THESIS

EXCAVATIONS AT THE GILLIGAN'S ISLAND SHELTERS (5FN1592), FORT CARSON MILITARY RESERVATION (FCMR), FREMONT COUNTY, COLORADO

VOLUME I-PRIMARY REPORT

Submitted by

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WE HEREBY RECOMMEND THAT THE THESIS PREPARED UNDER OUR SUPERVISION BY CODY M. ANDERSON ENTITLED EXCAVATIONS AT THE GILLIGAN'S ISLAND SHELTERS (5FN1592), FORT CARSON MILITARY RESERVATION (FCMR), FREMONT COUNTY, COLORADO BE ACCEPTED AS FULFILLING IN PART REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS.

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ABSTRACT OF THESIS

EXCAVATIONS AT THE GILLIGAN'S ISLAND SHELTERS (5FN1592),

FORT CARSON MILITARY RESERVATION (FCMR),

FREMONT COUNTY, COLORADO

This thesis examines the surface and subsurface archaeological work undertaken in 2002 at the Gilligan's Island site (5FN1592), located at the base of the Rocky Mountains on the Fort Carson Military Reservation, eastern Fremont County, Colorado. Permission was granted by Fort Carson to conduct an excavation at this site in order to determine its potential to produce significant subsurface occupational remains. Excavations focused on two connecting rock shelters at the base of a prominent cliff face. Four interconnecting grid units were positioned in a trench-like fashion through the central midline of each shelter proper. Deposition of excavated units ranges up to 1.3 meters in depth. These trenches exposed deeply stratified prehistoric materials including multiple intact features. The radiocarbon data (based on conventional uncalibrated dates) identified three prehistoric cultural components: Middle Archaic period (ca. 4240-3010 B.P.), Late Archaic period (ca. 2230-1880 B.P.), and Developmental period (ca. 1390-1070 B.P.). A historic component is also evident and is associated with probable looting activities in the shelters.

Excavation revealed that the integrity of the shelters is virtually intact, and thus the potential for significant interpretation is excellent. The multiple prehistoric occupations currently incorporate a comprehensive data set which includes analyses of artifacts, features, geomorphology, palyonology, flora, and fauna. The degree of recovered information allowed for four primary research themes to be identified and discussed. These themes include chronology, settlement and subsistence patterns, technology, and paleoclimate and geomorphology.

Analysis revealed that throughout the periodic ca. 4000 year prehistoric occupation of the shelters, utilization remained virtually homogeneous. There are few adaptations in subsistence and technology. Paleoclimatic conditions appear to have fluctuated from moist and dry conditions, but do not appear to have had an effect on shelter occupation.

Data recovered from the 2002 excavations at the Gilligan's Island shelters yielded information regarding prehistoric life ways of the Middle Archaic, Late Archaic, and Developmental periods. The site has produced data that contributes to archaeological research within the Arkansas River Basin and its surrounding regions.

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Investigations at the Gilligan's Island site were conducted under the terms set among Randy Korgel, Dr. Jeffery L. Eighmy, and myself. I wish to express thanks to Thomas Warren and the rest of the DECAM staff, especially that of the Cultural Resource Management, at Fort Carson for their support throughout the project.

A number of other great people have contributed throughout the project. Many are mentioned in the first chapter and I extend a whole hardened thanks to all of those who volunteered their time and energy. Michael McFaul owner of LaRamie Soils Service, Inc. helped immensely with geoarchaeological studies at the site. Special thanks are also expressed to Rose M. Hosmer who often acted as my rag-tag crew chief and contributed a significant amount of the summer to the fieldwork at the site. It was a great time.

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CHAPTER 1

INTRODUCTION

Project Description

The Gilligan's Island site (5FN1592) is located at the base of the Rocky Mountains in the southwestern portion of Fort Carson Military Reservation (FCMR) in Fremont County, Colorado (Figure 1). The site is oriented along the eastern side of a ridge that separates Salt Canyon to the west and an unnamed intermittent tributary of Red Creek to the east. The site consists of two connecting rock shelters with a large lithic artifact scatter. The rock shelters are at the base of a large cliff face that runs north/south and defines the eastern ridge, which overlooks the Red Creek drainage system, geologic folds, limestone mesas and the Western High Plains (Figure 2-4). The artifact scatter is located directly below the rock shelters, on a relatively flat bench that runs adjacent to the cliff face.

Gilligan's Island was originally recorded in the summer of 1998 by Fort Lewis College (FLC) during the cultural resource inventory of high- and medium-site sensitivity areas on the FCMR (Charles et al. 2000). Charles et al. (2000) determined that the site was significant based on the potential for intact subsurface deposits within the shelters and along the bench, and therefore might contribute important data in the context of the research themes defined in the FCMR's Cultural Resource Management Plan (Zier et al. 1997). The FLC archaeological crew noted the potential of the site with respect to the following research themes: chronology and cultural relationships, rock art, paleoclimates,

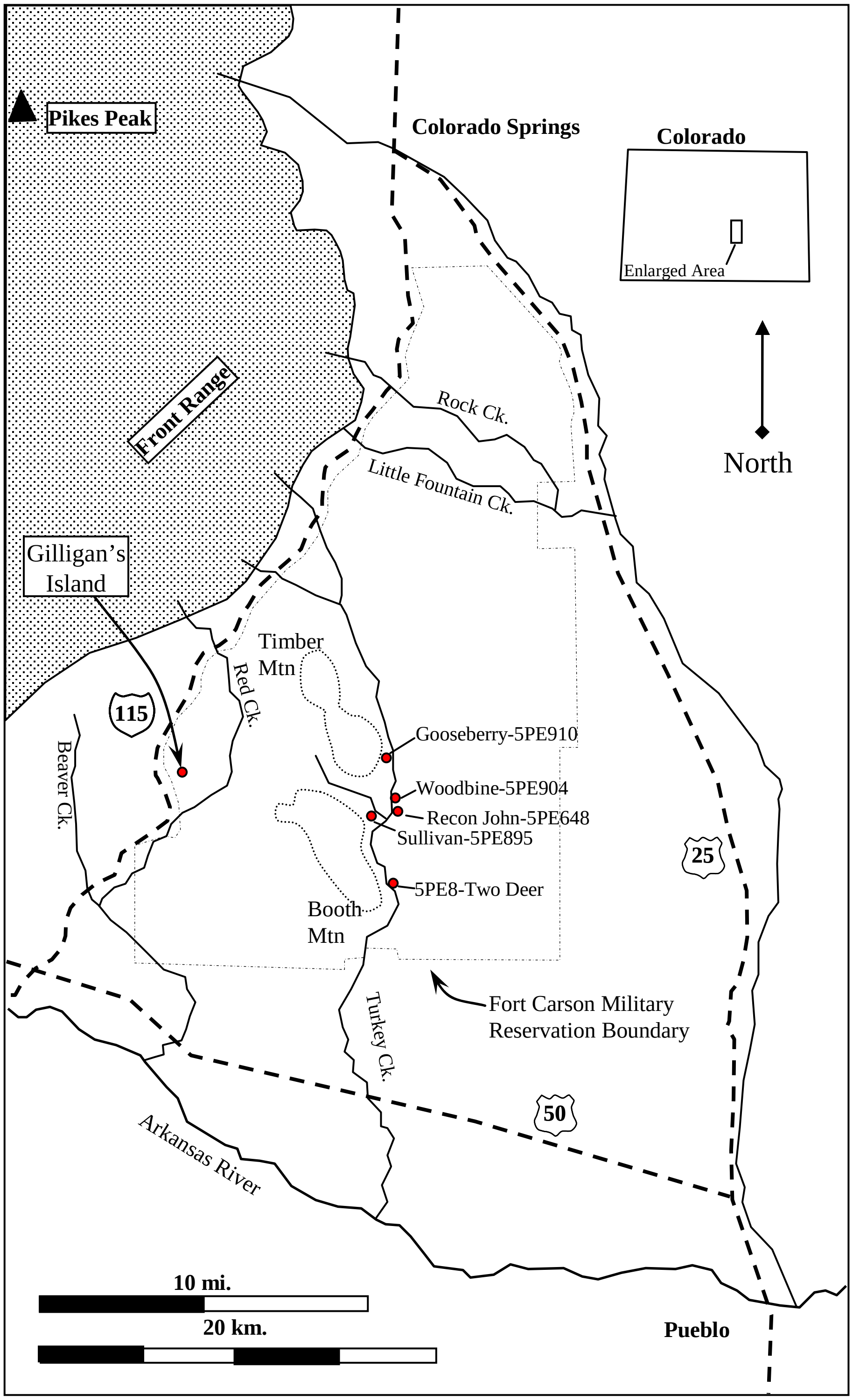

Figure 1. Map illustration location of the Gilligan's Island Shelter and other major interpretive shelters on Fort Carson.

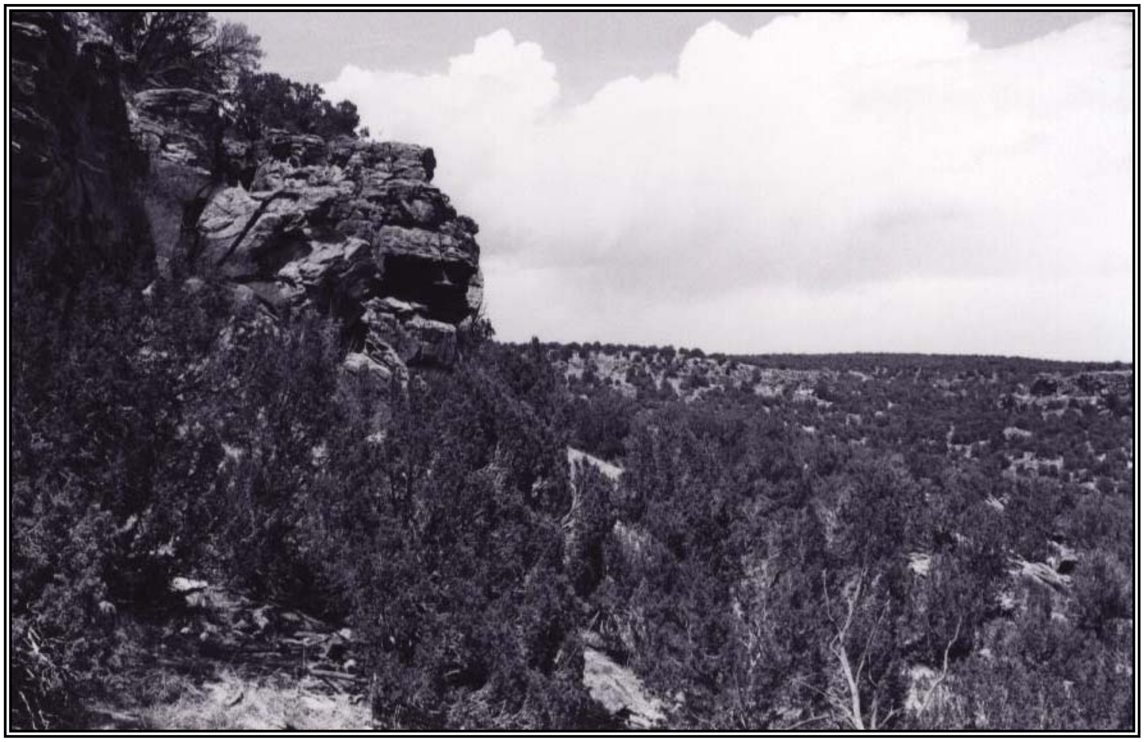

Figure 2. View from front of the Gilligan's Island Shelters looking north toward the head of an unnamed drainage of Red Creek.

Figure 3. View from front of the Gilligan's Island Shelters looking northeast. The bench of the site is in foreground, steep unnamed drainage is in mid-ground, geologic folds, including Booth Mountain are in background.

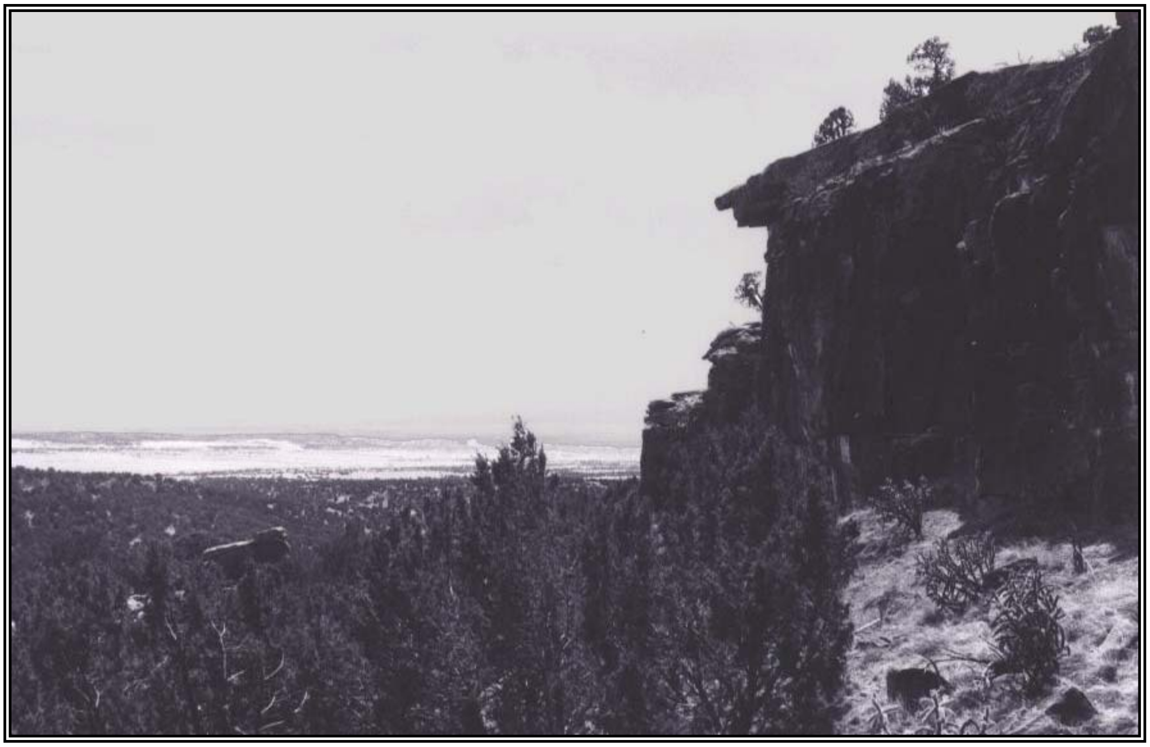

Figure 4. View from Shelter 1 looking south-southeast toward the limestone mesas and the Western High Plains.

settlement patterns, prehistoric economies, and horticulture (Charles et al. 2000:103). The interior of the shelters exhibited some evidence of disturbance from looting activities, and portions of the site were subject to erosion, which indicated that "subsurface excavations are necessary to determine the nature and extent of buried deposits" (Charles et al. 2000:103).

The excavation in 2002 focused on the two connecting rock. The author placed a single trench, one meter wide and four meters long, broken into four one-meter lengths, in each of the shelters. These trenches extended eastward from the interior of the shelters toward drip line. Eighty-three levels were excavated in arbitrary 10-centimeter increments, ranging to a depth of 1.37 meters below the present ground surface.

Project Management Data

The Gilligan's Island site was selected as a master's thesis project for several reasons. The location of the site is in the upper foothills of the FCMR and provides a unique opportunity to study prehistoric activities in a rock shelter setting. Many, if not all, of the rock shelters that have been professionally excavated in southeastern Colorado are located along drainages that have permanent or semi-permanent streams nearby (e.g. Recon John Shelter, Gooseberry Shelter, Wolf Spider Shelter, Two Deer Shelter Shelter, Sullivan Shelter and Woodbine Shelter). The location of the Gilligan's Island site with respect to water sources sets it apart from the previously mentioned sites. The nearest spring is over 1000 meters away in Salt Canyon and the landscape that separates the Gilligan's Island site from this water source is treacherous, consisting of several steep slopes and cliff escarpments.

The purpose of excavating these rock shelters that are farther away from water resources is to study prehistoric activities, paleoclimates, and geomorphology. The lack of water suggests that activities, during the prehistoric occupation, might have varied from those at the other rock shelters previously excavated in the Arkansas River Basin. Additionally, the variability in both geomorphic and climatic episodes can seriously affect the archaeological record of the site. It is this researcher's belief that the site's landscape position caused it to be slightly drier, and thus it had a greater degree of preservation of cultural materials. Sheltered sites within drainage areas are often impacted by wetter conditions, therefore causing some archaeological remains (eg. charcoal, bone and features) to degrade at an accelerated rate.

The probability of subsurface deposits suggested that intact cultural sediments were present in both of the rock shelters, and that excavations could provide information pertinent to the research themes noted by Charles et al. 2000; see also (Zier et al. 1997). The site was selected for archaeological excavations because of its geomorphology and because its topography, water resources and environment are different from those of any other rock shelter in the area. Based on these factors, it was hoped that the excavations would yield pertinent information which would aid in understanding the prehistory along the high plains-foothills transition zone of eastern Colorado.

As noted, the present investigations are an outgrowth of the original recommendations made by FLC when the site was first recorded. The objectives of the research are: (1) to conduct a controlled excavation of a portion of the intact cultural deposits within each of the shelters' matrices, designed with the proper methodology to interpret a chronological sequence for both cultural occupation and geomorphology; and (2) to conduct analysis of data recovered from the excavation in order to produce a synthesized interpretation of the history within the shelters.

In a sense this research approach is both macroscopic and microscopic. Most of the research in this thesis is done on a microscopic level that focuses strictly on the site, specifically on what it contains and what prehistoric activities to place. The macroscopic approach attempts to determine the variation in prehistoric peoples' lifestyles as they moved from one area to another in the same region. This research may uncover a correlation between those various resource areas. For myself and the majority of archaeologists, the macroscopic approach is the primary goal in archaeology. Determining some of the basic behavior patterns in a culture group (e.g. what people utilized while in one area and determining why those items were not utilized in another area) is an important step toward understanding the prehistoric past. However, macroscopic research cannot be complete without microscopic investigations. Therefore, the author hopes that the work provided by this thesis will be viewed not just as an excavation report on a single site, but may also provide a step toward a more complete understanding of the region and those people who once inhabited it.

Research Orientation

The original research proposal for the Gilligan's Island Site was submitted to the Fort Carson Cultural Resource Management Program and the Department of Anthropology at Colorado State University. Anderson (2002) identified six research themes that were specified in the original survey report (Charles et al. 2000:103). These themes were taken from the Cultural Resource Management Plan (CRMP) for Fort Carson Military Reservation (Zier et al. 1997).

Since 2002 additional information about the site has been obtained through excavation and the research themes have been condensed. Four research themes are now appropriately recognized as follows: (1) chronology, (2) settlement and subsistence patterns, (3) technologies (material culture), and (4) paleoclimates and geomorphology. These themes are the primary topics from which several general research topics and data needs have been discussed in Fort Carson cultural resource management plans (Zier et al. 1987) and research documents in context pertaining to southeastern Colorado prehistory (Zier and Kalasz 1999). These research themes are intended review, reconsider, and expand our knowledge about the prehistoric past.

The Gilligan's Island site was selected for excavation to specifically try and answer, or at least contribute additional data to these previous research designs and questions. The site is situated in a drier and more arid environment than other previously excavated sites in the regions. Several rockshelters along the Turkey Creek drainage system are situated at or near flood plain margins with increased precipitation rates, perhaps accelerating degradation of perishable materials (botanical, faunal, and feature morphology and/or function). The Gilligan's Island site is elevated far above any floodplain where site formation processes vary, excavation and analysis results should provide, or at least shed light on, unattainable answers in past research. The location of the Gilligan's Island Shelters may also provide data regarding rockshelter habitations farther away from drainage areas. Second, limitations in the archaeological database have made some of the questions asked in earlier research designs unattainable. Zier et al. (1996:46) expresses a problematic scenario:

> "Reports of recent archaeological investigations at Fort Carson (Zier et al. 1988; Zier 1989; Van Ness et al. 1990; Jepson et al. 1992; Kalasz et al. 1993) reveal a consistent frustration in research design execution because of various database limitations…prehistoric themes, such as prehistoric economies, horticulture, paleoclimate, and geomorphology, can be addressed only with comprehensive excavation data…too few sites are generally recorded to facilitate meaningful testing of ideas" (Zier et al. 1996:46).

The research in this Master's thesis attempts to answer a few of the previously conceived research designs that ask multiple questions. The result of such efforts will perhaps encourage further researchers in the region to maintain a strict methodology and analysis that will be useful in future archaeological work.

Research Constraints

The archaeological investigation of the Gilligan's Island site was constrained by the amount of time it took to conduct work, the number and qualifications of personnel involved in the excavation, the rock shelter's physical deposition, and the cultural materials found during the excavation. A limited time of three weeks was allotted for the primary excavation at the site. During this time professional and non-professional archaeologists and volunteers generally focused on the two connecting rock shelters. The overall amount of cultural materials and features found during the excavation of these shelters were greater than anticipated. Thus, the rest of the site, along the open bench, was no longer considered a probability for test excavations, given the time constraints allotted by army training activities. After the primary field session was complete, however, the site was fully mapped and additional artifacts and features on the surface of the site were recorded.

Project Administrative Data

Excavation at the Gilligan's Island site was conducted under the research design proposed by Cody M. Anderson for a master's thesis at Colorado State University (Anderson 2002). FCMR's cultural resource manager, Randy Korgel, granted permission to conduct a test excavation at the site in order to determine the site's subsurface potential to yield information important to the prehistory of the area. This information would determine the site's eligibility for listing on the National Register of Historic Places. Dr. Jeffrey L. Eighmy from Colorado State University acted as the Principal Investigator.

Funding for the project came from a number of different organizations and groups. FCMR's Directorate of Environment Compliance and Management (DECAM) Cultural Resource Department funded a portion of the costs, which consisted of vehicle transportation, most radiocarbon dating, pollen analysis, and periodic archaeological staff. Scholarships for the project analysis were provided by the Colorado Archaeological Society, Inc. from its Alice Hamilton Scholarship Fund; Colorado State University Foundation from its Karen S. Greiner Endowment for the Preservation of Colorado Archaeology; and the Colorado Council of Professional Archaeologists from its Ward F. Weakly Memorial Fund. The author provided the remainder of the necessary funding.

The primary fieldwork session was conducted between May 18 and June 9, 2002; however, additional excavation, mapping and surface recording continued into late August of 2002. Cody M. Anderson supervised all of the work at the site. Professional volunteer crewmembers were Kimberly K. Henderson, Daniel A. Jepson, Stephen M. Kalasz, Mark D. Mitchell and Christian J. Zier. Participating FCMR archaeological staff members were Michael Flowers, Thaddeus T. Swan and Kelly D. Wright. Paul W. Alford, Brook A. Anderson, Diane K. Anderson, Forrest L. Anderson, Lois (Sam) Bock, Glenda J. Guss, Rose M. Hosmer, Mark Howard, John Kitteridge, Don F. Owens, Greg Nolan, Robert Nolan, Warren Nolan, Cindy D. Souders, William R. Tilley, and Abigail (Abby) F. Zier were community volunteer crew members. Caron A. Rifficci provided a list of the immediate vegetation in the area, and Richard A. Krause surveyed the site area for ceramics.

There were eight primary specialists serving as consultants on the project: Michael McFaul, LaRamie Soils Service, Laramie, Wyoming (geomorphological analysis); Beta Analytic, Inc., Miami, Florida (radiocarbon dating); John G. Jones, Palynology Laboratory, Texas A&M University, College Station, Texas (pollen analysis); Jannifer W. Gish, Quaternary Palynology Research, Fort Collins, Colorado (macrobotanical analysis); Richard E. Hughes, Geochemical Research Laboratory, Portola Valley, California (x-ray fluorescence); Jodi A. Jacobson (faunal analysis); Sharon F. Urban (shell analysis); Danny Walker (faunal analysis).

All culturals material recovered during this project will be reposited at the Curation Facility at the FCMR.

CHAPTER 2

ENVIRONMENT

Introduction

This chapter will provide a description of the environmental setting of both the Gilligan's island site and the surrounding region. Knowing more about the environmental setting helps one understand the forceful interactions between human populations and their ecosystems (Butzer 1982:xi). Additionally, the physiography, geology, and hydrology of the area influence archaeological site formation and/or reduction.

A series of archaeological reports describes the natural environment of Fort Carson Military Reservation (FCMR) and its adjacent regions (e.g. Charles et al. 2000; Charles et al. 2001; D. Kuehn 1998; Van Ness et al. 1990; Zier 1989; Zier and Kalasz 1999). The information presented in the following subsections is based largely on these reports and on Michael McFaul's *Geoarchaeological Investigations 5FN1592* (McFaul 2003).

Site-Specific Physiography, Geology, and Hydrology

In general, the site is situated between two physiographic provinces, the Southern Rocky Mountains and the Great Plains provinces (Thornbury 1965) (Figures 5a and 5b). The faults at the edge of the eastern Rampart Range (also considered an extension of the southern Front Range) begin just to the west of the site. These mountains include the

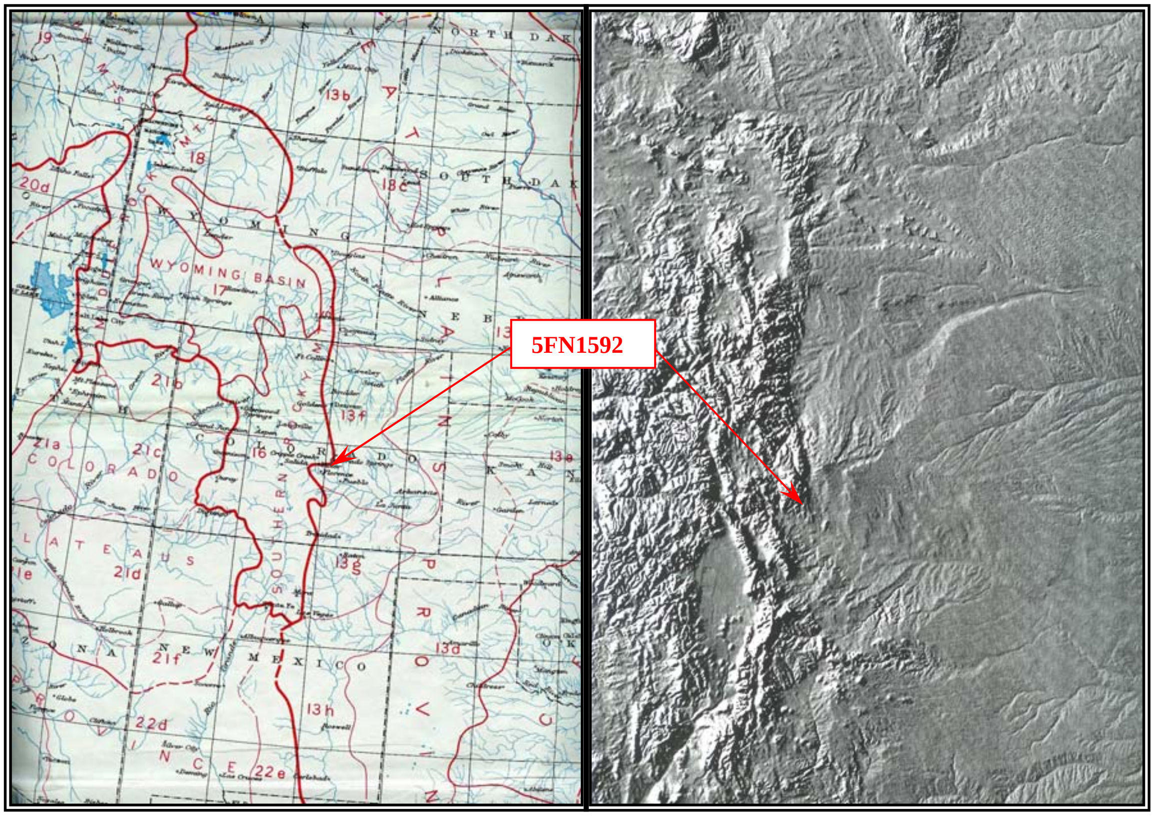

Figure 5: a) 5FN1592 physiographic province; b) Regional physiography from space (modified from McFaul 2005).

southern side of Pikes Peak and Cheyenne Mountain, which rise to the north, and the Wet Mountains to the southwest (Chronic and Williams 2002:105; Painter et al. 1999:5). To the east is a subdivision of the Great Plains province recognized as the Colorado Piedmont section. Farther from the steeply sloped mountains, the region is comprised of capped cuestas, mesas, dissected canyons and foothills that rapidly give way to high open plains (Chronic and Williams 2002:105; Painter et al. 1999:5).

The Gilligan's Island site area slopes into a perennial drainage basin that lies at the base of a steep gulch. Irregular floods caused mainly by summer rainstorms flow through the canyons of Red Creek and Beaver Creek before reaching the Arkansas River. The approximate distance to the Arkansas River via the drainage system is 15.4 miles.

When traversing the landscape on foot the nearest point of the Arkansas River is approximately 9.4 miles from the site in a south-southeasterly direction.

The Gilligan's Island site is situated on the upper segment of an eastern flanking cuesta that divides Salt Canyon to the west and a tributary of Red Creek to the east (Figures 6, 7, 8a and 8b). The mesa is capped with Cretaceous-age Dakota Sandstone. At the base of the cliff a thin tabular conglomerate of deep purple-red shale has caused differential erosion at the contact with the harder and more massive sandstone, resulting in the formation of two shelters. At approximately 1896 m (6220 ft) elevation, the shelters' locations provide an expansive view across the gulch. A steep, north south-trending ridge blocks the view of Red Creek, and farther east are bluffs capped with Niobrara limestone. The prominent Booth Mountain is to the north, and to the southeast are the High Plains that extend beyond Pueblo, Colorado. The rest of the site is situated along a gently sloped, south-trending bench, approximately 6 m (20 ft) below.

Environmental Overview of the Fort Carson Region

Climate: The following climate data are divided into three major categories consisting of modern climatic conditions, regional paleoclimatic trends, and hydrology.

Modern Climatic Conditions: The present climate of the eastern Colorado foothills-plains region has been characterized as a semi-arid continental climatic pattern (Charles et al. 2000:2.6; Kalasz et al. 2003:9). Climatic characteristics of the Great Plains region include low precipitation (particularly limited in winter), moisture instability that is dispersed over long and short periods, prominent daily and seasonal

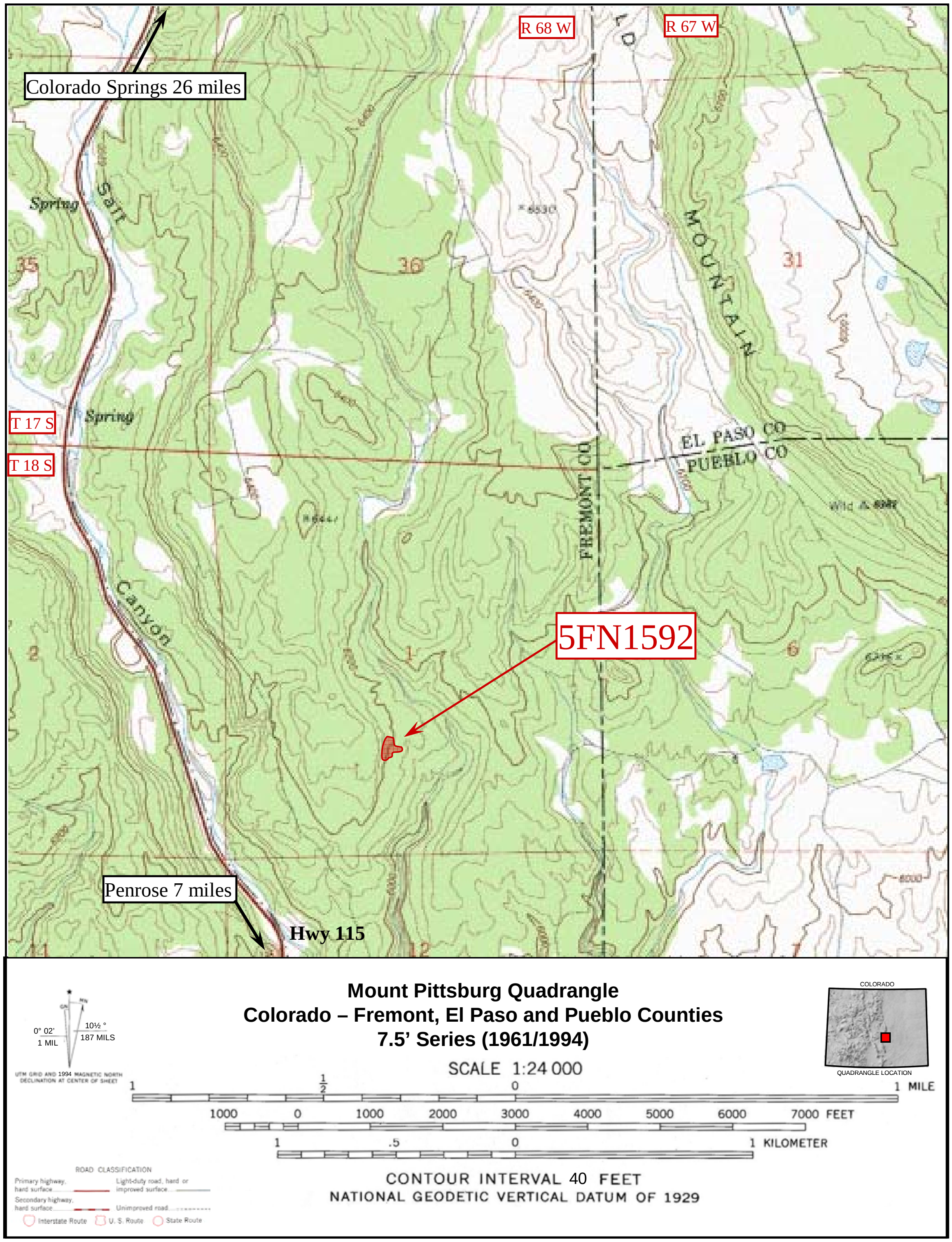

Figure 6: Gilligan's Island site location.

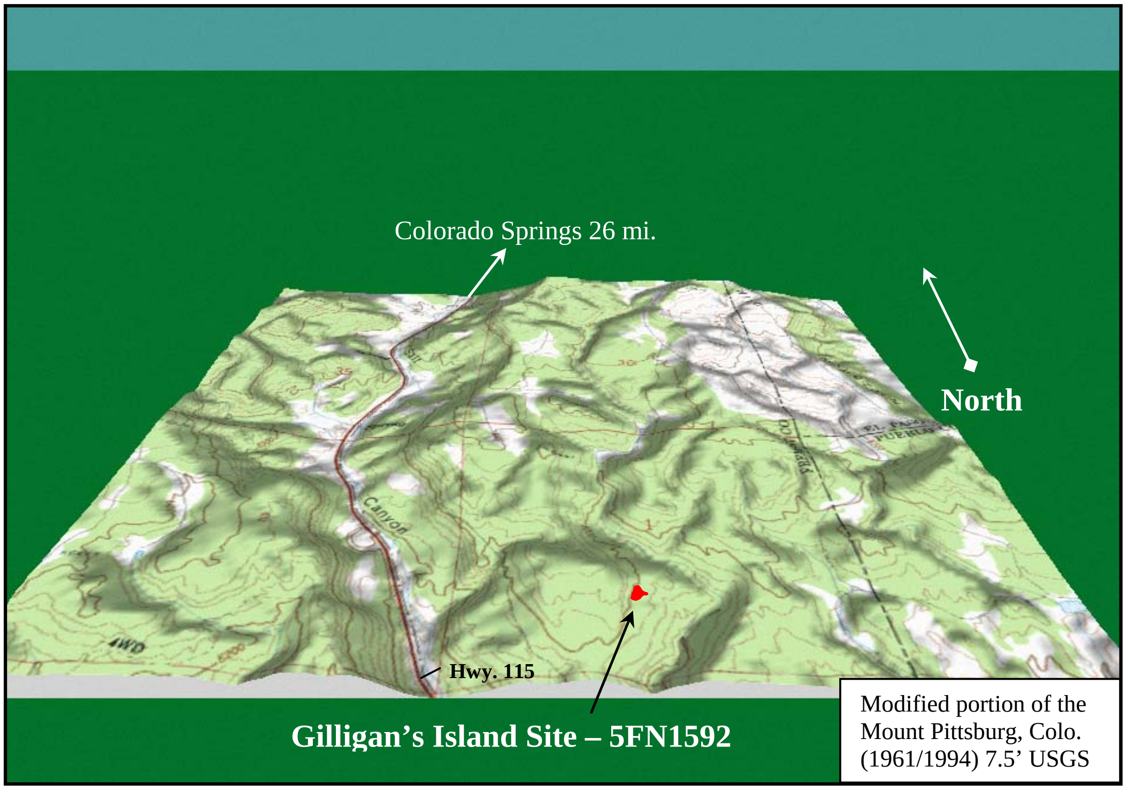

Figure 7: Oblique view of the Gilligan’s Island site location.

temperature ranges with low humidity and a high evaporation rate, severe droughts, and nearly continual winds (Wedel 1961:30; Kalasz et al. 2003:9). The prominent air masses that converge on Colorado are generally derived from three regions: south from Canada (Polar Continental), east from the Pacific Ocean (Polar Pacific or Tropical Pacific), and northwest from the Gulf of Mexico (sometimes tropical). These major air masses combine to influence climatic patterns in the area. They are, however, affected “by local controls of latitude, continental position, elevation, topography, and seasonally dominant storm-track positions”. The distance from these large bodies of water results in a climatic pattern that is generally dry year-round with cold winters and hot summers (Zier and Kalasz 1999:8).

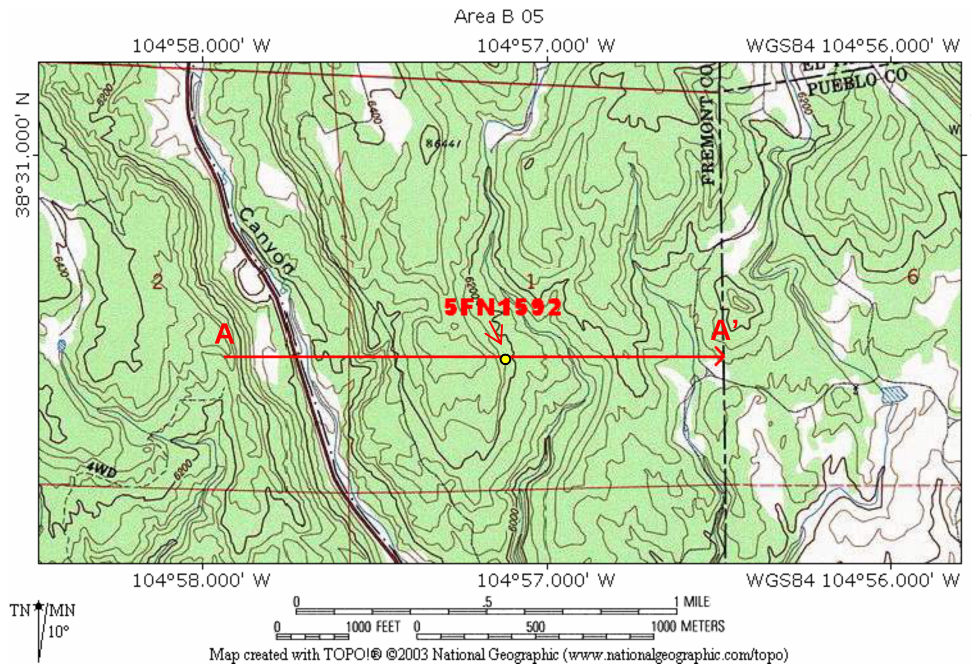

Figure 8a. Topographic map of site vicinity and profile A to A' (modified from McFaul 2003).

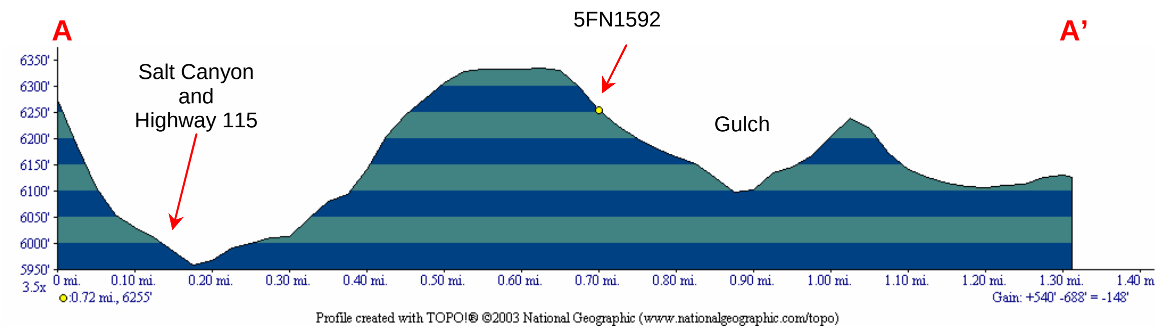

Figure 8b. West to east landscape profile A to A', ca. 1.3 mi. (2.1 km), through 5FN1592 (modified from McFaul 2003).

The exact climate of the site is unknown, although 26 miles north in Colorado Springs the weather records indicate that the average monthly high temperature ranges from 41º F in January to 85º F in July; the average monthly low temperature ranges from 17º F in January to 57º F in July. The yearly precipitation average in Colorado Springs is 17.5 inches, with May typically being the wettest month. The average snowfall per year is 42.6 inches; March has the highest monthly snowfall averages (www.weatherbase.com, 2004).

Regional Paleoeclimatic Trends: Information about the paleoclimatic conditions in the area of the Gilligan's Island site is limited and has been derived mainly from the prehistoric context of the Arkansas River Basin (Painter et al. 1999:21-24). Paleoenvironmental data are still in the early stages of development for this region. The following discussion therefore relies on paleoenvironmental information from the plains, foothills, and other adjacent regions.

Knowledge of Pleistocene climatic conditions in the Rocky Mountains and Western Plains is limited during the time for possible early Pre-Clovis sites (ca. 19,000-14,000 B.P.) (Brunswig 1992:6). Nearly 18,000 years ago, during the height of the Late Wisconsin (Pinedale) glacial maximum, the increased moisture from the northwest Atlantic supplied the North American Laurentide Ice Sheet with enough snowfall and development of ice to result in an advance farther south to form in northern Canada and move onto the Northern Plains (Brunswig 1992:6-7; Kay 1998:21; Siegert 2001:70,192). During the time between ca. 18,000-15,000 B.P., paleoclimatic data indicate that the Western Plains were cold and dry (Brunswig 1992:6; Zier and Kalasz 1999:21). The average temperatures were approximately 18º F (10º C) to 27º F (15º C) below the present values and the precipitation may have been 44 percent lower than today's standards (Brunswig 1992:7; Painter et al. 1999:21). These cooler environmental conditions indicate that the life zone boundaries were approximately 500 m (1,600 ft) lower in the Front Range foothills, and tundra conditions were some 1524- 1829 m (5,000-6,000 ft) lower in elevation than the present day. Along the base of the mountains and farther east, prairie-like conditions consisted of mainly grasslands with scattered boreal forests (Brunswig 1992:7; Painter et al. 1999:21). The faunal assemblages during this time period lack both large and small mammals and suggest a cold and less inhabitable ecosystem with a lower carrying capacity than modern times (Brunswig 1992:7; Painter et al. 1999:21).

Near the end of the Pre-Clovis period (ca. 15,000-11,500 B.P), the climatic conditions of eastern Colorado began warming but remained cooler and wetter than current conditions (Brunswig 1992:8; Painter et al. 1999:21). The mean annual summer temperatures might have averaged 16º F (9º C) colder than at present. Precipitation levels might have been 10-25 percent higher than those of the present day (Brunswig 1992:8; Painter et al. 1999:21). The southern Laurentide Ice Sheet began to retreat northwards. Unstable ice sheet dynamics was the primary reason for this recession, rather than the effects of climate change (Siegert 2001:167-169). Glacial ice sheet decay may have helped to make water tables higher and create an abundance of surface water during this period. The life zone boundaries in the mountains probably remained lower (Painter et al. 1999:21). Faunal studies indicate a dramatic increase in megafaunal species on the eastern Colorado plains and lower Front Range foothills after ca. 14,000 B.P. This increase of large mammalian populations probably indicates a higher proportion of open grassland savannahs and boreal woodland environments than that of the previous millennia (Brunswig 1992:8-9; Painter et al. 1999:21).

At approximately 12,000 B.P., just prior to the onset of the Clovis Period (11,500-10,950 B.P.), Pleistocene climatic began to change as warming and drying trends increased, while precipitation rate decreased (Painter et al. 1999:22). The Clovis period had colder and moister climatic conditions than present conditions, but environmental zones were depressed by only 900-1,000 feet in elevation (295-328 meters) lower than modern environmental zones (Brunswig 1992:11). Water tables began to lower as the Laurentide Ice Sheet withdrew northward and the localized glaciers withdrew into the Rocky Mountains (Brunswig 1992:11). As the glacial water supply began to decrease, the abundance of perennial pluvial lakes declined. Pluvial lakes were transformed into seasonal lakes and ponds (Painter et al. 1999:22). As a result of these climatic changes, short and tall grass prairies with interspersed spruce-pine woodlands expanded throughout eastern Colorado (Brunswig 1992:11; Painter et al. 1999:22). The combination of drought-like conditions and adjustments in vegetation may have had a dramatic effect on the megafauna in the region (Kay 1998:22). The role of humans as the primary cause for the extinction of Pleistocene megafauna remains open to debate (Frison and Bonnichsen 1996:308; Kay 1998:22; Martin 1984). By the end of this period megafaunal species began to decline or disappear from the archaeological and geological record of the region, marking the beginning of the cataclysmic terminal Pleistocene extinction process (Brunswig 1992:11; Painter et al. 1999:22).

The warming and drying trends that started around 12,000 B.P. continued into the Folsom period (10,950-10,250 B.P.) (Painter et al. 1999:22). But toward the end of the

Folsom period yearly precipitation increased causing warmer summers and colder winters, thus eventually relieving the drought conditions of the previous period (Brunswig 1992:13; Frison and Bonnichsen 1996:308; Painter et al. 1999:22). The resulting climate was milder with increased moisture over that of today, but by the end of the Folsom period temperatures were perhaps comparable to those of the present day (Brunswig 1992:13; Painter et al. 1999:22). Pleistocene megafauna were nearly extinct, while certain mammal species (e.g. bison and antelope) increased in numbers and expanded their geographical ranges (Painter et al. 1999:22). The pine-spruce woodlands on the eastern Plains and in the Foothills of Colorado began to diminish and were gradually replaced by a mixture of tall and short-grass prairies (Brunswig 1992:13).

Modern Holocene climatic conditions prevailed in North America by the beginning of the Plano period (10,250-7,800 B.P.) (Painter et al. 1999:22). By 10,000 B.P. the environment of eastern Colorado probably consisted of a semi-arid to arid shortgrass prairie with deciduous trees along the main watercourse drainage (Painter et al. 1999:22). Because of the dramatic change in climate, nearly all of the megafauna was extinct by this time period; however, species of bison (i.e. *Bison antiquus* and *B. a. occidentalis*) larger than modern bison (*B. bison*) inhabited the Plains until at least ca. 6,000 B.P., (Frison and Bonnichsen 1996:308; McDonald 1981:82-84). Throughout the Holocene in North America, there is a general shift from big game hunting to a hunter-gather lifestyle that was perhaps propelled by demographic and environmental factors that affected the subsistence economy (Stone 1999:113). However, on the Great Plains hunting and gathering was still dominated by large game (bison) hunting (Painter et al.

1999:22; Martin et al. 1985:27; Brunswig 1992:15; Frison and Bonnichsen 1996:308; Painter et al. 1999:22).

By the Early Archaic period (7,800-5000 BP) eastern Colorado's environmental setting appears to have fluctuated between hot and dry conditions and cool and moist conditions (Brunswig 1992:19; Painter et al. 1999:23). Vegetation on the eastern Plains of Colorado probably consisted of shortgrass and sagebrush-yucca prairies (Brunswig 1992:18; Painter et al. 1999:23).

The climatic cycles observed during the Early Archaic period are commonly referred to as the Altithermal. Antevs (1955) originally conceived of the Altithermal model as a long drought that lasted in the western United States for 2,500 years (between 7500 to 5000 BP) (Benedict 1979:1; Zier and Kalasz 1999:22). Benedict (1979:1), however, proposed that the Altithermal was actually comprised of two severe droughts that lasted for shorter intervals (ca. 7000-6500 BP and 6000-5500 BP). Investigations at Lubbock Lake (Johnson and Holliday 1986:44) confirm that two drought periods occurred within the Altithermal, although the dates (6400-5500 and 5000-4500 BP) are offset from those originally suggested in Benedict's Madole (Zier and Kalasz 1999:23). Even though these dates aren't exact matches, they demonstrate that drought-like conditions of the Altithermal may have been significant, and consequently affected the distribution of human, plant, and animal populations on the Plains (Brunswig 1992:19; Frison 1991:79). Benedict (1979:10) suggests that an increase in sites and diversity of cultural complexes within the Rocky Mountains indicates human migration toward the mountains, which ultimately provided an important refuge during the Altithermal. Black's (1991) investigations of Early Archaic assemblages in the central Rocky

Mountains indicate that there was a continuation of technologies that originally developed in the region during the Paleoindian Period (see Cassells 1997:116-118; Stone 1999:57). Thus, the localized *in situ* population evidenced from this analysis is at odds with Benedict's model.

Following the Altithermal, regional climates became mesic during the Middle Archaic (5000-3000 BP) to Late Archaic (3000-1850 BP) periods and the first millennium of the Late Prehistoric stage (A.D. 100-1000). Faunal and floral data also indicate that these conditions prevailed within southeastern Colorado (Painter et al. 1999:23). Geomorphic studies suggest that these periods were not entirely constant and arid climate fluctuations occurred, especially between ca. 4800 and 1000 B.P. (Painter et al. 1999:23-24). Slightly cooler and wetter conditions may have developed throughout the first 1,000 years of the Late Prehistoric stage, although they probably did not display a striking difference from those of either the Middle or Late Archaic periods (Painter et al. 1999:24).

During the last half of the Late Prehistoric stage (ca. A.D. 1000), climatic conditions in southeastern Colorado advanced toward a xeric state (Painter et al. 1999:24). Similar environmental conditions to those that prevailed in the southwestern United States during the thirteenth and fourteenth centuries also appear to have dominated southeastern Colorado (Painter et al. 1999:24). Conditions appear to have been severe enough to lead to the human abandonment of Colorado's southeastern Plains between ca. A.D. 1400 and 1500 (Painter et al. 1999:24). During the period ca. A.D. 1650-1850 the Little Ice Age or Neo-boreal episode introduced a reversal of the drought conditions of the previous two and a half centuries as cooler and wetter conditions set in

(Painter et al. 1999:24). By ca. 1850 modern climatic conditions had become established (Painter et al. 1999:24).

Hydrology: The FCMR lies on the northern side of the upper Arkansas River Basin. There are no permanent flowing streams within the boundaries of the reservation. The major streams on the base either drain east into the permanently flowing drainage of Fountain Creek or south into the Arkansas River (Charles et al. 2001:2.4). In the northeastern portion of the base several intermittent watercourses (Rock, Little Fountain, and Sand Creeks) drain from the hills and mountains to the west and flow in an east to southeast direction, eventually ending up in Fountain Creek (Zier 1989:22). An unnamed mesa that lies north of Table Mountain creates a natural drainage divide for these tributaries of Fountain Creek and separates the remaining intermittent watercourses on the southern portion of the base from Fountain Creek (Charles et al. 2001:2.4). These streams (Wild Horse, Turkey, Red and Beaver creeks) located on the southern portion of the base flow south in a dendritic drainage pattern, often carving narrow canyons into the sedimentary bedrock. They eventually flow into the Arkansas River (Zier 1989:22-23). Although many of these streams are mapped as intermittent drainages, there are several springs located within these basins that suggest a more permanent subsurface flow (e.g. Turkey and Salt Creek).

Geology and Geomorphology:

Geology: Regional surface geology consists mainly of sedimentary rocks that range in age from Pennsylvanian through Cretaceous (Table 1) (Charles et al. 2001:2.1). The topography is largely a product of a series of episodes that were caused by block faulting, uplift, volcanic activity and sediment deposition during the Late Cenozoic.

Table 1. Geologic Time Chart[1,2]

EON	ERA	PERIOD		EPOCH	BOUNDARYAGE IN MILLION YEARS
Phanerozoic	Cenozoic	Quaternary		Holocene	0.010
				Pleistocene	1.65
		Tertiary	Neogene Subperiod	Pliocene	5
				Miocene	23
			Paleogene Subperiod	Oligocene	36
				Eocene	57
				Paleocene	66
	Mesozoic	Cretaceous		Late Early	96 138
		Jurassic		Late Middle Early	205
		Triassic		Late Middle Early	250
	Paleozoic	Permian		Late Early	290
		Pennsylvanian		Late Middle Early	~330
		Mississippian		Late Early	355
		Devonian		Late Middle Early	405
		Silunian		Late Middle Early	435
		Ordovician		Late Middle Early	510
		Cambrian		Late Middle Early	~571[3]
Proterozoic	Late Proterozoic				900
	Middle Proterozoic				1600
	Early Proterozoic				2500
Archean	Late Archean				3000
	Middle Archean				3400
	Early Archean				3800?
pre- Archean[4]					4550

[1]modified from Madole 1990:Figure 11, [2] Terms and boundary ages used by the U.S. Geological Survey, 1986,[3]Rocks older than 570 m.y. also called Precambrian, a time term without specific rank, [4]Informal time term without specific rank

During the Late Cenozoic an accelerated growth of the Front Range mountains resulted in the transportation of sediment east onto the Great Plains. During the Late Miocene an important landscape feature known as the Colorado Piedmont was created on the eastern Plains of Colorado. Throughout this period uplift within the Colorado Rocky Mountains intensified canyon incising, creating powerful erosional processes from the western headwaters of both the Platte and Arkansas stream systems that washed out to the east (Madole 1990:110; Thornbury 1965:311-312). The fluvial corrosion from these two streams and their numerous lateral tributaries stripped the Tertiary sediments in front of the Rocky Mountains (Madole 1990:110; Thornbury 1965:311-312). The removal of the Tertiary mantle and lower surface topography of the Platte and Arkansas basins, make the Colorado Piedmont a distinct physiographic entity, compared to adjacent Tertiary formations on the Great Plains that are more elevated (Madole 1990:110; Thornbury 1965:311-312; Zier and Kalasz 1999:5).

Geomorphology: Geomorphological and geoarchaeological studies on the FCMR have focused on alluvial stratigraphic analysis within the Arkansas River tributaries of the Turkey Creek (Madole 1989; 1990) and Red Creek (D. Kuehn 1998) drainages. There have been no other geomorphological investigations in the area. A brief synopsis of these efforts is presented below. Madole (1989:276, 1990:104) analyzed the geomorphology of alluvial deposits along an approximate 8.5-kilometer (5.3 mile) segment of the Turkey Creek Canyon area within the FCMR. During this research, Madole (1989:277, 1990:104) identified three alluvial terraces on the valley floor of Turkey Creek which were designated Units 1, 2 and 3 (Figure 9). The deposit characteristics were based on the lithology, stratigraphic relations, landscape position, and development of soil (Madole 1989:277, 1990:104). Eleven radiocarbon ages were also obtained from detrital charcoal and buried humus material at Recon John Shelter, which provided a chronological history of the deposits. Madoles's investigation suggested that Unit 1 was the oldest in age dating to the middle Holocene and possibly late Pleistocene; Unit 2 appears to be Late Holocene in age; and Unit 3 is likely to be less than 100 years in age (Madole 1990:104).

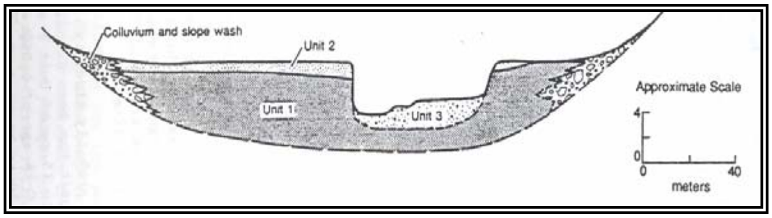

Figure 9: Schematic diagram showing the stratigraphic relations of Madole's three alluvial units on Turkey Creek (from Madole 1989: Figure 43; Madole 1990: Figure 10).

In 1997, the Center for Environmental Archaeology at Texas A&M University performed a reconnaissance-level geomorphological and geoarchaeological inventory along an 11-mile segment of the Red Creek drainage (D. Kuehn 1998). The Red Creek study area was divided into six segments of the drainage, based on the morphology of the valley, bedrock characteristics, and base level gradient (D. Kuehn 1998:v). In addition, a detailed investigation of four sections was selected as a representative sample of the various depositional environments and associated facies of the entire study area (D. Kuehn 1998:v). Results indicated that the stratigraphy at the confluence of Red Creek and Beaver Creek mainly consists of fluvial, alluvial fan, and colluvial slopewash deposits of the late Quaternary age. Farther north, in the upper portions of Red Creek, cut-terrace surfaces and glacio-fluvial fans of the Pleistocene were present (D. Kuehn 1998:5).

D. Kuehn (1998:5) identified four Holocene-aged fluvial sediments in the Red Creek drainage during this investigation. These deposits consist of the modern creek channel, active gravel bars and modern floodplain (T0), and two depositional terraces (T1 and T2) (D. Kuehn 1998:5). The floodplain and terrace fills are similar lithologically; however, differences occur in the sediments' age, height of deposition, and degree of pedogenic development. In addition, buried soils are virtually secluded in the T2 terraces (D. Kuehn 1998:17).

Madole's (1989; 1990) and D. Kuehn's (1998) investigations suggest a similar depositonal pattern within the drainages of Fort Carson. D. Kuehn (1998:16-22) identifies a simple correlation in depositional age between the T0, T1, and T2 sediments in the Red Creek drainage and those of Madole's (1989:276-288) Units 2 and 3 in the geomorphological analysis of the Turkey Creek. D. Kuehn correlates TO and T1 with the two surfaces levels of Unit 3, namely the upper and lower surfaces. The T0 floodplain at Red Creek can be correlated with the lower Unit 3 channel floor in Turkey Creek (0.5-1 m above stream level), and may have the same estimated depositional age of ca. 100 years or earlier (D. Kuehn 1998:16; Zier 1989:284). The T1 terrace at Red Creek and upper Unit 3 (1-1.5 m above stream level) at Turkey Creek share similarities in stratigraphic location, thickness, tree-growth estimates, and under-developed soils. This suggests that both the T1 and upper Unit 3 sediments were present within the last 100 to 150 years (D. Kuehn 1998:17).

Two radiocarbon samples were collected from the lower portion (2,975±75 B.P.) and upper portion (860±185 B.P.) of the T2 terrace at Red Creek (D. Kuehn 1998:17). The T2 deposits are considerably older in depositional age than either of the D. Kuehn's

T0 and T1 terraces or Madole's Unit 3 deposits (D. Kuehn 1998:17). D. Kuehn (1998:17) compares the date of the upper portions of the T2 terrace with the overlapping dates of Madole's upper Unit 2 geomorphic strata at Recon John Shelter along Turkey Creek. These depositional dates from Red Creek and Turkey Creek can be correlated with dates from drainage basins of similar size from southern Utah to western Oklahoma, suggesting that there was a period of increased alluvial deposition between 800 and 100 B.P. (D. Kuehn 1998:17; Madole 1989:284).

Ecosystem:

The principal vegetative community at the Gilligan's Island site lies within the pinyon-juniper woodland ecosystem. On the eastern slope of the Rocky Mountains these woodlands grow prominently along the foothills from approximately the same latitude as the Colorado Springs area southward, and abut the forest boundary along the base of the Rocky Mountains (Mutel and Emerick 1992:109). This vegetative community lies above the grasslands community and below the montane shrublands community, and generally occurs at an elevation range of 1675 m to 2440 m (5500-8000 ft) (Painter et al. 1999:11). Pinyon-juniper ecosystems generally occur in warm, dry areas with an annual precipitation between 10 and 20 inches (25.4-50.8 cm) and mean annual temperatures between 45º (7º C) and 55º F (13º C) (Mutel and Emerick 1992:110). These woodland stands are especially well developed along Colorado Highway 115 (Mutel and Emerick 1992:110).

Vegetation: Various kinds of vegetation are present within Colorado's pinyon-juniper woodlands. The dominant trees that grow in this community include the pinyon pine, one-seed juniper and the Rocky Mountain juniper or red cedar (Painter et al.

1999:11). Vegetative ground cover generally includes blue grama, June-grass, Indian ricegrass, fescues, muhly, bluegrass, yucca, and prickly pear (Painter et al. 1999:11).

Within the confines of the Gilligan's Island site the vegetation is diverse. Table 2 lists plant species identified on the site during August of 2002. While the site locality is distant from many of the mechanized activities that take place on the FCMR, evidence of historic tree cutting and livestock disturbance is present. As a result, the vegetative species composition and frequency may have been altered. This vegetation profile should therefore be referred to as a post-climax, or reflecting a condition in which the original native species have been intermixed with introduced species growing in disturbed soils.

Fauna: Mammalian species are prominent in the pinyon-juniper woodland ecosystem. The most prominent herbivores that find refuge within the pinyon-juniper habitat are mule deer and elk (Mutel and Emerick 1992:113). Pronghorn are also present, but generally occupy the periphery in which the wooded area grades into grasslands or shrublands (Mutel and Emerick 1992:113). Mammalian predators consist of mountain lion, bobcat, weasel, coyote, badger, and various species of fox (Mutel and Emerick 1992:113; Zier and Kalasz 1999:11). Other medium- and small-sized mammals consist of various bats, porcupine, cottontail, jackrabbit, Mexican woodrat, various mouse species, squirrel, and chipmunk (Mutel and Emerick 1992:113; Zier and Kalasz 1999:11).

A variety of birds and reptiles inhabit pinyon-juniper woodlands. The common nesting species are the pinion jay, plain titmouse, common bushtit, blue-gray gnatcatcher, ash-throated flycatcher, Berwick's wren, black-throated gray warbler, black-billed magpie, common raven, mountain chickadee, and chipping sparrow (Mutel and Emerick

Table 2. Vegetation in the Immediate Area of the Gilligan's Island Site[1]

Genus/Species	Common Name
Trees	
Juniperus monosperma	One Seed Juniper
Pinus edulis	Pinon Pine
Grasses	
Andropogon gerardii	Big Bluestem, Turkeyfoot
Schizachyrium scoparium	Little Bluestem
Bouteloua curtipendula	Side Oats Grama
Chondrosum gracile	Blue Grama grass
Oryzopsis micrantha	Little-Seed Ricegrass
Stipa viridula	Green Needlegrass
Sporobolus Cryptandrus	Sand Dropseed
Oryzopsis hymenoides	Indian Ricegrass
Muhlenbergia Montana	Mountain Muhly
Aristida divaricata	Poverty Three-awn
Aleopecurus pratensis	Meadow Foxtail
Cacti	
Cylindropuntia imbricata	Cholla cactus
Opuntia polyacantha	New Mexico Prickly Pear
Opuntia phaeocantha	Prickly Pear
Opuntia macrorhiza	Prickly Pear
Echinocereus triglochidiatus	Claret Cup
Shrubs	
Ribes inerme	Gooseberry
Rhus aromatica ssp. Tribolata	Skunkbush
Artemisia bigelovi	Big Sagebrush
A. frigida	Fringed Sage
Quercus gambelii turbinella	Hybrid Oak
Cercocarpus montanus	Mountain Mahogany
Yucca glauca	Small Soapweed
Forbs	
Verbascum thapsis	Great Mullein
Brickellia grandiflora	Brickelbush
Oxybaphus linearis	Four o'clocks
Eriogonum jamesii	Buckwheat
Ferns	
Cheilanthes feei	Lipfern
Miscellaneous	
	Moss
	Lichens
	Cryptobiotic soils

[1]Nomenclature according to Weber and Whitman (2001)

1992:114). The lark sparrow and mountain dove are birds that nest both in trees and on the ground (Mutel and Emerick 1992:114). Raptors that nest and hunt in these woodlands include prairie falcon, kestrel, red-tailed hawk, golden eagle, great horned owl, and screech owl (Mutel and Emerick 1992:114). During the warmer months various lizards and snakes are also present within the pinyon-juniper woodlands (Mutel and Emerick 1992:115).

<u>Regional and Site-Specific Land Use Patterns and Impacts</u>:

<u>Historic Land Use</u>: The history of the vicinity of the Gilligan's Island site is one of rural settlement, agriculture, quarrying and mining. Anglo-American homesteading began as early as the 1860s within the Fort Carson region; however, the earliest land entry dates were not documented until the 1870s (Zier 1989:35). The population in the area was sparse until the 1891 gold rush to Cripple Creek (Van Ness et al. 1990:27). The primary activity was cattle ranching, although farming was practiced along some of the streams such as Turkey Creek (Zier 1989:35). By the turn of the century the rapid development of towns and cities in the West created an increased market for stone and clay. Stone City, a stone quarrying and clay mining community, was established to serve these increased demands (Carrillo et al. 1991; Van Ness et al. 1990:28). This town is situated at the base of Booth Mountain, approximately 6 miles east of the Gilligan's Island site. Operations at Stone City began to decline by the 1930s and the town was abandoned in the 1950s (Carrillo et al. 1991; Van Ness et al. 1990:28); however, periodic clay mining operations exist to the present day. In 1965, the Department of the Army annexed a large parcel of land that resulted in the current FCMR boundaries (Van Ness et al. 1990:28).

<u>Current Land Use and Military Impacts</u>: Three major impact activities that affect cultural resources within the FCMR are training actions, training support actions, and non-training actions (Zier 1989:36). At the Gilligan's Island site, training actions are limited to a minimal amount of littering consisting of MRE (meals ready to eat) packages and a single vehicle part. These items appear to have been tossed off the cliff face at some point in the recent past. Training support actions are not present at the site. The most invasive impact on the Gilligan's Island site is the result of non-training actions and includes wind and water erosion on the open portion of the site, probable vandalism within the interior of the shelters, and an overall neglect of the entire site.

<u>Other Impacts</u>: Looting activities at the site are concentrated within the shelters. Surface and subsurface investigations within each shelter suggest that these major acts of vandalism are by far the most destructive agents that have impacted the site's cultural deposits.

Shelter 1 displays the largest degree of looting. During the original recording of the site, Fort Lewis College recognized a dirt pile near the dripline of Shelter 1 and suggested that it was the result of amateur excavations within the interior of the shelters (Charles et al. 2000:III.96). Excavations during the 2002 field season also suggested that the interior of Shelter 1 had been looted. The middle section of the dirt pile, discussed previously, was crosscut during the excavation of Trench B. The first stratigraphic layer that was excavated in this trench consisted of loose sandy sediment that had little in common with the underlying sedimentary layers. For that reason, along with the lower lying depression within the shelter's interior, this layer was recognized as probable overburden from looting activities within the interior of the shelter. The excavation unit closest to the interior of Shelter 1 (Unit B4) also exposed evidence of looting activities within the shelter. Disturbance indicators included a basin-shaped stratum that extended from the upper portion of the unit to the base of cultural deposits, and a moderate amount of dung, probably from sheep, which was found throughout the stratum's sediment. It is therefore not surprising that until the boundaries of this stratum were reached, there was an overall lack of features within the unit.

Intentional disturbances from amateur excavations were also identified within Shelter 2. During the excavation of Trench A a small looting pit (Feature 3) was identified in the upper portions of the cultural sediment. This pit was filled with loose sandy sediment and moderately large pieces of cow manure. Other probable amateur excavations were found just to the south of the trench, where several large pieces of sandstone rocks and ground stone (metates) rest. Farther south, beyond this rock concentration is a low-lying depression. Both the rock concentration and the depression suggest that looting took place in the area connecting Shelters 1 and 2.

Other impacts to the site consist of the effects historic ranching, possible firewood procurement and trail blazing operations. Indications of ranching consist of a layer of cattle and possibly sheep manure that was excavated in the upper portion of the shelter deposits. Historic tobacco tins and solder dot cans were present on the open areas of the site. Cut juniper trees are also found throughout the site and an old historic trail can be observed on the eastern extension of the site boundaries. Future excavations may help to determine the degree of impact that these more recent activities have had on the site.

CHAPTER 3

CULTURE HISTORY

Introduction

The following cultural history information is primarily derived from the most recent context research for the Arkansas River Basin (Zier and Kalasz 1999). The synthesis recognizes three aboriginal stages of prehistoric occupation of southeastern Colorado. In chronological order of occurrence, they are the Paleoindian, Archaic, and Late Prehistoric stages.

Radiocarbon dates from the Gilligan's Island shelters indicate that the occupation of the site dates to the Middle and Late Archaic periods of the Archaic stage and the Developmental period of the Late Prehistoric stage. Therefore, the following discussion primarily focuses on these periods. Because of the context of this thesis, special attention is also directed toward rockshelter sites within Fort Carson.

Paleoindian Stage

The Paleoindian stage in southeastern Colorado spans approximately 3,700 years between 11,500-7,800 B.P. The stage is divided into four periods: Pre-Clovis (> 11,500 B.P.), Clovis (11,500 – 10,950 B.P.), Folsom (10,950 – 10,250 B.P.), and Plano (10,250 – 7,800 B.P.) (Zier and Kalasz 1999:73-80). The beginning of this chronological sequence is essentially open-ended because archaeological research, although controversial, continues to suggest that America was occupied prior to 11,000-12,000 years ago, a time when the hypothetical interior, or midcontinental, migration route would have been available (Dixon 1999:28-34; Zier and Kalasz 1999:73-80). Recent information suggests that early occupation may have been the result of maritime migration into the New World, well before the end of the last Wisconsin glaciation (e.g. Dixon 1999; Stanford and Bradley 2002).

The Paleoindian stage is associated climatically and temporally with the last millennia of the Pleistocene climatic episode and the transition into the Holocene (Zier 1989:13). During this time of environmental and ecological change, Paleoindians are generally viewed as fully nomadic hunters focused primarily on large megafauna species, such as mammoth and *Bison antiquus* (Hofman and Graham 1998: 116-117; Kalasz et al. 2003:11). Several smaller game species were also exploited (S. Kuehn 1998; Walker 1982; Wheat 1979; Wilmsen and Roberts 1978; Kalasz et al. 2003:11). Lithic assemblages at Paleoindian sites are also associated with a hunting lifestyle. Flaked stone tools, often recognized for their primary use in hide and meat processing activities, are often found in Paleoindian components (Kalasz et al. 2003:11).

Above all else, the lanceolate projectile point remains the dominant characteristic of the Paleoindian stage (Zier 1989:13; Kalasz et al. 2003:11). These stone tools are generally recognized by their large size and exceptional craftsmanship (Zier 1989:13; Kalasz et al. 2003:11). Extensive excavations at kill/butchery sites, for example Murray Springs, Lange-Furguson, and Aubrey, indicate short term occupations that were not revisited (Hofman and Graham 1998:116).

The Paleoindian stage is poorly represented in the archaeological record of the Arkansas River Basin (Zier 1999a:73). Most of the finds dating to this stage consist of isolated projectile points found on the surface (Zier 1999a:73). Only two sites in the region, the Olsen-Chubbuck site and Runberg sites, have had a thorough archaeological investigation of their buried Paleoindian components (Zier 1999a:73).

A single rockshelter on Fort Carson has produced a projectile point that is temporally diagnostic to the Paleoindian stage. A shallow trowel test in the shelter of site 5EP1345 recovered the base of an Eden projectile point. However, it is thought to represent a curated artifact that was introduced during a later time period (Charles et al. 1999:6.22; Charles et al. 2001:7.17).

Archaic Stage

The Archaic stage in the Arkansas River Basin lasts for 5,950 years and dates between 7800-1850 B.P (Zier and Kalasz 1999:100). This stage is subdivided into three periods: Early Archaic (7800 – 5000 B.P.), Middle Archaic (5000-3000 B.P.), and Late Archaic (3000 – 1850 B.P. or A.D. 100) (Zier and Kalasz 1999:100).

On the plains of North America, archaeological evidence during the transition from the Plano period to the Early Archaic is virtually absent (Zier 1999b:102). Information that does exist (e.g., flora, fauna, lithic tool technology) indicates that climatic change occurred along with changes in material culture for the prehistoric inhabitants. The climate changed from cool and wet conditions in the late Pleistocene to more dry and arid conditions in the early Holocene. This alteration in patterns caused many of the large animals to become extinct, and impacted the prehistoric population as well (see Chapter 2). Prehistoric cultures adapted by shifting from a subsistence strategy focused mainly on hunting to one that combined hunting and gathering (Cassells 1997:95-99).

The Archaic stage is essentially characterized within the archaeological record as a time of long-standing continuity, with only slight changes apparent in lithic technology and material culture (Zier 1999b:100). The beginning of this stage is generally marked by a diverse subsistence strategy that often focused on smaller animals and increased use of plants; morphologically varied features; and a change in tool kit assemblages that typically includes non-lanceolate points of a large corner-notched or shallow side-notched style, as well as an increased utilization of grinding tools (Cassells 1997:95; Kalasz et al. 2005:13; Zier 1989:15). Indicators of human habitation within the Arkansas River Basin are minimal during the Early Archaic period; however, evidence of occupation begins to increase steadily throughout the Middle and Late Archaic periods (Zier 1999b:100).

Early Archaic Period:

A limited number of dates are available for the Early Archaic period, but the beginning date of 7800 B.P. for the Archaic stage is the most generally accepted because it coincides with the last radiocarbon age for the Plano period of the Paleoindian stage (Zier 1999b:100). The beginning of this period is closely associated with the onset of Altithermal climatic conditions described in the previous chapter. Benedict (1979:10) suggests that an increase in the number of sites as well as increased diversity of cultural complexes in the Rocky Mountains indicates human migration toward the mountains, which ultimately provided important refuge during the Altithermal. Black (1991), however, argues that there is a lack of evidence to suggest a plains migration into the mountains (Stone 1999:57). His investigations of Early Archaic assemblages in the central Rocky Mountains indicate that there was a continuation of technologies that originally developed in the region during the Paleoindian stage (Black 1991; Stone 1999:57).

Radiocarbon dates for the Early Archaic period within the Arkansas River Basin are non-existent (Zier 1999b:102). Evidence of occupation for this period is minimal and is primarily based on the presence of projectile points that were found either on the surface or during test excavations (Zier 1999b:102). Specifically within the boundaries of Fort Carson, only four surface sites have yielded projectile points that are of probable Early Archaic age. Because of the limited number of excavated Early Archaic sites and general absence of archaeological data, the technologies, settlement and subsistence patterns for this period are not yet fully understood (Zier 1999b:102-113; Kalasz et al. 2003:15).

Middle Archaic Period:

The beginning date for the Middle Archaic period is 5000 B.P. (Zier 1999b:101). This date corresponds with the appearance of McKean-complex projectile points and the outset of more mesic climatic conditions that occurred at the end of the Altithermal (Zier 1999b:101; Kalasz et al. 2003:15-16). The Middle Archaic is the earliest period with a solid archaeological database for the plains, plains/foothills and mountains of southeastern Colorado (Zier 1999b:113). The temporal distribution of Middle Archaic dates throughout this time period is nearly continuous and has only a few gaps of absolute radiocarbon ages (Zier 1999b:101,113).

Two sites, in the South Platte Basin, Dipper Gap (Metcalf 1974) and Magic Mountain (Irwin-Williams and Irwin 1966; Kalasz and Shields 1997), are especially important because they provide significant information about human occupation during this time period. Within the main study area of Colorado's Arkansas River Basin, Zier and Kalasz (1999:113-116) identify 20 sites that have Middle Archaic radiometric dates. At nine of these sites full-scale mitigative excavation was performed, while the other 11 were test excavated.

The increased level of investigation of Middle Archaic sites in southeastern Colorado has provided an expanded knowledge of this period. The pattern of habitation during this time period is geographically widespread and essentially parallels developments within the adjacent regions of the High Plains, Central and Southern Rocky Mountains, and intermountain basins (Zier 1999b:116). The significant increase in site numbers and distribution throughout these regions is viewed as a reflection of demographic processes, which were a result of either internal population growth or an outward expansion of populations from one or several core areas (Zier 1999b:116-117).

Both architectural and nonarchitectural features became more common during this period. Stone circles appeared in the Northwestern Plains and are thought to represent the remains of various circular lodge or tipi superstructures (Frison 1991:92-97). Basin-shaped houses also became more prevalent throughout the Wyoming Basin (Shields 1998; Zier 1999b:120). Evidence for Middle Archaic habitation architecture is less apparent in the Eastern Plains of Colorado. However, recent excavations at the Rueter-Hess Reservoir project in the South Platte Basin have produced basin-type structures that date to the Middle Archaic period (Gantt 2007). Only a single structure has been recorded within the Arkansas River Basin, consisting of a shallow, oval depression and a rudimentary semicircle of sandstone slabs (Rood 1990; Rood and Church 1989; Zier 1999b:120). Nonstructural features generally consist of various kinds of hearths that undoubtedly served a variety of functions including food preparation and/or heat sources (Kalasz et al. 2003:16). These features are generally small (less than 1 meter in diameter) and basin-shaped. They are either lined with rock or unlined, and the fill is either ash-stained sediment, charcoal or fire-cracked-rock, or some combination of these materials (Zier 1999b:120).

Tool assemblages reflect this region-wide population expansion. However, “the general absence of known sites during the Early Archaic period in fact makes most classes of artifacts seem to proliferate in the Middle Archaic” (Zier 1999b:118; cited in Kalasz et al. 2003:15). Projectile point styles consist of both lanceolate and stemmed-indented base forms (e.g., Duncan, Hanna, McKean lanceolate) that are associated with the technologically-based taxon known as the McKean complex (Zier 1999b:117; Kalasz et al. 2003:16). Ground stone tools, especially manos and metates, are common throughout this period, although they appear to be expedient and lack formalized shaping (Zier 1999b:118). Less common artifacts dating to this period consist of modified bone (e.g., tabular beads, awls and scapula scraping tools) and shell artifacts (Zier 1999b:119).

In the Arkansas River Basin 10 rockshelters have been excavated of which four have important information relevant to the Middle Archaic period (Zier 1999b:115). These sites are Draper Cave, Wolf Spider, Recon John Shelter, and Gooseberry (Hagar 1976; Hand and Jepson 1996; Zier 1989; Kalasz et al. 1993; Zier and Kalasz 1991; Zier 1999b:115). These rockshelters share similarities in that all exhibit Late Archaic and Late Prehistoric components which overlie the deepest and earliest Middle Archaic components (Zier 1999b:115).

Only two shelters dating to this period are located on the northern side of the Arkansas River drainage and both are within the confines of the FCMR. These sites are Recon John Shelter (Zier 1989) and Gooseberry Shelter (Kalasz et al. 1993). The sites are situated approximately 2.4 km (1.5 mi) apart along the Turkey Creek drainage. Recon John shelter occurs in overbank alluvial deposits and has a Middle Archaic component reaching a depth of 1.40-1.95 m. This site has produced the most Middle Archaic radiocarbon ages (4400B.P., 4050 B.P., 3680 B.P., 3530 B.P.) within the Arkansas River drainage (Zier 1999b:115). However, none of the projectile points is associated with the Middle Archaic period, which may reflect the limited volume of excavated deposits for this period (Zier 1989:149).

Gooseberry Shelter, also deeply stratified, is situated just above the Turkey Creek floodplain and is filled with eolian sediments. Two of the lowest strata (1.80 - 2.48 m below the modern ground surface) produced two features that date to 4930 B.P. and 3890 B.P. and thus fall within the Middle Archaic period. With the exception of the Olsen-Chubbuck site radiocarbon date (10,150 B.P.), Gooseberry Shelter's absolute date of 4930 B.P. is the oldest within the Colorado portion of the Arkansas River Basin (Zier 1999b:115).

Late Archaic Period:

The date 3000 B.P. separates the Middle and Late Archaic periods (Zier 1999b:101). This is an arbitrary date that marks the decline of projectile points associated with the McKean complex throughout the surrounding plains and mountain regions (Zier 1999b:101). The archaeological record indicates that about this time McKean-style projectile points were replaced by large, corner-notched point styles (Zier

1999b:101). The radiometric dates for the Late Archaic period are virtually uninterrupted throughout the Arkansas River Basin. This phenomenon is not, however, unique to this region alone. The nearly continuous dates for this period indicate that settlement that was widespread throughout the adjacent areas of the plains, plains/foothills and mountains.

Several multicomponent sites that have been excavated, including the rockshelters previously described from the succeeding Middle Archaic period, indicate a long-standing, localized hunter-gatherer tradition (Zier 1999b:128-130; Kalasz et al. 2003:16). The Late Archaic also displays the same foraging economy that evolved previously in the Archaic stage (Kalasz et al. 2003:16). Noticeable change occur in the projectile point styles, such as the development of corner-notched and stemmed dart points, which suggest a trend toward regionalism (Zier 1999b:130-136; Kalasz et al. 2003:16-17). Otherwise, the archaeological assemblages from this period, including nonstructural feature, lithics, and ground stone tools, are essentially the same as those dating to the previous period (Zier 1999b:130-136). A subtle difference has been noted in the frequency of bone and perishable materials, which increase throughout the Late Archaic. However, this may reflect better preservation rather than a technological change (Zier 1999b:131-132). Structures are rarely found in the archeological record of southeastern Colorado (Zier 1999b:134). Recent excavations have uncovered evidence of corn which may have been present during the latter portion of the Archaic stage; however, its low frequency indicates that it was, at best, only a subtle component of the prehistoric diet (Zier 1999b:137).

Within the boundaries of the FCMR are five Late Archaic sites that have been excavated or tested (5EP45, Renaud’s Shelter, Recon John Shelter, Gooseberry Shelter, and Two-Deer Shelter). Two of these sites, 5EP45 and Renaud's Shelter, are limited to the Late Archaic period. The human habitation at 5EP45 appears to have been sparse, yielding only a single radiocarbon age of (2100 B.P.) (Zier et al. 1996:169-177). In contrast, the other four sites dating to the Late Archaic period have abundant cultural deposits and suggest a continued incorporation of rockshelter occupation by the local hunter-gatherers population throughout time. The age of Renaud's Shelter was based on a single temporally diagnostic projectile point found on the surface of the shelter (Van Ness et al. 1990:54). Extensive test excavations took place during the early 1930s extended to a depth of 1.16 m below the present ground surface (Renaud 1931). Charcoal was found throughout most of the levels and indicates that the shelter is a multicomponent site.

There are three multicomponent rockshelter sites on Fort Carson that have radiocarbon ages within the Late Archaic occupation. Two of these shelters, Recon John and Gooseberry, were described previously in the discussion of the Middle Archaic period; the third rockshelter is Two Deer Shelter (Zier et al. 1996). At Recon John, two radiocarbon ages (1910 B.P. and 1870 B.P.) were obtained that date to the latter portion of the Late Archaic period (Zier 1989; Zier and Kalasz 1991; Zier 1999b:128). The lack of earlier dates during this period is probably a consequence of the shelters' location on an active flood plain, rather than an occupational hiatus (Zier 1999b:128). Zier (1989) suggests that erosional processes associated with Turkey Creek removed the earlier Late Archaic sediment. Therefore, this event left an approximate 1,500-year gap in time that dates between ca. 3500-2000 B.P (Zier 1989; Zier and Kalasz 1991; Zier 1999b:128).

Two shelters, Gooseberry and Two Deer, are both located within the Turkey Creek drainage. Both of these shelters are located a few meters above the flood plain and are generally filled with eolian sediment (Zier 1999b:128). The radiocarbon dates obtained from both Gooseberry (2600 B.P., 2160 B.P.) and Two Deer (2430 B.P., 2170 B.P., and 3070 B.P.) seem to corroborate the idea that erosional processes removed some Late Archaic cultural deposits at Recon John Shelter (Kalasz et al. 1993; Zier et al. 1996; Zier 1999b:128). The sequences of these radiometric dates, although not entirely uninterrupted, loosely fill in the missing dates for the early portion of the Late Archaic period at Recon John Shelter.

Late Prehistoric Stage

The Late Prehistoric stage in the Arkansas River Basin covers a 1,625-year time span and dates between 1850-225 B.P or A.D. 100-1725 (Zier and Kalasz 1999). This stage is subdivided into three periods: Developmental (1850-900 B.P. or A.D. 100-1050), Diversification (900-500 B.P. or A.D. 1050-1450), and Protohistoric (500-225 B.P. or A.D. 1450-1725). The Diversification period is further divided into two phases: Apishapa (900-500 B.P. or A.D. 1050-1450) and Sopris (900-750 B.P. or A.D. 1050-1200) (Zier and Kalasz 1999).

The beginning of the Late Prehistoric stage is characterized by the introduction of new technologies and subsistence strategies, which were added onto the already well-established and localized hunter-gatherer tradition of the Archaic stage (Kalasz et al. 1999b:141). The progression of the Late Prehistoric stage witnessed a striking transformation in settlement, subsistence, technology, trade, and demographics (Kalasz et al. 1999b:141). This surge in the material culture and adaptation continues throughout

Developmental and Diversification periods with minimal external influences. The commencement of the Protohistoric period, however, coincides with large-scale abandonment by local populations in the region. It is perhaps not a coincidence that around this same time, Athapaskan populations initially came into southeastern Colorado (Kalasz et al. 1999b:146).

<u>Developmental Period</u>:

The date A.D. 100 separates the Archaic stage and the Late Prehistoric stage and also marks the beginning of the Developmental period (Zier and Kalasz 1999). This somewhat arbitrary date marks the approximate earliest appearance of arrow point-sized projectile points in the region (Kalasz et al. 1999b:160). In fact, the principle technological advances that distinguish the Developmental period from the proceeding Late Archaic period are the introduction of the bow-and-arrow and ceramic containers. The introduction of these technologies was not abrupt. In effect, the small, corner-notched Scallorn arrow point that is the most diagnostic lithic tool for this period is commonly recovered in context with large corner-notched atlatl dart points associated with Archaic styles (Kalasz et al. 1999b:172). Over the course of the period, the smaller arrow points replace the atlatl dart point, until the latter is completely eliminated from the archaeological record (Kalasz and Zier 2003:17). Except for the change in projectile point morphology, however, the lithic assemblages of the Developmental period do not significantly deviate from those of the Archaic stage (Kalasz and Zier 2003:18).

Temporal data suggest that indigenous groups in the Arkansas River Basin adopted ceramic technologies approximately 200-300 years after the appearance of the bow-and-arrow (Zier and Kalasz 1999:Table 7-1; Kalasz and Zier 2003:17). Although the ceramic assemblages dating to the Diversification period are limited in both quantity and variety, two ceramic ware styles have been identified in southeastern Colorado (Kalasz et al. 1999b:172). These pottery styles consist of cord-marked wares and a thick, crude, oxidized pottery with sand tempering. Such styles share similarities to those manufactured in the later Diversification Period and suggest influences adopted from both the Central Plains region (cord-marked wares) and Park Plateau (crude oxidized wares) (Kalasz et al. 1999b:172-173; Kalasz and Zier 2003:17).

The production of pottery and the bow-and-arrow were not the only processes that occurred in the Arkansas River Basin during the Developmental Period. Basin houses with several interior elements consisting of hearths, storage features, postholes, and stone slab foundations were more common during this time than in the previous Late Archaic period (Kalasz et al. 1999b:178-181; Kalasz and Zier 2003:17). Economics continued to focus on wild faunal and floral resources, although domesticated plants, for example maize and beans, became increasingly important resources (Kalasz et al. 1999b:176-178; Kalasz and Zier 2003:18). In addition, the manufacture of bone and shell tools and become more prevalent during this period (Kalasz and Zier 2003:18).

Seven rockshelters at Fort Carson have produced radiocarbon dates from the Developmental period. These shelters consist of 5EP1345 (1090 B.P., 1200 B.P.), 5PE909 (1690 B.P.), 5PE1807 (1490 B.P.), Gooseberry Shelter (1400 B.P.), Sullivan Shelter (990 B.P.), Two Deer Shelter (1580 B.P., 1300 B.P., 1130 B.P.), and Recon John Shelter (1500 B.P.; 1400 B.P.; 1150 B.P.) (Charles et al. 2001; Kalasz et al. 1993; Zier 1989; Zier et al. 1996; Zier and Kalasz 1999:Appendix A). Some of these rockshelters, namely Two Deer, Recon John and Gooseberry, display extended stratigraphic sequences that date from the Archaic stage into the Developmental period. Even though maize and ceramics are present in small portions within the later of the two Developmental shelter components, few changes in subsistence and technologies occur from the preceding Late Archaic period (Kalasz et al. 1993; Zier 1989:313-314). The only significant change in the artifact assemblage is in the projectile point morphology, with shifts from large and medium sized stemmed bifaces in the Late Archaic to smaller forms during the Developmental period (Zier 1989:304). The overall lack of change indicates long-term stability of the hunter-gatherer lifestyle that was maintained throughout the Developmental period (Zier 1989:313-314).

The material remains at most, if not all, of these rockshelters on Fort Carson suggest that activities were limited in function and that the sites served as short-term occupations (Kalasz et al. 1993; Zier et al. 1996; Zier 1989). Other rockshelters within the Arkansas River Basin, e.g., Metate Cave (Campbell 1969) and Torres Cave (Hoyt 1979), had abundant and diverse features and artifact assemblages that date to the Developmental period (Kalasz et al. 1999b:175). The wealth of these cultural materials, in comparison to the Fort Carson's limited remains, suggests that at least during this period, rockshelters within the Arkansas River Basin served a variety of functions with varying levels of occupational intensity (Kalasz et al. 1999b:175).

Diversification Period:

In southeastern Colorado the middle portion of the Late Prehistoric stage is comprised of the Diversification period (A.D. 1050 to 1450) (Zier and Kalasz 1999). This period is generally distinguished from the preceding Developmental period by the appearance of small semi-sedentary village or hamlet settlements that consisted of several multiroom habitation structures (Kalasz et al. 1999b:189). The Diversification period is recognized by distinct changes in adaptive strategies between two main prehistoric cultural groups, also known as phase/focuses: Sopris (A.D. 1050 to 1200) and Apishapa (A.D. 1050 to 1450) (Zier and Kalasz 1999). Even though the Sopris and Apishapa phase populations share a common origin in the Developmental period, they have separate manifestations that make them distinct cultural entities during the Diversification period (Kalasz et al. 1999b:189). The Sopris phase is centered in the upper Purgatoire River area near Trinidad, Colorado and Raton New Mexico, even though the peripheries extend to the southern tip of the Park Plateau (Kalasz et al. 1999b:222). The Apishapa phase is generally centralized in the southeastern plains of Colorado within the Arkansas River Basin, although the boundaries extend from the Black Mesa area in the Oklahoma panhandle to the Cimarron-North Canadian divide in New Mexico (Drass 1998:422).

The Sopris phase is generally defined by influences from the northern Rio Grande Puebloans. Puebloan technologies were introduced to the local hunter-gatherers, at the southwest corner of the Arkansas River Basin and northeastern New Mexico, and resulted in a generally sedentary lifestyle (Kalasz and Zier 2003:19).

The dominant characteristics of the Sopris phase are the various Taos culinary ceramic wares and multi-room stone masonry structures that are rectilinear in shape (Kalasz et al. 1999b:222; Kalasz and Zier 2003:19). Both interior and exterior storage pits with remnants of cultivated materials suggest that maize, squash and beans, significant dietary items, although the abundance of projectile points as well as wild plant and animal remains indicates that such domesticates were only part of a dual subsistence strategy (Kalasz et al. 1999b:237). Burials were commonly placed beneath the floors of the structures. These mortuary practices suggest that the Sopris phase community organization was sedentary, and reflects the importance that was placed on household-based lineages (Kalasz et al. 1999b:229; Kalasz and Zier 2003:19).

The Apishapa phase constitutes the extreme western extent of the Plains Village tradition, which began to develop during the middle portion of the Late Prehistoric stage (A.D. 100 to 1725) (Zier and Kalasz 1999). The small permanent houses that characterize this tradition started to appear around A.D. 800 or 900 in the southern plains of western Kansas, central Oklahoma and the Texas Panhandle. These houses were generally constructed as single rooms made up of wattle and daub. The four-post structures were usually square or rectangular with a central fire pit. Prominently arranged in a small village setting, they were located in defensible locations adjacent to fertile flood plains. The archaeological record suggests that the inhabitants led a relatively sedentary lifestyle with a subsistence economy based on growing horticultural products such as maize, beans and squash. Plains Village people utilized mainly local, non-agricultural resources. Activities such as, gathering wild plants and hunting for both large and small game were commonly practiced (Drass 1998:422-425; Anderson 1989a:25-26).

The primary reason for separating the Apishapa phase from the greater Plains Village is the unique construction of stone-slab enclosures, consisting of circular single or paired stone rooms, which characterize the Apishapa (Zier and Kalasz 1999:198). Most such sites occupy defendable landscape positions in upper canyon areas or on buttes and mesas (Anderson 1989a:25). These sites generally exhibit shallow soil deposits that overlie solid bedrock, which offered minimal opportunities for excavating foundation supports while erecting a structure. Perhaps for this reason, construction methods tend to vary for Apishapa structures (Zier and Kalasz 1999:220-221).

Regardless of the variation found in construction, specific architectural attributes are characteristic of Apishapa phase sites. Stone slabs laid vertically or horizontally generally make up the foundations of these features. When Apishapa people positioned these structures in areas with deep sediment, they excavated trenches to provide footings for the rock slabs; at other times they incorporated natural rock outcrops and boulders into the walls. Room sizes range in measurement from only a few meters across to 15 meters in diameter. The curving rock walls suggest that they buttressed wood pole and brush superstructures. Rock collars found in the interiors of some excavated structures suggest that wooden posts may have supported the roof (Zier et al. 1988), while vertical rock slabs supported the wooden posts (Gunnerson 1989). Other features in the interiors of these structures are generally sparse, although some structures exhibit central hearths or other fire-related features (Gunnerson 1989; Ireland 1968; Nowak and Kantner 1990; Zier and Kalasz 1999:221).

The classic pattern of the Plains village tradition does not appear to have developed fully on the southeastern plains of Colorado. Even though a small number of sites provide evidence of cultigens and immovable storage facilities for the containment of horticultural products, it appears that horticulture did not play a major role in the Apishapa economy. The dominant subsistence strategy for the Apishapa phase focused on hunting large and small game and gathering wild plant resources (Anderson 1989a:21). Even though artifact traits like side-notched projectile points and grit-tempered, cord-marked pottery are indicators of Apishapa-Plains Village interaction, most Apishapa assemblages lack implements typical of the Plains Village tradition such as bison scapula hoes and alternately beveled knives. This dichotomy is suggestive of fundamental differences between the Apishapa hunter-gatherer economy and the horticultural economy of the Plains Village tradition (Zier and Kalasz 1999:208).

There are three rockshelters on Fort Carson with radiocarbon date from the Diversification period that is associated with the age of the Apishapa phase. These shelters consist of 5PE1610 (930B.P.), Woodbine Shelter (880 B.P.), and Two Deer Shelter (860 B.P) (Charles et al. 2001; Kalasz et al. 1993; Zier et al. 1996; Zier and Kalasz 1999:Appendix A). This designated time period, for 5EP1610, was based on a thin "ethnostratigrapic layer" that produced an abundant amount of rodent bones. The quantity of these bones demonstrates the presence of a cultural layer that ranges within a 2-sigma radiocarbon age of 945-730 B.P. (Charles et al. 2001:19.9). Woodbine is the only shelter that has architecture within its confines. It also displays common themes of the Apishapa phase including maize, pottery, and projectile points (Kalasz et al. 1999b:215). Two Deer Shelter displays projectile point morphologies and ceramic wares of this age, but lacks other specific attributes that are linked to the Diversification period (Kalasz et al. 1993:222; Zier et al. 1996:Table 25).

Apishapa phase rockshelters are commonly located near open residential base camps with habitation structures (Kalasz et al. 1999b:215). The rockshelters discussed previously are all located along or near Turkey Creek and are in close proximity to the Avery Ranch and Ocean Vista sites, two residential base camps with habitation structures (Zier et al. 1988; Zier et al. 1990; Kalasz et al. 1993; Kalasz et al. 1999b:215). At least at Fort Carson, the differences between the open architectural sites and the rockshelters lie mainly on the quantity and degree of artifacts that each type of site displays. Rockshelters at Fort Carson generally have a low frequency of cultural materials and indicate utilization of small mammal resources, whereas open sites have more abundant cultural materials and are suggestive of a subsistence base focused on large animal resources (Kalasz et al. 1999b:215).

The range of functions that rockshelters served in the overall settlement pattern of the Apishapa phase remains open for debate (Kalasz et al. 1999b:215). For example, data from Apishapa phase rockshelter sites on the Pinon Canyon Maneuver Site indicate that, at least toward the end of this period, large game became a more prominent occurrence within rockshelter settings (Andrefsky et al. 1990; Kalasz et al. 1999b:215).

The end of the Diversification period is marked by the abandonment/dispersal of the long-term population base that originated in the Archaic stage. Although current data suggest that the Sopris phase continued for a two and a half centuries longer than the Apishapa phase, there is no evidence at present to suggest that Diversification period populations were the Arkansas River Basin beyond the middle of the A.D. 15th century. It is likely that a combination of cultural and environmental factors, including warfare, drought, food-related stress, and social collapse, played a role in the abandonment of the area (Zier and Kalasz 1999:207-208; Kalasz and Zier 2003:19).

<u>Protohistoric Period</u>:

The Protohistoric period (A.D. 1450 to 1725) is the final period of the Late Prehistoric stage in the Arkansas River Basin (Zier and Kalasz 1999). The beginning date of ca. A.D. 1450 for the Protohistoric period is distinguished by the overlapping dates associated with abandonment of Diversification period populations and the arrival of Athapaskan (or Apachean) groups from the north (Kalasz et al. 1999b:250; Zier and Kalasz 2003:19). The ending date of ca. A.D. 1725 for the Protohistoric period is based on ethnohistoric research of Spanish expeditions, which indicate a withdrawal of Apachean bands provoked by Comanche and Ute invasions (Kalasz et al. 1999b:250; Kalasz and Zier 2003:19-20).

Evidence for the Protohistoric period is limited in the archaeological record of southeastern Colorado. Sites generally associated with this period are often identified on the basis of pottery, stone circles ("tipi rings"), and rock art typical of the Apachean culture, although the affiliation of stone circle sites is not specifically limited to the Protohistoric period (Kalasz et al. 1999b:257). Additionally, lithic and bone tool assemblages are similar to those of the preceding Diversification period (Kalasz et al. 1999b:255). In most cases, Protohistoric sites in the Arkansas River Basin are characterized by sparse artifacts and features, which indicate that resource procurement was oriented toward seasonal forays along major drainages (Kalasz et al. 1999b:257).

Perhaps the best indicator of Protohistoric activities is the presence of micacious ceramics. The ceramic attributes of Sangre de Cristo Micaceous and Dismal River Gray Ware pottery suggest that two types of influences were present among the Apachean groups of southeastern Colorado. Micaceous ware from the Sangre de Cristo or Jicarilla Apaches indicates interaction with Rio Grande Puebloans, whereas the gray ware from the western Dismal aspect suggests influences from Shoshonean groups of the western Rocky Mountains (Kalasz et al. 1999b:255; Kalasz and Zier 2003:20). The concept of assigning micaceous pottery to specific Apachean cultures, however, has its limitations and continues to be questioned within the archaeological discipline (Hummer 1989; Gulley 2000; Zier and Kalasz 1999:225-226; Kalasz and Zier 2003:20).

CHAPTER 4

FIELD AND LABORATORY TECHNIQUES

Field Techniques

General Excavation Strategy: The excavation was focused on two connecting rockshelters (Shelter 1 and Shelter 2) that lie at the base of a large east-facing sandstone cliff. The remaining portion of the site is approximately 20 feet downslope from the shelters and rests on a north/south-trending bench. This terrace consists of an open lithic and ground stone scatter. When FLC originally recorded the site in 1998 (Charles et al. 1998; Charles et al. 2000), the field technicians noted that the interior of these shelters appeared to have been looted. At the front of Shelter 1 was a small dirt mound, overlain with ground stone and sandstone slabs, which suggested such looting activity, although intact cultural deposits were still anticipated within each of these shelters.

Given the previous assumptions from FLC, a single segmented one-meter-wide trench, consisting of four contiguous excavation units, was placed in each of the rockshelters. Trench A was placed in Shelter 2, and Trench B was placed in Shelter 1. The trenches were oriented in an east/west direction, so that the western section of each trench was within the interior of the shelter, while the eastern section extended beyond the shelter driplines. The trenches exposed up to 1.37 meters of sediment below the present ground surface, which demonstrated cultural occupation and geomorphological processes at the site.

Surface Investigation: A surface survey of the site was conducted by the field crew throughout the 2002 field season. This process helped to define the site boundaries, identify previously unrecognized features, and locate tools. The site director presented a general reconnaissance and overview of the site's history for each group of new volunteers. This allowed the crews to orient themselves and identify the cultural materials they would find during the excavation phase. This process proved to be fruitful since previously unrecorded artifacts and features, including diagnostic artifacts, were found on the site. Due to the large frequency of surface artifacts in the open portion of the site, all tools, features, and a selected sample of flakes were pin-flagged. At the end of the field season, a systematic transect survey of five-meter intervals was performed on the site. All of the identified cultural materials, with the exception of debitage, were inventoried and their locations mapped using a Topcon electronic Total station (GTS-210 series), identified hereafter simply as "total station". Flaked tools and diagnostic artifacts were collected for analysis in the lab. Debitage, ground stone, and cores were analyzed in the field. Since the site exhibited hundreds of flakes on the surface, only 200 pieces of debitage were randomly sampled throughout the open area of the site. All of the cores and ground stone that were visible on the surface were analyzed. Newly discovered features were recorded, photographed and mapped.

Horizontal and Vertical Controls: The original rebar site datum implanted by FLC in 1998 was relocated along the approximate dripline of Shelter 1. Excavations during the 2002 field season were tied to this datum. The total station was placed over the existing site datum and a grid system was established with respect to true north. Horizontal control for the main site datum was designated 1000 m North, 1000 m East. For vertical control, the present ground surface at the base of the main site datum was given the arbitrary elevation of 1000 m.

In both of the shelters a single excavation unit point was tied into the main site grid system with the total station. After this grid point was marked, a compass and a measuring tape were used to plot each of the grid units. The excavation units in Shelter 2 were arbitrarily oriented with respect to true north, while the excavation units in Shelter 1 were oriented approximately 355° to true north. The corners were mapped with the total station. Each individual grid unit measured 1 m x 1 m, and the southwestern corner was used as the provenience designator.

A single 1 m x 4 m trench grid block with an approximate east/west long axis was established to cut across each of the shelters' midlines (Figure 25). The western section of each trench was oriented within the interior of the shelter, while the eastern section extended beyond the shelters drip lines. Each trench was assigned a consecutive alphabetical name based on the order in which the initial excavations began (i.e. Trench A, Trench B). Trench A is located in Shelter 2, while Trench B is in Shelter 1. Each of the individual 1 m x 1 m grid units was assigned an alphanumeric designation (e.g. A1, B1); they were sequentially ordered according to the designated trench (lettered A or B) and the numbered unit position from east/west (numbers 1 through 4). Excavation within these trenches was restricted to grids A1 through A4 in Trench A, and grids B1 through B4 in Trench B, resulting in a total surface area of 8 sq. m.

Two- to three-person crews typically worked in each unit; two screened while one alternately troweled and brushed each level. Levels that contained culturally sterile sediment were shovel skimmed as a matter of expediency. All excavations were conducted at arbitrary 10-cm levels until culturally sterile sediments or bedrock and/or large boulders were encountered (Figure 28 and 29). Because of the undulating shelter topography on the surface and the bedrock and boulders at the lowest levels, soil volume for the first and last levels of a unit were usually inconsistent. Additionally, a large boulder intruded into the southern portion of unit B3 and hindered the prospect of maintaining a controlled soil volume at the base of this unit.

Vertical control was maintained by a string and line level attached to wood sub-datums located near the corner of each unit. The top of each sub-datum was tied to the main site grid and the string level was measured to the nearest 0.1 m. Exceptions to this standard level system did occur. The first occurred for the sub-datum that was used for excavating Units A3 and A4. This sub-datum was measured to the nearest 0.2 m. The adjustment was not recognized during the excavation of the first four levels in Unit A3, therefore causing these levels to be offset from the rest of the units in Trench A. In order to compensate for this error, Level 5 was excavated as a 5-cm arbitrary unit, consequently adjusting the rest of the levels within this Unit to the standard 0.1 m. Use of the arbitrary 10-cm level was maintained throughout the rest of the excavated levels in Unit A3. The second exception occurred in Level 1 of Units A3 and A4, where the modern ground surface already displayed a thick, disturbed layer of cow/sheep manure. As a result, these excavations could be adjusted to the next arbitrary level. The third exception occurred during the initial excavation of unit B1, when a very loose sandy duff proved to be overburden from a looter's pile. In order to prevent mixing the disturbed sediment with the culturally intact sediment in the rest of the trench, the overlying deposit was scraped before the initial controlled excavations of unit B2, B3, and B4. The duff was up to 28 cm thick. The backdirt was removed and screened as the first level for each of these units, but vertical controls were not maintained.

Sediments excavated at the site were screened through 1/8” wire mesh. Screening activities took place in designated areas adjacent to the shelters where landscape fabric was laid out to minimize the mixture of backdirt sediment with intact deposits. Bulk artifacts collected in the screen from each level were separated by various material categories (i.e. bone, debitage, and ground stone). With the exception of debitage and small bone fragments, those items found *in situ* were assigned a point provenience and mapped in place.

Control samples representing 1/9 of the soil volume in each level, or 33 cm x 33 cm x 10 cm, were collected from most of the levels. These samples were saved for waterscreening through 1/16” mesh and were processed later when water was available in a laboratory setting. Occasionally, waterscreen samples were not collected for some of the excavation levels. Table 3 and 4 indicate those levels that are missing bulk soil collection for 1/9 of the excavated unit. Additional samples taken at the site consisted of flotation, soil, pollen, and radiocarbon material. Collection techniques for each of these sample types are described below in the following section.

At the end of the fieldwork, the entire wall slump was swept from the interior floor of the excavated units and screened through 1/8” mesh. All artifacts were collected and each was assigned a unique field specimen (FS) number. The excavation units were then lined with black landscape fabric and backfilled with refuse sediment resulting from the screening activities throughout the field season.

TABLE 3. Absent Waterscreen Samples According to Grid and Levels in Trench A/Shelter 2.

	GRID UNIT				TEMPORAL PERIOD
	A1	A2	A3	A4	
LEVEL(S)	N/A	N/A	N/A	N/A	OVERBURDEN
	N/A	N/A	N/A	2	DEVELOPMENTAL
	N/A	N/A	N/A	N/A	LATE ARCHAIC

TABLE 4. Absent Waterscreen Samples According to Grid and Levels in Trench B/Shelter 1.

	GRID UNIT				TEMPORAL PERIOD
	B1	B2	B3	B4	
LEVEL(S)	N/A	1	1	1	OVERBURDEN
	N/A	N/A	N/A	2	DEVELOPMENTAL
	N/A	N/A	N/A	N/A	LATE ARCHAIC
	N/A	6	N/A	N/A	MIDDLE ARCHAIC

Data Recording and Field Accessioning of Artifacts: Most of the field data were recorded on forms specifically developed for the volunteers working at the site. These standardized forms highlighted important archaeological information that might not have been collected had the regular FCMR excavation forms been in use. An excavation level form was filled out after completion of each 10-cm level within each unit. All features found during excavation were also recorded on site-specific forms. A scaled planview map was utilized for both level and feature forms. Features were defined as any cultural phenomena that were nonartifactual and/or nonportable (e.g. hearths, middens, charcoal concentrations, etc.). A scaled profile map was drawn for each identified feature. In addition, the north, south and west walls of excavation Trenches A and B were profiled after excavations were complete. Digital, black-and-white 35-mm, and color slide photographs were taken of all excavated features, surface features, selected grid levels, and excavation profiles, as were in-progress and general site overview photos.

For recording purposes, each 10-cm level was assigned a number in consecutive order from top to bottom of each excavation unit. Features were identified in the order in which they were discovered. Each feature was given a numeric designation. In some instances, an alphanumeric label was given to those newly uncovered features that were considered, at the time of the excavation, to be associated with previously identified features.

All of the cultural materials removed from the site were assigned unique FS numbers and placed in separate coin envelopes or paper bags. Each artifact container was labeled with site number, provenience (excavation unit, level, and northing and easting, if applicable), FS number, content description, excavator(s) initials, and collection date. Fragile materials, such as bone and shell, were placed in empty film canisters. Flotation and control samples were double bagged and wrapped with masking tape prior to transport from the site. Soil and ground stone collected for pollen samples were placed separately in sterile plastic bags and then in paper bags. These samples were also taped for extra protection. Charcoal collected for radiocarbon samples was packaged in clean aluminum foil envelopes.

Field Analytical Techniques:

Field Lithic Analysis: This study focuses on delineation of technological, functional, and temporal variability within the subsurface lithic assemblage at the Gilligans's Island site. Analytical deductions were determined through both subjective and quantitative attribute measurements which consisted of six major tasks: (1)

cataloging, (2) measurement and description of artifact attributes, (3) material type identification, (4) classification, (5) tabulation and statistical manipulation, and (5) interpretation of results.

Initial analysis of the surface lithic assemblage was conducted according to the classification system developed in Owens et al. (2000:17-22). All lithic materials analyzed in the field were separated into two major classes: chipped stone (debitage and stone tools) and ground stone. The chipped stone classification system was similar to that of Owens et al. (2000:17-21). Ground stone analysis procedures were based on those described in Dean (1992), with the exception of weight. Artifact attribute data for each lithic class were logged into a portable field computer in an EXCEL spreadsheet format. In order to avoid confusion between the lithic definitions of Owens et al. (2000) and Dean (1992), the artifact attributes analyzed in the field were later converted into the classification system that was specifically developed for the Gilligan's Island site. Lithic artifact definitions may be found later in this chapter.

The debitage analysis spreadsheet allows for recording the context in which the artifact was generally located, the material type, the presence/absence of cortex, and type of flake morphology. Three size grades were used to classify flake size. Handheld wire mesh screens with square openings measuring 1 inch, ½ inch, and ¼ inch on a side were used to measure flakes in the field. The mesh openings and techniques used to define debitage measurements and flake morphology were the same as those employed for the excavation lithic artifact analysis. The one exception was that platforms were not considered during field debitage analysis. Therefore, fragmented debitage with no proximal ends were also considered under the tech type category throughout the field analysis. A "comments" section was provided for additional nonspecific observation.

The stone tool analysis spreadsheet allows for recording the basic context, material types, presence/absence of cortex, and artifact type (core, biface, projectile point, etc.). In this project, size grade measurements were the same as those found above in debitage. A "comments" section was provided for additional nonspecific observation.

The ground stone analysis spreadsheet allows the following information to be recorded: function, type, material, condition or degree of completeness, and overall measurements (length, width, and thickness). In addition, each grinding surface is analyzed for individual attributes relating to technology (ground, polished, battered, pecked, flaked, incised, grooved), shape (oval, circular, irregular, etc.), striations (transverse, longitudinal oblique, circular, multiple, undetermined), use wear (light, moderate, heavy), and working edge measurements (length, width, depth). A "comments" section was provided for additional nonspecific observation.

Laboratory Analytical Techniques

The following narrative describes the analytical techniques used for both artifactual and biological materials from the Gilligan's Island site. These materials include lithic artifacts, faunal, remains, and macrobotanical remains. A large portion of the laboratory analysis was performed at Centennial Archaeology, Inc., Fort Collins, Colorado, and many of the analytical techniques and methods follow the guidelines set forth by this company. Some information below is derived from various Centennial reports including Kalsasz et al. (1993, 2003, 2005) and Zier (1989).

Database Management and Statistical Manipulation: Data obtained from the various analyses were either 1) recorded on paper forms and then entered into a Microsoft EXCEL 2000 and 2003 database or 2) placed directly into an EXCEL spreadsheet (Microsoft 2000 and 2003). The debitage EXCEL databases were then transferred into a SYSTAT 9 software package for statistical queries. Both the SYSTAT 9 and EXCEL software packages were used for management and variable manipulation of the analytical data (Kalasz et al. 2003:29).

Lithic Artifact Classification: Typology is a crucial concern for archaeologists studying the prehistoric past. Typological classification is the way in which artifacts are sorted to reduce the overall variability of an assemblage (Kalasz et al. 1999a:45). Most archaeologists would agree that the success of a useful classification system is dependent on the relevance of variables upon which each typology is based (Whallon 1982:127). The research emphasis of a particular investigator and the methods that he or she employs toward a particular typology may highlight certain characteristics of human adaptation while others may be missed (Kalasz et al. 1999a:45). Because typologies have an important integrated use in the archaeological discipline, there is an abundance of literature that pertains to this topic (e.g. Hill and Evans 1972; Cross 1983; Whallon 1972; Christenson and Read 1977; Sullivan and Rozen 1985; Whallon and Brown 1982). Clearly, the success of this study depends on the practical application of the classificatory device engaged in measuring variability in the stone artifact assemblage. Morphological attributes for this analysis are selected to measure three dimensions of lithic variability, specifically the technical, temporal, and functional aspects of stone tool manufacture (Kalasz et al. 1990:40; Kalasz et al. 2003:30).

The classification system employed for this lithic analysis divides artifacts into two major classes: chipped stone and ground/battered stone. Chipped stone artifacts are defined as all lithic resources that have been modified and/or detached in the processes of conchoidal fracture and/or chipping. The chipped stone class is divided further into two subclasses: (1) debitage (unmodified stone by-product) and (2) tools and/or cobbles (modified stone product). Ground/battered stone artifacts are defined as all those that have modification from abrasion (e.g. grinding, polishing, hammering, battering), although some ground stone edges may also be flaked. There are several separate subclasses of ground/battered stone, based on the following distinct morphologies: ground cobbles (manos), ground slabs (metates), battered cobbles (hammerstone), and manuports (unclassifiable items that are out of the natural context of the site and were likely introduced by humans). A miscellaneous stone artifact taxon was also created to describe unique artifacts (Kalasz et al. 1990:39-40; Kalasz et al. 2003:30-31; Zier 1989:94).

A brief description of the tool attributes selected for the lithic analysis is provided below. The attributes are organized based on the standard order in which each characteristic was used most throughout the analysis. For example, the material type is identified for all lithic artifacts in the assemblage; therefore, it is the first to be described. After each attribute has been defined within each major class (debitage, tools/cores, ground/battered stone), a brief description of the analytical procedures and their attributes is summarized when needed. To avoid redundancies, a detailed list of attributes and codes used throughout the lithic tool analysis (i.e., debitage, modified chipped stone tool, and ground/battered stone) is provided in Appendix B.

<u>Standard Lithic Attributes</u>:

Material Types

Recognizing material types is important in understanding the relationship between availability of resources and prehistoric peoples' preferences for lithic (Kalasz et al. 1993). The identification of lithic material types in this study is based on macroscopic observation. The classification of raw material types is subjective and is primarily based on color, inclusions, transparencies, mineral composition, texture, and structure (Andrefsky 1998:57).

The raw material definitions are derived largely from past field analyses at FCMR (Zier and Kalasz 1985; Zier et al. 1988, Kalasz et al. 1989; Kalasz et al. 1990, Kalasz et al. 1993). Field investigations from these projects and personal observation from the author are, useful for identifying material source information in the region. Local materials have been identified (Kalasz et al. 1993:40-41) as those that are naturally, as observed on Fort Carson by past archaeological field crews. Nonlocal materials are those that are unlikely to occur in the immediate areas or that have not been observed in nearby natural formations. Often this determination is made by using geologic maps of distant areas.

(1) **Chert**

A dense cryptocrystalline rock composed mineralogically of tightly interlocking grains of chalcedony and cryptocrystalline quartz (Kalasz et al. 1993:41). Chert is generally an opaque rock that exists in a wide range of colors and textures. A single prehistoric quarry site (5PE369) has been recorded as a chert source on Fort Carson and is probably derived from the Morrison Formation (Zier and Jepson 1992:65).

(2) **Chalcedony**

A transparent or translucent form of cryptocrystalline quartz that is also recognized as microcrystalline fibrous silica (Rice 1955:333; Kalasz et al. 1993:41). The same prehistoric quarry site as that noted above, also has been identified as a chalcedony source (Zier and Jepson 1992:65).

(3) **Quartzite**

A granular metamorphic rock consisting mainly of quartz that is produced by a recrystallization of sandstone transferred under heat or pressure (Bates and Jackson 1984:415). Quartzite artifacts in this study range from coarse to fine-grained material. The color is typically gray. A single prehistoric quartzite quarry site (5EP54) of unknown geologic age has been recorded on Fort Carson's Booth Mountain (Zier and Jepson 1992:65). Coarse-grained quartzite sources are, however, located on the eastern bench of the Gilligan's Island site and were probably utilized prehistorically.

(4) **Basalt**

An extrusive igneous rock that is common in lava flows. It is generally black in color and has a coarse grained texture. No specimens of this material are known to occur naturally in Fort Carson, although basalt hogbacks and cone-shaped volcanic remnants commonly occur south and southeast of Fort Carson nearer the Colorado-New Mexico state line.

(5) **Siltstone**

Silt that is altered by heat, cementation, or pressure but lacks lamination (Bates and Jackson 1984:469). No specimens of this material are known to be naturally occurring on Fort Carson.

(6) **Porcellanite**

A dense siliceous rock having the texture, dull luster, and general appearance of unglazed porcelain. The name has been attributed to impure chert, baked clay or shale found in the roof or floor of a burned coal seam, and fine-grained acidic tuff compacted by secondary silica (Bates and Jackson 1984:397).

(7) **Obsidian**

A black colored volcanic glass that is often transparent or translucent and is characterized by conchoidal fracture (Bates and Jackson 1984:352; Hand and Jepson 1996:43). Obsidian does not naturally occur on Fort Carson. The nearest source confirmed through a single x-ray fluorescence sample from the Gilligan's Island site has the same trace element composition as Cerro del Medio (Valles Rhyolite) obsidian from the Jemez Mountains of northern New Mexico (Hughes 2002).

(8) **Granitic**

Broadly applied to holocrystalline quartz-bearing plutonic rock. Granitic textures are characterized by medium to coarse grains (Bates and Jackson 1984:219,392). The major streams on Fort Carson, such as Turkey and Red creeks, produce quartzite in cobble form that probably originates in the foothills to the northwest (Zier and Jepson 1992:65).

(9) **Sandstone**

A clastic sedimentary rock generally composed of quartz sand particles and cemented in a silt or clay matrix (Bates and Jackson 1984:446). Massive sandstone formations are the dominant lithic material throughout the Gilligan's Island site area.

(10) **Quartz**

A crystalline silica that has a vitreous to greasy luster (Bates and Jackson 1984:414; Kalasz et al. 2003:31). The material is hard with a very coarse-grained texture. This type of rock is widely distributed in igneous, metamorphic, and sedimentary rock. It can be found in both pebble and cobble form in most of the major streams on Fort Carson.

(11) **Petrified Wood**

Originally, a wood material that hardens over time into a silica-based substance, typically in the form of opal or chalcedony (Bates and Jackson 1984:468-469). There are two types of petrified wood in the Gilligan's Island collection, characterized by a yellow/brown or gray/black color. The yellow/brown-petrified wood is probably palm from the Dawson Arkose formation in the Palmer Divide area. The gray/black material is from an unknown source. No known, naturally occurring petrified wood occurs on Fort Carson.

(12) **Quartz Crystal**

A fine-grained crystallized silicon dioxide (Rice 1955:332; Kalasz et al. 1993:42). The materials in this analysis are typically transparent, with a clear glasslike luster that fractures conchoidally. Specimens of this material are not identified on Fort Carson. However, the abundance of quartz crystal recovered from testing at Skeeter Shelter suggests that a localized resource is in the area (Swan and Rodgers 2007). Pikes Peak, rising above Fort Carson to the west, consists of Pikes Peak granite and often has interlocking crystals of glasslike quartz (Chronic and Williams 2002:46). This material can probably be found in the stream beds that run off of the Pikes Peak batholith and flow through Fort Carson.

(13) **Rhyolite**

An extrusive igneous rock, typically fine-grained groundmass, with a flow texture and containing sporadic quartz inclusions throughout its matrix (Bates and Jackson 1984:432; Kalasz et al. 2003:32). No known material of this type occurs naturally on Fort Carson. Rhyolite sources exist to the north near Denver, in the Tertiary sandstone and conglomerate of the Denver and Dawson formations.

Cortex

Cortex is the weathered outer layer of a cobble or nodule. In certain situations, lithic implements with cortical markings are assumed to represent early stages of manufacture otherwise known as decortication (Kalasz et al. 1993:44). In some cases, the exterior rind of the material can provide information of its origin or where it was originally collected, from either a stream or a formation. These variables were also considered for the interpretive value. Two attributes of cortex variation are recognized as either (0) absent or (1) present.

Metric Measurements

The length, width, and thickness were measured on all tools that had complete and/or confident measurable attributes. For example, if a hafted biface was missing a lateral edge, but the base, tip and maximum thickness were present the width of the implement would not be measured. Length, width, and thickness were measured with a digital caliper to the nearest 0.1 mm. Orientation of the various tool forms remained consistent throughout the analysis. Tool thickness was always measured perpendicular to the length in cross-section. Bifaces were always measured from tip to base. Width was measured across the widest face of the tool, one lateral edge to the other. For flake tools, the length is the maximum of intact proximal and distal lengths. The width was measured at the thickest portion of the cross-section that is perpendicular to the tool's length. For all ground/battered stone specimens, the overall maximum length, width and thickness were obtained. Measurements of individual surface length and width were based on the long axis of the overall tool. Surface depths of metates were measured by placing a straight edge ruler laterally across the top of the specimen. A second metric ruler was placed perpendicular to the lateral line and the distance was measured to the deepest portion of the interior surface. If the condition of the implement was beyond recognition of any of the surface attributes, it was not recorded. When suitable, the weight was measured to the nearest 0.1 gram with a digital scale. Occasionally, some artifacts weighed too much for the electric scale, and a kitchen scale was employed.

Debitage Analytical Procedures and Attributes: The debitage sample from the Gilligan's Island site necessitated the use of both aggregate and typological analysis. Two separate debitage analyses, consisting of a mass analysis and a platformed flake analysis, were used throughout the study. Aggregate or mass analysis is one of the most popular types of debitage analysis (see Andrefsky 2001:3; Ahler 1989) and has recently been used at the Monument Creek site (Kalasz et al. 2005) in Colorado Springs and Burke's Bend in Pinon Canyon (Kalasz et al. 2007). The debitage mass analysis in this thesis stratifies the entire provenienced debitage assemblage into size grades using screens, and then compares the separate proportions of debitage in each stratum. Such a process allows for the interpretation toward similarities and differences in the population.

Ahler (1989: 87) has observed the four benefits of this type of analysis. First, it allows the researcher to process a large proportion of the debitage assemblage in a short amount of time. Second, the analysis is replicable because of the standardized mesh. Third, the entire assemblage can be used as a data set. Finally, processing time is saved because no flake fragments are selected out of the assemblage (cited in Andrefsky 2001:4).

A cortex typology is also utilized on the mass analysis form. Cortex identification serves as a way of determining the stages in lithic reduction (Andrefsky 2001:7, 1998:102-104). The second debitage typology is an application load typology based on the analysis of flake platforms. Application load typologies generally focus on the kind of implement or tool used to detach a flake from an objective piece, such as the application of hard-hammer percussion versus soft-hammer percussion (Andrefsky 2001:6).

A brief description of the debitage attributes selected for this analysis is provided below.

Mass Analysis

Since lithic tool production is a reductive process, it is important to identify the various size grades of flakes in an assemblage. The variation among flakes sizes is a simple yet important characteristic that identifies the various stages of lithic reduction (Andrefsky 1998:96). The initial Mass Analysis form sorts all of the debitage specimens recovered from the site excavation into a series of four separate size grades. Three nested screens with varying mesh sizes were used to separate the debitage. Size Grade 1 is the largest mesh screen and measures 1” (25mm). Size Grade 2 is the middle range mesh screen and measures a ½” (12.5 mm), and Size Grade 3 is the smallest mesh screen, measuring a ¼” (5.6 mm). Each screen prevents specimens greater than this dimension from passing through. All of the remaining specimens that pass through the smallest quarter-inch screen are recognized as Size Grade 4.

Debitage from each of the specific excavation proveniences was subsequently poured through the three nested screens. Then, in order to ensure that the flakes passed through the mesh properly, the screens were rotated three times in a counter-clockwise direction for each sample bag processed. Each specimen was then assigned to one of the material types as defined previously in this chapter. The presence and/or absence of cortex was then recorded. Finally, the number(s) of debris or shatter specimens were sorted separately according to material type. Debris/shatter flakes are defined as those specimens that exhibit an irregular or cubical shape and lack flake attributes (e.g. platform, bulb of percussion, and dorsal/ventral surfaces).

Platformed Flake Analysis

The platformed flake analysis is a subset of the overall debitage assemblage. It specifically focuses on those individual flakes that have an intact and recognizable proximal end which display platform morphologies or a point of an applied force (Andrefsky 1998). The variables in this analysis were used to determine the most probable technique used in stone tool manufacture. Each of the flakes was first identified as to material type. Those flakes displaying platforms were assigned to a subjective flake type category based on the overall morphological attributes. Flake morphology analysis is changed according to those descriptions devised by Ahler (1986:70). Definitions for hard hammer flake, soft hammer flake, bipolar flake, and unidentifiable flake are given below:

Hard Hammer Flakes: tend to exhibit many but not necessarily all of the following characteristics:

a. thick, flattened transverse and longitudinal cross-sections
b. few dorsal flake scars
c. flat, unprepared striking platforms
d. unlipped platforms
e. parallel to highly variable flake outlines
f. prominent bulbs of force

Soft Hammer Flakes: tend to exhibit many but not necessarily all of the following characteristics:

1) Biface thinning flake characteristics

  a. thin, flattened transverse cross-sections
  b. thin, curved longitudinal cross-sections
  c. very acute lateral and distal edge angles associated with feathered terminations
  d. multiple dorsal flake scars originating from varied directions, including the opposite of the subject flake
  e. narrow, faceted and prepared platforms
  f. lipped platforms
  g. expanding flake outlines
  h. diminutive bulbs of force

2) Retouch/Pressure flake characteristics

  a. generally smaller than 1 cm in maximum length and extremely thin

b. scraper retouch flakes with highly curved distal ends

Bipolar Flakes: tend to exhibit many but not necessarily all of the following characteristics:

a. shattered or pointed platforms with little or no surface area
b. evidence of force having been applied at opposite ends of the flake
c. angular, polyhedral cross-sections with steep lateral edge angles
d. lack of well-defined bulbs of force
e. very pronounced ripple marks
f. parallel flake outlines
g. lack of distinction between ventral and dorsal surfaces

Unidentifiable Flakes: are generally characterized by a mixture of the above attribute lists, thereby prohibiting any specific type assignment.

The size sort category is a similar concept to that described for Andrefsky's (1998:100) flake size class. It is retained for those specimens that are complete. The intact flakes allow for replicable measurement data that broken flakes cannot reproduce (Andrefsky 1998:100, Figure 5.10). Each complete flake was oriented so that the ventral surface was facing the observer and was positioned in the center of a two-dimensional circular graph. In this project, center circle had a radius of 5 mm. The rest of the graph depicted a sequential numbered series of evenly spaced concentric circles that were set at a radius interval of 2.55 mm. Each interval within the circular graph was identified by a sequential number. The number associated with innermost circle that completely encompassed a given specimen was the value assigned to that specimen. Each complete flake was subsequently weighed to the nearest 0.1 g with an electronic scale.

Modified Chipped Stone Analysis: The modified chipped stone was sorted into separate categories and types. The four separate classes of chipped stone tools are flaked stone tools, cobbles, hafted bifaces, and unhafted bifaces. A complete list of the attributes measured on modified chipped stone follows, although the criteria for utilizing each type shift according to specific analytical needs of each tool category. In order to enhance the interpretive value of the specimens, additional attributes, including some quantitative, were also utilized. Those specimens that required additional explanation were described further, when needed. Even though the analysis was not totally compatible with previous analyses on Fort Carson, the information for the following attribute definitions are largely derived from past field analyses on the base (Kalasz et al. 1993:50-53).

It should be noted that some of the attributes described above were applied in this analysis (e.g. Material Type, Cortex, Metric Measurements). The reader is asked to refer to these previous descriptions when applicable.

Modified Chipped Stone Tool Procedures and Attributes

Inspectional Category

Flaked stone tools were classified according to a "traditional" descriptive or subjective assessment based on overall morphology. Twenty-three tool types are identified and described below. The following categories are intended to describe the general morphology of the implement rather than its function (Kalasz et al. 2003:34). Numerous experimental archaeology studies have indicated that a relationship exhists between artifact form and function, although few definitive conclusions have been drawn (see Andrefsky 1990; Frison 1989; Keeley 1980; Semenov 1964; Whittaker 1994:244-

248; cited in Kalasz et al. 2003:34). Subjective tool type definitions generally employ a mixture of functional and morphological terms. Most of the definitions in the following categories have been modified from Kalasz et al. (1993; 2003).

(1) **Early Stage Unstemmed Biface**: This category roughly corresponds to Callahan's (1979) and Ahler's (1986:59) Stage 2 bifaces. Stage 2 bifaces have undergone the initial edging process; edges are sinuous in outline, the biface is usually not bilaterally or bifacially symmetrical, and edge angles are thick (55-80 degrees). Width-to-thickness ratios are often approximately 2.0 or less (Andrefsky 1998:180-181; Whittaker 1994).

(2) **Midstage Unstemmed Biface**: This category roughly corresponds to Callahan's (1979) and Ahler's (1986:59) Stage 3 bifaces. Stage 3 bifaces have undergone the primary thinning process; flakes removed from edges extend to midline or beyond, the biface is lenticular in cross-section, edge angles are moderate to thick (40-60 degrees), and they often possess width-to-thickness ratios of approximately 3.0 to 4.0 (Andrefsky 1998:180-181).

(3) **Late Stage Unstemmed Biface**: This category corresponds roughly to Callahan's (1979) and Ahler's (1986:59) Stage 4 and 5 bifaces. Stage 4 bifaces have been secondarily thinned; these bilaterally symmetrical implements are flattened considerably through flake removal, have correspondingly thin edge angles (25-45 degrees), and often possess width-to-thickness ratios of 4.0 or higher. Stage 5 refers to those bifaces that have been shaped for actual use or fully prepared for final notching, fluting, basal retouch, etc.

(4) **Stemmed Biface - Projectile Point**: This category includes stemmed bifaces that exhibit hafting elements such as notches, flutes, shoulders, indented bases, etc.

(5) **Stemmed Biface – Knife**: This category includes stemmed bifaces as described above that exhibit heavily worn and/or resharpened lateral margins.

(6) **End Scraper**: This category was created for any flake tool implement characterized by significant retouch restricted to the distal edge. Typically, end scrapers are short, thick flakes with wide, rounded distal edges that exhibit very steep angle edge retouch (75-90 degrees). The proximal portion is generally narrower than the distal margin.

(7) **Disto-lateral Scraper**: Disto-lateral specimens differ from end scrapers in that they exhibit modification or retouch along one or both lateral margins as well as the distal margin. Lateral margin edge-modification is believed to be either the result of use or intentional edge preparation for hafting (Boldurian and Cotter 1999:41; Rule and Evans 1985). Disto-lateral specimens may represent hafted end scrapers rather than a separate tool class. For purposes of this subjective assessment of overall morphology, disto-lateral scrapers are differentiated from end scrapers.

(8) **Undetermined Scraper**: This category includes unifacial flake tools that do not fit any of the above descriptions or, more commonly, fragmentary pieces that exhibit the characteristic unifacial thinning and steep angle retouch but are not sufficiently intact to ascertain any other morphological determinants.

(9) **Expedient Flake Tool - Cutting/Scraping**: This category includes flake tools that exhibit minimal modification. These specimens, often termed utilized or retouched flakes, may be characterized by small areas of edge retouch, a lack of thinning, or modification restricted to use-wear evidence. Although modification is indicative of

minimal effort invested in manufacture, the location of such evidence is suggestive of cutting and/or scraping tasks.

(10) **Expedient Flake Tool - Multiple Task**: This category is comprised of flake tool specimens that exhibit a beak or pointed prominence with wear indicating use as a perforator as well as some other form of minimal modification indicating cutting/scraping tasks.

(11) **Core**: A core is defined according to Andrefsky (1998:80-81) as a "modified nucleus or mass of chippable stone rather than a tool with some particular kind of function. The nucleus is not a recognizable flake nor is it a biface." Obviously, there can be some functional overlap between bifacial implements classed as early stage bifaces and those classed as cores. In this analysis, any implement with a patterned bifacial edge along an entire margin or margins was placed into the biface category. Those implements placed within the core category tended to be characterized by less continuous and more steeply angled flake removal suggesting that creation of a thin, symmetrical product was not the priority.

(12) **Chopper**: A chopper is a cobble or large piece of stone that has had a few flakes removed from one end. This tool form is somewhat related to cores. Choppers are generally fashioned by removing sizable flakes from larger pieces of stone. They differ from cores because the pattern of flake removal clearly defines a significant working edge opposite an unworked "back" area where the tool is grasped. The chopper edge can be unifacial or bifacial, but is typically bifacial. Battering and dulling of the edge is usually indicative of severe wear, such as might be produced by woodworking and heavy-duty butchering tasks.

(13) **Indeterminate Core/Cobble Tool**: This catch-all category encompasses a range of nondescript cobble/nodule pieces, probably representative of tested materials and/or expedient heavy-duty tools that exhibit minimal modification.

(14) **Tested Cobble**: A cobble or pebble that exhibits a few (generally no more than three) flake scars, but does not appear to have been utilized as a core. These specimens are thought to represent cobbles that were "tested" for knapping quality and then discarded.

(15) **Other**: Within any sizable assemblage, there is a small percentage of tools that do not fit into any prescribed categories. This classification includes implements that are determined to be sufficiently unique to warrant individual narrative description in a separate section, or tools so fragmentary that it is impossible to assign them to a formal category.

(16) **Undetermined Bifacial Fragment**: This category represents bifaces that are fragmented beyond recognition and cannot be placed within any of the unstemmed bifacial stages listed above.

Completeness

The completeness of individual tool specimens was based on the following attributes:

(1) **Complete**: The tool is intact.

(2) **Incomplete**: The tool is fragmentary.

(3) **Nearly Complete**: The tool is not complete, but based on the shape of the intact portion of the tool its missing segment(s) is easily extrapolated.

(4) **Reconstructed**: The tool was originally incomplete or nearly complete; however, laboratory analysis has enabled reconstruction of the tool.

Thinning

Thinning is an indicator of the reduction strategy employed during tool manufacture. Of importance is the pattern of flake removal as indicated by the location(s) of thinning flake scars along the face(s) of the specimen. Edge retouch and utilization are excluded from consideration. Five attribute values are provided to record the degree of thinning for modified tools:

(1) **Bifacial**: The implement is reduced along two sides of a face(s).

(2) **Unifacial**: The implement is reduced along a singe side of a face(s).

(3) **Multifacial**: The implement has random flake removal from various directions.

(4) **Unthinned**: The implement is edge modified only, or in the case of cobbles, has only been tested.

(5) **Undetermined**: The reduction strategy of the implement could not be determined.

Edge Utilized and Retouched (Complete)

The percentage estimates of both utilized (%U) and retouched (%R) edges were recorded on lithic tools that were sufficiently complete (i.e., complete or nearly complete specimens). Although these are two separate variables, the methods for arriving at numeric measurement are the same. The purpose for measuring these variables is to arrive at a conclusion regarding the degree of tool use before it was exhausted and then discarded. Percentages were measured by placing the tool onto the center of a rectangular diagram that had been divided equally into five 20% increments (1-5).

(1) **1-20%**

(2) **21-40%**

(3) **41-60%**

(4) **61-80%**

(5) **81-100%**

Edge Utilized and Retouched (Complete and Fragmented)

In an ideal lithic assemblage, all lithic tools would be complete and the utilized/retouched edge category, as listed above, would be applicable to all specimens. However, the overall condition of most lithic collections, including that from the Gilligan's Island site, is fragmentary. Furthermore, the concept of "completeness" when examining the edge modification of a tool may be premature; for example, a broken tool may not have fractured along the portion of the utilized and/or retouched edge. Finally, the mechanics of lithic tool use are such that tools may not have been simply discarded after they were broken; because of their functionality, a fragmented tool could be adapted (i.e., retouched and utilized) for additional purposes. Therefore, a separate category in this analysis has been incorporated to include both complete and fragmented stone tools that have utilized and retouched edges. In fact, the cobbles and unhafted biface classifications only include this particular type. Each variable is marked simply as either Absent (0) or Present (1).

Origin

This variable defines the tool according to an assessment of its original form prior to modification. Five attributes are recognized:

(1) **Flake**: The implement exhibits major characteristics of detached pieces (e.g., platform remnant, bulb of percussion) removed from an objective piece by percussion or pressure (Kalasz 1993:51; Andrefsky 1998).

(2) **Stream Cobble**: The implement exhibits the characteristic rounded cortex of an alluvial cobble. This value does not include flakes made from stream cobbles.

(3) **Angular Cobble or Nodule**: The implement is derived from material assumed to be non-alluvial in origin.

(4) **Pebble**: The implement is made from a small, pebble sized parent material.

(5) **Undetermined**: The implement is culturally modified to the extent that any assessments of original form are not possible.

Patterned

This variable specifically refers to the Cobble classification. A patterned implement has flake scars oriented in a certain direction(s) that suggests an intentional reduction strategy of a core. Two attribute values are recognized:

(0) Absent: The implement has multidirectional flake scars that are randomly oriented.

(1) Present: The implement has uni-directional flake scars.

Stage

This variable describes the reduction sequences of unhafted bifaces. It defines the different forms of a biface through the manufacturing process. The various forms are considered stages of an evolutionary progression that results in a finished biface. The following categories correspond roughly to Callahan's (1974, 1979; cited in Andrefsky 1998:180-186) biface Stages 2 through 5. Callahan's Stage 1 is the blank, which may be regarded as a flake, cobble, or piece of raw material. Since flakes and cobbles are identified elsewhere in the analysis, further recognition is not required in this portion of the examination.

(1) **Stage 1**: Described as an initial biface that has had small chips removed from around the edges. The edge angles are thick (50° - 80°) with few flake scars across the face(s).

(2) **Stage 2**: Described as a thinned biface. It is primarily the thinning stage of the biface in which flakes are removed from the center. The edge angles are moderately thick (40°-50°) with most of the cortex removed.

(3) **Stage 3**: Described as a preform. It is the secondary thinning of the biface in which large, flat flake scars may be patterned across the mid-line. The edge angles are thin (25°-45°) and the tool has a flat cross-section.

(4) **Stage 4**: Described as a finished biface. It is the final shaping of the biface in which refined trimming of the edges occurs before notching or hafting.

(5) **Undetermined**: The implement is fragmented or incomplete to the extent that t stage could not be determined.

Hafted Bifaces

Projectile points from the Gilligan's Island site were analyzed by using traditional inspectional techniques. Because of the limited sample size, a subjective assessment rather than quantitative measurement was employed because the morphological attributes may indicate temporal and/or cultural significance. The descriptive method utilized here was developed by Anderson (1989b). Size and stem characteristics are primarily emphasized, since portions of the projectile point are reworked and reduced throughout the time of the implement's use, especially the blade. Measurements were taken on complete elements, specifically length and weight; stem characteristic such as shoulder indentation or notch depth, haft width, and base width were also considered. These measurements were not used to derive the types; rather, they were provided for comparisons with similar specimens from previous studies. These measurements give the reader an indication of what the analyst considers to be a "large," "medium," or "small," projectile points (Kalasz et al. 1993:58-59; Kalasz et al. 2003:39).

Additional attribute were recorded in order to characterize the general morphology of the projectile point rather than its function. Some of the categories have been described previously. Those that are not are listed below and apply specifically to hafted bifaces. Most of the definitions that follow have been modified from Kalasz et al. (1993) and Kalasz et al. (2003).

Edge Grinding

Edge grinding, or backing, was recorded for the stem and/or base of the hafting element. The more common forms of grinding include attrition, abrasion, and edge rounding which often is manifested as only a slight change between the haft element and the blade area. It is important to note that edge grinding is interpreted to signify intentional dulling during manufacture rather than a product of actual tool utilization. For example, the hafted portion of a biface edge is often dulled by grinding during late-stage manufacture, prior to the time that the implement is mounted into the haft. Such a technique is thought to provide better support and leverage (Andrefsky 1998:164). Two attribute values are recognized: edge grinding is absent, or edge grinding is present.

Flake Pattern

This variable is recorded for both patterned and unpatterned flaking. Flake pattern is most indicative of pressure flaking that occurs across the face(s) of a biface in the latter stages of manufacture (Whittaker 1994:166-167). Intentional and systematic flaking patterns suggest a specialized projectile point manufacture technology. Such a strategy may maximize the utility of the tool before exhaustion, while maintaining a temporal style (Frison 1991:369-395). For example, some Paleoindian projectile point styles (e.g., Pryor Stemmed and Lovell Constricted) that exhibit differences in morphology share characteristic flaking techniques (Frison 1991:393-394).

(1) **Collateral**: The flake scars are at an oblique angle to the edge of the artifact and repeatedly meet at the midline.

(2) **Oblique**: The flake scars approach the midline of the implement from opposite edges in an oblique fashion.

(3) **Chevron**: The flake scars approach the midline of the implement from opposite edges from approximately a 45° angle.

(4) **Horizontal Parallel**: The flake scars are perpendicular to the edge of the implement and are repeatedly parallel to one another.

(5) **Irregular or Random**: The flakes scars are random and/or irregular with no discernable patterning.

(6) **Unknown**: The implement is fragmented to the extent that recognition of flake scar patterning is not possible.

(7) **Other**: The flake scars do not resemble any of the attributes described above.

Reuse

This variable reflects the morphology of the blade with respect to the haft element. Reuse indicates an intentional modification or retouch of the blade edge (Andrefsky 1998:164), during the time in which the implement is mounted into the haft. Two attribute values are recognized: reuse is absent, or reuse is present.

Ground/Battered Stone Tool Analysis and Procedures: Ground/battered stone specimens were assigned to discrete categories or types based on overall morphology. This classification is intentionally broad and groups various tool types within the same assemblage that share similar attributes and uses (i.e., grinding and battering). The collection consists of complete, nearly complete and fragmentary items. Attributes were recorded on some of the implements while others did not have specific attributes. Those items that did not have attributes were recorded as incomplete, unknown, or undetermined. Regardless of these constraints, the maximum length, width, thickness, and weight of all specimens were recorded.

Two broad categories were analyzed for ground/battered stone tool. As a whole, the tools were categorized according to type, design, edge shape, function, completeness, and burning. Some of the attributes described above were also noted in this analysis (e.g., material type and metric measurements); the reader is asked to refer to these previous descriptions when applicable. In the second segment of the analysis information about the individual surfaces or facets of the implement was recorded. The data collected for surface analysis included the number of observable surfaces, technology, plan view shape, striations, and use-wear. The maximum length, width, and depth of each surface were also recorded for surfaces that provided such information. For example, surfaces were not measured on fractured ground stone if they did not have a complete portion or were too fragmented.

Type

Ground/battered stone tools were classified according to a "traditional" descriptive or subjective assessment based on overall morphology. Eleven tool types are identified and described below. The following categories are intended to describe the general morphology of the implement rather than its function (Kalasz et al. 2003:34). Subjective tool types generally exhibit a mixture of functional and morphological terms. Most of the definitions in the following categories have been modified from Adams (2002), Bender (1990), Owens et al. (2000), Kalasz et al. (1993; 2003).

(1) **Mano-Single Handed**: The implement appears to be small enough to be utilized with a single hand. It is generally a round or oval-shaped cobble with convex facets. Multiple grinding surfaces may be common; however, modification is generally greatest on either the top or bottom of the implement.

(2) **Metate-Slab**: A slab metate is a tabular implement with a flat or slightly concave surface along the long axis and a flat surface along the short axis. A minimal degree of grinding is often observed over the entire length of the ground stone faces. Because of the planar nature of the grinding surface, this type has been described as a flat metate (Bender 1990:X-28).

(3) **Ground stone-Unknown Type**: The implement has one or more ground surfaces; however, it is typically fragmented to the extent that it cannot be identified as a mano or a metate.

(4) **Mano Fragment-Unknown Type**: A mano fragment is a fragmented cobble implement bearing the typical convex grinding surfaces found on a mano.

(5) **Metate Fragment-Unknown Type**: A metate fragment is a portion of an implement which bears the typical flat and/or concave grinding surface found on a metate.

(6) **Hammerstone**: A hammerstone is typically a cobble or pebble-sized implement that exhibits crushing or battering attributes on one or multiple surfaces, resulting from use as an active tool. Tools of this nature do not exhibit intentional flake removal.

(7) **Manuport**: This type is a catch-all classification for any unmodified item that is out of geomorphic context and therefore appears to have been physically introduced by human activities.

Design

Design is a subjective category intended to describe a tool's complexity as it may relate to a planned function for an object (Adams 2002:18-21). Four attribute values are used to describe the general design of a tool.

(1) **Expedient**: The natural shape of the implement is modified only through use.

(2) **Strategic**: The natural shape of the implement is modified to achieve a specific shape or to make the tool easier to grasp or manipulate.

(3) **Indeterminate**: Two or more attributes are present that may indicate a possible function; however, the complexity of the tool could not be determined because the item is fragmented.

(4) **Incomplete**: This variable is similar to the indeterminate value because the item is fragmented beyond the ability to recognize the complexity of the tool. However, the incomplete attribute indicates only that the surface was ground and no other discernible characteristics about the design are present.

Edge Shape

This category accounts for the specific modification found on the margin(s) of a tool. These surfaces are generally parallel to the long axis and perpendicular to the short axis of the implement.

(0) **Unknown**: The margin of the tool is not present or is deteriorated beyond recognition and therefore its use cannot be determined.

(1) **Unshaped**: The margin of the tool is not altered.

(2) **Battered**: The margin of the tool shows evidence of active battering or impact fractures.

(3) **Flaked**: The implement exhibits flake scars along its margin(s), indicating that flake removal was employed in shaping the tool.

(4) **Ground**: The margin of the tool is ground.

(5) **Ground/Battered**: The margin of the tool has both ground and pecked surfaces.

Function

Function is a subjective category that suggests the primary use of the tool based on the observed attributes. It summarizes the combination of knowledge, ideas, behavior, and equipment that were utilized in the process of altering and/or reducing material(s), surface(s), and substances (Adams 2002:17). Four attribute values are used to describe the general utilization of a tool.

(1) **Grinding**: The tool exhibits only ground facets.

(2) **Battering**: The tool exhibits only battered facets.

(3) **Grinding/Battering**: The tool exhibits both ground and battered facets.

(4) **Unknown**: The implement is modified either culturally or naturally to the extent that any assessment of its original function is not possible.

Completeness

Four attribute values are used to describe the completeness of an individual tool.

(1) **Complete**: The tool is intact.

(2) **Incomplete**: Based on the shape of the intact portion of the tool, at least 50% of the implement is intact.

(3) **Fragment**: Based on the shape of the intact portion of the tool, less than 50% of the implement is intact.

(4) **Undetermined**: The implement is modified naturally or culturally to the extent that any assessment of its original form is not possible.

Origin

Tools are sorted according to an assessment of original form prior to modification. Five attributes are recognized:

(1) **Stream Cobble**: The implement exhibits the characteristic rounded cortex of an alluvial cobble.

(2) **Formation**: The implement is derived from material that originated from a geologic formation and is non-alluvial in nature.

(3) **Pebble**: The implement is made from a small, pebble-sized (approximately 5cm or less in diameter) parent material.

(4) **Undetermined**: The implement has been modified naturally or culturally to the extent that any assessment of origin is not possible.

Burning

For this subjective category the thermal alteration of an implement is examined. Experiments have shown that different materials react differently to heat stress (Adams 2002:232). Burned implements, particularly ground/battered stone items, are generally made of sandstone. Fire-altered modification on this kind of material is typically easy to distinguish because of the discolorations and fracture patterns. Fire of a certain temperature can cause the tool to fracture, or implements may have reddened surfaces caused from direct contact with a fire or fire-cracked rock. Two attribute values are recognized: (0) burning is absent, or (1) burning is present.

Surfaces

This category identifies the number of utilized or modified surfaces on an implement, including those on the margins or shoulders. In this study, each of the surfaces was assigned an alphanumeric designation that followed the degree of modification. For example, the primary ground surface on an implement was designated the letter "A" and the secondary surface was identified as "B," etc. Four attribute variables were recognized: non-modified, one surface, two surfaces, three or more surfaces.

Technology

The primary use of the tool is assessed based on the attributes observed on each of the individual surfaces of the implement. Eight surface technology attributes were included in the analysis. Three attributes were not found during the analysis and are consequently not described here; these are incised, grooved, and none evident. An additional attribute, flaked, was identified only on the margin of the tool and is therefore identified in the Edge Shape category. The remaining five attributes are identified below.

(1) **Ground**: A ground surface is characterized by a light, moderate, or heavily smoothed surface produced through attrition or grinding.

(2) **Battered**: A battered surface is generally indicative of active tool use. It is evidenced by overlapping step fractures and an irregular, severely crushed surface caused by the forceful removal of material (Kalasz et al. 1993:76).

(3) **Pecked**: A pecked surface indicates utilization of a passive tool. It is evidenced by small scalloped depressions that are typically distributed in a somewhat even pattern.

(4) **Ground/Pecked**: The surface has both ground and pecked attributes.

(5) **Ground/Battered**: The surface has both ground and battered attributes.

Planview Shape

The planview shape is intended to characterize the overall morphology or bordering edge of a ground stone surface. It is assumed that the amount of wear is one indicator of an implement's life history and probable function (Adams 2002:100). Seven attribute variables are identified to describe the planview shape of a tool.

(1) **Oval**: The surface outline of the implement is rounded and slightly elongated.

(2) **Circular**: The surface outline of the implement forms a circle.

(3) **Sub-square**: The surface outline of the implement is square with rounded edges.

(4) **Sub-rectangular**: The surface outline of the implement is rectangular with rounded edges.

(5) **Triangular**: The surface outline of the implement forms a triangle.

(6) **Irregular**: The surface outline of the implement is indefinite or amorphous in outline.

(7) **Unknown**: The surface outline of the implement has been modified naturally or culturally to the extent that any assessment of its original shape is not possible.

Striations

Striations were noted on the facet or surface of an implement. The macroscopic linear patterning of grooves or incisions caused by the abrasive movement of one surface rubbing against another was documented (Kalasz et al. 1993:78). Seven categories of striations were identified.

(0) **Absent**: Grinding is absent on the implement's surface.

(1) **Longitudinal**: Striations are parallel to the long axis of the tool.

(2) **Multiple**: Striations are in multi-directional lines with respect to the long axis of the tool.

(3) **Oblique**: Striations are at oblique or slanted angles with respect to the long axis of the tool.

(4) **Transverse**: Striations are at a 90° angle to the long axis of the tool.

(5) **Circular**: Striations are circular or oval with respect to the long axis of the tool.

(6) **Undetermined**: Striations are not visible on the tool.

Use Wear

This attribute refers to the amount of abrasive wear resulting in the loss of matter from the surface because of contact with a second surface (Adams 2002:25).

(1) **Light**: The natural surface is intact with little evidence of abrasion.

(2) **Moderate**: The natural surface is absent in the central portion of the abraded area.

(3) **Heavy**: The natural condition of the surface is absent or nearly absent throughout the entire surface of the implement.

(4) **Undetermined**: The implement has been modified naturally or culturally to the extent that any assessment of its original form is not possible.

<u>Faunal Remains</u>

Several methods of operation were involved during the faunal analysis. First the faunal remains were washed. The specimens were usually dampened and scrubbed with a toothbrush or damp cloth. Second, the bone was separated within each of the field specimen bags. Each of the field specimen items that could not be identified to a taxonomic category beyond gastropods, or indeterminate bone specimens, were placed in a bulk bag and counted separately from the identifiable remains. Those specimens believed to have further potential for taxonomic identification were individually bagged and given a temporary number. It is important to note that the specimens believed to provide additional anatomic identification variables also had the standard maximum length (mm) and weight (g) measured. Additional attributes recorded modification on the specimens and included human (e.g. burning, cutting, etc.) and non-human agents (e.g. carnivore, root etching, weathering, etc.) or both (e.g. breaking, polishing, etc.) (see Lyman 1994). After this process was complete, all of the specimens from the project were turned over to Jodi A. Jacobson for further analysis, with the exception of a single freshwater muscle shell (Unionoidae) that was sent to Sharon F. Urban. Ms. Jacobson verified the bulk bone material. Additional identification of the individually bagged specimens included the analyst's skeletal collection and various identification manuals (Cohen and Serjeantson 1996; Cope 1892; Jones and Manning 1992; Nagorsen 2002; Olsen 1964; Olsen 1968; Romer 1997). The Vertebrate Comparative Skeletal Collection from the Department of Anthropology at the University of Tennessee and Vertebrate Paleontology collection at the University of Texas were particularly helpful for specimens in the assemblage that were difficult to identify. Once returned to the author, the specimens were cataloged. During the cataloging process, additional specimens were relocated and sent to Danny N. Walker for the final stage of the analysis.

Faunal species identified in the analysis are presented in Table 18, along with the author's MNI count. In the primary faunal analysis report (Jacobson 2006) submitted to the author, the MNI is identified per taxon. For example, two left distal tibia bones are identified to either the Mexican woodrat or the bushytail woodrat (*Neotoma mexicana/cinerea*), while the MNI for the packrat (*Neotoma* sp.) genus is based on four right mandibles. This is one of several ways of determining MNI (Grayson 1984; Lyman 1994; Reitz and Wing 1999). In the following analysis, the MNI is defined as "the smallest number of individuals which is necessary to account for all of the skeletal elements (specimens) of a particular species found in the site" (Reitz and Wing 1999:194). The word species is emphasized in this definition because a number of samples can only be identified to the genus level or less (i.e. order, suborder, etc.). The species is generally the last option for an analyst to make regarding the taxa identification of a bone (Table 18). If a specimen cannot be determined to be a particular species, the analyst resorts to the genus, sub-family, family and so forth. That is not to say that the bones identified to the genus level are not actually from the same animal as other specimens identified to the species level. On the contrary, many of the bones may be from the same animal but some may only be identified to the order, family, genus level, and not directly to the species. MNI for the following analysis will consider all of the classifications. Again, using the previous woodrat (*Neotoma*) example to illustrate MNI counts in this analysis, it is determined that there are two distal tibias which account for the Mexican or woodrat (*Neotoma mexicana/cinerea*) species and five right mandible of the woodrat genus (*Neotoma* sp.). Since two of the woodrat (*Neotoma* sp.) specimens are accounted in the Mexican or bushy tail (*Neotoma mexicana/cinerea*) category, only two additional right mandibles are included in the woodrat genus (*Neotoma* sp.) category because they could have come from those animals previously accounted in the species category. In reality, there are probably more species present. However, this is a no-nonsense approach to MNI counts, especially for a large assemblages in complex stratigraphy, such as those recovered from the Gilligan's Island shelters.

Botanical Remains

Information about the botanical remains of the Gilligan's Island site was derived primarily from pollen and macrobotanical analysis. Nineteen pollen samples were submitted to John G. Jones of the Palynology Laboratory, Department of Anthropology, Texas A&M University, Texas, for the extraction of pollen and other organic materials (Jones 2003). Of these, samples represent pollen washes from ground stone tools and eight are sediment control samples associated with those artifacts. Macrobotanical samples were submitted to Jannifer W. Gish of the Quaternary Palynology Research, Ft. Collins, Colorado, for the identification of macrofloral materials (Gish 2005). Botanical remains recovered from the site are summarized in Tables 20, 21, and 22.

Pollen Analysis: The samples selected for pollen analysis consisted of ground stone that was in complete or nearly complete condition with at least one of the grinding surfaces lying face down. Once the ground stone was removed from the sediment, it was immediately placed in a large trash bag, wrapped and taped to ensure that the sample was not contaminated. A sediment sample was also taken from directly underneath or near the ground stone and placed in a small plastic zip-lock bag. An exception to the collection of sediment control samples occurred when certain ground stone samples (A3-42, B2-42, B3-66) were selected for pollen washes after the excavation. Therefore, no sediment samples were collected.

Prior to submitting the samples for analysis, pollen washes were processed for the selected ground stone. The grinding surfaces were washed with a muriatic acid solution and distilled water. A plastic bristle brush was used to remove excess sediment and calcium carbonates from the grinding surface. In cases where the ground stone exhibited several grinding surfaces and the entire sample was washed. After the grinding facet(s) was completely washed, the collected residue was tested with pH paper and the washes were neutralized with distilled water. These samples were then poured into sterile jars.

In addition, all of the equipment used during this process was sterilized by washing the items with warm soapy water, rinsing in tap water, and then pouring distilled water over all of the surfaces. This procedure was repeated after every sample was complete. The washes and sediment control samples were then sent to Texas A&M University for further analysis.

At the palynology laboratory, 10 mls of the sediment control was placed in sterile beakers and European *Lycopodium* spp. spores were added as a conservative extraction technique. The processing included a systematic chemical and physical treatment of the samples, in order to remove unwanted organic materials from the sample. In brief, large colloidal material was removed by hydrochloric acid, distilled water, 150-micron mesh screens, hydrofluoric acid, and sonication, followed by dehydration in glacial acetic acid, acetolysis treatment then the material is heated for a limited time. The concentration was further reduced by a flotation of zinc bromide and the lighter fraction was washed in potassium hydroxide. Finally, the synthesized palleniferous remains were dehydrated in absolute alcohol, and relocated to a glass vial at which point glycerine preservative was added.

The pollen washes from the ground stone were further processed at the laboratory, using the same systematic physical and chemical technique described for the control samples. The *Lycopodium* tracer spores were added to the wash samples to verify the processing techniques performed prior to being sent to the palynology laboratory. Even though the surface volume of sediment was unknown and a concentration value could not be calculated for the pollen washes, the residue could accurately indicate the subsistence.

Using permanent slides for each sample, the identifications of pollen grains were conducted under a Jenaval compound stereomicroscope at a 400-1000x magnification. Fossil grains were systematically counted to a standard 200 specimens. The recorded count was compared to an extensive pollen reference collection and is believed to be a fair representation of past vegetation.

A concentration value was calculated for all of the samples. While the values below 1000 to 2,500 grains/ml of sediment might be useful for determining vegetation in the region, they are not well suited for determining prehistoric conditions (Hall 1981; Bryant and Hall 1993). In addition, fossil pollen counts that display a low concentration value are cautioned because of the erratic nature of site formation within a shelter setting. In other words, the pollen obtained during the excavation of the shelters may reflect a different assemblage than that of the pollen record that was originally introduced into the sediment by the past occupants (Bryant et al. 1994).

Macrobotanical Analysis: The 12 macrobotanical samples were water-processed prior to being sent out for analysis. Each light fraction was processed through a series of graduated screens (4-mm, 2-mm, 1-mm, 0.5-mm, and 0.25-mm openings) with the remainder caught in a pan. The individual subfractions were weighed and, depending on the size variants, different techniques were utilized.

A systematic 20-piece wood count was obtained from the 4-mm charcoal. In some cases there was an insufficient charcoal sample from this sample size and the 2-mm subfraction was used as a supplement for the count. The wood charcoal was then randomly selected and "snapped" for species identification.

After the wood count, the remaining material in both the 4-mm and 2-mm subfractions was fully sorted, and distinctive items that were either charred or uncharred were extracted. The 1-mm subfraction was fully sorted and transferred onto a 0.5 cm x 0.5 cm grid tray, and materials were systematically scanned for missed objects. This process was often repeated several times with samples that contained an abundant amount of material. Distinctive items were extracted, counted, and packaged. The same steps were taken for the 0.5-mm subfraction, with the exception of those items that had been recorded previously in the larger subfractions. Abundant items were estimated rather than counted. The 0.25-mm subfraction required only scanning, with a focus on extracting small seeds. Estimates were also common. The remaining material from the final subfraction category was only weighed.

The grid tray was used to base the estimates for both the 0.5-mm and 0.25-mm subfraction. If an item occurred in 90 or more grid squares, it was averaged and then multiplied by the total number of squares covered by the material in the subfraction. Most of the estimates recorded for the analysis were recent/modern wind-blown material and are not considered to have a bearing on the prehistoric cultural deposits. Instead, they were used as a means of assessing the integrity of the sample.

Of the extracted items, pieces of identified wood charcoal were wrapped in aluminum foil, while specifically categorized and/or distinctive items were sometimes put in small envelopes of acid-free paper. Particularly fragile items were placed in micro-centrifuge tubes. For curation purposes, the aluminum foil charcoal wood packets were returned to the subfraction bag while other packaged material was placed in various sizes of film canisters before being returned to the sample bag. The remaining subfraction material was placed into a separate bag and submitted with the rest of the samples.

Geoarchaeological Investigations

Information about the geoarchaoelogy of the Gilligan's Island site was based primarily on an analysis by Michael McFaul of LaRamie Soils Service (McFaul 2003). Geoarchaeological investigations were designed to address the site-specific questions initially proposed by Charles et al. (2000:103) and regional questions regarding the Fort Carson area, specifically D. Kuehn (1998) and Zier et al. (1997:2-35) (see Chapter 1). The geoarchaeology analysis focused on the identification and interpretation of cultural occupations and geologic strata, correlation of the strata between the two shelters, and regional matters regarding the relationships the paleoclimatic conditions and prehistoric occupation.

Geomorphology, geology, and sediment relationships were defined during two field reconnaissances in June of 2002. The study was initiated with terrain reconnaissance to define the site's physical context (McFaul and Doering 2003; McFaul 1990). The reconnaissance was followed by the delineation, profiling, and description of individual deposits exposed in excavation units A1-A4 and B1-B4 in the two shelters. Descriptive procedures followed those outlined in Birkeland (1999), Birkeland et al. (1991), and Soil Survey Staff (1993). Sediment interpretations follow those for rockshelters and their associated terrains (McFaul and Doering 2003; Farrand 2001).

CHAPTER 5

FIELD INVESTIGATIONS

General Site Description

A general description of the environmental context of the Gilligan's Island is presented in Chapter 2. Specific information regarding the topography of the site is reviewed here only when it is necessary to designate the site's characteristics regarding landscape position, potential for cultural resources, and site formation.

The most apparent cultural features on the Gilligan's Island site are two connecting rockshelters (Shelters 1 and 2) that face toward the east and are underneath a large vertical cliff of Dakota Sandstone (Figures 10, 11). The cliff is part of an extending mesa that generally runs in a north-south direction. The height of the cliff face, borders the western edge of the site, is approximately 10-14 m. At the base of the cliff a steep 30° slope of colluvial debris has accumulated, which drops approximately 20 ft to a gently sloping bench. The bench is broad--approximately 20-30 m wide--and runs adjacent to the mesa.

Trending in a north-south direction adjacent to the cliff face, the shelters together-are approximately 30 m long, with a maximum depth of 5 m from the dripline (Figure 12). A 5-m length of sandstone separates the shelters. The shelters are quite different in terms of size and shape. The southern shelter, Shelter 1, has a high ceiling (approximately 10 m), with comparatively narrow width of 4 m N/S within the shelter

Figure 10. Oblique aerial photo of the Gilligan's Island shelters facing west.

proper (Figure 13). A natural shelf approximately 1.5 m above the ground surface is located along the northern interior of the shelter. The rear shelter wall extends approximately 5 m E/W from its maximum depth to the dripline. Beyond the dripline, in the front of the shelter, is an open bench area that measures approximately 10 m N/S x 4 m E/W. This area in front of Shelter 1 was probably created from a single cliff-spalling event, which caused the particularly high ceiling in the shelter to form. The elevated ceiling and the flat bench in front of the shelter create an area that is easily suited to human habitation.

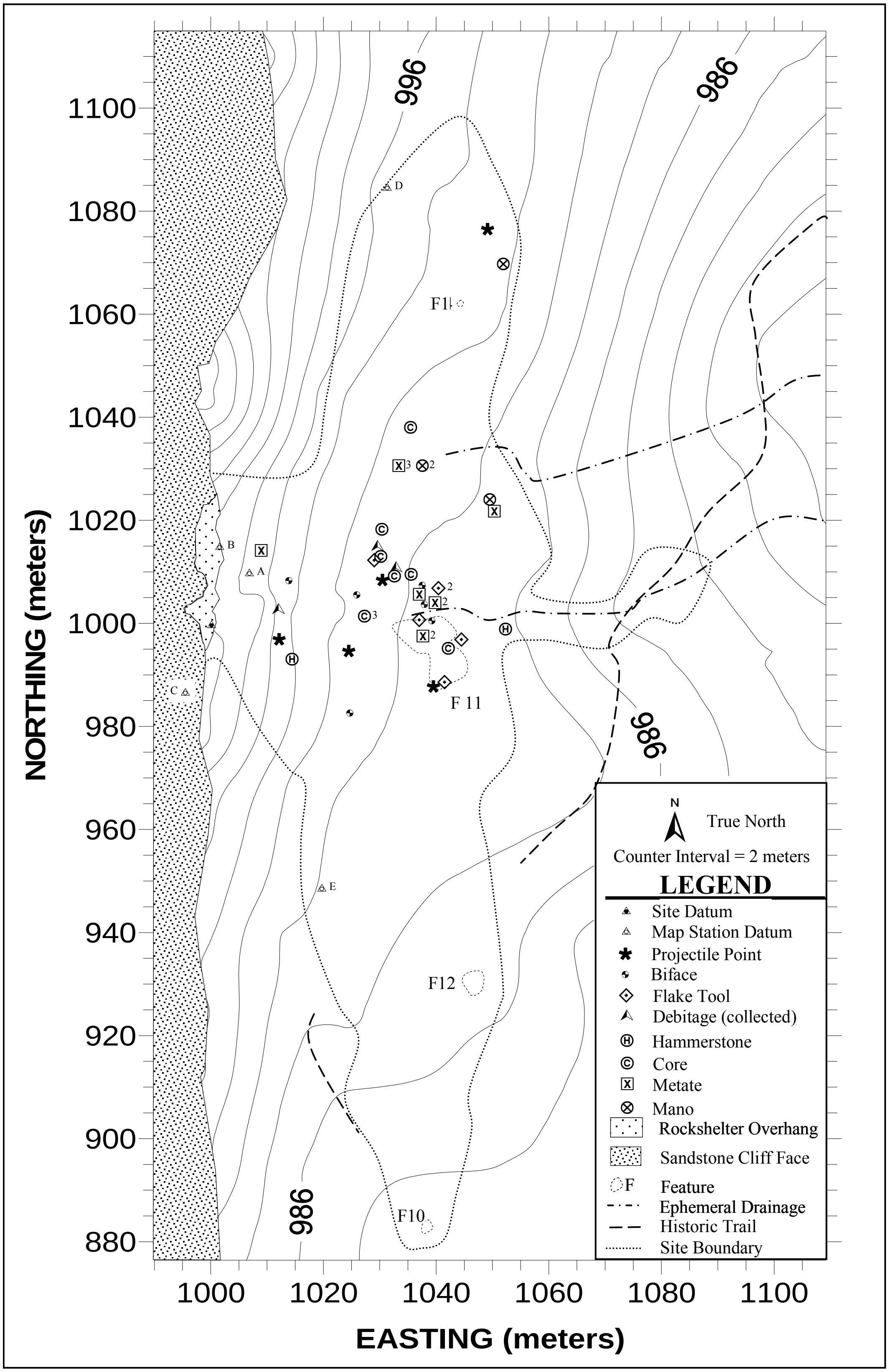

Figure 11. Site map indicating the location of artifacts and features on the surface.

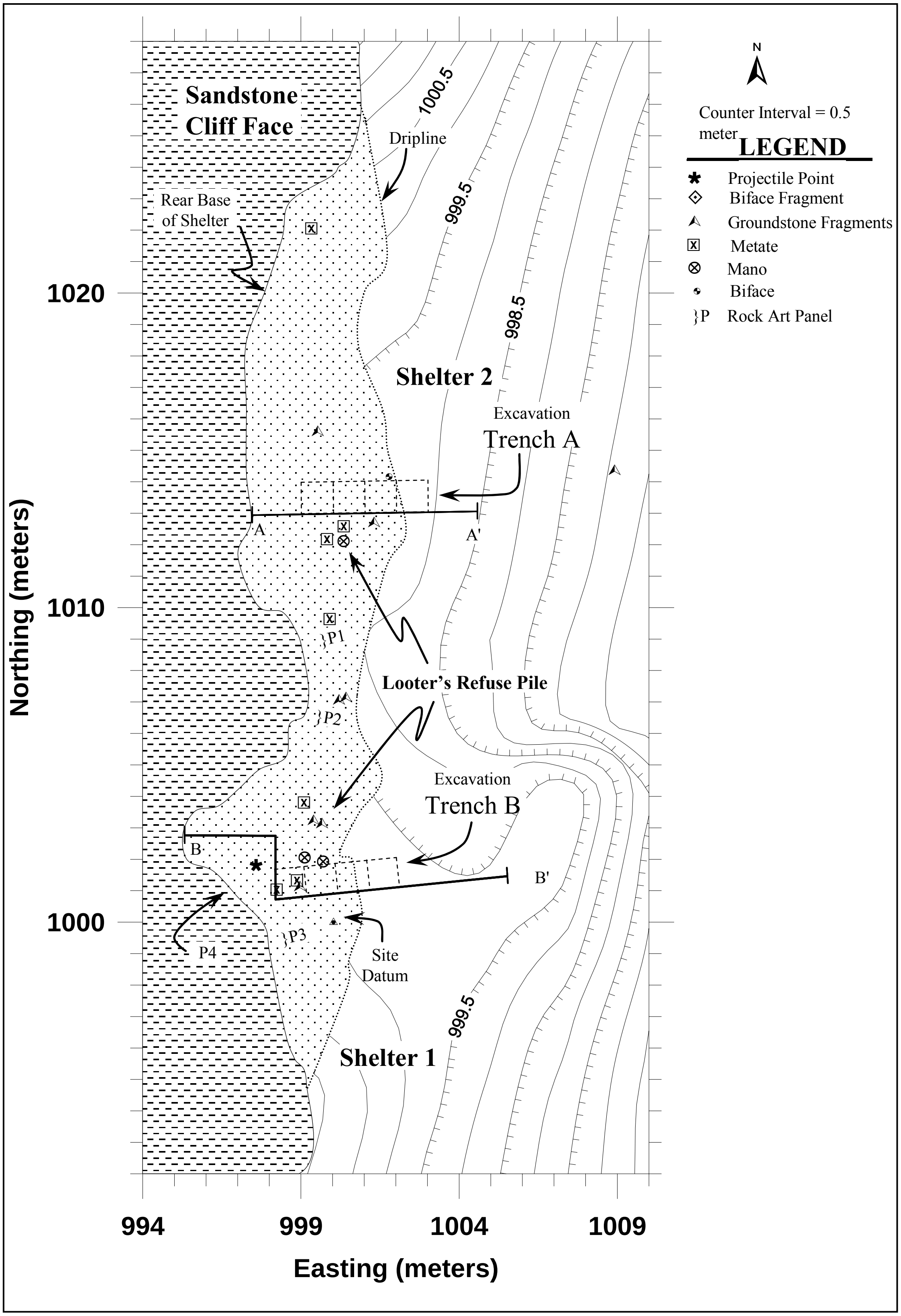

Figure 12: Plan view map of Gilligan's Island shelters showing distribution of cultural material on the surface.

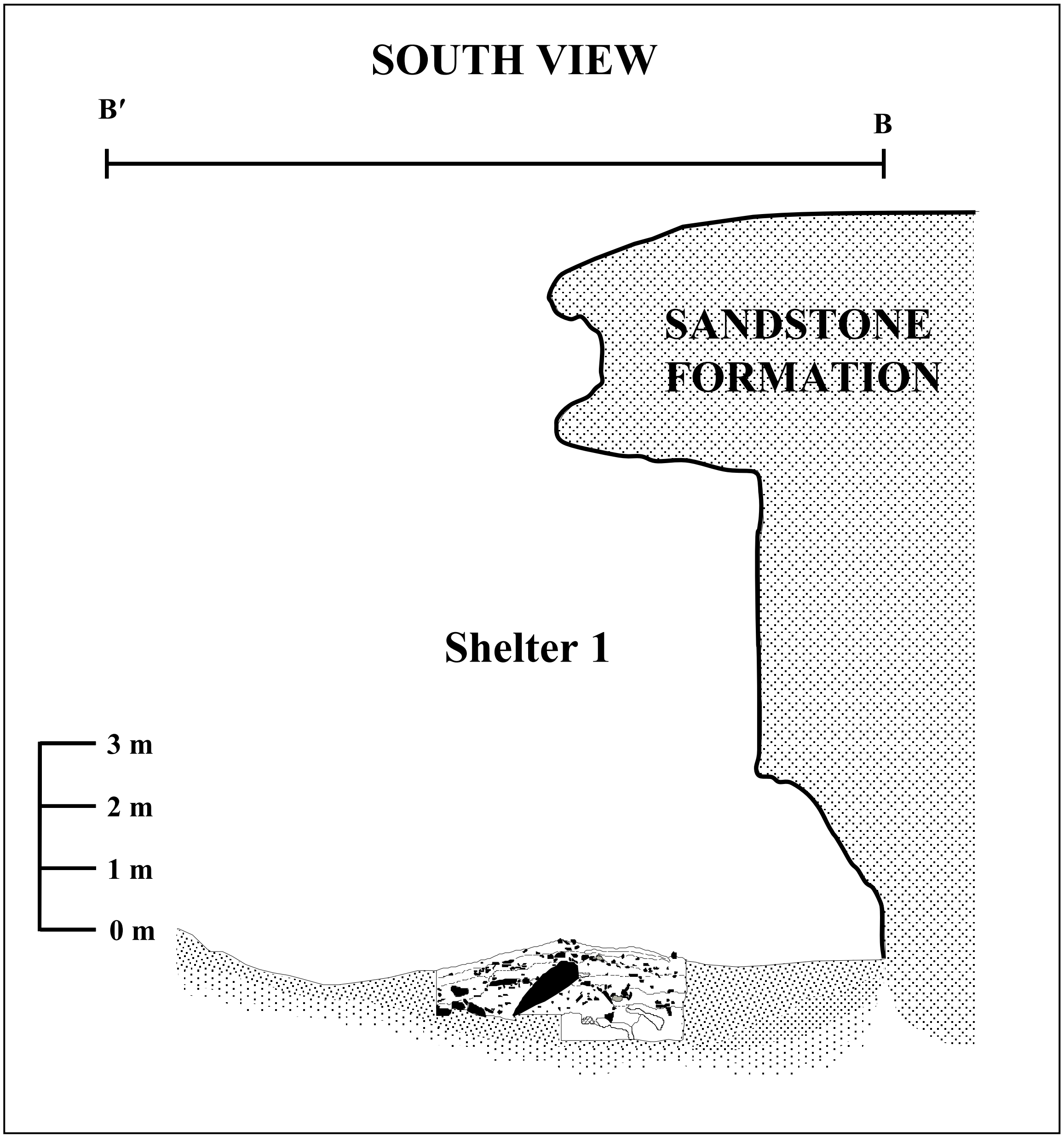

Figure 13. Cross-section of Gilligan's Island Shelter 1 showing Trench B profile, facing south.

The northern shelter, Shelter 2, is much longer (approximately 14 m) within the shelter proper and has a lower ceiling measuring approximately 3 m high in the front and declining to 1.5 m toward the rear wall (Figure 14). The immediate area of Shelter 2 has a maximum width of 5 m between the rear of the shelter wall and the dripline. The front

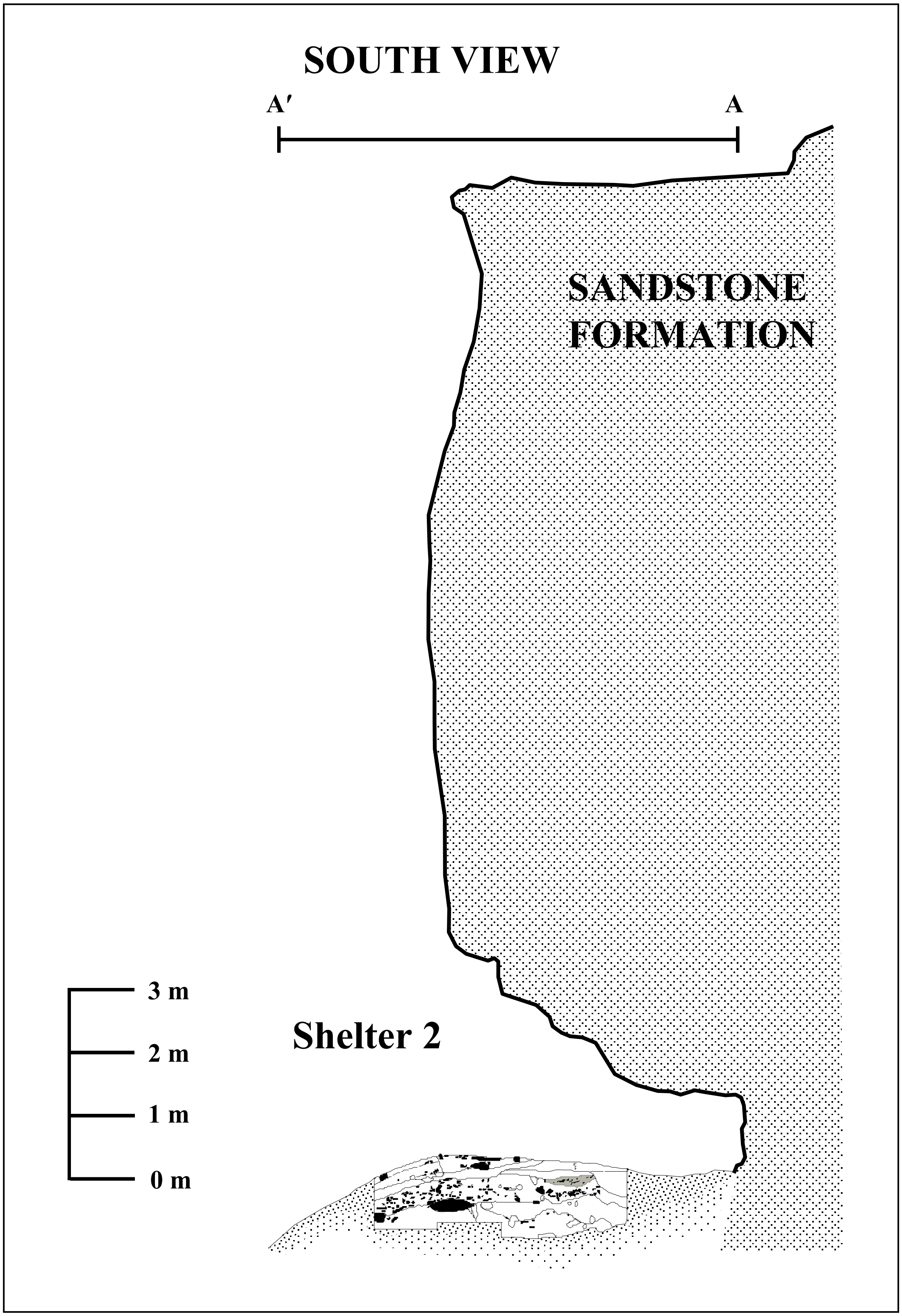

Figure 14. Cross-section of Gilligan's Island Shelter 2 showing Trench A profile, facing south.

of the shelter is restricted by a steep slope that declines approximately 20 ft. Shelter 2 provides better protection against the environmental elements than Shelter 1, although both are well protected with adequate room to maneuver, making them an ideal areas for human occupation.

Looting activities at the site are evident only within the shelters. Near the dripline of Shelter 1 an irregular dirt mound surrounds the southern half of the shelter and probably represents a backdirt pile caused by amateur excavations within the shelter. When compared to the surrounding ground surface, the interior of the shelter exhibits a shallow cavity that gently slopes approximately 20-30 cm below the backdirt pile. A large sandstone metate lying on this dirt pile dips toward the interior of the shelter and is probable testimony to vandals placing unwanted items onto the backfill.

Similar activities appear to have taken place in the southern portion of Shelter 2. In this location there is a shallow washbasin and a large rubble pile consisting of FCR and several large metates located to the north and east of the washbasin. The extent of the materials in this area was significant enough for FLC to identify the debris as a possible stone wall (Charles et al. 2000: Figure III.43). The abundant amount of cultural material in this region probably represents selective collection by amateur excavators digging in the area. The depression is only 5-10 cm below the modern ground surface. Ephemeral deposition and eolian sediment may have filled a majority of the excavation scars. Archaeological excavations in 2002 cut across each of the backfill piles and indicate that vandalism did in fact take place (see Historic Component). The overall extent of these looting activities remains undetermined the vandalism did not undermine the overall analysis for the 2002 excavation project.

Four rock art panels, consisting of three petroglyphs and a pictograph occur within the interior of the two shelters. Of these, two of the panels, Panels 1 and 4, are located on the southern portion of Shelter 1. The other two panels, Panels 2 and 3, are situated adjacent to one another and are located against the wall that separates the shelters. Some of these panels are abstract while others may represent geometric, zoomorphic, macrobotanic, and/or astronomic motifs (Charles et al. 2000).

The rockshelters and the steep slope that abut the cliff face represent the western-most boundary of the site (Figure 11). The northern and southern boundaries are located approximately 20 ft below the shelters and extend along a wide bench to the east of the rock face. The bench runs adjacent to the mesa and extends in a north-south direction. It is approximately 20-30 m wide. The boundaries are marked by the presence of the large scatter of lithic and ground stone artifacts on the surface. While most of the eastern boundary is located on the bench, cultural materials do extend down a small ephemeral drainage.

Previous Site Investigations

The only previous investigation at the Gilligan's Island Site occurred during the 1998 field season, when the surface manifestation was recorded by FLC (Charles et al. 2000). In addition to the shelters, four rock art panels and approximately 600 artifacts were recorded at that time. A corn cob, two biface fragments, one flake tool, and nine projectile points or point fragments were collected from the site (Figures 15 and 16). A hammerstone and 13 ground stone artifacts, including manos and slab metates, were also recorded. A 150-piece debitage analysis was conducted in the field. The debitage analyses indicated that tool manufacture was the primary lithic activity at the site and that

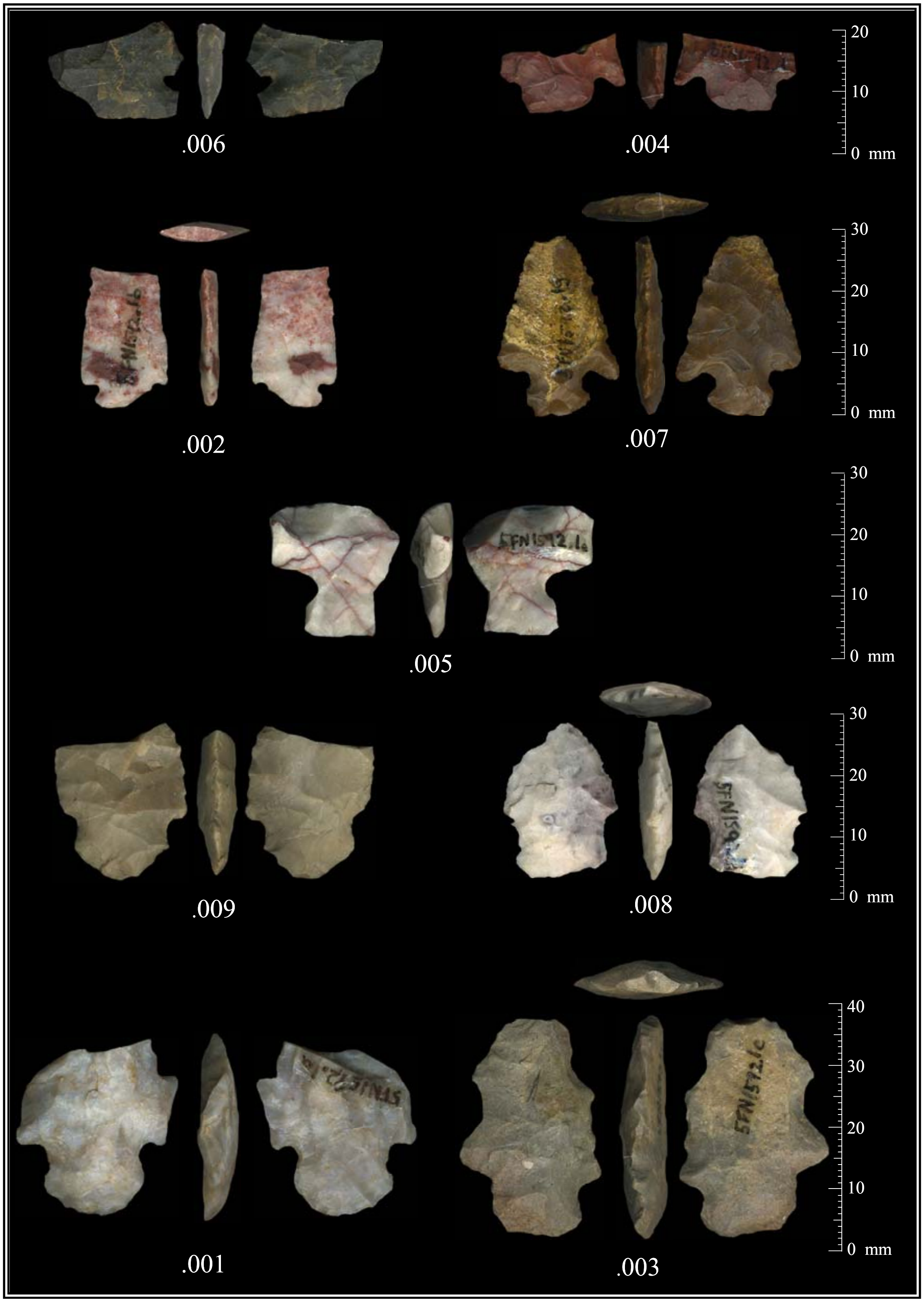

Figure 15. Gilligan's Island site projectile points recovered by FLC during the 1998 field season.

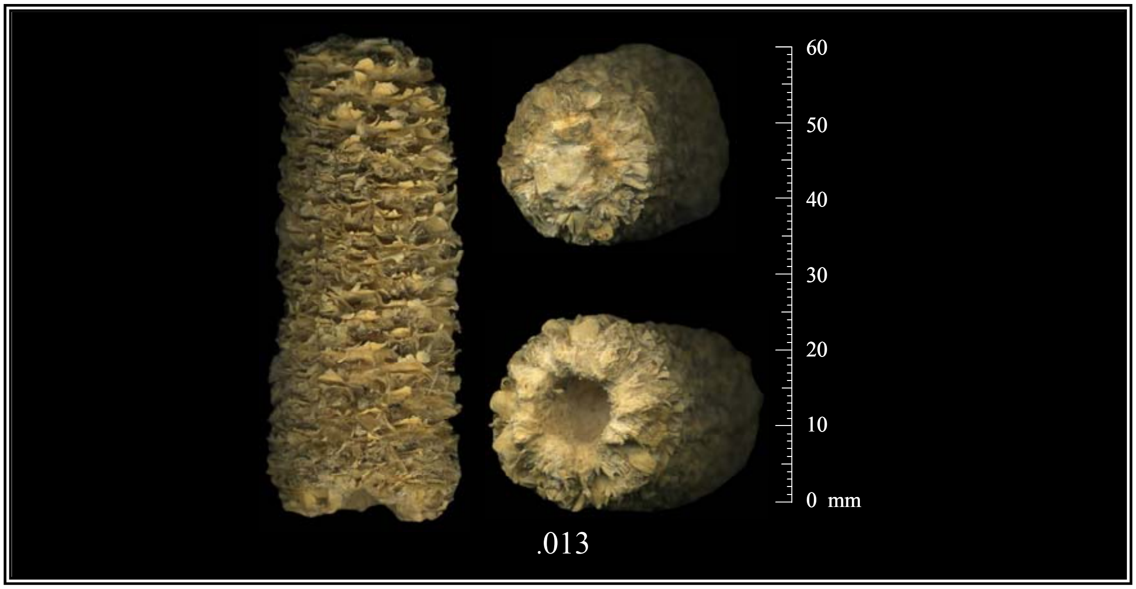

Figure 16. Gilligan's Island site corn cob recovered from the pack rat midden in Shelter 2.

most of the tools were derived from local raw materials. Silicified material, especially chert, was believed to have been prepared, before it was brought to the site. However, core reduction activities are also prevalent. Based on the diagnostic projectile points, the site components were estimated to date from the Middle Archaic period to the Developmental period. These chronological assessments, in addition to the subsurface deposits within the shelters and archaeological materials located along the bench, supported an assessment of the site as potentially eligible for the National Register of Historic Places (NRHP).

2002 Surface Investigations

A reevaluation of the surface inventory on the Gilligan's Island site during the 2002 test excavations produced several new finds (Figures 11 and 12). Four features, 66 artifacts, three rock art designs on two of the original panels, and a historic component were newly recorded. These accompaniments to the original surface inventory extend the site boundary an additional 30 m in a north-south direction along the bench. The site dimensions now exceed 100 m N/S x 200 m E/W.

Sixty-six surface artifacts were collected including projectile points, chipped stone tools, hammerstones and debitage. Cores and ground stone items were not collected. It should be noted that two of the debitage pieces were donated to the Colorado Council of Professional Archaeologists (CCPA) for petrified wood source studies, while the third debitage piece was mistaken for a utilized flake tool in the field. Appendix B provides a complete inventory and provenience data of those artifacts recorded during the 2002 investigation. With the exception of the three collected specimens, debitage is not included in the provenience inventory.

Prehistoric Component:

Artifacts: As recorded by FLC in 1998, the Gilligan's Island site has a large scatter of lithic artifacts (Charles et al. 2000). The original surface estimate of 600 artifacts appears accurate. The highest frequency of artifacts occurs in the open site area, directly below the shelters. This concentration is on the bench area, where a small ephemeral drainage has caused prominent sheetwash erosion. Exotic materials such as obsidian were lacking throughout the entire surface assemblage.

Six projectile points and point fragments, displaying hafting elements, were recovered from the surface of the site (Figure 17). All of the points are manufactured from chert. The only complete point (catalog number 5FN01592.000.297, hereafter .297) was located on the slope directly below Shelter 2. The point, by its dulled tip, convex blade, weakly-barbed shoulders, expanding stem, rounded tang and straight base, is consistent with Category P21 points recovered from the Pinion Canyon Maneuver Site

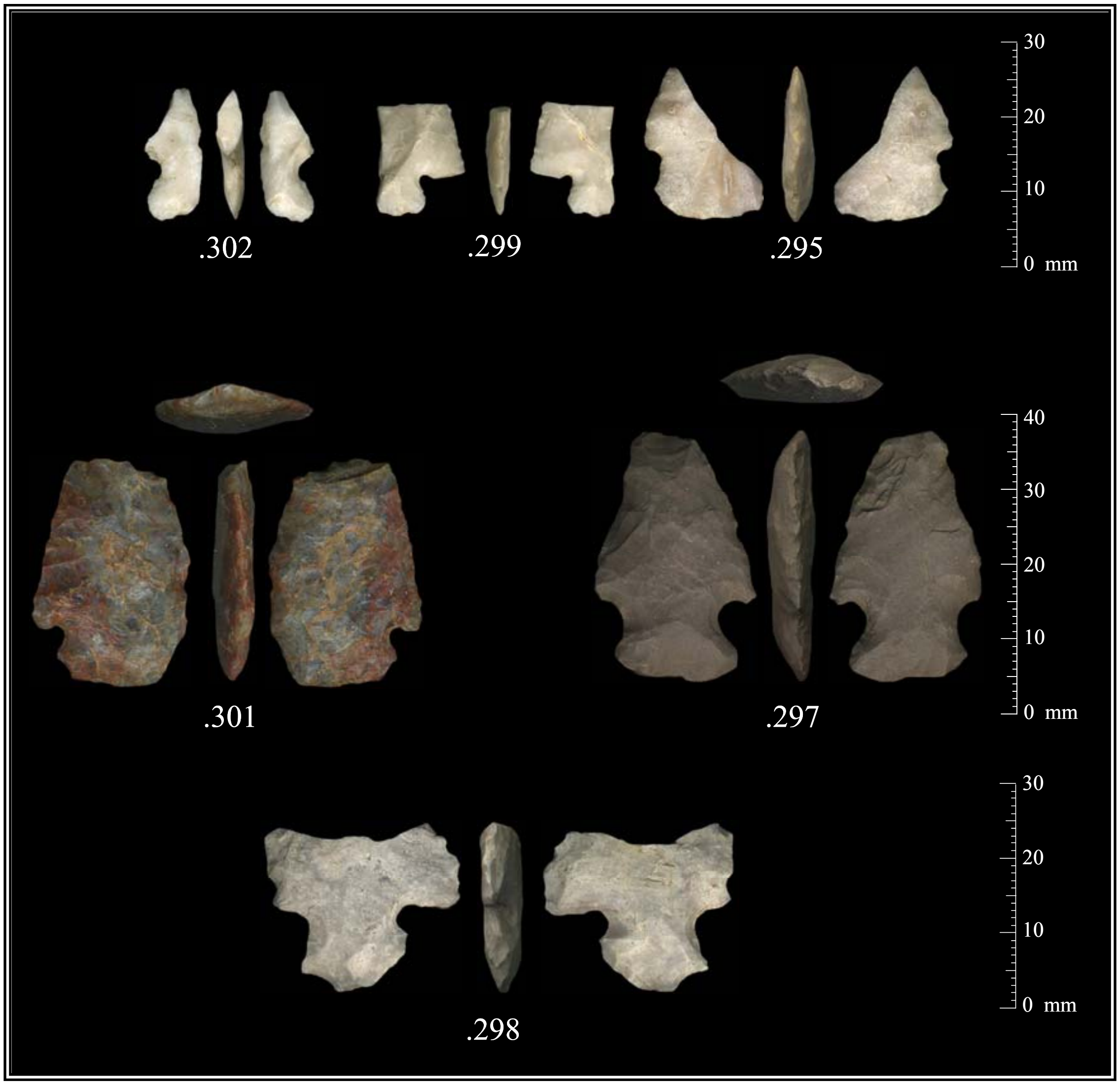

Figure 17. Gilligan's Island site projectile points recovered from the surface during the 2002 field season.

(PCMS) (Anderson 1989b:136-139; Figure 4.20-G). This style, commonly referred to as an "Ellis" point, dates from the Late Archaic period to the mid-Developmental period (1000 B.C. to A. D. 700). The second projectile point (.301), recovered approximately 15 m northeast of Feature 1, has a snapped tip, straight to convex blade, and a single barbed notch. The convex blade is roughly patterned and has no hafting element, indicating that the tool was either reworked or discarded during manufacture. This point is similar to Category P26 points of the PCMS and has an assigned age range of Late Archaic to mid- Developmental period (1000 B.C to A.D. 500) (Anderson 1989b:142-143; Figure 4.22-M). The third point (.298) was recovered on the northwestern side of a large artifact concentration. The point is snapped at the lower section of the blade, is roughly outlined along the margins, and has abrupt to slightly barbed shoulders, slightly expanding stem, and convex base. The point base is similar to Categories P7 and P28 points of the PCMS (Anderson 1989b:144-145; Figure 4.11F-K; Figure 4.14L). Since no dates are directly associated with these categories in the reviewed literature, the point is assigned a wide age range from the Middle Archaic period to the terminal Developmental period (3000 B.C.-A.D. 1000). The fourth point (.295) was found in the interior of Shelter 1. The point base is snapped at a vertical angle, to the extent that only a single blade and shoulder are present. Based on the abrupt to slightly barbed shoulder, slightly expanding and broad stem, rounded tang, and convex base, this point fragment is similar to a Category P35 (Anderson 1989b:153-155; Figure 4.27K). Described as "Avonlea" points in northern Colorado (Gooding 1981; Anderson 1989b:153-155), these points have been confidently radiocarbon dated in southeastern Colorado from the Late Archaic period to Diversification period (1000 B.C. and A.D. 1200) (Anderson 1989b:154-155). The fifth point (.299) was recovered near the footslope of the cliff face, between Shelter 1 and Feature 11. The fragment could not be assigned to a category because it had been snapped in multiple areas along the mid-section, blade and shoulder. The sixth and final point with a hafting element (.302), located in Feature 11, is also too fragmented to determine a proper age. The thickness of both of these undiagnostic points suggests that they were manufactured for a bow-and-arrow technology. Based on these artifacts, the site may have been occupied from the Middle Archaic period to the Diversification period.

Nine unstemmed biface tools were collected. All of these tools are incomplete, and five of the nine specimens are undetermined fragments. The raw material represent consists of chert and petrified wood. These tools represent the full range of bifacial production, consisting of early, middle and late stage bifaces. Edge retouch was observed on six of the pieces and in all three of the stages. Four of the biface fragments (.296, .307, .309, and .311) display probable hafting elements or are midsections of either dart and/or arrow points. The final three pieces represent either early or mid-stage bifaces. This biface collection suggests that many of these tools were either broken or discarded after they were utilized, including items with hafting elements.

Six flake stone tools were collected of which five are expedient flake tools and one is a disto-lateral scraper. All items are incomplete. The tools are made of chert and quartzite. Edge retouch is present on all but one of the items. None of these items has been thinned.

Thirty-five ground and battered stone artifacts were recorded on the site surfaces. Including 11 recorded by FLC. Seven single-handed manos occur in the assemblage. Three of the manos are granite and four are sandstone. The smooth and round cortex of the granitic material indicates that the cobbles originated in an alluvial area away from the site location. Three of them are complete which the remaining four are large fragments. The manos exhibited one to three or more surfaces that are either ground or pecked, with use-wear ranging from light to heavy. Twenty-five sandstone slab metates and metate fragments are included in the assemblages of which two are complete, 15 are broken or fragmented with less than half of the item present, and eight consist of fragments with more than half of the item present. Three of the metates were utilized on both sides. Three of the larger and intact metates were also noted as having modified edges with large flake scars along the margins. The surfaces are either ground, pecked, or ground/pecked. The grinding surfaces are diverse in shape, consisting of irregular, circular, oval, trapezoidal, rectangular and triangular. The facets are generally shallow with the deepest extending approximately 2.6 cm below the cortex of the slab. The ground stone data suggests that the site was probably used extensively as a plant food processing area.

Two hammerstones are included in the ground and battered stone inventory. These items are small and round, pebble-size pieces of granite and quartz. The cortexes indicate that they originated in an alluvial area. The stones display light to moderate battering concentrated in a single area. Based on size and shape, they were probably utilized as lithic reduction percussion tools.

Surface Features: Four features, consisting of a hearth and three sheet middens, were recorded during 2002. These features are located on the open bench area of the site (Figure 11).

Feature 1

Feature 1 is a hearth located on the northern side of the site that has been heavily deflated by sheetwash erosion (Figures 18 and 19). The boundaries of the feature, which measures 1.58 m N/S x 1.03 m E/W, are outlined by vertical and horizontal sandstone cobbles. The *in situ* vertical cobbles, arranged in a circular configuration, are believed to represent the original stone ring of the hearth, and the angle of the slabs suggests that the

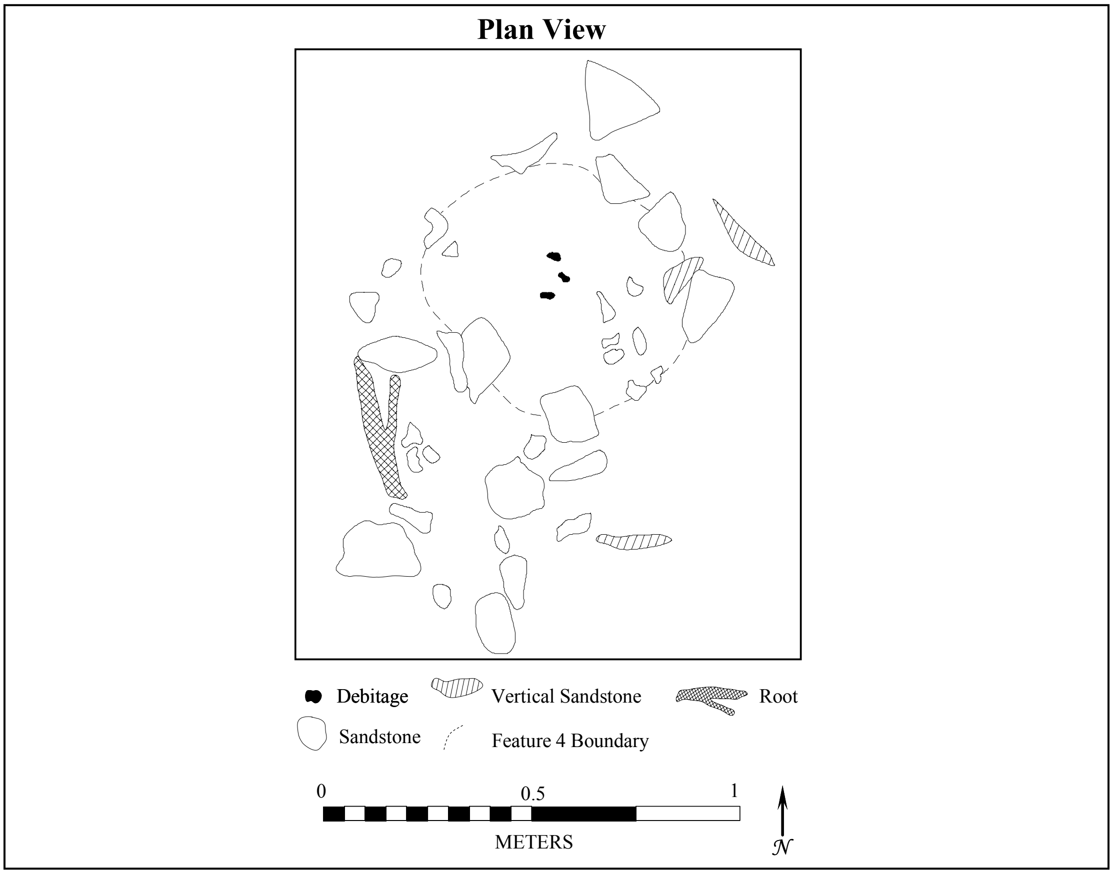

Figure 18. Feature 1 plan map.

Figure 19. Feature 1 overview; arrow is 25 cm in length and points north.

feature was originally constructed as a slab-lined hearth, similar to Feature 6B. The feature fill consists of a sandy loam that is a light brown/gray (10YR6/2) color, with a large amount of angular gravels throughout. Flat and angular sandstone fragments within the feature fill are an oxidized red color. Several debitage and calcined bone pieces are present within the center of the feature fill. The burned bone is thick enough to represent a medium- or large-size animal. The estimated maximum depth of the hearth is 4 cm below the ground surface.

Feature 11

Feature 11 is a large sheet midden located in the central portion of the open site area below the rockshelters. This feature, measuring 15 m N/S x 14 m E/W, consists of a dense concentration of exposed, thermally altered sandstone cobbles that are highly fractured (Figure 20). The feature fill is a dark brown (7.5YR3/2), loose sandy loam. The northern and eastern portions of this feature have been exposed by a shallow

Figure 20. View west of Feature 11, an exposed sheet midden. An abundant concentration of FCR is visible on the surface.

ephemeral drainage. A moderate amount of debitage and a small quantity of burned bone are eroding out of the palimpsest areas. Two ground stone pieces were also recorded on the northern side of the feature, while a quartzite core is located on the eastern side. Collected materials consist of three flake tools, a biface, and a projectile point. The western portion of this feature is covered by junipers, chollas, prickly pears, and grama grasses. The depth of the feature is unknown, although portions eroding out of the eastern side indicate that approximately 0.50 m of cultural fill is present. It should be noted that many of the artifacts recovered from this area, during this project and by FLC, are most likely associated with or came from this feature.

Feature 12

Feature 12 is a sheet midden located on the southern side of the site in an open grassland area. The midden is built up by a large concentration of thermally altered rock. The southern portion of the feature is exposed by sheetwash erosion and measures 4.70 m N/S x 4.0 m E/W. The feature fill consists of a concentration of sandstone fragments that are black, gray, and red in color, intermixed with a loose sandy loam of a very dark grayish brown (10YR3/2) color. The northern portion of the feature is covered with a brown (10YR4/3), loose sandy loam. No associated artifacts appear on the surface, perhaps indicating that the feature is mostly intact. The depth of the rock concentration is unknown, but the exposed southern portion indicates that at least 40-50 cm of cultural deposit exists.

Feature 10

Feature 10 is a sheet midden that generally consists of a concentration of thermally altered sandstone fragments. This feature defines the southern boundary of the site. A limited portion of the sheet midden, measuring 2.9 m N/S x 2 m E/W, is exposed on the southeastern side of the feature. Most of the rocks in this feature are small- to medium-size, angular sandstone rocks that are light gray to red in color. The sediment fill is a dark brown (7.5YR3/2) sandy loam. No artifacts are associated with the feature. The remainder of the midden is covered by cactus, grama grasses, and a juniper tree. Based on the exposed portion of the eroding feature, the estimated depth exceeds 30 cm.

Rock Art: FLC recorded four rock art panels (Figures 21-24). Three additional rock art designs were observed on two of the original rock art panels. These motifs, like some of the previously recorded panels, are shallowly pecked into the rock and can be seen readily only in the shade or on cloudy days. It should be noted that the sandstone bedrock can easily weather, and some of these panels originally may have been much more deeply pecked.

The first new addition is on Panel 2, a geomorphic or zoomorphic design, located between Shelter 1 and Shelter 2. The small addition to the figure is limited to an 18 cm x 13 cm area. The addition, found in the lower northern corner of the rock art panel is a curved line that projects from an oval outline in the lower northern corner of the panel and curves out to another small oval outline. The deterioration of the panel makes it difficult to determine if this addition was ground or pecked into the sandstone.

The last two additional rock art designs are on Panel 3, located on the southern exterior wall of Shelter 1. This panel was originally described as consisting of five zoomorphic, geomorphic and/or astropomorphic or possible plant figures. Additional rock art on the panel is located on the central and northern side. The central figure consists of a plant, possibly a corn (*Zea*) stalk, with an oval element (15 cm x 7 cm) on

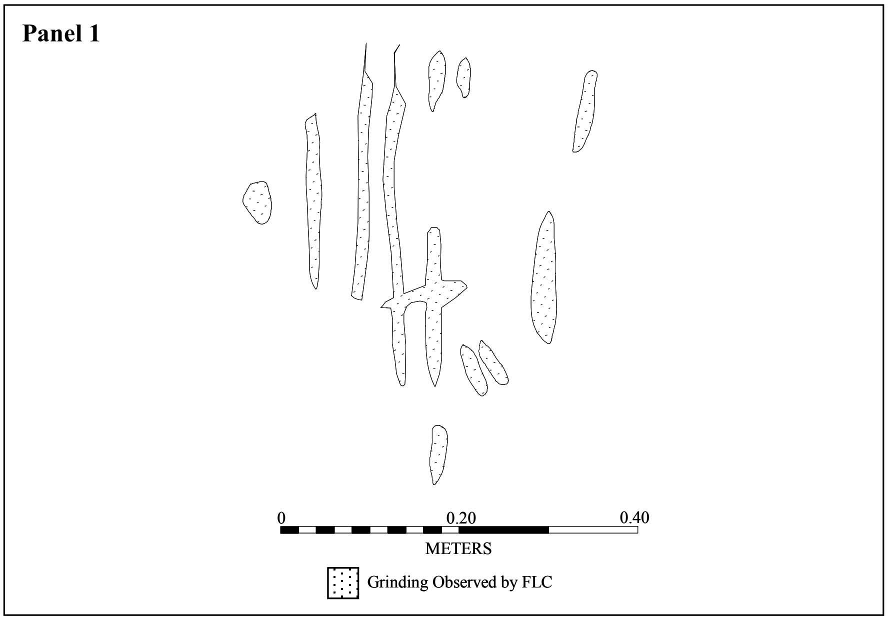

Figure 21. Rock art Panel 1 (modified from Charles 1998).

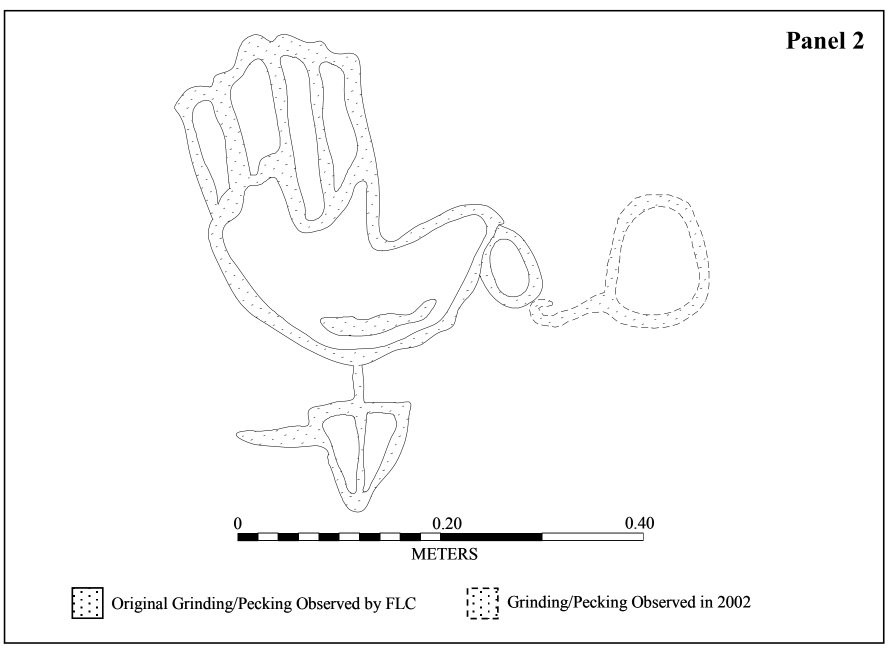

Figure 22. Rock art Panel 2 with additional grinding/pecking observed (modified from Charles 1998).

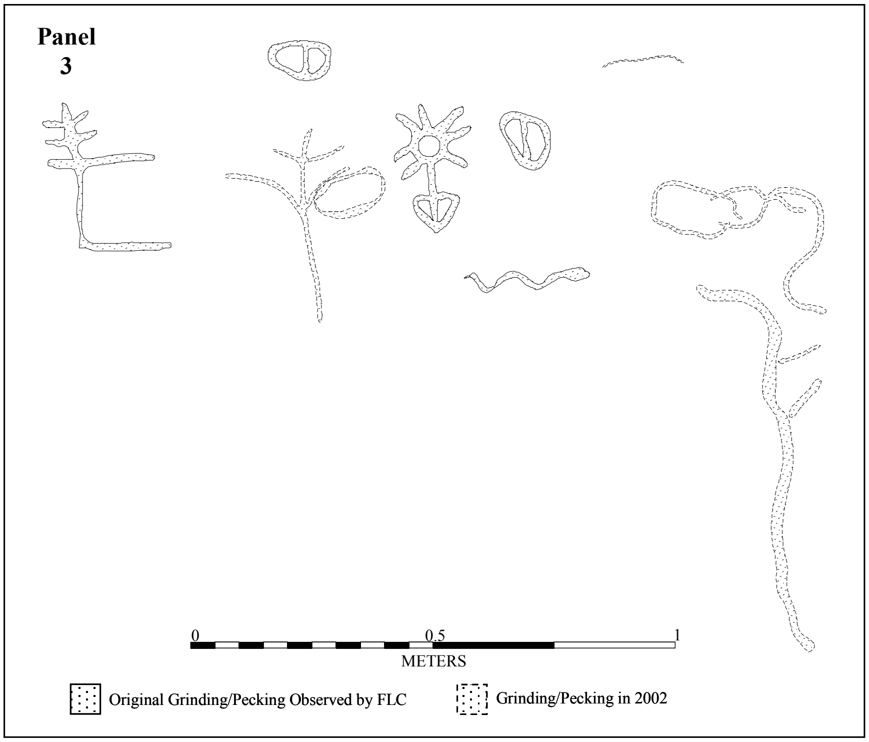

Figure 23. Rock art Panel 3 with additional grinding/pecking observed (modified from Charles et al. 2000:Figure III.44).

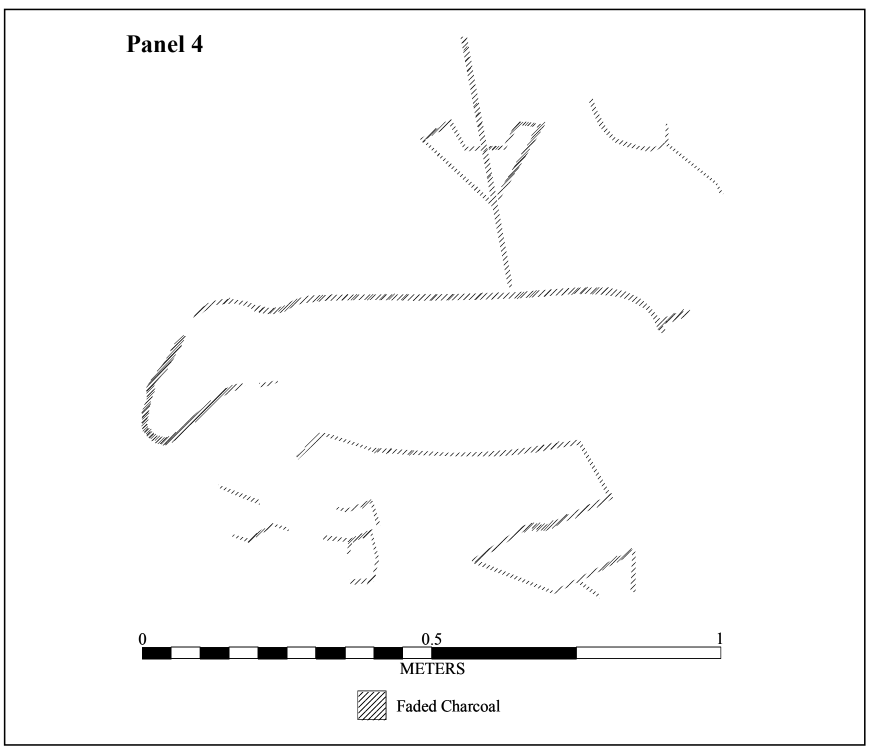

Figure 24. Rock art Panel 4 (modified from Charles et al. 2000:Figure III.44).

the right side of the stalk. The entire design measures 35 cm x 28 cm. It is difficult to determine whether the elements were scratched or pecked because of the deterioration of the sandstone. The second element, located on the northern side of the panel, consists of a random stipple-pecked line that extends for approximately 90 cm, connecting to an oval outline (17 cm x 12 cm) near the top of the panel.

Historic Component: The historic component is represented by a tobacco tin and a historic trail. Inventoried along the bench, the tobacco tin has the distinctive hipflask shape of a Prince Albert tobacco tin, roughly dating between the late nineteenth and early twentieth century (Sagstetter 1998:236).

The historic trail, bordering the southwestern and eastern sides of the site, is defined by a linear swath that cuts through the heavily forested areas. The trail is approximately 3 meters wide that trends in a southwest to northeastern direction below the cliff face. No wheel ruts or two-tracks swales present on the ground surface. However, the alignment of the trail suggests that the path originally intruded upon the southern half of the site. An old spring seat from an early automobile is located south of the site area, indicating that the trail is related to early twentieth century vehicle traffic. The bench below the cliff face, with a low gradient and wide area, would have provided the easiest access to the mesa tops during historic times. At the southeastern end of the site the trail appears to move off the bench and continue in a north-northeasterly direction toward the head of the drainage. The Gilligan's Island rockshelters are visible from the trail and could have been an attraction to those who took this route during historic times. Although the trail is not readily apparent and does not appear to have been heavily used, the rock art and artifacts at the site may have provided an incentive for exploring the area.

Excavation Results

Excavation Approach: The primary focus of the initial subsurface investigations at the Gilligan's Island site was the two connecting rockshelters (Shelter 1 and Shelter 2), located along the eastern cliff face. There were indications in both rockshelters that intact cultural deposits might exist (Charles et al. 2000). Testing was therefore oriented toward determining the degree of intactness of deposits within the shelters and verifying that chronological temporally significant sequences could be recovered and distinguished from one another (Anderson 2002). Four 1-meter-square test units were excavated in each of the rockshelters, resulting in eight excavated grid units (Figures 25-27).

Excavations commenced near the central region of each shelter where the most intensive prehistoric activities were anticipated. The initial 1 m x 1 m excavation unit in each shelter was placed on the outside of the dripline. In each shelter three additional grid units were situated sequentially to the west from the initial grid unit, progressing toward the direction of the shelter interior and oriented perpendicular to its long axis. This sequence resulted in four contiguous grid units that were positioned in a trench-like fashion through the central midline of each shelter. The grid block placed in Shelter 1 was designated Trench B, while the grids placed in Shelter 2 were identified as Trench A. Within these grid units, 84 levels were excavated up to depth 1.3 m below the modern ground surface (hereafter BMGS) (Figures 28 and 29). Fourteen subsurface features were exposed (Figure 30) and 8845 artifacts were recovered. The excavated grid units exposed deeply stratified prehistoric archaeological material that ranged from the early Middle Archaic period to the Transitional Developmental/Diversification period.

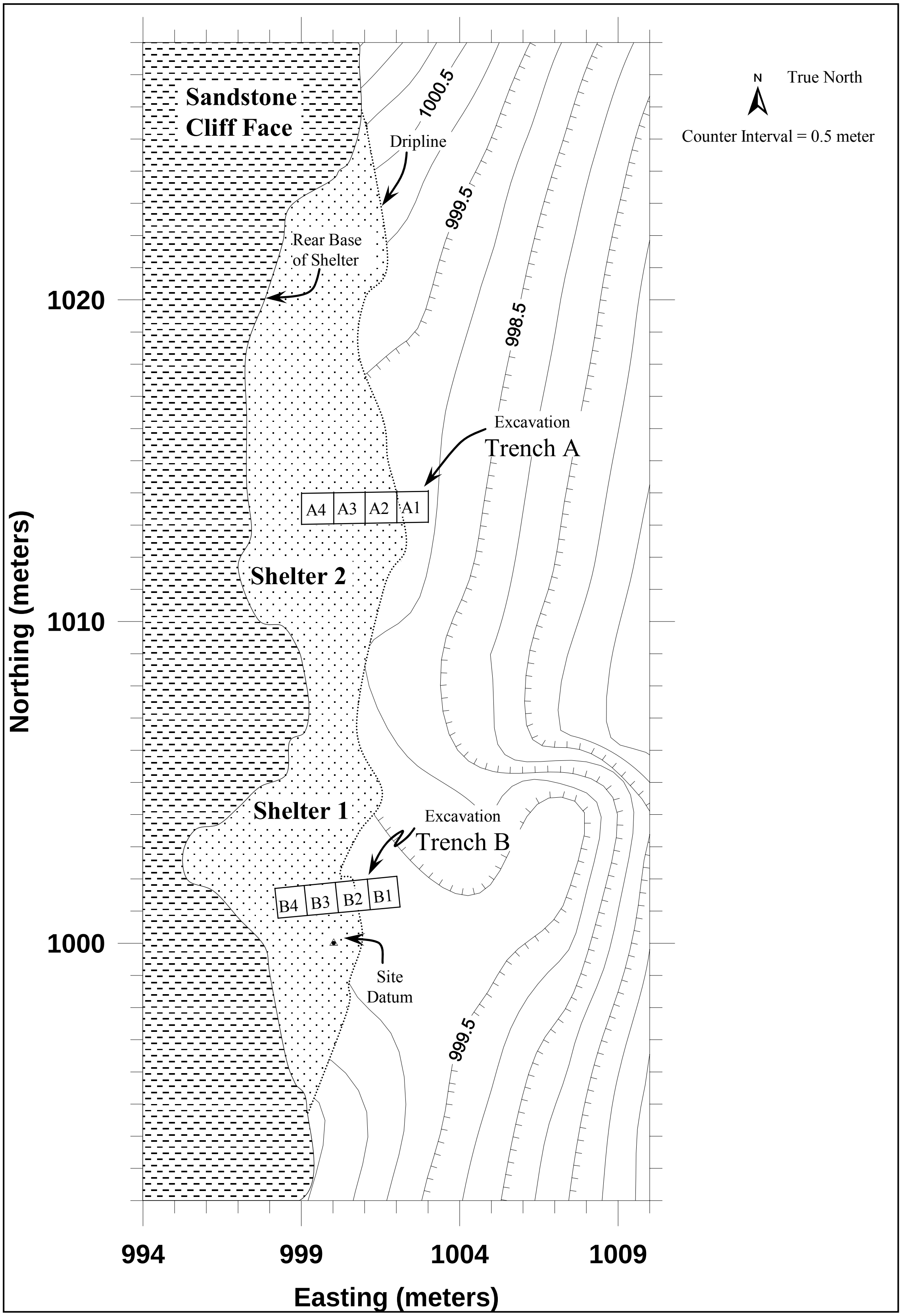

Figure 25. Map of Gilligan's Island shelters showing test unit excavation areas.

Figure 26. View of Trench A, facing west toward the interior of Shelter 2.

Figure 27. View of Trench B, facing west toward the interior of Shelter 1.

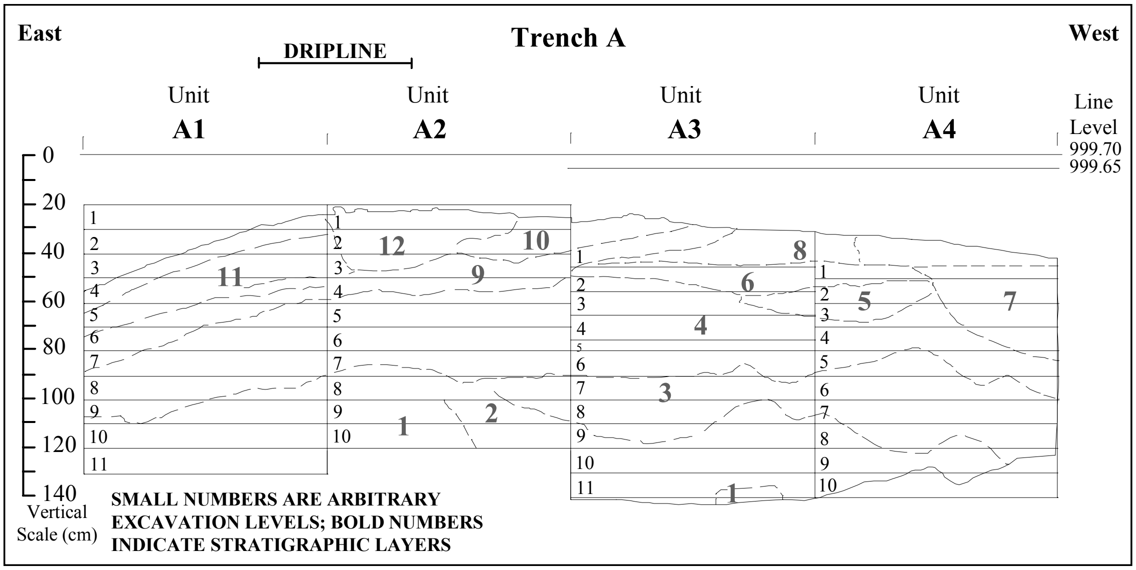

Figure 28. Schematic profile of Trench A showing excavated levels.

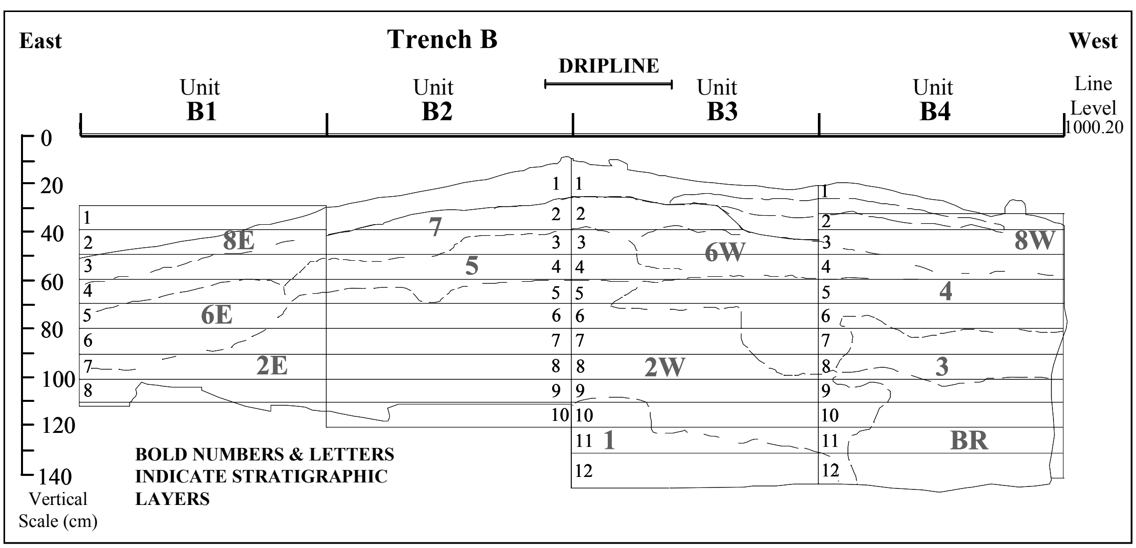

Figure 29. Schematic profile of Trench B showing excavated levels.

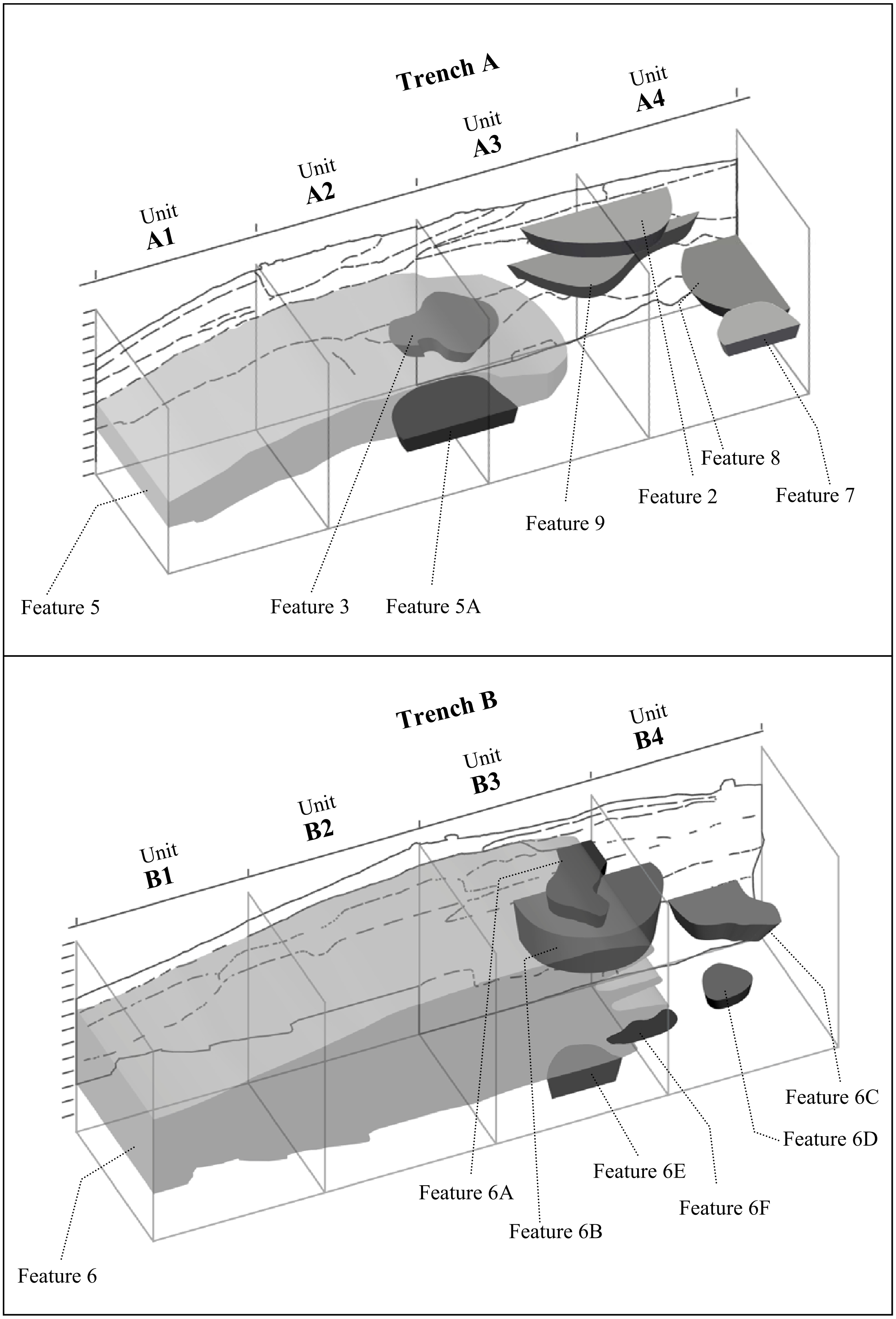

Figure 30. Three-dimensional schematic of feature locations in the trenches.

Site Stratigraphy: Most of the information regarding the stratigraphy of the Gilligan's Island site was derived from a geomorphology report submitted to the author (McFaul 2003). Twenty discrete sediment units were identified within the two east/west-trending excavation trenches that crosscut Shelter 1 (Trench B) and Shelter 2 (Trench A) (Figures 31 and 32). The strata in each of the trenches have separate numeric designations, with Stratum 1 being the lowest in each of the shelters. The materials represent Holocene sediments of both natural and cultural origin that date prior to the Early Middle Archaic and extend to the Historic period. Of these, two major sedimentary classes are defined. The first is probably derived from eolian deposition, and is a relatively well-sorted, fine-grained sand with typically low, single-digit percentages of roof fall; the second class consists of colluvial sand with a generally higher, double-digit percentage of roof fall (McFaul 2003:1).

The variation in size and sorting suggest that two types of climatic conditions influenced the deposition within the shelters (Table 5). A drier or xeric climate is defined by the fine-grained, well-sorted eolian sediment, whereas the poorly sorted deposit and roof fall represents a cooler, mesic climate. Radiocarbon ages associated with the various strata suggest that human occupation began when mesic conditions prevailed, during the early Middle Archaic period (ca. 4240 B.P.). Climatic conditions became xeric during the Middle Archaic period (ca. 3270 B.P.) and terminal Late Archaic period (ca. 3010 B.P.) (McFaul 2003:1). Climatic conditions are unknown for most of the Late Archaic period. Mesic conditions were predominant once again during the transitional Late

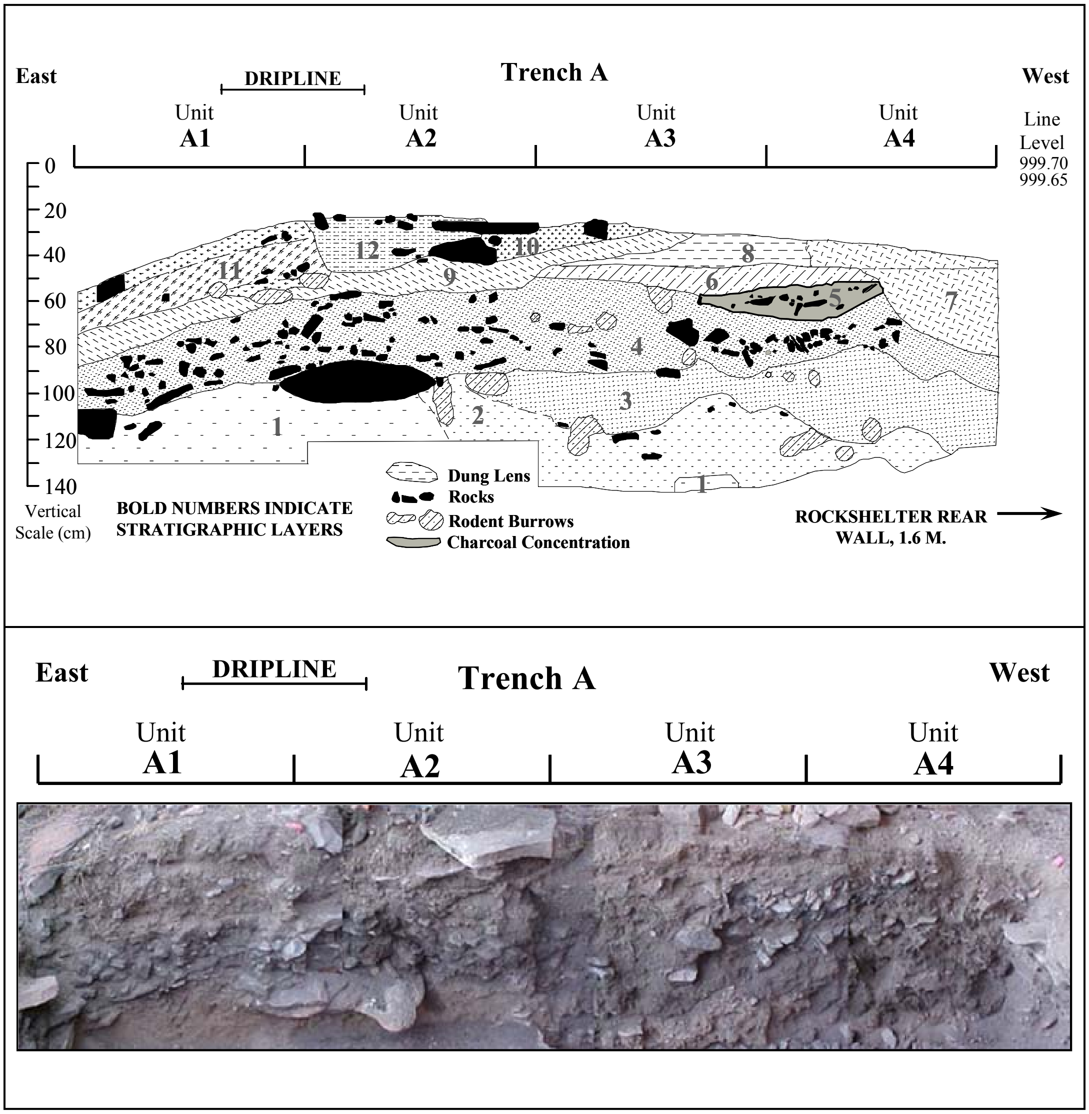

Figure 31. Schematic profile and photo of excavation Trench A, south wall.

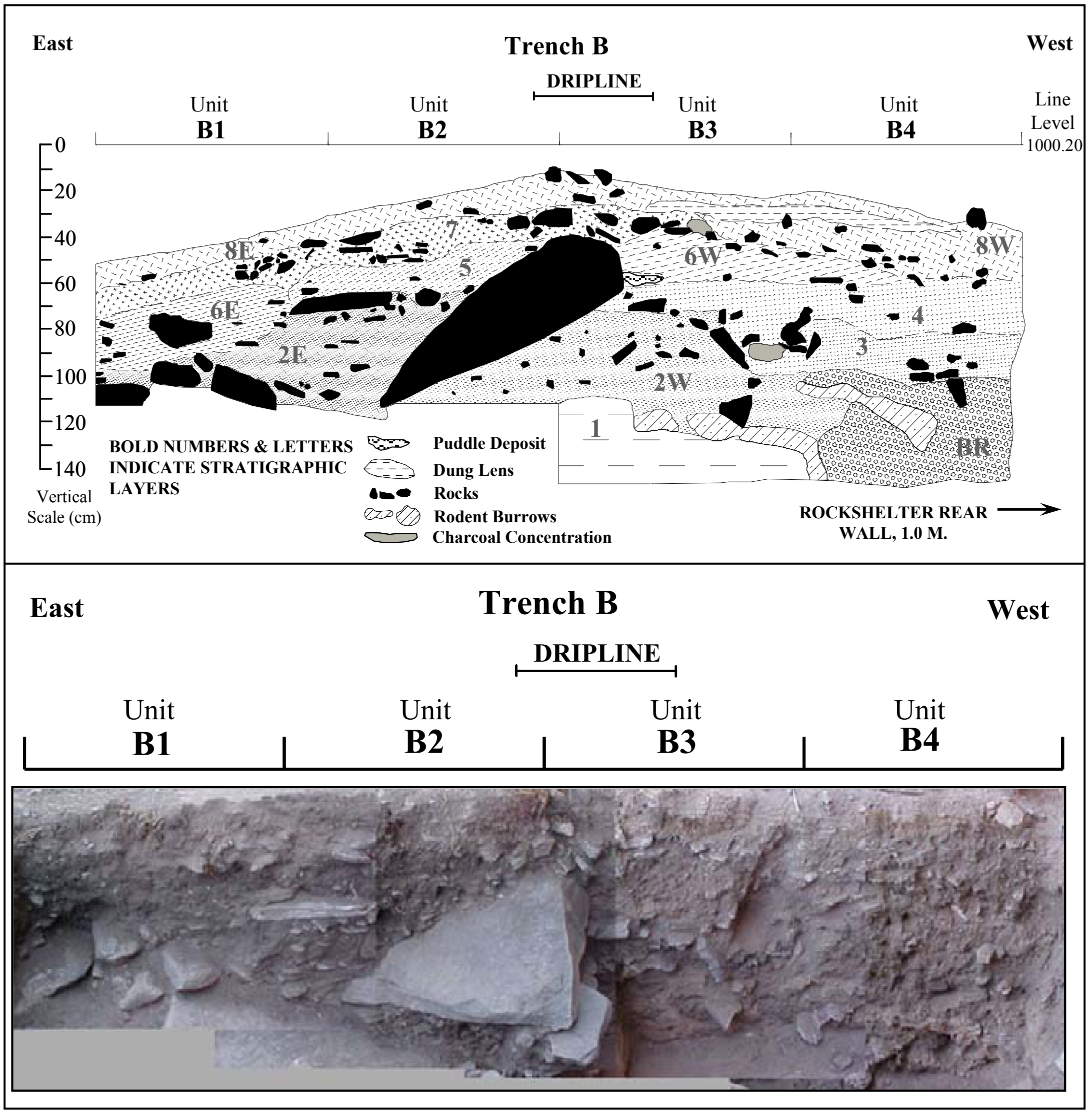

Figure 32. Schematic profile and photo of excavation Trench B, south wall.

Table 5. Comparison of Sediment Units in Trench A and B[1]

Trench A Stratum	Characteristics	Age (Conventional Radiocarbon B.P.)	Predominant Sediment	Predominant Geomorphic Agent	Trench B Stratum
	east 20% < 30 mm west 8% < 8 mm	Historic	sand	cultural	8
12	30 % < 3cm	Historic	roof fall	cultural	
11	6% < 8 mm bedded	Historic & Prehistoric	eolian sand/ humus matting	unknown	
10	7% < 8 mm	Historic	eolian sand	cultural	
9	10% <20 mm	Upper Historic & Lower Prehistoric?	eolian sand	unknown	
8	shelter surface	Historic	dung	cultural	
7	7% 3-15 mm	<1,070	eolian	unknown	
6	25% 2-40 mm	<1,070	roof fall	mesic/moist	
5	25% 2-40 mm	1,070±60	roof fall	cultural	
	Upper Sheet Midden/Feature F6-A	1,390	abundant organics	cultural & mesic/moist	7
	west 9% < 6 mm east 4% <10 mm	<3,270 to >1,390	eolian	mesic/moist to xeric/dry	6
4	Abundant roof fall	>1,880 to 1,070	roof fall	mesic/moist	
3	8% 3-15 mm	>3,010 to >2230	eolian	xeric/dry	
2	18% 2-20 mm	>3,010	roof fall	mesic/moist	
	25% <25 mm	<3,270 to >1,390	roof fall	mesic/moist	5
	6 % 3-9 mm	<3,270	eolian	xeric/dry	4
	40% 5-15 mm	4,240 to 3,270		mesic/moist cool	3
	Bk-horizon 9% west 3-8 mm 3% east 5mm	>4,240 to 3,270	eolian grading to roof fall	xeric/dry	2
	3% 4-5 mm	>4,240	eolian	xeric/dry	1
1	Btk-horizon 1% 4-8 mm	>4,240	eolian	xeric/dry	

[1]modified from McFaul 2003:Table 1

Archaic/Developmental period (ca. 1880 B.P.) and continued into the historic period (McFaul 2003:1).

Sediment Characteristics:

Trench A

Twelve strata were identified in excavation Trench A of Shelter 2. These deposits overlie an eastward-dipping bedrock floor composed of sandstone that gradually slopes to the east 89-120 cm BMGS within the rockshelter. Between the bedrock and the overlying sediment, a very thin, bluish-black shale layer extends toward the rear shelter wall. The shale weathers easily and breaks in tabular form. This friable material has undercut the sandstone above it, resulting in the formation of both Shelter 1 and 2.

Stratum 1

Stratum 1 is most prevalent in Grids A1 and A2, although a small remnant also occurs in Grid 3. The top of Stratum 1 is at a depth of 54-62 cm BMGS and is nearly contiguous with the overlying ground surface. The maximum depth of the layer is not exposed in the eastern portion of Grids A1 and A2; however, the deposit was excavated 115 cm BMGS to bedrock in Grids A3 and A4. This information indicates that Stratum 1 is the oldest Holocene sediment within either of the shelters. Stratum 1 consists of a compact brown to light brown (7.5YR4/2-6/3) sandy clay loam with well-sorted, fine- to medium-grained sands, and less than 1% pebbles (McFaul 2003:5, 6). Cultural materials are relatively sparse in Stratum 1 and are confined to rodent burrows, which contrast with the light brown color of the soil matrix. A paleosol occurs outside of Trench A dripline and exhibits argillic and calcareous horizons. The A horizon appears to have been scraped away (McFaul 2003:6). The paleosol was probably deposited in the middle

Holocene, since it post-dates its immediate host sediments from the Middle Archaic period. Interestingly, paleosols with similar soil development are located in the South Platte River Basin and are associated with a relatively moist climatic event that dates to the late Holocene, ca. 5120 to 4220 years ago (McFaul 2003:6; McFaul et al. 1994:363). Large sandstone spalls located directly beneath the shelter dripline and resting on top of Stratum 1 may relate to the moist climatic weathering episode (see Figure 62).

Stratum 2

Stratum 2 is exposed west of the dripline in Grids A2, A3, and A4. Stratum 2 is adjacent to Stratum 1 and their boundaries are diffuse. The top of Stratum 2 is irregular, ranging between 65-85 cm below the uneven ground surface, and the base was excavated to bedrock at 115 cm BMGS. Stratum 2 consists of a pink (7.5YR8/3) mixture of fine-grained, well-sorted sand and tabular sandstone roof fall with clasts 0.2-2 cm in diameter (McFaul 2003:5, 7). Coarse clasts are abundant (18%) and probably suggest that mesic climate conditions were present (McFaul 2003:7). Disturbance is regular and consists of ancient rodent runs. The position and color suggest that Stratum 2 is probably a modified version of Stratum 1 deposits, which resulted from the climatic transition and disturbance that occurred within the interior of the shelter.

Stratum 3

Stratum 3 is exposed only in the interior of Shelter 2, in Grids A2, A3, and A4, where its thickness varies from 7 to 43 cm BMGS. The border between Stratum 3 and Stratum 2 is indistinct to the east and the contact is irregular to the west, ending abruptly in the western portion of Grid A4. The top of Stratum 3 is 42-65 cm BMGS, and the base is 70-85 cm BMGS. Stratum 3 is the lowest stratum that contains an abundant amount of charcoal, which gives the deposit a dark gray (7.5YR4/1) color. The sediment is a well-sorted, loamy sand that is probably eolian in origin based on the fact that it contains less than 8% sandstone clasts that are 0.3-1.5 cm in diameter (McFaul 2003:5, 7). Bioturbation is evident throughout the stratum. The abundance of archaeological materials throughout this layer suggests that the first occupation of the shelter occurred when these sediments were deposited. Features 7 and 8 yielded a transitional Middle/Late Archaic period conventional radiocarbon date of 3010±40 B.P., as well as a conventional radiocarbon Late Archaic date of 2230±80 (McFaul 2003:7) (Table 6). Radiocarbon ages during this time are associated with an eolian event that occurred in the South Platte River Basin of eastern Colorado; this noticeable wind occurrence ended after ca. 2070 B.P. (McFaul 2003:7; McFaul et al. 1994:371).

Stratum 4

Stratum 4 is the longest exposed deposit, extending the entire length of Trench A. It is both inside and outside the dripline and increases in complexity toward the interior of the shelter. Parralleling the present ground surface, the base of Stratum 4 is 54-43 cm deep and the top is 12-19 cm BMGS. The stratum varies in thickness from 10 to 40 cm. From the western side of Grid A4 the lower boundary of Stratum 4 rises steeply and gradually slopes down toward the outside of the shelter. This boundary is generally irregular and indistinct throughout the contact of Stratum 3, while along the eastern portions Strata 1 and 2 are clearly defined. The upper boundary is irregular and clear because overlying Strata 5, 6, and 7, and perhaps a portion of Stratum 9, are intrusive sedimentary layers. Rodent disturbance is also prevalent throughout the deposit. The color of Stratum 4 changes from a gray (7.5YR5/1) west of the interior dripline, to a very dark gray (7.5YR3/1) outside of the shelter (McFaul 2003:5, 7). The sediment consists of a sandy loam with very fine-grained, well-sorted sand. Archaeological materials, especially FCR, are rich throughout all of the levels in Stratum 4. Stratum 4 may correspond with a moist, cool climatic event based on the abundance of very coarse, angular roof fall (less than 9 cm in diameter) (McFaul 2003:7). A few large boulder spalls near the top of the layer are oriented parallel to the stratum-bedding plane and suggest that increased spalling occurred during a mesic age (Figure 33). A transitional Late Archaic to early Developmental period conventional radiocarbon date of 1880±60 was obtained from Feature 9 (Table 6), near the top of Stratum 4. Interestingly, investigations in the middle of the South Platte River Basin suggest that a relatively moist climatic event occurred in the region sometime after ca. 2070 B.P. (McFaul 2003:7; McFaul et al. 1994:371), therefore supporting the idea that a mesic climate prevailed during the time in which Stratum 4 was deposited.

Stratum 5

Stratum 5 consists entirely of the field of Feature 2, a hearth (see feature descriptions), manifested as a clear and abrupt lens that intrudes into the top of Stratum 4 in Grids A3 and A4 and is overlain by Stratum 6. The feature deposit is 2-18 cm thick. The top boundary gradually angles to the east, ranging between 16-26 cm below the ground surface, and the lower boundaries create a basin shape and are 20-36 cm deep. The stratum matrix is dominated by large pieces of charcoal and 25% of its volume consists of sandstone clasts 0.2-4 cm in diameter (McFaul 2003:5, 7). Feature 2 yielded a conventional radiocarbon age of 1070±60 B.P., and dates within the transitional late Developmental and early Diversification period (Table 6). This date, in association with

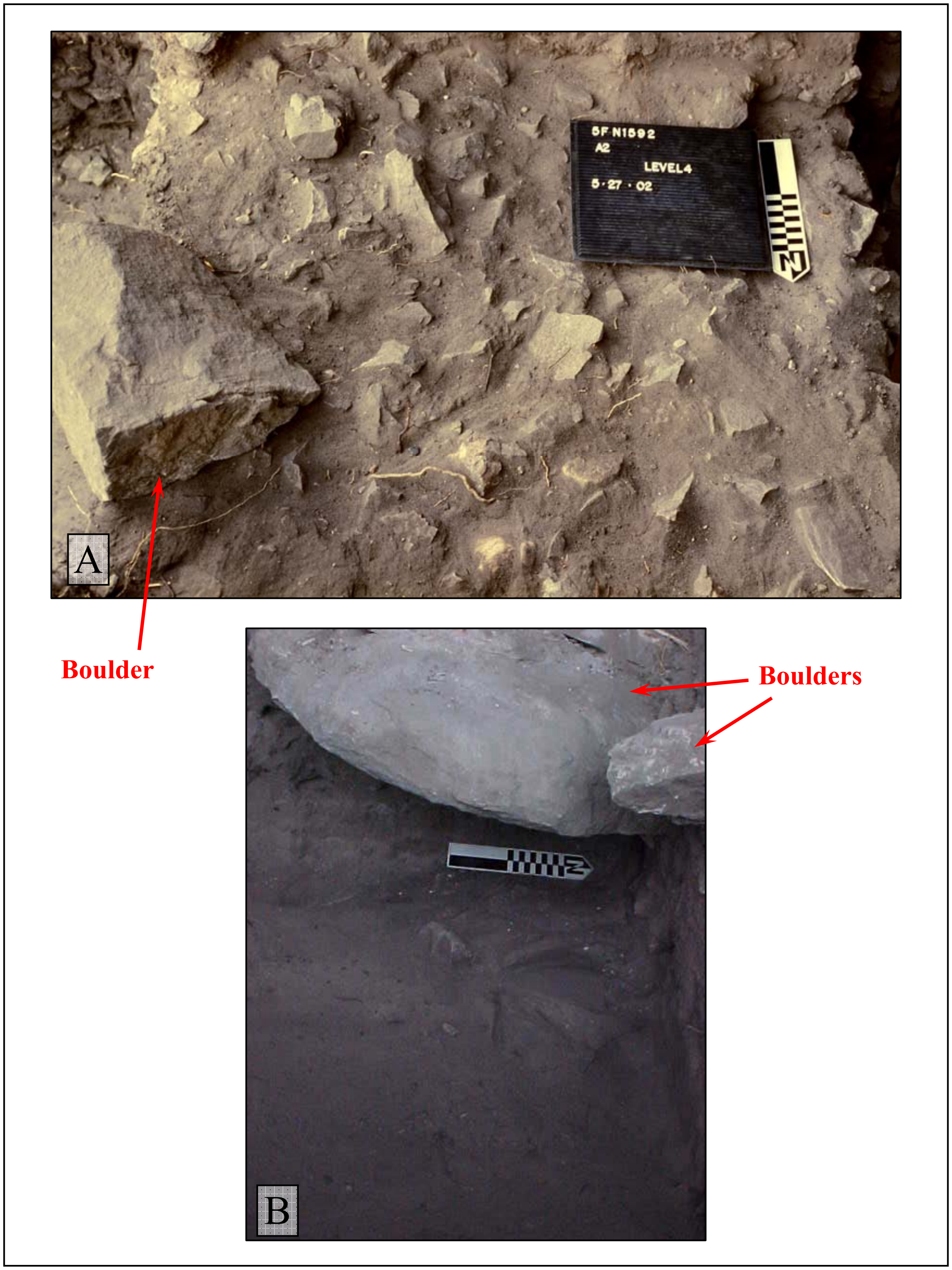

Figure 33. Boulder roof spalls resting near the top of Stratum 4 suggest a probable mesic climate during the Late Archaic to early Developmental period. A) Boulder resting on top of Feature 5 surface, Trench A, Unit A2, Level 4. B) Boulders initially exposed in northwest corner of Trench A, Unit A4, Level 4. Feature 7 exposed at floor. North arrow is 25 cm in length.

the age obtained from Feature 9 in Stratum 4, confirms local geomorphic data from Recon John Shelter and Turkey Creek (Zier 1989:308) and combined reconstruction of the Front Range region (Olyphant 1985). These investigations have suggested that a mesic climate was predominant between ca. 2000 B.P and 1000 B.P. The end of this period is also generally associated with a relatively moist climate in southwestern Colorado (Euler et al. 1979; McFaul 2003:7).

Stratum 6

Stratum 6 is noticeably different in size, shape, and color between the southern and northern wall profiles. These differences are probably related to disturbance along the southern side of the trench.

In the southern profile wall, Stratum 6 is a thin, 12-cm-thick lens that overlies a portion of Strata 4 and 5 in Grids A3 and A4. Stratum 6 is capped by Stratum 8, a manure layer. Ranging in depth between 10 and 20 cm below the interior ground surface of the shelter, the lower and upper boundaries are smooth and clear. The western side of the deposit is mixed with charcoal from Stratum 5, while the eastern side has a limited amount of charcoal. This stratum consists of a very fine grained, pinkish gray (7.5YR6/2) loamy sand. The sand is well sorted with less than 25% of the volume comprised of sandstone roof fall clasts ranging from 0.2 to 4 cm in diameter (McFaul 2003:5,7). Protected underneath Stratum 7, the color and well-sorted nature of the sands may suggest a limited occupation of the shelter when this layer was deposited by the parent material (i.e., roof spall) (McFaul 2003:7). The position between Stratum 5 and Stratum 6 indicates that they are similar in age and origin.

Stratum 6 in the northern profile wall is dramatically thicker. Extending throughout the entire trench, in Grids A1 through A4, its thickness ranges between 20 and 30 cm. The northern side of the trench overlies Stratum 4 and constitutes the present ground surface in the shelter. Maintaining the same texture as the southern side, the color on the northern side of the deposit generally has more gray (7.5YR5/1) than the southern side. The slight color differences probably occur because the northern side is exposed to the elements while the southern side is protected by an overlying sediment layer (Stratum 8).

Stratum 7

This stratum is located on the southern portion of Grid A4 and extends into the western wall. It intrudes into Stratum 4 and Stratum 5 from the west in the trench profile and is basin-shaped in profile. The top boundary is indistinct and may grade into Stratum 8. Stratum 7 is 38 cm thick with the base extending 40 cm from the ground surface. It consists of an ashy, gray (7.5YR5/1), very fine-grained and well-sorted sand. The stratum matrix has less than 7% coarse clasts (McFaul 2003:5, 7). Based on the accumulation of rodent fecal pellets, vegetative matter, loose sediment, position, and abruptly truncated boundary that cuts into Feature 2, it is likely that Stratum 7 is younger than Feature 2 and may be a remnant of looting activities that occurred south of the Trench A excavation (see General Site Description). The stratum is horizontally limited throughout the southern portion of Grid A4 and does not continue into the northern wall of the trench.

Stratum 8

Stratum 8 consists of a thin (0-14 cm) and moderately compact, grayish brown (10YR5/2) deposit of cow dung. Extending over a horizontal distance of 90 cm, the eastern side of Stratum 8 is clear and compact, mantling Stratum 5 and Stratum 6 in Grid A3. To the west, in Grid A4, Stratum 8 gradually diffuses into Stratum 7.

Probable Disturbed Strata

Looting activity is indicated by a mound of deposits that gradually increases toward the upper eastern portion of the Trench A deposits. The disturbance rises above the modern interior floor of the shelter toward the dripline. This mound is prevalent along the southern segment of Grids A1, A2, and A3, and subsides to the north near the central portions of these grids. Strata 9 through 12 are confidently associated with disturbance activities. It should be noted that the northern portion of the trench does not display any of the historically disturbed strata that are described below and the sediment is far less complicated in profile (see Figure 63). The differences in the profiles between the north and south walls of Trench A suggest that the trench cut through the northern periphery of disturbance activities, which seem to be concentrated to the south.

Stratum 9

This stratum is exposed on top of the present interior ground surface in Grid A3. In profile near the eastern section of Grid A3, Stratum 9 subsides underneath Stratum 10 and continues to decline gradually to the east, underneath Strata 11 and 12 in Grids A1 and A2 east of the dripline. The thickness of Stratum 9 varies from 9 to 14 cm. Stratum 9 is composed of a loose charcoal- and humus-rich, pale brown (10YR6/2) sandy loam rich in eolian sands (McFaul 2003:5, 7). The eastern segment of the stratum overlies

Stratum 4, while the western portion of Stratum 9 covers the east side of the compact manure lens of Stratum 8. The upper portion of Stratum 9 probably dates to the Historic period based on the fact that it overlaps the dung lens of Stratum 8. However, Feature 3, a looter's pit, appears to be intrusive into the lower portions of this deposit and indicates that the lower Stratum 9 sediment to the east of Grid A3 is prehistoric. A thin lens of manure overlying Stratum 9 in the western portion of Grid A1 (see Stratum 11) also supports an early age of at least some of the lower deposits in this layer.

Stratum 10

Stratum 10 consists of a moderately thin (0-15 cm) and short (72 cm) lens that is located within the interior of the shelter and near the dripline of Grids A2 and A3. The sediment is a loose, brown (7.5YR5/2) sandy loam with less than 7% pebbles, indicating a possible eolian origin (McFaul 2003:5, 7). A thin sandstone slab covers the eastern side of Stratum 10, while its western boundary constitutes the western slope of the disturbance heap. Charcoal is abundant; however, its position above the upper portions of Stratum 8 and Stratum 9 suggests that all of the deposits are disturbed by historic activity.

Stratum 11

Stratum 11 is 17-29 cm thick; it is outside of the shelter dripline in Grid A1 and the eastern side of Grid A2. Stratum 11 generally consists of a series of faintly bedded deposits that are eroding from the shelter. The sediment matrix is loose, predominantly a dark gray (7.5YR4/1) sandy loam with an abundance of vegetative matter. A mottled concentration of loose humus and manure is located in the lower portions of the layer and is probably associated with the same period as Stratum 8, a thicker manure lens found within the interior of the shelter. As described above in Stratum 9, this suggests that the underlying contact, the eastern portion of Stratum 9, may be of prehistoric age.

Stratum 12

Stratum 12 is a 14-cm-thick deposit located near the shelter dripline. The layer consists of a loose, dark gray (7.5YR4/1) sandy loam with 30% angular clasts (McFaul 2003:5, 7). The clasts are a mixture of cliff and roof spall dominated by FCR that may be derived from looting overburden.

Trench B

Eight stratigraphic sediment units were identified in excavation Trench B of Shelter 1. The deposits in the interior of the shelter overlie a slightly altered sandstone bedrock (BR). Farther east, outside of the dripline, the deposits are superimposed on large boulder roof spalls.

Stratum 1

Stratum 1 is restricted to the interior dripline in Grids B3 and B4. It is the oldest of the Holocene sedimentary deposits. The top of Stratum 1 is 96-130 cm below the undulating ground surface. The base of the stratum was never fully exposed, although it is at least 37 cm thick. This deposit is composed of a light brown (7.5YR6/3) sandy clay loam, very fine-grained, and well-sorted, of eolian sand with 3% angular and tabular sandstone granules that are 4-5 mm in diameter (McFaul 2003:8-7). This layer is culturally sterile except where bioturbation has introduced debris from the overlying levels. The Stratum 1 is similar to Stratum 1 in Shelter 2.

Stratum 2W/2E

Stratum 2 is a probable eolian deposit that is located throughout the entire trench. The composition varies between the sediments located in the interior of the shelter (2W) and those on the exterior (2E). Differences between these deposits imply that a climatic transition occurs as the dripline is crossed. Cultural material is present in the levels excavated in the Stratum 2 deposits. Bioturbation is prominent throughout the stratum matrix and are especially distinct in the interior of the shelter.

Stratum 2W consists of a dark gray (7.5YR4/1), weakly resistant (1.5) sandy clay loam with fine-medium grained sand, and 9% angular and sandstone pebbles that are generally 3.8 mm in diameter (McFaul 2003:8-9). The lower contact between Stratum 2W and Stratum 1 is irregular but clear. Stratum 3 and 4 overlie Stratum 2W. The upper boundary of Stratum 3 is clear, while Stratum 4 is gradual and mottled. Mottling and poorly-defined boundaries of Stratum 2W and the overlying sediment of Stratum 4 make dimensions difficult to determine. Generally, the thickness is greatest near the dripline and gradually diminishes as one moves westward, from 47 to 17 cm. The depth of Stratum 2W ranges from 28 to 66 cm at the top and 90 to 100 cm at the base.

Outside the shelter, Stratum 2E is located in Grids B1, B2, and the eastern side of Grid B3. The lower boundary is defined by large angular boulders that are 1 m in diameter or larger. Overlain by Strata 4, 5, and 6E, the upper boundary is irregular and gradual. Stratum 2E has a maximum thickness of at least 52 cm near the dripline and decreases to the east from the shelter to 8 cm in Grid B1. The depth of Stratum 2E ranges from 22 to 28 cm at the top and 59 to 90 cm at the base. The sedimentary matrix of Stratum 2E consists of a compact (4.5+), gray (7.5YR3/1) silty loam with 3% angular and tabular granules and pebbles that range between 3-8 mm in diameter. Large angular cobbles (3-6 cm diameter) and boulder-sized (40-cm-diameter) inclusions are abundant outside the dripline and were found lying both slanted and parallel to the bedding plane of the stratum. Very fine carbonate filaments are common (4%) in Stratum 2E, suggesting a similar mode of soil development to that of Stratum 1 in Trench A (McFaul 2003:8-9).

Stratum 3

Stratum 3 is located in Grids B3 and Grid B4, where it is entirely in the interior of the shelter. The lower boundary (46-62 cm deep) is clear and irregular, overlying the western boundary of Stratum 2 to the east and deteriorated sandstone to the west. Covered by Stratum 4, the top boundary is clear to gradual with a smooth to slightly wavy surface. The deposits consist of a brown (7.5YR5/2) sandy loam with an abundance of granules and pebbles (40%) that range between 5 and 15 mm in diameter. The high granule percentages suggest that a mesic climate prevailed when the sediment was deposited (McFaul 2003:8-9). Although large cobble- and boulder-size roof fall rocks are prominent in the layer outside of the dripline, they are absent within the Stratum 3 matrix. The lack of roof spalls in Stratum 3 possibly reflects its position beyond the lip of the dripline. Cultural materials proliferate throughout all of the levels of Stratum 3. A moderate amount of rodent disturbance is also present. An early Middle Archaic period date of 4240±70 B.P. (Feature 6C) was obtained from this stratum, as was another Middle Archaic date of 4140±70 B.P. (Feature 6D), making Stratum 3 the oldest absolute dated deposit in both of the shelters (Table 6). The position of Feature 6B, a hearth, suggests that it was dug into Stratum 3 and filled with Stratum 4 sediment. A conventional radiocarbon age of 3270±70 B.P. from Feature 6B indicates that deposition of Stratum 3 ended during the Middle Archaic period.

Stratum 4

This stratum is approximately 22 cm thick and is located in Grids B3 and B4 inside the shelter. The top of the stratum is 40 cm deep and 50-62 cm deep at the base. The matrix consists of a very dark gray (7.5YR3/1), very fine-grained loamy sand with 6% granules and pebbles ranging between 0.3 and 0.9 cm in diameter. The deposits are probably eolian in origin (McFaul 2003:8-10). Cultural material is present with large and small pieces of charcoal widespread in the stratum. A moderate amount of bioturbation is also present. A scarcely discernible stone line contact separates Stratum 4 from the overlying sediment of Strata 6W and 8W. The inclusions are generally oriented parallel to the bedding plane of the lower stratum boundary. Concentrated stone lined clasts such as these often represent a deflated surface where a palimpsest occurs.

Stratum 5

Stratum 5 is generally located underneath and outside the dripline in Grids B1, B2, and B3. On the southern side of the trench, the stratum boundary is broken by a large boulder that lies between Grids B2 and B3. Below the dripline and toward the eastern side of Grids B3, Stratum 5 is defined by sediments that are thinly bedded and are thought to represent puddling during a mesic climatic event. Outside the shelter, Stratum 5 abuts a large angled boulder to the west and diminishes in thickness from 20 cm, ending at a smaller rock spall to the east. The upper boundary loosely conforms to the gradual slope of the present ground surface (25-26 cm deep) while the lower boundary is diffuse and wavy between the rock spalls (32-36 cm deep). Stratum 5 consists of a very dark gray (7.5YR3/1) sandy loam, with poorly sorted sand containing pebbles that are less than 2.5 cm in diameter (McFaul 2003:8,10). Cultural materials are present in all of the levels excavated throughout this stratum.

Stratum 6W/6E

Stratum 6, a probable eolian deposit is divided into a western and eastern segments. The boundary between these segments is bisected in the southern trench profile by Stratum 5 and a large boulder spall. Both portions of Stratum 6 have intact cultural deposits. Bioturbation is present throughout the layer.

The western stratum, Stratum 6W, is located in the interior of the shelter in Grid B3 and B4. This portion of the stratum consists of a brown (7.5YR5/2) sandy clay loam, with 9% granules less than 6 mm in diameter (McFaul 2003:8, 10). The eastern side of Stratum 6W abutts a large rock spall near the dripline of the shelter. Stratum 6W is 20-cm-thick and is loosely defined by sandstone cobbles that lie horizontally at the lower boundaries of the stratum, while more concentrated rocks define the upper boundaries of the stratum. The upper and lower boundaries gradually pinch out toward the interior of the shelter. The top of Stratum 6W is 20-25 cm deep and the base is 22-40 cm deep.

The eastern deposit, Stratum 6E, is located outside the shelter in Grid B1. Stratum 6E is nearly parallel with the present ground surface, ranging between 10 and 26 cm thick and 22 to 44 cm deep. This deposit consists of a dark gray (7.5YR3/1), very fine-grained sandy clay loam, with 4% granules and pebbles less than 1 cm in diameter (McFaul 2003:8,10). Large inclusions make the underlying contact of Stratum 2E broken and erratic.

Stratum 7

Stratum 7 consists of a poorly defined stone line, encased in a loosely consolidated gray (7.5YR5/1) sandy loam (McFaul 2003:8, 10). These inclusions, rich with dark sediment, define the upper boundary of the intact cultural deposits within Grids B1, B2, and B3. Stratum 7 virtually parallels the present ground surface and its lower and upper boundaries range in depth from 10 to 18 cm. Irregular and indistinct, the lower boundaries of Stratum 7 overlie Strata 5 and 6. Once inside the interior dripline of the shelter, the color and definition rapidly subsides and pinches out at Feature 6A. Feature 6A overlies the western margin of Stratum 7, and consists of a charcoal concentration that yielded a conventional radiocarbon age of 1390±60, which dates to the Developmental period (Table 6).

Stratum 8W/8E

Stratum 8 is on the present ground surface, and is defined as an overburden pile which extends across the entire trench and is associated with historic activities (i.e., looting and agriculture). The stratum is divided into two parts, 8W, the interior, and 8E, the exterior. The sediments vary only slightly from one part to the other. Both segments of Stratum 8 are loose and are rich in organic materials; vegetative matter and rodent fecal pellets are especially concentrated on the western side of the trench profile, within the interior of the shelter. Outside the shelter dripline, Stratum 8E is a dark gray (7.5YR4/1) sandy loam, moderately sorted, with 20% pebbles that are less than 3 cm in diameter (McFaul 2003:8,10). The stratum is 10-14 cm thick in this region. Inside the shelter, Stratum 8W consists of a gray (7.5YR6/1) sandy loam, with well-sorted sands, with 8% granules that are less than 8 mm in diameter. Stratum 8W is 14-20 cm thick

(McFaul 2003:8, 10). Intermixed and difficult to define within Stratum 8W sediment is a thin lens (up to 8 cm thick) that consists of probable cow or sheep manure. This lens extends from the dripline west into the north and south walls of Grid B4, and is generally 2 cm below the present ground surface.

Chronology and Temporal Assignments: Temporal assessments are based on the stratigraphy exposed in the trench profiles and on radiocarbon samples obtained from features. The calibrated radiocarbon samples are derived from eight features exposed throughout the excavation units and are summarized in Table 6. All of the samples were analyzed by Beta Analytic, Inc. (Beta) and the 2-sigma calibrated radiocarbon age assessments were recalibrated using the CALIB REV 5.0.2 database (Radiocarbon 2005). Beta's report of radiocarbon dating analyses and calibration of radiocarbon age to calendar years are presented in Appendix A.

The strata are comprised of eolian, colluvial, agricultural and anthropogenic deposits. Taking into account the incorporation of bioturbation into these deposits it is difficult, if not impossible, to identify finite similarities in stratum relationships between the two shelters; therefore numeric designations of the stratigraphic layers do not necessarily correspond between Shelter 1 and Shelter 2. There are few exceptions. Stratum 1 is the perhaps the most important omission to this rule. This stratigraphic layer is the deepest culturally sterile deposit found resting on the bedrock in each of the shelters. Stratum 1 is a distinct brown to light brown color and similar sediment characteristics. The sediment of Stratum 1 was deposited prior to the initial occupation of the shelter during the early Middle Archaic period. The following text describes the

Table 6. Radiocarbon Age Assessment of Features as Ordered by Age.

Sample No. (Beta-)	Trench	Feat. No.	Analysis Type	Conventional Radiocarbon Age (B.P.)	Calibrated Two-Sigma Range [2] (B.P./Christian Calendar)	Temporal Group Designation by Period[3]
171016	A	2	Standard	1070±60	Cal BP 1170-802/ **Cal AD 780-1148**	**Transitional Developmental-Diversification**
171020	B	6A	Standard	1390±60	Cal BP 1404-1179/ **Cal AD 546-771**	**Developmental**
171018	A	9	Standard	1880±60	Cal BP 1651-1632/ **Cal BC 19-AD 318**	**Transitional Late Archaic-Developmental**
171017	A	7	Standard	2230±80	Cal BP 2361-1997/ **Cal BC 412-48**	**Late Archaic**
171765	A	8	AMS	3010±40	Cal BP 3335-3078/ **Cal BC 1386-1129**	**Transitional Middle-Late Archaic**
171021	B	6B	Standard	3270±70	Cal BP 3681-3364/ **Cal BC 1732-1415**	**Middle Archaic**
171767	B	6D	Standard[1]	4140±70	Cal BP 4841-4446/ **Cal BC** 2892-2497	**Middle Archaic**
171766	B	6C	Standard	4240±70	Cal BP 4969-4569/ **Cal BC 3020-2620**	**Early Middle Archaic**

[1]Extended counting
[2] Radiocarbon Calibration Program – CALIB REV5.0.2
[3] based on Kalasz et al. (1999a:69)

chronological arrangement of radiocarbon dates in relation to the stratigraphic layers in each of the shelters.

Four radiocarbon samples were submitted from Trench A in Shelter 2. These dates provide most of the chronological control for the 12 stratigraphic units identified. Eight of these stratigraphic layers are undisturbed prehistoric deposits; one stratum may have contents that are both prehistoric and historic, while three are interpreted as the result of anthropogenic and agricultural events of the historic period. Stratum 2 is an undated layer that lies horizontally and overlaps Stratum 1. The cultural material and charcoal remains suggest that Stratum 2 is an intact cultural layer that may date to the Middle Archaic period. This assumption is based on the two earliest dated radiocarbon samples, which were recovered from the overlying Stratum 3 deposits. Stratum 3 samples are associated with a two-sigma, calibrated age range of 3335-1997 B.P., placing the initial occupation of Shelter 2 within the transitional Middle-Late Archaic periods to Late Archaic period. Stratum 4 completely overlies the previously described strata. Radiocarbon dates recovered from the middle portion of the stratum place it within the two-sigma, calibrated age range of 1651-1632 B.P. (transitional Late Archaic-Developmental period), while Stratum 5 (Feature 2) intrudes into the upper portion of the stratum and terminates cultural occupation at a calibrated age of 1170-802 B.P. (transitional Developmental-Diversification period). Stratum 6 is a natural sedimentary layer that is not well represented in the southern wall of the trench, but is thick in the upper portions of the northern wall. The upper portions of Stratum 6 suggest that the sediment dates later than 802 B.P. These natural sediments are overlain by Stratum 8, a dense concentration of manure that is undoubtedly historic in age. Stratum 8 indicates that the sedimentary units situated above the agricultural layer, Strata 7, 10, 11, and 12, are historic. The underlying sediment in Stratum 9, below Strata 11 and 12, may be of prehistoric age, while the upper boundary of the sediment, bordering Strata 6, 8, and 10, are historic.

Four radiocarbon dates were analyzed from Trench B in Shelter 1. These dates establish the chronology of eight stratigraphic units. Identified strata consist of seven intact deposits and a single disturbed sediment layer. As described above, Stratum 1 appears to be culturally sterile. A radiocarbon sample recovered near the contact of deteriorated sandstone bedrock and the base of Stratum 3 indicates that cultural occupation of the shelter began at a calibrated age of 4969-4569 B.P., during the early

Middle Archaic period. Near the upper boundaries of Stratum 2W an additional calibrated age of 4841-4446 B.P. is associated with a slightly lower elevation, indicating that it is also of a Middle Archaic age. Feature 6B intrudes into the upper portions of Stratum 2W and Stratum 3. Charcoal from this feature yielded a calibrated radiocarbon age of 3681-3364 B.P., confirming that the lower deposits are of the Middle Archaic period. The final radiocarbon sample was recovered near the top of Stratum 7 and yielded a calibrated date of 1404-1179 B.P., which conforms to the Developmental period. There is an estimated 1,960-year gap represented by Strata 4, 5 and 6, for which no radiocarbon dates exist. The lower portions of these three strata are of probable Late Archaic age, while the upper portions most likely date to the Developmental period. Stratum 8 overlies the lower strata and is characterized by loose sediment and a thin manure lens that is indicative of a historic age.

Three temporal periods -- Middle Archaic, Late Archaic and Developmental -- are assigned to the excavation units. Tables 7 and 8 indicate the associations of these periods with specific excavation levels. Figures 34 and 35 are schematic profiles illustrating the position of each temporal period with respect to assigned levels in each excavation unit and within each trench. The Middle Archaic period can be identified only within Trench B, while the Late Archaic and Developmental period are represented in both Trench A and Trench B. The overburden levels are considered to be the result of looting activities and are excluded from the chronological analysis.

Excavation Results and Analysis of Components: Excavation results are separated into four major categories that include baseline data, Middle Archaic period, Late Archaic period, and Developmental period.

Baseline Data: The baseline data are used in two ways. First, the information is intended to define large features that are associated with all three of the temporal periods (i.e., sheet middens). Second, overall counts resulting from particular types of analysis from the 2002 excavation project are summarized. Tables 9 and 10 display the total inventory of cultural materials recovered and the samples submitted for analysis. The following data include the artifacts recovered from the overburden levels and other disturbances that would otherwise not be included in any of the temporal periods. These data may be useful for future analysis at the site.

TABLE 7. Temporal Assignment according to Grid and Levels in Trench A, Shelter 2.

	GRID UNIT				TEMPORAL PERIOD
	A1	A2	A3	A4	
LEVEL(S)	1	1	1	1	OVERBURDEN
	2-5	2-5	2-4	2-4	DEVELOPMENTAL
	6-11	6-10	5-11	5-10	LATE ARCHAIC

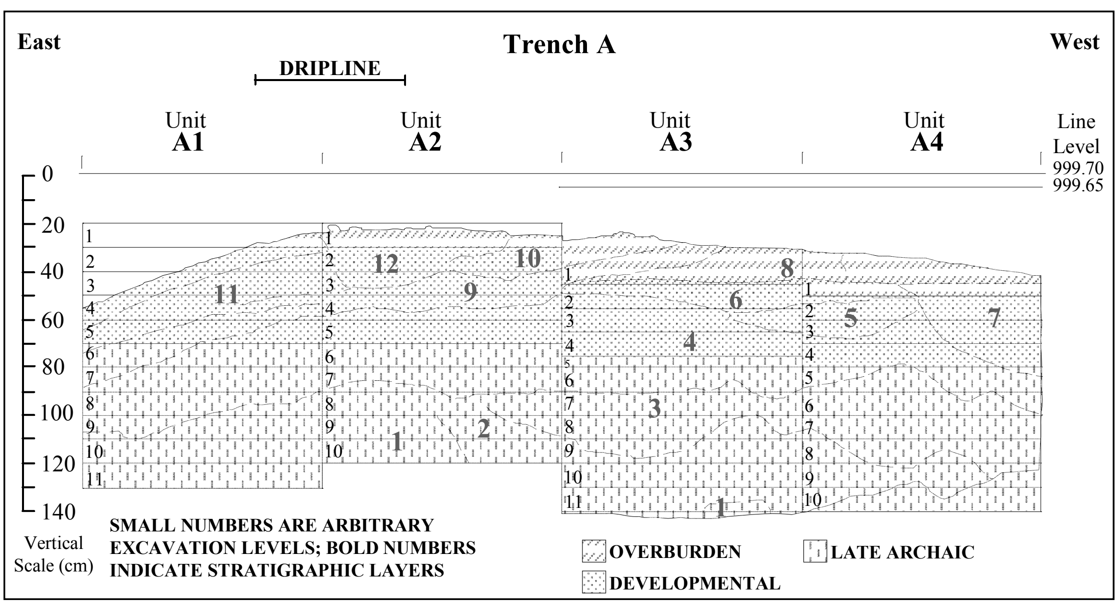

Figure 34. Schematic profile of Trench A showing temporal designations of excavated levels.

TABLE 8. Temporal Assignment according to Grid and Levels in Trench B/Shelter 1.

	GRID UNIT				TEMPORAL PERIOD
	B1	B2	B3	B4	
LEVEL(S)	1	1	1	1	OVERBURDEN
	2-4	2-3	2-3	2-3	DEVELOPMENTAL
	5-6	4-5	4-5	4-5	LATE ARCHAIC
	7-8	6-10	6-12	6-12	MIDDLE ARCHAIC

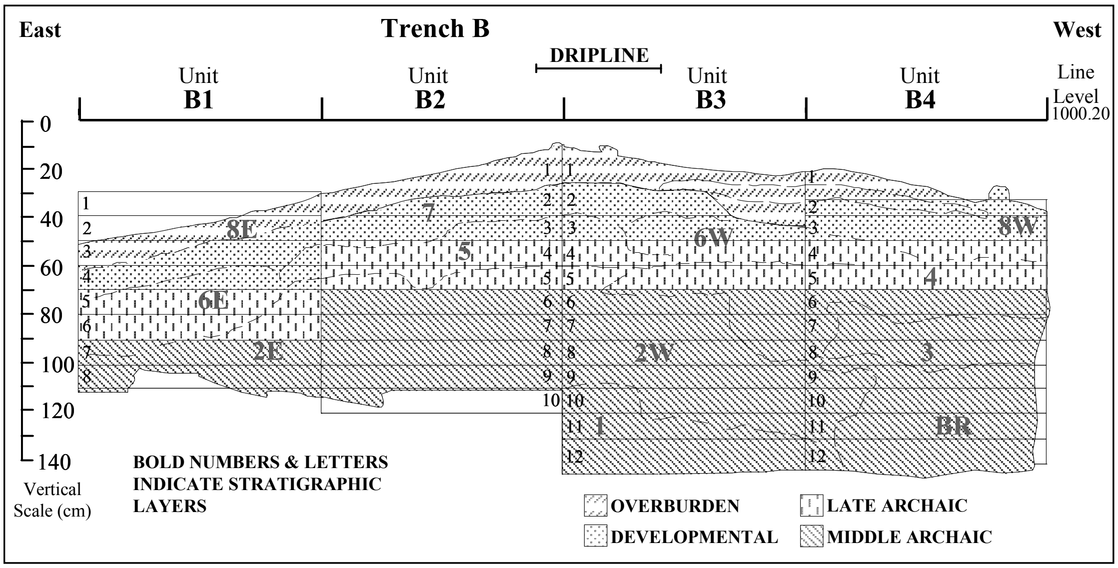

Figure 35. Schematic profile of Trench B showing temporal designations of excavated levels.

Features Transcending Temporal Periods

Two large sheet middens were uncovered in the eastern excavation units of both Shelters 1 and 2. These sheet middens are identified as Features 5 and 6, and generally consist of thick and moderately compact gray (7.5YR3/1) to very dark gray (7.5YR3/1) sedimentary layers. The artifacts and heat altered rocks throughout these sheet middens are heavily coated with a solid cortex of sooty sediment that is difficult to remove and is somewhat greasy. The western boundaries of these features tend to become diffuse near the dripline because of the climatic differences between the inside and outside of the

Table 9. Inventory of Recovered Cultural Materials

Type	Non-Designated		Temporal Periods						Total Recovered Items
	Disturbance/ Overburden		Middle Archaic		Late Archaic		Developmental		
	Count	Row Percent	Count	Row Percent	Count	Row Percent	Count	Row Percent	
Debitage	**387**	13.7	**567**	20.1	**1138**	40.4	**723**	25.7	**2815**
Flaked Stone Tools	**17**	17.7	**13**	13.5	**38**	39.6	**28**	29.2	**96**
Ground/Battered Stone	**19**	12.7	**40**	26.7	**49**	32.7	**42**	28.0	**150**
Misc. Lithics	**0**	0.0	**0**	0.0	**1**	50.0	**1**	50.0	**2**
Faunal Artifacts[1]	**1**	7.7	**2**	15.4	**4**	30.8	**6**	46.2	**13**
Faunal Remains	**243**	4.2	**2194**	38.0	**1996**	34.6	**1336**	23.2	**5769**
Total Counts and Row Percentages	**667**	7.5	**2816**	31.8	**3226**	36.5	**2136**	24.1	**8845**

[1]= totals also included in the faunal remains count

Table 10. Inventory of Submitted Samples

Type	Temporal Periods						Total Samples Submitted
	Middle Archaic		Late Archaic		Developmental		
	Count	Row Percent	Count	Row Percent	Count	Row Percent	
Radiocarbon	3	37.5	3	37.5	2	25.0	**8**
Obsidian Sourcing	0	0.0	0	0.0	1	100.0	**1**
Macrobotanical Remains	4	30.8	3	23.1	6	46.2	**13**
Pollen	2	10.5	11	57.9	6	31..6	**19**
Total Counts and Row Percentages	**9**	**22.0**	**17**	**41.5**	**15**	**36.6**	**41**

shelters. The darker sheet midden deposits are essentially developing anthropogenic soils that are derived from cultural processes. The sediment structure of the middens outside of the shelter has a greater internal uniformity. In essence, these features appear to be rubble piles that were created throughout the millennia from the tossing of debris and unwanted items that were processed within the shelters. Fire-cracked and fire-altered sandstone materials are particularly concentrated in these features. Neither of the sheet midden features was fully exposed during the 2002 excavation.

Each of the sheet midden deposits has an associated basin-shaped roasting pit that defines the lower northwestern edge of the midden (Features 5A and 6E). The locations and direct associations of these roasting pits provide for a probable interpretation of the sheet middens. The rich black (7.5YR2.5/1) sediment inside the roasting pits is somewhat darker than that of the overlying, very dark gray sediment of the sheet midden deposits. However, both the sheet midden and the associated roasting pits consist of dark, rich sediment with an abundance of heavily oxidized FCR. Some of the items originating inside these roasting pits, and probably other features throughout both shelters as well, have contributed to the abundance of the sheet midden deposits. Materials from these various features may have simply been scooped or brushed out and piled in front of the shelters, essentially creating the large rubble deposits constituting Features 5 and 6.

The sheet middens vertically transcend individual temporal boundaries. Based on the radiocarbon dates derived from other excavated features that are horizontal in relation to Features 5 and 6, these sheet middens date from the Middle Archaic period to the later portion of the Developmental period. Even though Feature 5 and 6 deposits span temporal boundaries, both features were excavated in standard arbitrary 10-cm levels. Therefore, the grid unit levels identified in Table 6 are applicable to the levels within these features. The overall boundaries and relevant data pertaining to Features 5 and 6 are described below.

Feature 5

Feature 5 is a large sheet midden located near the eastern front of Shelter 2, as described above. The overall boundary of the feature is undefined and only excavated portions of the sheet midden are illustrated in Figures 30 and 36. The exposed portion of Feature 5, including its sub-feature (Feature 5A), measures 2.42 m length and is 0.50 m thick. Most of the feature fill is located in Stratum 4, which makes up the entire eastern portion of the feature boundary. The eastern lower boundary of Feature 5 is typically defined by large north/south-trending rock spalls that occur in Levels 7 and 8 in Grid Unit A2 and a light brown sediment of Stratum 1 (see Sediment Characteristics: Stratum 1). The western boundary is defined by the black fill of Feature 5A, as well as the upper eastern boundaries of Strata 2 and 3. The feature appears to continue in an eastward direction downslope of Grid Unit A1. The western boundary is generally beyond the dripline of the rockshelter in Grid Unit A3. Feature 5 was not identified as a feature until

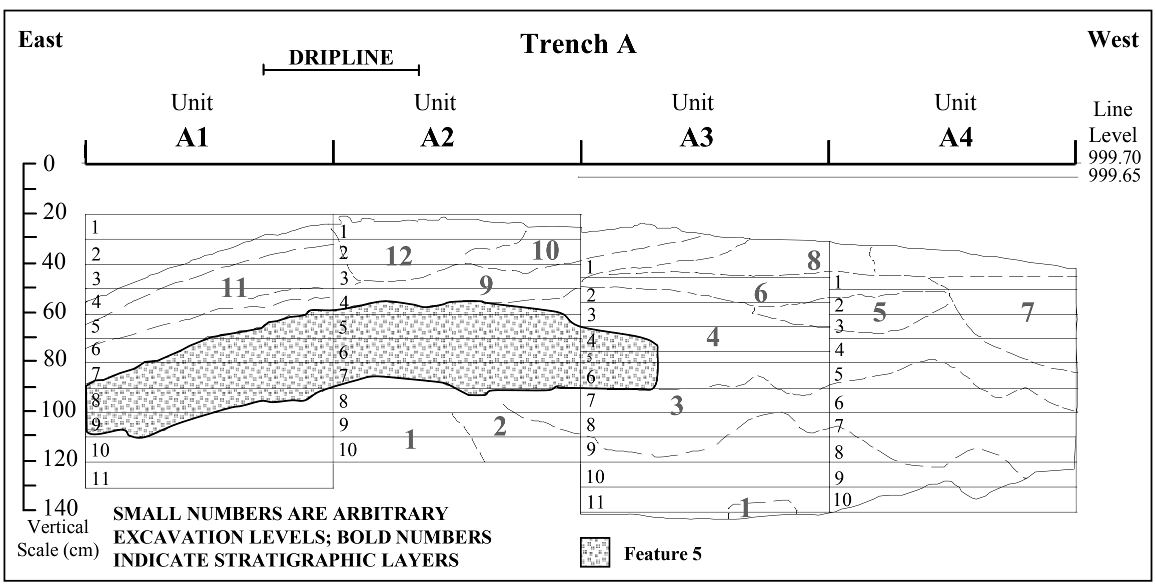

Figure 36. Schematic profile of Trench A showing the designated boundary of Feature 5 in association with the stratigraphic layers and excavated levels.

after its western periphery and some of the upper segments of the sheet midden were excavated. However, once the feature was identified, extreme care was taken to determine the western boundary. As a result, the western boundary is defined by field level form information including plan maps, descriptions, and sediment profiles. After the feature was identified, the sediment was screened separately from the standard level fill.

The plan view map of Level 5 in Grid Unit A3 illustrates a linear alignment of medium-size rocks indicative of a possible barrier wall for the sheet midden deposit of Feature 5 (Figure 79). It is probably not a coincidence that Feature 9, a roasting pit dating to the transitional Late Archaic/early Developmental period, is positioned approximately 20 cm from this stone alignment. The probable barrier suggests that by this time the sheet midden was not an ambiguous depositional area, but rather had become a consciously predetermined locality within which to place discarded items. However, further excavation would be required to fully document, and thus confirm, this interpretation.

Feature 6

Feature 6 is a large sheet midden located near the eastern front of Shelter 1, as described above. The greater boundary of the feature is undetermined and only the excavated portions are illustrated in Figures 30 and 37. The exposed portion of Feature 6, including its sub-feature (Feature 6E) in Trench B, measures approximately 3 m in length and is 1 m thick. The top of the feature is defined by the upper boundaries of Stratum 7. The lower boundaries are large boulder concentrations in the eastern portion of Trench B, in Grid Units B1, B2, and the eastern portion of Grid Unit B3. The lower

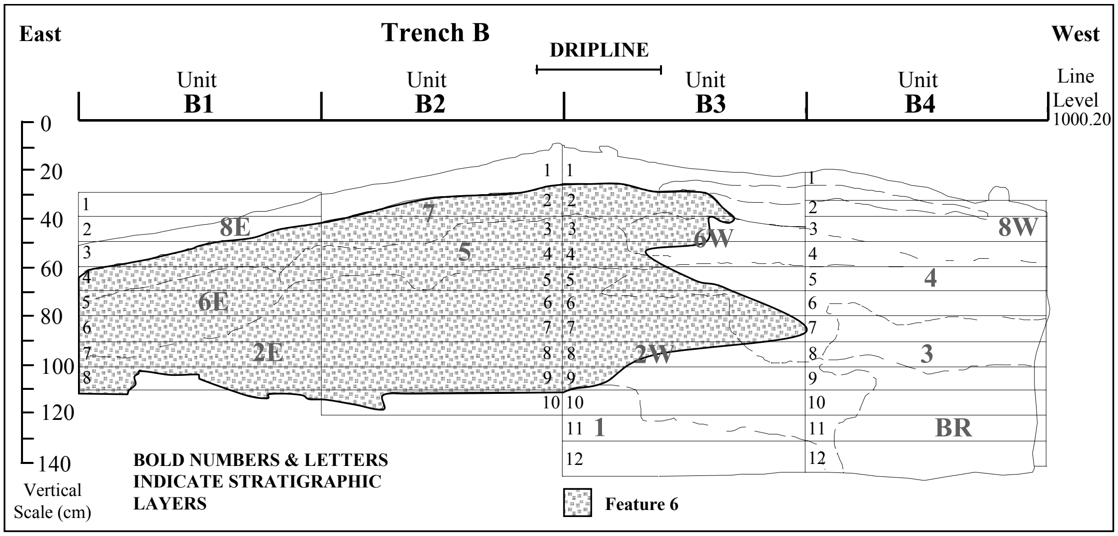

Figure 37. Schematic profile of Trench B showing the designated boundary of Feature 6 in association with the stratigraphic layers and excavated levels.

western boundaries are identified by light brown sediment of Stratum 1 and black fill of associated Feature 6A (see Middle Archaic: Features). Additional strata in the feature fill consist of Strata 5, 6E, 2E and portions of Stratum 2W (see Sediment Characteristics). The feature continues to the east into the eastern wall of Grid Unit A3; the western boundary is generally beneath the dripline of the rockshelter in Grid Unit B3. The sheet midden deposits in the westernmost periphery were distinguished by a dark sedimentary fill that contrasts with the lighter and generally unconsolidated shelter fill. Throughout the excavation, extreme care was taken to define the boundary of the feature. Once identified, the sheet midden sediment was screened separately from the standard level fill.

Material Culture

Lithic Material

Flaked Stone

In total, 2,815 debitage specimens and 96 flaked stone tools were recovered from the Gilligan's Island site. A single piece of chert debitage from the surface of the bench area is included in this count, while the remaining 2,814 flakes were recovered from the interior of Shelters 1 and 2. The lithic data indicate that early stages of stone tool production occurred before the items were brought to the shelter area, and mid- to late-stage reduction is responsible for the most common flake form at the site. Chert is the most commonly used material and local quartzite was used secondarily, as supplemental material. Expedient flake tools and bifacial items are common, while larger tool items occur less frequently.

Debitage

Debitage specimens were recovered in the field using a standardized 1/8-inch screen size for the entire site. In addition to on-site screening, a bulk sediment sample, consisting of approximately 1/9 of an excavation unit, was waterscreened through 1/16-inch window screen in the laboratory. Sampling a portion of each excavation unit with a smaller screen size is required on Fort Carson, and such practices have become standard in recent archaeological excavations on the eastern plains of Colorado (e.g., Kalasz et al. 2005, Kalasz et al. 2003; Charles et al. 2001, Ahler 2002). A smaller screen size is important in debitage analysis in order to ascertain late-stage reduction strategy techniques that might otherwise go unrecognized. For example, a stone tool manufactured from a valued lithic material may be retouched rather than manufactured at the site. The larger screen size (1/8-inch) may fail to recover these smaller flakes and thus miss clues to the behavior of the prehistoric occupants.

The debitage specimens recovered from the excavation units consist of 2814 specimens. Of these, 1,904 items were recovered from the standard 1/8-inch screen utilized during excavation. The remainder of the sample is composed of 910 items recovered from the 1/16-inch screen. Initially, the entire debitage collection was separated by the screen sizes utilized in the field (standard 1/8-inch screen) and in the laboratory (1/16-inch screen). Of the entire collection, 258 specimens were lacking definable attributes (i.e., debris/shatter) such as a bulb of percussion or dorsal and ventral surfaces. These two bulk assemblages were then separated into four size grades during the mass analysis. Tables 11 and 12 summarize the results of the mass analysis. Note that size grade 1 represents the largest debitage items that do not pass through a 1-inch (25 mm) screen, and size grade 4 represent the smallest flakes that pass through a ¼-inch (5.6 mm) screen. Table 11 lists the tabulated standard screen data recovered during the field excavation, which indicates that noncortical size grade 4 chert has the greatest number of specimens within the 1,904-item sample. Slightly larger size grade 3 chert is also a prominent occurrence, followed by noncortical quartzite in the same size grade. The larger two size grade items are present in the assemblage, but in considerably smaller quantities. Table 12 represents the debitage recovered from the waterscreen samples. The distribution of material and size grades from the waterscreen is similar to that of the standard screen, and suggests that a majority of the debitage pieces at the site are less than 1/8-inch across, smaller than the size screen utilized for the recovery of artifacts in the field. Both the standard and waterscreen samples have more noncortical items in the two smallest size grades, which suggests that late stage reduction typically occurred at the site. The larger size grades indicate that early- and mid-stage reduction took place, but its occurrence was much less frequent.

Quartzitic material is represented by the highest number of large flakes in the sample, which suggests that this material was utilized most often for early stage

Table 11. Debitage Mass Analysis Summary of Recovered Materials Standard 1/8-inch Screen[1]

MATERIAL TYPE	SIZE GRADE FREQUENCIES								TOTALS	
	1 (Large)		2 (Medium)		3 (Small)		4 (Micro)			
	Cortex	No Cortex	Cortex	No Cortex	Cortex	No Cortex	Cortex	No Cortex	Freq.	Column Percent
Chert	0	2	47	46	117	377	59	688	**1336**	**70.1**
Chalcedony	0	0	0	0	3	9	0	10	**22**	**1.2**
Quartzite	21	10	43	45	37	139	12	78	**385**	**20.2**
Basalt	1	0	0	0	0	0	0	0	**1**	**<1.0**
Siltstone	0	0	1	1	0	1	1	0	**4**	**<1.0**
Sandstone	0	0	3	3	1	0	0	0	**7**	**<1.0**
Quartz	1	0	9	2	5	17	2	16	**52**	**2.7**
Petrified Wood	1	0	5	5	4	23	0	46	**84**	**4.4**
Quartz Crystal	0	0	0	0	2	0	0	11	**13**	**<1.0**
Rhyolite	0	0	0	1	0	0	0	0	**1**	**<1.0**
TOTAL COUNTS	**24**	**12**	**108**	**103**	**169**	**566**	**74**	**849**	**1905**	**100**
ROW PERCENTAGES	**1.3**	**<1.0**	**5.7**	**5.4**	**8.9**	**29.7**	**3.9**	**44.6**	**100**	

[1] Results include a single size grade 2 cortical chert piece collected from surface of bench area

Table 12. Debitage Analysis Summary of Recovered Materials 1/16-inch Waterscreen

MATERIAL TYPE	SIZE GRADE FREQUENCIES								TOTALS	
	1 (Large)		2 (Medium)		3 (Small)		4 (Micro)			
	Cortex	No Cortex	Cortex	No Cortex	Cortex	No Cortex	Cortex	No Cortex	Freq.	Column Percent
Chert	1	0	8	6	14	71	20	552	**672**	**73.8**
Chalcedony	0	0	0	0	0	2	0	4	**6**	**<1.0**
Quartzite	4	1	19	13	11	42	5	75	**170**	**18.7**
Basalt	0	0	0	0	1	1	0	0	**2**	**<1.0**
Sandstone	0	0	1	1	1	0	0	0	**3**	**<1.0**
Quartz	0	0	0	0	1	3	0	19	**23**	**2.5**
Petrified Wood	0	0	0	1	1	2	0	26	**30**	**3.3**
Quartz Crystal	0	0	0	0	0	1	0	3	**4**	**<1.0**
TOTAL COUNTS	**5**	**1**	**28**	**21**	**29**	**122**	**25**	**679**	**910**	**100**
ROW PERCENTAGES	**<1.0**	**<1.0**	**3.1**	**2.3**	**3.2**	**13.4**	**2.8**	**74.6**	**100**	

reduction. These data are not entirely unexpected since quartzitic material is available near the eastern border of the Gilligan's Island site, along the edge of the bench area. Most of the quartzitic material in the excavated assemblage is similar in color and grain size to this geologic formation, which suggests that the material was obtained at or near the site. Such frequencies of quartzite in the sample could perhaps be utilized in the analysis as a baseline representative for indicating early reduction processes. This is not to suggest that all of the quartzite from the site was subjected to early stage reduction; however, experimental studies of core reduction and tool manufacture have shown that an abundant amount of smaller-size debitage is produced through such tool manufacture (Kalasz et al. 2005:76; Baumler and Downum 1989:105). In fact, smaller lithic fragments are generated by all of the reduction processes because of shatter; flakes may also break apart once they have been removed from the core because of trampling or other post-core removal and depositional processes (Andrefsky 1998:81). The absence of larger flakes generally indicates that early stages of reduction have already occurred (Kalasz et al. 2005:76; Baumler and Downum 1989:105).

The most commonly occuring materials at the Gilligan's Island site are chert and quartzite. The knapping qualities of these materials vary; quartzite is generally coarse-grained, while chert has a fine grain. The quartzite materials believed to have been obtained from near the site from the site commonly have a flat and smooth cortex, indicative of a non-alluvial origin and likely derived from a geological formation. Some of the chert exteriors are rounded or smooth, suggesting that these materials originated from stream cobbles or pebbles. Other chert materials also have rough exteriors, with thick rinds that diffuse into a fine-grained texture within the interior, suggesting that these items were quarried from a geologic formation or from another non-alluvial source.

Another trend in the standard and waterscreen samples is that materials other than chert and quartzite are low in number (Tables 11 and 12). Chalcedony, basalt, siltstone, sandstone, quartz, and petrified wood occur in both samples, but make up less than 10% of the total debitage. Four pieces of siltstone and a single piece of rhyolite were collected from the standard sample, as were more exotic materials such as obsidian. Chalcedonies are limited and are considered a subcategory of chert in this analysis because of the similarities in knapping characteristics and origins. There are generally two types of petrified wood in the assemblage. The first is a fine-grained brown to caramel colored material that is most typical of the Dawson Arkose Formation on the Palmer Divide (Black 2000; Voynick 1994). The second is a gray to black material that typically step-terminates because of blocky fractures. Although these specimens were never compared collectively, this type of petrified wood may resemble materials found in the Florissant Fossil Beds, located in the foothills near Divide, Colorado (Chronic and Williams 2002:139). The quartz crystal has characteristics similar to the interlocking crystalline materials from the Pikes Peak batholith, with a transparent and fine grain material that fractures conchoidally (Chronic and Williams 2002:46), while the quartz and basalt have medium particle textures. The rounded rind of quartz cortex indicates that it probably came from drainages or terrace gravels flowing out of the mountains and the foothills (Chronic and Williams 2002:106 Figure). The basalts are commonly found to the southeast of the site, where elongated dikes and cone-shaped volcanic remnants exist between Pueblo and the Colorado-New Mexico state line (Chronic and Williams

2002:74). Most of the sandstone appears to be local and is probably debris resulting from modifying the edges of metates. The quality of stone, variability of resources, and cortical differences suggest that lithic material was obtained from the site as well as other settings in the region including drainages, plains, foothills, mountains, and the Palmer Divide. With the exception of quartzite, most of the materials appear to have been reduced prior to arrival at the site. Even though quartzite occurs naturally at or near the site, chert, a more distant resource, was probably preferred because of its higher quality as a knapping material. Chert and the remaining materials came from multiple sources and show evidence of several stages of reduction.

The second type of analysis is used specifically on those pieces of debitage that have platforms. Those pieces of debitage that bear intact platform morphologies provide specific technological data such as hard hammer and bifacial thinning attributes. Variability in technological flake type category may indicate the type of reduction processes utilized on the objective stone. For instance, hard hammer flakes that generally have attributes such as flat striking platforms, thick bulbs of percussion, and few dorsal scars are assumed in this analysis to indicate core reduction and early- to middle-stage biface manufacture, which typically requires a hard hammer. Bifacial flakes represent a more controlled activity, in which a soft hammer (i.e., bone, antler, wood) is generally utilized to detach flakes from the margin of a biface, during the middle to late stage of reduction (Andrefsky 1998:118; Kalasz et al. 2005:77). Ideally, flakes resulting from bifacial thinning have a complex striking platform with pronounced and angled lips that are recognized as the detached margins of bifacial tools; realistically these attributes are less common and usually include thin, flat flakes, with feathered termination and multiple dorsal scars. Mid-range theory studies have shown that in some cases hard hammer percussion can produce bifacial thinning flakes, while soft hammer flaking may under some conditions have attributes closer to those of a hard hammer technology (Mauldin and Amick 1989; Patterson 1982; Patterson and Sollbergber 1978; Kalasz et al. 2005:77). Regardless, technological trends in flake morphology typically follow the somewhat subjective assumptions characterized above in terms of broad patterns in the assemblage, and are generally thought to have been confirmed in large-scale analyses (Prentiss 1998; Kalasz et al. 2005:77).

Flaked Stone Tools

Ninety-six specimens are identified in the subjective flaked stone tool category (Table 13). Bifaces identified in the study include early, middle, and late stage unstemmed bifaces and stemmed biface projectile point/knife. Flake tools consist of scrapers including end scrapers, disto-lateral scrapers, and an undetermined scraper, as well as expedient flake tools that are mainly indicative of tool-cutting/scraping or multiple tasks. Miscellaneous tools are identified broadly under the subjective category. Larger and heavier tools include cores, tested cobbles, indeterminate core/cobble tools, and a single chopper. Further discussion of individual subjective categories is presented in each of the designated temporal periods (e.g. Middle Archaic period, Late Archaic period, and Developmental period). Attribute values for all of the individual tools are provided in Appendix B. It should be noted that two miscellaneous lithic items are presented in miscellaneous tool data Appendix B, but are not identified in Table 13. These items consist of a chert manuport (.293) and an ochre fragment (.294) and

Table 13. Baseline Data for Flaked Stone Tool Types by Material Type[1]

Tool Type	MATERIAL FREQUENCIES						Tool Totals	
	Chert	Petrified Wood	Quartzite	Basalt	Quartz Crystal	Obsidian	Freq.[1]	Col. %[2]
Early Stage Biface	5						**5**	5.2
Middle Stage Biface	1		1				**2**	2.1
Late Stage Biface	4		2		1		**7**	7.3
Undetermined Bifacial Fragment	11	1					**12**	12.5
Stemmed Biface Projectile Point/Knife	10						**10**	10.4
Scraper	6	2	1				**9**	9.4
Expedient Flake Tool	31	1	3			1	**36**	37.5
Core	1		4	1			**6**	6.3
Tested Cobble			2				**2**	2.1
Indeterminate Core/cobble Tool	1		2				**3**	3.1
Chopper			1				**1**	1.0
Miscellaneous Tool	2	1					**3**	3.1
Material Totals	**72**	**5**	**16**	**1**	**1**	**1**	**96**	100.0
Row Percent	75.0	5.2	16.6	1.0	1.0	1.0	100.0	

[1] Freq. = Frequency, [2]Col. % = Column Percent

described under Miscellaneous Lithic Artifacts in the Late Archaic Period and Developmental Period sections.

Inspectional Analysis of Stemmed Bifaces

The following section consists of inspectional analysis of projectile point morphology and chronology. Much of the chronological data is derived from Kalasz et al. (2007) and focuses particularly on the southeastern Colorado region. There are 10 bifaces that have stems or are stem fragments (Figure 38, Table 14). These bifacial stems are separated into two large categories based on size and technology. The first is a dart-size category that is typically associated with the atl-atl. The second is an arrow-size category that is associated with the bow-and-arrow. While an additional fragment

Table 14. Projectile Point Summary Data

	Type	Cat. #[1]	Unit	Level	Material	Complete	Length (cm)	Width (cm)	Thickness (cm)	Neck Width (cm)
DART	1	.027	A1	2	chert	complete	2.6	1.7	0.4	1.4
	2	.026	A1	2	chert	complete	2.7	2.1	0.5	1.4
	U	.015	A1	7	chert	incomplete	--	--	--	--
	U	.019	A4	7	chert	incomplete	--	--	--	--
	U	.049	A4	5	chert	incomplete	--	--	--	--
	1	.052	A4	7	chert	incomplete	--	2.1	5.8	1.3
	U	.079	B3	5	chert	incomplete	--	--	--	--
	U	.090	B4	5	chert	incomplete	--	--	--	--
ARROW	1	.048	A4	2	chert	nearly complete	2.6	1.7	3.1	1.2
	U	.064	B2	4	chert	incomplete	--	--	--	--
	U	.088	B4	3	chert	incomplete	--	--	--	--

[1] Cat. # = Catalog Number (50FN1592.000.-), U = Unclassifiable Points

midsection is included without a stem, it has attributes (i.e., flake pattering, thickness) commonly associated with dart points from a broad age group (Paleoindian stage). Projectile points representing these categories are typically connected with hunting activities; however, these points may have served a variety of tasks while hafted. For example, several of the implements have retouched edges, especially along one side, and were probably utilized as knives. Regardless of their use, these artifacts have morphological attributes that are temporally diagnostic to the region. The inspection and sorting process is similar to that used in the development of Anderson's (1989b) morphological inspectional categories. However, the following analysis has a greater tendency to "lump," rather than "split," the subjective stem types. The following description represents an attempt to relate the individual points from the Gilligan's Island shelters to stemmed items recovered in regional studies.

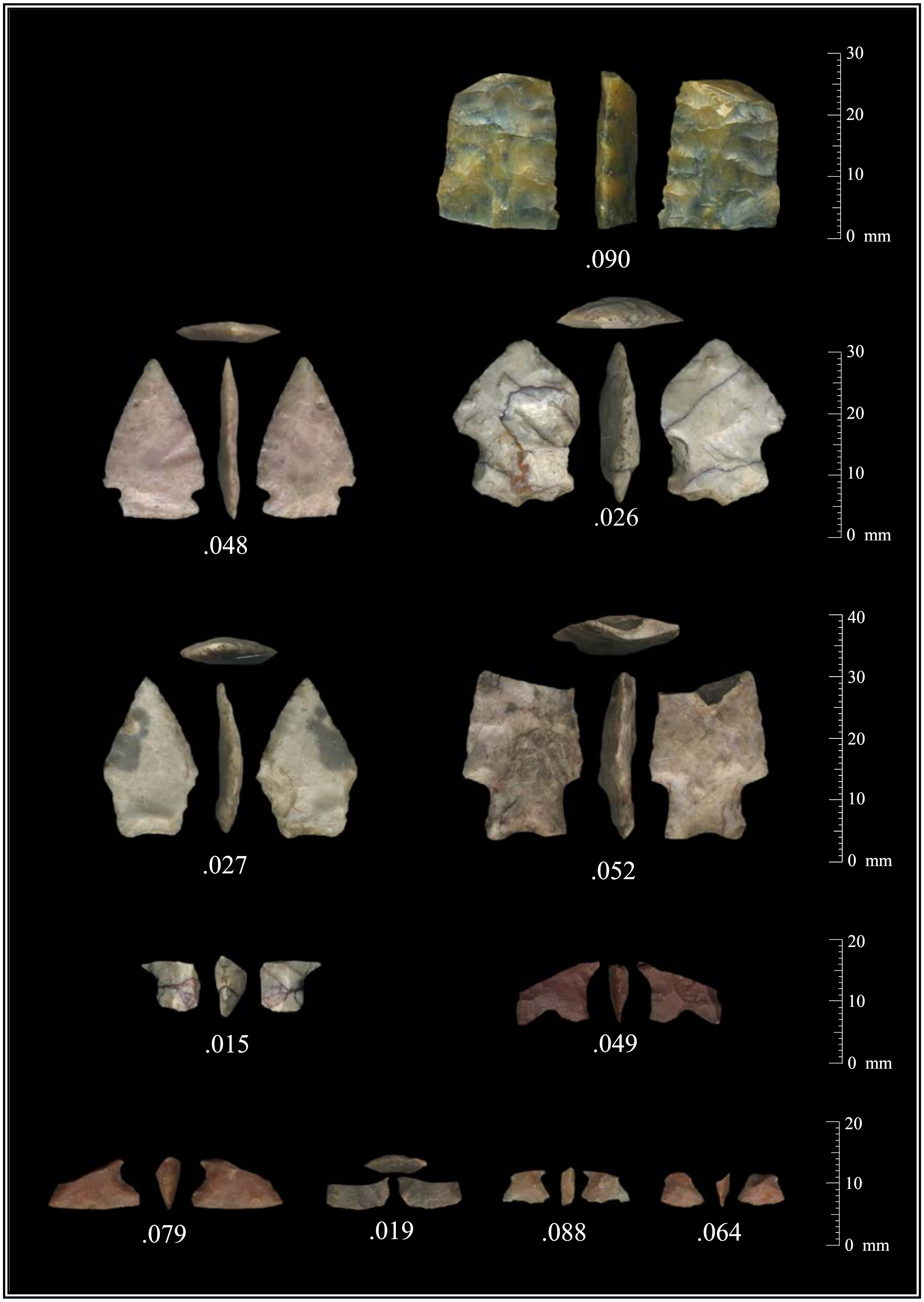

Figure 38. Gilligan's Island site projectile points recovered during the 2002 field excavations.

Dart-size Projectile Points

Type 1: Medium-size, Stemmed-indented Base

N=2 (Figure 38 Table 14)

Description: These two points display a wide degree of morphological variability but each exhibits a stemmed indented base. The complete point (.027) has a sharp tip, straight convex edge, sloped to rounded shoulders, contracting stem, and concave base. In cross-section the point is concavo-convex, indicating that it was processed from a flake. The blade is heavily worked on one side and appears to have been resharpened during a post-manufacture event. The tool is not thinned, maintaining a crude and irregular flaking pattern along the margin. The other specimen (.052) has a snap fracture through the mid-section that was probably caused by a large void in the material. The remaining portion of the point has straight edges, abrupt shoulders, straight to slightly expanding stem, one snapped as well as one rounded tang, and an indented base. The point is plano-convex in cross-section. The haft element is ground and one edge exhibits use-wear, indicating that the item was utilized as a knife. The tool has a flaked pattern that is in a roughly horizontal-parallel to chevron.

Similarities to Previously Recognized Types: McKean Complex-Duncan/Hanna (Mulloy 1954; Wheeler 1954); Pinot Shouldered (Holmer 1978); PCMS Category-P14, P18 Anderson (1989b)

Associated Radiometric Dates from the 2002 Excavations: Originally discovered in the dry screen, specimen .052 was recovered in the northeastern corner of Grid Unit A4, an estimated 3-5 cm below and in the same level as the top of Feature 7, indicating that the point was deposited before Feature 7 was constructed. Charcoal from this hearth yielded a calibrated, two-sigma radiocarbon age range of 412-48 B.C. (see Table 6).

Chronological Assessment: Stemmed-indented base point types are associated with the Middle Archaic period in eastern Colorado (Tate 1999:118-131). However, the form of the dart point is believed to reflect a trait that originated in the Great Basin, diffusing out from this region sometime during the terminal Early Archaic period (Kalasz et al. 2003:136-137; Kalasz et al. 2007).

Two excavated open camp sites in the Palmer Divide region of the South Platte River Basin have produced a large number of stemmed-indented base points in association with multiple radiometric dates. These sites include the East Plum Creek site (Kalasz et al. 2003) and the Hess site (Gantt 2007). The excavation reports include broad discussions of stemmed-indented base dart points and their context within eastern Colorado. The East Plum Creek site recovered 10 stemmed indented base specimens from the Middle Archaic period proveniences. The six radiocarbon dates associated with the Middle Archaic period suggest these projectile points yields a calibrated, two-sigma age range between 3640-4040 B.P. (Kalasz et al. 2003:Table 6, 95-100). The Hess site has a 16 stemmed indented base points associated with 12 Middle Archaic radiocarbon dates that yield a calibrated, two-sigma range of 3325-2139 B.C. (Gantt 2007:Table 7-2, 327-335). Two of the Type 4 specimens were recovered in a basin house that yielded a two-sigma calibrated age estimate of 2567-2036 B.C. (Gantt 2007:334).

In southeastern Colorado stemmed-indented base points may be correlated with P14 and P18 specimens from the PCMS, which have no radiocarbon dates in association (Anderson 1989b:128-129, 131-133, Figures 4.15 and 4.18). Burke's Bend, a recently excavated site area at the PCMS, has produced similar points, but they were apparently collected and reused by Late Prehistoric inhabitants and are out of context. On Fort Carson, a stemmed-indented base point was recovered at Gooseberry Shelter. This point was at roughly the same vertical level as Feature 7, a hearth, which yielded an Early-to-Middle Archaic period radiocarbon age (uncalibrated 4930±210 B.P.) (Kalasz et al. 2003:136-137).

Type 2: Medium-size, Large Expanding-stemmed

N=1 (Figure 38 Table 14)

Description: This triangular point (.026) is small and thick, indicating that it is a dart point. The blade is obviously retouched and its original length was probably greater. The specimen has a sharp tip, straight blade edges, abrupt to rounded shoulders, very slightly expanding stem with a broad neck, rounded tang and convex base. The point was produced from a flake; the ventral surface has few retouch flaking scars on its surface. It is plano-convex in cross-section. Most of the retouch flaking on the dorsal surface is in a rough chevron pattern. Use-wear is present along the lateral margin of the point, on the rounded tang and blade.

Similarities to Previously Recognized Types: PCMS Category P10 and P21 (Anderson 1989b); Type 9 (Hand and Jepson 1996); Type 6 (Slessman et al. 2003); Type 6 (Kalasz and Shields 1997); Type 12 (Zier 1989)

Associated Radiometric Dates from the 2002 Excavations: None

Chronological Assessment: In southeastern Colorado, the Type 2 point is similar to P10 points of the PCMS, which have no radiocarbon dates (Anderson 1989b:124-126; 250-251; Figure 4.14). It is also similar to P21 points with an estimated age range for this style believed to occur between 1000 B.C. and A.D. 700 (Anderson 1989b:136-139, Figure 4.20). Along the Purgatoire River, a similar point was recovered from excavations at Leef Ranch site (Type 6 category), but no radiocarbon date was associated with it (Slessman et al. 2003:119-120, Figure 45). Wolf Spider Shelter, also located on a perennial tributary of the Purgatoire River, produced a similar point (Type 9). It is associated within Feature 3, a hearth, which yielded a Developmental period radiocarbon age of cal 1320±120 B.P. (Hand and Jepson 1996:36, 73-74, Figure 16). The Type 12 point style from Recon John Shelter on Fort Carson is also comparable and is in context with Late Archaic period deposits (Zier 1989: 140, Figure 31). There are also abundant resemblances with the Type 6 point styles at the Magic Mountain site (Kalasz and Shields 1997:95-96, Figure 12).

Unclassifiable Dart-size Stem Fragments

N=5 (Figure 38 Table 14)

Description: Five dart-size fragments are identified. Of these, four are stemmed bifaces that are too fragmentary to allow a confident point type assignment. Based on morphology and thickness, these remnants are believed to represent dart points on which the basal stems have snap fractured. The stem fragments vary in morphology, and include stemmed-indented base (.049), expanding stem (.079), and straight (.015, .019). The remaining unclassifiable point (.090) is a midsection blade segment, with horizontal-parallel to collateral flaking pattern. Even though there are several unclassifiable midsections of dart or arrow point sizes in the assemblage, this particular point is probably of Paleoindian age.

Similarities to Previously Recognized Types: None

Associated Radiometric Dates from the 2002 Excavations: Specimen .019 was recovered in the same level and grid unit as Feature 7. Charcoal from this hearth yielded a calibrated, two-sigma radiocarbon age range of 412-48 B.C. (see Table 6). Specimen .079 was collected in the same level (5) and grid unit (B3) in which Feature 6B was exposed. Charcoal from this hearth yielded a calibrated, two-sigma radiocarbon age range of 1732-1415 B.C. (see Table 6).

Chronological Assessment: None

Arrow-size Projectile Points

Type 1: Small Flange-stemmed (Nick-like Notches)

N=1 (Figure 38 Table 14)

Description: Type 1 (.048) is a small triangular point with a very sharp tip, straight blade edges, and abrupt shoulders, with particularly low, nick-like notches near the very base of the blade, a contracting flange stem, a rounded tang (one tang is snapped), and a straight base that is nearly as wide as the blade. The point is obviously manufactured from a flake that is curved with a plano-convex to slightly bi-convex cross-section. The ventral and dorsal surfaces are retouched only along the blade edge, in a chevron flaking pattern. A pot-lid is present along one side of the blade, which indicates heat altering.

Similarities to Previously Recognized Types: PCMS Category-P81 (Anderson 1989b).

Associated Radiometric Dates from the 2002 Excavations: Specimen (.048) was provenienced at the base of Level 2, Grid Unit A4. The point is 7-11 cm below the top of Feature 2 and 8-12 cm above the top of Feature 9, in the same grid unit, indicating that the specimen was deposited after the abandonment of Feature 9 and before the construction of Feature 2. The date of the point manufacture falls between the calibrated, two-sigma radiocarbon age range of 19 B.C.-A.D. 318 for Feature 9 and A.D. 546-771 for Feature 2. This data suggests that the point was manufactured during the middle portion of the Developmental period.

Chronological Assessment: This flanged stem point is similar to the P81 category defined by Anderson (1989b:215) and described as having "shallow nick-like notches." Van Ness et al. (1990) suggest that this point style may represent an early version (ca. pre-A.D. 800) of the flange-stemmed points that are typically associated with the Diversification period and/or Protohistoric period. At Recon John Shelter, similar specimens (Type 16) were recovered from deep Levels 10 and 14 in Grid Unit B-2 (Zier 1989:143, Figure 32). Raw radiocarbon ages (1400±90 B.P. and 1500±70 B.P.) were associated with Level 11, from two separate units that were 2 m to 3 m from the points. At the Ocean Vista site, a similar nick-like notched point (Type 4) was recovered from the lowest level of Test Pit 1. A raw radiocarbon age directly associated with the provenience dates the point to 1360±110 B.P. (Kalasz et al. 1993:63-64, Figure 9). A similar nick-notch point (Type 4) was recovered 2-12 cm above Feature 6, a hearth/roasting pit, at Burke's Bend (site 5LA3188) on the PCMS. Charcoal from the hearth yielded a raw radiocarbon age of 960±60 B.P. (Kalasz et al. 2007:135-136, Figure 55).

Unclassifiable Arrow-size Stem Fragments

N=2 (Figure 38 Table 14)

Description: Two bifacial base stems (.064, .088) are too fragmented to confidently place into a temporal category, but based on size and thickness they are believed to be arrow point remnants. The two specimens exhibit small expanding base stems and straight to convex bases.

Similarities to Previously Recognized Types: None

Associated Radiometric Dates from the 2002 Excavations: None

Chronological Assessment: None

Ground/Battered Stone

One hundred fifty ground/battered stone specimens were recovered during the excavations. Ground/battered stone items are generally defined as lithic artifacts that exhibit grinding surfaces through use, while battered and/or pecked surfaces may also exist. Table 15 provides an inventory of the tool categories that were collected. The ground stone items are divided into three major groups: manos, metates, and unknown ground stone. All of the items that were complete enough to be categorized to a specific

Table 15. Baseline Data of Ground/Battered Stone by Material Type.

Type	MATERIALS			Totals	
	Sandstone	Granite	Rhyolite	Freq.	Col. Percent
Manos					
One-handed Mano	2	3	1	**6**	**25.0**
Mano Unknown Type	4	2	0	**6**	**25.0**
Mano Totals	**6**	**5**	**1**	**12**	**100**
Mano Row Percentages	**50.0**	**41.6**	**8.3**	**100**	
Metates					
Slab Metate	20	0	0	**20**	**15.0**
Metate Unknown Type	112	1	0	**113**	**84.9**
Metate Totals	**132**	**1**	**0**	**133**	**100**
Metate Row Percentages	**99.2**	**0.8**	**0**	**100**	
Unknown Ground Stone Type	3	2	0	**5**	**100**
Total Ground/Battered Stone Counts	**141**	**8**	**1**	**150**	**100**
Ground/Battered Stone Row Percentages	**94.0**	**5.3**	**0.6**	**100**	

type are either one-handed manos or slab metates. Manos and metates are generally related tools that are commonly associated with grinding and pulverizing plant and animal remains during food processing (Adams 2002:99). During grinding activities, the mano is the implement utilized to grind the material against a stable stone surface (metate). Other uses for these tools exist; for example, some manos are believed to have been utilized for hide processing in southeastern Colorado (Owens 2006).

A majority of the specimens in the collection are highly fragmented to the point that only basic typological differentiation is possible. For instance, on fragmented pieces with areas large enough to display some attributes of ground stone morphology, the convex grinding surface generally indicates a mano of an unknown type, while the concave grinding surfaces suggest a metate of unknown type. Of the 150 ground/battered stone items analyzed, only eight (5.3%) are complete, two (1.3%) have half or more than half of the implement present, and 140 (93.3%) are fragments with less than half of the implement present. The fragmented ground stone material is generally highly fractured and heat altered. In most cases, these materials appear to have been used secondarily as heating implements (i.e., FCR) for cooking and heating food as in Features 2 and 6B.

Lithic materials represented in the ground/battered stone collection are generally derived from local sources. Tabular sandstone is abundant at the site area, while rounded granite cobbles are available in nearly all of the drainage areas that flow from the Rocky Mountains. One item in the mano category consists of rhyolite, which is not available in the immediate area and may come from a more distant source, possibly on the Palmer Divide.

Faunal Artifacts

Faunal artifacts in this analysis include bone items that have been modified by cutting, grinding, scraping, incising, scoring, and any other techniques that appear to have involved bone in manufacturing processes. Two major types of modified bone are identified: bone tools and faunal ornaments. The types of the bone artifacts identified include awl, billet, bone bead, and shell artifact. Table 16 provides the temporal association, provenience data, measurements, weight, and attributes for faunal artifacts.

Table 16. Faunal Artifact Data

Temporal Period	Category	Cat. #[1]	Provenience		Species/Element Identification	Size (mm)[2]			Wt.[3] (g)	Attributes[4]
			Unit	Level		L	W	T		
N/A	Awl	.996	B3	1	Indeterminate mammal, unknown fragment	--	--	--	0.0	p
Middle Archaic	Bead fragment	.900	B1	7	Indeterminate small mammal, cf. metapodial	--	--		0.0	cl, fe, ep
Middle Archaic	Bead fragment	3.080	B4	6	Indeterminate vertebrate, unknown fragment	--	--	--	0.0	xp, gs, eg, er
Late Archaic	Short bead	.882	B1	5	possible ground squirrel (cf. *Citellus* sp.), femur	12.6	2.6	0.8	0.0	xp, eg, fe, ep
Late Archaic	Billet	4.109	B4	5	deer (*Odocoileus* sp.), antler beam	59.1	36.3	--	22.9	eg, er, eg, st
Late Archaic	Shell Artifact	4.108	B4	4	freshwater mussel (Unionidae), shell piece	32.0	18.0	3.0	3.2	eg, n, s
Late Archaic	Short bead	4.112	B4	5	indeterminate hare/rabbit (Lagomorph), metapodial shaft	8.1	2.6	0.6	0.0	xp, eg, fe, ep, er
Develop-mental	Short bead	.582	A2	4	Indeterminate very small mammal, long bone	20.6	3.1	1.1	0.1	fe
Develop-mental	Bead fragment	.818	B1	2	Indeterminate vertebrate, unknown fragment	--	--	--	0.0	cl, fe
Develop-mental	Bead fragment	.923	B2	3	Indeterminate small mammal, unknown diaphysis segment	--	--	--	0.0	er
Develop-mental	Bead fragment	.924	B2	3	packrat (*Neotoma* sp.), femur	--	--	--	0.1	er
Develop-mental	Short bead	1.937	A4	3	indeterminate small mammal, tibia	17.1	4.4	1.5	0.2	fe, gs
Develop-mental	Bead fragment	4.111	B3	2	indeterminate medium mammal, metapodial shaft	--	--	--	0.1	cm, er, eg, gs

[1] Cat. # = Catalog Number (5FN01592.00-), [2] L = Length, W = Width, T = Thickness, [3] Wt. = Weight, [4] Attributes: cl = calcined, cm = cut marks, eg = edge grinding, ep = edge polish, er = end rounding, fe = flat end, gs = groove-and-snapped bead technology, n = notched, p = polished, s = snapped, st = striations, xp = exterior polish

In many cases, these artifacts are fragmented to the extent that a species identification and measurements could not be determined. Additionally, the weight of some items was so minimal that a digital scale was of no use.

Bone Tools

Two bone tools were recovered. One of the items is an awl. It has no temporal designation and it is described below. The second bone tool is a billet and is described in the discussion of the Late Archaic period.

Awl

Bone awls are pieces of sharp bone that are manufactured by grinding an edge to make a point. These items are generally used as a perforating tool in leather craftsmanship or working with soft plant materials. A single bone awl (.996) was recovered from the overburden deposits (Level 1) of excavation unit B-3 (Figure 39, Table 16). The awl is tip or distal fragment that is heavily polished, probably through use-wear. The specimen is derived from an indeterminate mammal and weighs less than 0.1 g.

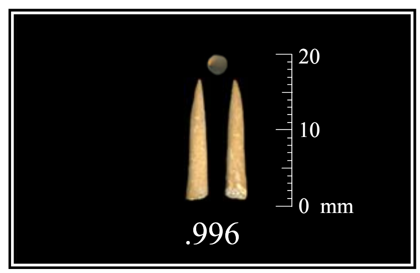

Figure 39. Gilligan's Island site awl.

Faunal Ornaments

Eleven ornamental items were recovered of which 10 are bone beads and one is a shell artifact. The shell, described in the discussion of the Late Archaic period, is uncertain as an ornamental item since it is morphologically incomplete.

Bone Beads

The 10 bone beads fall into two types: short beads (n=4) and bead fragments (n=6). Short beads are the only beads in the assemblage with identifiable morphological attributes. Bead fragments are indeterminate as to type. Those bone bead items that are identified as to species typically represent small to very small animals.

The bead assemblage displays limited workmanship. The beads are products of the groove-and-snap technique, in which the proximal and distal cancellous or spongy ends of various long bones (e.g., metacarpals, tibia, and femur) from very small to medium-size animals are scored or cut. Once the cut is deep enough into the bone it is snapped, leaving the diaphysis -- a compact and resilient portion of the bone -- with a central hole that is available for bead craftsmanship. The end pieces of the original bone are discarded. The edges of the diaphysis, are then typically ground to eliminate roughened portions resulting from the snapping process. The bead is then ready to be strung. Polishing of the bead probably occurs when the ornament is worn and rubs against other items. There are three specimens in the Gilligan's Island bead assemblage that show various stages of the groove-and-snap processing technique (1.937, 3.080, and 4.111). This technique is common in southeastern Colorado, and artifacts reflecting this method of manufacture have also been described by Hand and Jepson (1996:90), Kalasz et al. (2007:150), and Zier (1989:197).

Subsistence-Related Remains

Faunal Remains

Most of the faunal data are derived from a faunal report (Jacobson 2006) submitted to the author along with Microsoft Excel spreadsheet of the analysis (Appendix C). Additional faunal analysis added to the database includes interpretation made by Sharon F. Urban (Urban 2006), Danny N. Walker, and the author. There are 5,769 bone fragments recovered from standard dry screen (1/8-inch screen) and waterscreen (1/16-

inch screen) samples (Table 17). A majority of these remains (74.6%) were derived from the fine screening that includes 1/9-unit level waterscreen and feature flotation samples. The combined analysis of these samples indicates that at least 43 species of animals are represented including gastropods, bivalves, fish, amphibians, reptiles, birds, and mammals (Table 18). The differences in screen size suggest that if the 1/16-inch screen sample has been used throughout the entire excavation there would be an increase in every bone category. Not surprisingly, smaller items such as gastropods, indeterminate mammalian bone fragments, and indeterminate vertebrate bones were not recovered through the standard 1/8-inch dry screening process.

The specimens recovered represent a variety of ecosystems. Figures 40 and 41 illustrate the relative percentages of animals in the assemblage and identify the specific environments that these animals would utilize. Even though the presence of aquatic remains is limited, it is interesting to note since the site is distant from a riparian

Table 17. Faunal Summary (NISP) according to Screen Size

	Standard 1/8-inch screen		Waterscreen 1/16-inch screen		Total	
Taxonomic Group	NISP	Col. %	NISP	Col. %	NISP	Col. %
Gastropods, unionidae	10	0.7	208	4.8	218	3.8
Fishes	4	0.3	3	>0.1	7	0.1
Amphibians	2	0.1	20	0.5	22	0.4
Reptiles	9	0.6	46	1.1	55	1.0
Reptile/amphibian	1	>0.1	9	0.2	10	0.2
Birds	51	3.5	38	0.9	89	1.5
Bird/hare or rabbit	0	0	1	>0.1	1	>0.1
Very small mammals	84	5.7	267	6.2	351	6.1
Small mammals	245	16.7	239	5.6	484	8.4
Medium mammals	74	5.1	43	1.0	117	2.0
Medium-large mammals	95	6.5	19	0.4	114	2.0
Large mammals	8	0.5	2	>0.1	10	0.2
Indeterminate mammals	132	9.0	210	4.9	342	5.9
Indeterminate	748	51.1	3201	74.3	3949	68.5
Total	1463		4306		5769	

TABLE 18. Faunal Summary and MNI Determination[1]

CLASS	ORDER/ SUBORDER	FAMILY/ SUB-FAMILY	GENUS/SPECIES	COMMON NAME	MNI
Invertebrate					
Gastropoda	--	--	--	Snail	--
Bivalvia	**Unionoida**	**Unionidae**	--	Freshwater Mussel	1
Vertebrate					
Osteichtheyes	--	--	--	Bony Fish	--
Actinopterygii	**Cypriniformes/ Siluriformes**	--	--	Minnow/Catfish	1
Amphibia	**Caudata**	--	--	Salamander	1
	Anura	**Bufonidae**	*Bufo* sp.	Toad	
			B. woodhousii	Woodhouse's Toad	1
		Scaphiopodidae	*Scaphiopus bombifrons*	Plains Spadefoot Toad	1
	Misc. Amphibian	--	--	Amphibian	--
Reptilia (Sauropsida)	(Suborder Lacertilia)	--	--	Lizard	--
	Squamata	**Phrynosomatidae**	cf. *Sceloporus* sp.	Spiny Lizard	1
		Scincidae	--	Skink	1
		Teiidae	--	Whiptails	1
	(Suborder Serpentes)	**Colubridae**	--	Non-Venomous Snake	1
	Testudines	**Emydidae**	--	Box and Water Turtles	1
	Misc. Reptile	--	--	Reptile	--
Aves	Medium Aves	--	--	e.g. ducks, hawks, owls	--
	Anseriformes	**Anatidae**	*Anas sp.*	Duck	1
	Falconiformes	**Accipitridae**	--	Hawks, Kites, Eagles	1
	Strigiformes	**Strigidae**	cf. *Otus flammeolus*	Flammulated Owl	1
	Small Aves	--	--	e.g. dove, blue jay, etc.	--
	Very Small Aves	--	--	e.g. finches, sparrows	--
	Passeriformes	--	--	Perching Bird	1
	Misc. Aves	--	--	Bird	--
Mammalia	**Lagomorpha**	**Leporidae**	*Lepus sp.*	Jackrabbit/Hare	--
			L. americanus	Snowshoe Hare	1
			L. californicus/townsendi	Black-tailed or White-tailed jackrabbit	1
			Sylvilagus sp.	Cottontail	--
			S. nuttalli/auduboni	Mountain or Desert Cottontail	1

TABLE 18. Faunal Summary and MNI Determination (Continued)[1]

CLASS	ORDER/ SUBORDER	FAMILY/ SUB-FAMILY	GENUS/SPECIES	COMMON NAME	MNI
Mammalia (continued)	Small Rodent	--	--	--	--
		Small Sciuridae	**--**	--	--
		Sciuridae	*Sciurus* sp.	Tree Squirrel	1
			Tamiasciurus hudsonicus	American Red Squirrel	1
			Cynomys sp.	Prairie Dog	2
			Citellus sp.	Ground Squirrel	--
			cf. *C. tridecemlineatus*	Thirteen-lined Ground Squirrel	--
			C. variegatus	Rock Squirrel	1
	Very Small Rodent	Very Small Sciuridae	--	--	--
			Eutamias sp.	Chipmunk	--
			E. dorsalis	Cliff Chipmunk	1
		Geomyidae	*Geomys bursarius*	Plains Pocket Gopher	1
			Thomomys sp.	Western Pocket Gopher	--
			T. talpoides	Northern Pocket Gopher	1
	Rodentia	**Dipodidae/Muridae**	--	Gerbils, Rats, Mice, Voles	--
		Zapodidae	*Zapus sp.*	Jumping Mouse	1
		Cricetidae	--	New World Mouse/Rat	--
			Phenacomys intermedius	Mountain Phenacomys Vole	1
		Arvicolinae (Subfamily)	--	Voles and muskrats	--
			Microtus sp.	Vole	1
		Neotominae (Subfamily)	*Neotoma* sp.	Packrats	2
			N. mexicana/cinearea	Mexican or Bushytail Woodrat	2
			Peromyscus sp.	Deer Mice and White-Footed Mouse	2
			cf. *P. boylei*	Brush Mouse	--
		Sigmodontinae (Subfamily)	--	New World South American Mouse/Rat	1
		Muridae	cf. *Cleithrionomys* sp.	Red-back Vole	--
			C. gapperi	Boreal Red-back Vole	1
		Misc. Rodent	--	Rodent	--

TABLE 18. Faunal Summary and MNI Determination (Continued)[1]

CLASS	ORDER/ SUBORDER	FAMILY/ SUB-FAMILY	GENUS/SPECIES	COMMON NAME	MNI
Mammalia (continued)	Carnivora	Large Carnivore	--	--	1
		Medium Carnivore	--	--	--
		Canidae	*Canis* sp.	Coyote/ Dog	1
			Urocyon cinereoargenteus	Gray Fox	1
		Small Carnivore	--	--	--
		Mephitidae	*Mephitis mephitis*	Striped Skunk	1
			Spilogale putorius	Spotted Skunk	1
		Mustelidae	--	Weasel, Badger	1
	Insectivora	--	--	Insectivore	1
	Chiroptera	--	--	Bat	1
	Artiodactyla	Large Artiodactyl	--	e.g. Elk, Bison	1
		Medium-Large Artiodactyl	--	e.g. Pronghorn, Mountain Sheep	--
		Cervidae	*Odocoileus* sp.	Deer	1
		Misc. Artiodactyl	--	Even-toed Ungulates	--
	Very Small Mammal	--	--	e.g. Wood Rats, Mice, Voles, Chipmunks, Bats	--
	Small Mammal	--	--	e.g. Leporidae, Prairie dogs, Squirrels, Skunks	--
	Medium Mammal	--	--	e.g. Fox, Coyote	--
	Medium-Large Mammal	--	--	e.g. Deer, Pronghorn, Mountain Lion	--
	Large Mammal	--	--	e.g. Elk, Bison, Bear	--
	Misc. Mammal	--	--	Mammals	--

1 Bold items represent Class, Order, and Family levels.

environment. The remaining animals that are represented would commonly be found in a pinyon-juniper forest along the base of the Colorado Front Range. The boreal redback vole and jumping mouse are the only microtines from the site that may indicate climatic change. These species occur in the Middle Archaic period and Late Archaic period, but are limited to only three specimens, offering only a tentative indicator of a mesic climate with increased forestation during these periods (Jacobson 2006).

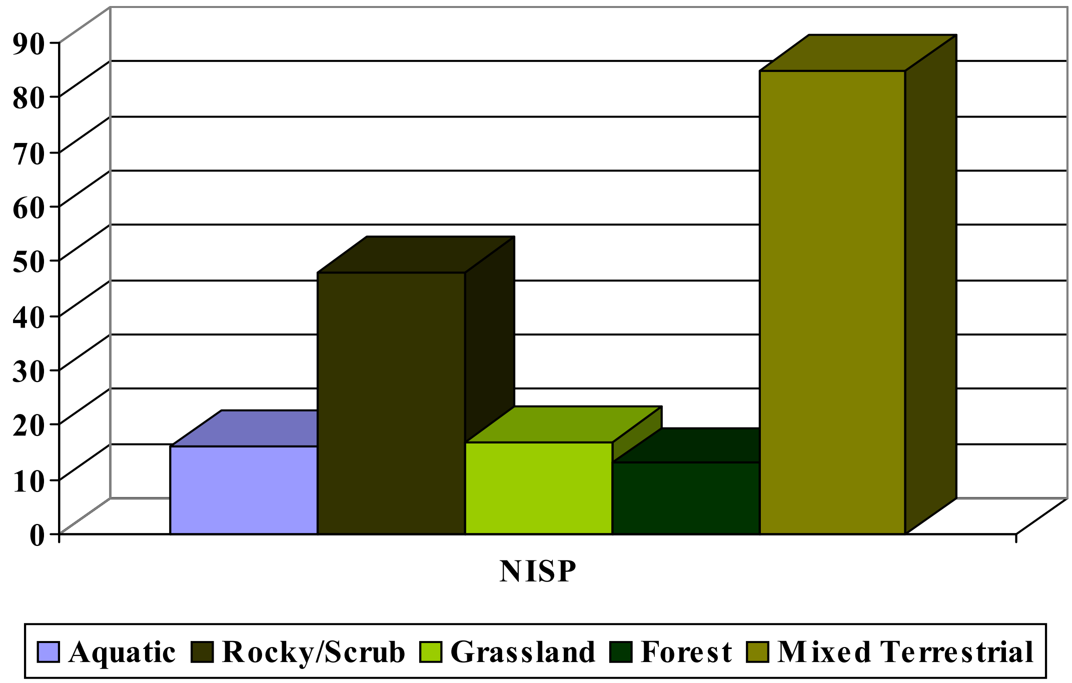

Figure 40. NISP for faunal species recovered from Gilligan's Island that utilize various habitats (from Jacobson 2006: Figure 2).

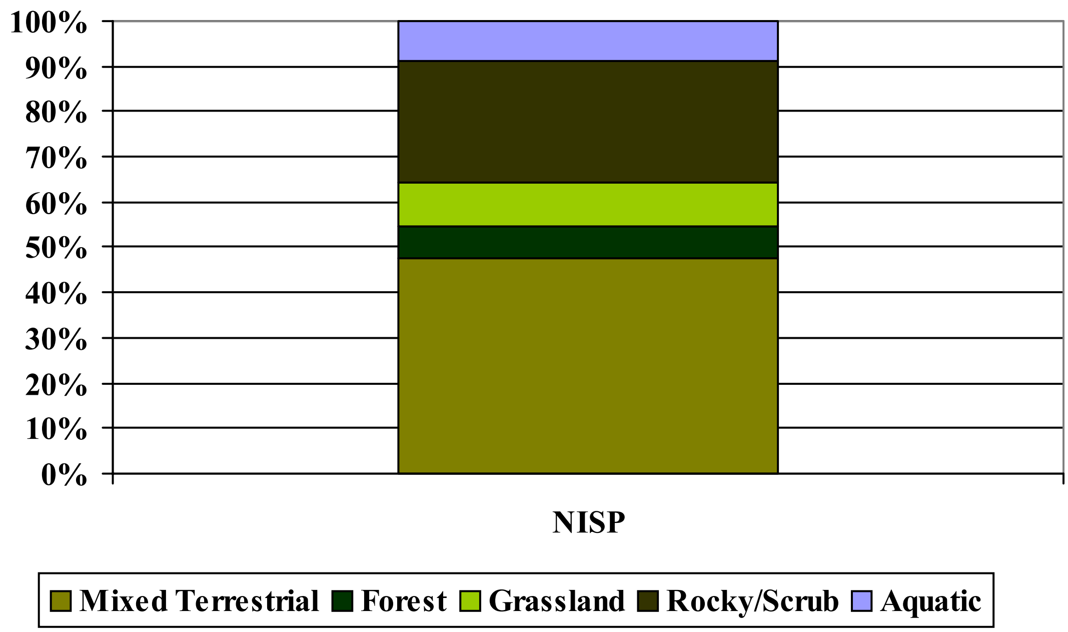

Figure 41. Percent of aquatic, rocky or scrub brush, grassland, forest, and mixed terrestrial species at Gilligan's Island (from Jacobson 2006: Figure 3).

The presence of aquatic remains is interesting since the nearest water resource capable of harboring such species is located at the base of Salt Canyon. The Gilligan's Island shelters are separated from the Salt Canyon valley floor by a minimal ground distance of 0.72 km (0.45 mi), which includes a long ridge that is 115 m (380 ft) high. A large branch above the Shelter 2 presently acts as a roosting place for raptors and ravens. It is likely that remnants of the predatory meals of these birds have been incorporated into the site, and could include aquatic species from Salt Canyon. However, it should be noted that amphibian species are identified in the fill of two features (Features 6B and 8). Even though these items are limited in number, the presence of these specimens indicates that aquatic resources were economic value to the occupants at the shelters.

The collection species list is shown in Table 19. It provides the species recovered in association with the three designated temporal categories and gives a total excavation count that includes items from overburden and other miscellaneous disturbances. Several attributes were recorded during the faunal analysis in order to identify cultural modification in the assemblage (e.g., breaking, burning, and discrete/extensive cutting). Burned/calcined bone provides the greatest information regarding cultural utilization throughout the three temporal periods and is described in the discussions of the individual temporal groups. Generally, these data indicate that very small to small mammals were the dominant animal resources utilized throughout the Middle Archaic period and Late Archaic period, and into the Developmental periods. This includes indeterminate hare/rabbit (Lagomorph), jackrabbit/hare (*Lepus* sp.), black- or white-tailed jackrabbit (*L. californicus/townsendi*), cottontail (*Sylvilagus* sp.), mountain or desert cottontail (*S. nuttalli/auduboni*), American red squirrel (*Tamiasciurus hudsonicus*), prairie dog

Table 19. Collection Species List

Taxa	Temporal Designations: Middle Archaic Period NISP	Col. %	Late Archaic Period NISP	Col. %	Developmental Period NISP	Col. %	Total Site NISP	MNI
Invertebrate								
Gastropod	41		86		86		217	
snail								
Unionidae			1				1	1
freshwater mussel								
Vertebrate								
Fish								
Indeterminate fish			1		4		6	
Siluriformes/Cypriniformes			1				1	1
Indeterminate minnow/catfish								
Amphibian								
Indeterminate Reptile/Amphibian	8		2				10	
Indeterminate Amphibian			3				3	
Caudata			3				3	1
salamander								
Bufonidae	2						2	
toad family								
Bufo sp.					1		10	
toad								
Bufo woodhousii			1				1	1
woodhouse's toad								
Scaphiopus bombifrons					1		1	1
plains spadefoot toad								
Anura	6		4		1		11	
frog or toad								
Reptile								
Indeterminate Reptile	3				1		4	
Indeterminate Scaled Reptile	2		3		1		6	
Indeterminate Lizard	22		4		1		27	
Phrynosomatidae/Teiidae	4						4	2
Indeterminate spiny/whiptail lizard								
cf. *Sceloporus* sp.	1						1	
possible spiny lizard								
Scincidae	1						1	1
skink family								

Table 19. Collection Species List (continued)

Taxa	Temporal Designations: Middle Archaic Period NISP	Middle Archaic Period Col. %	Late Archaic Period NISP	Late Archaic Period Col. %	Developmental Period NISP	Developmental Period Col. %	Total Site NISP	Total Site MNI
Serpentes	2		1				3	
Indeterminate Snake								
Colubridae	3		1				5	1
non-venomous snake family								
Testudines					2		2	
Indeterminate turtle								
Emydidae	1						1	1
box and water turtle family								
Bird								
Indeterminate medium bird	6		14		6		32	
Anseriformes			2				2	
Indeterminate waterfowl								
Anatidae							1	
duck family								
Anas sp.	1						1	1
duck								
Falcniformes/Strigiformes			1				1	
Indeterminate raptor								
Falconiformes							1	
Indeterminate diurnal bird of prey								
Accipitridae	1						2	1
hawk family								
cf. *Otus flammeolus*					1		1	1
flammulated owl								
Indeterminate small bird	3		6		5		17	
Indeterminate very small bird	1				2		3	
Indeterminate small passeriformes	1				1		2	1
small perching bird								
Indeterminate very small passeriformes			1		2		3	1
very small perching bird								
Indeterminate bird	2		4		3		11	
Indeterminate bird or hare/rabbit			1				1	
Eggshell	7		5				12	
Mammal								
Indeterminate very small mammal	55		37		30		128	
Indeterminate small mammal	69		101		60		240	
Indeterminate medium mammal	28		36		28		106	
Indeterminate medium-large mammal	17		32		24		89	

Table 19. Collection Species List (continued)

Taxa	Temporal Designations: Middle Archaic Period NISP	Col. %	Late Archaic Period NISP	Col. %	Developmental Period NISP	Col. %	Total Site NISP	MNI
Indeterminate large mammal			2		3		5	
Indeterminate mammal	127		106		93		342	
Indeterminate rodent					2		2	
Lagomorph Indeterminate hare or rabbit	13		13		9		35	
cf. Lagomorph possible hare or rabbit	1		4				5	
Lepus sp. jackrabbit or hare	1		4		3		8	
Lepus americanus snowshoe hare	1						1	1
Lepus californicus/townsendi black-tailed or white-tailed jackrabbit	1		1		1		3	1
Sylvilagus sp. cottontail	22		34		9		74	
Sylvilagus nuttalli/auduboni mountain or desert cottontail	5		3		6		20	4
Indeterminate small rodent	3		19		9		32	
Indeterminate small squirrel	11		10		6		28	
Sciurus sp. tree squirrel			1		3		4	1
Tamiasciurus hudsonicus American red squirrel			1				2	1
Cynomys sp. prairie dog	2		2		2		7	2
Citellus sp. ground squirrel	2		1				3	
cf. *Citellus* sp. possible ground squirrel			4		1		5	
cf. *Citellus tridecemlineatus* thirteen-lined ground squirrel			1				1	
Citellus variegatus rock squirrel			1		1		3	1
Indeterminate very small rodent	43		51		15		111	
Indeterminate very small squirrel	4		1		2		8	
Eutamias sp. chipmunk	1		1		1		3	

Table 19. Collection Species List (continued)

Taxa	Middle Archaic Period NISP	Middle Archaic Period Col. %	Late Archaic Period NISP	Late Archaic Period Col. %	Developmental Period NISP	Developmental Period Col. %	Total Site NISP	Total Site MNI
Eutamias dorsalis cliff chipmunk			1		2		3	1
Geomys bursarius plains pocket gopher	1		1				2	1
Thomomys sp. western pocket gopher					1		1	
Thomomys talpoides northern pocket gopher					1		2	1
Dipodidae/Muridae jumping mouse/true mouse family			1				1	
Zapus sp. jumping mouse			1				1	1
Cricetidae Indeterminate New World mouse/rat family	1				1		2	
Phenacomys intermedius Mountain Phenacomys					1		1	1
Arvicolinae rodent subfamily: vole					1		1	
Microtus sp. vole	2				4		6	1
Neotoma sp. packrat	16		14		15		49	2
cf. Neotoma sp. possible packrat					1		1	
Neotoma mexicana/cinearea Mexican or Bushytail Woodrat	5				4		12	2
Peromyscus sp. deer mice	3		3		2		8	2
cf. *Peromyscus* sp. possible deer mice			1				1	
cf. *Peromyscus boylei* brush mouse					1		1	
Sigmodontinae Indeterminate New World South American Mouse/Rat					1		1	1
cf. *Cleithrionomys* sp. possible red-back vole			1				1	

Table 19. Collection Species List (continued)

Taxa	Temporal Designations: Middle Archaic Period NISP	Col. %	Late Archaic Period NISP	Col. %	Developmental Period NISP	Col. %	Total Site NISP	MNI
Clethrionomys gapperi	1		2				3	1
boreal red-back vole								
cf. *Cleithrionomys gapperi*			1				1	
possible boreal red-back vole								
Indeterminate large carnivore					1		2	1
Indeterminate medium carnivore	1		1		3		6	
Canidae			1				1	
canine family								
Canis sp.					1		2	1
coyote/dog								
Urocyon cinearoargenteus							1	1
gray fox								
Indeterminate small carnivore	2		1		1		4	
Mephitis mephitis							1	1
Striped Skunk								
Spilogale putorius			1				1	1
Spotted Skunk								
Mustelidae	2		2				4	1
weasel or badger family								
Insectivora			2		2		4	1
Indeterminate insectivore								
Chiroptera	1						1	1
Indeterminate Bat								
Indeterminate artiodactyl			2				2	
Indeterminate large artiodactyl	1		1		1		3	1
Indeterminate medium-large artiodactyl	2		5		7		16	
Odocoileus sp.	1		4		1		7	1
deer								
white-tailed deer								
Indeterminate Vertebrate	1628		1336		859		3947	
Indeterminate	1		1				2	
Total	2194		1996		1336		5769	50

(*Cynomys* sp.), vole (*Microtus* sp.), packrat (*Neotoma* sp.), and Mexican or bushytail packrat (*N. Mexicana/cinearea*), as well as indeterminate rodent/squirrel (Rodentia) of variable sizes. During these temporal periods there was a lower reliance on medium and medium-large mammals. Large mammals appear to have been used the least in the mammalian category. Alternatively, the majority of medium to large animal bones recovered from the shelter excavations are long bones (Figure 42), and green or spiral fractures are prevalent (29.8%). These data, combined with the overall high fragmentation rate, suggest that medium and large specimens were processed, perhaps for the extraction of marrow and grease (Jacobson 2006). However, the limited number of epiphyses recovered from medium to large animals suggests that this activity was

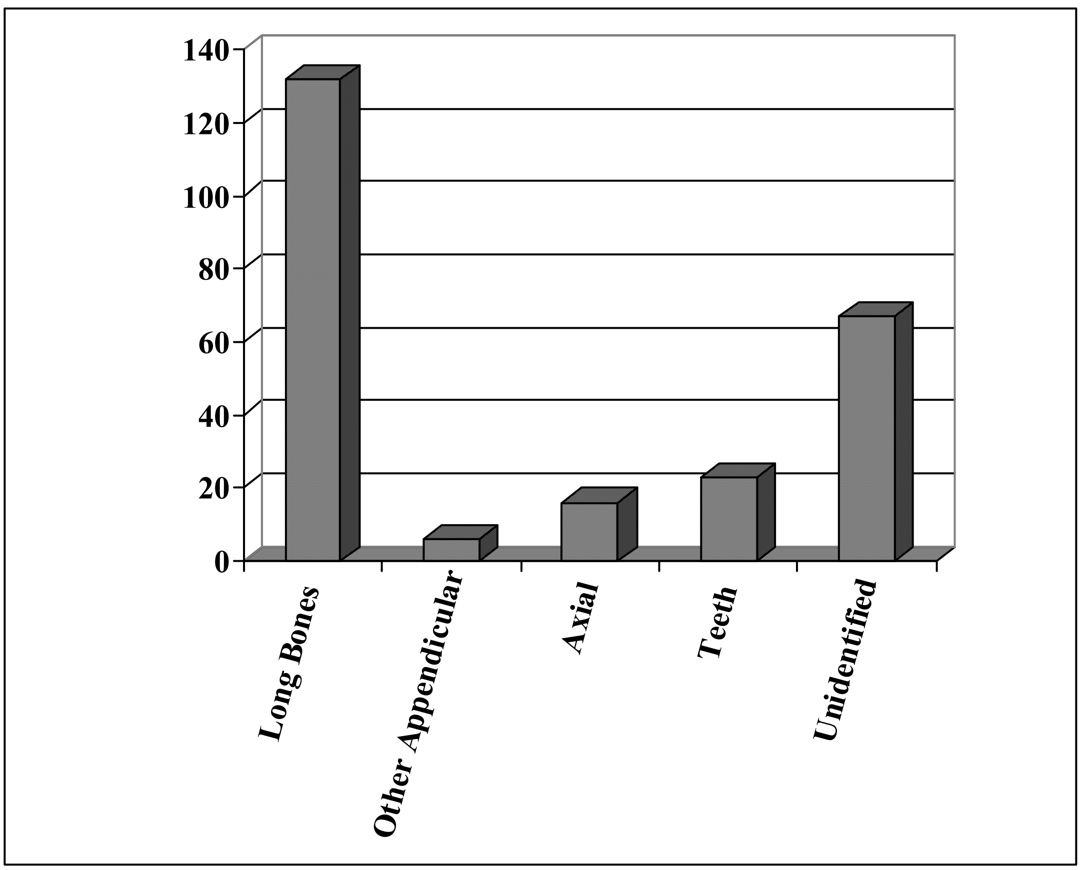

Figure 42. Distribution of medium, medium-large, and large mammal bone at Gilligan's Island site (from Jacobson 2006: Figure 1).

probably limited at best within these shelters. The lack of larger faunal remains may simply reflect the fact that these heavy items were left at a processing area away from the site. Ultimately, smaller animals have a greater representation in the assemblage than animals in the medium to large ranges.

Macrobotanical Remains

Twelve flotation samples and one pocket of seeds were submitted to Quaternary Palynology Research for analysis. Most of the information regarding the macrobotanical data at the Gilligan's Island site is derived from an archaeobotanical report submitted to the author (Gish 2005). The flotation samples were recovered from 12 features during the excavations in Shelter 1 and Shelter 2. The isolated seed sample was collected from an excavation level in Shelter 2. The macrobotanical analysis of these samples encompasses approximately 20,016 specimens representing more than 45 plant taxa (Table 20). The results from the entire macrobotanical analysis are presented in Tables 21 and 22. Provenience data for the samples and inventories of remains identified in each sample are presented in the discussions of the designated temporal periods (Table 23). Both charred and uncharred remains are identified in the flotation sample. Since the samples were floated at different soil volumes, the results in Table 21 are presented first as whole or fragmentary number(s) of plant parts, and then as parts per liter (PPL). The PPL allows for comparison of the findings among the various features. In this case, all of the PPL numbers have been added together from the various macrobotanical samples.

In this study, only the charred occurrences are considered indicative of prehistoric utilization. These charred materials are the subject of the following macrobotanical sections. Generally, this concept is supported by the modern condition of the seeds, the

Table 20. Index of Macrobotanical Taxa by Taxonomic Order[1]

SCIENTIFIC NAME	COMMON NAME	FAMILY	SUBCLASS/ CLASS	
Pinus edulis	**Pinyon pine**	**Pinaceae**	**GYMNOSPERMAE**	
P. ponderosa	**Ponderosa pine**			
***Pinus* sp. (3-needle, entire)**	**Pine**			
Pinus	**Pine**			
Pinaceae (*cf. Pinus*)	**Pine family (pine)**			
Pseudotsuga menziesii	**Douglas-fir**			
Abies	**Fir**			
Juniperus scopulorum	**Rocky Mountain juniper**	**Cupressaceae**		
***J. monosperma*-type**	**One-seed juniper**			
Juniperus	**Juniper**			
Sporobolus* or *cf. Sporobolus	**Drop-seed grass**	**Poaceae**	**MONOCOT**	**ANGIOSPERMAE**
Oryzopsis	Rice grass			
cf. Panicum	**Panic grass**			
cf. Zea	**Maize**			
Poaceae or cf. Poaceae	**Grass family**			
cf. Cyperaceae	**Sedge family**	**Cyperaceae**		
Yucca	**Yucca**	**Agavaceae**		
Quercus	**Oak**	**Fagaceae**	**DICOTYLEDONEAE**	
Celtis	Hackberry	Ulmaceae		
Chenopodium cf. berlandieri	**Pit-seed goosefoot**	**Chenopodiaceae**		
Atriplex canescens	**Four-wing saltbush**			
Atriplex	**Saltbush**			
cf. Amaranthus	Pigweed	Amaranthaceae		
Cheno-Am	**Goosefoot/pigweed**	**Chenopodiaceae/ Amaranthaceae**		
Portulaca	**Purslane**	**Portulacaceae**		
Draba aurea	Draba	**Brassicaceae**		
cf. Descurainia	**Tansy mustard**			
Brassicaceae	Mustard family			
Cleome	Beeweed	Capparidaceae		
cf. Fabaceae	**Pea family**	**Fabaceae**		
Euphorbia	Spurge	Euphorbiaceae		
Rhus cf. trilobata	**Sumac**	**Anacardiaceae**		
Sphaeralcea	**Globe-mallow**	**Malvaceae**		
Echinocereus-type	**Hedgehog-type cactus**	**Cactaceae**		
Opuntia (Platyopuntia)	Prickly-pear cactus			
Opuntia (Cylindropuntia)	**Cholla cactus**			
Opuntia	**Prickly-pear or cholla**			
***Cactaceae or* cf. Cactaceae**	**Cactus family**			
Lappula cf. redowski	Stick-seed	Boraginaceae		
Verbena cf. bracteata	Vervain	Verbenaceae		
Physalis	Groundcherry	Solanaceae		
Nicotiana	Tobacco			
Ambrosia	Ragweed	**Asteraceae**		
Helianthus	Sunflower			
Artemisia	**Sagebrush/Wormwood**			
Asteraceae or cf. Asteraceae	Sunflower family			

[1]Bold-faced represent charred plant items in the analysis; modified from Gish 2005:Table 2

Table 21. Baseline Data of Macrobotanical Remains

Plant Taxon or Other Category	Plant Part	Condition & Quantity					
		Charred			Uncharred		
		Whole	Frag.[1]	PPL[2]	Whole	Frag.	PPL
Pinus edulis	**Nut hull**		**24**	**11.3**		40	25.0
	Needle		**573**	**281.9**		180	123.5
	Female Cone		**115**	**44.0**		8	4.0
	Fascicle		**1**	**0.2**			
P. ponderosa	**Needle**		**12**	**4.6**			
***Pinus* sp.**	**3-needle**		**17**	**10.3**		5	3.8
Pinus	**Male cone**		**1**	**0.9**			
	Female cone					2	1.5
	Sheath		**14**	**7.3**		3	1.1
	Seed					2	0.5
Pinaceae (*cf. Pinus*)	**Wood**		**119**	**59.4**			
Pseudotsuga menziesii	**Needle**		**4**	**1.8**			
Abies	**Needle**		**2**	**1.5**			
Juniperus scopulorum	**Twig**		**32**	**11.6**		8	3.9
***J. monosperma*-type**	**Twig**		**348**	**189.2**		634	330.2
	Seed	**1**		**0.6**		1	0.6
	Berry				1		0.7
Juniperus	**Wood**		**109**	**51.5**			
	Twig		**8**	**3.6**			
	Seed		**13**	**6.4**	5	145	92.0
	Male Cone	**4**	**16**	**11.3**	18	69	42
Gymnospermae	**Wood**		**15**	**7.0**			
Sporobolus	**Grain**	**5**	**1**	**2.3**	614	1	288.6
Oryzopsis	Seed coat					3	1.4
cf. Panicum	**Grain**	**1**		**0.6**			
cf. Zea	**Kernel**		**1**	**0.5**			
Poaceae	**Grain**	**9**	**1**	**5.4**	5	1	4.0
	Stem		**319**	**170.3**		8	3.3
	Stem/leaf					X[3]	N/A[4]
	Panicle					1	0.7
cf. Poaceae	**Grain**		**3**	**2.2**			
cf. Cyperaceae	**Stem**		**2**	**1.2**			
Celtis	Seed				1		0.9
Yucca	**Fiber**		**7**	**2.7**			
	Leaf		**3**	**1.7**			
Quercus	**Nut hull**		**2**	**0.7**		3	2.2
Chenopodium cf. berlandieri	**Seed**	**94**	**107**	**78.6**	16	12	15.7
Atriplex canescens	Fruit wing					1	0.7
	Fruit case		**1**	**0.6**			
Atriplex	**Wood**		**2**	**0.7**			
cf. Amaranthus	Bract				2		1.2
Cheno-Am	**Seed**	**201**	**223**	**186.5**	8660	2027	703.3

Table 21. Baseline Data of Macrobotanical Remains (Continued)

Plant Taxon or Other Category	Plant Part	Condition & Quantity					
		Charred			Uncharred		
		Whole	Frag.[1]	PPL[2]	Whole	Frag.	PPL
Portulaca	**Seed**	**2**		**0.6**	11		5.5
Draba aurea	Capsule					7	4.3
cf. Descurainia	**Seed**	**2**		**0.6**			
Brassicaceae	Seed				13	1	4.7
Cleome	Seed				1		0.3
cf. Fabaceae	**Seed**	**1**	**1**	**1.5**			
Euphorbia	Seed				54	671	227.4
Rhus cf. trilobata	**Seed**	**1**	**23**	**10.0**			
Sphaeralcea	**Seed**	**1**		**0.3**			
Echinocereus-*type*	**Seed**	**3**		**0.8**	2	1	0.7
Opuntia (*Platyopuntia*)	Seed					410	187.6
***Opuntia* (*Cylindropuntia*)**	**Seed**		**10**	**3.5**	2	754	511.5
Opuntia	**Areole & spine**		**6**	**2.3**	1		0.7
	Areole		**9**	**3.7**		3	1.2
	Spine		**441**	**249.9**		349	242.4
cf. Cactaceae	**Wood**		**1**	**0.3**			
	Tissue		**7**	**3.2**			
Cactaceae	**Tissue**		**12**	**4.7**		16	9.2
Lappula cf. redowski	Seed coat					20	8.9
Verbena cf. bracteata	Seed/nutlet				15		5.7
	Seed coat					1668	624.2
Physalis	Seed				11	1	9.3
Nicotiana	Seed				8		4.5
Ambrosia	Achene				1		0.3
Helianthus	Achene				1		0.7
	Seed coat					324	105.8
Artemisia	**Wood**		**4**	**2.2**			
Asteraceae	Achene				16	19	13.9
cf. Asteraceae	Achene				1		0.7
Dicotyledoneae	**Seed**	**6**	**6**	**4.2**	10	22	14.8
	Seed coat					26	15.4
	Fruit stem		**2**	**0.9**		2	0.9
	Capsule					109	79.0
	Leaf				2	8	3.3
	Thorn		**11**	**4.6**	1	1	1.6
	Flower					1	0.7
	Floret	**1**		**0.3**			
	Bud Cluster				1		0.2
	Bract				3		1.5
Unknown	**Wood**		**11**	**5.6**			
Plant Totals:		**2972**		**1457.6**	17044		3737

[1]Frag.=Fragment (s), [2]PPL= Parts Per Liter, [3]X = present, [4]N/A = Not Applicable

Table 22. Macrobotanical Remains Collection List by Temporal Period[1]

Taxa	Temporal Designations: Middle Archaic Period charred	Middle Archaic Period non-charred	Late Archaic Period charred	Late Archaic Period non-charred	Developmental Period charred	Developmental Period non-charred	Total Site charred	Total Site non-charred
Gymnospermae	6		8		1		15	
Pinus sp./*Pinus*/ Pinaceae (cf. *Pinus*)	42	1	50	4	59	1	151	6
P. edulis	183	26	250	24	280	34	713	84
P. ponderosa	1		6		5		12	
Pseudotsuga menziesii	1		1		2		4	
Abies					2		2	
Juniperus	24	82	33	64	93	91	150	237
J. scopulorum	2		16	3	14	5	32	8
J. monosperma-type	5	3	79	259	265	374	349	636
Poaceae/cf. Poaceae	55	4	51	3	113	18	219	25
Sporobolus/cf. *Sporobolus*	2	40	3	235	1	340	6	615
Oryzopsis						3		3
cf. *Panicum*	1						1	
cf. *Zea*					1		1	
cf. Cyperaceae					2		2	
Celtis		1						1
Yucca	4				6		10	
Quercus	2					3	2	3
Cheno-Am	107	75	229	1868	88	8744	424	10687
Chenopodium cf. *berlandieri*	42	17	129	10	30	1	201	28
Atriplex			1		1		2	
A. canescens		1			1		1	1
cf. *Amaranthus*						2		2
Portulaca		1	2	3		7	2	11
Brassicaceae				11		3		14
Draba aurea						7		7
cf. *Descurainia*			2				2	
Cleome				1				1
cf. Fabaceae					2		2	
Euphorbia		1		667		57		725
Rhus cf. *trilobata*	16		8				24	
Sphaeralcea			1				1	
Cactaceae/cf. Cactaceae	1		4		15	16	20	16
Echinocereus-type	1		2	1		2	3	3
Opuntia	24	3	49	27	383	323	456	353
Opuntia (*Cylindropuntia*)	1	620	8	73	1	63	10	756
Opuntia (*Platyopuntia*)		117		183		110		410

Table 22. Macrobotanical Remains Collection List by Temporal Period (continued) [1]

Taxa	Middle Archaic Period charred	Middle Archaic Period non-charred	Late Archaic Period charred	Late Archaic Period non-charred	Developmental Period charred	Developmental Period non-charred	Total Site charred	Total Site non-charred
Lappula cf. *redowski*		13				7		20
Verbena cf. *bracteata*		197		1027		459		1683
Physalis		2				10		12
Nicotiana				3		5		8
Ambrosia				1				1
Helianthus		3		257		65		325
Artemisia	3				1		4	
Asteraceae/cf. Asteraceae		2		24		10		36
Dicotyledoneae	5	144	9	25	12	21	26	190
Unknown	8		2		1		11	
Total	1889		5716		12309		19914	

[1] does not include estimates, specimens identified as present in analysis were inventoried on this list as a single item

usually poor preservation of most uncharred seeds, and the availability of the seeds in the present local environment (Minnis 1981). In some cases, uncharred items show weathering and cracking, indicating that they are older and could reflect cultural use; however, given the protected condition of the rockshelter, these items could also have grown in the shelter vicinity and been deposited naturally in the past (Gish 2005:10). Domesticates such as uncharred maize are obviously exempted from this rule. Even though most of the charred remains probably represent prehistoric use of any given

Table 23. Macrobotanical Samples Associated with Temporal Periods

Macrobotanical Samples	Temporal Period
Features 6B, 6D, 6E, 6F	Middle Archaic
Features 5A, 7, 8	Late Archaic
Features 2, 5, 9, 6, 6A, and pocket of seeds A4-03	Developmental

species, some charring may be the result of naturally placed items within the shelter having been burned or charred by incidental prehistoric human activities or natural events such as forest fires (Minnis 1981; Gish 2005:5).

Pollen Analysis

Nineteen pollen samples were submitted to the Palynology Laboratory at Texas A&M University, and most of the pollen data are extracted from a report submitted to the author (Jones 2003). All of the identified pollen taxa from the site are shown in Table 24. In this study, the results of the pollen analysis are used to make inferences regarding tool function, utilization of local economic resources, use of prevalent cultigens, and prehistoric environmental conditions. Selections of pollen samples were based on the probability of meeting these objectives. Pollen washes were conducted on intact or nearly intact ground stone items that were recovered with the primary grinding surfaces face down and thus facing the original ground surface. Washes were generally sampled from these primary surfaces. Since fossilized pollen grains were abundant in all of the samples, a systematic 200-grain count was utilized. Jones (2003) discusses the complications of pollen distribution (i.e., movement by help of wind and animals) and the subsequent effects on the archaeological record. Less indicative pollen types are probably either herbs introduced into the sample naturally or local plants reliant on wind to distribute their pollen grains, which therefore cannot be associated with either cultural or natural processes. For these reasons, only non-wind pollinated or zoophilous pollen-type plant taxa are identified as having potential economic use. These plant species rely on a host (i.e., insect or animal) to transport pollen. The pollen grains

Table 24. Index of Identified Pollen Taxa[1]

SCIENTIFIC NAME	COMMON NAME (S)
Non-Arboreal	
Apiaceae	Parsley Family
Artemisia	Sage, Sagebrush
High Spine Asteraceae	Sunflower Group
Low Spine Asteraceae	Ragweed Group
Liguliflorae	Dandelion, Chicory
Cirsium	Thistle
Brassicaceae	**Mustard Family**
Cheno-Am	Goosefoot, Pigweed
***Coryphantha*-type**	**Cactus**
Cylindropuntia	**Cholla**
Cyperaceae	Sedge Family
Dalea	Dalea
Ephedra nevadensis-type	Joint Fir, Mormon Tea
Ephedra torreyana-type	Joint Fir, Mormon Tea
Eriogonum	**Desert Buckwheat**
Fabaceae	Legume Family
Gentianaceae	Gentian Family
Platyopuntia	**Prickly Pear**
Poaceae	Grass Family
Polemoniaceae	Phlox Family
Polygonaceae	Knotweed Family
Ranunculaceae	Buttercup Family
Rosaceae	**Rose Family**
***Sarcobatus*-type**	**Greasewood, Pickleweed**
Shepherdia argentea	Silverleaf Buffaloberry
Solanaceae	Nightshade Family
Sphaeralcea	Globe Mallow
Typha/Sparganium	**Cattail/Burreed**
Arboreal	
Abies	Fir
Betula	Birch
Cornus	Dogwood, Bunchberry
Juniperus	Juniper
Picea	Spruce
Pinus	Pine
Populus	Cottonwood, Aspen, Poplar
Prunus	**Plum, Cherry**
Quercus	Oak
Rhus	**Sumac, Poison Ivy**
Salix	Willow
Indeterminate	Too Poorly Preserved to Identify

[1]Plant taxon in bold face represents potential economic types according to Jones (2003:Table 2)

typically remain close to the plant if they are not removed. Based on ethnographic literature, Jones (2003) identifies a number of zoophilous pollen types with potential economic value. These plants include mustard family (Brassicaceae), cactus (*Coryphantha*-type), cholla (*Cylindropuntia*), desert buckwheat (*Eriogonum*), prickly pear (*Platyopuntia*), rose family (Roasaceae), greasewood or pickleweed (*Sarcobatus*-type), cattail or burreed (*Typha/Sparganium*), plum or cherry (*Prunus*), and sumac (*Rhus*). Solitary or low-frequency grain counts from these species are *not* indicative of economic use.

It should be noted that the pollen analysis should not be heavily relied upon as an indicator for the presence or absence of domesticates at the site. Cultigens, such as maize, have very large and heavy wind born pollen grains that limit their ability to become widely distributed and often fall directly below the plant. These grains are very fragile and can be easily destroyed during repeated wet and dry cycles. The semi-arid environment of Colorado is prone to the cyclical processes of moist and dry conditions even within rockshelter setting this is one of the leading causes of fossil pollen destruction (Bryant and Hall 1993; Campbell and Campbell 1994; Holloway 1989). This problem is compounded by the fact cultivated cereals look virtually identical to wild grass species and is nearly impossible to categorize these grains into separate genera or species (Bryant 2007a). Phytoliths and starch grains may provide better results for cultigens in future research (Bryant 2003; Bryant 2007b).

Middle Archaic Period: Three radiocarbon dates from hearths or hearth-like features in the lower portions of Trench B, Shelter 1 are associated with the Middle Archaic period (Figure 35, Table 8). The feature locations, associated radiocarbon dates, and stratigraphy define the Middle Archaic period (see Chronology and Temporal Age Assessments). There are six features associated with this component, including the large sheet midden on the eastern side of the trench (see Baseline Data: Features Transcending Temporal Periods). Compared to the overall total of the 2002 excavation, the cultural material associated with this component consists of 2814 artifacts including 20.1% of the debitage, 13.5% of the flaked stone tools, 26.7% of the ground/battered stone, 15.4% of the faunal artifacts. Faunal remains associated with the Middle Archaic period make-up 38.0% of the overall faunal assemblage. Compared to the other identified temporal groups, the subsistence-related remains include 30.8% of the total macrobotanical samples and 10.5% of the pollen samples.

Feature Descriptions

Six features are identified for the Middle Archaic period component. Features 6 is the lower portion of the large sheet midden and has been described above (see Features Transcending Temporal Periods). Feature 6E is directly associated with this sheet midden and is the single example of a basin-shaped roasting pit within Shelter 1. Feature 6A is a charcoal concentration; Features 6B is a hearth that has a distinctive vertical slab-lined wall; Feature 6C is a probable hearth remnant of similar design; Feature 6D is a small concentrated cluster of fire-cracked rock and charcoal debris; and Feature 6F is identified in the northern wall of the trench and consists of a dark stain lens that is probably a hearth. Even though all the features excavated in Trench B share a vertical association with Feature 6, they should not be interpreted as having a direct association with the sheet midden deposits unless acknowledged in the text.

Feature 6B

Feature 6B is an intact slab-lined hearth which was originally exposed in the middle of Level 6 of Grid Units B3 and B4 (Figures 43 and 44). Approximately two-thirds of the feature is exposed in the southern portion of these grid units, while the remaining portion extends into the southern wall of Trench B. This southern portion remains intact and is visible in the southern wall of the trench profile (see Site Stratigraphy). In plan view, the exposed portion of the hearth is circular in shape, measuring 40 cm N/S x 23 cm E/W. The walls are lined with sandstone slab supports, most of which are exposed at approximately 52-56 cm BMGS and extend to a depth of 17-24 cm. The base is not slab-lined and is defined by the brown (7.5YR5/2) sediment of Stratum 3. Based on the exposed slab-line boundary, the entire feature measures approximately 50 cm in diameter, with a maximum thickness of 24 cm.

The dominant characteristics of this feature are the preserved vertical sandstone slabs that support the walls of the hearth. The material selected for the wall lining consists of various pieces of sandstone slabs that are long, thin, and moderately narrow. Two of the vertical wall slabs are metates (.413), only one of which was recovered; the other remains in the southern wall of the trench. Smaller cobbles were used as supports to stabilize the vertical slabs. A basalt battering stone (.105) on the top of the slab lining was wedged in between the top of two slabs, while other smaller pieces of sandstone fragments were occasionally placed near the base of those slabs with a shorter length. These base fragments were used as foot supports, both to stabilize the vertical slabs and to elevate the shorter slabs to an equal lip height at the top of the feature. One of the wall slabs in the northeastern corner is especially long and rises approximately 6-10 cm above

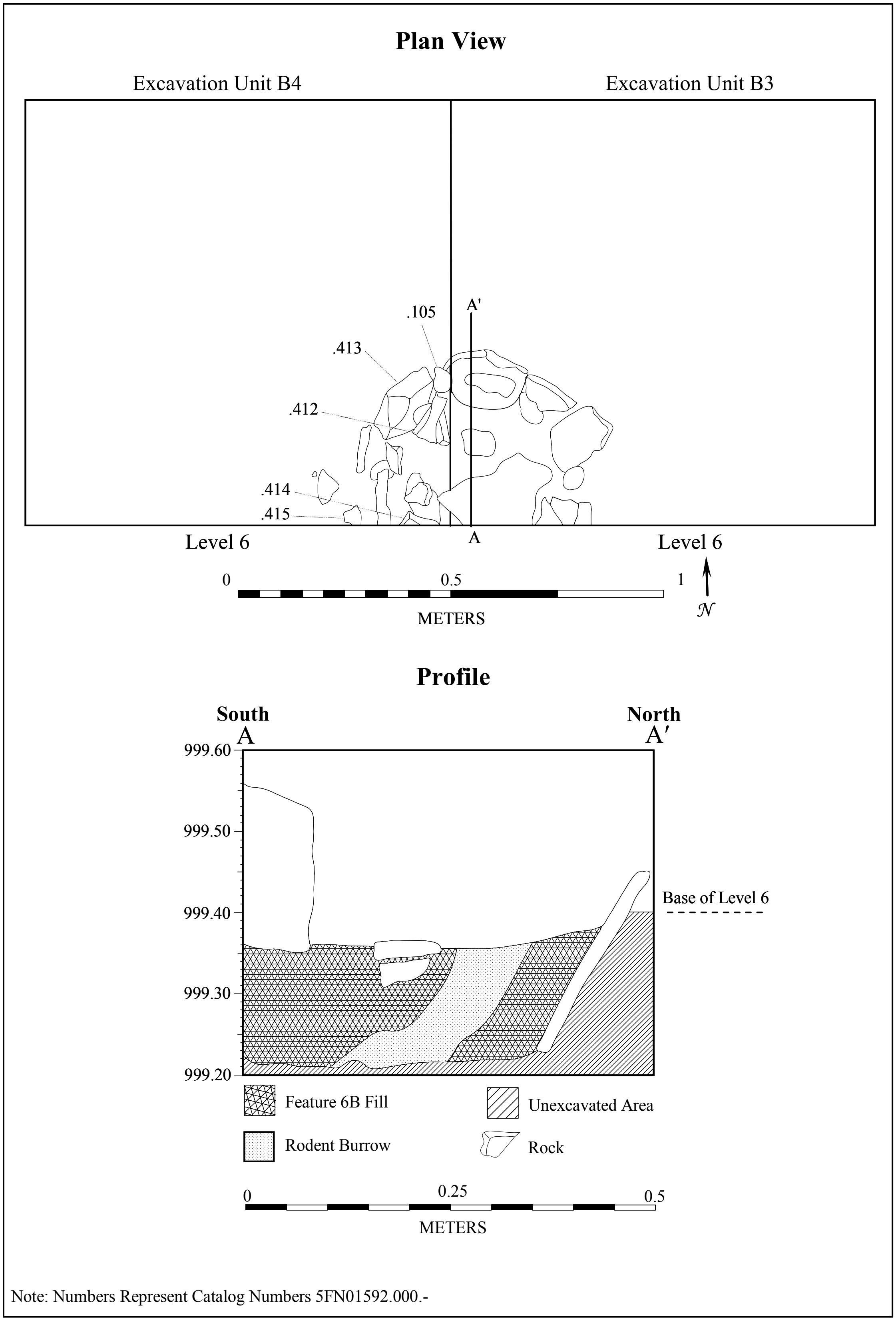

Figure 43. Feature 6B plan map and profile.

Figure 44. Overview of Feature 6B, exposed at base of Level 6, Excavation Units B3 and B4. North arrow is 25 cm in length.

Figure 45. View of Feature 6B in Trench B, facing east.

the rest of the rock lining, and perhaps acted as a deflector for smoke (Figure 45). Either way, based on the overall upper lip of the rock alignment, the occupational surface appears to have occurred at approximately 52-56 cm BMGS.

Despite some minor rodent burrows, the interior of the feature is well preserved. One of the reasons the feature remains intact is that a large angular sandstone boulder (approximately 22 cm x 20 cm x 15 cm) was purposefully placed in the interior fill of the hearth, perhaps to preserve the outer stone-lined wall. The feature matrix consists of a black (7.5YR2.5/1) ash with 16 angular pieces of FCR interspersed throughout the fill. Four of the pieces of FCR are metate fragments, three of which (.395, .412, .414) were found inside the feature, while the fourth (.415) was located just outside of the western lip of the hearth. Near the base of the feature is an 8-cm-thick charcoal lens. Large pieces of charcoal collected from this lens yielded a conventional radiocarbon age of 3270±70 B.P., indicating utilization of the feature during the Middle Archaic period (Table 6). A macrobotanical sample was collected from the northeastern side of the hearth. This sample yielded more than 264 charred botanical remains representing 17 different taxa (see Macrobotanical Remains). The diversity of edible resources from these charred items suggests that this feature was used thoroughly to process plant food items. The rest of the feature matrix was screened through standard 1/8-inch screen. Forty lithic artifacts were collected from the excavated portion of the feature. Of these, 34 pieces of debitage were recovered from the heavy fraction of the macrobotanical sample. Larger items include one basalt battering stone, one incomplete slab metate, and four metate fragments. Faunal remains recovered in 1/16-inch screen consist of 252 bone fragments representing amphibian, reptile, and mammalian taxa (Table 25). Feature 6B is similar to Feature 6C in Shelter 1 and Feature 8 in Shelter 2, although the later two features are not as well preserved. Considering the degree of preservation of other features in the area (i.e., Feature 6C), the rock that was placed on top of Feature 6B spared it from trampling activity that obviously impacted the shelters throughout time (Figure 46).

Feature 6C

Feature 6C is a concentration of long and thin slabs, suggesting that vertical slab-walled hearth had collapsed. Located in Levels 7-8 of Grid Unit B4 (Figure 47), this slab concentration is irregular in shape, measuring 38 cm N/S x 45 cm E/W in plan view. The feature was exposed at a depth of 55 cm BMGS and extends to a depth of approximately

Figure 46. Oblique overview of exposed Feature 6C (right), excavated remnant of Feature 6B (left), and the upper portion of Feature 6D (bottom left) partially exposed. North arrow is 25 cm in length.

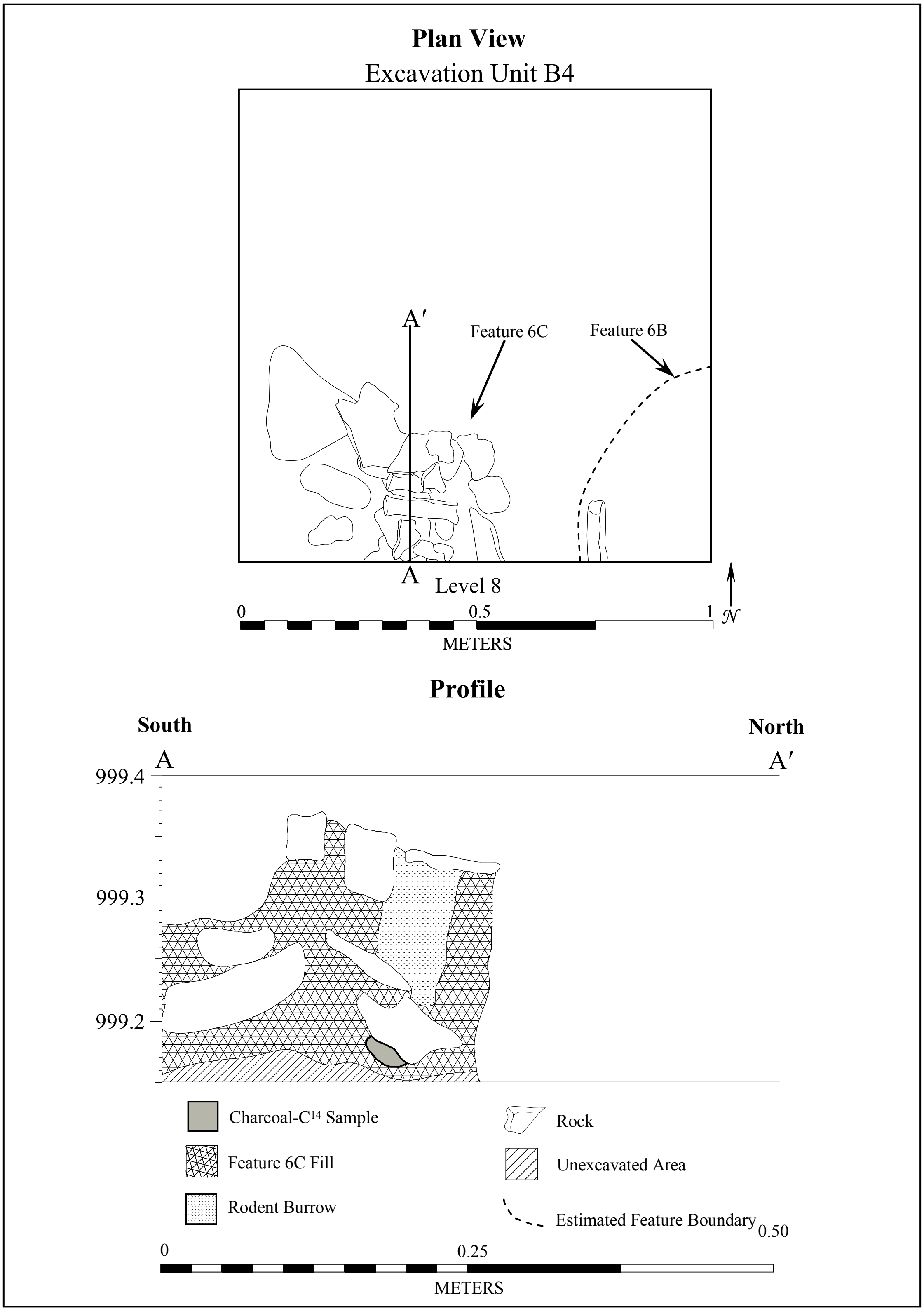

Figure 47. Feature 6C plan map and profile.

21 cm. The feature was not fully exposed; several of the slabs extend into the southern wall of Grid Unit B4 and were observed in profile (Figure 5-20). Located near the base of Stratum 3, the hearth remnant rests on top of the Stratum 1 contact.

This feature is a distinct cluster of generally long, thin, and narrow to wide pieces of thermally altered sandstone slabs. The interior is difficult to distinguish from the surrounding Stratum 3 matrix, varying only slightly from a dark brown (7.5YR3/2), loose sandy silt sediment with noticeably larger pieces of charcoal (approximately 1-2 cm in length), compared to the surrounding matrix. The charcoal pieces were especially prominent underneath the rock slabs near the base of the feature. Some of the larger sandstone slabs are aligned in a circular configuration near the base. The arrangement and angle of the Feature 6C slab concentration suggests that some of the slabs on the eastern side collapsed toward the center; the slabs in the northwest portion may have tilted backward while the base slumped toward the center. A charcoal sample taken underneath two of the large slabs near the base yielded a conventional radiocarbon age of 4240±70 B.P., indicating utilization of the feature during the early Middle Archaic period (Table 6). Cultural materials consist of one metate fragment and two debitage pieces. Faunal remains are limited to one mammal bone (Table 25).

Both the material remains and the basal arrangement of the slabs indicate that when Feature 6C was intact, it shared morphological traits with Feature 6B. These features are in close proximity to one another; Feature 6C is situated 18 cm to the west of Feature 6B. Although Feature 6C was clearly exposed at a greater depth, if the slabs were vertically standing from the base of the feature they may have been at or near the same height as Feature 6B.

Table 25. Faunal Specimens Recovered from Middle Archaic Period Features[1]

Feature	Taxa	Total Count	Burn[2] Burned	Burn[2] Calcined
6B	**Amphibian**			
	Anura	3		
	frog or toad			
	Reptile			
	Indeterminate Scaled Reptile	1		
	Indeterminate Lizard	1		
	Mammal			
	Indeterminate very small sized mammal	5		2
	Indeterminate small sized mammal	2		1
	Indeterminate medium mammal	2		1
	Indeterminate medium-large mammal	1		
	Sylvilagus sp.	3		1
	cottontail			
	Indeterminate very small sized rodent	1		
	Neotoma sp.	1		
	packrat			
	Indeterminate Vertebrate	232	2	31
	Total	252	2	36
Feature **6C**	**Mammal**			
	Indeterminate mammal	1		
	Total	1		
Feature **6D**	**Mammal**			
	Indeterminate very small sized mammal	2	1	1
	Indeterminate small sized carnivore	2		
	Indeterminate Vertebrate	36		7
	Total	40	1	8
Feature **6E**	**Mammal**			
	Indeterminate very small sized mammal	14		4
	Indeterminate medium mammal	1		
	Indeterminate mammal	3		2
	Sylvilagus sp.	4		2
	cottontail			
	Indeterminate very small sized rodent	5		2
	Indeterminate very small sized squirrel	1		1
	Neotoma sp.	1		
	packrat			

Table 25. Faunal Specimens Recovered from Middle Archaic Period Features[1] (Continued)

Feature	Taxa	Total Count	Burn[2] Burned	Burn[2] Calcined
6E	*Peromyscus* sp.	1		
	dear mice			
	Indeterminate Vertebrate	298	1	53
	Total	328	1	64
Feature **6F**	**Mammal**			
	Indeterminate mammal	1		
	Indeterminate small squirrel	1	1	
	Indeterminate very small sized rodent	2		1
	Indeterminate Vertebrate	48	1	16
	Total	52	2	17

[1]Gastropodia not included, [2]Burn attributes do not include indeterminate bulk bone counts

Feature 6D

Feature 6D is a concentration of FCR and charcoal. The feature was exposed at the base of Level 9 in the north-central portion of Grid Unit B4 (Figures 48 and 49). This cluster may be the lower portion of a rock concentration that was not recognized as a feature during excavation. The larger FCR concentration was originally located in the northwestern corner of Level 8 Grid Unit B3 and the east-central side of Grid Unit B4. The overall FCR concentration within Feature 6D measures approximately 35 cm N/S x 90 cm E/W, and is approximately 64 cm BMGS, extending to a depth of 23 cm (Figure 50). The overall proportion of Feature 6D also suggests an association with Feature 6F, and further implicates the dark stain as a hearth (see Feature 6F). The rock concentration of Feature 6D may also be an extension of Feature 6. Because Feature 6D is inside the dripline of the shelter, it may have maintained a more consolidated sediment that did not undergo the soil transformations which occurred in the trench farther to the east. The

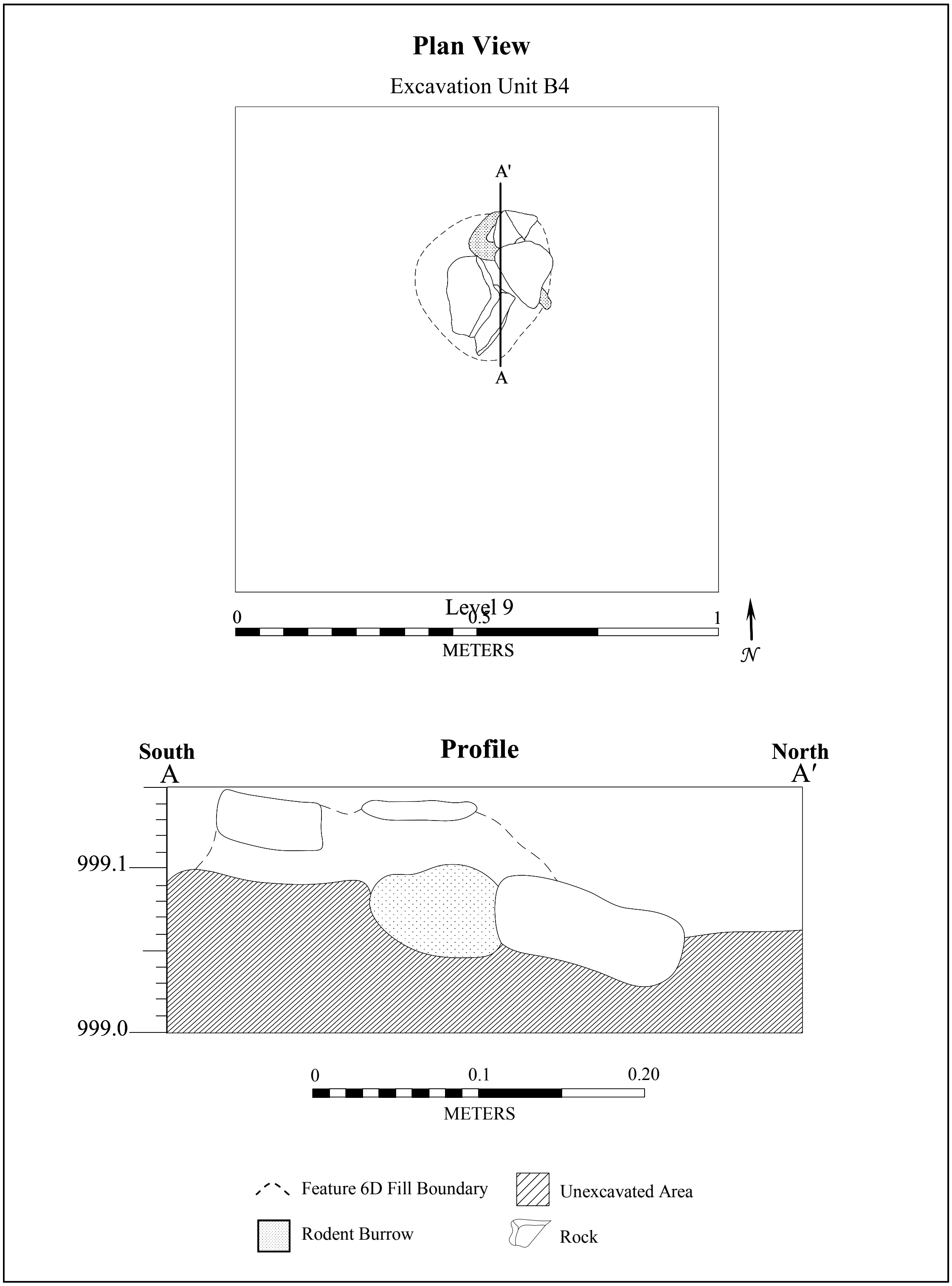

Figure 48. Feature 6D plan map and profile.

Figure 49. Overview of Feature 6D, Level 9. North arrow is 25 cm in length.

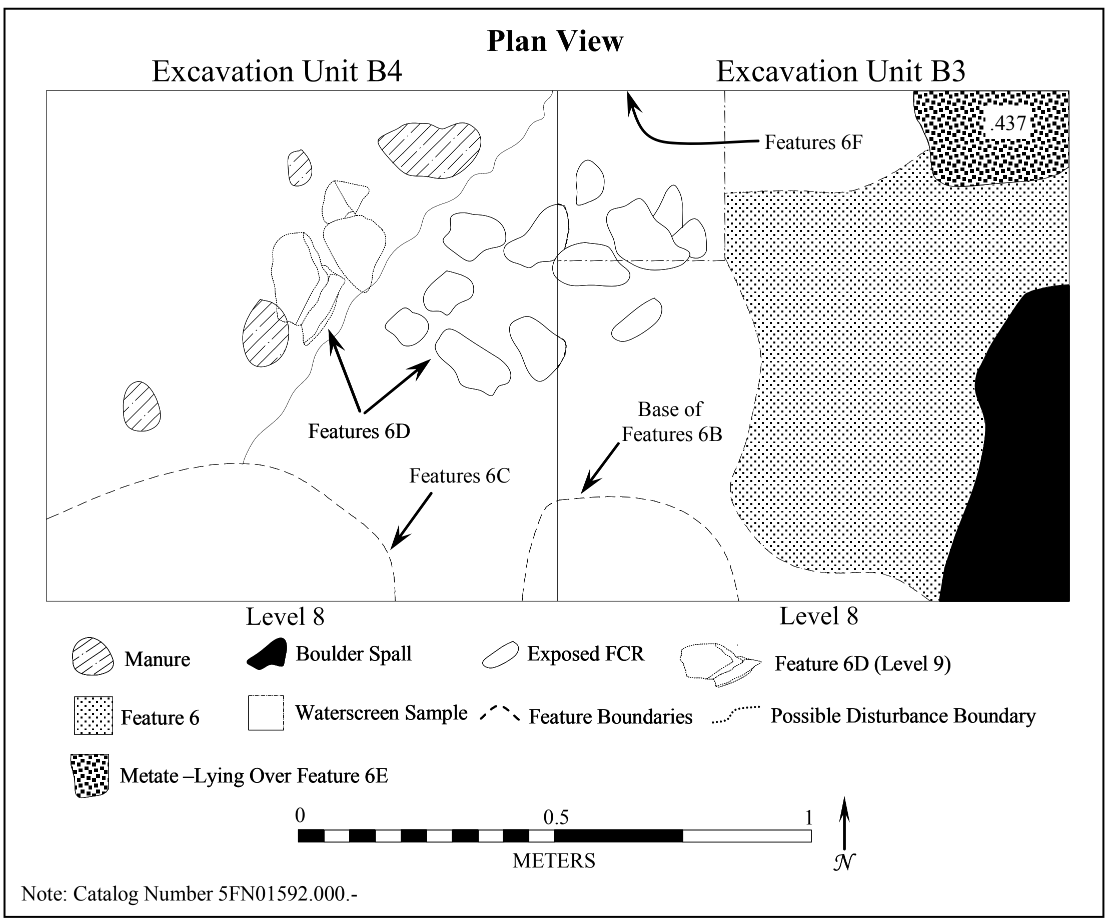

Figure 50. Plan view of Feature 6D in association with adjacent features.

western portion of the concentration may have been disturbed by looting activities (see Historic Period).

The lower portion of the feature is situated at the base of the culturally rich matrix of Stratum 3, and rests directly on top of a light brown (7.5YR6/4) sandy loam sediment that is identified in this area as a deteriorated sandstone conglomerate of Stratum 1. This rock concentration is irregular in shape, measuring 27 cm N/S x 29 cm E/W in plan view. The top rock was first exposed at a depth of approximately 74 cm BMGS and extends to a depth of 13 cm. The feature consists of four red, thermally-altered pieces of thin sandstone slabs and unconsolidated, very dark gray (7.5YR3/1) sandy silt. A concentrated charcoal deposit was collected between two of the sandstone fragments. This charcoal sample yielded a conventional radiocarbon age of 4140±70 B.P., suggesting that the feature was utilized during the Middle Archaic period (Table 6). A macrobotanical sample yielded 59 charred remains (see Macrobotanical Remains). The heavy fraction from the macrobotanical sample produced six flakes and 40 bone fragments, nine of which are burned/calcined (Table 25).

Feature 6E

Feature 6E is a basin-shaped roasting pit, located in the northern portion of Levels 9-12 of Grid Unit B3 (Figure 51, 52, and 53). The roasting pit is circular, measuring 20 cm N/S x 42 cm E/W in plan view. Only the southern half of the pit was excavated; the remaining half is exposed in the northern wall of Trench B. The feature was exposed at a depth of 98 cm BMGS and is 17 cm in depth. Based on the exposed portion of the feature, it probably measures 40 cm in diameter in its entirety. Exposed near the base of a Stratum 2W, the boundaries were easily defined by the light brown (7.5YR6/4) sterile

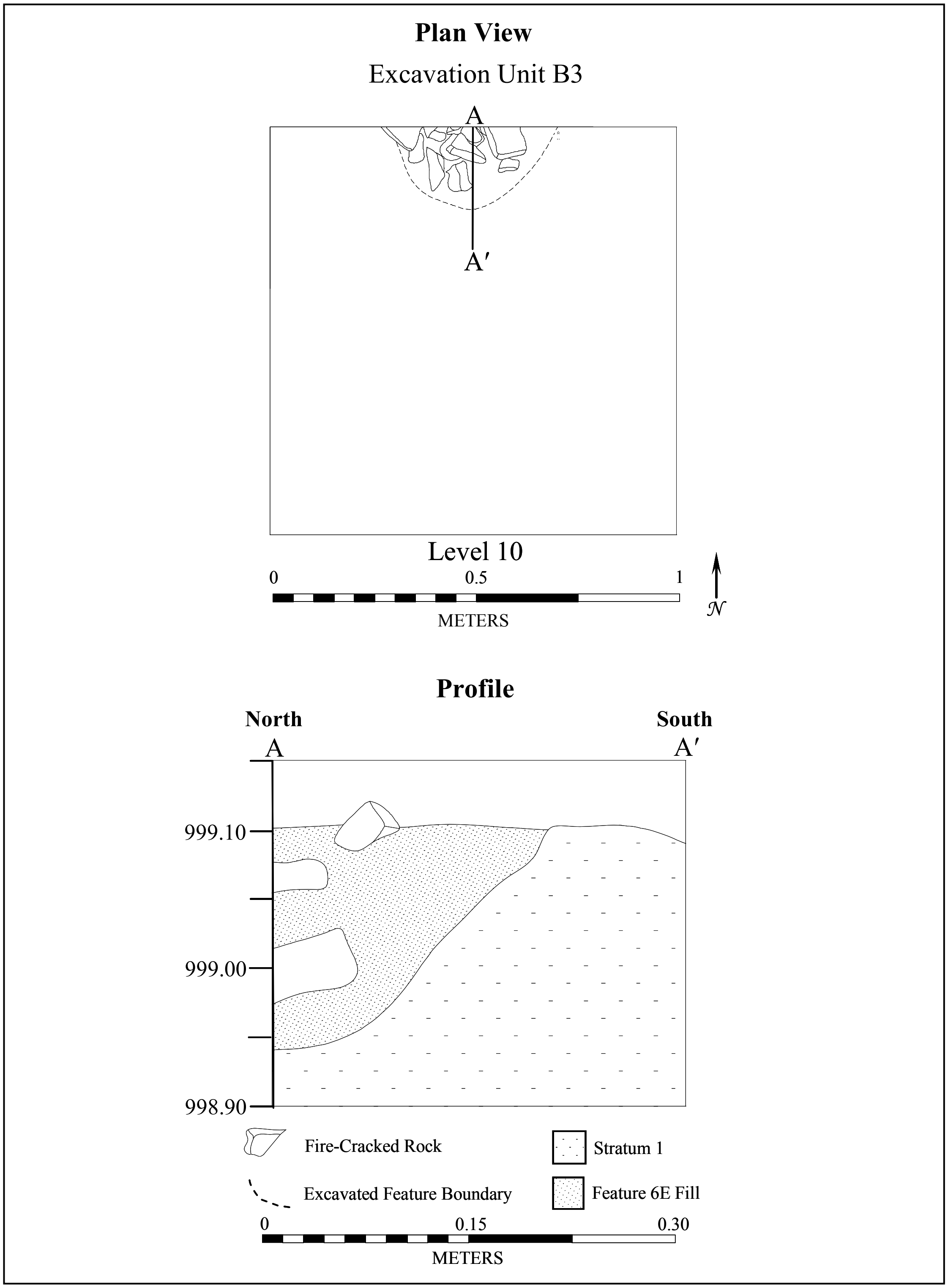

Figure 51. Feature 6E plan map and profile.

Figure 52. Oblique view of Feature 6E, partially exposed. North arrow is 25 cm in length.

Figure 53. Oblique view of Feature 6E, fully excavated. North arrow is 25 cm in length.

sediment of Stratum 1 matrix, which made the black (7.5YR2.5/1) feature fill easily recognized as a culturally intrusive sediment.

The feature fill consists of compact sandy silt with medium (5-10 cm; 2 lb [0.8 kg]) to large (>10 cm; 17.5 lb [6.5 kg]) pieces of FCR throughout. The FCR within the roasting pit is oxidized and highly fractured sandstone with a cortex of black sooty sediment. The soot resembles a greasy sediment coating that is difficult to remove from the rock. Charcoal is sparse within the feature and could not be recovered in sufficient quantity for radiocarbon dating. Based on the radiocarbon dates from features 6D, 6B and 6C, this roasting pit appears to date to the Middle Archaic period (Table 6). The only evidence of disturbance was a rodent burrow near the base of the feature, which was filled with small pieces of charcoal. A macrobotanical sample yielded 108 charred remains (see Macrobotanical Remains). The heavy fraction from the macrobotanical sample produced 27 flakes and 328 bone fragments, 65 of which are burned/calcined (Table 25). Additionally, three pieces of FCR in the feature are metate fragments (.396), of which two refit (.397). A pollen sample was also taken from a large metate (.392) found with the grinding surface placed face down. This metate covered the eastern, upper portion of the feature (see Pollen Analysis). Another large slab metate (.393) underlies the one described above and was exposed in Feature 6, Level 10 of Grid B3, 12 cm to the east of Feature 6E. The roasting pit makes up the westernmost edge of the sheet midden (see Feature 6) and may be associated with the activities of Feature 6E.

Feature 6F

Feature 6F is a dark basin-shaped stain lens that is a probable hearth. Originally unrecognized during excavation, the southern portion of Feature 6F was excavated with the rest of the general fill of Levels 7 – 8 in Grid Units B3 and B4. Only during profiling of the northern wall was it recognized as a dark, cultural basin-shaped stain (Figure 54 and 55). A concentration of FCR in the northwestern corner of Level 8 of Grid Unit B3 and the east-central side of Grid Unit B4 suggests a possible association with Feature 6F (see Figure 50). Perhaps the rock concentration in Level 8 originally defined the southern boundary of the feature, which may also be the upper portions of 6D (see Feature 6D). In the northern wall, Feature 6F measures 47 cm E/W; the top of the stain is 51 cm BMGS and extends downward approximately 20 cm. Defined in profile as a diffuse basin-shaped lens, it is a black (7.5YR2.5/1) sandy loam displaying a clearly defined boundary with the surrounding very dark gray (7.5YR3/1) matrix of Stratum 2W.

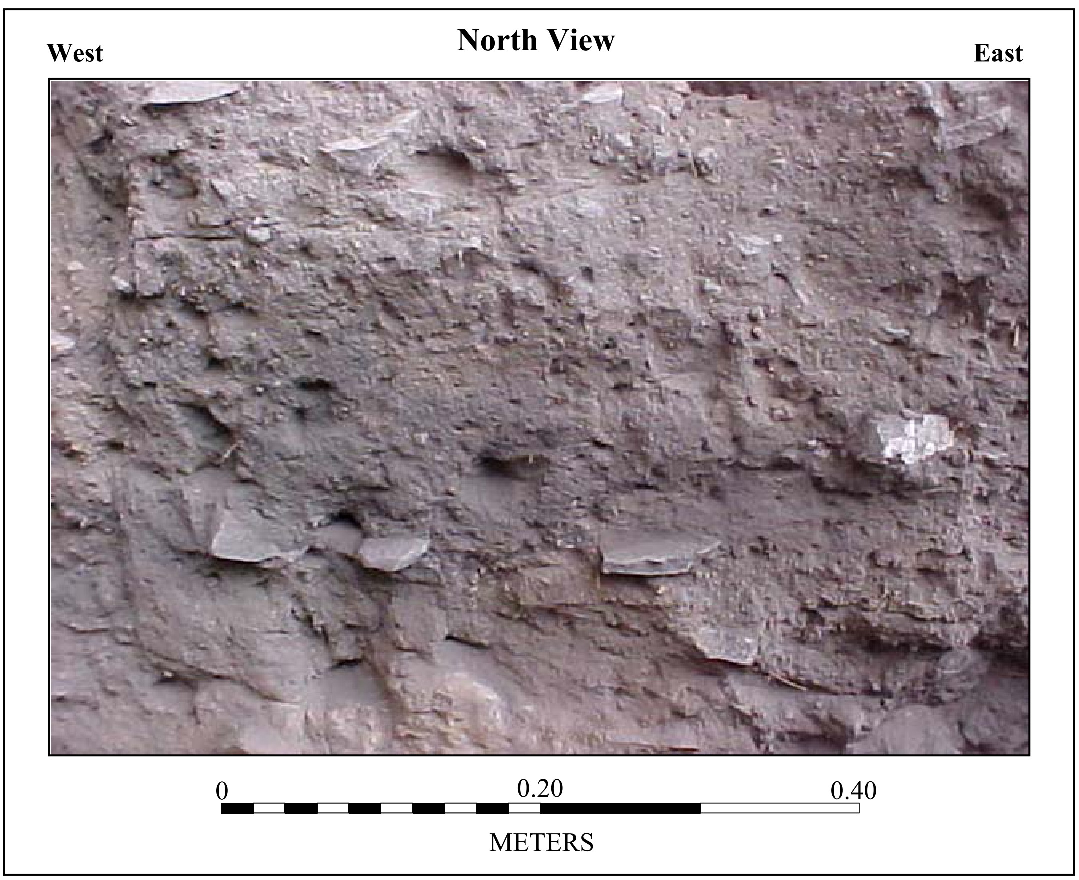

Figure 54. Profile of Feature 6F, a dark stain with rocks lining the base.

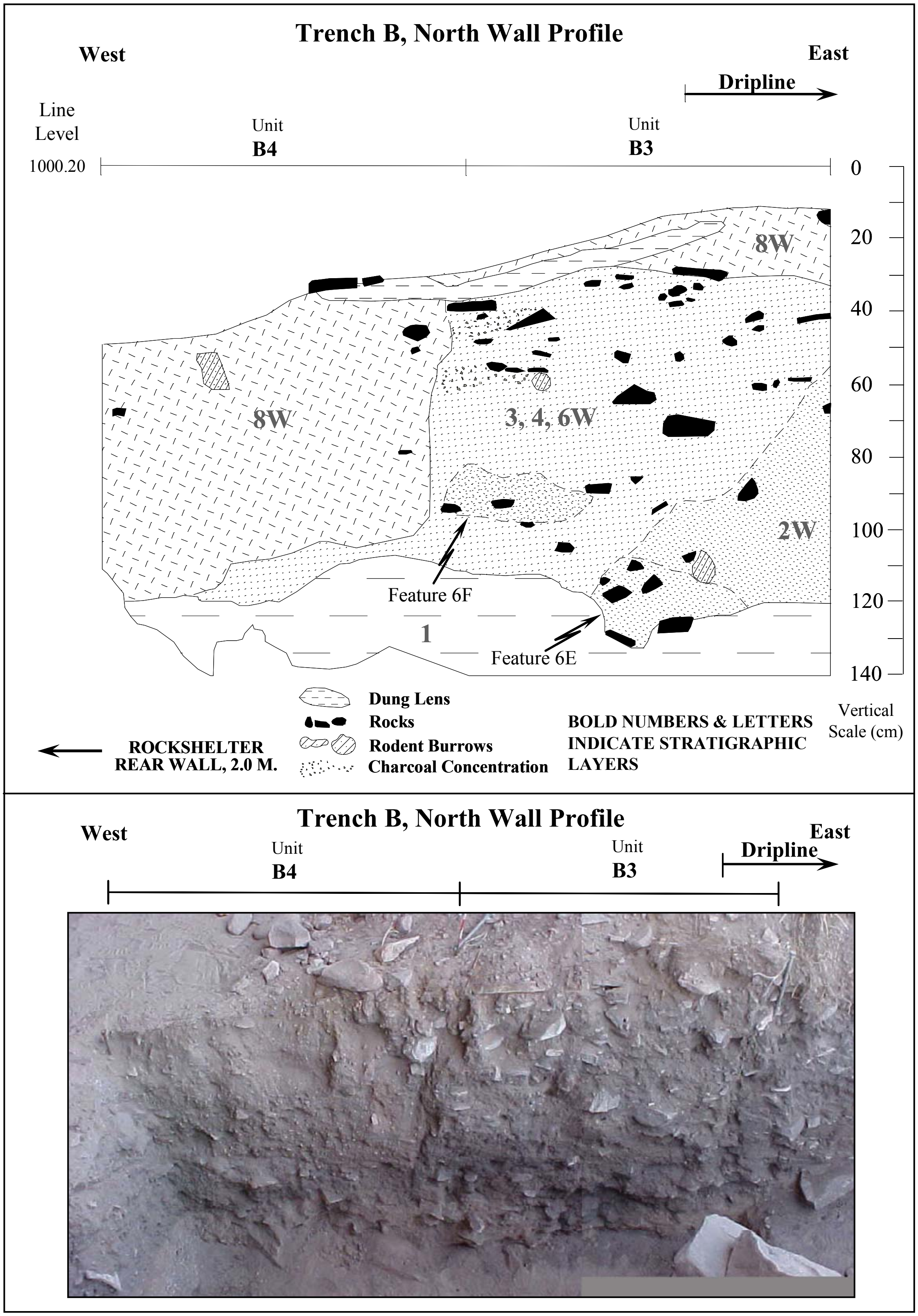

Figure 55. Schematic profile and photo of Excavation Unit B3 and B4, north wall showing Feature 6Fexposed in wall.

Small charcoal flecks are present in the feature fill. Three highly fractured small to medium (0-5 cm) sandstone FCR pieces help to define the lower boundary of the feature, while a medium sandstone rock defines the eastern side. The western most portion may have been disturbed by looting activities (see Historic Period). Based on the position of the stain adjacent to the lower boundaries of Feature 6B and within the mid-portion of Stratum 2W, this feature is associated with the Middle Archaic period. Since Feature 6F was recognized after unit excavation, a macrobotanical sample was collected into the central portion of the features profile. This sample yielded 105 charred material remains indicative of cultural utilization (see Macrobotanical Remains). Seven pieces of debitage and 52 pieces bone were collected from the heavy fraction of the macrobotanical sample. Nineteen pieces of the bone were either burned/calcined (Table 25).

Material Culture

Lithic Material

Lithic materials of the Middle Archaic period include flaked stone and ground/battered stone items. The following data indicate that the occupants heavily utilized these materials to the extent that most of the artifacts are heavily fragmented.

Flaked Stone

A total of 567 debitage specimens and 13 flaked stone tools were recovered from the Middle Archaic period component at the Gilligan's Island site. The lithic data indicate that Middle Archaic occupants at the site generally emphasized mid- to late-stage reduction strategies to manufacture flake tools and maintain other items. Cores are rare.

Debitage

The debitage sample of the Middle Archaic period consists of 567 specimens. Of this number, 306 items were recovered from the standard 1/8-inch screen utilized during excavation; the remaining 261 flakes are specimens recovered from the waterscreen sample. One of the bulk control samples, making up 1/9 of an excavated level, was not collected for waterscreening in this designated temporal period (Table 4). Two separate types of analysis were performed on the debitage items: 1) mass analysis, and 2) platform flake analysis. Initially, the entire debitage collection of the Middle Archaic period was separated by the standard 1/8-inch screen sizes utilized in the field and the 1/16-inch waterscreen used in the laboratory. Seventy-two specimens are identified as debris/shatter, which lack categorized attributes and are generally defined as blocky pieces of knappable materials. These two bulk assemblages were individually separated into four size grades during the mass analysis.

Tables 26 and 27 summarize the results of the mass analysis (Appendix B). The tabulated standard screen data in Table 26 reveal that, among the 306 debitage items, most of the noncortical chert is within the smaller size grades 3 (n=58) and 4 (n=118). In comparison, the larger cortical and noncortical size grades 2 chert flakes are fewer in number (n=17). Quartzitic materials are the second most frequently recovered, but number only 62 specimens. Other materials, consisting of sandstone, quartz, and petrified wood, are even less common.

The large amount of small- and noncortical-size debitage indicates that the later stages of tool production were performed in the shelters. The very small amount of large cortical debitage suggests that core reduction and early reduction flaking was virtually

Table 26. Mass Debitage Analysis Summary of Middle Archaic Period: Standard 1/8-inch Screen

MATERIAL TYPE	SIZE GRADE FREQUENCIES 1 (Large)		2 (Medium)		3 (Small)		4 (Micro)		TOTALS	
	Cortex	No Cortex	Cortex	No Cortex	Cortex	No Cortex	Cortex	No Cortex	Freq.	Column Percent
Chert	0	0	10	7	15	58	8	118	**216**	**70.5**
Chalcedony	0	0	0	0	1	2	0	0	**3**	**<1.0**
Quartzite	1	0	3	7	8	29	1	13	**62**	**20.2**
Sandstone	0	0	1	0	1	0	0	0	**2**	**<1.0**
Quartz	0	0	1	0	1	4	1	5	**12**	**3.9**
Petrified Wood	0	0	2	1	0	3	0	5	**11**	**3.5**
TOTAL COUNTS	**1**	**0**	**17**	**15**	**26**	**96**	**10**	**141**	**306**	**100**
ROW PERCENTAGES	**<1.0**	**0.0**	**5.5**	**4.9**	**8.4**	**31.3**	**3.2**	**46**	**100**	

Table 27. Mass Debitage Analysis Summary of Middle Archaic Period: 1/16-inch Waterscreen

MATERIAL TYPE	SIZE GRADE FREQUENCIES 1 (Large)		2 (Medium)		3 (Small)		4 (Micro)		TOTALS	
	Cortex	No Cortex	Cortex	No Cortex	Cortex	No Cortex	Cortex	No Cortex	Freq.	Column Percent
Chert	0	0	4	2	3	15	6	164	**194**	**74.3**
Chalcedony	0	0	0	0	0	0	0	2	**2**	**<1.0**
Quartzite	0	0	5	4	2	13	2	23	**49**	**18.7**
Basalt	0	0	0	0	1	0	0	0	**1**	**<1.0**
Quartz	0	0	0	0	0	2	0	7	**9**	**3.4**
Petrified Wood	0	0	0	0	0	1	0	5	**6**	**2.2**
TOTAL COUNTS	**0**	**0**	**9**	**6**	**6**	**31**	**8**	**201**	**261**	**100**
ROW PERCENTAGES	**0.0**	**0.0**	**3.4**	**2.3**	**2.3**	**11.8**	**3.1**	**77.0**	**100**	

absent. Table 27 illustrates the division of the debitage recovered from the waterscreen samples of the Middle Archaic period component. These results parallel those from the standard screen and support the fact that larger debitage is absent from the assemblage. In both the standard and waterscreen samples, the numbers of cortical debitage increase as the debitage sizes get smaller, at least until the smallest size grade where the trend is reversed. Such a distribution suggests that, while some primary reduction might have occurred in Shelter 2, middle to late stage reduction was a frequent practice for the occupants at the Gilligan's Island site during the Middle Archaic period. Chert was the preferred material for flintknapping, even though coarse-grained quartzite could be obtained nearby. The larger quartzitic materials indicate that initial core reduction occurred at the site, although the limited numbers suggest that procurement and manufacture of this material was sporadic. Other materials were utilized including chalcedony, basalt, quartz and petrified wood, but together these materials make up less than 8% of the debitage total. The two sandstone pieces may be the result of modification to the margins of ground stone metates.

The second type of analysis performed on the debitage assemblage utilizes a subset of the entire collection and selects only those flakes that bear striking platforms. The analytical process for selection is discussed in Chapter 5, while a general review of standard assumptions for platformed flake analysis is discussed briefly in the section about debitage baseline data. The platformed flake sample consists of 205 specimens or 36% of the debitage assigned to the Middle Archaic period component. Table 28 compares the presence and absence of cortex flakes in hard hammer and bifacial thinning technologies (Kalasz et al. 2005:78). These evaluations, based on a chi-square test, show statistical significance at the 95% confidence level. The tabulations indicate that 68.1% of the hard hammer flakes in the sample lack cortical attributes, and only two of the 86 bifacial thinning flakes have a cortex. These data suggest that both the hard hammer and bifacial thinning technologies are strongly connected with the later stages of tool reduction and maintenance. However, 31.9% of the hard hammer flakes have a cortex, which indicates that the early stage core reduction occurred.

Table 28. Middle Archaic Period Platformed Flake Summary (Standard 1/8-inch Screen and 1/16-inch Waterscreen Total Sample): Cortex by Technological Flake Type

CORTEX	HARD HAMMER		BIFACIAL THINNING		TOTALS	
	Freq.	Col. pct	Freq.	Col. pct	**Freq.**	**Col. pct**
Present	38	31.9	2	2.3	**40**	**19.5**
Absent	81	68.1	84	97.7	**165**	**80.4**
TOTALS	**119**	**100**	**86**	**100**	**205**	**100**

Test Statistics for Cortex by Technological Flake Type:
Chi-square=27.864; degrees of freedom=1;prob.=0.00

Tables 29 and 30 are presented in order to demonstrate that reduction strategies, in this case hard hammer and bifacial thinning technologies, vary according to material type (Kalasz et al. 2005:78). Similar to the mass debitage analysis described above, these tabulations are split according to the standard 1/8-inch screen and 1/16-inch waterscreen samples. Not surprisingly, the material types identified in the platformed flake analysis share trends with those observed in the entire debitage assemblage of the Middle Archaic period component. For example, the two dominant materials in the overall mass debitage sample are chert 70.5% and quartzite 20.2%. These data are similar in the standard platformed flake analysis subset, which show chert at 68.7% and quartzite at 22.1%. The tabulated results from the platformed analysis standard screen sample in Table 29 indicate that chert is the dominant material, which is represented in both the hard hammer bifacial thinning categories, whereas quartzite is represented most in the hard hammer category. The remaining materials, including chalcedony, sandstone, quartz and petrified wood, are rarer and fall mainly within the hard hammer category. Table 30 shows that the material type frequencies in the waterscreen sample are generally similar, albeit in smaller in numbers, to that of the standard screen. However, when complete platformed

Table 29. Platformed Flake Summary of Middle Archaic Period (Standard 1/8-inch Screen): Material Type by Flake Type

MATERIAL TYPE	HARD HAMMER		BIFACIAL THINNING		TOTALS	
	Freq.	Col. pct	Freq.	Col. pct	**Freq.**	**Col. pct**
Chert	58	63.0	32	82.1	**90**	**68.7**
Chalcedony	1	1.1	0	0.0	**1**	**<1.0**
Quartzite	24	26.1	5	12.8	**29**	**22.1**
Sandstone	1	1.1	0	0.0	**1**	**<1.0**
Quartz	2	2.2	0	0.0	**2**	**1.5**
Petrified Wood	6	6.5	2	5.1	**8**	**6.1**
TOTALS	**92**	**100**	**39**	**100**	**131**	**100**

Table 30. Platformed Flake Summary of Middle Archaic Period (1/16-inch Waterscreen): Material Type by Flake Type

MATERIAL TYPE	HARD HAMMER		BIFACIAL THINNING		TOTALS	
	Freq.	Col. pct	Freq.	Col. pct	Freq.	Col. pct
Chert	12	44.4	39	83.0	**51**	**68.9**
Chalcedony	0	0.0	1	2.1	**1**	**1.3**
Quartzite	14	51.9	5	10.6	**19**	**25.7**
Basalt	1	3.7	0	0.0	**1**	**1.3**
Petrified Wood	0	0.0	2	4.3	**2**	**2.7**
TOTALS	**27**	**100**	**47**	**100**	**74**	**100**

flakes from standard and waterscreen samples were weighed, 40 of the size grade 4 complete chert specimens weigh less than 1.0 g (Table 31). This suggests that the small microflakes or pressure flakes were produced during terminal reduction and tool maintenance.

The platformed flake data suggest that chert materials were used most often through early and middle stages of manufacture, for flake tool removal or perhaps biface manufacture. In the standard screen sample, 90 chert specimens platform-bearing flakes. When chert is compared between the 58 hard hammer and 32 bifacial thinning flakes, only 35.6% represent bifacial thinning. This suggests that late stage bifacial manufacture

Table 31. Middle Archaic Period Complete Platformed Flake Size Summary (Standard 1/8-inch Screen and 1/16-inch Waterscreen): Size Grades and Weights for Major Material Type Groups[1]

SIZE GRADE	DESCRIPTIVE STATISTICS	Complete Flake Size Weight (grams)	
		CHERT	QUARTZITE
1 (Large Debitage)	N	0	1
	Minimum		17.300
	Maximum		17.300
	Mean		17.300
	Standard Deviation		17.300
2 (Medium Debitage)	N	6	9
	Minimum	0.700	0.500
	Maximum	8.300	14.300
	Mean	3.567	6.556
	Standard Deviation	3.097	4.637
3 (Small Debitage)	N	19	19
	Minimum	0.100	0.100
	Maximum	1.200	1.400
	Mean	0.284	0.495
	Standard Deviation	0.254	0.354
4 (Micro Debitage)	N	40	8

[1] Weight for some size grade 4 specimens could not be read on digital scale.

occurred, but was limited, and that hard hammer flake tool production was more common in the shelters during the Middle Archaic period. At most, the platformed flake data suggest that hard hammer techniques, which are usually indicative of core reduction and early- to middle-stage biface manufacture (Kalasz et al. 2005:77), are the best represented in nearly all of the material groups. An exception to this pattern is evident in the waterscreen sample in which size grade 4 items are more common than in standard screens. Table 31 illustrates that the weights of chert materials in this size category have a value of less than a gram, indicating that these are very small retouch flakes or microflakes.

In summary, the mass debitage clearly shows that few materials entering the site had a cortex; most items were in a secondary stage of lithic reduction. The platformed data do not suggest that the later stages of biface manufacture were normally performed in the shelters. Rather, middle to late stages of core reduction or tool manufacture may have been more frequent, perhaps in the production of flake tools. Bifacial tools were likely to have been in a reduced state prior to entering the site and were periodically thinned as needed, but materials were not brought to the site for use in the later stages of biface production. The reader is reminded that the sample size of the platform-bearing debitage is limited in size for the Middle Archaic component, and these interpretations are therefore tentative.

Flaked Stone Tools

The flaked stone tool assemblage assigned to the Middle Archaic period is comprised of 13 items (Figures 56). Table 32 provides an inventory of the assemblage, which consists primarily of flake tools displaying informal or very little modification other than use-wear and retouched edges. More formalized tools such as bifaces are also present, but in smaller numbers. Heavier tools, such as cores, are very limited in number. Initially, the material type distribution for the flake stone tool appears similar to that of the debitage sample, both of which are dominated by chert. A closer examination of the lithic tool assemblage indicates that quartzite from the site vicinity is entirely lacking, a fact that is inconsistent with its presence in the debitage sample. At the same time, minor occurrences of materials from more distant resources, such as petrified wood and basalt, correspond with the limited debitage count. The presence of such resources as obsidian, which are found only within the flaked tool assemblage, attests to the limited availability of exotic trade wares entering the site.

The biface group generally represents the greatest investment of time and manufacture effort (Kalasz et al. 2005:81). The full range of biface production is

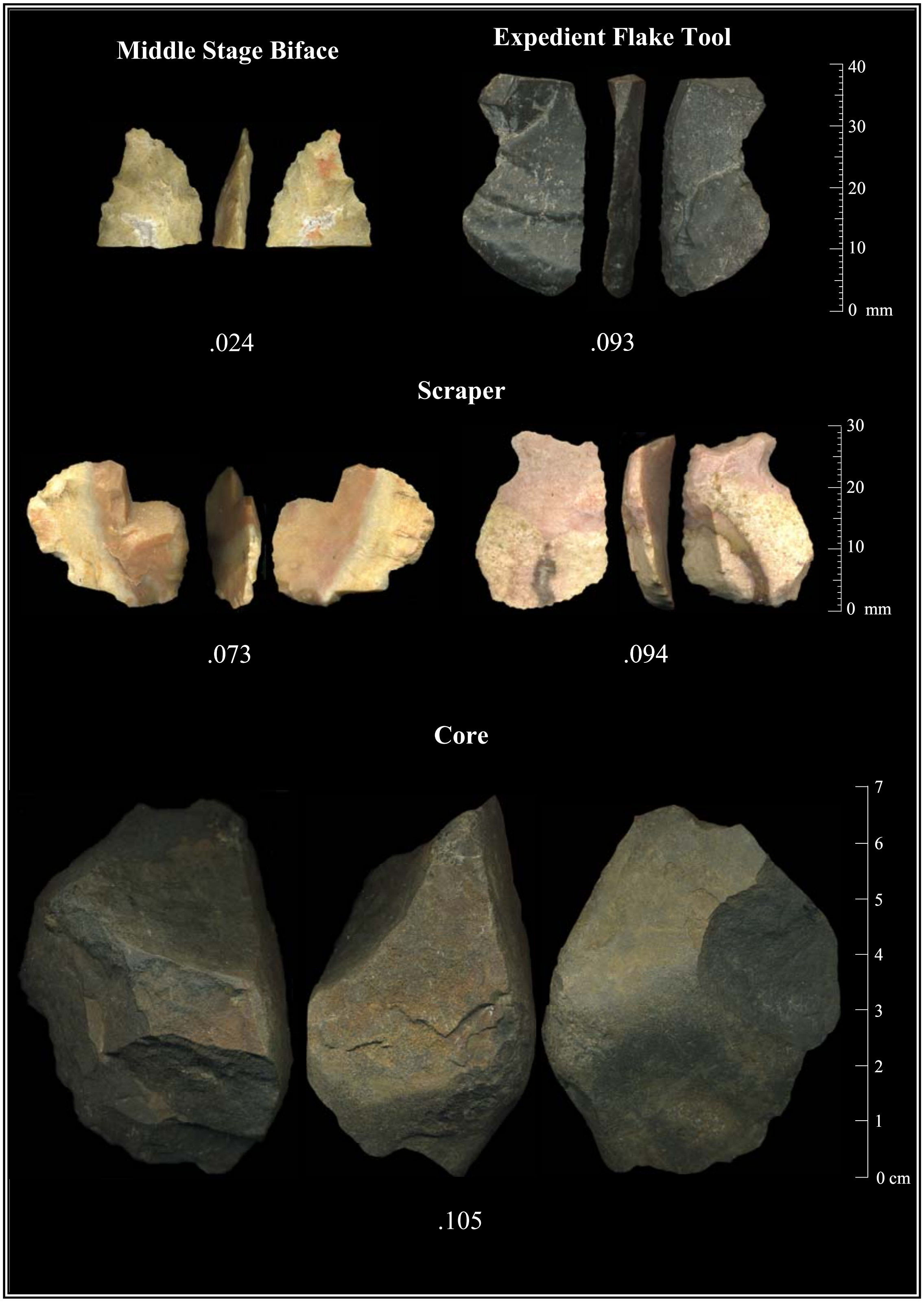

Figure 56. Gilligan's Island site lithic tools assigned to the Middle Archaic period component (note reduced scale of core).

Table 32. Middle Archaic Period Flaked Stone Tool Types by Material Type

Tool Type	MATERIAL FREQUENCIES				Tool Totals	
	Chert	Petrified Wood	Basalt	Obsidian	Freq.[1]	Col. %[2]
Early Stage Biface	1				**1**	7.7
Middle Stage Biface	1				**1**	7.7
Undetermined Bifacial Fragment	2				**2**	15.4
Scraper	2				**2**	15.4
Expedient Flake Tool	4	1		1	**6**	46.2
Core			1		**1**	7.7
Material Totals	**10**	**1**	**1**	**1**	**13**	100.0
Row %	76.9	7.7	7.7	7.7	100.0	

[1]Freq. = Frequency, [2]Col.% = Column Percent

generally not represented in the assemblage, with only four bifaces assigned to the Middle Archaic period. All the bifacial tools are manufactured from chert material. Only one specimen can be assigned to a specific early stage unstemmed biface category, in which most of the cortex is removed and the edge angles are moderately thick. One middle stage biface is thinned and thus may indicate the later stages of reduction. The remaining two bifaces are too fragmented to assign to a particular stage of manufacture. All of the bifaces are incomplete and exhibit edge retouch and utilization, except for the middle stage unstemmed biface. While these three bifaces are thinned or fragmented to the extent that origin cannot be determined, the final early stage biface has cortex that is indicative of a reduced stream cobble. The biface collection represents discarded and/or broken tools that were worn, indicating that most items were employed as functional items and were heavily utilized while at the site.

The flake tool group from the Middle Archaic period consists of scrapers and expedient flake tools. These subjective categories exhibit flake attributes that are not indicative of bifacial thinning and are therefore easier to produce. Scrapers are the most formal flake tools in the assemblage, consisting of a disto-lateral scraper and an undetermined scraper. The undetermined scraper is the only flake tool that exhibits cortex. Both of the scrapers are complete and made of chert. The edges are heavily utilized and retouched, modified tool margins range from 60% to 100%. The expedient flake tools are made from chert (n=4), petrified wood (n=1), and obsidian (n=1). All of these items were likely used for a variety of cutting and scraping tasks, based on the evidence of utilization and retouch along the edges of the flakes. Half of the expedient flake tools are retouched.

A single basalt core is the heaviest tool in this analytical group. This cobble appears to have been derived from an alluvial deposit. It displays flaking on one side and is battered on the other, indicating that multiple tasks were performed with this large stone item. The core was wedged between the upper portions of two stone slabs of Feature 6B, and it appears that the final use of the item was as construction material for stabilizing the stone slab walls of the hearth.

The flaked stone tool data for the Middle Archaic period component are indicative of a highly mobile group that had prepared itself for travel prior to entering the shelters of the Gilligan's Island site. Most of the tools are from distant, but regional, sources, and were in a prepared state, perhaps to lighten loads for traveling. There is no evidence to suggest that bulkier items such as cores/core tools were commonly utilized by the occupants of the site during the Middle Archaic period. The lack of quartzitic material in the tool assemblage also supports the concept that the occupants were previously equipped and did not rely heavily upon nearby sources. This may indicate that the inhabitants at the site during this period were focused on different activities that were less reliant on flaked stone tools. Alternatively, they may have been at the site for a short duration, eliminating the need to restock lithic material.

Ground/Battered Stone

Forty ground stone items are associated with the Middle Archaic component. The collection includes a mano fragment, slab metates, typologically indeterminate metate fragments, and an unidentifiable ground stone fragment that is not identifiable as either a cobble or slab (Table 33). Only one ground stone specimen is complete, one is more than 50% intact, and the remaining 38 are fragmentary with less than 50% of the specimen present. Burned and/or fire-cracked attributes are present on 87.5% of the ground stone objects, indicating heavy secondary use for the items as heating implements. The various modifications of these tools suggest that they were expedient but versatile.

Manos

The single mano (.429) is manufactured from sandstone. The specimen is fragmented to the extent that typological attributes are indeterminate. It is 7.7 cm long, 7.1 cm wide and 3.2 cm thick. It has two discernible facets indicating that grinding as well as battering occurred. The implement appears to have been burned or fire cracked.

Metates

The entire metate collection consists of sandstone slabs or blocks, materials that are available from the formations within the site area. Thirty-eight metates make up

Table 33. Middle Archaic Period Ground/Battered Stone by Material Type

Type	MATERIAL
	Sandstone
Manos	
Mano Unknown Type	1
Metates	
Slab Metate	5
Metate Unknown Type	33
Unknown Ground Stone Type	1
Total Ground/Battered Stone Counts	40

95.0% of the total Middle Archaic ground/battered stone assemblage. Of these, 12.5% are slab metates while 82.5% are typologically indeterminate metate fragments.

The single complete slab metate (.437) is 36.0 cm long, 23.2 wide, and 9.1 cm thick (Figure 57). Extending nearly the entire length of the sandstone slab, the specimen has one surface that is 33.0 cm long, 21.0 cm wide and 2.0 cm deep. This facet is heavily ground in an irregular shape, with longitudinal striations. The edges of the tool are unshaped, indicative of its expedient design. It is fire-reddened or burned.

Four fragmented slab metates were recovered. Of these, one item is greater than 50% complete and the remaining three are less than 50% intact. The dimensions of the four fragmented slab metates are 19.6 to 26.0 cm long, 17.8 to 20.0 cm wide, and 5.3 to 7.3 cm thick. The surfaces are ground to ground/pecked, with use-wear ranging from moderate to heavy. Two of the specimens are utilized on both sides. The edge margin is unshaped.

A total of 33 typologically indeterminate metate fragments are represented by less than 50%. These specimens are 3.7 to 22.6 cm long, 3.5 to 16.2 cm wide, and 1.1 to 6.3 cm thick. Surfaces display both grinding and grinding/pecking, with use-wear ranging

Figure 57. Gilligan's Island site metate assigned to the Middle Archaic period component (note reduced scale).

from light to heavy. Three of these fragments have been utilized on both sides. Three items display margins, two of which were minimally shaped, one by flaking and one by grinding. Burned and/or fire-cracked attributes are present on 90.9% of the indeterminate metate fragments.

Unidentifiable Ground Stone

One specimen (.351) is to the extent that it cannot be assigned to a specific ground stone type. It is 7.6 cm long, 3.6 cm wide and 5.2 cm thick. One surface is ground.

Faunal Artifacts

Two bone artifacts are associated with the Middle Archaic period. Both of the items are ornamental bead fragments.

Faunal Ornaments

Bone Beads

Two bone bead fragments were recovered from Trench B, Shelter 1 (Figure 58, Table 16). Each is fragmented to the extent that modification is exhibited mainly on one end of the specimen. The first bead fragment (.900) is manufactured from a possible metapodial of an indeterminate small mammal. Cultural modification of the item consists of one edge that is ground flat and polished. The second bead fragment (3.080) is derived from an indeterminate vertebrate. The bone is modified on one edge, which exhibits groove-and-snap technology. The exterior edge of the item has been ground and rounded, perhaps erasing the score marks, while the interior edge displays divots where the snapping technique occurred. The exterior margin of the specimen is polished.

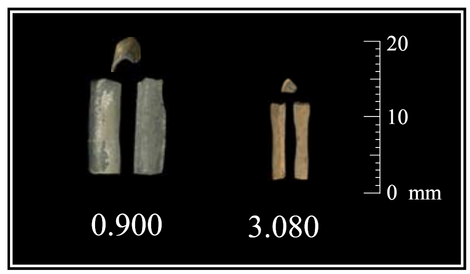

Figure 58. Gilligan's Island bone beads assigned to the Middle Archaic period component.

Subsistence-Related Remains

Faunal Remains

The faunal remains of the Middle Archaic period are comprised of 2194 items. Individual specimen counts are tabulated in Table 18 (see Baseline Data). The following section is concerned primarily with identifying those remains that can be confidently interpreted as a resource for subsistence or material items, such as tools or ornaments. Table 34 identifies all of the modified bone with perimortem modifications, which occur at or near the time of death and are typically identified with human activities. Examples are burning, cutting, and green breaks. Green breaks occur when the bone is fresh and the failure rate is high; once the bone breaks, a spiral fracture is commonly produced (Johnson 1985:176; Schiffer 1987:187). Dry breaks are generally related to postmortem modification, in which the failure mode of dry bone is decreased by longitudinal cracks that commonly break perpendicular, parallel, or diagonal to the surface plane (Johnson 1985:176; Schiffer 1987:187). They are not acknowledged in this analysis as being the product of human processes. The modified category is a "catch-all" for those items that display grinding or a particular kind of green break, such as an impact cone or impact flake. It should be noted that of the estimated 859 bulk bone items associated with the Middle Archaic period, 811 were identified as indeterminate vertebrates (n=809) or mammal (n=2) specimens. Many of these bulk bone items are burned and/or calcined but are not incorporated into the tabulated modified faunal count. These fragments would clearly increase the indeterminate vertebrate count. However, these fragments are of little interpretative value.

The data in Table 34 indicate that a majority of the modified bone exhibits dry breaks. The low representation of burned/calcined bone among some taxa may simply reflect previous deposition of bones adjacent to thermal features. This is especially likely for smaller taxa (e.g., rodents) that occurred naturally in the shelter. This scenario is plausible considering the multiple features within the shelters that required a substantial amount of digging through previous depositional layers to produce. This concept is also

Table 34. Middle Archaic Period Modified Faunal Specimens[1]

Taxa	Break		Burn		Extensively	Discretely	
	Green	Dry	Burned	Calcined	Cut/Ground/ Scrape/Score	Cut	Modified
Amphibian							
Indeterminate Reptile/Amphibian		7					
Bufonidae		2		1			
toad family							
Anura		6					
frog or toad							
Reptile							
Indeterminate Reptile		1					
Indeterminate Scaled Reptile		1					
Indeterminate Lizard		9					
Scincidae		1					
skink family							
Serpentes		2					
Indeterminate Snake							
Colubridae		2					
non-venomous snake family							
Emydidae		1	1				
box and water turtle family							
Bird							
Indeterminate medium bird		4		1			
Anas sp.		1					
duck							
Accipitridae		1					
Indeterminate small bird		3					
Indeterminate very small bird		1					
Indeterminate small passeriformes		1					
Small perching bird							
Indeterminate bird		3		2			
Mammal							
Indeterminate very small mammal		34	1	17		1	
Indeterminate small mammal		67		27		2	
Indeterminate medium mammal	3	24	1	16			
Indeterminate medium-large mammal	5	12					
Indeterminate large mammal				5			
Indeterminate mammal	4	119	8	47			1
Lagomorph	2	11		2			
Indeterminate hare or rabbit							

Table 34. Middle Archaic Period Modified Faunal Specimens (Continued)[1]

Taxa	Break		Burn		Extensively	Discretely	
	Green	Dry	Burned	Calcined	Cut/Ground/ Scrape/Score	Cut	Modified
cf. Lagomorph		1					
possible hare or rabbit							
Lepus sp.		1		1			
jackrabbit or hare							
Lepus americanus		1					
snowshoe hare							
Lepus californicus/townsendi		1		1			
black-tailed or white-tailed jackrabbit							
Sylvilagus sp.		19	1	5			
cottontail							
Sylvilagus nuttalli/auduboni		5		3			
mountain or desert cottontail							
Indeterminate small rodent		3		1			
Indeterminate small squirrel		7	1	2			
Cynomys sp.		2					
prairie dog							
Citellus sp.		1					
ground squirrel							
Indeterminate very small rodent		32		8			
Indeterminate very small squirrel		2		1			
Geomys bursarius		1					
plains pocket gopher							
Microtus sp.		1		1			
vole							
Neotoma sp.		14		1			
packrat							
Neotoma Mexicana/cinearea		5		1			
Mexican or Bushytail Woodrat							
Peromyscus sp.		2					
Clethrionomys gapperi		1					
boreal red-back vole							
Indeterminate medium carnivore		1					
Indeterminate small carnivore		2					
Mustelidae		1					
weasel or badger family							
Chiroptera		1					
Indeterminate large artiodactyl		1					
Indeterminate medium-large artiodactyl		2					
Odocoileus sp.		1					
deer							

Table 34. Middle Archaic Period Modified Faunal Specimens (Continued)[1]

Taxa	Break		Burn		Extensively	Discretely	
	Green	Dry	Burned	Calcined	Cut/Ground/ Scrape/Score	Cut	Modified
Indeterminate Vertebrate	7	779	14	275	1		
Indeterminate		1					
Total	21	1201	27	418	1	2	2

[1] Does not include indeterminate bulk bone counts

supported by the higher counts of natural dry breaks and the low frequency of calcined bone. Extensive cutting or discrete modification of bone is minimal. Of the five specimens with extensively cut or discretely modified bone, two are beads from a small mammal and an indeterminate vertebrate. One very small and one small mammal bone are discretely cut, while the final modified specimen is an impact flake.

Of greater importance, the tabulations in Table 34 indicate burned and calcined bone counts. These attributes have the greatest reliance for demonstrating human utilization for faunal resources. Figure 59 illustrates the combined burned and calcined counts for the Middle Archaic period. These data indicate that very small and small mammals are represented most frequently. The very small mammal category includes indeterminate very small rodent (vole, packrat, and Mexican/bushytail packrat) as well as very small squirrel (chipmunk). Indeterminate small mammals may include other items in the figure such as the jackrabbit or hare, indeterminate small rodent, and indeterminate squirrel. Indeterminate medium mammals are also substantially higher in frequency than the large faunal specimens. The low number of burned bone from large mammal specimens indicates that these larger animals were processed minimally during cooking activities at the site. The lower number of large mammals, as well as a lack of medium-large mammals, may reflect a separate subsistence strategy for marrow extraction, as

Middle Archaic Period

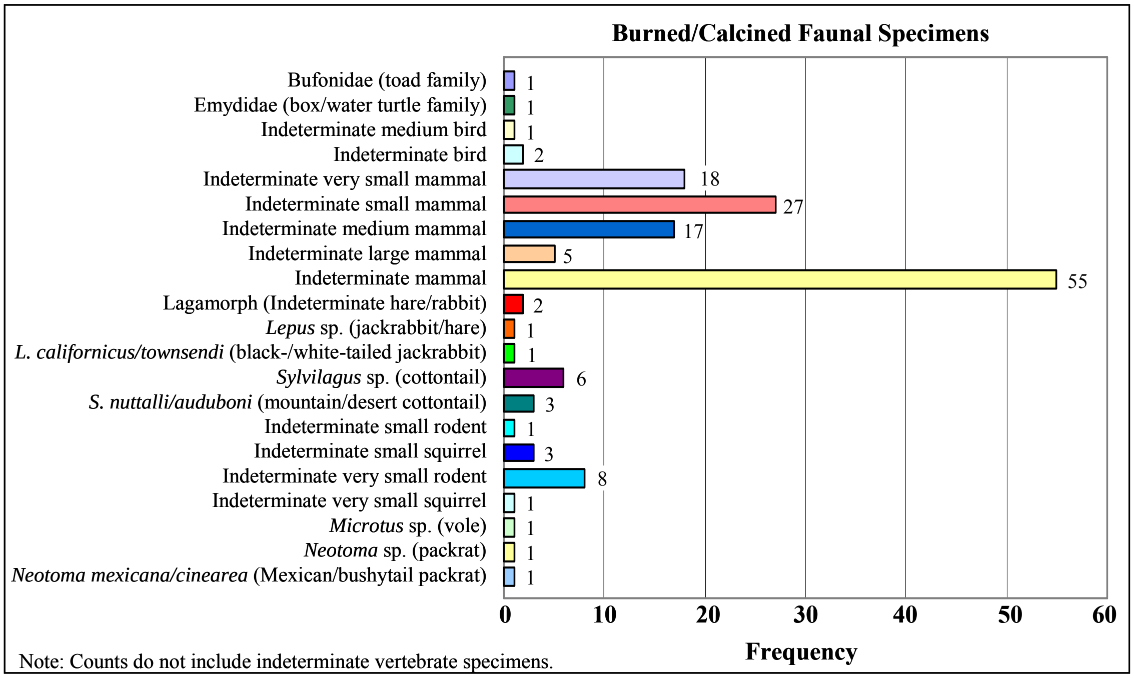

Figure 59. Burned/calcined faunal remains recovered from the Middle Archaic period deposits.

discussed previously in the baseline data (Figure 42). These larger species are poorly represented in both the modified bone count and the species list (Table 19).

Macrobotanical Remains

Four flotation samples are associated with the Middle Archaic period component. These samples were recovered from Shelter 1, Trench B. The macrobotanical analysis of these samples yielded 1884 specimens representing 33 plant taxa. The results from the analysis are presented in Tables 35 and 36. Table 35 provides provenience data for each analytical sample, while Table 36 provides the inventory of remains identified in each sample. Each macrobotanical sample has been identified by the individual feature from which it was recovered. These features types include a roasting pit, hearths and hearth-like features (see Features). Both charred and uncharred remains are identified in the flotation sample. The total volume of each sample prior to flotation processes and light

Table 35. Provenience Data for Macrobotanical Remains of Middle Archaic Period Component

Feature No.	Shelter No.	Unit No.	Northing	Easting	Level	Elevation[1]	Context
6B	1	B3	0-38	0-35	N/A	999.39-.22	Northeastern portion of Feature
6D	1	B4	41-68	45-70	N/A	999.16-.03	General fill
6E	1	B3	80-100	30-72	N/A	999.13-998.93	General fill
6F	1	B3	100	7-30	N/A	999.29-.20	9 cm excavated into northern trench wall

[1] Elevation based on site datum relative elevation of 1000 m.

fraction weight after processing are presented in Table 36. For a complete explanation of the table layout and determination of culturally affiliated flora, the reader is referred to the Baseline Data for the Macrobotanical Remains.

Analytical results from the four Middle Archaic macrobotanical samples suggest that a pinyon-juniper plant community was present throughout the period. The local conifers identified in the botanical remains are pinyon pine (*P. edulis*), Rocky Mountain juniper (*Juniperus scopulorum*), and one-seed juniper (*J. monosperma*-type). The abundance of evidence for these trees in the samples implies that they were the predominant near the site. The infrequent occurrence of the Douglas-fir (*Pseudotsuga menziesii*) suggests that these trees were uncommon in the region and elements may have deposited naturally in the shelter (Gish 2005:5). Localized shrubs that were probably integral to the local environment include sagebrush (*Artemisia*), oak (*Quercus*) and sumac (*Rhus cf. trilobata*). Succulents consist of yucca (*Yucca*), hedgehog-type cactuses (*Echinocereus*-type), cholla (*Opuntia* [*Cylindropuntia*]) and/or other cactuses such as prickly-pear (*Opuntia*). Herbaceous groundcover includes drop-seed grass (*Sporobolus*),

Table 36. Middle Archaic Period Macrobotanical Remains

Feature No.	Plant Taxon or Other Category	Plant Part	Condition & Quantity					
			Charred			Uncharred		
			Whole	Frag.[1]	PPL[2]	Whole	Frag.	PPL
6B	Volume Floated: 2.96 (liters)							
	Light Fraction Weight: 68.58 (grams)							
	Pinus edulis	**Nut hull**		**6**	**2.0**			
		Needle		**>25**	**8.5**		3	1.0
		Female Cone		**75**	**25.3**			
	Pinaceae (*cf. Pinus*)	**Wood**		**7**	**2.4**			
	Pseudotsuga menziesii	**Needle**		**1**	**0.3**			
	Juniperus scopulorum	**Twig**		**1**	**0.3**			
	***J. monosperma*-type**	**Twig**		**3**	**1.0**			
	Juniperus	**Wood**		**12**	**4.1**			
		Male Cone		**1**	**0.3**			
	Sporobolus	**Grain**	**1**		**0.3**			
	Poaceae	**Stem**		**>48**	**16.2**			
		Stem/leaf					X[3]*	N/A
	Yucca	**Fiber**		**4**	**1.4**			
	Quercus	**Nut hull**		**2**	**0.7**			
	Chenopodium cf. berlandieri	**Seed**	**9**		**3.0**	2		0.7
	Cheno-Am	**Seed**	**26**	**>5**	**10.5**	7	>2	3.0
	Rhus cf. trilobata	**Seed**		**12**	**4.0**			
	Echinocereus-*type*	**Seed**	**1**		**0.3**			
	Opuntia (*Cylindropuntia*)	Seed				1		0.3
	Opuntia	**Areole & spine**		**1**	**0.3**			
		Areole		**4**	**1.4**			
		Spine		**>15**	**5.1**			
	cf. Cactaceae	**Wood**		**1**	**0.3**			
	Lappula cf. redowski	Seed coat					13*	4.4
	Verbena cf. bracteata	Seed coat					>195*	65.9
	Dicotyledoneae	Seed					7	2.4
		Seed coat					5	1.7
		Leaf					X	N/A[4]
		Thorn		**3**	**1.0**			
	Unknown	**Wood**		**1**	**0.3**			
	Plant Totals:		**264**		**89**	235		79.4
	Non-Floral Items:							
	Bone						2	N/A
	Gastropoda	Shell					X	N/A
		High-spire				12		N/A
		Low-spire				19		N/A

Table 36. Middle Archaic Period Macrobotanical Remains (continued)

Feature No.	Plant Taxon or Other Category	Plant Part	Condition & Quantity					
			Charred			Uncharred		
			Whole	Frag.	PPL	Whole	Frag.	PPL
6D	Volume Floated: 1.64 (liters)							
	Light Fraction Weight: 2.59 (grams)							
	Pinus edulis	**Needle**		**3**	**1.8**			
	Pinaceae (*cf. Pinus*)	**Wood**		**4**	**2.4**			
	Juniperus scopulorum	**Twig**		**1**	**0.6**			
	Juniperus	**Wood**		**7**	**4.3**			
	Sporobolus	**Grain**	**1**		**0.6**			
	cf. Panicum	**Grain**	**1**		**0.6**			
	Poaceae	**Grain**	**1**	**1**	**1.2**			
		Stem/leaf					X*	N/A
	Chenopodium cf. berlandieri	**Seed**	**6**	**6**	**7.3**			
	Cheno-Am	**Seed**	**10**	**6$^{\pm}$**	**9.8**			
	Opuntia	**Spine**		**1**	**0.6**			
	Artemisia	**Wood**		**3**	**1.8**			
	Dicotyledoneae	**Seed**	**1**	**1**	**1.2**			
	Unknown	**Wood**		**6**	**3.7**			
	Plant Totals:		**59**		**35.9**	0	0	
	Non-Floral Items:							
	Gastropoda	High-spire				5		N/A
		Low-spire				3		N/A
6E	Volume Floated: 1.06 (liters) Light Fraction Weight: 43.52 (grams)							
	Pinus edulis	**Nut hull**		**5**	**4.7**		3	2.8
		Female cone		**7**	**6.6**			
		Needle		**13**	**12.3**		6	5.7
	***Pinus* sp.**	**3-needle**		**1**	**0.9**		1	0.9
	Pinus	**Male cone**		**1**	**0.9**			
	Pinaceae (*cf. Pinus*)	**Wood**		**19**	**17.9**			
	J. monosperma-type	Twig					1	0.9
	Juniperus	**Wood**		**1**	**0.9**			
	Sporobolus	Grain				15$^{\pm}$		14.2
	Poaceae	Stem/leaf					X*	N/A
	Celtis	Seed				1		0.9
	Chenopodium cf. berlandieri	**Seed**	**12**	**5**	**16.0**		2	1.9
	Cheno-Am	**Seed**	**23**	**16$^{\pm}$**	**36.8**	6		5.7
	Portulaca	Seed				1		0.9
	Rhus cf. trilobata	**Seed**		**4**	**3.8**			
	Opuntia (*Platyopuntia*)	Seed					3**	2.8

Table 36. Middle Archaic Period Macrobotanical Remains (continued)

Feature No.	Plant Taxon or Other Category	Plant Part	Condition & Quantity: Charred Whole	Charred Frag.	Charred PPL	Uncharred Whole	Uncharred Frag.	Uncharred PPL
6E	***Opuntia* (*Cylindropuntia*)**	**Seed**		**1**	**0.9**		4**	3.8
	Verbena cf. bracteata	Seed/nutlet				2*		1.9
	Physalis	Seed				2		1.9
	Dicotyledoneae	Leaf					1	0.9
		Thorn					1	0.9
	Plant Totals:		**108**		**101.7**	49		46.1
	Non-Floral Items:							
	Bone			3	N/A		12	N/A
	Gastropoda	Shell					X	N/A
		High-spire				32	1	N/A
		Low-spire				35	3	N/A
6F	Volume Floated: 1.38 (liters)							
	Light Fraction Weight: 20.39 (grams)							
	Pinus edulis	**Nut hull**		**1**	**0.7**		6	4.3
		Female cone		**1**	**0.7**			
		Needle		**47**	**34.1**		8	5.8
	P. ponderosa	**Needle**		**1**	**0.7**			
	Pinaceae (*cf. Pinus*)	**Wood**		**10**	**7.2**			
	***J. monosperma*-type**	**Twig**		**2**	**1.4**		2	1.4
	Juniperus	**Wood**		**3**	**2.2**			
		Seed					81±	58.7
		Male cone					1	0.7
	Gymnospermae	**Wood**		**6**	**4.3**			
	Sporobolus	Grain				25±		18.1
	Poaceae	**Stem**		**5**	**3.6**			
		Stem/leaf					X*	N/A
	Chenopodium cf. berlandieri	**Seed**	**4**		**2.9**	13		9.4
	Atriplex canescens	Fruit wing					1*	0.7
	Cheno-Am	**Seed**	**15**	**6±**	**15.2**	33±	27±	43.5
	Euphorbia	Seed				1		0.7
	Opuntia (*Platyopuntia*)	Seed					114±**	82.6
	Opuntia (*Cylindropuntia*)	Seed					615±**	445.7
	Opuntia	**Spine**		**3**	**2.2**		3	2.2
	Helianthus	Achene				1		0.7
		Seed coat					2	1.4
	Asteraceae	Achene					2	1.4
	Dicotyledoneae	Seed				1	3	2.9

Table 36. Middle Archaic Period Macrobotanical Remains (continued)

Feature No.	Plant Taxon or Other Category	Plant Part	Condition & Quantity					
			Charred			Uncharred		
			Whole	Frag.	PPL	Whole	Frag.	PPL
6F	Dicotyledoneae	Seed coat					16±	11.6
		Capsule					109±*	79.0
	Unknown	**Wood**		**1**	**0.7**			
	Plant Totals:		**105**		**75.9**	1064		770.8
	Non-Floral Items:							
	Gastropoda	High-spire				13	1	N/A
		Low-spire				11		N/A

[1]Frag. = Fragment (s), [2]PPL = Parts Per Liter, [3]X = present, [4]N/A = Not Applicable, * some items display modern/recent wind-blown plant parts, ** some items display rodent-gnawed, ± estimated count, > greater than

panic grass (*cf. Panicum*), pit seed goosefoot (*Chenopodium cf. berlandieri*), and other goosefoot and/or pigweed species (Cheno-am).

The inventory of identified plant species also demonstrates that multiple activities took place in Shelter 1 during the Middle Archaic period, and that a variety of fuels, foods and possibly fibers was utilized (Figure 60). Abundant fragments of charred wood, needle, and other tree items suggest that most of the thermal features were fueled by pine family (Pinacea [*cf. Pinus*]), pinyon pine, junipers, Rocky Mountain juniper, and one-seed juniper. Seeds from pit-seed goosefoot and other goosefoot/pigweed species indicate that these were the dominant edible plants during the Middle Archaic period occupation, although the quantity of pinyon pine nut hulls and female cones also suggests that pinyon nuts were procured. Other probable food items include grass grains (i.e., drop-seed grass, panic grass), oak acorns, prickly-pear and/or cholla, and sumac. The low numbers of charred Douglas-fir, yucca fiber fragments, probable cactus (cf. Cactaceae) wood, and hedgehog-type cactus seeds in the samples are considered to be of interpretive value. The charred plant remains suggest that utilized plant materials were

Middle Archaic Period

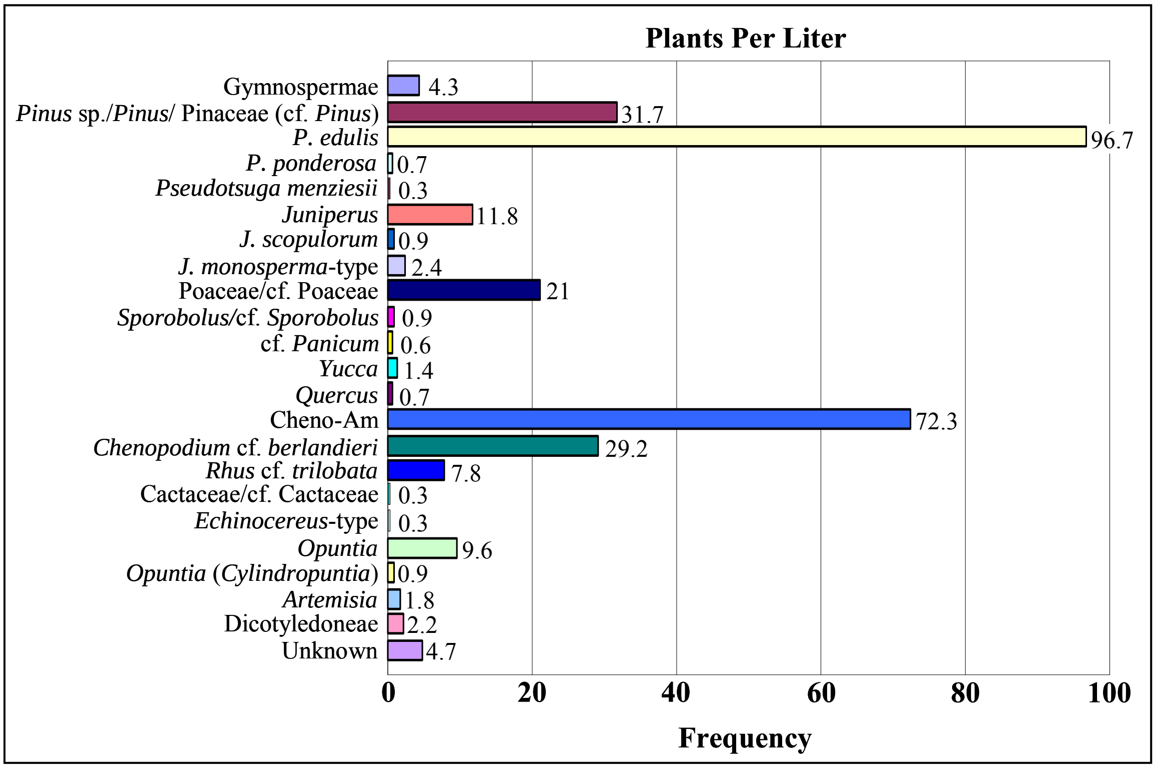

Figure 60. Macrobotanical plant estimates per liter of floated sediment from four samples collected from Middle Archaic period features.

consistent with a hunter-gatherer lifestyle. Plant gathering probably occurred at least during the summer and fall seasons.

Pollen Analysis

Information regarding analysis of Middle Archaic pollen samples is derived from Jones (2003). Two pollen samples, recovered from Shelter 1, Trench A, are associated with the Middle Archaic period component. Analysis from these samples identified a minimum of 15 pollen grains representing various plant taxa. Pollen data for the two samples are presented in Tables 37 and 38. Table 37 provides provenience data for the recovery of each sample, while Table 38 provides the inventory of pollen grains

Table 37. Middle Archaic Period Component Provenience Data for Pollen

Sample	Description	Cat. No.[1]	Shelter No.	Unit No.[2]	Lev	N[3]	E[4]	El.[5]	Context
1	Slab Metate	.437	1	B3	9	95	75	999.30-.11	Above Feature 6E, in Feature 6
2	Slab Metate	.373	1	B2	6	27	43	999.45-.38	Feature 6

[1]Cat. No.- Catalog Number (5FN01592.00-),[2]Unit No.- Excavation Unit Number, [3]N-Northing, [4]E-Easting, [5]El. = Elevation based on site datum relative elevation of 1000 m

identified in each sample. The pollen samples associated with the Middle Archaic period consist of two pollen washes that were selected in the laboratory.

The two pollen samples from the Middle Archaic period yielded similar results. Even though a soil control sample is not present for either of the ground stone artifacts, there are noticeably higher quantities of pollen grains from the goosefoot/pigweed

Table 38. Middle Archaic Period Component Pollen Count and Percentages

Pollen Taxon	Sample No. 1				Sample No. 2			
	Metate (Cat.[2] .373)		Soil Control		Metate (Cat. .437)		Soil Control	
	#[3]	%[4]	#	%	#	%	#	%
Non-Arboreal								
Artemisia (Sage, Sagebrush)	15	7.5			15	7.5		
Low Spine Asteraceae (Ragweed Group)	22	11.0			12	6.0		
Cheno-Am (Goosefoot, Pigweed)	52	26.0			37	18.5		
***Eriogonum* (Desert Buckwheat)**[1]	**1**	**0.5**						
Gentianaceae (Gentian Family)					1	0.5		
Poaceae (Grass Family)	9	4.5			8	4.0		
Polemoniaceae (Phlox Family)					1	0.5		
Polygonaceae (Knotweed Family)	2	1.0						
Rosaceae (Rose Family)	**1**	**0.5**						
Arboreal								
Juniperus (Juniper)	61	30.5			38	19.0		
Picea (Spruce)					2	1.0		
Pinus (Pine)	24	12.0			80	40.0		
***Prunus* (Plum, Cherry)**					**1**	**0.5**		
Quercus (Oak)	2	1.0						
Salix (Willow)	1	0.5						
Indeterminate	10	5.0			5	2.5		
Total	200	100			200	100		
Concentration Value	N/A		N/A		N/A		N/A	

[1] Plant taxon in bold face represents potential economic types according to Jones (2003), [2]Cat.=Catalog Number (5FN01592.00-), [3] #=Pollen Grain Count, [4]%=Percent

species, juniper, and pine. These significantly higher grain counts are from plants that disperse pollen by wind currents. Since wind-pollinated plants produce abundant pollen grains that travel great distances on airstreams, they are not considered an accurate representation of an archaeobotanic resource. Economic plant types identified in the washes are desert buckwheat (.373), rose family, and plum or cherry (.437). These taxa display very low pollen grain counts and could represent pollen that was introduced by insects and/or animals rather than by human utilization.

Pollen wash results from the Middle Archaic lack evidence to suggest that these ground stone items were utilized for processing plant resources. Pollen is indicative of a pinyon-juniper environment, similar to that of the present day.

Late Archaic Period: The Late Archaic period is identified in the middle portions of Trench B, Shelter 1 and the lower portion of Trench A, Shelter 2 (Figures 34 and 35, Tables 7 and 8). Identification of this temporal period was based on the three radiocarbon dates recovered from hearths or hearth-like features, and the feature boundaries in relation to the stratigraphic layers of the shelter (see Chronology and Temporal Age Assessments). The recovered specimens of the Late Archaic period are significant in terms of numbers when compared to the entire site assemblage. This is mainly because earlier radiocarbon dates, of the Middle Archaic period, could not separate the lower portions of deposits in Trench A, thus a greater number of items were assigned to the Late Archaic period (Table 7 and Figure 34). There are five features associated with this component, including the two large sheet middens (see Baseline Data: Features Transcending Temporal Periods). Compared to the total recovered artifacts from the 2002 excavation, the cultural materials of the Late Archaic period make up 40.4% of the total debitage count, 39.6% of the total flaked stone tools, 32.7% of the total ground stone, 30.8% of the total faunal artifacts. One manuport is also included. The faunal remains make up 34.6% of the entire assemblage. Of the sampled subsistence-related remains submitted from the site, 23.1% of the total macrobotanical samples are and 57.9% of the pollen samples from the Late Archaic period.

Feature Descriptions

Five features are identified in the Late Archaic period component. The only feature identified in Shelter 1/Trench B for the Late Archaic period is Feature 6, a sheet midden, while the lower portion of the Feature 5 sheet midden is present in Shelter 2. These sheet middens have been described previously (see Features Transcending Temporal Periods). Feature 5A is a basin-shaped roasting pit that is directly associated with Feature 5. The remaining two features, also located within Shelter 2/Trench A, are variations of hearth-type features. Feature 7 is a slab-lined, basin-type hearth, while Feature 8 appears to be a deteriorated vertical slab-walled hearth.

Feature 5A

Feature 5A is a basin-shaped roasting pit. It is located in the northern portion of Trench A, along the line that separates Grid Units A2 and A3 (Figure 61 and 62). The western portion of the feature was not identified in Grid Unit A3 and the feature fill was excavated with the rest of the general sediment in Levels 6 – 8. At approximately 58 cm BMGS, the top of the feature was identified near the middle of Level 7 in Grid Unit A2, and the feature continued throughout Levels 8 and 9. Only the southern half of this roasting pit was excavated. As viewed from the north wall of the trench the excavated portion measures approximately 40 cm N/S x 60 cm E/W. The circular shape in plan

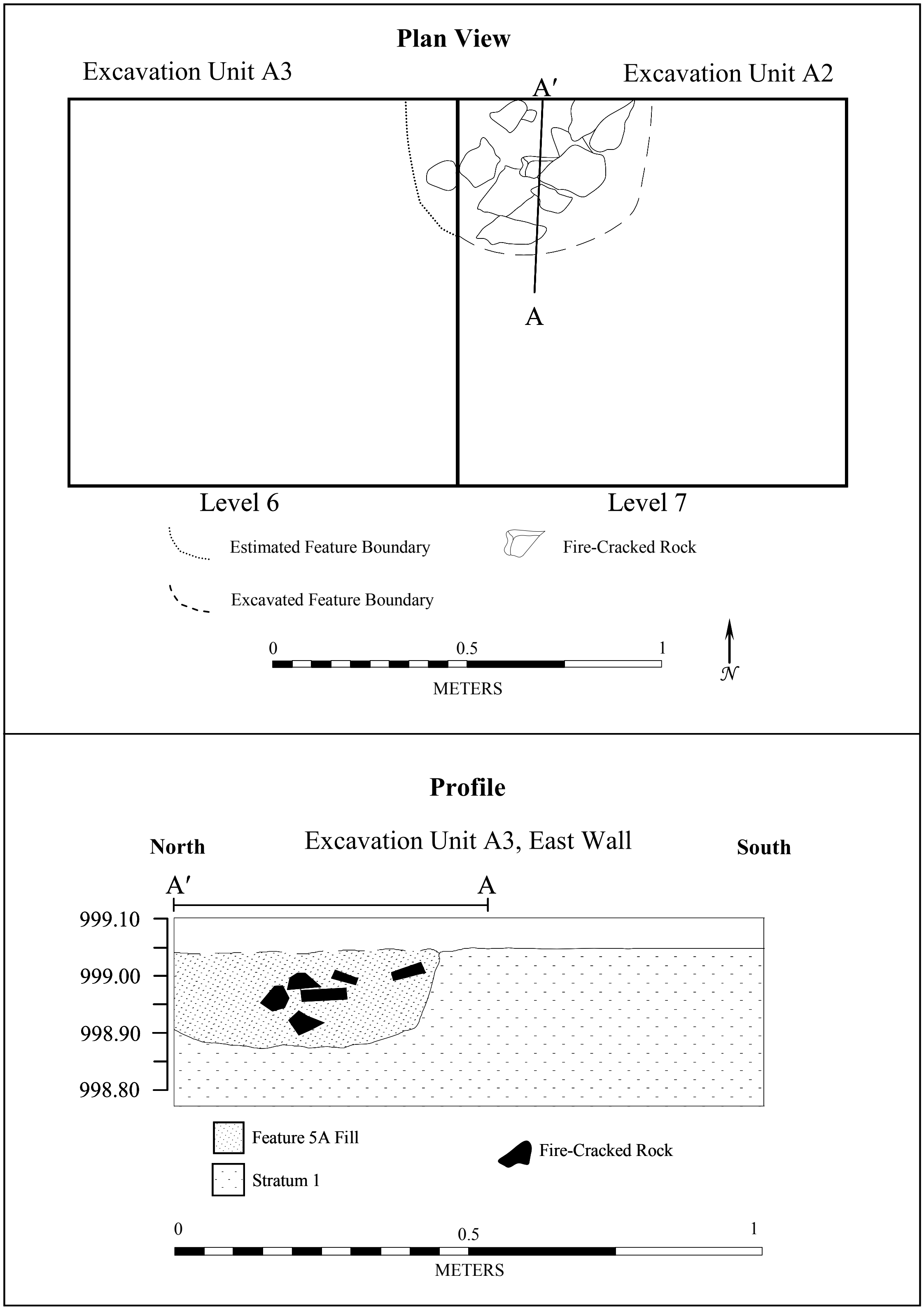

Figure 61. Feature 5A plan map and profile.

Figure 62. Feature 5A exposed at base of Level 7, Excavation Unit A2. North arrow is 25 cm in length. Large roof spalls are to the right of the arrow and indicate a moist climatic episode.

view and basin profile suggests that the feature in its entirety is approximately 60 cm in diameter and 22 cm thick. Situated at the base of Stratum 4, the loose and rich black (7.5YR2.5/1) sandy silt sediment of Feature 5A clearly intrudes into the compact brown (7.5YR5/4) sediment of Stratum 1, visible along the eastern edge of the feature, while the pink (7.5YR8/3) sandy sediment of Stratum 2 defines the western boundary. The feature fill consists mainly of highly fractured and heat-altered, cobble-sized sandstone (≥ 10 cm diameter); tiny pieces of charcoal and soot from the sediment coat the sandstone. The roasting pit is well preserved and evidence of disturbance is minimal, consisting of a few notable rodent burrows. A macrobotanical sample from the feature produced 37 charred remains that suggest utilization of plant material. Two ground stone fragments and 13 pieces of debitage were collected from the southeastern portion of the feature including. Additional items from the heavy fraction include 76 general faunal remains including 13 calcined bone items (Table 39). Most of the bone and debitage is from the heavy fraction

Table 39. Faunal Specimens Recovered from Late Archaic Period Features[1]

Feature	Taxa	Total Count	Burn[2] Burned	Burn[2] Calcined
5A	**Mammal**			
	Indeterminate very small sized mammal	1		
	Indeterminate mammal	2		
	Sylvilagus sp.	2		
	cottontail			
	Indeterminate Vertebrate	71		11
	Total	76		11
Feature **7**	**Bird**			
	Eggshell	2		
	Mammal			
	Indeterminate small sized mammal	1		
	Indeterminate medium mammal	1	1	
	Citellus sp.	1		
	ground squirrel			
	Indeterminate very small sized rodent	2		
	Neotoma sp.	3		
	packrat			
	Indeterminate Vertebrate	71	1	7
	Total	81	2	7
Feature **8**	**Amphibian**			
	Caudata	1		
	salamander			
	Reptile			
	Indeterminate Scaled Reptile	1		
	Mammal			
	Indeterminate very small sized mammal	7		3
	Indeterminate small sized mammal	2		2
	Indeterminate mammal	3		2
	Indeterminate very small sized rodent	2		
	Peromyscus sp.	1		
	deer mice			
	Indeterminate Vertebrate	121		16
	Total	138		23

[1]Gastropodia not included [2]Burn attributes do not include indeterminate bulk bone counts

of the flotation sample. This roasting pit is adjacent to Feature 5, and makes up the lowest and westernmost edge of the sheet midden deposit (see Feature 5). Similarly, Features 6 and 6E in Shelter 1 are similar in character to Feature 5 and 5A (see Middle Archaic period and Figure 31).

Feature 7

Feature 7 is a slab-lined, basin-shaped hearth (Figures 63, 64, and 65). The southern half of this feature was excavated in the northern portion of Level 7 in Grid Unit A4, and the remaining half can be observed in the northern wall. The southern portion of this hearth is circular in shape, measuring 33 cm N/S x 53 cm E/W in plan view. Exposed in Stratum 3, at a depth of 55 cm BMGS, the matrix of the hearth intrudes into the pink (7.5YR7/3-7/4) Stratum 2 deposit. The hearth is 13 cm thick and the western base of the feature abuts the shale bedrock. The feature fill consists of a black (10YR2/1) and unconsolidated sandy silt sediment with moderate charcoal flecking. The boundary of the feature fill is defined by an ash stain and a shallow basin lining of sandstone slabs, angular sandstone slab fragments and granitic river cobbles. These rocks were arranged in a flat and shallow rock lining, intermixed with and possibly overlying a charcoal lens, which suggests that the rocks were utilized as a possible cooking surface. The stream cobbles (.346, .347), brought into the site from a remote location, lightly ground and battered beyond the natural processes that typically occur in alluvial-derived stone materials. Charcoal collected from the hearth yielded a conventional radiocarbon age of 2230±80 B.P. (Table 6). A macrobotanical sample fill yielded 285 charred plant remains (see Macrobotanical Remains). There were two complete manos and 13 pieces of debitage collected from the fill. Additional items included 81 general faunal remains,

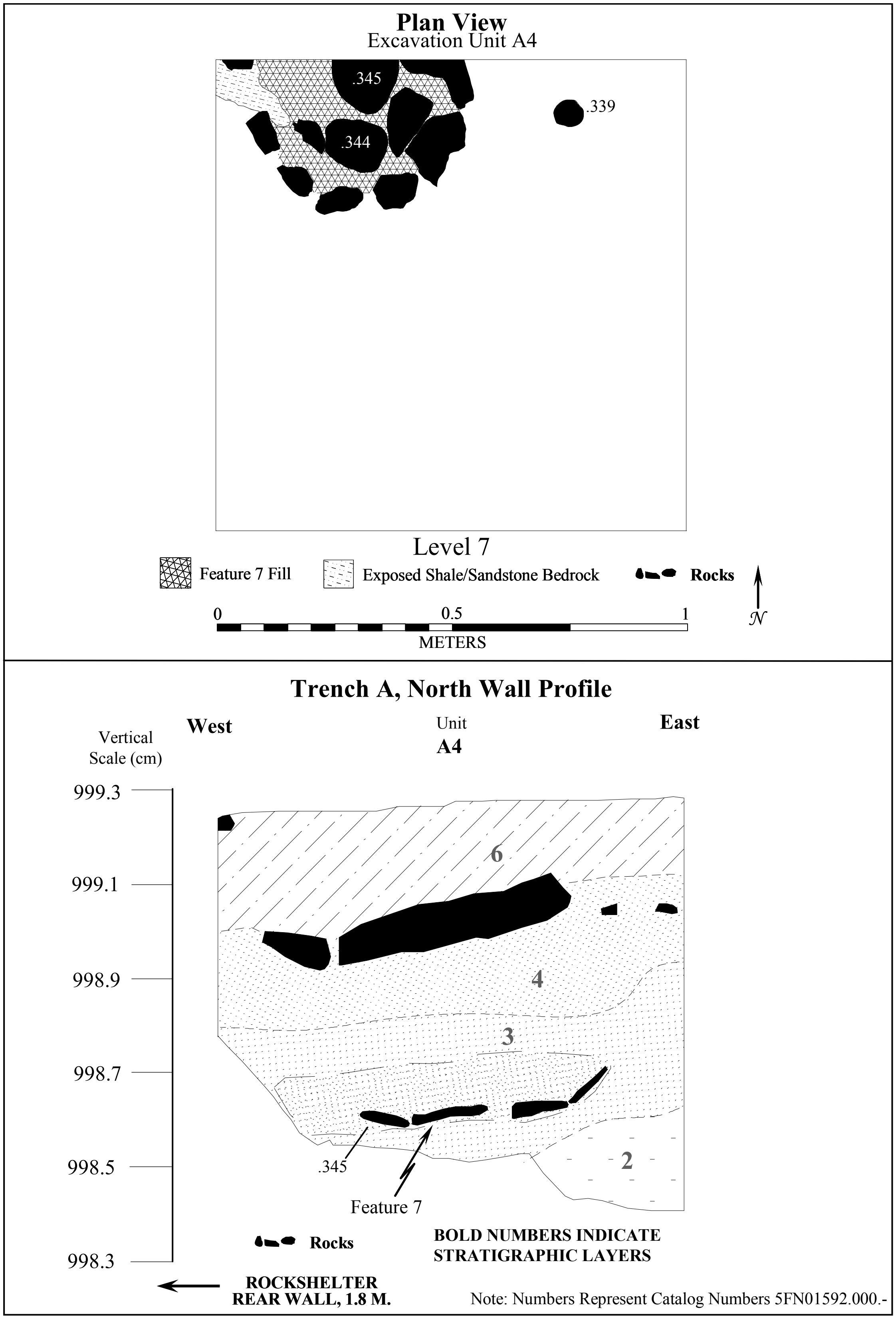

Figure 63. Feature 7 plan map and profile.

Figure 64. Feature 7, oblique overview. North arrow is 25 cm in length.

Figure 65. Feature 7, oblique profile facing north-northeast.

nine of which are burned and/or calcined (Table 39). Most of the bone and debitage is from the heavy fraction of the flotation sample.

Feature 8

Feature 8 is a concentration of sandstone slabs that probably represents a deteriorated vertical slab-walled hearth. This slab concentration is located in Levels 6-8 of Grid Unit A4 (Figure 66 and 67). The feature was exposed at a depth of 50 cm BMGS in Stratum 4 and extends to a depth of 22 cm, where the base rests on top of the shale and sandstone bedrock layer. The boundary is irregular; the feature measures 38 cm N/S x 26 cm E/W in plan view. The feature consists of generally large angular slabs ranging between 6 and 22 cm long and 1.5 cm thick. The slabs are arranged in a circular configuration with the three southern pieces angling inward at an approximate 35º angle (as measured from the vertical). Only the eastern half of the feature appears to have been exposed as most of the slabs are slightly depressed toward the central region of the hearth, along the western wall of Grid Unit A4. The southern slabs in particular angle northwest into the central portion of the feature. Hearth fill is a black (10YR2/1) sandy silt with a higher charcoal concentration than the surrounding. A macrobotanical sample was collected from the area of ash stained sediment; the remainder of the exposed feature was screened through a standard 1/8-inch screen during general level excavations. The macrobotanical sample yielded 632 charred botanical remains (see Macrobotanical Remains). Items in the heavy fraction included 21 pieces of debitage and 138 general faunal remains, 23 of which are calcined (Table 39). Small pieces of charcoal were collected from an ash stain between two of the slabs and required accelerated mass spectrometry (AMS) analysis for radiocarbon dating. The charcoal yielded a

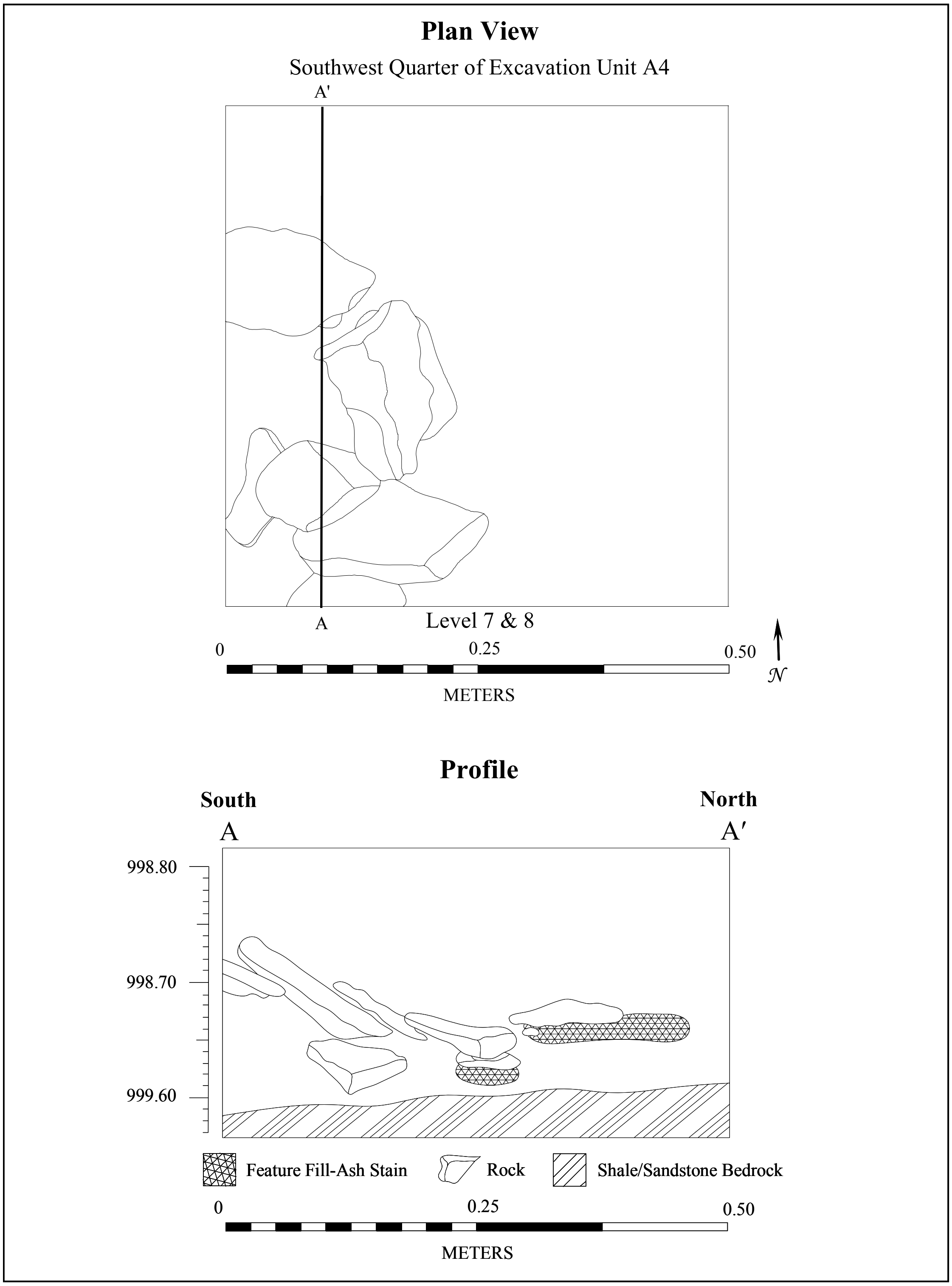

Figure 66. Feature 8 plan map and profile.

Figure 67. Feature 8, oblique overview. North arrow is 25 cm in length.

conventional radiocarbon age of 3010±40 B.P., suggesting that the feature dates to the transitional Middle Archaic/Late Archaic period (Table 6).

Material Culture

Lithic Material

Lithic materials of the Late Archaic period component include flaked stone and ground/battered stone items. The following data indicate that the occupants during this period were exploiting more distant, fine-grained, materials to the extent that most of the artifacts are heavily fragmented. Coarse-grained quartzitic materials near the site were utilized less often.

Flaked Stone

A total of 1138 debitage specimens and 38 flaked stone tools were recovered from the Late Archaic period component at the Gilligan's Island site. The stone data indicates that the inhabitants produced a range of lithic tools; however, middle to late stage reduction was generally emphasized. Larger tools and flakes that generally indicate early-stage reduction are uncommon and are made of quartzite.

Debitage

The Late Archaic debitage is made up of 1138 specimens, of which 768 were collected in the field by standard screen and 370 specimens from waterscreen samples. The standard and waterscreen samples were analyzed separately through the entire analytical procedures, which included both mass analysis and platform-bearing flakes. The initial data derived from the debitage indicates that 81 specimens are debris or shatter items, which lack definable flake attributes such as a platform, bulb of percussion, or feathered termination. During the mass analysis, both the standard and waterscreen samples were sorted through a series of nested screens with various screen sizes, and the flakes were categorized according to size grade.

Tables 40 and 41 summarize the results of the mass analysis for the individual excavation trenches in each shelter, and combine the results of the two shelters for the entire Late Archaic period component. The size grades in these tabulations are categorized by material type and represent flake sizes in stone tool production, during which the objective piece or stone tool decreases in size throughout tool manufacture, as do the discarded flakes that were produced during manufacture (Andrefsky 1998:126). The combined totals of the standard screen data in Table 40 reveal that the dominant material utilized is chert, followed by quartzite, while the remaining samples make up less than 13% of the 768-item inventory. The largest quantity of debitage is associated with the two smallest noncortical size grades 3 and 4, indicating that the later stages of reduction are mainly represented. Size grades 1 and 2, representing the early and middle

Table 40. Mass Debitage Analysis Summary of Late Archaic Period: Standard 1/8-inch Screen

	MATERIAL TYPE	SIZE GRADE FREQUENCIES								TOTALS	
		1 (Large)		2 (Medium)		3 (Small)		4 (Micro)			
		Cortex	No Cortex	Cortex	No Cortex	Cortex	No Cortex	Cortex	No Cortex	Freq.	Column Percent
TRENCH A	**Chert**	0	0	7	8	27	106	13	137	**298**	**76.4**
	Chalcedony	0	0	0	0	1	3	0	2	**6**	**1.5**
	Quartzite	4	3	5	6	2	24	1	18	**63**	**16.1**
	Basalt	1	0	0	0	0	0	0	0	**1**	**<1.0**
	Quartz	0	0	1	0	1	1	0	0	**3**	**<1.0**
	Petrified Wood	0	0	0	0	1	8	0	7	**16**	**4.1**
	Quartz Crystal	0	0	0	0	0	0	0	3	**3**	**<1.0**
	TOTAL COUNTS	**5**	**3**	**13**	**14**	**32**	**142**	**14**	**167**	**390**	**100**
	ROW PERCENTAGES	**1.2**	**<1.0**	**3.3**	**3.5**	**8.2**	**36.4**	**3.5**	**42.8**	**100**	
TRENCH B	**Chert**	0	1	5	10	21	65	16	150	**268**	**70.8**
	Chalcedony	0	0	0	0	0	1	0	1	**2**	**<1.0**
	Quartzite	2	4	10	8	7	25	3	15	**74**	**19.5**
	Siltstone	0	0	1	0	0	0	1	0	**2**	**<1.0**
	Sandstone	0	0	0	1	0	0	0	0	**1**	**<1.0**
	Quartz	0	0	3	0	0	3	0	6	**12**	**3.2**
	Petrified Wood	0	0	0	0	2	3	0	11	**16**	**4.2**
	Quartz Crystal	0	0	0	0	0	0	0	2	**2**	**<1.0**
	Rhyolite	0	0	0	1	0	0	0	0	**1**	**<1.0**
	TOTAL COUNTS	**2**	**5**	**19**	**20**	**30**	**97**	**20**	**185**	**378**	**100**
	ROW PERCENTAGES	**<1.0**	**1.3**	**5.0**	**5.3**	**7.9**	**25.7**	**5.3**	**48.9**	**100**	
COMBINED TOTALS	**Chert**	0	1	12	18	48	171	29	287	**566**	**73.7**
	Chalcedony	0	0	0	0	1	4	0	3	**8**	**1.0**
	Quartzite	6	7	15	14	9	49	4	33	**137**	**17.8**
	Basalt	1	0	0	0	0	0	0	0	**1**	**<1.0**
	Siltstone	0	0	1	0	0	0	1	0	**2**	**<1.0**
	Sandstone	0	0	0	1	0	0	0	0	**1**	**<1.0**
	Quartz	0	0	4	0	1	4	0	6	**15**	**2.0**
	Petrified Wood	0	0	0	0	3	11	0	18	**32**	**4.2**
	Quartz Crystal	0	0	0	0	0	0	0	5	**5**	**<1.0**
	Rhyolite	0	0	0	1	0	0	0	0	**1**	**<1.0**
	TOTAL COUNTS	**7**	**8**	**32**	**34**	**62**	**239**	**34**	**352**	**768**	**100**
	ROW PERCENTAGES	**<1.0**	**1.0**	**4.2**	**4.4**	**8.1**	**31.1**	**4.4**	**45.8**	**100**	

Table 41. Mass Debitage Analysis Summary of Late Archaic Period: 1/16-inch Waterscreen

	MATERIAL TYPE	SIZE GRADE FREQUENCIES								TOTALS	
		1 (Large)		2 (Medium)		3 (Small)		4 (Micro)			
		Cortex	No Cortex	Cortex	No Cortex	Cortex	No Cortex	Cortex	No Cortex	Freq.	Column Percent
TRENCH A	Chert	0	0	1	1	3	24	0	133	**162**	**74.6**
	Chalcedony	0	0	0	0	0	1	0	0	**1**	**<1.0**
	Quartzite	1	0	7	4	2	5	1	19	**39**	**17.9**
	Basalt	0	0	0	0	0	1	0	0	**1**	**<1.0**
	Sandstone	0	0	0	0	1	0	0	0	**1**	**<1.0**
	Quartz	0	0	0	0	0	0	0	4	**4**	**1.8**
	Petrified Wood	0	0	0	1	0	0	0	6	**7**	**3.2**
	Quartz Crystal	0	0	0	0	0	0	0	2	**2**	**<1.0**
	TOTAL COUNTS	**1**	**0**	**8**	**6**	**6**	**31**	**1**	**164**	**217**	**100**
	ROW PERCENTAGES	**<1.0**	**0.0**	**3.6**	**2.7**	**2.7**	**14.2**	**<1.0**	**75.5**	**100**	
TRENCH B	Chert	1	0	1	0	0	9	4	97	**112**	**73.2**
	Chalcedony	0	0	0	0	0	0	0	2	**2**	**1.3**
	Quartzite	1	0	1	0	2	6	1	18	**29**	**19.0**
	Quartz	0	0	0	0	0	0	0	3	**3**	**2.0**
	Petrified Wood	0	0	0	0	0	0	0	7	**7**	**4.6**
	TOTAL COUNTS	**2**	**0**	**2**	**0**	**2**	**15**	**5**	**127**	**153**	**100**
	ROW PERCENTAGES	**1.3**	**0.0**	**1.3**	**0.0**	**1.3**	**9.8**	**3.3**	**83.0**	**100**	
COMBINED TOTALS	Chert	1	0	2	1	3	33	4	230	**274**	**74.1**
	Chalcedony	0	0	0	0	0	1	0	2	**3**	**<1.0**
	Quartzite	2	0	8	4	4	11	2	37	**68**	**18.4**
	Basalt	0	0	0	0	0	1	0	0	**1**	**<1.0**
	Sandstone	0	0	0	0	1	0	0	0	**1**	**<1.0**
	Quartz	0	0	0	0	0	0	0	7	**7**	**1.9**
	Petrified Wood	0	0	0	1	0	0	0	13	**14**	**3.8**
	Quartz Crystal	0	0	0	0	0	0	0	2	**2**	**<1.0**
	TOTAL COUNTS	**3**	**0**	**10**	**6**	**8**	**46**	**6**	**291**	**370**	**100**
	ROW PERCENTAGES	**<1.0**	**0.0**	**2.7**	**1.6**	**2.2**	**12.4**	**1.6**	**78.6**	**100**	

stages of reduction, have far less debitage than the smaller two size categories. Size grade 2 debitage is mainly represented by equal distributions of cortical and noncortical chert and quartzitic materials, while the largest specimens in size grade 1 are dominated by quartzite with a nearly equal distribution of cortical and noncortical attributes. This same pattern is represented in the standard screen samples in both of the shelter trenches, with very little variation in material types, size grades, and cortex attributes. The waterscreen results in Table 41 differ only slightly from those of the standard screen. These samples share the same distributions among material types and size grades.

The attributes of the standard and waterscreen samples indicate that while early- and middle-stage reduction was accomplished at the site, the later stages are represented most often. This suggests that most of the lithic materials brought to the Gilligan's Island site during the Late Archaic period were previously manufactured items. The large frequency of smaller flakes versus the limited number of larger debitage items is most indicative of terminal reduction stages and tool maintenance. Some early stage reduction of quartzitic materials appears to have occurred periodically, but these materials were probably derived mainly from local resources. The limited number of large quartzitic flakes reveals that this practice was not as common as late-stage reduction.

The platform-bearing flake sample is used to explore whether quartzitic materials were fully manufactured from the initial core and reduced to make bifaces and flake tools. The platformed flake sample is a subset of the debitage assemblage, which utilizes those flakes that have striking platform. These items are analyzed by a series of subjective observations to infer which technique was used for lithic manufacture. The analytical processes of selection are discussed in Chapter 5. The platform flake sample for the Late Archaic period component consists of 485 items or nearly 43% of the debitage assemblage. Table 42 shows the distribution of cortical and noncortical flakes representing hard hammer and bifacial thinning technologies from the excavation units in Trench A, Shelter 2 and Trench B, Shelter 1, as well as the combined total of the entire component from both shelters (Kalasz et al. 2005:78). The tabulated results are based on a chi-square test that was selected to show a 95% confidence interval. These data demonstrate that of the combined total, 67.0% of the hard hammer flakes lack a cortex and 96.8% of the bifacial thinning flakes are noncortical. The separate data from each of the shelters show that both the hard hammer and bifacial thinning flakes have fewer cortical flakes. The low percentages of cortex in each technology can be correlated with the mid to late stages of core reduction and biface manufacture.

The data in Tables 43 and 44 are used to determine whether the different material types in the debitage assemblage vary between hard hammer and bifacial thinning

Table 42. Late Archaic Period Platformed Flake Summary (Standard 1/8-inch Screen and 1/16-inch Waterscreen Total Sample): Cortex by Technological Flake Type

	CORTEX	HARD HAMMER		BIFACIAL THINNING		TOTALS	
		Freq.	Col. pct	Freq.	Col. pct	Freq.	Col. pct
TRENCH A	Present	45	37.5	5	3.9	**50**	**20.1**
	Absent	75	62.5	124	96.1	**199**	**79.9**
	TOTALS	**120**	**100**	**129**	**100**	**249**	**100**
TRENCH B	Present	43	29.3	2	2.2	**45**	**19.1**
	Absent	104	70.7	87	97.8	**191**	**80.9**
	TOTALS	**147**	**100**	**89**	**100**	**236**	**100**
Combined Trench TOTALS	Present	**88**	**33.0**	**7**	**3.2**	**95**	**19.6**
	Absent	**179**	**67.0**	**211**	**96.8**	**390**	**80.4**
	TOTALS	**267**	**100**	**218**	**100**	**485**	**100**

Test Statistics for Cortex by Technological Flake Type:
Trench A: Chi-square = 43.797; degrees of freedom = 1; prob.= 0.00
Trench B: Chi-square = 26.197; degrees of freedom = 1; prob.= 0.00
Total: Chi-square= 67.427; degrees of freedom= 1; prob.= 0.00

Table 43. Platformed Flake Summary of Late Archaic Period (Standard 1/8-inch Screen): Material Type by Flake Type

	MATERIAL TYPE	HARD HAMMER		BIFACIAL THINNING		TOTALS	
		Freq.	Col. pct	Freq.	Col. pct	**Freq.**	**Col. pct**
TRENCH A	**Chert**	60	62.5	69	87.3	**129**	**73.7**
	Chalcedony	1	1.0	2	2.5	**3**	**1.7**
	Quartzite	30	31.3	5	6.3	**35**	**20.0**
	Basalt	1	1.0	0	0.0	**1**	**<1.0**
	Petrified Wood	4	4.2	2	2.5	**6**	**3.4**
	Quartz Crystal	0	0.0	1	1.3	**1**	**<1.0**
	TOTALS	**96**	**100**	**79**	**100**	**175**	**100**
TRENCH B	**Chert**	88	65.7	36	90.0	**123**	**70.7**
	Chalcedony	1	<1.0	0	0.0	**2**	**1.2**
	Quartzite	36	26.9	2	5.0	**38**	**21.8**
	Siltstone	1	<1.0	0	0.0	**1**	**<1.0**
	Quartz	2	1.5	0	0.0	**2**	**1.2**
	Petrified Wood	6	4.5	2	5.0	**8**	**4.6**
	TOTALS	**134**	**100**	**40**	**100**	**174**	**100**
Combined Trench TOTALS	**Chert**	**148**	**64.3**	**105**	**88.2**	**253**	**72.5**
	Chalcedony	**2**	**<1.0**	**2**	**1.7**	**4**	**1.1**
	Quartzite	**66**	**28.7**	**7**	**5.9**	**73**	**20.9**
	Basalt	**1**	**<1.0**	**0**	**0.0**	**1**	**<1.0**
	Siltstone	**1**	**<1.0**	**0**	**0.0**	**1**	**<1.0**
	Quartz	**2**	**<1.0**	**0**	**0.0**	**2**	**<1.0**
	Petrified Wood	**10**	**4.3**	**4**	**3.4**	**14**	**4.0**
	Quartz Crystal	**0**	**0.0**	**1**	**<1.0**	**1**	**<1.0**
	TOTALS	**230**	**100**	**119**	**100**	**349**	**100**

technologies (Kalasz et al. 2005:78). These data are presented for both of the trenches in each shelter. This subset of the platformed flake analysis is split according to the standard 1/8-inch screens and 1/16-inch waterscreen sample. The combined trench totals indicate that the dominant material types identified in the platformed flake analysis for the standard screen consist of chert (72.5%) and quartzite (20.9%). These are also the leading materials in the mass debitage assemblage described above (Table 40). Again, in

Table 44. Platformed Flake Summary of Late Archaic Period (1/16-inch Waterscreen): Material Type by Flake Type

	MATERIAL TYPE	HARD HAMMER		BIFACIAL THINNING		TOTALS	
		Freq.	Col. pct	Freq.	Col. pct	Freq.	Col. pct
TRENCH A	Chert	10	41.7	41	82.0	**51**	**68.9**
	Chalcedony	0	0.0	1	2.0	**1**	**1.4**
	Quartzite	14	58.3	5	10.0	**19**	**25.7**
	Petrified Wood	0	0.0	2	4.0	**2**	**2.7**
	Quartz Crystal	0	0.0	1	2.0	**1**	**1.4**
	TOTALS	**24**	**100**	**50**	**100**	**74**	**100**
TRENCH B	Chert	7	53.8	39	79.6	**46**	**74.2**
	Quartzite	6	46.2	6	12.2	**12**	**19.4**
	Petrified Wood	0	0.0	4	8.2	**4**	**6.4**
	TOTALS	**13**	**100**	**49**	**100**	**62**	**100**
Combined Trench TOTALS	Chert	**17**	**45.9**	**80**	**80.8**	**97**	**71.3**
	Chalcedony	**0**	**0.0**	**1**	**1.0**	**1**	**<1.0**
	Quartzite	**20**	**54.1**	**11**	**11.1**	**31**	**22.8**
	Petrified Wood	**0**	**0.0**	**6**	**6.1**	**6**	**4.4**
	Quartz Crystal	**0**	**0.0**	**1**	**1.0**	**1**	**<1.0**
	TOTALS	**37**	**100**	**99**	**100**	**136**	**100**

the combined platformed flake summary of the standard screen, chert is best represented among both the hard hammer or bifacial thinning flakes, while the next most common material type, quartzite, and all of the remaining materials are more prevalent in the hard hammer category. The waterscreen sample indicates that finer-grained materials, such as chert, petrified wood, and quartz crystal, occur mainly within the bifacial thinning flake category. However, when the weights for the complete platformed flakes from both the standard and wasterscreen samples are compared, it is apparent 165 of the complete chert size grade 4 flakes weighed less than 1.0 g each (Table 45). This suggests that these small fine-grained microflakes or pressure flakes were created when the objective tool was being reduced during the later stages of manufacture. This concept is probably

Table 45. Late Archaic Period Complete Platformed Flake Size Summary (Standard 1/8-inch Screen and 1/16-inch Screen): Size Grades and Weights for Major Material Type Groups[1]

	SIZE GRADE	DESCRIPTIVE STATISTICS	Complete Flake Size Weight (grams)	
			CHERT	QUARTZITE
COMBINED TRENCH TOTALS	1 (Large Debitage)	N	**2**	**18**
		Minimum	11.000	9.900
		Maximum	12.200	79.300
		Mean	11.600	33.183
		Standard Deviation	0.849	21.702
	2 (Medium Debitage)	N	**21**	**35**
		Minimum	1.200	1.500
		Maximum	9.900	19.700
		Mean	3.957	5.894
		Standard Deviation	2.741	4.376
	3 (Small Debitage)	N	**119**	**44**
		Minimum	0.100	0.100
		Maximum	1.400	4.000
		Mean	0.383	0.680
		Standard Deviation	0.304	0.731
	4 (Micro Debitage)	N	**165**	**24**
		Minimum	N/A	0.100
		Maximum	N/A	0.200
		Mean	N/A	0.104
		Standard Deviation	N/A	0.020

[1] Weight for some size grade 4 specimens could not be read on digital scale.

applicable to the other finer-grained materials, even though the frequencies are far too small to be of interpretive value.

The combined platformed flake data for the standard screen suggests that chert was utilized primarily during both hard hammer reduction and bifacial thinning processes. When the 253 chert specimens are compared in terms of hard hammer (n=148, 58.5%) versus bifacial thinning (n=105, 41.5%) technologies, it is evident that the hard hammer approach is more prevalent. Hard hammer attributes also occur in high frequencies on quartzite (n=66, 90.4%), indicating that the quartzitic materials were subject to hard hammer technology for core reduction and early to middle stages of biface manufacture. While chert was most often used for hard hammer reductions, bifacial thinning was also utilized. However, when the combined 350-item platformed flake assemblage from both the standard (n=253) and waterscreen (n=97) samples examined in terms of compared to the complete platformed flake weight, it is apparent that 165 (47% of the entire platformed flake assemblage) weigh less than 1.0 g. This again suggests that a large proportion of the bifacial thinning flakes recorded in the analysis represent microflakes or pressure flakes produced during the later stages of reduction, or when the stone tools were retouched and sharpened. This is supported by the 97 chert flake specimens from the waterscreen sample, of which 80 are bifacial thinning flakes (82.5%) compared to 17 hard hammer flakes (17.5%).

In summary, the mass debitage analysis indicates that chert was the dominant material on the site. Chert and the other lithic materials from more distant sources entered the shelters in a reduced state, perhaps displaying the middle to later stages of core reduction and tool manufacture. Hard hammer reduction and bifacial thinning have a greater representation among noncortical flakes in the collection, which is indicative of a secondary stage of reduction. The platformed analytical data do not suggest that artifacts quartzite or any of the other lithic material types were fully manufactured on the site. Even though quartzite is a more localized resource, the large number of hard hammer flakes compared to the limited number of bifacial thinning flakes suggests that the latter were limited to early- to middle- stage reduction. Chert shows nearly equal distribution between the two technologies; however, the high number of low weight flakes indicates that limited reduction of finer and more distantly available materials occurred. These data suggest that the Late Archaic occupants at the Gilligan's Island shelters maintained an inventory of generally fine-grained tools prepared before entering the site, probably representative of the middle to late stages of production. These items seem to have been reduced periodically, but final stone tool manufacture does not appear to have been a significant activity while in the shelters. However, locally available quartzitic materials were subjected to an early- to middle- stage reduction and were perhaps utilized as supplements for minor tasks. The earlier stages of reduction for this material do not indicate that it was prepared for transport away from the site. The interpretations of the debitage assemblage for the Late Archaic component remain tentative since the sample is small.

Flaked Stone Tools

Thirty-eight flaked stone tools are assigned to the Late Archaic period (Figures 68 and 69). Table 46 provides an inventory of the assemblage; bifaces are the most abundant, followed by flake tools and finally heavier items such as cores. The stone material type distribution appears to be similar to that of the debitage sample. Chert is the dominant material followed by quartzite, petrified wood, and basalt.

Bifaces in the flaked stone tool assemblage represent the greatest investment of time during the manufacturing process. Eighteen bifaces were recovered from the Late Archaic component and include both unhafted and hafted items. Unhafted bifaces consist of one early stage biface, one middle stage biface, five late stage bifaces, and five bifaces that were too fragmented to confidently determine the stage of reduction. Only a single middle stage quartzite biface is complete, while the remaining hafted and unhafted items were incomplete. The majority of the bifaces are manufactured from chert, while the

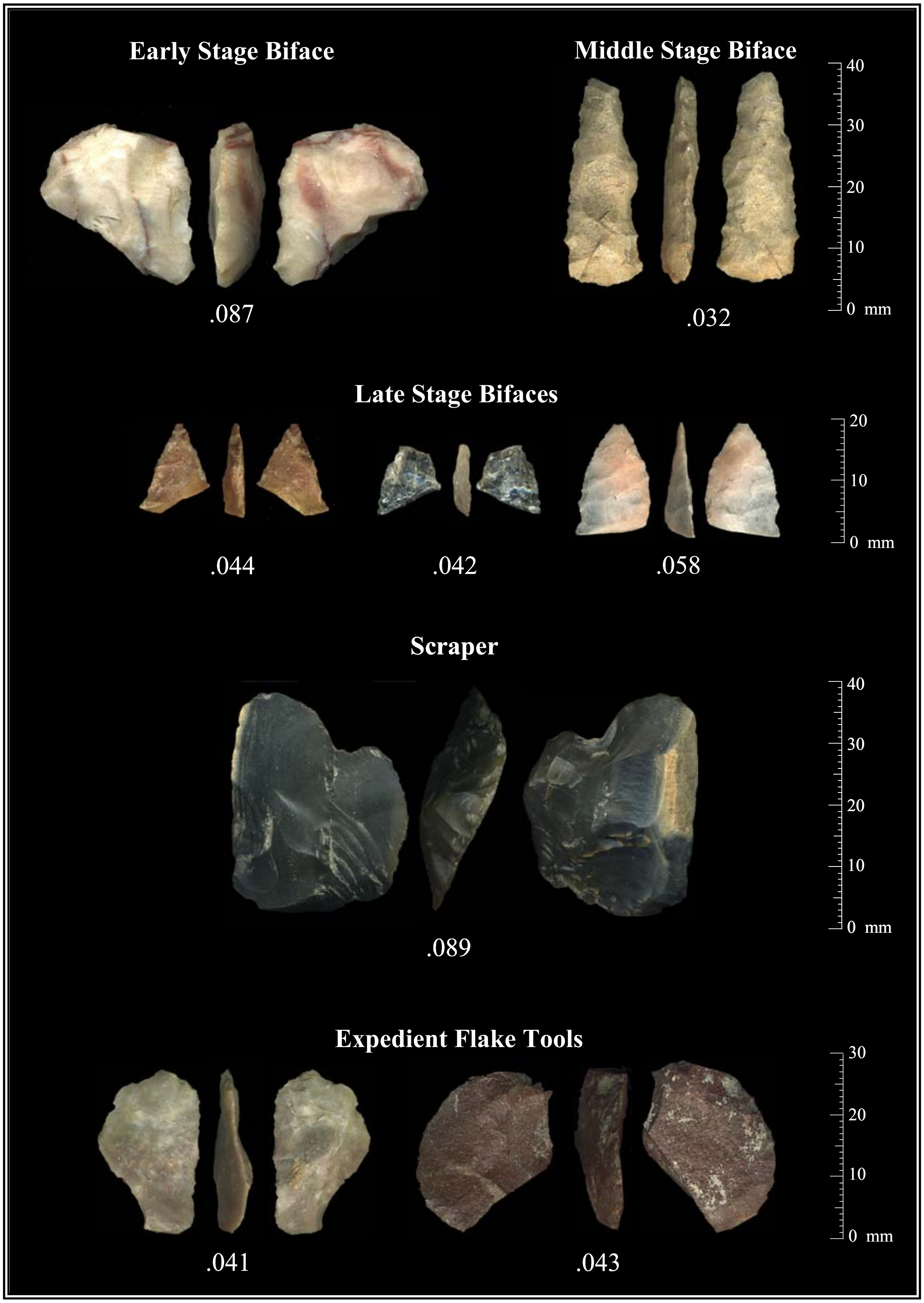

Figure 68. Gilligan's Island site flaked stone tools assigned to the Late Archaic period component.

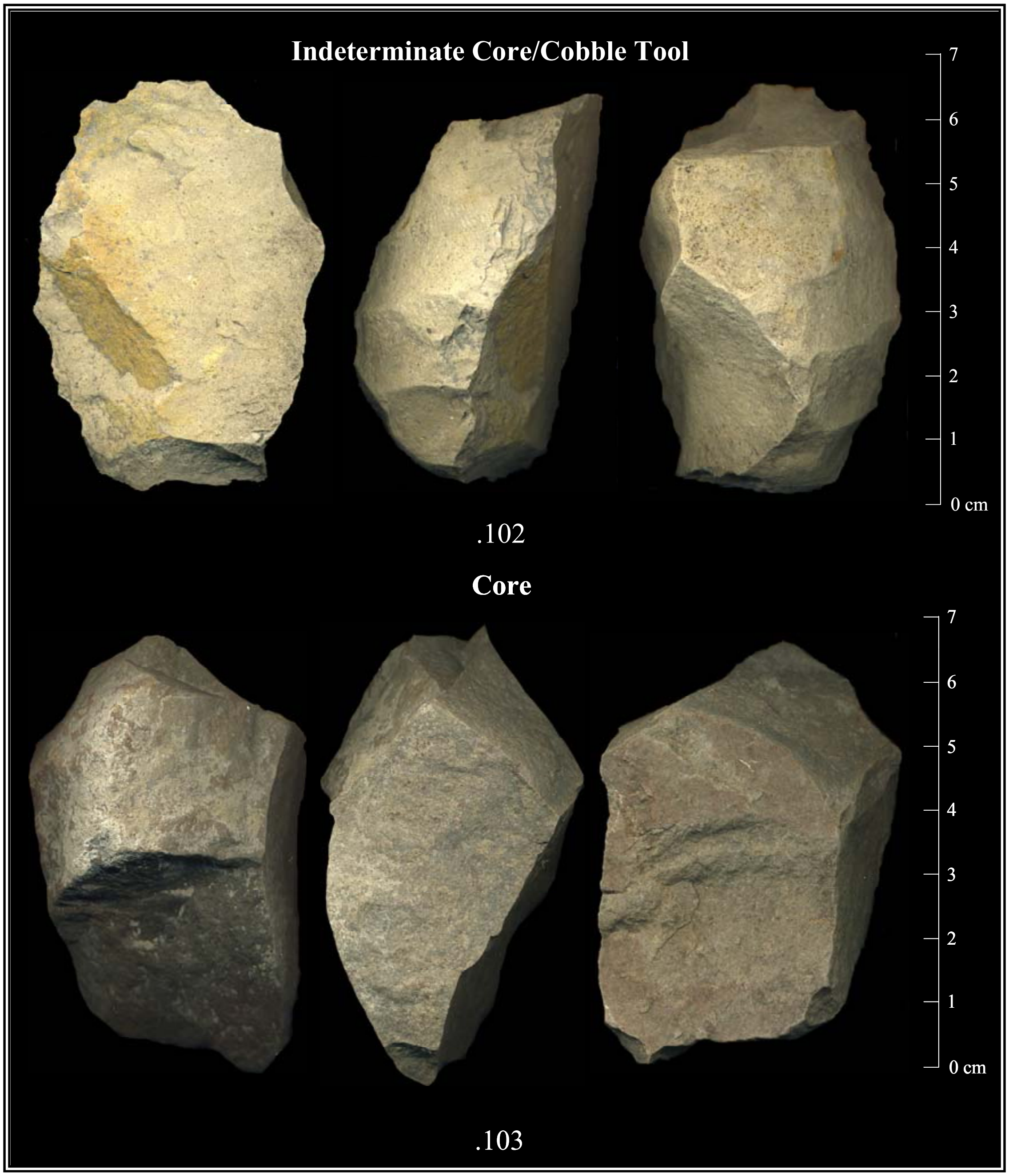

Figure 69. Gilligan's Island site indeterminate core/cobble tool and core assigned to the Late Archaic period component (note reduced scale).

Table 46. Late Archaic Period Flaked Stone Tool Types by Material Type[1]

Tool Type	MATERIAL FREQUENCIES				Tool Totals	
	Chert	Petrified Wood	Quartzite	Quartz Crystal	Freq.[1]	Col. %[2]
Early Stage Biface	1				**1**	2.6
Middle Stage Biface			1		**1**	2.6
Late Stage Biface	3		1	1	**5**	13.2
Undetermined Bifacial Fragment	4	1			**5**	13.2
Stemmed Biface Projectile Point	6				**6**	15.8
Scraper	1	1	1		**3**	7.9
Expedient Flake Tool	11		1		**12**	31.6
Core			1		**1**	2.6
Tested Cobble			2		**2**	5.3
Indeterminate Core/cobble Tool	1		1		**2**	5.3
Material Totals	**27**	**2**	**8**	**1**	**38**	100.0
Row %	71.1	5.3	21.1	2.6	100.0	

[1]Freq. = Frequency, [2]Col.% = Column Percent

remaining items were crafted from quartzite, petrified wood and quartz crystal. All of the items lack a cortex, making the origin of most tools difficult to assess. Only the middle stage chert biface exhibits sufficient morphological attributes that it can be identified it as a derivative of a flake. Eight of the unhafted biface items show evidence of utilization and seven are retouched. A single hafted item (.064) is probably an arrow point base, which not surprisingly suggests that there is either a subtle mixing of upper Developmental period component sediments with the lower Late Archaic period components, or that temporal designations in the analysis are slightly skewed, or both. The degree of fragmentation and utilization of the biface collection suggests that the discarded tools were broken during tool use, rather than during tool manufacture.

The flake tool group of the Late Archaic period includes scrapers and expedient flake tools. These items do not exhibit bifacial thinning and are therefore easy to manufacture. Scrapers are limited to one chert and one quartzite end scraper and one disto-lateral scraper manufactured from petrified wood. Two of the scrapers are complete and one is nearly complete, and all three have cortex present. The complete scrapers display approximately 61% to 80% of the edges utilized, and 20% to 60% retouch. One of the items is unifacially thinned. Twelve expedient flake tools occur in the Late Archaic period assemblage. These items include nine tools that were probably used for a variety of cutting and scraping tasks and three that are multiple-task tools. The expedient flake tools are chert with the exception of one quartzite cutting/scraping tool. Two of the tools have exhibit cortex. Only one of the expedient flake tools is complete; the remaining 11 items are either incomplete (n=9) or nearly complete (n=2). Ten of the tools appear to have utilized edges and five of the edges are retouched. A majority of these expedient tools (n=8) are not thinned.

The analytical group with the heaviest artifacts includes two indeterminate core/cobble tools, two tested cobbles, and one core. These typically large cobble items were sources of lithic materials, and the flake removal on most core items is usually at a steep angle. Materials consist of quartzite and chert, and three of the quartzitic items have cortex. Two of these items, a core (.103) and a tested cobble (.022), exhibit cortex that appears to include that they were derived from non-alluvial sources. The cortex of another tested cobble (.317), exhibits characteristics of a stream cobble, which indicates that it had been transported to the site. The indeterminate core/cobble tool (.102) of quartzite appears to be a multi-use item with attributes like those of a scraping tool. It is a single-handed item that has unidirectional flake scars, as well as utilization and retouch, primarily along the same side. The indeterminate core/cobble tool (.072) of chert exhibits bifacially thinning, retouch, and evidence of utilization.

The flaked stone tool data of the Late Archaic period component indicate that of the tools were used for various activities but were not manufactured at the site. Most of the items display multiple modifications and many were highly fragmented before being discarded. Bulkier items such as cores/core tools appear to have been used for multiple activities, and not just collected as raw lithic material. Based on the above evidence and the debitage data, it appears that the Late Archaic occupants of the site were in possession of a prepared tool assemblage when entering the site, and lithic manufacture was of minimal concern during the occupation of the shelters.

Ground/Battered Stone

Forty-nine ground/battered stone items are associated with the Late Archaic period component. The assemblage includes one-handed manos, typologically indeterminate mano fragments, slab metates, typologically indeterminate metate fragments, and an unidentifiable ground stone fragment (Table 47). Three of the ground/battered stone specimens are complete, one is more than 50%, and 45 are less than 50% complete. Attributes suggesting heating, such as fire-cracking and oxidation, are present on 83.7% of the ground stone items. Not surprisingly, these data indicate a heavy secondary use for many of these items in a thermal heating device. The extreme degree of alteration of these specimens (grinding, battering, and heating) suggests that they were manipulated in many different ways to fit the needs of the inhabitants who were engaged in various activities at the site.

Table 47. Late Archaic Period Ground/Battered Stone by Material Type

Type	MATERIALS			Totals	
	Sandstone	**Granite**	**Rhyolite**	Freq.	Col. Percent
Manos					
One-handed Mano	1	3	1	**5**	**50.0**
Mano Unknown Type	3	2	0	**5**	**50.0**
Mano Totals	**4**	**5**	**1**	**10**	**100**
Mano Row Percentages	**40.0**	**50.0**	**10.0**	**100**	
Metates					
Slab Metate	8	0	0	**8**	**21.1**
Metate Unknown Type	29	1	0	**30**	**78.9**
Metate Totals	**37**	**1**	**0**	**38**	**100**
Metate Row Percentages	**97.4**	**2.6**	**0**	**100**	
Unknown Ground Stone Type	1	0	0	**1**	**100**
Total Ground/Battered Stone Counts	**42**	**6**	**1**	**49**	**100**
Ground stone Row Percentages	**85.7**	**12.2**	**2.0**	**100**	

Manos

Ten manos comprise 20.4% of the total Late Archaic component ground/battered stone assemblage. Of these, five are one-handed manos and five are typologically indeterminate mano fragments. Although the assemblage is small and the significance of the material types is not clear, it may be noteworthy that sandstone is represented in minority of the items (40%). More distantly available materials, such as granite and rhyolite, make up the remaining 60.0% of the mano collection. These figures are not particularly unexpected since these items are less cumbersome than larger ground stone items such as slab metates and are an easily transportable part of a lithic tool kit.

Three complete one-handed manos were recovered, all of which are manufactured from granitic material (Figure 70). None of the items appears to be burned or fire-cracked. Two of these specimens (.344 and .345) were recovered from the stone lining of Feature 7, in which they acted as a probable roasting or cooking surface (Figures 63 and

Figure 70. Gilligan's Island site manos assigned to the Late Archaic period component (note reduced scale).

64). These manos are derived from alluvial stream cobbles; they are circular in shape and appear to have been selected for their moderately flat surface. The first specimen (.345) is heavily modified to form a disc-like shape. Displaying a heavily ground/battered edge as well as a heavily ground facet and a moderately ground/battered or ground/pecked surface, the implement is 14.3 cm long, 13.4 cm wide, and 5.0 cm thick. The surfaces are flat to slightly convex. The second specimen (.344) exhibits less modification. It is 13.0 cm long, 11.8 cm wide, and 5.0 cm thick. The edges are light to moderately battered. One surface is moderately concave while the other is slightly convex. While grinding modification may have occurred in several different areas of the specimen, it is most apparent on the convex surface, where battering is also lightly manifested. As noted in the feature descriptions, these round, thick discs from Feature 7 do not appear to have been utilized as a traditional grinding implements used to process food. Rather, they have been modified as part of a planned cooking technology. The third complete one-handed mano specimen (.332) was recovered from Feature 6. Oval to slightly round in shape, this implement is 13.1 cm long, 11.1 cm wide, and 6.6 cm thick. The edge is battered and lightly ground. Three grinding surfaces are present. The main surface that exhibits the greatest amount of modification is convex, heavily ground, on the basal portion of the specimen. Two ground facets with light to moderate use-wear are present on the same long-axis margin as the primary surface. Minor grinding may occur on the opposite side; however, this modification is obscured by the naturally ground alluvial cortex.

Two fragmented one-handed manos that more than 50% were recovered from the Late Archaic component. Both are either burned or fire-cracked. The first specimen

(.319), rhyolite, is 5.3 cm long, 5.2 cm wide, and 4.3 cm thick. The edge is ground and battered and two surfaces have grinding; however, the implement is too fragmented to confidently determine the degree of the use-wear. The second specimen (.453) is sandstone and is 6.0 cm long, 7.2 cm wide, and 3.4 cm thick. Two facets are heavily ground with longitudinal and transverse striations. The edge is moderately ground and battered.

Five of the Late Archaic ground/battered stone items are typologically indeterminate mano fragments. Three of the fragments are sandstone and two are granitic material. These specimens are 3.1 to 10.8 cm long, 2.4 to 7.9 cm wide, and 2.9 to 6.2 cm thick. Surfaces are moderately to heavily ground. Three of the implements exhibit two facets. Three items have edges, one of which is battered, while the remaining two are ground. One item appears to be burned and/or fire-cracked.

Metates

The metates are made of sandstone that is available from the geologic formations in the site area. Thirty-eight metates make up 77.6% of the total Late Archaic ground/battered stone assemblage. Of these, 21.1% are slab metates while 78.9% are typologically indeterminate metate fragments. None of the metates is complete.

Eight fragmented slab metates are associated with the Late Archaic component. Of this group, only one is more than 50% complete. Dimensions of the fragmented slab metates are 6.2 to 30.0 cm long, 6.8 to 25.3 cm wide and, 1.5 to 10.5 cm thick. Six of the metates primary surface, that exhibits the greatest modification, has a moderate to heavy use-wear that is ground to ground/pecked. Two of the specimens have lightly ground secondary facets on the opposite side from the main facet. Six specimens have edge margins, one of which has been modified by flake removal. All eight of these specimens have attributes suggesting that they were burned or fire-cracked.

Thirty typologically indeterminate metate fragments are associated with the Late Archaic component. One piece is of granitic material and 29 are sandstone. These fragments are 2.6 to 18.6 cm long, 1.6 to 15.1 cm wide, and 1.0 to 7.6 cm thick. The larger and more identifiable sandstone pieces resemble the sandstone that occurs naturally at or near the site. Larger and identifiable facets show light to heavy use-wear, with grinding or grounding/pecking. One item has a margin and it is unshaped. Twenty-nine or 96.6% of the specimens have burned or fire cracked attributes.

Unidentifiable Ground Stone

One sandstone specimen (.449) is fragmented to the extent that it could neither be identified as a mano nor a metate. The item is 4.3 cm long, 5.4 cm wide, and 1.7 cm thick. The grinding surface is too small to determine the extent of grinding. The implement is fire-cracked.

Miscellaneous Lithic Artifacts

Manuport

Manuports are items that do not naturally occur in context in the area surrounding a site, and it may be inferred that they were brought to the location by human inhabitants. In essence, these items do not appear to have cultural modification that would allow them to be categorized as typical artifacts. At the Gilligan's Island rockshelters, one manuport was recovered in the Feature 5 deposits of the Late Archaic period. The item (.293) consists of a smooth and rounded chert pebble that was probably collected from a local creek bed. The small item is 3.26 cm long, 3.20 cm wide, and 2.19 cm thick, and weighs 34.1 g. It is unmodified and does not exhibit any type of use-wear.

Faunal Artifacts

Three bone artifacts are associated with the Late Archaic period (Table 16). These items consist of a single bone tool fragment and two complete ornamental beads.

Bone Tools

Billet

A bone billet fragment (4.109) was recovered from Excavation Unit B4, Level 4 (Figure 71). Bone billets are generally associated with lithic tool production, during which they are used as soft hammers for lithic reduction. The billet is a two-piece refit from the base of a deer (*Odocoileus* sp.) antler beam. The specimen is small, measuring 5.9 cm long, 3.6 cm wide, and 2.0 cm thick, and weighing 22.9 g. The dorsal portion of the beam has been cut. Both ends of the specimen are heavily ground and rounded. Longitudinal striations dominate both edges, but multi-directional striations are also present.

Faunal Ornaments

Bone Beads

Two complete bone beads were recovered from Trench B, Shelter 1 (Figure 71, Table 16). These beads are short, consisting of a femur from a possible ground squirrel (cf. *Citellus* sp.) (.882) and a metapodial shaft from an indeterminate hare or rabbit (4.112). Both of the artifacts exhibit exterior polishing and the edges are ground, flattened, and polished. Edge rounding is also present on one end of the latter specimen.

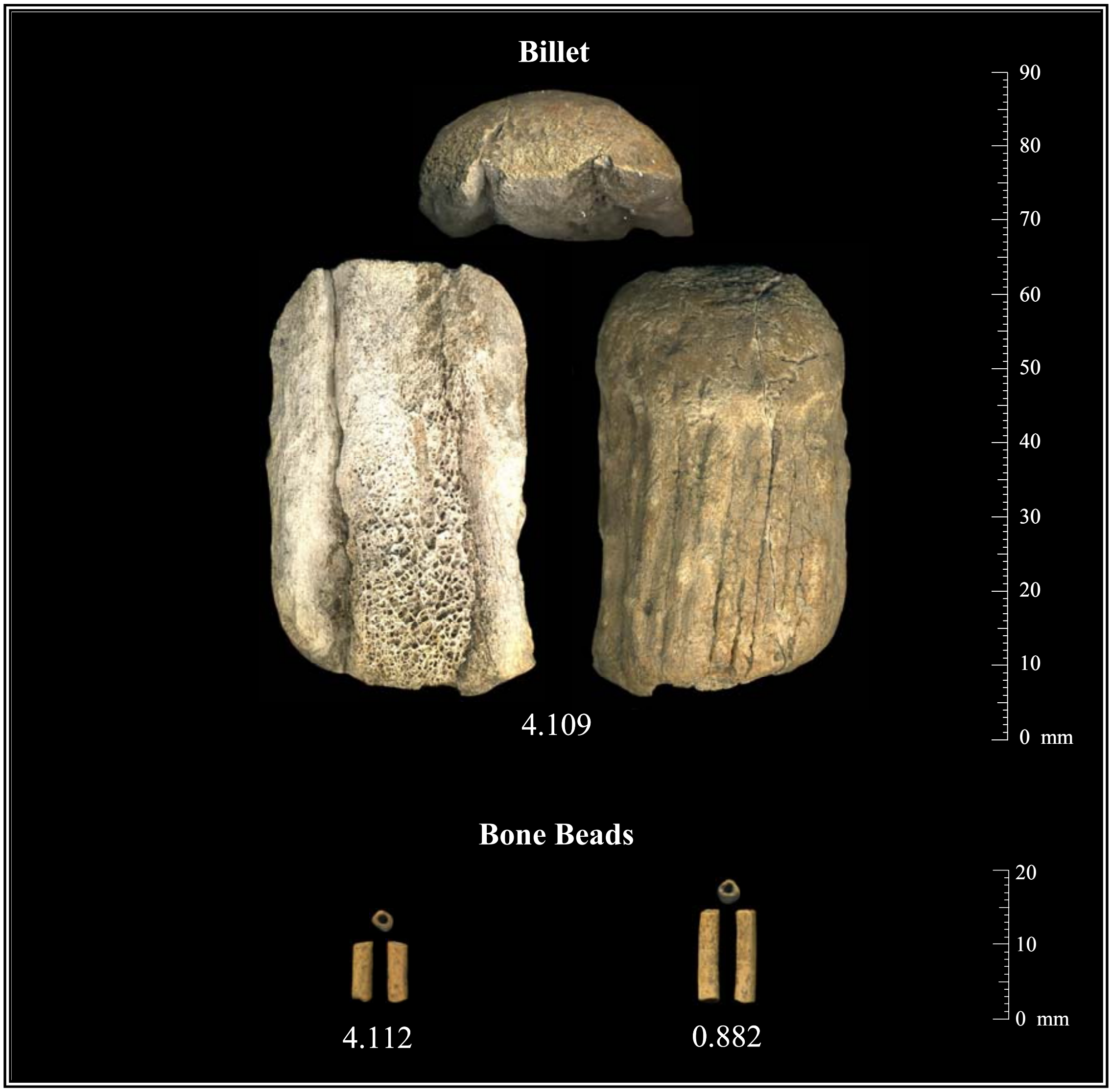

Figure 71. Gilligan's Island site modified bone assigned to the Late Archaic period component.

Shell

Excluding the natural gastropod-type species inhabiting the Gilligan's Island site, shell is practically absent. The only shell artifact (4.108) was recovered from Stratum 6W, in Level 4, Excavation Unit B4 (Figure 72, Table 16). The shell was analyzed by Urban (2006). The specimen is consistent with the freshwater mussels, or Unionidae family, obtainable from major watercourses such as the Arkansas River (Urban 2006:1).

Figure 72. Gilligan's Island site modified shell assigned to the Late Archaic period component.

The artifact represents approximately one-quarter of the original valve (Urban 2006:2). It is modified in a trianguloid shape and is derived from near the lateral or distal margin of the shell, generally the thickest portion of a freshwater mussel. On the posterior or convex side of the shell are several rough growth layers that are a flat gray color, while a naturally smooth nacre sheen is present on the anterior or concave surface. The shell body was probably worked when it was fresh, at a time when the shell was less friable (Urban 2006:2). The medial side is straight and convex, and one shoulder is thick and ground to a rounded shape, while the opposite shoulder is thin and straight with a "V"-shaped notch toward the center. The lateral side is thick and ground to a convex shape, roughly parallel to the growth layers of the shell. The straightness of the medial margin, in addition to a percussion scar on the anterior side of the shell, indicate that it was snapped to a preferred size and ground down afterward. The V-shaped notch appears to be an intentional modification, rather than a manufacturing mistake. The notch may represent a suspension hole or a design element (Urban 2006:1-2). The shell measures 3.2 cm long, 1.8 cm wide and 0.3 cm thick, and weighs 3.2 g.

Modified shell, especially freshwater bivalves, have become increasingly prevalent in excavation assemblages in southeastern Colorado. The delicate nature of shell makes it unlikely to survive in the archaeological record. Shell are artifacts therefore usually recovered in drier areas such as rockshelters. Perhaps for this reason, most shell assemblages are recovered from upper stratigraphic layers of Developmental period or Diversification period occupations, rather than from sediments of earlier periods. Rockshelters in southeastern Colorado with modified shell are Trinchera Cave (Wood-Simpson 1976:117), Torres Cave (Hoyt 1979:15), Recon John Shelter (Zier 1989:197), and Wolf Spider Shelter (Hand and Jepson 1996:91-93). The Pinyon Canyon Maneuver Site has also produced modified shell artifacts from tested shelters (5LA6568, Shelter 2 and 5LA6592), Welsh Canyon (Schiavitti et al. 2001:43, 121), and Burke's Bend (5LA3188 and 3189) in the upper drainage of Burke Arroyo (Kalasz et al. 2007: 155-157, Figure 63; 276, 281-283, Figure 114). Open sites, associated especially with the Sopris phase (5LA1211, 5LA1416), have yielded a variety of worked shell artifacts (Wood and Bair 1980:174-175, Plate 18, a-e).

Most of the shells recovered from rockshelter and open sites are of the localized, perhaps poorer quality, freshwater bivalve variety. Only a few of the shells in the artifact assemblages of southeastern Colorado are identified as exotic materials imported into the region, and they have been recovered only from the upper portion of the Purgatoire River Valley. A single *Olivella* sp. shell was collected from the Trinidad Reservoir Project (Wood and Bair 1980:174), while a single Neogastropoda (similar in morphology to *Olivella* sp.) was recovered from Trinchera Cave (Wood-Simpson 1976:117, Table 52, Plate 5, A). These exotic materials are indigenous to the Pacific Coast, although Gulf of

Mexico sources also exist (Vehik 2002:44). Modified shell from these sites is typically described as ornamental, in the form of pendants or discs that are round or tabular in shape (Hand and Jepson 1996:92-93). Drill holes in the center and margin are often present (Wood and Bair 1980:174-175, Plate 18, a-e; Hand and Jepson 1996:91-93, Figure 24, a and b).

Subsistence-Related Remains

Faunal Remains

The faunal remains associated with the Late Archaic period consist of 1996 specimens. Counts of individual species are recorded in Table 18 (see Baseline Data). The following discussion is concerned with those items that are culturally modified. Table 48 presents all of the modified bone associated with the Late Archaic period. Modification attributes have been defined previously (see Middle Archaic period Faunal Remains). There are 774 bulk bone items that are associated with the Late Archaic period. Many of these items consist of indeterminate vertebrate (n=683) and mammal (n=2) fragments, some of which were burned and calcined. These items are of little interpretative value and they are thus omitted from the following discussion, tables, and figures.

Table 48 shows that perimortem bone modifications occur in low numbers, and that most of the bone associated with the Late Archaic period cannot be directly associated with cultural activities at or near the time of death. Green breaks occur most often within small- and medium-size mammal categories. Extensive and discrete modification is present on 13 bone items. Bone ornaments and tool items include one snapped and ground freshwater mussel, one hare or rabbit bone bead, one-half of a deer

Table 48. Late Archaic Period Modified Faunal Specimens

Taxa	Break		Burn		Extensively	Discretely	
	Green	Dry	Burned	Calcined	Cut/Ground/Scrape/Score	Cut	Modified
Invertebrate							
Unionidae	1						1
freshwater mussel							
Vertebrate							
Fish							
Indeterminate fish		1					
Siluriformes/Cypriniformes		1					
Indeterminate minnow/catfish							
Amphibian							
Indeterminate Reptile/Amphibian		2					
Indeterminate Amphibian		3					
Caudata		1					
salamander							
Bufo woodhousii		1					
woodhouse's toad							
Anura		4					
frog or toad							
Reptile							
Indeterminate Scaled Reptile		3					
Indeterminate Lizard		2					
Serpentes		2					
Indeterminate Snake							
Colubridae			1				
non-venomous snake family							
Bird							
Indeterminate medium bird	1	10		2			
Anseriformes		2		1			
Falcniformes/Strigiformes		1					
Indeterminate raptor							
Indeterminate small bird		3		1			
Indeterminate very small bird		1					
Indeterminate bird		4		2			
Indeterminate bird or hare/rabbit		1					
Mammal							
Indeterminate very small mammal		26		7			
Indeterminate small mammal	11	85	3	25	1	1	
Indeterminate medium mammal	4	28	4	10		1	
Indeterminate medium-large mammal	3	25	1	12			
Indeterminate large mammal	1	1		1			

Table 48. Late Archaic Period Modified Faunal Specimens (Continued)

Taxa	Break		Burn		Extensively	Discretely	
	Green	Dry	Burned	Calcined	Cut/Ground/ Scrape/Score	Cut	Modified
Indeterminate mammal	9	82	6	35			1
Lagomorph	1	11		1	1	1	
Indeterminate hare or rabbit							
cf. Lagomorph		4				1	
possible hare or rabbit							
Lepus sp.		4		1			
jackrabbit or hare							
Lepus californicus/townsendi		1		1			
black-tailed or white-tailed jackrabbit							
Sylvilagus sp.	1	27		2		2	
cottontail							
Sylvilagus nuttalli/auduboni		3		1			
mountain or desert cottontail							
Indeterminate small rodent		16					
Indeterminate small squirrel		5					
Sciurus sp.		1					
tree squirrel							
Tamiasciurus hudsonicus		1		1			
American red squirrel							
Cynomys sp.		1					
prairie dog							
cf. *Citellus* sp.					1		
possible ground squirrel							
Citellus variegatus		1					
rock squirrel							
Indeterminate very small rodent		29					
Indeterminate very small squirrel		1					
Eutamias sp.		1					
chipmunk							
Eutamias dorsalis		1					
cliff chipmunk							
Geomys bursarius		1					
plains pocket gopher							
Zapus sp.		1					
jumping mouse							
Cricetidae		1					
Neotoma sp.		10					
packrat							
Peromyscus sp.		1					

Table 48. Late Archaic Period Modified Faunal Specimens (Continued)

Taxa	Break: Green	Break: Dry	Burn: Burned	Burn: Calcined	Extensively Cut/Ground/ Scrape/Score	Discretely Cut	Modified
deer mice							
cf. *Peromyscus* sp.							
possible deer mice							
cf. *Cleithrionomys* sp.		1					
possible red-back vole							
Clethrionomys gapperi		1					
boreal red-back vole							
cf. *Cleithrionomys gapperi*		1					
possible boreal red-back vole							
Indeterminate medium carnivore		1					
Canidae	1						
canine family							
Indeterminate small carnivore		1					
Spilogale putorius		1					
Spotted Skunk							
Mustelidae		1					
weasel or badger family							
Insectivora		2					
Indeterminate insectivore							
Indeterminate artiodactyl		2					
Indeterminate large artiodactyl		1					
Indeterminate medium-large artiodactyl	1	4					
Odocoileus sp.	1	2		1	1		
deer							
Indeterminate Vertebrate	7	608	5	141		1	
Indeterminate		1		1			
Total	42	1037	20	246	4	7	2

[1] Does not include indeterminate bulk bone counts

antler (*Odocoileus* sp.) billet, and one bone bead from a possible ground squirrel. A metapodial of a hare or rabbit appears to have been squared off for possible bead preparation, and a long bone from an indeterminate small mammal is extensively cut on one end. Six bone fragments have discrete cuts including one possible hare or rabbit long bone, two cottontail pelvis pieces that re-fit back together, one indeterminate medium mammal long bone fragment, and one undetermined bone fragment from an indeterminate vertebrate cut along the mid-shaft. One modified bone piece is an indeterminate mammal bone that appears to be an impact flake. The dry breaks typically indicate natural deterioration of the bone and may simply confirm that some of the specimens (i.e. smaller taxa) with low numbers of burned or calcined remains may also be of natural origin. One possible explanation for lower burned bone counts among some taxa may be that some of these bones were buried material that had been burned later when a fire was made in the nearby sediment. Another probable explanation may be that these items were may simply represent a less utilized resource.

Burned and calcined bone represents the greatest quantity of modified faunal material. These charred remains are generally considered to have been associated with subsistence activities. Figure 73 illustrates the combined burned and calcined counts of

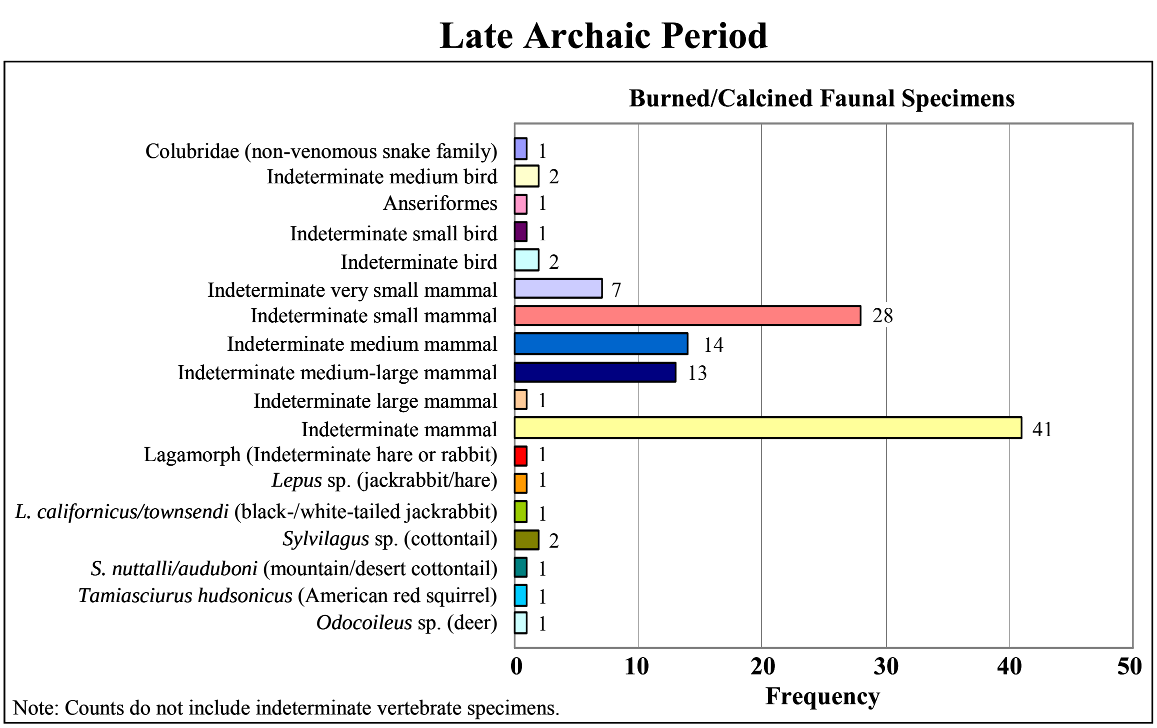

Figure 73. Burned/calcined faunal remains recovered from the Late Archaic period deposits.

the Late Archaic period. This figure demonstrates that the small mammals may comprise the predominant faunal resource during the Late Archaic period at the Gilligan's Island shelters. Small size categories include indeterminate small-sized mammals, such as the genus/species of hare and/or rabbit, as well as the American red squirrel. Very small to medium-large mammalian species are also represented moderately in the assemblage. Large mammals are poorly represented in the burned/calcined bone inventory. Marrow extraction or the use of off-site activity locations have been discussed as explanations reasons for the occurrence of fewer medium- to large-sized mammals in the faunal remains (see Baseline Data section). These explanations are applicable to the Late Archaic period as well. Ultimately, the low numbers of medium- to large- mammals in the entire Late Archaic assemblage suggest a heavier reliance on smaller animals during this period.

Macrobotanical Remains

Three flotation samples were recovered from Late Archaic period deposits. These samples are all from Shelter 2, Trench A. The macrobotanical analysis from the Late Archaic period includes approximately 5724 specimens representing 31 plant taxa. The results of the macrobotanical analysis are presented in Tables 49 and 50. Table 49 provides provenience data for each analytical sample, while Table 50 gives the inventory

Table 49. Provenience Data for Macrobotanical Remains of Late Archaic Period Component

Feature No.	Shelter No.	Unit No.	Northing	Easting	Level	Elevation[1]	Context
5A	2	A2	60	48	N/A	999.75-.65	Lower portion of fill
7	2	A4	63-100	0-53	N/A	998.66-.55	General Fill
8	2	A4	0-45	0-20	N/A	998.71-.50	General Fill

[1] Elevation based on site datum relative elevation of 1000 m

Table 50. Late Archaic Period Macrobotanical Remains

Feature No.	Plant Taxon or Other Category	Plant Part	Condition & Quantity					
			Charred			Uncharred		
			Whole	Frag.[1]	PPL[2]	Whole	Frag.	PPL
5A	Volume Floated: 4.36 (liters)							
	Light Fraction Weight: 9.36 (grams)							
	Pinus edulis	**Nut hull**		**1**	**0.2**			
		Fascicle		**1**	**0.2**			
	Pinaceae (*cf. Pinus*)	**Wood**		**12**	**2.8**			
	Juniperus scopulorum	Twig					2	0.5
	J. monosperma-type	Twig					2	0.5
	Juniperus	**Wood**		**7**	**1.6**			
		Seed				1		0.2
		Male cone					2	0.5
	Sporobolus	Grain				16±		3.7
	Poaceae	Stem/leaf					X[3]*	
	Chenopodium cf. berlandieri	**Seed**		**11±**	**2.5**			
	Cheno-Am	**Seed**	**3**	**1**	**0.9**		1	0.2
	Dicotyledoneae	Leaf				1	X	0.2
		Bud Cluster				1		0.2
	Unknown	**Wood**		**1**	**0.2**			
	Plant Totals:		**37**		**8.4**	26		6
	Non-Floral Items:							
	Gastropoda	High-spire				1		N/A[4]
		Low-spire				8		N/A
7	Volume Floated: 3.32 (liters)							
	Light Fraction Weight: 14.66 (grams)							
	Pinus edulis	**Nut hull**		**2**	**0.6**			
		Needle		**61±**	**18.4**		3	0.9
		Female cone		**3**	**0.9**			
	P. ponderosa	**Needle**		**2**	**0.6**			
	***Pinus* sp.**	**3-needle**		**1**	**0.3**			
	Pinus	**Sheath**		**1**	**0.3**			
	Pinaceae (*cf. Pinus*)	**Wood**		**10**	**3.0**			
	Juniperus scopulorum	**Twig**		**7**	**2.1**			
	***J. monosperma*-type**	**Twig**		**18**	**5.4**		19±	5.7
	Juniperus	Seed					6	1.8
		Wood		**4**	**1.2**			
		Male cone	**1**	**2**	**0.9**			
	Gymnospermae	**Wood**		**5**	**1.5**			
	Sporobolus	**Grain**	**1**		**0.3**	81±		24.4

Table 50. Late Archaic Period Macrobotanical Remains (continued)

Feature No.	Plant Taxon or Other Category	Plant Part	Condition & Quantity					
			Charred			Uncharred		
			Whole	Frag.	PPL	Whole	Frag.	PPL
7	**Poaceae**	**Grain**	**1**		**0.3**			
		Stem		**35$^{\pm}$**	**10.5**			
	Chenopodium cf. berlandieri	**Seed**	**20**	**29$^{\pm}$**	**14.8**		10$^{\pm}$	3.0
	Cheno-Am	**Seed**	**19**	**48$^{\pm}$**	**20.2**	68$^{\pm}$	543$^{\pm}$	184.0
	Portulaca	**Seed**	**1**		**0.3**	2		0.6
	cf. *Descurainia*	**Seed**	**2**		**0.6**			
	Brassicaceae	Seed				1		0.3
	Euphorbia	Seed				28$^{\pm}$	610$^{\pm}$	192.2
	Rhus cf. trilobata	**Seed**	**1**	**1**	**0.6**			
	Opuntia (*Platyopuntia*)	Seed					18$^{\pm}$**	5.4
	***Opuntia* (*Cylindropuntia*)**	**Seed**		**1**	**0.3**		25$^{\pm}$**	7.5
	Opuntia	**Spine**		**6**	**1.8**			
	Cactaceae	**Tissue**		**1**	**0.3**			
	Verbena cf. bracteata	Seed/nutlet				10$^{\pm}$*		3.0
		Seed coat					762$^{\pm}$*	229.5
	Nicotiana	Seed				1		0.3
	Ambrosia	Achene				1		0.3
	Helianthus	Seed coat					11$^{\pm}$	3.3
	Asteraceae	Achene				2		0.6
	Dicotyledoneae	Seed				3	2	1.5
		Leaf				1		0.3
		Floret	**1**		**0.3**			
	Unknown	**Wood**		**1**	**0.3**			
	Plant Totals:		**285**		**85.8**	2207		664.6
	Non-Floral Items:							
	Bone							
	Gastropoda	Shell					X	N/A
		High-spire				16	8	N/A
		Low-spire				8	6	N/A
8	Volume Floated: 3.76 (liters)							
	Light Fraction Weight: 37.86 (grams)							
	Pinus edulis	**Nut hull**		**7**	**1.9**		3	0.8
		Female cone		**18**	**4.8**		4	1.1
		Needle		**157**	**41.8**		14	3.7
	P. ponderosa	**Needle**		**4**	**1.1**			
	***Pinus* sp.**	**3-needle**		**3**	**0.8**			
	Pinus	Seed					2	0.5
		Sheath		**2**	**0.5**		2	0.5

Table 50. Late Archaic Period Macrobotanical Remains (continued)

Feature No.	Plant Taxon or Other Category	Plant Part	Condition & Quantity					
			Charred			Uncharred		
			Whole	Frag.	PPL	Whole	Frag.	PPL
8	**Pinaceae (*cf. Pinus*)**	**Wood**		**21**	**5.6**			
	Pseudotsuga menziesii	**Needle**		**1**	**0.3**			
	Juniperus scopulorum	**Twig**		**9**	**2.4**		1	0.3
	***J. monosperma*-type**	**Twig**		**>61**	**16.2**		238$^{\pm}$	63.3
	Juniperus	**Wood**		**15**	**4.0**			
		Seed		**2**	**0.5**		14	3.7
		Male cone	**1**	**1**	**0.5**	6	35	10.9
	Gymnospermae	**Wood**		**3**	**0.8**			
	Sporobolus	**Grain**	**2**		**0.5**	138$^{\pm}$		36.7
	Poaceae	**Grain**	**1**		**0.3**	1		0.3
		Stem		**>14**	**3.7**			
		Stem/leaf					X*	N/A
	Chenopodium cf. berlandieri	**Seed**	**26**	**54$^{\pm}$**	**21.3**			
	Atriplex	**Wood**		**1**	**0.3**			
	Cheno-Am	**Seed**	**46**	**112$^{\pm}$**	**42.0**	102$^{\pm}$	1154$^{\pm}$	334.0
	Portulaca	**Seed**	**1**		**0.3**	1		0.3
	Brassicaceae	Seed				10		2.7
	Cleome	Seed				1		0.3
	Euphorbia	Seed				10	19$^{\pm}$	7.7
	Rhus cf. trilobata	**Seed**		**6**	**1.6**			
	Sphaeralcea	**Seed**	**1**		**0.3**			
	***Echinocereus*-type**	**Seed**	**2**		**0.5**		1	0.3
	Opuntia (Platyopuntia)	Seed					165$^{\pm}$**	43.9
	Opuntia (Cylindropuntia)	**Seed**		**7**	**1.9**		48$^{\pm}$**	12.8
	Opuntia	**Spine**		**38$^{\pm}$**	**10.1**		25$^{\pm}$	6.6
		Areole		**2**	**0.5**		2	0.5
		Areole & Spine		**3**	**0.8**			
	Cactaceae	**Tissue**		**3**	**0.8**			
	Verbena cf. bracteata	Seed/nutlet				3*		0.8
		Seed coat					252$^{\pm}$*	67.0
	Nicotiana	Seed				2		0.5
	Helianthus	Seed coat					246$^{\pm}$	65.4
	Asteraceae	Achene				5	17$^{\pm}$	5.9
	Dicotyledoneae	**Seed**	**3**	**5**	**2.1**	4	1	1.3
		Seed coat					3	0.8
		Leaf					7*	1.9
		Bract				1		0.3
	Plant Totals:		**632**		**168.2**	2537		674.8

Table 50. Late Archaic Period Macrobotanical Remains (continued)

Feature No.	Plant Taxon or Other Category	Plant Part	Condition & Quantity					
			Charred			Uncharred		
			Whole	Frag.	PPL	Whole	Frag.	PPL
8	Non-Floral Items:							
	Bone						2	N/A
	Gastropoda	Shell					X	N/A
		High-spire				69		N/A
		Low-spire				61±	1	N/A
	Lithics	Debitage					3	N/A

[1]Frag. = Fragment (s), [2]PPL = Parts Per Liter, [3]X = present, [4]N/A = Not Applicable, * some items display modern/recent wind-blown plant parts, ** some items display rodent-gnawed, ± estimated count, > greater than

of remains identified in each sample. Each macrobotanical sample has been identified by the individual feature from which it was recovered. These features include a roasting pit and hearth-like features (see Features). Both charred and uncharred remains are identified in the flotation sample. The total volume of each sample prior to flotation processes and light fraction weight after processing are presented in Table 50. For a complete explanation of the table layout and determination of culturally affiliated flora, refer to the Baseline Data for the Macrobotanical Remains.

Analysis of the macrobotanical samples assigned to the Late Archaic period suggests that a pinyon-juniper plant community was present at the Gilligan's Island site during this time. Prominent conifer species included pinyon pine, Rocky Mountain juniper, and one-seed juniper species. Ponderosa pine and Douglas-fir were within the region. Local shrubs probably included saltbush (*Atriplex*), and sumac. Herbaceous groundcover consists of drop-seed grass, purslane (*portulaca*), tansy mustard (*cf. Descurainia*), globe-mallow (*Sphaeralcea*), pit-seed goosefoot, and other goosefoot/pigweed varieties. Cactuses consist of cholla or prickly pear varieties, and hedgehog-type cactus.

Results of the macrobotanical samples associated with the Late Archaic period component suggest that a variety of plants was utilized in the thermal features (Feature 74). Primary fuels probably included pinyon pine, juniper, Rocky Mountain juniper, and one-seed juniper species. Pit-seed goosefoot and other goosefoot/pigweed species are present in all of the features. There is evidence that pinyon nuts, grasses (particularly drop-seed grass), sumac, and prickly pear and/or cholla were also processed in or around the features. The evidence of these plants suggest that a hunter-gatherer subsistence strategy was in place during the Late Archaic, and that at least a portion of the activities

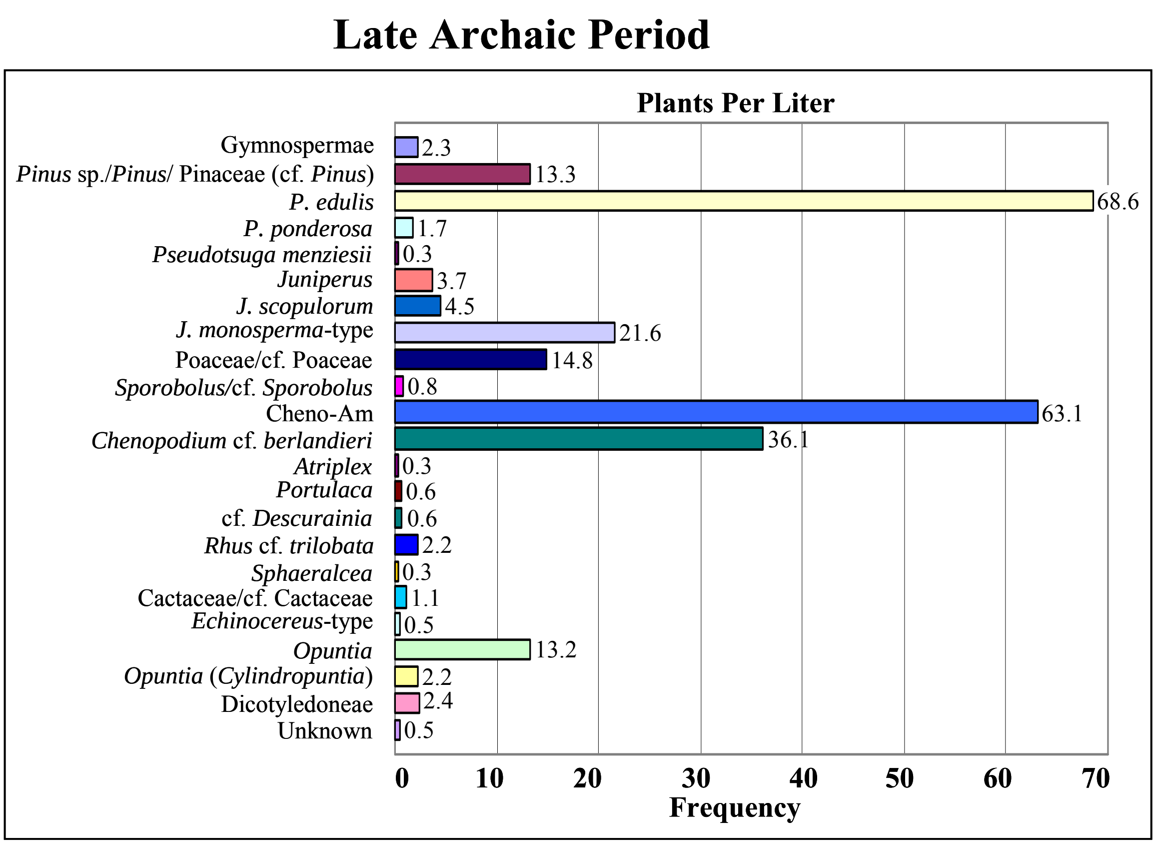

Figure 74. Macrobotanical plant estimates per liter of floated sediment from three samples collected from Late Archaic period features.

consisted of the gathering and procurement of localized plants during the summer and fall seasons.

Pollen Analysis

Information regarding the pollen analysis for the Late Archaic period component is derived from Jones' (2003) polynological report. Eleven pollen samples, recovered from Shelter 1, Trench B and Shelter 2, Trench A, are associated with the Late Archaic period component. These samples yielded a minimum of 33 different pollen grains representing various plant taxa. Pollen analysis for the 11 samples is presented in Tables 51 and 52. Table 51 provides provenience data each sample, while Table 52 lists the inventory of pollen grains identified in each sample. The pollen samples associated with

Table 51. Late Archaic Period Component Provenience Data for Pollen

Sample	Description	Cat. No.[1]	Shelter No.	Unit No.[2]	Lev	N[3]	E[4]	El.[5]	Context
1	Slab Metate	.368	1	B2	5	52	95	999.61-.47	Feature 6
	Control	4.102	1	B2	5	52	95	999.50-.49	Under Metate (Cat. No. .361)
2	Slab Metate	.370	1	B2	5	30	16	999.62-.52	Feature 6
	Control	4.103	1	B2	5	30	16	999.52-.49	Under Metate (Cat. No. .363)
3	Slab Metate	.330	2	A3	5	10	62	998.93	Periphery of Feature 5
4	Single Handed Mano	.344	2	A4	7	83	30	998.64-.56	Feature 7
	Control	4.097	2	A4	7	83	30	998.53	Under Mano (Cat. No. .346)
5	Single Handed Mano	.345	2	A4	7	95	32	998.66-.59	Feature 7
	Control	4.096	2	A4	7	95	32	998.58	Under Mano (Cat. No. .347)
6	Slab Metate	.338	2	A4	7	70	75	998.69	Adjacent to Feature 7
	Control	4.099	2	A4	7	69	75	998.74	Under Metate (Cat. No. .340)

[1]Cat. No.- Catalog Number (5FN01592.00-),[2]Unit No.- Excavation Unit Number, [3]N-Northing, [4]E-Easting, [5]El. = Elevation based on site datum relative elevation of 1000 m

Table 52. Late Archaic Period Pollen Count and Percentages

Pollen Taxon	Sample No. 1				Sample No. 2			
	Metate (Cat.[2] .368)		Soil Control		Metate (Cat. .370)		Soil Control	
	#[3]	%[4]	#	%	#	%	#	%
Non-Arboreal								
Artemisia (Sage, Sagebrush)	7	3.5	14	7.0	18	9.0	19	9.5
High Spine Asteraceae (Sunflower Group)	2	1.0	1	0.5			5	2.5
Low Spine Asteraceae (Ragweed Group)	48	24.0	27	13.5	46	23.0	26	13.0
Liguliflorae (Dandelion, Chicory)	2	1.0					2	1.0
Cirsium (Thistle)			1	0.5				
Brassicaceae (Mustard Family)[1]			2	1.0			2	1.0
Cheno-Am (Goosefoot, Pigweed)	57	28.5	76	38.0	64	32.0	61	30.5
***Cylindropuntia* (Cholla)**	**1**	**0.5**			**1**	**0.5**	1	0.5
Cyperaceae (Sedge Family)	1	0.5						
Fabaceae (Legume Family)					1	0.5		
Poaceae (Grass Family)	17	8.5	12	6.0	8	4.0	8	4.0
Polygonaceae (Knotweed Family)							2	1.0
Rosaceae (Rose Family)					**1**	**0.5**	1	0.5
Sphaeralcea (Globe Mallow)							1	0.5
Arboreal								
Juniperus (Juniper)	31	15.5	36	18.0	36	18.0	50	25.0
Pinus (Pine)	18	9.0	19	9.5	14	7.0	14	7.0
Quercus (Oak)	2	1.0	1	0.5	2	1.0	1	0.5
Salix (Willow)	2	1.0	2	1.0	1	0.5		
Indeterminate	12	6.0	9	4.5	8	4.0	7	3.5
Total	200	100	200	100	200	100	200	100
Concentration Value	N/A		4091		N/A		5870	
	Sample No. 3				**Sample No. 4**			
	Metate (Cat. .330)		**Soil Control**		**Mano (Cat. .344)**		**Soil Control**	
Non-Arboreal								
Apiaceae (Parsley Family)					1	0.5	17	8.5
Artemisia (Sage, Sagebrush)	20	10.0			20	10.0	1	0.5
High Spine Asteraceae (Sunflower Group)							16	8.0
Low Spine Asteraceae (Ragweed Group)	16	8.0			23	11.5		
Brassicaceae (Mustard Family)					**2**	**1.0**	4	2.0
Cheno-Am (Goosefoot, Pigweed)	45	22.5			34	17.0	47	23.5
***Coryphantha*-type (Cactus)**							1	0.5
***Cylindropuntia* (Cholla)**							1	0.5
Ephedra nevadensis-type (Joint Fir, Mormon Tea)	1	0.5						
Ephedra torreyana-type (Joint Fir, Mormon Tea)	1	0.5						
***Eriogonum* (Desert Buckwheat)**	**1**	**0.5**					3	1.5
Fabaceae (Legume Family)	3	1.5			2	1.0	1	0.5
Poaceae (Grass Family)	9	4.5			19	9.5	17	8.5
Polygonaceae (Knotweed Family)	2	1.0					1	0.5
Rosaceae (Rose Family)	**1**	**0.5**						
Sphaeralcea (Globe Mallow)							1	0.5
***Typha/Sparganium* (Cattail/Burreed)**	**1**	**0.5**						

Table 52. Late Archaic Period Pollen Count and Percentages (continued)

Pollen Taxon	Sample No. 3				Sample No. 4			
	Metate (Cat. .330)		Soil Control		Mano (Cat. .344)		Soil Control	
	#	%	#	%	#	%	#	%
Arboreal								
Juniperus (Juniper)	40	20.0			53	26.5	22	11.0
Picea (Spruce)					1	0.5		
Pinus (Pine)	53	26.5			41	20.5	57	28.5
Quercus (Oak)	3	1.5			1	0.5		
Salix (Willow)	1	0.5					1	0.5
Indeterminate	3	1.5			3	1.5	10	5.0
Total	200	100			200	100	200	100
Concentration Value	N/A		N/A		N/A		5625	

	Sample No. 5				Sample No. 6			
	Mano (Cat. .345)		Soil Control		Metate (Cat. .338)		Soil Control	
	#	%	#	%	#	%	#	%
Non-Arboreal								
Artemisia (Sage, Sagebrush)	15	7.5	14	7.0	16	8.0	16	8.0
High Spine Asteraceae (Sunflower Group)	1	0.5			1	0.5	1	0.5
Low Spine Asteraceae (Ragweed Group)	19	9.5	28	14.0	19	9.5	18	9.0
Cirsium (Thistle)					1	0.5		
Brassicaceae (Mustard Family)			3	1.5			2	1.0
Cheno-Am (Goosefoot, Pigweed)	47	23.5	55	27.5	56	28.0	57	28.5
Dalea (Dalea)							1	0.5
Ephedra torreyana-type (Joint Fir, Mormon Tea)			1	0.5				
Fabaceae (Legume Family)	1	0.5			1	0.5		
***Platyopuntia* (Prickly Pear)**	**1**	**0.5**			**2**	**1.0**	1	0.5
Poaceae (Grass Family)	21	10.5	10	5.0	12	6.0	20	10.0
Polygonaceae (Knotweed Family)	2	1.0	2	1.0	1	0.5	1	0.5
Rosaceae (Rose Family)			1	0.5				
***Sarcobatus*-type (Greasewood, Pickleweed)**	**1**	**0.5**						
Shepherdia argentea (Silverleaf Buffaloberry)							1	0.5
Solanaceae (Nightshade Family)			1	0.5				
Sphaeralcea (Globe Mallow)	1	0.5						
Arboreal								
Betula (Birch)	1	0.5						
Juniperus (Juniper)	32	16.0	32	16.0	38	19.0	23	11.5
Picea (Spruce)	1	0.5					1	0.5
Pinus (Pine)	48	24.0	43	21.5	41	20.5	45	22.5
***Prunus* (Plum, Cherry)**							1	0.5
Quercus (Oak)	1	0.5	1	0.5	2	1.0	2	1.0
***Rhus* (Sumac, Poison Ivy)**					**1**	**0.5**		
Salix (Willow)	1	0.5			1	0.5	1	0.5
Indeterminate	7	3.5	9	4.5	8	4.0	9	4.5
Total	200	100	200	100	200	100	200	100
Concentration Value	N/A		5455		N/A		3313	

[1] Plant taxon in bold face represents potential economic types according to Jones (2003), [2]Cat.=Catalog Number (5FN01592.000-), [3] #=Pollen Grain Count, [4]%=Percent

the Late Archaic period consist of six pollen washes from ground stone artifacts, as well as five soil control samples. However, a single pollen wash was selected in the laboratory (.330) although a sediment sample for this artifact was not collected in the field, thus leaving a blank space in Table 52.

The results of analysis of the 11 pollen values are similar and are discussed here as a group. Compared to the sediment samples, the ground stone washes often have noticeable values of sagebrush (.344,), ragweed group (.344, .368, .370), grass family (.345, .368), juniper (.338, .344), and pine (.345). These pollen types are not regarded as having significant resource potential to prehistoric populations because each of these plant species is wind-pollinated. A few plant types with potential economic values found in the pollen washes consist of cholla (.368 and .370), mustard family (.344), prickly pear) (.338 and .345), desert buckwheat (.330), rose family (.330 and .370), greasewood or pickleweed (.345), cattail/burreed (.330), and sumac or poison ivy (.338). However, pollen counts are low for all of the items and do not necessarily signal economic utilization of these plants.

Pollen washes from the Late Archaic ground stone lack evidence to suggest that any of the items were utilized for processing plant resources. Pollen grains dependent on wind are abundant, but less reliable resource for determining cultural use of plants. These wind pollinated plant types, such and juniper and pine, are abundant and indicate pinyon-juniper environment, similar to the surrounding environment of the present day. As expected, the pollen analysis suggests that wild plant foods were locally available during the Late Archaic period.

Developmental Period: The Developmental period is associated with the upper portions of non-disturbed sedimentary fill in Trench B, Shelter 1 and Trench A, Shelter 2 (Figures 34 and 35, Tables 7 and 8). The identification of this temporal period is based on two radiocarbon dates recovered from a hearth and a hearth-like feature. Additional factors for defining the Developmental period include alignment of these features in association with stratigraphic layers (see Chronology and Temporal Age Assessments). The materials associated with the Developmental period make up a significant portion of the total excavated assemblage. Including the two sheet middens previously described (see Baseline Data: Features Transcending Temporal Periods), there are five features associated with this component. Of the total excavated material culture recovered from the shelter, the Developmental period represents 25.7% of the debitage, 29.2% of the flaked stone tools, 28.0% of the ground/battered stone, and 46.2% of the faunal artifacts. The only obsidian from the entire project that was submitted for source analysis is from this collection. One small piece of ochre was also recovered from a Developmental period level. Faunal remains from this component comprise 23.2% of the site total, subsistence-related remains 46.2%, and pollen samples, 31.6%.

Feature Descriptions: Five features are associated with the Developmental period component. There are two features identified in Shelter 1/Trench B, which include Features 6 and 6A. Feature 6A is a charcoal concentration situated on top of the sheet midden and directly associated with Feature 6. An additional sheet midden, Feature 5, is located in Shelter 2/Trench A. Both of these midden deposits, Features 5 and 6, have been described previously (see Features Transcending Temporal Periods). Additional features exposed in Shelter 2/Trench A consist of two basin-shaped features; Feature 2 is a hearth, while Feature 9 is a roasting pit.

Feature 2

Feature 2 is a basin-shaped hearth that is defined mainly by a concentration of large charcoal pieces and a small number of tabular gravels and cobbles of burned sandstone (Figures 75 and 76) It is located in Levels 2 and 3 of Grid Units A3 and A4. The lateral extent of the excavated, northern portion of the feature measures 79 cm E/W x 46 cm N/S in plan view. It is defined by loose, unconsolidated sediment. The hearth was initially exposed in the lower portion of Stratum 6, at a depth of 15 cm BMGS. The basin portion of the hearth extends into Stratum 4. The feature is approximately 16 cm thick.

When the feature was initially exposed, in Grid A3, a small portion of the eastern side was fully excavated in the general grid unit levels. The feature was identified as a hearth in the profile wall after the first two levels of Grid Unit A3 had been excavated. In Grid Unit A4, the northwestern half of Feature 2 was fully recorded and a controlled excavation of the hearth was performed. Only the northern half of the feature was excavated; the entire southern half of the feature remains intact in the southern wall of Trench A (Figure 76).

Large pieces of charcoal collected from the center of the charcoal lens yielded a conventional radiocarbon age of 1070±60 B.P., which suggests utilization of the feature during the transition from the Developmental period to the Diversification period (see Table 6). A macrobotanical sample, collected from the central region of Feature 2, yielded 642 total charred botanical remains (see Macrobotanical Remains). The remainder of the exposed feature was screened through standard 1/8-inch mesh. Artifacts

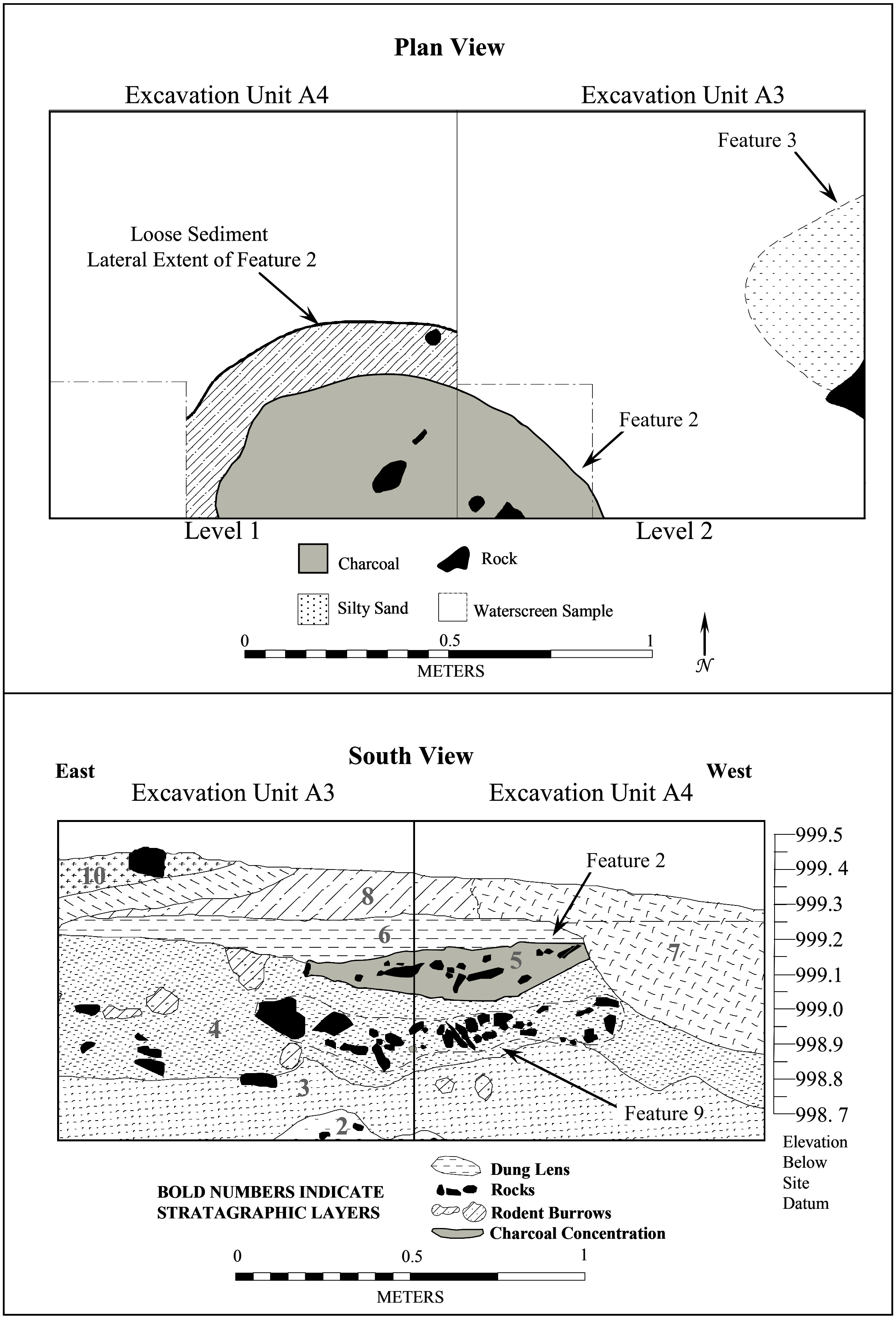

Figure 75. Feature 2 plan view (top) and profile (bottom). Feature 9 is also visible in profile.

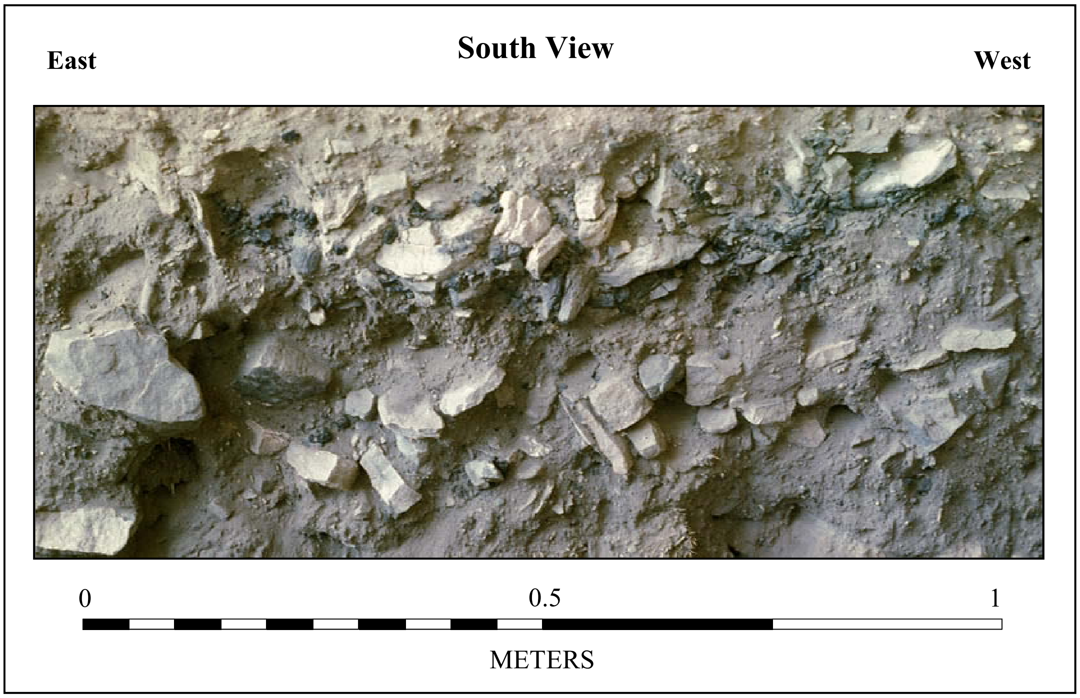

Figure 76. Profile lenses of Feature 2 (top) and Feature 9 (bottom).

and general faunal remains were collected from the heavy fraction of the flotation sample and the feature fill screened through the 1/8-inch mesh include three ground stone fragments, 12 items of debitage, and 14 bones. Five of the faunal specimens recovered from the feature fill are burned/calcined Table 53.

Feature 6A

Feature 6A is a charcoal refuse pile with an amorphous shape. This feature was uncovered between the manure lens of the overburden contact (Stratum 8W) and the FCR lining (Stratum 7) that encased Feature 6 in Level 1 of Grid Unit B3 (Figures 77 and 78). Feature 6A measures 60 cm N/S x 45 cm E/W in plan view; it was exposed at a depth of 9 cm BMGS and is approximately 10 cm thick. When the feature was first uncovered, it extended into the southern and western walls of Grid Unit B3; however, its boundaries were not observed in Grid Unit 4. The feature consists of a loose concentration of large

Table 53. Faunal Specimens Recovered From Developmental Period Features[1]

Feature	Taxa	Total Count	Burn[2] Burned	Burn[2] Calcined
2	**Mammal**			
	Indeterminate small size mammal	2		1
	Indeterminate medium mammal	1		
	Indeterminate Vertebrate	11	1	3
	Total	14	1	4
Feature **6A**	**Reptile**			
	Indeterminate Lizard	1		
	Mammal			
	Indeterminate mammal	15		3
	Lagomorph	1		1
	Indeterminate hare or rabbit			
	Indeterminate medium-large size artiodactyl	1		
	Indeterminate Vertebrate	67		13
	Total	85		17
Feature **9**	**Mammal**			
	Indeterminate small size mammal	1		
	Indeterminate mammal	2		2
	Indeterminate very small size rodent	1		1
	Indeterminate Vertebrate	75	1	20
	Total	79	1	23

[1]Gastropodia not included, [2]Burn attributes do not include indeterminate bulk bone counts

and small (≤ 2.5cm) pieces of charcoal dispersed throughout the area and intermixed with smaller (5-7cm) pieces of FCR. The sediment within the feature is mottled and ranges between a very dark gray (7.5YR3/1) fine sandy silt and dark brown (7.5YR3/2) sandy silt. Large pieces of charcoal collected from this lens yields a conventional radiocarbon age of 1390±60 B.P., suggesting that the feature dates to the Developmental period (see Table 6). A macrobotanical sample was collected from the northern portion of the charcoal concentration and the remainder of the exposed feature was screened through standard 1/8-inch screen. The macrobotanical sample yielded 307 charred botanical remains (see Macrobotanical Remains). Artifacts and faunal remains were collected from

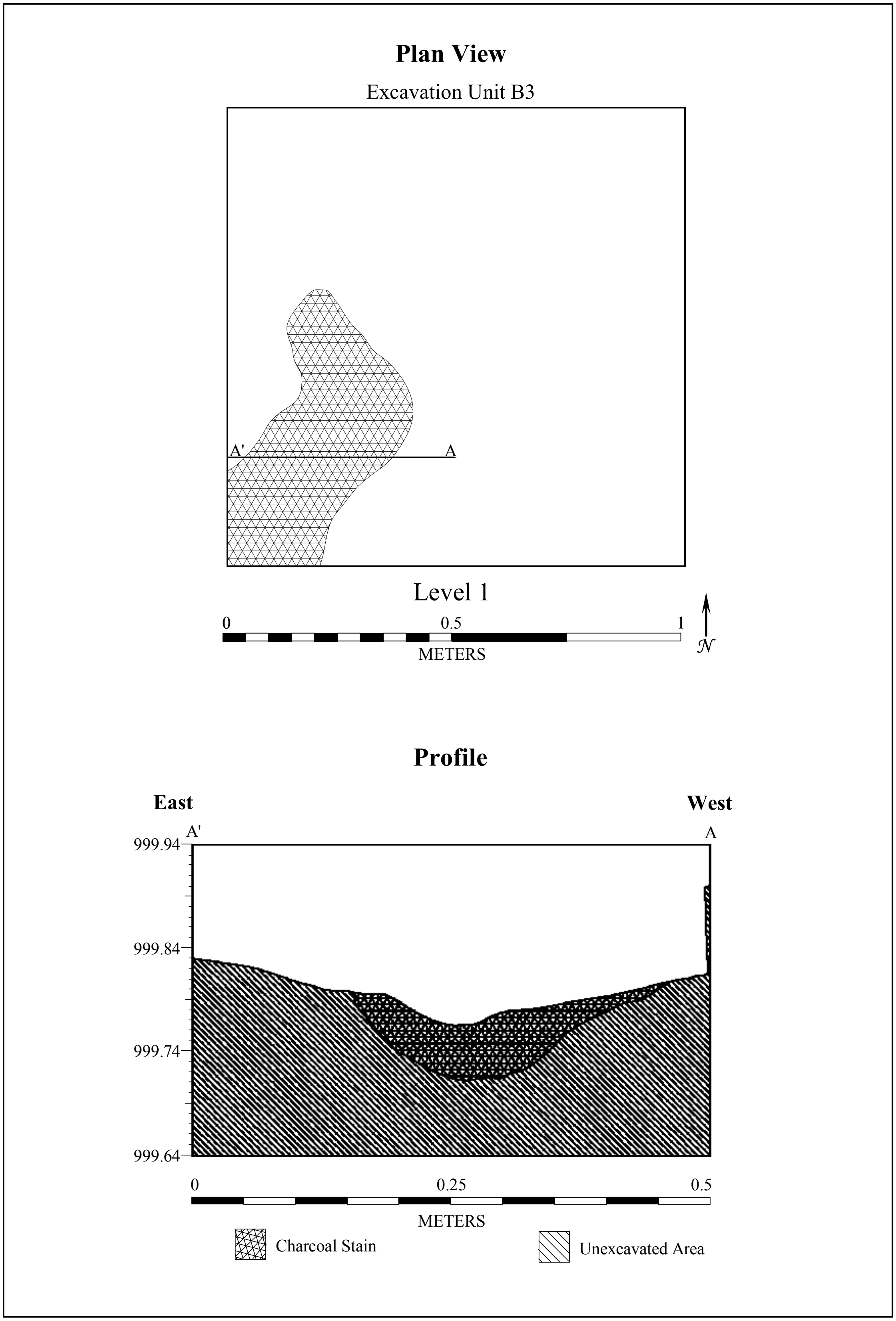

Figure 77. Feature 6A plan map and profile.

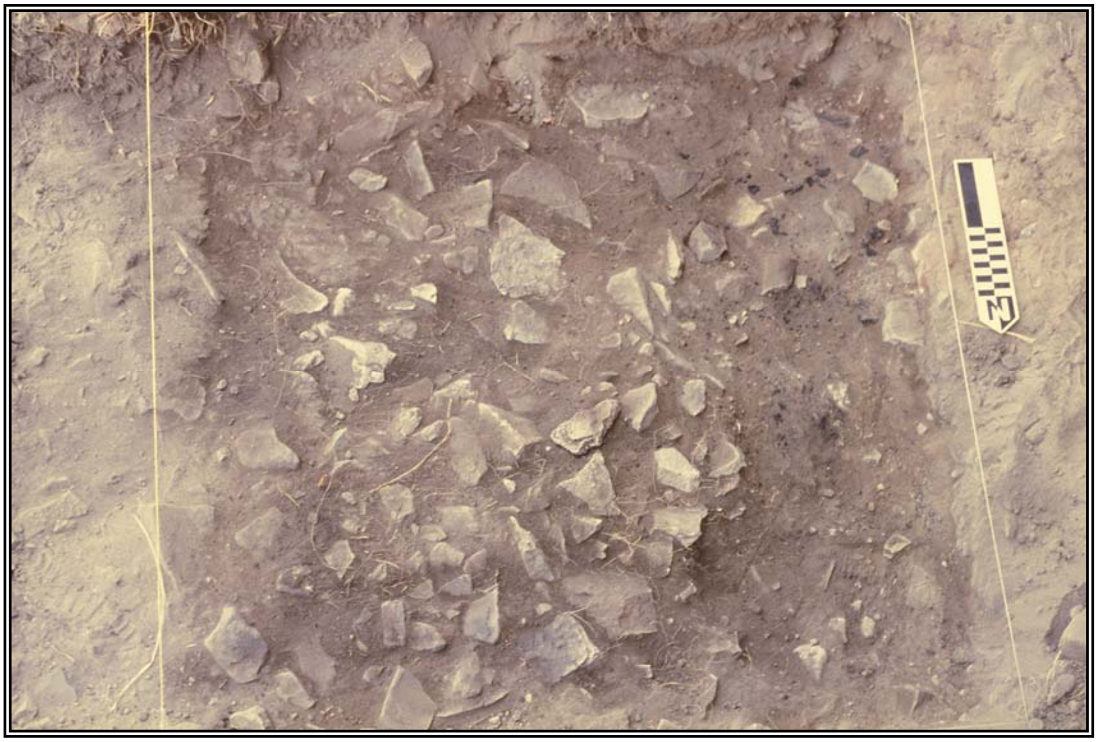

Figure 78. View of base of Level 1, Excavation Unit B3. Feature 6A, a charcoal concentration, is at the west-southwestern side of unit. The western top of Feature 5, sheet midden, is exposed on the eastern and central portion of the unit. North arrow is 25 cm in length.

both the heavy fraction of the flotation sample and the standard 1/8-inch screen. These artifacts include 13 pieces of debitage and 85 general faunal remains. Seventeen of the bones are calcined (Table 53). The amorphous appearance of the feature and abundant quantity of charcoal suggest that this feature represents hearth debris from another location, which was then dumped in this area.

Feature 9

Feature 9 is a basin-shaped roasting pit that consists mainly of a dense cluster of cobble-sized heat altered sandstone, with small pieces of charcoal flecks interspersed throughout the fill. While partially exposed in plan view, this roasting pit was originally thought to be a part of the sheet midden deposit from Feature 6 and was therefore

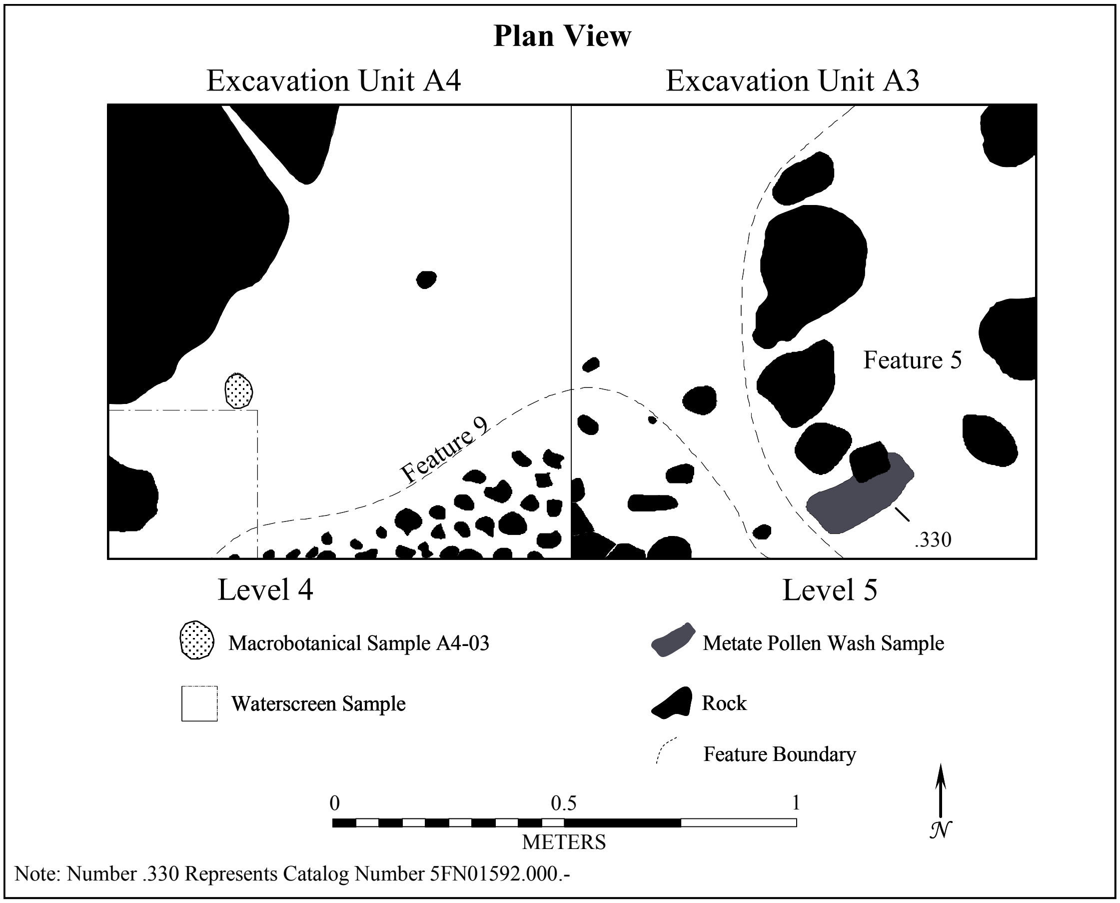

Figure 79. Feature 9 plan map.

excavated along with the general fill of Levels 4-7 in Grid Units A3 and Levels 3-5 in Grid Unit A4 (Figures 79). After these levels were excavated, the distinct concentration of rocks was identified as a separate feature in the southern profile wall of Trench A, where approximately half of the feature remains intact (Figures 75 and 76). The feature was initially exposed in Stratum 4 at a depth of 38 cm BMGS and is approximately 22 cm thick, extending into the upper portions of Stratum 3. From the southern wall of the trench, it measures approximately 30 cm N/S cm x 102 cm E/W.

Radiocarbon and macrobotanical samples were taken from the central region of the feature that was exposed in the southern wall of the trench. A concentrated charcoal sample from the lens of Feature 9 yielded a conventional radiocarbon age of 1880±60

B.P., suggesting that the feature was utilized during the transition between the Late Archaic period and the Developmental period (Table 6). The macrobotanical sample was recovered by excavating 12 cm into the southern wall of the trench. This sample yielded 433 charred botanical remains (see Macrobotanical Remains). Twenty-two pieces of debitage and 79 faunal remains were recovered from the heavy fraction of the macrobotanical sample. Twenty-four of the bones are burned/clacined (Table 53).

Material Culture

Lithic Material

Flaked Stone

A total of 723 debitage specimens and 28 flaked stone tools were recovered from the Developmental period component at the Gilligan's Island site. The stone data indicate that mid- to late-stage reduction was typical for tool maintenance and manufacture during the Developmental period. Large tools typically associated with early stage reduction are uncommon, and are generally manufactured from quartzitic material available in the immediate area of the site.

Debitage

The debitage sample from the Developmental period consists of 723 specimens. Two waterscreen samples are absent from each individual excavated trench (Table 3 and 4). The standard and waterscreen samples were kept separate through the entire analytical procedures, which included both mass analysis and platform-bearing flakes. The initial data derived from the debitage specimens indicate that 72 specimens debris or shatter, characterized as blocky lithic material that lacks definable flake attributes such as a platform or feathered termination. During the mass analysis, both the standard and waterscreen samples were sorted through nested screens and categorized according the various screen size grades.

Tables 54 and 55 summarize the results of the mass analysis for the individual excavation trenches in each shelter, and combine the results for the entire Developmental period component. These tables represent the flake sizes of tool production, in which the objective pieces being produced will continually decrease in size throughout tool manufacture, as will the flakes and the amount of cortex (Andrefsky 1998:126). The combined total from the standard screen data in Table 54 reveals that chert was the most commonly utilized material, followed by quartzite. The remaining samples consisting of chalcedony, siltstone, sandstone, petrified wood, quartz, and quartz crystal collectively make up less than 14% of the sample. The greatest number of debitage specimens is present in the two smallest size grades; in both of these categories, noncortical debri occur most often. The early and middle stages of reduction, represented by size grade 1 and 2, have far fewer flakes than the two smaller size categories. The size grade 2 items are represented most by nearly equal distributions of cortical and noncortical chert and quartzitic materials. The largest flake items represented by size grade 1 are entirely quartzitic specimens, most of which have some degree of cortex. The individual shelters, characterized by Trenches A and B, display the same distribution pattern of debitage sizes, materials and cortex attributes. The waterscreen data shown in Table 55 display a similar division between material types and size grades as the standard screen sample. The noticeable difference in the waterscreen sample is that there are no large debitage items recovered from Shelter 2, Trench A, and chert counts are lower in the size grade 2

Table 54. Mass Debitage Analysis Summary of Developmental Period: Standard 1/8-inch Screen[1]

	MATERIAL TYPE	SIZE GRADE FREQUENCIES								TOTALS	
		1 (Large)		2 (Medium)		3 (Small)		4 (Micro)			
		Cortex	No Cortex	Cortex	No Cortex	Cortex	No Cortex	Cortex	No Cortex	Freq.	Column Percent
TRENCH A	**Chert**	0	0	8	7	17	60	4	83	**179**	**67.2**
	Chalcedony	0	0	0	0	1	1	0	5	**7**	**2.6**
	Quartzite	5	1	8	9	4	17	3	6	**53**	**19.9**
	Sandstone	0	0	1	0	0	0	0	0	**1**	**<1.0**
	Quartz	0	0	2	0	3	4	0	1	**10**	**3.7**
	Petrified Wood	0	0	1	2	1	5	0	5	**14**	**5.2**
	Quartz Crystal	0	0	0	0	2	0	0	0	**2**	**<1.0**
	TOTAL COUNTS	**5**	**1**	**20**	**18**	**28**	**87**	**7**	**100**	**266**	**100**
	ROW PERCENTAGES	**1.8**	**<1.0**	**7.5**	**6.7**	**10.5**	**32.7**	**2.6**	**37.5**	**100**	
TRENCH B	**Chert**	0	0	6	5	12	31	6	60	**120**	**58.5**
	Chalcedony	0	0	0	0	0	2	0	2	**4**	**2.0**
	Quartzite	4	0	7	5	7	23	3	12	**61**	**29.8**
	Siltstone	0	0	0	1	0	1	0	0	**2**	**<1.0**
	Sandstone	0	0	1	0	0	0	0	0	**1**	**<1.0**
	Quartz	0	0	1	0	0	2	1	3	**7**	**3.4**
	Petrified Wood	0	0	0	0	0	0	0	8	**8**	**3.9**
	Quartz Crystal	0	0	0	0	0	0	0	2	**2**	**<1.0**
	TOTAL COUNTS	**4**	**0**	**15**	**11**	**19**	**59**	**10**	**87**	**205**	**100**
	ROW PERCENTAGES	**2.0**	**0.0**	**7.3**	**5.4**	**9.3**	**28.8**	**4.9**	**42.4**	**100**	
COMBINED TOTALS	**Chert**	0	0	14	12	29	91	10	143	**299**	**63.5**
	Chalcedony	0	0	0	0	1	3	0	7	**11**	**2.3**
	Quartzite	9	1	15	14	11	40	6	18	**114**	**24.2**
	Siltstone	0	0	0	1	0	1	0	0	**2**	**<1.0**
	Sandstone	0	0	2	0	0	0	0	0	**2**	**<1.0**
	Quartz	0	0	3	0	3	6	1	4	**17**	**3.6**
	Petrified Wood	0	0	1	2	1	5	0	13	**22**	**4.7**
	Quartz Crystal	0	0	0	0	2	0	0	2	**4**	**<1.0**
	TOTAL COUNTS	**9**	**1**	**35**	**29**	**47**	**146**	**17**	**187**	**471**	**100**
	ROW PERCENTAGES	**1.9**	**<1.0**	**7.4**	**6.2**	**10.0**	**31**	**3.6**	**39.7**	**100**	

Table 55. Mass Debitage Analysis Summary of Developmental Period: 1/16-inch Waterscreen[1]

	MATERIAL TYPE	SIZE GRADE FREQUENCIES								TOTALS	
		1 (Large)		2 (Medium)		3 (Small)		4 (Micro)			
		Cortex	No Cortex	Cortex	No Cortex	Cortex	No Cortex	Cortex	No Cortex	Freq.	Column Percent
TRENCH A	**Chert**	0	0	0	1	3	15	3	79	**101**	**69.6**
	Quartzite	0	0	5	4	3	12	1	8	**33**	**22.7**
	Quartz	0	0	0	0	0	1	0	2	**3**	**2.0**
	Petrified Wood	0	0	0	0	1	0	0	5	**6**	**4.1**
	Quartz Crystal	0	0	0	0	0	1	0	1	**2**	**1.3**
	TOTAL COUNTS	**0**	**0**	**5**	**5**	**7**	**29**	**4**	**95**	**145**	**100**
	ROW PERCENTAGES	**0.0**	**0.0**	**3.4**	**3.4**	**4.8**	**20.0**	**2.7**	**65.5**	**100**	
TRENCH B	**Chert**	0	0	1	1	4	6	6	61	**79**	**73.8**
	Chalcedony	0	0	0	0	0	1	0	0	**1**	**<1.0**
	Quartzite	2	1	1	1	1	5	0	7	**18**	**16.8**
	Sandstone	0	0	1	1	0	0	0	0	**2**	**1.9**
	Quartz	0	0	0	0	1	0	0	2	**3**	**2.8**
	Petrified Wood	0	0	0	0	0	1	0	3	**4**	**3.7**
	TOTAL COUNTS	**2**	**1**	**3**	**3**	**6**	**13**	**6**	**73**	**107**	**100**
	ROW PERCENTAGES	**1.8**	**<1.0**	**2.8**	**2.8**	**5.6**	**12.1**	**5.6**	**68.2**	**100**	
COMBINED TOTALS	**Chert**	0	0	1	2	7	21	9	140	**180**	**71.4**
	Chalcedony	0	0	0	0	0	1	0	0	**1**	**<1.0**
	Quartzite	2	1	6	5	4	17	1	15	**51**	**20.2**
	Sandstone	0	0	1	1	0	0	0	0	**2**	**<1.0**
	Quartz	0	0	0	0	1	1	0	4	**6**	**2.4**
	Petrified Wood	0	0	0	0	1	1	0	8	**10**	**4.0**
	Quartz Crystal	0	0	0	0	0	1	0	1	**2**	**<1.0**
	TOTAL COUNTS	**2**	**1**	**8**	**8**	**13**	**42**	**10**	**168**	**252**	**100**
	ROW PERCENTAGES	**<1.0**	**<1.0**	**3.2**	**3.2**	**5.2**	**16.7**	**4.0**	**66.7**	**100**	

waterscreen sample than in the standard screen. Both of these observations are of little interpretive value since the absolute numbers in the standard screen are small.

The general distributions of the standard and waterscreen samples indicate that the most common forms of lithic reduction correspond to the later stages, while early and middle stages were less frequently practiced. This suggests that most of the stone material brought to the site during the Developmental period had been manufactured previously or had been subjected to mid- to late-stage reduction. At the site, the occupants appear to have been concerned mainly with terminal reduction stages and tool maintenance. The limited number of large cortical quartzitic flakes indicates that local quartzites were utilized occasionally, and were subjected to the early stages of core reduction.

The second type of debitage analysis focuses strictly on those specimens with striking platforms. These data are used to determine the separate kinds of stone tool technologies and to identify the preferred materials that were used with each technology. The analytical processes for platformed flake analysis are described in Chapter 5, while a general review of standard assumptions is given in the discussion of baseline data for the debitage. The platformed flake sample consists of 300 specimens or 41.5% of the total debitage assemblage assigned to the Developmental period. Table 56 compares the presence and absence of cortex flakes in hard hammer and bifacial thinning technologies (Kalasz et al. 2005:78). These tabulations are based on a 95% confidence from a chi-square test. The combined trench totals shows that 56.4% of the hard hammer flakes lack cortex while only eight of the 121 bifacial thinning flakes exhibit cortex. These data suggest that both the hard hammer and bifacial thinning technologies are associated with

Table 56. Developmental Period Platformed Flake Summary (Standard 1/8-inch Screen and 1/16-inch Waterscreen Total Sample): Cortex by Technological Flake Type[1]

	CORTEX	HARD HAMMER		BIFACIAL THINNING		TOTALS	
		Freq.	Col. pct	Freq.	Col. pct	**Freq.**	**Col. pct**
TRENCH A	**Present**	41	48.8	5	6.8	**46**	**29.1**
	Absent	43	51.2	68	93.2	**111**	**70.9**
	TOTALS	**84**	**100**	**73**	**100**	**157**	**100**
TRENCH B	**Present**	37	38.9	3	6.3	**40**	**28.0**
	Absent	58	61.1	45	93.8	**103**	**72.0**
	TOTALS	**95**	**100**	**48**	**100**	**143**	**100**
Combined Trench TOTALS	**Present**	**78**	**43.6**	**8**	**6.6**	**86**	**28.7**
	Absent	**101**	**56.4**	**113**	**93.4**	**214**	**71.3**
	TOTALS	**179**	**100**	**121**	**100**	**300**	**100**

Test Statistics for Cortex by Technological Flake Type:
Trench A: Chi-square= 33.197; degrees of freedom= 1; prob.= 0.00
Trench B: Chi-square= 16.921; degrees of freedom= 1; prob.= 0.01
Total: Chi-square = 48.239; degrees of freedom= 1; prob.= 0.00

[1]Modified from Kalasz et al. 2005:Table 6

the later stages of tool reduction and maintenance. Interestingly, the presence of cortex in the hard hammer technology remains high at 43.6%, indicating that middle stages of core reduction and bifacial thinning may have occurred more often than the mass debitage analysis suggests.

The material types are separated by the standard 1/8-inch screen and 1/16-inch waterscreen samples, both of which demonstrate that hard hammer and bifacial thinning technologies occurred on the site. These results are shown in Tables 57 and 58. Not surprisingly, the material types in the platformed flake analysis share trends with the mass debitage samples described above. In both types of analyses, chert dominates the specimen count followed distantly by quartzite. For instance, in the standard platformed flake sample of the 77 bifacial thinning flakes, 63 of the specimens, or 81.8% of the material, are chert, followed by six quartzitic flakes, or 7.8%. In comparison, the

Table 57. Platformed Flake Summary of Developmental Period (Standard 1/8-inch Screen): Material Type by Flake Type[1]

	MATERIAL TYPE	HARD HAMMER		BIFACIAL THINNING		TOTALS	
		Freq.	Col. pct	Freq.	Col. pct	Freq.	Col. pct
TRENCH A	Chert	24	38.7	45	88.2	**69**	**61.1**
	Chalcedony	1	1.6	3	5.9	**4**	**3.5**
	Quartzite	30	48.4	1	2.0	**31**	**27.4**
	Quartz	1	1.6	0	0.0	**1**	**<1.0**
	Petrified Wood	4	6.5	2	3.9	**6**	**5.3**
	Quartz Crystal	2	3.2	0	0.0	**2**	**1.8**
	TOTALS	**62**	**100**	**51**	**100**	**113**	**100**
TRENCH B	Chert	50	61.7	18	69.2	**68**	**63.6**
	Chalcedony	1	1.2	1	3.8	**2**	**1.9**
	Quartzite	28	34.6	5	19.2	**33**	**30.8**
	Siltstone	1	1.2	1	3.8	**2**	**1.9**
	Quartz	1	1.2	0	0.0	**1**	**<1.0**
	Petrified Wood	0	0.0	1	3.8	**1**	**<1.0**
	TOTALS	**81**	**100**	**26**	**100**	**107**	**100**
Combined Trench TOTALS	Chert	74	51.7	63	81.8	**137**	**62.3**
	Chalcedony	2	1.4	4	5.2	**6**	**2.7**
	Quartzite	58	40.6	6	7.8	**64**	**29.1**
	Siltstone	1	<1.0	1	1.3	**2**	**<1.0**
	Quartz	2	1.4	0	0.0	**2**	**<1.0**
	Petrified Wood	4	2.8	3	3.9	**7**	**3.2.0**
	Quartz Crystal	2	1.4	0	0.0	**2**	**<1.0**
	TOTALS	**143**	**100**	**77**	**100**	**220**	**100**

[1]Modified from Kalasz et al. 2005:Table 8

material frequencies in the hard hammer category are quite different. Chert remains the dominant material, making up 74 or 51.7% of the 143 total flakes; however, quartzitic materials are far more prevalent in this category, consisting of more than 40% (n=58). These data suggest that chert was utilized throughout the early and late stages in biface reduction, while quartzitic material was reduced during the early stages of core reduction; the later stages of bifacial thinning were not commonly practiced. The early stage of hard

Table 58. Platformed Flake Summary of Developmental Period (1/16-inch Waterscreen): Material Type by Flake Type[1]

	MATERIAL TYPE	HARD HAMMER		BIFACIAL THINNING		TOTALS	
		Freq.	Col. pct	Freq.	Col. pct	Freq.	Col. pct
TRENCH A	Chert	7	31.8	17	77.3	**24**	**54.4**
	Quartzite	15	68.2	3	13.6	**18**	**40.9**
	Quartz	0	0.0	1	4.5	**1**	**2.3**
	Petrified Wood	0	0.0	1	4.5	**1**	**2.3**
	TOTALS	**22**	**100**	**22**	**100**	**44**	**100**
TRENCH B	Chert	7	50.0	18	81.8	**25**	**69.4**
	Quartzite	7	50.0	1	4.5	**8**	**22.2**
	Petrified Wood	0	0.0	3	13.6	**3**	**8.3**
	TOTALS	**14**	**100**	**22**	**100**	**36**	**100**
Combined Trench TOTALS	Chert	14	38.9	35	79.5	**49**	**61.3**
	Quartzite	22	61.1	4	9.1	**26**	**32.5**
	Quartz	0	0.0	1	2.3	**1**	**1.3**
	Petrified Wood	0	0.0	4	9.1	**4**	**5.0**
	TOTALS	**36**	**100**	**44**	**100**	**80**	**100**

[1]Modified from Kalasz et al. 2005:Table 8

hammer core reduction often produce a large quantity of debris with flat platform. This would account for the fact that in the waterscreen sample for the hard hammer category, quartzitic specimens are predominant.

The platformed flake data given above, both in terms of the presence and absence of cortex and material types, demonstrate the continuity of chert throughout the mid- to late-phases of tool reduction. This is to say that occupants during the Developmental period appear to have been actively bringing chert materials to the site, and frequently manufacturing the tools in the shelters. For instance, in the combined standard platformed flake analysis, 137 chert specimens have platforms, 63 (46.0%) are bifacially thinned, and 74 (54.0%) represent hard hammer technology. This represents a moderately even distribution of both technologies. The total number of platform-bearing flakes of chert for both the standard (n=137) and the waterscreen (n=49) analyses is 186. When this total is compared to the combined size grades and weight of complete platformed chert flakes in Table 59, 62 of the total complete or unbroken flake assemblage weigh less than 0.1 g, indicating that 32.3% are of microflake size. These data indicate that pressure flakes were often factored into the analysis; however, the distribution of hard hammer and bifacial thinning technologies suggests that later stages of lithic manufacture are commonly represented.

Table 59. Developmental Period Complete Platformed Flake Size Summary(Standard 1/8-inch Screen and 1/16-inch Waterscreen): Size Grades and Weights for Major Material Type Groups[1]

	SIZE GRADE	DESCRIPTIVE STATISTICS	Complete Flake Size Weight (grams)	
			CHERT	QUARTZITE
COMBINED TRENCH TOTALS	1 (Large Debitage)	N	**0**	**7**
		Minimum	N/A	18.100
		Maximum	N/A	79.300
		Mean	N/A	44.514
		Standard Deviation	N/A	19.463
	2 (Medium Debitage)	N	**10**	**14**
		Minimum	1.900	1.900
		Maximum	9.900	16.600
		Mean	4.480	6.107
		Standard Deviation	2.955	4.368
	3 (Small Debitage)	N	**41**	**21**
		Minimum	0.100	0.100
		Maximum	1.300	2.400
		Mean	0.359	0.633
		Standard Deviation	0.269	0.627
	4 (Micro Debitage)	N	**62**	**8**
		Minimum	N/A	N/A
		Maximum	N/A	N/A
		Mean	N/A	N/A
		Standard Deviation	N/A	N/A

[1] Weight for some size grade 4 specimens could not be read on digital scale.

Ultimately, the data above indicate that a wide range of lithic reduction occurred in the shelters, although variations on core reduction and tool manufacture appear to be dependent upon material type. It appears, at least in the case of chert materials, that the middle to late stages of both core reduction and bifacial thinning occurred in the shelters, and most of the objective materials were in a moderately reduced state prior to arrival at the site. The similar distributions of hard hammer flakes and bifacial thinning flakes suggest that larger chert cobbles or bifacial tools were commonly reduced, and the middle to late stages of tool manufacture often occurred in the shelters. On the other hand, quartzite materials, probably derived from a nearby source, are mainly representative of hard hammer technology as indicated by an increase in larger flake sizes. This information, along with the limited number of small quartzite flakes, implies that this material type was subjected to the early to middle stages of core reduction but not the later stages. The debitage sample size for the Developmental period is small, and therefore these conclusions should be regarded as tentative.

Flaked Stone Tools

Twenty-eight flaked stone tool items are associated with the Developmental period in the Gilligan's Island shelters (Figures 80 and 81). Table 60 provides an inventory of these tools according to separate subjective category. These data reveal that flaked stone tools are the most abundant, followed closely by more complex bifacial tools and then by heavier tool items. As with the Developmental period debitage sample, chert is the common material type, followed distantly by quartzite and petrified wood.

Bifaces generally take more time and skill to manufacture than any of the other items in the flaked stone tool kit. Nine bifaces, consisting of hafted and unhafted

Table 60. Developmental Period Flaked Stone Tool Types by Material Type[1]

Tool Type	MATERIAL FREQUENCIES			Tool Totals	
	Chert	Petrified Wood	Quartzite	Freq.[2]	Col. %[3]
Early Stage Biface	3			3	10.7
Undetermined Bifacial Fragment	2			2	7.1
Stemmed Biface Projectile Point/Knife	4			4	14.3
Scraper	1	1		2	7.1
Expedient Flake Tool	8		1	9	32.1
Core	1		3	4	14.3
Indeterminate Core/cobble Tool			1	1	3.6
Chopper			1	1	3.6
Miscellaneous Tool	1	1		2	7.1
Material Totals	20	2	6	28	100.0
Row %	71.4	7.1	21.4	100.0	

[1]Modified from Kalasz et al. 2005:Table 10, [2]Freq. = Frequency, [3]Col.% = Column Percent

specimens, are associated with the Developmental period component. All of the bifacial tools were manufactured from chert. The unhafted items consist of three early stage bifaces and two bifaces that were fragmented beyond the point at which a stage of manufacture could be confidently determined. One early stage biface (.025) is complete, and the edges of the item appear to have been retouched as well as utilized. The outer cortex of the specimen indicates that it was derived from a non-alluvial source. The edge of another early stage biface (.029) also has a utilized edge. The remaining unhafted bifaces do not exhibit cortex. Both of the undetermined bifacial fragments are retouched, while only one has a utilized edge (.097).

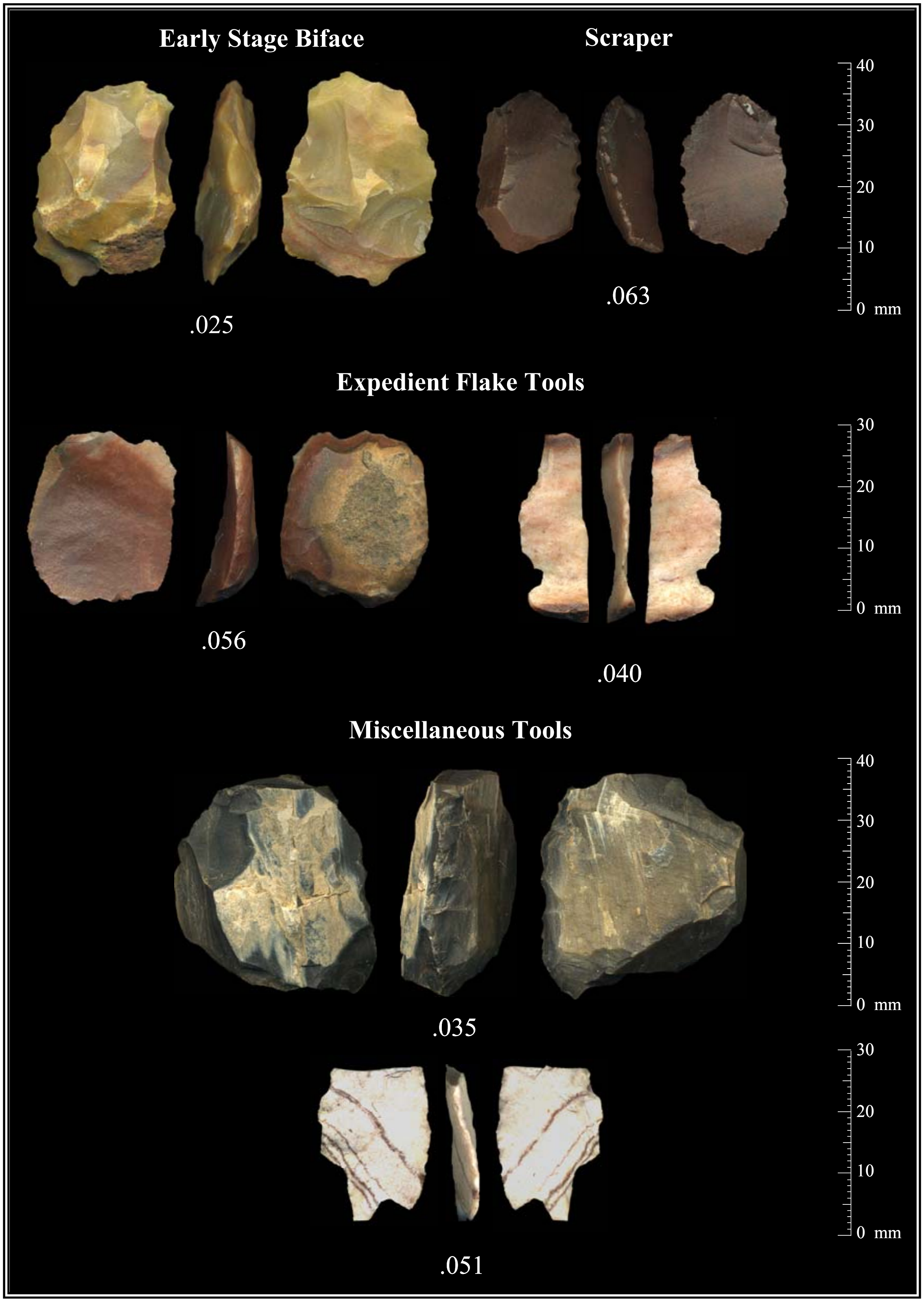

Figure 80. Gilligan's Island site lithic tools assigned to the Developmental period component.

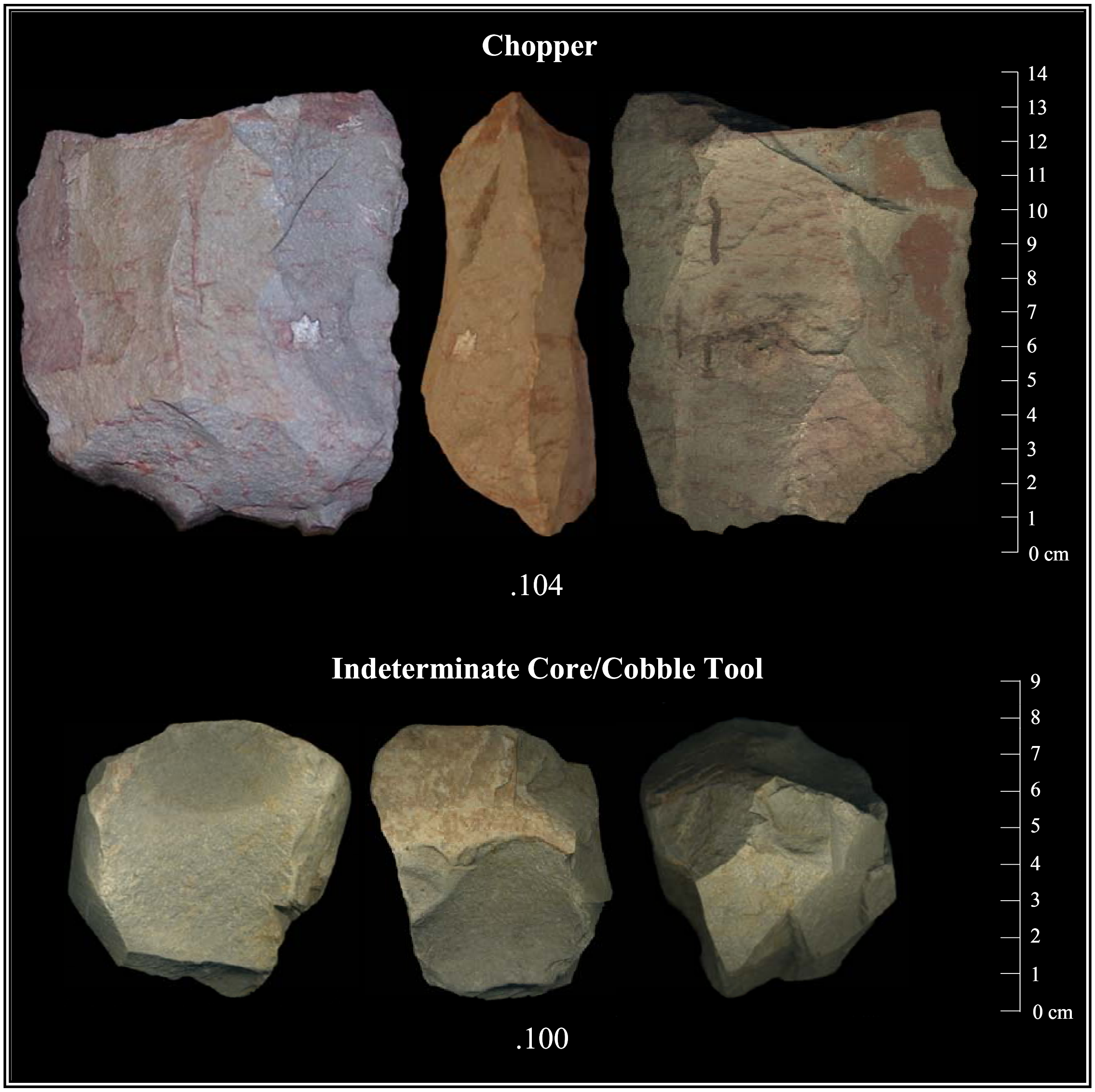

Figure 81. Gilligan's Island site lithic tools assigned to the Developmental period component (note reduced scale).

The hafted or stemmed biface group includes three projectile points and one knife. None of the hafted bifaces has a cortex. The hafted biface collection includes both complete to incomplete items. Only two specimens appear to have been made from flakes, while the remaining items are either too fragmented or have been thinned to the extent that origin could not be determined. The stemmed items that are complete consist of a projectile point (.027) and a knife (.026). Each of these complete stemmed bifaces has been heavily modified or reused, utilized edges are present along the blade element, and edge grinding is clear at the base of the stem. Flake patterning on two of the stemmed points is irregular or random.

Flake tools are generally easier to manufacture than bifaces. The subjective categories for flake stone tools in the Developmental period consist of scrapers and expedient flake tools. Scrapers are limited to two complete, disto-lateral scrapers, made of chert and petrified wood. Cortex is present on one of the scrapers and both are unthinned. The edges are utilized and retouched to varying degrees (8% to 100%). Nine expedient flake tools are associated with the Developmental period and include specimens that were probably used for a variety of cutting and scraping tasks. Eight of the expedient items are of chert and one is made of quartzite. Two of the modified chert flakes are complete, the quartzite flake is nearly complete, and the six remaining specimens are incomplete. Seven of the flake tools are utilized, while three have edge retouch. One specimen has cortex present.

The heaviest analytical group associated with the Developmental period includes the subjective categories of cores, indeterminate core/cobble tools, and choppers. All of the quartzitic materials described below, which are present in the heavier tool categories, are coarse-grained and gray in color, and thus similar to quartzite that occurs naturally near the site. Cores are large cobbles of raw material used to acquire flakes during the first stages of tool production (Kalasz et al. 2005:85). They are the most abundant items in the heavy portion of the analytical group, consisting of one specimen of chert and three of quartzite. All of the cores are thinned in multiple directions. The chert core has a smooth and rounded outer cortex, which indicates that the tool was derived from a stream cobble. Two of quartzitic cores are angular cobbles or nodules, and all three of the quartzite cores have a cortex that indicates that they acquired from a non-alluvial environment, such as a geologic formation. One of the cores (.101) was found *in situ* and fractured within the Feature 6 sheet midden deposit. The implement may have shattered as the result of a cooling event during heat treatment. Alternatively, the quartzite may have been utilized in the cooking process (i.e., FCR) and the flaked outer edges, which appear cultural, could in fact be the result of natural flake spalls. One indeterminate core/cobble tool (.100) is quartzite, with a cortex indicative of an implement which was obtained from a non-alluvial area. The specimen displays multi-facial thinning and has a utilized and retouched edge along one side. At the base of this edge the specimen is smooth to the extent that the flake scars have been buffed. Based on these traits it is probable that this core was also utilized as a scraper, perhaps in the preparation of hides. The final heavy tool is a large quartzite chopper (.104) that exhibits unifacial thinning at the base. The thinned edge is also utilized as well as retouched and a probable grease residue covers the area.

Two miscellaneous items that do not fit a particular subjective category were identified in the Developmental period collection. The first implement (.051) consists of an incomplete, bifacially thinned, noncortical chert flake tool that is retouched along the medial edges. A probable hafting element appears partially snapped on both ends. The second miscellaneous implement (.035) is a thick and complete flake made from petrified wood. The tool is not thinned; however, the distal end of the flake is heavily retouched and modified.

The flaked stone tool data of the Developmental period component indicate that most of the smaller implements and bifaces were utilized for various activities at the site. These implements, probably derived from local material, are heavily utilized and/or exhausted. A large portion of the collection consists of incomplete or fragmented items, which indicates that the tools were utilized until they were exhausted or broke. Very few complete items appear to have been discarded or misplaced. The bulkier items such as core/core tools and choppers were obtained from quartzite sources similar to those found near the site. Based on the flaked stone and the debitage data, the occupants during the Developmental period had a prepared flaked stone tool kit suited for mobility. Cumbersome and bulkier items were substituted by coarse-grained and probably less valued local quartzitic material. Interestingly, these heavier and less mobile items were better integrated into the tool assemblage than is the case with the Archaic stage components. Perhaps these data indicate a longer periods of occupation at the site, or activities different from those carried out by the previous occupants, which required greater utilization of nearby lithic resources.

Obsidian Source Analysis

A single piece of obsidian recovered from the Gilligan's Island site was subjected x-ray fluorescence (xrf) source analysis. The obsidian artifact is a flake tool (4.107) that was recovered from the general fill of Level 6, Excavation Unit B3, within the Trench B deposits in Shelter 1. This provenience is associated with the Developmental Period. The xrf analysis indicates that the material is an example of Cerro del Medio obsidian, also known as Valles Rhyolite, from the Jemez Mountains of northern New Mexico (Hughes 2002:2).

Ground/Battered Stone

Forty-one ground/battered stone items are associated with the Developmental component. The ground/battered stone assemblage includes a one-handed mano, slab metates, typologically indeterminate metates, and unidentifiable ground stone fragments (Table 61). Three of the ground/battered stone specimens are complete and 38 are highly fragmented with less than 50% of the specimen present. Fire cracking or fire reddening was noted on 90.2% (n=37) of the ground stone implements. These data, of course, indicate that grinding/battered stone items were expedient tools that were often utilized as heating implements and ultimately filled the needs of many different activities associated with subsistence (e.g., food preparation and cooking). This is not to say that these implements were not utilized for other activities, such as hide processing (Owens 2006).

Table 61. Developmental Period Ground/Battered Stone by Material Type

TYPE	MATERIALS	
	Sandstone	Granite
Manos		
One-handed Mano	1	0
Metates		
Slab Metate	6	0
Metate Unknown Type	33	0
Unknown Ground Stone Type	1	1
Total Ground/Battered Stone	**41**	**1**

Manos

A single complete one-handed sandstone mano (.358) is associated with the Developmental period component (Figure 82). Oval in shape, the specimen measures 12.0 cm long, 7.6 cm wide, and 3.7 cm thick. Both sides of the implement are heavily ground. The surfaces also display some battering for rejuvenation, as well as transverse

Figure 82. Gilligan's Island site mano assigned to the Developmental period component (note reduced scale).

grinding striations adjacent to the long axis. The edges were apparently ground and then heavily battered.

Metates

Metates are generally large sandstone slabs or blocks from the bedrock formations near the site area. Thirty-nine metates are identified in the Developmental component, comprising 95.1% of the ground/battered stone assemblage. Slab metates make up 15.4% of the metates category, while 80.5% are typologically indeterminate metate fragments.

Two of the slab metates are complete (Figure 83). The first specimen (.325) is 37.2 cm long, 31.4 cm wide, and 13.0 cm thick. The long axis of the slab is heavily ground on one entire side of the implement. This facet is irregular in shape. The second

Figure 83. Gilligan's Island site metates assigned to the Developmental period component (note reduced scale).

specimen (.327) is 41.6 cm long, 26.4 cm wide, and 7.6 cm thick. One surface is heavily ground and pecked in an oval shape. Pecking is concentrated in the central portion of the metate, while grinding occurs on the larger portion of the surface. Both of the slab metates have cortical attributes, indicating that they are derived from nearby sandstone outcrops.

Four fragmented slab metates were recovered. Each of these four items has less than half of the original implement present. These specimens range in size from 11.7 to 26.9 cm in length, 9.7 to 21.5 cm in width, and 3.6 to 7.3 cm in thickness. Surface use-wear ranges from light to moderate, consisting of grinding or grinding/pecking. Three of the metate fragments have discernible margins, one of which has modified flaked edges, while the remaining two are unshaped. All of the slab metate fragments exhibit only one modified surface. The slab metate fragments have attributes indicating that they have been burned or fire-cracked.

Thirty-three metate fragments are typologically indeterminate. These specimens measure 3.0 to 14.4 cm long, 2.6 to 11.7 cm wide, and 1.1 to 6.2 cm thick. Facets are either ground or ground/pecked with light to heavy use-wear. Five of the fragments are utilized on both sides. One fragment has a discernible edge that appears to display flake modification. Thirty-two or 97.0% of the indeterminate metate fragments are burned and/or fire-cracked.

Unidentifiable Ground Stone

One ground specimen (.343) is fragmented to the extent that it could not be specifically categorized. Consisting of sandstone, this item is 6.7 cm long, 3.6 cm wide, and 1.2 cm thick, and is fire-cracked.

Miscellaneous Lithic Artifacts

Ochre

Ochre is a natural mineral pigment that has a chalk-like texture. It is essentially clay that is stained with iron oxides. Depending upon the amount of iron oxide present, the color of the material may range from a red (70%), to brownish yellow (60%), to greenish brown (60%) (Mineralszone 2007). One piece of ochre (.294) was recovered from the Feature 6 sediments of the Developmental period. The specimen is a yellowish brown (10YR5/6) color. It is 0.15 cm long, 0.63 cm wide, and 0.31 cm thick, and weighs 0.4 g. It is not culturally modified.

Faunal Artifacts

Six bone artifacts are associated with the Developmental period. All six items represent bead ornaments.

Faunal Ornaments

Bone Beads

Of the six ornamental bone bead items, two are complete or nearly complete and four are fragmentary (Figure 84). Three fragmented items are not described below (.923, .818, and .924). However, Table 16 describes all of the bone bead attributes. The most complete specimen (.582) is a short bead fragment manufactured from the long bone of a very small mammal. Both of the edges are flat. Two of the specimens appear to have been split during the manufacturing process. One of the nearly complete specimens (1.973) is a tibia from an indeterminate mammal that was originally recovered in two pieces. The two pieces refit to make up a partially manufactured bead that appears to have been fragmented during manufacture. One of the modified edges is flat and appears

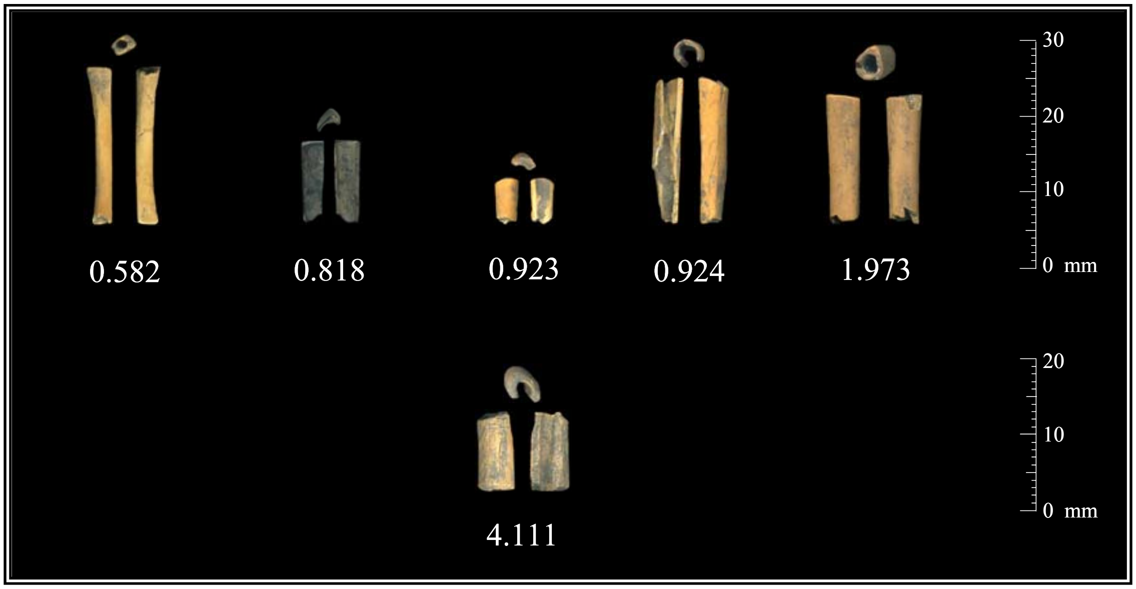

Figure 84. Gilligan's Island site bone beads assigned to the Developmental period component.

to have been completely processed. The other end is partially cut through on one side, while the opposite side is angular and appears to have split, separating the long bone longitudinally along the present fracture line. Another bead fragment (4.111) is a metapodial shaft is from an indeterminate medium-size mammal. This bead has two modified ends. One end is ground and rounded. The other end has several cut marks that indicate an attempt to score the bone. This end was eventually cut deeply into the shaft. However, the central portion of the metapodial is roughened indicating an abandonment of the bead before processing was complete.

Subsistence-Related Remains

Faunal Remains

There are an estimated 1336 faunal specimens associated with the Developmental period. The species collection list is presented in Table 18. This section describes those items that may reflect cultural modification of the faunal assemblage. The modified bone attributes of the Developmental period are tabulated in Table 62. These attributes have been defined previously (see Middle Archaic period Faunal Remains). An estimated 543 bulk bone items are associated with the Developmental period. The bulk bone items include medium mammal (n=1), indeterminate mammal (n=11), and indeterminate vertebrate (n=451) that are not included in the tables or the figures. It is noted that some of these items are burned/calcined, but they are very fragmented items and have limited interpretative value in the following discussion. Therefore, the bulk bone items are not identified in the following tables, figures or discussion.

Specimen counts in Table 62 indicate that perimortem modification or bone modification (at or near the time of death) is minimal within the Developmental period. Attributes such as green breaks, extensive cutting, grinding, scraping, and/or scoring and discrete modifications are typical indicators of perimortem modification. Most of these attributes occur on indeterminate small mammals to medium-large mammals. Extensive and discrete modification is recorded for 13 specimens. Six extensively modified pieces are bone bead fragments that include one packrat (*Neotoma* sp.), one indeterminate very small mammal, two indeterminate small mammals, one indeterminate medium mammal, and one indeterminate vertebrate. One fragment of an indeterminate medium mammal specimen also has extensive cut marks. One long bone fragment of an indeterminate medium-large mammal has multiple modifications including green breaks, discrete cut marks, and calcined burning, while a long bone diaphysis fragment from an indeterminate small mammal also appears to have green breaks and discrete cutting. Impact flake scars were observed on four specimens including indeterminate mammals of small, medium, and medium-large size as well as an indeterminate vertebrate. The dry breaks typically indicate natural processes. The dry break data may suggest that some of the specimens

Table 62. Developmental Period Modified Faunal Specimens[1]

Taxa	Break: Green	Break: Dry	Burn: Burned	Burn: Calcined	Extensively Cut/Ground/ Scrape/Score	Discretely: Cut	Discretely: Modified
Fish							
Indeterminate fish		3					
Scaphiopus bombifrons		1					
plains spadefoot toad							
Anura		1					
frog or toad							
Reptile							
Indeterminate Scaled Reptile		1					
Indeterminate Lizard		1					
Testudines		1	1				
Indeterminate turtle							
Bird							
Indeterminate medium bird		6		1			
Indeterminate small bird	1	3	1				
Indeterminate very small bird		1		1			
Indeterminate small passeriformes		1					
small perching bird							
Indeterminate very small passeriformes		1					
very small perching bird							
Indeterminate bird		3					
Mammal							
Indeterminate very small mammal	1	19	2	7	1		
Indeterminate small mammal	6	50	1	10	2	1	1
Indeterminate medium mammal	8	17		12	2		1
Indeterminate medium-large mammal	9	14	1	10		1	1
Indeterminate large mammal	1	1	1	1			
Indeterminate mammal	7	72	3	34			
Indeterminate rodent		1		1			
Lagomorph	3	5		1			
Indeterminate hare or rabbit							
Lepus sp.		2	1				
jackrabbit or hare							
Lepus californicus/townsendi		1					
black-tailed or white-tailed jackrabbit							
Sylvilagus sp.		7					
cottontail							
Sylvilagus nuttalli/auduboni		6					
mountain or desert cottontail							
Indeterminate small rodent		8		1			
Indeterminate small squirrel		6					

Table 62. Developmental Period Modified Faunal Specimens (Continued)[1]

Taxa	Break		Burn		Extensively	Discretely	
	Green	Dry	Burned	Calcined	Cut/Ground/ Scrape/Score	Cut	Modified
Sciurus sp.		3					
tree squirrel							
Cynomys sp.	1	1	1				
prairie dog							
cf. *Citellus* sp.		1					
possible ground squirrel							
Indeterminate very small rodent		11	2	3			
Indeterminate very small squirrel		2					
Eutamias dorsalis		2					
cliff chipmunk							
Thomomys sp.		1					
western pocket gopher							
Thomomys talpoides		1					
northern pocket gopher							
Arvicolinae		1					
rodent subfamily: vole							
Microtus sp.		3					
vole							
Neotoma sp.		10			1		
packrat							
cf. Neotoma sp.		1		1			
possible packrat							
Neotoma Mexicana/cinearea	1	1					
Mexican or Bushytail Woodrat							
Peromyscus sp.		1					
deer mice							
Sigmodontinae		1					
Indeterminate New World South American Mouse/Rat							
Indeterminate medium carnivore		1		1			
Indeterminate small carnivore		1					
Insectivora		2					
Indeterminate insectivore							
Indeterminate large artiodactyl		1					
Indeterminate medium-large artiodactyl	2	4					
Odocoileus sp.		1					
deer							
Indeterminate Vertebrate	13	381	10	126	1		1
Total	52	664	24	210	5	2	6

[1] Does not include indeterminate bulk bone counts

with low frequencies of burned items, particularly smaller-sized taxa, could represent coincidental burning of items that had been deposited previously.

Burned and calcined bone comprises the largest subset of culturally modified faunal material in the Developmental period assemblage. Figure 85 illustrates the combined burned and calcined counts of the Developmental period. This figure shows that mammalian species of various sizes constituted an economic resource that was utilized often during this period. This is especially true for very small to medium-large sizes. Very small and small mammals have produced the greatest quantity of burned remains. Very small mammals include very small rodents and a possible packrat (cf. *Neotoma* sp.). Small mammals include indeterminate rodent, indeterminate small rodent, hare or rabbit (Lagomorph), and prairie dog (*Cynomys* sp.). The nearly equal distribution

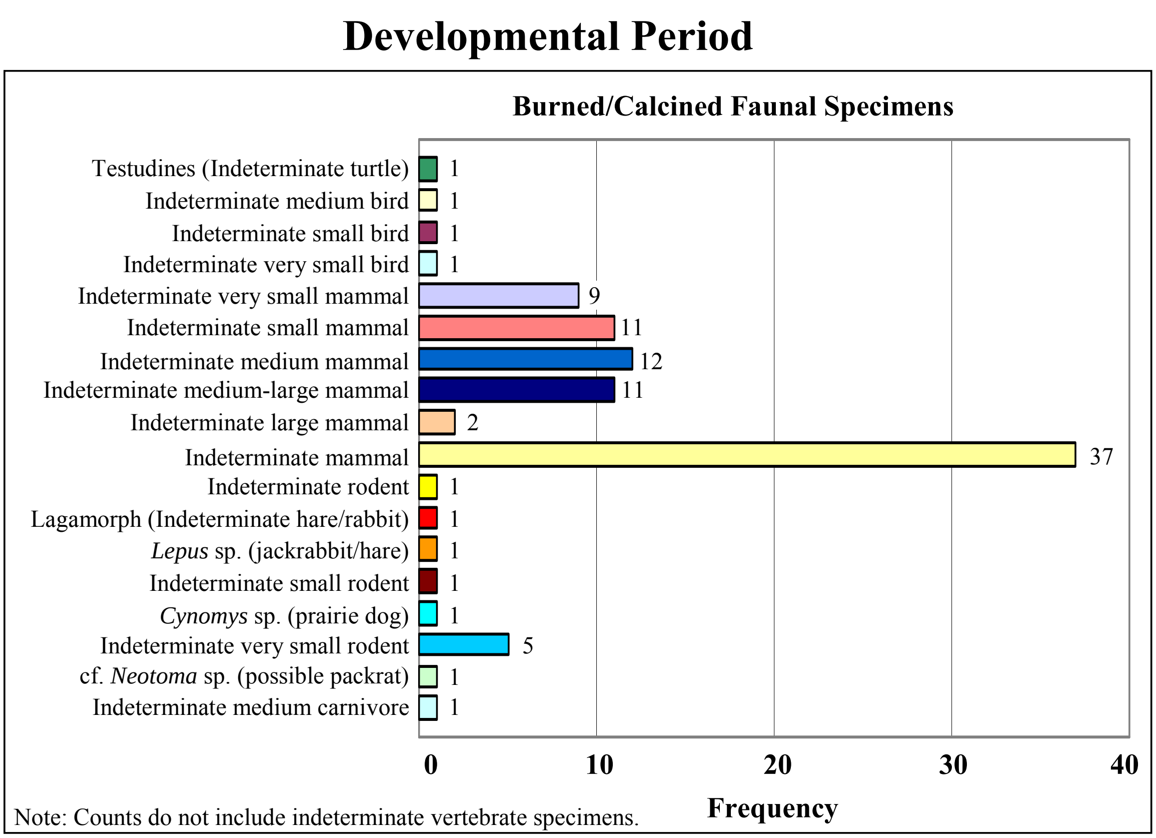

Figure 85. Burned/calcined faunal remains recovered from the Developmental period deposits.

of various animal sizes should not be overlooked and suggests that a variety of economic resources, including bigger animals such as small, medium, and medium-large mammalian species, were being processed as well. It is possible that the limited number of large mammals indicates a separate subsistence activity that extended beyond merely cooking or roasting portions of the bones. Bone marrow extraction, for example, may reduce the number of identifiable specimens in the assemblage. These other alternatives have been discussed previously in the baseline data and are pertinent to the interpretation of the faunal remains from the Developmental period. Ultimately, the low count of large animal remains shows a limited reliance on these resources during the Developmental period.

Macrobotanical Remains

There are six macrobotanical samples associated with the Developmental period component. These samples were recovered from both Shelter 1 (Trench B) and Shelter 2 (Trench A) deposits and include approximately 12,408 specimens representing at least 40 plant taxa. The results of macrobotanical analysis of the six flotation samples are presented in Tables 63 and 64. Table 63 provides provenience data for the recovery of each analytical sample, while Table 64 gives the inventory of remains identified in each sample. Each macrobotanical sample has been identified by the individual feature from which it was recovered. These feature types include the fill of a roasting pit, a hearth, a probable refuse pile from a thermal feature, and two sheet middens (see Features). Both charred and uncharred remains were identified in the macrobotanical sample. The total volume of each sample prior to flotation, as well as light fraction weight after the samples were floated, are presented in Table 64. For a complete explanation of the table layout

Table 63. Provenience Data for Macrobotanical Remains of the Developmental Period

Feature/ Sample No.	Shelter No.	Unit No.	Northing	Easting	Level	Elevation[1]	Context
2	2	A4	0-35	42-100	N/A	999.16-.04	General Fill
5	2	A2	56	88	5	999.07-.03	Recovered under a large rock
9	2	A3	0	20-80	N/A	998.90-.76	Recovered from southern trench wall
6	1	B2	10-30	80-100	2	999.76-.73	Recovered under a large rock
6A	1	B3	44-63	12-28	N/A	999.80-.71	Northern portion of feature fill
A4-03	2	A4	35	85	4	998.89	Concentration of seeds

[1] Elevation based on site datum relative elevation of 1000 m

and determination of culturally affiliated flora, refer to the Baseline Data for the Macrobotanical Remains. It should be noted that sample A4-03 was recovered from a seed concentration observed during excavation and was not processed as a regular flotation sample from a feature.

Sample A4-03 consists of a concentration of seeds exposed in Level 4 of Excavation Unit A4 (Table 63). The seed concentration is oval, measuring approximately 7 cm N/S X 5 cm E/W. It was recovered 35 cm northwest of the upper boundary of Feature 9 (Figure 79). The level at which this sample was collected is assigned a Developmental period age (Figure 34, Table 7). The dominant plant items identified in the sample are more than 8500 goosefoot and/or pigweed (Cheno-am) seeds. None of these seeds were burned or charred and the embryos were visibly present, suggesting that a non-cultural process, such as caching by rodents caused the placement of the seeds. Cheno-am plants are a common occurrence on recently disturbed soils, such

Table 64. Developmental Period Macrobotanical Remains

Feature or Sample No.	Plant Taxon or Other Category	Plant Part	Condition & Quantity					
			Charred			Uncharred		
			Whole	Frag.	PPL	Whole	Frag.	PPL
Feature 2	Volume Floated: 1.36 (liters)							
	Light Fraction Weight: 80.57 (grams)							
	Pinus edulis	Nut hull					16**	11.8
		Needle		**129$^{\pm}$**	**94.9**		140$^{\pm}$	102.9
		Female cone					4	2.9
	***Pinus* sp.**	**3-needle**		**10$^{\pm}$**	**7.4**		4	2.9
	Pinus	**Sheath**		**1**	**0.7**			
		Female cone					2	1.5
	Pinaceae (*cf. Pinus*)	**Wood**		**8**	**5.9**			
	Abies	**Needle**		**2**	**1.5**			
	Juniperus scopulorum	Twig					1	0.7
	***J. monosperma*-type**	**Twig**		**169$^{\pm}$**	**124.3**		341$^{\pm}$	250.7
		Berry				1		0.7
	Juniperus	**Seed**		**4**	**2.9**	2	18$^{\pm}$	14.7
		Wood		**12**	**8.8**			
		Male cone	**2**	**11$^{\pm}$**	**9.6**	11	26$^{\pm}$	27.2
	Sporobolus	Grains				168$^{\pm}$		123.5
	Poaceae	**Grain**	**3**		**2.2**	4	1	3.7
		Stem		**113$^{\pm}$**	**83.1**			
		Stem/leaf					X*	N/A
		Panicle					1*	0.7
	cf. Poaceae	**Grain**		**3**	**2.2**			
	Quercus	Nut hull					3	2.2
	Chenopodium cf. berlandieri	**Seed**	**6**		**4.4**	1		0.7
	Cheno-Am	**Seed**	**27**	**8$^{\pm}$**	**25.7**	48	37$^{\pm}$	62.5
	Portulaca	Seed				2		1.5
	Brassicaceae	Seed					1	0.7
	cf. Fabaceae	**Seed**	**1**	**1**	**1.5**			
	Euphorbia	Seed				4		2.9
	Opuntia (*Platyopuntia*)	Seed					12**	8.8
	Opuntia (*Cylindropuntia*)	Seed				1	44$^{\pm}$**	33.1
	Opuntia	Areole & spine				1		0.7
		Spine		**132$^{\pm}$**	**97.0**		312$^{\pm}$	229.4
		Areole					1	0.7
	Cactaceae	Tissue					7	5.1
	Lappula cf. redowski	Seed coat					5*	3.7

Table 64. Developmental Period Macrobotanical Remains (Continued)

Feature or Sample No.	Plant Taxon or Other Category	Plant Part	Condition & Quantity					
			Charred			Uncharred		
			Whole	Frag.	PPL	Whole	Frag.	PPL
Feature 2	*Physalis*	Seed				9	1	7.4
	Nicotiana	Seed				5		3.7
	Helianthus	Seed coat					22$^{\pm}$	16.2
	Asteraceae	Achene				7		5.1
	cf. Asteraceae	Achene				1		0.7
	Dicotyledoneae	Seed				1		0.7
		Seed coat					1	0.7
		Thorn				1		0.7
		Leaf					X*	
		Bract				1		0.7
		Flower					1*	0.7
	Plant Totals:		**642**		**472.1**	1269		931.8
	Non-Floral Items:							
	Bone						1	N/A
	Gastropoda	Shell					X	N/A
		High-spire				19	8	N/A
		Low-spire				6	9	N/A
Feature 5	Volume Floated: 2.24 (liters)							
	Light Fraction Weight: 14.71 (grams)							
	Pinaceae (*cf. Pinus*)	**Wood**		**1**	**0.4**			
	Juniperus	**Wood**		**18**	**8.0**			
	Sporobolus	Grain				1		0.4
	Chenopodium cf. berlandieri	**Seed**	**1**		**0.4**			
	Cheno-Am	Seed				1		0.4
	Portulaca	Seed				3		1.3
	Echinocereus-type	Seed				1		0.4
	Artemisia	**Wood**		**1**	**0.4**			
	Plant Totals:		**21**		**9.2**	6		2.5
	Non-Floral Items:							
	Gastropoda	Low-spire				4	1	N/A
Feature 9	Volume Floated: 2.22 (liters)							
	Light Fraction Weight: 51.37 (grams)							
	Pinus edulis	Nut hull					10	4.5
		Needle		**49**	**22.1**		1	0.5
		Female Cone		**6**	**2.7**			
	P. ponderosa	**Needle**		**4**	**1.8**			
	***Pinus* sp.**	**3-needle**		**2**	**0.9**			

Table 64. Developmental Period Macrobotanical Remains (Continued)

Feature or Sample No.	Plant Taxon or Other Category	Plant Part	Condition & Quantity					
			Charred			Uncharred		
			Whole	Frag.	PPL	Whole	Frag.	PPL
Feature 9	***Pinus***	**Sheath**		**2**	**0.9**			
	Pinaceae (*cf. Pinus*)	**Wood**		**8**	**3.6**			
	Juniperus scopulorum	**Twig**		**8**	**3.6**			
	***J. monosperma*-type**	**Twig**		**90**	**40.5**		5	2.3
	Juniperus	**Wood**		**12**	**5.4**			
		Twig		**8±**	**3.6**			
		Seed		**1**	**0.5**	2	23	11.3
		Male Cone					2	0.9
	Sporobolus	Grain				58±		26.1
	Oryzopsis	Seed coat					3	1.4
	cf. Zea	**Kernel**		**1**	**0.5**			
	Poaceae	**Grain**	**3**		**1.4**			
		Stem		**60±**	**27.0**			
		Stem/leaf					X*	N/A
	Yucca	**Leaf**		**1**	**0.5**			
		Fiber		**1**	**0.5**			
	Chenopodium cf. berlandieri	**Seed**	**5**	**2**	**3.2**			
	Cheno-Am	**Seed**	**25±**	**16±**	**18.5**	77±	42±	53.6
	Portulaca	Seed				1		0.5
	Euphorbia	Seed				8±	42±	22.5
	Opuntia (*Platyopuntia*)	Seed					98±**	44.1
	Opuntia (*Cylindropuntia*)	Seed					12±**	5.4
	Opuntia	**Spine**		**102±**	**45.9**		8±	3.6
	Cactaceae	**Tissue**		**8**	**3.6**		9	4.1
	cf. Cactaceae	**Tissue**		**7**	**3.2**			
	Verbena cf. bracteata	Seed coat					114±*	51.4
	Helianthus	Seed coat					42±	18.9
	Asteraceae	Achene				2		0.9
	Dicotyledoneae	**Seed**	**2**		**0.9**	1		0.5
		Fruit stem		**2**	**0.9**		2	0.9
		Thorn		**8±**	**3.6**			
		Bract				1		0.5
	Plant Totals:		**433**		**195.3**	563		253.9
	Non-Floral Items:							
	Bone			1				N/A
	Gastropoda	Shell					X	N/A
		High-spire				18		N/A
		Low-spire				20		N/A

Table 64. Developmental Period Macrobotanical Remains (Continued)

Feature or Sample No.	Plant Taxon or Other Category	Plant Part	Condition & Quantity					
			Charred			Uncharred		
			Whole	Frag.	PPL	Whole	Frag.	PPL
Feature 6	Volume Floated: 2.42 (liters)							
	Light Fraction Weight: 5.35 (grams)							
	Pinus edulis	**Needle**		**$32^{\pm}$**	**13.2**			
		Nut hull					2	0.8
	P. ponderosa	**Needle**		**1**	**0.4**			
	Pinaceae (*cf. Pinus*)	**Wood**		**17**	**7.0**			
	Juniperus scopulorum	**Twig**		**2**	**0.8**			
	***J. monosperma*-type**	**Twig**		**1**	**0.4**		$4^{\pm}$	1.7
	Juniperus	**Seed**		**6**	**2.5**		1	0.4
	Gymnospermae	**Wood**		**1**	**0.4**			
	Sporobolus	Grain				$99^{\pm}$		40.9
	Poaceae	**Stem**		**3**	**1.2**		$8^{\pm}$	3.3
		Stem/leaf					X*	N/A
	Yucca	**Fiber**		**2**	**0.8**			
	Chenopodium cf. berlandieri	**Seed**	**1**		**0.4**			
	Atriplex	**Wood**		**1**	**0.4**			
	Cheno-Am	**Seed**	**2**		**0.8**	$15^{\pm}$	4	7.9
	Portulaca	Seed				1		0.4
	Brassicaceae	Seed				1		0.4
	Euphorbia	Seed				2		0.8
	***Opuntia* (*Cylindropuntia*)**	**Seed**		**1**	**0.4**		4**	1.7
	Lappula cf. redowski	Seed coat					2*	0.8
	Unknown	**Wood**		**1**	**0.4**			
	Plant Totals:		**72**		**29.1**	144		59.1
	Non-Floral Items:							
	Gastropoda	Shell					X	N/A
		High-spire				9	2	N/A
		Low-spire				29	2	N/A
Feature 6A	Volume Floated: 1.64 (liters)							
	Light Fraction Weight: 81.49 (grams)							
	Pinus edulis	**Nut hull**		**2**	**1.2**			
		Needle		**>57**	**34.8**		>5	3.0
		Female Cone		**5**	**3.0**			
	Pinus	**Sheath**		**8**	**4.9**		1	0.6
	Pinaceae (*cf. Pinus*)	**Wood**		**2**	**1.2**			
	Pseudotsuga menziesii	**Needle**		**2**	**1.2**			

Table 64. Developmental Period Macrobotanical Remains (Continued)

Feature or Sample No.	Plant Taxon or Other Category	Plant Part	Condition & Quantity					
			Charred			Uncharred		
			Whole	Frag.	PPL	Whole	Frag.	PPL
Feature 6A	***Juniperus scopulorum***	**Twig**		**3**	**1.8**		4	2.4
	***J. monosperma*-type**	Twig					6	3.7
		Seed	**1**		**0.6**		1	0.6
	Juniperus	**Wood**		**18**	**11.0**			
		Seed					2	1.2
		Male Cone					3	1.8
	Sporobolus	**Grain**		**1**	**0.6**		1	0.6
	Poaceae	**Stem**		**>41**	**25.0**			
		Stem/leaf					X*	N/A
	cf. Cyperaceae	**Stem**		**2**	**1.2**			
	Yucca	**Leaf**		**2**	**1.2**			
	Chenopodium cf. berlandieri	**Seed**	**4**		**2.4**			
	Atriplex canescens	**Fruit case**		**1**	**0.6**			
	cf. Amaranthus	Bract				2*		1.2
	Cheno-Am	**Seed**	**5**	**>5**	**6.1**	>9	>5	8.5
	Draba aurea	Capsule					7*	4.3
	Brassicaceae	Seed				1		0.6
	Euphorbia	Seed				1		0.6
	Opuntia (*Cylindropuntia*)	Seed					2	1.2
	Opuntia	**Areole & spine**		**2**	**1.2**			
		Areole		**3**	**1.8**			
		Spine		**>143**	**87.2**		1	0.6
	Verbena cf. bracteata	Seed coat					>345*	210.4
	Helianthus	Seed coat					1	0.6
	Dicotyledoneae	Seed					9	5.5
		Seed coat					1	0.6
		Leaf					X*	N/A
	Plant Totals:		**307**		**187**	407		248
	Non-Floral Items:							
	Gastropoda	Shell				X	X	N/A
		High-spire				12		N/A
		Low-spire				17		N/A
FS# A4-03	Volume Floated: N/A (liters)							
	Light Fraction Weight: 0.87 (grams)							
	Juniperus scopulorum	**Twig**		**1**	**N/A**			
	***J. monosperma*-type**	**Twig**		**4**	**N/A**		16$^{\pm}$	N/A
	Juniperus	**Male Cone**		**1**	**N/A**	1		N/A

Table 64. Developmental Period Macrobotanical Remains (Continued)

Feature or Sample No.	Plant Taxon or Other Category	Plant Part	Condition & Quantity					
			Charred			Uncharred		
			Whole	Frag.	PPL	Whole	Frag.	PPL
	Sporobolus	Grain				$13^{\pm}$		N/A
	Cheno-Am	Seed				8294	$212^{\pm}$	N/A
	Echinocereus-type	Seed				1		N/A
	Opuntia	**Spine**		**1**	**N/A**			
	Plant Totals:		**7**		**N/A**	8537		N/A
	Non-Floral Items:							
	Bone						1	
	Gastropoda	Shell						
		High-spire				1		
		Low-spire						

* some items display modern/recent wind-blown plant parts, ** some items display rodent-gnawed, ± estimated count, > greater than, FEA. = Feature, Frag. = Fragment (s), FS# = Field Specimen, N/A = Not Applicable, PPL = Parts Per Liter, X = present

as those found at newly abandoned sites. Additionally, the condition of the embryos suggests that these seeds are modern (Gish 2005:11). In fact, dried Cheno-am remains were observed on the surface of Shelter 2 during the beginning of the 2002 excavation project. In order to determine if the seeds were recent enough to sprout, a simple germination test was conducted by taking approximately 30 of the seeds and placing them in a moist paper towel for a number of days (Gish 2005:11). None of the seeds germinated, which suggests that the seeds were relatively old. Given the condition of nearly all the macrobotanical remains recovered during the 2002 excavation, the state of the Cheno-am embryos in this sample is not entirely surprising, since the shelters provide a great deal of protection against a wide range of environmental conditions. However, it is interesting to note that very few plant items such as stems and leaves occur in the Cheno-am concentration and only a small number of other uncharred plant remains are present. No other indicators such as rodent-gnawing and/or fecal pellets were noted in the sample. The size and shape of the seed concentration are suggestive of a rodent burrow. However, in most rodent caches, at least those observed by the author, plant matter is usually intermixed with fecal pellets and other evidence of rodents. Rodent caches do not generally have a ubiquitous type of single plant fill, such as the Cheno-am seeds. Therefore, the general location of to Feature 9 may have some cultural significance and should not be overlooked. It is possible, given the context and location of the concentration, that these seeds were collected by human inhabitants at the site and placed in an item (e.g., leather or fiber pouch or wrapped in leaves) that has degraded since that time. Ethnobotanical data indicate that North American Indian tribes gathered a variety of Chen-Am species and stored them for later use (Moerman 1998).

Analysis of the six macrobotanical samples assigned to the Developmental period suggests that a pinyon-juniper plant community was present at the site. The local tree community consisted of pinyon pine, Rocky Mountain juniper, and one-seed juniper species. ponderosa pine (*P. ponderosa*) and fir (*Abies*) are regional species that occur in the general area but not at the site. Local shrubs clearly include sagebrush, yucca, saltbush, and four-wing saltbush (*Atriplex canescens*). Cactuses consist of prickly pear or cholla. Herbaceous plants include grasses (particularly drop-seed grass), members of the pea family (cf. Fabaceae), pit-seed goosefoot, and other goosefoot/pigweed species. Members of the sedge family (cf. *Cyperaceae*) were probably limited to the drainage systems in the region. Macrobotanical remains associated with the Developmental period component suggest that numerous plants were processed in and around the thermal features (Figure 86). Dominant wood fuels consisted of juniper, pinyon pine and other conifer species. Diagnostic portions of twigs from Rocky Mountain juniper and one-seed

Developmental Period

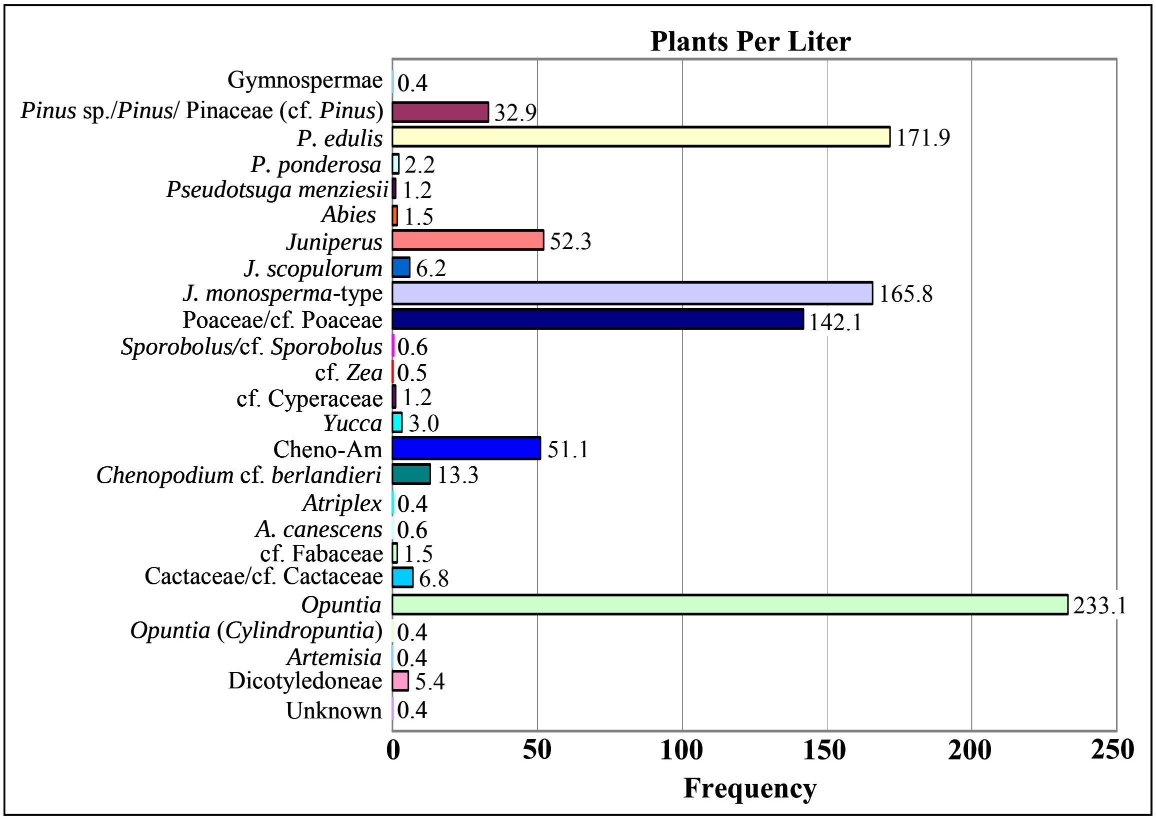

Figure 86. Macrobotanical plant estimates per liter of floated sediment from five samples collected from Developmental period features. Figure does not include sample A4-03.

juniper indicate that branches were utilized as a source of fuel. Dominant food plants consist of pit-seed goosefoot and other goosefoot/pigweed species. Additional localized plant species processed in or around the features include pinyon (nuts), prickly-pear and/or cholla, grasses, and perhaps members of the pea family. Yucca is utilized non-food plant. These plants are most commonly associated with a hunter-gatherer lifestyle, in which procurement occurred at least during the summer and fall seasons. A single kernel fragment similar to that of maize (cf. *Zea*) is the only domesticate recovered during the excavations. This specimen may be indicative of horticultural products being introduced into the region, during the transitional Late Archaic-Developmental period.

Pollen Analysis

Information regarding the pollen analysis for the Developmental period component is derived from Jones' (2003) palynological report. Six pollen samples, recovered from Shelter 1, Trench B and Shelter 2, Trench A, are associated with the Developmental period component. Analysis from these samples revealed a minimum of 25 pollen grains representing various plant taxa. Analytical results for the six samples are presented in Tables 65 and 66. Table 65 gives provenience data for each sample, while Table 66 provides the inventory of pollen grains identified in each sample. The pollen samples associated with the Developmental period consist of six pollen washes from a single mano and two metates. A soil control was taken in association with each of the ground stone artifacts submitted for the pollen analysis. The paired information on Table 66 is complete.

Pollen counts among the six archaeological samples are similar, and the samples are discussed as a group. The pollen counts observed in the control are typically higher than those found on the ground stone pieces. Noticeably higher quantities of pollen

Table 65. Developmental Period Component Provenience Data for Pollen

Sample	Description	Cat. No.[1]	Shelter No.	Unit No.[2]	Lev	N[3]	E[4]	El.[5]	Context
1	Single Handed Mano	.358	1	B2	3	33	95	999.79-.68	Feature 6
	Control	4.101	1	B2	3	33	95	999.68-.66	Under Mano (Cat. No. .357)
2	Slab Metate	.327	2	A3	4	40	15	999.02-998.94	Adjacent to Feature 9
	Control	4.100	2	A3	4	40	15	998.95-.92	Under Metate (Cat. No. .329)
3	Slab Metate	.325	2	A3	4	81	14	999.15-.99	Adjacent to Feature 9
	Control	4.098	2	A3	4	81	14	998.99-.95	Under Metate (Cat. No. .327)

[1]Cat. No.- Catalog Number (5FN01592.00-),[2]Unit No.- Excavation Unit Number, [3]N-Northing, [4]E-Easting, [5]El. = Elevation based on site datum relative elevation of 1000 m

Table 66. Developmental Period Pollen Count and Percentages

Pollen Taxon	Sample No. 1				Sample No. 2			
	Mano (Cat.[2] .358)		Soil Control		Metate (Cat. .327)		Soil Control	
	#[3]	%[4]	#	%	#	%	#	%
Non-Arboreal								
Artemisia (Sage, Sagebrush)	24	12.0	23	11.5	29	14.5	19	9.5
High Spine Asteraceae (Sunflower Group)	1	0.5	1	0.5	1	0.5	2	1.0
Low Spine Asteraceae (Ragweed Group)	21	10.5	13	6.5	23	11.5	11	5.5
Liguliflorae (Dandelion, Chicory)			1	0.5				
Cirsium (Thistle)	1	0.5						
Brassicaceae (Mustard Family)[1]			3	2.5			1	0.5
Cheno-Am (Goosefoot, Pigweed)	66	33.0	41	20.5	26	13.0	35	17.5
***Cylindropuntia* (Cholla)**					**1**	**0.5**		
Ephedra nevadensis-type (Joint Fir, Mormon Tea)	1	0.5	3	1.5				
Ephedra torreyana-type (Joint Fir, Mormon Tea)	1	0.5	1	0.5				
Fabaceae (Legume Family)					2	1.0		
***Platyopuntia* (Prickly Pear)**			1	0.5	**1**	**0.5**		
Poaceae (Grass Family)	4	2.0	7	3.5	16	8.0	4	2.0
Polygonaceae (Knotweed Family)			1	0.5	1	0.5	1	0.5
Rosaceae (Rose Family)			1	0.5			1	0.5
Arboreal								
Juniperus (Juniper)	48	24.0	57	28.5	41	20.5	49	24.5
Picea (Spruce)	1	0.5	1	0.5	1	0.5	2	1.0
Pinus (Pine)	25	12.5	38	19.0	53	26.5	72	36.0
Populus (Cottonwood, Aspen, Poplar)	1	0.5						
***Prunus* (Plum, Cherry)**	**1**	**0.5**						
Quercus (Oak)			2	1.0	1	0.5		
Salix (Willow)			2	1.0	1	0.5	1	0.5
Indeterminate	5	2.5	4	2.0	3	1.5	2	1.0
Total	200	100	200	100	200	100	200	100
Concentration Value	N/A		2298		N/A		13500	

	Sample No. 3			
	Metate (Cat. .325)		Soil Control	
	#	%	#	%
Non-Arboreal				
Artemisia (Sage, Sagebrush)	35	17.5	16	8.0
High Spine Asteraceae (Sunflower Group)	2	1.0		
Low Spine Asteraceae (Ragweed Group)	17	8.5	16	8.0
Cheno-Am (Goosefoot, Pigweed)	22	11.0	62	31.0
Ephedra nevadensis-type (Joint Fir, Mormon Tea)			1	0.5
***Eriogonum* (Desert Buckwheat)**	**2**	**1.0**	1	0.5
***Platyopuntia* (Prickly Pear)**	**1**	**0.5**	1	0.5
Poaceae (Grass Family)	21	10.5	9	4.5
Polygonaceae (Knotweed Family)			2	1.0
Ranunculaceae (Buttercup Family)			1	0.5
Arboreal				
Abies (Fir)			1	0.5

Table 66. Developmental Period Component Pollen Count and Percentages (Continued)

Pollen Taxon	Sample No. 3			
	Metate (Cat. .325)		Soil Control	
	#	%	#	%
Cornus (Dogwood, Bunchberry)	1	0.5		
Juniperus (Juniper)	40	20.0	32	16.0
Picea (Spruce)	1	0.5	45	22.5
Pinus (Pine)	53	26.5		
Quercus (Oak)	1	0.5	2	1.0
Salix (Willow)	1	0.5	4	2.0
Indeterminate	3	1.5	7	3.5
Total	200	100	200	100
Concentration Value	N/A		5243	

[1] Plant taxon in bold face represents potential economic types according to Jones (2003), [2]Cat.=Catalog Number (5FN01592.00-), [3] #=Pollen Grain Count, [4]%=Percent

grains from the ground stone assemblage are limited to sagebrush (.325, .327, .358), ragweed group (.325, .327, .358), goosefoot or pigweed (.327, .358), grass family (.325, .327), juniper (.325), and pine (.325). Unfortunately, these pollen types represent wind-pollinated plant species and are therefore an unreliable indicator of economic resource potential even under the best of conditions. The significant amount of pollen from the ground stone washes may indicate that the plant species had significant economic value; alternatively, these plants could have simply been responsible for a heavy pollen rain during the time in which the grinding surface was flipped over. Jones (2003:13) acknowledges that "these plant taxa are often over-represented in western archaeological samples, as they are wind-pollinated, durable and easy to recognize." Also represented in the selected ground stone pollen samples are insect-pollinated plants including desert buckwheat (.325), cholla (.327), prickly pear (.325, .327), and plum or cherry (.358). However, the low quantities of these pollen grains suggest that these plants were not introduced by human activity, and easily could have been deposited naturally.

Pollen washes from the Developmental period ground stone assemblage do not suggest that any of the pollen grains were specifically associated with human activity. Even though pollen should not be relied upon heavily for evidence of cultigens (see Baseline Data: Pollen Analysis, above), it should be not that the Developmental period entirely lacks evidence of cultigens in both the washes and soil control samples. At best the pollen data are indicative of a pinyon-juniper environment, similar to the environment of the present day.

Historic Period: There are several anomalies identified in the profiles and noted in grid unit levels that suggest historic disturbance. Some of these disturbances have been described previously in the Sediment Characteristics section of the Site Stratigraphy. The Probable Disturbed Strata (see Sediment Characteristics) in particular identifies Strata 9, 10, 11, and 12 as having characteristics indicative of some degree of disturbance in Shelter 2/Trench A. In Shelter 1/Trench B, Stratum 8W/8E is also identified as a disturbed layer. Additional disturbances, or probable disturbances, are identified as features. Such anomalies are described below for future excavation reference but not for analytical purposes. The features represent probable looting holes that were exposed in Shelters 1 and 2 during excavation.

Probable Looting Hole

A thin manure lens was noted in the south wall of Stratum 8W/8E. A similar lens is in the northern wall in Grid Units B3 and B4. Directly below this manure lens, in the northern profile wall of Grid Unit B4, an abrupt vertical change in sediment appears on the eastern side of the unit. This sediment change begins approximately 10 cm BMGS and drops vertically 52 cm, after which the lower boundary gradually dips another 20 cm to the west. This probable disturbed deposit is indicated by small bits of vegetative matter, rodent fecal pellets, charcoal, and possible manure from domestic animals scattered throughout a dark brown (10YR3/2) sandy loam matrix. This sediment is very distinct from the darker, compact sediments of Strata 3 and 4 to the east. The base of the disturbance was also noted in the plan view maps of Levels 8 and 9 of Grid Unit B4, where manure contact was noticeably high. This deposit is also present in the western wall and angles down and to the north (Figure 55). It is possible that this abrupt sediment change represents Stratum 8W and is the edge of a deep looting hole. Further investigation would be required in order to confirm this interpretation.

Feature 3

At approximately 20 cm BMGS, Feature 3 is a looters hole identified at the western base of Level 3 of Grid Unit A2 (Figure 87 and 88). This hole extends down approximately 10 cm, intruding into Level 4. The feature was originally exposed in Stratum 9 and extended into Stratum 4. This hole was also observed in the eastern section of Grid Unit A3 in Levels 2 and 3; however, these levels in Grid Unit A3 were excavated previously during the project and prior to the recognition of Feature 3. In plan view, this hole is irregular to circular in shape, measuring averaging 65 cm in diameter. The feature is filled with distinct white/gray and light brown unconsolidated sand that is intermixed with large angular rocks and large clumps of cow manure. Displaced artifacts within the feature include a single unhafted biface, five pieces of debitage, and seven pieces of bone.

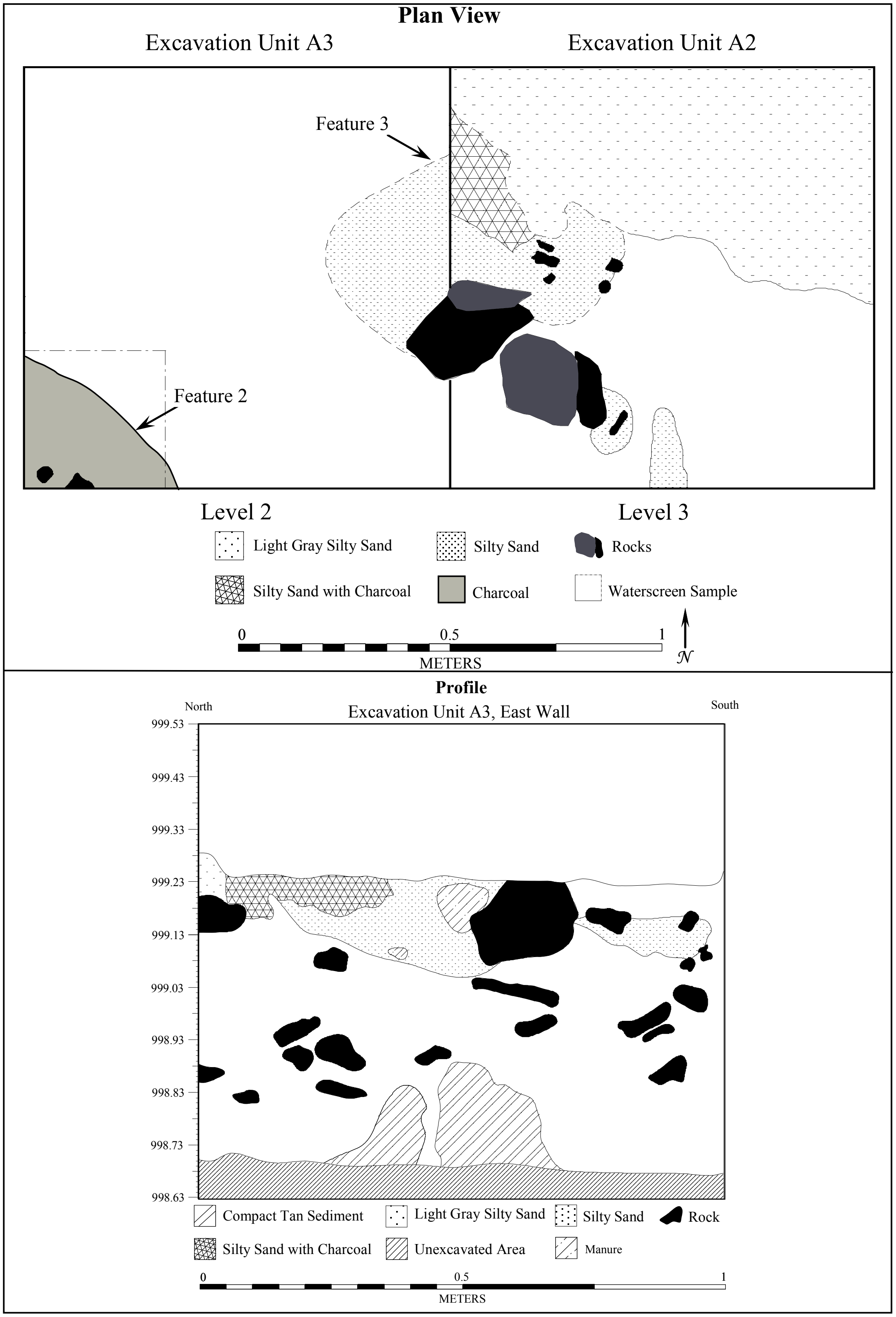

Figure 87. Feature 3 plan map and profile.

Figure 88. Profile of Feature 3, facing east. North arrow is 25 cm in length.

CHAPTER 6

SYNTHESIS AND INTERPRETATIONS

Discussion of Research Themes

The 2002 field investigations at the Gilligan's Island shelters confirmed the presence of a chronological sequence that dates from the Middle Archaic period to the terminal Developmental to early Diversification period. The shelter is situated along a prominent sandstone cliff face overlooking a series of steep drainages that flow into Red Creek. The immediate area is surrounded by a pinyon-juniper canyon landscape. The shelters provided a protected location in an area that has a variety of economic plant and animal resources. Inhabiting the site required little to no modification, an ideal situation for localized hunter-gatherer bands. A well-established pattern of use by the occupants of the site is evident : coming to the site area, procuring and processing available economic resources in the area for a short period of time, and then moving on, perhaps to a seasonal base camp. This situation appears to have held for the inhabitants of the Gilligan's Island shelters for thousands of years. Tools and ornaments are generally manufactured from regional stone, bone, and shell sources. Exotic materials and domesticated plants are practically lacking, suggesting that the inhabitants remained within the region. Major processed resources consist of an assortment of plants items including pinyon nuts, cheno-am seeds, grass seeds/grains, and cactus pads and/or fruits. Smaller animals such as jackrabbits, cottontails, squirrels, and packrats appear to have been a reliable resource of food, supplemented by smaller-sized birds, reptiles, and amphibians.

The following interpretations are based on a small sample of data from the site. These data are organized into four research themes as described in the first chapter: chronology, settlement and subsistence patterns, technology, and paleoclimate and geomorphology. These themes are organized according to the research designs, data needs, and questions posed in the cultural resource management plan for Fort Carson (Zier et al. 1997) and research context applicable for the Arkansas River Basin of Colorado (Zier and Kalasz 1999). The broad themes put forth in these documents incorporate a number of different questions that are specifically centered on the Archaic and Late Prehistoric stages and are intended to direct research in the region (Zier and Kalasz 1999:109-112, 122-125, 137-140,181-188, 239-249). Most of the following data are compared in context with test excavated and excavated rockshelter sites located on Fort Carson. However, the data are also more generally applicable to the Arkansas River Basin and its adjacent areas.

Chronological Data

Data suggest that the Gilligan's Island shelters were occupied periodically for a little more than 4000 years. Chronological data are derived from absolute radiocarbon dates and relative projectile point morphology. Chronological information was obtained mainly from eight charcoal samples distributed throughout the strata of both shelters (Table 6). The samples were recovered from isolated features that were distributed throughout 20 stratigraphic layers identified in the excavated trenches. The radiocarbon dates represent a span of occupation that ranges from ca. 3020 B.C. to A.D. 1148, or early Middle Archaic period to the transitional Developmental-early Diversification period.

Three prehistoric temporal units were identified in the Gilligan’s Island shelters based on the radiocarbon ages and associated stratigraphic layers. Temporal units consist of the Middle Archaic period, Late Archaic period, and Developmental period. The Middle Archaic period is represented in Shelter 1, Trench B, while the Late Archaic period and Developmental period are represented in both Trench B and Shelter 2, Trench A. The overburden or disturbance areas, generally recognized in the upper portions of the fill, may be defined as a fourth temporal unit of historic age. The overburden may be indicative of historic period looting activities in both shelters.

Artifact assemblages suggest that no lengthy occupational hiatus occurred at the site. Figure 89 illustrates the stratigraphic locations of classifiable and unclassified projectile points in context with temporal designations. This figure shows that point styles do not all fall within the culturally assigned units, which is not surprising given the context of the shelters and the complexity of the stratigraphy. Despite the fragmented projectile point collection and complex nature of the strata, however temporal changes can be observed in the hafted point collection. Changes in projectile points are represented by only a few items; most of the hafted bifaces are fragmented and unclassifiable, offering only the basal morphology and thickness to suggest dart or arrow technology. With the exception of a few of the larger points that were recovered from the upper levels of excavation, there is an overarching technological trend from dart-sized points in the lower levels (.052) of the trenches to bow-and-arrow technology near the top (.048). Two of the dart points (catalog number .026 and .027) in Grid Unit A1, Level 2

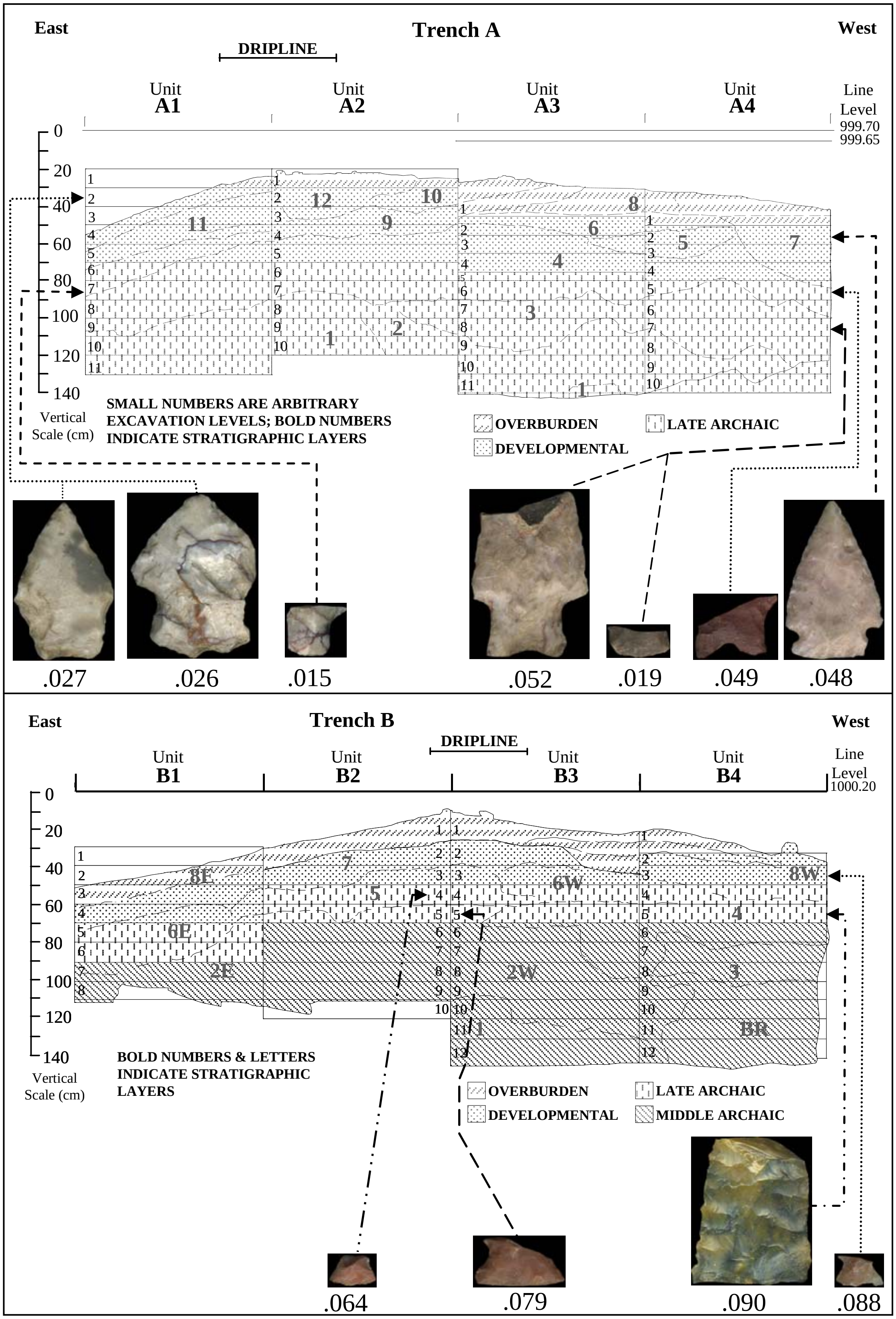

Figure 89. Schematic profile of excavation trenches showing distribution of temporally diagnostic bifaces. Bifaces are at their actual size.

are best explained by movement as a result of looting activities, while the larger biface midsection (.090) found in Unit B4, Level 7, may be of Paleoindian age. This midsection was probably brought to the site at a much later date, possibly during the Late Archaic period. Undoubtedly, these bifaces were heavily utilized to the extent that few classifiable specimens were recovered.

Middle Archaic occupation is indicated by two medium sized stemmed-indented base projectile points (.027 and .052) that display a wide range of morphological variability. A fragment of an indented base (.049) point is also indicative of the Middle Archaic period. A single medium sized, large expanding stem point (.026) may represent Late Archaic or Developmental period occupation. Arrow sized stem fragments (.064 and .088) are unclassifiable but are probably small, expanding stem Scallorn points that generally date to the Developmental period. A single flanged stemmed point (.048) with shallow nick-like notches indicates late Developmental to early Diversification occupation, ca. 800 B.P.

No ceramics have been recovered from Gilligan's Island. Ceramics are generally sparse in the region and do not yet provide a useful means for distinguishing between the Developmental and Diversification periods. Ceramics are commonly found in artifact assemblages from rockshelter sites along Turkey Creek (Charles et al. 2001; Hartley et al. 1983; Kalasz et al. 1993; Van Ness et al. 1990; Zier and Kalasz 1991; Zier et al. 1996; Zier 1989), although, shelters located farther from major drainage systems, on Booth Mountain, do not have ceramic inventories (Charles et al. 2001). Certainly the absolute lack of ceramics from the Gilligan's Island site supports the radiocarbon data and further suggests that the shelters were not occupied during the middle to late Diversification period and Protohistoric period.

Chronological data from Fort Carson rockshelters indicate that the oldest shelters date to the terminal Early Archaic to early Middle Archaic period and occupation appears to end toward the terminal Late to early Diversification period. Most of the excavated shelters on Fort Carson occur along Turkey Creek (Figure 90), a fact that reflects cultural resource management priorities of the U.S. Army. The most chronologically comparable rockshelter excavations with absolute radiocarbon dates to that of Gilligan's Island occur on the valley floor of the Turkey Creek drainage. Shelter sites with radiocarbon dates from the Middle Archaic period to Developmental period consist of Recon John Shelter (Zier 1989; Zier and Kalasz 1991), Gooseberry Shelter (Kalasz et al. 1993), and Two Deer Shelter (Zier et al. 1996). These sites have undergone detailed investigations that have exposed multicomponent chronological sequences. The deposition of these shelters occur in alluvial or eolian/colluvial environments, and the sediments are much deeper than those of Gilligan's Island, typically ranging to depths of 2.42 to 3.15 meters. Shelters located well above the canyon floor have also demonstrated the potential for Archaic stage dates. For example, deposits in shelter 5EP45, located 30 m above the canyon floor in an ephemeral tributary of Turkey Creek, suggest that shelters with shallower deposits (40 cmbgs) and located farther away from major stream channels (1.75 km) have the potential to harbor Late Archaic period materials (Zier et al. 1996:168-177). Skeeter Shelter, a more recently excavated shelter, has deposits that date to the Middle Archaic period, but reliable results are pending (Swan and Rodgers 2007).

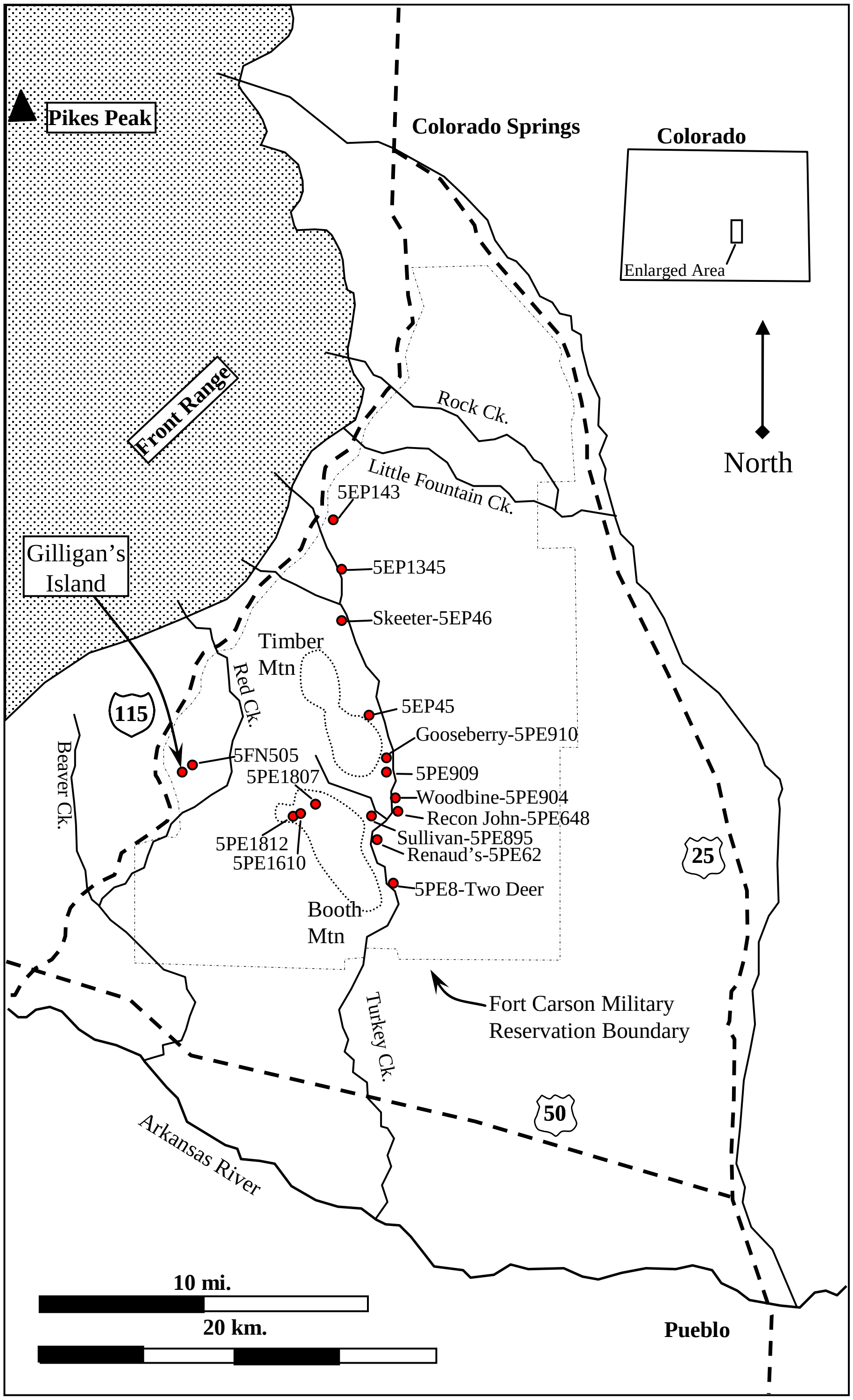

Figure 90. Distribution of tested and excavated rockshelters investigations in Fort Carson. Shelters with minimal testing, such as shovel testing and small test units of 50 cm x 50 cm, are not shown.

Generally, shallower shelter deposits, shelters with minimal test excavation (some relying on relative dating methods), or shelters with a shorter chronological time range date to the Developmental period to early Diversification period. These shelters are also commonly located in the Turkey Creek drainage either in the valley, i.e., 5PE909 (Kalasz et al. 1993), along tributaries, i.e., Sullivan Shelter (Kalasz et al. 1993), or along sandstone escarpments on the ridgeline overlooking Turkey Creek, such as Skeeter Shelter and 5EP143, 5PE1345 (Hartley et al. 1983; Swan and Rodgers 2007). Farther from Turkey Creek, on the western side of Booth Mountain, rockshelter sites have also yielded absolute radiocarbon dates that fall in the Developmental period (5PE1807) to early Diversification period (5PE1610) (Charles et al. 2001).

Absolute radiocarbon dates that fall strictly within the Diversification period have been obtained from Two Deer and Woodbine Shelters. In contrast to all of the other shelters in the area, Woodbine Shelter is strictly dated to the early Diversification period and is the only excavated rockshelter site on the base that contain formal architectural elements. This single structure is associated with the Apishapa phase (Kalasz et al. 1993). Apishapa phase architectural sites are well known in Fort Carson and radiocarbon dates from Ocean Vista and Avery Ranch show that occupation continued in the area throughout the Diversification period (Kalasz et al. 1993; Zier et al. 1988; Zier et al. 1990). The lower number of dates from the Diversification period may reflect a shift away from occupation of rockshelter sites or it may simply reflect sample size limitations.

Settlement and Subsistence Patterns

The stream channels that flow southeast into the Red Creek drainage system have cut deep canyons that are often heavily covered by pinyon-juniper woodlands (see Chapter 2). Short grass meadows commonly occur on the top of the ridgelines and along some of the wider drainage channels such as Salt Canyon, where small springs and ponds are present. These ephemeral drainage basins supported a stable hunter-gatherer economy that was based primarily on the exploitation of a diverse set of small mammals and wild plant species, as reflected from the investigations at the Gilligan's Island shelters. Pronounced changes in economic resource use are not evident in either the floral or the faunal assemblages at the site. There are, however, some subtle variations among the three prehistoric periods. Given the limited sample area excavated and type of recovery that took place in the shelters -- trench excavation and sample analysis from formal and informal features -- it is difficult to draw firm conclusions regarding minor economic trends.

Thirty-one charred plant taxa are indicative of cultural utilization. Even though a large number of such remains are present, only a few of these taxa are represented by sufficiently high numbers of wild plant remains that they may be characterized as significant economic resources (Minnis 1981; Moerman 1998; Hastorf and Popper 1988; Zier 1989:Table 40). These remains suggest that the most common plant types processed at the site were pinyon pine, grasses, cheno-ams, goosefoot, and prickly pear or cholla. Not surprisingly, goosefoot seeds dominate the assemblage, while cactuses and grasses are also common. All of these plants are fairly common and accessible throughout the Fort Carson area. These types of plants are considered to have been widely used at various sites throughout the area by prehistoric occupants even though preservation of macrobotanical remains is often dictated by specific site conditions, e.g., moist versus dry, or alluvial versus eolian (Kalasz et al. 1993; Zier et al. 1990; Zier 1989; Zier et al. 1996).

Dense pinyon-juniper woodland areas seem to have attracted the local gatherer population that inhabited Gilligan's Island. This is reflected in the quantities of charred female cones and nut hull fragments which suggest that pinyon pine nut processing occurred. This evidence may indicate that forays were made to gather and process these nuts from the area surrounding the site. A large rock placed in one of the more complex hearths (Feature 6B) suggests a method for preserving the feature, and indicates that occupants intended to return and reuse it again. This feature in particular is indicative of pinyon nut processing activities (Gish 2005). As with most macrobotanical remains, there is little evidence from surrounding sites in the area to suggest that pinyon nut procurement and processing occurred (Zier et al. 1988; Zier et al. 1990:161). This is probably a reflection of poor preservation at various site locations.

A concentration of goosefoot seeds is particularly interesting in Gilligan's Island Shelter 2 deposits. The size and shape of the seed concentration suggest morphologic similarities to a rodent burrow, but rodent caches often have a mixture of plant debris, and rodent droppings are entirely lacking in this seed concentration. These seeds are also identified in the analysis as uncharred. However, goosefoot seeds are characteristically small and black, and the effects of time often obscure the distinction between charred and parched materials, making them particularly difficult to interpret (see Zier 1989:254). The final interpretation is that these seeds were bundled for a processing event that never occurred. Its location near a Developmental period hearth/roasting pit supports this assumption.

Domesticates are not considered to have had much, if any, influence on the subsistence strategy of the Gilligan's Island occupants. Subsurface evidence for domesticated plants is almost nonexistent at the site; pollen analysis, 1/8-inch dry screening, and 1/16-inch water screen of samples all failed to produce evidence of agriculture. Besides uncharred corn cob fragments in pack rat midden, only one charred corn (cf. *Zea*) kernel that was recovered from flotation samples. This item came from a feature that yielded a two-sigma calibrated date of 1651-1632 B.P., placing it within the transitional Late Archaic-Developmental period. However, it is a single kernel and was not confidently identified. Maize remains have been found in miniscule quantities at several sheltered sites in Fort Carson (Charles et al. 2001; Charles et al. 2000; Hartley et al. 1983; Kalasz et al. 1993; Van Ness et al. 1990; Zier 1989).

It is not entirely uncommon for maize to be associated with early-age deposits. Corn cob remains were recovered from hearths at Gooseberry Shelter, including material which may date as far back as the Middle Archaic period, ca. 3890 B.P. (Kalasz et al. 1993:266), which would predate the earliest Southwestern maize (ca. 3700 B.P.) by more than 100 years (Vierra 2005:3). Recon John Shelter also has produced maize from Middle Archaic levels, although this find is regarded with skepticism by the investigators and a Late Archaic to Developmental period time range of ca. 1900-1500 B.P. is acknowledged for the probable use of corn at the site (Zier 1989:294). Regardless of age, maize appears to represents a secondary food source that prehistoric occupants of southeastern Colorado used modestly as a supplement to a wild resource diet of plant and animals. This is apparent at well-preserved shelters at the later-age Diversification sites, such as Woodbine Shelter, in which a reliance on local wild plants is demonstrated by more than 5000 charred goosefoot seeds and a variety of other wild plant remains recovered from an isolated feature in the Apishapa phase architecture (Kalasz et al. 1993:224-240). Domesticates are also present in the rockshelter, but in far few quantities, indicating an emphasis on a semisedentary hunter-gatherer lifestyle.

Several attributes were recorded during the faunal analysis as a means of identifying cultural modification within the Gilligan’s Island assemblage (breaking, burning, and discrete/extensive cutting). Burned/calcined bone provides the greatest amount of information regarding cultural utilization. Very small and small-sized mammals were the dominant animal resource within the assemblage. These animals include indeterminate hare/rabbit, jackrabbit/hare, black- or white-tailed jackrabbit, cottontail, mountain or desert cottontail, American red squirrel, prairie dog, vole, packrat, and Mexican/bushytail packrat, as well as various indeterminate rodents/squirrels. Small- to medium-sized birds, snakes, toads, and turtles also appear to have been processed, probably to a lesser extent. The data indicate a lower reliance on medium and medium-large mammals, with large mammals appearing least frequently. Most bones assignable to medium- to large-size mammal taxa are long bones that occasionally have green or spiral fractures were also present. These data, combined with an overall large fragmentation rate, suggest that medium and large-size animals were processed, perhaps for the extraction of bone marrow and grease (Jacobson 2006:1). Overall, smaller animals are better represented in the assemblage than medium to large mammals. It is also worth noting that the presence of acquatic animals in the assemblage suggests that the distance to a reliable water source may not have had much of an effect the occupants at the site and brief forays to water sources at the base of Salt Canyon may have been a familiar activity.

Shelter sites in the riparian environment of Turkey Creek, such as Recon John and Gooseberry Shelters, have similar faunal assemblages including small birds, reptiles, amphibians and mammals of various sizes. Fish are also present at Recon John Shelter. Similar to Gilligan's Island, there are no significant shifts in animal resources in any of these assemblages throughout time. Interestingly, the burned bone from Gooseberry Shelter and Recon John Shelter differs in subtle ways from that of Gilligan's Island and indicates that larger animals were repeatedly processed at these locations (Kalasz et al. 1993:275; Zier 1989:292-293). However, smaller animals such as cottontail, jackrabbit, and black-tailed prairie dog were often prepared at these shelters and proved to be a more reliable resource than deer or antelope.

Evidence for seasonality is restricted to wild plant and animal remains, which suggest a spring to fall occupation of the shelters, although it was probably inhabited during portions of the winter as well. Valuable seasonal data are often obtained from larger-size animals (Jacobson 2006). The faunal remains recovered from the shelters, however, are generally fragmented bones from smaller animals. The specimens indicate that the site was utilized during the spring and/or summer months, but not during the fall and winter (Jacobson 2006). Three neonatal/fetal bird bones were recovered from Developmental period deposits and may suggest an occupation during the late spring and/or summer (Jacobson 2006). However, these items lack evidence of human modification, and natural introduction to the site should be considered. Seasonal animals such as ducks, amphibians and reptiles are present, but most are too limited in representation in the modified bone assemblage to be of use in determining seasonality (Jacobson 2006). The antler bone billet is not considered an indicator for seasonal occupation since this artifact could have served as a tool for an extended period of time prior to arriving at the shelter. Furthermore, the antler could was recovered a long time after it had been shed by the animal. The quantity and diversity of plant materials are reflective of summer and fall occupation. Many of the macrobotanical remains consist of annuals and perennials that are often associated with warmer months of the year. Thus, these data point toward the summer and fall seasons. It should be noted, however, that the semi-arid climate along the Front Range may allow preservation of several of these plant types into the winter and spring months (Seebeck 1998).

There are no dominant trends suggesting that a continual trade pattern existed with outside groups. The only exotic item consists of a piece of obsidian derived from the Cerro del Medio in the Jemez Mountains of New Mexico (Hughes 2002). Most of the fine-grained lithic materials at the site were probably collected from stream cobbles or discrete chert nodules that can be probably be obtained from various Jurassic sedimentary rocks, especially the Morrison Formation, which are exposed in throughout the area (Taylor 1999: Figure 4). The nearest recorded lithic procurement site with fine-grained cryptocrystalline material is a chalcedony exposure that is eroding from bedrock that underlies the Jurassic Formation on the western side of Booth Mountain, approximately 3.64 miles east-southeast of the Gilligan's Island site (Charles et al. 1997:6.31-6.33). The materials in this quarry appear to be sparse. The lithic data suggest that microcrystalline procurement areas are sparse in the Fort Carson area (see Flaked Stone Technology, below). Most of the petrified wood was probably obtained a short distance to the north, along the Palmer Divide. Dendritic Trout Creek Jasper, found in the Upper Arkansas River Basin near Buena Vista, may also be present in very low quantities in the assemblage.

The lack of ceramics suggests that occupants of the site were utilizing perishable materials, such as baskets, to transport food and water to the shelters. The absence of such remains, particularly during the Developmental period, may indicate that the shelter was used for purposes of logistical mobility, in which occupants went to the site in the course of extended foraging trips from a residential base camp (Binford 1980). Such tasks may not have required ceramic items that were bulky and easy to break while traveling over longer distances. It is interesting to note that across the unnamed drainage from Gilligan's Island, at site 5FN505, very small undiagnostic ceramic sherds were recovered during test excavations (Hartley et al. 1983). The presence of ceramics in the local area further supports the notion that Gilligan's Island was used as a specialized processing area, in which various culinary tasks involving the use of pottery were not required or preferred.

Technology

The artifact assemblage is reflective of a light-weight hunter-gatherer tool kit that was subjected to the later stages of manufacture before being transported to the shelter. While at the site these tools served a variety of functions. Tasks requiring large heavy pounding/chopping tools were supplemented by local quartzite as needed. This type of artifact assemblage may be indicative of a semi-seasonal camp, in which occupants came to the shelter with the intent of staying for only a few days. The atl-atl was originally used by inhabitants of the site and was later replaced by bow-and-arrow technology. Modified bone tools and ornaments are present in limited numbers. Simple bone bead design and manufacturing techniques are represented throughout all of the designated temporal periods.

Flaked Stone Technology: The debitage analysis demonstrates that the initial stages of core reduction were accomplished largely at other locations. A majority of the debitage material types can be identified only as originating from local and/or regional sources that are common throughout eastern Colorado. Some of the petrified wood is undoubtedly derived from the Dawson Arkose formation along the Palmer Divide. The low quantity of larger-size debitage suggests that most of the lithic materials were brought to the site in a fully reduced state. Reduction strategies appear to have emphasized the production and maintenance of expedient tools, while bifacial reduction occurred less often. Most of the intensively reduced debitage is of fine-grained materials. Coarse-grained quartzite is common in the assemblage and is available in the site area. This material has typically undergone unintensive core reduction, and was procured for tasks that required larger implements, such as choppers, that were too heavy and cumbersome to have been transported over long distances.

A variety of flaked stone tools were recovered during the excavation. In general, tools were manufactured from materials derived from distant sources and are heavily utilized or completely exhausted, while raw materials procured near the site provided heavier tools that offered greater durability. Bifacial and nonbifacial flaked stone tools are generally small and light weight items manufactured from chert, fine-grained quartzite, and petrified wood. Exotic materials are represented by a single obsidian expedient flake stone tool. Simple flake tools dominate the collection, but the overall set also includes a variety of formal tools such as bifaces in various stages of reduction, end scrapers, and disto-lateral scrapers. Most of these tools, including projectile points, are heavily reworked and/or broken. Larger, non-intensively reduced tools such as cores and choppers are typically manufactured from coarse-grained quartzite found at or near the site. Intensively reduced large lithic tools that were obviously manufactured from materials from more distant raw material sources appear to have been used to perform a number of tasks. With the exception of the projectile points, the overall function and morphology of the lithic tools do not appear to have changed significantly through time.

This trend in lithic material procurement and curation can be seen in virtually every shelter site that has been studied on Fort Carson. Fine-grained microcrystalline materials are virtually exhausted and at the later stages of manufacture, while coarse-grained materials that are more difficult to flintknap were being used as supplemental material to produce tools for tasks requiring less precision. The local materials are in the early to middle stages of reduction in terms of both debitage counts and tool inventories, and were obviously selected for casual chores. Analysis of larger lithic assemblages, such as Recon John Shelter, led Zier and Kalasz (1991:129-131) to develop a model for this phenomenon, occurred from the Late Archaic to the Developmental period. This model appears to be equally applicable to the Middle Archaic period based on the Gilligan’s Island assemblage. According to the model, high-quality materials such as chert and petrified wood were obtained in the course of seasonal movement or trade. By the time the items arrived at the shelter they were partially reduced or finished. These materials were used to make specialized tools, such as knives and scrapers. Meanwhile, readily available local materials, such as limestone and quartzite, were easy to procure but of poorer quality. These materials were subjected to unintensive reduction to manufacture expedient tools that could be easily replaced. Most of these tools include heavy pounding/chopping and flake tools.

The few intact and identifiable projectile point from the Gilligan's Island shelters suggest that atl-atl technology was originally in place at the site and was later replaced by bow-and-arrow technology. Dart-sized projectile points include medium-sized, stemmed-indented base and large expanding-stemmed types ranging in age from the Middle Archaic to Developmental periods. Several dart and arrow points are unclassifiable stem fragments. A single flanged point (.048) exhibits small nick-like notches toward the point base and is associated with the Developmental period of occupation (Figure 89). Van Ness et al. (1990) have suggested that these shallow notches may represent an evolutionary change in point morphology from expanding stemmed to flanged stemmed points. It is also interesting to note that the other type of flanged points, commonly referred to as Washita, Reed, and/or Desert-Side-Notched and typically associated with the Diversification period and/or Protohistoric period in this region, were not recovered in either of the shelters, nor from the surface.

Several rockshelters in the Fort Carson area have yielded projectile points indicative of both atl-atl to bow-and-arrow technology. Dart points are typically found in and near the Turkey Creek drainage bottom in deeply stratified settings. Recon John (Zier and Kalasz 1991; Zier 1989), Gooseberry (Kalasz et al. 1993), and Two Deer Shelters (Zier et al. 1996) display a diverse morphological range of large to medium-sized dart points with a variety of haft element styles and overall shapes. Some points represent generalized styles that are similar to a variety of points found at locations in eastern Colorado including the Magic Mountain site (Irwin-Williams and Irwin 1966; Irwin and Irwin 1959; Kalasz and Shields 1997), Wolf Spider Shelter (Hand and Jepson 1996), and the Pinon Canyon Maneuver Site (Anderson 1989b). More distinct Middle and Late Archaic period points from these shelter deposits share morphological traits with the Duncan, Mallory Side-Notched, Marcos, Kent, and Yarborough point types (Kalasz et al. 1993:59-62, Figure 9 A; Zier and Kalasz 1991:126, Figure 9; Zier et al. 1996:98-99 Figure 5 D; Zier 1989:139-140, Figure 31 A-C, F). Eden point styles tentatively dating to the Late Paleoindian period have also been found in sheltered sites, but later investigations have shown that the deposits are of Late Prehistoric age and the items were probably curated during that occupation (Charles et al. 1999:6.22; Charles et al. 2001:7.17). Small expanding stem arrow point, commonly known as Scallorn points, are ubiquitous in shelter deposits that either date to or are indicative of the Developmental period (Kalasz et al. 1993:269-284; Zier 1989:141-142; Zier and Kalasz 1991:126-129; Zier et al. 1996:200-201; Hartley et al. 1983:47-54, 105-110, 135-136). Meanwhile, small triangular flanged points are less common; shallow nick-like notch points have been found in assemblages from 5EP143 and Recon John Shelter (Hartley et al. 1983:132-133, Zier and Kalasz 1991:126-127; Zier 1989:143, Figure 32 I-J) while points with deeper and more noticeable side notching (Reed and Washita points) have been recovered at Gooseberry and Woodbine Shelters (Kalasz et al. 1993:65-66, Figures 9 S-T, 10 B).

Ground Stone Technology: The ground stone collection consists largely of fragmented items that reflect expedient manufacture for multiple functions. Ground stone items generally served a variety of functions at the shelters. Their primary function was most likely to grind and pulverize wild plant and animal remains. Secondary uses of these items are numerous. Most of the assemblage is heavily fractured and appears to have been fire-altered, and the items typically were used as cooking or heating implements. Some specimens were used in the construction of hearths. Placed vertically or horizontally, these items may have been used simply because the shape fit the needs of construction, or a flat surface may have served as a cooking surface. Other items may have been used in hide processing.

Sandstone slabs and cobbles are the dominant source materials for metates; they were probably procured from the site area. Complete or nearly complete metates are classified as slab types that are common throughout southeastern Colorado. Metates in the Gilligan's Island assemblage generally reflect short-term utilization. The edges are unmodified, with heavily ground and ground/pecked working surfaces that are flat or have a shallow basin.

Most of the manos in the assemblage are of the oval, single-handed type, heavily ground on both sides with battered and/or ground margins. Complete or nearly complete manos are often manufactured from fine-grained sandstone or granite stream cobbles that appear to have been collected from drainages located some distance from the shelters. One granite mano has a particularly unique, round and flat disk-like shape. This item along with another granitic mano with less modification was incorporated into slab lining that appeared to have been constructed above or around an ember of coals in Feature 7. The items may not have been collected and manufactured specifically for use as grinding implements; rather, their flat surfaces heat containment properties may have been valued for food preparation. Not surprisingly, a number of the other ground stone items show secondary utilization in the construction of thermal features (Feature 6B) or as heated stones within feature fill (Features 2, 5A, 6B, 6C, and 6E). One rhyolite mano may have been used for hide processing after it was utilized as a core; another specimen classified as an indeterminate core/cobble tool displays similar abrasion (catalog no. 0.100).

Ground stone items are common in site assemblages in southeastern Colorado. Virtually all of the assemblages from larger excavated sites are heavily fragmented, indicating that ground stone served a variety of functions such as those described above. Since metates are often large and bulky items that were not easily transported they may reflect very broadly the extent of time spent at a site. Short-term camp sites, such as Recon John Shelter, generally resemble the Gilligan's Island shelters in terms of the ground stone assemblage. The metates are flat and suggest a minimum investment of time (Zier and Kalasz 1991; Zier 1989). Longer term multifunctional campsites, such as the nearby Avery Ranch site (Zier et al. 1988; Zier et al. 1990), generally have a wider assortment of ground stone items representing more specific tasks and include items such as shaft abraders. Metates are heavily used, as indicated by deeper basin wear, and specific design elements, such as marginal percussion flaking, are regularly present in metate assemblages (Zier et al. 1988:148).

Bone and Shell Industries: Thirteen modified faunal items recovered from the shelters are classified as ornaments and bone tools. The ornaments include 10 bone beads and a single modified freshwater mussel shell. The bone tools consist of an awl tip and a deer antler billet. The awl is from an indeterminate animal and was recovered in the overburden of Shelter 1. The modified shell and the bone billet are of probable Late

Archaic age. The beads are fashioned from the bones of very small to medium-size animals; bone elements represented include metapodial, vertebrate, femur, and tibia. The beads, found in deposits from all three temporal periods, appear to be the result of simple groove-and-snap manufacture with no design elements added, suggesting a long-term manufacturing preference for short and small beads. Bone industry assemblages are generally limited in the Fort Carson area to Late Prehistoric stage components, as seen at the Avery Ranch site (Zier et al. 1988; Zier et al. 1990) and Recon John Shelter (Zier 1989; Zier and Kalasz 1991). While further to the south-southeast of Colorado, the Burke's Bend site (Kalasz et al. 2007) and Wolf Spider Shelter (Hand and Jepson 1996) also have sizeable modified bone assemblages. The limited sample size of the Gilligan's Island site simply suggests that the groove-and-snap technique of small mammalian taxa may to be a method that occurred during the Middle Archaic and Late Archaic periods. However, similar to those finds at Recon John (Zier and Kalasz 1991), these beads may not have been commonly manufactured until the Developmental period.

Feature Technology: Feature identification and interpretation is often a difficult and subjective chore. This is never more true than in rockshelter settings where inhabitants continually revisit and disturb deposits. This scenario is compounded by the fact that features are generally not intact entities. Major components of a feature are often altered during the intended activity. Several features at Recon John Shelter for example, appear to have been secondary refuse piles, perhaps during food processing activities or simply during routine cleaning of thermal features. Charcoal, rock, and ash, perhaps still hot, may have been moved rapidly from one area to another (Zier 1989:72-82). The few features that appear to have been abandoned in place at Recon John, Gooseberry, Sullivan and Two-Deer Shelters were often subjected to rigorous environmental degradation (Kalasz et al. 1993; Zier 1989; Zier et al. 1996). Rodent activity, trampling, moisture leaching through the deposit and decay of materials are common contributing factors to feature deterioration. However, this was not always the case, for deep and shallow basins or hearths have also been found virtually intact. When compared to one another they display a morphological range and often lack formal design (Kalasz et al. 1993:266-268; Zier et al. 1996:195-196; Zier 1989:72-82). Additionally, architectural and nonarchitectural features at Woodbine Shelter have demonstrated that macrobotanical remains can be recovered in vast quantities (Kalasz et al. 1993:231-235).

Eighteen features were recorded during the 2002 investigations of the Gilligan's Island site. Four features are exposed on the bench surface below the shelters (Figure 11); one of these is a deflated hearth at the northern portion of the bench, while the remaining three are sheet middens that consist of large burned rock piles in the central and southern portions of the site. The remaining 14 features were uncovered during excavation and consist of a single looter's pit, two sheet middens, three roasting pits, three hearths, and five probable hearth remnants (Figure 30).

While looting may also have occurred elsewhere in the shelters, a shallow excavated pit (Feature 3) appears to be the only obvious evidence (see Historic period). The feature exhibited large chunks of manure and loose, lightly colored sand. This pit appears to have intruded minimally into deposits that date to the Developmental period and Late Archaic period.

The sheet middens are best described as accumulations of burned rock with dark sediment matrices. Each of these features has a distinctly dark and sooty residue that coats all of the materials in the matrix. This residue probably resulted from the exposure of cultural sediment to moisture outside the shelter dripline. The features are believed to represent accumulations of discarded materials placed at and/or swept toward the front of the shelters during food production. The basin-shaped roasting pits found at the base of each sheet midden have interior fill identical to that of the middens, and suggest a relationship with the intense food production activities that occurred during the occupation of the shelters. These basin-shaped roasting pits (Features 5A and 6E) were not radiocarbon dated but both are believed to be Middle Archaic in age (even though this is not reflected in the Late Archaic period designation for Feature 5A) The sheet midden deposits appear to have accumulated well into the later portion of the Developmental period. Large thermally-altered rock piles are also located on the open bench in front of the shelters. These massive fire-cracked-rock concentrations suggest that occupational intensity of the site for processing and cooking foodstuffs was fairly intense. The size and morphology of sheet midden deposits is variable throughout southeastern Colorado. Interestingly, these types of features are often associated with environmental settings similar to that of the Gilligan's Island site, in elevated juniper woodland zones (Mitchell 2001:2). In very general terms the irregular shaped, large accumulation of dark, rich sediment, burned rock, ash, and charcoal are believed to represent communal processing areas for preparing plant foodstuffs such as yucca, cholla, prickly pear and bush morning glory (Mitchell 2001).

An additional roasting pit in Shelter 2 (Feature 9) also exhibits a basin-shaped design and dates to the Developmental period. The elements in this feature are small, densely concentrated burned rocks intermixed with charcoal pieces. An alternative function of this feature is that it served as a hearth used for heating rocks in cooking preparations. Its morphology and design are similar to a hearth (Feature 2) situated directly above it.

The three hearths vary in morphology and probably served a variety of functions similar to that described above. Not surprisingly, most appear to be associated with food preparation. The hearths range from complex, lined fire pits to simple unlined basin pits. Building materials range from locally-available sandstone slabs and cobbles to granitic and basalt river cobbles from more distant sources. Some of the items are recycled ground stone slabs and cores that were probably already present at the site prior to construction of the features, while other items may have been obtained from more distant sources to serve a specific purpose. One hearth (Feature 6B), dating to the Middle Archaic period, is particularly well constructed with vertical and/or angled slabs lining the side walls of the basin; it is notable that the bottom of the basin is unlined. A boulder was placed in the hearth interior, probably for the purpose of maintaining its integrity for later use. A Late Archaic hearth (Feature 8) consists of a shallow basin pit exhibiting rock lining and containing charcoal. Two of the rocks are granitic manos that appear to have been specifically placed with their flattest surfaces facing upward. The rock lining may have acted as some sort of cooking platform. The final hearth (Feature 2), dating to the Developmental period, is an unlined basin-shaped feature with abundant large charcoal flecks and burned rocks.

The five probable hearth remnants are less formal in design. One appears to be a secondary charcoal concentration (Feature 6A), while another (Feature 6F) was identified in the northern wall of Trench 2 and consists of a dark basin-shaped stain with a few small rocks defining the base. The other three features in this group (Feature 6C, 6D, and 7) are mainly burned slab concentrations with associated charcoal and ash stains. Two of these features (Feature 6C and 7) have large sandstone slabs which are angled inward, suggesting that they are partially collapsed vertical slab-walled hearths.

Some materials recovered from the interior of the features were undoubtedly introduced by rodents or represent other types of disturbance. Lithic material is sparse and does not suggest that these features were constructed for tool manufacturing purposes. For the most part, a variety of wild animal and plant remains recovered from these thermal features suggest that they served a number of different tasks. At least some of the features may have been reused several different times to serve a variety of functions. The features and associated interior remains are indicative of an opportunistic, multi-functional pattern of use.

Even though the sample is limited and most of the features were not fully uncovered there does appear to be general trend in feature morphology. Features 5A and 6E are roasting pits that were built into the Stratum 1 sediment. Both features are associated with the Archaic stage, but were probably utilized during the Middle Archaic period, even though radiocarbon data from Shelter 2 not support such an age. Additional morphological similarities are apparent in the intact vertical slab hearth (Feature 6B), associated with the Middle Archaic period, which is comparable to the less intact features of this period (Feature 6C) and of the Late Archaic period (Feature 7). Feature similarities, in terms of design and construction, are also present between the roasting pit (Feature 9) and/or hearth (Feature 2) dating to the Developmental period.

Paleoclimate and Geomorphology

Paleoclimatic and paleoecological data where derived through several analytical techniques. A geomorphic analysis was conducted in both excavated trenches. Pollen samples were taken from ground stone washes and sediment control samples. Macrofloral remains were recovered from sheet midden deposits, intact hearths, roasting pits, and hearth-like features. Faunal remains were collected from all excavated components and subsequently analyzed.

Nineteen pollen samples were recovered during the excavations. Wind reliant (anemophilous) and biologic-reliant (zoophilious) fossil pollen grains were present in all of the samples. These remains represent a minimum of 39 different pollen taxa. Comparative data from the sediment control values indicate that the pollen assemblage is fairly representative of the vegetation of the Middle Archaic period, Late Archaic period and Developmental period. Only wild plants were identified in the pollen samples.

The floral remains are well preserved within the shelter interiors. Thirteen macrobotanical samples yielded evidence of 45 botanical taxa and approximately 20,000 plant parts. Thirty-two of the taxa include charred seeds indicating utilization by prehistoric occupants. The botanical remains represent a wild plant community similar to that of the present. Prominent charred species are arboreal pinyon pine and one-seed juniper and non-arboreal grasses, goosefoot/pigweed species, pit-seed goosefoot, and prickly pear and/or cholla.

An estimated 5,769 bone fragments were recovered from standard dry screen and water screen samples. A majority of these remains (74.6%) are from the fine-mesh screening that includes bulk soil samples from nearly every level and water screen and the heavy fraction from flotation samples. The combined results of the analysis indicate the presence of at least 43 species of animals, including gastropods, bivalves, fish, amphibians, reptiles, birds, and mammals. These specimens represent an environment that is commonly associated with the pinyon-juniper forests that surround the shelters. However, the presence of aquatic remains is notable since the site is far from a riparian environment. The boreal redback vole and jumping mouse are the only microtines from the site that may indicate climatic change. These species occur during the transition from the Middle to Late Archaic periods, but are limited to three specimens that offer only a tentative indicator of a mesic climate with increased forestation during these periods (Jacobson 2006).

Geomorphic sediments suggest that two climatic regimes influenced deposition within the shelters. A drier or xeric climate is indicated by fine-grained, well-sorted eolian sediment, whereas poorly sorted deposits and roof fall represents a cooler, mesic climate. Unfortunately, cultural occupation complicates geomorphic indicators of climatic trends in the Gilligan's Island deposits. The largest roof spalls are undoubtedly indicative of mesic conditions in the shelter. Radiocarbon ages associated with the various strata suggest that cultural occupation began when mesic conditions prevailed during the early portion of the Middle Archaic period (ca. 4969-4569 B.P.) (Figure 62) These climatic conditions seem to have become more xeric by the transitional Middle Archaic to terminal Late Archaic period (ca. 3681-3078 B.P.). Large-size boulder roof spalls resting near the top of Stratum 4 suggest that a mesic climate prevailed during the terminal Late Archaic to early Developmental period, ca. 1651-1632 B.P. (Figure 33). Eolian and mesic conditions appear to have alternated afterward (Table 5).

Intensive geomorphologic climate data obtained from Turkey Creek and Recon John Shelter suggest that the climate was cooler and wetter during the latter portion of the Late Archaic to Developmental period (ca. 2000-1000 B.P.), which corresponds with the Audubon glacial advances along the Front Range (Madole 1989; Benedict 1968, 1973, 1981, 1985; Zier 1989; Zier and Kalasz 1991:122). These data are consistent with the large roof spalling episodes that are evident in the upper deposits at the Gilligan's Island shelters, particularly in Shelter 2, where roof spalling is more discrete.

Perhaps the greatest confidence can be placed in paleoclimatic data from the earliest, culturally sterile deposits in the base of the shelter, which predate ca. 5000 B.P. Stratum 1 has a distinctively fine-grained fraction that is virtually free of roof spall. It characterizes long-term, dry conditions that are perhaps allowed eolian sediment to be blown into the shelter under Altithermal-type climate conditions. Near the dripline of Trench A are large boulder roof spalls that overlie Stratum 1. Cultural materials do not occur underneath but are found directly above the spalls suggesting that cooler, mesic conditions were predominant just prior to the occupation of the shelters, sometime before ca. 4969 B.P.

Wind-blown sediment deposition under dry conditions does not appear to be an isolated phenomenon and is comparable to deposition that occurred directly below transitional terminal Early Archaic to Middle Archaic period materials at Gooseberry Shelter (Zier et al. 1996: 262-284, Figure 71). This particular sediment is identified as Stratum H at Gooseberry Shelter and includes a distinctively dark yellowish brown clayey silt that is believed to have originated on the western side of Turkey Canyon and was transported to the shelter by eolian action. At a depth of at least 315 cm below the present ground surface, this homogenous deposit is comparable to Stratum I in the Gilligan’s Island deposits. It is hypothesized here that these two deposits represent a regional depositional episode perhaps caused by Altithermal warming and drying. Such a trend may have altered plant growth on stable soils and caused large amounts of wind blown sediments to accumulate (Eckerle 1997). The similarities between these strata is reinforced by the fact that both are culturally sterile and both have cultural deposits resting directly above them that yielded absolute radiocarbon dates indicating that initial occupation of the shelters occurred during the terminal Early Archaic to Early Middle Archaic period. It has not yet been determined if earlier deposits occur below Stratum H at Gooseberry Shelter. However, the lower deposits of the Turkey Creek drainage are believed to date to the late Pleistocene. This sediment may have aggraded as much as 1.0 cm to 1.5 cm per decade since that time (Madole 1989:286-288). It is also interesting to note that some multicomponent sites in the region that have an Early Archaic component, such as the Hess site (Gantt 2007) in northeastern Colorado and Barnes site (Ahler 2002) in Pinon Canyon Maneuver Site, exhibit fine-grained sediments that separate the Early Archaic component from the later components at the site. These sites may attest to the presence of dry depositional conditions that ended sometime near the beginning of the Middle Archaic period. At least at three of these sites, Gilligan’s Island shelters, Gooseberry Shelter and the Hess site, human occupation either begin or continue during the Middle Archaic period.

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APPENDIX A

RADIOCARBON ANALYSIS DATA

Mr. Cody Anderson | Report Date: 10/31/02

Department of the Army | Material Received: 9/30/02

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 171016 SAMPLE : F2-05 ANALYSIS : Radiometric-Standard delivery MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid 2 SIGMA CALIBRATION : Cal AD 870 to 1040 (Cal BP 1080 to 910)	1070 +/- 60 BP	-25.0* o/oo	1070 +/- 60* BP
Beta - 171017 SAMPLE : F7-1 ANALYSIS : Radiometric-Standard delivery MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid 2 SIGMA CALIBRATION : Cal BC 410 to 60 (Cal BP 2360 to 2010)	2230 +/- 80 BP	-25.0* o/oo	2230 +/- 80* BP
Beta - 171018 SAMPLE : F9-01 ANALYSIS : Radiometric-Standard delivery MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid 2 SIGMA CALIBRATION : Cal AD 5 to 255 (Cal BP 1945 to 1695)	1880 +/- 60 BP	-25.0* o/oo	1880 +/- 60* BP
Beta - 171020 SAMPLE : 6A-01 ANALYSIS : Radiometric-Standard delivery MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid 2 SIGMA CALIBRATION : Cal AD 560 to 720 (Cal BP 1390 to 1230) AND Cal AD 745 to 760 (Cal BP 1205 to 1190)	1390 +/- 60 BP	-25.0* o/oo	1390 +/- 60* BP
Beta - 171021 SAMPLE : F6B-14 ANALYSIS : Radiometric-Standard delivery MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid 2 SIGMA CALIBRATION : Cal BC 1700 to 1410 (Cal BP 3650 to 3360)	3270 +/- 70 BP	-25.0* o/oo	3270 +/- 70* BP

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: est. C13/C12=-25:lab. mult=1)

Laboratory number: **Beta-171016**

Conventional radiocarbon age[1]: **1070±60 BP**

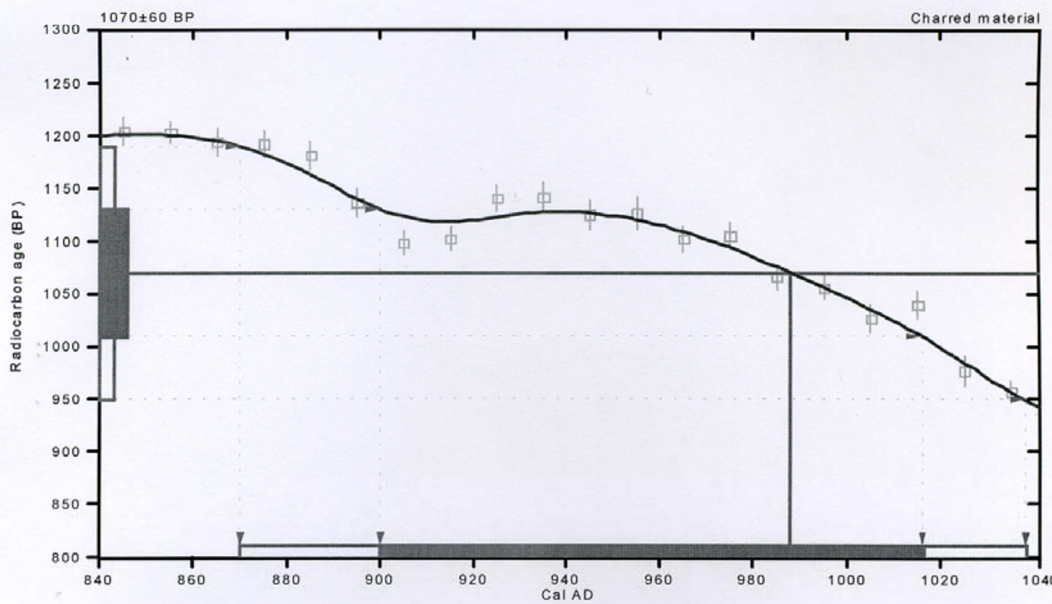
2 Sigma calibrated result: (95% probability) **Cal AD 870 to 1040 (Cal BP 1080 to 910)**

[1] C13/C12 ratio estimated

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 990 (Cal BP 960)

1 Sigma calibrated result: (68% probability) Cal AD 900 to 1015 (Cal BP 1050 to 935)



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A Simplified Approach to Calibrating C14 Dates

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: est. C13/C12=-25:lab. mult=1)

Laboratory number: **Beta-171017**

Conventional radiocarbon age[1]**:** **2230±80 BP**

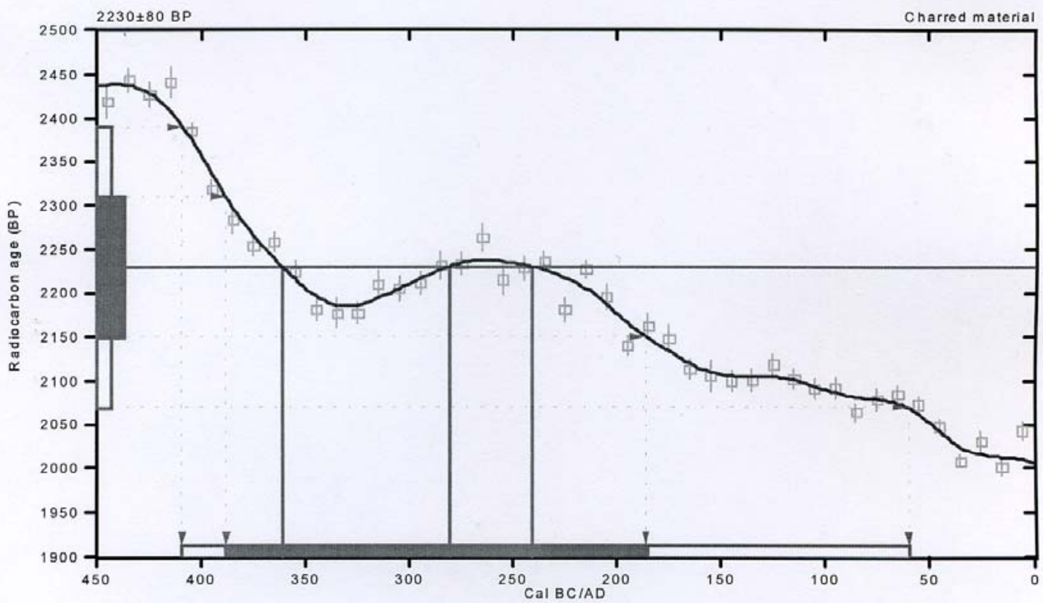
2 Sigma calibrated result: **Cal BC 410 to 60 (Cal BP 2360 to 2010)**
(95% probability)

[1] *C13/C12 ratio estimated*

Intercept data

Intercepts of radiocarbon age with calibration curve: Cal BC 360 (Cal BP 2310) and
Cal BC 280 (Cal BP 2230) and
Cal BC 240 (Cal BP 2190)

1 Sigma calibrated result: Cal BC 390 to 190 (Cal BP 2340 to 2140)
(68% probability)



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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: est. C13/C12=-25:lab. mult=1)

Laboratory number: **Beta-171018**

Conventional radiocarbon age[1]: **1880±60 BP**

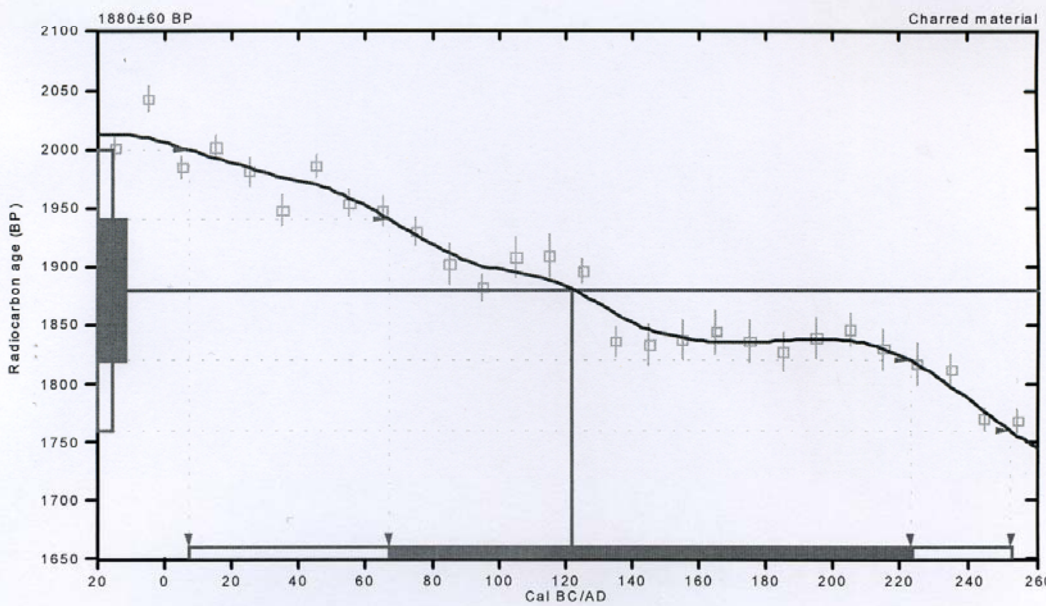
2 Sigma calibrated result: (95% probability) **Cal AD 5 to 255 (Cal BP 1945 to 1695)**

[1] C13/C12 ratio estimated

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 120 (Cal BP 1830)

1 Sigma calibrated result: (68% probability) Cal AD 65 to 225 (Cal BP 1885 to 1725)



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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: est. C13/C12=-25:lab. mult=1)

Laboratory number: **Beta-171020**

Conventional radiocarbon age[1]: **1390±60 BP**

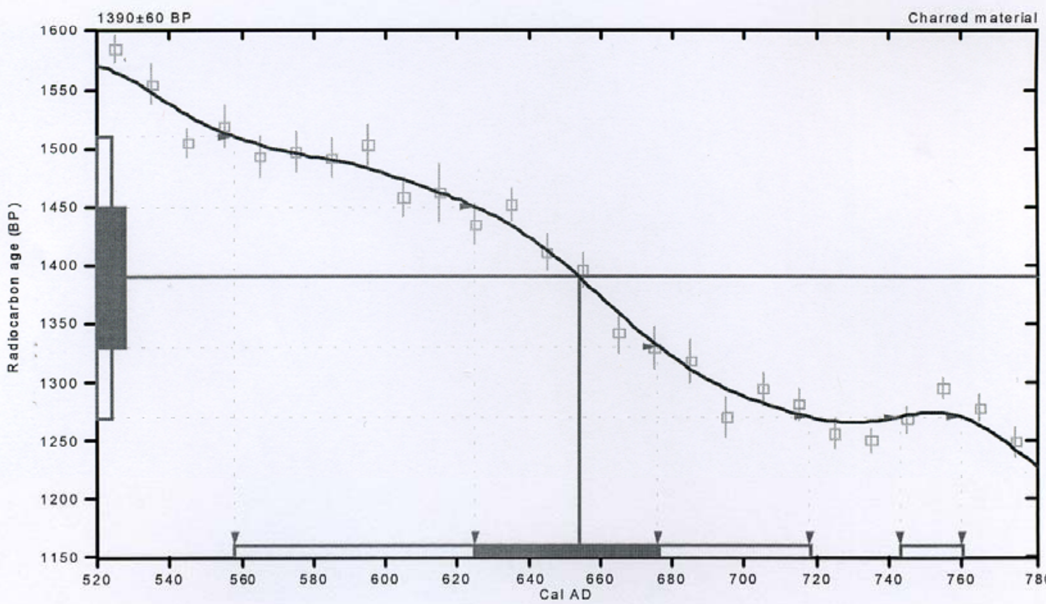
2 Sigma calibrated results: (95% probability) **Cal AD 560 to 720 (Cal BP 1390 to 1230) and Cal AD 745 to 760 (Cal BP 1205 to 1190)**

[1] C13/C12 ratio estimated

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 655 (Cal BP 1295)

1 Sigma calibrated result: (68% probability) Cal AD 625 to 675 (Cal BP 1325 to 1275)



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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: est. C13/C12=-25:lab. mult=1)

Laboratory number: **Beta-171021**

Conventional radiocarbon age[1]: **3270±70 BP**

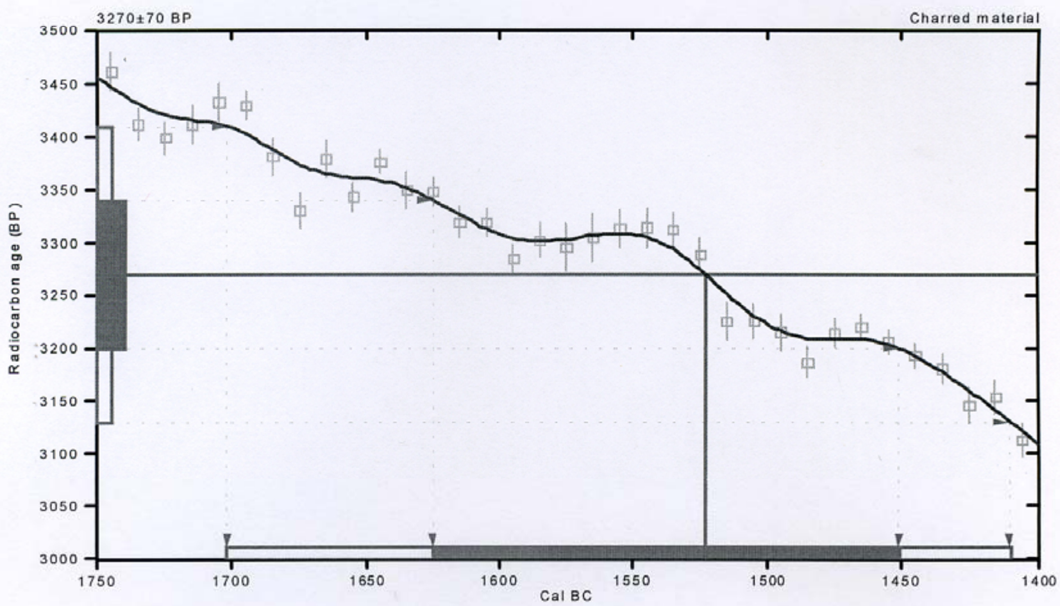
2 Sigma calibrated result: (95% probability) **Cal BC 1700 to 1410 (Cal BP 3650 to 3360)**

[1] C13/C12 ratio estimated

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 1525 (Cal BP 3475)

1 Sigma calibrated result: (68% probability) Cal BC 1625 to 1450 (Cal BP 3575 to 3400)



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REPORT OF RADIOCARBON DATING ANALYSES

Mr. Cody Anderson — Report Date: 11/18/02

Department of the Army — Material Received: 10/21/02

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 171765	2950 +/- 40 BP	-21.1 o/oo	3010 +/- 40 BP

SAMPLE : F8-02
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid
2 SIGMA CALIBRATION : Cal BC 1390 to 1120 (Cal BP 3340 to 3070)

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 171766	4240 +/- 70 BP	-25.0* o/oo	4240 +/- 70* BP

SAMPLE : 6C-05
ANALYSIS : Radiometric-Standard delivery
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid
2 SIGMA CALIBRATION : Cal BC 3000 to 2980 (Cal BP 4950 to 4930) AND Cal BC 2940 to 2620 (Cal BP 4880 to 4570)

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 171767	4140 +/- 70 BP	-25.0* o/oo	4140 +/- 70* BP

SAMPLE : 6D-01
ANALYSIS : Radiometric-Standard delivery (with extended counting)
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid
2 SIGMA CALIBRATION : Cal BC 2900 to 2490 (Cal BP 4840 to 4440)

Dates are reported as RCYBP (radiocarbon years before present, "present" = 1950A.D.). By International convention, the modern reference standard was 95% of the C14 content of the National Bureau of Standards' Oxalic Acid & calculated using the Libby C14 half life (5568 years). Quoted errors represent 1 standard deviation statistics (68% probability) & are based on combined measurements of the sample, background, and modern reference standards.

Measured C13/C12 ratios were calculated relative to the PDB-1 international standard and the RCYBP ages were normalized to -25 per mil. If the ratio and age are accompanied by an (*), then the C13/C12 value was estimated, based on values typical of the material type. The quoted results are NOT calibrated to calendar years. Calibration to calendar years should be calculated using the Conventional C14 age.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-21.1:lab. mult=1)

Laboratory number: **Beta-171765**

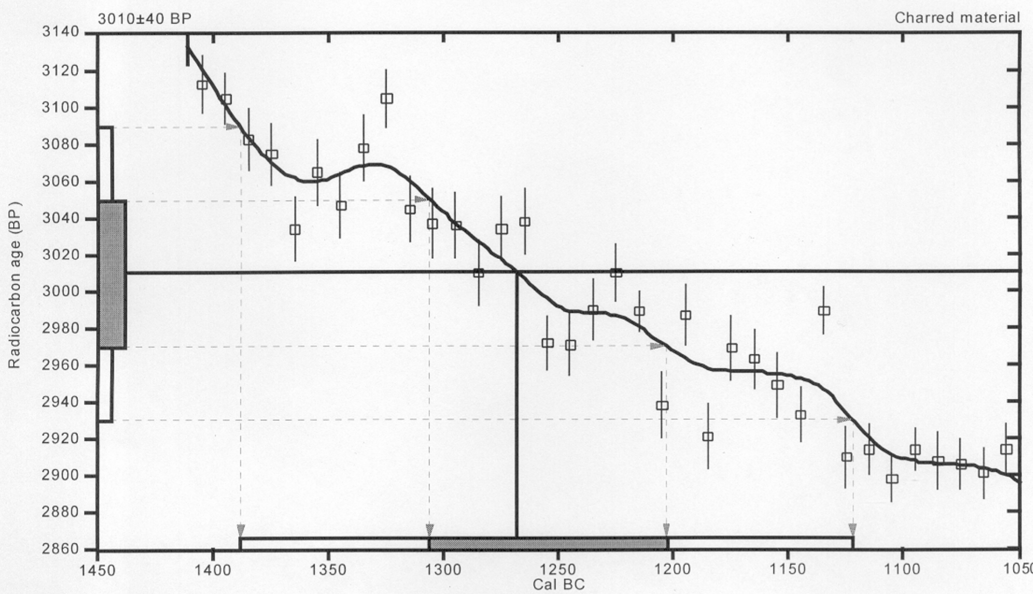
Conventional radiocarbon age: **3010±40 BP**

2 Sigma calibrated result: (95% probability) **Cal BC 1390 to 1120 (Cal BP 3340 to 3070)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 1270 (Cal BP 3220)

1 Sigma calibrated result: (68% probability) Cal BC 1310 to 1200 (Cal BP 3260 to 3150)



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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: est. C13/C12=-25:lab. mult=1)

Laboratory number: **Beta-171766**

Conventional radiocarbon age[1]: **4240±70 BP**

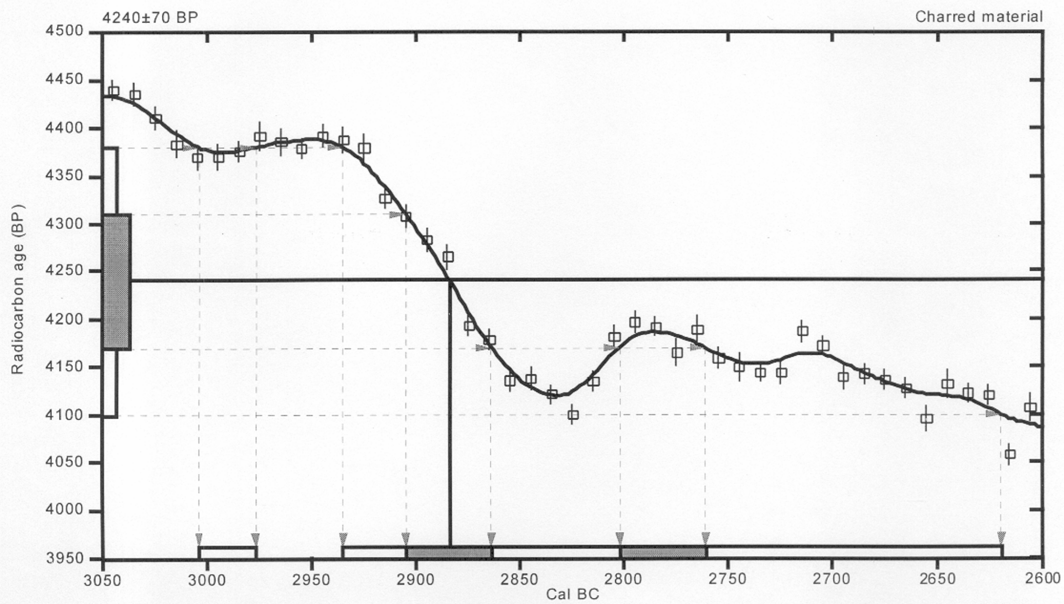
2 Sigma calibrated results: (95% probability) **Cal BC 3000 to 2980 (Cal BP 4950 to 4930) and Cal BC 2940 to 2620 (Cal BP 4880 to 4570)**

[1] C13/C12 ratio estimated

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 2880 (Cal BP 4830)

1 Sigma calibrated results: (68% probability) Cal BC 2900 to 2860 (Cal BP 4860 to 4810) and Cal BC 2800 to 2760 (Cal BP 4750 to 4710)



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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: est. C13/C12=-25:lab. mult=1)

Laboratory number: **Beta-171767**

Conventional radiocarbon age[1]: **4140±70 BP**

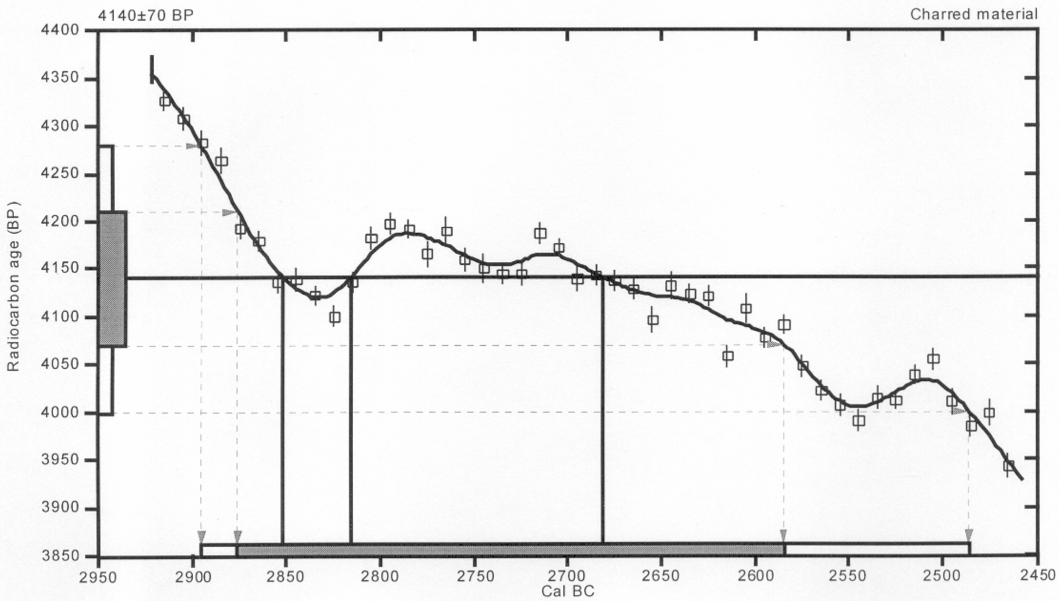
2 Sigma calibrated result: (95% probability) **Cal BC 2900 to 2490 (Cal BP 4840 to 4440)**

[1] C13/C12 ratio estimated

Intercept data

Intercepts of radiocarbon age with calibration curve: Cal BC 2850 (Cal BP 4800) and
Cal BC 2820 (Cal BP 4770) and
Cal BC 2680 (Cal BP 4630)

1 Sigma calibrated result: (68% probability) Cal BC 2880 to 2580 (Cal BP 4830 to 4540)



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