DATA RECOVERY at the Hermit Road Site (AZ B:16:1125) and the Three Mile Rest House Site (AZ B:16:0134), Grand Canyon National Park, Arizona

By Jim H. Collette, L. Theodore Neff, Michael R. Robins, Elizabeth Hickey, Brian Kranzler, Jim Hasbargen, and Jason Nez

Museum of Northern Arizona
September 2009

DATA RECOVERY AT THE HERMIT ROAD SITE (AZ B:16:1125) AND THE THREE MILE REST HOUSE SITE (AZ B:16:0134), GRAND CANYON NATIONAL PARK, ARIZONA

by

Jim H. Collette
L. Theodore Neff
Michael R. Robins
Elizabeth Hickey
Brian Kranzler
Jim Hasbargen
Jason Nez

Submitted to:
National Park Service
Grand Canyon National Park
P.O. Box 129
Grand Canyon, Arizona 86023

Submitted by:
L. Theodore Neff, Ph.D.
Archaeology Projects Principal Investigator
Museum of Northern Arizona
3101 North Fort Valley Road
Flagstaff, Arizona 86001

Final
September 2009

ABSTRACT

In the fall of 2007 and the spring of 2008 archaeologists from the Museum of Northern Arizona (MNA), Flagstaff, and the National Park Service (NPS) excavated two prehistoric sites in Grand Canyon National Park, Coconino County, Arizona. Site AZ B:16:1125 is located along Hermit Road adjacent to the South Rim and consisted of a lithic scatter exposed on outcropping Kaibab Limestone. It is situated partly within the right-of-way of Hermit Road, which was scheduled for improvement between Grand Canyon Village and Hermit's Rest. Site AZ B:16:0134 is near the Bright Angel Trail northeast of Three Mile Rest House. It is situated at the top of the Redwall Limestone Formation overlooking Indian Garden. The NPS proposes to place composting toilets in this location to better serve visitors using Three Mile Rest House. The prehistoric component of AZ B:16:0134 consisted of a roasting pit (F1), a buried thermal feature (F3), and associated lithic artifacts. Site AZ B:16:1125, also known as the Hermit Road Site, had artifacts associated with three possible time periods: the Late Archaic, the Late Formative, and the Protohistoric/Historic. The primary component comprised a surface lithic scatter of mostly expedient core flakes and tools that probably represent a temporary Formative camp, although no diagnostic artifacts were found in association. The features at AZ B:16:0134, also known as the Three Mile Rest House Site, were radiocarbon dated to three time periods: the Late Archaic, the Late Archaic/Early Agricultural transition, and Late Pueblo I-Early Pueblo II. The dates appear to reflect intermittent re-use of the roasting pit over 2500 years. Macrobotanical analysis showed that the pit was used to roast agave.

ACKNOWLEDGMENTS

It was a pleasure to work with the National Park Service at Grand Canyon National Park and our own staff at the Museum of Northern Arizona on this project. We would like to thank Ellen Brennan, the NPS Key Official for the excavations at the Three Mile Rest House Site and Hermit Road Site. Ellen was instrumental in getting the project off to a fantastic start and introducing us to the project area. We would also like to thank Amy Horn, Archaeology Program Manager, who saw the project to its fruitful conclusion and shepherded us through the intricacies of the Park cultural resource database. NPS archaeologist Jim Hasbargen was our very able mate in the field, and Ray Knight, also from the Park, safely packed in our supplies by mule during our work at Three Mile. At MNA, Pats Shriver and Lynn Yeager provided the critical administrative and budgetary aide that enabled the project to proceed smoothly and efficiently; thank you both. Big thanks are also due to the hard work of crew members Brian Kranzler and Jason Nez, and analysts Michael "Mick" Robins and Elizabeth Hickey; we couldn't have done it without you, nor looked as fashionable while doing it. Finally, we would like to express our gratitude to Robert Breunig at MNA, and Janet Balsom at Grand Canyon N.P., for their long-term support and encouragement.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1
Introduction

This report summarizes the results of data recovery at two archaeological sites within Grand Canyon National Park (GRCA, or the Park) in Coconino County, Arizona (Figure 1). Site AZ B:16:1125, also known as the Hermit Road Site, is located on the South Rim of the Grand Canyon between the rim and the west side of the historic Hermit Road (Figure 2). It consists of a prehistoric lithic scatter perched atop a level expanse of Kaibab limestone on a small point immediately adjacent the rim. Site AZ B:16:0134 is located near Three Mile Rest House just east of the Bright Angel Trail (Figure 2). It is comprised of the remains of a large prehistoric roasting pit and associated lithic scatter on a rocky point that overlooks Indian Garden along Garden Creek.

The work was conducted in the fall of 2007 and the spring of 2008 by archaeologists from the Museum of Northern Arizona (MNA), Flagstaff, and the GRCA. The scope of work for the project was prepared by Brennan (2007), and incorporated treatment plans created by the Park for AZ B:16:1125 (Weaver 2006) and AZ B:16:0134 (Weaver and Horn 2005). The plans were developed in accordance with the National Environmental Policy Act and the National Historic Preservation Act, as amended, to address potential adverse effects to AZ B:16:1125 and AZ B:16:0134 from the widening of the Hermit Road and the installation of composting toilets adjacent to the Three Mile Rest House.

Background

Site AZ B:16:1125 was originally recorded as a 190 m^2 prehistoric lithic scatter located on the South Rim of the Grand Canyon (Anderson and Brennan 2006). The site is southwest of Mohave Point, a popular tourist overlook, and is situated just above the Great Mohave Wall, which forms the eastern face of The Abyss within the Canyon (Figure 2). The Kaibab Limestone Formation forms much of the rim of the south side of the Canyon, and the site is confined to a minor point of limestone bedrock between the rim and the road. Fill from the original road construction, dating to 1936, covers the east edge of the site (Figure 3). When the road is widened for the current, proposed project, additional impacts are expected to occur. In addition, a section of the Rim Trail passes through the site, as well as other, secondary trails that visitors use to access the rim and the road. When initially recorded, approximately 50 surface artifacts were observed, including Kaibab chert thinning flakes, a quartzite thinning flake, a small Presley Wash obsidian biface, and a small Presley Wash projectile point. Utilized hematite nodules were also noted at the site.

Site AZ B:16:0134 is located about 40 m northeast of Three Mile Rest House, a heavily-used rest area for hikers along the Bright Angel Trail (Figure 4). The rest house, which was built by the Civilian Conservation Corps in the 1930s, is situated on a level portion of a north-south ridge just above a steep escarpment comprised of the Redwall Limestone Formation. Although the rest house has potable water it does not have a toilet, which

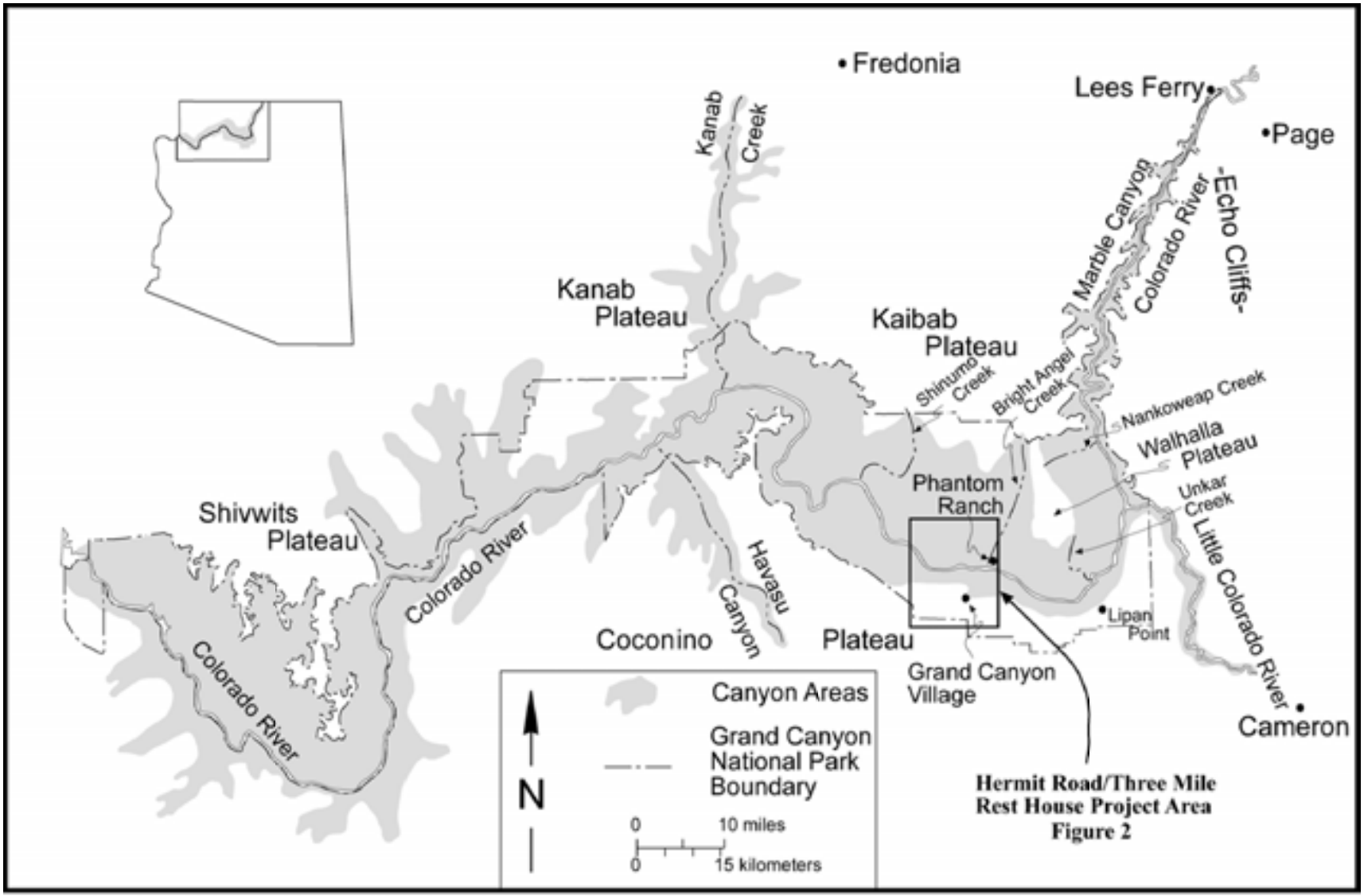


Figure 1. Grand Canyon National Park and surrounding region in northern Arizona (after Map 1 in Douglass W. Schwartz et. al., 1980, "Archaeology of the Grand Canyon: Unkar Delta").

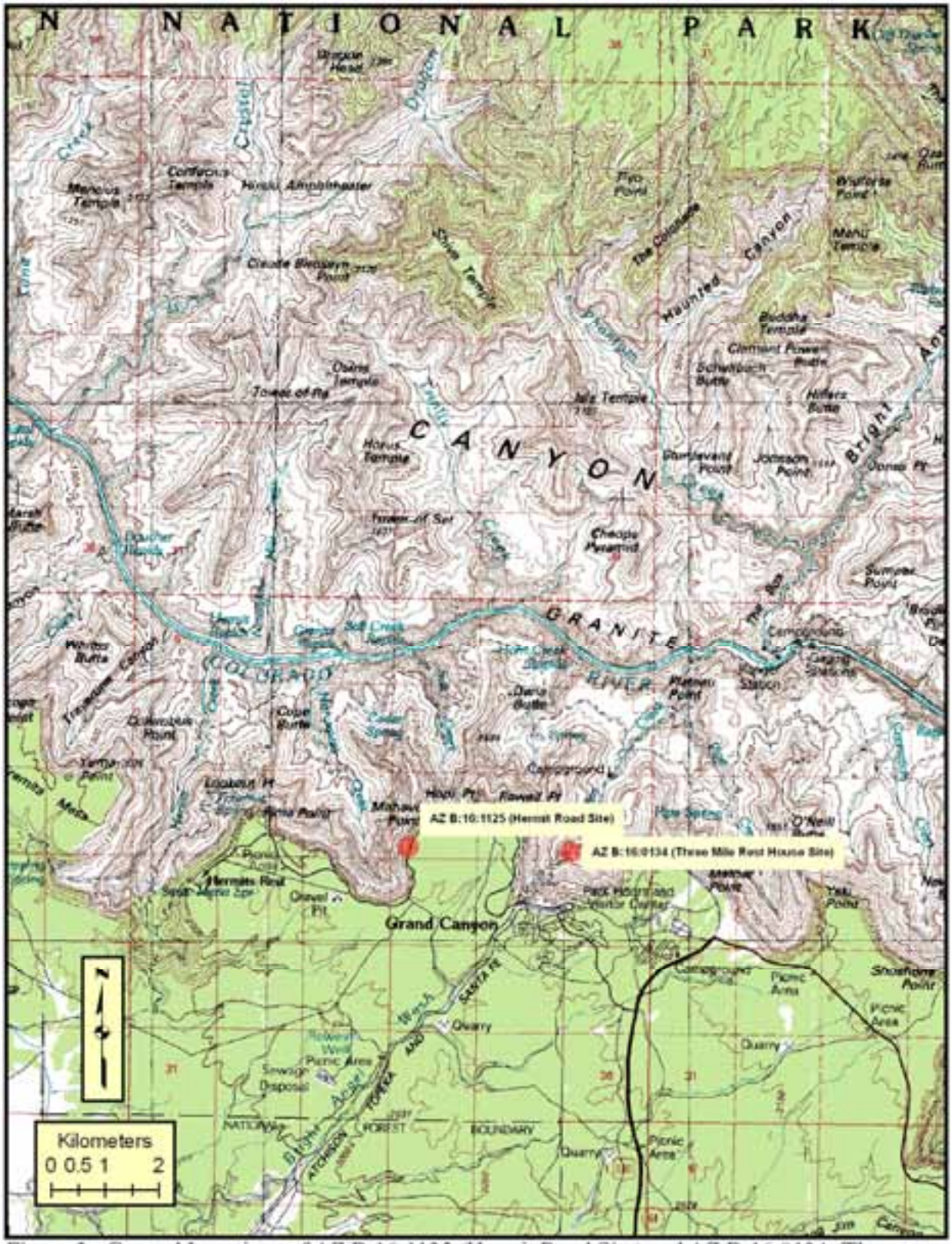


Figure 2. General Locations of AZ B:16:1125 (Hermit Road Site) and AZ B:16:0134 (Three Mile Rest House Site). Base map is 1:100,000 scale Grand Canyon, Arizona, 1984.

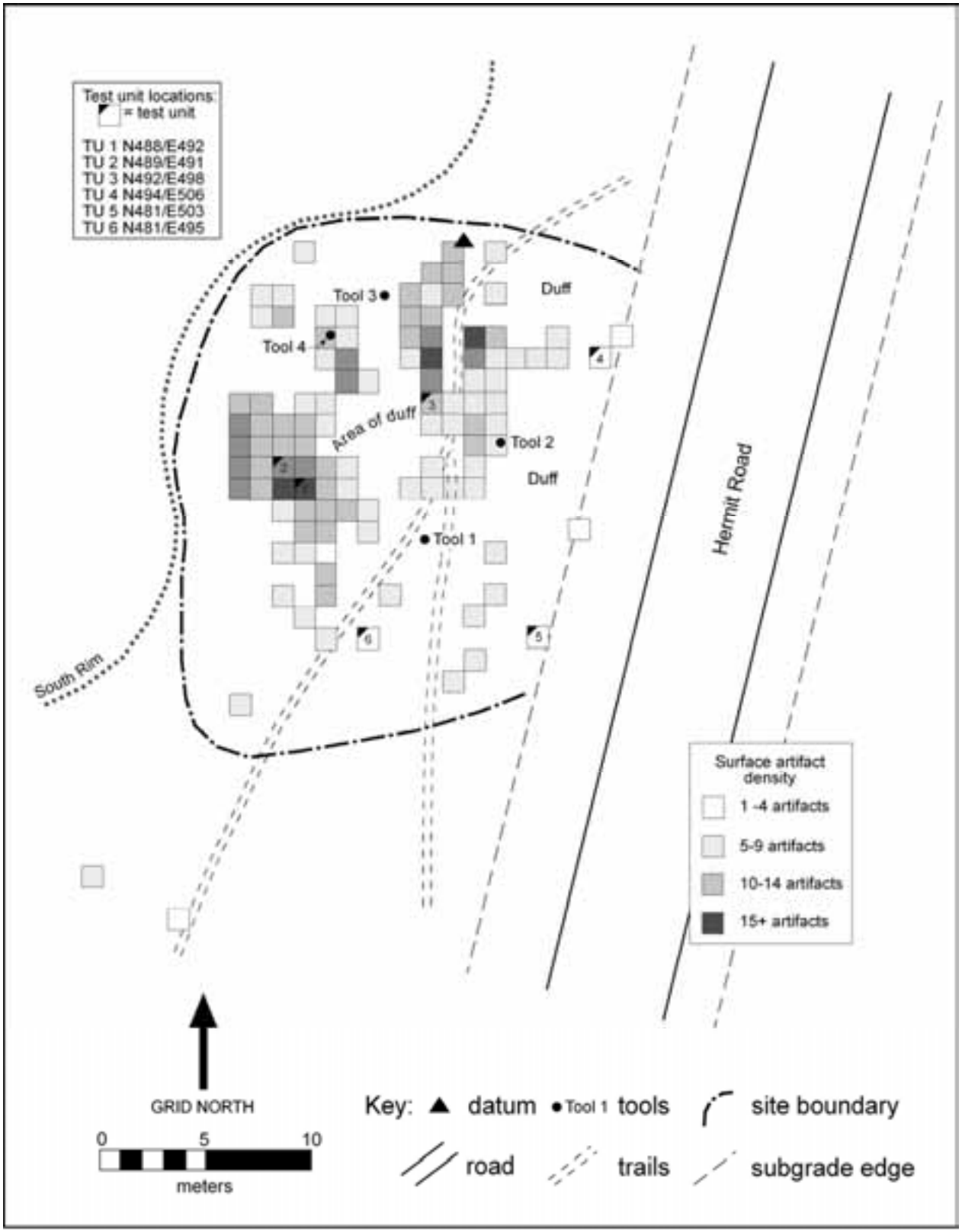


Figure 3. Plan view of site AZ B:16:1125 showing surface collection and hand excavation units; key illustrates artifact density by unit.

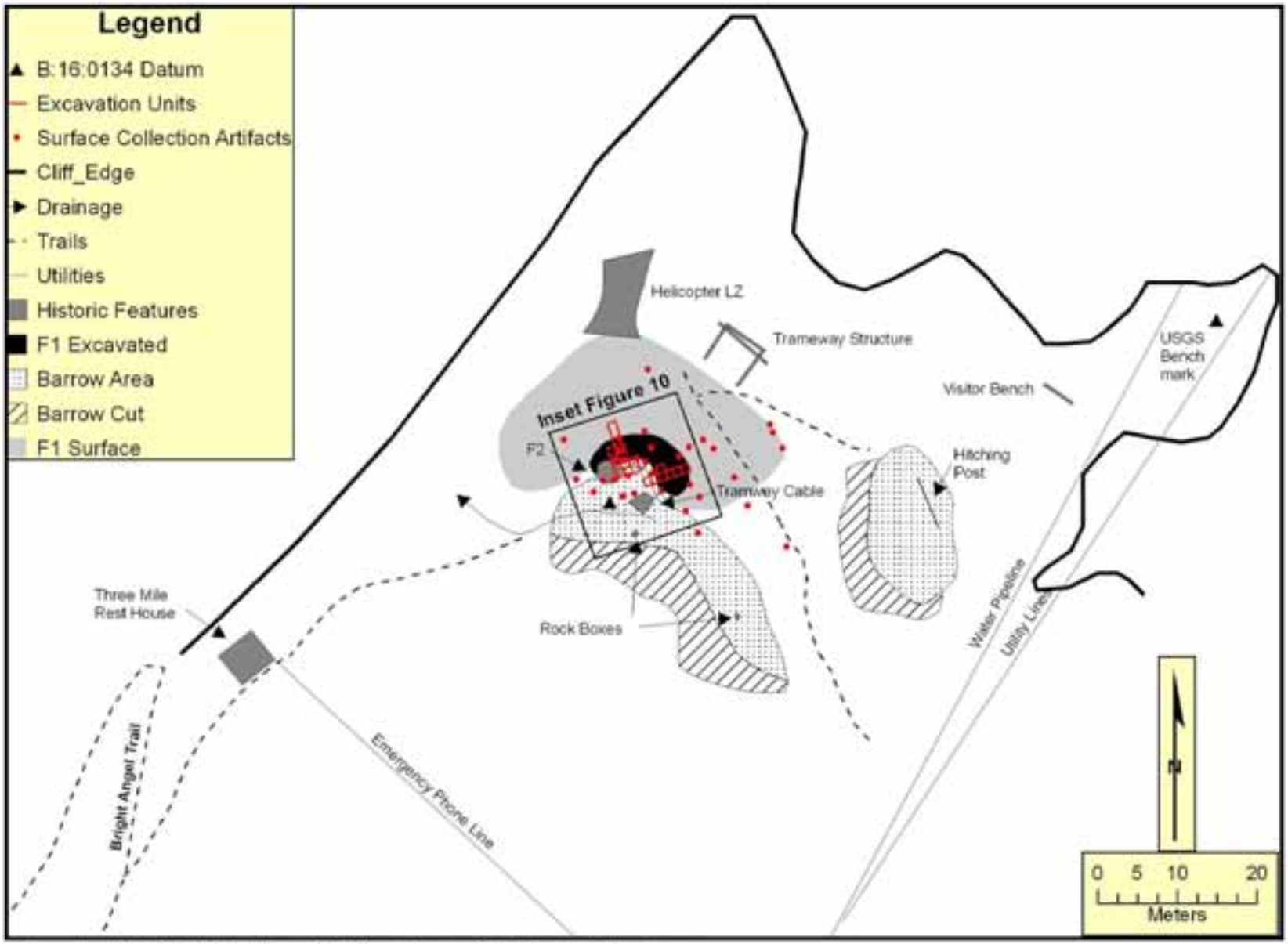


Figure 4. AZ B:16:0134 (Three Mile Rest House Site) planimetric site map.

results in human waste and toilet paper and generally unsanitary conditions on the surrounding landscape. To remedy the problem, the Park is proposing to build a three-stall composting toilet in the same general location as AZ B:16:0134. Although alternative locations were considered, the proposed location is easily accessible from the rest house and does not impinge on other Park facilities, such as a helicopter landing pad immediately north and a mule string staging area to the east. The proposed location has also been previously disturbed and does not require new ground disturbance. A final consideration is that the other locations would have required construction of above-ground vault toilets, which would not have had sufficient capacity for demand.

The proposed location of the composting toilets, while preferred, is adjacent a large roasting feature that comprises the prehistoric component of AZ B:16:0134 (the historic component, which includes old tramway cable supports and other features, is described in Anderson 2004). When originally recorded, the feature had been highly disturbed by previous activities in the vicinity. The principal impact was a borrow pit that cut into the south side of the roasting pit, reportedly used to quarry material for trail construction. It is also possible that the area was used as a "landing site" for the now-dismantled tramway, which once brought supplies to the campground and ranger station at Indian Garden. Lithic artifacts were observed in association with the roasting feature, which sits on a slightly higher part of the ridge than the helicopter landing pad.

Justification

36 CFR, Sections 800.5 and 800.6 of the Advisory Council's revised regulations detail the process by which Federal agencies determine whether their undertakings will adversely affect historic properties. Under 36 CFR, Section 106, part 800.9, criterion b, an undertaking is considered to have an adverse effect when the effect on a property may cause physical destruction, damage, or alteration of all or part of the property. Both sites AZ B:16:1125 and AZ B:16:0134 have received adverse impacts from recreational and administrative use at the Park through time. The proposed scope of work (Brennan 2007) advocated examining the remaining features and artifacts at the sites before the properties lost their integrity due to continued disturbance, as well as to mitigate any possible effects from the rehabilitation projects. The following justifications were offered to recommend data recovery as an appropriate treatment:

- Both sites are considered eligible for nomination to the National Register and are of value chiefly for the information on prehistory they are likely to yield through data recovery.
- Neither of the sites is likely to contain human remains, funerary or sacred objects, or items of cultural patrimony as defined by the Native American Graves Protection and Repatriation Act (25 U.S.C.3001).
- Neither site has long-term preservation value, such as traditional cultural or religious importance to an Indian tribe.
- Neither of the sites is known to possess special significance to an ethnic group or community that would object to the site's excavation or removal of its contents.
- The sites do not appear to have value for permanent public interpretation.

CHAPTER 2
Environment

The Hermit Road and Three Mile Rest House Sites are a little less than 2 miles apart as the crow flies and are located at almost the same latitude (Figure 2). Both sites were undoubtedly affected in similar ways by the regional climate of northwestern Arizona, and share the same Colorado Plateau geologic province. At the level of broad, ecological classifications, both sites are located within the Upper Sonoran Life-zone (Lowe 1985) and each is perched within the upper geologic formations of the Grand Canyon. Yet, there are important differences as well, as AZ B:16:1125 is situated directly on the rim of the Canyon, and AZ B:16:0134 is located within the Garden Creek drainage and side canyon (Figure 5). This chapter summarizes both the general and specific environmental settings of the two site areas.

Geology

The four uppermost formations within the Grand Canyon are, from top to bottom, the Kaibab, Toroweap, Coconino, and Hermit. Both the Kaibab and Toroweap are generally gray limestones deposited by shallow seas and tidal flats, however, the Kaibab is cliff forming while the Toroweap tends to erode as ledgey slopes. The Coconino is a whitish sandstone formation derived from coastal and inland dunes that also forms cliffs. The Hermit is often described as "Hermit Shale," but is actually a red siltstone and sandstone that forms slopes. Below the Hermit are several sandstone, mudstone, and siltstone units collectively known as the Supai Group, which sits atop a steep escarpment known as the Redwall Limestone. The Redwall is a massive, red-stained limestone that forms the highest, most impenetrable cliff in the Grand Canyon. All of the formations are composed of sedimentary rock of the Paleozoic Era, namely the Pennsylvanian and Permian periods that ended as recently as 245 million years ago (Kamilli and Richard 1998).

Site AZ B:16:1125 is located on top of partially exposed bedrock of Kaibab Limestone, which forms the South Rim of the Grand Canyon. For early Native Americans the formation had both advantages and disadvantages. The formation is highly permeable, which results in little surface water in the vicinity of the rim or the Coconino Plateau in general. On the other hand, various marine fossils within the Kaibab Formation form the heart of siliceous nodules or concretions that archaeologists call Kaibab chert (Nations and Stump 1981). The chert ranges from fine to coarse, but is flakeable and was used by various cultures through time for stone tool manufacture. It is the most ubiquitous kind of raw material along the canyon rim and was particularly suitable for core reduction and production of expedient flake tools, such as those found at the Hermit Road Site.

The geologic landscape played a different role in the development of site AZ B:16:0134, located along the Bright Angel Trail. The trail is made possible by the Bright Angel Fault, which cuts through the cliff-like Coconino and Redwall formations and crosses the

Figure 5. Site overviews. (Top) Site AZ B:16:1125 showing proximity to canyon rim; flags mark artifacts. Rim Trail is behind tarp. (Bottom) Site AZ B:16:0134 prior to excavation showing Feature 1; flags mark artifacts. Redwall Formation is in background, Indian Garden in canyon to right.

canyon along a nearly straight southwest-northeast course that includes Bright Angel Creek on the north side of the Colorado River. The trail was and continues to be one of the few places along the South Rim where a descent can be made to the river and up the opposite side of the canyon. In so doing the trail passes the well-watered oasis of Indian Garden. The trail also allows access to lateral routes within the canyon, such as the Tonto Trail above the inner canyon.

The site at Three Mile Rest House is situated at the contact between the lower Supai and the Redwall Limestone. It actually occupies the somewhat level toe of a slope of Supai colluvium, some of which may be from the lowest member of the Supai Group, the Watahomigi Formation of red mudstone and siltstone. Below the site is the lip of the Redwall, upon which the rest house itself was constructed. Site AZ B:16:0134 would have not only been ideally situated to access both the rim and the resources of Indian Garden, it is the jumping off point for east-west travel along the rim of the Redwall Formation (which, for example, can be followed east to the South Kaibab Trail). It is likely that the roasting pit at AZ B:16:0134 was specifically sited here to cook foodstuffs that could be found along the minor benchland that makes up the juncture between the Supai and Redwall.

Biotic Communities

There are several means of categorizing the plant and animal communities of the Southwest. In fact, one of the earliest—the "life-zone" system created by C. Hart Merriam (1890)—originated in a study of the San Francisco Peaks to the south of the Grand Canyon. It continues to be used in conjunction with more recent biogeographic systems such as biomes and biotic communities and provinces. In this section we will refer to the project areas within the system of biotic communities described in Brown (1994) and Brown and Lowe (1980).

The Hermit Road Site is primarily within the biotic community known as the Great Basin Conifer Woodland, which includes most of the upland South Rim of the Grand Canyon and the Coconino Plateau. Much of the woodland is composed of two cold-adapted evergreens—juniper (*Juniperus*) and pinyon (*Pinus*). The woodland favors rocky, thin soils that receive relatively little precipitation (usually between 25-50 cm per year, with this part of the Grand Canyon averaging 36.6 cm [Brown 1994: Table 4]).

Within the site boundary of AZ B:16:1125 the understory is fairly thin, probably due to the extreme lack of soil and exposures of sheer bedrock. Typically, however, the woodland includes associates such as big sagebrush (*Artemisia tridentata*), cliffrose (*Cowania mexicana*), snakeweed (*Gutierrezia sarothrae*), Mormon tea (*Ephedra viridis*),

barberry (*Berberis fremonti*), and mountain mahoganies (*Cercocarpus* spp.). Locally common grasses and herbs can include Indian ricegrass (*Oryzopsis hymenoides*), Galleta grass (*Hilaria jamesii*), dropseeds (*Sporobolus* spp.), various muhleys (*Muhlenbergia* spp.), buckwheats (*Eriogonum* spp.), globemallows (*Sphaeralcea* spp.) and bromes (*Bromus* spp.). Nearby and to the south are montane communities dominated by Ponderosa pine (*Pinus ponderosa*), a widespread yellow pine. Although single-species dominant, the community includes a grassy understory as well as associated trees such as various firs and aspen.

The situation at AZ B:16:0134 is more complex, with the site in contact with not only the pinyon-juniper and montane conifer woodlands, but the upper reaches of a community known as Great Basin Desertscrub. The latter is more endemic to the Tonto Platform below the Redwall, but the Tonto itself "straddles" a Mohave Desert-Great Basin Desert "tension line" dominated by blackbrush (*Coleogyne ramosissima* [Brown 1994:151-152]). In the vicinity of site AZ B:16:0134, however, the vegetation has more in common with the sagebrush series of desertscrub, although—unlike other areas of the canyon, such as Fishtail Mesa—it is not dominated by this woody shrub. Of interest to the investigation of the Three Mile Rest House Site, is that *Agave utahensis* is a prominent succulent member of the community, as well as other species with edible fruit such as *Opuntia* (prickly pair cactus). It is probably the north-facing aspect of the site area that allows the woodlands (including a few firs) to "creep" downward into the canyon.

A vegetation survey of the AZ B:16:0134 project area by NPS archaeologist Jim Hasbargen included the following trees, shrubs, and associated species: pinyon pine, juniper, blackbrush, snakeweed, Mormon tea, yucca (*Yucca* spp.), Utah agave, sagebrush, cliffrose, threeleaf sumac (*Rhus trilobata*), sego lily (*Calochortus nuttallii*), mockorange (*Philadelphus microphyllus*), rabbitbrush (*Chrysothamnus* spp.), hedgehog cactus (*Echinocereus* spp.), Indian ricegrass, and others unidentified grasses and forbs just beginnng their annual cycle.

Fauna

The fauna common to the two project areas is about the same, with perhaps a greater variety within the desertscrub community.

At both sites the crew observed desert cottontail (*Sylvilagus audubonii*) and mule deer (*Odocoileus hemionus*). Mammals that are closely attached to the pinyon-juniper woodland include the pinyon mouse (*Peromyscus truei*), pinyon jay (*Gymnorhinus cyanocephalus*), and types of woodrats (*Neotoma* spp.). Pronghorn (*Antilocapra americana*) can sometimes enter from the south, and elk (*Cervus canadensis*) are known to be transients in this area. Other species can include coyote (*Canis latrans*), mountain lion (*Felis concolor*), rock squirrel (*Spermophilus variegatus*), cliff chipmunk (*Eutamias dorsalis*), and gray fox (*Urocyon cinereoargenteus*). Other species that are more typical of the yellow pine community, but are certainly found along the rim, are squirrels

(*Sciurus* spp.), striped skunk (*Mephitis mephitis*), porcupine (*Erethizon dorsatum*), and various mice, shrews, and voles.

Many of the same species can be found in the upper desertscrub community, such as mule deer, rabbits, ground and tree squirrels, chipmunks, and skunks (including the spotted skunk, *Spilogale putorius*). To this list we can add ringtail (*Bassariscus astutus*) and black-tailed jackrabbit (*Lepus californicus*), although these are more likely to be found below the Redwall. Another important ungulate to this community is the bighorn or mountain sheep (*Ovis canadensis*). While visitors to the Bright Angel Trail are more likely to see this animal around Indian Garden or side canyons that cut into the Tonto, there are records of bighorn all up and down the trail, including at the South Rim (Hoffmeister 1971:154-156).

Climate

A weather station has been located at Grand Canyon National Park for many decades at an elevation of about 6950 feet (Sellers and Hill 1974:240-241). This station is located only a few miles east of site AZ B:16:1125. While the Hermit Road Site is about 50 feet higher than the weather station, records from the latter can reasonably serve as a proxy for AZ B:16:1125. The climate for site AZ B:16:0134—at 4844 ft.— is more difficult to gauge, as the only other nearby stations are at the North Rim (8400 ft.) and Phantom Ranch (2570 ft.). Although the Three Mile Rest House Site is north facing, and in a cold-air drainage, it is warmer than the rim and probably less watered. For example, during excavation in March, 2008, the rim and the upper reaches of the Bright Angel Trail were still snow covered and required the use of crampons, while the rest house and site area were free of snow.

The South Rim of the Grand Canyon averages about 14 inches of precipitation a year, which is about at the limit of sustainability for maize (Hack 1942). The frost-free period averages 148 days annually, with the normal date of the first occurrence of 32° F being October 12, and the last occurrence being May 17. This is within the growing season parameters for maize, but freezing temperatures have been recorded for every month of the year at Park headquarters. During a year with a normal or long growing season, crop production would have been more dependent on spring snowmelt and summer rainfall. Although the mean is 14.46 inches, the range at the South Rim between 1931 and 1972 was 7.59 inches in 1956, and 24.62 inches in 1941 (Sellers and Hill 1974:241). In fact, in any given year the precipitation is either too little or barely at the threshold for maize production. This was probably not an issue at site AZ B:16:1125, which does not appear to be associated with agricultural or horticultural activities. By all indications, site AZ B:16:0134 was related to processing of wild plants such as agave, and not corn. The soil at neither site is particularly well suited for growing domesticates.

CHAPTER 3
Previous Research and Culture History

As the following chapters will demonstrate, the greatest contribution of this project may be in the dating and analysis of two thermal features at site AZ B:16:0134, also known as the Three Mile Rest House Site. Feature 1, a roasting pit, returned two radiocarbon dates that indicate use during the Late Archaic and again during the transition between the Late Archaic and Basketmaker II, i.e., the Early Agricultural Period. Feature 3—which is likely a late event in the use of F1—dated to Late Pueblo I-Early Pueblo II (see below for date ranges of all temporal periods). The analysis of lithic artifacts from site AZ B:16:1125 is a contribution in its own right, but the primary component was not dateable to any specific time period.

With this in mind, this chapter will focus on the culture history of the Late Archaic-Early Agricultural periods and Late PI-Early PII. Rather than reiterate a culture history that has been well summarized in several recent archaeological overviews, we have structured the chapter so as to: 1) Introduce relevant overviews for the interested reader; 2) Provide a capsule culture history to place the project findings in cultural and temporal context; and 3) Summarize previous research, both in proximity to the project area, as well as major projects relevant to the Hermit Road/Three Mile Rest House findings.

Archaeological Overviews of the Grand Canyon

We are fortunate that Grand Canyon National Park has been the subject of several excellent archaeological overviews in the last two decades, and the interested reader is directed to the following publications for an introduction to Canyon prehistory.

An early and little-known overview of Park archaeology is Walker (1974), but has been referred to as a "major disappointment" in print (Ahlstrom et al. 1993:68). The first readily available synthesis of Formative-era archaeology consists of several volumes that report the results of excavations by the School of American Research (SAR) at Unkar Delta (Schwartz et al. 1980), the Bright Angel Site (Schwartz et al. 1979), and the Walhalla Plateau (Schwartz et al. 1981). The SAR work was actually conducted in the 1960s, and it was not until the 1980s that excavation even approaching this scale of effort was conducted at five sites within the river corridor (Jones 1986). The volume provided a much-needed update on Grand Canyon prehistory and contains a valuable bibliography. At about the same time Euler (1984) edited a report on Stanton's Cave (1984), with its famous cache of split-twig figurines; this probably remains the most widely published work on the Archaic within the Canyon.

An overview of the Arizona Strip by Altschul and Fairley (1989) includes portions of the Park north of the Colorado River, and one could argue that it is the first over-arching synthesis of archaeology in the vicinity of the Grand Canyon. An extensive bibliography of the Grand Canyon and lower Colorado River was compiled soon after by Stamer (1990) in a handy ring-bound format, but with limited distribution.

The early 1990s witnessed the most intensive and far-ranging pedestrian survey in Grand Canyon National Park. Fairley et al. (1994) is an important document that summarizes the results of the Grand Canyon River Corridor Survey Project, a 255-mile long survey of the Colorado River corridor through the Park that resulted in the documentation of 475 sites; it includes a succinct previous research section but lacks a cultural overview. This was partially rectified in 1993 when Ahlstrom et al. produced what might be called the first "official" archaeological overview of Grand Canyon National Park; it benefits from excellent summaries of major projects in the Park and a nicely annotated bibliography.

The latter report was produced by SWCA Inc., which a few years later released a cultural resources data synthesis on sites within the Colorado River corridor in the Park and Glen Canyon National Recreation Area (Neal et al. 2000). This report is not so much a synthesis of culture history, but does integrate information on the Park's long-term monitoring program of river corridor sites, tribal research and recommendations, ancillary studies, and management and public education efforts. Both the 1993 and 2000 reports by SWCA are primarily internal GRCA documents with limited distribution. In 2003 Statistical Research, Inc. (SRI) published the most extensive overview of Grand Canyon archaeology and prehistory up to that point, also by Helen Fairley. Titled "Changing River: Time, Culture, and the Transformation of Landscape in the Grand Canyon," it placed the culture history of the Grand Canyon within a landscape-based research design for future archaeological studies, but was oriented toward cultural resources within the Canyon and along the Colorado River.

While the SRI report was an outgrowth of archaeological work conducted along the Colorado River corridor, the Park early on recognized a need for a plan and research orientation for an at-large inventory of GRCA. The result was a survey design for a "partial park-wide archaeological inventory" (Neff 2004), which included research domains and research themes specific to the Grand Canyon. Along these lines, two theme-based overviews were recently published, one on rock art in the Park south of the South Rim (Christensen and Dickey 2006), the other on evidence for Paleoindian and Archaic use of the Grand Canyon and surrounding areas (Hollenshead 2007). The most recent published synthesis of archaeological research in the Canyon is by Balsom (2005), as part of the Inaugural Grand Canyon History Symposium that took place in 2002.

Mention should be made of a major synthesis of Grand Canyon prehistory currently underway. Francis E. Smiley, Christian E. Downum, and Susan Smiley of Northern Arizona University, have been contracted by the National Park Service to write a history and overview of GRCA archaeology and culture history that will incorporate new work that has been accomplished since the early 1990s. Foremost among these are two recent data recovery efforts along the Colorado River corridor in Grand Canyon, the first funded by the GRCA and conducted by personnel from the Park and the Museum of Northern Arizona (MNA), the second administered by the Bureau of Recreation and carried out by personnel from Utah State University and Humboldt State University archaeologist Jonathan Damp.

Summary of Culture History in the Park

To a large degree the culture history of Grand Canyon National Park is still evolving. Temporal ranges of culture periods, for example, may or may not mirror those established for other areas. This is particularly true for the Archaic, but even the Formative Period may not partition in the same manner as the framework for the Kayenta Anasazi to the east, and there are other cultural traditions present—such as the Cerbat and Cohonina—that are not found elsewhere. For the purposes of this report, we will use the chronology presented in Table 2 of Fairley (2003), repeated here as Table 1. Note that her "Preformative Period" equates with Basketmaker II and III, and her "Formative Period" encompasses Pueblo I, II and III.

Temporal Period	Date Range
Archaic Period	ca. 8000-1000 B.C.
Early Archaic	*ca. 8000-5000 B.C.*
Middle Archaic	*ca. 5000-3000 B.C.*
Late Archaic	*3000-1000 B.C.*
Preformative Period	ca. 1000 B.C.-A.D. 400
Formative Period	ca. A.D. 400-1250
Early Formative	*ca. A.D. 400-1000*
Late Formative	*ca. 1000-1250*
Late Prehistoric/Protohistoric Period	A.D. 1250-1776
Historic Period	A.D. 1776-1950

Table 1. Chronology (after Fairley 2003:Table 2).

Paleoindian Period

The Paleoindian Period is the least well known of all the temporal intervals in the Grand Canyon. This period, which begins with the first entry of humans into the region, overlapped with the occurrence of species of megafauna that were probably an important food source for early peoples. These roving bands of hunter-gatherers would undoubtedly have also utilized other plant and animal resources at their disposal, but most of our information about this period on the Colorado Plateau derives from finds of isolated projectile points suitable for big game hunting.

While evidence for Paleoindian use of the Grand Canyon is scant, there is a growing body of evidence for Paleoindian and very early Archaic occupation of what Hollenshead called the "Greater Grand Canyon Region," or GGCR (2007:3). Within the Park a Clovis point fragment was found near Desert View. The point was fashioned from chert derived from the Chuska Mountains along the Arizona-New Mexico border, suggesting that either the finished point or raw material was brought or traded-in to the area; if the former, it may indicate a wide-ranging annual round by hunter-gatherers of that period. Also found in the Canyon was a partial Folsum point collected in the area of Little Nankoweap Canyon (reported in Hollenshead [2007:18] as being "identified by B[ruce]

Huckell in 1993"). Hollenshead (2007) reports a number of other Clovis, Folsum and other Paleo-era lanceolate point finds from the Flagstaff, Little Colorado River and Page areas, but artifact density appears to be biased towards the most heavily surveyed provinces.

Within the Park, there is more artifactual evidence for use during the transition between the Paleoindian and the earliest stages of the Early Archaic. In a 1997 study, Schroeder found that 4% of the projectile points identified as Paleoindian or Archaic dated to the late Paleo. This interval is exemplified by the appearance of shouldered and stemmed projectile point types, such as Lake Mohave, Silver Lake, and—somewhat later in time—Bajada/Jay. Points that belong to the "Stemmed Point Tradition" have been found within the Park on the Kanab Plateau and Tuckup Canyon in the western part of Grand Canyon (Huffman et al. 1990), and to the east near Mather Point, the Hilltop Site, Grandview, Buggelin picnic area, Point Sublime, Hitson Tank, Rowe Well, and Shoshone Point Road (Hollenshead 2007; Schroeder 1997) plus other locations in the GGCR.

Archaic Period

The Archaic Period in the Southwest is typically divided into Early, Middle, and Late (see Table 1). On the northern Colorado Plateau it is best represented in sheltered settings in the Great Basin, southern Utah, and northern Arizona (see Geib 1996 for a summary). The Archaic lifeway followed the extinction of Pleistocene megafauna and a subsequent reliance on plant gathering and hunting of smaller game. The three Archaic periods are defined, to a greater or lesser degree, by changing material traits, such as sandals and projectile points, stylistic differences related to rock art, and evolving ways in which hunter-gatherers used and moved about the landscape.

Various Archaic cultures, traditions, and complexes have been developed for the Southwest, but most are based on sites and finds from areas off of the Colorado Plateau and far from the Grand Canyon (see Moffitt and Moffitt 2004:11-15 for a recent summation). The most applicable of the traditional cultures/traditions to the Grand Canyon are the Pinto Basin Culture, first defined by Campbell and Campbell (1935), and the Oshara Tradition, originally described by Irwin-Williams (1973). Broadly speaking, the two traditions reflect early aspects of the Archaic from the west (Pinto) and east (Oshara) regions of the Southwest. The age range of Pinto points continues to be debated, but some argue for a long cultural continuum that derives from Lake Mohave-type assemblages. Interestingly, "Pinto points are the predominate lithic artifact form representing the Early Archaic period in GRCA" (Moffitt and Moffitt 2004:13), with 27 having been documented in the Park as of 2004—25 on the South Rim alone. The Bajada/Jay points, previously mentioned, typify the namesake Bajada and Jay phases of Irwin-Williams' Oshara Tradition—the two earliest phases of this sequence. Depending on the author/analyst, Bajada/Jay points are included in either discussions of the terminal Paleoindian period (as we have done), or the Early Archaic.

Whatever their absolute position on the prehistoric timeline, clearly there is a profusion of points being used in the GGCR by the Early Archaic. Aside from shouldered,

stemmed and lanceolate points, there is also a sequence of corner- and side-notched points that appear during this time period. In fact, Phil R. Geib and others have proposed a Northern Colorado Plateau (NCP) sequence that might better fit the kinds of point diagnostics found in the region (see Holmer 1978). The NCP sequence has its roots in the so-called Desha Complex defined from excavated shelters and caves in southern Utah and northern Arizona (e.g., Lindsay et al. 1968; Lindsay 1969; Ambler 1984). Whether the sequence can be applied to the greater Grand Canyon area will require much more work—ideally in well-dated, stratigraphic contexts within sheltered settings.

While 31% of the Paleo-Archaic artifacts from the Grand Canyon are Early Archaic, only 9% may date to the Middle Archaic (Schroeder 1997). This reflects a fall-off of sites, artifacts and radiocarbon-dated material remains that is typical for the Colorado Plateau during the middle phase of the Archaic. The "lull" during the Middle Archaic may be attributable to a true population decline—perhaps a migratory abandonment on the heels of regional climate change (see Berry and Berry 1986), but other scenarios have been offered (see Geib 1996). Nevertheless, Middle Archaic points are known in the Canyon, most interestingly from the Walhalla Plateau at an elevation of 8000-8250 feet (Schroeder 1997).

As is the case elsewhere on the Plateau, there is much greater evidence for use during the Late Archaic in the Grand Canyon; almost 50% of the Paleo-Archaic sites and isolated finds can be attributed to this period (Schroeder 1997). The most frequently encountered projectile point during this period is Gypsum (Holmer 1978), seen in concert with other Late Archaic points on both rims.

The most spectacular Late Archaic material item, however—recognizable to the point of being an icon of Canyon prehistory—are animal figurines made of split twigs (Euler 1984). The so-called "split-twig figurines," fashioned in the form of antelope and deer, are found in Late Archaic contexts in sheltered settings—most commonly, limestone solutions caverns within the Redwall Formation. Figurines were reported as long ago as the 1930s (Wheeler 1939, 1949), and Schwartz et al. (1958) described some initial finds within the Grand Canyon, but Robert C. Euler's work at Stanton's Cave along the Colorado River remains the most extensive investigation of what is now known as the Grand Canyon Figurine Complex (Euler 1984; Euler and Olson 1965; Schroedl 1977; see Emslie et al. 1995 and Coulam and Schroedl 2004 for recent interpretations). In all, over 470 figurines have been found in GRCA, and, until recently, comprised the best data set for the Late Archaic in the Grand Canyon. Since then, numerous radiocarbon dates have been obtained from buried Archaic features along the Colorado River as part of studies related to the impacts of Glen Canyon Dam on downriver resources (Fairley 2003:57-63). Still, there is a great need for "information related to all aspects of the Late Archaic landscape…beyond the ritual use of caves" (Fairley 2003:137), and this is doubly so for preceding periods of the Archaic.

One promising avenue of study concerns Archaic rock art in the Grand Canyon, including a western variant of the Barrier Canyon rock art style (Schaafsma 1990). What has been called "an analogous but distinct style" (Moffitt and Moffitt 2004:14) called Grand

Canyon Polychrome may date to the Late Archaic (Allen 1986, 1992; Christensen and Dickey 2006). Although there is some evidence that the style may pre-date the terminal Archaic, at least one radiocarbon date (Schaafsma 1990:215) was roughly contemporaneous with dated figurines and associated remains of the Grand Canyon Figurine Complex (Schwartz et al. 1958; Euler and Olson 1965). Most recently, Christensen and Dickey (2006) investigated 76 rock art sites on the South Rim of the Canyon and the adjacent Tusayan District of the Kaibab National Forest, which comprise an astounding 6308 pictographs and 1296 petroglyphs; the earliest examples appear to date to the Late Archaic.

Preformative Period

This period encompasses the transition to agriculture from what was a hunting and gathering lifestyle during the Archaic. It has the dubious honor of being one of the least well-known culture periods in the Grand Canyon, perhaps even less understood than the preceding Late Archaic. The latter period has seen considerably more investigation, even if the data retrieved is heavily weighted toward the collection of "ritual" objects that speak only narrowly to the lifeways of Archaic peoples.

The temporal meaning of what "ends" the Archaic and "begins" the Early Agricultural Period is also undergoing revision across the Colorado Plateau. Outside of the Grand Canyon the first use of maize on the southern Colorado Plateau is now believed to be at least 1000 B.C. (Smiley 2002), but sites on the northern part of the Plateau tend to lag in the introduction of corn by several hundred years. Thus, it was all the more surprising when Davis et al. (2000) claimed that there was evidence for corn agriculture in the Grand Canyon *before* 1000 B.C., based on maize pollen bracketed by two radiocarbon dates of 3160±60 B.P. and 4460±50 B.P. Fairley (2003:84-85) goes to some length to cast doubt on these results, but it is the case that we are beginning to "fill in" what was thought believed to be an occupational hiatus between 1000 B.C. and A.D. 500 (see Jones and Euler 1979) with radiocarbon-dated samples that fall within this interval.

The evidence for a Basketmaker II presence in the Grand Canyon is growing but could be much more robust. Most of the dates derive from wood charcoal samples and may be susceptible to the "old wood" problem, in which the dated sample can be several hundred years older than the target event. In addition, we still have little idea what Early Agricultural/Basketmaker II people were *doing* in the canyon, since the sample is skewed toward tested thermal features in fluvial, river-level contexts. Finally, we do not know who the Basketmaker II people were or where they came from. Could they have been an in situ development growing out of the Archaic? Or were they migrants with no relationship to the hunter-gatherers that came before?

Formative Period

The Formative Period is less than 850 years old in the Grand Canyon but witnessed the greatest amount of cultural change in the shortest amount of time in settlement and subsistence practices, material goods, and even—perhaps—cultural identity. Fairley

(2003) divides the period into Early (A.D. 400-1000) and Late (A.D. 1000-1250). The Formative can also be separated into four broad, temporal periods: Basketmaker III (ca. A.D. 400-700/750), Pueblo I (A.D. 700/750-900), Pueblo II (A.D. 900-1000/1150) and Pueblo III (A.D. 1000/1150 to 1250 in the Canyon and up to A.D. 1300 in the so-called Kayenta Anasazi "heartland"), with each period tied to changing styles in ceramics, architecture, site layout, social patterns and so on. The time ranges of these periods, however, are based primarily on cross-dated ceramic types from the east; ceramic types north and west of the Colorado River are not as well dated and may begin or end earlier or later than their eastern counterparts. The Formative Period is generally described as a time when populations became increasingly sedentary and more and more dependant on agricultural crops such as corn, beans, squash, and occasionally cotton. It is, visibly, the most "obvious" period on the ground as sites became more architecturally complex, with above ground masonry rooms, below ground kivas, and integrated site layouts that tie together storage, habitation and ceremonial functions.

On the Colorado Plateau the Formative has traditionally been known as the "Puebloan Period," and the folk of that time are now commonly referred to as Ancestral Puebloan. By A.D. 1000 at least three archaeological cultures bounded the Canyon: the Kayenta Anasazi to the east (see Powell and Smiley 2002 for a recent summary regarding the "heartland" Kayenta), the Virgin Anasazi to the north (Aikens 1966), and the Cohonina to the south (Hargrave 1938; McGregor 1950, 1951, 1967; Cartledge 1979, 1987; Jennings 1971; James 1977; Euler 1981; Sullivan 1986; Samples et al. 1991, 1992; Hanson 1996; Horn-Wilson 1997; Moffitt 1998).

Archaeologists have also defined a culture to the west called "Cerbat," which appears to post-date the 13th Century (Euler 1975; Cleeland et al. 1992). Although the particulars of Cerbat identity are still being debated, they may have been the successors to the Cohonina and the precursors to later Pai peoples, such as the Havasupai. Cerbat ceramics, in the form of Tizon Brown Ware, can be found in the project area, but tend to be more common to the west.

As elsewhere on the Colorado Plateau, the Puebloan occupation peaked during Late Pueblo II and came to an end by the beginning or middle of the A.D. 1200s. Probably the best-known and most visited PII/III sites in the Grand Canyon are Tusayan Ruin on the South Rim (Haury 1931) and the Unkar Delta settlement along the Colorado River (Schwartz et al. 1980; see also Schwartz 1991 for a popular account of the School of American Research investigations at this and other sites).

Fairley (2003), Neff (2004), and Moffitt and Moffitt (2004) provide excellent, current overviews of the Early and Late Formative and volumes can and will be written on this important interval in Grand Canyon history. For the purposes of this report we will focus briefly on the Early Formative, or what is commonly referred to as Basketmaker III through Early Pueblo II, specifically the transition between PI and PII. Pueblo I is usually considered to be an outgrowth of the preceding Basketmaker III, but neither period is terribly well dated or well defined in the Canyon. The BMIII Period in the Canyon is known, for the most part, from some two dozen dated features and contexts

that sometimes have uncertain provenience, questionable association with observed artifacts, and a reliance on samples from wood charcoal (Fairley 2003:88-90). Nevertheless, the dates affirm an occupation during an interval that Effland et al. (1981:13) believed had "no direct evidence of human presence."

By late Pueblo I sites with ceramics tend to be dominated by San Francisco Mountain Gray Ware, primarily Deadmans Gray, with some decorated such as Kana-a Black-on-white, and intrusive red wares types, such as Deadmans Black-on-red. Schwartz et al. (1980) argued that the first Puebloan occupation of the Grand Canyon was by the Cohonina, rather than the Kayenta Anasazi, and recent MNA/GRCA Colorado River Corridor Archaeological Project excavations in the Canyon interior tend to support this view. In fact, a model that is currently being tested by personnel from the MNA/GRCA Colorado River Corridor Archaeological Project proposes three broad, Puebloan occupations of the Grand Canyon interior: a Late PI-Early PII presence by the Cohonina, an Early PII-Mid-PII occupation by Kayenta migrants, and a final Late PII-Early PIII occupation that appears to be an in situ development expressed through the Shinarump family of wares and other locally-produced variants.

Whoever was in the Grand Canyon by A.D. 900-1000 (the time frame for Feature 3 at site AZ B:16:1125), they appear to be operating at a less intense or permanent level than later PII inhabitants. In contrast to PII/III masonry roomblocks, PI/II features within the inner Canyon are known only by possible pit structures (such as at UN-8 [Schwartz et al. 1980]), a roasting pit (found by Jones [1986] at Deer Creek, buried ceramics of that time period at Furnace Flats (Hereford et al. 1991), and a dated hearth in the same general area (Balsom and Larralde 1996). "With the exception of UN-8, and possibly UN-52…none of the Early Formative sites in the canyon has constructed features other than slab-lined cists, hearths and roasting pits" (Fairley 2003:92).

We would dispute Neff's contention that "many sites along the Colorado River are attributed to the Cohonina culture" (2004:13), a conclusion he based primarily on results from the GCRCS (Fairley et al. 1994). Of the 348 ceramic sites identified on that survey, only 8 (about 2%) had Cohonina ceramics. Nevertheless, early Formative components *are* being identified by the MNA/GRCA excavations currently underway along the Colorado River (Neff et al., in progress), most with Cohonina ceramics, but they are usually buried beneath meters of sediment and often underlay later occupations by peoples with predominantly Kayenta, Virgin and local wares.

On the South Rim of the Grand Canyon there are, indeed, numerous sites with San Francisco Mountain Gray Ware and other Cohonina attributes that generally fall within the A.D. 600-1150 time frame (see following section on "Previous Research in the Project Area"). Identification of single component Cohonina sites can be difficult, as many rim sites have evidence of multiple occupations by not only the Cohonina, but Anasazi, Cerbat, Hopi, and other ancestral and historic peoples. And, without accompanying trade wares, like Tusayan White Ware and San Juan Red Ware, it can be challenging to attribute Cohonina occupations to a specific time interval (e.g., A.D. 950-1000).

Settlement-subsistence models for this period are still being developed. Alan P. Sullivan has worked in the Upper Basin east of Desert View for many years, and his evolving model that the Cohonina were "semi-sedentary collectors" (1986:330) benefits from the best survey and excavation data set on the South Rim. Whether his ideas will carry the day will require additional work from diverse parties inside and outside of the GRCA. Even the better understood PII and PIII periods in the Canyon have generated so many conflicting strategies (e.g., Schwartz 1966, Effland et al. 1981, Euler and Green 1978, Sullivan 1986, Sullivan et al. 2002) that Fairley best summed up the resulting picture as "perplexing" (2003:93). At this point, a tentative model would indicate that PI/II peoples were using the inner Canyon for logistical forays and short-term habitation as part of a subsistence round that included the South Rim, interior benches, and river-level lowlands. Permanent, year-round habitation in the eastern Grand Canyon was apparently not yet being practiced.

In any case, by early A.D. 1000/1050 there was an intrusion of Kayenta peoples from the east—the first generation that would ultimately call the interior of the Grand Canyon "home." Since Cohonina and "Kayentan" ceramics often co-occur, the nature of the interaction between these two groups—related in the broad "Puebloan" sense, but with completely divergent ceramic trajectories—is unknown. What we do know is that sometime between A.D. 1000 and 1100 ceramic assemblages are increasingly dominated by Tusayan White and Gray wares, and Tsegi Orange Ware. Cohonina ceramics dwindle in numbers, proportionally, and essentially disappear by A.D. 1100 to 1150.

Protohistoric and Historic Periods

The end of the Puebloan occupation of the Grand Canyon is earlier than in the so-called Kayenta heartland, where it persisted well past A.D. 1250 until nearly A.D. 1300—an interval called the Tsegi Phase by archaeologists. As recently as this decade Fairley judged that "by A.D. 1150 the majority of the Puebloan sites had been abandoned, and by A.D. 1200…the Puebloan occupation of the Grand Canyon had ended," (2003:95), although she cited Jones (1986:324) as suggesting that it may have been as late as A.D. 1220. Data recovery work by the MNA/GRCA Colorado River Corridor Archaeological Project is beginning to affirm a late presence at sites like Gidget Gulch, one that likely continued after the beginning of the 13th Century. The lack of dendrochronological dates, however, and the uncertain terminal date ranges of locally produced ceramics, leaves the final abandonment of the inner Canyon open to question. Few would argue that by A.D. 1250, all was quiet on the terraces and deltas of the eastern Grand Canyon.

The Protohistoric Period begins on the Colorado Plateau after A.D. 1300, with most archeologists figuring it to last until A.D. 1776—the year of the Dominguez-Escalante expedition through southern Utah and northern Arizona. However, there is an unknown interval of time between the abandonment of the Grand Canyon by the Puebloans and the arrival of ancestral Pai and Southern Paiute from the west. It may have been as little as a moment—if the cultures overlapped in space and time (Simonis 2001)—or one to two hundred years, if they arrived between A.D. 1150 and 1300 as Euler (1974) suggests.

Huffman (1993) has argued that—with the end of the Formative occupation in the Canyon being pushed forward, and the beginning of the Protohistoric being pushed backward—that the "gap" may have been exceedingly short. Excavations by Jones (1986) at Whitmore Wash and Tuna Creek indicate a "relatively brief" (Fairley 2003:98) temporal interval between possible Paiute and Puebloan strata. Testing of roasting pits in Tuckup Canyon returned radiocarbon dates as early as the A.D. 1300s and 1400s (Huffman 1993), but were aggregate samples of wood charcoal and subject to mixing of old wood. Roasting pits are more common in the western reaches of the Canyon, and many date to this time period. Interestingly, plant and pollen analyses of the features often indicates use other than as agave roasting pits (Hutira 1986, Hubbard et al. 2001), which contrasts with the results from site AZ B:16:0134 (see Chapter 7).

Use of the Grand Canyon by the Pai and Paiute continued unabated through the centuries, with frequent incursions by the Hopi and Navajo in the eastern Canyon. But by the mid-1800s the end was nigh for traditional Native American use of the Grand Canyon. Trappers, miners, explorers, missionaries, scientists and, ultimately, tourists, first displaced the native lifestyle, then commercialized it as a commodity (Coder 1994).

Of interest to this project are the impacts that 20th Century development had on both sites AZ B:16:1125 and 0134. At the former, the Hermit Road was constructed in the late 1920s along the South Rim west of Grand Canyon Village, allowing vehicle access to Hermit Rest and parts beyond. The road impacted a portion of site AZ B:16:1125, and, later, the Rim Trail bisected the site, with thousands of visitors walking over artifactual remains that few probably recognized as such. Site AZ B:16:0134 has had it worse, with impacts ranging from use of the nearby Bright Angel Trail and Three Mile Rest House by hikers and mule riders, construction of a tramway and utility lines, use of the area as a helicopter landing pad, and, most seriously, excavation of part of the roasting pit for the recovery of borrow material.

Previous Research in the Project Area

The following section is divided into two parts. The first part is a summary of major projects within Grand Canyon National Park that are either in proximity to the project area or may be related, temporally, to dated features from the project. An example of the latter is Stanton's Cave (AZ C:5:0003), which is some distance away but features prominently in any discussion of the Archaic Period in the Grand Canyon. The second part is a synthesis of sites near the project area that were mostly recorded during cultural resource inventories conducted by the NPS and other contracted entities. While a few of these sites are below the South Rim, most are located on or near the rim.

Major Projects

This summary extracts information presented in Altschul and Fairley (1989), Ahlstrom et al. 1993, Fairley (2003), Neff (2004), Moffitt and Moffitt (2004) and GRCA site files, but concentrates on archaeological projects conducted on the South Rim and along the upper Bright Angel Trail in the vicinity of the project area. In this section (and the preceding

culture history) we also include projects from across the Grand Canyon that gathered important data on the Late Archaic-Early BMII and Late PI-Early PII time periods.

The first professional interest in the general project area was by members of the Milwaukee Public Museum, which conducted limited surveys and excavations along the South Rim and Bright Angel Canyon in 1923 (West 1925); the latter included survey along the Bright Angel Trail. Additional survey of the South Rim and Coconino Basin was undertaken by Gila Pueblo during its excavations at Tusayan Ruin (Haury 1931), but little record of the survey has been found (see McKee 1931). Tusayan Ruin was dendrochronologically dated to between A.D. 1170 and 1205 and was interpreted as a late Anasazi habitation on the western fringe of the so-called Kayenta Branch.

Also near Tusayan Ruin, and bearing on this report, is the excavation of a Pueblo I site by Wheat and Wheat (1954). Of interest to the excavators was the relationship between the site (designated GC 505, aka NA5542) and Tusayan Ruin, only a few hundred meters away. Excavations demonstrated, however that GC 505 pre-dated Tusayan Ruin by about 300 years, with an estimated occupation of between A.D. 700 and 900. Furthermore, the site had a preponderance of Cohonina pottery, in contrast to the Kayenta wares found at Tusayan Ruin.

In the mid-1950s, investigations of split-twig figurines in the Grand Canyon ushered in a new era of archaeology centered on the pre-Formative history of the Park. Excavations directed by Douglas Schwartz at four caves recovered 99 figurines, two of which were radiocarbon-dated to 3530 ± 300 B.P. and 3100 ± 110 B.P. (Schwartz et al. 1958). The undertaking, referred to as the Grand Canyon Figurine Project, was conducted under the auspices of MNA. All of the caves are located in the Redwall Limestone, which is the formation immediately beneath the Three Mile Rest House Site. The closest of the caves to the site—AZ B:16:0298—is located above the east side of Pipe Creek.

Over a decade later, Robert E. Euler, with Prescott College, conducted investigations at Stanton's Cave, a large solution cavern in the Redwall Limestone above the Colorado River. Seventy-four split-twig figurines were collected and a wealth of paleoclimatic data was collected (Euler 1984). Radiocarbon dates from Stanton's Cave placed the use of the figurines at about 4000 years before present. More recent dates (see Emslie et al. 1995 and Horn 2001) now place the use of split-twig figurines in the Grand Canyon to between 4200 and 3000 B.P., and some of the conventional radiocarbon ages from Schwartz and others overlap with the oldest date returned from site AZ B:16:0134.

About the same time as Euler's work at Stanton's Cave, Schwartz was excavating Bright Angel Pueblo upstream of the confluence of Bright Angel Creek and the Colorado River (Schwartz et al. 1979). The site is along an important cross-canyon route, and, at times when the Colorado River was at low water, inhabitants could have accessed lands south of the river. A likely access route would have been along Indian Creek—what we now call the Bright Angel Trail. The first occupation of the pueblo was Schwartz's Room 7, which he dated to A.D. 1050-1065+. It is possible that the room pre-dates this range, based on our interpretation of a very limited assemblage of ceramics. If so, the

occupation of Room 7 may have overlapped with the 2 Sigma calibrated date range of Feature 3 from site AZ B:16:0134, which extends to A.D. 1040. At Unkar Delta Schwartz identified two sites (UN-8 and UN-52) with buried components that appeared to date to the Medicine Valley phase of the Cohonina—roughly A.D. 900.

Information on the Cohonina within Grand Canyon National Park is increasing, but much of the formative work on this culture took place on the Coconino Plateau to the south and around Flagstaff (e.g., Colton 1932, 1939; Colton and Hargrave 1937; Hargrave 1937, 1938). McGregor synthesized what was known about the Cohonina in the 1950s and 1960s (1951, 1967) based on his work in the Red Butte and Mt. Floyd areas, but one could argue that it was Cartledge who ushered in the modern era of Cohonina research with his 1979 "re-evaluation" (see also Cartledge 1986, 1987). Since then there has actually been a substantial amount of work on Cohonina sites in the Upper Basin (Sullivan 1986), and around Sitgreaves Mountain (Samples 1989, 1992; Samples et al. 1991), a recent assessment by Moffitt (1998), and research into Cohonina tree-ring dating (Ahlstrom 1984), cultural affiliation (Hanson 1996), and projectile points (Horn-Wilson 1997). Still, there is a need for a major synthesis that would pull together these seven decades' worth of insights.

By the 1970s archaeological work in the Grand Canyon had shifted somewhat from research-centered projects to compliance-based undertakings related to development and other management issues within the GRCA. One of the earliest and most comprehensive projects was an intensive pedestrian survey by MNA of 352 acres in and around Grand Canyon Village in 1973 (Pilles 1973), directly south of site AZ B:16:0134 and southeast of site AZ B:16:1125. Fifty-three sites were recorded, including three sites identified as Pueblo I and attributed to the Anasazi, and 10 Cohonina sites that could be placed within either the Coconino or Medicine Valley phase; other potentially early sites could not be as precisely dated.

Since the 1970s there have been a number of archaeological investigations along the South Rim within the GRCA. Many are related to improvements to Park infrastructure (e.g., roads, parking, housing, utility lines), and general upkeep (e.g., prescribed burns), but a few were directly associated with construction of the new visitors' center at Mather Point and associated projects, such as the proposed Light Rail Project. The projects described below do not constitute all of the archaeological clearance surveys undertaken in this part of the Park, but include major projects with important findings (see Neff 2004:28-30 for a listing of additional compliance work).

Two of the earlier projects—though somewhat far afield from the project area—concern survey and testing of 17 sites along the Desert View waterline (Balsom 1986), and a survey of part of the East Rim Drive, which resulted in the testing of one site (Fairley and Balsom 1990). Given our findings at the Hermit Road Site, the latter (site AZ I:1:053) is of interest because evidence was found for use by the Anasazi, Cerbat, Hopi, and Navajo of the same area. The multi-component nature of South Rim sites is a common theme that runs through many NPS survey and testing reports, but, in this instance, the investigators were able to define discreet loci for each component.

Of the various archaeological inventories related to prescribed burns, three large surveys were in the general vicinity of the project area. Forty-two sites were located within 749 acres of Park land during a survey for the Topeka Prescribed Burn Unit (Horn-Wilson 1998). Forty-nine sites were found within 474 acres for the Horsethief Prescribed Burn Unit (Horn-Wilson 1999). This survey was distinguished by the number of Archaic projectile points located and associated remains. Most of the sites tended to cluster along the drainage that comprises the upper "headwaters" of Hermit Basin. A third survey, consisting of 405 acres for the Shoshone Prescribed Burn Unit, revealed 68 archaeological sites (Horn-Wilson and Haines 1999). Of the prehistoric sites recorded during the three surveys, many were Cohonina/Ancestral Puebloan (Kayentan) with a mix of wares attributable to both cultures. Of interest to this report, at least 18 of the sites from the three projects appeared to be strictly Cohonina, which are more likely to date to Pueblo I or Early-mid Pueblo II (a higher proportion of these were located in the Shoshone burn unit). Most were artifact scatters but a few sites with 1-2 possible structures were noted.

Perhaps the most intensive archaeological work performed in the project area was related to development of the new GRCA visitor's center, initially labeled the Mather Point Orientation Center (MPOC) but eventually designated as the Canyon View Information Plaza (CVIP). A few sites were initially recorded in the area by Pilles (1973) and Dryer (1991) for unrelated projects, but the majority were discovered in 1995 during an intensive, systematic survey of the CVIP project area (Fairly 1995). Sixteen sites were tested for significance during 1996 and 1997 (Schroeder 1997), and 10 of these were selected for data recovery in 1998, resulting in a report by Moffitt and Moffitt in 2004. The project is notable in that the majority of the excavated sites were Cohonina, dating to Pueblo I to early-mid Pueblo II and generally preceding the in-migration of Kayentan peoples from the east after A.D. 1100/1150. It remains the most thoroughly documented (and reported) investigation of Cohonina sites on the South Rim of Grand Canyon National Park, and complements the multi-year work by Alan Sullivan in the Upper Basin. The authors conclude that their analyses "supports the model of Cohonina behavior suggested by Sullivan," which they describe as "semi-sedentary collectors who exploited resources in their catchment areas from seasonally occupied base camps often located great distances from their permanent settlements" (Moffitt and Moffitt 2004:201).

As an adjunct to the CVIP project, an intensive survey was accomplished for the preferred route of a light rail route designated the Transit Corridor Project (TCP, aka the Light Rail Corridor Project or LRCP). The survey included 432 acres within the Park boundaries, resulting in the identification of 45 cultural properties. The only documentation of this project is a brief preliminary report of the survey findings by Linda Moffitt (1997), plus a follow-up mitigation plan (Moffitt et al. 1998), although the later SAIP survey design states that fieldwork was completed on 19 prehistoric sites (Neff 2004:30). The majority of the ceramic sites appeared to be Cohonina, and there were fewer sites with Archaic diagnostics than within like-sized surveys near the rim. The light rail itself has yet to be constructed.

Part of the TCP area was again surveyed for the South Rim Visitor Transportation Plan, which was part of SAIP and involved an inventory of 30 acres on either side of Highway 180 near the south boundary of the Park (Hasbargen and Brennan 2006). Fourteen sites were re-located but no previously unidentified sites were encountered. Again, most of the ceramic-era sites were Cohonina, although they often had Kayenta wares (as was the case with the TCP survey). In some inventories such sites are designated as Cohonina/Ancestral Puebloan. In the opinion of the senior author, many of these sites are authentically "Cohonina" with an admixture of Kayenta intrusives, but much more work needs to be done to resolve issues of cultural identity on the rim.

Also related to the original MPOC project was a survey between the existing Visitor's Center and Yavapai Point (Fairley and Horn-Wilson 1996). Twenty-one cultural properties were recorded in 105 intensively surveyed acres; two of the sites had been previously recorded by MNA in 1973 (Pilles 1973). Of the sites with ceramics, five were considered to be Cohonina habitations and one was a Kayenta Anasazi habitation. Cohonina site AZ B:16:213 is of interest because it may have a roasting pit. The Anasazi site (AZ B:16:526) had no trademark Cohonina ceramics but did have 12 Moenkopi Corrugated, suggesting post-A.D. 1100 use.

Of surveys in the project area that have resulted in subsurface investigations, 12 archaeological sites were documented in a 99-acre assessment for the Pinyon Park Housing Project (Schroeder 1996). Pinyon Park was a proposed location for an employee housing area on the south end of Grand Canyon Village. The sites included a reported Cohonina pithouse (AZ B:16:105; although a number of Kayenta Anasazi ceramic types were present at the site). Even more intriguing was a possible Cohonina "patio house" (AZ B:16:186), but ceramic frequencies for the site are not provided in Schroeder (1996:10), who acknowledges that "puebloan [i.e., Anasazi/Ancestral puebloan] affiliation is a possibility." Other ceramic sites were either Cohonina or Ancestral Puebloan. Two sites were ultimately excavated to mitigate impacts from the housing project: AZ B:16:104B (actually one of two loci of site AZ B:16:104) and AZ B:16:355 (Schroeder 1998). Both sites had multiple loci, but, in general, the loci with ceramics appear to reflect Cohonina occupations sometime after A.D. 700 and before 1150. Site AZ B:16:355 also had projectile points suggestive of use during the Late Archaic.

Most recently, part of a multi-component site near Hermit's Rest was excavated where the NPS proposed replacing a failing septic system (Brennan and Robertson 2008). Site AZ B:16:1198 included a prehistoric component consisting of a lithic "prospect" and scatter. A total of 1321 artifacts were collected, comprised primarily of flaked stone debris, cores and one stone tool. The primary activity at the site appeared to be procurement of lithic raw material—in this case, local outcropping chert. Because no diagnostic artifacts were recovered, temporal or cultural affiliation could not be determined. The characteristics of the lithic assemblage, however, are quite similar to that of site AZ B:16:1125, described later in this report.

In the 1980s annual NPS monitoring trips along the Colorado River began to incorporate archaeological sites—both within Grand Canyon National Park and Glen Canyon

Recreation Area between Glen Canyon Dam and Lee's Ferry (see Fairley 2003: 50-57 for an extensive history); monitoring continued through the 1990s and is still a vital part of GRCA cultural resource management along the river corridor. At the same time, an abundance of geomorphological research was undertaken by various parties both before and during the Glen Canyon Environmental Studies (GCES) program, a multidisciplinary examination of the effects of the operation of Glen Canyon Dam on downstream cultural and natural resources (Fairley 2003:57-63). As a result, numerous archaeological sites along the river corridor received some level of "remedial action" by the NPS and others, such as site mapping, testing, surface collection, erosion control, and limited feature excavation and sampling. All of the sites were being impacted by erosion, with the intent to salvage information before it was lost.

Of particular interest are investigations that have revealed evidence of Late Archaic-BMII and Pueblo I-Early Pueblo II sites. Within the Park, Late Archaic dates have been obtained from excavations at site AZ C:2:0096 in Marble Canyon (O'Conner et al. 1994), and much further downstream at the Arroyo Grande site, AZ G:3:0064 (Hereford et al. 2000). Portions of site AZ C:2:0096, also known as Axehandle Shelter, were excavated by personnel from MNA and GRCA in the fall of 2008 (Neff et al., in progress). While radiocarbon samples have not yet been submitted, the crew recorded an uninterrupted sequence of colluvial and fluvial strata up to 3 m below present ground surface, several of which had numerous associated features and artifacts. Radiocarbon dates that fall around the Late Archaic-BMII transition, or Early BMII, have also been reported in the Park (Davis et al. 2000; Hereford et al. 2000; O'Conner et al. 1994). It is important to note, however, that none of these sites are in the project area. In fact, all are located in buried contexts in fluvial settings along the Colorado River.

Over the last 20 years our understanding of the Late Pueblo I-Early Pueblo II transition has become slightly more robust thanks to work by Jones (1986), Alan Sullivan in the Upper Basin of the South Rim (e.g., Sullivan et al. 2002), the GCRCS project (Fairley et al. 1994), continued GCES and NPS remedial work along the river corridor, and, most recently, the MNA/GRCA Colorado River Corridor Archaeological Project.

We have remarked that Early Formative sites in the eastern Grand Canyon tend to be dominated by San Francisco Mountain Gray Ware, early decorated types of the Kayenta Anasazi, and San Juan Red Wares. An abundance of S.F. Mountain Gray Ware and Kana'a was found at the two Unkar Delta sites by Schwartz et al. (1980), and this pattern continues to be seen on the South Rim, with the multi-year work of Sullivan in the Upper Basin, and with early Formative components excavated at Crash Canyon (AZ C:13:0371), Palisades (AZ C:13:099), and Furnace Flats (AZ C:13:0010) by the MNA/GRCA Colorado River Corridor Archaeological Project. In fact, Pueblo I ceramics at Furnace were first noted by Anne Trinkle Jones (1986) and her crew in the 1980s, and again by Fairley and Jan Balsom in the early 1990s (Hereford et al. 1991); the latter also observed an underlying stratum with PI ceramics at Palisades.

As mentioned in the preceding section, other possible PI/II features in the Grand Canyon include: a possible PI roasting pit found by Jones (1986) at a site (AZ B:10:0004) near

Deer Creek; a slab-lined hearth in the Furnace Flats area that returned a radiocarbon date of 1510 ± 50 B.P.; and a PI-PII surface site with Cohonina ceramics recorded by Euler south of AZ C:13:099 (reported in Fairley 2003:92). The Kanab Plateau Project (KPP), conducted by Northern Arizona University, dated a small, dry shelter and a buried roasting pit to BMIII/PI (Huffman 1993; Huffman 1994). Both the shelter and the pit were located in Tuckup Canyon, below the North Rim in the western half of the Canyon.

Other Sites in the Project Area

While the preceding projects have made some of the most substantive contributions to Grand Canyon prehistory, thousands of sites have been recorded in Grand Canyon National Park in the course of routine cultural resource investigations by NPS staff and others. Most of these sites have been entered into a Park-wide database that can be queried as to location, cultural affiliation, temporal affiliation, and so on. Numerous archaeological sites have been documented in the vicinity of the project area, with tentative temporal affiliations assigned to some components.

MNA staff queried the database for all site components designated as Archaic and or Formative between Late Pueblo I and early Pueblo II. The query was limited to sites between upper Hermit Basin to the west, Long Jim Canyon to the east, the Colorado River to the north, and Coconino Wash to the south. These broad temporal periods correspond to the dated features from site AZ B:16:0134; the primary component at site AZ B:16:1125 did not have any diagnostic artifacts or dateable features, but may be a Formative-era occupation. The query resulted in 97 total sites. Forty-four of the sites had at least one component designated as Archaic. Fifty-three of the sites had at least one component regarded as Pueblo I-II.

Much of this area has been intensively surveyed, but the site distribution may be slightly skewed because it is not necessarily representative of the entire universe. Some tentative observations about site and spatial patterns can be made, however.

The Archaic sites cluster primarily around the upper drainage of Hermit Basin and at a few points along the rim. Most of the sites are either artifacts scatters, or scatters associated with features such as FCR concentrations, roasting pits, and other thermal features. Many of the sites are quite large with several possible temporal and cultural components. Archaic affiliations were usually assigned on the basis of dart-size projectile points and lithic assemblages reflecting biface reduction technologies. Point styles were observed from all three Archaic periods, Early, Middle and Late. Early Archaic points included Pinto, Northern Side-notched, and Humboldt; Bajada-like points have also been identified. Middle Archaic points consisted of Rocker and Sudden Side-notched. Points identified with the Late Archaic were Gypsum and Gate Cliff split stem. Numerous Elko Series points were observed, which has a broad temporal range from the Archaic through Puebloan times, including some Elko Eared, which may be more temporally restricted to the Archaic.

Among the sites near the rim are two occurrences (AZ B:16:0064 and AZ B:16:0115) that consist of rockshelters with numerous pictographs and petroglyphs. Site AZ B:16:0064 is 10 m from the Bright Angel Trail and was probably known to the native peoples who created the features at AZ B:16:0134. The shelter contains almost 300 pictographs affiliated with the Archaic, Cohonina, and Havasupai. The other shelter has pictographs of deer and geometric designs.

Within the inner reaches of the Grand Canyon, but still only a few kilometers from the project area, are two additional rockshelter sites. Both AZ B:16:0084 and AZ B:16:0298 are located within the Redwall Limestone and take advantage of solution caves that are common to this formation—the same formation above which the Three Mile Rest House Site is situated. Spit-twig figurines were recovered from both sites, which indicates that they were at least partly used during the Late Archaic. The shelters may have been accessible to parties at AZ B:16:0134, as the top of the Redwall forms a narrow bench that can be followed along an east-west transect. Also known is a site along Cremation Creek (AZ B:16:1092) that has a roasting pit associated with a Pinto point.

The possible Pueblo I-II sites do not cluster as readily as the Archaic sites, but appear to be more randomly distributed across the landscape. There is a tendency for them to be near the South Rim or within 1-3 km of the rim. Small groupings can be seen above Hermit Basin, south of Mohave Point (in the area of AZ B:16:1125), around Grand Canyon Village and between Yavapai and Shoshone points. Many are artifact scatters, but a few sites have 1-2 rooms and other features. In general, the sites appear to reflect transient use of the rim on a seasonal basis, with permanent habitations probably located elsewhere.

The trademark diagnostic ceramic type for most of these early Formative sites is Black Mesa Black-on-white, an Early PII type within Tusayan White Ware. A few sites had Wepo Black-on-white—a transitional type between Kana-a B/w and Black Mesa B/w. Interestingly, no Kana-a was observed, although some Lino Gray was also noted. The latter—a type of Tusayan Gray Ware--may be true Lino, but they might also be body sherds for neck-banded or neck-corrugated vessels. In the absence of Kana-a, and later type such as Sosi and Dogoszhi black-on-whites, the sites likely date between A.D. 900 and 1050, which encompasses the most recent 2-sigma calibrated radiocarbon determination from the last use of the roasting pit at site AZ B:16:0134.

CHAPTER 4
Field and Laboratory Methods

This chapter outlines the general field excavation and laboratory analysis methods used during the data recovery efforts at AZ B:16:1125 and AZ B:16:0134. The actual work effort as implemented is discussed in the site descriptions in Chapters 6 and 7. The methods derive from the Scope of Work entitled *Archaeological Data Recovery at Two Sites in Grand Canyon National Park* by Ellen Brennan (2007), with minor modifications dictated by the exigencies of fieldwork, which are described below.

Field Methods

The MNA personnel had an opportunity to visit AZ B:16:1125 (the Hermit Road Site) prior to data recovery, but a pre-fieldwork visit was not possible for AZ B:16:0134 (the Three Mile Rest House Site). The first task at both sites involved comparing previous site notes and maps with what was observed on the ground. All features were relocated and surface artifacts were marked with pin flags. In so doing the site boundaries were established, which generally coincided with what had been previously documented by Park archaeologists.

Surface Mapping

While excavation was underway the sites and surrounding landscape were mapped with a total station to precisely locate surface features, artifact distributions, and modern features, landmarks and disturbances. The maps, reproduced as Figures 3 and 4 in this report, include specific features such as trails, utility lines and pipelines, roads, borrow pits, canyon rims and escarpments, benchmarks, and the like.

During fieldwork site datums and various sub-datums were established as needed; these were later georeferenced to UTM coordinates and elevations reckoned in meters above sea level. Horizontal and vertical provenience control was maintained for all features and recovered artifacts by means of a surveyed grid. A 4 by 4 m grid was marked on the ground at both sites with wooden stakes or metal spikes for the purpose of artifact collection. Certain feature plans and profiles were accomplished by use of the "three-nail" system of mapping. In theses cases, nails were located arbitrarily where needed, and then provenienced with a total station with reference to the site datum.

Artifact and Specialized Sample Recovery

At both sites, 100% of all observed surface artifacts were collected. Bulk surface artifacts were provenienced to 1 x 1 m grid units at the Hermit Road Site (Figure 3). The units were assigned alpha designations in the field (e.g., A, B, C...AA, etc.). The quantity of surface artifacts was sufficient at AZ B:16:1125 to create an artifact distribution map (Figure 3). There were far fewer surface artifacts at AZ B:16:0134, such that those found were simply point provenienced according to the grid with the total station. At both sites

all observed, catalogable artifacts (primarily stone tools) were also point provenienced and collected separately from the bulk artifacts.

Artifacts collected from excavated sample units were assigned to natural strata (e.g., Stratum I, III, III, etc.) that were identified during data recovery. Since no stratigraphy was observed in the fill of any excavated features (such as the roasting pit at AZ B:16:0134) artifacts from these contexts were assigned to arbitrary 10 cm levels (e.g., Level 1, 2, 3, etc.) tied to vertical elevations. All excavated sediment was screened through at least 1/4-inch mesh to recover artifacts, plant remains, animal bone, and other cultural items. A sample of units at AZ B:16:1125 was screened through 1/8-inch mesh to gauge differential artifact recovery rates and recover smaller items such as small faunal fragments and pressure flakes. In situ fill from the thermal features at AZ B:16:0134 was always screened through 1/8-inch mesh when not collected as a float sample. Artifacts were bagged separately by class, such as ceramic, flaked stone, ground stone, and bone. Samples, such as flotation, pollen, radiocarbon, and macrobotanical, were also collected separately and double-bagged to ensure preservation. Fragile plant remains and radiocarbon samples were placed in padded vials or boxes and then bagged.

Artifact and sample bags were pre-stamped with labels to prompt information on project name, site number, Field Specimen (FS) number, general material and specimen codes, content, grid coordinates, feature number, stratigraphy/level, component, mesh size, date collected and initials of the excavator. The context of each bag was also entered, with commonly used contexts including surface, cultural and non-cultural strata, and in situ feature fill. A complete list of context types and general material and specimen codes can be found in Appendix A. Artifact bags were usually secured with rubber bands, while heavy sample bags were bound with strapping tape.

Site AZ B:16:1125 yielded only stone tools and flakes in the way of artifacts; no ceramics or faunal bone were observed, and there were no opportunities to collect paleoethnobotanical, microcharcoal, dendrochronological, or pollen samples. At site AZ B:16:0134 the crew collected stone tools, debitage, and groundstone, but no ceramics that were positively associated with the site. Flotation samples were collected from arbitrary levels within two columns of Feature 1 fill (the primary roasting pit), and additional samples were collected from units placed within the richest concentrations of charcoal in F1. Flotation samples were also taken from the fill of Feature 3, a possible thermal feature located beneath F1 (see the AZ B:16:0134 site description for more details on these two features). Pollen samples were collected from the base of the overlying feature fill in Feature 1, and a modern pollen sample was taken from the surface of the surrounding landscape.

In regards to dating, while some tiny charcoal fragments were retrieved from the Three Mile House Site, no specimens were large enough for tree-ring dating. Neither were there appropriate contexts that could have reasonably yielded archaeomagnetic samples at either site. On the other hand, charred annuals were found in the light flotation of several macrobotanical samples from Features 1 and 3 at AZ B:16:0134, suitable for AMS radiocarbon dating, and supporting data on possible age range was available from the

lithic analysis. The temporal placement of the Hermit Road Site is much more equivocal, but lithic analysis did provide some clues, which are presented in Chapter 6.

Excavation

All excavation work was performed by hand using shovels, picks, trowels, brushes and other appropriate tools. Screened material was deposited onto tarps to avoid impacting the ground surface any more than necessary. After excavation was completed, all screened sediment was used to backfill the site to its original grade; no units or other excavated contexts were left open. The crew endeavored to return each site to its original condition as much as possible.

At AZ B:16:1125 work was limited to excavation of 1 x 1 m sample units due to the lack of observed features. All sediment within the units was screened, but soil depth was generally shallow—between 0 and 30 cm—consisting of a thin mantle above Kaibab limestone bedrock. Most artifacts were located within the uppermost 5 cm of soil. There was no stratigraphy to speak of, so artifacts were provenienced to two general contexts: surface, and cultural stratum.

Site AZ B:16:0134 presented a more complex excavation scenario, as it contained two thermal features. The original treatment strategy (presented in Appendix 1 in Brennan [2007]), primarily addressed the excavation of Feature 1, the roasting pit. Two options were presented: excavate the feature as a whole, or bisect or quarter the feature to conduct a stratigraphic test. The excavators chose a variation of the latter, due to time and logistical constraints. It was also the case that one-half to two-thirds of the feature had already been removed as borrow pit material, presumably for trail construction. Specifically, the center of the feature had been destroyed, leaving mostly the north and east "ejecta" ring. The crew elected to excavate two long trenches—at right angles to each other—through the remaining sides of the feature, with additional units investigated adjacent the trenches; the entire work effort is described in more detail in Chapter 7. In addition, all of Feature 3—a possible hearth or small roasting feature situated beneath F1—was excavated by halves.

All excavation and other work was documented, at both sites, with photographs, plan view maps, and profile drawings. At the Hermit Road Site a plan map (Figure 3) was completed of all surface collection and test excavation units; this figure doubles as an artifact distribution map. At the Three Mile Rest House Site, profiles were drawn of both test trenches through Feature 1, illustrating natural and cultural stratigraphy. A plan view map of F1 was also completed showing the location of the trenches and adjoining test units in relation to what remained of the roasting pit. A plan view and cross-section was also done for Feature 3.

Black-and-white print photographs and color digital photographs were taken of the two sites and investigated features. Photo documentation included pre-excavation site and feature photos, photos documenting features and field activities, and "scenic" photos of the sites and surrounding landscapes and viewsheds. Photo logs were completed for roll

film and digitals with information on roll or image file numbers, frame or exposure number, site number, subject matter, direction of photo, date taken and photographer. Separate photo logs were maintained for digital and 35 mm images.

Laboratory Processing and Specialized Analyses

All artifacts, samples and original site documentation were returned from the field to the Museum of Northern Arizona, Flagstaff. Site notes, maps, drawings, logs, and other documentation had been previously compiled into three-ring binders and this material was photocopied to provide a backup record of each site. This report, associated data files, GIS metadata, and digital photographs are stored in two separate locations: an MNA server and in digital format (CDs) at the MNA Anthropology Laboratory.

Site maps were generated from total station data and configured in ARC-GIS. Feature drawings and other figures drawn in the field were scanned and re-drafted in Macromedia Freehand 10.

At the time of collection, all recovered artifacts and samples were logged in the field and assigned a unique Field Specimen (FS) number. The FS log duplicates the information on the artifact/sample bags. After the bags were checked into the MNA wet lab, the logs were entered into an Access database. Artifacts and samples were separated by class, and lithic items were counted, washed, dried, labeled, and re-bagged in readiness for analysis. All artifacts and samples have been entered in processing and tracking logs, which track the status of provenienced items from initial processing to final transfer to the National Park Service.

Lithic analysis was performed by Michael R. Robins at his office in Phoenix, Arizona. Mr. Robins analyzed both flaked and ground stone, and photographed selected items to preserve a record of their formal properties.

Paleoethnobotanical analysis was performed by Elizabeth Hickey from the Laboratory of Paleoethnobotany at Northern Arizona University, Flagstaff. Ms. Hickey conducted both the flotation of the bulk samples and the subsequent analysis. During this process, selected, carbonized annuals were segregated for possible radiocarbon dating. Ultimately, three samples from site AZ B:16:0134 consisting of a juniper nut shell and agave spines were submitted to Beta Analytic, Inc. in Coral Gables, Florida for dating by Accelerator Mass Spectrometry (AMS). The results of the macrobotanical and radiocarbon analyses are integrated within this report and presented as Appendices B and C, respectively.

No ceramics, faunal remains, dendrochronological specimens or textiles/basketry were recovered from either site. Pollen samples were collected from strat columns located within the fill of Feature 1 at AZ B:16:0134, but the context was not considered ideal for preservation of pollen grains and the samples were not submitted. No suitable contexts for pollen sampling were observed at the Hermit Road Site.

Curation of Artifacts and Excavation Records

All material is currently stored in a secure office and laboratory facility at MNA prior to final conveyance to the NPS. Artifacts, field notes, maps, data files, photographs, and all other associated site records generated during this project will be curated permanently at Grand Canyon National Park. The materials and data produced during the performance of this project are the sole property of the United States government.

CHAPTER 5
Data Recovery at AZ B:16:1125 (Hermit Road Site)

Data recovery at AZ B:16:1125, also known as the Hermit Road Site, was conducted between November 5-7, 2007 by archaeologists from the Museum of Northern Arizona, Flagstaff. L. Theodore "Ted" Neff was the Principal Investigator, aided in the field by Jim H. Collette, Brian Kranzler, and Jason Nez. A total of 120 person hours was spent on mapping and excavation. The crew was based out of Tusayan, Arizona, and commuted to the work site each day. National Park Service employee and Vanishing Treasures Archaeologist Ellen Brennan, acting through Grand Canyon National Park, was the NPS Key Official.

Background

Location and Setting

Site AZ B:16:1125 is a small prehistoric site located within Grand Canyon National Park, Arizona. The site is northwest of Grand Canyon Village, the administrative center of the Park, on the west side of a peninsula of land that forms part of the South Rim of the Grand Canyon (Figure 2). This landform includes several tourist overlooks, named (from east to west) Maricopa, Powell, Hopi, and Mohave points. Site AZ B:16:1125 is about ½ mile southwest of Mohave Point along the Hermit Road. The latter extends from Grand Canyon Village to Hermit's Rest, a distance of approximately seven miles. The site is immediately west of the road and is perched directly on the rim overlooking a wide, deep side canyon called The Abyss (Figure 6).

Along this portion of the South Rim the land drains from north to south, with the rim over 250 feet higher than the "neck" of the peninsula. In general, the landform that forms the peninsula rises to the northeast to a prominence south of Hopi Point at 7060 feet. The site elevation, by comparison, is about 6900 feet. There is little topographic relief within the site boundary, which, of course, ends at the edge of the South Rim, a natural escarpment. The site occupies a gentle northeast to southwest slope, although the road embankment has impacted natural drainage patterns.

The east-west dimension of the site is constrained by the road and the rim, a maximum distance of 20-25 meters (Figure 3). The canyon rim delimits the west side of the site, while the road currently forms the eastern boundary. Prior to excavation, the crew found isolated tools and a light-density scatter of flakes on the other side of the road, suggesting that the site may have continued some distance east. The highest artifact density, however, appears to be 5-10 m west of Hermit Road within the so-called "lithic concentration" that was originally recorded by the NPS; we believe that site activities were probably focused on this area.

The north side of the site is defined by a small east-west drainage where the rim pinches up against the road; this bottleneck is partly a modern creation, but does seem to mark the

Figure 6. Site AZ B:16:1125 overviews. (Top) Flags marking artifact concentration near rim; Rim Trail in foreground. (Bottom) Main site area looking toward Hermit Road in background. Rim Trail meanders through site in foreground. Note pinyon pine and juniper woodland.

end of the artifact scatter that comprises AZ B:16:1125. The south/southwest end of the scatter is less definitive, but the surface artifact distribution shows that it essentially ends within 20 m of the center of the site. Again, isolated artifacts can be found almost anywhere along the South Rim, but this should be expected in an area where activities were compressed against such an attractive, but formidable, boundary.

The Kaibab Limestone Formation forms this part of the South Rim, and the site is situated on a thin mantle of sediment that overlies the limestone. In places the bedrock is exposed, particularly near the rim. No actual soil formation was present, and the sediment appears to be the result of alluvial sheetwash and residual erosion of the parent rock. Little to no eolian deposition was noted. It is possible that Hermit Road acts as a barrier to further soil accumulation derived from deeper sediment located to the east and northeast; if so, soil deposition at the site may actually be diminishing. What sediment is present is mixed with some residual limestone and organics. Tree duff, in particular, has accumulated beneath several pinyon pine and juniper to a depth of 5-10 cm. The duff tends to obscure the present ground surface, as well as artifacts that may lie on that surface.

Excavation did not reveal any intact prehistoric surface or cultural stratum. The majority of the artifacts were located on the surface or within 2-3 cm of the surface in undifferentiated, slightly clayey sediment with no apparent stratigraphy. Charcoal staining that could be attributed to cultural use was also absent, although there was some very diffuse charcoal noted near the edge of the site that might have been the result of natural burn-overs.

The Kaibab Limestone is a resistant rock that forms an eroded cliff face below the site. This formation, in conjunction with the underlying Toroweap Formation and Coconino Sandstone, form the Great Mohave Wall that is the east face of The Abyss. No modern or prehistoric route down into the Canyon is known in the vicinity of the site. The closest trails are the Hermit Trail about 5 miles west (linear distance), and the Bright Angel Trail approximately 4 miles to the east. Access to the upper formations might have been possible along a major ridge called The Alligator below Mohave Point. It is possible that the most attractive feature of AZ B:16:1125 was its panoramic view of The Abyss and the warm updrafts from the canyon interior.

No modern springs are located within 1 mile of the site, although seasonal seeps may have been present prehistorically. The Kaibab Limestone is porous and does not retain water in surface catchments as well as some of the lower formations, such as the sandstone slickrock of the Esplanade. Vegetation consists primarily of the Upper Sonoran pinyon-juniper woodland community, which includes pinyon, juniper, cliffrose, sagebrush, oak, snakeweed, prickly pear, cholla, bunch grasses and forbs.

At first glance the modern landscape probably does not look appreciably different from that seen prehistorically. If you face away from the road, the vegetation, topography and geology is much the same, and certainly the view of the canyon has not dramatically

changed, especially within the untrodden depths of The Abyss. Nevertheless, the site has been substantially impacted in the last 100 years.

Construction of the road to Hermit's Rest probably destroyed or covered the east and southeast edge of the site to an unknown degree. The road has likely altered drainage patterns in and around the site, and possibly diminished soil deposition on the site. There is also evidence, from the lithic analysis, that rock material used in the road bed can emulate flake waste from stone tool production. As we describe, some "artifacts" from a 1 x 1 m unit placed at the foot of the road shoulder displayed superficial attributes of debitage, but were otherwise distinct from the actual lithic assemblage. It now appears that these items were cherty limestones that had been fractured by mechanical equipment during road construction and subsequent use.

Finally, the most transparent impact to the site—and most visible to the excavators—was the stream of tourists using the West Rim Trail to walk from point to point. The trail passes directly through the site, and easily a hundred people used the trail during the three days of data recovery by MNA. Because the trail is not marked, and the terrain is fairly flat, numerous interweaving side and alternate trails course through the area as well—some accessing a small overlook on the west edge of the site. No collectors' piles were noted, but it is possible that some casual collecting has occurred through time. For example, the MNA team was unable to re-locate a Desert Side-Notched projectile point that had been observed by the NPS survey crew (Anderson and Brennan 2006).

Work Effort

The data recovery work effort began by flagging all observed artifacts in the area originally defined as the site boundary of AZ B:16:1125. The site boundary, as re-established by MNA, was slightly further to the north, west, and south, but the site extent and location was generally in agreement with that recorded by the NPS. The crew also conducted an informal, reconnaissance-level survey east of the road to determine if the site boundary extended in this direction. Within an area roughly 50 m N-S and 25 m E-W the crew located two flaked stone tools and 6-7 flakes. One of the tools was a possible Elko-Eared projectile point, which dates to the Archaic period. The density of the artifacts, however, was much lower than the lithic concentration observed at AZ B:16:1125, and is not considered to be part of the site. The artifacts east of Hermit Road were later georeferenced to UTM coordinates by NPS archaeologist Ellen Brennan.

After defining the limits of the site, a site datum was established using an existing brass cap that was originally installed during construction of Hermit Road. The cap, dated 1936, was placed by the then U.S. Department of Agriculture, Bureau of Public Roads, and shows an elevation of 6936.07 feet. The total station was set up over the cap and a metric grid oriented to true north was established across the site. The site datum had an arbitrary provenience of N500/E500, with an elevation of 500 meters. The local grid system was later tied to UTM coordinates and elevation above mean sea level by the NPS. Due to line-of-sight issues, a sub-datum was also utilized at the coordinate N488/E500.

Once the grid was in place, the crew collected 100% of all surface artifacts within the site boundary provenienced to 1 x 1 m grid units. Artifacts were collected from a total of 108 1 m^2 units. Although all *observed* artifacts were collected, tree duff inhibited ground visibility in three areas totaling about 20 square meters. Surface artifacts were generally not visible in such contexts, but a 1 x 1 m unit excavated into the duff showed that artifacts do occur subsurface. Artifacts were provenienced to the 1 x 1 m unit in which they were found, with the southwest corner of the unit used as the identifying grid number (e.g., N505/E500, which would include all artifacts recovered from N505-506 and E500-501).

A tally was recorded of surface artifact quantity by unit and this information was used to help determine the location of excavation units. A total of six 1 x 1 m units were excavated across the site (Figure 3 shows the location of the surface collection and test units). Three of the units (N488/E492, N489/E491, and N492/E498) were excavated in the main site area, i.e., where surface artifact density was highest. Two units (N494/E506 and N481/E503) were excavated along the eastern margin of the site, at the base of the Hermit Road. One unit (N481/E495) was dug on the south end of AZ B:16:1125 to verify the extent of the site in this direction. As mentioned, the north and west limits of the site correspond with the rim of the canyon.

The depth of the units ranged from less than 5 cm to as much as 25 cm. Over much of the site soil depth was either non-existent (where bedrock was exposed at the surface) or less than 10 cm; in each unit excavation ceased at bedrock, consisting of Kaibab limestone (Figure 7). The excavation units demonstrated that most artifacts were restricted to the surface or the upper 2-3 cm of sediment. The scarcity of artifacts in the two southernmost units indicated that subsurface artifacts were few or absent south of the N480 line (see Figure 3). Only three artifacts were recovered from unit N494/E506, suggesting that the site extent was at or near the road edge in this area (a conclusion substantiated by the lack of artifacts in nearby surface collection units). The unit at N481/E503 was incongruous in that it contained 28 lithic items. After closer examination during lithic analysis, however, much of the so-called “debitage” was thought to be rocks with flake-like attributes derived from road bed material (Figure 7). At this time the main site area is believed to be between N483 and N500, and E489 and E502.

While excavation was underway the site area was mapped with the total station (Figure 3). The site map shows the relationship between AZ B:16:0134 and the surrounding landmarks. Included in the map is the site boundary, site datum, point provenienced artifacts, lithic concentration, local trails, Hermit Road, the canyon rim, drainages and the USDA benchmark.

Stratigraphy

Six test units were excavated to bedrock, in part, to expose any extant stratigraphy at the site. Excavation demonstrated that there were no developed soil horizons at the site, nor was there evidence for a prehistoric ground surface. Sediment consisted of an

Figure 7. Test units at AZ B:16:1125. (Top) Test Unit 5 showing Kaibab Limestone bedrock below surface. (Bottom) Test Unit 5 at juncture of present ground surface and bottom of Hermit Road shoulder; Jason Nez in background. Note bedrock in excavated unit.

undeveloped layer of gray, clayey silt and sand with residual limestone rocks and roots and pockets of duff in the upper few centimeters. The soil was generally sterile with most artifacts located in the upper 2-3 centimeters.

Much of the sediment at AZ B:16:1125 was probably deposited by sheetwash from the northeast. It is likely that the current ground surface is within 0-10 cm of the primary prehistoric surface, but it is also possible that the artifacts have "lagged out' to their current location. In other words, the prehistoric surface may have been somewhat higher than it is now, and has since eroded downward through erosion.

However, we believe that there is slightly more evidence that the soil has been stable or even accumulating for a millennium or more. This is suggested by the finding of a projectile point similar to Elko Corner-Notched atop bedrock in unit N488/E492, which may date to between the Archaic and Basketmaker II. The point was deposited when this section of bedrock was exposed to the surface. When discovered, it was covered with over 20 cm of mostly sterile sediment, which, itself, was capped with a later assemblage of artifacts. In addition, a Desert Side-Notched projectile point, which commonly dates to the protohistoric or early historic periods, was found on the surface of the site when originally recorded by the NPS (Anderson and Brennan 2006). If the DSN point is later than the primary component at the Hermit Road Site, it suggests that the current ground surface has not appreciably changed in the last few centuries.

In sum, while there was soil deposition at AZ B:16:1125 *after* the Archaic-BMII, the ground surface has likely been stable since the later occupation(s) at the site.

Archaic-Basketmaker II Component

Artifacts

The evidence for an Archaic-Basketmaker II component at AZ B:16:1125 consists of a single biface that is almost a complete dart or arrow point of high-quality gray chert (see Figure 8b). The point measures 1.8 cm in width, and 0.4 cm in thickness. These measurements, along with overall morphology (i.e., the corner notch and straight base), are similar to a point type described by Brown (1994:260) from the western Arizona upland region. Brown defines this point type as "similar" to the Elko Corner-Notched regional type, a dart point present throughout the Archaic period and into the early Basketmaker II period (ca. 9000 B.C. to A.D. 0 or later [see Holmer 1993: Figure 12]). Because of the shallow corner notch, however, the point from the Hermit Road Site is difficult to classify. The point tip exhibits a bending, as opposed to impact, fracture break.

Ancestral Puebloan Component

No features were found that might be associated with the primary component at AZ B:16:1125, which we are tentatively assigning to the Ancestral Puebloan or Formative period (A.D. 500 to 1300). The dating of this component is based on the stone reduction

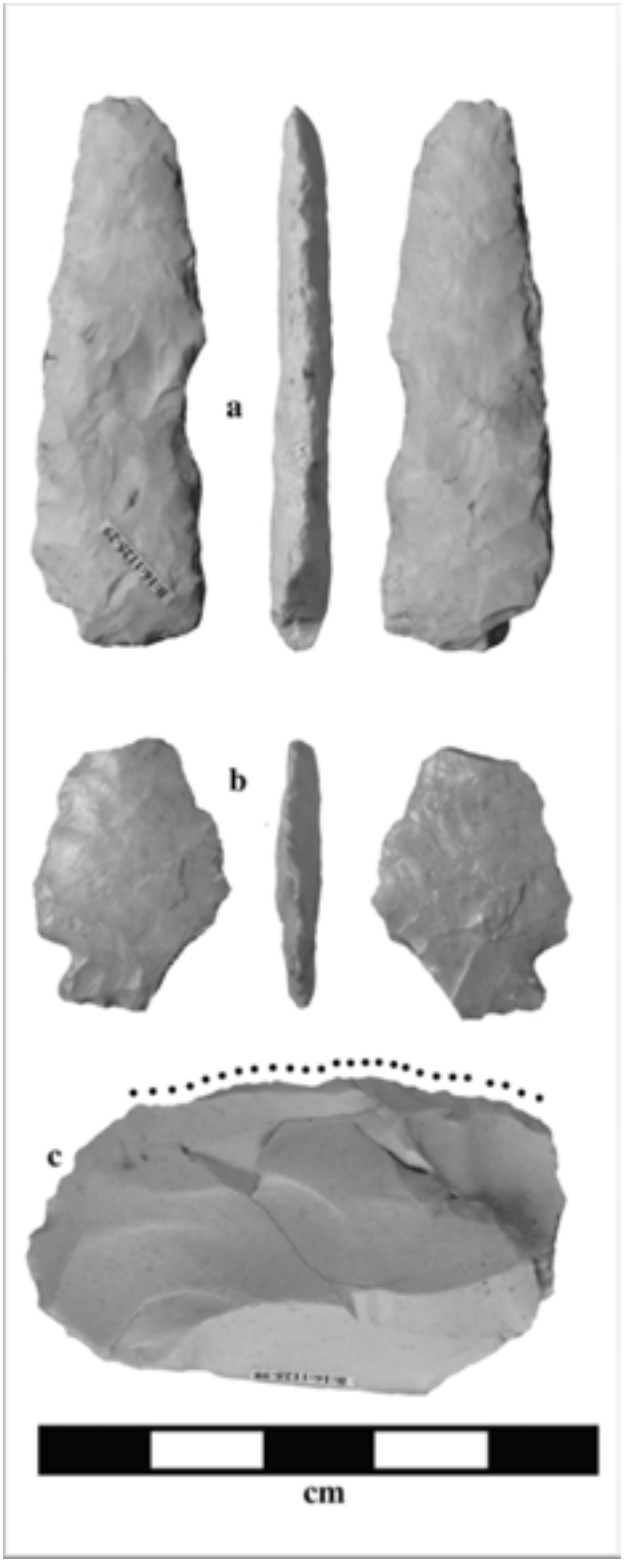


Figure 8. Three facially flaked tools from AZ B:16:1125: a) possible knife of Kaibab chert; b) projectile point similar to Elko Corner-Notched; c) retouched scraper made from DFP core flake of Kaibab chert (dots show scraping edge).

technology of the vast majority of lithic artifacts at the site, and is not corroborated by clearly diagnostic artifacts, or other dating techniques due to an absence of appropriate samples.

Artifacts

The only artifacts recovered from AZ B:16:1125 were lithics, and these were entirely flaked stone items (no ground stone), such as bifaces, core nodular tools, and debitage. No ceramics, bone, vegetal, or other material was observed, and no non-artifactual samples were obtainable.

Stone

The total number of lithic artifacts recovered from excavations at AZ B:16:1125 is 585. These include 577 pieces of debitage, five facially flaked tools, and three nodular tools. The site was criss-crossed with foot trails, and thus heavily impacted by pedestrian traffic (as well as impacted by road construction and maintenance during and since the 1930s). Use-wear analysis of the debitage was omitted due to the high probability of unintended attrition caused by this traffic and disturbance activity.

The stone reduction technology is dominated by expedient reduction (i.e., Direct Freehand Percussion [DFP] or DFP core). While diagnostic items are very limited, the overall dominance of expedient core flakes typify assemblages of the Formative period in the Northern Arizona region south of the Colorado River (see Geib et al. 2001:380 for a discussion on the reliance on core and bipolar reduction at Kayenta Anasazi sites).

Debitage

The frequencies for raw material types by both count and weight are given in Table 2. The most commonly occurring material is a tan, fine-grained variant of local Kaibab chert. Kaibab chert derives from nodules embedded in the Kaibab Limestone Formation, which is ubiquitous along the South Rim of the Grand Canyon. This material accounts for 46% of the debitage by count and 42% of the debitage by weight. The second most common material is a *coarse*-grained variant of the same material, which accounts for a further 25% by count and 38% by weight. Together, these two material variants account for 67% by count and 80% by weight. It is possible that the variants are derived from the same parent rock, which is abundant as lag deposits throughout the region.

Most of the other material types and variants in the assemblage occur in similar proportions by count and weight; however, there is one notable exception. The red, fine-grained variant of Kaibab chert accounts for 19% by count, but only 4% by weight. As shown below, this material dominates the bifacial thinning flake category, which consists largely of interior thinning flake fragments. Sources of red Kaibab chert have been noted in drainages in the area around Red Butte and Red Horse Wash (Robins 2002; Jennings 1971), approximately 20 km south of the Hermit Road Site. But closer sources may have been available to the inhabitants of AZ B:16:1125. Park archaeologists have identified

approximately 12 Kaibab chert lithic "prospects" on the South Rim, and at least one of these contains examples of salmon or red fine-grained chert (Amy Horn, personal communication, 2009).

Raw Material	Count	%	Weight (g)	%
Kaibab Chert (fine-tan)	234	40.6	1019.9	41.5
Kaibab Chert (coarse)	141	24.4	942.1	38.3
Kaibab Chert (fine-red)	107	18.5	85.3	3.5
Kaibab Chert (fine-white)	46	8.0	232.9	9.5
Kaibab Chert (fine-gray)	18	3.1	43.2	1.8
Kaibab Chert (coarse-red)	13	2.3	18.0	0.7
Redwall? Chert	8	1.4	13.3	0.5
Fine-grained Quartzite	4	0.7	92.2	3.8
Dark Gray Chert	3	0.5	6.0	0.2
Gray Chert (old)	1	0.2	2.0	0.1
Obsidian (P. Wash)*	1	0.2	1.3	0.1
Pink Dendritic Chert	1	0.2	0.4	0.0
Total (col %)	577	100.0	2456.6	100.0

* Presley Wash

Table 2. Debitage at AZ B:16:1125; raw material by count and weight.

Non-local material types present in the assemblage include: probable Redwall chert (an off-white, coarse-grained material); a probably non-local, fine-grained quartzite; a high quality dark gray chert; one flake of gray chert with a patinated surface (probably an older flake that was brought into the site in prehistoric times); a piece of distinctive battleship gray obsidian from the Presley Wash source; and one flake of a distinctive pink chert with dendrite inclusions.

Table 3 presents the distribution of raw material types by flake technology. Most of the flake types in the assemblage (n=382 [66%]) are untyped fragments and chunks. High numbers of fragmented rock are not unusual in assemblages from primarily Formative period sites, where expedient flake reduction technology tends to dominate.

A large portion of these untyped flakes consists of shatter. By definition, *shatter* refers to debitage with no apparent technology morphology, and may or may not be cultural. Kaibab chert, however, tends to be highly fractured when exposed to the surface, and will contain numerous flaws. When knapped, this material may partially disintegrate, so that the presence of shatter in the assemblage may be due to human activity.

As Table 3 shows, there is a strong raw material correlation between indeterminate flake types and flake technology. Direct Freehand Percussion (DFP) flakes, i.e., those flakes removed from simple non-standardized cores, tend to occur in higher frequencies in both fine-tan and coarse Kaibab chert—material types in which correspondingly higher frequencies of indeterminate flake types also occur. This pattern strongly suggests that

these materials were brought into the site from nearby and then reduced to workable and useable forms.

	Flake Category*									
	Biface NFS		DFP Core		Edge Prep		Indeterminate		Total	
Raw Material	n	%	n	%	n	%	n	%	n	%
Dark Gray Chert			1	0.7	1	7.7	1	0.3	3	0.5
Fine-grained Quartzite			1	0.7			3	0.8	4	0.7
Gray Chert (old)			1	0.7					1	0.2
Kaibab Chert (coarse)			49	33.6			92	24.1	141	24.4
Kaibab Chert (coarse-red)	3	8.3	0	0.0	1	7.7	9	2.4	13	2.3
Kaibab Chert (fine-gray)			3	2.1	0	0.0	15	3.9	18	3.1
Kaibab Chert (fine-red)	31	86.1	11	7.5	2	15.4	63	16.5	107	18.5
Kaibab Chert (fine-tan)	2	5.6	62	42.5	8	61.5	162	42.4	234	40.6
Kaibab Chert (fine-white)			15	10.3	1	7.7	30	7.9	46	8.0
Obsidian (P. Wash)**			1	0.7					1	0.2
Pink Dendritic Chert			1	0.7					1	0.2
Redwall? Chert			1	0.7			7	1.8	8	1.4
Total (col %)	36	100.0	146	100.0	13	100.0	382	100.0	577	100.0

* see Crabtree 1972, and Parry and Kelley 1987 for complete definitions.
** Presley Wash

Table 3. Debitage at AZ B:16:1125; raw material by flake category.

A similar correlation between indeterminate flake types and flake technology also is apparent for red Kaibab chert. This material appears to have been used more-or-less exclusively for bifacial reduction. In contrast to DFP core reduction, biface thinning generally produces small flakes.

As is indeed the case at this site, there should be a notable difference between the average flakes weights for raw materials most strongly associated with these two technologies. The average flake weight for indeterminate coarse and fine-tan Kaibab chert is 4.6 g, and the average flake weight for indeterminate flakes of red Kaibab chert is 0.7g. These data

imply that indeterminate flake fragments of red Kaibab chert were most likely produced from bifacial work.

The presence of cortex on flakes is another common marker for differentiating local from non-local materials. Table 4 gives the cortex data for raw materials represented by eight or more flakes. The data shows that both coarse and fine-tan Kaibab chert are well represented by cortex bearing flakes, and indicate that these materials were collected from the local area. By contrast, red Kaibab chert, while present in a large quantity (n=107), is represented by only three cortical flakes. The dominance of interior flakes of red Kaibab chert indicates that preforms and initial cores were roughed out at the source—a practice common to this technology whereby only preforms deemed relatively free of faults are transported from the quarry area.

	Cortex			
Raw Material	**Present**	**% Present**	**Absent**	**Total**
Kaibab Chert (coarse)	76	53.9	65	141
Kaibab Chert (coarse-red)	0	0.0	13	13
Kaibab Chert (fine-gray)	9	50.0	9	18
Kaibab Chert (fine-red)	3	2.9	104	107
Kaibab Chert (fine-tan)	98	72.1	136	234
Kaibab Chert (fine-white)	13	39.4	33	46
Redwall Chert?	0	0.0	8	8

Table 4. Debitage raw material by cortex at AZ B:16:1125, where greater than eight flakes are present.

In contrast to the bifacial reduction attributed to fragments of red Kaibab chert, DFP core reduction is most frequent in fine tan, and coarse Kaibab chert. As Table 2 shows, this type of chert comprises 66% of the raw material presence in the assemblage. The three cores in the assemblage (below) are also of these material types. The average flake weight for DFP core flakes of coarse Kaibab chert is 6.8 g, and the average flake weight for fine tan Kaibab chert is 7.1 g. This similarity in overall flake weight suggests that there was no apparent selectivity for either material as regards usable flake size. Edge preparation flakes are most commonly produced with this technology, as the margins of cores are trimmed and prepared for flake removal.

Core Nodular Tools

Three core nodular tools were recovered from AZ B:16:1125. All three items are DFP cores, two of which are illustrated in Figure 9.

The first of these cores (Figure 9a) consists of a large chunk of coarse chert, with a distinctive, fossilized texture. According to Park archaeologists, this is actually a form of fossilized sponge that derives from Kaibab chert (dubbed “spongiform chert” by the

NPS). Examples have been collected from the unnamed east-west drainage that feeds into Hermit Basin, approximately 1 km southwest of the site (Amy Horn, personal communication, 2009). As yet, no "spongiform" prospects have been identified. The core has a multi-directional flaking pattern, and measures 8.8 x 7.7 x 4.3 cm. The core was found on the surface at N495.63/E493.72.

The second core is a small chunk of coarse Kaibab chert bearing a distinctive chalky cortex (Figure 9b); this item measures 8.0 x 3.8 x 2.2 cm. It was located within excavated unit N494/E506. The third core is fragmentary, and is of fine-tan Kaibab chert. It was another surface find located at N497.43/E496.29.

Facially Flaked Tools

Five facially flaked tools were recovered from the site, consisting of three bifaces and two retouched flake scrapers. One of the tools—a point similar to an Elko Corner-Notched (Figure 8b)—was previously described in the section on the possible Archaic-BMII component.

The second biface is illustrated in Figure 8a. It is a complete, pressure-flaked tool—possibly a small knife—made of fine-tan Kaibab chert. Both of the margins of this tool are fairly worn from use. The biface is distinctive in that a wide, shallow notch was pressure flaked just below the mid-point on one side, which may have been used to haft the biface to a handle. The tool measures 4.9 x 1.6 x 0.6 cm. It was found on the surface of the site at N490.65/E501.84.

The third biface consists of a small, thin, finely pressure-flaked margin fragment of probable Presley Wash obsidian. The fragment is 0.3 cm in thickness. It was surface collected in unit N490/E489.

The first of the two retouched scrapers is a worked DFP core flake of coarse Kaibab chert; this tool is illustrated in Figure 8c. It measures 4.6 x 2.7 x 1.3 cm and has a used scraping edge approximately 3 cm in length. The tool was found on the surface and point provenienced to N486.16/E498.13. The second retouched flake tool consists of a modified DFP core flake of fine-tan Kaibab chert. It measures 4.6 x 2.7 x 1.3 cm and has a used edge of 3.9 cm. The tool was also located on the surface of the site at N487.75/E500.10.

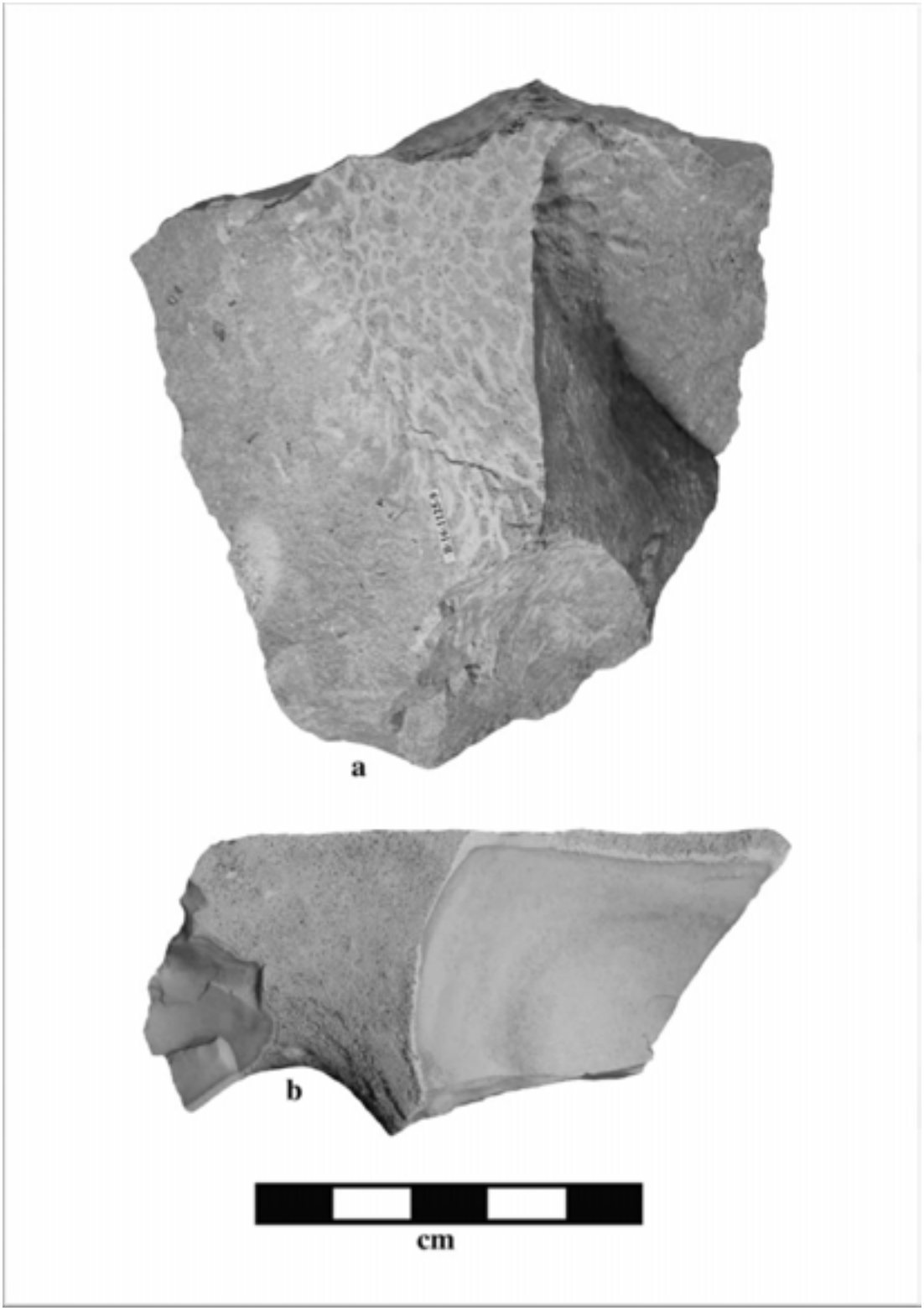


Figure 9. Two core nodular tools from AZ B:16:1125: a) core consisting of coarse chert with coral-like texture and multi-directional flaking; b) core of coarse Kaibab chert with chalky cortex.

Post-Formative Component

Artifacts

The identification of a post-Formative component at AZ B:16:1125 is very tentative and is based solely on a projectile point of Presley Wash obsidian that was found during the 2005 cultural resource inventory of the Hermit Road right-of-way by the NPS (Anderson and Brennan 2006:38). The point is reportedly a Desert Side-Notched, which can occur from Late Prehistoric to Historic times in the area. It can be affiliated with Cerbat, Pai, Paiute, and other early Native American sites, but is most commonly found post-dating the Puebloan occupation of the Grand Canyon and western Colorado Plateau. Since its initial recording, the point has not been relocated by other NPS archaeologists, and it was not observed by the MNA crew. It may have been collected by a visitor, or remains buried in an unknown location.

We currently have no method of determining if the point found by the NPS is associated with the primary artifact scatter at AZ B:16:1125. It is interesting to note that a single DFP core flake of possible Presley Wash material was recovered by MNA, but at this time we are considering the point to be intrusive into an otherwise Formative-area lithic assemblage.

Summary and Interpretation

AZ B:16:1125, also known as the Hermit Road Site, is a prehistoric lithic scatter located between Hermit Road and the South Rim of the Grand Canyon southwest of Mohave Point. The site is roughly 20 m N-S by 20 m, but the main lithic concentration occupies about 221 square meters. The site is adjacent the rim on a slightly sloping exposure of Kaibab Limestone. The limestone bedrock is mantled by a thin (0-30 cm) layer of undifferentiated sediment with little or no soil development and no identifiable stratigraphy. The surrounding pinyon-juniper woodland has an understory of shrubs, such as sagebrush, cliffrose, and snakeweed, and scattered bunch grass. The east and southeast margins of the site have been impacted by the Hermit Road, constructed in the 1930s, and the West Rim Trail passes through the center of the site.

The interpretation of AZ B:16:1125 is limited to an analysis of lithic tools and debris, as no ceramics, features or other non-artifact materials and samples were observed or recovered. There are three possible components at the Hermit Road Site, but two of the components are based entirely on single artifacts and should be considered extremely tentative. The third component is based on the nature of the primary lithic reduction strategy employed at the site.

The earliest component is suggested by a projectile point similar to Elko Corner-Notched, which occurs from the Archaic Period through early Basketmaker II (ca. 7000 B.C. to A.D. 0 or later). The point was found lying atop bedrock at the bottom of a test excavation unit.

The second and primary component at the site may be related to Ancestral Puebloan (Formative) use, but the time frame could be anywhere between A.D. 400 and 1300. This component is inferred from the 576 lithic items (excluding the Elko point) recovered by MNA from both the surface and six excavation units. The artifacts were mostly located on the present ground surface or within 2-3 cm of this surface.

In addition to flakes, two bifaces and two retouched flake tools were collected that may be associated with this component. The lithic assemblage primarily reflects reduction and limited use of two varieties of local Kaibab chert. The dominant reduction technology is expedient core reduction, a lithic technology that characterizes most archaeological sites in the Southwest from Basketmaker III times on (see Parry and Kelly 1987). Also present in the assemblage is waste material from bifacial reduction, specifically, the reduction of red Kaibab chert. This material may be non-local to the site area, with known sources being Red Butte and Red Horse Wash. It reflects activities of a group in transit between resources, or, resources and a main habitation area.

The lithic tools from the Formative component are mostly of the cutting and scraping variety. Edge wear was observed on two of the bifaces, one of which may have been hafted as a knife. No ground stone or obvious abrading implements were observed at the site. The lack of evidence for ceramic vessels and grinding tools, and the types of tools present, suggest a temporary camp oriented toward hunting or processing of unknown foodstuffs or materials by means of cutting, chopping, and scraping. The nominal presence of a flake each of Redwall chert and Presley Wash obsidian suggest that the inhabitants were transiting primarily on the rim of the canyon, but in an area large enough to encompass sources of red Kaibab chert.

The third component is highly tentative and is based on the finding of a Desert Side-Notched projectile point of Presley Wash obsidian by the original NPS survey crew. The point could not be relocated by MNA. The point type is most common on sites that post-date the Formative (i.e., after A.D. 1300) during the Protohistoric and early Historic periods, and might suggest use by Pai or other Native American groups of those eras.

As a final note, we should stress MNA did not excavate 100% of the site, nor was this the intent in the NPS data recovery plan. Given the 577 artifacts collected, and the density of the surface collection and excavated units, we estimate that an equal number of items may yet remain at AZ B:16:1125. If so, the lithic assemblage recovered by MNA is a roughly 50% sample of the entire assemblage and should be considered highly representative of the kinds of raw material, and types of flakes/tools, at the site.

CHAPTER 6
Data Recovery at AZ B:16:0134 (Three Mile Rest House Site)

Data recovery at AZ B:16:0134, also known as the Three Mile Rest House Site, was conducted between March 3-7, 2008 by archaeologists from the Museum of Northern Arizona and National Park Service. L. Theodore "Ted" Neff was the Principal Investigator, assisted by MNA archaeologists Jim H. Collette and Brian Kranzler, and NPS archaeologist Jim Hasbargen. A total of 200 person hours was spent on mapping and excavation. The crew camped at the NPS trail crew cabin at Indian Garden, and hiked to and from the site along the Bright Angel Trail each work day. National Park Service employee and Vanishing Treasures Archaeologist Ellen Brennan, acting through Grand Canyon National Park, was the NPS Key Official.

Background

Location and Setting

Site AZ B:13:0134 is located near the Bright Angel Trail below the South Rim of Grand Canyon National Park, Arizona (Figure 2). The site is almost directly north of Grand Canyon Village, where the trail debarks from a point just west of the Kolb Studio. The trail follows a natural break in the South Rim created by an offset of the Bright Angel Fault, which extends across the canyon to the North Rim. The fault has allowed access into the canyon for probably thousands of years, as evidenced by not only AZ B:13:0134 but other prehistoric and early Native American sites, including rock art, along the trail. Indian Garden could also be reached by this route, and the site—which is perched above the cliffs of the Redwall Formation—overlooks this well-watered oasis. During periods when the Colorado River was not flooding, cross-canyon travel was possible via Bright Angel Creek on the north side of the canyon.

As the site name suggests, AZ B:13:0134 is approximately three miles down the Bright Angel Trail. The rest house was constructed by the Civilian Conservation Corps in the 1930s, and is a popular respite and turn-around point for day hikers. This is one of the few areas on the South Rim where one can "easily" descend though the Redwall, and both the rest house and site take advantage of a narrow, level bench at the Supai-Redwall contact. The bench follows the rim of the cliff-forming Redwall Formation and can be used to facilitate east-west travel at this elevation. From the vantage point of the site one has a panoramic view of the North Rim, Indian Garden and the broad tableland of Powell Point.

Site AZ B:13:0134 is about 60 m northeast of the rest house (Figure 4) at an elevation of 4400 feet. The site is situated near the bottom of a north-south ridge that is directly above the lip of the Redwall. The ridge is composed of the Supai Group of sandstone, mudstones, and siltstones, most of which are slope-forming. The roasting pit associated with AZ B:13:0134 is located on a small, level portion of the ridge, with the north side of the feature cascading down a slope of Supai colluvium. This part of the Supai may be the

basal Watahomigi Formation of red mudstone and siltstone and gray limestone and dolomite.

At the toe of the slope is an expanse of exposed Redwall limestone, part of which is used as a helicopter landing pad. In fact, the area has seen considerable use during historic times. The site includes remnants of supports for a tramway cable that once served Indian Garden, and the transcanyon water pipeline and a pair of utility lines runs along the east side of the ridge. Between the site and the pipeline is a large borrow pit where a hitching post is located for the benefit of mule trains. A smaller borrow pit cuts into the south side of the roasting feature at AZ C:13:0134. Hikers routinely use the area as a lunch spot, and the lack of restrooms at Three Mile Rest House has contributed to general unsanitary conditions in the vicinity.

The vegetation surrounding the Three Mile Rest House Site is not unlike that of the South Rim, with a pinyon pine and juniper woodland present, but there is more species diversity. As mentioned in Chapter 2, plants of the Great Basin Desertscrub can be found at this elevation, including the desirable Utah agave. One of the benefits of the site is that it is located at the ecotone between the conifer woodland and cold-temperate desertland. At the same time, micro-climates along the north-facing slope allow pockets of Ponderosa pine and fir to thrive, especially in cold air drainages. By moving between Garden Creek under the Redwall and the formations below the rim, prehistoric peoples could take advantage of a wide range of wild foods and other plant resources in turn.

While there are no permanent springs in the immediate vicinity, year-round water is available only an hour away at Indian Garden. Kolb Seep, which generally runs year-round, is also located near the rest house at 1 ½-mile. During favorable times of the year, other seeps can be located along the Bright Angel Trail within the upper formations. At the time of the MNA/NPS excavation in March, 2008, an abundant snowpack was still extant just above the site elevation, and crampons were necessary to safely descend the trail. The excavation crew hauled water from Indian Garden, and during dry spells when water was unavailable above the Redwall, prehistoric peoples at AZ B:13:0134 may have done the same.

Fauna common to the area are discussed in Chapter 2, but mention should be made of two large mammal sightings during 2008. During the excavation at AZ B:13:0134 mule deer were observed just above Indian Garden along the Bright Angel Trail. And in late September of that same year, the MNA/NPS crew associated with the MNA/GRCA Colorado River Corridor Archaeological Project (Neff et al., in progress) saw three bighorn sheep on the same trail just below the South Rim. According to the NPS, such sightings are not unusual along the trail and on the rim immediately above.

Work Effort

Unlike at site AZ B:13:1125, the excavation crew was not able to visit the Three Mile Rest House Site prior to data recovery. The MNA archaeologists viewed the site for the first time on the initial day of work, although NPS archaeologist Jim Hasbargen was

familiar with the location. After arriving at AZ B:13:0134 the crew quickly located Feature 1, the roasting pit, and associated historic features and modern landmarks. Pin flags were used to mark all observed surface artifacts, which consisted entirely of lithic items in the vicinity of Feature 1. Artifact density was low, with most items located in and around the ejecta ring of the roasting pit.

A close inspection of the roasting feature showed that the borrow pit had seriously impacted F1, with most of the south and west sides of the feature having been eliminated. It appeared that much of the center of the pit—where foodstuffs were likely to have been cooked—had also been removed. NPS records indicated that the borrow pit had, at one time, been used by NPS crews to quarry rock and sediment for trail construction and maintenance. It is also possible that the area was used as a "landing pad" for the now dismantled tramway. In either event, what remained of Feature 1 was a portion of the ejecta ring, primarily on the north and east sides of the pit, where rock and charcoal-stained soil had been raked into a donut-shaped mound. As part of this, a thin layer of erosional debris was draped over the slope to the north, almost reaching to the shelf of exposed Redwall bedrock (Figure 4). The feature and other site attributes closely matched that of the previous NPS site description and field map (included in Brennan 2007).

The crew used an existing vertical iron bar, located just south of F1, as the site datum. The bar was permanently placed and may be related to construction of the tramway. The site datum was assigned an arbitrary provenience of N500/E500, with an arbitrary elevation measured from the top of the bar of 500 m. From this datum a metric grid oriented to true north was established across the site with a total station. The local grid system was later tied to UTM coordinates and elevation above mean sea level by the NPS. A single benchmark was located near the site and shot with the total station at N522.84/E576.17 (elev. 483.09 m). The benchmark reads *U.S. Dept. of the Interior, National Park Service, P-L 1, 1982*.

The site was then mapped with the total station. The site map, which is reproduced as Figure 4, shows known and newly-discovered prehistoric features, extent of the artifact scatter, historic features such as the tramway remains, modern features such as the pipeline, utility lines, emergency telephone line, hitching post, borrow pits, helicopter landing pad, NPS benchmark, and rest house, and the rim of the Redwall formation. Due to the scarcity of observed surface artifacts, all items were individually provenienced with the total station and collected.

Data recovery proceeded at the same time as site mapping. All excavation was restricted to Feature 1 and an underlying thermal feature designated as F3 (see feature descriptions). The work effort consisted of three main tasks: 1) excavation of two trenches (T1 and T2) through Feature 1; 2) stripping of 4 sq m around F3; and 3) excavation of three 1 x 1 m units adjacent to T1 and T2 (Figures 4, 10, and 11).

The two trenches were 1 m wide and excavated and provenienced by 1 m^2 units (Figure 10). Trench 1 was excavated through the northeast quadrant of F1 and was 6 m long.

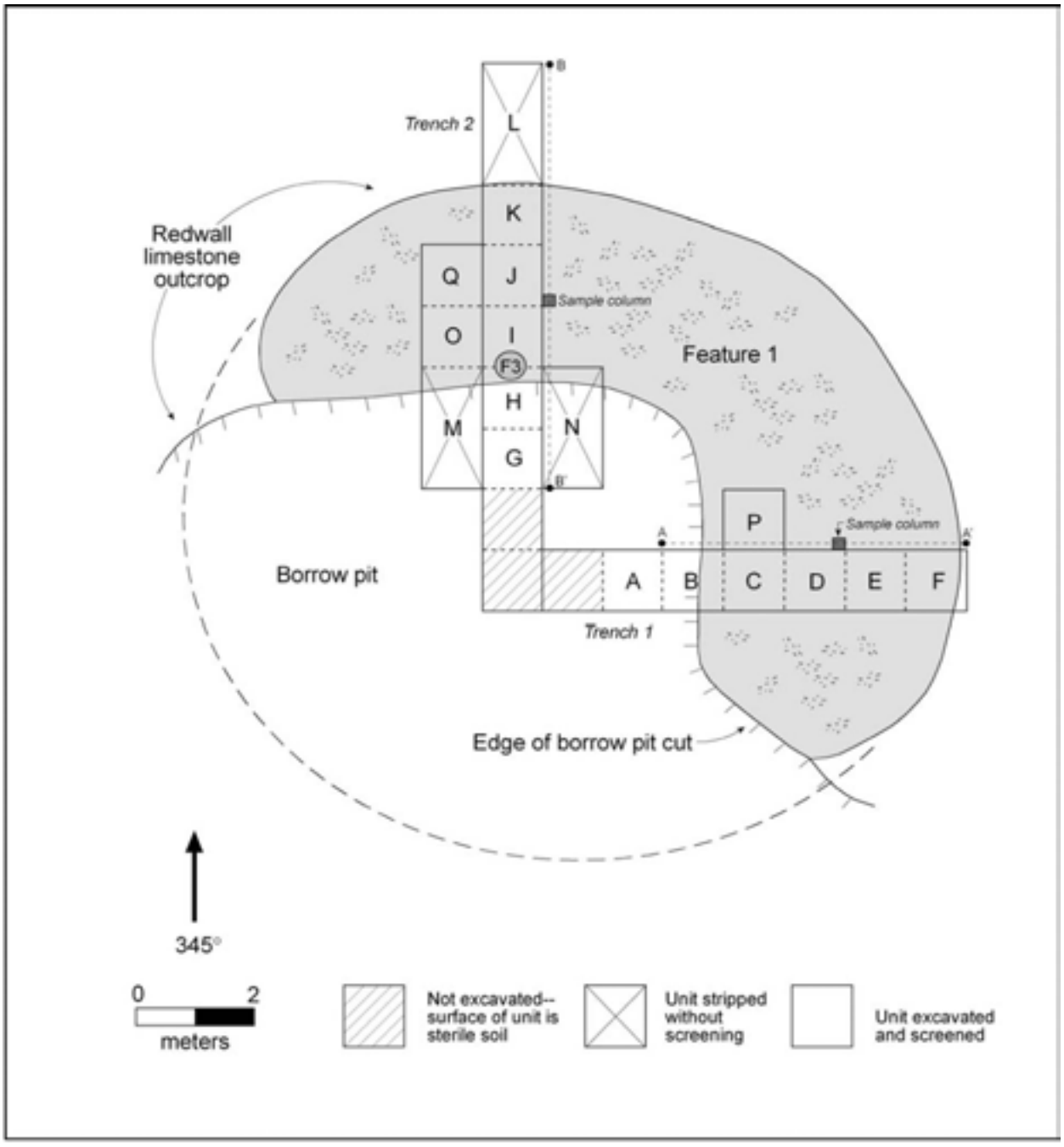


Figure 10. Plan view of roasting pit (F1) at AZ B:16:0134 showing locations of hand excavated trenches and units.

Figure 11. Feature 1 at AZ B:16:0134. (Top) F1 prior to excavation; flags mark artifacts. Note discarded cable—possibly from tramway. (Bottom) F1 and F2 (pile of rocks to left) before excavation. Foreground consists mostly of borrow pit that was dug into F1.

Trench 2 was excavated through the northwest quadrant of the feature and was 7 m long. The purpose of the trenches was to determine what kind of internal structure still remained at F1, the feature's relationship to the underlying sterile soil, the spatial and vertical extent of the existing remains, and stratigraphy of the fill (if any). Ten of the 13 units were screened through 1/4-inch mesh to obtain a representative sample of artifacts. Profiles were drawn along the entire lengths of both trenches, and photographs taken both before and after excavation.

During excavation of Trench 2 a possible buried thermal feature was found that was designated F3. The feature was excavated by halves, with one half of the fill screened through 1/8-inch mesh, and one half collected as a flotation sample. Four 1 x 1 m units were stripped (i.e., excavated but not screened) around F3 to sterile soil to look for additional features; none were observed.

To improve the sample of collected artifacts, three additional 1 x 1 m units within F1 were excavated and screened. One unit was located next to Trench 1 in the area of greatest fill depth. Two other units were located adjacent to Trench 2, also in the deepest portion of the remaining fill. Two of the units were screened through 1/4-inch mesh and one was screened through 1/8-inch mesh. The latter was meant as a control unit to determine if any additional, small remains (such as bones and pressure flakes) could be retrieved using the smaller mesh size. A comparison of artifacts indicated that there was no appreciable difference between quantity or type of items recovered from either mesh size.

Flotation and pollen samples were collected at various depths within two 25 cm^2 columns excavated next to Trenches 1 and 2 (Figure 10). Charcoal fragments within the fill of F1 and 3 were generally quite small, with few items observed in the field that were larger than the head of an eraser. Inspection of light fraction from flotation, however, revealed several small specimens of annuals, other plant parts, and wood charcoal; three samples were submitted for radiocarbon dating. No faunal remains were recovered from either of the thermal features.

After excavation was completed all screened backfill was returned to the features and the surface reconfigured to its original grade. Work ended on March 7, with the crew returning to the rim via the Bright Angel Trail.

Stratigraphy

There is little to no soil formation beneath the roasting pit of AZ C:13:0134, which is primarily a surficial site. The center of the roasting pit, designated as Feature 1, may have originally been excavated somewhat into the rock and residual sediment of the ridge slope, but the ejecta ring is perched on the surface itself. Artifacts and features associated with the tramway and other historic events are located on the modern ground surface. Profiles were drawn of two excavated axes within Feature 1, but mostly show the unstratified nature of the eject pile.

Archaic/Basketmaker and Ancestral Puebloan Components

While the site boundary of AZ B:16:0134 contains features and artifacts from the Historic Period, data recovery focused on the prehistoric locus at the site, which initially consisted of Feature 1, a roasting pit. Radiocarbon determinations indicated that Feature 1 was used during the latter part of the Late Archaic Period and, perhaps, the Late Archaic-Basketmaker II transition. The Late Archaic begins about 2800 B.C. and ends between 1000 and 500 B.C. on this portion of the Colorado Plateau. In the central Kayenta region to the east of the Grand Canyon the Basketmaker II Period (also described as the "Early Agricultural Period") may begin as early as 1000 B.C., but is currently placed at around 600 B.C. based on early corn dates. Feature 3, a thermal feature that was probably associated with a later re-use of F1, dated to Late Pueblo I-Early Pueblo II. Pueblo I begins about A.D. 800 and Pueblo II follows at about A.D. 1000.

Features

The prehistoric component of AZ B:16:0134 consisted of Features 1 and 3. Feature 1 was a roasting pit that had been previously identified during the initial recording of the site by the NPS. Feature 3 was found and added by the MNA/NPS crew. It consisted of a small, basin-shaped thermal feature that was found below Feature 1 (Figures 4, 10, and 11). The focus of the data recovery work effort was Feature 1 and 3. Therefore, aside from mapping, the crew did not investigate the historic component at the site. Of this component, the most interesting are the remains of a tramway structure and cable. The MNA/NPS crew did add one new feature to this component: F2, a historic pile of rock that may have been deposited by crews digging the borrow pit.

Feature 1

Feature 1 is the remains of a donut-shaped roasting pit that may have originally been up to 12 m in diameter. The pit was located on a small, level portion of a ridge slope of Supai colluvium and residual sediment, situated just above the top of the Redwall Formation.

The feature was actually perched at the edge of the level area, such that burned rock and debris from the pit could be raked down the slope to the north. Figures 12a and 12b, which are profiles of two trenches that were excavated through F1, illustrate the positioning of the roasting pit relative to the slope (see also Figure 13). In both profiles, the mound that forms the so-called "donut," or ejecta ring, is located at the edge of the level area. In Figure 12a, one can see that the ground slopes away to the north, where a veneer of rock and charcoal-stained soil has eroded—almost to the level of the Redwall bedrock below. This kind of positioning is typical for large roasting pits in the Grand Canyon, and allows ejecta to be repeatedly removed from the center of the pit without mounding up around the perimeter.

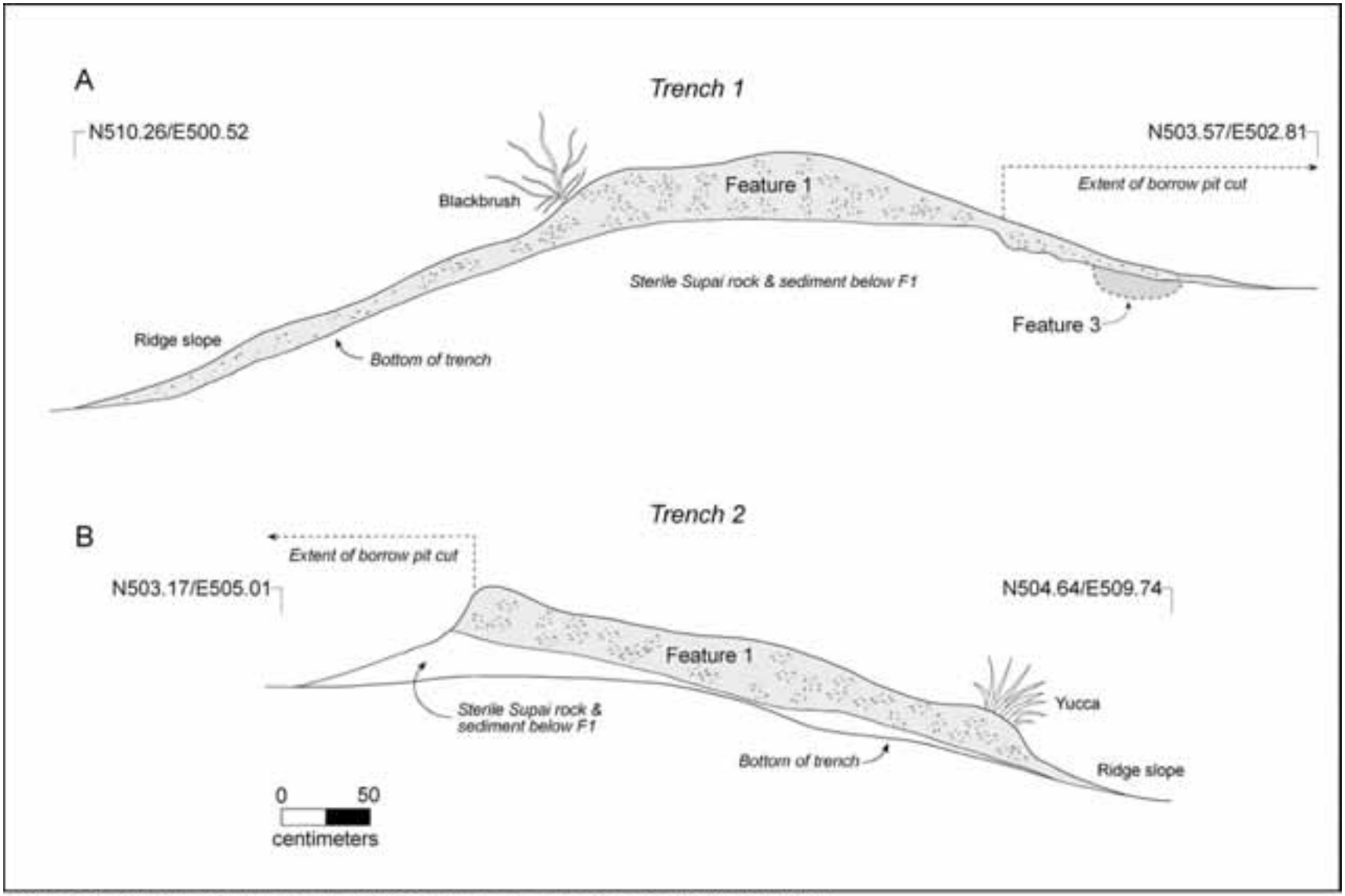


Figure 12. Profiles of Trenches 1 and 2 in Feature 1, a roasting pit at AZ B:16:0134.

Figure 13. Feature 1 excavation at AZ B:16:0134. (Top) Trench 2 through northwest side of feature; note borrow cut at far left. (Bottom) North face of Test Unit P showing F1 ejecta ring fill atop sterile Supai Formation sediment.

The exact size and configuration of F1 cannot be known for certain, because a modern borrow pit was excavated into the south half of the roasting pit (Figures 4 and 10). The borrow pit removed all cultural material from approximately 60% of the feature, including the center of the roasting pit where foodstuffs were likely to have been cooked. The borrow pit not only destroyed this portion of F1, but cut up to 25 cm into sterile sediment below the feature. What remained was primarily the northwest and northeast sides of the eject ring, as shown in Figures 12a and 12b; in the profiles we have approximated where the borrow pit cut begins. The south margin of the borrow pit was excavated 2-3 m into the ridge slope.

Although the borrow pit eliminated the center of Feature 1, it does provide some information about the original construction of the pit. Investigation of the borrow pit area showed that the "heart" of the roasting feature was not excavated prehistorically to any appreciable depth into sterile soil. In other words, there is no evidence that the pit center was more than 25 cm below the bottom of the ejecta ring.

Figure 10 shows that the intact part of the ring was approximately 3.5 m wide, while Figures 12 and 13 demonstrates that the maximum depth of the remaining fill was 40 cm. It is possible that the deepest part of the mound was removed by the trail crew, but the pit was probably never more than 50-60 in depth. In fact, when whole, the center of roasting pits often form a slight depression within the "donut" itself.

By its nature, the ejecta ring was situated atop the prehistoric ground surface, and has no subsurface depth. The ring also had no internal stratigraphy, but simply consisted of discarded rock and a matrix of sediment and diffuse charcoal. Both limestone and sandstone rock were observed. The limestone may derive from the Redwall Formation, but a similarly-colored gray limestone can be found in the lower formation of the Supai Group (Kamilli and Richard 1998). Rocks were mostly fist-size or smaller, but some larger rocks—up to 20 cm in diameter—were observed on top of the mound.

The content of the roasting pit fill looked unpromising in the field, with few charcoal chunks of a size larger than 5 mm and no burned bone. Artifactual remains were limited to lithic items, most of which were flakes; no ceramics were observed. In the lab, however, a number of identifiable macrobotanical specimens were recovered from flotation, including carbonized agave spines, herbaceous stems, and juniper nut shells. The results of the analysis are discussed in more detail under "Specialized Analysis."

Feature 2

Feature 2 was located on the west edge of the roasting pit (see Figures 4 and 15). It consisted of a pile of large, football-size rocks that were probably deposited by the trail crew during excavation of the borrow pit. The function of the pile is not known. Perhaps the crew was sorting out rocks that were too large for their purposes, or they intended to use the rocks at a later time. The feature was noted for the record because it is partially situated on the westernmost ejecta ring of Feature 1.

Feature 3

While excavating Trench 2 in Feature 1, a separate, smaller thermal feature was discovered that was covered by F1 (see location in Figure 10). This feature, designated F3, appeared to pre-date Feature 1. It had also been impacted by borrow pit activities. In fact, the feature marks the northernmost extent of the borrow pit. The borrow pit cut did not consist of a single vertical face, but "stepped down" from north to south, such that the north half of F3 was reasonably intact while the upper fill of the south half had been partially removed (see plan and cross-section in Figure 14 and photograph in Figure 15). Nevertheless, at least 75% of the feature remained intact.

Feature 3 had been excavated prehistorically into the sterile soil beneath F1. It was basin shaped, with a rounded bottom and a slightly flaring rim. The feature was 60-67 cm in diameter and at least 25 cm in depth. It was not slab lined, but the sides of the pit were lightly oxidized. The fill was lightly charcoal-stained; it was not as rich as F1, but did have larger charcoal fragments. The fill was mottled with clay inclusions. In the north half of the pit the feature appeared to be covered by a 1-2 cm layer of more sandy sediment—almost as if it had been capped by eolian deposition (although there is currently little evidence for such deposition in the area). The lower fill of Feature 1 seemed to be directly on top of F3, but the exact relationship was muddled, somewhat, by the intrusion of the borrow pit.

The crew excavated what remained of the south half of Feature 3 first, exposing a profile of the north half. Aside from the possible "capping" layer of sandy soil, there was little to distinguish the fill, which consisted of undifferentiated, lightly charcoal-stained sediment. Flotation samples were collected from the north half of the fill, and all remaining fill was screened through 1/8-inch mesh. The fill was notable in that it included 6-7 small pressure and thinning flakes, of the type commonly associated with biface thinning and maintenance. The flakes contrasted with the type of debitage associated with F1; the latter contained mostly larger flakes from direct freehand percussion (DFP)—an entirely different kind of lithic reduction. A more detailed analysis of the Feature 3 lithics follows under "Artifacts."

Artifacts

The only artifacts recovered from AZ B:16:0134 were lithics, consisting mostly of flaked stone items such as bifaces, core nodular tools, and flakes. A piece of limonitic sandstone and a possible atlatl weight were also recovered. All stone tools were found either on the surface of the site (usually on or around Feature 1), or from screened units within F1. No ceramics or bone was observed. Radiocarbon, flotation, and pollen samples were collected from the two thermal features at the site (F1 and 3).

Stone

The total number of lithic artifacts recovered from excavations at AZ B:16:0134 is 189. The total includes 149 pieces of debitage, 24 utilized flakes, 10 facially flaked tools, four

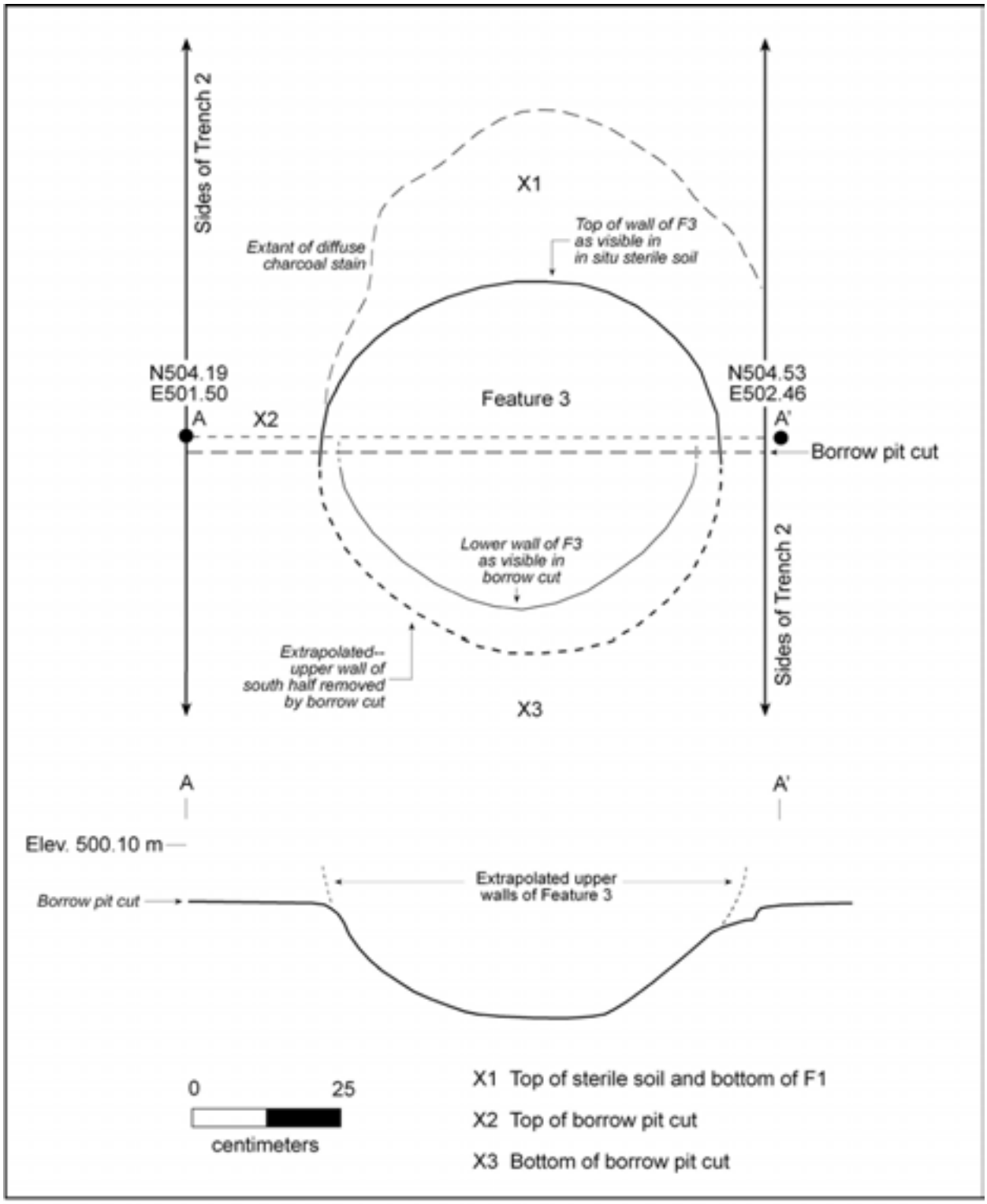


Figure 14. Plan view and cross-section of Feature 3 in Trench 2 at site AZ B:16:0134.

Figure 15. Features 2 and 3 at AZ B:16:0134. (Top) Feature 2, consisting of pile of rocks on west edge of F1 from borrow pit activity. (Bottom) Feature 3 in relation to F1 and Trench 2; F3 is concavity in center of photo at bottom of trench. Borrow pit has exposed plant roots at top of photo.

nodular tools, and two miscellaneous items. The stone reduction technology is dominated by direct freehand percussion (DFP), although biface reduction is well represented and consists of a much wider variety of raw material types and variants. While diagnostic material is limited, a possible atlatl weight fragment and a serrated, dart-size mid-section suggests the presence of an Archaic component. Given the site's location on a well-traveled route, however, it is possible that the assemblage contains material from later cultures.

Debitage

As might be expected, local Kaibab cherts dominate the lithic assemblage. This material was typed by color and granularity to track preferences for certain kinds of tool production or refurbishment. The frequencies for raw material types by both count and weight are given in Table 5.

Raw Material	**Count**		**Weight (g)**	
	n	%	g	%
Chalcedony	3	1.7	2.4	0.2
Coarse Chert NFS	13	7.5	142.2	14.5
Fossil Coral	1	0.6	6.0	0.6
Kaibab Chert (coarse)	55	31.8	670.3	68.3
Kaibab Chert (fine-gray/pink)	25	14.5	44.6	4.5
Kaibab Chert (fine-pink)	4	2.3	3.6	0.4
Kaibab Chert (fine-red)	14	8.1	26.5	2.7
Kaibab Chert (fine-tan)	22	12.7	26.5	2.7
Kaibab Chert (fine-white/pink)	35	20.2	59.4	6.1
Obsidian	1	0.6	0.1	0.0
Total (col %)	173	100.0	981.6	100.0

Table 5. Debitage and utilized flakes at AZ B:16:0134, raw material by count and weight.

The most commonly occurring material is coarse-grained Kaibab chert. This material accounts for 32% of the debitage by count and 68% of the debitage by weight. Other materials include an untyped coarse chert that, while present in relatively small amounts (n=13), accounts for an additional 15% of the raw material weight. The remainder of the raw material consists of varied amounts of fine-grained Kaibab cherts. While the fine-grained cherts are abundant, they comprise only a small percentage of the material weight. Aside from local Kaibab material, three flakes of chalcedony, and a single flake of black obsidian were noted. A single flake of fossil coral is noteworthy, as a flake of this same material was noted at the Hermit Road Site (AZ B:16:1125); both were DFP core flakes.

Some of the variability in the fine-grained Kaibab chert may be due to natural variety inherent in the rock (see Brown 1988), but some may be due to intentional thermal

alteration, i.e., heat treatment. Heat treatment renders stone more workable for flintknapping. Actualistic experiments at the Navajo Nation Archaeology Department in Flagstaff, indicate that white Kaibab chert will turn pink when heat treated (Geib et al. 2001:186). The pink hue noted on much of the material seen at AZ B:16:0134 may indicate that the material was heat treated, but supporting evidence is limited. "Hard" evidence of heat treatment is the presence of differential flake luster or color on negative flake scars (see Geib 2001:Figures 16 and 17). Heat treatment *is* suspected on one of the bifaces (see below), an item made of non-local, high quality chert.

The average flake weight for coarse-grained material is 11.9 g, and the average weight for fine-grained material is 1.6 g. The difference is significant, and indicates general differences in the reduction technology (and probably use) of these two types of materials. Table 6 provides a cross-tabulation of raw material and technological flake category. Coarse-grained Kaibab chert comprises the bulk (56%) of DFP core reduction. Flake tools from this material were being produced from large, expedient cores of local material. Biface reduction, in contrast, generally made use of finer-grained materials, although a few biface flakes of coarse-grained chert were observed.

	Flake Category									
	Biface		**DFP Core**		**Edge Prep**		**Indet**		**Total**	
Raw Material	n	%	n	%	n	%	n	%	n	%
Chalcedony	1	3.0	0	0.0	0	0.0	2	2.7	3	1.7
Coarse Chert NFS	0	0.0	0	0.0	0	0.0	13	17.6	13	7.5
Fossil Coral	0	0.0	0	0.0	1	6.3	0	0.0	1	0.6
Kaibab Chert (coarse)	4	12.1	28	56.0	1	6.3	22	29.7	55	31.8
Kaibab Chert (fine-gray/pink)	5	15.2	7	14.0	2	12.5	11	14.9	25	14.5
Kaibab Chert (fine-pink)	1	3.0	1	2.0	2	12.5	0	0.0	4	2.3
Kaibab Chert (fine-red)	4	12.1	2	4.0	0	0.0	8	10.8	14	8.1
Kaibab Chert (fine-tan)	7	21.2	4	8.0	5	31.3	6	8.1	22	12.7
Kaibab Chert (fine-white/pink)	11	33.3	7	14.0	5	31.3	12	16.2	35	20.2
Obsidian	0	0.0	1	2.0	0	0.0	0	0.0	1	0.6
Total (col %)	33	100.0	50	100.0	16	100.0	74	100.0	173	100.0

Table 6. Debitage and utilized flakes at AZ B:16:0134, raw material by flake category.

The presence of cortex on debitage can be an indicator of proximity to raw material resources. Cortex is the exterior rind of a nodule, and its presence on flakes usually indicates the earliest stages of reduction. The more local a material, the greater the likelihood that larger quantities of cortex will be present in the assemblage. Table 7 presents a cross-tabulation for the presence/absence of cortex by raw material type. Two

types that might be more local than others are coarse Kaibab chert and fine-tan Kaibab chert. On the other hand, most of the Kaibab variants had cortex-bearing flakes. In all probability, most of the material at this site was collected nearby, probably near the canyon rim, and brought to the site for further reduction. The only known exotic materials are the chalcedony and obsidian.

	Cortex			
Raw Material	**Present**	**% Present**	**Absent**	**Total**
Chalcedony		0	3	3
Coarse Chert NFS	2	15.4	11	13
Fossil Coral		0	1	1
Kaibab Chert (coarse)	25	45.5	30	55
Kaibab Chert (fine-gray/pink)	8	32.0	17	25
Kaibab Chert (fine-pink)		0	4	4
Kaibab Chert (fine-red)	3	21.4	11	14
Kaibab Chert (fine-tan)	9	40.9	13	22
Kaibab Chert (fine-white/pink)	9	25.7	26	35
Obsidian		0	1	1

Table 7. Debitage and utilized flakes atB:16:0134, raw material by cortex.

Utilized flakes

All flakes from the Three Mile Rest House Site were examined for use wear using a 40X binocular microscope. Tool function is inferred from certain morphological characteristics, such as direction and size of micro-flaked edge wear, and edge polish. By categorizing use wear, it is possible to describe the variability in wear types, such as scraping, cutting, and sawing tools, and compare function with flake technology and size variation. The results of this analysis are summarized in Table 8, which displays a cross-tabulation of flake technology and size by inferred function for the 23 utilized flakes recovered from AZ B:16:0134. Here, flake technology comprises the categories "Biface," "DFP Core," "Indeterminate," and "Edge Preparation." Each flake was ranked by size, the dimensions of which are defined at the bottom of Table 8. Finally, under "Inferred Function," are counts for each tool type by flake category/size.

Category	Size*	Inferred Function: Scraping	Cutting	Sawing	Edge Polish	Notch Scraping	Total
Biface	01		1				1
DFP Core	01	1	1	2	1		5
Biface	02	1	2				3
DFP Core	02		3				3
Indeterminate	02		1				1
Biface	03	2	2			1	5
DFP Core	03		2				2
Edge Prep	03		1				1
Indeterminate	03	1	1				2
Total		5	14	2	1	1	23

*Size ranking as follows: 01 = > 1.5", 02 = <1.5" but < 1", 03 = < 1".

Table 8. Utilized flakes at AZ B:16:0134, flake category and size grade by inferred function.

Two patterns emerge from a review of Table 8. First, DFP core flakes (n=5) dominate the large and medium tool categories, and include the broadest range of use wear variability. (Large DFP core flakes also comprise most of the retouched scrapers, which are described below.) Second, biface flakes (n=5) dominate the small tool category. Most of the utilized flake tools exhibit cutting-wear attrition, where micro-flaking is present on both sides of the used edge. This suggests that over half (14 out of 23) of the tools were used for cutting purposes. Fewer tools (n=5) were used primarily for scraping, and two tools had wear reflective of sawing action. A minor pattern is that the three biface thinning flakes in the medium (02) size range were the only items to display more than one used edge. Of course, inferred function is only an approximation of actual use, and is subject to certain vagaries, such as wear produced by multiple uses.

Core Nodular Tools

Four core nodular tools were recovered from the site. All four items are DFP cores. Two of the four tools are illustrated in Figure 16 as items *a* and *b*.

The first of the three tools consists of a fragment of a small, conical core of coarse Kaibab chert (Figure 16a). It is 3.2 cm long and 2.0 cm thick. Cores of this type were noted at the Hermit Road Site, and are not unusual in Formative Period assemblages (e.g., Cameron 1987:105). The platform of this tool utilizes a naturally flat cortical surface. No use wear was noted on the tool, which was simply used to detach useable flakes—some of which may have served as flake tools. The core was recovered from the fill of Feature 1.

A second, fragmented conical core was found on the surface of the site. The core is composed of fine white-pink Kaibab chert, but was too fragmented to obtain any dimension measurements; it is not illustrated.

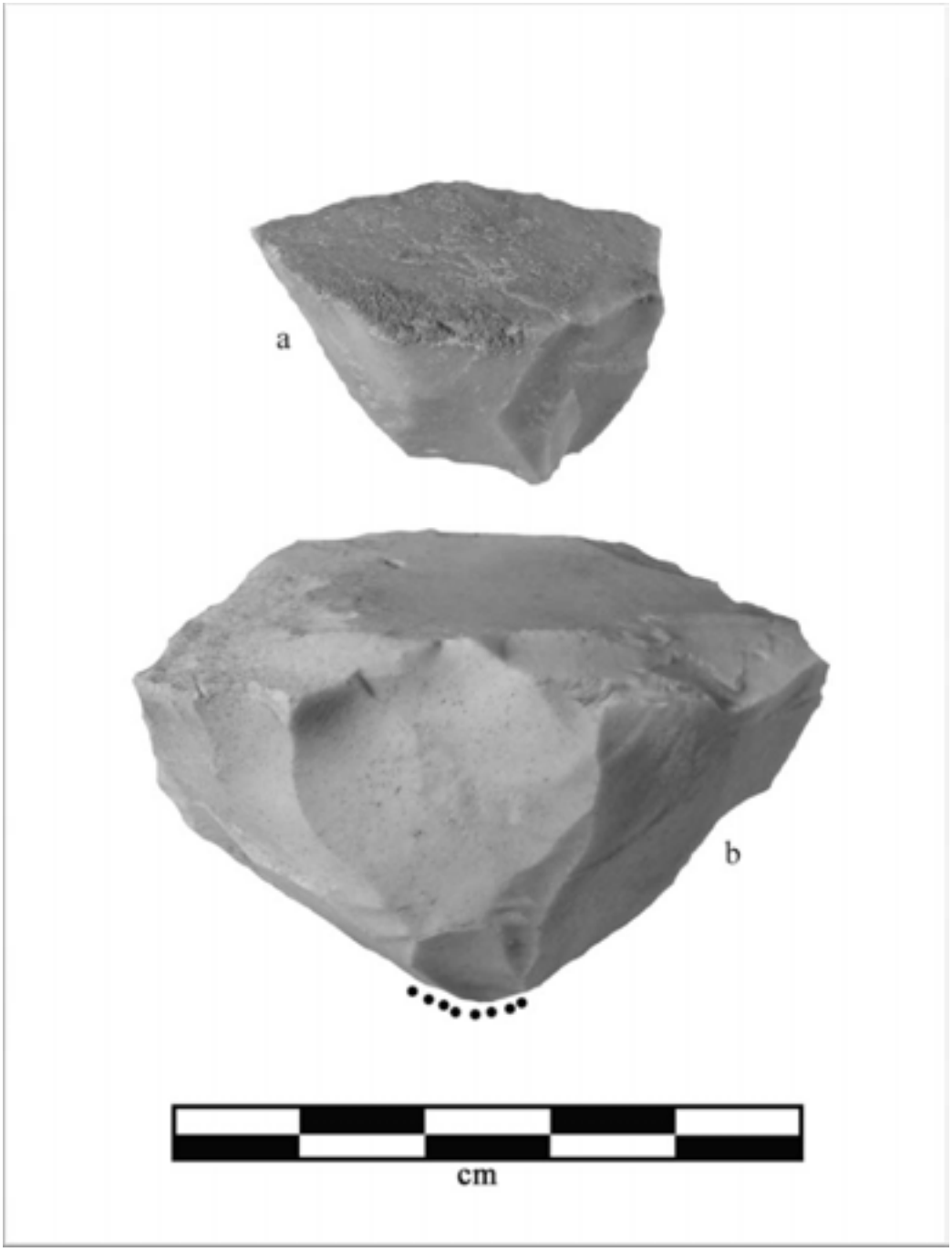


Figure 16. Core nodular tools from AZ B:16:0134: a) core of coarse Kaibab chert used to detach useable flakes; b) core of Kaibab chert; dots show area of pecking use wear on distal end.

The third core is conical in shape and was also found on the site surface; it is shown as Figure 16b. It is made of fine white-pink Kaibab chert, and is complete. The core is 5.2 cm long, 3.7 cm wide, and 3.2 cm thick. This core displays pecking use wear on the distal end, and may have been used as a hammerstone. It is large enough to still have some potential use, and thus was not exhausted at the time it was abandoned. The platform for the core was prepared by the removal of a single, large, lateral flake.

The fourth and final core was a large (1103 g) chunk of coarse Kaibab chert that was located in the fill of Unit D within Feature 1. It was minimally worked and still has cortex over much of its surface. The core measures 11.4 cm in length, is 8.6 cm wide, and 8.2 cm thick.

Several DFP core flakes were noted in the assemblage that bear negative edge trimming flake scars behind the platform. Edge trimming is necessary in order to prepare the platform for flake detachment, and would have been essential for removal of flakes from conical cores. Thus, these flakes probably derived from the same cores (or similar types of cores) as found at AZ B:16:0134. Edge trimming was observed on 12 flakes: seven of coarse Kaibab chert, two of fine white-pink Kaibab chert, one on fine tan Kaibab chert, one on fine pink Kaibab chert, and one on fossil coral.

Facially Flaked Tools

Ten facially flaked tools were recovered from site AZ B:16:0134, consisting of six retouched flake scrapers and four bifaces. Two scrapers and two bifaces are shown in Figure 17 as items *a-d*.

The first retouched flake scraper is an end scraper made from a DFP core flake of fine, white-pink Kaibab chert; it is illustrated in Figure 17a. The tool is 5.1 cm long, 4.3 cm wide, and 1.3 cm thick. The second retouched flake tool is a denticulated scraper made off a DFP core flake fragment of fine, white-pink Kaibab chert. The tool is illustrated in Figure 17b, and measures 5.8 cm in length, 2.3 cm in width, and is 1.5 cm in thickness. The denticulated margin, visible on the left side of the tool, extends for a length of 4.1 cm. The flake, which is triangular in cross-section, also exhibits use wear from scraping on two other margins. Both tools were found on the surface of the site.

The four other retouched flake tools are not illustrated. The third retouched flake tool was recovered from Unit D in Feature 1. It is a DFP core flake of fine gray-pink Kaibab chert used as an end/side scraper, and measures 5.7 cm long, 4.7 cm wide, and 2.0 cm thick. Scraping attrition is evident on three margins of the flake (all but the proximal end), but only one side of the flake has been modified.

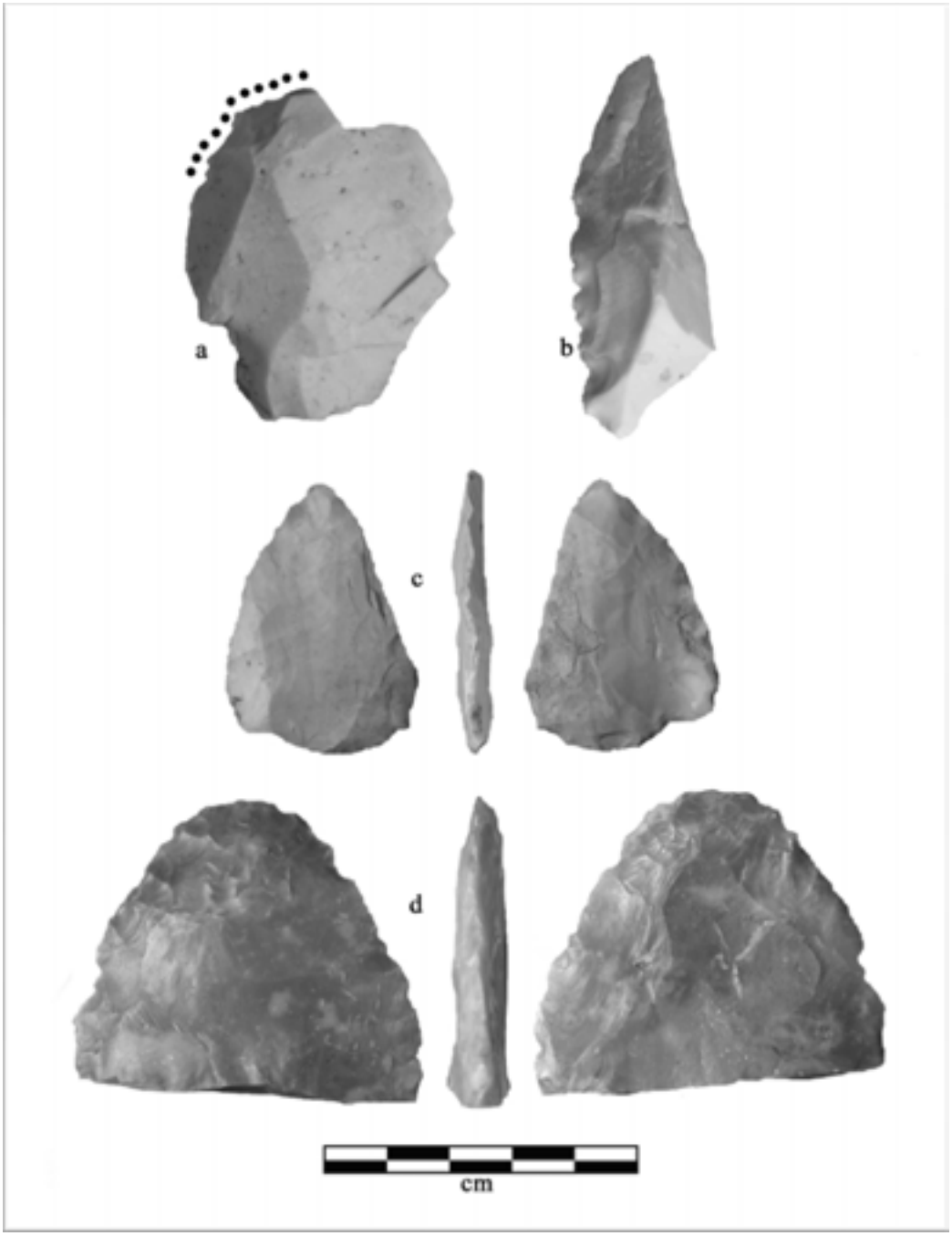


Figure 17. Facially flaked tools from AZ B:16:0134: a) retouched flake scraper of Kabab chert; dots show area of retouch; b) denticulated flake scraper of Kaibab chert; note denticulated margin on left of tool; c) dart-sized preform of Kaibab chert; d) distal fragment of chert preform.

The fourth retouched flaked tool was located on the site surface and consists of a minimally modified DFP decortication flake of coarse Kaibab chert. The retouch consists of the removal of a single notch 0.76 cm wide by 0.2 cm deep. The tool may have been used as a kind of spoke shave.

The fifth retouched flake tool was found in the fill of Unit O of F1 and is a small, DFP core flake of obsidian. The flake was retouched along one margin to produce a straight scraping edge 1.6 cm long. The entire tool is 2.1 cm long, 1.2 cm wide, and 0.9 cm thick. The debitage assemblage also contains a single, small DFP core flake of this same kind of obsidian.

The final tool of this type consists of a broken DFP decortication flake of fine gray-pink Kaibab chert. One small edge—where high quality chert was exposed beneath the cortex—was finely retouched to produce a straight scraping edge 1.6 cm long. The flake measures 3.3 cm in length, 2.0 cm in width, and is 0.7 cm thick.

The first two bifacial tools are illustrated as Figure 17c and d. Both items were recovered from the fill of Unit F in Feature 1. The first is a dart-sized preform and is shown in Figure 17c. It is made of fine, white-pink Kaibab chert and is 4.3 cm long, 3.1 cm wide, and 0.5 cm thick. In the production of bifaces, preforms represent a late stage of reduction where the item has already been well-thinned and can now be shaped, if need be, into its final form (although it can also be used as is).

The second biface is a large, distal fragment of a well-flaked preform, shown in Figure 17d. The preform is made of high-grade, toffee-colored chert that is partially mottled blue-white. The material has a waxy sheen except for a single, older-appearing flake scar on one face. Either the biface had been worked off of an old flake that had dulled with age, or the material was heat treated. Heat treating will typically produce a waxy, "vitreous" luster to most siliceous material (Crabtree 1972:94). The flake scars on the preform show that both percussion and pressure flaking were used to fashion the item. The tool measures 5.6 cm in width and is 0.5 cm thick.

The third bifacial tool is a mid-section fragment of a serrated, dart-sized projectile point that was recovered from Unit C. It is made of red Kaibab chert and measures 1.7 cm in width and 0.5 cm in thickness. While not diagnostic per se, serration is common on San Jose points, which date to the middle-to-late Archaic Period (see Justice 2002:129-138 for a discussion). If it is San Jose, the site would be on the northernmost distribution of this point type. Gypsum points, the most common Late Archaic point type found at GRCA, can also be serrated. Serration is also common on certain Formative points, but the tool does appear to be dart-size and not an arrow point. The point seems to have been fragmented by fire, rather than by a production or impact break.

The final biface at AZ B:16:0134 is a margin fragment of a mid-to-late stage biface found on the site surface. It is made of fine white-pink Kaibab chert, and exhibits a rolling break along one entire margin. This was probably a production-related break, and it appears that an attempt was made to flake a new platform margin along this break. The

fragment also exhibits a lateral break that has exposed fresher-looking material; this break is much more recent. The biface fragment is 0.7 cm in thickness.

Miscellaneous Stone Items

The two miscellaneous items from site AZ B:16:0134 consist of a possible atlatl weight fragment, and a piece of limonitic sandstone.

The possible atlatl weight is illustrated in Figure 18. Atlatls were the principal projectile-throwing implement of the Archaic Period, and were later replaced by the bow and arrow during the early Formative Period. The fragment found at the Three Mile Rest House Site was found on the surface.

The weight is made of brown mudstone and is abraded on all surfaces. The item is D-shaped in cross section, and somewhat "boat"-shaped longitudinally, tapering at the end before terminating in an abrupt facet. The item is flat on one side. Atlatl weights recorded in the Southwest tend to have a flat side to ensure good contact against the atlatl (Geib et al. 2001:166). There is no evidence of a binding groove, however. A binding groove is an incised groove around the middle of the weight, and is used to bind the weight securely to the atlatl (see Guernsey 1931:72 for an example). In this case, the groove may be missing since the fragment represents less than half of the original weight. The fragment is 1.6 cm wide and 1.3 cm thick.

The second miscellaneous item is a rounded chunk of limonitic sandstone that was found in Unit I. It measures 3.2 cm in length, 2.2 cm in width, and is 1.9 cm thick. Little can be said about the item's source, but it may have been used for ochre or pigment.

Non-Artifactual Remains

Non-artifactual remains at the Three Mile Rest House Site consisted entirely of archaeobotanical remains from Features 1 and 3. Due to the thermal nature of the features, pollen samples were collected but not submitted for analysis. Carbonization of pollen grains creates problems of preservation, and available funds were used for analyses of the more promising macrobotanical remains and radiocarbon samples. No other non-artifactual remains, such as bone, shell, fibers, or suitable dendrochronological specimens were observed.

Macrobotanical

Sample Selection

Archaeobotanical data for the Three Mile Rest House Site derived from seven flotation samples collected from two general proveniences: Feature 1, a roasting pit, and Feature 3, a smaller thermal feature found within and below F1. Five of the samples were from separate proveniences in F1: upper and lower fill samples from Unit D, upper and lower fill samples from Unit J, and a sample from the lower fill of Unit I. Two samples were

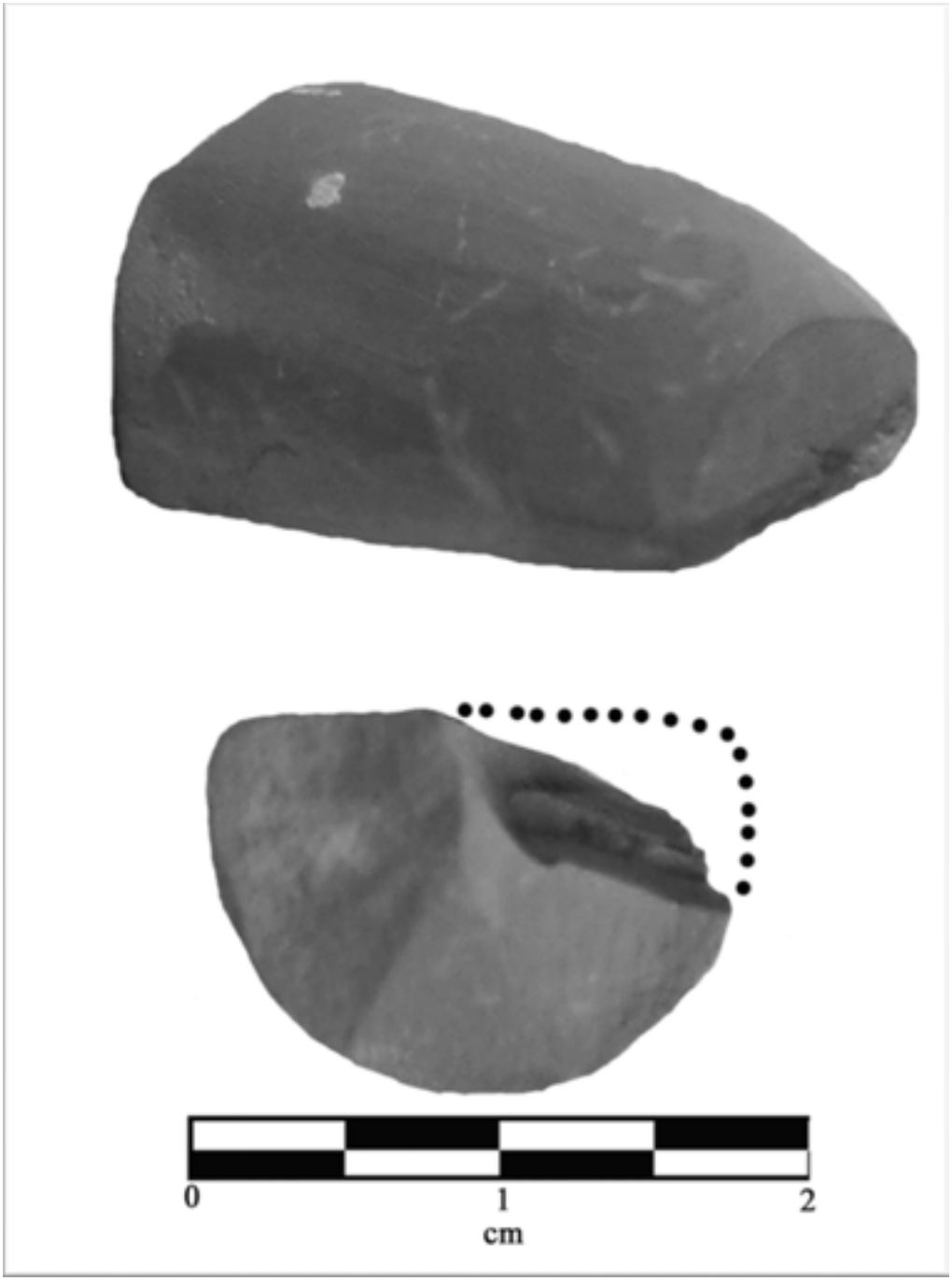


Figure 18. Possible atlatl weight fragment of brown mudstone from AZ B:16:0134. Top shows oblique view with tapered end terminating in abrupt facet. Bottom shows D-shaped cross-section; dots project outline of missing portion.

collected from Feature 3, one from the north half of the feature and one from the south half. A total of 13.9916 g of wood charcoal was recovered from the samples. In addition, a significant amount of *Agave* sp. leaf fragments (0.9487 g), and two *Juniperus* sp. seed fragments were recovered. Only carbonized remains were considered by the analyst to be contemporaneous with cultural Features 1 and 3.

A summary of the flotation results is presented in Table 9. The complete palaeoethnobotanical results from AZ B:16:0134 can be found in report form in Appendix B.

Results

Wood charcoal was present in all seven macrobotanical samples. Overall, 2336 fragments of carbonized wood were identified in the samples, which accounted for 91% of the total carbonized weight. The wood was not identifiable as to species, but the presence of two burned *Juniperus* sp. seed fragments (see below) suggests that juniper wood was a fuel source for at least Feature 1 (see Table 9). No juniper seeds were recovered from Feature 3, but it did have a much higher presence of wood charcoal by count and weight than Feature 1. The two samples from F3 accounted for 76% of the total wood recovered by weight. This may simply reflect better preservation of the fill contents of the F3 samples, which are more recent—by half—than the samples from Feature 1.

Aside from wood charcoal, the most ubiquitous taxon identified at AZ B:16:0134 consisted of fibrous leaf fragments of Agavaceae spp., which was present in all of the samples; total, the seven samples from F1 and 3 yielded 2777 fragments. The genera *Yucca* and *Agave* are both in the family Agavaceae and exhibit similar leaf structures. When yucca and agave leaves become charred, individual species are often impossible to distinguish. Considering the amount and presence percentage of the fibers in the samples, however, it is assumed that the *Agave* sp. plant was intentionally cooked in the features. The hearts and leaves of agave plants are often processed in this manner, while the utilization of yucca as a food source focuses primarily on the seed pods and flowers (Dunmire and Tierney 1995:125; Ebeling 1986:468-475).

Three species of agave grow in the vicinity of the Three Mile Rest House Site: *A. parryi* (Parry's agave), *A. utahensis* Engelm. (Utah agave), and *A. phillipsiana* W.C. Hodgson (Grand Canyon century plant). A search of the Southwest Environmental Information Network online herbarium database (SEINet 2008) revealed that specimens of *A. utahensis* and *A. phillipsiana* had been collected at various locations in the Grand Canyon. Although no herbarium specimens of *A. parryi* were listed as having Grand Canyon origins, examples from elsewhere in Coconino County—growing in environments and elevations consistent with the location of AZ B:16:0134—have been collected (SEINet 2008). Agave plants were identified within 100 m of the site by NPS archaeologist Jim Hasbargen, but not to the species level.

Table 9. Macrobotanical data from Features 1 and 3, AZ B:16:0134.

Taxa	Samples							Total
	FS #67 Feat. 3, N ½ N504.39-504.66 E501.71-502.29 4.5 liters LF #1	FS #68 Feat. 3, S ½ N504.39-504.66 E501.71-502.29 4.5 liters LF #2	FS #69 Feat. 1, Context 1, Unit 1 N505.11-506.37 E500.91-502.16 6.0 liters LF #3	FS #70 Feat. 1 N. wall of Unit D Lower sample N503.95- 504.27 E507.42- 507.75 4.0 liters LF #4	FS #71 Feat. 1, N. wall of Unit D Upper sample N503.95- 504.27 E507.42- 507.75 5.0 liters LF #5	FS #72 Trench 2 E. wall of Unit J Lower sample N506.44- 504.71 E501.74- 502.06 5.0 liters LF #6	FS #73 Trench 2 E. wall of Unit J Upper sample N506.44- 504.71 E501.74- 502.06 4.5 liters LF #7	
Wood (n =) Weight (g)	200 1.2091	1473 9.4225	191 1.0893	77 0.3408	56 0.2257	229 1.1155	110 0.5887	2336 13.9916
Agavaceae spp. leaf frag. (n =) Weight (g)	318 0.1261	2222 0.7554	88 0.0230	4 0.0008	6 0.0022	56 0.0117	83 0.0295	2777 0.9487
Juniperus sp. (n =)			1	1				2
Unidentifiable seeds (n =)		1		2				3
Herbaceous stems (n =) Weight (g)					2 0.0012	1 0.0015	1 0.0094	3 0.0121
Unidentifiable Weight (g)	7 0.0051		10 0.0298			4 0.0014	3 0.3698	24 0.4061

Agave was used extensively by prehistoric peoples, and it is known that in pre-Columbian Mexico the plant was cultivated for a number of purposes. However, researchers now suggest that several species of agave were cultivated, as well, by the Hohokam in southern Arizona (Fish et al. 1992; Sauer 1993:176). Closer to home, Minnis and Plog (1976) suggest a correlation between the presence of *A. parryi* in the western part of the Apache-Sitgreaves National Forest and the locations of archaeological sites.

Interestingly, *Agave phillipsiana* is only known to exist in four locations within the Grand Canyon, all of which occur along terraces near permanent waterways. Three of these locations are in the vicinity of prehistoric agricultural features or habitation sites, suggesting that the Grand Canyon century plant is also associated with the use areas of prehistoric peoples and perhaps represents another agave cultivar north of Mexico (Flora of North America 2008). It is not known if *A. phillipsiana* was used in either of the thermal features at AZ B:16:0134, but a survey of the benchland above the Redwall Formation may reveal the species in proximity. What is obvious is that species of agave were utilized in both features, and thus represents episodes of agave processing in the same location between the latter stages of the Late Archaic and Late Pueblo I-Early Pueblo II.

Two *Juniperus* sp. seed fragments were recovered from two separate samples within Feature 1 (see Table 9). According to McDougall (1973:4-5), seven species exist in northern Arizona. However, only four species of juniper grow in conditions consistent with the environment and elevation of the Three Mile Rest House Site. These species consist of *J. deppeana* Steud. (alligator juniper), *J. monosperma* (Engelm.) Sarg. (one-seed juniper), *J. osteosperma* (Torr.) Little (Utah juniper), and *J. scopulorum* Sarg. (Rocky Mountain juniper). A search of the Arizona State University Vascular Plant Herbarium, University of Arizona Herbarium, Northern Arizona University Herbarium, and Grand Canyon National Park using the Southwest Environmental Information Network online database (SEINet 2008) revealed specimens of *J. scopulorum, J. osteosperma*, and *J. monosperma* collected in the Grand Canyon.

Although juniper berries served as a source of food for prehistoric peoples in the Southwest (Bowers and Wignell 1993:37; Dunmire and Tierney 1995:105-107; Ebeling 1986:114, 463), the low frequency of juniper seeds from the site samples, combined with the abundance of Agavaceae spp. fragments, suggests that juniper berries were not being processed at AZ B:16:0134. Instead, the seeds most likely entered the archaeological record accidentally through a fuel source or during preparation of the roasting pit.

The remainder of the collection consisted of three unidentifiable seed fragments that were recovered from F1 and 3, seven unidentified herbaceous stems from F1, and 24 unidentifiable items from both features. Due to the fragmentary nature of the specimens further identification was not possible.

Chronology

Radiocarbon Dating

Sample selection

One of the objectives of the macrobotanical analysis was to identify high-quality plant remains for Accelerated Mass Spectrometry (AMS) dating. In brief, high-quality materials are those that provide radiocarbon determinations that accurately estimate the true age of past human activity (see Smiley 1985:68-74 and 1994:175-176).

Maize, for example, is a high-quality annual plant of definite cultural origin and one of the best candidates for radiocarbon dating. Not quite as desirable, but valuable nonetheless, are annual cultigens or wild plants from contexts that indicate cultural activity. Less desirable is wood charcoal, which was abundant in F1 and 3, but can return date estimates—due to the "old wood" problem—that are easily 200 years too old. This is less of an issue for Archaic features, where associated culture periods are measured in thousands of years, but more so for Formative Period contexts, where such imprecision can seriously affect site interpretation. As a result, we explicitly excluded the dating of wood charcoal samples from either feature.

The samples from AZ B:16:0134 were chosen by members of the Three Mile data recovery project and paleobotanist Elizabeth Hickey based on their ability to positively identify annual plant remains from selected proveniences within Features 1 and 3. Each of the radiocarbon samples was selected from three separate soil samples that were floated to obtain archaeobotanical data. Two samples were collected from Feature 1, consisting of an *Agave* sp. fragment from the upper fill of Unit J, and a *Juniperus* sp. seed fragment from the lower fill of Unit D. One sample was collected from the south half of the fill of Feature 3, also a fragment of agave. The resulting dates should have a clear temporal relationship with the cooking or heating episodes in F1 and 3, as the agave is presumed to have been processed for food, and the juniper seed was probably introduced along with the fuel source. Two samples were analyzed from Feature 1 to determine if the pit was used during a limited period of time, or repeatedly over an extended period of time. Feature 3 was sampled to determine its age and relationship to F1; in the field, it appeared that F3 was either earlier than F1, or was associated with a cooking event *within* Feature 1.

Results

Radiocarbon dating results are presented in Table 10. Because all of the samples consisted of minute fragments, all assays were done by AMS. The two samples from Feature 1 returned assays of 3160 ± 40 B.P. and 2590 ± 40 B.P. Table 10 also gives the calibrated results in calendar years, with a 2 Sigma (95% probability) calibrated result of 1500 to 1380 B.C. for the sample within Unit J, and a 2 Sigma calibrated result of 810 to 760 B.C. and 680 to 670 B.C. for the Unit D sample (the latter having two intercepts of radiocarbon age with the calibration curve; see Appendix C for complete calibration

results of all samples). The dates range from the end of the Late Archaic to, possibly, the earliest stage of Basketmaker II—depending on the onset of early agriculture in the Canyon area. The beginning of the Early Agricultural Period is contingent on the dating of domesticates, which is as early as 1000-1500 B.C. on the southern Colorado Plateau (e.g., Gilpin 1994; Smiley 1994), but may be no older than the start of the Christian era north of the Colorado and San Juan rivers (Geib 1996). It is probably safe to say that F1 was used at least twice during a 500- to 800-year interval that we can call the "Archaic-Formative Transition."

Sample No. (Beta -)	Feat.	FS No.	Material Dated	^{14}C Age (B.P.)	Calibrated 1 Sigma Range	Calibrated 2 Sigma Range
249006	F3	FS68	agave	1030±40	A.D. 980-1030	A.D. 900-920 and A.D. 960-1040
249007	F1	FS70	juniper nut shell	2590±40	800-780 B.C.	810-760 B.C. and 680-670 B.C.
249008	F1	FS73	agave	3160±40	1460-1410 B.C.	1500-1380 B.C.

Table 10. Radiocarbon determinations for Features 1 and 3, site AZ B:16:0134.

The sample from Feature 3 returned a conventional radiocarbon age of 1030 ± 40 B.P., with a 2 Sigma calibrated result of A.D. 900 to 920 and A.D. 960 to 1040. The age range indicates that Feature 3 was used during the Late Pueblo I or Early Pueblo II periods. In the Kayenta area, Pueblo I occurs between A.D. 800 and 1000, and Pueblo II between A.D. 1000 and 1150. These periods may differ somewhat in the Grand Canyon, but in a general sense Feature 3 was likely utilized during years leading up to—and possibly including—the PI-PII transition. This result ran contrary to one of our initial hypotheses about Feature 3—that it was a discrete, basin-type hearth and that it pre-dated the use of F1. However, it does support the idea that F3 was simply a late event in the use-life of the F1 roasting pit. In fact, it demonstrates that the pit continued to be used well into the Formative. Given the preponderance of agave material in both features, it also indicates that the function of the roasting pit did not appreciably change in almost 2500 years of use.

Summary

Site AZ B:16:0134, also known as the Three Mile Rest House Site, is situated along the Bright Angel Trail below the South Rim of the Grand Canyon. It is approximately 50 m northeast of the Three Mile Rest House, a popular stop for hikers along the trail. The trail follows a known Native American route into the Canyon that accesses the well-watered oasis of Indian Garden below the Redwall Formation. Data recovery focused on the prehistoric component at AZ B:16:0134, which primarily consisted of a large roasting

pit, designated Feature 1. Portions of the feature had been used as a borrow pit for trail and construction and maintenance in the past.

Results from data recovery showed that F1 had been used to roast species of agave during the Late Archaic and again during the transition between the Late Archaic and the Early Agricultural Period. Lithic analysis corroborated these results, with identification of a dart point fragment and a probable atlatl weight fragment from the F1 artifact assemblage. While excavating the roasting pit, a smaller thermal feature, designated Feature 3, was located within the confines of F1. This feature dated to Late Pueblo I-Early Pueblo II, and also contained large quantities of agave material. It now appears that F3 represents a late event in the use of the F1 roaster. The results of data recovery demonstrate nearly 2500 years of use and re-use of a single roasting pit for the purposes of cooking agave plants within the Grand Canyon.

CHAPTER 7
Discussion and Conclusion

The data recovery efforts at the Hermit Road Site (AZ B:16:1125) and the Three Mile Rest House Site (AZ B:16:0134) were guided by research questions included in the treatment plans for both sites (Weaver and Horn 2005; Weaver 2006). The results can also be viewed in the context of several research domains and questions posited in Fairley (2003:103-133) and Neff (2004:46-59).

The specific research issues suggested for AZ B:16:1125 consisted of: 1) formal properties, chronology, and activity organization; 2) subsistence; and 3) social and political organization. The specific research domains formulated for AZ B:16:0134 consisted of: 1) formal properties, chronology, and activity organization; 2) subsistence; 3) exchange, craft production and interaction; and 4) social and political organization. The treatment plan for AZ B:16:0134 also included "methodological questions" concerning primarily the relationship between surface and subsurface remains and the ability to accurately gauge the nature of sites from surface attributes.

This chapter is divided into three sections. The first section addresses the specific research questions that were listed in Weaver and Horn (2005:7-8) and Weaver (2006:3). The second section elaborates on the research issues that can be *best* addressed with the data obtained from sites AZ B:16:1125 and AZ B:16:0134; these consist of: chronology, settlement and subsistence (i.e., socioeconomic structure), and cultural affiliation/identity. The order of discussion equates, generally, to how well we can interpret the information. From the Three Mile Rest House Site we have robust data on the temporal range of the site and the function of the main feature. At the Hermit Road Site the primary component is not well dated, but there are indications that the sites area encompasses three different time periods. The function of site AZ B:16:1125, however, can only be indirectly derived from lithic analysis. The issue of the cultural affiliation of both sites is complex as, like many sites in and around the Grand Canyon, there is evidence of multiple occupations and use. Cultural identity is mostly an archaeological construct, but it is critical to identify—even during survey—patterns on the ground that could indicate use by different peoples at different times. The chapter concludes with a summary of important findings from the excavations at the Hermit Road and Three Mile Rest House Sites.

Research Questions: AZ B:16:1125

Formal Properties, Chronology and Activity Organization

Is the site related to the Pai or earlier Cerbat culture—or perhaps to the even earlier Archaic Period? Are ceramics present in subsurface contexts? Since no ceramics have been found on the surface of the site, what other data are present that can enable us to place the site in a specific prehistoric or protohistoric context?

It is not known whether the site is related to the Pai or Cerbat cultures. Although a Desert Side-Notched projectile point of Presley Wash obsidian was found on the surface of AZ B:16:1125 during earlier investigations, this point could not be relocated during data recovery. The only diagnostic artifact observed during excavation was an Elko-like projectile point found atop bedrock. The point was situated beneath a mostly surface scatter of lithics, which is presumed to be the primary component at the site. The lithic assemblage is similar to a form of reduction technology typically found on Formative-era sites. No ceramics were found during excavation, and no features were discovered that would be appropriate for radiocarbon sampling. Based on the two projectile points and the nature of the surface artifact scatter, we are proposing a maximum of three temporal components at AZ B:16:1125: a possible Archaic/Basketmaker component, based on the dart-sized point fragment; a possible Formative component based on the nature of the flaked stone assemblage; and a possible post-Formative (protohistoric/historic) component based on the presence of a DSN point. We believe that the Formative component may have been the primary occupation of the site.

Will testing uncover any features at the site? Do the combination of features, artifacts, and ethnographic research enable us to determine the overall site function?

No cultural features, such as hearths, roasting pits, or structures, were found during excavation of the site. Soil depth is minimal and has virtually no potential for intact subsurface remains, other than artifacts. Most artifacts were found in the top 2-3 cm of sediment. Site function was inferred entirely from the artifact assemblage. For the possible Formative occupation, the lack of evidence for ceramic vessels and grinding tools, and the types of tools and flakes present, suggest a temporary camp oriented toward hunting or processing of unknown foodstuffs or materials by means of cutting, chopping, and scraping. The projectile points suggest intermittent use of the rim for hunting activities, possibly by unrelated cultures during the pre- and post-Formative.

What is the overall range of site use or occupation, as represented by the sum of all artifacts discovered? Was this use or occupation intermittent or continuous?

The area encompassed by the site boundary may have seen intermittent use between the Archaic and the beginning of the Historic Period. Elko series projectile points are the most common dart point found on the Colorado Plateau, but are also the least temporally sensitive; they span a range of use between 6000 B.C. and 1000 B.C. (Holmer 1978, 1986), although, in some reports, they are sometimes considered to be an Archaic diagnostic. Desert Side-Notched points are good post-Formative indicators, occurring anywhere between A.D. 1300 and about A.D. 1900. We suspect that the primary occupation of AZ B:16:1125, however, occurred sometime between Pueblo II and III, or roughly A.D. 1000 and 1200. Therefore, the use of the AZ B:16:1125 site area was probably discontinuous during three separate time intervals.

Subsistence

What does available subsistence evidence suggest about the seasons of occupation or use of the site? What temporal trends, if any, are apparent in subsistence activities at the site?

No subsistence data was available from botanical or animal remains at AZ B:16:1125, and little information on seasonality was forthcoming from the lithic analysis. It is likely that, because the possible Formative component was related to short-term processing, the residents were on a logistical foray an unknown distance from their permanent habitation. If so, it suggests a warm weather or "shoulder season" encampment; the lack of hearths might support this interpretation. The reliance on a core reduction technology of local raw material suggests a more settled regime operating within a prescribed subsistence zone. This contrasts with earlier, pre-Formative cultures that favored curation and maintenance of high-input bifaces, but there is some indication that the reduction technologies of the Grand Canyon Cohonina and Anasazi differed as well; this topic is discussed in more detail later in this chapter.

Social and Political Organization

How does site AZ B:16:1125 compare with similar Cerbat or Pai sites excavated at Grand Canyon and the surrounding area when examining social activities? Does this site appear to be contemporary with other sites recorded within the Grand Canyon Village area or even along the river corridor?

We cannot establish an absolute affiliation with the Cerbat or Pai, but the DSN point may have belonged to members of these cultures. Other protohistoric/historic peoples, such as the Hopi and Navajo, also utilized the South Rim of the Grand Canyon. The primary component, which appears to be Formative, is roughly contemporary with other sites on the rim that date from Late Pueblo I to Early Pueblo III. Cohonina sites in the area tend to date between Late Pueblo I and Early-mid Pueblo II, while Anasazi sites tend to post-date this interval.

It is not known where on the Puebloan timeline site AZ B:16:1125 falls and, in the absence of ceramics, whether the site is Cohonina or Ancestral Puebloan (Anasazi). The lithic assemblage looks very similar to non-diagnostic prospect sites, such as AZ B:16:1198 at Hermit's Rest (Brennan and Robertson 2008), and possible Cohonina components at AZ B:16:104B and AZ B:16:355 at Pinyon Park (Schroeder 1998). For sites excavated during the CVIP data recovery, a mix of core and biface reduction technologies were used at Formative sites, not unlike at AZ B:16:1125 (Moffitt and Moffitt 2004). Indeed, even between Archaic and Formative sites differences in reduction technology were not as apparent as differences in material selection, with the former having more exotic raw materials present (2004:174). The lithic assemblage at the Hermit Road Site does look very similar to the Pueblo II-III habitations that MNA/GRCA have dug along the Colorado River, but we have already alluded to the

possibility that the Cohonina and Anasazi utilized the Grand Canyon interior in different ways.

Clearly, we need a better understanding of the characteristics of flaked stone lithics at Cohonina and Anasazi specialized activity and habitation sites, both inside and outside of the Grand Canyon.

Research Questions: AZ B:16:0134

Formal Properties, Chronology and Activity Organization

Based on its location along the Bright Angel Corridor and our knowledge of cultural use of the trail, is the site related to the Pai or earlier Cerbat culture—or perhaps to the even earlier Archaic period? Are ceramics present in subsurface contexts? What other data is present that can enable us to place the site in a specific prehistoric or protohistoric context?

No ceramics were found on or within the prehistoric features at AZ B:16:0134. No whole, diagnostic projectile points were collected, but a fragmentary, dart-sized point was recovered from feature fill that is likely Archaic/Basketmaker. In addition, a fragment of a possible atlatl weight was also found. If it is a true atlatl weight, it pre-dates bow-and-arrow technology, which enters the southern Colorado Plateau after the 5th Century. The best information we have concerning the chronology of the Three Mile Rest House Site derives from radiocarbon dating. Two samples were dated from Feature 1, the roasting pit, and one sample was dated from F3, what initially appeared to be a small, thermal feature within F1. The samples from the roasting pit returned two dates—one from the Late Archaic and one from the Late Archaic-Early Agricultural transition (see below for conventional and calibrated date ranges). The sample from F1 returned a date from the Pueblo I-Early Pueblo II period. It now appears that F3 was actually a late instance in the use of the roasting pit. Later in this chapter we suggest that the PI date may be affiliated with Cohonina use of the roaster.

Are there additional sub-surface structures or features that have not been previously noted? If so, what is the form and function of these features? How are they related to the features visible at the surface of the site?

During data recovery an additional thermal feature, designated Feature 3, was discovered within the interior of Feature 1. At the time of excavation F3 appeared to be an earlier feature—perhaps a hearth used before the construction of the roasting pit. However, F3 dated later than F1 (see above) and we now believe that it was simply a late use of the same roasting pit area. Because F3 was located closer to the center of the pit, it probably represents a slightly deeper part of the overall roasting pit, likely where foodstuffs were placed and cooked. Interestingly, both Features 1 and 3 contained burned agave parts. In fact, analyzed flotation samples from F3 had a greater quantity of agave than any of the samples from Feature 1.

What is the overall range of site use or occupation, as represented by the sum of all features and artifacts discovered? Was this use or occupation intermittent, or continuous?

Radiocarbon dating indicates that the roasting pit (which includes both Features 1 and 3) was in use beginning in the Late Archaic and continuing through the Pueblo I-II period. To our knowledge it was not used any later than Early Pueblo II, but because almost half of the roasting pit had been previously removed as borrow pit material, evidence of later episodes of use may be missing. The calibrated 2-sigma age range of the F1 dates do not overlap, and the PI-II date from F1 is considerably later. Therefore, there is no evidence that the roasting pit was used continuously over this period of time. On the contrary, the data suggests that roasting activities at AZ B:16:0134 occurred *discontinuously* over the course of 2500 years.

Subsistence

What does available subsistence evidence suggest about the seasons of occupation or use of this site? What does this evidence suggest about the relative importance of agricultural activities versus gathering and hunting? How does this evidence relate to current debates about the nature of Cohonina subsistence?

The roasting pit at AZ B:16:0134 was initially used during the closing millennia of the Archaic and, perhaps, at the conception of early agriculture on the Colorado Plateau. The later Archaic date from Feature 1, which likely falls between 810 and 680 B.C., is at the cusp of early farming on the plateau, but, thus far, there is no firm evidence for the practice of agriculture in the Grand Canyon by this time period. The early use of the roasting pit at AZ B:16:0134 fits with our current model of Archaic subsistence, which was based on the exploitation of wild resources. The Cohonina, however, may have also practiced a less sedentary form of settlement and subsistence that favored hunting, gathering, and horticulture rather than farming (Samples 1992). Collecting and roasting of agave also fits this kind of procurement strategy, although it could just as easily be a component of a strategy focused on agriculture (early overviews by McGregor [1951, 1967] did suggest that the Cohonina practiced farming).

What temporal trends, if any, are apparent in subsistence activities at the site?

Results of macrobotanical analysis showed that the roasting pit was used for cooking agave during both the Late Archaic and early Formative times. This was an unexpected outcome of the data recovery findings, since agave plant parts have not been recovered as a dominant taxon in most Grand Canyon roasting features. It suggests that the roasting pit at the Three Mile Rest House Site may have been uniquely positioned to take advantage of this local resource. It also poses a tantalizing question: is this shared procurement strategy evidence that the Cohonina derived from an Archaic population base (see Jennings 1971; Schwartz 1979)? The question cannot be answered on the basis of a single site, and in the absence of ceramics, we cannot be certain that the PI-II date reflects Cohonina usage of the pit.

The roasting pit was originally identified as a "mescal" pit, which is more commonly referred to today as an "agave" pit. What do the plant remains at this site tell us about its use?

Paleobotanical remains were examined from the light fraction of several flotation samples collected from Features 1 and 3. Aside from wood charcoal, the most common taxon observed was that of Agavaceae spp., which was found in all of the samples. This suggests that, not only was the roasting pit used for roasting agave, it was utilized for the same purpose by different culture groups—in this case, both Archaic and Formative peoples. The results of the excavation demonstrate that roasting pits can be re-used over the span of centuries, which has important implications for how one samples and dates target events (see Geib 2008:356). Curiously, there has been little direct evidence of prehistoric pits being used to roast agave in the Grand Canyon; thus, site AZ B:16:0134 may reflect one of the oldest dated incidences of agave roasting in the Park.

Exchange, Craft Production, and Interaction

What non-local items were recovered during data recovery? What mechanisms are suggested for how these objects and materials arrived at the site? Can a picture of regional exchange or economic ties be created based on the site's contents?

There was little evidence for non-local items being brought to site AZ B:16:0134. One obsidian flake clearly derives from a source outside of the Park, possibly the San Francisco volcanic fields to the south (Lesko 1989). It is interesting that no pattern emerged in the lithic analysis that would indicate contrasting lithic reduction strategies, as you might expect from use by both peoples of the Archaic and Puebloan eras. Likewise, the lithic raw material from the site was very much local; if there was an expectation that Archaic peoples, for example, might import exotic stone from the limits of their foraging round, there was no evidence for it at AZ B:16:0134. A major analytical problem is that the flaked stone assemblage is probably a mix of use episodes over time. There was no way to partition most artifacts to any particular time period or relative stratigraphic ordering, therefore, with the exception of a dart point fragment and portion of an atlatl weight, little can be said about the cultural association of the lithic assemblage or regional interaction at large. An exception might be the small collection of thinning flakes found in Feature 3, which are discussed below.

Is there any evidence of on-site production of ceramics, lithic artifacts, ornaments, or other crafts at the site?

The artifact assemblage only indicated that core and bifacial reduction was occurring at the site, and perhaps finished flaked stone tools were being manufactured and maintained. The level of manufacture was casual and expedient and not part of an organized craft-making industry.

Social and Political Organization

How does the site compare with similar Cohonina sites from adjacent cultural provinces?

No ceramics were recovered from the prehistoric component of AZ B:16:0134, but the radiocarbon date from Feature 3 (which is interpreted as late use of the roasting pit) was roughly Late Pueblo I or Early Pueblo II. Grand Canyon sites from this time period are generally described as Cohonina when they have ceramics weighted toward San Francisco Mountain Gray Ware; such sites are usually dated by diagnostic types from intrusive wares—primarily Tusayan White Ware. At this time we assume that the last use of the roasting pit at AZ B:16:0134 was by Cohonina peoples. A query of the GRCA database showed numerous examples of sites that dated to Early PII and a few Formative sites that may be earlier. By far the most common diagnostic type at these sites was Black Mesa Black-on-white, a Tusayan White Ware. The date range for this type (about A.D. 950-1100) overlaps with one of the calibrated radiocarbon determinations for F3, which was A.D. 960-1040. The vast majority of the possible Cohonina sites are on the South Rim rather than the Canyon interior. Many are artifact scatters, but a few have features such as single rooms, thermal features, and rock alignments.

Chronology

The temporal affiliations of sites AZ B:16:1125 and AZ B:16:0134 are based on three direct and indirect lines of evidence: radiocarbon dating, characteristics of lithic reduction, and diagnostic stone tools. At the Hermit Road Site there were no opportunities to radiocarbon date fill from features, of which none were found; thus, dating is dependent on diagnostic artifacts and attributes of the flaked stone assemblage. At the Three Mile Rest House Site there were two stone tools that, while not positively diagnostic, were suggestive of Archaic use. Lithic analysis of debitage from the two features (F1 and F3) also suggested a difference in reduction technologies. Most importantly, both features yielded ideal samples for ^{14}C dating, with two dates obtained from Feature 1 and one date from Feature 3.

Site AZ B:16:1125 is a case study in the difficulties in identifying the cultural and temporal affiliations of artifact scatters that are essentially surface phenomena. The site is situated atop Kaibab Limestone bedrock within meters of the South Rim of the Canyon. Soil depth at the site averaged less than 10 centimeters of undeveloped sediment, with most artifacts found in the upper 2-3 centimeters; in some cases, artifacts were lying directly on top of bedrock.

The primary component at the Hermit Road Site is believed to be the layer of artifacts at or near surface level, consisting mostly of flaked stone debris (ceramics were not observed). No diagnostic artifacts associated with this component were recovered by the MNA crew. The stone reduction technology is dominated by flakes removed by direct freehand percussion and expedient stone tools, such as cores and scrapers, although bifaces were also seen. The characteristics of the assemblage are typical of reduction

strategies employed by Formative-era cultures. The site appears to be a temporary camp oriented to hunting or processing of foodstuffs or materials.

At this time we have tentatively identified three temporal components for the Hermit Road Site. The earliest component is associated with an Elko-like projectile point found on top of bedrock below the primary concentration of artifacts. While the point might be pre-Formative, Elko Series points can range well into the Puebloan era. Nevertheless, its location relative to the surface artifacts scatter suggests that it is earlier than the primary component. The point was probably lost when the bedrock in this part of the site was exposed to the surface. As such, it is essentially an isolated tool since no associated remains were found at this level.

We believe that the second and primary component at AZ B:16:1125 is Formative, but there are a few caveats to this attribution.

First, the Formative can include the transition from Basketmaker III to Pueblo I all the way to the end of the Puebloan occupation of the Grand Canyon—perhaps as late as A.D. 1220+. This 500-year interval is not only broad, it encompasses use by at least two archaeological cultures: first the Cohonina, and later, the Anasazi. This issue will be considered further under "Cultural Identity," which follows. For sites that we have examined along the Colorado River, lithic assemblages associated with the Cohonina appear to be dominated by thinning and pressure flakes (Neff et al. in progress). Pueblo II-III occupations associated with the Anasazi tend to reflect DFP reduction, and this pattern continues up to the Puebloan abandonment. The point here is that two so-called Formative-era cultures can have two completely different patterns in material remains.

In the case of AZ B:16:1125, the lithic assemblage better reflects the expedient core reduction we associate with Anasazi sites inside the Canyon. At this time, it appears that the Cohonina may have been using the inner Canyon in a logistical fashion, leaving behind debitage from the curation and maintenance of bifaces. The Anasazi—presumably more tethered to the Canyon interior—mimicked the core reduction technology that their Kayenta brethren favored to the east. Whether this pattern will hold up for sites on the South Rim we cannot say. Here, the Cohonina were possibly closer to their permanent habitations, and it may be that both cultures used the same form of core reduction and expedient tool-making technologies "above the rim."

Second, the artifact assemblage could yet be earlier or later than the Formative. For example, a Desert Side-Notched projectile point was previously recovered by the NPS within the site area—usually an indicator of post-Formative or, at the earliest, Late Prehistoric use (Slaughter et al. 1992). However, the artifacts that might be associated with the point seem less typical of post-Formative use. On plateaus to the north, hunting sites associated with the Southern Paiute tend to be much smaller than those of earlier cultures, with sparse, discrete remains resulting from simple core reduction to detach useable flakes to make working unifaces (Geib et al. 2001). Even the Paiute arrow points were usually made from small tertiary flakes that were shaped and notched by pressure

flaking; evidence of a biface reduction technology, as might be expected, was almost entirely lacking.

Alternatively, the primary component of AZ B:16:1125 might pre-date the Formative. The dart point found atop bedrock at AZ B:16:1125 appeared to be in an earlier context, but it is possible that the shallow soil profile might lend itself to re-working of artifacts. As to the assemblage as a whole, Archaic sites often reflect an emphasis on bifacial tools, but this is not always the case. Depending on site function, pre-Formative lithic assemblages can include a mix of bifacially thinned tools and tools from core reduction, such as unifacial and unidirectional scrapers and choppers. Nevertheless, the stone reduction technology at AZ B:16:1125 is dominated by expedient core flakes; with no pre-Formative diagnostics found in the surface artifact assemblage, it is simpler and more parsimonious to consider the primary component as Formative.

The third possible component at AZ B:16:1125 is based on the find of the DSN point, just mentioned. The point, made of Presley Wash obsidian, was originally found by NPS personnel but could not be relocated by the MNA crew. It was adjacent to the Rim Trail and may well have been collected by passersby. Tri-notched points of this type begin to be used during the Late Prehistoric (ca. A.D. 1300 or later)—an interval not represented archaeologically at the Grand Canyon. It is more common during the Protohistoric and Early Historic periods, and, in this region, can indicate use by Pai, Paiute, Navajo or other historic tribes. We suggest that the point is an isolate that happens to be within the main site area. Thus, when we speak of three components, only the second and primary component is likely the result of short-term habitation.

At the Three Mile Rest House Site (AZ B:16:0134) we have direct radiocarbon dating of carbonized annuals from two prehistoric features, as well as ancillary evidence for temporal affiliation from the lithic assemblage. The two samples from Feature 1, a roasting pit, returned assays of 3160 ± 40 B.P. and 2590 ± 40 B.P., which date to the Late Archaic and the Late Archaic-Early Agricultural transition, respectively. The samples were collected from two different test units within the ejecta ring of the donut-shaped pit. One sample was dated from Feature 3, a small, basin-shaped thermal feature at the bottom of F1. The sample returned a conventional radiocarbon age of 1030 ± 40 B.P., roughly at the Late PI-Early PII transition. It appears that F3 actually represents a late use of F1, and probably represents a central pit excavated partly into sterile to contain foodstuffs being cooked.

Stone tools and debitage from the lithic assemblage provide some support for the radiocarbon dates. Within Feature 1 were found a dart-size projectile point fragment and a possible piece of an atlatl weight. Atlatl use pre-dates bow and arrow technology, which does not become widespread on the southern Colorado Plateau until after A.D. 500, although there are indications that it may date as early as Basketmaker II in some areas (Geib 1996:64-66). As for Feature 3, no ceramics were found in association, although one might expect a suite of wares and types that would include San Francisco Mountain Gray Ware, San Juan Red Ware, and early Tusayan White Ware-Kayenta series types such as Kana-a Black-on-white.

Instead, the fill of F3 contained a number of small thinning and pressure flakes. While these would not look out of place in an Archaic setting, similar lithic assemblages are now being found in buried PI-PII contexts along the Colorado River (see Chapter 6). Such flakes are found with ceramics dominated by S.F. Mt. Gray Wares, namely Deadmans Gray. Cohonina ceramics are commonly observed on early Puebloan sites in the Grand Canyon (Fairley 2003:92-93) but, until recently, little attention was paid to associated lithic attributes. The difference between the reduction technologies of the PI-II Cohonina and the later PII-III Anasazi may reflect contrasting settlement-subsistence strategies in and around the Canyon. The first and second authors of this report are also leading investigations for the MNA/GRCA Colorado River Corridor Archaeological Project , and will be examining this issue in greater detail as fieldwork for that project continues.

In summary, excavation and dating of Features 1 and 3 indicate that the two features are probably part and parcel of the same roasting locus that was used off and on between the Late Archaic and the end of Pueblo I-beginning of Pueblo II. If there is a common denominator between AZ B:16:1125 and 0134, it is that both saw re-use by different cultures over hundreds if not thousands of years. This topic will be discussed in more detail in the "Cultural Identity" section that follows.

Settlement and Subsistence

The earliest ^{14}C date from Feature 1 at AZ B:16:0134 suggests that the initial use of the roasting pit was during the Late Archaic, a time period in the Grand Canyon that corresponds with the ritual use of split-twig figurines. In fact, it is possible that the party that first constructed and used Feature 1 had knowledge of the figurine caches located within two nearby caves (AZ B:16:0084 and AZ B:16:0298), or at least were familiar with the shelters. All three sites are situated atop or within the Redwall Limestone Formation. They may have also left pictographs within the shelter of AZ B:16:0064 at the head of the Bright Angel route. Of course, the age of figurine use in the Canyon, which ranges from ca. 4200 to 3000 B.P., far exceeds the life span of any one generation, but the current array of dates from twig figurines (see Coulam and Schroedl 2004 and Horn 2001) suggests that the individuals using the roasting pit at the Three Mile Rest House Site may well have participated in the ritualized act of fashioning and depositing figurines in sheltered, non-habitation contexts.

The early date from Feature 1 at AZ B:16:0134 is further evidence that Late Archaic peoples did not simply use the Grand Canyon for ritual visits, but inhabited the Canyon and made use of its diverse resources. In addition to figurine caches, we now have evidence for possible Late Archaic rock art in the eastern (Clark 1991) and western (Schaafsma 1990) reaches of the Canyon, numerous camps along the rims and adjoining plateaus (Schroedl 1988) with Late Archaic diagnostics, and thermal features at river level that have returned radiocarbon dates from this period (O'Conner et al. 1994; Hereford et al. 2000). In fact, recent work by the MNA/GRCA Colorado River Corridor Archaeological Project at one of the same river corridor sites in Marble Canyon (AZ

C:2:0096) has revealed numerous thermal and pit-like features in buried, semi-sheltered strata that appear to date between the Late Archaic and Early Agricultural periods, although independent dating of the features is still underway.

While the number of dated pre-Formative features in the Grand Canyon is growing, relatively little paleobotanical data has been forthcoming. Corn pollen was found between dated strata at Comanche Creek (Davis et al. 2000), suggesting that maize was being grown in the Grand Canyon prior to 1000 B.C., but Fairley (2003:84-85) argues against the uncritical acceptance of the claim. The corn pollen also derived from alluvium, not feature fill.

The direct dating of a carbonized *Agave* sp. fragment from Feature 1 at site AZ B:16:0134 to 3160±40 B.P. is some of the best evidence we have for Late Archaic plant use in the Grand Canyon. It also possible—but cannot be demonstrated at this time—that the agave was a cultivar, as was the case in southern and central Arizona. A second date (2590±40 B.P.) was obtained from a charred juniper nut shell within F1, which suggests use during the Late Archaic-Basketmaker II transition. The shell fragment was likely introduced from fuel wood, and does not indicate agave processing during this time period. However, leaf fragments of Agavaceae spp. were found in all six macrobotanical samples from F1, and were the only non-wood taxon identified. The samples were collected from separate spatial and vertical proveniences within F1, and are assumed to represent the archaeobotanical remains of the roasting pit.

Roasting pits are commonly referred to as "agave" or "mescal" roasting pits in the archaeological literature (e.g., Greer 1965). But roasting pits are versatile tools (Gasser 1982). Projects in the region have recovered large quantities of animal bone from pits (Ellis et al. 1982 and Moffit et al. 1978 on the Arizona Strip), and a Northern Arizona University excavation on the Hualapai reservation suggested that these features were used to heat-treat chert. In Tuckup Canyon, within the Park, Huffman (1993:137-138) reported that 85 to 90% of the identified taxa from a series of roasting pits consisted of cactus epidermis fragments comparable to *Opuntia* pads and fruits. More recently, Hubbard et al. (2001:86) conducted testing and data recovery at a midden and two roasting features at Indian Canyon (AZ G:3:0004), stating that there was "no evidence…to indicate that agave was processed at Indian Canyon." Instead, the features "were most likely used to roast a variety of local wild plants, cultigens, and animals."

The results from AZ G:3:0004 were surprising, as Robert C. Euler had collected charcoal from the site in 1972 that reportedly contained charred agave. Overall, however, there has been little evidence for agave use in any excavated features within the Grand Canyon. Aside from agave found in a midden excavated by Jones at AZ A:16:0001, other roasting and thermal features have yielded mostly burned bone (Jones 1986; Glass and Glass 1990), wood, and wild and cultivated plants other than agave (Jones 1986; Yeatts 1998; Huffman 1993). Most of the features from these projects also dated later than the Late Archaic/Early BMII.

Agave processing at the Three Mile Rest House Site apparently continued into Late Pueblo I-Early Pueblo II. Feature 3 returned a direct date of 1030±40 B.P on a fragment of agave. Based on its position relative to F1, we now believe that F3 was actually the last known use of the roasting pit. Perhaps because it was more recent, the Feature 3 sample (4.5 l) had far more wood (n=1473; 9.4 g) and agave (n=2222; 0.75 g) than any other sample (which all ranged between 4.5 and 6.0 liters).

The use of the roasting pit at AZ B:16:0134 during three possible time periods over approximately 2500 years is probably due to the attractiveness of the location and available resources of the site. As previously discussed, the site is situated near the Bright Angel Trail along a known prehistoric route. It is also located in an ecotone between the lower limits of the Great Basin Conifer Woodland and the upper limits of Great Basin Desertscrub; the former contributes the large amounts of fuel wood needed for slow cooking of foodstuffs, while the latter provides the food itself—in this case, agave. What was additionally needed was a method to retain heat within the roasting pit. By locating the pit just above the Redwall Formation, a source of limestone was readily available. The thermal properties of limestone are such that, when heated, it retains heat for a longer period than other rock types, such as granite, shale or sandstone. The top of the formation also forms a narrow benchland, which would have made travel—in search of agave—that much easier.

If the roasting pit was used during the PI and PII transition, it was during a time when the Canyon was being used by early Puebloan groups in a less intensive fashion than later occupants. Fairley (2003:92) cautions that the level of intensity is not truly known due to the lack of data recovery within components that may date to this period, but recent work by the MNA/GRCA Colorado River Corridor Archaeological Project is continuing to show a modest occupancy compared to the Late PII-Early PIII occupation. Subsurface investigations have yet to reveal architecture or site complexity anywhere near that of the later Puebloans. Indeed, preliminary artifact analyses suggests that much of the PI and early PII use was logistical in nature. Pithouses are known, but thus far they appear to be single-family habitations, perhaps seasonally occupied. Currently the most explicit model of early Puebloan use is by Sullivan (1986), but it is strongly weighted toward exploitation of the South Rim, specifically the Upper Basin.

Since the main occupation at site AZ B:16:1125 may date to any point along the Formative time line, it is almost impossible to describe its role in any particular settlement system or subsistence strategy. There is a suggestion, based on attributes of the lithic assemblage, that it may date to the late Formative. If so, it was a temporary camp associated with hunters or foragers who were ranging from a more sedentary base. No features were observed, and the tool assemblage does not indicate an emphasis on grinding. Tools were used to cut and scrape, and stone reduction was oriented toward making these kinds of implements. The isolated projectile points from the other two possible components were also probably lost or discarded during hunting excursions along the rim.

Cultural Identity

The cultural affiliation of sites AZ B:16:1125 and AZ B:16:0134 is not a simple matter of who made what. Even the archaeological remains of historic Native Americans can be almost impossible to attribute to specific peoples, since many material remains and site patterns cross-cut tribal affiliations. At the Grand Canyon—and this is true throughout the Southwest—*prehistoric* cultural affiliations are generally based on archaeological constructs, and there is a never-ending debate on whether those constructs equate to emic notions of identity (the old "pots equals people" argument).

To complicate matters further, sites in the Grand Canyon are often multi-component. A review of survey and excavation literature shows a continuing pattern of use and re-use in favored site locales, such as river deltas, canyon rims, and shelters (e.g., Schwartz et al. 1979, 1980; Jones 1986; Fairley et al. 1994, and current excavations at Furnace Flats, Palisades, Crash Canyon and elsewhere as part of the MNA/GRCA Colorado River Corridor Archaeological Project. We would argue that specific loci within the Grand Canyon lend themselves to constant re-use over time; people naturally congregated around and along rims, trails, springs, ridge tops, pinnacles, caves, shelters and travel corridors, and did so throughout the human history of the Canyon. This is true throughout Southwest, but it is ironic that the "biggest hole on Earth" restricts and delimits even more acutely where one can and cannot work, travel, and play.

The Hermit Road Site, for example, is one of many surface artifact scatters recorded near the South Rim that have a mix of diagnostic artifacts from widely-divergent time periods. A trio of examples from the area of the Dripping Springs Trail/Eremita Mesa include: site AZ B:16:1021, which has Parowan, Northern and Desert Side-Notched projectile points, as well as ceramics; nearby site AZ B:16:1023 with Pinto, Rose Spring and Cottonwood triangular points, plus ceramics; and AZ B:16:1024, which has Basketmaker II-style points, a Rocker Side-notched, and ceramics from several archaeological cultures; other examples from the upper Hermit Basin and elsewhere are plentiful (see Anderson and Brennan 2006 for descriptions of multi-component sites recorded during the Hermit Road Cultural Resource Inventory, although most of these were combinations of prehistoric and historic occupations).

Perhaps even more common is to have post-Formative artifacts on Puebloan sites. When originally recorded site AZ B:16:1125 appeared to be Cerbat or Pai (Brennan 2007), based on the presence of the Desert Side-Notched point. Particularly to the west, Puebloan and Pai/Paiute artifacts commonly co-occur. All of the Kanab Plateau Project sites with Paiute artifacts also had Archaic/Puebloan artifacts (Huffman 1993:72). All six Paiute sites identified during a survey of the Shivwits Plateau had Pueblo II components (Wells 1991). And the phenomenon is not restricted to the Grand Canyon. Further afield, five of eight Quail Creek sites in southwestern Utah with protohistoric radiocarbon dates also had Anasazi ceramics (Walling et al. 1986), and five of seven sites excavated in western Washington County, Utah had co-occurrences of Paiute and Archaic/Anasazi artifacts (Tucker 1982). Other examples can be found from investigations near the

Beaver Dam Mountains, Utah (Moffit et al. 1978) and Green Springs, Utah (Westfall et al. 1987).

The Grand Canyon also appears to be a transition zone between several identified archaeological cultures, especially during the Formative and post-Formative periods. Broadly speaking, it is at the intersection of the Kayenta Anasazi to the east, the Virgin Anasazi to the north and west, and the Cohonina to the south; but it is more complicated than even that. A model that has been developing since the 1960s suggests that the first Formative inhabitants were the Cohonina, with a trajectory that would bring them into the Canyon from points south. This pattern emerges during Pueblo I, when ceramics dominated by Cohonina wares first become noticeable (which begs the question of whether the Cohonina derived from a Basketmaker III base or came afterward as a separate migration). By mid-Pueblo II ceramics become increasingly "Kayenta-like," with assemblages dominated by Tusayan White and Gray wares and associated wares such as Tsegi Orange Ware. Here, the evidence suggests a Kayenta migration into the eastern reaches of the Canyon, particularly in the reach that encompasses Unkar Delta and other habitable deltas and terraces upstream.

There is yet a third shift by Late Pueblo II-Early Pueblo III, when ceramics take on a uniquely provincial aspect. The Shinarump series of white, gray and red wares increases in numbers, and more local types that cannot be identified to known wares but share similar temper, paste and firing attributes to Shinarump and so-called Virgin wares. At this point, evidence of Cohonina wares is virtually non-existent. By the end of the Anasazi occupation of the Grand Canyon, ceramic assemblages no longer look like the imported fragments of outside migrants, but remains of a generation that probably considered themselves "peoples of the Grand Canyon"—in whatever language that label was uttered.

The picture earlier in prehistory is even murkier. Berry and Berry (1986) have long advocated a series of Archaic abandonments and migrations to account for "gaps" in the radiocarbon record on the Colorado Plateau. One of these, between 3000 and 2500 B.P., happens to fall almost exactly between the two Archaic radiocarbon dates obtained from Feature 1 at AZ B:16:0134. Geib (1996), on the other hand, sees less support for complete abandonment and evidence for a more continuous occupation of pre-ceramic peoples (in the Glen Canyon area, at least), with occasional changes in population densities and settlement patterns. What seems more clear, is that the Canyon was a locus for a "striking…perishable figurine industry" (Huckell 1996:342)—occasionally referred to as the Grand Canyon figurine complex—during the Late Archaic. These same peoples apparently participated in a distinctive style of rock art called Grand Canyon Polychrome (Allen 1988; Schaafsma 1990), which may be related to the similar Middle-Late Archaic Barrier Canyon style elsewhere on the plateau.

How does all of this affect our interpretation of sites AZ B:16:1125 and 0134? At the former, relatively little can be deduced concerning the cultural affiliation of the primary component. The primary component appears to be Formative, but no diagnostic artifacts were recovered in clear association. We have already alluded to a possible lithic

reduction technology that may be affiliated with PI Cohonina sites *within* the Grand Canyon; we have not analyzed similar sites on the South Rim to determine if the industry applies elsewhere. This technology, which is based on the manufacture and maintenance of bifaces or tools that are shaped and refurbished by pressure flaking, is distinct from the DFP style of core reduction found on later Anasazi components. Flakes of this kind were found in small quantities in Feature 3 at AZ B:16:0134, which dated to Late Pueblo I-Early Pueblo II. Similar assemblages are being found by the MNA/GRCA Colorado River Corridor Archaeological Project crews in buried horizons with Cohonina ceramics along the river. If this association means anything, it could indicate that the DFP-dominated assemblage at AZ B:16:1125 is more indicative of later Puebloan use, perhaps during Pueblo II-III.

Site AZ B:16:0134 is also multi-component, but in a completely different and unexpected fashion; here, it appears that the primary prehistoric feature—the roasting pit—was utilized more than once over a period of roughly 2500 years. If there is a break between the Late Archaic and Early Agricultural occupancy of the Canyon, the use of Feature 1 (and F3) may have been by three different cultures: those affiliated with the Late Archaic "Grand Canyon figurine" complex, peoples from early Basketmaker II, and early Puebloans associated with the Cohonina culture.

While the multi-component nature of archaeological sites in the Grand Canyon might be expected, more surprising is the multiple re-use of features such as the roasting pit at AZ B:16:0134. There is some evidence, however, to indicate this is not an isolated case. Of the ^{14}C samples collected in Tuckup Canyon during the Kanab Plateau Project, one pit at AZ B:9:0267 returned both Pueblo I and protohistoric dates. Just downslope from the feature were Virgin Anasazi sherds, but on the feature itself was Paiute Utility ware and a DSN point. From a buried roasting feature at Deer Creek (site AZ B:10:0004) Jones (1986:105) obtained two dates calibrated at 2 sigma of 380 B.C.-A.D. 210 and A.D. 230-610, although the extreme ends of the ranges could mean use separated by only a few decades. During what is perhaps the largest study of roasting pits in the region, MNA excavated 29 pits at six sites in southwest Utah and the Arizona Strip. From one pit at site NA11,500, a date of A.D. 190 was obtained from a sample 80 cm below present ground surface, while a date from a sample 30 cm higher was simply described as "recent" (Moffit et al. 1978).

In almost all of the cases from projects described in this chapter, sites with roasting pits had either artifacts from two or more cultures/time periods (e.g., Archaic and Puebloan, or Puebloan and protohistoric), or displayed surface artifacts at odds with radiocarbon dates obtained from the pits themselves. The mixing of features and artifacts from different cultures and time periods has important implications for the interpretation of age, cultural affinity, and subsistence orientation of sites with pits. Unfortunately, there may be a tendency for researchers to dismiss widely disparate dates from the same features as "spurious," or to place more confidence in associated artifacts than the dates themselves.

In an excellent study of roasting pits and other features around California Wash in southern Nevada, Blair (1986:94-97) obtained two dates from samples collected from a "classically-shaped roasting pit" at the Roadside Roast Site (26CK1091). The samples, separated by a vertical distance of about 50 cm, yielded dates of A.D. 1370±135 from the upper unit and 480±305 B.C. from the lower unit. Blair considered the dates to be "suspect" due to the "relatively wide" plus or minus range and the approximately 1800 years between the two dates. Interestingly, the pit also contained at least four thermal features that Blair defined as hearths, and she partly attributed the "distortion of the C-14 dates" to intermixing between features. Blair relied on ceramics averaging to arrive at a period of "heavy usage" for the site between A.D. 700-1100., but the array of radiocarbon dates and diagnostic points and ceramics indicates continued use of this sheltered site along the old Spanish Trail during the Archaic, Basketmaker II, Basketmaker III, Pueblo I, Pueblo II and Late Prehistoric/Protohistoric. Under the circumstances, re-use of the roasting pit seems more than plausible.

A second example comes from the Upper Basin Archaeological Research Project (UBARP) directed by Alan P. Sullivan in the Upper Basin of the Kaibab National Forest southeast of the Grand Canyon (Sullivan 1992). The multi-year project is important to the study of Grand Canyon prehistory because Sullivan's conclusions have a direct bearing on the identity and subsistence orientation of prehistoric peoples in and around the Park. In the 1992 report Sullivan details work at 33 thermal features, including several at two adjacent sites: MU 235 and 236. The sites were considered to be of Anasazi affiliation because the ceramic assemblages were dominated by Tusayan Gray Wares. Sullivan believed that the roasting features were used to roast pinyon nuts, and perhaps process grasses and annuals, which he offered as evidence for a Puebloan dependence on wild resources rather than domesticated plants such as corn.

Of the four roasting features radiocarbon-dated by Sullivan, however, two (Feature 3 and FCR pile 1) date to between A.D. 1285 and 1395, and one (FCR pile 5) post-dates A.D. 1898. Only one feature (from the "northern array") dated to the Puebloan period: A.D. 728 to 885. Like Blair, Sullivan believed that the dates could not be taken at face value. The more recent dates, he contended, derived from samples whose "radiocarbon reservoirs" may have been "updat[ed]" by modern vegetation. Conversely, he argued that the "old wood" problem accounted for the unexpectedly early Puebloan date. Yet he goes on to claim that "FCR Pile 1 at MU 236 is the most firmly dated [feature] because there is no discrepancy between its radiocarbon assay and the age of [a] Sityatki Polychrome sherd…found on the pile's surface" (1992:212). This type post-dates A.D. 1375 (Breternitz 1966:95) and it is not unusual to find it on protohistoric sites in the Grand Canyon. Sullivan also notes that FCR pile 1 was re-used, and that other FCR features at nearby MU 235 were scavenged of groundstone. Finally, he identified a possible Navajo structure in close vicinity to the sites.

Once again, though there are multiple lines of evidence at Sullivan's sites for use and re-use over the centuries, greater credence is given to the age range of the associated ceramics. While the ceramics at sites MU 235 and 236 do indicate an Ancestral Puebloan presence, three of the four radiocarbon dates do not suggest a Formative affiliation, and

thus do not support his thesis of a "Grand Canyon Anasazi dependence (or near dependence) on wild resources" (1992:227).

To conclude this section on cultural identity, we would like to emphasize that in the Grand Canyon there is one feature in particular that can be difficult to assign a cultural or temporal affiliation based on associated remains, and that feature is the roasting pit.

Roasting pits were re-used and recycled, not only intra-culturally, but by succeeding peoples as well. This re-use could take place over days, weeks, or hundreds of years. In many cases we believe that the age and affiliation of the pits cannot be determined without the use of radiocarbon dating, but even this method had its drawbacks. By their very nature, roasting pits, like hearths, are often excellent sources of wood charcoal. The charcoal can occur in quantity and be relatively well preserved, even given the open setting of most pits. One might be tempted to run standard dates on large fragments of wood charcoal, but these are susceptible to the "old wood" problem, or wood that has ceased metabolic activity prior to burning. If large enough specimens are not available, one could run an aggregate sample. But because many pits are the result of multiple fuel-burning episodes over time, this can lead to an averaging of events from different time periods. The best recourse is to date carbonized annuals and run multiple samples from the same feature—if the budget permits and if such samples can be recovered.

Summary and Conclusion

This report summarizes the results of data recovery at two archaeological sites within Grand Canyon National Park. Personnel from the Museum of Northern Arizona and the National Park Service excavated site AZ B:16:1125 in the fall of 2007, and site AZ B:16:0134 in the spring of 2008. Site AZ B:16:1125, also known as the Hermit Road Site, is located along Hermit Road adjacent to the South Rim. It occupies a point of exposed Kaibab Limestone bedrock between the rim and the road overlooking The Abyss, southwest of Mohave Point. The site consisted of a prehistoric lithic scatter atop a thin mantle of sediment. Site AZ B:16:0134, also known as the Three Mile Rest House Site, is located along the Bright Angel Trail northeast of Three Mile Rest House, a popular rest area. The site is situated at the foot of a ridge above the Redwall Limestone Formation, overlooking Indian Garden and the inner Canyon below. The prehistoric component of the site consisted of a roasting pit and associated artifacts. Both sites were excavated to mitigate the effects of two proposed NPS undertakings: the improvement of the historic Hermit Road, and construction of composting toilets near Three Mile Rest House (Brennan 2007).

Data recovery at AZ B:16:1125 showed that the lithic scatter was probably a Formative hunting or processing camp, although no diagnostic artifacts were found in association. Lithics consisted mostly of flakes from core reduction and a few flaked stone tools and cores; no groundstone or ceramics were observed. The scatter was generally confined to the surface and upper 2-3 cm of soil. Below the scatter, and resting directly on top of bedrock, was a dart point fragment. The point probably dates to Archaic-Basketmaker II, but is an isolate with no associated remains. Prior to excavation—when the site was

originally recorded—a Desert Side-Notched point was observed on the site surface. This point could not be relocated by MNA, but may suggest use of the area during the post-Formative (protohistoric to early historic).

Excavation at site AZ B:16:0134 was focused on the roasting pit, designated Feature 1. Two hand-excavated trenches and several 1 x 1 m units were dug into what remained of the ejecta ring of the feature. The rest of the pit, including most of the center of the feature, had been removed as borrow pit material by trail crews. During excavation a second feature—Feature 3—was located at the base of F1. While originally thought to pre-date F1, results from radiocarbon dating told a different story. Two radiocarbon samples were dated from F1 and one sample was dated from F3. The two samples from F1 returned assays of 3160±40 B.P. and 2590±40 B.P., with 2 Sigma calibrated results of 1500-1380 B.C. and 810-760 B.C./680-670 B.C., respectively. The dates range from the Late Archaic to, possibly, early Basketmaker II. The sample from F3 returned a conventional radiocarbon age of 1030±40 B.P., with a 2 Sigma calibrated result of A.D. 900-920/A.D. 960-1040. Feature 3 thus dates somewhere between the end of Pueblo and the beginning of Pueblo II. It now appears that F3 was the last known event in the use of the primary feature—F1. The results of macrobotanical analysis of F1 and 3 showed that the roasting pit was used to roast agave during all intervals of use. Lithic analysis also identified a dart point fragment and a possible atlatl weight fragment from the fill of Feature 1.

The primary contribution of the archaeological work conducted at the two sites concerns the findings from the prehistoric features at site AZ B:16:0134. Excavation demonstrated that the roasting pit (which essentially consists of both F1 and 3) was re-used at least three times during three separate intervals: the Late Archaic, the Late Archaic-Early Agricultural transition, and Pueblo I-II. We believe that the dates are accurate representations of the three events, as the two F1 samples consisted of a carbonized *Agave* sp. fragment and a juniper nut shell, and the F3 sample also consisted of a charred agave fragment. The dates indicate that certain types of thermal features, such as roasting pits, lend themselves to re-use, and that this re-use can be over many centuries by completely different cultural groups. Macrobotanical analysis also showed remarkable consistency in *what* was being processed; in this case, agave. Curiously, there has been little direct evidence of agave roasting from the many Grand Canyon roasting features analyzed to date. We suggest that the location of the Three Mile Rest House Site was well-suited to agave processing: it was located where agave plants were available; it was situated along a known prehistoric route into the Canyon; and it was immediately above a source of limestone rock (the Redwall Formation), valued for its heat retention properties during roasting.

Finally, data recovery at the two sites—particularly AZ B:16:0134—demonstrated the value in investigating sites that are otherwise not in pristine condition. The roasting pit at the Three Mile Rest House Site had been substantially impacted by previous work related to maintenance of the Bright Angel Trail. Yet, what remained resulted in a valuable contribution to the study of Grand Canyon prehistory, especially the little known periods that pre-dated the arrival of the Ancestral Puebloans. We commend the National Park

Service and the resource managers of Grand Canyon National Park for helping to "expand our current understanding of the Grand Canyon's complex and fascinating human story" (Fairley 2003:147).

REFERENCES

Ahlstrom, Richard V.N.
1984 Tree-ring Dating the Cohonina. Copy on file, Department of Anthropology, University of Arizona, Tucson.

Ahlstrom, Richard V.N., David E. Purcell, M. Zyniecki, Dennis Gilpin, and Virginia L. Newton
1993 *An Archaeological Overview of Grand Canyon National Park*. SWCA Archaeological Report No. 93-92. SWCA Inc. Environmental Consultants, Flagstaff, Arizona. Submitted to National Park Service, Grand Canyon National Park, Grand Canyon, Arizona.

Aikens, C. Melvin
1966 *Virgin-Kayenta Cultural Relationships*. University of Utah Anthropological Papers No. 79. University of Utah Press, Salt Lake City.

Allen, Mary K.
1986 An Unusual Pictograph Site in Grand Canyon (Spirit Shelter). Paper presented at the 1986 Utah Rock Art Research Association Symposium.

1988 New Frontiers in Rock Art: The Grand Canyon. Paper presented at the 1988 American Rock Art Research Association Symposium, Ridgecrest, California.

1992 New Frontiers in Rock Art: The Grand Canyon. In *American Indian Rock Art*, Vol. 15, edited by Kay K. Sanger, pp. 49-70. American Rock Art Research Association, San Miguel, California.

Altschul, Jeffrey H. and Helen C. Fairley
1989 *Man, Models and Management: An Overview of the Archaeology of the Arizona Strip and the Management of its Cultural Resources*. Statistical Research, Plateau Archaeology, Dames & Moore, Inc. Submitted to USDA Forest Service and USDI Bureau of Land Management, Contract No. 53-8371-6-0054.

Ambler, J. Richard
1984 A Synopsis of the Archaeology and Stratigraphy of Dust Devil Cave. Paper presented at the 19th Biennial Great Basin Anthropological Conference, Boise, Idaho.

Anderson, Michael F.
2004 Bright Angel Trail Three-Mile Rest House: Historic Characteristics of Archaeological Site B:16:134. Manuscript on file at Grand Canyon National Park, Branch of Cultural Resources, Grand Canyon, Arizona.

Anderson, Michael F. and Ellen Brennan
2006 Report of Findings: Hermit Road Cultural Resource Inventory. Manuscript on file at Grand Canyon National Park, Branch of Cultural Resources, Grand Canyon, Arizona.

Balsom, Janet R.
1986 Archaeology of the Grand Canyon: Data Recovery of 17 Sites Along the Desert View Waterline. Copy on file, Science Center, Grand Canyon National Park, Arizona.

2005 A Little Knowledge Goes a Long Way: A History of Archaeological Research at the Grand Canyon. In *A Gathering of Grand Canyon Historians: Ideas, Arguments, and First-Person Accounts*, compiled and edited by Michael F. Anderson, pp. 111-114. Proceedings of the Inaugural Grand Canyon History Symposium, January 2002. Grand Canyon Association, Grand Canyon, Arizona.

Balsom, Janet R. and Signa Larralde (editors)
1996 *Mitigation and Monitoring of Cultural Resources in Response to the Experimental Habitat Building Flow in Glen and Grand Canyon, Spring 1996*. USDI Bureau of Reclamation, Upper Colorado Region, Salt Lake City.

Berry, Claudia F., and Michael S. Berry
1986 Chronological and Conceptual Models of the Southwestern Archaic. In *Anthropology of the Desert West: Essays in Honor of Jesse D. Jennings*, edited by Carol J. Condie and Don D. Fowler, pp. 253-327. Anthropological Papers No. 110. University of Utah Press, Salt Lake City.

Blair, Lynda M.
1986 A New Interpretation of Archaeological Features in the California Wash Region of Southern Nevada. Unpublished Master's thesis, Department of Anthropology, University of Nevada, Las Vegas.

Bowers, Janice E. and Brian Wignall
1993 *Shrubs and Trees of the Southwest Deserts*. Southwest Parks and Monuments Association, Tucson, Arizona.

Brennan, Ellen
2007 Archaeological Data Recovery at Two Sites in Grand Canyon National Park: Scope of Work. Manuscript on file at Grand Canyon National Park, Branch of Cultural Resources, Grand Canyon, Arizona.

Brennan, Ellen and Stewart Robertson
2008 Hermit Septic Data Recovery Report of Findings. Archeological Project No. GRCA-2007-B. Report No. 2007-01-GRCA. Copy on file, Science and Resource Management, Cultural Resources, National Park Service, Grand Canyon National Park, Arizona.

Breternitz, David A.
1966 *An Appraisal of Tree Ring Dated Pottery in the Southwest*. Anthropological Papers of the University of Arizona No. 10. University of Arizona Press, Tucson.

Brown, David E. (editor)
1994 *Biotic Communities: Southwestern United States and Northwestern Mexico*. University of Utah Press, Salt Lake City.

Brown, David E. and Charles H. Lowe
1980 *Biotic Communities of the Southwest.* General Technical Report RM-78. Rocky Mountain Forest and Range Experimental Station, USDA Forest Service.

Brown, Gregory M.
1988 Appendix 3: Chipped Stone Raw Material Descriptions. In *Cultural Resource Investigations on the Kaibab Plateau, Northern Arizona: The Highway 67 Data Recovery Project*, compiled by Alan Schroedl. Cultural Resources Report 420-1-8819, P-III Associates, Salt Lake City, Utah.

Brown, K.L.
1994 Projectile Points. In *Across the Colorado Plateau: Anthropological Studies for the Transwestern Pipeline Expansion Project, Volume XII, Excavation of Cohonina and Cerbat Sites in the Western Arizona Uplands*. Edited by Gerald A. Bair and Karol W. Stoker. Office of Contract Archaeology, Maxwell Museum of Anthropology, University of New Mexico, Albuquerque.

Cameron, Catherine M.
1987 Chipped Stone Tools and Cores: An Overview of the 1982-1983 Field Seasons. In *Prehistoric Stone Technology on Northern Black Mesa, Arizona*, edited by William J. Parry and Andrew L. Christenson, pp. 95-141. Center for Archaeological Investigations Occasional Paper 12. Southern Illinois University, Carbondale.

Campbell, E.W.C. and W.H. Campbell
1935 The Pinto Basin Site: An Ancient Aboriginal Camping Ground in the California Desert. *Southwest Museum Papers* 9:1-51.

Cartledge, Thomas R.
1979 Cohonina Adaptation to the Coconino Plateau: A Re-evaluation. *Kiva* 44(4):297-317.

1986 Prehistory and History of the Cohonina Plateau Region, Northern Arizona: A Cultural Resources Overview. Copy on file, Kaibab National Forest, Williams, Arizona.

1987 Current Concepts in Cohonina Prehistory. A paper presented to the AAC meeting in Flagstaff, Arizona. Copy on file, Kaibab National Forest, Williams, Arizona.

Christensen, Don D. and Jerry Dickey
2006 Beyond the Rim: An Overview of Rock Art on the South Rim of the Grand Canyon National Park and the Tusayan District of the Kaibab National Forest, Arizona. Copy on file, National Park Service, Grand Canyon National Park, Arizona.

Clark, Victoria H.
1991 The Grand Canyon River Corridor Survey Project: Archaeological Survey along the Colorado River between Glen Canyon Dam and Navajo Bridge. Manuscript on file, Glen Canyon National Recreation Area Division of Resources, Page, Arizona.

Cleeland, Teri A., John A. Hanson, Larry M. Lesko, and Neil S. Weintraub
1992 Native American Use of the South Kaibab National Forest, An Ethnohistoric Overview. Copy on file, Grand Canyon National Park Reference Library, Arizona, and Kaibab National Forest, Williams, Arizona.

Coder, Christopher
1994 Historical Archaeology. In *The Grand Canyon River Corridor Survey Project: Archaeological Survey along the Colorado River between Glen Canyon Dam and Separation Canyon*, by Helen C. Fairley, Peter W. Bungart, Christopher Coder, Jim Huffman, Terry L. Samples, and Janet R. Balsom, pp. 113-146. Submitted by Janet Balsom, Principal Investigator, Grand Canyon National Park. Prepared in Cooperation with the Glen Canyon Environmental Studies, Grand Canyon National Park, Cooperative Agreement No. 9AA-40-07920.

Colton, Harold C.
1932 *A Survey of Prehistoric Sites in the Region of Flagstaff, Arizona.* Bureau of American Ethnology Bulletin 104. Smithsonian Institution, Washington D.C.

1939 *An Archaeological Survey of Northwestern Arizona Including the Descriptions of Fifteen New Pottery Types*. Museum of Northern Arizona Bulletin 16. Northern Arizona Society of Science and Art, Flagstaff.

Colton, Harold C. and Lyndon L. Hargrave
1937 *Handbook of Northern Arizona Pottery Wares*. Museum of Northern Arizona Bulletin No. 11. Northern Arizona Society of Science and Art, Flagstaff.

Coulam, Nancy J. and Alan R. Schroedl
2004 Late Archaic Totemism in the Greater American Southwest. *American Antiquity* 69(1).

Crabtree, Don E.
1972 *An Introduction to Flintworking*. Occasional Papers of the Idaho State University Museum No. 28. Idaho State University, Pocatello.

Davis, Sidney W., Marie E. Davis, Ivo Lucchitta, R. Finkel, and M. Caffee
2000 Early Agriculture in the Eastern Grand Canyon. *Geoarchaeology* 15:783-798.

Dryer, James
1991 Archaeological Clearance Survey Form: Telephone Line Replacement, South Rim, Grand Canyon National Park. Clearance No. 034-91-GRCA. Copy on file, National Park Service, Grand Canyon National Park, Arizona.

Dunmire, William W. and Gail D. Tierney
1995 *Wild Plants of the Pueblo Province*. Museum of New Mexico Press, Santa Fe.

Ebeling, Walter
1986 *Handbook of Indian Foods and Fibers of Arid America*. University of California Press, Berkeley.

Effland, Richard W., Anne Trinkle Jones, and Robert C. Euler
1981 *The Archaeology of Powell Plateau: Regional Interaction at Grand Canyon*. Monograph No. 3, Grand Canyon Natural History Association, Grand Canyon, Arizona.

Ellis, Robert, Richard H. Brooks, Eileen Green, and Teri Swearingen
1982 *A Cultural Resources Survey and Limited Test Excavations in the Vicinities of Quail Point, Bunkerville Ridge, and Hackberry Spring, Virgin and Mormon Mountains, Southern Nevada*. Archaeological Research Center Report 21-5-8. Museum of Natural History, University of Nevada, Las Vegas.

Emslie, Steven D., Jim I. Mead, and Larry Coats
1995 Split-Twig Figurines in Grand Canyon, Arizona: New Discoveries and Interpretations. *Kiva* 61:145-173.

Euler, Robert C.
1974 Future Archaeological Research in the Grand Canyon. *Plateau* 46:139-148.

1975 The Pai: Cultural Conservatives in Environmental Diversity. In *Collected Papers in Honor of Florence Hawley Ellis*, edited by Theodore R. Frisbie, pp. 80-97. Papers of the Archaeological Society of New Mexico No. 2, Albuquerque.

1981 Havasupai-Cohonina Relationships in the Grand Canyon. In *Collected Papers in Honor of Erik Kellerman Reed*, edited by Alfred H. Schroeder, pp. 167-175. Anthropological Papers No. 6. Archaeological Society of New Mexico, Albuquerque.

1984 *The Archaeology, Geology and Paleobiology of Stanton's Cave, Grand Canyon National Park, Arizona*. Monograph No. 6, Grand Canyon Natural History Association, Grand Canyon, Arizona.

Euler, Robert C. and Dee F. Green
1978 *An Archaeological Reconnaissance of Middle Havasu Canyon, Arizona*. Cultural Resources Report No. 22. Southwest Region, USDA Forest Service, Albuquerque, New Mexico.

Euler, Robert C. and Alan P. Olson
1965 Split Twig Figurines from Northern Arizona: New Radiocarbon Dates. *Science* 145:368-369.

Fish, Suzanne K., Paul R, Fish, and John H. Madsen
1992 Evidence of Large-scale Agave Cultivation in the Marana Community. In *The Marana Community in the Hohokam World*, edited by Suzanne K. Fish, Paul R. Fish, and John H. Madsen, pp. 73-87. Anthropological Papers of the University of Arizona, No. 56. The University of Arizona Press, Tucson.

Fairley, Helen C.
2003 *Changing River: Time, Culture, and the Transformation of Landscape in the Grand Canyon*. Technical Series 79, Statistical Research, Inc. Prepared for the U.S. Geological Survey, Grand Canyon Monitoring and Research Center, Flagstaff, Arizona, Contract No. 01WRAG0078.

Fairley, Helen C. and Amy Horn-Wilson
1996 Archaeological Survey from the Visitor's Center to Yavapai Point, Grand Canyon National Park, Arizona. Copy on file, National Park Service, Grand Canyon National Park.

Fairley, Helen C. and Janet R. Balsom
1990 Reconstruction of State Route 64, East Rim Drive, Grand Canyon National Park, Arizona. Copy on file, Science Center, Grand Canyon National Park, Arizona.

Fairley, Helen C., Peter W. Bungart, Christopher Coder, Jim Huffman, Terry L. Samples, and Janet R. Balsom
1994 *The Grand Canyon River Corridor Survey Project: Archaeological Survey along the Colorado River between Glen Canyon Dam and Separation Canyon*. Submitted by Janet Balsom, Principal Investigator, Grand Canyon National Park. Prepared in Cooperation with the Glen Canyon Environmental Studies, Grand Canyon National Park, Cooperative Agreement No. 9AA-40-07920.

Flora of North America Database
2008 Flora of North America @ efloras.org. Electronic document, http://www.efloras.org. Accessed September-October 2008.

Gasser, Robert E.
1982 Are Roasting Pits Always Roasting Pits? *Kiva* 47:171-176.

Geib, Phil R.
1996 *Glen Canyon Revisited*. University of Utah Anthropological Papers No. 119. University of Utah Press, Salt Lake City.

2008 Age Discrepancies with the Radiocarbon Dating of Sagebrush (Artemisia Tridentata Nutt.). *Radiocarbon* 50(3):347-357.

Geib, Phil R., Jim H. Collette, and Kimberly Spurr
2001 *Kaibabitsinüngwü: An Archaeological Sample Survey of the Kaiparowits Plateau*. Cultural Resource Series No. 25, Grand Staircase-Escalante National Monument Special Publication No. 1. USDI Bureau of Land Management, Salt lake City, Utah.

Gilpin, Dennis
1994 Lukachukai and Salina Springs: Late Archaic/Early Basketmaker Habitation Sites in the Chinle Valley, Northeastern Arizona. *Kiva* 60:203-218.

Glass, S.E. and J.B. Glass
1990 *1990 Progress Report: Archaeological Surface Survey and Photographic Inventory Lower Granite Gorge, Grand Canyon National Park*. Manuscript on file at Wilderness Studies Institute, Durango, Colorado.

Greer, John W.
1965 A Typology of Midden Circles and Mescal Pits. *Southwestern Lore* 31:41-55.

Guernsey, Samuel J.
1931 *Explorations in Northeastern Arizona*. Papers of the Peabody Museum of American Archaeology and Ethnology, Vol. 12, No. 1. Harvard University, Cambridge.

Hack, John T.
1942 *The Changing Physical Environment of the Hopi Indians of Arizona*. Reports of the Awatovi Expedition. No.1. Papers of the Peabody Museum of American Archaeology and Ethnology, Vol. 35, No. 1. Harvard University, Cambridge.

Hanson, John A.
1996 Cultural Affiliation Assessment: Cohonina. In *Cultural Affiliations: Prehistoric Cultural Affiliations of Southwestern Indian Tribes*. Copy on file, Kaibab National Forest, Williams, Arizona.

Hargrave, Lyndon L.
1937 A New Sub-culture in Arizona. *Southwestern Lore* 3(3):54-57.

1938 Results of a Study of the Cohonina Branch of the Patayan Culture in 1938. *Museum of Northern Arizona, Museum Notes* 11(6):43-50.

Hasbargen, Jim and Ellen Brennan
2006 Report of Findings South Rim Transportation Plan Cultural Resource Inventory. Archaeological Project No. GRCA-2006-A. Copy on file, Branch of Cultural Resources, National Park Service, Grand Canyon National Park, Arizona.

Haury, Emil
1931 *Kivas of the Tusayan Ruin, Grand Canyon, Arizona*. Medallion Papers No. 9. Gila Pueblo, Globe, Arizona.

Hereford, Richard, Kelly J. Burke, and Kathryn S. Thompson
2000 *Map Showing Quaternary Geology and Geomorphology of the Granite Park Area, Grand Canyon, Arizona*. Miscellaneous Investigations Series Map I-2662, scale 1:2000. U.S. Geological Survey, Washington, D.C.

Hereford, Richard, Helen C. Fairley, Kathryn S. Thompson, and Janet R. Balsom
1991 *The Effect of Regulated Flows on Erosion of Archeological Sites at Four Areas in Eastern Grand Canyon National Park, Arizona: A Preliminary Analysis*. U.S. Geological Survey, Flagstaff. Submitted to the Glen Canyon Environmental Studies Program, USDI Bureau of Reclamation, Flagstaff, Arizona.

Hoffmeister, Donald F.
1971 *Mammals of the Grand Canyon*. University of Illinois Press, Urbana.

Hollenshead, Marci
2007 Exploration of Paleoindian and Early Archaic in the Greater Grand Canyon Region: Recent Evidence from Grand Canyon and Implications for Prehistoric Land Use. Copy on file, National Park Service, Grand Canyon National Park, Arizona.

Holmer, Richard N.
1978 A Mathematical Typology for Archaic Projectile Points of the Eastern Great Basin. Ph.D. dissertation, Department of Anthropology, University of Utah, Salt Lake City. University Microfilms, Ann Arbor.

1986 Common Projectile Points of the Intermountain West. *In Anthropology of the Desert West: Essays in Honor of Jesse D. Jennings*. Edited by Carol J. Condie and Don D. Fowler, pp. 90-115. University of Utah Anthropological Papers No. 110. University of Utah Press, Salt Lake City.

Horn, Amy
2001 Recent Split-Twig Figurine Research at Grand Canyon. Paper presented at the 66th Annual Meeting of the Society for American Archaeology, New Orleans.

Horn-Wilson, Amy
1997 Projectile Points of the Cohonina: A Pilot Study. Unpublished Master's thesis, Department of Anthropology, Northern Arizona University, Flagstaff.

1998 Archaeological Clearance Survey Form: Topeka Prescribed Burn Unit, South Rim, Grand Canyon National Park, Arizona. Report No. 98-03. Copy on file, National Park Service, Grand Canyon National Park.

1999 Archaeological Clearance Survey Form: Horsethief Prescribed Burn Unit, Sub-Unit 3, South Rim, Grand Canyon National Park. Report No. 1998-98-06. Copy on file, National Park Service, Grand Canyon National Park, Arizona.

Horn-Wilson, Amy and Jeremy Haines
1999 Archaeological Clearance Survey Form: Shoshone Prescribed Fire Project, South Rim, Grand Canyon National Park, Arizona. Report No. 98-10. Copy on file, National Park Service, Grand Canyon National Park.

Hubbard, Duane C., Adam M. Berg, and Erik Whiteman
2001 *The Indian Canyon Site (AZ G:03:04): 2000 Testing and Data Recovery, Grand Canyon National Park, Arizona*. Archaeological Report No.1212. Northern Arizona University, Flagstaff.

Huckell, Bruce B.
1996 Archaic Prehistory in the North American Southwest. *Journal of World Prehistory* 10:305-373.

Huffman, Jim
1993 Between River and Rim: A Comparative View of Subsistence Systems in Grand Canyon, Arizona. Unpublished Master's thesis, Department of Anthropology, Northern Arizona University, Flagstaff.

1994 The Hidden Affiliation of Grand Canyon Roasting Pits: Who Made Them and When? Manuscript on file, Archaeology Laboratory, Museum of Northern Arizona, Flagstaff.

Huffman, Jim, Carl J. Phagan, Gregory Haynes, and Timothy W. Burchett
1990 *Archaeological Survey on the Kanab Plateau: 1989-90 Annual Technical Report*. Northern Arizona University Archaeology Report No. 1044. Archaeology Laboratory, Department of Anthropology, Nothern Arizona University, Flagstaff.

Hutira, Johna
1986 Analysis of Plants, Pollen and Coprolites. In *A Cross-Section of Grand Canyon Archeology: Excavations at Five Sites along the Colorado River*, by Anne Trinkle Jones, pp. 269-322. Publications in Anthropology No. 28. Western Archeological and Conservation Center, USDI National Park Service, Tucson.

Irwin-Williams, Cynthia
1973 The Oshara Tradition: Origins of Anasazi Culture. *Eastern New Mexico University Contributions in Anthropology* 5:1-28.

1979 Post-Pleistocene Archaeology 7000-200 b.c. In *Southwest*, edited by Alfonso Ortiz, pp. 31-42. Handbook of North American Indians, Vol. 9 (W.C. Sturtevant, general editor). Smithsonian Institution, Washington, D.C.

James, Charles D.
1977 *The Mule Bend Site: A Study of a Cohonina Lithic Quarry and Plant Processing Area*. Museum of Northern Arizona Research Paper 9. Museum of Northern Arizona, Flagstaff.

Jennings, Calvin
1971 Early Prehistory of the Coconino Plateau, Northwestern Arizona. Ph.D. dissertation, University of Colorado, Boulder. University Microfilms, Ann Arbor.

Jones, Anne Trinkle
1986 *A Cross-Section of Grand Canyon Archeology: Excavations at Five Sites along the Colorado River*. Publications in Anthropology No. 28. Western Archaeological and Conservation Center, National Park Service, Tucson.

Jones, Anne Trinkle and Robert C. Euler
1979 *A Sketch of Grand Canyon Prehistory*. Grand Canyon Natural History Association, Grand Canyon, Arizona.

Justice, Noel D.
2002 *Stone Age Spear and Arrow Points of the Southwest United States*. Indiana University Press.

Kamilli, Robert J. and Stephen M. Richard (editors)
1998 *Geologic Highway Map of Arizona*. Arizona Geological Society and Arizona Geological Survey, Tucson.

Lesko, Larry M.
1989 A Reexamination of Northern Arizona Obsidian. *Kiva* 54(4):385-399.

Lindsay, Alexander J., Jr.
1969 The Tsegi Phase of the Kayenta Cultural Tradition on Northeastern Arizona. Ph.D. dissertation, Anthropology Department, University of Arizona, Tucson. University Microfilms, Ann Arbor.

Lindsay, Alexander J., Jr., J. Richard Ambler, Mary Ann Stein, and Philip M. Hobler
1968 *Survey and Excavations North and East of Navajo Mountain, Utah, 1959-1962*. Museum of Northern Arizona Bulletin No. 45, Glen Canyon Series No. 8. Museum of Northern Arizona, Flagstaff.

Lowe, Charles H.
1985 *Arizona's Natural Environment*. The University of Arizona Press, Tucson.

McDougall, Walter B.
1973 *Seed Plants of Northern Arizona*. Museum of Northern Arizona, Flagstaff.

McGregor, John C.
1950 Excavations of Cohonina Sites, 1949. *Plateau* 22(4):68-74.

1951 *The Cohonina Culture of Northwestern Arizona*. University of Illinois Press, Urbana.

1967 *The Cohonina Culture of Mount Floyd, Arizona*. University of Kentucky Press, Lexington.

McKee, Edwin D.
1931 An Archaeological Exhibit. *Grand Canyon Nature Notes* 6(1):1-2.

Minnis, Paul and Stephen E. Plog
1976 A Study of the Site Specific Distribution of *Agave parryi* in East Central Arizona. *The Kiva* 41(3-4):299-308.

Moffitt, Linda R.
1997 Archaeological Survey of the Transit Corridor Project Area, Grand Canyon National Park, Arizona, Preliminary Report. Copy on file, National Park Service, Grand Canyon National Park.

Moffitt, Steven A.
1998 Cohonina Adaptations to the South Rim: Results from the Mather Point Orientation Center Project, Grand Canyon, Arizona. Paper presented at the 63rd Annual Meeting of the Society for American Archaeology, Seattle. Copy on file, Science Center, Grand Canyon National Park, Arizona.

Moffitt, Steven A. and Linda R. Moffitt
2004 The Archaeology of Mather Point: Results from the Canyon View Information Plaza Project. Copy on file, National Park Service, Grand Canyon National Park, Arizona.

Moffitt, Steven A., Linda R. Moffitt, Amy Horn-Wilson, and Melissa R. Schroeder
1998 The Mather Point Orientation Center Project Supplemental Mitigation Plan. Including the Results of 1997 Test Investigations at AZ B:16:212, 278, 436, 437, and 479. Copy on file, Science Center, Grand Canyon National Park, Arizona.

Moffitt, Kathleen, Sandra Rayl, and Michael Metcalf
1978 *Archaeological Investigations along the Navajo McCullough Transmission Line, Southern Utah and Northern Arizona*. Museum of Northern Arizona Research Report No. 10. Northern Arizona Society of Science and Art, Flagstaff.

Nations, Dale and Edmund Stump
1981 *Geology of Arizona*. Kendall/Hunt Publishing Company, Iowa.

Neal, Lynn A., Dennis Gilpin, Lilian Jones, and Jean H. Ballagh
2000 *Cultural Resources Data Synthesis within the Colorado River Corridor, Grand Canyon National Park and Glen Canyon National Recreation Area, Arizona*. SWCA Cultural Resources Report No. 98-85. SWCA Inc. Environmental Consultants, Flagstaff, Arizona.

Neff, Loy C.
2004 Survey Design for the Grand Canyon Partial Park-Wide Archaeological Inventory: 2003-2007. Copy on file, National Park Service, Grand Canyon National Park, Arizona.

O'Conner, Jim E., Lisa L. Ely, Ellen E. Wohl, Lawrence E. Stevens, Theodore S. Melis, Vishaws S. Kale, and Victor R. Baker
1994 A 4500-Year Long Record of Large Floods on the Colorado River in the Grand Canyon, Arizona. *Journal of Geology* 102:1-9.

Parry, William J. and Robert L. Kelly
1987 Expedient Core Technology and Sedentism. In *The Organization of Core Technology*, edited by J.K. Johnson and C.A. Morrow, pp. 285-304. Westview Press, Boulder Colorado.

Pilles, Peter J., Jr.
1973 *Final Report for an Assessment and Evaluation of the Cultural Resources of Grand Canyon Village.* Archaeological Clearance Investigations, USDI National Park Service, Grand Canyon, Arizona. Museum of Northern Arizona, Flagstaff.

Powell, Shirley and Francis E. Smiley (editors)
2002 *Prehistoric Culture Change on the Colorado Plateau: Ten Thousand Years on Black Mesa*. University of Arizona Press, Tucson.

Robins, Michael R.
2002 *A Cultural Resources Survey of Segment 3b of the Navajo Transmission Line for the Dine Power Authority*. Navajo Nation Archaeology Department Report No. 02-002. Manuscript on file at Navajo Nation Archaeology Department, Window Rock, Arizona.

Samples, Terry L.
1989 A Preliminary Analysis of Deadmans Gray in the Sitgreaves Mountain Area, Kaibab National Forest. Copy on file, Kaibab National Forest, Williams, Arizona.

1992 Cohonina Archaeology: The View from Sitgreaves Mountain. Unpublished Master's thesis, Department of Anthropology, Northern Arizona University, Flagstaff.

Samples, Terry L., John A. Hanson, and David Wilcox
1991 Cohonina Archaeology: Past and Present. Paper presented at the 1990 Society for American Archaeology Meeting, Las Vegas, Nevada.

Sauer, Jonathan D.
1993 *Historical Geography of Crop Plants: A Select Roster*. CRC Press, Boca Raton, Florida.

Schaafsma, Polly
1990 Shaman's Gallery: A Grand Canyon Rock Art Site. *Kiva* 55:213-234.

Schroeder, Melissa R.
1996 An Archaeological Assessment for Pinyon Park Housing Project, Grand Canyon National Park, Contract 143C. Copy on file, Cultural Resource Management, National Park Service, Grand Canyon National Park, Arizona.

1997 *Archaeological Test Excavations and Mitigation Plan for the Mather Point Orientation Center Project, Grand Canyon National Park, Arizona*. Prepared for the National Park Service, Denver Service Center Environmental Compliance Team. Copy on file at the National Park Service, Grand Canyon National Park.

1998 The Archaic at the Grand Canyon: A View from the Rim. Paper presented at the 1997 Pecos Conference, Chaco Culture NHP, NM. Copy on file, National Park Service, Grand Canyon National Park, Arizona.

Schroedl, Alan R.
1977 The Grand Canyon Figurine Complex. *American Antiquity* 42(2):255-265.

1988 *Cultural Resource Investigations on the Kaibab Plateau, Northern Arizona: The Highway 67 Data Recovery Project*. P-III Associates, Salt Lake City. Submitted to the West Region Interagency Archeological Services Branch, USDI National Park Service, San Francisco.

Schwartz, Douglas W.
1966 A Historical Analysis and Synthesis of Grand Canyon Archaeology. *American Antiquity* 31:469-484.

1991 *On the Edge of Splendor: Exploring Grand Canyon's Human Past*. School of American Research, Santa Fe.

Schwartz, Douglas W., Richard C. Chapman, and Jane Kepp
1980 *Archaeology of Grand Canyon: Unkar Delta*. School of American Research, Santa Fe, New Mexico.

Schwartz, Douglas W., Jane Kepp, and Richard C. Chapman
1981 *Archaeology of Grand Canyon: Walhalla Plateau*. School of American Research, Santa Fe, New Mexico.

Schwartz, Douglas W., Arthur L. Lange, and Raymond DeSaussure
1958 Split-Twig Figurines in the Grand Canyon. *American Antiquity* 23:264-274.

Schwartz, Douglas W., Michael P. Marshall, and Jane Kepp
1979 *Archaeology of Grand Canyon: The Bright Angel Site*. School of American Research, Santa Fe, New Mexico.

Sellers, William D. and Richard H. Hill (editors)
1974 *Arizona Climate: 1931-1972*. The University of Arizona Press, Tucson.

Simonis, Donald
2001 Immaculate Conceptions: Problems with Archaeological Conceptions Concerning the Pai and Cohonina. Paper presented at the 66th Annual Meeting of the Society for American Archaeology, New Orleans.

Slaughter, Mark C., Lee Fratt, Kirk Anderson, and Richard V.N. Ahlstrom
1992 *Making and Using Stone Artifacts: A Context for Evaluating Lithic Sites in Arizona*. SWCA Inc., Environmental Consultants, Tucson. Submitted to Arizona State Parks, State Historic Preservation Office, Phoenix, Arizona.

Smiley, Francis E.
1985 The Chronometrics of Early Agricultural Sites in Northeastern Arizona: Approaches to the Interpretation of Radiocarbon Dates. Ph.D. dissertation, Department of Anthropology, University of Michigan. University Microfilms, Ann Arbor.

1994 The Agricultural Transition in the Northern Southwest: Patterns in the Current Chronometric Data. *Kiva* 60:165-189.

2002 The First Black Mesa Farmers: The White Dog and Lolomai Phases. In *Prehistoric Culture Change on the Colorado Plateau: Ten Thousand Years on Black Mesa*, edited by Shirley Powell and Francis E. Smiley, pp. 37-65. University of Arizona Press, Tucson.

Southwest Environmental Information Network (SEINet)
2008 Herbarium Database. Electronic document, http://seinet.asu.edu/collections/selection.jsp, accessed Oct. 1, 2008.

Sullivan III, Alan P.
1986 *Prehistory of the Upper Basin, Coconino County, Arizona*. Archaeological Series No. 167. Cultural Resource Management Division, Arizona State Museum, University of Arizona, Tucson.

1992 Pinyon Nuts and Other Wild Resources in Western Anasazi Subsistence Economies. *Research in Economic Anthropology Supplement* 6:195-239.

Sullivan III, Alan P., Philip B. Mink II, and Patrick M. Uphus
2002 From John W. Powell to Robert C. Euler: Testing Models of Grand Canyon Prehistoric Puebloan Settlement History. In *Culture and Environment in the American Southwest: Essays in Honor of Robert C. Euler*, edited by David A. Phillips, Jr. and John A. Ware, pp. 49-68. Anthropological Research Paper No. 8, SWCA, Phoenix.

Tucker, Gordon C., Jr.
1982 *Results of Archaeological Excavations in Washington County, Utah*. Manuscript on file at Nickens and Associates, Montrose, Colorado.

Walker, James B.
1974 *An Overview of Grand Canyon Prehistory: Final Report*. On file, Study Collections, Grand Canyon National Park, Arizona, and Museum of Northern Arizona, Flagstaff.

Walling, Barbara A., Richard A. Thompson, Gardiner F. Dalley, Dennis G. Weder, Kathleen M. Heath, and La Mar W. Lindsay
1986 *Excavations at Quail Creek*. Cultural Resources Series No. 20, Bureau of Land Management, Utah, Salt Lake City.

Weaver, Susan
2006 *Archaeological Treatment Plan for Site AZ B:16:1125, Grand Canyon National Park, Coconino County, Arizona*. Copy on file at National Park Service, Grand Canyon National Park.

Weaver, Susan and Amy Horn
2005 *Archaeological Treatment Plan for Two Sites Affected by the Construction/Repair/Rehabilitation of Restrooms Parkwide, Grand Canyon National Park, Coconino County, Arizona*. Copy on file at National Park Service, Grand Canyon National Park.

Wells, Susan J.
1991 *The Shivwits Plateau Survey: Archaeology at Lake Mead National Recreation Area*. Publications in Anthropology 56. Western Archaeological and Conservation Center, USDI National Park Service, Tucson, Arizona.

West, George A.
1925 Cliff Dwellings and Pueblos in the Grand Canyon, Arizona. *Yearbook of the Public Museum of the City of Milwaukee* 3:74-96.

Westfall, Deborah A., William E. Davis, and Eric Blinman
1987 *Green Spring: An Anasazi and Southern Paiute Encampment in the St. George Basin of Utah*. Cultural Resource Series No. 21. Bureau of Land Management, Utah State Office, Salt Lake City.

Wheat, Joe Ben and Pat Wheat
1954 A Pueblo I Site at Grand Canyon. *American Antiquity* 19:396-403.

Wheeler, S.M.
1939 Split-Twig Figurines. *Masterkey* 13(1):42-45.

1949 More about Split-Twig Figurines. *Masterkey* 23:153-158.

Yeats, Michael
1998 *1997 Data Recovery at Five Sites in the Grand Canyon*. Hopi Tribe, Hopi Cultural Preservation Office, Kykotsmovi, Arizona. Submitted to the USDI Bureau of Reclamation, Salt Lake City, Utah, and the U.S. Geological Survey Grand Canyon Monitoring and Research Center, Flagstaff, Arizona.

APPENDIX A

General Material Classification 1 = Animal, 2 = Composite (Ceramic, Daub, etc.), 3 = Human remains 4 = Mineral (lithics), 5 = Unidentified Material, 6 = Vegetal

Specimen Number 1 = Antler, 2 =Bone, 3 = Feather, 4 = Shell, 5 = Other Animal Materials, 6 = Artifactual (Human Remains Only), 7 = Ceramic, 8 =Clay, 9 = Glass, 10 = Metal, 11= Soil, 12 = Stone, 13 = Other Mineral Materials, 14 = Unidentified (Unidentified Material Only), 15 = Fibers, 16 = Wood, 17 Other Plant Materials, 18 = Pollen, 19 = Flotation, 20 = C-14, 21 = Dendro., 22 = Daub

Context Type 1 = Surface, 2 = Midden, 3 = Erosional Fill, 4 = Deliberate Fill, 5 = *In Situ* Feat. Fill, 6 = Wall/Roof Fall, 7 =In Situ Architectural Artifact, 8 = Subfloor, 9 =Floor Fill, 10 = Floor, 11 = Extramural Surface, 12 = Cultural Stratum, 13 = Non-Cultural Stratum, 14 = Burial, 20 = Other/Unknown (describe in comments), 21 = Indeterminate Feature Fill, 30 = Rodent/Root; 31 = Disturbance (Previous Excavation)

APPENDIX B

PALEOETHNOBOTANICAL ANALYSIS FROM AZ B:16:0134, THREE MILE REST HOUSE SITE, GRAND CANYON NATIONAL PARK, ARIZONA

Elizabeth R. Hickey
Laboratory of Paleoethnobotany
Northern Arizona University

Report Submitted to:
L. Theodore Neff, Ph.D.
Archaeology Projects Principal Investigator
Museum of Northern Arizona
3101 North Fort Valley Road
Flagstaff, AZ 86001

October 1, 2008

INTRODUCTION

In July 2008 the Laboratory of Paleoethnobotany at Northern Arizona University (NAU) was contracted by the Museum of Northern Arizona (MNA) in Flagstaff for the purpose of conducting paleoethnobotanical analysis on material recovered from site AZ B:16:0134 (Three Mile Rest House Site). The prehistoric roasting pit, located along the Bright Angel Trail in Grand Canyon National Park at an elevation of 1476 m (4844 ft), was excavated in preparation for construction of new toilet facilities in the area (L. Theodore "Ted" Neff and Jim H. Collette, personal communication 2008). Two research objectives were addressed through the analysis of the archaeological plant remains: 1) to determine what plants were used at the site, and 2) to identify appropriate plant remains for accelerated mass spectrometry (AMS) analysis. Fourteen soil samples from seven distinct proveniences were analyzed.

Analysis of the archaeobotanical remains were completed in September 2008. The following report describes and interprets the data produced. The first section provides an overview of the methods used to collect, identify, and analyze the archaeobotanical data. Included in this section is a summary of field, laboratory, and analytical procedures. The next section offers an analysis and summary of flotation data, ending with the research conclusions.

All flotation, identification, and analysis of the paleoethnobotanical samples were conducted at the Laboratory of Paleoethnobotany, Northern Arizona University, Flagstaff, Arizona.

METHODS

Field Procedures and Sampling Strategy

The paleoethnobotanical field sampling strategy consisted of collecting soil samples for water flotation from thermal features identified in the field as possible sources for botanical remains. The sampling strategy resulted in the collection of 14 soil samples from seven distinct proveniences (two soil samples were taken from each provenience) for a total volume of 33.5 liters. Soil samples from the same provenience were floated and analyzed together for a total of seven flotation samples. The samples were recovered from two thermal features (Feature 1 and Feature 3) at the site. Feature 1 consisted of the remains of a 12 m (39 ft) diameter roasting pit that had been severely damaged by the construction of a modern borrow pit. Five soil samples from Feature 1 were collected at arbitrary levels within a column of excavated roasting pit fill and from within units exhibiting high concentrations of charcoal. Feature 3 consisted of a smaller thermal feature discovered underneath the main roasting pit. Feature 3 was also impacted by the modern borrow pit but to a lesser extent. The feature was split into two halves (north and south) and soil samples collected from each (L. Theodore "Ted" Neff and Jim H. Collette, personal communication 2008).

Laboratory Procedures

Flotation

The soil samples were processed with a modified Flote-Tech machine-assisted flotation system (Dausman 1989). The Flote-Tech system contains two 50-gallon water tanks, a flotation tank and a water reservoir, through which water continuously recycles though filters. The system uses air supplied by aeration pipes in the flotation tank to

assist with flotation. Other components of the system include a 3/4 horsepower water pump, as well as four removable components: a main box insert with a 0.5 mm screen bottom, a light/heavy fraction lattice tray, a solid work tray, and a baffle. The procedure for using the Flote-Tech system is as follows:

1. The sample bag is opened and the contents spread out and allowed to dry.

2. The provenience data, soil volume, flotation personnel, and processing time are entered in the Flotation Processing Log.

3. Both the flotation and water reservoir tanks are filled with water. Each tank requires 50 gallons of water. When full the water level in the flotation tank just covers the aeration pipes, while in the reservoir tank the appropriate water level is two inches below the light/heavy fraction tray brackets.

4. Once the tanks are full, the main box insert is placed on brackets in the flotation tank and secured. In this position the main box is situated directly over the aeration pipes.

5. A light fraction cloth made of 0.3 mm nylon is attached to the light fraction lattice tray which is placed on the brackets in the reservoir tank.

6. The water pump is turned on which forces water up through the main box insert and over a sluiceway into the light fraction lattice tray. Once this occurs, the soil sample is poured slowly into the main box insert.

7. Water flow and aeration, which are adjustable, agitate the soil causing the buoyant botanical material to rise to the surface and be carried over the sluiceway onto the lattice tray. Small, non-buoyant material and soil pass through the main box insert and into the flotation tank. Larger material, such as artifacts and soil particles larger than 0.5 mm, remain in the main box.

8. When no more botanical material is observed passing over the sluiceway, the baffle is inserted to increase the rate of water flow along the bottom of the box. This encourages the movement of dense, water saturated botanical material under the baffle and over the sluiceway.

9. Once all the botanical material is recovered the water pump is turned off and the light fraction cloth is gathered, tagged, and hung to dry.

10. A new 0.3 mm nylon cloth is attached to the lattice tray to capture the heavy fraction. The main box insert is removed from the flotation tank, turned upside down on the work tray and all the remaining material is sprayed out and gathered into the heavy fraction cloth, tagged, and hung to dry.

11. Following each soil sample, an attached hand-operated diaphragm pump is used to remove sludge from the bottom of the flotation tank. More water is added to the system if necessary.

12. The procedure is repeated until all samples have been processed.

Use of the Flote-Tech system for processing of soil samples ensures a high recovery rate of botanical materials and a minimal amount of cross-contamination (Hunter and Gassner 1998). To assess the efficiency of the system, blind poppy-seed tests are conducted during flotation sessions. These tests consist of adding 50 poppy seeds (*Papaver somniferum*) to an unknown, unprocessed sample. One test was conducted on the samples (LF#7) in this study and resulted in 88 percent recovery rate.

Sample Sorting

Flotation samples were hand sorted to separate the recovered archaeobotanical material from non-botanical residuals. Heavy fractions were sieved through a 2 mm geological screen. The >2 mm split was spread out and examined with the naked eye to remove any charred botanical material, bone, lithics, or other artifacts. Any recovered charcoal was added to the light fraction of the sample and the artifacts were bagged to be returned to Grand Canyon Project personnel.

The light fraction portions of the samples were completely sorted using a binocular microscope. The samples were first divided into four splits by sieving them through a series of three nested geological screens, creating >2 mm, >1 mm, and >0.5 mm splits. For the >2 mm split all carbonized material is sorted into categories including wood, nutshell, rind, seeds, etc., using a 10x magnification. All material types except seeds were counted and weighed. All carbonized material, except wood, was removed from the >1 mm and >0.5 mm splits and sorted into botanical categories using 10x to 70x magnification. Similar to the >2 mm split, all material types except seeds were counted and weighed. Seeds were counted only and all material types were placed in plastic vials. Material <0.5 mm was recovered in the catch pan of the geological screens and considered too fragmented and small to identify and was not analyzed.

Identification of Botanical Remains

Identification of all carbonized plant material was preformed using a one-to-one comparison of unknown specimens and known modern specimens in the comparative collection housed at the NAU Laboratory of Paleoethnobotany. Martin and Barkley's (1961) illustrated seed guide also aided in identification of appropriate material. Plant remains were identified to the species level when possible. Other remains could only be identified to the genus and family level. When a specimen could not be identified to any of these taxonomic levels it was placed in the unidentifiable category.

Biases in Macrobotanical Remains

Flotation data has distinct characteristics which dictate and limit how data may be quantitatively analyzed. Due to the climate of the region and the open nature of the Three Mile Rest House site only carbonized plant remains would be expected to preserve through time. Floral material that was not carbonized when intentionally burned as fuel

or garbage, or accidentally when roasted, usually does not preserve well. While carbonized remains are unaffected by chemical forces they are not impervious to mechanical processes such as frost heave, erosion and soil slumping, or dry weather cracking. In addition, some carbonized macrobotanical remains, such as nutshell, preserve better than other plant remains like small, fragile seeds which often deteriorate despite carbonization.

Biases, therefore, exist due to differential carbonization and preservation of material. Not all plants used by prehistoric peoples were predisposed to charring due to the variety of techniques employed to process food. Some foods were eaten raw and never exposed to fire. Still other plant remains, such as roots and tubers, are so minute and small they do not preserve well even when carbonized. Combined, these biases result in some macrobotanical remains appearing absent or under-represented in the archaeological record. The absence of a particular botanical species, therefore, does not necessarily indicate a lack of use or dietary importance (Hunter and Wright 1998:9).

Another potential source of biases in the paleoethnobotanical record comes from the possible introduction of modern floral materials into archaeological deposits. Such material may be introduced through animal burrowing and other mechanical processes such as the soil turbations mentioned above. However, most modern material is uncarbonized and can be easily separated from archaeological material. For this reason, only carbonized remains are considered contemporaneous with cultural features and deposits in this report.

FLOTATION ANALYSIS FROM THE THREE MILE REST HOUSE SITE

Archaeobotanical data for the Three Mile Rest House Site came from seven flotation samples collected from various proveniences within the site. A total of 13.9916 g of wood charcoal was recovered from the samples. In addition, a significant amount of *Agave* sp. leaf fragments (0.9487 g), and two *Juniperus* sp. seed fragments were recovered. The data generated by analysis of the samples from the Three Mile Rest House Site will be further discussed in the following sections.

Wood Data

The flotation samples were analyzed for wood charcoal in the >2 mm splits. Wood was present in all seven macrobotanical samples. Overall, 2336 fragments of carbonized wood (13.9916 g) were identified in the samples (see Table 1) accounting for 91% of the total carbonized weight. The presence of wood in the samples is attributed to fuel.

Agave Data

Agavaceae spp. fibrous leaf fragments were also present in all of the samples (see Table 1). In total, the samples yielded 2777 fragments (0.9487 g), the majority coming from LF #2 (2222 fragments, 7554 g) which was collected from smaller thermal feature (Feature 3). The genera *Yucca* and *Agave* are both in the family Agavaceae and exhibit similar leaf structures. When yucca and agave leaves become charred individual species

are often impossible to discern. However, considering the amount and presence percentage of the fibers in the analyzed samples it is assumed that the Agavaceae spp. plant was intentionally cooked in the feature. The hearts and leaves of agave plants are often processed in this manner while the utilization of yucca species as a food source focuses primarily on the seed pods and flowers (Dunmire and Tierney 1995:125; Ebeling 1986:468-475). Therefore, the following discussion will focus only on species of the genus *Agave*.

Thirty-six species of agave grow between California and Florida (USDA 2008). However, only three species – *Agave parryi* Engelm. (Parry's agave), *A .utahensis* Engelm. (Utah agave), and *A. phillipsiana* W.C. Hodgson (Grand Canyon century plant) – grow in the vicinity of the Three Mile Rest House Site (McDougall 1973:105; USDA 2008). A search of the Southwest Environmental Information Network online herbarium database (SEINet 2008) revealed specimens of *A. utahensis* and *A. phillipsiana* collected at various locations in the Grand Canyon. In addition, *A. uthahensis* was observed in the vicinity of the site by Jim Hasbargen, a National Park Service archaeologist associated with the project (L. Theodore "Ted" Neff and Jim H. Collette, personal communication 2008). Although no herbarium specimens of *A. parryi* were listed as having Grand Canyon origins, examples from elsewhere in Coconino County growing in environments and elevations consistent with the Three Mile Rest House Site have been collected (SEINet 2008).

Species of agave produce basal rosettes of thick fibrous leaves. Although utilized extensively by prehistoric peoples, modern populations of *A. parryi* and *A. utahensis* are now considered threatened and endangered in the wild (USDA 2008). Minnis and Plog (1976) suggest a correlation between the presence of *A. parryi* in the western part of the Apache-Sitgreaves National Forest and the locations of archaeology sites. It is known that pre-Columbian populations in Mexico cultivated agave plants for a number of purposes, and researchers now suggest several species of agave were cultivated by the Hohokam in southern Arizona as well (Fish et al. 1992; Sauer 1993:176). Interestingly, *Agave phillipsiana* is only known to exist in four locations within the Grand Canyon, all of which occur along terraces near permanent waterways. Three of these locations are in the vicinity of prehistoric agricultural features or habitation sites, indicating that modern populations of *A. phillipsiana* also exhibit an association with the landscape of prehistoric peoples and may represent another agave cultivar (Flora of North America 2008; Hodgson 2001:410-413).

Most of the agave leaf fragments recovered from the Three Mile Rest House Site consisted of individual rod-like fibers. However, some fragments exhibited a more compound structure with several fibers attached together with connective tissue. While the heart of the plant was the primary focus of agave processing for food purposes, leaf fragments and fibers are commonly found in prehistoric agave roaster macrobotanical samples (Fish et al. 1992:83). Use of agave and processing techniques are well documented within the ethnographic record (Castetter et al. 1936; Ebeling 1986:468-475; Sauer 1993:175-178 to name only a few) and an extensive review is not necessary here. However, a brief explanation of how agave leaf fragments can enter the archaeological record is useful.

During harvesting, the leaves of the agave rosette were cut off leaving only the heart and leaf bases. Removal of the leaves resulted in a product that looked much like a

pineapple and in some regions is still called a *piña* (the Spanish word for pineapple). Layers of hearts were placed in roasting pits lined with fire-heated rocks for up to three days. Although processing the agave hearts was the main reason for the roasting events, the leaves removed during harvesting also played a role. In some instances they were intentionally cooked along with the hearts. The leaves were then dried and could be reconstituted later with water. The flesh was consumed in a similar fashion to artichokes whereby the inner flesh of the leaves were scraped off and eaten. The cooked leaves could also be chewed to expose the inner flesh and the fibrous quid discharged after the edible portion was swallowed. Additionally, agave leaves, along with grass (Poaceae spp.) and beargrass (*Nolina* sp. Michx.), were placed in between the layers of hearts during roasting (Balls 1962:18; Ebeling 1986:471). Either method could have contributed charred leaf fragments to the samples.

Seed Data

Two *Juniperus* sp. seed fragment were recovered from LF #4 and LF#6. A total of 28 species of *Juniperus* grow in North America from Texas to Canada (USDA 2008). According to McDougall (1973:4-5) seven of these species exist in northern Arizona. However, only four species grow in conditions consistent with the environment and elevation at the Three MileRest House Site. These species include *J. deppeana* Steud. (alligator juniper), *J. monosperma* (Engelm) Sarg. (one-seed juniper), *J. osteosperma* (Torr.) Little (Utah Juniper), and *J. scopulorum* Sarg. (Rocky Mountain juniper). A search of the Arizona herbariums on SEINet (2008) revealed specimens of *J. scopulorum*, *J. osteosperma*, and *J. monosperma* collected in the Grand Canyon. These species of Juniper are spreading or bushy shrubs that grow from 8 to 12 m (26-39 ft) high and are found between 914 and 2743 m (3000-9000 ft) in Arizona (McDougall 1973:5).

Species in the genera *Juniperus* produce seeds in berry-like cones. Although these berries served as a food source for many prehistoric peoples in the Southwest (Bowers and Wignall 1993:37; Dunmire and Tierney 1995:105-107; Ebeling 1986:114,463), the low frequency of Juniper seeds combined with the abundance of Agavaceae spp. fragments indicates that Juniper berries were not being processed at this site. Instead, the seeds most likely entered the archaeological record accidentally through a fuel source or during preparation of the roasting pit. Juniper is a hot burning fuel that does not produce the pitchy smoke of pinyon wood (Bowers and Wignall 1993:37; Ebeling 1986:114). The fuel is prized by the Zuni for cooking purposes in outdoor rock and mud ovens. Boughs are also used to clean ashes and coals out of the ovens when the desired temperature is achieved (Miller and Albert 1993:76). Either of these circumstances has the potential to introduce juniper seeds into a context where they would become charred.

Three unidentifiable seed fragments were found in LF#3 and LF#4. However, due to the fragmentary nature of the specimens, further identification was limited and the seeds are not included in the following discussion.

SUMMARY OF RESULTS AND RESEARCH CONCLUSIONS

Two research objectives were addressed through the analysis of the archaeological plant remains. The first was to determine what plants were used at the site. While only a few archaeological botanical remains were recovered from the samples, the specimens identified give a clear picture of how the site was used. The edible plants identified in the samples include agave and juniper species. However, the relative abundance of agave to juniper remains indicates that the site was used to roast agave and not to process juniper berries. The juniper seeds most likely appear in the samples because the species was used as fuel or during preparation of the pit for roasting.

The second objective was to identify plant remains for accelerated mass spectrometry (AMS) dating. Three samples were chosen by members of the Grand Canyon Project team and the author based on the ability to positively identify the plant remains and their location within the context of the site. The three samples that were chosen include an *Agave* sp. fragment from LF #2 and LF #7, and a *Juniperus* sp. seed fragment from LF #4. The results of the AMS dating will be discussed elsewhere in the report for the Three Mile Rest House Site.

Table 1. Macrobotanical Data

Taxa	Samples							Total
	FS #67 Feat. 3, N ½ N504.39-504.66 E501.71-502.29 4.5 liters LF #1	FS #68 Feat. 3, S ½ N504.39-504.66 E501.71-502.29 4.5 liters LF #2	FS #69 Feat. 1, Context 1, Unit 1 N505.11-506.37 E500.91-502.16 6.0 liters LF #3	FS #70 Feat. 1 N. wall of Unit D Lower sample N503.95-504.27 E507.42-507.75 4.0 liters LF #4	FS #71 Feat. 1, N. wall of Unit D Upper sample N503.95-504.27 E507.42-507.75 5.0 liters LF #5	FS #72 Trench 2 E. wall of Unit J Lower sample N506.44-504.71 E501.74-502.06 5.0 liters LF #6	FS #73 Trench 2 E. wall of Unit J Upper sample N506.44-504.71 E501.74-502.06 4.5 liters LF #7	
Wood (n =) Weight (g)	200 1.2091	1473 9.4225	191 1.0893	77 0.3408	56 0.2257	229 1.1155	110 0.5887	2336 13.9916
Agavaceae spp. leaf frag. (n =) Weight (g)	318 0.1261	2222 0.7554	88 0.0230	4 0.0008	6 0.0022	56 0.0117	83 0.0295	2777 0.9487
Juniperus sp. (n =)			1	1				2
Unidentifiable seeds (n =)		1		2				3
Herbaceous stems (n =) Weight (g)					2 0.0012	1 0.0015	1 0.0094	3 0.0121
Unidentifiable Weight (g)	7 0.0051		10 0.0298			4 0.0014	3 0.3698	24 0.4061

REFERENCES CITED

Balls, Edward K.
1962 *Early Uses of California Plants*. University of California Press, Berkeley, California.

Bowers, Janice Emily, and Brian Wignall
1993 *Shrubs and Trees of the Southwest Deserts*. Southwest Parks and Monuments Association, Tucson, Arizona.

Castetter, Edward F., Willis H. Bell, and Alvin R. Grove
1938 The Early Utilization and the Distribution of *Agave* in the American Southwest. *University of New Mexico Bulletin, Biology Series* 5(4), pp. 1-92.

Dausman, Raymond J.
1989 Multimodal Flotation. *Wisconsin Archaeologist* 70:362-264.

Dunmire, William W., and Gail D. Tierney
1995 *Wild Plants of the Pueblo Province*. Museum of New Mexico Press, Santa Fe.

Ebeling
1986 *Handbook of Indian Foods and Fibers of Arid America*. University of California Press, Berkeley, California.

Fish, Suzanne K., Paul R. Fish, and John H. Madsen
1992 Evidence of Large-scale Agave Cultivation in the Marana Community. In *The Marana Community in the Hohokam World*, edited by Suzanne K. Fish, Paul R. Fish, and John H. Madsen, pp. 73-87. Anthropological Papers of the University of Arizona Number 56. The University of Arizona Press, Tucson, Arizona.

Flora of North America Database
2008 Flora of North America @ efloras.org. Electronic Document, http://www.efloras.org. Accessed September-October 2008.

Hodgson, Wendy C.
1967 Taxonimic Novelties in American Agave (Agavaceae). *Novon* 11(4):410-416.

Hunter, Andrea A., and Brian R. Gassner
1998 Evaluation of the Flote-Tech Machine Assisted Flotation System. *American Antiquity* 63:143-156.

Hunter, Andrea A., and Karen A. Wright
1998 *Paleoethnobotanical Analysis of Sinagua Subsistence Strategies at Elden Pueblo*. Report submitted to the Coconino National Forest Service, Flagstaff, Arizona.

Miller, Ronald K., and Steven K. Albert
1993 Zuni Cultural Relationships to Pinon-Juniper Woodlands. *Rocky Mountain Fores and Range Experiment Station, Forest Service, U.S. Department of Agriculture* Oct. (236), pp. 74-78.

Minnis, Paul E., and Stephen E. Plog
1989 A Study of the Site Specific Distribution of *Agave parryi* in East Central Arizona. *The Kiva* 41(3-4):299-308.
McDougall, W.B.
1973 *Seed Plants of Northern Arizona*. Museum of Northern Arizona, Flagstaff, Arizona.
Martin, Alexander C., and William D. Barkley
1961 *Seed Identification Manual*. University of California Press, Berkeley.
Sauer, Jonathan D.
1993 *Historical Geography of Crop Plants: A Select Roster*. CRC Press, Boca Raton, Florida.
Southwest Environmental Information Network (SEINet)
2008 Herbarium Database. Electronic Document, http://seinet.asu.edu/seinet/collections/selection.jsp accessed Oct. 1, 2008.
USDA Plants Database
2008 The PLANTS Database. Electronic Document, http://plants.usda.gov. Accessed September-October 2008.

APPENDIX C

BETA

Consistent Accuracy . . .
. . . Delivered On-time

Beta Analytic Inc.
4985 SW 74 Court
Miami, Florida 33155 USA
Tel: 305 667 5167
Fax: 305 663 0964
Beta@radiocarbon.com
www.radiocarbon.com

Darden Hood
President

Ronald Hatfield
Christopher Patrick
Deputy Directors

September 29, 2008

Mr. L. Theodore Neff
Museum of Northern Arizona
3101 N. Fort Valley Road
Flagstaff, AZ 86011
USA

RE: Radiocarbon Dating Results For Samples GRCA74618a, 16134FS68LF2, 16134FS70LF4, 16134FS73LF7

Dear Ted:

Enclosed are the radiocarbon dating results for four samples recently sent to us. They each provided plenty of carbon for accurate measurements and all the analyses proceeded normally. As usual, the method of analysis is listed on the report with the results and calibration data is provided where applicable.

As always, no students or intern researchers who would necessarily be distracted with other obligations and priorities were used in the analyses. We analyzed them with the combined attention of our entire professional staff.

If you have specific questions about the analyses, please contact us. We are always available to answer your questions.

Our invoices are enclosed. Please, immediately give them to the appropriate officer for prompt payment or send VISA charge authorization. Thank you.

Sincerely,

Darden Hood

Digital signature on file

BETA ANALYTIC INC.
DR. M.A. TAMERS and MR. D.G. HOOD
4985 S.W. 74 COURT
MIAMI, FLORIDA, USA 33155
PH: 305-667-5167 FAX:305-663-0964
beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Mr. L. Theodore Neff

Report Date: 9/29/2008

Museum of Northern Arizona

Material Received: 9/11/2008

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 249005	330 +/- 40 BP	-23.2 o/oo	360 +/- 40 BP
SAMPLE : GRCA74618a			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (plant material): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal AD 1440 to 1640 (Cal BP 510 to 310)			
Beta - 249006	820 +/- 40 BP	-12.1 o/oo	1030 +/- 40 BP
SAMPLE : 16134FS68LF2			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal AD 900 to 920 (Cal BP 1050 to 1040) AND Cal AD 960 to 1040 (Cal BP 990 to 910)			
Beta - 249007	2530 +/- 40 BP	-21.5 o/oo	2590 +/- 40 BP
SAMPLE : 16134FS70LF4			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal BC 810 to 760 (Cal BP 2760 to 2710) AND Cal BC 680 to 670 (Cal BP 2630 to 2620)			
Beta - 249008	2900 +/- 40 BP	-9.0 o/oo	3160 +/- 40 BP
SAMPLE : 16134FS73LF7			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal BC 1500 to 1380 (Cal BP 3450 to 3330)			

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-23.2:lab. mult=1)

Laboratory number: **Beta-249005**

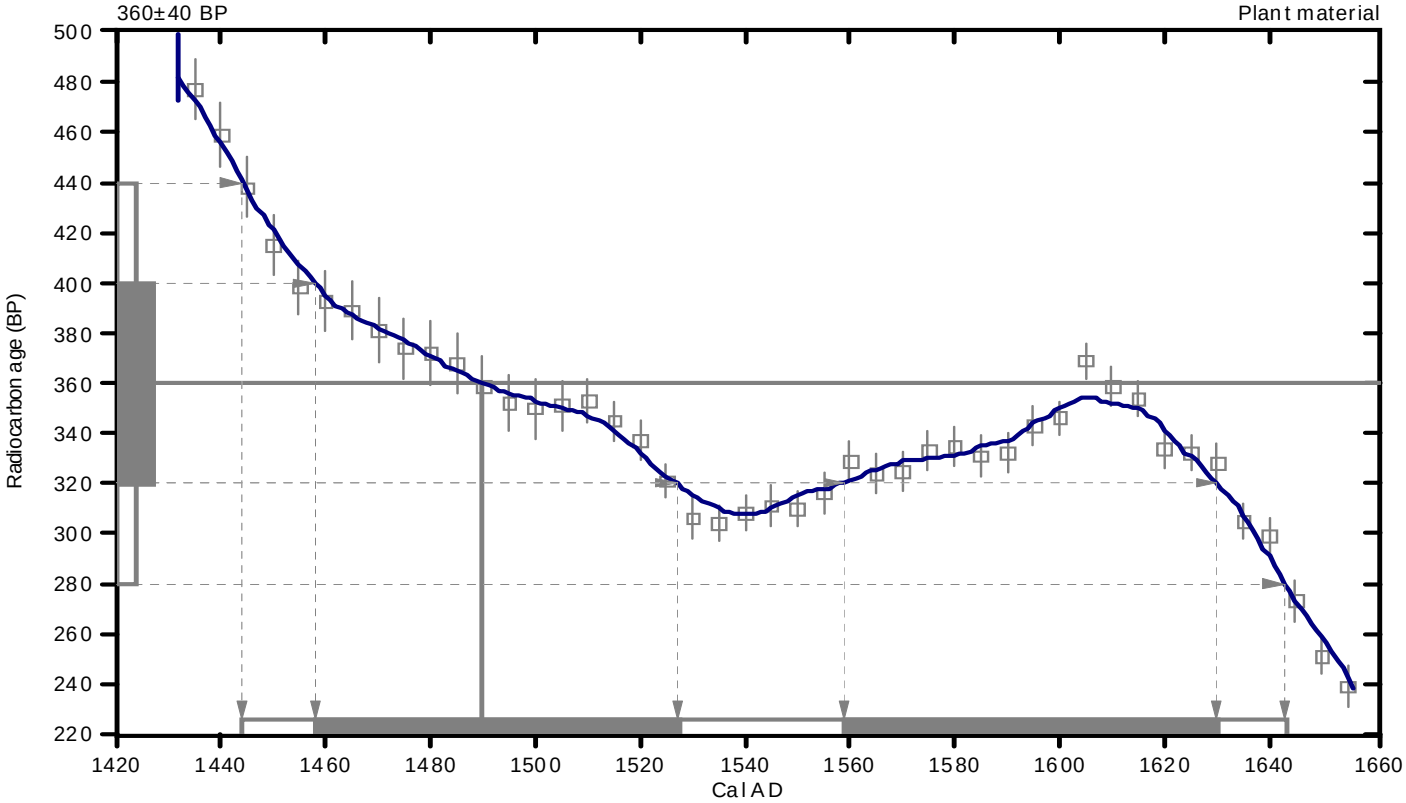
Conventional radiocarbon age: **360±40 BP**

2 Sigma calibrated result: (95% probability) **Cal AD 1440 to 1640 (Cal BP 510 to 310)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 1490 (Cal BP 460)

1 Sigma calibrated results: (68% probability) Cal AD 1460 to 1530 (Cal BP 490 to 420) and Cal AD 1560 to 1630 (Cal BP 390 to 320)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

Beta Analytic Radiocarbon Dating Laboratory

4985 S.W. 74th Court, Miami, Florida 33155 • Tel: (305)667-5167 • Fax: (305)663-0964 • E-Mail: beta@radiocarbon.com

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-12.1:lab. mult=1)

Laboratory number: **Beta-249006**

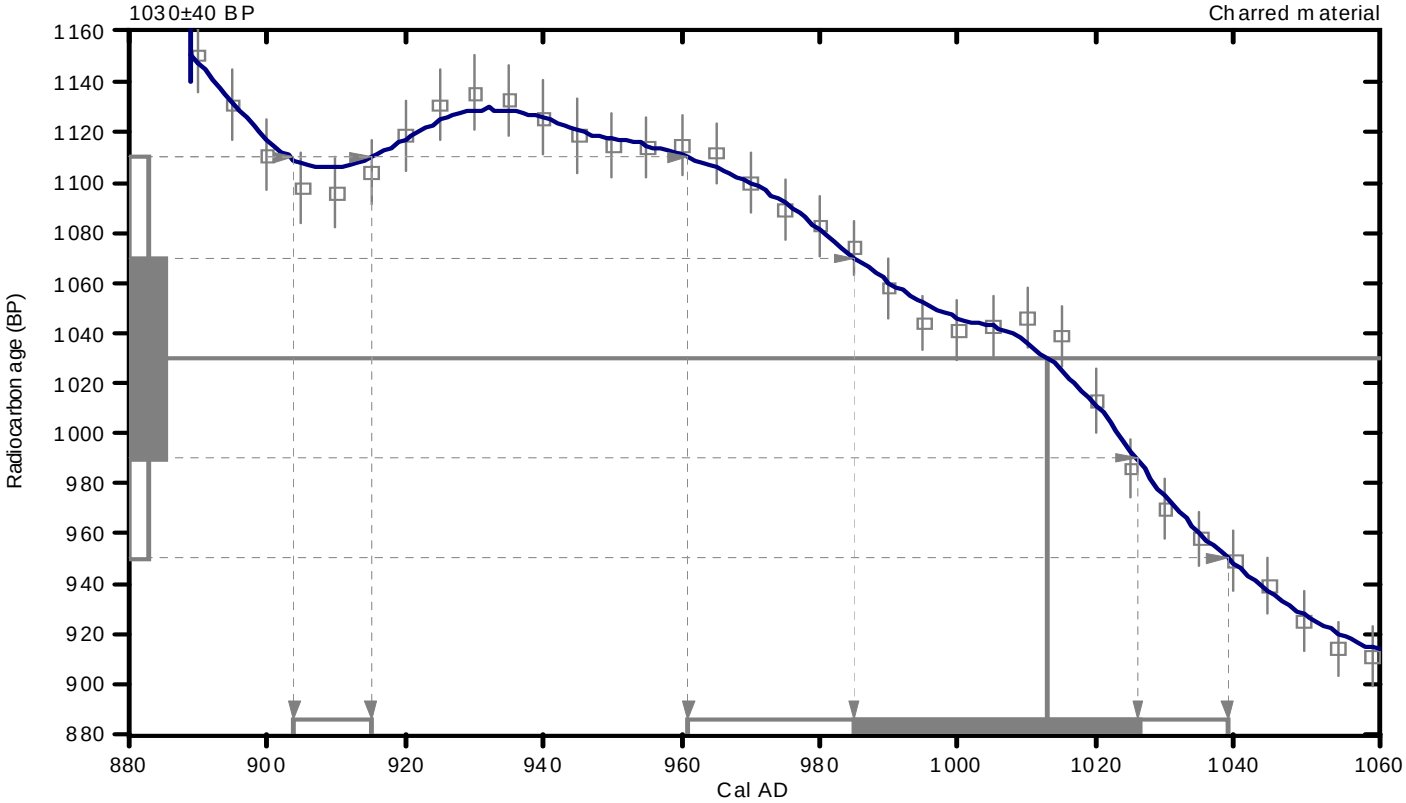
Conventional radiocarbon age: **1030±40 BP**

2 Sigma calibrated results: (95% probability) **Cal AD 900 to 920 (Cal BP 1050 to 1040) and Cal AD 960 to 1040 (Cal BP 990 to 910)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 1010 (Cal BP 940)

1 Sigma calibrated result: (68% probability) Cal AD 980 to 1030 (Cal BP 960 to 920)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

Beta Analytic Radiocarbon Dating Laboratory

4985 S.W. 74th Court, Miami, Florida 33155 • Tel: (305)667-5167 • Fax: (305)663-0964 • E-Mail: beta@radiocarbon.com

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-21.5:lab. mult=1)

Laboratory number: **Beta-249007**

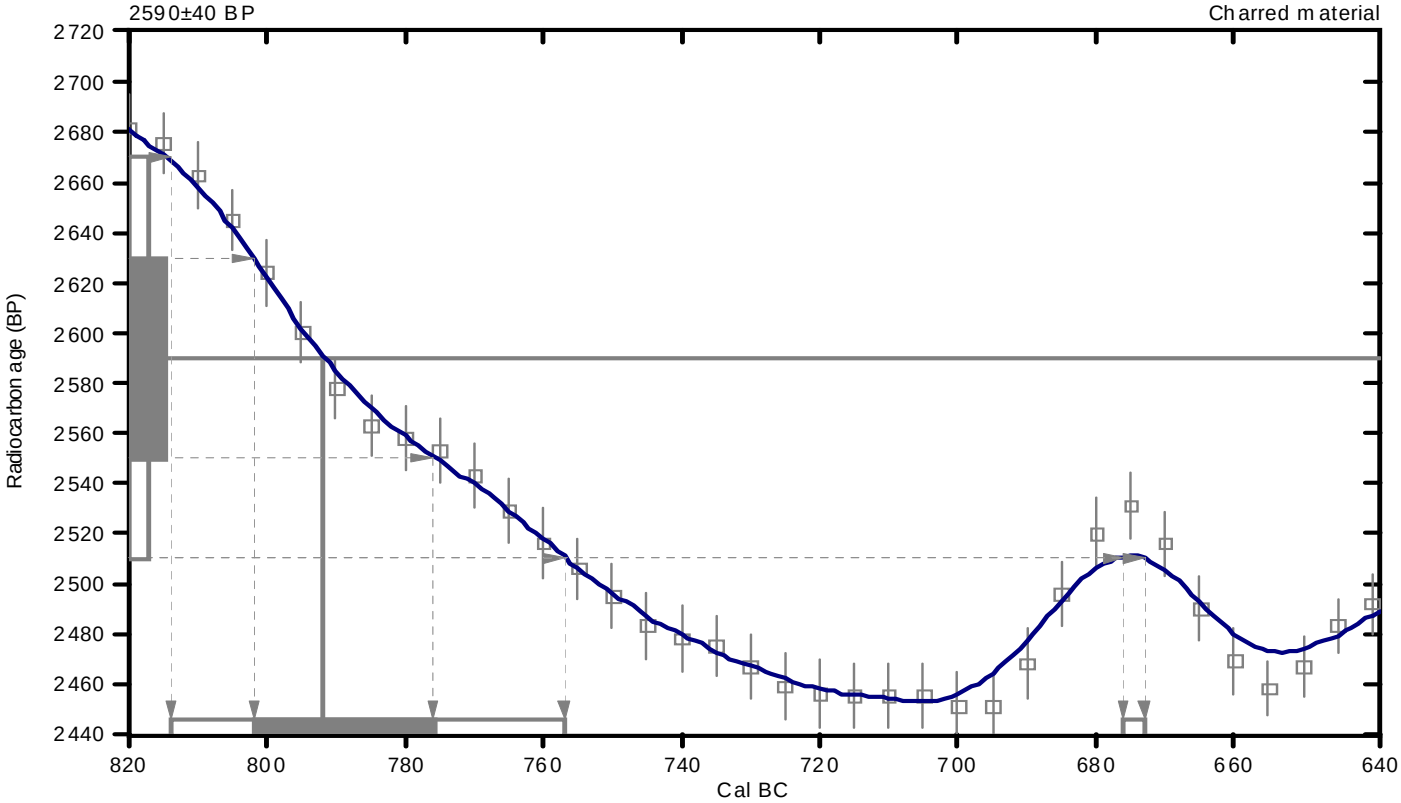
Conventional radiocarbon age: **2590±40 BP**

2 Sigma calibrated results: (95% probability) **Cal BC 810 to 760 (Cal BP 2760 to 2710) and Cal BC 680 to 670 (Cal BP 2630 to 2620)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 790 (Cal BP 2740)

1 Sigma calibrated result: (68% probability) Cal BC 800 to 780 (Cal BP 2750 to 2730)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

Beta Analytic Radiocarbon Dating Laboratory

4985 S.W. 74th Court, Miami, Florida 33155 • Tel: (305)667-5167 • Fax: (305)663-0964 • E-Mail: beta@radiocarbon.com

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-9:lab. mult=1)

Laboratory number: **Beta-249008**

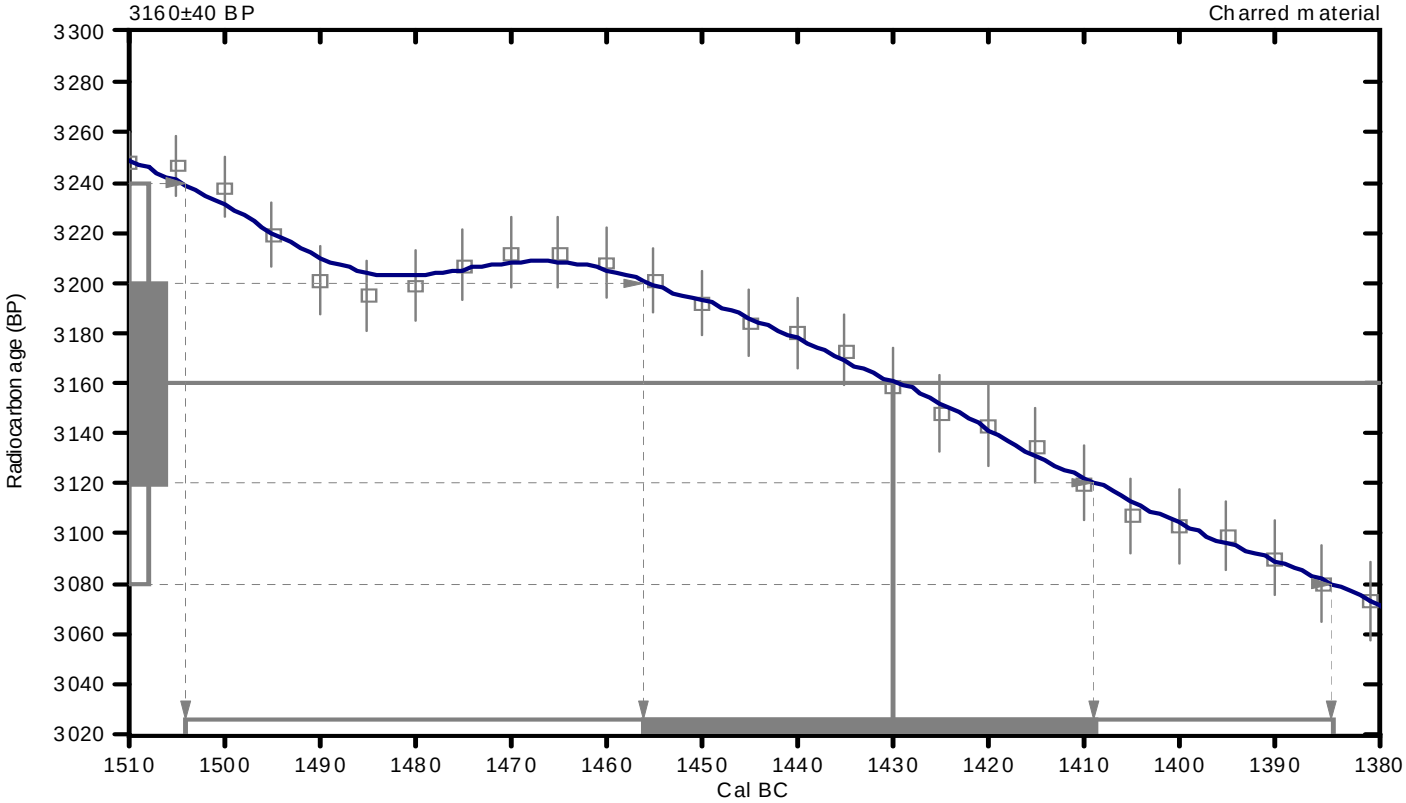
Conventional radiocarbon age: **3160±40 BP**

2 Sigma calibrated result: (95% probability) **Cal BC 1500 to 1380 (Cal BP 3450 to 3330)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 1430 (Cal BP 3380)

1 Sigma calibrated result: (68% probability) Cal BC 1460 to 1410 (Cal BP 3410 to 3360)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

Beta Analytic Radiocarbon Dating Laboratory

4985 S.W. 74th Court, Miami, Florida 33155 • Tel: (305)667-5167 • Fax: (305)663-0964 • E-Mail: beta@radiocarbon.com