

**EXCAVATIONS AT FOUR SITES ON AND  
NEAR THE PALISADES DELTA, GRAND  
CANYON NATIONAL PARK**

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## ABSTRACT

Archaeological excavations were conducted at a sample of features at four sites (C:13:099, C:13:343, C:13:347, and C:13:349) on and near the Palisades Delta in the river corridor of Grand Canyon National Park. Excavations were necessary because features at these sites were threatened with destruction from ongoing erosion of surface sediments. Data recovery through excavation was determined to be the only viable preservation alternative for the excavated features. This report outlines the historical, legal, environmental, and archaeological context of this project and presents the methods and results of data recovery excavations. Due to their severely eroded condition, the excavated features at the four sites yielded limited information, but they did produce radiocarbon dates and macrobotanical data useful for understanding prehistoric human activities in the Grand Canyon. Results from excavation affirmed previous interpretations of these sites as Ancestral Puebloan habitations and resource processing locations, and helped to fix the dates of occupation or use from the late 9<sup>th</sup> through late 12<sup>th</sup> centuries AD. The report concludes with recommendations for future preservation and data recovery activities for similar types of sites and features.

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## CHAPTER 1. INTRODUCTION

This report presents the results from 1999 excavations designed to recover data from four archaeological sites in Grand Canyon National Park (GRCA). One of the sites was located on the Palisades Delta (AZ C:13:099 [GRCA]<sup>1</sup>), and the remaining three (AZ C:13:343, C:13:347, C:13:349) were located nearby in Reach 5 of Grand Canyon National Park (Figures 1.1 and 1.2). This work was planned and supervised by the River Corridor Monitoring Project (RCMP), a joint effort conducted by personnel of GRCA and Northern Arizona University (NAU).

The RCMP implemented data recovery excavations at the four sites due to ongoing erosion and continuing loss of cultural material. The crews that performed the work were diverse. At site AZ C:13:099, the crew consisted of archaeologists from GRCA, NAU, the Western Area Power Administration, the Hopi Tribe, and the Arizona State Historic Preservation Office. Excavations at AZ C:13:349 were conducted by RCMP staff, and RCMP staff alone completed work at AZ C:13:343 and AZ C:13:347.

### BACKGROUND

Work at the four sites was necessary because of changes to the flow regime and sedimentology of the Colorado River within GRCA. The closure of Glen Canyon Dam (GCD) in 1963 initiated the accelerated erosion of downstream cultural resources in Grand Canyon National Park (Leap, Kunde, Hubbard, Andrews, Downum, Miller

and Balsom 2000). The GCD has changed the hydrologic and geomorphic dynamics of the river corridor. Prior to closure of the dam, the Colorado River experienced large, sediment-laden floods that exceeded 100,000 cubic feet per second (cfs) annually and delivered a yearly average of approximately 66 million tons of sediment. Since the dam closure, such floods no longer occur (Collier et al. 1996) and the river no longer exhibits the annual stream flow variation and sediment load that it once did. The lack of sediment in the river and the cumulative effects of the operations of Glen Canyon Dam have accelerated the erosion of archaeological resources in the pre-dam terraces (Coder, Leap, Andrews, and Hubbard 1994, 1995; Coder, Leap, Andrews, Hubbard, and Kunde 1995; Coder, Leap, Andrews, Kline, and Hubbard 1994; Hereford et al. 1993; Hereford 1993, 1996; Leap, Andrews, Hubbard, and Kunde 1997; Leap, Burchett, Kunde, Andrews, and Hubbard 1998).

The RCMP has employed preservation measures at numerous sites in the River Corridor. These measures have been designed to reduce physical impacts to archaeological sites due to sediment loss and visitor activities. Such measures have been partly successful, but some sites still face irreversible destruction due to active river-based and terrace-based drainage erosion. As a general policy, archaeological excavations are conducted only after RCMP staff members have employed all other reasonable preservation options. When it is apparent that such measures are insufficient to stem erosion and loss of cultural materials, excavations and other methods of data recovery are implemented to obtain valuable cultural

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<sup>1</sup> All site numbers referenced in this document are Grand Canyon National Park (GRCA) numbers, unless otherwise noted.

information before it is lost. Archaeologists use the recovered material to piece together the little known cultural history of the Grand Canyon. Information gathered to date indicates that humans occupied the Grand Canyon for thousands of years and developed various subsistence strategies in this variable environment.

### ARCHAEOLOGICAL SETTING AND CONTEXT

The first explorers of the Grand Canyon region, in what is now known as Grand Canyon National Park, documented the existence of material remains belonging to prehistoric or "Mogon" Indians (Powell 1875). Later, explorers and archaeologists began to document the existence of prehistoric and historic remains, laying the groundwork for understanding human occupation in this region of the American Southwest.

The earliest known period of occupation, the Paleoindian period, begins at approximately 11,500 BP and lasts approximately 3,000 years to the end of the last ice age. During this occupation, small, mobile bands of people hunted a variety of fauna including ground sloth, and bison. Early inhabitants also gathered wild plants. Paleoindian sites are extremely rare in the Southwest; archaeologists have discovered only one site within the Grand Canyon.

By around 9,000 years BP, changes in climate had brought about numerous environmental changes, including shifts in the locations of existing vegetation and the creation of new vegetation communities. Paleoindians adapted to these changes and developed new subsistence strategies. The descendants of the Paleoindians, known as Archaic peoples, hunted small game and moved seasonally across the land-

scape procuring seasonal resources across vast territories. Archaic tool kits included chipped stone tools, ground-stone tools such as metates and manos for plant processing and atlatls for dart throwing. Archaic sites generally consist of temporary camps, rock art panels, rockshelters, hearths, plant processing tools, projectile points, flake debitage and animal and plant remains. Archaeologists have recorded Archaic sites in various topographic settings throughout the Grand Canyon (Fairley et al. 1994).

By around 3500 BC, populations in some locations began to cultivate crops such as maize and squash (Smiley and Powell 2002). With agriculture came a gradually more sedentary lifestyle, facilitated by the use of storage cists used to store surplus crops. These and other changes were characteristic of the Formative Period, a time of settled life based on an agricultural economy. Technological and organizational shifts appeared as well. In some locations, ceramics were adopted in the first one or two centuries AD. By AD 550 or so, pottery was fairly widespread. Settlements were established in both rock shelter and open-air environments, where subterranean structures storage cists, and some small granaries were constructed. In some locations, multiple pit houses were clustered together into the first true villages. Beans were added to be diet, and new hunting technologies, such as the bow and arrow, also appeared.

Over the next few centuries there were additional changes. In most locations, pit houses were gradually replaced by above-ground masonry structures. A more stable subsistence strategy that combined agriculture and hunting and gathering promoted the continued aggregation of individuals into small villages or hamlets. Ceramic technology and design styles became

more elaborate and new technologies developed, including the use of cotton for textiles. The small surface storage rooms that were created gradually developed into above ground habitation structures and larger, contiguous pueblos in some locales.

With the passage of time, individual groups began to develop regional distinctiveness, probably signaling cultural identities. These were manifest in regional styles of ceramics, architecture, ceremonial structures, and burial practices. Puebloan peoples arrived by about AD 900 along the Colorado river corridor in the Grand Canyon. Like their neighbors, these groups cultivated maize, evidenced by the presence of corn pollen on living surfaces (Schwartz et al. 1979). The presence of both Tusayan Gray Ware and Tusayan White Ware ceramics in eastern Grand Canyon suggest that these groups represent a geographical expansion of the pattern known as the Kayenta Branch of the Anasazi (Ancestral Puebloan) archaeological culture.

During the latter portion of the 10<sup>th</sup> century, masonry surface pueblos and semi-subterranean kivas appeared. Population growth was gradual and resulted in linear pueblos of two to seven contiguous rooms. Kayenta Branch ceramic wares continued to dominate ceramics assemblages, with a gradual increase in the occurrence of ceramics from the northern Virgin Branch of the Anasazi (Ancestral Puebloan) archaeological culture.

An abrupt change in architecture occurred in eastern Grand Canyon after A. D. 1100. Habitation structures became more interspersed with storage rooms and bins, fire pits, and increased use of outdoor activity areas (Schwartz et al. 1979). Pottery distributions continued to show an increase in the frequency of Virgin Branch styles of decoration. Habitation appears to have

moved to higher terraces, perhaps to fully exploit regions adjacent to water sources for increased fertile agricultural productivity. According to Schwartz, Marshall, and Kepp (1979), it appears that rather than population influxes from different indigenous groups, trade connections with the north were more fully developed in conjunction with localized ceramic traditions.

Archaeologists believe that by AD 1300, semi-nomadic, non-puebloan peoples also occupied the river corridor of Grand Canyon. These Pai and Paiute hunter-gatherers had a stable subsistence economy based on combined agriculture and hunting and gathering, supplemented by trade. These hunter-gatherer sites often included dispersed settlements of wickiup rings, rockshelters, and extensive roasting complexes containing ceramics and abundant flake stone tools and debitage. Archaeologists also believe that hunter-gatherers made use of perishables such as baskets, mats, sandals, and twine. These ancestors of the present day Hualapai, Havasupai and Paiute seasonally used both the rim and river corridor until interdiction by the U. S. Government in the 1800s.

In addition to indigenous populations, Europeans also traversed the Grand Canyon. The historic period includes visitation by Spanish Missionaries, miners and tourism entrepreneurs, and more recently, hydroelectric power exploration and production.

The prehistory of the river corridor in Grand Canyon closely follows the sequences of regional occupation and abandonment generally agreed upon by Southwestern archaeologists. Localized variation in habitation, construction, and ceramic technologies are to be expected. No doubt the inhabitants of Grand Canyon were influenced by the same climatic changes that occurred across the entire southwest. Archaeolo-

gists also assume that population expansion along the river corridor was a direct result of population growth along the rims of the Grand Canyon. Because there are limited numbers of entrance and exit points into Grand Canyon, a majority of the sites recorded at permanent water sources and along access routes contain evidence of multiple occupations through time.

River corridor archaeologists have recorded the deterioration and loss of important material remains since 1992. These remains have the potential to provide a more precise understanding of cultural chronology and processes of cultural change along the Colorado River corridor in Grand Canyon. The information generated through data recovery is intended to enhance knowledge about the people inhabiting the river corridor in Grand Canyon.

## ENVIRONMENTAL SETTING AND CONTEXT

### GEOMORPHOLOGY

The Grand Canyon is one of the most geologically diverse regions in the world. To better understand and define the Canyon's diversity, Schmidt and Graf developed 13 "reaches" or divisions of the Colorado River in Grand Canyon National Park (Schmidt and Graf 1990). The reach divisions are based on geomorphological characteristics of the river channel such as average channel width, average channel shape, reach slope, and relation to major tributaries.

The sites reported in this volume all lie within Reach 5. To place the Palisades area sites into a larger context, it is instructive to consider the relative density and nature of the sites found in Reach 5. The Grand Canyon River Corridor Survey recorded a total

475 sites along the entire river corridor of the Grand Canyon in 1990-91 (Fairley et al. 1994). About 18% of all sites recorded on this survey were found in Reach 5, which comprises only 6.2 percent of the project area. Reach 5 contains the highest number of sites (85) for any section of the river corridor. It also exhibits a high frequency of ancestral Puebloan components, which comprise 55% of all cultural affiliation categories recorded in the reach. Reach 5 also has a high frequency (37) of sites classified as "small structures." The presence of many such small sites is consistent with Ancestral Puebloan settlement patterns in adjacent areas.

The broad alluvial terraces in Reach 5 provided an area suitable for farming and settlement. Several routes and trails descend to the river from both the north and south rims in the area where sites AZ C:13:099, C:13:343, C:13:347, and C:13:349 are located. Archaeologists have also recorded some of the highest Puebloan site densities in the Park on the rim country above Reach 5 (i.e., Tusayan Ruin and Wallowa Glades).

### CLIMATE

The climate of the Grand Canyon varies due to the vast extent of the park and extreme variations in topographic relief. The topographic extremes range from around 1,240 ft above sea level (asl) at the river corridor to nearly 8,200 ft asl at the North Rim. The Colorado River Corridor contains elevational and geological variation that creates a diverse ecosystem along the river. The elevation of the river starts at 3107 ft asl at Glen Canyon Dam and descends to 1240 ft asl at Separation Canyon. Temperature and precipitation also vary due to differences in elevation. The North Rim contains the coldest recorded temperature (-22° F)

while Phantom Ranch recorded the warmest (120° F) (Sellers and Hill 1974; Western Regional Climate Center website, <http://www.wrcc.dri.edu>). Temperature generally increases at a rate of about 5.5° F with each 1,000 ft loss in elevation (Bowman 1999). The highest temperatures are found at the lowest elevations in the Canyon. Average monthly mean temperatures along the river range from around 45° F in the winter to nearly 90° F in the summer (at Phantom Ranch). Monthly mean precipitation along the river (at Phantom Ranch) ranges from .5 inches to around 1.5 inches (Bowman 1999).

#### PREVIOUS ARCHAEOLOGICAL RESEARCH IN THE GRAND CANYON

Europeans initially encountered the Grand Canyon in 1540 when a Spanish expedition led by Don Garcia Lopez de Cardenas reached the south rim. Cardenas was one of Coronado's captains who was led to the Canyon by Hopi Guides (Pilles 1973). The earliest recording of Grand Canyon archaeological sites occurred in the late 18<sup>th</sup> and 19<sup>th</sup> centuries. Friar Francisco Garces recorded the first observations of local populations in 1776 (Coues 1900). Garces resided with the Havasupai for four days conducting ethnographic observation. Major John W. Powell explored the Colorado River from 1869 to 1871. Major Powell recorded eight archaeological sites along the river from the Little Colorado River to Tapeats Creek (Stanton 1965). Robert B. Stanton conducted a land survey from 1889 to 1890 to determine the engineering feasibility of a railroad along the course of the river. Stanton recorded four archaeological sites at the mouth of Nankoweap Creek, sites at the base of the Tanner Trail, near the mouth of the

Little Colorado River, and near Lava Canyon (Walker 1974:9).

Many prominent Southwest archaeologists worked at Grand Canyon in the early 20<sup>th</sup> century. Neil Judd surveyed land on the north rim in 1915 and 1926 (Judd 1917, 1926). Judd surveyed along the Walhalla Plateau, the Kaibab Plateau, and inner Canyon locations (Walker 1974:11). Leslie Spier worked with the Havasupai from 1918 to 1921, compiling the first definitive ethnography of the Havasupai (Spier 1918, 1928). Lyndon L. Hargrave of the Museum of Northern Arizona conducted excavation at the Pittsburg Village Site south of the Grand Canyon (Hargrave 1938). Hargrave speculated that the village, comprised of semi-sedentary farmers, was occupied between AD 900 AD and 1100. The dominant ceramic type found consisted of San Francisco Mountain Gray Ware. As a result of the excavations in this area, Hargrave developed a new cultural division termed "Cohonina" (Walker 1974:29).

John McGregor excavated 16 Cohonina sites near the Grand Canyon Village, South Rim in 1949. McGregor defined many additional characteristics of the "Cohonina." McGregor identified San Francisco Mountain Gray Ware as the dominant ceramic type and dendrochronology dates indicated an occupation of the area between AD 750 and 1050. McGregor suggested a Cohonina/Havasupai connection based solely on similarities in geographic location (Walker 1974:34).

Other archaeologists such as Walter Taylor, Douglas Schwartz and Robert Euler conducted numerous archaeological projects from the 1950s through the 1980s. Intensive overviews of Grand Canyon archaeology are available in several publications (Ahlstrom et al. 1993; Euler 1967; Euler and Chandler 1977; Euler and Taylor 1966; Fairley et al. 1994; Jones and Euler

1979; Schwartz 1957, 1958, 1960, 1963, 1966, Schwartz, Chapman, and Kepp 1980; Schwartz, Kepp, and Chapman 1981; Schwartz, Marshall, and Kepp 1979; Taylor 1958).

#### PREVIOUS ARCHAEOLOGICAL RESEARCH IN REACH 5 OF GRAND CANYON NATIONAL PARK

Previous archaeological work in the immediate vicinity (Reach 5 and the surrounding rim country) extends back to the early 1920s. George West surveyed Lipan Point, Bright Angel Creek and excavated near Cape Royal in 1923 (West 1923). West located five sites on the south rim near Lipan Point including Tusayan Ruin. He also conducted excavations on the North Rim at Cliff Spring.

Emil Haury and Harold Gladwin excavated Tusayan Ruin in 1930 (C:13:124). The archaeologists discovered eight habitation rooms arranged in a "U-shape" surrounding a plaza. Two kivas were recorded in association with the ruin and the pueblo was dated with dendrochronology between AD 1170 and 1205 (Gladwin 1946; Haury 1931). Haury and Gladwin termed the occupants of the ruin as "Proto-Kayenta." Tusayan Ruin is located directly above the Palisades/Tanner stretch of the river on the south rim. In addition to excavating Tusayan Ruin, Harold S. Gladwin and Emil Haury led the first professional survey around Desert View in 1930. They recorded approximately 100 sites in the vicinity. E.T. Hall Jr. surveyed the Walhalla Glades in 1937 (Hall 1942). Hall's 40 day survey, covering six square miles of the Walhalla Plateau, discovered 273 sites ranging from single room and multi-room structures to series of checkdams and garden terraces (Hall 1938, 1942). Using ce-

ramic data, Hall speculated that the prehistoric "Anasazi" occupation in the Walhalla area started in AD 700, peaking around AD 900 to 1100, and ending around AD 1200. He suggested a mixing of the Virgin River peoples with the "resident Anasazi" populations on the Walhalla Plateau. Hall attributed the population decline around AD 1100 to pressure from an unnamed third group of people. He suggested that the people depopulating the North Rim moved to sites on the South Rim, such as Tusayan Ruin (Walker 1974:25). Walhalla Plateau is located on the rim country directly above Unkar Delta and Furnace Flats.

Walter Taylor was the first professional archaeologist to conduct a survey down the Colorado River. Talyor and a group of scientists from the Museum of Northern Arizona discovered one site at South Canyon (C:05:001), three sites at the mouth of Nankoweap Creek, the Hopi Salt Mines (C:13:003), the Unkar Delta Complex (C:13:001), the Bright Angel Site (B:16:001), and three habitation sites at Deer Creek (Taylor 1958). Taylor believed that due to lack of arable land and geographic isolation of the river corridor, few sites existed along the Colorado River in Grand Canyon National Park.

Joe Ben Wheat and Pat Wheat conducted excavations of site G.C. 505 near Tusayan Ruin in 1954. Wheat excavated a shallow circular Cohonina pithouse, a group of related storage pit, and two rooms located a few meters west of Tusayan Ruin. The site was dated between AD 700 and 900 (Wheat and Wheat 1954).

Douglas Schwartz surveyed Nankoweap Canyon in June 1960. Schwartz and a crew of two recorded 47 sites consisting of thirteen one-room habitation structures, twenty-one multi-room habitation structures, four sherd scatters, eight agricultural

alignment areas, and one granary. Schwartz speculated that the puebloan population of Nankoweap Canyon began about AD 1000 with a migration of people from the North Rim region, peaked around AD 1050 to 1100, and declined by about AD 1200 (Walker 1974:49).

In 1963 Schwartz surveyed the Colorado River from Nankoweap Creek to Unkar Creek as well as the north side canyons of Nankoweap, Kwagunt, Lava, Unkar and the Little Colorado River Canyon. The three participants recorded 21 sites (Schwartz 1965). Schwartz speculated from the survey that people occupied the area as early as AD 900 until around AD 1150. Schwartz believed that the farmers and gatherers of the large northern deltas were affiliated with the people occupying the north rim of the Grand Canyon. He based this assumption on the similarities between ceramic types and architectural styles.

Robert Euler and Walter Taylor revisited the areas that Schwartz had recorded on his earlier survey in 1965. The archaeologists recorded additional sites along the river including the extensive site AZ C:13:010 at Furnace Flats (Euler and Taylor 1966).

Schwartz and the School of American Research performed excavations at the Unkar Delta in 1967 and 1968. Schwartz discovered 52 sites on the delta of which many were tested or excavated. Extensive excavations on the Unkar Delta provided information about Puebloan occupation in the area from AD 875 to 1200 (Schwartz, Chapman, and Kepp 1980). The earliest occupation on the delta lasted from approximately AD 875 until AD 1050. The site composition of this time period consisted of small structures in areas of high agricultural potential. The second occupation of the Delta (AD 1050 to 1130) indicated a much larger group of

people organized into small "population units" specializing in different tasks for the benefit of the larger community (Walker 1974:69). The third occupation of the Delta began at around AD 1130 and is marked by site locations on the delta that exhibited the least amount of arable land. Schwartz believed that this site locational shift represented a move to maximize the amount of arable land for agriculture (Walker 1974:70). The social units of this period appear less autonomous than the previous period. The abandonment of the delta occurred around AD 1200.

Schwartz completed a north rim survey and excavations on the Walhalla Plateau in 1969. The archaeological crew recorded and excavated on the Walhalla Plateau between Cape Royal and Greenland Lake (Schwartz 1970). The excavations on the Walhalla Plateau represented the first intensive study of North Rim occupations. Schwartz identified the first occupation of this area between AD 875 and 950. The sites in this period consist of small settlement units, usually one-room habitation structures concentrated in areas of rich agricultural potential. The next occupation period spanned AD 950 to 1050, marked by a slight shift in site location to the south. The third period between AD 1050 and 1150 included a 400% increase in the number of sites and a trend toward larger sites. Between AD 1130 and 1200, the number of sites dramatically decreased suggesting a decline in agricultural productivity (Walker 1974:74).

Schwartz, Marshall, and Kepp (1979) excavated the Bright Angel Site (B:16:001) in 1969. The pueblo consisted of four contiguous habitation rooms, two storage rooms, and associated kiva. The archaeologists suggest an occupation of the Bright Angel Delta beginning around AD 1060. Total

abandonment of the site occurred between AD 1150 and 1190.

Peter J. Pilles discovered 53 sites during an intensive systematic survey covering 352 sq. acres at the Grand Canyon Village, South Rim in 1973. Pilles suggested that from AD 700 to 1000 the Grand Canyon Village area was inhabited by both Kayenta and Cohonina people. Archaeologists discovered most of the Cohonina sites near the rim and Kayenta sites in pinon-juniper areas, near small valleys conducive to agriculture. Kayenta and Cohonina sites were generally small. Minimal evidence for the Archaic and Historic were also discovered on the survey (Pilles 1973).

Trinkle Jones completed a 293 hectre survey for agricultural systems on the Walhalla Plateau. Jones recorded 84 sites of which over half had water control systems, checkdams, linear borders, grid borders, terraces, or reservoirs (Ahlstrom et al. 1993:193).

Trinkle Jones conducted an excavation project at Furnace Flats (AZ C:13:010) during the spring of 1984 (Jones 1986). Archaeologists at Furnace Flats excavated several structural features and collected floral and faunal remains, as well as lithic and ceramic artifacts. The collected prehistoric material culture indicates that Puebloans of the Kayenta Branch occupied the site from AD 850 to AD 1150. The projects led by Schwartz and Jones represent the most extensive excavation projects conducted in the Reach 5 area along the river corridor. Furnace Flats is located approximately one mile downstream from sites (AZ C:13:343, C:13:347, and C:13:349) on the north bank and approximately 5 miles downstream of C:13:099.

Janet R. Balsom performed a clearance survey and data recovery project along the Desert View Waterline in June 1984. During the 115.3-acre sur-

vey archaeologists discovered 32 archaeological sites, 25 of which were wholly or partially within the waterline corridor. Limited test excavations were performed at 17 sites in the summer of 1985.

Fairley and Balsom conducted survey and testing on a reconstruction project of State Route 64 on the East Rim Drive in 1989 (Fairley and Balsom 1990). The 100% survey covered the length of the road from 1.8 miles east of Grandview Point to the turn-off at Tusayan Museum. A 50 meter wide corridor, 25 meters on each side of the road was surveyed for 7.0 miles, covering 149.1 total acres. A total of 38 sites were located within the corridor. Testing was conducted at site AZ I:1:53 which contained Archaic, Pueblo, Protohistoric, and recent use of the area.

Monitoring archaeological sites in the river corridor began in the 1970s by Robert Euler. Although a comprehensive survey was not conducted until 1990-91 (Fairley et al. 1994), many sites were identified along the river by helicopter reconnaissance and occasional raft trips. Monitoring initially consisted of general remarks about a site's overall condition. In the 1980s monitoring was increased to a yearly assessment of "known sites" in the river corridor. Occasional data recovery work was performed on an emergency basis throughout Reach 5 (AZ C:13:291, C:13:323).

During the 1990-91 survey, several charcoal samples were extracted from various features in Reach 5. Additional charcoal samples were taken during geomorphological and archaeological research conducted by Hereford and Fairley (Hereford 1996). The RCMP has conducted the most extensive data recovery projects and monitoring in this reach since 1984 (Leap 1995d, Leap 1996c, Leap 1999c, Leap 1999d, Leap n.d., Leap and Kunde 1997, Leap and

Yeatts 1998, Leap, Yeatts and Kunde 1999b, 1999c, Yeatts 1998).

The RCMP proceeded with feature-based data recovery projects by mitigating impacts to features in imminent danger of obliteration. One of these efforts is the subject of this report.

#### SITES IN THE IMMEDIATE VICINITY

Table 1.1 displays the twelve sites that are within one mile of AZ C:13:099. Table 2 shows the 20 sites within one mile of AZ C:13:343, C:13:347 and C:13:349.

The cultural, geographical, and temporal context of this area can be summarized as follows. The majority of cultural affiliations (18 of 32 identified components, or 56%) were identified as Anasazi or Ancestral Puebloan. Two other sites were identified simply as belonging to the prehistoric "Formative" stage of cultural development (AD 400-1200; 6% of identified components), and one site (3% of identified components) was affiliated with the Cohonina archaeological culture. Nearly all sites (25 of 32, 78%) were dated in whole or in part to the time period after AD 950. One site (3%) was placed in the Archaic stage of cultural development (2500 BC to AD 400), and six (19%) were either of unknown temporal affiliation, or were "aceramic" sites that might have been created prior to the advent of ceramics in this area (i.e., prior to about AD 550). Two of the sites post-dating AD 950 were historic Euro-American structures. Most sites are rather small in extent and have a limited number of features or structures. Nine of 32 sites

(28%) were classified as "small structure" sites, and nine (28%) were considered to be either a single "roasting feature" or "thermal feature." Only three sites (9%) were characterized as a "pueblo," and two each (6%) were considered to be either a "multi-complex" or "roasting complex" site.

These data suggest that in this reach of the Grand Canyon River Corridor (the Palisades area of Reach 5), the most intensive period of cultural activity that resulted in the formation of archaeological sites took place during the 11<sup>th</sup> through 13<sup>th</sup> centuries AD. Most material remains can be attributed to Ancestral Puebloan culture, though some belonged to the geographically adjacent Cohonina culture. Sites in this area tend to be small, consisting of small structures or individual roasting features or thermal features of unknown form and use. Most sites are accompanied by ceramics, but some have chipped stone and other artifacts in the absence of ceramics. There is some suggestion, from the presence of at least one definite Archaic age site, that activities in this reach of the canyon certainly pre-date the use of ceramics and may pre-date the cultivation of crops. This Archaic site and other aceramic sites open the possibility that there may be stratified or multi-component sites whose earlier components might be obscured by more highly visible later remains such as ceramics and masonry structures. This possibility has important implications when considering the meaning of the results of the excavations reported in this volume, particularly regarding deeply buried features and relatively early radiocarbon dates.

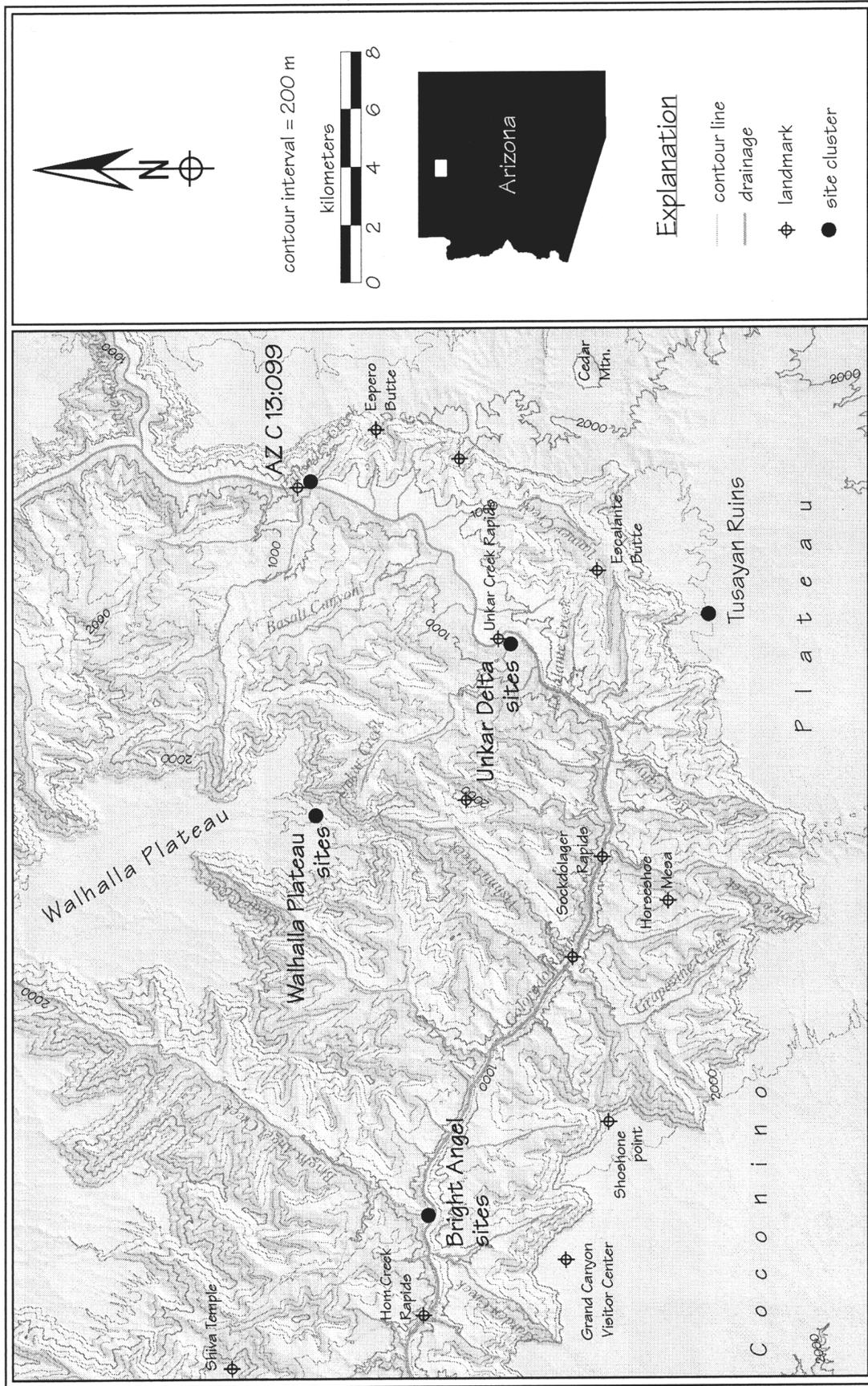


Figure 1.1. Major site clusters in the Reach 5 area of Grand Canyon National Park.



TABLE 1. 1.

SITES WITHIN ONE MILE OF AZ C:13:099

Site No. (AZ)	Property Type	River Bank	Primary Cultural Affiliation	Primary Temporal Affiliation	Secondary Cultural Affiliation	Secondary Temporal Affiliation	Tertiary Cultural Affiliation	Tertiary Temporal Affiliation
C:13:007	Small Structure	R	Anasazi (Ancestral Puebloan)	AD 1050-1200	.	.	.	.
C:13:033	Small Structure	L	Anasazi (Ancestral Puebloan)	AD 400-1200	.	.	.	.
C:13:098	Historic Structure	L	Euro-American	AD 1900-1945	.	.	.	.
C:13:100	Pueblo	L	Anasazi (Ancestral Puebloan)	AD 1000-1150	.	.	.	.
C:13:101	Multi-Complex	L	Formative	AD 950-1050	.	.	.	.
C:13:272	Small Structure	L	Anasazi (Ancestral Puebloan)	AD 1000-1150	.	.	.	.
C:13:275	Historic Structure	R	Euro-American	AD 1885-1915	.	.	.	.
C:13:332	Small Structure	L	Anasazi (Ancestral Puebloan)	AD 1050-1100	Euro-American	AD 1900-1945	.	.
C:13:334	Multi-Complex	L	Cohonina	AD 950-1050	.	.	.	.
C:13:336	Thermal Feature	L	Anasazi (Ancestral Puebloan)	AD 1050-1150	.	.	.	.
C:13:355	Roasting Feature	L	Paiute	AD 1200-1600	.	.	.	.
C:13:384	Thermal Feature	R	Anasazi (Ancestral Puebloan)	AD 1000-1050	Aceramic	AD 1200-1850	Euro-American	AD 1885-1915

TABLE 1. 2.

SITES WITHIN ONE MILE OF AZ C:13:343, C:13:347 AND C:13:349

Site No. (AZ)	Property Type	River Bank	Primary Cultural Affiliation	Primary Temporal Affiliation	Secondary Cultural Affiliation	Secondary Temporal Affiliation
C:13:008	Pueblo	L	Anasazi (Ancestral Puebloan)	AD 1000-1200	.	.
C:13:009	Pueblo	R	Anasazi (Ancestral Puebloan)	AD 1000-1200	.	.
C:13:092	Historic Structure	R	Anasazi (Ancestral Puebloan)	AD 950-1050	Euro-American	AD 1885-1915
C:13:321	Roasting Complex	R	Unknown	Unknown	.	.
C:13:325	Roasting Feature	L	Formative	AD 400-1200	Euro-American	AD 1900-1930
C:13:327	Roasting Feature	L	Archaic	2500 BC-AD 400	Anasazi (Ancestral Puebloan)	AD 1050-1150
C:13:328	Small Structure	L	Unknown	Other/Unknown	.	.
C:13:338	Roasting Complex	L	Aceramic	Aceramic/Unknown	.	.
C:13:340	Roasting Feature	L	Anasazi (Ancestral Puebloan)	AD 1000-1150	.	.
C:13:342	Historic Structure	L	Euro	AD 1900-1930	.	.
C:13:344	Roasting Feature	L	Aceramic	Aceramic/Unknown	.	.
C:13:345	Small Structure	L	Aceramic	Aceramic/Unknown	.	.
C:13:346	Small Structure	L	Anasazi (Ancestral Puebloan)	AD 1100-1200	.	.
C:13:348	Artifact Scatter	L	Anasazi (Ancestral Puebloan)	AD 1100-1200	.	.
C:13:350	Roasting Feature	L	Aceramic	Aceramic/Unknown	.	.
C:13:351	Artifact Scatter	L	Anasazi (Ancestral Puebloan)	AD 1100-1200	.	.
C:13:352	Artifact Scatter	L	Anasazi (Ancestral Puebloan)	AD 1050-1150	.	.
C:13:356	Small Structure	L	Anasazi (Ancestral Puebloan)	AD 400-1200	.	.
C:13:357	Small Structure	L	Anasazi (Ancestral Puebloan)	AD 1050-1150	.	.
C:13:358	Roasting Feature	L	Anasazi (Ancestral Puebloan)	AD 1050-1100	.	.

## CHAPTER 2. RESEARCH DESIGN

The primary objective of data recovery is to prevent the loss of site specific archaeological information. Discussed below are some of the broad research issues that are behind the data recovery projects discussed in this report. It needs to be recognized however, that because of the restricted and impacted nature of the remains that are the focus of this project, the research issues that can be fully addressed at any given site are limited. Instead, the information collected will most likely be used as a piece of what will become a larger data set that can ultimately be used to address these stated research goals. Under each of the topics, the types of research questions and hypotheses to be investigated, as well as data requirements will be discussed (Leap, Yeatts and Kunde 1999c).

### RESEARCH TOPIC 1: CULTURE AND TEMPORAL ISSUES

Under this research domain is definition of cultural and/or ethnic identity through time and the same issue through space. It is clear that the material remains, including individual artifact types, styles, assemblages, and site types present in the Grand Canyon vary between the eastern and western ends of the Canyon and similarly vary through time. Currently, the cultural and/or ethnic basis for this variability in the archaeological record is not well categorized nor understood in either of these dimensions.

By looking only at the spatial dimension and holding time constant, what, if any, is the relationship between people living in the different portions of the Canyon during any given time period? To begin addressing this question requires the selection of a group of

traits in the material culture that can be used for representing the group. Which traits are selected may vary depending on the specific research questions being posed. For southwestern archaeology, the types of materials used to produce ceramics and the designs that they are adorned with have traditionally stood proxy for cultural groups. While this trait set has obviously been used very successfully by archaeologists, its ability to identify groups that would have recognized themselves as a cohesive unit is unknown. Be that as it may, ceramics will likely be one of the most sensitive indicators to use in the Grand Canyon to define areas where geographical, political, or other mechanisms have allowed people to utilize the same set of resources in the same manner. Likewise it may also limit their use by unaffiliated groups. As the definition of groups through space falls more within the subject of research topic 2, Boundaries, this aspect will not be expanded on here. Suffice it to say that how these areas are defined will influence broader interpretations of interaction, be it between cultural/ethnic groups or internally within a group.

Taking instead a single location or section of the Canyon through time, a different picture emerges. At different times, groups utilized the same resource base in varying ways to earn a living. In order to understand these varying, culturally defining approaches requires both chronological information and an understanding of how the immediate environmental setting was being manipulated. From an archaeological standpoint, data requirements include information on the resources that were being processed at the site, the processing technology (in the form of tools, feature morphology, etc.), and ap-

proaches to shelter. This information should be viewed as minimal information for addressing larger issues of culture. As a working hypothesis, however, it can be proposed that distinct cultures will not generate an identical suite of remains when faced with the same environmental setting. An approach to testing this is to examine a range of sites in an area known to have been utilized by different cultures at different times and determine the respective range of cultural manifestations. For this to be valid, multiple site types need to be grouped to form a representative sample of the broader lifestyles.

## RESEARCH TOPIC 2: BOUNDARIES

While derived from and greatly intertwined with the previous research issue, boundaries have enough separate geographic (rather than solely cultural/temporal) dimensions that it will be addressed separately. Although discussed separately there is still recognition of the implications on research topic 1 and vice versa.

The common view of the Grand Canyon as a major boundary is likely driven by modern society's heavy focus on automobile transportation, for which the Canyon is a major barrier. To the prehistoric and historic inhabitants of the Canyon, however, the Canyon itself was likely viewed as an opportunity and the Colorado River as an inconvenience to travel as opposed to a major boundary. This is not to say, however, that the River was without effect on the pattern of human distribution. At times of the year (such as spring runoff), it is quite possible that the River was a true barrier. In order to test the degree to which the river limited movement, several trends in artifact distribution can

be hypothesized. First, if the River was acting as a boundary, assemblages from sites that are temporally and functionally the same should manifest differences on each side of the River. This may be reflected in ceramic assemblages that include more types associated with areas to the north or south of the Canyon (e.g. Tusayan series to the south, Virgin series to the north). It may also imply a representation of resources that are differentially distributed due to a mostly north facing aspect to the south of the river and the opposite on the north side. If this trend is manifest, the degree should be less pronounced in areas associated with cross-Canyon routes.

An ideal location to look for distinct patterning during the Pueblo II period would be in the Furnace Flats geomorphic reach of the river. In this stretch, there are enough habitation sites located on both sides of the river to provide large artifact assemblages for identification of statistically significant patterns. During later periods when distinct cultures are known to be utilizing the Canyon, any patterning between the north and south sides of the River may be due entirely to cultural factors. Knowing that separate cultures are responsible for distinct patterning of material remains, however, may be useful in assessing traits that are associated to cultural variability versus those associated with occupation focused on one or the other side of the River.

A second aspect of the boundary issue deals with cultural distinction along the length of the River. As with the previous potential north-south postulated patterning, the picture is clearer during the late prehistoric- protohistoric-historic period. Because groups with distinct cultural/ethnic identity are known to have used particular areas, the remains are more easily attributed to a given group. During

the prehistoric period, only broad distinctions in material culture are recognized, and the boundaries and realities between these areas are blurry.

During the later periods, distinguishing the extent of Pai, Paiute, Puebloan, Navajo, and other cultures' use of the areas is an important goal. This may be possible by employing a combination of ethnohistoric research and identifying diagnostic material traits in core areas and then tracking these traits into areas farther removed. Currently, the most frequently utilized and best-understood material for defining cultures in the Southwest is through ceramic artifacts. However, because ceramics are not present at many site types, a better understanding of other culturally distinctive artifacts, feature types, and site attributes is needed. This will aid in better evaluation of the possible presence of groups such as Pai, Paiute, and Navajo.

One feature class that has traditionally been overlooked, but that may be culturally diagnostic, is cooking features. These are potentially diagnostic of the presence of a particular cultural group, because the choice of foods to be prepared, their combinations, and the method of food preparation can be tied to cultural views of the appropriateness of particular food items and culturally-dictated methods for their preparation.

Similarly, access to certain material items by different groups may yield patterning that can be observed in artifact assemblages. Different cultural groups maintained different regional exchange ties, which resulted in distinctive combinations of material items from different sources. Obsidian, a material with multiple geographic origins, may be a particularly informative commodity to study in this respect. Correlating different sources of obsidian with different site types, time periods, and combinations of material items and fea-

tures may prove to be useful for identifying cultural affiliations of the people who created the sites on which it is found.

For the prehistoric period, it is unclear in the broader realm of archaeological theory what classes of material remains are accurate at revealing "true cultural/ethnic" identity. Therefore, boundaries may need to be developed based on catchment areas, and assume that those within the zone shared a greater affinity to each other than with those outside the zone. Currently this approach, on a broad scale, is at the heart of using ceramics to define groups. It is assumed that the people with access to the same catchment of raw materials were more closely related to each other than to a group utilizing a different set of materials. Similarly, those sharing the same concepts of design style would be more closely related than those utilizing a different concept.

Initially, basic data (feature morphology, site layout, artifact types and assemblage composition, etc.) need to be collected from various types throughout the Canyon in order to assess the degree of variability present. Given the current methodology of only mitigating portions of sites that are being impacted, focusing for comparative purposes at the level of the individual feature may be the most productive with supplemental information provided by analysis of surface artifact assemblages. Once a better understanding of the diversity present for various feature classes/site types is known attributes that manifest diversity through space can be used in combination to define the regional variability and establish territories.

A more specific research design can be developed for particular reaches of the river corridor due to the greater information known from previous archaeology projects. It is hypothesized

that the specific reaches of the corridor (such as Reach 5), at a given time period, will have a greater degree of cultural similarity than other portions of the corridor. This is because of the relative ease with which certain portions of the Canyon can be traversed at river level, compared to adjacent portions. At functionally equivalent sites in a specific reach of the River, similar frequencies of ceramic types, including both locally produced and exotic types, should be present. Similarly, there should be comparable frequencies of exotic ceramics, lithics, and other material items, because individuals participating in the cultural system within a given reach should be expected to maintain similar regional exchange ties.

If the River itself and its various reaches act as boundaries, as suggested above, then, in addition to the reaches of the river, the north and south sides of the River should be treated as separate entities, at least for the initial definition of groups. In some areas, these patterns of north-south difference may interact with the general east-west course of the river corridor itself. It would be interesting to examine the relative similarities of cultural remains along the stretch of river from Nankoweap to Bright Angel. While much more difficult to traverse at river level, the north side of the River shares common access to the Walhalla Plateau, which was most likely utilized by the same groups using the River corridor, at least on a seasonal basis (Schwartz, Kepp, and Chapman 1981:129). By comparing the Furnace Flats/Unkar Delta area ceramic assemblages with comparable assemblages from Nankoweap sites, an assessment could be made of the degree of relatedness for inhabitants of sites in this entire section of the River. If it is essentially a single cultural entity with a high degree of interaction, the frequency of ceramic types in the assem-

blages should be comparable. If they are separate populations, but have access to the same resources during part of the year (on Walhalla, the common element) then the ceramic assemblages should reflect a distinction in materials produced locally in the Canyon, but similarities when produced on the rim. Finally, if the relationships and connections within this section of the river could be developed, they could be compared to other areas outside this particular reach.

Quantifying the local production of ceramics is an area that has a great deal of potential to inform on relationship throughout the Canyon. Currently, the range invariability of the Shinarump series is not well known. It appears that there may be a local variety in the Unkar area. Schwartz, Marshall, and Kepp (1979) have even given it the separate type name Walhalla to distinguish it from the closely related Shinarump type, but this separation is not universally agreed to. Similarly, there are ceramics at Nankoweap that likewise are not of the classic Shinarump type, and their relationship to the Shinarump and Unkar area materials needs to be better defined. Refiring experiments may be helpful to determine the number of source areas involved by comparing Shinarump from the core area farther west, with the "good" Shinarump and local varieties at Nankoweap and in the Furnace Flats reach. Sampling of raw materials in the respective areas as well as some chemical characterization approaches may also be useful. These types of studies may quickly identify whether the sub-vitrification used in defining Shinarump has a basis in the origin of the production materials, culturally distinguishing firing technology, or is only characteristic that taxonomists have identified, but which is not reflective of any cultural patterning.

### RESEARCH TOPIC 3: RESOURCE PROCUREMENT, SETTLEMENT STRATEGIES, AND SEASONAL- ITY

One of the opportunities provided by the Grand Canyon is the availability of many ecological zones within very close proximity. Literally, it is possible to travel from a Sonoran desert ecological zone to a ponderosa pine/subalpine environment by foot in two to three hours. This allows for the cultural management of seasonality as a subsistence strategy. That is, it is possible to make a given season last much longer (or shorter) by exploiting its occurrence at different times based on elevation. It is known that during the protohistoric/historic period, both the Paiutes and the Pai peoples exploited this opportunity by maintaining settlement systems that were seasonally mobile, moving from the Canyon interior to rims seasonally (Schwartz 1983). It can be assumed that the earlier people who occupied the Canyon may have exploited the access to multiple ecological zones in a similar manner, but to what extent is not known with any certainty.

Agricultural dependence obviously has an effect on mobility, but to what degree it tethers a group to a specific location can be examined with the data from the Canyon. The following discussion is focused on habitation type sites. Non-habitation activity loci will obviously only reflect those limited activities and resources that were being pursued.

The information to be examined in assessing the tethering effect related to agricultural dependence, and therefore the effect on potential seasonal exploitation patterns, is twofold. First, the degree of reliance on agricultural products needs to be made. The most

direct approach is identifying the proportion of domesticated versus non-domesticated food and other items in the floral assemblage, the assumption being that the higher the proportion of domesticates the more reliance that was being placed on them.

Next, the degree of mobility needs to be assessed. This can be done by assessing the variability of the catchment area that is reflected in the overall assemblage of materials, both floral and otherwise. Going from one end of the spectrum to the other, the following hypothesized assemblages should be reflective of the degree of sedentism. If the group maintain a year-round habitation in a single location, the floral assemblage should be dominated by items available primarily within the catchment area of the site and contain the various items that become available in all the different seasons within the given zone. If on the other hand, the settlement pattern is highly mobile, the floral assemblage reflected at a given site should be restricted to those available in the given season of occupation. The longer the time spent at any given site the wider the range of potential resources that becomes available.

A confounding factor to these simple settlement systems is one that combines year-round occupation in one settlement with some, but not all, of the group seasonally relocating. This may be the best explanation for the Puebloan settlements seen at the larger delta areas. A continuous, year-round occupation is proposed for the sites in the Canyon and then the rims are seasonally utilized for a shorter duration by a subset of the population, with returns at the end of season. Identification of the seasons when there are occupations or hiatuses would be important in evaluating overall resource procurement strategies. Additional information that may yield clues to issues of

seasonality are to be found in architecture, such as the presence of ceremonial features that are used only in certain seasons, and presence of indoor hearths. Tribal research should be incorporated into the evaluation of all architectural and other remains.

An aspect of determining seasonal mobility, that of assessing catchment area is going to be critical in identifying settlement stability. As noted above, it is relatively easy to exploit a wide range of ecological zones with minimal travel. This will somewhat blur the resolution for defining catchment zones, but should not entirely obscure patterns. While it is possible to collect items from the rim to be used in the Canyon, and the opposite during a trip of short duration, it is unlikely that the entire range of resources from one zone will be transported to another. More likely, a single resource will be targeted when it is in season to supplement the more diverse locally available materials. To control for this, better characterization and definition of the distribution of resources may be needed. This may include genetic and stable isotope characterization of economic species currently in the Canyon to compare to the prehistoric assemblages. This will be discussed in the next research topic (4).

Once mobility and degree of agricultural reliance are determined, statements of the relationship between the two can be proposed. It is suspected that as agricultural reliance increases, mobility will decrease. The ultimate relationship between these two variables will have major implications on what a group does given changing environment conditions and how this is reflected in the archaeological record.

#### RESEARCH TOPIC 4: PALEOENVIRONMENT AND SPECIES DISTRIBUTION

It is probably safe to assume that throughout most of the prehistoric use and occupation of the Canyon, the environment was generally similar to what is now present. The ability to characterize it through archaeologically obtainable data is important for addressing a number of issues important for interpretation of prehistoric and historic patterns and to provide baseline information for other areas of research currently being conducted in the Canyon.

Agave has been hypothesized as one of the important wild resources to be utilized in the canyon (Hubbard 2000; Huffman 1993). It was of enough importance to become a trade item between the Havasupai and the Hopi. The ubiquitous thermal features, particularly in the western portion of the Canyon, have been popularly called "Mescal" or "Agave" roasting pits. Unfortunately, the true role of agave and how it relates to these thermal features is not known. Assuming that the roasting features are associated with agave processing, a number of hypotheses can be forwarded. First is that there should be more of this class of feature in the areas where agave is present. In the river corridor at least, this assumption does not appear to be the case. In fact the opposite appears true. Agave populations decrease to essentially zero in the areas, as this class of feature becomes the most common. This then leads several potentialities.

First, that the features were not used for roasting Agave. Ethnographic data suggests that this may be the case, at least for the Pai groups. The ethnographic evidence points out that many resources were being processed in this

type of feature, including meat, cholla, and prickly pear cactus. The Hopis, who likewise are in an area lacking agave, use subterranean ovens for roasting corn. At roasting features excavated at site UN-4 on Unkar Delta, and dating to 1100-1150, corn stalks were found in the pit (Schwartz, Chapman, and Kepp 1980). So there may be a temporal/cultural component to what was processed in the pits. In addition, it has been suggested that Whipple's yucca, which becomes common in the area that the roasting features also become more prevalent, was used in place of agave.

The second possibility is that the features were used for roasting agave, at least to some extent, and that the apparent lack of agave in the area where this class of feature is most common was either culturally resolved or is a more recent phenomenon. It may be that agave was collected at a distance from the roasting locations and brought in. Alternatively, agave may have occurred in the areas of the highest roaster density, but due to over harvesting, was extirpated. Finally, it may be that a cultivated species of agave was grown, but without continued human propagation, has died out. This possibility is suggested by the occurrence of two clone populations of an unnamed, likely domesticate variety of agave in the Canyon (Wendy Hodson, personal communication to Duane Hubbard, 1998).

In order to address these ranges of possibilities, the collection of two types of data is important. First, recovery of samples of the materials that were being processed in the roasting features is vital. Successful recovery of materials will go along way to answering the question of what the features were being used to process. Sampling should be conducted both within the features and on any paleo-surface sur-

rounding the features. Off site sampling may also be useful in addressing issues of the local paleo-fauna. In addition, it will be necessary to sample temporally, spatially, and ecologically discrete features to clarify whether any differences in materials processed are due to the culture using the feature, and or ecological zone in which it is located.

If agave is recovered from features in areas where it currently is not found, it will be important to attempt to identify where it originated. It is also important because this information will have implications on the procurement patterns and catchment areas (see research topic 3) which may also inform on cultural boundaries (research topic 2) when combined with chronological information.

In order to identify the origin of the agave, it will be necessary to not only identify where agave occurs near the sites of interest, but also to establish whether the nearest population is in fact the population from which the sample was derived. Ultimately, the development of a Canyon wide database characterizing the current agave distribution based on both morphological traits and on microscopic, chemical and genetic traits will be important in assessing the prehistoric assemblages. The importance of the microscopic, chemical and genetic characterization is that most agave remains from cultural contexts lacks the morphological traits necessary for traditional species characterization. Instead, evidence suitable for characterizing fiber or leaf fragments, possibly charred, will likely be necessary. Suitable techniques may include fiber characteristics, phytolith and oxalate crystal analysis, stable isotope analysis (which is suitable for charred specimens), and genetic work.

It is anticipated that characterization of agave populations as a sub-

species, sub-regional level is possible based on the variability that exists in the modern agave population throughout the Canyon. Not only are a number of species present, including the potentially cultivated variety mentioned above, but even within species, particularly the *Agave utahensis*, there is considerable variability dependant of location. In the eastern end of the Canyon, the species occurs mostly as solitary plants; by the central Canyon, it forms cloned groups. Once the modern variability is characterized, prehistoric examples can be compared to the modern assemblage and an evaluation can be made as to whether they fit into the current distribution, or if they may represent extirpated populations. In addition, this same approach could be employed for other culturally important species that show variability through the Canyon, including *Opuntia* sp., possibly mesquite, yucca, and other plants.

A second part of this research topic that potentially can be addressed by archaeologically derived information is in the categorizing the pre-dam, pre-colonial species distribution. For example, there is a dearth of information regarding distributions and life history information on the native fish in the pre-dam time period. As native fish remains have been previously recovered from archaeological sites in the Grand Canyon (Jones 1986) and in Glen Canyon, there is no reason to suspect that they will not be found at other archaeological sites in the Canyon. Any samples of fish remains should be considered to be a valuable addition, not only to our knowledge of the paleo-environment, but also to issues of resource utilization and possibly cultural affiliation based on food taboos.

## RESEARCH TOPIC 5: GEOMORPHOLOGICAL FACTORS AND SITE PRESERVATION

The record for human occupation and use of the Canyon is fairly continuous from about AD 600 onward. Prior to this period, however, there seems to be a nearly complete lack of people in the Canyon. There are several reasons why this might be the case. A first hypothesis would be that there truly was less use of the Canyon either due to lack of resources that were of interest or simply a lower population density. Alternatively, the apparent influx of people after AD 600 may only be the result of differential preservation; factors related to site preservation may be creating the perceived absence of people before this date. It may be that there are earlier sites present, but they are not routinely exposed because of their depth. There is some evidence indicating that this may be the case, including Archaic age materials being uncovered during excavations in 1983 (Jones 1986) and the presence of Archaic material in cave sites away from the River. It may be that some of the undated lithic scatters are in fact Archaic or older, but have gone unrecognized as such. Finally, it may be that prior to AD 600, there was a period of erosion (or no net deposition) that effectively removed evidence of earlier occupation and use.

In order to examine these competing hypotheses, it is necessary to identify and characterize those deposits that potentially predate the striped alluvium (Hereford et al. 1993). Initially the collection of chronological samples from deposits stratigraphically below the known Pueblo era sites will be of value. Further, collection of samples in the western Grand Canyon, where dating of cultural remains by means of diagnostic material culture is even less secure,

may identify deposits that predate the AD 600 period. Finally, more work is necessary at lithic scatters. A combination of analysis to identify the reduction technology and dating, where possible, can be employed to better understand this chronological issue. Further, there may be distinctive combinations of raw material types that characterize lithic assemblages from different time periods and from different cultures.

A final aspect of geomorphological research concerns the agents affecting deterioration and loss of integrity for

archaeological sites. Excavations have the potential to reveal the degree to which sites have been affected by factors such as sheetwash, lateral and downward cutting of arroyos and gullies, and aeolian stripping. A fine-scale understanding of geomorphological processes and their effects on specific archaeological features can complement the larger picture of erosional change that has so far been gained by geomorphological studies in the Grand Canyon (Hereford 1993; Hereford et al. 1993; Thompson et al. 1998).

## CHAPTER 3. EXCAVATIONS AT SITE AZ C:13:099

This chapter presents a description of the excavations at site AZ C:13:099 (Figures 1.2 and 3.1). The purpose of the chapter is to present basic information on the formal characteristics of the site, previous work, monitoring and remedial action history, geomorphic setting, field methods, form and contents of excavated units and features, and analytical results. A synthesis of the work conducted at the site, and a discussion of the significance of these results, will be presented in Chapter 7.

### SITE DESCRIPTION AND PREVIOUS WORK

Site AZ C:13:099 is located along a dune ridge near an abundant river cobble deposit in the "Palisades of the Desert" region of the eastern Grand Canyon. The site lies 56 meters from the base of the tamarisks, and 3.4 meters above the 28,000 cfs water mark of the Colorado River. The site has eleven identified features. These consist of two probable masonry structures (Features 3 and 5), a probable eroding pit house (Feature 11), and several eroding roasting pits or other types of thermal features (Features 1, 2, 4, 6, and 8). Two designated features (Features 9 and 10), once thought to represent possible cultural constructions, are now considered to be entirely natural accumulations of rock.

The site is dissected by numerous drainages, including two main arroyos that converge just down slope from Feature 1. One of the two arroyos originates from a natural impoundment of runoff that forms a seasonal water catchment. This feature, referred to as a

"playa" (Figure 3.1) rests at the base of steep cliffs of Cardenas basalt about 50 meters southeast of AZ C:13:099. During times of heavy rainfall, this playa fills with water and drains northwest into a major arroyo that cuts through AZ C:13:099. This runoff has had a devastating effect on the integrity of site AZ C:13:099, stripping surface sediments and leading to formation of abundant rills, gullies, and arroyos that cut through cultural features. A series of check dams have been built within the drainages of the site to stem erosion.

Site AZ C:13:099 site has been divided into two spatial areas. Locus A encompasses the eastern portion of the site. It consists of Features 1, 2, 7, 8, and 11. Locus B spans the western portion of the site, and includes features 3-6. As previously noted, two additional features (9 and 10) initially were recorded at the site but have since been rejected as cultural. Overall boundaries of site AZ C:13:099 as currently defined extend about 50 meters northwest-southeast and 20 meters northeast-southwest. The site is joined by several other archaeological sites in close proximity, including site AZ C:13:100, immediately north. Site C:13:272 lies farther north (north of C:13:100), and sites C:13:101, C:13:334, C:13:336 lie to the south of C:13:099.

Site AZ C:13:099 was initially recorded on July 11, 1978 by NPS archaeologists Robert Euler and Ann Trinkle-Jones. Their recording of the site included two of the features (Features 1 and 2) now included within Locus A. Euler and Trinkle Jones recorded several charcoal lenses and slabs eroding out of a "shifting sand

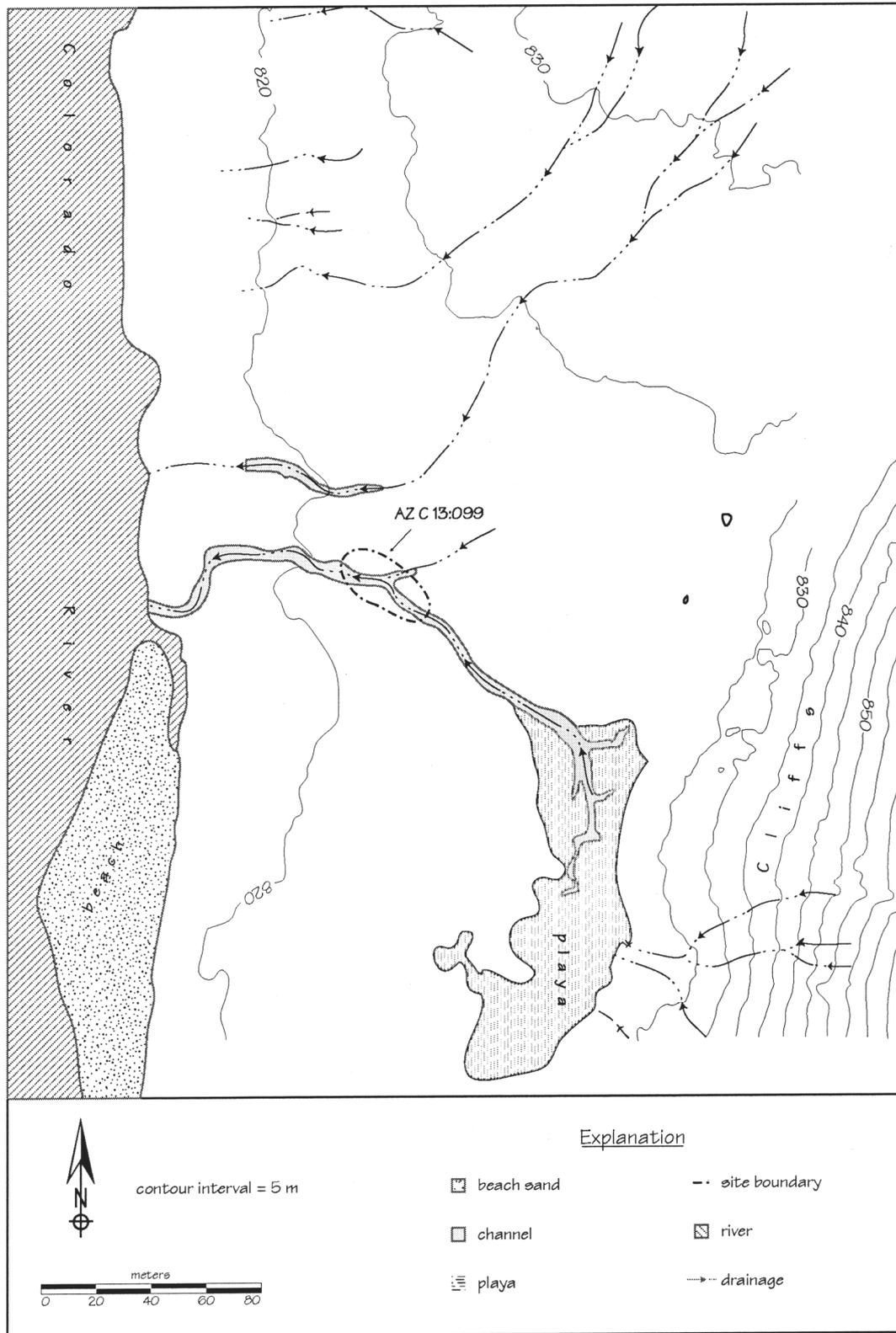


Figure 3.1. Physiographic setting of AZ C:13:099.

dune area with lower areas of mud flats cut by arroyos which deepen towards the river." They identified the site as "Kayenta Anasazi" (Ancestral Puebloan) with a temporal range of AD 1050 to 1100 based on tree-ring dated ceramic types. The physical condition in 1978 was termed "badly eroded."

NPS Park archaeologists Ann Trinkle-Jones, Janet R. Balsom and Doug Brown re-recorded the site in September 13, 1982. At this time the number of features recognized at the site was expanded, and the western component of the site was designated as Locus B (AZ C:13:099B). The 1982 crew recorded a masonry structure (probably Feature 5) and slabs within Locus B. The masonry structure consisted of one "good" wall ca. 3 meters in length. Other walls (possibly the feature now recognized as Feature 3) were recorded as "incomplete" with occasional upright slabs. The crew noted that AZ C:13:099 was badly eroded, with few artifacts visible. The archaeologists also noted a "wash" located south of the structure (Feature 5). In the south-facing slope of the "wash cut-face" was an area of "blackened deposits with charred wood visible and fire-cracked rocks." An organic sample was taken from the blackened deposits of Feature 4 at a depth of 0.6 meters below ground surface.

In the summer of 1989 researchers extracted carbon samples from an eroding hearth from an unspecified feature at AZ C:13:099. The sample date was reported to GRCA by geomorphologist Lisa Ely of the University of Arizona. The sample provided a calibrated age (95%) range of AD 1220 to 1450 (U of A #5363

During the 1990-91 Grand Canyon River Corridor Survey Project, archaeologists from NPS and NAU further defined Loci A and B and determined that the site extended over an area measuring about 25 by 40 meters

(Fairley et al. 1994). Archaeologists determined that the two loci (A and B) contained multiple fire-cracked rock features, collapsed and buried structures, and artifacts. Locus A contained Features 1, 2, 7, and 8. These features were observed eroding out of a dune-like area being cut by an arroyo. Sherds and Redwall chert flakes were noted. Ceramics observed during the 1990-91 survey suggested an Early-mid PII Anasazi occupation (AD 950-1050). Locus B contained a masonry structure (Feature 5) constructed of undressed sandstone and limestone river rocks. Another possible feature (Feature 4) was observed to be eroding just a few meters south.

In 1990-91 archaeologists observed charcoal eroding out of unspecified "slumped erosional slopes" of AZ C:13:099. Charcoal was also noticeable in Feature 1, then recognized as an artifact scatter/charcoal stain. C-14 samples were previously taken from a profile in the arroyo cutbank next to Feature 1. Cultural material was being exposed in arroyo that cuts through Feature 3, a structure eroding into the main arroyo. There was some confusion about this feature, as previous archaeologists identified it as a roasting pit. Radiocarbon date (PCRC5) for Feature 3 was calculated at 1170 +/- 60 BP; calibrated age 95% = AD 650-920. Feature 4 is another concentration of eroding charcoal and fire-cracked rock from which carbon Trinkle-Jones also retrieved samples in 1982. Feature 5 is a one-room structure with at least three well-defined walls. It measures approximately three by four meters and is built of undressed, irregularly shaped sandstone and limestone river rocks.

In subsequent monitoring visits conducted by the NPS-NAU RCMP crews, three additional features were located. These were slab-lined cists (Features 6, 7, and 8) exposed by ero-

sion of the arroyos that pass through the site. Features 6 and 7 were discovered in October of 1993. Feature 8 was discovered in an eroding arroyo in October, 1995.

In September 1998 archaeologists identified two possible rock features located near the "playa" beyond the southeast end of the site. These features were designated as Features 9 and 10. They have subsequently been determined to be natural accumulations of rock, and are no longer considered to be cultural features.

### MONITORING AND REMEDIAL ACTION HISTORY

The RCMP staff monitored AZ C:13:099 semiannually since FY93 (Coder and Leap 1993, 1994; Coder, Leap, Andrews, and Hubbard 1994, 1995; Coder, Leap, Andrews, Hubbard, and Kunde 1995; Kunde 1998; Leap 1995b, 1996a, 1997c, 1997e, 1998b; Leap and Hubbard 1996). Archaeologists have discussed the erosion of sites on the Palisades Delta for several decades. NPS/NAU archaeologists of the River Corridor Monitoring Project (RCMP) have intensively documented, evaluated, and prioritized physical and visitor-related impacts to archaeological sites in the river corridor since 1992. RCMP data indicate that AZ C:13:099 is one of the most highly impacted sites in the river corridor (Leap et al. 2000).

The site's primary physical impact is a large river-based drainage system. Monitoring activities have documented that this site is actively eroding and is in very poor condition. The drainage's channel is 4 meters wide, 1-2 meters deep and extends 100 m from a "playa" at the southeast end of site C:13:099 to the river (Figures 3.1-3.4);

Hereford 1993:12). The catchment that feeds the drainage system is 20,000 to 30,000 m<sup>2</sup> (Hereford 1993:19). Geomorphologists confirmed the accelerated erosion of the Palisades drainage system beginning in 1973 (Hereford 1993:20). Due to the site's geomorphic setting, geomorphologists have recommended data recovery for AZ C:13:099 since 1993 (Thompson et al. 1998:24).

FY94 monitors recommended trail work, installing check dams, total station mapping and subsurface testing. FY95 monitors recommended trail work, planting vegetation, installing check dams, subsurface testing, data recovery and total station mapping. In FY95 the GRCA trail crew performed trail obliteration work along the Beamer Trail, which relocated the hiking trail near the river to reduce visitor impacts to the site.

In September 1995 RCMP staff and representatives from state and federal agencies, and tribal entities constructed 44 check dams at AZ C:13:099 (Leap 1995c). AZ C:13:099 is the first location where Zuni-style check dams were built in the river-corridor. Archaeologists used a photogrammetric map (Hereford et al. 1993) for recording, prior to completion of a total station map in FY97. Each check dam was photo-documented before and after its construction with 35mm prints and slides. FY96 monitors recommended additional trail work and planting vegetation. Trail obliteration work was completed in FY97. RCMP archaeologists conducted additional monitoring efforts during the research flow of 1996 (Balsom and Larralde 1996). FY97 archaeologists recommended check dam maintenance and data recovery. FY98 monitors recommended data recovery,

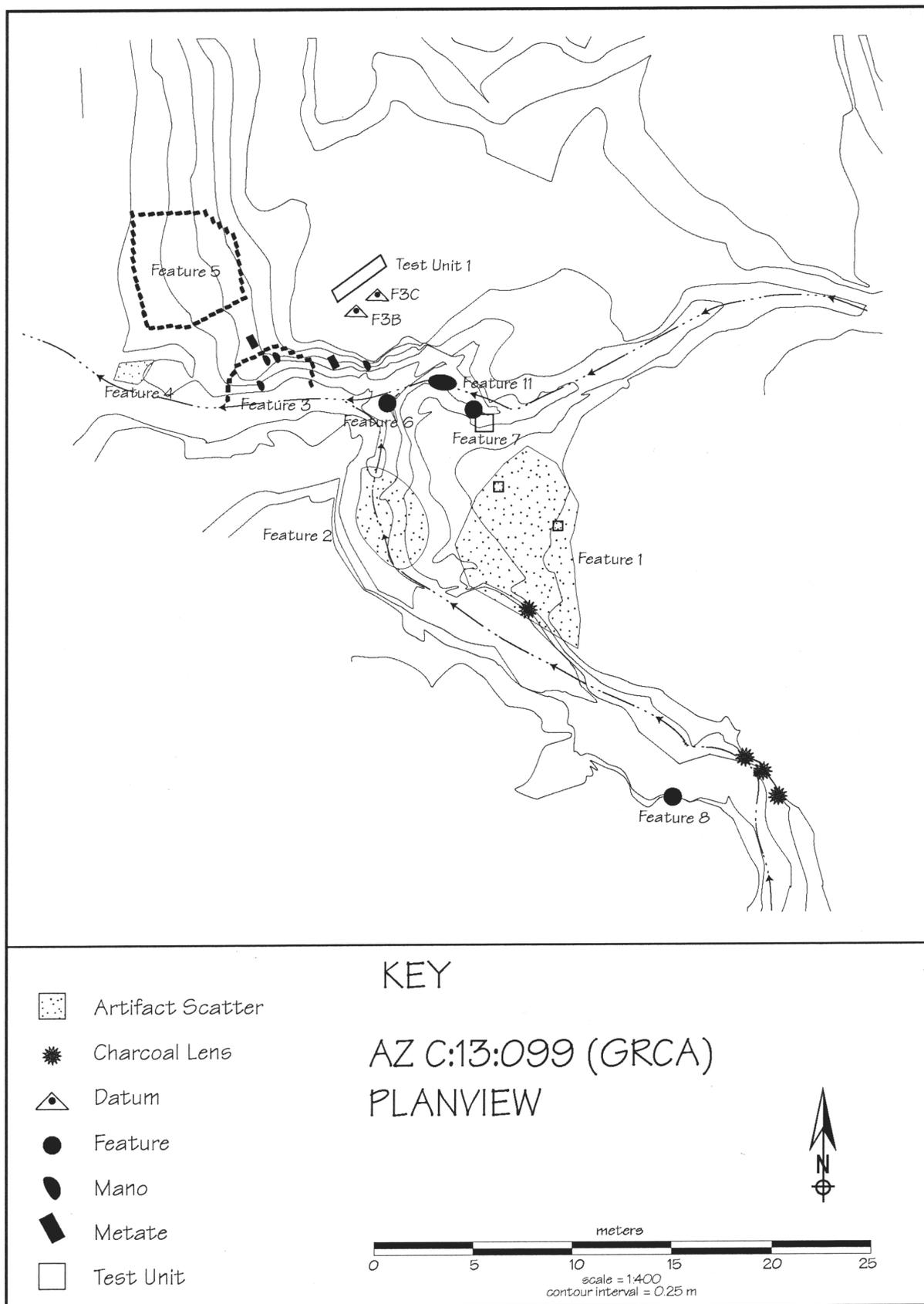


Figure 3.2. Plan view of AZ C:13:099.

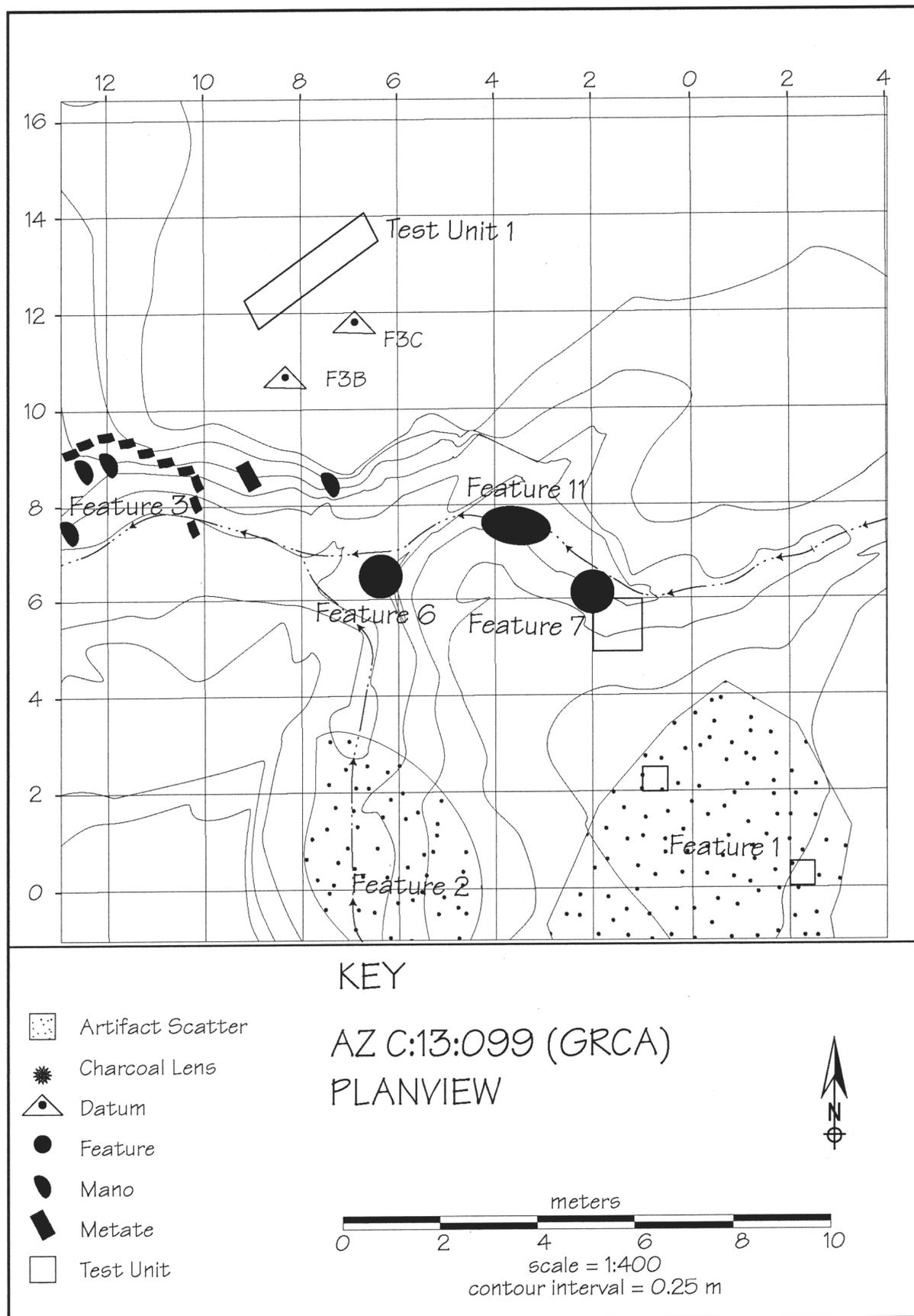


Figure 3.3. Plan view of AZ C:13:099 inset, showing detail of features and excavation units.

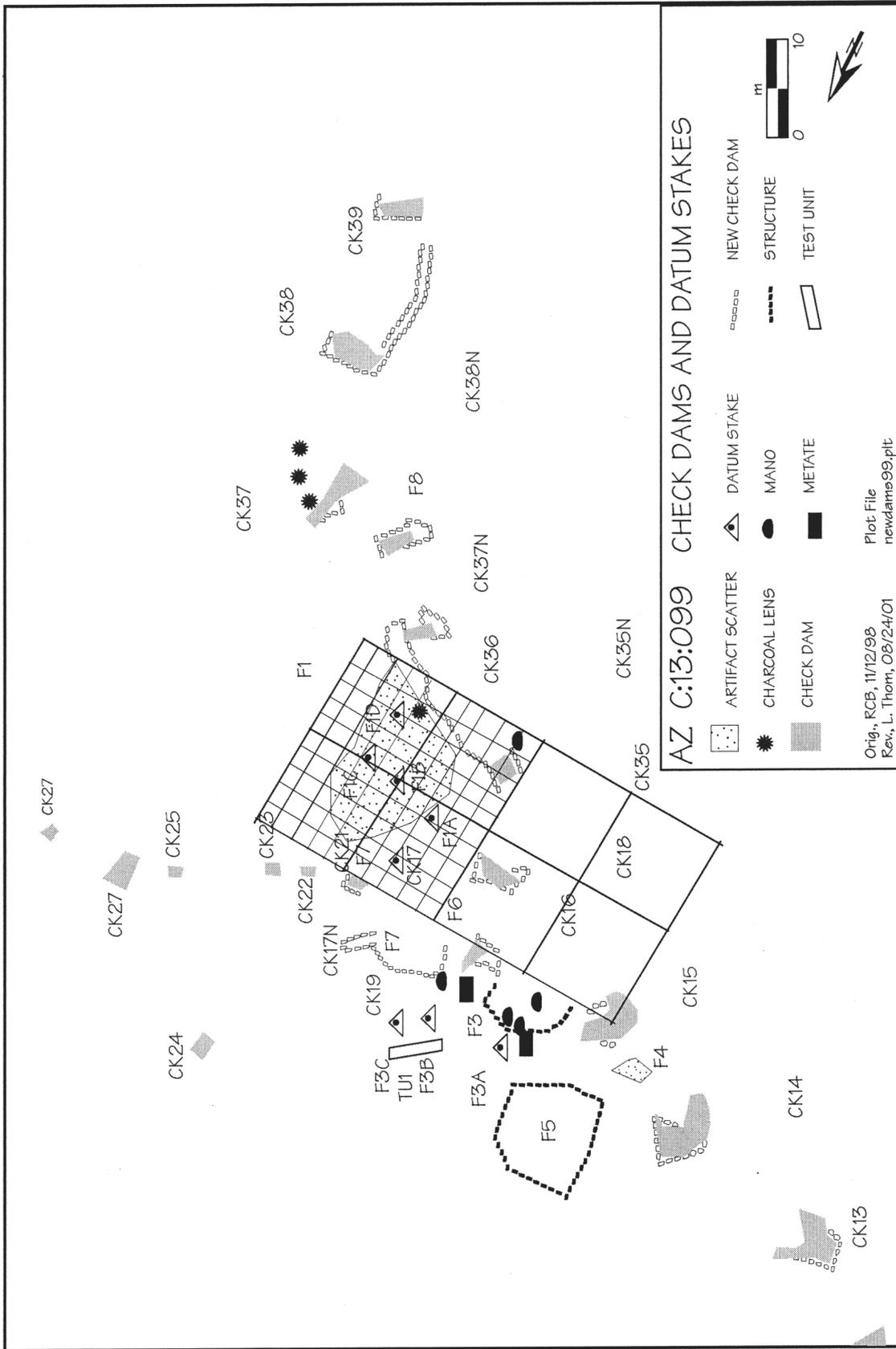


Figure 3.4. AZ C:13:099, features, grid, excavation units and check dams.

planting vegetation and check dam maintenance. Check dam maintenance projects were completed in FY97 and FY98 (Leap et al. 1997; Leap, Burchett, Kunde, Andrews, and Hubbard 1998). Monitors recommended medium format photography and projects were completed in FY95, FY96 and FY98 (Leap 1995a, 1996a, 1996b, 1998a). FY99 monitors recommended trail work, planting vegetation and data recovery.

### GEOMORPHIC SETTING

Site AZ C:13:099 is located in Reach 5 (Miles 61.6 to 77.4) on the Palisades Delta. Reach 5 extends 16 miles from the mouth of the Little Colorado River to Red Canyon and contains the most open and alluviated area of the river corridor. Also, the Reach 5 river channel is broader and shallower than any other reach in the Canyon. Figures 1.1 and 1.2 illustrate Reach 5 and the locations of AZ C:13:099, C:13:343, C:13:347 and C:13:349 in relation to Grand Canyon National Park.

Richard Hereford intensively mapped the surficial geology and geomorphology of the Palisades Delta in 1993 (Hereford 1993). The topography of the Delta is dominated by two debris fans of prehistoric and historic age. Fan-forming deposits from Palisades Creek created the Palisades Delta (USGS 95-57). Sand at Palisades formed several discontinuous terraces around the distal margins of the fans, ranging in age from the prehistoric to post-dam (USGS 95-97). The sand is extensively reworked by aeolian activity, forming coppice dunes that cover a large part of the underlying alluvium. Prehistoric alluvial deposits range in elevation from 823-825 meters around the margin of the fan (USGS 95-97:13). Large Colorado River floods and inter-

bedded debris-flow deposits form the alluvial units that contain AZ C:13:099.

The Palisades Delta contains a long geomorphic sequence as indicated by local stratigraphy and radiocarbon dates. First, deposition of striped alluvium began about 2769 BP until about 1700 BP, followed by erosion of alluvium and non-deposition until 1300 BP. Second, deposition of alluvium of Pueblo-II age occurred from 1300 BP until 800 BP with erosion occurring from 800 BP until about 600 BP. Finally, deposition of the alluvium of upper mesquite terrace occurred until about 1880. AZ C:13:099 is located in the alluvium of Pueblo-II age. The alluvium of Pueblo II age consists of very-fine to fine-grained, silty sand with an exposed thickness of 1 to 3 meters, interbedded with thin medium to light gray (N7) or moderate orange pink (10YR 7/4), poorly sorted granule to small pebble gravel with clay to sand matrix of debris-flow origin.

### AZ C:13:099 RESEARCH QUESTIONS

The work conducted at AZ C:13:099 addressed the same broad research topics as discussed in the previous section (Leap, Yeatts, and Kunde 1999a). Because little was known of the specific occupational history of the site, special emphasis was placed on culture and temporal issues. Also of particular interest was the topic of boundaries, specifically, the relationship between sites on the north and south sides of the river.

### FIELD METHODS AT AZ C:13:099

Archaeologists mapped the site with a total station and photo-documented all features prior to data

recovery. Excavations at AZ C:13:099 were guided by the placement of metric excavation units (usually squares measuring 0.5 by 0.5 meters) within features. The field crew used a combination of natural stratigraphic layers and arbitrary vertical excavation units to maintain vertical provenience control. Excavation of all units was terminated at culturally sterile except for Feature 3, where a test trench was used to explore the horizontal extent of the feature.

Archaeologists used a trowel and/or hand shovel and a 1/4" mesh during the excavation of cultural deposits. A 1/8" mesh was employed when appropriate, i.e., when excavating deposits containing obvious cultural material. Crew members identified artifact provenience by unit/feature, level and trench. Sub-feature exploration was conducted to determine if additional cultural deposits were present. Once the crew completed the excavation, the work area was backfilled, using methods to enhance the stability of the remaining portions of the site

During and following the excavation of particular units or strata, archaeologists documented all features in both scale drawings and photographs. All visual documentation was oriented to illustrate the morphological traits of each feature. As with all sites excavated during this project, crewmembers at AZ C:13:099 collected carbon, pollen, and flotation samples from appropriate contexts. Samples were collected that provided information on feature or site function, chronology, subsistence, trade, and relationships to other Grand Canyon cultural resources. These included such things as radiocarbon, dendro-

chronological, macrobotanical, pollen, and other types of samples

Archaeologists transported all artifacts to the RCMP office in Flagstaff for appropriate analysis and documentation as described below. Northern Arizona University student workers analyzed all artifacts recovered. Radiocarbon samples were sent to Beta Analytic, dendrochronological sample to the University of Arizona Lab, and macrobotanical and pollen samples to the Northern Arizona University Laboratory of Paleocology. Field and lab analysis forms and artifacts have been stored with the GRCA Museum Collection at the South Rim.

## EXCAVATION OF FEATURES AND UNITS AT AZ C:13:099

### FEATURE 1

Feature 1 (Figures 3.2-3.10) is an artifact scatter containing ceramics, lithics, and fire-cracked rock. An arroyo cuts through the feature's southern edge. Feature 1 extends to the arroyo cutbank where more artifacts and charcoal are exposed. Archaeologists created two arbitrary .5 by .5 meter excavation units, designated Units 1 and 2, to guide the excavation of Feature 1 (Figure 3.3). Unit 1 was excavated using arbitrary 10-cm levels for vertical provenience control. Archaeologists took elevation measurements from a datum with its top at 822.364 meters. Archaeologists excavated Unit 2 with arbitrary 20 cm levels, taking elevation measurements from a datum with its top at 822.242 meters.



Figure 3.5. AZ C:13:099, Feature 1, before testing .

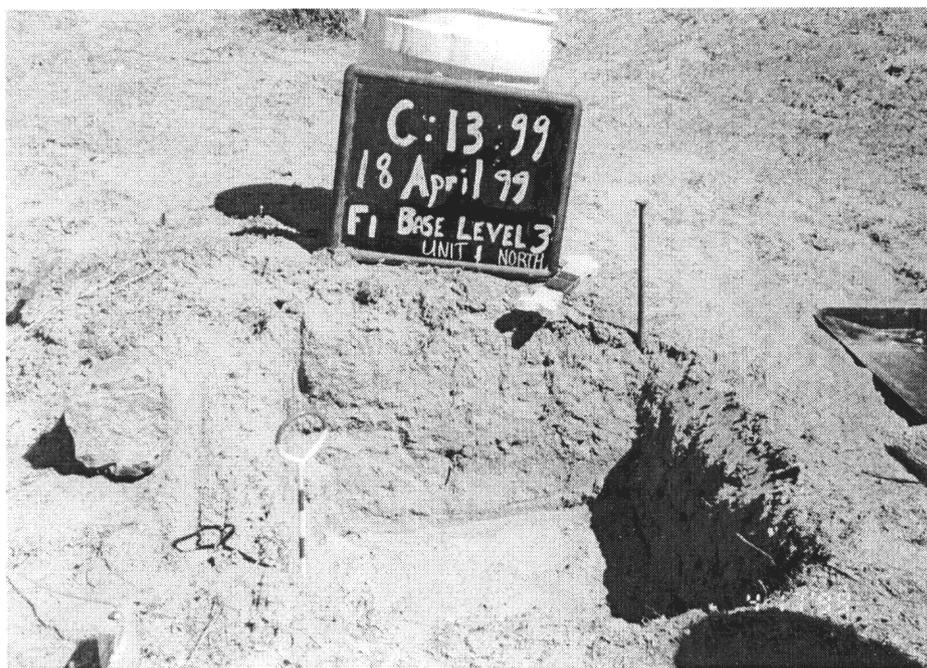


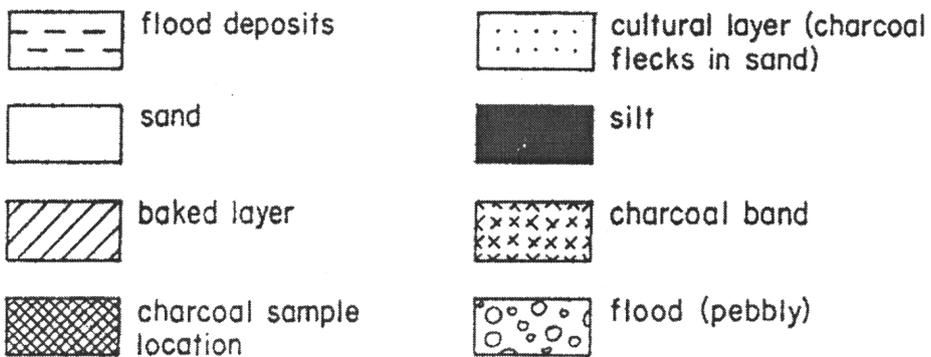
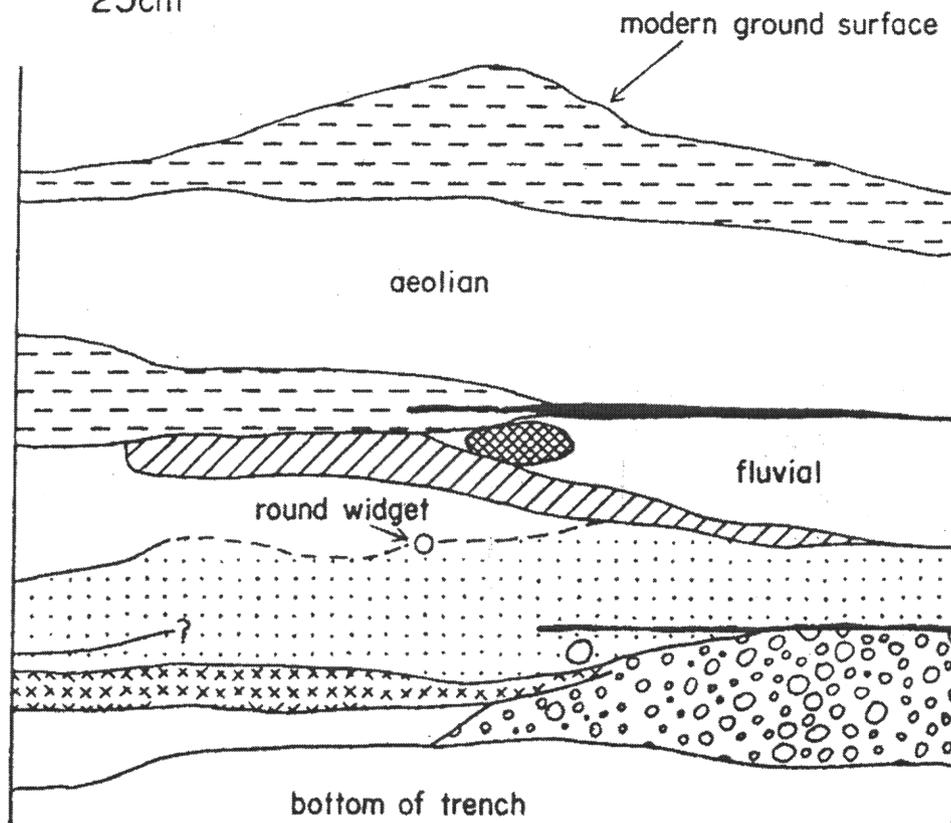
Figure 3.6. AZ C:13:099, Feature 1, Test Unit 1, Level 3, profile of north wall of unit.



*Figure 3.7. AZ C:13:099, Feature 1, Test Unit 2, profile of north wall of unit.*

# AZ·C·13·99 Locus A profile

0 25cm



Fairley/Hereford, 1991

Figure 3.8. AZ C:13:099, profile of Locus A (probably Feature 1).

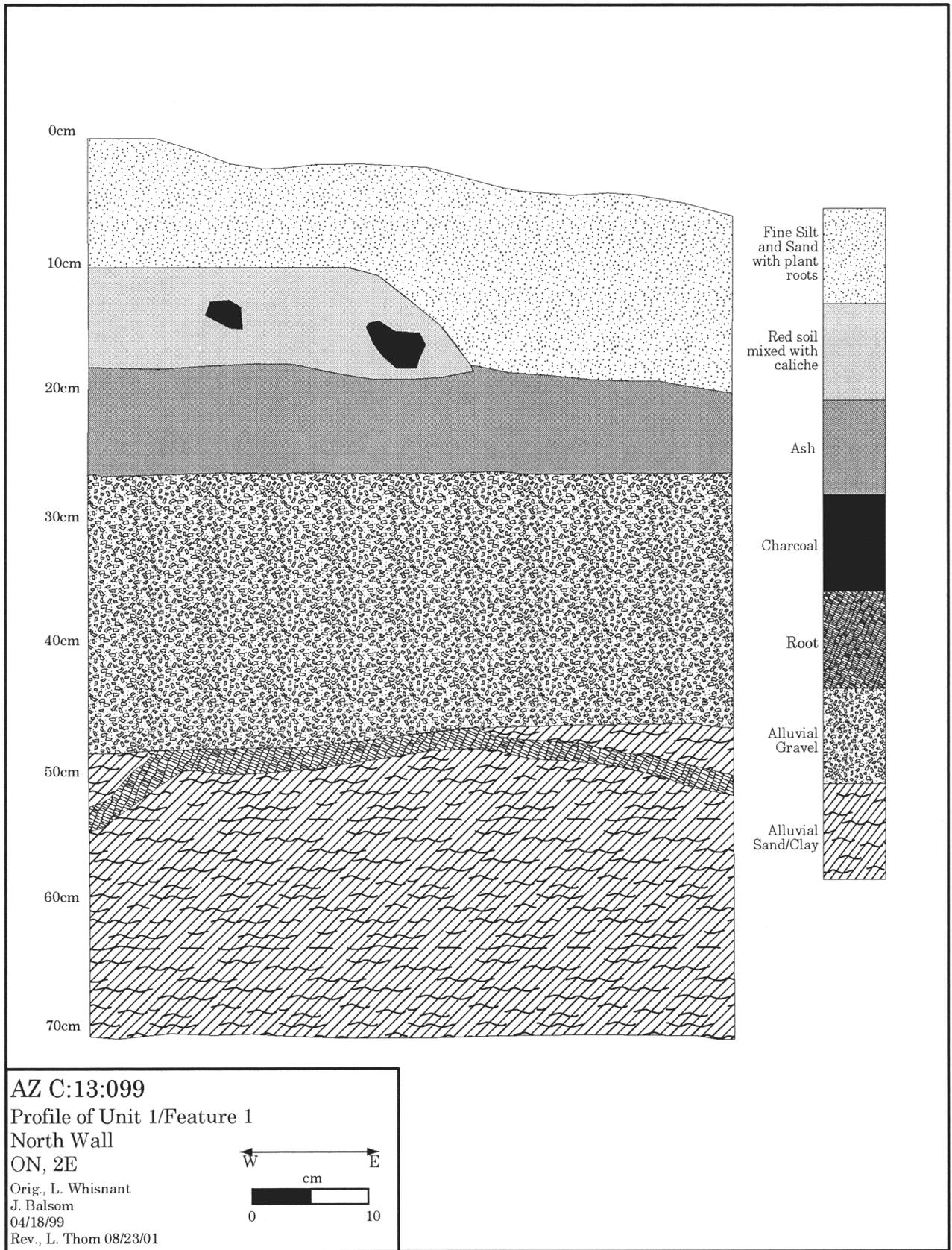


Figure 3.9. AZ C:13:099, Feature 1, Unit 1, profile of north wall of unit (looking north).

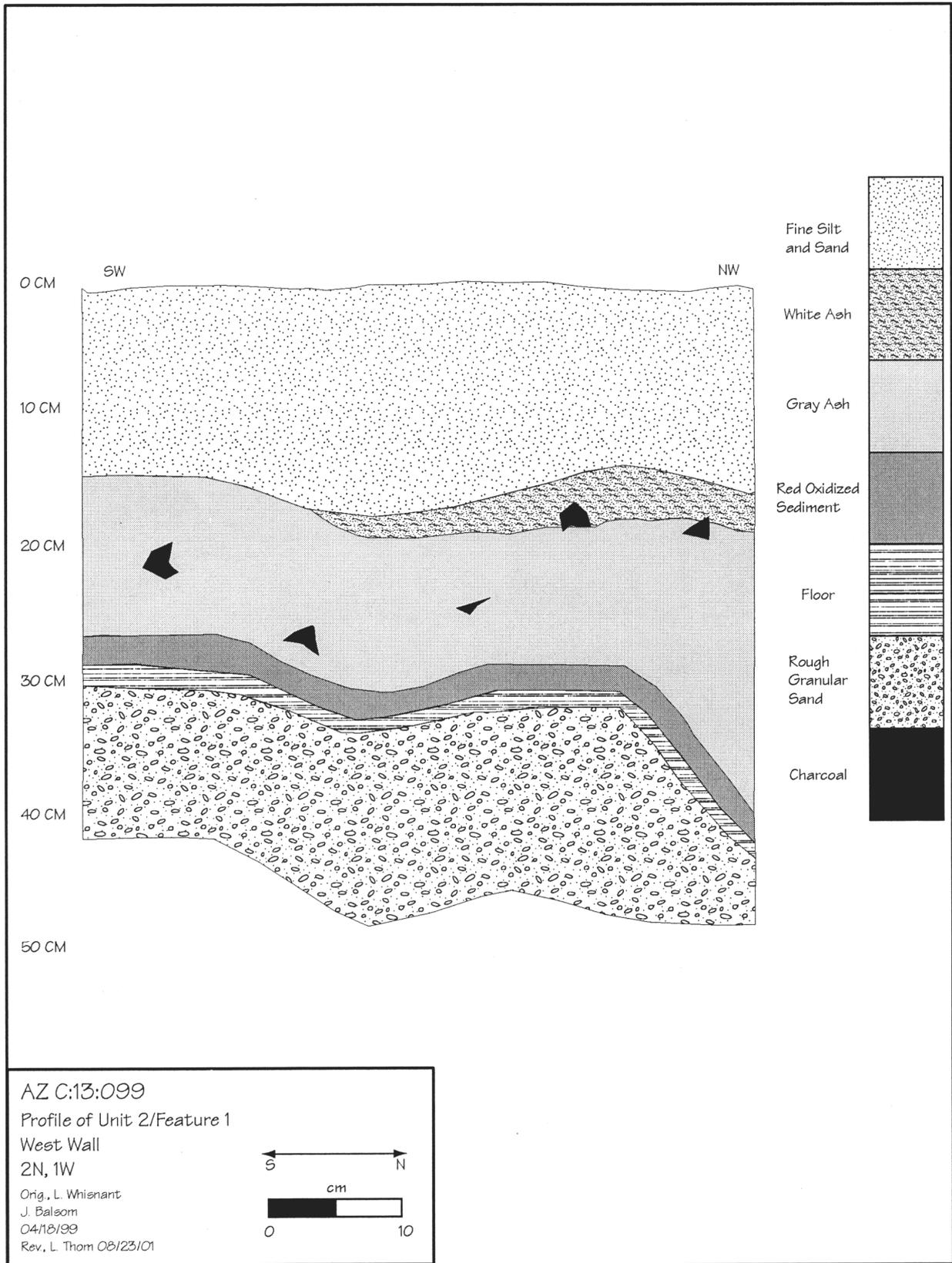


Figure 3.10. AZ C:13:099, Feature 1, Unit 2, profile of west wall of unit (looking west).

The fill and artifacts recovered from each level of these two units are described below.

### Unit 1

#### *Level 1 (0-10 cm)*

Level 1 was primarily made up of aeolian sand (Figure 3.9). A small piece of unidentified material was collected in Level 1 that may be vitrified charcoal. Also, archaeologists recovered one ceramic and one lithic.

#### *Level 2 (10-20 cm)*

Archaeologists discovered reddish fine sediment deposit in the upper portion of Level 2. A caliche layer was discovered mid way through the level. Small flakes of charcoal and organics were discovered throughout the level. No charcoal samples were taken. Archaeologists discovered a layer described in field notes as "ashy soil" at the bottom of the level. Nine ceramics, six lithic artifacts and two animal bones were collected.

#### *Level 3 (20-30 cm)*

The sediments of Level 3 consisted of sand and an ash layer (Figure 3.6). The ash layer tapered to the east part of the unit. Archaeologists defined an ash layer on the west unit wall at 15 cm BD (822.214 meters). An ash layer was identified at 3 cm BD on the east wall. Nine pieces of charcoal and three animal bones were recovered at this level. No other artifacts were recovered in Level 3.

#### *Level 4 (30-40cm)*

The sediments of Level 4 consisted of gravel, alluvial deposits and

reddish fine sediments. The ashy layer of Level 3 was not present in Level 4.

#### *Level 5 (40-50 cm)*

The deposits of Level 5 consisted of gravel, alluvial deposits and reddish fine sediments. One Tsegi Orange Ware sherd was discovered but may have fallen from an upper level. Level 5 was the end of the alluvial layer. Roots were located in the northeast corner at the base of the level.

#### *Level 6 (50-60 cm)*

Level 6 consisted of sand, small amounts of clay and reddish fine sediments. No artifacts were discovered, but one charcoal sample was taken from this level.

#### *Level 7 (60-70 cm)*

Level 7 contained gravel, sand, and small amounts of clay deposits. The sediments were moist and contained no artifacts or charcoal. This was the last level excavated in Unit 1.

### Unit 2

#### *Level 1 (0-19 cm)*

Level 1 was excavated beyond the 10 cm level until the ash layer discovered in Unit 1 was located (Figure 3.10). The first 20 cm consisted of aeolian sand with intermixed charcoal fragments. Four sherds and one lithic were discovered in this unit.

#### *Level 2 (19-30cm)*

Level 2 was excavated as a 10 cm level. Archaeologists discovered significant amounts of ash and charcoal fragments throughout the unit. An "in-

tense" layer of ash appeared at 822.072 meters to 822.052 meters. This layer grades into a light ash/sandy layer, dark gray in color. Four ceramics were discovered at this level.

#### *Level 3 (30-42 cm)*

Level 3 was excavated as a 10 cm level. Two ashy layers were noted in the north wall profile. A distinctive layer containing red, fine sediments was discovered at 821.892 meters. Three ceramic artifacts were discovered in this unit.

### **FEATURE 3**

Feature 3 is likely a structural feature based on the materials eroding from the arroyo cut bank (Figures 3.2, 3.3, 3.11-3.15). Feature 3 is eroding into the main arroyo about five meters southeast of Feature 5. There is some confusion about this feature, as previous surveyors have suggested that it is a roasting pit. However, surface observations and excavations in 1999 suggest that Feature 3 was in fact a structure. Items observed at the surface included ceramic sherds, chipped stone debitage, fragments of ground stone artifacts, burned rock, and ash. The burned rock and ash indicate that the structure probably represented by Feature 3 had burned.

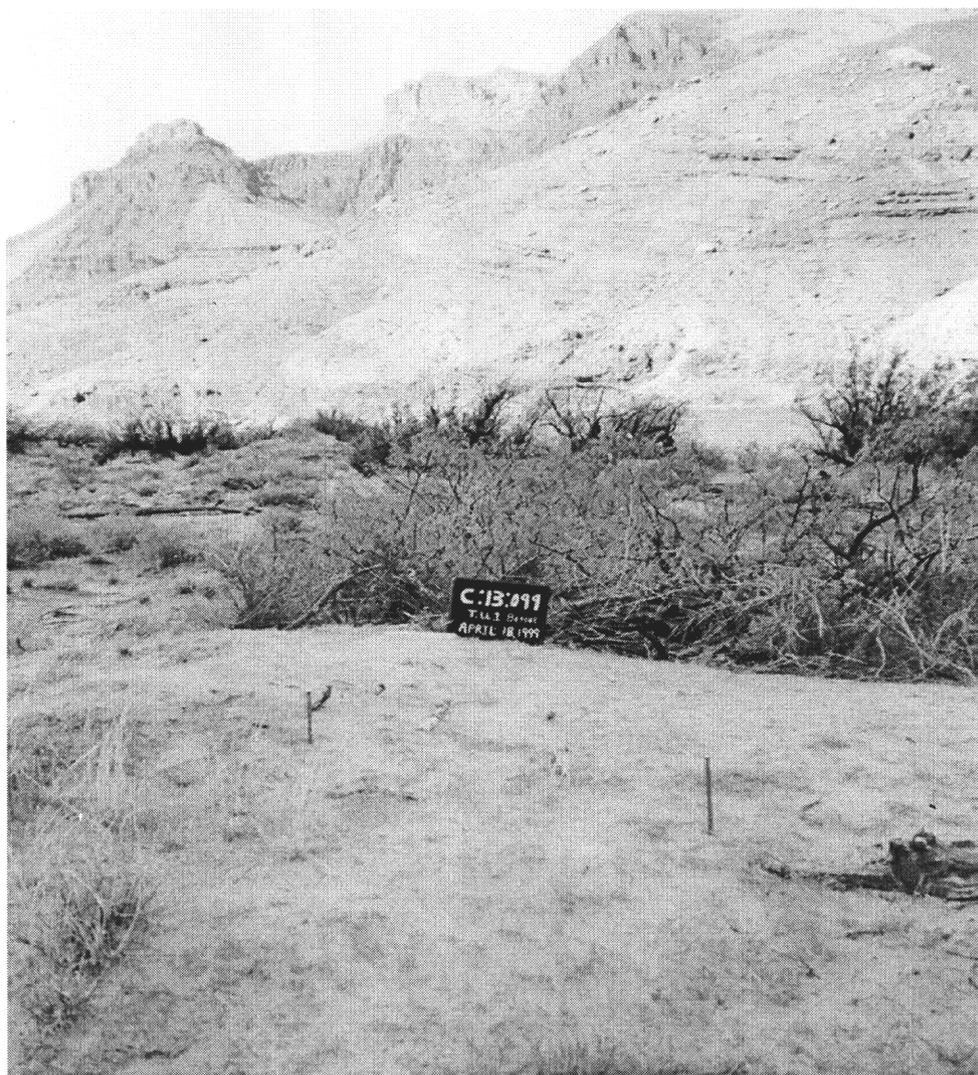
A previous radiocarbon date taken from Feature 3 suggests that the structure dates to the Pueblo I stage of Ancestral Pueblo development. A radiocarbon date (PCRC5) for Feature 3 suggested an age of 1170 +/- 60 BP; calibrated age 95% = AD 650-920. This feature is located under a relatively deep unconsolidated sand dune. In 1991, a profile of the arroyo cutbank was recorded (Figures 3.2, 3.3, and 3.13).

### **Unit 1**

Archaeologists excavated Feature 3 by creating a one by two meter trench running parallel to Datums B and C (Figures 3.2 and 3.3). The unit was excavated with a shovel and trowel, and excavated deposits were passed through a screen with a ¼ inch mesh. The southeast corner of the trench was established at 1.15 m north of Datum C. Archaeologists oriented the test unit at an azimuth of 235 degrees. Elevations were taken from Datum C (with its top at 823.088 meters). The purpose of excavating the trench was to allow archaeologists to ascertain if Feature 3 extended into the adjacent sand dune from its exposed profile in the arroyo. Portions of the Feature 3 were exposed in the active arroyo cutbank south of the test unit. Archaeologists compared the stratigraphic layers exposed in the arroyo to the stratigraphic sequence within the test trench.

#### *Level 1*

Due to the amount of overburden (aeolian sand) archaeologists approached the test trench using natural layers to define the stratum. Loose aeolian sand comprised the first 80 cm BD (823.088 meters to 821.288 meters). A gravel layer and the first artifacts were discovered at 80 to 83 cm BD. The sediments observed below 80 cm BD consisted of consolidated silt, sand and red fine sediments. Within this layer archaeologists began discovering charcoal fragments and burned pieces of wood. A large piece of burned wood was discovered 15 cm east of the west unit wall (102 cm BD, 822.068 meters). A large rock was encountered at 110 cm BD



*Figure 3.11. AZ C:13:099, Feature 3, Test Unit 1, between datums B and C, before excavation.*

# AZ·C·13·99b

## pithouse depression profile

0 40cm

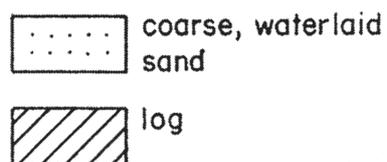
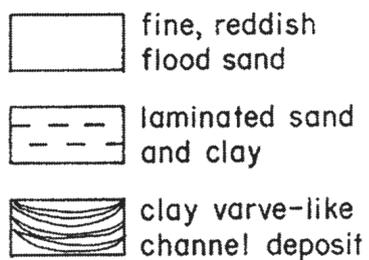
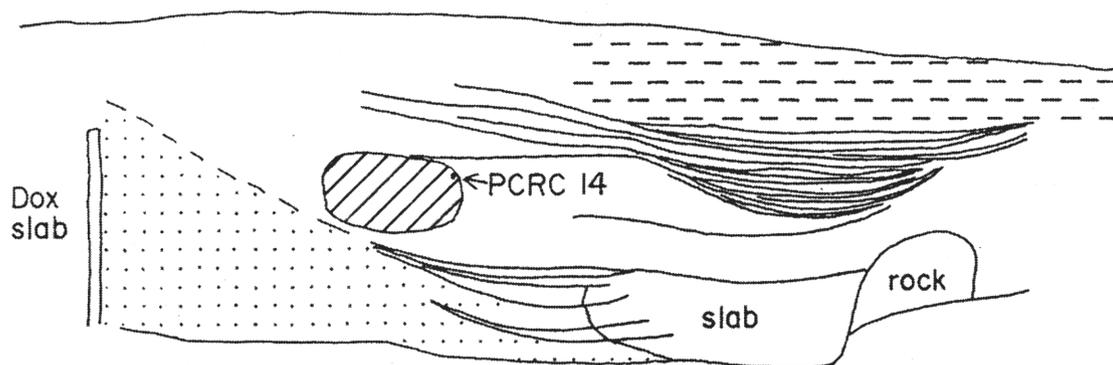


Figure 3.12. AZ C:13:099, profile of "pit house", Locus B (probably Feature 11 -- origin unknown).

# AZ·C·13·99b Feature 3 area profile

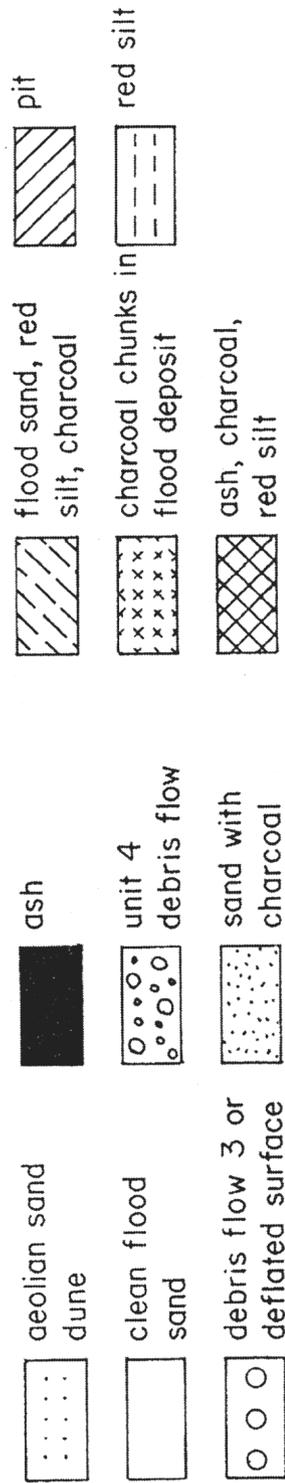
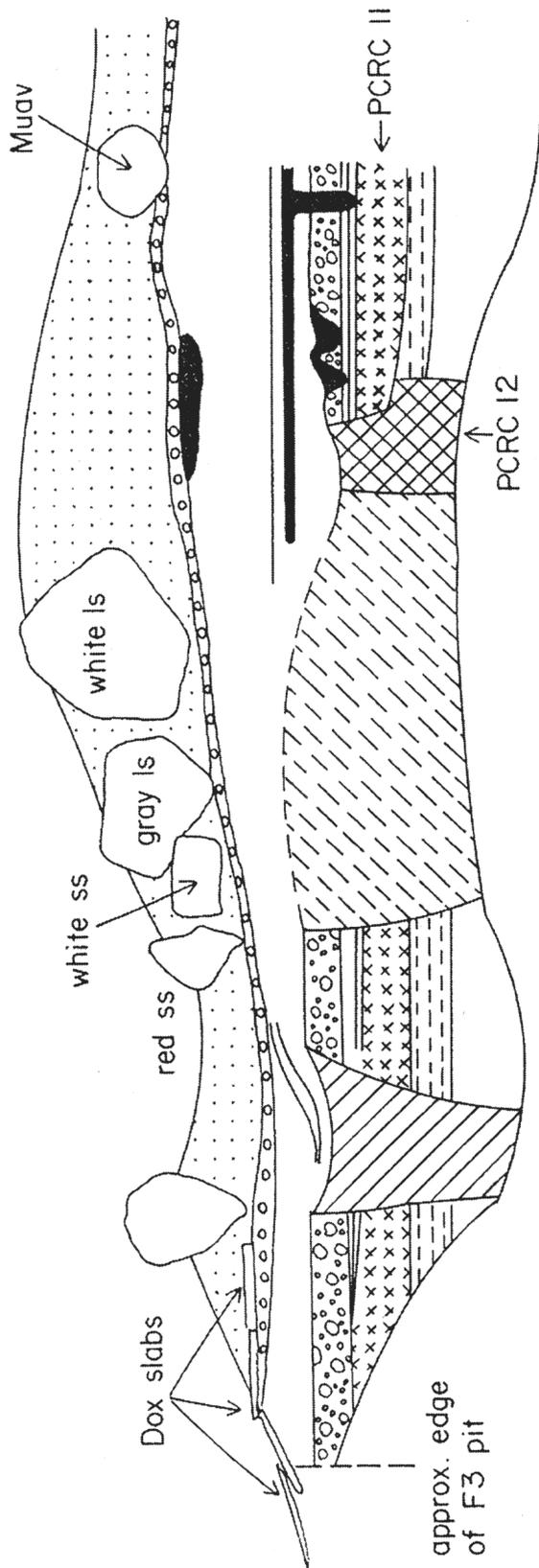


Figure 3.13. AZ C:13-099, Feature 3, profile made by Fairley and Hereford, 1991.

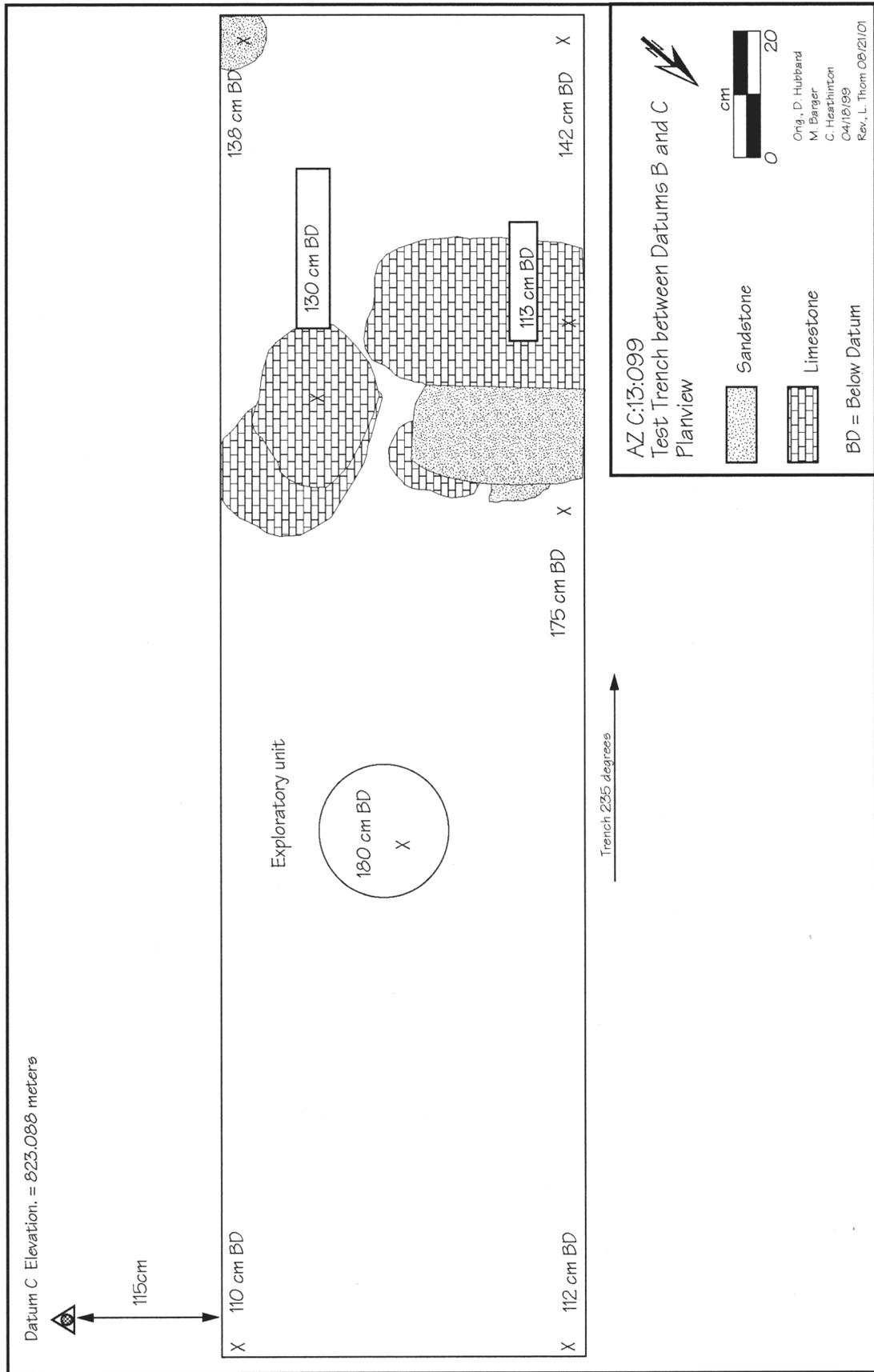


Figure 3.14. AZ C:13:099, Feature 3, plan view of Test Trench between Datums B and C.

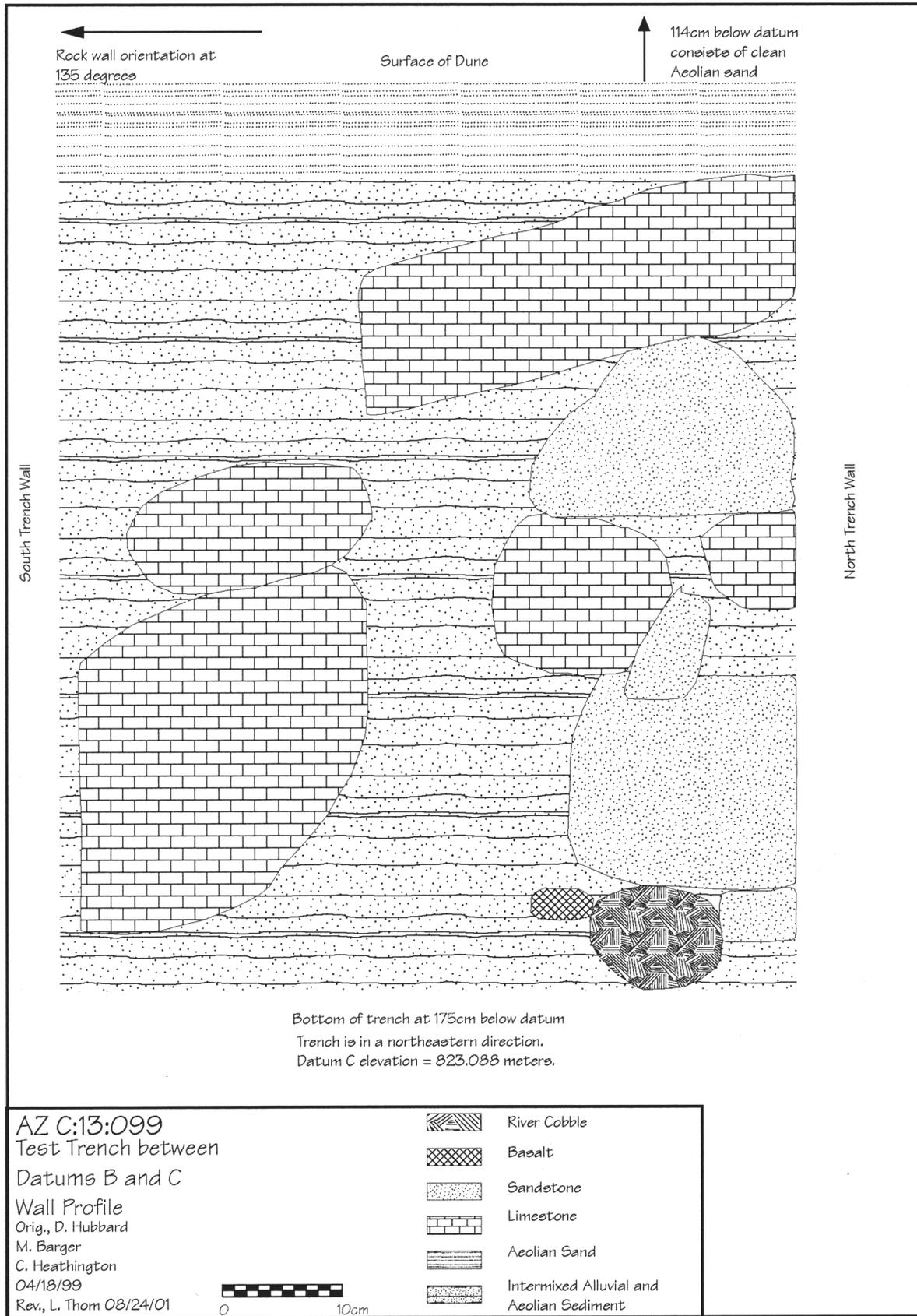


Figure 3.15. AZ C:13:099, Feature 3, profile of west wall of Test Trench (looking west).



Figure 3.16. AZ C:13:099, Feature 7, Test Unit 5N, 2W, datum F1B, before excavation.

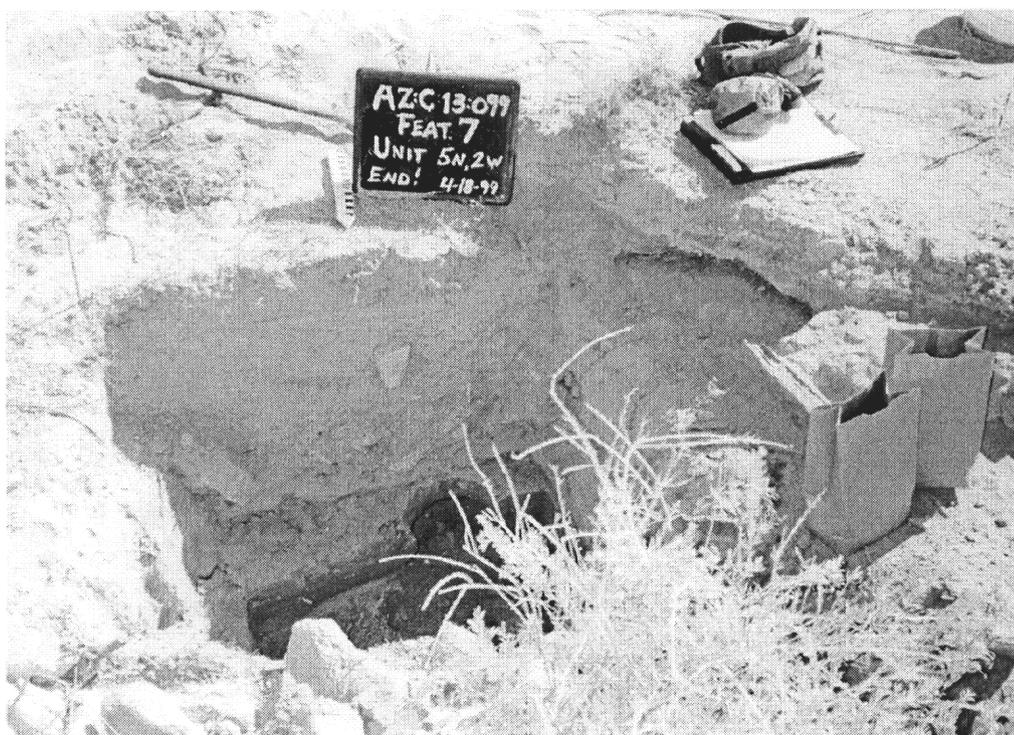


Figure 3.17. AZ C:13:099, Feature 7, Test Unit 5N, 2W, datum F1B, after excavation.

at 40 cm east of the west wall (821.988 meters). Shortly after the discovery of the first rock, second and third rocks were identified directly below it. The majority of artifacts, compacted sediments, and charcoal were discovered in the west half of the unit.

### *Level 2*

Archaeologists defined Level 2 when the sediments changed from aeolian sand to clearly identified alluvial/colluvial sediments in the unit. The Level 2 sediments on the east side of the wall alignment were red and contained more gravels than the same elevation on the west side of the wall. One sherd was found at 110 to 120 cm BD (821.988 meters to 821.888 meters). Charcoal chunks were intermixed throughout at this level. Wall courses 4 and 5 were discovered directly below the rocks found in Level 1. Course 5 was found at 170 cm BD (elevation 821.388 meters).

### **Test in Center of Unit 1**

At the conclusion of the excavation of Unit 1, a test hole (20 cm in diameter by 20 cm deep) was placed below the base of the 5<sup>th</sup> course of the wall exposed in Unit 1. The purpose of the test was to determine if a floor could be identified in association with the exposed wall. The test hole was taken to a depth of 180 cm below the top of the excavation datum (elevation 821.288 meters). No floor was discovered, and the sediments exposed were consistent with what had been discovered in Level 2.

### **FEATURE 7**

This feature (Figures 3.2-3.4, 3.16-3.17) appears to be the last vestiges of a slab-lined cist impacted by

an active arroyo. Because of the degree of disturbance, it was unclear whether the feature is a cist or portions of an upright slab wall. The intent of the testing at this feature was to identify the morphology of the feature and ascertain whether there were remaining intact cultural deposits.

### **Unit 1**

Archaeologists established a 1 by 1 meter unit on the top of Feature 7. Vertical provenience measurements were taken from the datum at an elevation of elevation of 823.740 meters. The unit was excavated using 10 cm arbitrary levels for vertical provenience control. Archaeologists used a shovel, trowel and 1/8 inch screen for Levels 1 and 2 and a 1/4 inch screen for Levels 3 to 6.

### *Level 1 (0-10 cm)*

This level consisted of the sediments from the ground surface and immediately below. The level comprised a small slice of sediment taken from the southeast corner of Unit 1. Deposits consisted of dry, sandy silt, becoming coarser at the bottom of the level. The coarser material was identified as the start of a colluvial pebble layer. Small fragments of charcoal were discovered, however, no artifacts were discovered.

### *Level 2 (10-20 cm)*

The sediments from this unit consisted of sand with very coarse colluvial sand lenses. Archaeologists discovered possible chunks of daub at the unit bottom. The daub likely originated from slope wash from Feature 1, and probably did not come from Feature 7.

#### *Level 3 (20-30 cm)*

Sediments of Level 3 consisted of sand, pebbles, red clay/silt, cobbles that measured about 10 to 15 cm in diameter, and small fragments of charcoal. These deposits were probably natural flood deposits. One stone flake was recovered from this level.

#### *Level 4 (30-40 cm)*

Level 4 sediments consisted of a red clay band with occasional patches of pebbles. A juniper fragment, about 10 cm long by 3 cm wide, was recovered. Dox Sandstone slabs and sandstone cobbles were located in Level 4 in the west half of the unit. Abundant gravel and pockets of clay existed throughout.

#### *Level 5 (40-50 cm)*

The sediments of Level 5 consisted of small fragments of tan, brown, red, well-consolidated debris flow material. Roots were abundant and minor animal burrowing was present. The unit's shape was changed to one meter (east to west) by 0.70 meters (north to south). Archaeologists recovered six ceramic sherds, one lithic artifact, and two historic items, a piece of purple glass and metal fragments, from this unit.

#### *Level 6 (50-75 cm)*

This was the last level excavated at Feature 7. The sediments of Level 6 consisted of tan, sandy-silt clay, and occasional pea-sized gravel where the artifacts were exposed. The west end of the unit contained more sand than the east. This level was still in disturbed context. Higher frequencies of charcoal fragments were

discovered at this level. Archaeologists discovered culturally sterile deposits at a depth of .89 meters below the datum (elevation 822.850 meters). A section of the unit was taken down to 1.17 meters BD (822.570 meters) to ensure that sterile deposits were encountered. Artifacts, including a coarse-grained sandstone mano fragment, were found intermixed with the debris flow deposits. A layer of sand was discovered at 1.04 meters below datum (elevation 822.700 meters). The tan sand layer appeared to alternate with bands of red clay-silt-sand

## DATA ANALYSIS

### PALEOETHNOBOTANICAL REMAINS

Two paleoethnobotanical samples were recovered from AZ C:13:099. The first, from Feature 1, was designated as Flotation Sample No. 12. This sample consisted of 2000 ml of excavation fill recovered from an ash layer above a burnt floor. The second sample, also from Feature 1, had a volume of 350 ml. It was taken from a deposit described as "upper ash."

Flotation Sample No. 12 produced small fragments of charcoal including some that were identified as conifer charcoal. Flotation Sample No. 13 produced bits of conifer charcoal and charcoal fragments identified as *Pinus* sp.

### RADIOMETRIC DETERMINATIONS

Prior to the 1999 work, several radiocarbon dates were obtained from materials recovered at site AZ C:13:099 (Ely 1989; Hereford 1993). In 1989, geomorphologist Lisa L. Ely of the University of Arizona Department of Geosciences reported recovery of a charcoal sample from "the exposed

wall of a gully running through Archaeological Site AZ C:13:99A. The sample was retrieved from a depth of 34 to 56 cm below the surface, from within a hearth on the surface of a "flood unit" (also referred to as a "paleoflood section"). The sample apparently came from an arroyo cut immediately south of Feature 1. This sample was designated as sample GC:Pal2, and was dated by the Laboratory of Isotope Geochemistry-Environmental Isotope Research at the University of Arizona. It yielded a conventional uncalibrated radiocarbon age of 610 +/- 100 BP, a 1-Sigma calibrated date of Cal AD 1280-1420, and a 2-Sigma calibrated date of Cal AD 1220-1450 (A-5363; Ely 1989).

In the early 1990s, USGS geomorphologist Richard Hereford visited site AZ C:13:099 and recovered radiocarbon samples for the purpose of reconstructing the geomorphological history of the Grand Canyon (Hereford 1993). The samples recovered by Hereford were assigned field numbers PCRC5 (field number 2-2), PCRC11 (field number 2-3), PCRC12 (field number 2-4), and PCRC14 (field number 2-5). All three samples were extracted from cultural deposits observed in cross-section in the banks of eroding arroyos. Sample PCRC5 was obtained from an arroyo south of Feature 3, from a location near the apparent west wall of Feature 3. Samples PCRC11 and PCRC12 were taken from the same arroyo cut, from the central interior of Feature 3. Sample PCRC14 was taken from an arroyo that cut through an apparent pit house (Feature 11; Figures 3.2, 3.3, and 3.13). Samples PCRC5 and PCRC14 were dated by the U.S. Geological Survey Radiocarbon Lab in Reston, Virginia. The other two samples were dated by Beta Analytical

Radiocarbon Laboratory of Miami, Florida.

Sample PCRC5, identified only as "charcoal," produced a conventional uncalibrated radiocarbon age of 1170 +/- 60 BP (1-sigma range) and 2-Sigma calibrated date options of AD 690-700, 710-750, and 760-980 (W-6289; Hereford 1993:16). Sample PCRC12, also identified as "charcoal," yielded a conventional uncalibrated radiocarbon age of 1410 +/- 120 BP (1-sigma range) and a calibrated date of AD 390-890 (Beta-51470; Hereford 1993:16). Sample PCRC13, of charcoal, yielded a conventional uncalibrated radiocarbon age of 1380 +/- 140 (1-sigma range; no calibration available; Beta-51471). Sample PCRC14, described as the outer rings of a piece of driftwood and also as a "charred log from pit house depression north of Features 1 and 2," gave a conventional radiocarbon age of 885 +/- 60 and a 2-Sigma calibrated date of AD 1030 to 1250 (W-6373; Hereford 1993:16).

Another radiocarbon date from Beta Analytic (B-51472) exists in the GRCA radiocarbon date data base maintained by GRCA Resources. This sample has a Beta Analytic number in the same series as the other dates reported by Hereford, but it is not referenced in his 1993 report. This date is reported to have come from a "hearth," "Feature 3," evidently the same Feature 3 described in this report. The date for this sample was 1020 +/- 50 BP (uncalibrated, 1-sigma range, no calibration given; Beta 51472).

In 1993, another radiocarbon sample was recovered from site AZ C:13:099 and submitted for dating by GRCA archaeologist Helen Fairley. The context of this sample is unknown, but it was probably recovered from an arroyo cut as part of Hereford's ongoing geomorphological stud-

ies. The sample was designated as "C:13:099X," and was submitted to Beta Analytic. It yielded a conventional uncalibrated radiocarbon age of 970 + / - 60 BP (one sigma range; Beta-66261).

During the 1999 project reported in this volume, four additional radiocarbon samples were recovered and submitted for dating. Results are described below.

### Feature 1

A sample of charcoal was collected from Level 6, Unit 1 of Feature 1. The sample was assigned the position of 2E in coordinates of the grid system established by Duane Hubbard during excavation of the site in 1999. The sample was given the field designation of "Sample C13099A." This sample yielded an uncalibrated conventional radiocarbon age of 1440 + / - 50 BP (1-Sigma range), a 1-Sigma calibrated date of Cal AD 580 to 650, and a 2-Sigma calibrated result of Cal AD 540 to 670 (Beta-158803).

Two additional radiocarbon samples, of unspecified material, were recovered in 1999 from Feature 1 at AZ C:13:099. One sample yielded a conventional radiocarbon age of 1440 + / - 50 (uncalibrated, no calibration date available; Beta-158803). The second sample (Beta-147230) yielded a conventional radiocarbon age of 1820 + / - 50 BP, a 1-Sigma calibrated date of Cal AD 130 to 250, and a 2-Sigma calibrated result of Cal AD 80 to 340.

### Feature 7

A juniper twig fragment, approximately 10 cm long and 3 cm wide, was recovered from Level 4 of Unit 1, at a depth of about 60 cm below datum. This sample was given the field designation of "Sample C13099B." The

position of this sample was given as 5N, 2W, coordinates in Hubbard's grid system of 1999. This piece yielded a conventional uncalibrated radiocarbon age of 880 + / - 60 BP (1-Sigma range), a 1-Sigma calibrated date of Cal AD 1040 to 1230, and a 2-Sigma calibrated result of Cal AD 1020 to 1270 (Beta 158804).

## CERAMIC ARTIFACTS

A total of 52 ceramic artifacts were recovered from all proveniences at site AZ C:13:099. Table 3.1 lists these ceramics by ware, type, and provenience. All ceramics but one (an unidentified specimen) were attributed to the Kayenta Branch of the Ancestral Pueblo culture (Colton 1939, 1946, 1955; Colton and Hargrave 1937; Hays-Gilpin and van Hartesveldt 1996). The majority of identifiable types dated to the Pueblo I or early Pueblo II stage. Further temporal assessment is possible using the mean ceramic date formula (Christenson 1994). Following the dates provided by Downum (1988, 1996), each of the features was dated using the mean ceramic date approach. Feature 1 yields a mean ceramic date of AD 1040. Feature 3 yields a mean ceramic date of AD 1104, and Feature 7 a mean ceramic date of AD 1099. The site as a whole yields a mean ceramic date of AD 1079.

TABLE 3.1.  
 CERAMIC ARTIFACTS RECOVERED FROM SITE AZ C:13:099.

Ware	Style	Type	Feature 1	Feature 3	Feature 7	Total	Percent
Tusayan Wares							
	Unpainted						
		Tusayan Corrugated	5	5	3	13	67.30%
		Kana-a	2			2	
		Honani Tooled			2	2	
		Other	1	4	9	14	
		Unidentified	4			4	
	Painted						
		Unidentified	7	1		8	17.3%
		Kana-a		1		1	
San Juan Redwares							
	Painted						
		Unknown	2			2	7.69%
		Deadmans B/R		1	1	2	
Tsegi Orangewares							
	Painted						
		Unidentified			1	1	3.84%
	Unpainted			1		1	
Jeddito Yellowware							
	Unpainted						
		Unidentified		1		1	1.92%
Unidentified	Unpainted		1			1	1.92%
Total			22	14	16	52	100.00%

## CHAPTER 4. EXCAVATIONS AT SITE AZ C:13:343

### SITE DESCRIPTION AND PREVIOUS WORK

Archaeologists recorded AZ C:13:343 (Figures 1.2 and 4.1) in 1990 (Fairley et al. 1994). This site is a Pueblo II limited activity area with three slab-lined features, a small artifact and fire-cracked rock scatter, and a rock alignment. After testing Features 1 and 2 in FY99, archaeologists determined that they are not cultural features. Feature 3 is a small, circular, Dox Sandstone slab-lined feature. At the top of a dune are two rock alignments; one measures four meters long and the other consists of two Dox slabs. Artifacts are mostly sparse, consisting of sherds, lithics, and fire-cracked rock; one chert scraper was noted. FY98 monitors identified Dogozshi and Sosi Black-on-White sherds in the active side canyon cutbank.

### MONITORING AND REMEDIAL ACTION HISTORY

Archaeologists of the NPS/NAU RCMP monitored site C:13:343 in FY92, FY93, FY95, FY97, FY98 and FY99 (Coder, Leap, Andrews, and Hubbard 1994, 1995a; Coder, Leap, Andrews, Hubbard, and Kunde 1995, Coder, Leap, Andrews, Kline and Hubbard 1994; Hubbard 1999; Leap, Andrews, Hubbard, and Kunde 1997; Leap, Burchett, Kunde, Andrews, and Hubbard 1998). Monitors recorded surface erosion, bank slump, arroyo cutting, aeolian activity and side canyon erosion since 1990. A small gully bisects the site and drains into the side canyon. Surface erosion consistently moves artifacts down into the drainage. Archaeologists recorded new ceramic and lithic

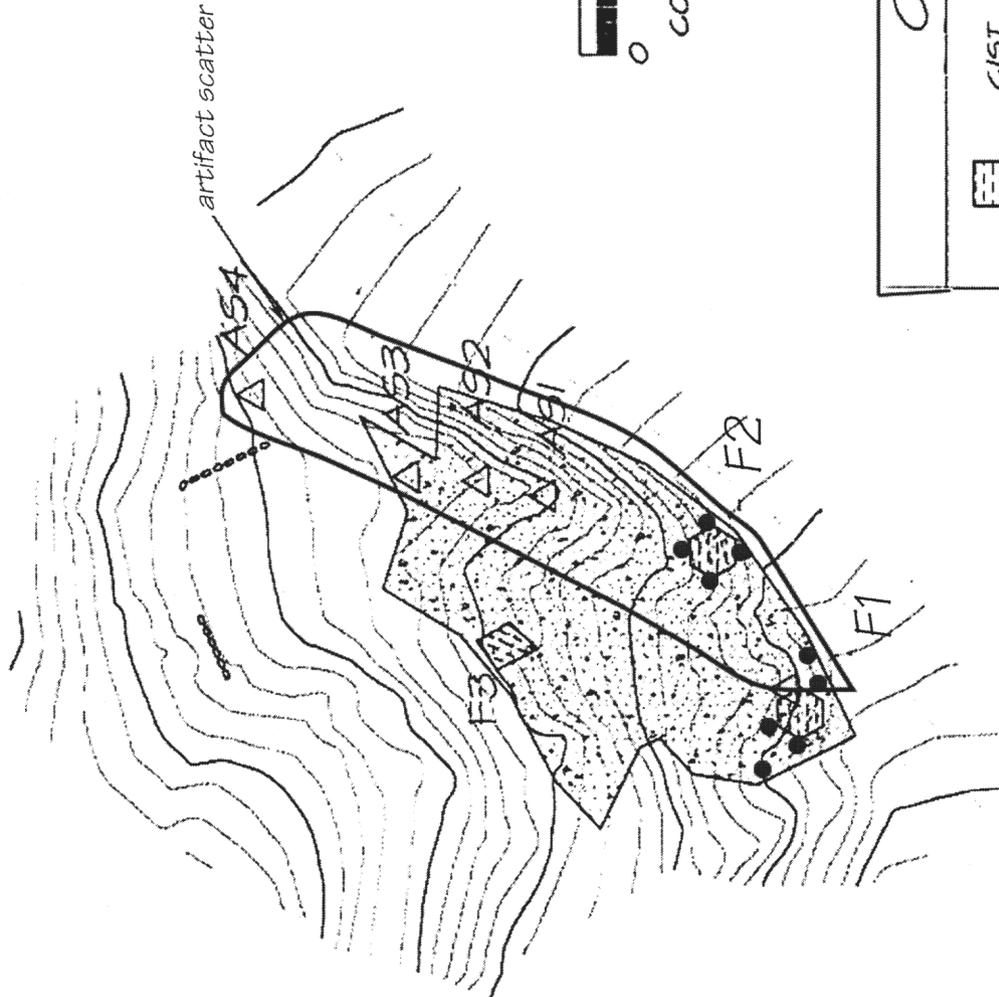
artifacts eroding from this site since 1990. They consistently recorded no visitor impacts at this site. Future visitation could be attributed to backpackers that travel the Cardenas/Tanner Trail above the site.

Since 1995 Features 1 and 2 have been recommended for data recovery because of their precarious location on a slope adjacent to a side canyon and because there is little evidence that these two features are actually cists/hearths.

The dense artifact scatter is located adjacent to the side canyon and less than 10 m from Features 1 and 2. During our monitoring of this area we have observed a variety of sherds that indicate several site functions and a large range of dates. Charcoal is abundant in the cutbank of the same side canyon.

### RESEARCH QUESTIONS AT AZ C:13:343

The research issues that can be addressed include Questions 1, 2, 3, and 5. At Features 1 and 2, the focus of the research was directed towards identifying the morphology and function of the features. Because of the ephemeral nature of the remains, surface indications are of only marginal utility in evaluating the role that these features played at the site. Collection of the artifact scatter clarified the role and function of the site in general. If intact deposits are encountered, information from chronological samples will be used to place the site into a temporal context for addressing questions posed under research topic 2. Information from the



C:13:343

	GIST		ARTIFACT SCATTER
	ROCK ALIGNMENT		METATE
	DATUM STAKE		

F1 & F2 EXCAVATED FY99

● = sample units

Testing conducted in 1999 determined that Features 1 and 2 are not cultural.

Revised by L. Thom 02/04/04

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PLOT FILE  
C-13-343.PLT

DATE  
7-29-97

Figure 4.1. Site plan map of AZ C:13:343.

artifact collection and analysis was used comparatively in addressing the other sites north and south of the River (Leap, Yeatts, and Kunde 1999b:16).

#### FIELD METHODS AT AZ C:13:343

A crew of two RCMP archaeologists and two archaeological technicians performed the work at this site. Archaeologists conducted exploratory testing at Features 1 and 2 and a 100% surface collection of a five meter (width) by eighteen meter (length) area on the site (Figure 4.1). The surface collection area was selected on the south portion of the site. The collection unit was oriented in a 30-degree direction and all artifacts within this area were collected.

#### SURFACE COLLECTION AND EXCAVATIONS AT AZ C:13:343

##### SURFACE COLLECTION

Archaeologists conducted a 100% surface collection of a collection unit placed at the south portion of the site. The collection unit was oriented at an azimuth of 30 degrees, and consisted of a rectangle 5 m wide by 18 m long. All artifacts within the unit were collected.

##### FEATURES 1 AND 2

Features 1 and 2 were located along the southeastern margin of the site (Figure 4.1). Both features were questionable and were identified by the 1990 survey crew as "probably not cists." However, the features were still recorded. Subsequently, NPS/NAU archaeologists also questioned the validity of both features. Archaeologists noted that the area has received active down slope movement of Dox Sandstone slabs due to the gradient of the site's slope. The initial recording of the features is

attributed to the assumption that humans formed the supposed uprights. However, archaeologists have observed that many Dox slabs have been naturally carried down slope and rest in semi-upright positions.

Given the uncertainty of Features 1 and 2 as cultural features, archaeologists decided to resolve the issue by placing excavation units in both. Excavations and their results are given below.

##### Feature 1 Testing for Significance

Four units were excavated by trowel within a three-meter diameter area (Figure 4.1). The testing confirmed that Feature 1 is not a cultural manifestation and is part of a natural debris flow.

##### Feature 2 Testing for Significance

Five units were excavated by trowel within a five meter area to locate the questionable Feature 2. Archaeologists discovered that Feature 2 was not a cultural manifestation but part of a natural debris flow.

#### DATA ANALYSIS

The only materials collected and analyzed from AZ C:13:343 were those recovered from the surface collection. Artifacts collected at this site were: one battered unidentified chert core tool; one rhyolite unifacial scraper with approximately 30% cortex on one surface; a Tapeats Sandstone mano fragment (coarse-grained); a fine-grained sandstone mano fragment; and eight unretouched secondary core reduction flakes (6 of chert, and 2 of quartzite); one white chert core; and 27 potsherds. The sherds consisted of two large Dogoszhi Black-on-white bowl sherds; 24 Tusayan/Moenkopi Corrugated jar

sherds; and one unidentified sherd (possibly Paiute?).

Chipped and ground stone artifacts suggest a variety of tasks were conducted at this site, including the grinding of corn meal or wild plant food products, and procurement or processing of animal foods. The uncertain type assignments for much of the ceramic

assemblage precludes a precise date estimate using the mean ceramic dating technique. However, the presence of Dogoszhi Black-on-white and Tusayan/Moenkopi Corrugated sherds (possibly transitional) suggests a date in the late 11<sup>th</sup> through 12<sup>th</sup> centuries AD.

## CHAPTER 5. EXCAVATIONS AT SITE AZ C:13:347

### SITE DESCRIPTION AND PREVIOUS WORK

Archaeologists recorded site C:13:347 (Figures 1.2 and 5.1) in 1990 (Fairley et al. 1994). This site consists of a masonry wall and metate eroding out of a steep arroyo. While producing a total station map of the site in FY94, archaeologists discovered a serpentine pipe bowl fragment eroding from the arroyo next to the wall. Archeologists collected the pipe bowl fragment and brought it to NPS facilities on the South Rim, where it is now curated. In FY95, archaeologists discovered a Flagstaff Black-on-White sherd eroding from the same location. RCMP staff collected the sherd during exploratory testing in FY99.

### MONITORING AND REMEDIAL ACTION HISTORY

RCMP archaeologists from NPS and NAU monitored site C:13:347 in FY92, FY93, FY95, FY96, FY97, FY98 and FY99 (Coder, Leap, Andrews, and Hubbard 1994, 1995a; Coder, Leap, Andrews, Hubbard, and Kunde 1995, Coder, Leap, Andrews, Kline and Hubbard 1994; Hubbard 1999; Leap, Andrews, and Kunde 1996; Leap, Andrews, Hubbard, and Kunde 1997; Leap, Burchett, Kunde, Andrews, and Hubbard 1998). The RCMP staff consistently recorded surface erosion, arroyo downcutting, bank slump, and animal burrowing at this site since FY92. Since 1990 new artifacts and charcoal lenses have eroded from the arroyo. The arroyo is river-based and the site is located precariously close to the river (ca. 15 meters). RCMP staff recorded no visitor-related distur-

bances, although a river trail is located approximately 10 meters below, and the Tanner/Cardenas Trail is located 25 meters above the site. No river camps are located in the vicinity.

In FY95, archaeologists recommended extensive total station mapping. In FY96, NPS/NAU archaeologists of the RCMP conducted medium format photography before the 1996 Beach Habitat and Building Flows and recommended check dam installation and data recovery. In FY97, NPS archaeologists recommended data recovery, testing and installing check dams. Zuni conservators and RCMP staff assessed the site for preservation action in FY97 and determined that data recovery was appropriate. Surveyors completed a total station map for this site in FY97. In FY98, NPS archaeologists recommended data recovery before more cultural material was lost.

### RESEARCH QUESTIONS AT AZ C:13:347

This site represents one of several exposed masonry walls located in this reach of the Canyon. The priority for this site entailed determining if intact cultural material extended into the alluvial terrace. Information from this site will add to chronological, subsistence and material culture information in the area.

### FIELD METHODS AND EXCAVATIONS AT AZ C:13:347

Two RCMP archaeologists created a profile in the river-based arroyo impacting the exposed wall alignment (Figures 5.2 and 5.3). Archaeologists





*Figure 5.2. AZ C:13:347, mouth of arroyo.*



*Figure 5.3. AZ C:13:347, close-up collapsed wall.*

excavated into the cutbank to a horizontal length of 1 meter. At this time it was noted that the feature still contained intact cultural material and excavations were stopped.

#### DATA ANALYSIS

Artifacts collected during this project included one unretouched flake of Redwall Chert, and the following potsherds: one Tusayan White Ware (Flagstaff Black-on-white), one San

Francisco Mountain Gray Ware (Deadmans Gray), and one Tusayan Gray Ware (Tusayan Corrugated). No other cultural material or samples were taken from this location.

The sparse artifact assemblage does not permit detailed interpretation. Ceramics suggest cultural affiliation with the Ancestral Puebloan and Cohonina archaeological cultures. Potsherds indicate use or occupation of the site took place sometime from the late 11<sup>th</sup> through late 12<sup>th</sup> centuries AD.

## CHAPTER 6. EXCAVATIONS AT AZ C:13:349

### SITE DESCRIPTION AND PREVIOUS WORK

Site C:13:349 (Figures 1.2 and 6.1-6.6) was originally recorded in 1990 (Fairley et al. 1994). At this time a profile was examined at this site to better understand flood and debris flows along the river (Hereford et al. 1993).

This multi-component site consists of a historic cabin/dugout, fire-cracked rock, and artifacts. No artifacts indicating function were found in association with the structure. The prehistoric components are both pre-ceramic and Pueblo I (PI) to Pueblo II (PII) stage Ancestral Puebloan (ca. AD 700 to 1100). Archaeologists observed charcoal fragments in a drainage that appear to pre-date the site. There are eight remaining wood pieces to the historic structure. The back of the structure, consisting now of just one foundation pine plank, is banked against a dune. The prehistoric fire-cracked rock midden/roasting pits have good assemblages of sherds and lithics, but no formal tools were noted. The site is located in mesquite-anchored dunes 100 meters from the river. New charcoal lenses and fire-cracked rock have been exposed since the initial recording of the site. The site is situated on a pre-dam alluvial terrace adjacent to a mesquite thicket.

Replicated photographs from 1990 depict continued bank slump exposing new charcoal lenses and fire-cracked rock. At the time of the initial recording of this site, particularly Features 2 and 5, erosion was identified as an ongoing problem based on the existence of a two meter deep arroyo. Sev-

eral artifacts were eroding from this area. Long-term monitoring has tracked the cyclical filling and downcutting of this terrace-based arroyo. At present, the arroyo continues to cut downward and has reached a depth of over four meters. Features 2 and 5 and artifacts have been lost due to the ongoing arroyo activity. Feature 3 is very stable and located about 15 m away from the active arroyo cut and Feature 2.

Since 1994, archaeologists have recommended data recovery for the features within this large arroyo. In the early 1990s H. Fairley excavated Feature 5 and submitted five radiocarbon samples for dating. The dates range from 1610 +/- 70 to 2270 +/- 100 BP (Hereford et al. 1993). Additional radiocarbon samples could generally increase our knowledge of the chronology of this site.

### MONITORING AND REMEDIAL ACTION HISTORY

Archaeologists of the NPS/NAU RCMP have monitored the site annually since FY93 (Coder, Leap, Andrews, and Hubbard 1994, 1995a; Coder, Leap, Andrews, Hubbard, and Kunde 1995, Coder, Leap, Andrews, Kline and Hubbard 1994; Hubbard 1999; Leap, Andrews, Hubbard, and Kunde 1997; Leap, Burchett, Kunde, Andrews, and Hubbard 1998). A total station map of the site was completed in 1997 and the site was remapped in September 1998. The site was assessed for stabilization by the Zuni Conservation Project in FY97. Stabilization was determined to be inappropriate at this location.

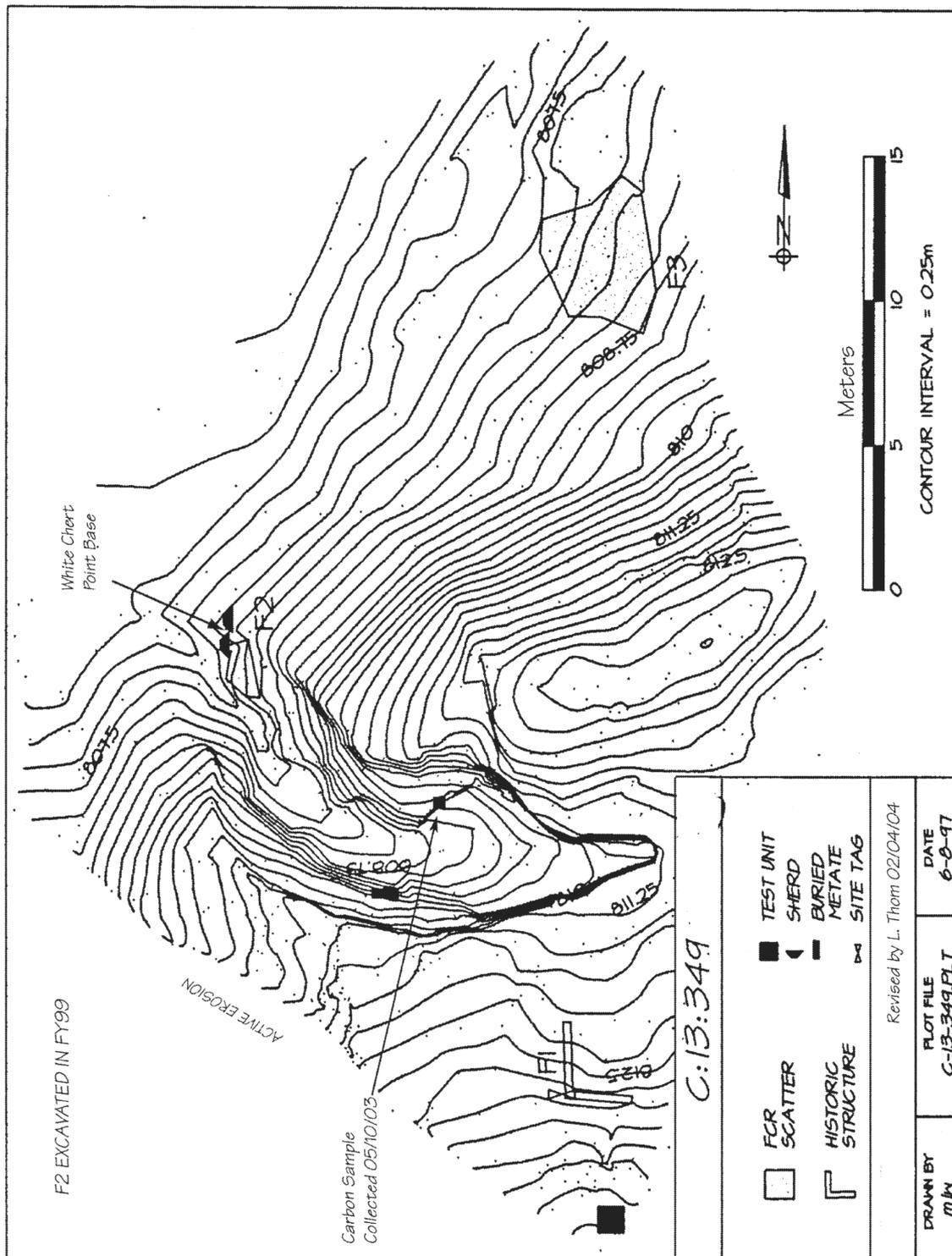


Figure 6.1. Site plan map of AZ C:13:349.



*Figure 6.2. AZ C:13:349, Feature 2 after profiling and stabilization.*



*Figure 6.3. AZ C:13:349, close-up new slump, arroyo cutting, and deflation impacting Feature 2.*



*Figure 6.4. AZ C:13:349, mouth of large arroyo.*

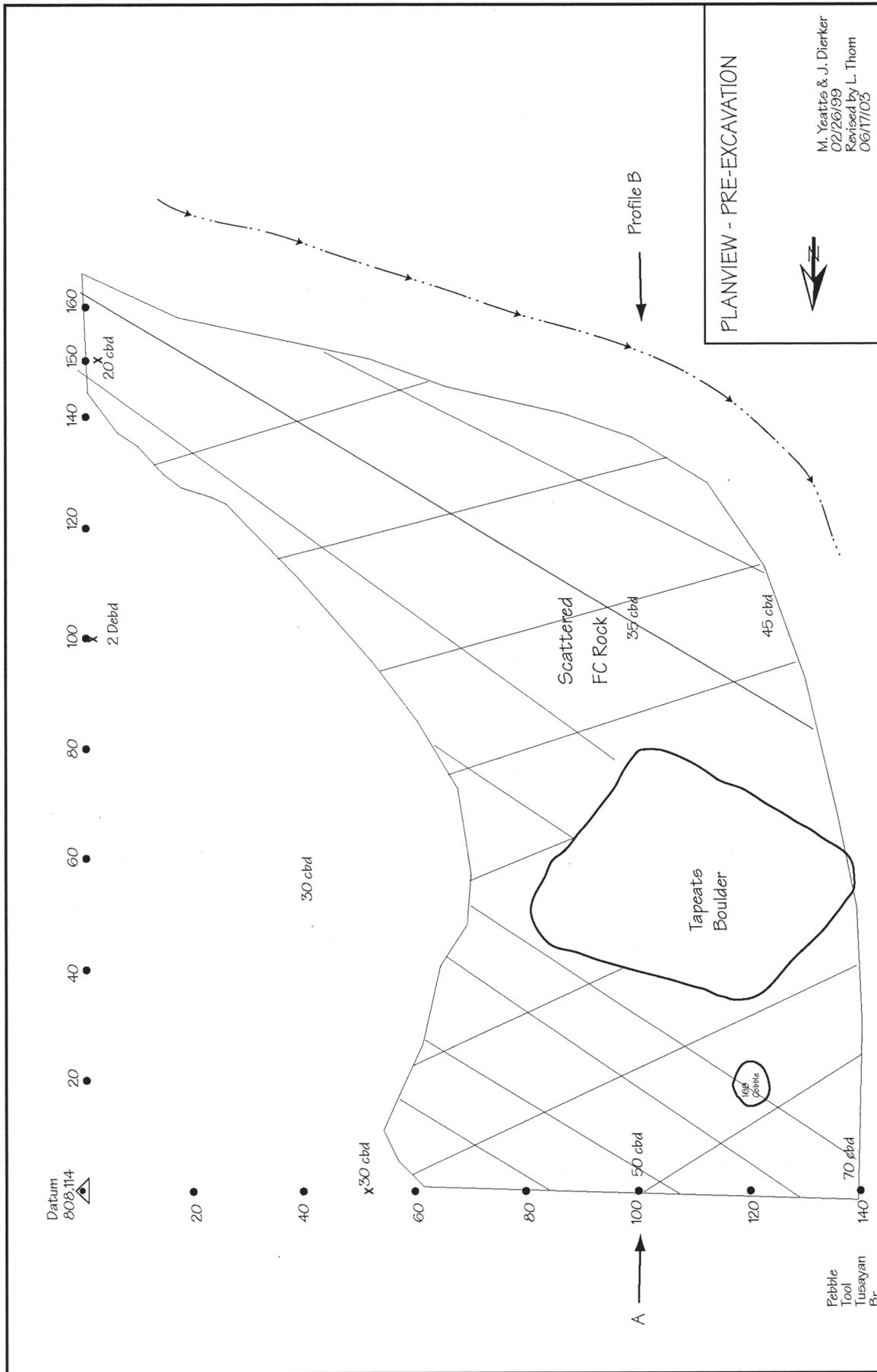


Figure 6.5. C:13.349, plan view of Feature 2.

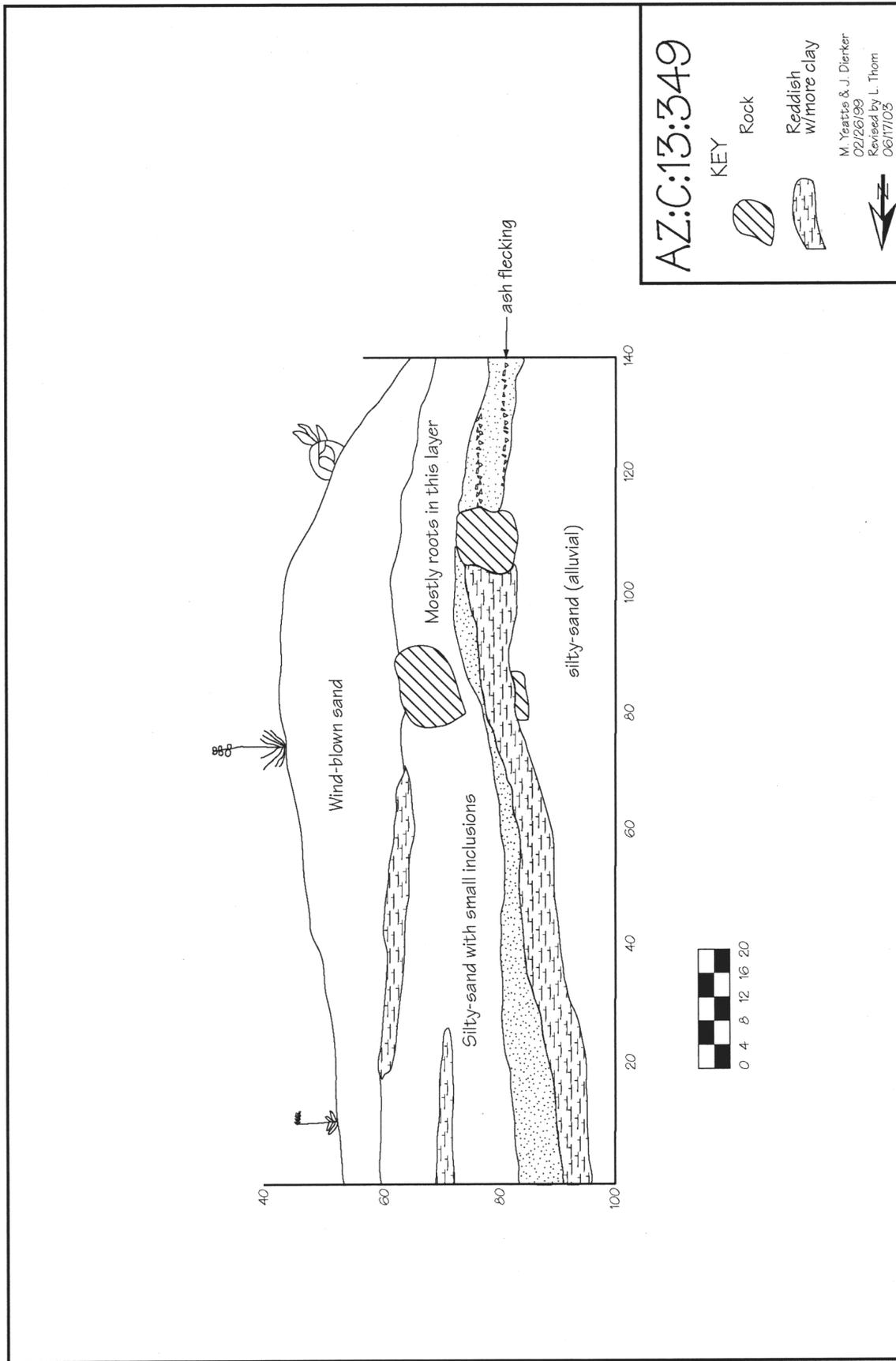


Figure 6.6. C:13:349, profile of feature looking east.

## RESEARCH QUESTIONS AT AZ C:13:349

The first priority during testing was to identify whether there was in fact a cultural feature at this location. RCMP staff wanted to identify its physical attributes, function and temporal affiliation. The information collected will be tied into Richard Hereford's studies of the area, conducted in 1993 (Hereford et al 1993).

A point of interest regarding Feature 2 is that it appears to be the remains of a PII stage Kayenta Ancestral Puebloan thermal feature based on the ceramic assemblage and projectile point. However, is it really indicative of PII use with the dates obtained from Feature 5? A similar site type upstream, AZ C:13:371, was originally documented as a PII stage Ancestral Pueblo habitation site based on ceramic assemblage. Two carbon samples were obtained from AZ C:13:371 that provided dates of 350 to 120 BP. Not only does this information change the site to a multi-component site, occupied at one time by Puebloan peoples, and later by possibly Pai peoples, but it also changes the historic record of the use in the Canyon. Therefore, accurate dating when combined with the general site type information obtained during recording of the site can be used to address research topic 2, through the comparison with other sites receiving work in this stretch of the River (such as AZ C:13:010, C:13:323, C:13:324, C:13:326, C:13:327, C:13:332, C:13:338, and C:13:349) (Leap, Yeatts, and Kunde 1999b):19.

## FIELD METHODS AT AZ C:13:349

Work at this site was focused entirely on assessing the integrity of cultural deposits in the area identified as Feature 2. All artifacts were collected within the vicinity of Feature 2. A north-south line was laid out from the datum stake and a grid established over the feature. The feature was faced off and profiled. A unit was extended 60 cm from the arroyo edge into the feature and taken down to a depth of 20 cm.

### EXCAVATIONS AT AZ C:13:349

#### FEATURE 2

Feature 2 was identified in September 1990 as a fire-cracked rock/artifact scatter.

#### Feature 2 Unit

A profile was cut to culturally sterile deposits, below the base of the arroyo. After a profile was drawn (Figure 6.6), a sediment sample was collected out of an ash layer. This ash layer may have ultimately been derived from cultural context, but it now appears to be a secondary deposit. The ash-stained sediments discovered in the unit followed the stratigraphic layers and did not show evidence of being burned in place. This area appears to be the eroded remains of a thermal feature without any current intact morphology or integrity. If any of the feature remains, it is located upslope in the dune. It seems unlikely that anything is still intact at this feature. No artifacts were discovered below the surface at this feature. A plan view of the

area was generated (Figure 6.5) and all surface artifacts collected.

### DATA ANALYSIS

The artifacts recovered on the surface consisted of one Tsegi Orange Ware sherd (Tusayan Black-on-red), one Tusayan Gray Ware sherd (Tusayan Corrugated), five flakes of unidentified chert (two proximal flake fragments, and three unretouched complete flakes), an unidentified chert bi-

face midsection, an unidentified chert point base, and two sandstone cobble manos.

The variety of chipped and ground stone artifacts recovered at the site suggest activities such as grinding of corn or wild plant foods, processing and procurement of animal foods, and cooking. The sparse ceramic assemblage indicates cultural affiliation with the Kayenta Anasazi (Ancestral Pueblo) archaeological culture, and suggests site occupation or use during the late 11<sup>th</sup> through mid-12<sup>th</sup> centuries AD.

## CHAPTER 7. SUMMARY AND CONCLUSIONS

This chapter summarizes the results of excavations at C:13:099, C:13:343, C:13:347, and C:13:349. The discussion proceeds by the five research topics that were presented in Chapter 2 (Research Design).

### RESEARCH TOPIC 1: CULTURE AND TEMPORAL ISSUES

Subsurface material remains recovered by excavation of the four sites generally confirmed the picture of cultural and temporal affiliation that had been provided by surface artifacts and features.

#### SITE C:13:099

Site C:13:099 had been identified during initial recording as Ancestral Pueblo (Kayenta Branch) with an estimated span of occupation or use of AD 1050 to 1100. When the site was recorded during the 1990-91 archaeological survey of the canyon (Fairley et al. 1994), it was identified as having an Ancestral Puebloan cultural affiliation in the early to mid-Pueblo II stage (AD 950-1050).

Subsurface ceramic artifacts recovered from C:13:099 confirmed an Ancestral Puebloan cultural affiliation. All identifiable ceramics were attributed to the Kayenta Branch of the Ancestral Puebloan culture (Colton 1939, 1946, 1955; Hays-Gilpin and van Hartesveldt 1996). More than two-thirds of the ceramics were unpainted utilitarian wares such as Tusayan Corrugated and Kana-a Gray. These sherds likely were from vessels used for cooking or food storage. About 29% of the sherds were from decorated types,

mostly Tusayan white wares but also including some San Juan Red Ware and Tsegi Orange ware sherds. The location of manufacture for the Tusayan Gray Ware, Tusayan White Ware, San Juan Red Ware, and Tsegi Orange Ware ceramics is most likely outside the Grand Canyon area. These ceramics are known to have been made in various parts of northeastern Arizona and southeastern Utah, within the archaeological cultural province of the Kayenta branch of the Ancestral Puebloan culture (Colton 1955, Hays-Gilpin and Van Hartesveldt 1996). The ceramics were either obtained by Canyon residents through trade or were transported into the Grand Canyon by site residents who had manufactured the ceramics elsewhere. In either case, an exclusive presence of Kayenta ceramics strongly suggests an Ancestral Puebloan cultural affiliation during the Pueblo II and Pueblo II use or occupation of the site.

A single sherd of Jeddito Yellow Ware, manufactured in the Hopi Mesas area, was present at the site. Jeddito Yellow Ware is a strong marker of late Ancestral Puebloan cultural affiliation (Pueblo IV stage), in this case early Hopi culture. A single sherd is difficult to interpret, given that it is unclear exactly how the sherd arrived at the site and how the vessel represented by the sherd was used. The presence of an early Hopi Yellow Ware sherd may signal use of the site area by Hopi people during the 14<sup>th</sup> through 16<sup>th</sup> centuries AD. A single sherd, however, is not strong evidence of cultural affiliation, so other mechanisms for the transport of this sherd to the site should be considered.

Dating of the site from excavated materials also confirmed previous assessments of the site's age. Application of the mean ceramic date formula to excavated sherds yielded individual feature dates of AD 1040 (for Feature 1), AD 1104 (for Feature 3) and AD 1099 (for Feature 7). The site as a whole yielded a mean ceramic date of AD 1079. These ceramically derived dates accord well with previous assignments of the site to the Pueblo II through Pueblo III stages of Ancestral Pueblo development. A few earlier sherds (Kana-a Gray and Kana-a Black-on-white) hint that the site area was also used or occupied during the Pueblo I stage (ca. AD 875-1025, based on tree-ring derived dates for these ceramic types [Downum 1988, 1996]). The single sherd of Hopi Yellow Ware (Jeddito Yellow Ware) as noted above suggests some use of the site area, apparently not represented by construction of durable site features, during the 14<sup>th</sup> through 16<sup>th</sup> centuries AD.

Radiometric determinations from the site generally confirmed a Puebloan use and occupation, though they tended to be earlier overall than the ceramically-derived site dates. This may be due largely to the "old wood" problem (Schiffer 1982, Smiley 1998a, 1998b). The old wood problem refers to disjunctions between true ages of features and radiometric determinations from wood charcoal. C-14 dates on small bits of wood charcoal tend to be systematically too early. This is due to multiple factors. Small pieces of wood charcoal often come from the heartwood of a tree which may produce radiocarbon dates up to a few centuries before the outer portion of the tree (thus providing much earlier dates than the cultural use of the tree for building material or firewood). Some species of trees, such as mesquite, can also persist at the surface in useable form for centuries after the

tree has died, again creating a considerable offset between the actual dated event (death of the tree's wood) and the desired target event (cultural use of the wood as building material or firewood). The problem is compounded in an area like the Grand Canyon, where driftwood from long dead trees regularly was deposited in the vicinity of prehistoric camps and villages.

Feature 1 at AZ C:13:099 produced a 2-sigma calibrated age of AD 540 to 670, which would place the use of this feature in the Basketmaker III stage of Ancestral Pueblo culture. This is clearly at odds with the recovery of Pueblo I and Pueblo II age ceramics from the feature, and the mean ceramic date of AD 1040 that was derived from these features. As noted above, the old wood problem may account for the seeming discrepancy between C-14 dates and ceramic dates from C:13:099.

Samples from Feature 1 at C:13:099 produced C-14 dates ranging from the first through 6<sup>th</sup> centuries AD. Again, there was no evidence from artifacts or features that would support these relatively early dates, so they are regarded as possible additional examples of old wood dating anomalies.

A C-14 date from Feature 7, known to have come from a relatively small fragment of a juniper twig provided a much closer fit between radiometric and ceramic date determinations. The radiocarbon date from Feature 7 was calibrated at a 2-sigma date range of AD 1020 to 1270. The midpoint of this C-14 date (AD 1145) fits relatively well with the mean ceramic date estimate of AD 1099 that was derived from Feature 7. In this case, the fact that the radiocarbon sample came from a small twig provides some basis for viewing the resulting radiocarbon date with more favor. Small twigs are less likely to contain older heartwood,

are less likely to have survived extensive transport and re-transport as driftwood, and also are less likely to have lain at the surface for centuries prior to use.

Overall, then, excavations produced the following picture of cultural affiliation and estimated time of occupation or use for site C:13:099: The site was used primarily by people having an Ancestral Pueblo affiliation. Principal use or occupation was during the mid-11<sup>th</sup> through early 12<sup>th</sup> centuries AD. Minor activities are detectable as early as the late 9<sup>th</sup> century AD and potentially as late as the late 16<sup>th</sup> century AD.

#### **SITE C:13:343**

Investigations at site C:13:343 generally confirmed conclusions about the cultural and temporal affiliation of the site previously made on the basis of surface evidence. The site had previously been characterized as having an Ancestral Pueblo cultural affiliation. It was dated to the Pueblo II stage on the basis of Dogoszhi and Sosi Black-on-white sherds found at the surface.

No radiometric dates were obtained from AZ C:13:343. Surface collection and subsequent analysis of potsherds largely confirmed previous assessments of cultural affiliation. All recovered sherds, with one exception, were Ancestral Puebloan types of the Kayenta Branch. Twenty-six of twenty-seven sherds were Tusayan White Ware or Tusayan Gray Ware types. The one exception was an unidentified sherd that was considered to be possibly of Paiute affiliation. If so, this would add a possible protohistoric or early historic period Paiute affiliation to the site. A single, equivocally identified sherd, however, is not a strong basis for inferring the presence of Paiute people at the site, so this question remains open.

Temporal placement of the site in the Pueblo II stage was largely confirmed by the surface sherds. A mean ceramic date was not estimated for this site due to the small sample size and the ambiguous type assignments for the Tusayan Gray Ware sherds (either Moenkopi or Tusayan; analysts were not firm in their type assignments and believed the sherds might have been from a temporally transitional vessel). However, the ceramic types Dogoszhi and Sosi Black-on-white, along with either Tusayan or Moenkopi Corrugated sherds, indicate an occupation between about A.D. 1050 and 1300 (Downum 1988, 1996). If the Tusayan/Moenkopi sherds were indeed from the time of the transition between the corrugation styles, the site would date to a fairly restricted time frame, probably within the period from about A.D. 1125 to 1150.

#### **SITE C:13:347**

Prior to investigations at site C:13:347, cultural and temporal affiliation was poorly understood due to a paucity of surface artifacts. Based on the 1990-91 survey, the site was considered to have an unknown cultural affiliation because no surface artifacts were found (Fairley et al. 1994:233). Archaeological monitoring crews subsequently located a pipe bowl fragment and a single sherd of Flagstaff Black-on-white.

The 1999 investigations did not add a large quantity of information about either cultural or temporal affiliation. Only three additional sherds were collected, a Flagstaff Black-on-white, a Tusayan Corrugated, and a Deadmans Gray sherd. This very small sample suggests cultural affiliation with Ancestral Pueblo and Cohonina archaeological culture traditions, within a span ranging from the late AD 1000s

through 1200s. Little more can be inferred, pending recovery of a larger artifact sample.

#### SITE C:13:349

Prior to the investigations documented in this report, site C:13:349 was regarded as a multicomponent site having both historic and prehistoric elements. Ancestral Pueblo potsherds of the Kayenta Branch tradition were observed at the surface, and these were types dating to the Pueblo II stage. Based on investigations and relatively recent C-14 dates from another, similar site (site C:13:371) however, it was thought that C:13:349 might also include a protohistoric or historic period Pai component.

Unfortunately, investigations did not result in recovery of materials that could be submitted for C-14 dating. Only two sherds were recovered, both from surface contexts. These sherds were one of Tusayan Black-on-red and one of Tusayan Corrugated. This meager evidence reinforces previous interpretations that the site has an Ancestral Pueblo cultural affiliation (in this case, with the Kayenta Branch), and suggests a date from the late 11<sup>th</sup> through mid-12<sup>th</sup> centuries AD.

#### RESEARCH TOPIC 2: BOUNDARIES

The research questions associated with the topic of cultural boundaries need for their solution large samples and extensive spatial distributions of sites and artifacts. The 1999 investigations detailed in this report contribute in some measure to a greater understanding of boundaries, but do not support strong conclusions. All of the sites investigated lay along the left bank of the river, all were within a rela-

tively restricted area of the Grand Canyon (the Palisades of the Desert), and all were confined to a relatively brief interval of Ancestral Pueblo occupation and land use (primarily Pueblo II and early Pueblo III stages). These limitations, along with the rather slim sample of artifacts yielded by the sites, constrain what can be said about the nature of cultural boundaries and how they might have changed through time.

Available information suggests that the sites investigated fit within the boundaries of the distribution of the Kayenta Branch of Ancestral Pueblo culture. Recovery of a single sherd of San Francisco Mountain Gray Ware and a possible Paiute sherd hint that the Palisades area was not the sole province of Ancestral Puebloans. As noted by Schwartz, Marshall, and Kepp (1979), Schroeder and Downum (2001), and others, several early ceramic period sites in the Grand Canyon show an affiliation with the Cohonina archaeological culture. Presence of Pai and Paiute remains is also well attested, though they occur more commonly in the western reaches of the Grand Canyon.

It was believed prior to field investigations that some of the thermal features at sites targeted for excavation might reveal culturally diagnostic artifacts and perhaps distinctive "styles" of feature construction. Unfortunately, none of the investigated features proved to be intact enough to yield such data. We were also unable to recover the types of ceramics that might indicate through their constituent materials something about the zones of ceramic production within the canyon and the spatial distributions of artifacts made within these zones. Thus, perhaps the best that can be said about the contribution of the current project to the research topic of boundaries is that it has provided information that may prove

informative within the context of larger, regional studies.

### RESEARCH TOPIC 3: RESOURCE PROCUREMENT, SETTLEMENT STRATEGIES, AND SEASONALITY

This research topic, like the topic of boundaries, is best addressed with robust samples of features, artifacts, and other information drawn from a broad geographical distribution of sites. Nonetheless, any regional understanding is built from individual cases, and the investigations at Palisades sites contribute to a larger picture of settlement, land use, and resource procurement. The combination of features and artifacts recovered have become part of a regional database relevant to the prehistoric human use of the Grand Canyon (Sullivan, Mink, and Uphus 2002).

Investigations at site C:13:099 revealed the presence of a buried architectural feature that may represent a substantial pueblo room, perhaps part of a block of rooms. A substantial masonry construction observed at a depth of about 1.5 m suggests that site C:13:099 contained a room built with considerable investment of labor and intended to provide a permanent dwelling. Whether or not this dwelling was occupied seasonally or year-round is a question that must await further investigation. However, the documentation of such a structure at the site is significant, and suggests that C:13:099 was an important and perhaps central element of the larger cultural landscape. Based on results of test excavations at C:13:099, it is suggested that this site should be placed among the relatively short list of Grand Canyon sites with substantial pueblo architecture. Future excavations could clarify precisely how the apparent room was used, and thus

how C:13:099 fit within a larger picture of settlement and land use. A pattern of seasonal movement between different environmental zones of the Grand Canyon, as proposed by Schwartz, Kepp, and Chapman (1981) can neither be confirmed nor refuted with available data.

The relatively precise time period to which site C:13:099 was assigned is also informative. As argued above, based on ceramics and to a lesser extent C-14 dates, it appears that the most intensive period of occupation and use of this site belongs to an interval from about AD 1040 through AD 1145. This time period fits almost precisely the peak of Grand Canyon occupation previously proposed by Schwartz and others (Fairley et al. 1994; Schwartz, Chapman, and Kepp 1980; Schwartz, Kepp, and Chapman 1981). On this basis, it can be inferred that site C:13:099 was part of a larger process of Ancestral Pueblo range expansion that occurred in the last half of the 11<sup>th</sup> through first half of the 12<sup>th</sup> centuries AD. Schwartz, Kepp, and Chapman (1981) have attributed this expansion to wetter climatic conditions that improved farming potential in the Grand Canyon. The present project, however, did not recover data that were directly relevant to that proposition.

Other sites that were investigated seem likely to have been used only as temporary camps, seasonal settlements, or resource processing areas. Site C:13:343 was found to represent little more than a scatter of lithic and ceramic artifacts. A diversity of ceramic artifacts, including probable serving vessels (represented by black-on-white sherds) and cooking vessels (represented by at least gray ware corrugated vessel) suggests that food processing was one of the activities conducted here.

Site C:13:347 revealed a masonry wall, lithic debitage, sherds from

serving and cooking vessels, and a serpentine pipe bowl fragment. The diversity and nature of these remains indicate activities beyond those of a short-term resource processing area. The presence of a masonry wall and a pipe bowl fragment suggest the possibility that the site was a habitation locus. Excavations revealed that a substantial portion of the masonry wall and its associated deposits remain intact, so future investigations are necessary to explore whether the wall is part of an isolated pueblo structure. If so, the presence of a one-room structure with relatively limited artifacts might indicate a seasonally inhabited farmstead.

Site C:13:349 appears to have been used as a resource gathering locus. Unfortunately, the limited number of artifacts and the highly eroded nature of Feature 2 limits our ability to infer precisely how the site might have been used.

#### RESEARCH TOPIC 4: PALEOENVIRONMENT AND SPECIES DISTRIBUTION

Investigation of this topic was hampered by the meager quantity and poor quality of the paleoethnobotanical samples that were recovered. None of the investigated sites produced significant quantities of burned plant or animal remains that would be useful in paleoenvironmental reconstructions. With the exception of juniper, all of the species of plant parts that were recovered grow near the sites today. The recovery of juniper wood is easily accounted for by the probability that site residents obtained at least part of their building materials and firewood from recent driftwood accumulated near the site. The lack of recovered botanical and faunal remains means that this topic could not be adequately investi-

gated by the current project, and must await future excavations of more productive features and sites.

#### RESEARCH TOPIC 5: GEOMORPHOLOGICAL FACTORS AFFECTING SITE PRESERVATION

The 1999 investigations at Palisades sites revealed important aspects of geomorphological factors and site preservation. As noted in the introductory chapter of this report, the sites were chosen for excavation and other archaeological investigations because of ongoing erosion, which had resulted in substantial loss of site sediments, artifacts, and features. Generally, the 1999 work revealed that the sites were indeed heavily damaged by erosion and in many cases had severe impacts to their integrity. Site C:13:99 shows very active erosion that is severely affecting the integrity of features, deposits, and structures. The fresh erosional cuts and resulting loss of covering natural-sediments, cultural matrix, artifacts, and features argues that this site is experiencing accelerated erosion that has only recently begun to eat away at previously stable cultural deposits. Site C:13:099 is a site now being eroded by drainages that cut across the Palisades delta directly to the Colorado River. As such, it provides an excellent example of the potential effects of sediment loss and erosion caused by the existence and operation of the Glen Canyon.

Check dams have been constructed at the site in an effort to stem erosional loss of cultural materials, and evaluation of the effectiveness of these features is currently ongoing. The 1999 excavations reported here provide substantiation of the nature and degree of loss that can come from erosional forces,

and are important data in future evaluations of the effectiveness of check dams on site preservation. On the positive side, the presence of an intact structure some 1.5 m below the surface suggests that significant buried features remain at the site. Erosion clearly has not yet adversely affected all of the features at this site, and preservation efforts or full-scale mitigation are needed to curtail the loss of significant features.

Sites C:13:343, C:13:347, and C:13:349 showed considerable adverse effects from erosion. One of the major goals of this project was to assess the potential of sites like these to contain intact subsurface remains. Unfortunately, it appears that for these three sites data recovery came too late to retrieve significant materials from the features that were investigated. It is suggested that in the future, mitigation efforts should be undertaken well prior to the total or near-total loss of cultural deposits. At present, C:13:343 has at least one well-preserved, stable architectural feature, and artifact-bearing deposits continue to erode. C:13:347 has experienced more severe erosion and only a single deflating fire-cracked rock pile remains.

#### SUMMARY AND CONCLUSION

Excavation of four sites on and near the Palisades Delta have provided significant information on the nature of prehistoric occupation and land use in Reach 5 of Grand Canyon National Park. The most successful efforts were within the domain of investigation into the cultural and temporal affiliations associated with the sites. Excavation produced useful samples of artifacts and radiometric determinations. A general picture of late PII to early PIII Ancestral Pueblo land use and occupa-

tion along this stretch of the river was strengthened.

Other research questions were more difficult to address, owing to a paucity of cultural materials recovered. In many cases, it appears that mitigation efforts came too late in the sequence of erosional events to capture sufficient data for sound archaeological interpretations. The effects of erosion were quite evident at all sites that were investigated. The extreme adverse effects from erosion that were documented lend support to the idea that cultural resources at some Grand Canyon sites (especially those with river-based local drainage systems) are severely threatened by continuing sediment loss.

In a seeming paradox, although site C:13:099 is considered to have the most active ongoing erosion, it yielded the most information. Apparently, site C:13:099 has beneath its surface relatively stable dune deposits that provide an intact matrix holding cultural features and artifacts. The other sites, with less visible active erosion, have already mostly lost the stable deposits that once held in situ cultural materials. Future research is needed to identify the characteristics of sites that have experienced destructive erosion in the past (but may not show a great deal of active erosion today), and those that are now actively eroding but may still have intact cultural deposits beneath a veneer of actively eroding sediments. Additional archaeological testing and excavations of a larger number of sites could assist in identifying the surface characteristics of each type of site.

The relative roles of natural climatic shifts, and the effects of existence and operation of the Glen Canyon Dam await further investigation. The excavations reported in this volume undoubtedly can contribute to answering these larger research questions.

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