized color of sherds would be expected.

Figure 1 shows the relative frequency of each of the analytical color groups within each reach. Color group Red-6 and Red-7 display not only the highest frequencies in each reach, but also change dramatically from east to west (Reach 0 to Reach 10). The Buff color groups also show interesting patterns ofchange. Interpreting the meaning of the changing frequencies of color groups in terms of ceramic production and/or exchange is the problem.

Tables 3 and 4 are tabulations of wares that refire to color group Red-6 and Red-7. In Reach 0, 40.5 percent of all wares are produced from clays that refire to color group Red-6, while 13.1 percent refire to color group Red-7. In Reaches 4 and 5, this pattern is reversed, and Red-7 is the predominant refired color group. This pattern is reversed again in Reach 10 where Red-6 predominates.

Table 1. Munsell Color Groups and Analytical Color Groups

Munsell Color Group	Color Group Name*
10 YR 8/1-8/4 10 YR 7/1-7/4 2.5 Y N8-8/4 2.5 Y N7-7/4 5 Y 8/1-8/4	Buff 1
7.5 YR N8-8/4 7.5 YR N7-7/4 10 YR 8/6-8/8	Buff 2
5 YR 8/1-8/4 5 YR 7/1-7/4	Buff 3
7.5 YR 8/6 7.5 YR 7/6-7/8 7.5 YR 6/4-6/8 7.5 YR 5/4-5/8	Yellowish Red 4
5 YR 7/6-7/8 5 YR 6/4-6/8 5 YR 5/4-5/8	Yellowish Red 5
2.5 YR 6/3-6/8 2.5 YR 5/3-5/8 2.5 YR 4/4-4/8	Red 6
10 R 6/1-6/8 10 R 5/1-5/8 10 R 4/1-4/6	Red 7
5 YR 3/2-3/4 5 YR 4/2-4/6	Brown 8
2.5 YR 3/3-3/6 2.5 YR 4/2-4/3	Red Brown 9

*Note: Analytical Groups 1 through 7 follow Windes (1977, Table 10.5); Groups 8 and 9 added for this analysis.

Table 2. Clay Samples

Sample No.	Munsell Color	Color Group	River Mile	Bank	Reach
1	5 YR 7/4	3	0	Right	1
2	10 R 5/4	7	2.8	Right	1
3	10 R 5/4	7	3.5	Left	1
4	10 R 5/4	7	3.6	Left	1
5	2.5 YR 4/4	6	5.8	Right	1
6	10 R 5/4	7	7.9	Right	1
7	10 R 5/6	7	7.9	Right	1
8a	2.5 YR 5/6	6	8.0	Right	1
8b	2.5 YR 5/6	6	8.0	Right	1
9	-	-	-	-	-
10	2.5 YR 6/6	6	10.0	Left	1
11	5 YR 7/4	5	20.5	Right	2
12	2.5 YR 6/6	6	24.0	Left	3
13	5 YR 7/4	6	24.5	Left	3
14	5 YR 7/4	6	31.7	Right	3
15	5 YR 7/4	6	40.0	Left	4
16	5 YR 7/3	3	40.1	Left	4
17	5 YR 7/3	3	52.2	Right	4
18a	10 R 6/6	7	56	Right	4
18b	10 R 5/4	7	56	Right	4
18c	10 R 4/3	7	56	Right	4
18d	2.5 YR 6/6	6	56	Right	4
19a	2.5 YR 6/6	6	61.5	Left	4
19b	2.5 YR 6/6	6	61.5	Left	4
19c	5 YR 6/4	5	61.5	Left	4
20	7.5 YR 6/4	4	62.3	Right	5
20a	7.5 YR 7/4	2	63.0	Right	5
21	2.5 YR 6/6	6	64.3	Left	5
22	2.5 YR 6/6	6	64.6	Right	5
23	2.5 YR 6/6	6	65.3	Right	5
24	2.5 YR 6/6	6	65.5	Left	5
25	2.5 YR 6/6	6	65.5	Right	5
26	2.5 YR 5/6	6	70.2	Left	5
27	2.5 YR 6/6	6	76.5	Left	5
28	5 YR 7/4	3	91.7	Right	6
29	2.5 YR 5/6	6	112.0	Left	6
30	2.5 YR 6/6	6	119.95	Right	7
31	2.5 YR 6/6	6	120.0	Right	7
32	2.5 YR 6/6	6	122.8	Left	7
33a	2.5 YR 8/4	1	125	Left	7
33b	2.5 YR 6/6	6	125	Left	7
34	2.5 YR 6/4	6	129	Left	8
35	7.5 YR 8/4	2	131	Right	8
36	10 R 5/6	7	137	Left	8
37	2.5 YR 6/6	6	143.3	Left	9
38	10 R 8/3	1	143.5	Right	9
39	5 YR 7/4	5	148	Left	9
40	7.5 8/4	2	150	Right	9
41	5 YR 7/4	3	166	Left	10
42	5 YR 7/4	3	168	Right	10
43	2.5 YR 6/6	6	171	Right	10
44	5 YR 7/4	3	175.6	Left	10
45	2.5 YR 6/6	6	198.5	Right	10
46	5 YR 7/4	3	202	Right	10
47	5 YR 7/4	3	209	Right	10
48	7.5 YR 8/2	2	217	Left	11

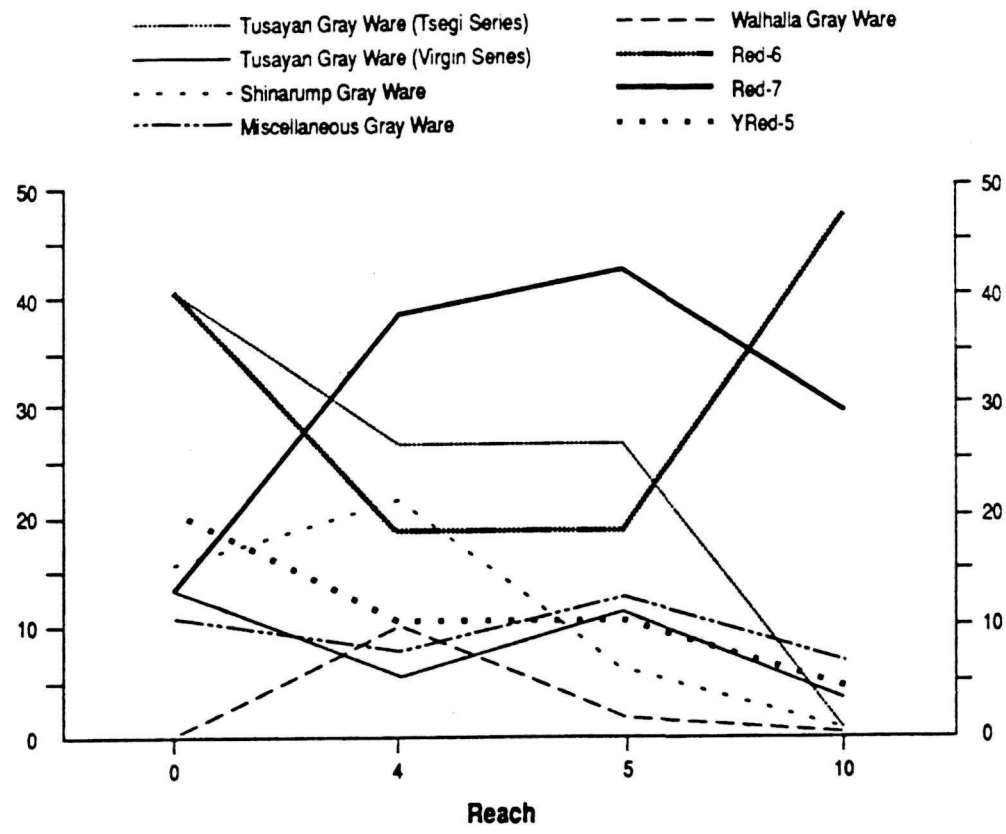

Figure 1. Relative Frequency of Color Group YRed-5, Red-6, Red-7 and Selected Wares

Figure 2 shows the relative frequencies of brown wares and San Francisco Mountain Gray Ware within color group designation. Tizon Brown Ware is largely responsible for the high frequency of Red-6 but is primarily restricted to Reach 10 and is not an influence in Reaches 0, 4 or 5. Figure 3 shows the relative frequencies of gray wares within color group designations. It is apparent that Shinarump Gray Ware, Tsegi Series Tusayan Gray Ware, Virgin Series Tusayan Gray Ware, and Moapa Gray Ware all contribute to the high frequency of Red-6 and Red-7 color groups. This evidence alone suggests that there are a number of wares being produced in different areas from local clays that refire to the same Red-6 and Red-7 color groups.

Because plain wares have the most likelihood of being locally produced, and because the great majority of ceramics present in the project area are plainwares that refire to color groups Red-6 and Red-7, the following discussion will focus on the variability of Tusayan Gray Ware (Tsegi Series), Tusayan Gray Ware (Virgin Series), Shinarump Gray Ware, and Miscellaneous (Unidentified) Gray Ware. The buff-firing color groups are primarily white wares; these are assumed to have been widely exchanged, and therefore will not be the focus of the discussion. The buff color group gray ware distribution is meaningful because these sherds were apparently not locally produced and may be tied to white ware production areas. Figure 4 shows the relative frequencies of each of the four gray ware categories by color group and by reach.

Reach 0 (Figure 4a)

Tsegi Series Tusayan Gray Ware sherds display a great deal of variability, occurring in every color group; however, the tendency is clearly towards red-firing clays rather than buff. This evidence suggests that a number of different clays were used to produce sherds that were typed as Tsegi Series Gray Ware. These sherds are consistent in terms of clear quartz sand temper inclusions. Virgin Series Gray ware also has a tendency towards red-firing clays in Reach 0, although a few were in the buff color groups. Shinarump Gray Ware sherds are almost exclusively produced from red-firing clays, predominantly Red-6 or Red-7. The miscellaneous or unknown sherds in Reach 0 could belong to any

Table 3. Relative Frequency of Wares: Color Group Red 6

Ware	Reach 0		Reach 4		Reach 5		Reach 10	
	N	%	N	%	N	%	N	%
Jeddito	1	1.2	-	-	-	-	1	.2
Miscellaneous Brown Ware	1	1.2	1	.2	3	.6	10	1.6
Miscellaneous Gray Ware	3	3.6	15	2.6	19	4.0	12	1.9
Shinarump Gray Ware	8	9.5	24	4.2	8	1.7	1	.2
Tsegi Orange Ware	3	3.6	1.4	2.4	7	1.5	1	.2
Tusayan Gray Ware (Tsegi Series)	11	13.1	17	3.0	19	4.0	-	-
Tusayan Gray Ware (Virgin Series)	6	7.1	6	1.0	15	3.1	9	1.4
Tusayan White Ware (Virgin Series)	1	1.2	-	-	2	.4	4	.6
Shinarump White Ware			1	.2	-	-	-	-
San Juan Red Ware (LCS)			1	.2	-	-	1	.2
Tusayan White Ware (Kayenta Series)			5	.9	7	1.5	-	-
Walhalla Gray Ware			21	3.7	2	.4	1	.2
Miscellaneous Ware					-	-	10	1.6
Miscellaneous White Ware					-	-	1	.2
San Juan Red Ware (SJS)					3	.6	1	.2
Moapa Gray Ware					-	-	27	4.3
Moapa White Ware					-	-	1	.2
Paiute Brown Ware					-	-	31	5.0
San Francisco Mountain Gray Ware					4	.8	45	7.2
Shivwits Plain					-	-	16	2.6
Tizon Brown Ware					-	-	124	19.8
Total	34	40.48	105	18.32	89	18.50	296	47.28

Table 4. Relative Frequency of Wares: Color Group Red 7

Ware	Reach 0		Reach 4		Reach 5		Reach 10	
	N	%	N	%	N	%	N	%
Jeddito	-	-	-	-	-	-	1	.2
Miscellaneous Brown Ware	-	-	3	.5	30	6.2	10	1.6
Miscellaneous Gray Ware	4	4.8	17	3.0	28	5.8	29	4.6
Shinarump Gray Ware	5	6.0	75	13.1	17	3.5	-	-
Tsegi Orange Ware	-	-	25	4.4	26	5.4	-	-
Tusayan Gray Ware (Tsegi Series)	1	1.2	16	2.8	23	4.8	-	-
Tusayan Gray Ware (Virgin Series)	1	1.2	9	1.6	12	2.5	3	.5
Tusayan White Ware (Virgin Series)			6	1.0	2	.4	1	.2
Shinarump White Ware			3	.5	7	1.5	-	-
San Juan Red Ware (LCS)			13	2.3	1	.2	1	.2
Tusayan White Ware (Kayenta Series)			12	2.1	8	1.7	-	-
Walhalla Gray Ware			21	3.7	6	1.2	-	-
Miscellaneous Ware			-	-	-	-	5	.8
Miscellaneous White Ware			-	-	-	-	-	-
San Juan Red Ware (SJS)			18	3.1	5	1.0	-	-
Moapa Gray Ware			-	-	2	.4	8	1.3
Moapa White Ware			-	-	-	-	-	-
Paiute Brown Ware			-	-	1	.2	25	4.0
San Francisco Mountain Gray Ware			4	.7	28	5.8	12	1.9
Shivwits Plain					-	-	7	1.1
Tizon Brown Ware					-	-	82	13.1
Little Colorado White Ware					7	1.5	-	-
Total	11	13.10	222	38.74	203	42.20	184	29.39

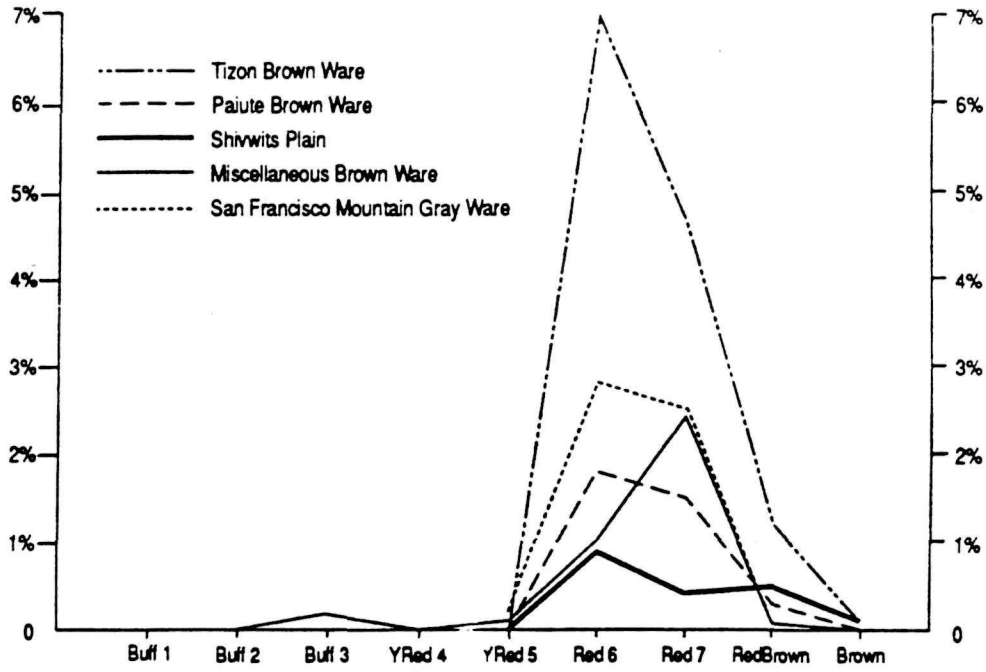

Figure 2. Relative Frequency of Selected Brown Wares and San Francisco Mountain Gray Ware Tabulated with Color Group

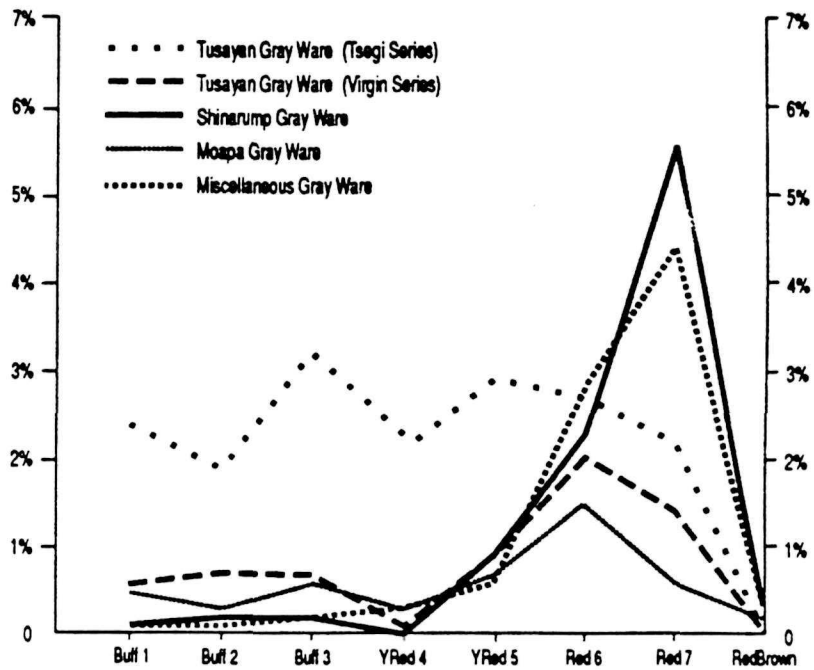

Figure 3. Relative Frequency of Selected Gray Wares Tabulated with Color Group

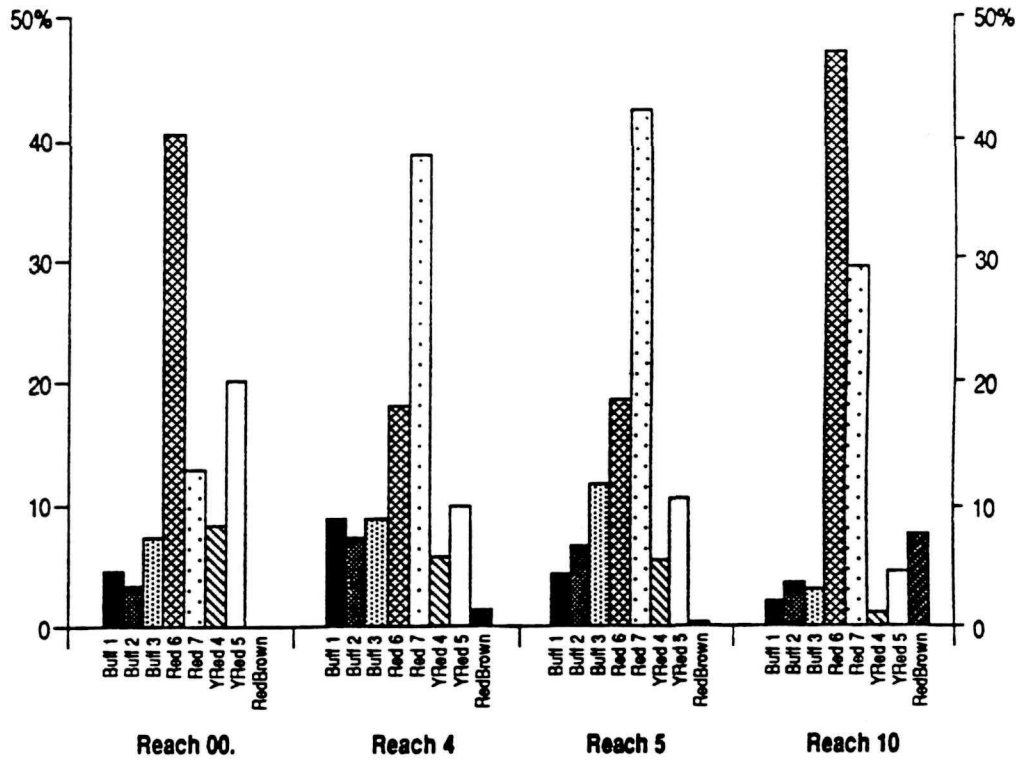

Figure 4. Relative Frequencies of Color Groups by Reach 0, 4, 5, and 10

of the three defined gray wares, but the Red-7 sherds are produced from clays similar to those used to produce Shinarump Gray Ware.

Unfortunately, clays suitable for collection were not found in Reach 0. Within the next eight miles downstream, however, three of the nine clay samples collected are color group Red-6 and five are color group Red-7 (Table 2). One sample from river mile 0 refired to color group Buff-3.

Reach 4 (Figure 4b)

In contrast to Reach 0, Tsegi Series Gray Ware in Reach 4 has a greater tendency to have been produced from buff-firing clays although red-firing clays were also used frequently. This suggests that sherds identified as Tsegi Series Gray Ware were produced in at least two different geographic areas. The buff color group sherds may be imported from the Tusayan White Ware production area in northeastern Arizona (Geib and Callahan 1987; Kojo 1991). Remember that on the basis of ceramic assemblages, the cultural affiliation of site components in Reach 4 are 84 percent Kayenta Anasazi. These numbers alone suggest a real cultural presence of Kayenta people, and a high degree of interaction with people from the Kayenta area is certainly demonstrated. The red-firing Tsegi Gray Ware sherds appear to be local expressions of Kayenta pottery traditions. Clays derived from the Chinle Formation, prevalent in Reaches 1-3 of the project area could be one possible source for these clays.

Virgin Series Gray Ware displays a great deal of variability in Reach 4 but has a greater tendency towards Red-6 and Red-7, although a few sherds were produced from buff-firing clays. Shinarump Gray Ware is most frequently produced from Red-7 in Reach 4, in contrast to Reach 0 where Red-6 firing clays predominate. The high frequencies of Red-6 firing clays in Reach 0 compared with the high frequencies of Red-7 firing clays in Reach 4 probably reflect changes in clay availability rather than changes in exchange relations.

The clay samples collected within Reach 4 (Table 2) also display some refired color variability. Color groups Buff-3 (two), Yellowish-Red-5 (one), Red-6 (four), and Red-7 (three) were represented. Therefore, some of the wares could have been produced from clays that occur within the reach. Miscellaneous wares in this reach could belong to any of the three identified wares. Those that refire to color group Red-6 and Red-7 are produced from

clays similar to those used for Shinarump Gray Ware.

Reach 5 (Figure 4c)

Tsegi Series and Virgin Series Tusayan Gray Wares in this reach are produced from clays that refire to all color groups. The buff clays are more strongly represented in the Tsegi series but both series show a tendency towards red firing clays. Shinarump Gray Ware is primarily restricted to Red-6 and Red-7 firing clays. Shinarump is more variable and not as frequent in Reach 5 as in Reach 4. Note that Shinarump Gray was produced primarily from Red-7 firing clays in Reach 4. Miscellaneous Gray Ware is almost exclusively Red-6-7 but could belong to any of the defined wares in terms of refired color.

The higher relative frequencies of buff-firing Tsegi Series Gray wares in Reach 4 contrasted with higher frequencies of red-firing Tsegi Gray Ware sherds in Reach 5 have some interesting implications. Reach 4 is closer to the production area of "classic" (buff-firing) Tsegi Series Tusayan Gray Ware. Least-cost principles argue that importing gray wares would be more economical nearer the source, and local production would be less imperative to satisfy the needs for utility vessels. Reach 5 exhibits a higher frequency of both Tusayan Gray and White Ware, yet a lower frequency of buff-firing Tsegi Gray Ware sherds. This suggests that Tusayan Gray Ware was being produced locally, and tradewares from the "classic" Tsegi Series Gray Ware production area were being imported less fre-quently. Furthermore, there is a higher frequency of Virgin Series Gray Ware in Reach 5 than Reach 4, indicating that exchange with people producing Virgin Series ceramics may have been more economical.

Shinarump Gray Ware is unevenly distributed across the reaches (Figures 5, 6, and 7), and was produced almost exclusively from Red-6 and Red-7 firing clays, primarily Red-7. Red-6 firing clays were most often used in Reach 0, while Red-7 firing clays dominate in Reaches 4 and 5. The source of Red-7 firing clays, commonly used in the production of indigenous wares in the Virgin culture area, is unknown, but probably occurs on the plateaus in the western reaches north of the Colorado River. The relative frequency of Shinarump Gray drops off sharply from Reach 4 to Reach 5 and is absent in Reach 6 (Figures 5 and 6), suggesting that the production and distribution area for the eastern variant of Shinarump Gray (sherds made from Red-6 clays) was centered east of the Kaibab Plateau. In Reaches 7 and 8, Shinarump Gray has a high relative frequency along with San Francisco Mountain Gray Ware and Virgin Series Gray Ware. It appears that sherds identified as Shinarump Gray Ware could have been produced by both Virgin and western Kayenta ceramicists. A separate production area for sherds identified as Shinarump Gray in the western reaches is suggested.

Interestingly, Shinarump Gray falls from 19.4 percent of the total ceramic assemblage in Reach 4 to only 4.6 percent in Reach 5. What appears to replace Shinarump Gray in Reach 5 are Tsegi Series Gray Wares produced from Buff-3, Yellow Red-5, Red-6, and Red-7 clays as well as some Virgin Series Gray Ware. In general terms, the increased variability of wares, combined with color group variability within wares in Reach 5, suggests that exchange relations were more diverse and that diverse production localities were more common below the Little Colorado River than above it.

Since the collected clay samples indicate that Red-6 firing clays predominate in the region encompassed by both reaches, sherds that refire to the same color group could have been produced and/or exchanged within a broad area. In any case, one cannot discriminate the production source on the basis of Red-6 color alone.

Reach 10 (Figure 4d)

The gray wares considered above are interesting in this reach because of their near absence. Red-6 firing clays comprise nearly half (47.3%) of all ceramics analyzed within the reach, followed by Red-7 (29.4%). Tizon Brown Ware and Paiute Brown Ware are primarily responsible for the high frequencies in the two red color groups. Moapa Gray Ware also refires almost exclusively to Red-6 or Red-7, as does San Francisco Mountain Gray Ware and Virgin Series Gray Ware. This evidence suggests that Red-6 and Red-7 firing sherds are produced from clays that occur in the immediate area and that clays in the region must be fairly homogeneous in terms of color (compositional) variability. The high frequency of Virgin Series Gray Ware and Miscellaneous Gray Ware, produced from Red-6 and Red-7 firing clay in Reach 10 is most likely due to use of clays that are indigenous to the region. The miscellaneous sherds are not consistent in terms of temper ingredients and could not be typed to existing ware categories. They may be local variants of either Virgin Series Gray Ware or San Francisco Mountain Gray Ware.

Seven clay samples were collected in Reach 10. Only Buff-3 and Red-6 firing clays are represented (Table 2). Of the gray and brown wares that frequently occur below Reach 5 (Tables 3 and 4), Moapa Gray Ware, Virgin Series Gray Ware, and Miscellaneous Brown Ware sherds occasionally refired to color group Buff-3. Thus, some of these sherds could have been produced from the buff-firing clays that occur in the reach.

Traditionally, the Virgin Anasazi and Southern Paiute culture areas are assumed to be on the north

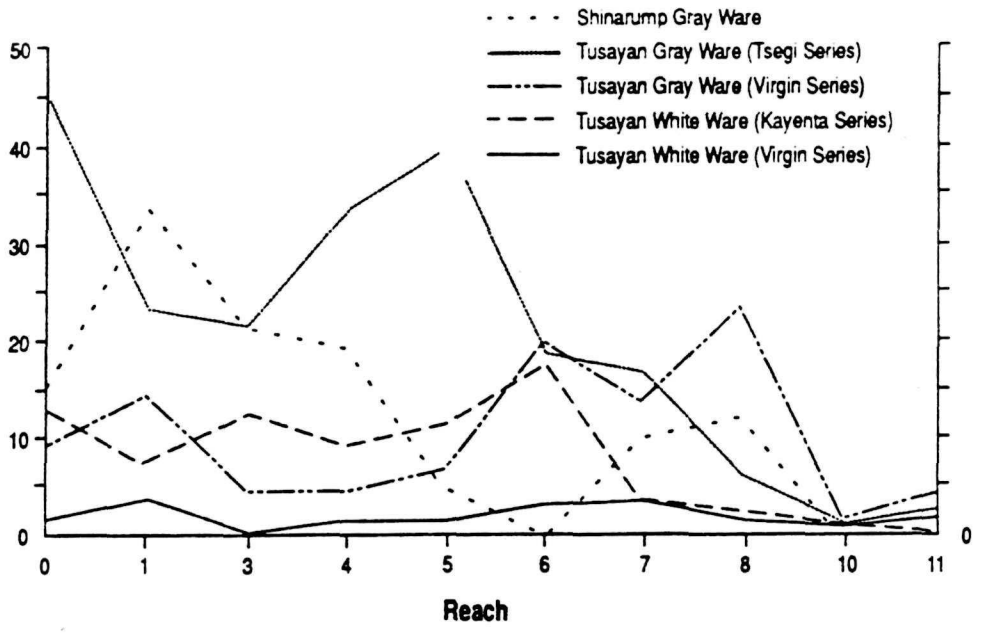

Figure 5. Frequency Distribution of Selected Wares by Reach

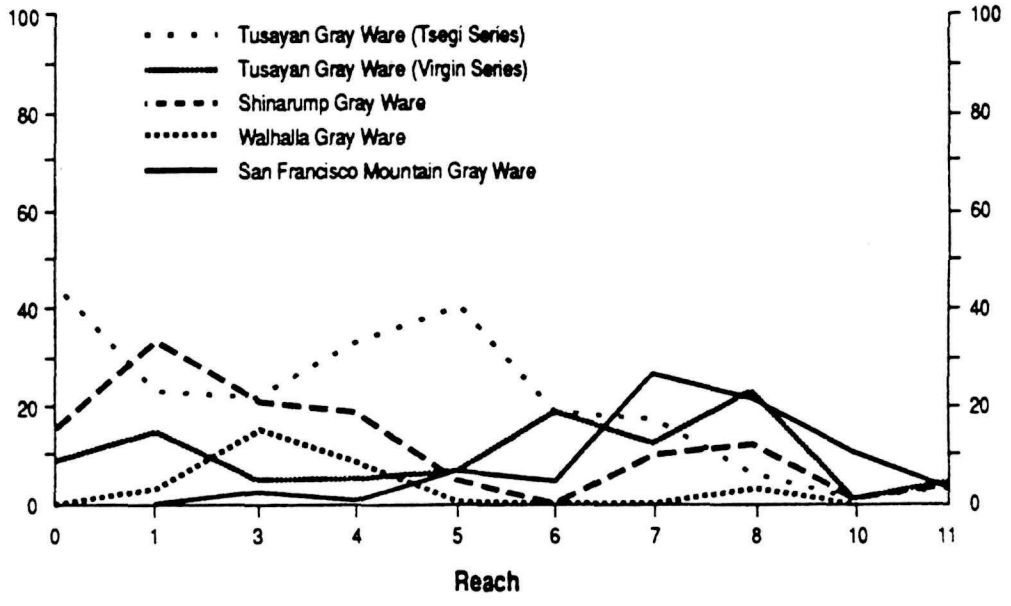

Figure 6. Frequency Distribution of Selected Gray Wares by Reach

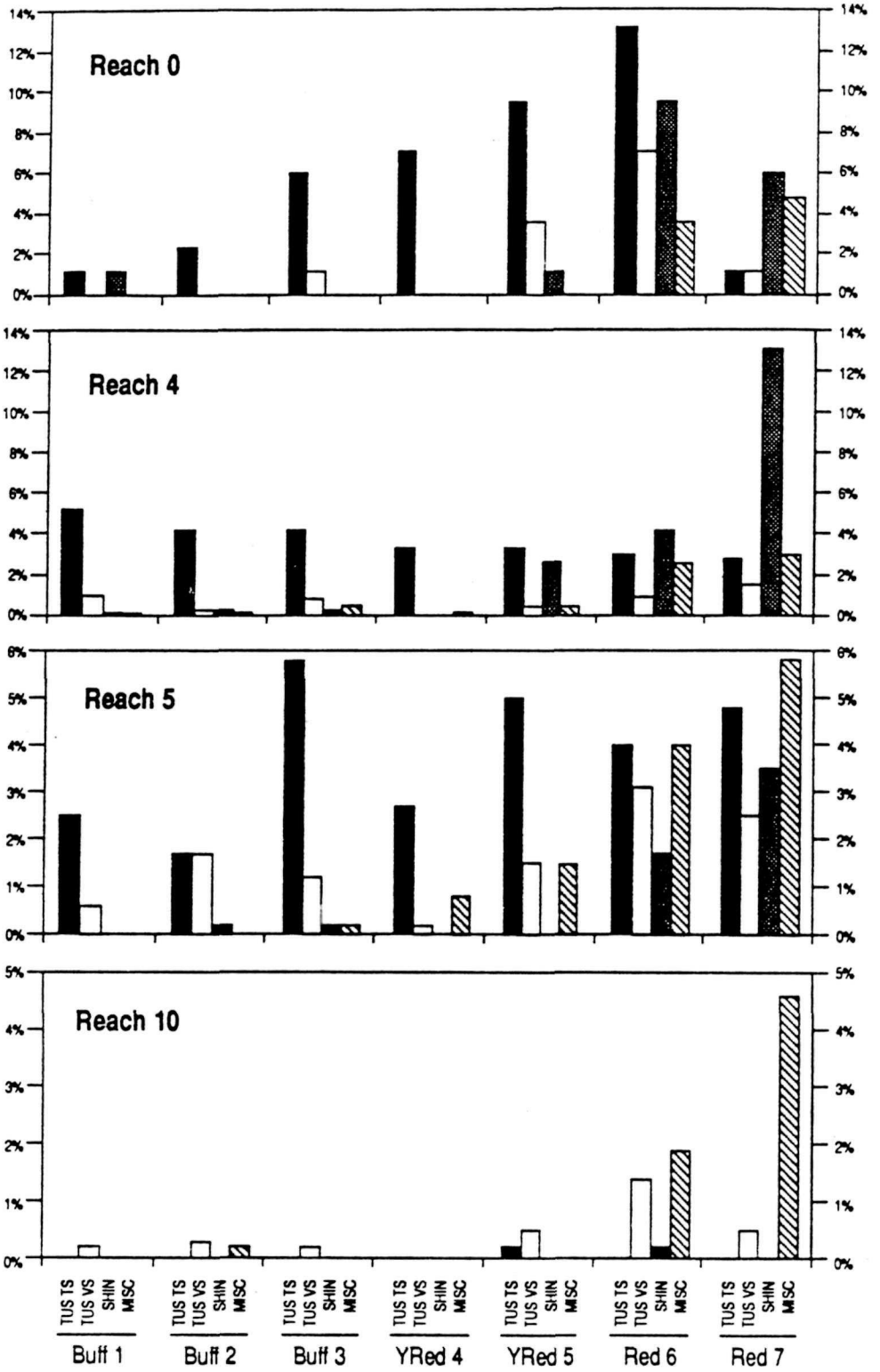

Figure 7. Selected Gray Wares: Color Group Variability by Reach

side of the river, and the Cohonina and Pai (Cerbat culture) areas on the south side of the Colorado River. There are twice as many Virgin and five times as many Paiute components on the north side of the river as on the south, as might be expected if the river acted as a cultural boundary or barrier. On the south side of the river, there are over four times as many Pai and twice as many Cohonina components as on the north side (see Table 10 in survey report). The uneven distribution of cultural material across the river suggests that there is some validity to the assumption that the river did represent a cultural boundary to some degree. It follows that if local production was common and if the local clays are compositionally different in the two areas, then contrasting production areas should be reflected in different color groups north and south of the river.

San Francisco Mountain Gray Ware (Cohonina) and Tizon Brown Ware (Pai) sherds are produced almost exclusively from Red-6 or Red-7 firing clays. In Reach 10 (Tables 3 and 4), 45 San Francisco Mountain Gray Ware sherds (7.2% of all Red-6 sherds) refired to Red-6 and 12 (1.9%) refired to Color Group Red-7, while 124 sherds (19.8%) of Tizon Brown Ware are Red-6 and 82 (13.1%) are produced from Red-7 firing clays. Thus, on the south side of the river, the indigenous wares (San Francisco Mountain Gray Ware and Tizon Brown Ware) have a greater tendency to be produced from Red-6 firing clays.

On the north side of the river, the assumed production area for Virgin Series Gray Ware, Moapa Series Gray Ware, Shivwits Plain, and Paiute Brown Ware, Red-6 firing sherds again predominate. If the clay collection is representative of the diversity of clays available in the corridor in Reach 10, then sherds that refire to Red-7 must have been produced from clays that occur elsewhere, because only one of 35 clay samples collected between river mile 56 (Reach 4) and river mile 217 (Reach 11) refired to color group Red-7 (Table 2). This evidence indicates that the majority of the refired sherds from Reach 10 and other western reaches could have been produced from Red-6 clays that are indigenous to the region, while the Red-7 sherds were apparently produced from clays that occur elsewhere (on the plateaus either north or south of the river) and were imported.

In a separate study (Samples 1989), 90 sherds of San Francisco Mountain Gray Ware were refired. The sherd sample came from Pueblo II Cohonina sites located on the west slope of Sitgreaves Mountain. Eighty percent of the sherds were produced from Red-6 firing clays. None of the sherds refired to Red-7. Additionally, a clay deposit near Sitgreaves Mountain produced samples that fired Red-6, indicating that many of the sherds could have been produced locally or from compositionally similar clay. The production-distribution system that was responsible for the Red-7 firing San Francisco Mountain Gray Ware in the project area was apparently not related to the Cohonina exchange system in this part of the Coconino Plateau, nor are the Red-7 firing clays likely to come from this locality.

On the Kanab Plateau, in a similar study, 180 sherds from a late Pueblo II-early Pueblo III site were refired (Burchett 1990). Sixty-nine sherds (primarily sherd-tempered gray ware) refired to Red-6. None of the 180 refired sherds were produced from Red-7 firing clays. The ceramic assemblage is dominated by Moapa Series Gray Ware, Shinarump Gray Ware, and sherd-tempered gray ware. Shinarump Gray Ware was produced from Red-6 or Brown-8 firing clay. If Red-7 firing clays were available in this part of the Kanab Plateau, they were apparently not being used to produce the ceramics that occur on this site. Alternatively, the ceramics on the site may not have been locally produced and therefore would not reflect the availability of local clays. In either case, it is suggested that Red-7 firing clay deposits must occur further to the northwest since Moapa Gray Ware, Virgin Series Gray Ware, Shivwits Plain, and Paiute Brown Ware were commonly produced from Red-7 firing clay in Reach 10.

Refiring tests neither support nor refute the proposition that distinctive production areas were separated by the Colorado River in the western reaches of the survey corridor. Compositionally, clays appear to be relatively homogeneous over broad areas on both sides of the river and in the different culture areas. Apparently both Red-6 and Red-7 firing clays were available to ceramicists on both sides of the river. The source of the Red-7 firing clay is unknown, but the source is different from the clay samples that were collected. Thus, even though the location of production areas cannot be distinguished, we can say that sherds produced from Red-7 firing clays were not produced in the project area.

Ceramic (Thin-Section) Analysis

Thirty-six sherds were selected for petrographic analysis (Appendix III). Classic examples of particular wares and types were chosen as well as an assortment of unidentified sherds. Because the discrimination of ware categories is based to a great extent on temper inclusions, it is important to know if visual identifications of mineral inclusions are accurate. Additionally, identifying rare mineral inclusions may help to distinguish discrete temper sources that could be linked with specific ceramic production areas.

Six sherds of Paiute Brown Ware were chosen because the temper inclusions in this ware are quite variable, making classification problematic. It is important to know the range of temper variability within Paiute Brown Ware, especially in the Grand Canyon region where this attribute has not been well documented. In the majority of the sherds identified as Paiute Brown Ware, the temper comprises 35-40 percent of the sherd and is commonly derived from granitic rock. Mineral inclusions include high percentages of quartz and potassium feldspar, which are typically poorly sorted, angular to rounded grains. One sherd (#3) contained possible sherd temper, while another (#29) had traces of identifiable crushed sherd temper (the crushed sherd had quartz temper), plus 50 percent pyroxene, 40 percent altered mafic mineral, and 10 percent quartz.

Ten sherds classified as Tizon Brown Ware were analyzed. Mineral inclusions are derived from granitic rock in eight of these specimens. Two sherds (#31-19,#32-19), tentatively classified as Aquarius Brown, exhibit a wider range of variability. These specimens have temper inclusions that are probably derived from an intermediate igneous rock. Mineral inclusions include olivine, clinopyroxene, and traces of biotite.

Three sherds of San Francisco Mountain Gray Ware were analyzed: an oxidized variant of Deadman's Gray (#18), a Floyd Black-on-gray (#26), and a Deadman's Black-on-gray sherd (#27). All three sherds were collected from sites in the western reaches of the project area (A:15 and G:03 quads). Fine to medium-grained temper (40-65% quartz) comprises 35-50 percent of the sherd in all specimens. Feldspar (40%) was identified only in the oxidized variant of Deadman's Gray. The temper is most likely stream sediment derived from a granitic parent rock. In contrast, at Unkar Delta a temper identified as "Type 4" (probably a sandstone) was found exclusively in the San Francisco Mountain Gray Ware sample (Warren 1980b). The temper in these sherds comprised 30 percent of the sherd and was primarily fine to coarse, subangular grains of quartz with minor amounts of mica flakes, feldspar, and other black, angular, vitreous grains. Apparently, the temper in the Unkar Delta specimens was derived from a different parent rock source. This suggests a separate production area for the Unkar Delta sample of San Francisco Mountain Gray Ware.

Two sherds of Shinarump Corrugated (#31 and #32) and two sherds of Walhalla Corrugated (#30 and #33) were analyzed. Temper ingredients (55-90% quartz) in both wares were similar and probably derived from two different sources: a sandstone and an intrusive igneous rock, the latter possibly a gabbro or a porphyritic basalt. The temper materials in all four specimens appear to be derived from stream sediment rather than crushed rock. This most recent analysis concludes what earlier research suggested (Balsom 1984, Jones 1986)—that the eastern variant of Shinarump Gray Ware may form a continuum with Walhalla Gray Ware and should be considered one and the same.

In general, petrographic analysis of typed sherds tended to confirm their identification within established ware categories. In other words, the sherds exhibit the appropriate temper ingredients and other characteristics required for classification within a specific ware category.