Archaeological Investigations at Eleven Sites of Welsh Canyon in the Pinon Canyon Maneuver Site, Las Animas County, Colorado

by
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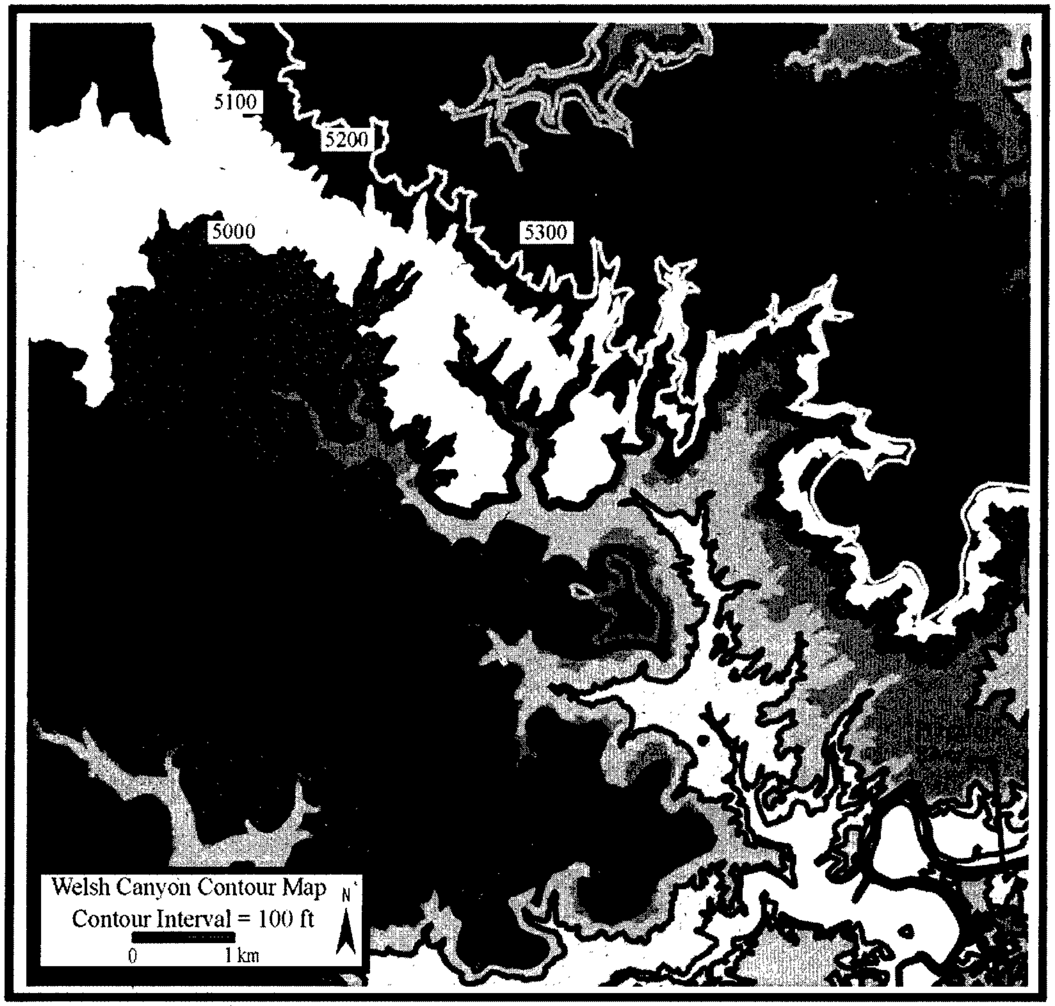

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13. ABSTRACT *(Maximum 200 words)*

In the summer of 1996 New Mexico State University under a cooperative agreement with the National Park Service and the United States Army conducted archaeological research consisting of subsurface testing and mapping of 11 sites in Welsh Canyon at the Pinon Canyon Maneuver Site in southeastern Colorado. Artifacts and ecofacts recovered from the investigated sites indicate that subsistence was rather mixed with good evidence for both plant processing and the hunting of small mammals. Palynological analysis indicates that the climate from about A.D. 950 to A.D. 1200 was somewhat more arid than the climate in the previous period. This period of mild moisture stress appears to be associated with an increase in population, a diversification of subsistence practices and raw material used in the production of chipped stone tools, and an increase in trade and exchange.

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TECHNICAL ABSTRACT

In the summer of 1996 New Mexico State University (NMSU) under a cooperative agreement with the National Park Service (NPS) and the United States Army conducted archaeological research at 11 sites in Welsh Canyon at the Pinon Canyon Maneuver Site (PCMS). The work reported on in this document consisted of subsurface testing and mapping of nine sites (5LA6568, 5LA6569, 5LA6562, 5LA6595, 5LA6599, 5LA6602, 5LA6603, 5LA6612, and 5LA6618) and the mapping of surface features at two sites (5LA6575 and 5LA6576). Of the 11 sites worked on, eight are eligible for National Register nomination and three are not. Ten of the 11 sites date to the prehistoric period. Radiocarbon date determinations from the prehistoric sites indicate that they were occupied between ca. A.D. 50 and A.D. 1300. The single historic site (5LA6602) is a dugout residence or storage building dating to the end of the nineteenth century.

Artifacts and ecofacts recovered from the investigated sites indicate that subsistence was rather mixed with good evidence for both plant processing and the hunting of small mammals such as *Sylvilagus* and *Lepus*. Palynological analysis indicates that the climate from about A.D. 950 to A.D. 1200 was somewhat more arid than the climate in the previous periods. This period of mild moisture stress appears to be associated with an increase in population, a diversification of subsistence practices and raw material used in the production of chipped stone tools, and an increase in trade and exchange.

POPULAR ABSTRACT

Most of the prehistoric sites tested in the 1996 field season belong to the Early and Middle Ceramic stages (ca. A.D. 200-1500). This span of time is characterized by a predominantly hunter/gatherer lifestyle. We recovered no direct evidence that the occupants of Welsh Canyon in the PCMS farmed. Data from the sites investigated indicate that the inhabitants practiced a type of subsistence based on the use of wild plants and animals.

A cache of four grinding stones probably used to grind plant remains was recovered from the site of 5LA6595. At another site (5LA6568), we have evidence for an activity area consisting of two fire pits in a small rockshelter. Two shallow depressions in the surface near the pits may have been rests for ceramic pots. The chipped stone debris indicates that individuals worked on making and maintaining their stone tools while perhaps cooking the meat from hunted animals in the fire pits. Just outside the shelter are several bedrock grinding areas useful for processing plant foods. In a nearby rockshelter at the same site, we discovered good evidence that the inhabitants were processing the prickly pear cactus for use as food. We also found what appears to be the midsection of an arrow shaft at 5LA6569. This artifact is made of two pieces of wood tied together with what appears to be deer sinew.

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Thanks to all the people who helped carry out this project. We would particularly like to thank our field crew including: Maria Victoria Quiroz Becerra, Cindy Coriel, Aaron Mannon, Bonnie Newman, Mary Schmucker, and especially Paula Turkon. Additional thanks go to Chris Loendorf, Jane Arie, Michael Flowers, Sylvia Marinas, and Ted Oliver who were members of the survey crew and helped out when we needed it. Warn thanks also go to Sheri Landis and John Gallegos for making our time in camp a pleasurable experience. Maria Victoria Quiroz Bacerra deserves thanks for the artifact illustrations and the administrative magic of Renee Beltran is also greatly appreciated.

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PREFACE

The archeological survey and evaluations reported in this manuscript are an important part of the Fort Carson Cultural Resources Management Program whose goal is to maintain the largest possible area for military training while protecting significant cultural and environmental resources. The current study is part of an integrated program that takes a long-term systematic approach to meeting identification, evaluation, and resource protection requirements mandated by the National Historic Preservation Act. While meeting legislated requirements, this project also provides a valuable contribution to our knowledge of the prehistory and resources of Las Animas County, Colorado. Under a cooperative agreement, New Mexico State University operating through the National Park Service, Midwest Archeological Center, provides assistance in meeting fort Carson's cultural resources goals.

Fort Carson began cultural resources studies immediately following the purchase of the lands that became the Pinon Canyon Maneuver Site in 1983. The Cultural Resources Program takes a multidisciplinary approach, combining archeological theory and historical methods with geological, geomorphological, botanical, and statistical techniques and procedures in order to focus its efforts to locate, evaluate, and protect significant cultural properties. Professional studies and consultations with Native American tribes have resulted in the identification of National Register eligible sites and districts. The cultural resources of Fort Carson and the Pinon Canyon Maneuver Site represent all major prehistoric and historic cultural periods recognized in the Great Plains and Rocky Mountains. Sites of the Paleoindian, Archaic, Ceramic, and Protohistoric periods are present, as are sites from the Fur Trade era, 19^{th} century Hispanic and Euroamerican settlement, early 20^{th} century homesteading and ranching, and World War II and Cold War era military sites.

The Cultural Resources Management Program is in the Directorate of Environmental Compliance and Management (DECAM). The directorate is tasked with maintaining Fort Carson's compliance with federal, state, and local environmental laws and mandates. The DECAM holistic management philosophy maintains that all resources are interrelated. Because decisions affecting one resource will impact other resources, the decisions we make today will affect the condition of Department of Army lands and resources for future training, research, and recreation. Mission requirements, training resources, wildlife, range, soil, hydrology, air, and recreation influence cultural resources management decisions. Integrating compliance and resource protection concerns into a comprehensive planning process reduces the time and effort expanded on the compliance process, minimizes conflicts between resource protection and use, allows flexibility in project design, minimizes costs, and maximizes resource protection.

Federal laws protect the resources on the Pinon Canyon Maneuver Site and Sort Carson. Theft and vandalism are federal crimes. Protective measures ensure that Army activity does not inadvertently impact significant cultural and paleontological sites. Fort Carson does not give out site location information nor are sites developed for public visitation. Similar resources are located in the Picketwire Canyonlands where public visits can be arranged through the U.S. Forest Service, Comanche National Grasslands in La Junta, Colorado.

Fort Carson endeavors to make results of the resource investigation available to the public and scientific communities. Technical reports on cultural resources are on file at the Fort Carson Curation Facility (Building 2420) and the Colorado State Historic Preservation Office and are available through the National Technical Information Service, Springfield VA. Non-technical reports on the prehistory, history and rock art of southeastern Colorado have been distributed to schools and public libraries in Colorado. Three video programs produced by Fort Carson are periodically shown on Public Broadcasting Stations. Fort Carson continues to demonstrate that military training and resource protection are mutually compatible goals.

Thomas L. Warren
Director
Environmental Compliance and Management
Fort Carson, Colorado
December 2001

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CHAPTER I: INTRODUCTION

In the summer of 1996, New Mexico State University (NMSU) conducted archaeological fieldwork at 11 sites in Welsh Canyon at the Piñon Canyon Maneuver Site (PCMS). The fieldwork was carried out under a cooperative agreement between NMSU and the National Park Service (NPS) Midwest Archeological Center. The U.S. Army funded the work. The PCMS is federal property that has been under the management of the Department of the Army, Fort Carson command since 1983. The site is used primarily as a training area for mechanized tracked and wheeled vehicles with helicopter and high performance aircraft support. During some types of maneuvers approximately 6000 troops along with tanks, heavy trucks, and helicopters can descend upon the area for military exercises and, if proper precautions are not taken, impact adversely upon cultural resources. The goal of the work discussed here is to evaluate the 11 sites based on the criteria set by the National Register of Historic Places (NRHP) in order to identify important archaeological and historical resources located in a predetermined area of the PCMS and provide the appropriate recommendations to insure their protection.

The NRHP criteria are originally listed in the *Code of Federal Regulations, Title 36, Part 60*. These criteria are reproduced and listed in a *National Register Bulletin* (1991) that discusses the justifications and application procedures for properties that may be eligible for National Register status. According to this document historic places are determined to be significant or not, and the criteria used to make this judgment are as follows: "The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:

A That are associated with events that have made a significant contribution to the broad patterns of our history; or
B That are associated with the lives of persons significant in our past; or
C That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
D That have yielded, or may be likely to yield, information important in prehistory or history."

These criteria provide useful, broad outlines for the evaluation of historic places, but they lack specificity especially concerning prehistoric sites. In other words, how does one actually determine if an archaeological site may yield important information on the prehistory of an area? In order to aid in this determination, four "research domains" have been established for the Colorado Plains (Eighmy 1984). More specific contexts relating to the PCMS can be found in Andrefskey (1990a) and Andrefsky et al. (1990). These domains include chronology, paleoenvironments, settlement-subsistence systems, and exchange and mobility. Essentially, if it can be demonstrated that prehistoric sites or locales have the potential to yield data bearing on these research domains, they should be considered as significant and therefore eligible for the NRHP.

Chronology is important in that it establishes the framework allowing the description of patterns of change and stability through time. Without chronology, archaeologists are limited to rather sterile synchronic descriptions. Chronologies should be constructed through a combination of numerical age estimating and relative dating techniques (Andrefsky et al. 1990:1068-1087; Andrefsky et al. 1990:XVI-2; Andrefsky and Zier 1990:VIII-14). The analysis of diagnostic artifacts such as projectile points and certain ceramic types combined with the use of radiocarbon, archaeomagnetic, obsidian hydration, and cation-ratio varnish dating is required to aid in the construction of chronologies. A site that contains or has potential to yield data that would refine or establish a regional chronology should be considered eligible for the National Register of Historic Places.

The second research domain is paleoenvironments. The prehistory of the PCMS is dominated by hunter/gatherers who tend to be rather sensitive to changes in the environment. Much of the change in the artifact assemblages of hunters/gatherers has been explained as the result of adaptive responses to climatic conditions. The lack of sites dating to the PaleoIndian and Early Archaic periods has been attributed to post-Altithermal erosional processes (Schuldenrein et al. 1985), however, some scholars (McFaul and Reider 1990) have recently suggested that there are some isolated sediments dating to the late Pleistocene and early Holocene. Schuldenrein et al. (1985) suggests that the southeastern Colorado climate was warm and dry after A.D. 1000 with no significant mesic changes. He also concludes that between approximately 350 B.C. and A.D. 1000 the climate was drier and wetter than the period after A.D. 1000. Loendorf et al . (1996:279-280) indicate that the climate was somewhat wetter, but vegetation remained stable. Chomko (1997) suggests that the environment of the entire span of the Ceramic Stage remained relatively stable. Scott (1984) and Scott Cummings (Appendix 1) indicates a fairly complex set of climatic fluctuations through time. Based on observations from 5LA5255 (Sue Site) she concludes that warm and wet conditions prevailed with some fluctuations between approximately 500 B.C. and A.D. 970. Periods characterized by less effective moisture began at approximately A.D. 970. By A.D. 1200, conditions ameliorated somewhat with a return to more mesic conditions. These interpretive discrepancies indicate the need to refine our understanding of the nature of environmental changes through time at the PCMS and in southeastern Colorado in general. The analysis of floral and faunal materials from site and non-site localities can provide valuable information on paleoenvironments and how they may be related to adaptive responses of the human populations living in the area.

One way human populations adapt to changing circumstances is by altering their movements across the physical environment and land use patterns. These changes are often reflected in the settlement-subsistence system, which is the third research domain. Essentially, this domain deals with the analysis of spatial and locational information on the distribution of different site types across the landscape and how these patterns may be related to subsistence activities. Two important research questions have been postulated for the PCMS that fit within this domain. The first deals with the degree of continuity in settlement and economic strategies between the Archaic and Ceramic Stage occupations of the PCMS.

The second tries to determine if increasing sedentism and population aggregation during the Ceramic Stage was caused by a deteriorating climate. Along with subsistence information derived from floral and faunal analyses, locational and site structure information is needed to address these questions.

The fourth domain is that of exchange and mobility. No society or culture group lives in total isolation. Interactions of different kinds are common occurrences among neighboring cultural groups. Exchanges of goods such a raw material for stone tool manufacture is one such type of interaction. Exchange and interaction can lead to the adoption of new technologies or other sociological influences. At least four major technological changes may have been adopted by PCMS populations as a result of their interactions with the American Southwest. These changes include the adoption of the bow and arrow, ceramics, cultigens, and semipermanent dwellings (Andrefsky and Zier 1990:VIII-22). The degree of stylistic similarities of artifacts (especially ceramics) between neighboring groups is often used as an indicator of interaction. Lithic raw materials are another line of evidence that can be used to suggest exchange between neighboring groups. Obsidian, alibates, some types of chalcedony, some silicified wood, and some cherts are not locally available to the populations of the PCMS (Andrefsky 1994:25). The presence of these raw materials at PCMS sites indicates that they may have arrived via trade and exchange with other external groups.

The authors of this report also consider data that bear on the reconstruction of a group's ideology or how a group gives meaning to the world around them through the use of symbols in a determination of a site's eligibility to the NHRP. The most pertinent class of data from the PCMS that can be used for addressing research question in this domain is rock art. Settlement location and site structure of sites with rock art information are also important for addressing questions within this research domain.

Eleven sites are evaluated in this report. They include: 5LA6568, 5LA6569, 5LA6575, 5LA6576, 5LA6592, 5LA6595, 5LA6599, 5LA6602, 5LA6603, 5LA6612, and 5LA6618. Nine of these sites were mapped and received subsurface testing while two of them were only mapped. The excavations were conducted in order to locate any subsurface features such as hearths or pits and to collect a sample of artifacts that could aid in determining the National Register eligibility of each site.

The fieldwork was completed in three, 10 day cycles between June 26 and August 3 of 1996. The crew consisted of three archaeologists in the first 10 days, 5 in the second, and 6 in the third 10 days for a total of 140 person days. Subsurface testing was conducted primarily with the excavation of test pits although some surface reconnaissance and shovel test probes were also conducted. Excavations and laboratory procedures followed the standards established by Dean (1992) for the PCMS.

This report documents the procedures and results of this fieldwork. Materials derived from this work including notes, forms, photographic prints and negatives, scaled drawings, and artifacts are currently curated at the Museum of Anthropology at New Mexico State

University. Eventually this material will be housed with other archaeological remains at the Fort Carson, CO curation facility.

Results from the fieldwork recommend seven of the eleven sites as eligible for the National Register. The recommended sites include: 5LA6568, 5LA6575, 5LA6576, 5LA6592, 5LA6595, 5LA6599, and 5LA6603. Justification for these determinations is given below in the section pertaining to the eligibility recommendation for each of the sites investigated.

CHAPTER II: BACKGROUND

Physical Environment of the PCMS

The PCMS is a restricted military reservation that covers an area of approximately 380 square miles of semiarid lands in Las Animas County of southeastern Colorado (Figure 1). The PCMS belongs to the High Plains region of Colorado which itself is part of the extensive Interior Plain of North America. The plains, low hills, and canyons of the PCMS range in elevation from between 1341 to 1768 m (4400 to 5800 ft) above sea level.

The Purgatoire River, a tributary of the Arkansas River, forms the eastern boundary of the PCMS. Much of the PCMS is composed of relatively flat to low rolling plains that are deeply dissected by several west to east canyons and arroyos that drain into the Purgatoire River. There are four major topographic units in the PCMS (Schuldenrein et al. 1985). These include the steppe, the canyons, the hills, and the "hogback". McFaul and Reider (1990:1-11) also note the existence of several alluvial and colluvial terraces along the Purgatoire River and its tributaries along with some dune deposits mantling segments of the steppes.

The Big Arroyo Hills, Bear Spring Hills, and the Black Hills located in the northeast and west exhibit the most differentiated terrain and consist of upland mesas and steep slopes. Piñon-Juniper savanna is the type vegetative pattern. The Black Hills in the northwest area of the PCMS rise to nearly 300 m above the canyon floor of the Purgatoire River.

The grassland steppes are the single largest topographic unit in the PCMS. The steppes are composed of a somewhat level or gently sloping terrain with sparse grassland vegetation. Trees are somewhat rare but do exist near larger watercourses and rocky outcrops with springs.

The "hogback" is a steep ridge of shales and limestones that extends for 15 km. The hogback is located along the southern boundary of the PCMS and is bounded by Van Bremer Arroyo to the north. Its main feature is an exposed basalt dike along its crest. Patches of piñon and juniper grow along the crest, with grasses and low shrubs dominating the rocky slopes. Rock art is commonly found on the basalt blocks that have eroded onto the steppes along Van Bremer Arroyo as well and atop the dike itself.

Arroyo and canyon landforms dissect the grassland steppes. The main canyon areas include Van Bremer Arroyo, Burke Arroyo, Taylor Arroyo, Lockwood Canyon, Red Rock Canyon, Welsh Canyon, Stage Canyon, Bent Canyon, Iron Canyon, and Minnie Canyon. The canyons extend in a southeasterly direction and drain into the Purgatoire River. The canyon valleys are up to 150 m deep and 700 m wide in the major drainages (Lockwood and Red Rock Canyons). The canyons are steep sided with exposed cliff faces and talus slopes littered with eroded boulders near the valley floor. Riparian vegetation such as cottonwood

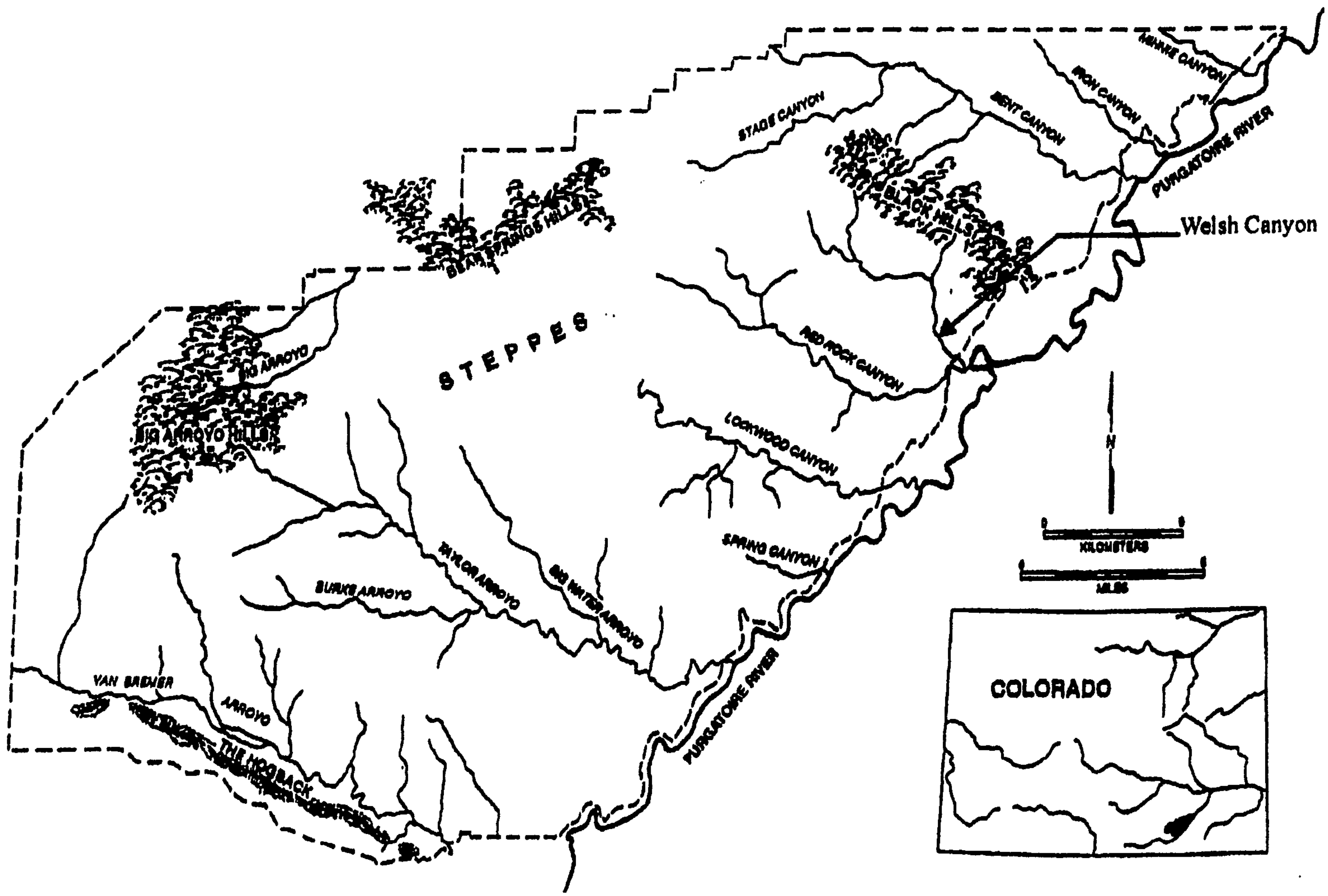


Figure 1: Major topographical features of the Piñon Canyon Maneuver Site

trees, grasses and shrubs grows along the channels. Juniper trees, shrubs, small prickly pear cactus, and cholla are common along the canyon slopes.

The fieldwork reported on here deals with sites located within or adjacent to the northern portions of Welsh Canyon. As with the other canyons in the PCMS, Welsh Canyon drains the grassland steppes in a northwest to southeast direction. It is located just south of the Black Hills and north of Red Rock Canyon (Figure 2). The canyon is approximately 5.75 km long from its headwaters to its confluence with the Purgatoire River and approximately .3 km wide due south of 5LA6599. The canyon opens up to approximately 3 km wide just west of the Purgatoire River. Near the main cluster of sites tested for this report, the canyon floor rests at about 42 m below its rim.

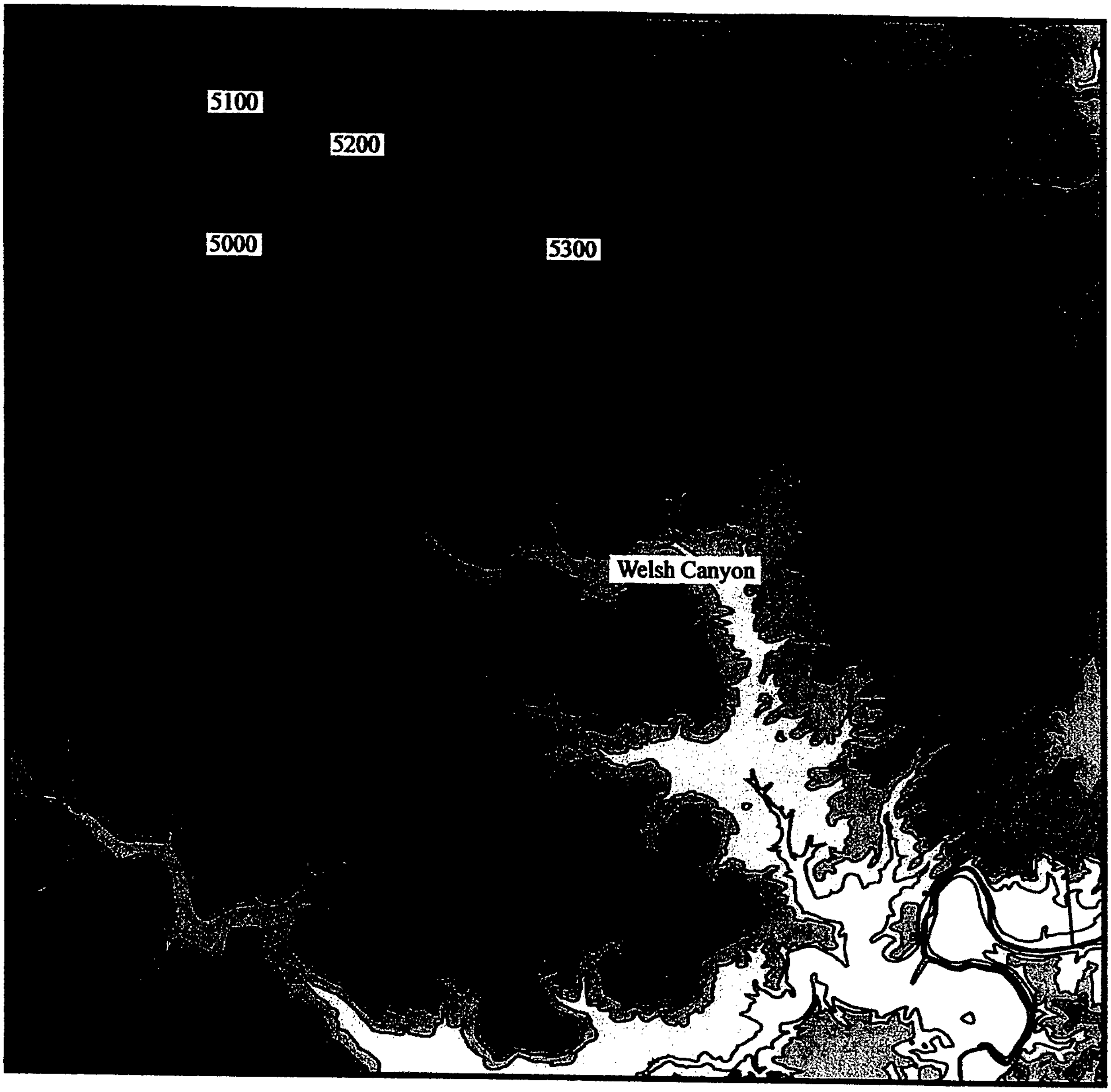
The present climate in the PCMS is most directly influenced by its location and proximity to the Rocky Mountain range to the west. Most precipitation is released over the Rockies leaving the southeastern plains of Colorado semiarid (Levings 1951:12). However, across the different areas of the PCMS, precipitation and temperature can vary greatly. The temperatures in Las Animas County ranged from -32 degrees Fahrenheit to 110 degrees Fahrenheit over a 21 year period. January temperatures average 32.7 degrees Fahrenheit while the average temperature in July is 71.5 degrees Fahrenheit. Most precipitation falls during the spring and summer and the annual amount of precipitation averages at 14.02 inches. Temperature and rainfall, along with other factors result in an average annual growing season of 142 days beginning some time in mid May and ending in early October.

The paleoclimate for the PCMS is somewhat difficult to characterize. Antevs' (1955) general model of Holocene climatic change is good for a broad area, however there were likely some localized areas where climatic variability differed from the general model. Scott (1984) and Scott Cummings (Appendix 1) concludes that, for some areas of the PCMS, warm and wet conditions prevailed with some fluctuations between approximately 500 B.C. and A.D. 970. Periods characterized by less effective moisture began at approximately A.D. 970 and by A.D. 1200, conditions ameliorated with a return to more mesic conditions.

Cultural Overview of the PCMS

The classification system for the prehistoric period in the PCMS is outlined in Anderson (1985, 1990). Her classification divides the prehistory of the area into four stages and nine periods (Table 2.1). This section offers a brief summary of the prehistory of the PCMS as it is currently known. For further details, the reader should consult: Butler 1986; Campbell 1969; Gunnerson 1989; Haury 1989a; Lintz 1984; Lintz and Anderson 1989. For more information on the Historic and Protohistoric periods as they pertain to the PCMS the reader should consult: Carrillo 1990; Haury 1989b; Hanson and Chirinos 1989; Freidman 1985; Stoffle et al. 1984.

One of the most interesting debates in American archaeology deals with whether human occupation of the New World predates ca. 12,500 B.P. Putative occupations



Welsh Canyon Contour Map

Contour Interval = 100 ft

SCALE

0 2 km

N

Figure 2: Welsh Canyon Contour Map.

predating 12,500 B.P. are referred to as preprojectile occupations. To date there are few accepted sites in North America that predate 12,500 B.P. and no remains from this stage has yet to be recovered from southeastern Colorado or the PCMS.

Table 2.1. Classificatory Scheme for the PCMS (Anderson 1985, 1990).

Stage/Period	Dates
Pre-Projectile	**pre 11000 B.C.**
PaleoIndian	**11000-5500 B.C.**
Clovis	10500-9000 B.C.
Folsom	9000-8200 B.C.
Plano	8200-5500 B.C.
Archaic	**5500 B.C. - A.D. 200**
Early	5500-3000 B.C.
Middle	3000-1000 B.C.
Late	1000 B.C. - A.D. 200
Ceramic	**A.D. 200-1750**
Early	A.D. 200-800/1000
Middle	A.D. 800/1000-1500
Late	A.D. 1500-1750

The PaleoIndian Stage is the earliest occupation in eastern Colorado that is accepted by most North American archaeologists. PaleoIndians were nomadic hunters and gatherers who arrived to the New World approximately 12,500 B.P. Most archaeologists believe that they entered the New World by walking across a land bridge connecting modern day Siberia with Alaska that was temporarily exposed by the lowering of the sea level at the end of the Wisconsin glaciation. Ice-free corridors opened as the glaciers retreated allowing PaleoIndian populations to migrate further to the south. Anderson (1985) recognizes three periods of the PaleoIndian Stage in the PCMS: Clovis (10,500-9000 B.C.), Folsom (9,000-8,200 B.C.), Plano (8,200-5,500 B.C.). Remnants of the PaleoIndian Stage are rare in the PCMS. As of 1992, only 28 of the 1442 recorded sites on the PCMS contain PaleoIndian remains (Andrefsky 1990b:XIV-2). However, there are several PaleoIndian sites known in the areas surrounding the PCMS, including the type site for the Folsom period which is located about 100 km to the south in New Mexico.

In general, PaleoIndian remains are often associated with Pleistocene megafauna such as the mammoth and an extinct cousin of the bison. This association has led many archaeologists to suggest that PaleoIndian subsistence was almost exclusively based on big game animals. However, recent studies have documented the presence of small game animals such as jackrabbits, marmots, and turtles at PaleoIndian sites. McNeish (1964:535), based on his work in Mexico, suggests that PaleoIndians probably had a broader subsistence base than once recognized.

Archaeological sites in the PCMS begin to become more common and better understood during the Archaic Stage. The Archaic Stage is divided into three periods: Early (5,500-3,000 B.C.), Middle (3,000-1,000 B.C.), and Late (1,000 B.C. - A.D. 200). Archaic sites yield grinding stones, large stemmed and notched projectile points, other bifacially and unifacially made chipped stone tools, and flake tools. There are special function sites, such as game drive sites or butchering and processing areas, and short-term use campsites (Butler 1986:181).

In general, the Archaic Stages of North America are characterized by an increase in regional variation. However, the basic pattern of Archaic life consisted of people living in relatively small groups and relying on hunting and foraging for subsistence. Since much of the Pleistocene fauna relied upon by PaleoIndians became extinct, archaic hunters and gatherers had to shift the main focus of their subsistence. High frequencies of grinding stones suggest that plants started to become more important in the diets of Archaic people. The oldest rock art dated thus far in the PCMS is found at Archaic sites. The earliest forms of rock art are usually composed of abstract designs, but animal forms are also known.

Most of the sites discussed in this report date to the Ceramic Stage, which is divided into three periods: Early (A.D. 200-800/1000), Middle (A.D. 800/1000-1500), and Late (A.D. 1500-1750). It is important to note that other terms, such as Plains Village for the Middle Ceramic period and Protohistoric for the Late Ceramic period, are employed to divide the Ceramic Stage. Butler (1986, 1988) comments on the strengths and weaknesses of these different classifications. For the most part, we stay with Anderson's classification and refer to the other systems only when cited in other works.

Important changes of the Ceramic Stage include the utilization of domesticated plants. As the name of the stage suggests, ceramics were also an important addition to the technology of Early and Middle Ceramic period people. There is also evidence to suggest that the bow and arrow was also adopted. Mobility decreased and sedentism increased from the Early Ceramic (A.D. 200-800/1000) to the Middle Ceramic (A.D. 800/1000-1500) as attested to by the presence of slab structures. In the PCMS, these structures tend to be small (approximately 2-3 m in diameter), circular structures with upright slabs. More formal structures such as enclosing walls and dividing walls also appear in rockshelters at this time. By the end of the Middle Ceramic (A.D.1000) drought conditions prevailed that hampered the growing of crops.

Euroamerican contacts and the introduction of the horse at around A.D. 1700 characterize the Late Ceramic period. Between A.D. 1500 and 1700, the area of the PCMS may have been in control of the Plains Apache. The Comanche were also in the area between A.D. 1700 and 1750. After A.D. 1750, the Kiowa were linked with the Comanche and often made expeditions into the PCMS area. Late arrivals into the area include the Ute, Cheyenne, and Arapaho (Hanson and Chirinos 1989:18-38).

Euroamerican settlements to the south of the area made for significant changes after A.D. 1600. The active trade between the Plains Apache and the Pueblo Indians in this period was an important part of this change. The Pueblo traders supplied corn, pottery, and blankets for Apache deerskins and buffalo hides, meat, and tallow (Carrillo 1990:XVIII-7). The Spaniards, New Mexicans, and Comanche entered into this trading pattern in what is referred to as the *Comanchero* period.

Ultimately, the New Mexicans and Spaniards started their own buffalo hunting for trade; these groups, known as the *ciboleros*, were not well liked by the Comanche, who complained about them until the buffalo were exterminated. By A.D. 1821, when Mexico obtained its independence from Spain, sheep raising became an important industry in the region. It became an even more popular means of livelihood by the end of the Mexican-American War (A.D. 1848).

By A.D. 1859 there was a permanent sheep ranching operation on the upper Purgatoire River that was operated by two Hispanic brothers, Gabriel and Juan Gutierrez (Carrillo 1990:XVIII-27; Friedman 1985:63-64). The discovery of gold in the mountains near Denver stimulated economic growth and the demand for supplies. Travel routes brought more settlers to the region, and by the late 1860's, Charles Goodknight established a route to drive cattle from Texas through the west end of the PCMS. Permanent settlement by Euroamericans quickly followed (Friedman 1985; Haury 1989b).

CHAPTER III: FIELD AND LABORATORY METHODS

Introduction

The 1996 NMSU archaeological testing at the PCMS was conducted between June 26 and August 3, 1996. Work was carried out under the direction of Dr. Lawrence L. Loendorf, Principle Investigator, and Dr. Vincent W. Schiavitti, Field Director of Archaeological Testing, both of NMSU. The field crew consisted of Cindy Coriel, Aaron Manion, Bonnie Newman, Maria Victoria Quiroz Becerra, Mary Schmucker, and Paula Turkon. Additional support was provided by Michael Flowers, Randy Korgel, Chris Loendorf, and Ted Oliver who were members of the reconnaissance team.

The 1996 New Mexico State University archaeological investigations at the PCMS included both site reconnaissance and subsurface testing of several sites in Welsh Canyon. The site reconnaissance portion of the work concentrated, primarily, in the lower portion of Welsh Canyon (Loendorf and Loendorf 1999).

The sites tested in the 1996 field season were located and reported on during the 1995 reconnaissance of the upper reaches of Welsh Canyon. The surface data recorded in 1995 have been included in this report. This report describes the work carried out at 11 sites all located in the upper reaches of Welsh Canyon (5LA6568, 5LA6569, 5LA6575, 5LA6576, 5LA6592, 5LA6595, 5LA6599, 5LA6602, 5LA6603, 5LA6612, 5LA6618). Of the 11 sites, nine received subsurface testing while the remaining two sites (5LA6575 and 5LA6576) were only mapped. Subsurface testing was done primarily with the excavation of test pits. The goal of the work was to collect subsurface data that would help determine the National Register eligibility of each site.

Subsurface Testing

In general, test excavations were conducted following the standards established by Dean (1992) for the PCMS, however, certain alterations of these methods were needed owing to the contingencies of the field. All tested sites were approached with the same methodology in mind. The plan was to excavate 1 x 1 m test units until sufficient data were retrieved to determine the site's eligibility for the National Register. The placement and number of each test pit for each site was determined based on the size of the site and the nature of the deposits into which the pits were to be excavated. A total of 21 1x1 m and one 1x2 m units was excavated. More details regarding the number and placement of each test pit are given below in the section discussing each site.

The test units were excavated primarily by hand trowel and shovel. In some cases, when the deposits were extremely hard, a pick was also used. Excavation was conducted in 10 cm arbitrary levels until a natural or cultural layer could be discerned. The excavated fill was passed through ¼" screens and the debris visually searched for artifacts. Diagnostic artifacts were point provenienced and recorded in situ when possible. A soil sample measuring 33 x 33 x 10 cm was retained from each excavated level. Pollen samples of about 250 ml and larger were removed from these and the remaining soil was wet screened in the field laboratory by passing the fill through a 1/16" screen with the aid of water from an ordinary garden hose. All excavated samples were transported to the Museum of Anthropology at NMSU for more detailed analysis and cataloguing.

Observations during the process of excavation were recorded on standard PCMS excavation level forms and plan view maps were made of every excavated level. Each test unit was regularly photographed in black and white prints and color slides. Profile drawings of at least two walls of each excavated test unit were also made. Finally, the individuals responsible for excavating each test unit wrote a Unit Summary describing the results of their work.

Shovel tests were used at one site (5LA6612) to help determine the horizontal extent of the site and the nature of its subsurface. The information from the shovel test was used to determine the location of the test units. The shovel tests measured 50 x 50 cm and were dug at least 25 cm in depth. Artifacts, when encountered, were collected and the different soil types and colors were recorded for each test.

Mapping

Mapping was conducted with the use of a theodolite and EDM laser transit. The theodolite was provided by NMSU and the EDM was provided by the National Park Service. Mapping was conducted by several members of the field crew including Vincent Schiavitti, Ted Oliver, Jane Arie, Sylvia Marinas, and Victoria Quiroz. The primary strategy used in mapping was the shooting of polar coordinates and distances in the field. These data were then converted into X, Y, and Z points using TurboCad. The data points were then imported into Surfer where they were converted into a grid system. Contour maps were then generated using the standard Surfer map utility. The Surfer generated maps were then imported into CorelDraw where they were combined with digitized maps showing various details such as unit locations, rocks, trees, and other site features.

Chipped Stone

The chipped stone assemblage from the sites excavated in the 1996 field season were processed according to the standards described in Dean (1992). The chipped stone tools were classified into bifaces, flaked tools, and cores, blocks, and split cobbles. The chipped stone debitage was classified into unbroken and broken debitage. Additional information including raw material type, retouch/utilization, degree of cortex, and length and width measurements where appropriate was recorded on coding sheets. These data were recorded by Bonnie Newman and Michael Flowers under the direction of Vincent Schiavitti. These data were then transferred to dBase III, which is the standard database format for the PCMS project. Apart from the raw material type and cortex information, these data were not directly used in the analysis presented in this report. According to Ahler (1996:15), this information "is devoid of much meaningful interpretive information having to do with how stone tools were manufactured, modified, used, and discarded…it provides [only] a descriptive inventory of artifact collections, an inventory that can be taken by lab workers with minimal training in lithic technology."

Since chipped stone debitage (or flaking debris) far outnumbers chipped stone tools, of primary concern in this report is how to best analyze chipped stone debitage. Chipped stone debitage is an artifact type generated as the by-product of a controlled fracture of some lithic parent material. Chipped stone debitage does not exhibit any purposeful modification after it has been removed from the core. Stone tools can be defined as chipped stone that has been modified by use or additional flaking by controlled fracture (Ahler 1986:129).

There is currently a debate as to how best to approach the analysis of chipped stone debitage in order to generate useful information on how stone tools were manufactured, modified, used, and discarded. Traditional analyses of chipped stone debitage incorporate typologies that distinguish flakes according to the degree of cortex present on the dorsal side. The assumption is that the amount of cortex is related to the order in which a flake was removed from the parent material (Doelle 1980:306; Jeter 1977:395-396; Rodgers 1977:109). However, Sullivan and Rozen (1985:756) suggest that, "the assumption that these categories represent an invariant sequence of flake removal is erroneous because no technological dependency obtains between them and core reduction. Primary flakes (flakes with substantial cortex), for example, may be removed at any point in a reduction sequence (see Jelinek et al. 1971)."

Other typologies attempt to identify bifacial reduction through the application of a subjective flake classification. Often, a high proportion of bifacial thinning flakes in the chipped stone debitage assemblage is used to identify bifacial reduction. Bifacial thinning flakes are thought to have been produced by a soft percussion technique and are identifiable through the presence or absence of certain attributes of the flake. However, based on experimental studies (Bradley and Sampson 1986:43; Patterson 1982), it appears that there are some difficulties with identifying the salient differences between flakes produced by hard and soft percussion techniques.

In this report, Ahler's (1989) approach of mass analysis of flaking debris is used. This type of analysis focuses on size grade distributions of the different raw material types represented in any given context. At its essence is the assumption that, in proportional terms, smaller flakes will be generated during the later stages of lithic reduction, while larger flakes will predominate during the earlier stages of lithic reduction strategies. Ahler (1989; 1996:13) recommends use of the following size grades:

G1 - Size Grade 1 - 25.40 mm (1.0000 in) opening
G2 - Size Grade 2 - 12.70 mm (0.5000 in) opening
G3 - Size Grade 3 - 5.60 mm (0.2230 in) opening
G4 - Size Grade 4 - 2.54 mm (0.1000 in) opening
G5 - Size Grade 5 - 1.18 mm (0.0469 in) opening

An additional size grade (Size Grade 6) was included in this analysis. Following Ahler (1989), this analysis groups Size Grades 4-6 as small flakes and Size Grades 1-3 as large flakes. Throughout the chipped stone debitage analyses conducted in this report, the frequencies of G4-6 flakes are determined by the actual counts of these flakes from water screening multiplied by nine (water screening was carried out on only 1/9 of the excavated deposits). In addition to size grade information, the chipped stone debitage was classified according to flake categories devised by Ahler (personal communication 1997). These categories include chunk/shatter, simple and complex flakes, bifacial thinning flakes, and bipolar flakes.

Chunk/shatter is a generally angular piece of flaked and flakable stone that lacks any feature that will allow determination of dorsal or ventral surfaces or any determination of direction of force application. Binford and Quimby (1963:278) define shatter as, "cubical and irregularly shaped chunks that frequently lack any well-defined bulbs of percussion or systematic alignment of cleavage scars in the various faces." According to Ahler and Christensen (1983:187), experimental studies indicate that shatter is customarily generated by hard hammer cobble testing. Therefore, a high proportion of shatter in the chipped stone debitage assemblage will be used as one indicator to identify cobble testing.

A simple flake is a freehand percussion or pressure flake that exhibits parts of two or fewer previous flake scars on the dorsal surface (exclusive of small platform trimming/shaping flakes). The flake may or may not retain the platform.

Complex flakes are freehand percussion or pressure flakes that lack the specialized features of a bifacial thinning flake but which do clearly exhibit all or parts of three or more previous flake scars on the dorsal surface (exclusive of small platform trimming/shaping flakes). Once again these flakes may or may not retain the platform.

Bifacial thinning flakes represent technologically specialized flakes removed from a biface during mid-to late stages of thinning Ahler and Christensen (1983:189) identify bifacial thinning flakes as having, "a thin flattened transverse cross section; a thin, curved longitudinal cross section; very acute lateral and distal edge angles associated with feather terminations, including opposite that of the subject flake; a narrow, faceted and prepared platform representing a small segment of a prepared and dull bifacial tool edge; a lipped platform; little or no cortex on the dorsal flake face; an expanding flake shape; and a diminutive, flattened or subdued positive bulb of force."

Bipolar flakes are technologically specialized flakes indicative of bipolar percussion flaking. The place of force application consists of a point or ridge, often shattered or crushed. These flakes may also have evidence of opposing fracture or force applications. Often the distinction between the dorsal and ventral face is difficult to determine. Linear and often parallel flake scar surfaces are apparent. Bipolar flakes tend to have angular, transverse cross-section and a high frequency of pronounced ripple marks on flake surfaces.

Several raw material types for chipped stone have been recognized for the PCMS. Most of these material types were initially devised by Andrefsky (1990) and Ahler (1997, personal communication) has created a typology of material types that is based on this early classification. The different material types used in this analysis are described in more detail in Appendix 4 of this report and the data coding for the chipped stone debitage analysis is presented in Appendix 5.

Radiocarbon Dates

A total of 17 radiocarbon dates were run on carbon samples from the 1996 excavations. All samples were submitted to Beta Analytic Laboratories where they underwent a pretreatment process designed to remove contaminants. Each sample was corrected for potential differential ratios of C12:C13 referred to as fractionation correction. The result is a conventional C14 age. The conventional C14 ages were then calibrated and converted into calendar dates using the Pretoria Calibration Procedure program. The results of the radiocarbon dating are presented in Table 3.1.

Many archaeologists treat radiocarbon dates as either means or as a range within which the true date likely falls. Certainly, the use of the mean radiocarbon date of a sample is inadequate since the actual date has a substantial probability of being somewhat different. However, even the use of a date's one or two standard deviation range on either side of the mean has its disadvantage. The use of a range implies that any point within that range has an equal probability of representing the actual date. In fact, the farther a date is from the mean, the less likely it is to represent the true date.

Kintigh (1994) provides an alternative method of depicting radiocarbon dates in which he notes that radiocarbon dates are probability distributions and any date or range of dates within the distribution can be described in probabilistic terms. In other words, the archaeologist can set and determine the probability for any interval or range of dates. For example, Beta-100214 has a mean date of 1500 ± 60 B.P. With this basic information, we know that there is a 68% chance that the true date falls within 1440 and 1560 B.P. However, with Kintigh's C^{14} method, the archaeologist can determine the probability that the true date falls within 1490 and 1530 B.P. In this case, there is approximately a 32% chance that the true date falls within the predetermined range.

Another advantage of Kintigh's method is that several dates from a series can be combined and represented as a single probability distribution. Nelson (1997:100) explains some of the details and assumptions:

> "This additive property, which is achieved by standardizing the distributions associated with the individual dates and then summing the probabilities for each interval, allows the creation of an aggregated probability distribution that gives appropriate weight to each date and its respective precision...Also, if one wishes to make the assumption that the dated materials are a random sample of wooden objects discarded or abandoned in the dated context, and that such materials were deposited at a regular rate, then it is possible to quantitatively evaluate the overall distribution as if it represented an actual population of dates. By assuming, for example, the outer

Table 3.1. Radiocarbon Dates From The Sites Tested In The 1996 Field Season.

Lab no.	Site	Unit	Level	C^{14} Age BP[1]	1σ	$\delta\ ^{13/12}C$[2]	Conventional C^{14} Age - BP[3]	Intercept(s) of conventional C14 dates with calibration curve in years A.D.	Calibrated ranges (1σ) in years A.D.[4]
B-100202	5LA6568	1	4	820	80	-24.1 $^0/_{00}$	830	1225	1165-1275
B-100203	5LA6568	1	6	800	60	-26.7 $^0/_{00}$	770	1270	1225-1290
B-100206[5]	5LA6569	1	5	900	90	-25.3 $^0/_{00}$	890	1175	1030-1250
B-100207[5]	5LA6569	1	4	1130	100	-24.4 $^0/_{00}$	1140	895	785-1005
B-100208	5LA6592	1	3	1140	60	-24.0 $^0/_{00}$	1160	885	800-975
B-100209[5]	5LA6592	3	3	870	60	-24.4 $^0/_{00}$	880	1180	1045-1105 and 1115-1235
B-100210	5LA6595	1	9	700	50	-23.6 $^0/_{00}$	720	1285	1270-1300
B-100211	5LA6595	1	12	1390	90	-23.6 $^0/_{00}$	1410	650	590-685
B-100212	5LA6599	1	3	940	60	-25.0 $^0/_{00}$	940	1045, 1105, and 1115	1020-1180
B-100214	5LA6603	1	5	1500	60	-25.0 $^0/_{00}$	1500	590	535-635
B-100215	5LA6603	1	4	1130	80	-23.7 $^0/_{00}$	1150	890	790-990
B-102656	5LA6568	3	2	1020	80	-23.1 $^0/_{00}$	1050	1000	905-920 and 950-1035
B-102657	5LA6568[5]	3	3	1130	130	-22.5 $^0/_{00}$	1170	885	695-1005
B-103151[5]	5LA6595	1	9	860	50	-24.9 $^0/_{00}$	870	1195	1065-1075 and 1155-1235
B-103152	5LA6595	1	18	1800	80	-22.5 $^0/_{00}$	1840	210	90-260
B-103153[5]	5LA6595	1	4	730	70	-23.7 $^0/_{00}$	750	1275	1235-1295
B-103154	5LA6603	2	5	960	50	-23.8 $^0/_{00}$	980	1030	1010-1055 and 1090-1150
B-102658[6]	5LA6568	3	15	1930	60	-26.1 $^0/_{00}$	1910	100	55-160

[1] Mean years BP is the radiocarbon years before present (RCYBP) and has not been corrected or calibrated.
[2] $\delta\ ^{13/12}C$ refers to the fractionation correction.
[3] Date after the fractionation correction has been applied.
[4] All calibrated dates are based on the conventional C14 age ($^{13/12}C$ corrected).
[5] This sample was small and was given extended counting time.
[6] This sample was too small for the standard radiometric dating technique and underwent accelerated mass spectrometry analysis (AMS).

12.5% on each end of the distribution represents sampling error, one may ask what interval contains 75% of the 'probabilistic dates' in the distribution, and obtain and reasonably accurate estimate of the span of occupation."

However, Kintigh (1994) warns against the use of the program with calibrated dates since they are not normally distributed. Therefore, in this report, Kintigh's program is used with the conventional C^{14} date (that is dates corrected for the C^{13}/C^{12} ratio). For the most part, this program is used to make comparison of radiocarbon dates from the same site and across different sites to determine if the dated contexts are coeval or likely date to different time periods. Keeping the assumptions outlined by Nelson (1997) in mind, a multimodal distribution should indicate multiple events or occupations, while a unimodal distribution should indicate a single occupation.

Other Analyses

The pollen was sent to Linda Scott Cummings of Paleoresearch Laboratories of Golden Colorado. The methodology and results of her work are presented in Appendix 1. The obsidian was sent to Chris McKee at the New Mexico Bureau of Mines and Mineral Resources for x-ray fluorescence. The results of the x-ray fluorescence were then analyzed to determine source locations by Raymond Kunselman from the Department of Physics at the University of Wyoming. The letter report outlining the results can be found in Appendix 2. Finally, the shell was analyzed by Victoria Vargas from Arizona State University. The methodology and results of that analysis are presented in Appendix 3. Appendix 4 is a list of the different lithic raw material types and was compiled by Stanley A. Ahler. The chipped stone analysis was conducted by Vincent W. Schiavitti of New Mexico State University. Appendix 5 presents the data coding for the chipped stone debitage analysis. The faunal analysis was conducted by Erica Hill of the University of New Mexico. The methodology of her work and the data tables are reported in Appendix 6. The site by site results of the faunal analysis are presented in the chapter pertaining to each specific site.

CHAPTER IV: 5LA6568

Site 5LA6568 is a rockshelter located on the eastern side of one of the two main tributaries at the headwaters of Welsh Canyon (Figure 3a). The site is composed of three rockshelters and associated overhangs on an upper and lower level (Figure 4). The dimensions of the site as determined by the limits of artifacts on the surface measure 52 x 55 m. The site elevation is between 1487 and 1494 m (4880 and 4900 ft) above sea level and the shelters face southeast. An intermittent stream (Welsh Canyon) is located approximately 20 m down slope from the lower part of the site. In the immediate area of the site, bedrock outcrops form cliffs that rise approximately 25 m above the canyon floor. The overhangs are composed of yellowish-brown Dakota sandstone, which is the most widely exposed bedrock in the PCMS area (Scott 1968; Helgren et al. 1985:55-56).

Several artifacts from the surface were recorded during the 1995 reconnaissance and these data are presented in Table 4.1. These data were located by conducting several intensive but non-systematic transects across the site. A total of 66 pieces of chipped stone debitage was recorded. Seven of these are primary flakes, 38 are secondary flakes, 10 are tertiary flakes, and 11 are debris or shatter. Four retouched flakes or unifacial tools and two bifacially worked fragments were also recorded. One piece is recorded as a shatter tool and there were 13 cores/tested cobbles. Two mano fragments and 11 sandstone metate fragments were also found.

Table 4.1. Summary of Chipped Stone Debitage and Tools From 5LA6568 Recorded in the 1995 Reconnaissance.

Artifact Type	**Material**	**Quantity**
Primary Flake	Quartzite	7
Secondary Flake	Quartzite	35
Secondary Flake	Chert	2
Secondary Flake	Siltstone	1
Tertiary Flake	Quartzite	8
Tertiary Flake	Chalcedony	1
Tertiary Flake	Argillite	1
Shatter	Quartzite	7
Shatter	Argillite	4
Retouched Flake	Quartzite	3
Retouched Flake	Argillite	1
Biface	Quartzite	2
Shatter Tool	Chalcedony	1
Core/Tested Cobble	Quartzite	13

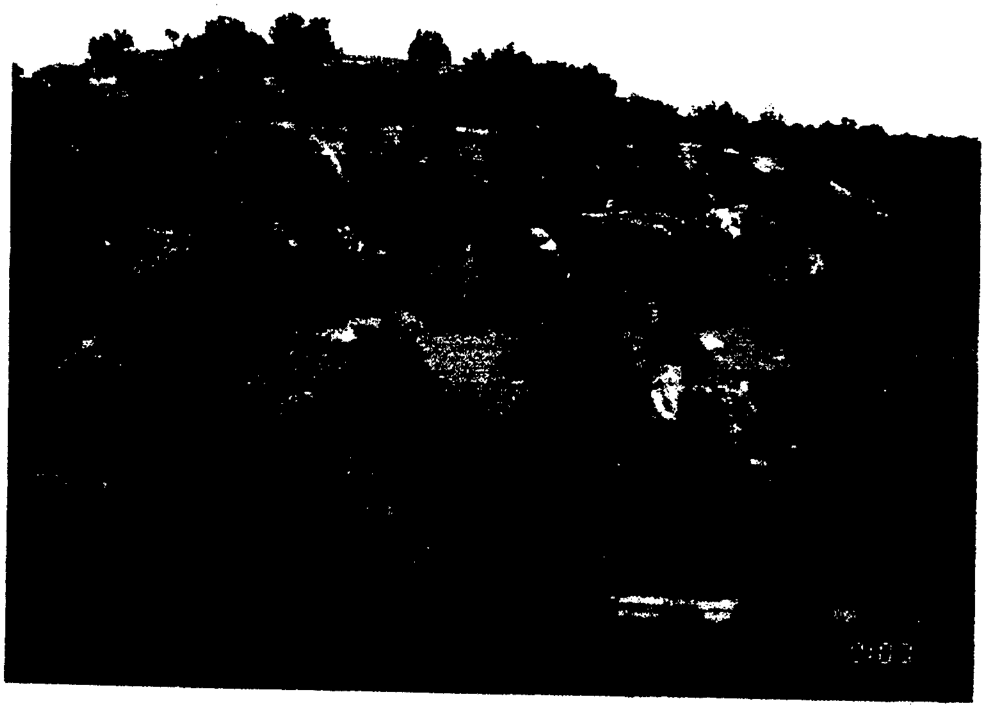


Figure 3a: Site 5LA6568, site overview from opposite side of canyon, taken facing north.

Figure 3b: Site 5LA6568, general view of Shelter 1, Unit 2, taken facing north.

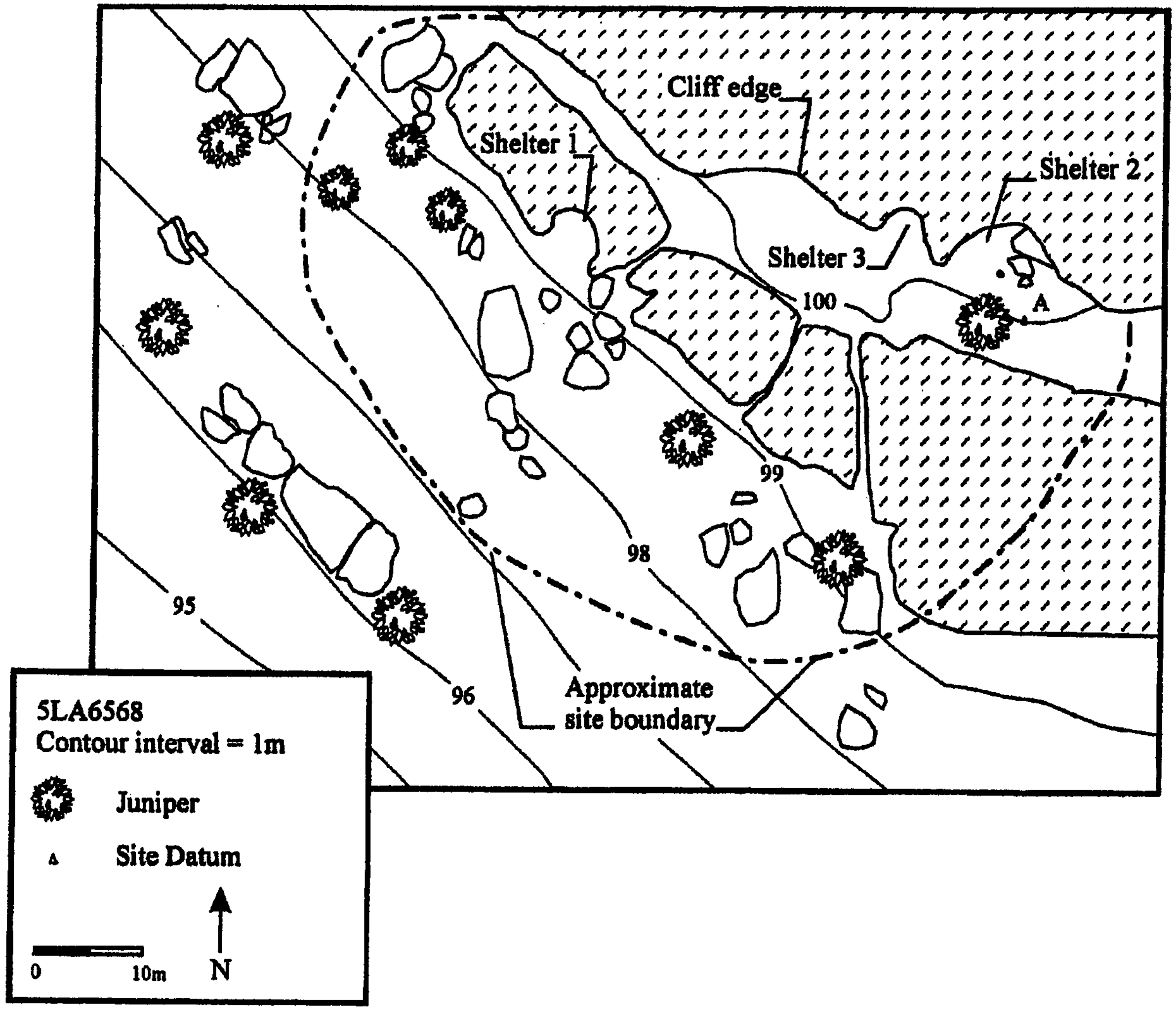


Figure 4: General site map of 5LA6568.

Shelter 1

Shelter 1 has an opening of a little less than 3 m and the maximum distance from the back of the shelter to the drip line measures a little more than 2 m (Figure 3b). The shelter ceiling is approximately 2 m above the shelter floor at its highest point near the drip line (Figure 5). A single 1 x 1 m test unit (Unit 2) was excavated in the shelter. The unit was placed adjacent to, but not in contact with the stone enclosure. Excavations were conducted in this area to explore the construction of the stone enclosure.

Depositional History of Unit 2

A bedrock shelf was exposed in the southern third of the unit at approximately 47 cm below the surface. Two additional levels were excavated to a depth of 71 cm below the surface at which point work in the unit was terminated.

The surface of the bedrock exposed in Unit 2 is quite irregular. An elevated portion of the bedrock is located in the southern third of the unit at a level of 47 cm below the surface and steps down an additional 24 cm near the northern wall of the unit. There is no evidence to indicate that this irregular surface was used in any way by the site's occupants.

Table 4.2 presents the different strata along with their corresponding excavated levels, depths below the surface, and a brief description. Three strata overlying bedrock are identified for the unit (Figure 6). The lowest stratum (Stratum 3), lying directly over bedrock, contains no definitively cultural material (Figure 7). No chipped stone artifacts were recovered from these levels. No vertebrate fauna from dry screening was recovered and 16 unidentified pieces came from the water screened deposits of Level 5. None of the recovered fauna from this stratum shows evidence of burning or human modification. Shale inclusions were prevalent in the clay silt soil of this stratum. The stratum measures about 38 cm thick in the northern part of the unit and about 14 cm thick in the south. The deposits, likely formed by the erosion of the bedrock, were compacted from water percolation. Stratum 3 represents the naturally laid deposits that make up the base on top of which later human activities took place.

Table 4.2. List of Strata for 5LA6568 Unit 2.

Stratum	Levels	Description
1	1	topsoil and mixed cultural debris
2	2-4	cultural debris
3	5-8	culturally sterile soil

The earliest cultural activities appear in Stratum 2 which consists of a layer of clay silt flecked with charcoal, an embedded thin lens of what appeared to be burnt or discolored clay silt, and two overlying silty sand levels. The silty sand of Stratum 2 contains the majority of the artifacts found in the unit.

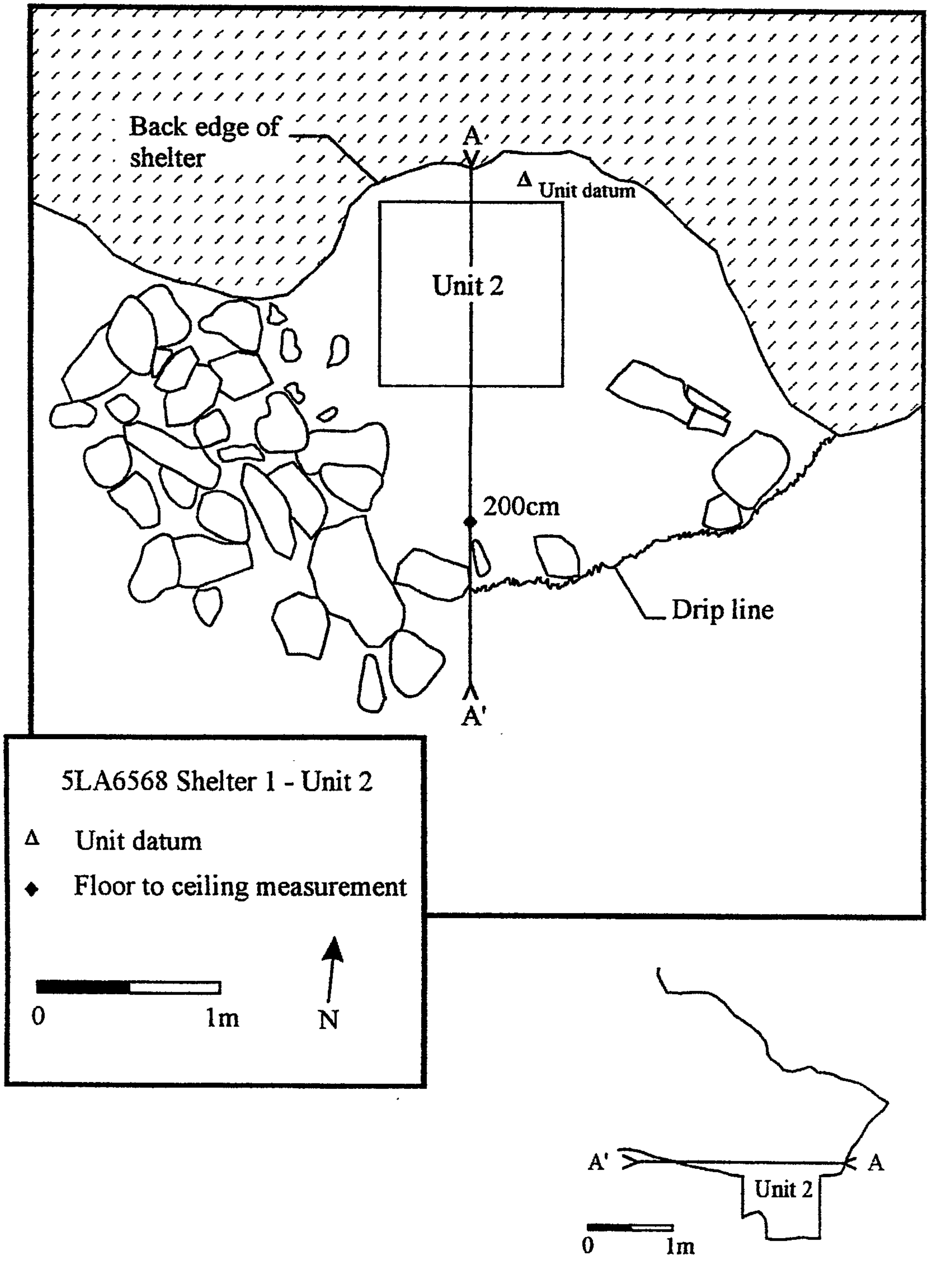
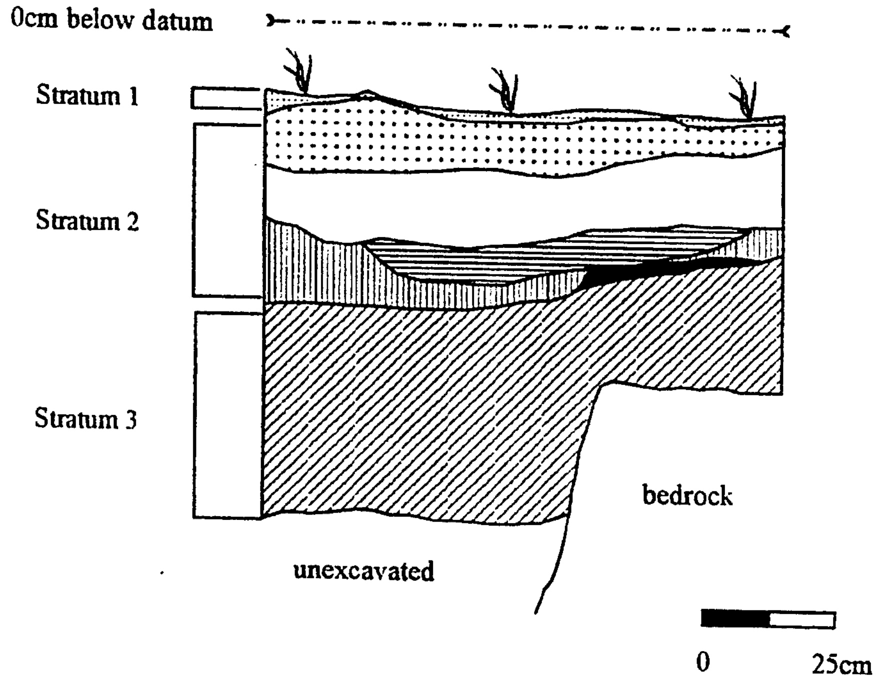


Figure 5: Site 5LA6568, Shelter 1, Unit 2 plan view.



Grayish brown (10YR 5/2) silty sand - topsoil

Grayish brown (10YR 5/2) silt w/ coarse sand - cultural deposit

Light olive brown (2.5Y 5/3) fine silty sand - cultural deposit

Grayish brown (10YR 5/2) silt w/ coarse sand and carbon - cultural deposit

Dark grayish brown (10YR 4/2) clay silt w/ carbon - cultural deposit

Dark reddish gray (5YR 4/2) clay silt w/ carbon

Dark grayish brown (2.5Y 4/2) clay w/ shale - culturally sterile deposit

Figure 6: Site 5LA6568, Shelter 1, Unit 2 east wall profile.

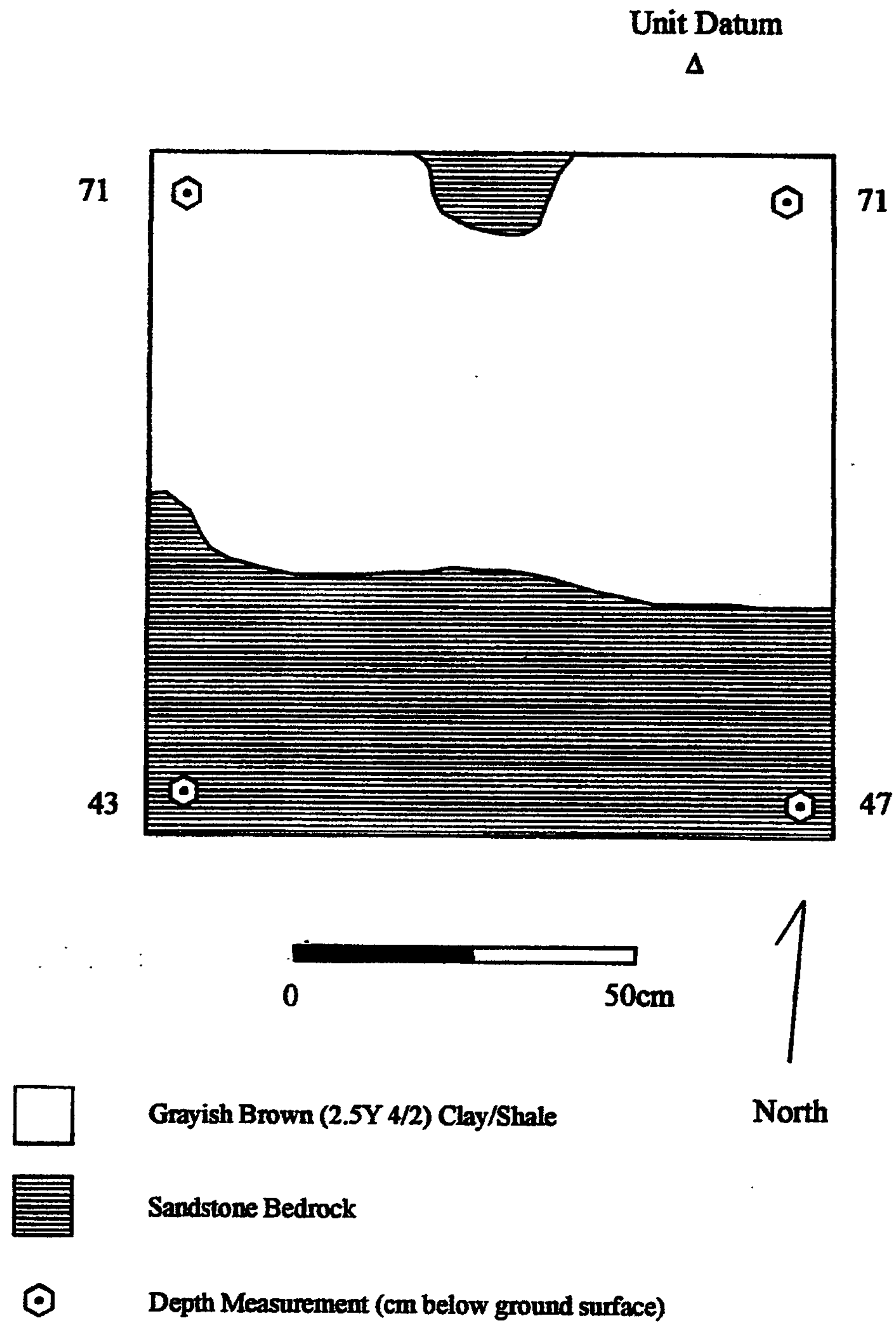


Figure 7: Site 5LA6568, Shelter 1, Unit 2, plan view of Level 8.

This stratum represents the period of most intensive human occupation of Shelter 1. Since distinct layers can be discerned within the stratum, it is possible that two or more distinct occupation episodes may be represented.

Stratum 1 is the uppermost and most recent of Unit 2. It is comprised of only Level 1 (0-10cm below surface) and corresponds to the topsoil, which is thoroughly mixed and loosely packed fine sand. Disturbance of this stratum was likely caused by recent pedestrian traffic and animal activities.

Chipped Stone

A total of 82 pieces of chipped stone debitage were recovered from Unit 2 of Shelter 1. Five different types of lithic raw materials are identified (Figure 8). Chert is the most common raw material recovered. In fact, Unit 2 of 5LA6568 has the highest proportion of chert debitage (50%) of all the units excavated in the 1996 field season. The vast majority of this chert is translucent and yellowish in color with reddish spots. It is likely that this material is not found locally at the PCMS. The next most common raw material is quartzite (22.0%), followed by argillite (19.5%), obsidian (6.1%), and chalcedony (2.4%).

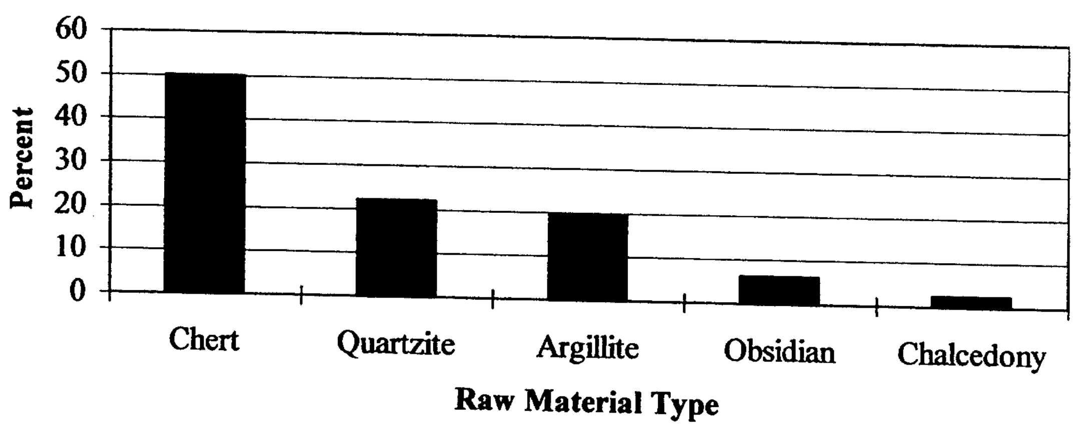


Figure 8: Raw material types for the debitage from Unit 2 of 5LA6568.

The five pieces of obsidian found in Unit 2 represent about 56% of all the obsidian recovered in the 1996 testing. Three of the five obsidian pieces were examined using X-ray fluorescence. As indicated in Appendix 2, all three specimens derive from the Jemez Mountains of northern New Mexico located approximately 160 km south of the project area. Two of the specimens (Sample 1a and 1b) come from a source called Cerro Medio in the central portion of the Jemez Mountains while the third specimen (Sample 1c) comes from the Rabbit Mountain source located in the southern Jemez Mountains.

The unusually high percentage of chert flakes is the result of the recovery of what appears to be a single tool manufacture/maintenance episode. According to (Ahler 1996:101), "ratios on the order of 2.5-3.5 [to 1] are common in pure freehand core reduction operations." These ratios are better suited for coarser raw material types such as coarse hornfels, and local quartzites, while core reduction of finer grained materials such as cherts and argillite should yield somewhat higher ratios. For Unit 2, the ratio of small to large flakes (G4-6 to G1-3) is quite high (17.4:1) which may represent late-stage, tool finishing/maintenance activities. Additional support for this inference can be found when the frequencies of flakes with cortex are examined. Unit 2 yielded only 1 chert flake with cortex. In general, cortical flakes should predominate in the early stages of core reduction while non-cortical flakes should predominate in the later stage of lithic reduction and tool finishing/maintenance operations. Furthermore, there is a high frequency of bifacial thinning flakes (11%) in the debitage assemblage. Of the 41 chert flakes, 18 (43.9%) are either bifacial thinning or complex flakes while only one piece is shatter (2.4%). The remaining 22 (53.7%) pieces are simple flakes. These figures strongly suggest that the chert debris, especially the translucent yellowish chert, resulted from the final stages of tool production or tool maintenance.

The argillite debitage shows a somewhat different pattern. The small to large flake ratio of argillite flakes from Unit 2 is 5.4:1. This ratio is not unreasonable for freehand core reduction given the fine grained nature of the raw material. Quartzite debitage has a small to large flake ratio of 5.72:1. This is a somewhat higher ratio than expected for pure freehand core reduction, but this ratio may suggest a mix of early-stage core reduction and late-stage lithic reduction operations.

Overall, the lithic assemblage of Unit 2 indicates that a mixed bag of lithic reduction strategies was employed within or around Shelter 1. Both early and late-stages of lithic reduction are represented and it seems likely that the assemblage of chert debitage represent the late stages of tool finishing/maintenance.

The only shaped tool recovered from the unit is a bifacially flaked, cobble tool made from water worn hornfels/basalt (Figure 9). The cobble likely came from the stream bed approximately 40 m below. The tool weighs 156.8 g and measures 8.1 x 5.5 cm and is 3.1 cm thick. Apparently, on the more intensively worked side, three of the flake scars were made some time after two others. It is possible that the tool was worked, then discarded and became weathered. After sometime, the tool was worked once again. In addition, a flake measuring 6.6 x 3.4 cm was found nearby in the same level. This flake can be refitted to the cobble tool.

Two possible mano fragments also came from Unit 2, but no other diagnostic tools, retouched pieces, shaped tools, or bifaces were recovered. Shell was also absent from this unit.

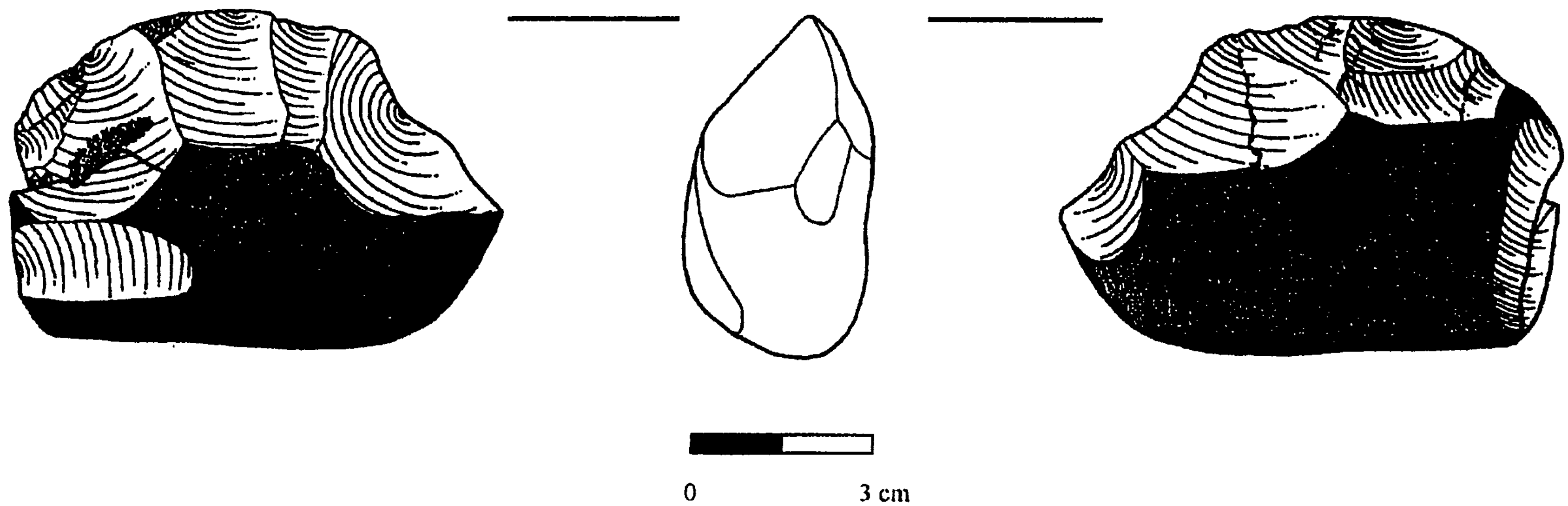


Figure 9; Bifacially flaked cobble tool from Unit 2 of 5LA6568.

Vertebrate Fauna

Of the three units excavated at 5LA6568, Unit 2 yielded the fewest faunal remains. A total of 104 bones were recovered from Unit 2. Fifty-one of these were from dry screening and 53 were recovered from the water screening procedure. Of the 104 only nine (8.7%) were identified to genus or species. As with the other two units, *Sylvilagus* sp. is the most abundant identified taxon, although woodrat and artiodactyl remains are also identified. None of the bones recovered from Unit 2 show any evidence of burning.

Shelter 2

The upper part of 5LA6568 is cloistered between the upper cliffs of the canyon and the large boulders forming the back edge of Rockshelter 1. It appears that rather thick deposits of over 2 m have formed in the narrow corridor between these two rock formations. Two rockshelters (Shelters 2 and 3) are located on the upper part of the site (Figure 10a). Both shelters face south southwest and are well protected by the rock formations mentioned above. Although Shelters 2 and 3 are separated by only 5 m, their depositional histories are sufficiently different to warrant individual treatment.

The opening of Shelter 2 measures 6.5 m and the maximum distance from the back of the shelter to the drip line measures nearly 3.5 m. The shelter ceiling is approximately 1.8 m above the shelter floor at its highest point (Figure 11). Three bedrock metates are located at the back wall of the shelter. The first measures 20 x 10 x 0.5 cm and is rectangular. There is some pecking or pitting evident in the central part of the basin and it has transversely oriented striations. The second metate measures 24 x 10 x 0.9 cm and is oval. It also has transverse striations and exhibits evidence of pecking or pitting only in approximately 2/3 of the basin. The third metate measures 12 x 7 cm and is oval. The orientations of the striations cannot be determined and there are no indications of pecking or pitting.

A large boulder (160 x 87 cm) located at in the eastern part of the shelter contains three smooth bedrock metates, three rough pecked bedrock metates, and several abraded grooves (Figure 12). Metate 1 measures 24 x 28 x 2 cm and is circular. The metate has central pecking or pitting and the direction of the striations in the basin of the metate cannot be determined. Metate 2 measures 16 x 24 x 1.5 cm and is oval. The metate exhibits pecking or pitting over its entire surface and the directions of the striations cannot be determined. Metate 3 measures 21 x 16 x 0.8 cm and is oval. The metate has pecking or pitting confined to the central part of the basin and the directions of striations cannot be determined. Metate 4 measures 35 x 28 x 2 cm and is circular. There is pecking or pitting across the entire surface and there are transversely oriented striations. Metate 5 measures 18 x 12 x 0.5 cm and is oval. There is pecking or pitting across the entire surface of the metate and the direction of the striations cannot be determined. Metate 6 is partially eroded but what remains measures 20 x 7 cm. The orientation of the striations cannot be determined, but there is pecking or pitting across the entire extant surface of the metate.

Figure 10a: Shelters 2 and 3 of Site 5LA6568.

Figure 10b: Features 2-5 of Unit 1 from Site 5LA6568.

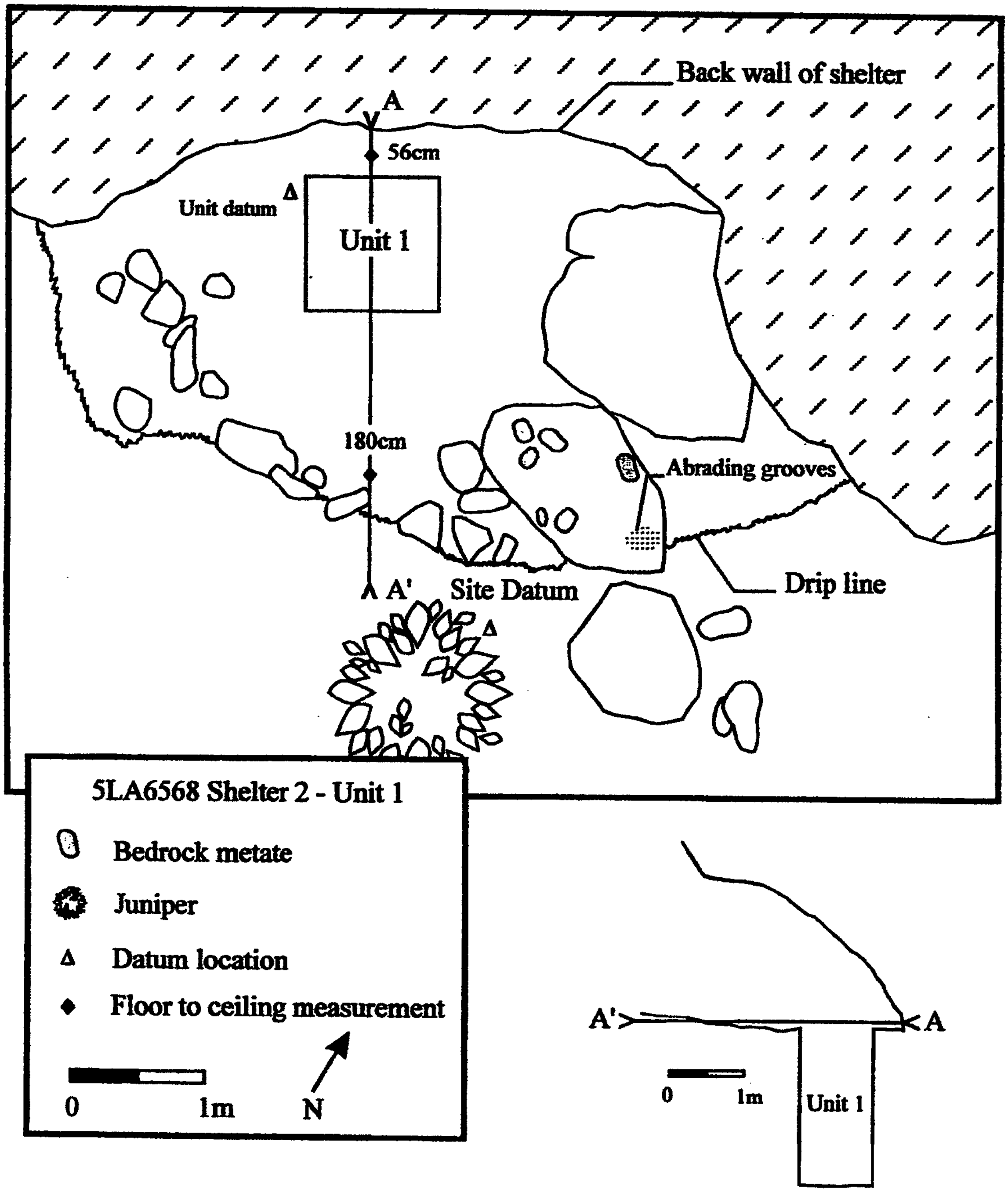


Figure 11: Site 5LA6568 Shelter 2, Unit 1 plan view.

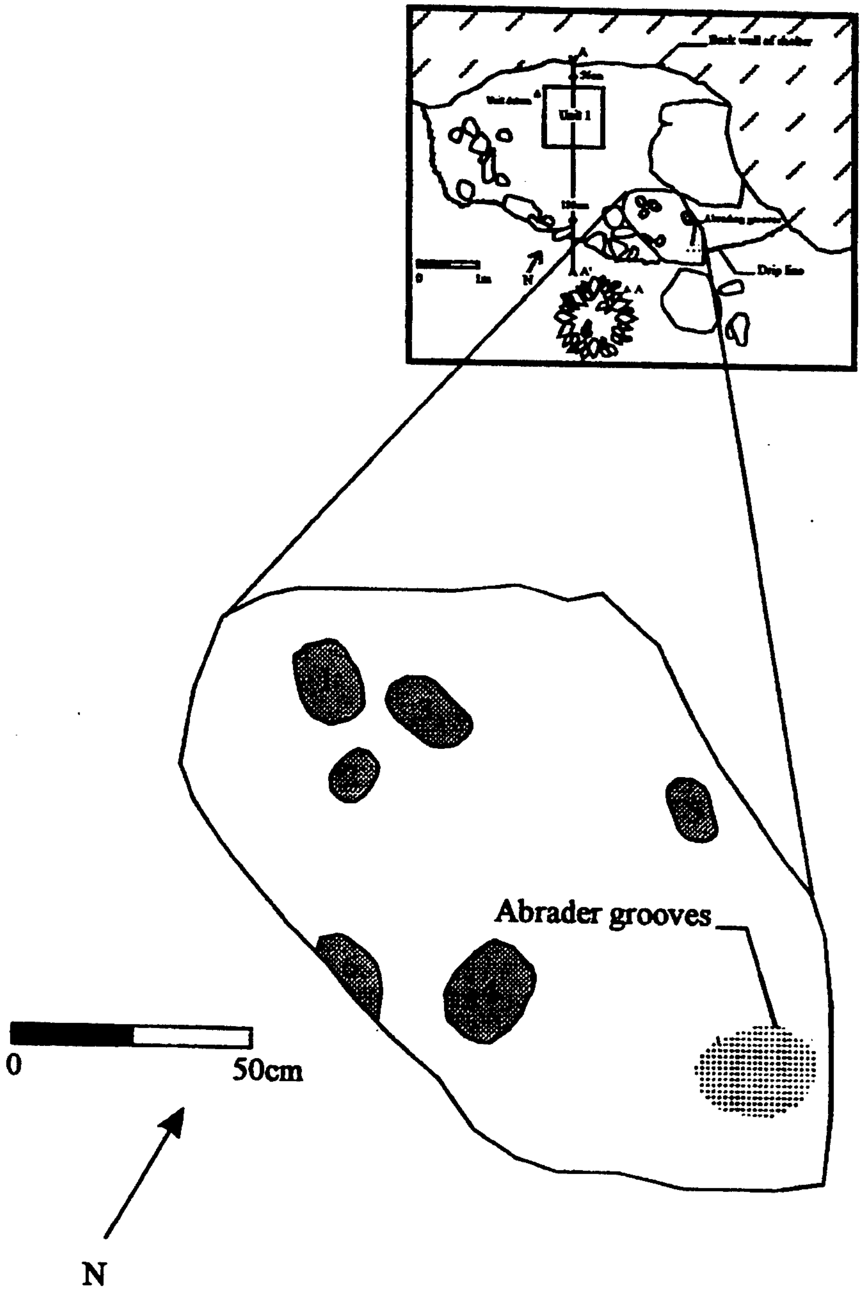


Figure 12: Site 5LA6568 Shelter 2, close-up of bedrock metates.

A single 1 x 1 m unit (Unit 1) was centrally placed in the shelter. Owing to the unexpectedly thick (perhaps over 2 m) deposits and a lack of time, bedrock was not reached in this unit. Excavations were carried out to a depth of 1.82 m below the present ground surface. Apparently, the narrow corridor of the upper part of the site acts as a catchment area for erosional deposits.

Depositional History of Unit 1

Three strata are identified for the unit (Figure 13, Table 4.3). The lowest stratum (Stratum 3) is composed of a yellowish brown (10YR 6/4) relatively hard packed silt with occasional rodent or small animal disturbances and is probably culturally sterile. The total depth of the deposit cannot be determined, but its recorded depth suggests a thickness of over 1.5 m. Only 6 pieces of chipped stone debitage were recovered from the bottom 12 levels. Apparently, these either fell in from the upper levels in the course of excavation or they represent intrusives from animal disturbances. The total lack of definitive artifacts from the water screened samples in Levels 6 to 17 also supports the idea that the lower excavated levels are culturally sterile. Furthermore, there is no vertebrate fauna in these lower levels. Although, the lower excavated levels appear to be culturally sterile, there is currently no way, short of more excavations, of determining the presence of human occupation below Level 17. This stratum appears to have formed through years of continuous soil deposition and the laying down of silts through pluvial processes. These levels form the foundation on which later human occupation occurred.

Table 4.3. List of Strata for 5LA6568 Unit 1.

Strata	Levels	Description
1	1-2	topsoil and mixed cultural debris
2	3-5	cultural debris associated with an occupational surface
3	6-17	culturally sterile soil

Stratum 2 represents the main occupational layers of the rockshelter. It is composed mainly of what appears to be an intact living or activity surface, which was uncovered at the bottom of Levels 3 and 4. The surface is actually the contact between Strata 1 and 2 and is the yellowish brown silt described above. The surface itself slopes down from south to north approximately 12 cm.

Four features are associated with this surface (Figures 10b and 14). Features 3 and 4 are somewhat small, shallow, circular depressions in the surface. Feature 3 is 22 cm in diameter and Feature 4 is 13 cm in diameter. Fill from these features was not recovered separately since they were only noticed after they had been fully excavated. These two features may have served as pot or basket rests.

Features 2 and 5 are thermal features, most likely hearths that were excavated into the surface at the bottom of Level 4. Feature 2 is located in the northeastern corner of the unit

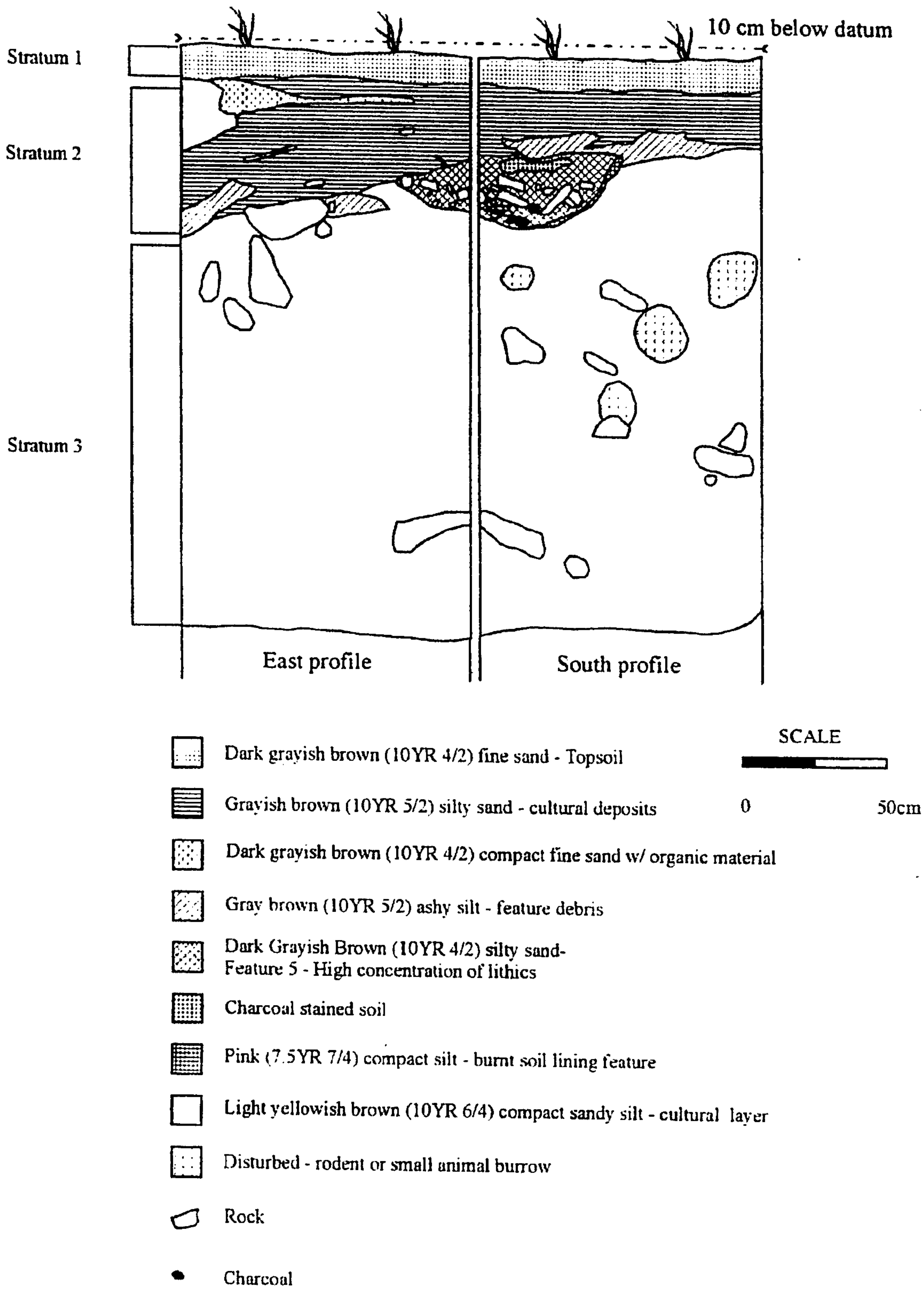


Figure 13: Site 5LA6568, Shelter 2, Unit 1 east and south wall profiles.

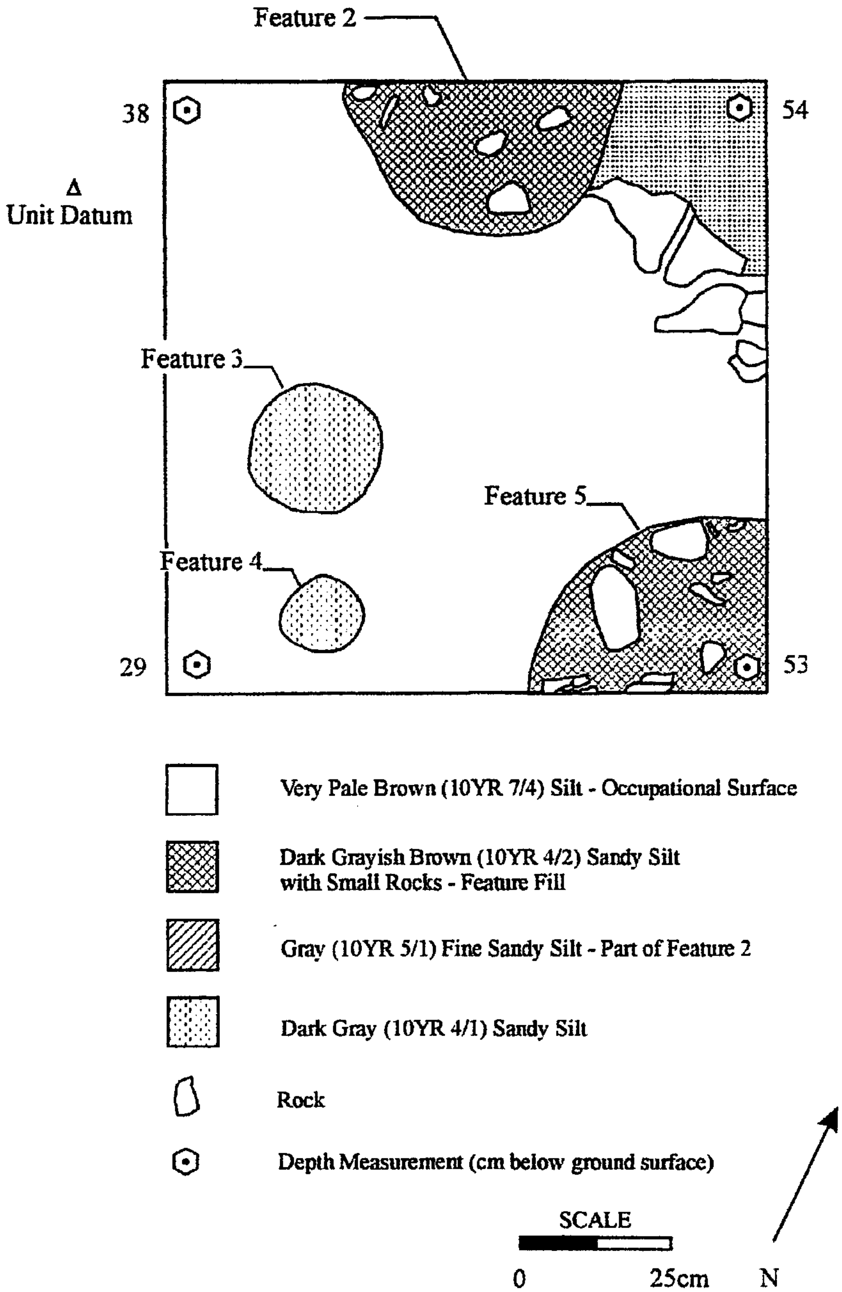


Figure 14: Site 5LA6568 Shelter 2, Unit 1 plan view of Level 5 showing Features 2-5.

(Figure 15a). Its entire dimension cannot be determined since it extends into the north and east walls of the unit, but the exposed area of the feature measures approximately 44 cm in diameter and it reaches a depth of approximately 16 cm. The feature fill was a dark grayish brown (10YR 4/2) silt with charcoal and thermally altered rocks. Approximately five flat, sandstone rocks were placed along the eastern side of the feature. Ashy gray deposits were located just above these rocks. This fill may have been deposited from the cleaning the feature, but it is more likely that this area served as a rest for items pulled from the feature.

Feature 5 is a well defined hearth located near the southeast corner of the unit (Figure 15b). Its dimensions cannot be determined since it likewise extends into the walls of the unit. The exposed portion of the feature measures 45 x 26 cm and it reaches a depth of nearly 20 cm. The feature fill was a dark grayish brown (10YR 4/2) silt with carbon and thermally altered rocks. At the bottom and edges of the feature, a thin pink (7.5YR 7/4) compact silt lens was encountered that was likely the result of the high temperatures from burning in the feature.

Above the occupational surface just discussed are three levels of cultural debris also included within Stratum 2. This soil is predominantly a gray brown (10YR 5/2) sandy silt and yielded a considerable number of artifacts. Feature 1 was identified in Level 3. This feature is somewhat large and amorphous, but mostly localized in the southeast corner of the unit. As with Feature 2 and 5, Feature 1's entire dimensions are not known owing to its extension into the walls of the unit. Its exposed dimension measures approximately 60 x 60 cm in diameter and it was excavated to a depth of approximately 7-8 cm. The feature was composed of a light gray (10YR 7/1) sandy silt with some charcoal. Feature 1 appears to have most likely been an ashy component associated with Feature 5.

Finally, Stratum 1 is the uppermost and most recently laid deposits. It is comprised of Levels 1 and 2 (0-20cm below ground surface) and the soil is a loosely packed fine sand. This stratum is disturbed from recent pedestrian traffic and animal activities.

Radiocarbon Dates

Two radiocarbon dates were run on samples from Unit 1. Both samples come from the levels associated with the occupational surface and its features. The first is a general sample collected from Level 4 which is the deposit that makes up the matrix of occupational surface discussed above. This sample yielded a date of 820 ± 80 B.P. (Beta-100202; wood charcoal; $^{13/12}C$ -24.1 $^{0}/_{00}$). The second comes from charcoal in the lower levels of Feature 5. This sample yielded a date of 800 ± 60 B.P. (Beta-100203; wood charcoal; $^{13/12}C$ -26.7 $^{0}/_{00}$). The probability distribution of these two samples is distinctly unimodal (Figure 16). The pooled mean of the two dates is A.D. 1170 and 75% of the distribution falls between A.D. 1050 and A.D. 1250, which gives a plausible range for the use of the occupational surface and its associated features.

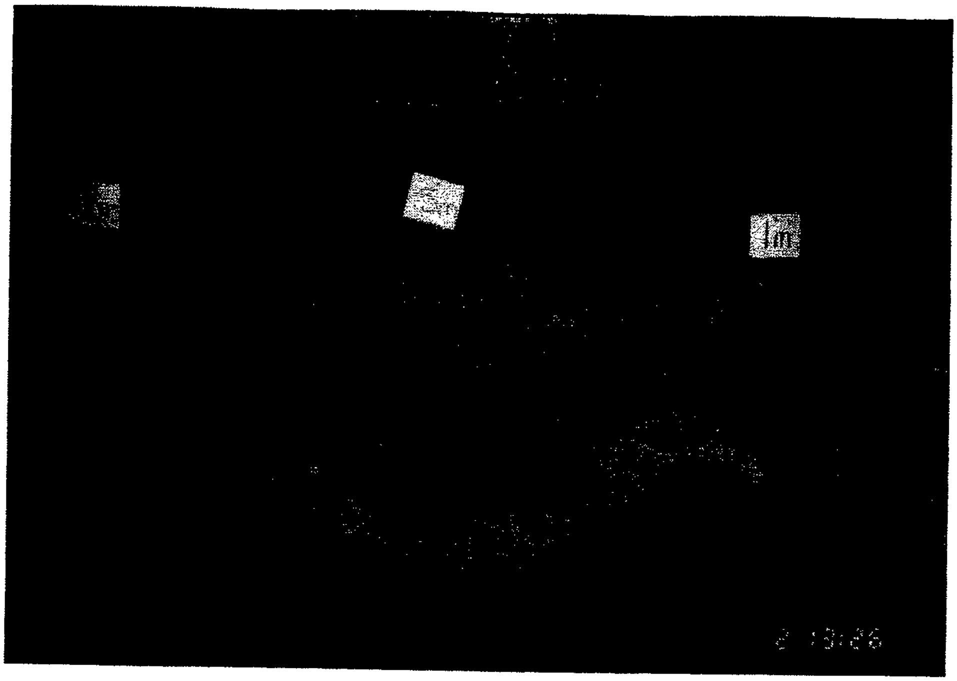


Figure 15a: Site 5LA6568, Feature 2, Unit 1, north wall.

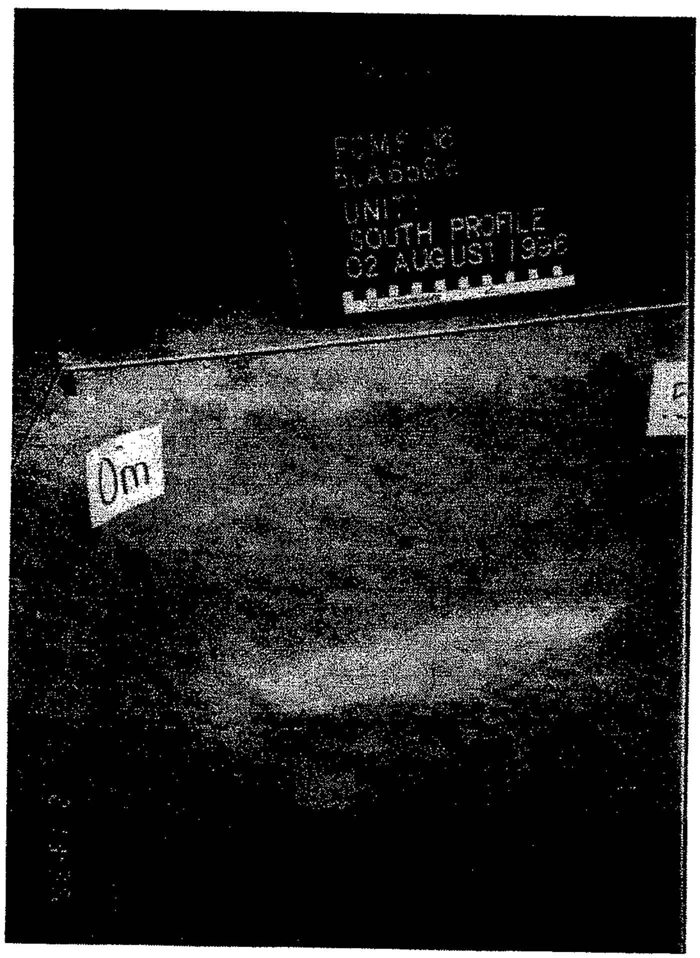


Figure 15b: Site 5LA6568, Feature 5, Unit 1 south wall.

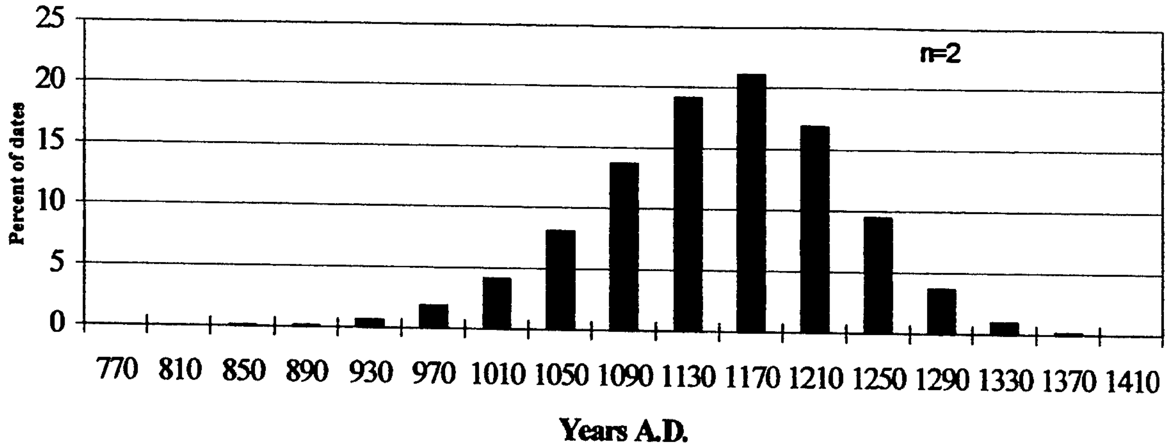


Figure 16: Site 5LA6568, probability distribution for radiocarbon dates from Unit 1.

Chipped Stone

Unit 1 produced greater quantities of artifacts than any other test unit excavated in the 1996 field season. A total of 528 pieces of chipped stone debitage was recovered from the 17 excavated levels. Five different raw material types were recovered from Unit 1 (Figure 17). Quartzite is the most common material (68.6%) followed by chert (30.1%). All the material types except for obsidian can be found locally in the PCMS area. Neither of the two pieces of obsidian from this unit was sourced, but it is likely that they come from the Jemez Mountains.

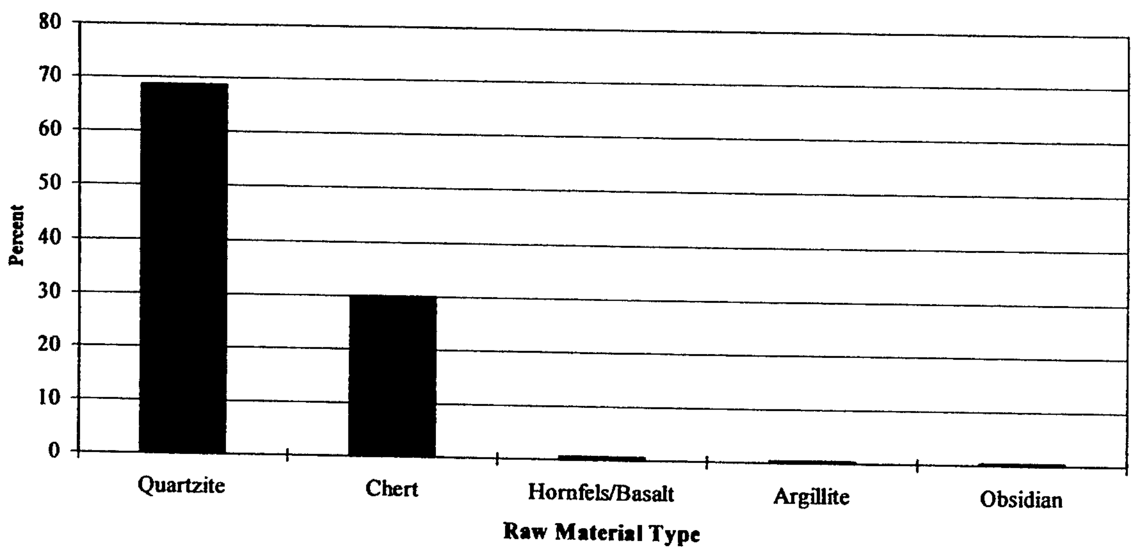


Figure 17: Raw material types for the chipped stone debitage from Unit 1 of 5LA6568.

Most of the chipped stone debitage (89.6%) comes from Stratum 2 (Levels 3-5) and is associated with the living surface and its features. Stratum 2 is composed of at least three different analytical units that include, Features 1 and 5, Feature 2, and non-feature contexts. Since Stratum 1 (Levels 1 and 2) is somewhat mixed and disturbed the chipped stone associated with those levels is not included in the following discussion. Analysis of the debitage from these contexts indicates that the lithic reduction strategies employed near feature and non-feature contexts did not differ significantly. This pattern may be the result of the rather close proximity of the two contexts and a generalized mixing of the chipped stone debitage across the different contexts. Examination of the small to large flake ratios does indicate that quartzite and chert received different reduction strategies. The small to large flake ratio of quartzite across all contexts in Stratum 2 is 4.2:1. This ratio indicates that freehand core reduction was likely responsible for much of the quartzite debitage observed at the site. However, the small to large flake ratio of chert debitage is 65.6:1 indicating the later stages of tool finishing/maintenance. Furthermore, there is a relatively high proportion of chert bifacial thinning flakes compared to the proportion of quartzite bifacial thinning flakes (Figure 18).

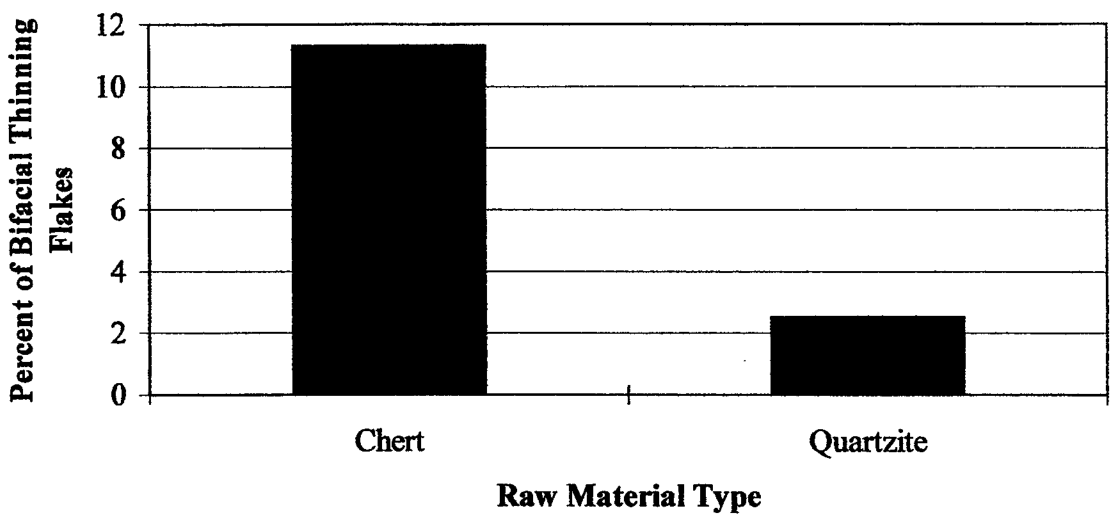


Figure 18: Bar chart of bifacial thinning flakes by material types from Unit 1 of 5LA6568.

One bifacially flaked projectile point fragment was excavated from Level 3 of Unit 1 (Figure 19a). Unfortunately, this specimen is broken with a transverse hinge fracture. What remains of the projectile point indicates that it was perhaps corner-notched and may have exceeded 3.5 cm in length and has a flat and elliptical cross section. The point is made from a honey brown colored chert. Based on the amount of chert debitage present at the shelter, it is quite likely that this projectile point was manufactured/finished at the site. Only one of the notches is well formed and has evidence for grinding. It is possible that the point was broken during manufacture - most likely when the second notch was attempted. Apportionment into one of Anderson's (1989) projectile point categories is difficult, however, its estimated length may indicate that it belongs to one of the large categories - perhaps P41 (Anderson 1989:160). These points have not been found in dated contexts in the PCMS. However similar points have been found outside the PCMS and these have dates ranging from approximately A.D. 600 to A.D. 1200.

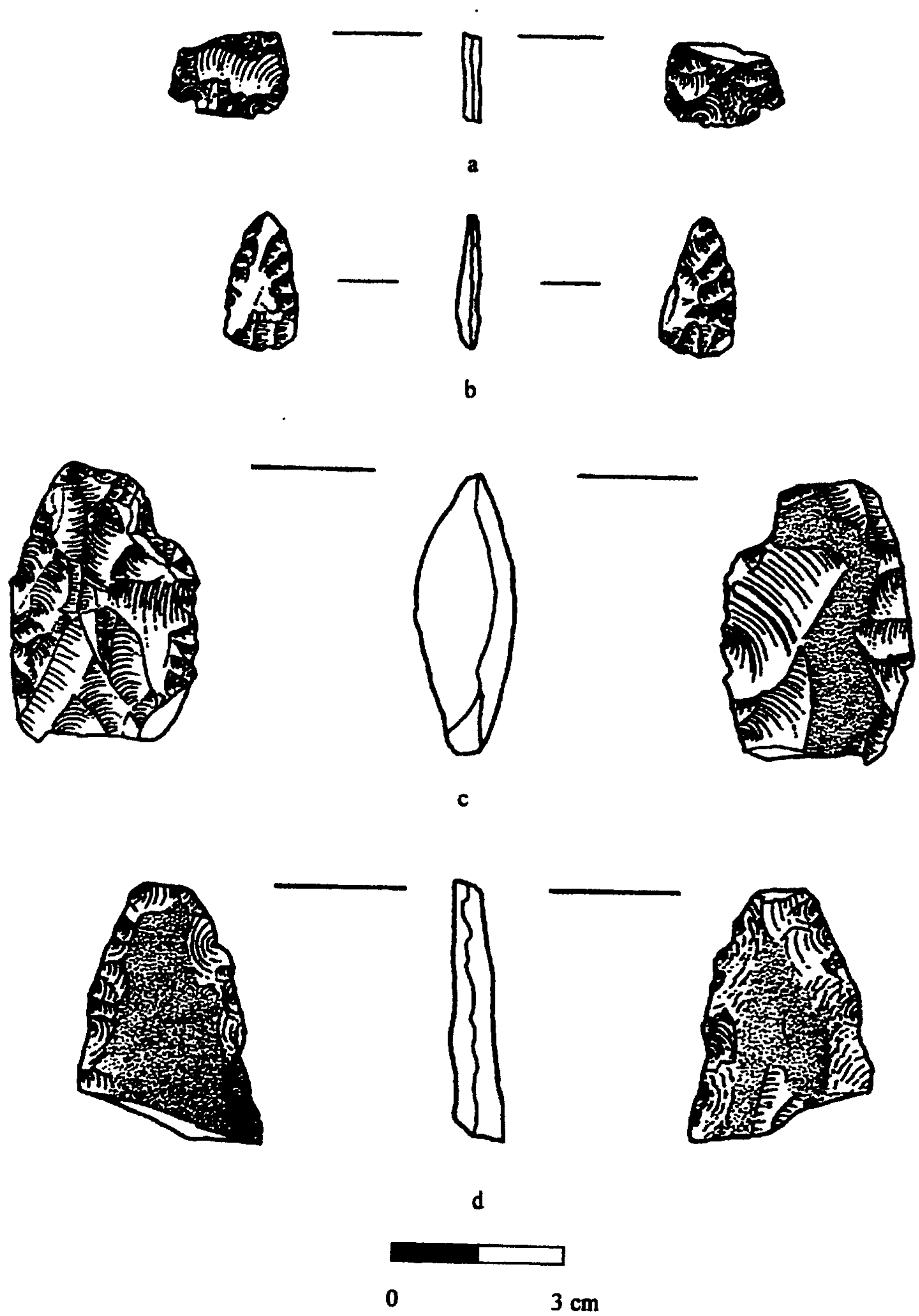


Figure 19: Bifacially flaked chipped stone tools from Unit 1 at 5LA6568.

Another projectile point was recovered from the surface during the 1995 reconnaissance of Welsh Canyon. It was located within Shelter 2 only a short distance from Unit 1. This biface is a complete, triangular point with a slightly convex base (Figure19b). The point is made of a yellowish brown quartzite and measures 2.4 x 1.3 cm and is 0.4 cm thick. The blade length is 2.1 cm with the left blade edge slightly convex and a straight left blade edge. The point's cross section is flat and elliptical and there is no evidence for basal grinding. This projectile point fits the criteria of size and form for Anderson's P49 category. According to Anderson (1989:173-174), there are no examples of this point type from dated contexts in the PCMS area. She does mention that some specimens of P49 type points in other areas of Southeastern Colorado range in date from A.D. 1070 to A.D. 1360. More recently, a P49 type projectile point is illustrated by Loendorf et al. (1996:179; Figure 6.11d). They suggest that a regional comparison with other P49 type points indicates that they date to between A.D. 800 and A.D. 1750.

Two additional bifacially chipped tools were recovered from Unit 1. One of these is a relatively thick (1.8 cm), light gray quartzite tool from Level 4 (Figure 19c). This specimen weighs 28.5 g and measures 4.9 x 3.3 cm. It has a snap fracture towards its distal end and a transverse crack emanating from the fracture. No use wear is evident, but the right edge is somewhat serrated. The second bifacial fragment comes from Level 14, but likely fell in from above while cleaning the walls of the unit. This artifact is made from a coarse gray quartzite and it has some cortex on the dorsal side. The artifact measures 4.8 x 3.1 cm and is 1.0 cm thick (Figure 19d). Both lateral edges are bifacially worked and both ends have snap fractures. The specimen may be a large projectile point with a double-beveled cross section. However, if this were the case, then it would be outside the range of variability for projectile point size presented by Anderson (1989).

Five unifacial tools were recovered from Unit 1. The first is a relatively small, (2.5 cm in diameter) retouched/utilized flake made from gray quartzite (Figure 20a). It comes from Level 3 and may be an unfinished scraper, but there is no distinct shaping of the tool. The second retouched/utilized flake was recovered when cleaning the walls of the unit for photographs. It is made from a rather large quartzite flake (8.8 x 5.5 cm and 2.2 cm thick) weighing 89.8 g (Figure 20b). About 75% of the dorsal side is covered with cortex and before it was retouched it was likely a primary flake. The tool has three flakes removed from the dorsal side. The ventral side has one flake removed, but this appears to occurred relatively recently. A thick deposit of calcite can be seen on the distal end of the tool. A third retouched/utilized flake comes from Level 4 of Unit 1 and is made from a yellowish brown fine chert (Figure 20c). The tool measures 3.9 x 2.1 cm and is 0.8 cm thick with a weight of 5.6 g. Use wear is evident along nearly the entire length of the ventral side. On the dorsal side of the tool, there is a rather pronounced negative flake scar across the center. One of the lateral edges and the proximal end of the dorsal side are retouched with pressure flaking. The fourth unifacial tool is made from a basalt flake and came from Level 5 of Unit

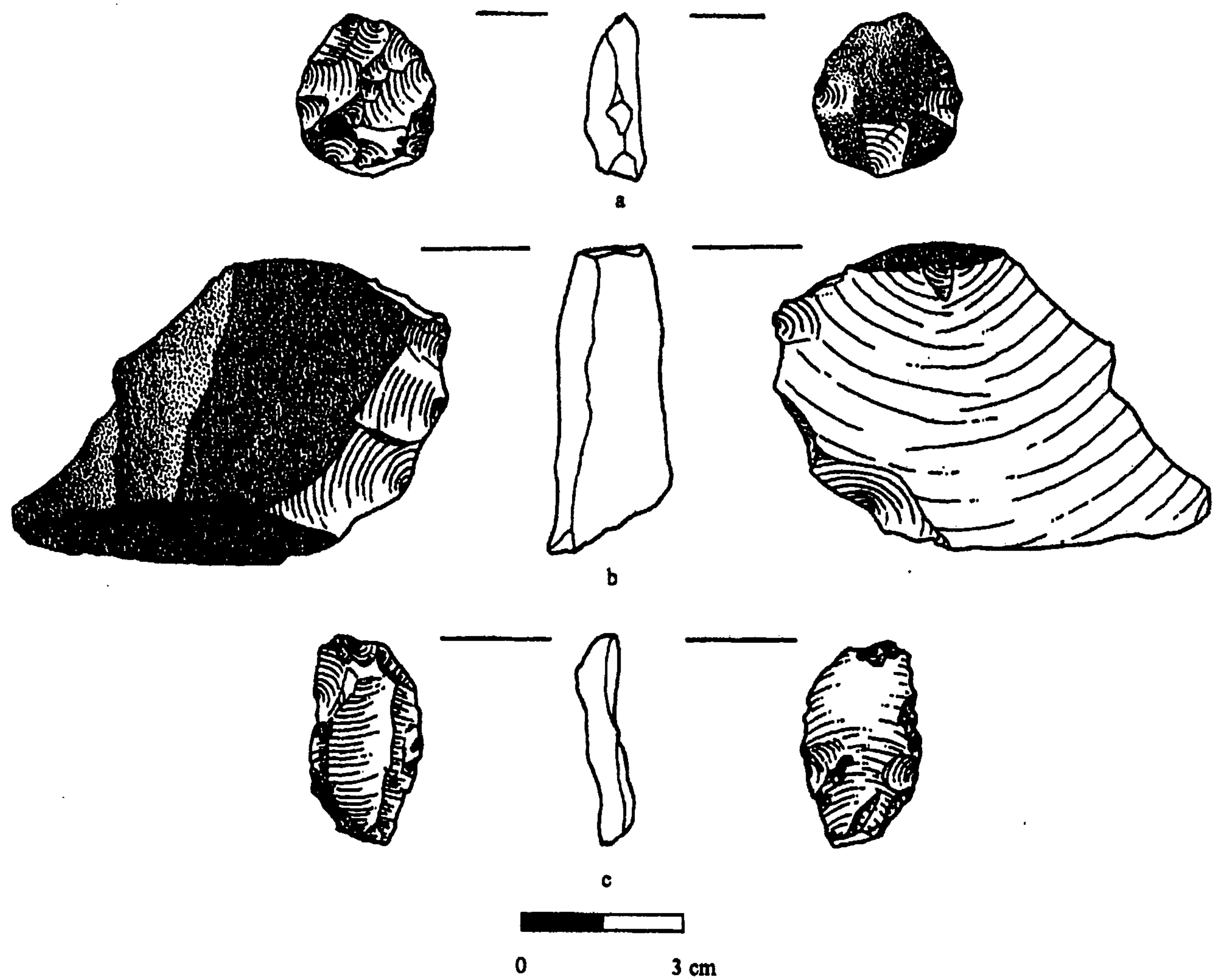


Figure 20: Unifacially retouched/utilized chipped stone tools from Unit 1 of 5LA6568.

1. It measures 5.3 x 3.4 cm with a thickness of 1.4 cm. The specimen weighs 19.8 g and it is retouched or utilized along the left hand margin of the dorsal side which gives it a nibbled appearance (Figure 21). The fifth unifacially worked tool is a retouched/utilized flake made from basalt. It measures 5.2 x 3.4 cm and is 1.4 cm thick. The tool weighs 19.9 g and the piece appears to have three or four flakes removed form the dorsal side, this may have occurred when the flake was initially struck from the core.

Ground Stone

Unit 1 yielded two specimens of ground stone. One of these comes from Level 3 of Feature 1 and is a small, quartzite mano fragment that weighs 33.6 g (Figure 22a). Owing to the fragmentary nature of the specimen, it is difficult to determine if it was a one- or two-hand mano. Although the absence of two-handed manos in the region suggests it was the commonly found one hand type. The fragment measures 6 x 4.4 cm and is 1.5 cm thick and shows no indications of burning. The remaining portion of the grinding surface is approximately 4.3 x 3 cm. The striations are somewhat difficult to discern owing to the coarseness of the raw material, but they seem to be oriented along the width of the mano.

The second piece of ground stone from Unit 1 was found while cleaning the walls of the unit and, therefore, its precise provenience is difficult to determine. This specimen appears to be a complete, one hand mano made from sandstone (Figure 22b). It weighs 235.4 g and the entire piece is 7.6 x 6.0 cm and 3.8 cm thick. The mano has a single, oval grinding surface that measures 6.9 x 5.4 cm and has evidence of burning at the proximal (slightly wider) end. Striations are multidirectional; they are oriented along both the length and width of the mano. The presence of pitting around the perimeter of the grinding surface may indicate that the mano was used for a combination of pounding and grinding.

Shell

Two shell samples were recovered from Unit 1 (Appendix 3). One of these was in poor shape and fragmented into several pieces. One of the larger fragments of this sample showed evidence of grinding along the edge and is thought to be part of a pendant. The second sample is a small fragment (1.2 x 0.9 cm) that appears to have been a pendant that broke in the process of manufacture. Both the shell specimens are local freshwater mollusks and, even though the sample is small, indicate that shell pendent manufacture took place at the site.

Vertebrate Fauna

The vertebrate fauna of Unit 1 is relatively extensive. This unit yielded 1401 pieces of bone, which is more bone than any other unit tested in the 1996 field season. Of the 1401 pieces of bone, 1124 came from dry screening and 277 came from wet screening. Most of the bone recovered from Unit 1 (77.7%) comes from Levels 3-5 and the associated features.

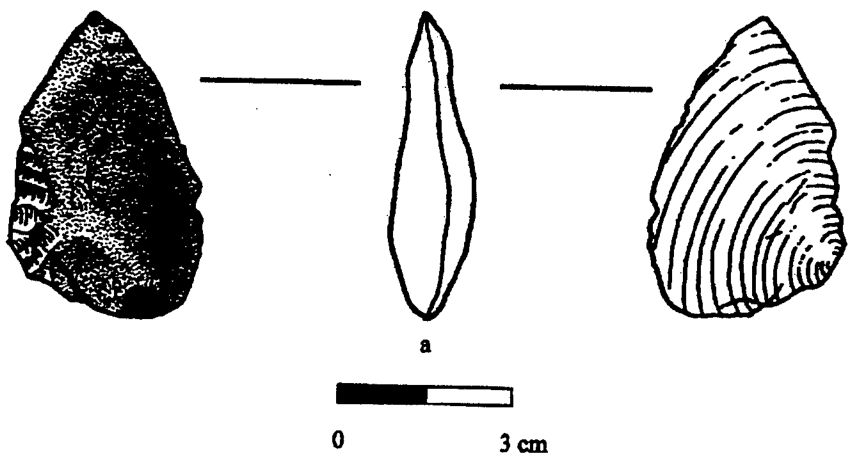


Figure 21: Unifacially retouched/utilized tool from Unit 1, Level 5 at Site 5LA6568.

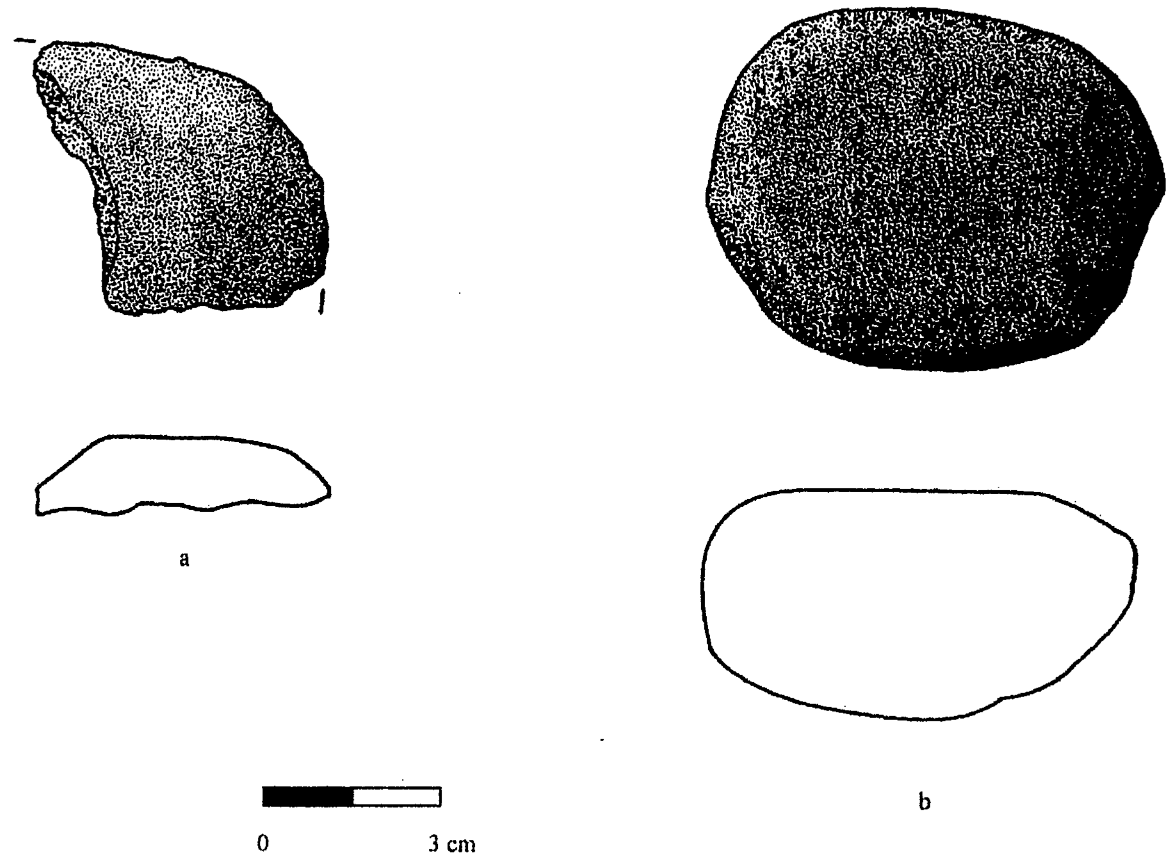


Figure 22: Ground stone from Unit 1 at 5LA6568.

Levels 1 and 2 of Unit 1 both contain highly mixed faunal assemblages, probably as a result of their disturbance by rodents as well as foot traffic. These levels contained four genera of rodents, ranging in size from the prairie dog (*Cynomys* sp.) to the tiny white-footed mouse (*Peromyscus* sp.). The only instance of *Pappogeomys castanops* (Yellow-faced pocket gopher) in the entire assemblage occured in Unit 1, Level 2. This species is the only member of the genus *Pappogeomys* to occur north of Mexico. A dietary generalist (Hollander 1990:9), *P. castanops* prefers grassland habitats. *Neotoma* sp. (woodrat) was also identified in Level 1. The four molars identified as *Neotoma* sp. most likely belonged to the same individual. The uniform and extensive dental attrition evident on the molars (the enamel was worn to the gumline) indicates a single, older adult.

Levels 1 and 2 contain numerous cottontail rabbits (*Sylvilagus* sp.). Level 1 also has one of the three occurrences of the horned lark (*Eremophila alpestris*) encountered in these excavations. *E. alpestris* is a relatively abundant species in this region today, preferring areas of low plant density where there is abundant exposed soil (Andrews and Righter 1992:230).

Levels 3 through 5 in Unit 1 are part of an occupational surface that contains thermal features. These levels likely date to the Middle Ceramic Stage (A.D. 800/1000 to A.D. 1500). *Sylvilagus* sp. is the most numerous identified genus across all of the occupation levels, however jackrabbit (*Lepus* sp.), prairie dog (*Cynomys* sp.), and woodrat (*Neotoma* sp.) are present as well. Excluding materials recovered from feature contexts, cottontail or jackrabbit remains comprise 4.8% of the vertebrate faunal materials in Levels 3 through 5. Interestingly, bovid, artiodactyl or medium to large mammal remains are noted in all three occupation levels (including features). Only four specimens of the 25 identified as being medium to large mammal, artiodactyl or bovid display evidence of burning; three of the burned large mammal remains are associated with Level 3 of Feature 1.

Overall, Feature 1 yielded abundant burned vertebrate remains. A relatively high percentage of the bones recovered from this feature has indications of burning. In addition to the three burned large mammal specimens, cottontail (3.0% of the faunal assemblage of Feature 1), woodrat, prairie dog, and otherwise unidentified small mammal remains have evidence of burning. Evidence of burned woodrat (*Neotoma* sp.) is especially interesting. While it is quite possible that *Neotoma* sp. was eaten prehistorically (Szuter 1991:Chapter 5), evidence for consumption has been sparse in the archaeological record. There is abundant ethnographic evidence for the consumption of rodents, however rodent bones rarely, if ever, display cut or chop marks.

Even if rodents such as *Neotoma* were being consumed, they may be cooked in such a way as to avoid evidence of human use. For example, whole rodents may be used as part of a stew, in which case there would be little or no evidence of de-boning. Ethnographic accounts indicate that small mammals and birds were often cooked by placing the animal in the hearth and covering it with ashes and coals. In this case, the flesh and skin would protect skeletal elements from burning, with the exception of peripheral elements such as incisors, metapodials, carpi, tarsi, phalanges and caudal vertebrae (Morlan 1994:139; Szuter 1991:167). This interpretation contrasts with that of Rhodes (1984:121), who has reported on one of the few complete archaeological investigations in southeastern Colorado, and states that the lack of burn damage on woodrat remains "[indicates] that these specimens probably were residents of the shelter or the vicinity and the one burned bone represents an accidental occurrence."

Woodrat (*Neotoma* sp.) was identified at 44% (14 out of 32) of the sites yielding vertebrate fauna studied by Andrefsky et al. (1990), and at six out of seven sites analyzed for this study. Whether rodent remains such as woodrat are intrusive or cultural must be determined on the basis of context, in addition to evidence of modification.

Feature 5, a hearth like Feature 1, yielded minimal faunal remains. Only 30 specimens were recovered, and while the majority is burned, no identifications to family, genus or species could be made. But, it is important to note that Feature 5 may be the same context as Feature 1.

Feature 2, the pit-like thermal feature in Level 6, yielded only two genus-level identifications: *Sylvilagus* sp. and *Cynomys* sp. One burned cottontail maxilla is identified; all other burned materials are either small mammals or unidentified. Cottontail comprises 3.4% of the total faunal assemblage of Feature 2.

In summary, these three thermal features display abundant evidence of burned vertebrate fauna, as expected. While Feature 1 contains a greater diversity of faunal taxa, the fauna of both Features 1 (3.0%) and 2 (3.4%) is dominated by cottontail. These percentages are slightly lower than the percentage of leporids (4.8%) from non-feature contexts in Levels 3, 4 and 5, although not significantly so. While medium to large mammals are identified within the feature contexts, such animals occur much more commonly without a feature association. In Levels 3 through 5, 5.6% of the total non-feature assemblage is composed of medium to large mammals, artiodactyls or bovids. The assemblages of Features 1 and 2 yield only 1.2% of such mammals. The occurrence of larger mammals outside of feature contexts in Unit 1 is statistically significant, as demonstrated by the following table. As discussed above, medium to large mammal remains display minimal evidence of burning.

The results of the chi-square test indicate that the number of medium to large mammals, artiodactyls and bovids occurring in non-feature contexts relative to feature contexts is much higher than expected; conversely, fewer large mammals than expected were recovered from feature contexts. These counts could be a function of differential preservation within features relative to the surrounding non-feature contexts. For example, fewer small mammal bones could be recovered from non-feature contexts, thereby artificially inflating the count of medium to large mammal bones.

Another possibility is that human behaviors near the features were different from those in the surrounding areas. For example, small animal bones may have been deposited into the hearth area, while the remains of larger mammals were deposited beyond the hearth, and so were recovered in non-feature contexts. Unfortunately, the lack of clear evidence for human use or modification of the larger mammal elements makes this supposition merely speculative. Cut or chop marks on the larger mammal remains would support the argument that differential deposition of these elements was due to human factors as opposed to taphonomic ones.

Table 4.4. Occurrence of Medium to Large Mammals Inside and Outside Feature Contexts.

	FEATURE CONTEXTS (Features 1 and 2)	NON-FEATURE CONTEXTS (Levels 3-5)
medium to large mammals, Artiodactyls and Bovids	Observed = 6 Expected = 19 Adj. Residuals = -3.96*	Observed = 38 Expected = 25 Adj. Residuals = 3.96*
Total Count (excluding medium to large mammals, Artiodactyls and Bovids)	Observed = 509 Expected = 496 Adj. Residuals = 3.96*	Observed = 655 Expected = 668 Adj. Residuals = -3.96*

* significant at the .001 level

$X^2 = 14.5$
$p < .001$

[Adjusted residuals are read as standard normal deviates; that is, values greater than 3.30 or less than -3.30 are significant at the .001 level. A negative adjusted residual value indicates that the observed value is less than expected, while a positive adjusted residual indicates that the observed is greater than expected.]

Only four faunal specimens were recovered from contexts deeper than Level 6. These specimens are unidentified except for a single cottontail tooth. In terms of fauna, there is no evidence for cultural activity below Level 6.

Unit 1 of 5LA6568 also yielded 6 specimens of artifactual bone (Figure 23). Five of the six are bone tubes or beads. Two of these five have been identified to genus (*Lepus* sp. and *Sylvilagus* sp.). The specimen coming from *Lepus* sp. (Figure 23b) (Unit 1, Level 2) is relatively long (1.19 cm) and is split. The shaft is polished and displays several cut marks. The ends are rounded and polished. Another piece of artifactual bone (Unit 1, Level 4) is a 'scraper' made from an indeterminate element of a large mammal (Figure 23e). This tool was shaped at the end and exhibits evidence of use wear.

Both of the bone tubes identified to genus were made from leporid tibiae. Given the similar size and radial dimensions of the other bone tubes from 5LA6568, they too may have been made from the tibiae of either cottontail or jackrabbit. However, no osteological features were present enabling a genus or element identification to be made. Andrefsky et al. (1990) have reported on several pieces of artifactual bone that are clearly within the same bone-working tradition as that observed in this assemblage. Even when a genus and element identification is not possible, they report that beads are made from the "mid-shaft of a small

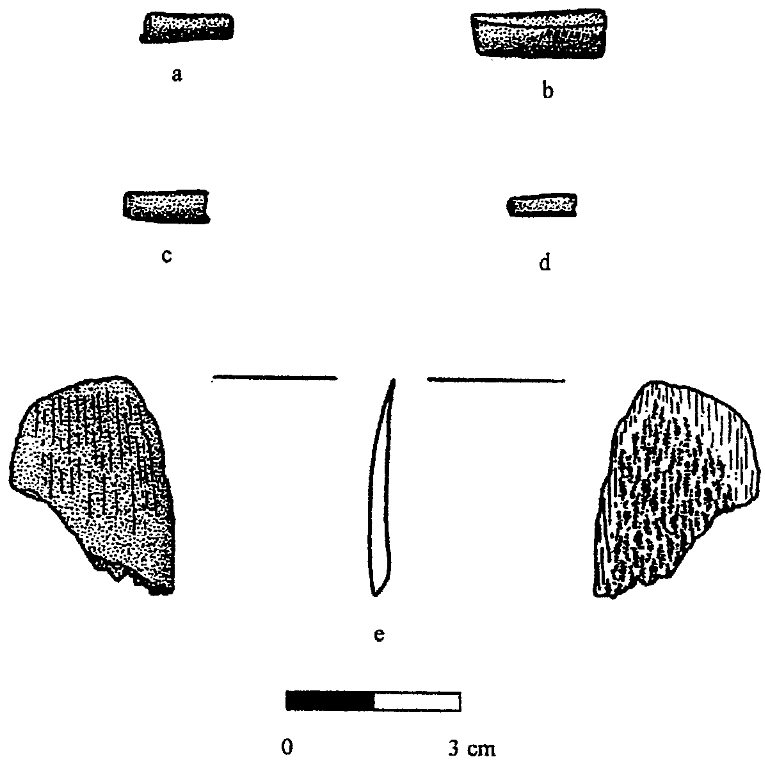


Figure 23: Artifactual bone from Unit 1 at 5LA6568.

mammal bone which has been cut on both ends. The surface and both ends of the artifact exhibit polish" (Andrefsky et al. 1990:145). This is exactly the kind of bone artifact patterning exhibited at the sites excavated in 1996. Andrefsky et al. (1990) identify several instances in which a genus and/or element identification is possible. In the majority of these cases, the genus is leporid and the element employed is the tibia (e.g., Andrefsky et al. 1990:294, 296, 532, 764, 912).

Shelter 3

The opening of Shelter 3 measures approximately 2.5 m and the maximum distance from the back of the shelter to the drip line measures 2.0 m (See Figure 10a). The shelter ceiling is approximately 0.98 m above the shelter floor at its highest point (Figure 24). A group of rocks closes off the western side of the rockshelter Shelter 3. These rocks may be part of a semicircular enclosing wall that extends out nearly 2 m from the cliff edge toward the center of the rockshelter opening. A few scattered rocks may continue across the front of the rockshelter and may be part of this enclosing wall. No bedrock metates, abrader grooves, or rock art has been found associated with this shelter.

A single 1 x 1 m unit (Unit 3) was placed adjacent to the enclosing wall. As was the case with Unit 1, Unit 3 was not excavated to bedrock owing to a lack of time and its unexpectedly thick deposits. Excavations were carried out to a depth of 1.86 m below ground surface. Unlike Unit 1, Unit 3 yielded artifacts even in the lowest excavated levels and culturally sterile soil was not reached although the number of artifacts decreased in the lower levels.

Depositional History of Unit 3

Unit 3 can be divided into four general strata (Figure 25, Table 4.5). Stratum 4 is the lowest of the excavated deposits of Unit 3 (Figure 26). It is composed of a brown (10YR 5/3) compact sandy silt with a few small rocks scattered throughout the deposit. Carbon was present, but is very dispersed and in fairly small amounts. Several carbon samples were taken from these lower levels, but few samples yielded more than 2.0 g of usable carbon.

Table 4.5. List of Strata for 5LA6568 Unit 3.

Strata	Levels	Description
1	1	topsoil and mixed cultural debris
2	2-3	cultural deposit
3	4-9	cultural deposit
4	10-17	cultural deposit

The interface between Strata 3 and 4 separates the lower deposits from the upper. Stratum 3 is composed of a very pale brown (10YR 7/3) compact silt. There is some evidence for small animal or rodent disturbance in this stratum and cultural material is present,

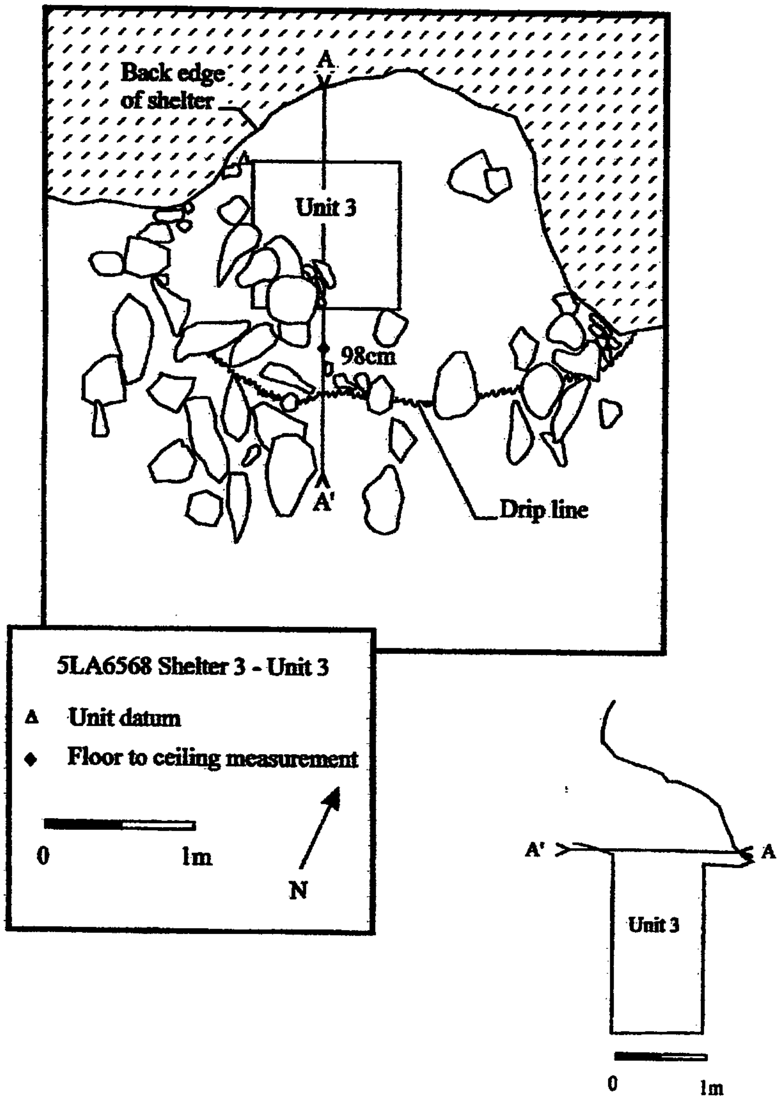


Figure 24: Site 5LA6568, Shelter 3, Unit 3 plan view.

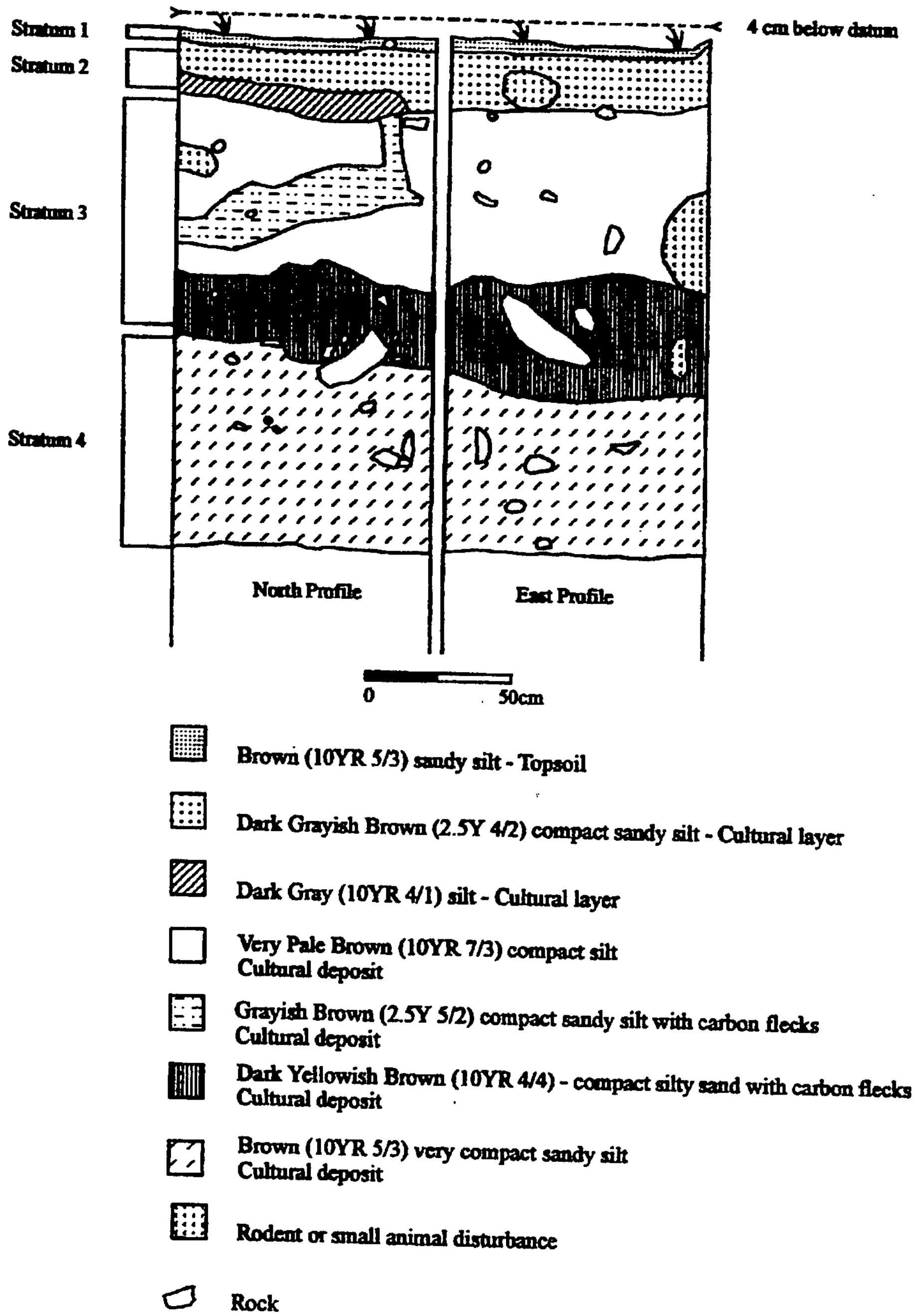


Figure 25: Site 5LA6568, Shelter 3, Unit 3 north and east wall profiles.

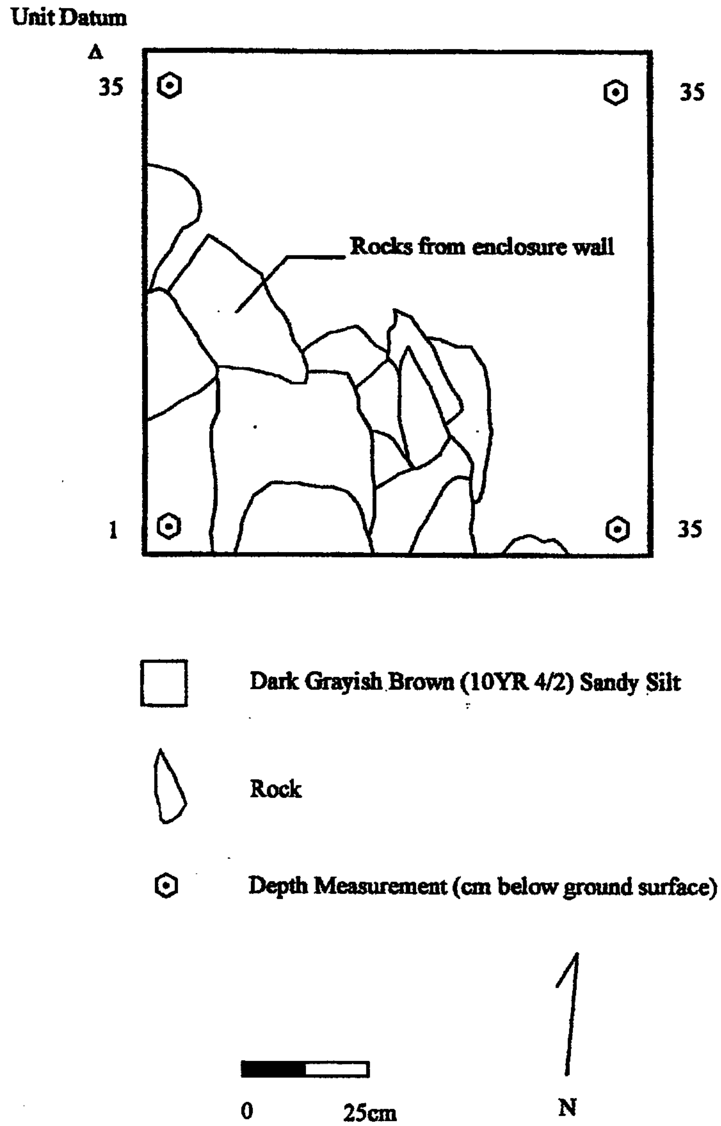


Figure 26: Site 5LA6568, Shelter 3, Unit 3 plan view of Level 4.

but in moderate amounts. An irregularly shaped lens of grayish brown (2.5Y 5/2) sandy silt with carbon flecks can be seen in the north profile.

Stratum 2 contains the most cultural materials from the unit and likely represent the most intensive period of occupation. Stratum 2 deposits are characterized as dark grayish brown (2.5Y 4/2) compact sandy silt. This deposit has the same general characteristics as Stratum 2 of Unit 1, however, no occupational surface or features were uncovered. A lens of dark gray (10YR 4/1) silt appears in the north profile and there is also evidence of some animal disturbance.

Finally, Stratum 1 is the uppermost and most recently laid deposits. It is comprised of Level 1 (0-10cm below ground surface) and the soil is a brown (10YR 5/3) sandy silt. This stratum is disturbed and mixed from recent pedestrian traffic and animal activities.

Radiocarbon Dates

Three radiocarbon dates were run on carbon samples from Unit 3. A date of 1170 ± 130 B.P. (Beta-102657; wood charcoal; $^{13/12}C$ -22.5 $^0/_{00}$) comes from a general carbon sample in Level 2. The second date is 1050 ± 80 B.P. (Beta-102656; wood charcoal; $^{13/12}C$ -23.1 $^0/_{00}$) which comes from a point provenienced carbon sample in Level 3. These two samples should adequately date the upper layers of Unit 1. The third date comes from a small general sample from Level 15. The sample was too small to receive a standard radiometric determination so it was analyzed by accelerated mass spectrometry (AMS). The date is 1910 ± 60 B.P. (Beta-102658; wood charcoal; $^{13/12}C$ -26.1 $^0/_{00}$). Unfortunately, there are no other supporting dates from the lower levels. Figure 27 illustrates the probability distribution for the radiocarbon dates from Unit 3. This distribution clearly indicates at least two occupational episodes for Shelter 3. The early episode dates to between approximately A.D. 55 and A.D. 160. The more recent occupation most likely dates to between approximately A.D. 750 and A.D. 970.

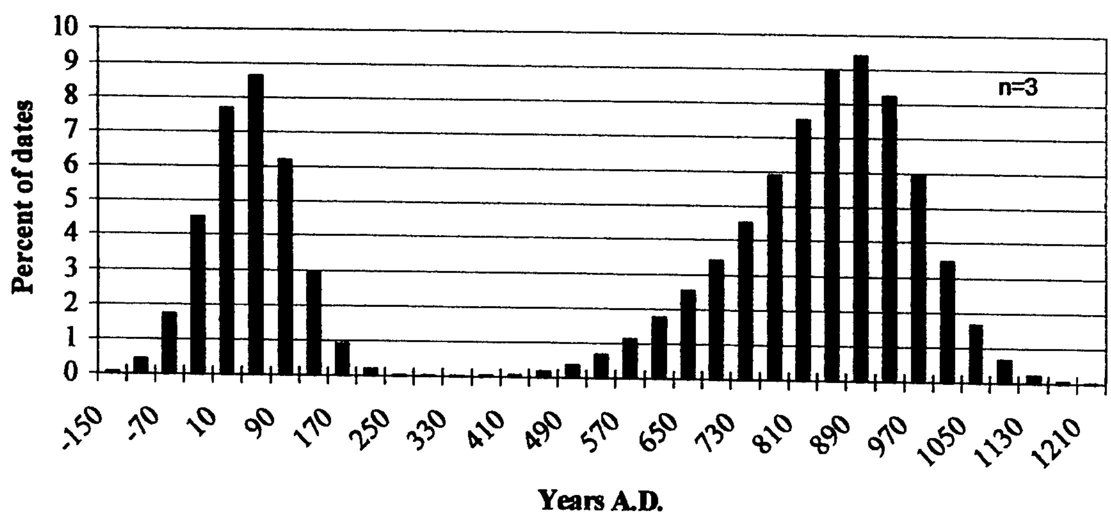


Figure 27: Site 5LA6568, probability distribution for radiocarbon dates from Unit 3.

Chipped Stone

A total of 76 pieces of chipped stone debitage was recovered from Unit 3. Only four different raw material types were recovered from the unit (Figure 28). Quartzite is by far the most common material (73.7%) followed by chert (19.7%), argillite (4.0%), and hornfels/basalt (2.6%). No obsidian was recovered from Unit 3 and it appears as though all the raw materials found in the unit were locally available.

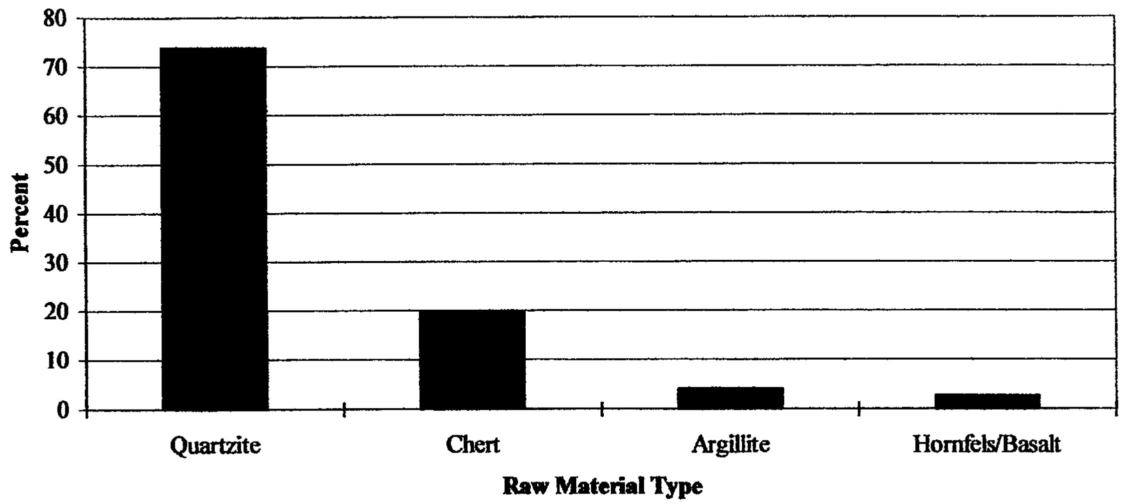


Figure 28: Raw material types for the chipped stone debitage from Unit 3 at 5LA6568.

Chipped stone debitage was found mainly in the top six levels of Unit 3 (Figure 29). The majority of the debitage is simple flakes (68.4) followed by complex flakes (21.1%),

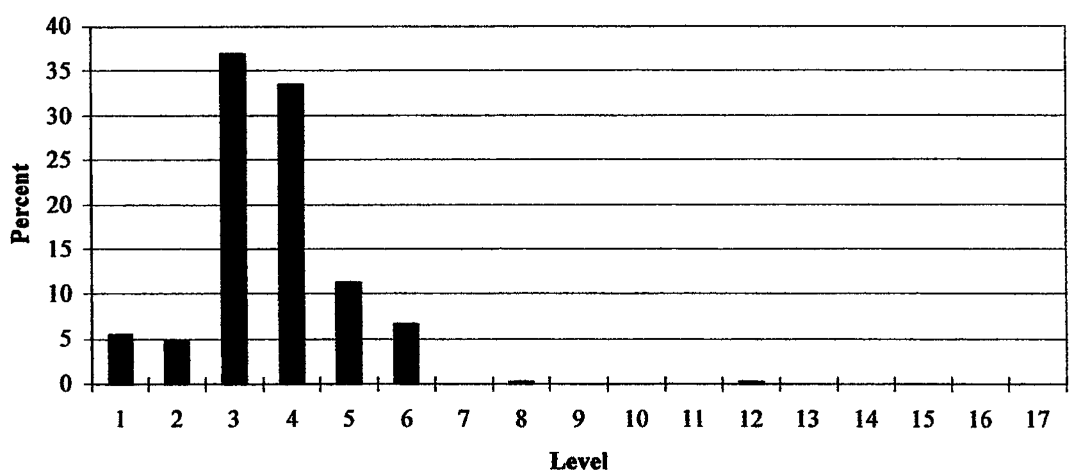


Figure 29: Percent of chipped stone debitage by level from Unit 3 at 5LA6568.

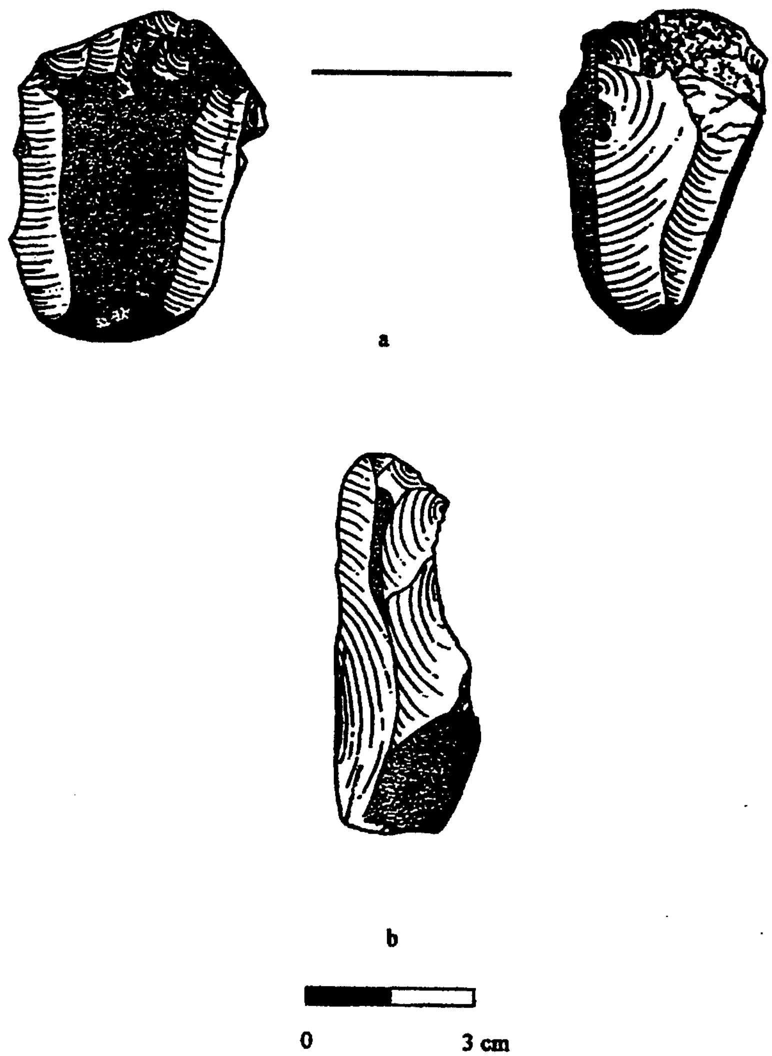


Figure 30: Cores from Unit 3 at 5LA6568.

shatter (9.2%), and bifacial thinning flakes (1.3%). There are some interesting differences between the artifacts from the upper levels and those from the lower levels that may indicate functionally different uses of the rockshelter through time. Unfortunately, there were only 13 pieces of chipped stone debitage recovered from Levels 10-17. However, 69.2% of the chipped stone debitage in these levels are cortical flakes and only 30.7% are non-cortical. In the upper eight levels, 74.1% are non-cortical flakes while only 25.9% have cortex.

One cobble core and another possibly broken or spent core were recovered from the lower levels. The first core comes from Level 15 and is made of fine grained hornfels/basalt (Figure 30a). It has six flake scars on its lateral and distal margins. It measures 6.0 x 4.2 cm and weighs 108.6 g. The second specimen is made from coarse gray quartzite, measures 6.5 x 2.6 cm, is 1.9 cm thick, and weighs 29.5 g (Figure 30b). Cores were not found in the upper levels.

Three bifacially flaked tools were also recovered from these upper levels. The first comes from Level 1 and is a relatively thick (0.9 cm) specimen made from a light blue-gray chert (Figure 31a). It is oval and measures 3.1 x 2.1 cm and weighs 5.8 g. The specimen is broken along the right margin of the distal end. The tool may have been a preform for a projectile point, but owing to imperfection in the raw material along the margin it may have been abandoned during production. There is some use wear along at the proximal end, but retouching produced a very fractured edge making the identification of use wear difficult. A second biface comes from Level 4 and is made from a quartzite flake (Figure 31b). It is a rather small piece (1.5 x 1.0 cm and 0.5 cm thick) and broken. The specimen weighs 0.8 g and it is bifacially worked along its intact margins. The proximal end shows evidence of a snap fracture. It is likely that this biface may be the remnant stem base of a projectile point broken in production. Owing to its fragmentary nature, classification into one of Anderson's (1989) projectile point classes is tenuous. A third biface is made from argillite. It comes from Level 7 and measures 2 x 1.0 cm and is 0.5 cm thick. The specimen weighs 1.3 g seems to be an expediently made, multipurpose tool. According to Ahler (in Loendorf et al. 1996:90), "these tools are relatively small and unpatterned in form, having an irregular morphology with bifacially flaking or trimming around only a part of the artifact."

The final tool from Unit 3 is a unifacially retouched side and end scraper from Level 9 (Figure 31c). This tool is made from maroon quartzite, measures 4.1 x 3.7 cm and is 1.8 cm thick. The specimen is retouched on the dorsal side along each of the margins. The proximal end of the scraper is rather steep relative to the sides and it appears that both sides and the distal ends were utilized.

Core reduction appears to have been relatively important in the lower levels given the presence of cores, the high relative proportion of cortical to non cortical flakes, and the low small to large flake ratio (0:11) of the quartzite debitage. However, the chipped stone from the upper levels is somewhat difficult to interpret. Early to later stages of tool production are indicated by the relatively high frequencies of bifaces and retouched/utilized flakes and non-cortical flakes. However, freehand core reduction is indicated from the low small to large flake ratio from the upper level (1.1:1). This evidence may suggest that a somewhat mixed

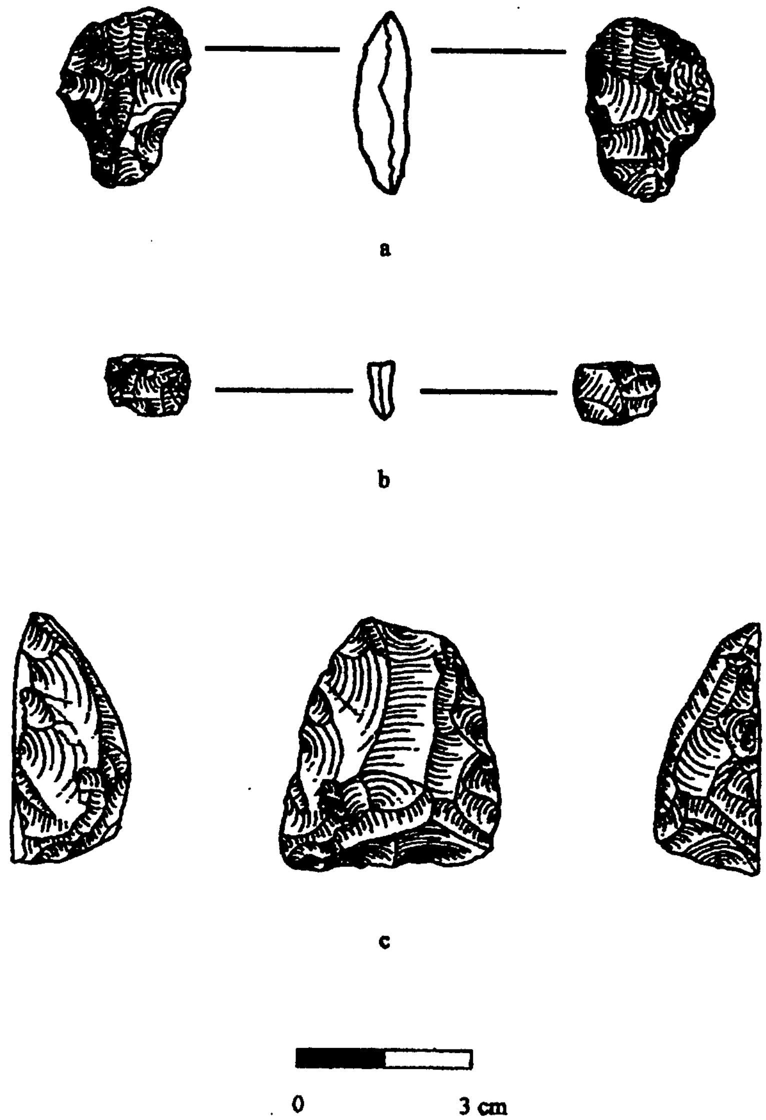


Figure 31: Chipped stone tools from Unit 3 at 5LA6568.

set of technological operations (both core reduction and tool finishing/maintenance) were carried out in the upper levels.

Vertebrate Fauna

Unit 3 yielded 126 pieces of bone; 53 come from dry screening and 73 from wet screening. This unit yielded faunal materials from nine of the 17 excavated levels. Levels 1 and 2 produced a mixed faunal assemblage including herpetofauna, cottontail, jackrabbit, woodrat, and unidentified mammals from all size classes. Several unidentified fragments are burned. Artiodactyl or otherwise unidentified large mammal remains are rare in Unit 3, in comparison to Unit 1 where they occur more frequently. Again, cottontail dominates the identified faunal taxa. Nearly 10% of the total number of specimens (including unidentified) from Levels 2 through 4 is cottontail remains. This percentage rises to 14.9% when *Lepus* sp. (jackrabbit) remains are added. This proportion is much higher than the proportion of leporid remains occurring either inside or outside of feature contexts in Unit 1; this percentage may be a function of sample size given that Unit 2 yielded considerably fewer faunal remains than Unit 1.

Minimal faunal materials were recovered from Unit 3 at the lower levels, although burn damage was observed on two unidentified specimens from Level 10.

Pollen

A stratigraphic pollen column was constructed for Unit 3 of 5LA6568. The column is composed of 11 samples. The first six samples were taken at 10 cm intervals while the lower five were taken at 20 cm interval. The details of this analysis are discussed in Appendix 1. One interesting result of this analysis is the high percentage of *Opuntia* pollen from Level 9. Interestingly, there was no chipped stone debitage recovered from this level. The only artifact noted from Level 9 is an end scraper (See Figure 31c). Based on this evidence it is reasonable to infer that *Opuntia* processing was a relatively important activity for this part of the shelter and that, perhaps, the end scraper was utilized in the processing of that resource. *Opuntia* is considered a marginal food resource - used when other food sources have failed or are no longer available. The pollen signature of Level 9 indicates a reduction in available plant variety. However, this pattern may be the result of the unusually high percentage of *Opuntia* at the expense of other plant genera or a period of unusually high pollen destruction due to erosional processes.

Discussion of the Results of 5LA6568

The three rockshelters that make up 5LA6568 provide some interesting comparative information. The probability distribution of the five dates from 5LA6568 indicates at least three distinct occupational periods (Figure 32). The site appears to have been utilized from between approximately A.D. 55 and A.D. 1290 and spans the Late Archaic to the Middle Ceramic Stages.

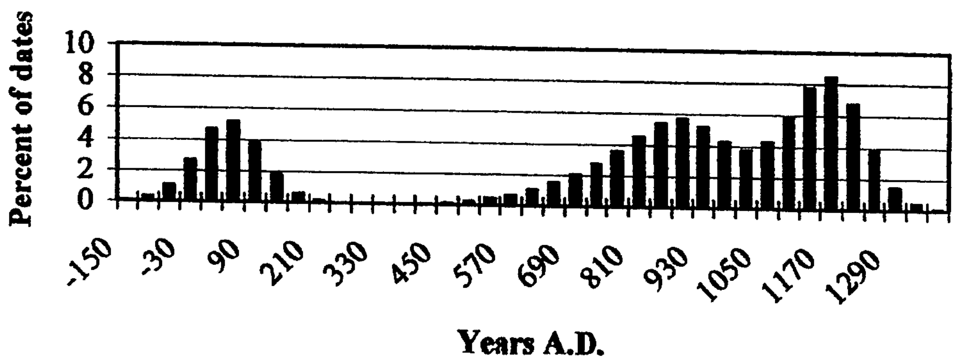


Figure 32: Site 5LA6568, probability distribution for all radiocarbon dates from site.

The early occupational episode likely dates to between A.D. 55 and A.D. 160 and is represented by just a few artifacts in the lower levels of Unit 3. Unfortunately, there are no diagnostic projectile points found in the levels associated with this range of dates. This early occupation fits into the time span represented by the Late Archaic Stage (1000 B.C. - A.D. 200).

The middle occupation dates to between approximately A.D. 750 and A.D. 970 and is based on a date taken from Level 3 of Unit 3. This particular occupation likely fits within either the later part of the Early Ceramic Stage (A.D. 200-A.D. 800/1000) or perhaps the early part of the Middle Ceramic Stage (A.D. 800/1000 - A.D. 1500).

The deposits in which the *Opuntia* processing is likely to have occurred (Level 9 of Unit 3) do not have a direct radiocarbon date association. However, those deposits are sandwiched between Level 15 with a calibrated intercept date of A.D. 100 and Level 3 with an intercept date of A.D. 885. If the stratigraphy of Unit 3 is not mixed or inverted in any way, then it is reasonable to suggest that the *Opuntia* processing of Level 9 dates squarely within the Early Ceramic Stage (A.D. 200 - A.D. 800/1000). The scraper found in Level 9 is also of special note and may have been used, in part, in processing *Opuntia*. Based on their ethnographic research in Mexico, Parsons and Parsons (1990) discuss the possible use of scrapers to process the maguey plant. Nelson (1992), based on his work in Northwest Mexico, has argued convincingly that scrapers with similar morphology, which have been called strangulated scrapers, were used to process maguey at the site of La Quemada, Zacatecas, Mexico. These implements were used to cut and remove the fibers from the maguey plant. He also suggests that *Opuntia* is somewhat more drought resistant than other local domesticates such as corn. *Opuntia* and maguey are considered by some paleoethnobotanists (Minnis 1991) to be famine foods utilized more intensively during periods of drought or when other food resources become scarce.

Scott Cummings (Appendix 1) indicates that the time span from B.C. 50 to A.D. 970, which is incorporated in the Early Ceramic Stage (A.D. 200 - A.D. 800/1000), is characterized by wetter and warmer conditions, but with some fluctuations. The pollen signature of Level 9 in Unit 3 demonstrates a reduction in plant variety that may have resulted from the unusually high percentage of *Opuntia* at the expense of other plant genera or from a period of unusually poor pollen preservation due to erosional process. However, a decrease in the amount of piñon pollen is accompanied by an increase in the amount of juniper pollen. This pattern is usually interpreted as a decrease in the availability of moisture. In any case, the pollen analysis clearly indicates that the occupants of Shelter 3 were involved in processing *Opuntia*.

The latest occupation is associated with the surface and features of Unit 1 and dates to between approximately A.D. 1050 and A.D. 1250. P41 and P49 projectile points (Anderson 1989) are associated with the occupation of Shelter 2. These projectile points have dates that range between approximately A.D. 600 and A.D. 1750. The projectile points and the radiocarbon dates indicate that the occupation falls within the Middle Ceramic Stage (A.D. 800/1000 - A.D. 1500). Shelter 2 has evidence for the processing of medium to large mammals and perhaps shell pendant production.

Shelter 1 (Unit 2) appears to have been utilized primarily as a locale where the later stages of tool production/finishing occurred. Unfortunately, there are no radiocarbon dates or diagnostic projectile points from Shelter 1, which makes a chronological assessment difficult at this time.

Eligibility Recommendation

The subsurface testing conducted at 5LA6568 has provided sufficient data to determine that the site is eligible for the National Register. The data that was recovered from excavations can be used to address each of the four research domains of chronology, paleoenvironment, trade and exchange, and subsistence-settlement patterns. The domain of chronology can be addressed with a combination of radiocarbon dating and the presence of temporally sensitive projectile points. Five radiocarbon dates have already been run from carbon found at the site. These dates indicate a range of occupation between approximately A.D. 55 and A.D. 1250. More excavations coupled with additional radiocarbon dates may yield good associations of projectile points with datable deposits, thus aiding in the building and strengthening of the area's chronology.

Good preservation of pollen is apparent and the initial steps to building a substantial, stratified pollen sequence has already been initiated. These data can be used to address questions regarding subsistence and paleoenvironment. A fairly distinctive pollen signature in Level 9 of Unit 3 indicates that prickly pear cactus (*Opuntia*) was being processed at the site. The pollen sequence from Unit 3 also indicates changes in vegetation through time (Appendix 1). Changes in the amount of effective moisture and perhaps a decrease in the available plant variety can be inferred from these data. Further excavations can help to determine the intensity of these changes and their affects on human populations of Welsh Canyon.

The presence of obsidian from the Jemez Mountains and other non-local raw material resources (such as those recovered from Shelter 1) may aid in addressing questions regarding trade and exchange. Additional work at 5LA6568 can perhaps yield more non-local resources that would allow the partial reconstruction of the area's trade network. Finally, several classes of data from 5LA6568 can be used to examine the domain of settlement-subsistence patterns. The pollen evidence has already been discussed in terms of how it can be used to reconstruct subsistence. The faunal data were adequately well preserved to allow inferences on the use and processing of animals such as cottontail rabbit, jackrabbit, woodrat, and artiodactyls. Apparently, some areas of the site were reserved for the processing of medium to large mammals (Feature 5 of Unit 1) while other areas had a more mixed faunal assemblage. Further work at the site can focus on seasonality and how resource and land use of the area around 5LA6568 fits into a broader settlement system.

CHAPTER V: 5LA6569

Site 5LA6569 is a rockshelter located on the eastern side of a large tributary of Welsh Canyon. The shelters of the site look across a narrow portion of the headwaters of Welsh Canyon. The site elevation is approximately 1609 m (5280 ft) above sea level. The stream channel of the tributary is located approximately 70 m down slope from the site. The site is located near the top of the canyon in an area where the cliff face is not very pronounced.

The site is made up of two rockshelters 22 m apart, but only Shelter 1 received subsurface, evaluative testing. There were no surface indications of intact cultural deposits in Shelter 2, so no subsurface testing was conducted there (Figure 33a-b). A scatter of artifacts is found extending down the talus slope in front of the shelters and indicates a site size of approximately 37 x 23 m (Figure 34).

Table 5.1 presents the artifacts from the surface recorded when the site was surveyed in 1995. No diagnostic artifacts were found on the surface in the 1995 reconnaissance. However, one bifacially retouched flake, likely a scraper, was found. A unifacially retouched flake was also recorded from a surface context. It was retouched to create a serrated edge. In addition to these tools, two primary flakes, 22 secondary flakes, and five tertiary flakes were recorded from the surface of 5LA6569.

Two ground stone non-portable artifacts were recorded. One is located just outside the opening of Shelter 1. It is an unshaped, block metate made from sandstone measuring 150 x 50 x 40 cm with multidirectional striations. The sandstone block has two grinding surfaces. One is complete and it measures 22 x 21 x 2 cm while the other is eroded and only a portion measuring 25 x 12 x 1 cm remains. The second ground stone feature is an unshaped, slab metate made from sandstone. It is located just outside the opening of Shelter 2. The metate has a single, flat grinding surface that is oval and measures 40 x 35 cm.

Table 5.1. Summary of Chipped Stone Debitage and Tools From 5LA6569 Recorded in the 1995 Reconnaissance.

Artifact Type	Material	Quantity
Primary Flake	Quartzite	2
Secondary Flake	Quartzite	20
Secondary Flake	Chert	2
Tertiary Flake	Quartzite	4
Tertiary Flake	Chert	1
Retouched Flake	Quartzite	1
Biface	Chert	2

Figure 33a: Site 5LA6569, general view of Shelter 1, facing northeast.

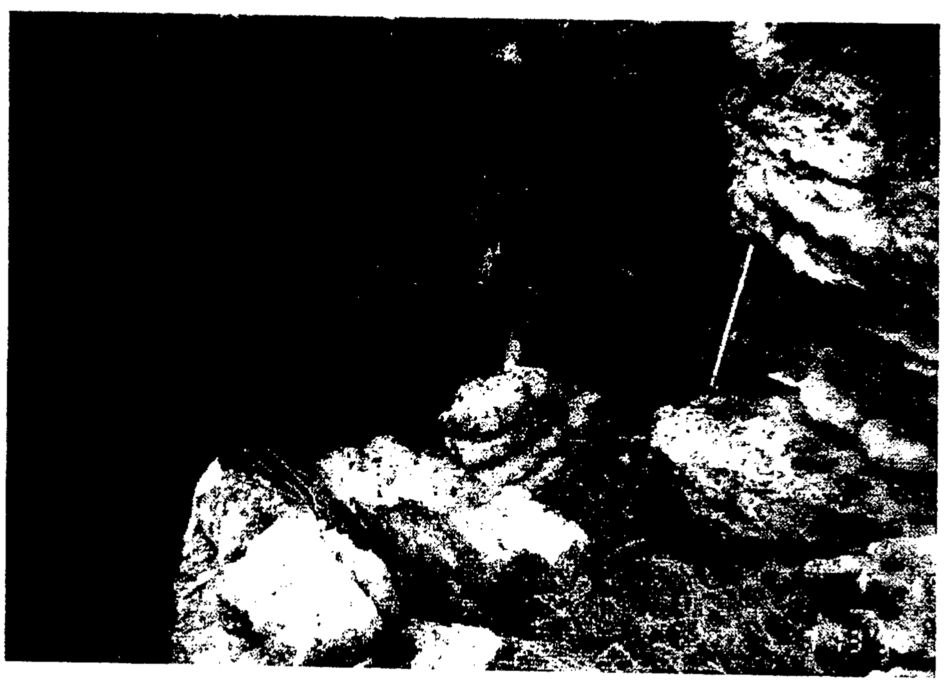


Figure 33b: Site 5LA6569, general view of Shelter 2, facing southwest.

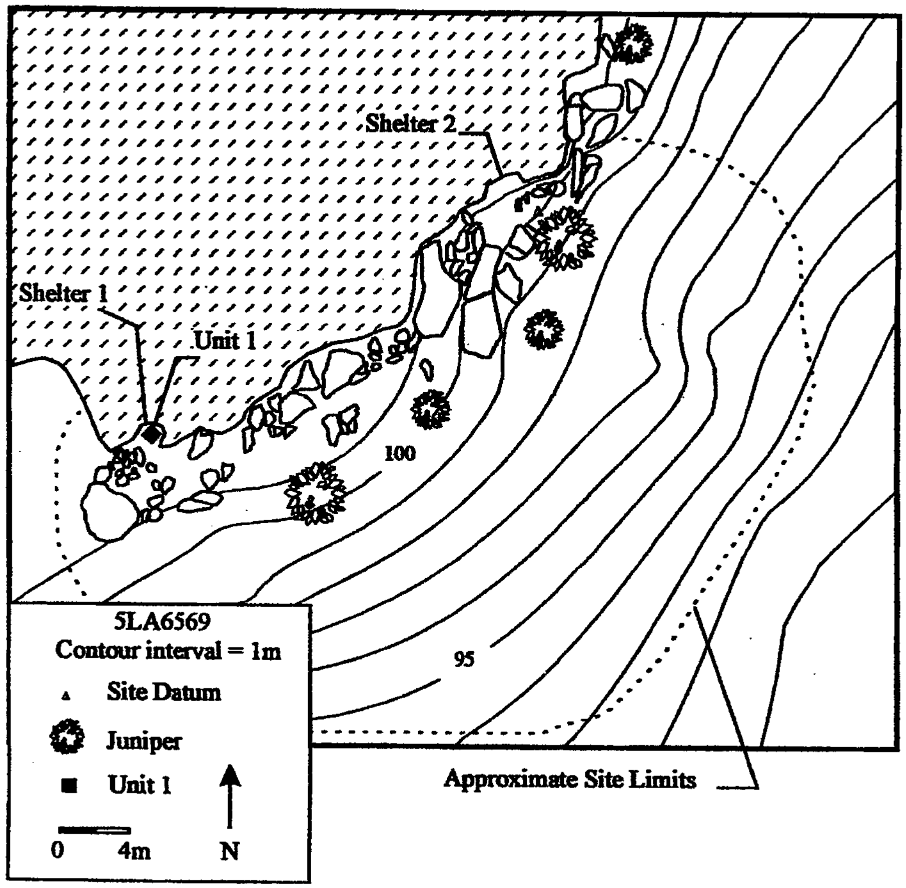


Figure 34: General site map of 5LA6569.

Shelter 1

Shelter 1 has an opening of approximately 4 m and the maximum distance from the back of the shelter to the drip line measures approximately 3 m. The shelter ceiling is approximately 1.5 m above the shelter floor at its highest point (Figure 35). A pile of rocks is scattered along the mouth of the shelter. These rocks may be the remains of a stone enclosure wall much like that described for Shelters 1 and 3 of 5LA6568. The interior surface area of the rockshelter was almost entirely covered with woodrat debris and exhibited evidence of substantial disturbance.

Depositional History of Unit 1

Unit 1 was excavated to a depth of approximately 36 cm below the surface and bedrock was exposed throughout the bottom layer. Bedrock is composed of a yellowish Dakota sandstone. The surface of the bedrock in the shelter appears to be somewhat irregular and ranges in depth from 31 to 41 cm below the surface with the east and west corners of the unit lower than the north and south corners.

Three depositional strata are identified for Unit 1 (Figure 36; Table 5.2). Lying directly above bedrock, Stratum 3 is composed of a dark grayish brown (2.5Y 4/2) sandy silt. This stratum contained the majority of the chipped stone debitage recovered from the unit and may represent the earliest cultural occupation of the shelter. Unfortunately, the extensive animal disturbance makes it unlikely that this stratum represents an intact deposit.

Table 5.2. List of Strata for 5LA6569 Unit 1.

Strata	Levels	Description
1	1-2	topsoil and mixed cultural debris
2	3-4	mixed cultural deposits
3	5	mixed cultural deposits

Stratum 2 also contains evidence of human occupation, but it also mixed and disturbed. This stratum is composed of a thin layer of a light olive brown (2.5Y 5/4) fine sand overlain by lenses of a light gray brown (2.5Y 5/2) silty sand. A layer of light olive brown (2.5Y 5/4) silty sand was deposited over these lenses. Once again it is likely that this stratum does not represent an intact deposit. In several areas Stratum 1 dips down considerably and cuts completely through Stratum 2.

Stratum 1 is the uppermost and most recently laid deposit. It is comprised of a single relatively thick layer of an olive brown (2.5Y 4/4) sandy loam. A large animal burrow can be seen in the north profile. This area of disturbance extends nearly to bedrock. This stratum contained considerable amounts of rat amber and organic materials likely brought to the

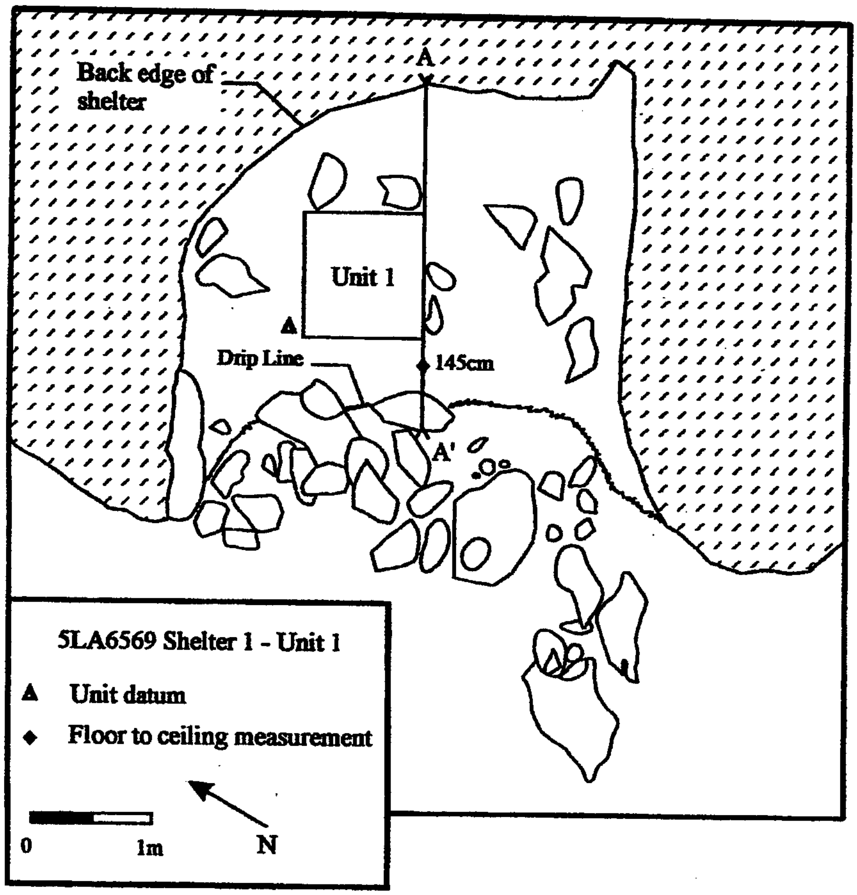


Figure 35: Site 5LA6569, Shelter 1, Unit 1 plan view.

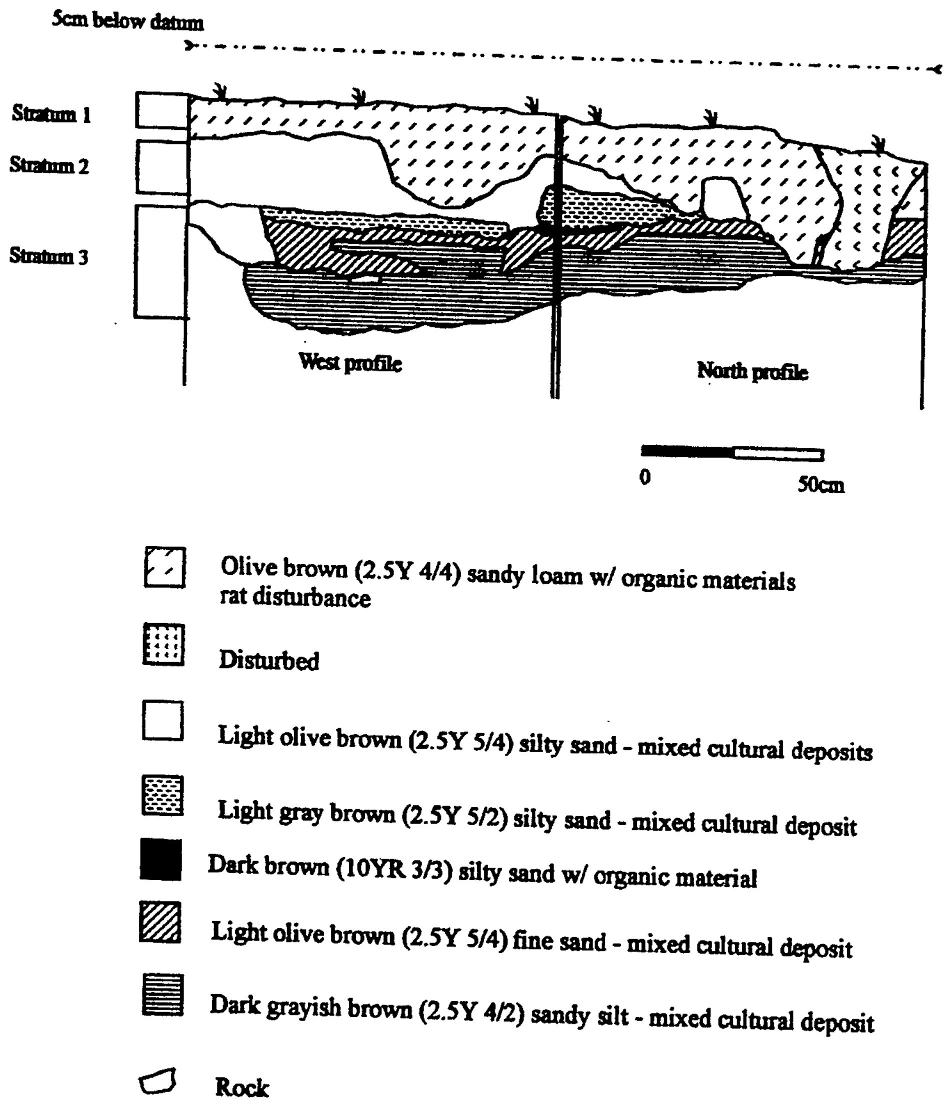


Figure 36: Site 5LA6569, Shelter 1, Unit 1 west and north wall profiles.

shelter from elsewhere by woodrat behavior. The stratum is very disturbed and mixed from these animal activities.

Radiocarbon Dates

Two radiocarbon dates were run from carbon samples recovered from Unit 1. The first sample comes from Level 4 of Stratum 2 and yielded a date of 1130 ± 100 B.P. (Beta-100207; wood charcoal; $^{13/12}C$ -24.4 $^{0}/_{00}$). The second date is from a sample in Level 5 of Stratum 3 and it yielded a date of 900 ±90 B.P. (Beta-100206; wood charcoal; $^{13/12}C$ -25.3 $^{0}/_{00}$). When the probability distributions of these dates is viewed, a somewhat bimodal distribution is apparent (Figure 37) indicating that two temporally different occupations may be represented. However, the rather large standard deviations of the dates cause some overlap in the distribution. Unfortunately, the stratigraphic contexts of the dates are reversed; the earlier of the two dates is stratigraphically above the older date. This reversal of the stratigraphic contexts is likely the result of the animal documented in the depositional history of Unit 1.

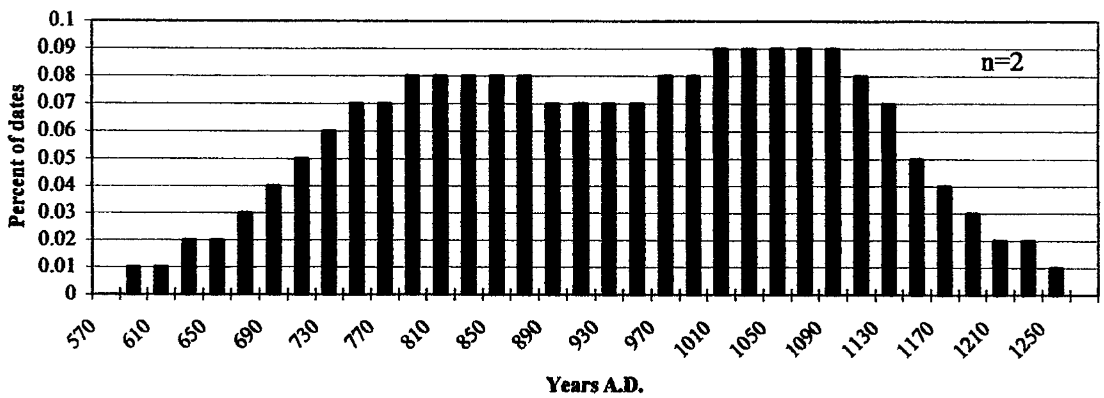


Figure 37: Site 5LA6569, probability distribution for all radiocarbon dates from site.

When the dates are calibrated and converted into years A.D., it seems likely that the rockshelter was occupied some time between A.D. 785 and A.D. 1250. The estimated dates of the three diagnostic projectile points also correspond well with the radiocarbon dates and place the occupation of the shelter most likely in the Middle Ceramic Stage (A.D. 800/1000 to A.D. 1500). However, attributing a precise date to the artifacts or behaviors represented in the unit is tenuous owing to the mixing and disturbance of the deposits.

Chipped Stone

A total of 50 pieces of chipped stone debitage was recovered from excavations in Unit 1. Only two different raw material types were recovered from the excavations. Quartzite (66.0%) is the most common type followed by chert (34.0%). Of the entire chipped stone assemblage 64.0% are simple flakes, 22.0% are complex flakes, 10.0% are shatter, and 4.0% are bifacial thinning flakes (Figure 38).

Size grade data illustrate slightly different reduction strategies across the two material types. Quartzite has a somewhat high small to large flake ratio of 7.5:1 which indicates that a mixture of early and late stage reduction operations were important. Chert has a high small to large flake ratio (16.5:1) indicating that late-stage tool finishing/maintenance was important in generating the chert debitage. The rather high percentage of chert, non-cortical flakes (88.2%) also supports this inference.

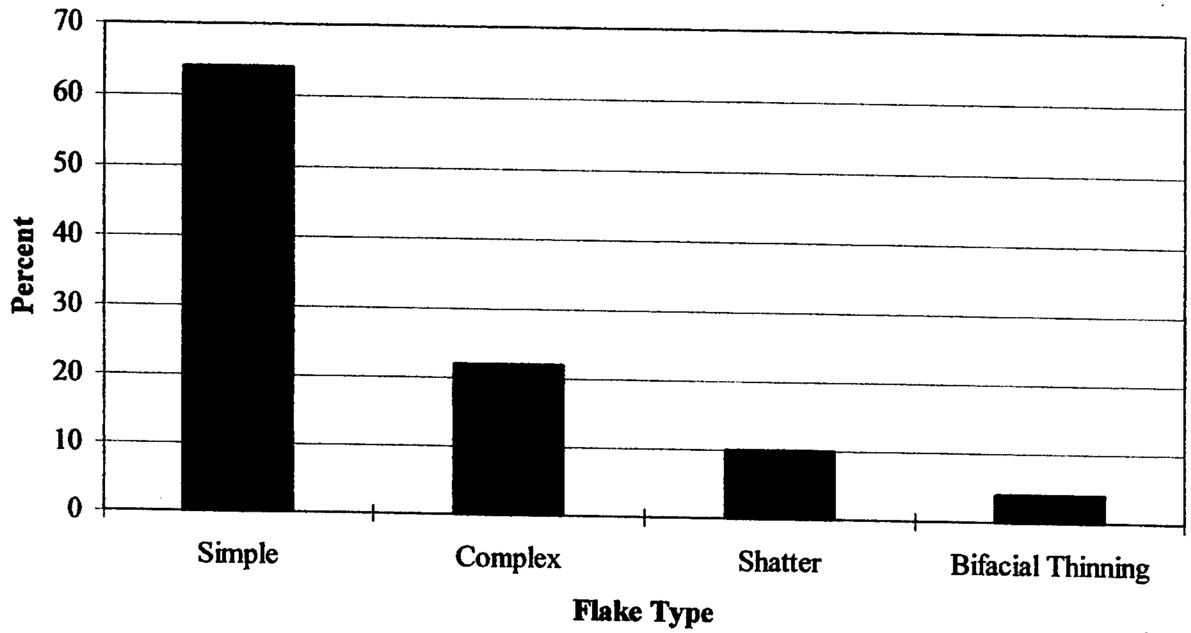


Figure 38: Bar chart of flake types from 5LA6569.

One of the unusual things about this site is the relatively high proportions of diagnostic artifacts recovered from excavations. A total of three complete projectile points, a hafted biface, one core fragment, and one retouched/utilized flake tool came from the excavated levels of Unit 1.

The first projectile point is a small side-notched point made from basalt and comes from Level 4 of Unit 1 (Figure 39a). The point measures 2.4 x 1.4 cm and is 0.3 cm thick. The point is nearly complete; a small portion of the lateral margin of the base is missing. Bifacial pressure flaking is apparent around each of the margins. The blade edges are straight and have a length of 1.7 cm. The specimen comes to a very narrow point and has a basal length of 0.7 cm. The width of the base is 1.3 cm and the notches are 0.2 cm deep. The cross section shape is flat and elliptical. This specimen most closely resembles those in Anderson's (1989:222-223) P85 category. These points have not been found in dated contexts in the PCMS. However similar points have been found outside the PCMS and these have dates ranging from approximately A.D. 1000 to A.D. 1400.

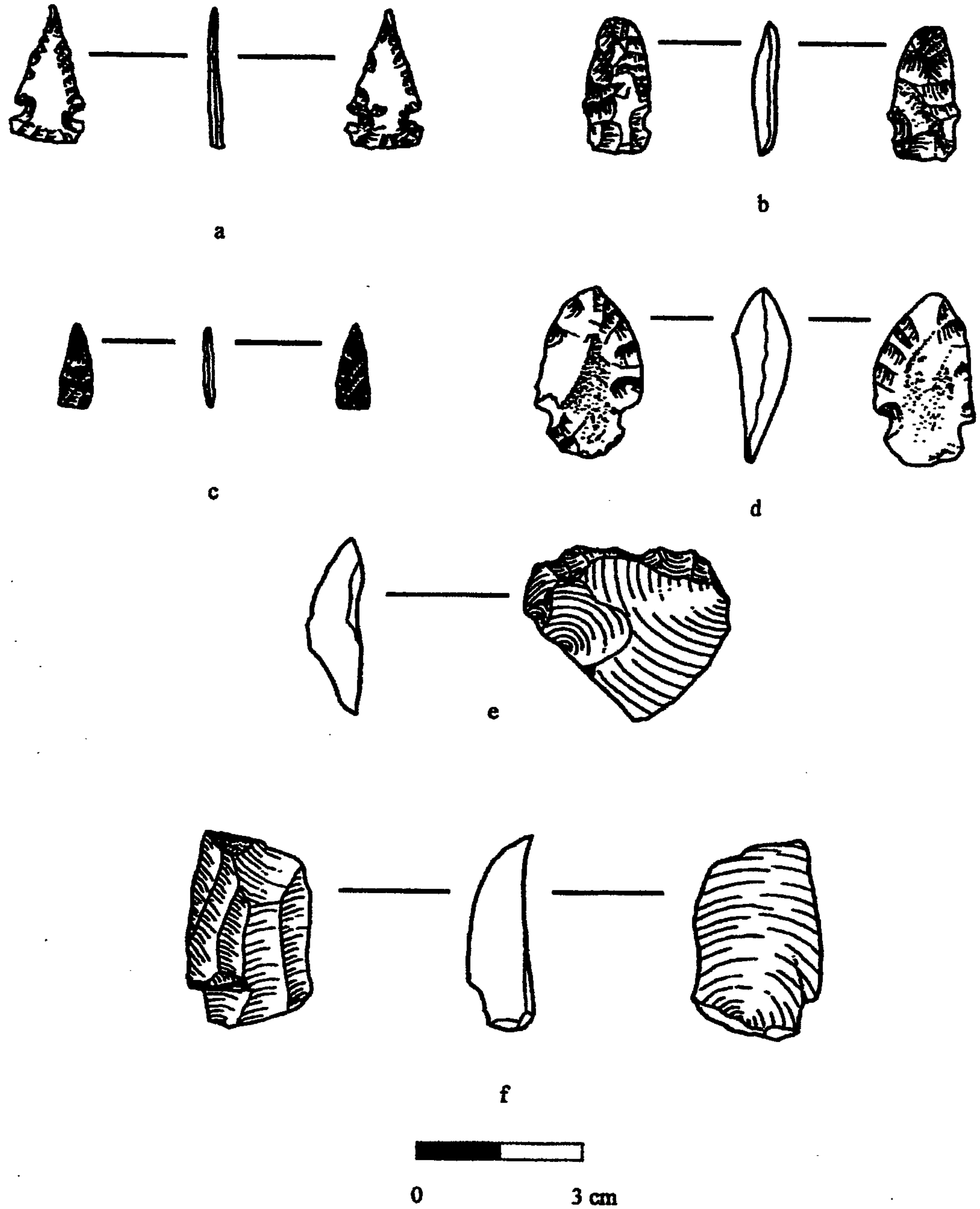


Figure 39: Chipped stone artifacts from 5LA6569.

The second point comes from Level 5 and is made from an orange and gray chert (Figure 39b). It measures 2.4 x 1.2 cm and is 0.4 cm thick. The point, which weighs 1.6 g, has relatively shallow side-notches. The tip is blunted and the point is bifacially pressure flaked along each of the margins. The blade edges are relatively straight and measure 1.7 cm long. The base is broken along one margin and measures 0.5 x 1.1 cm. The point has a plano-convex cross section and does not fit well into any of the projectile point categories outlined by Anderson (1989), but it has some affinities to those points in the P67 class.These points have not been found in dated contexts in the PCMS. However, Anderson (1989:201) suggests that similar points have been found outside the PCMS and these have dates ranging from approximately A.D. 800 to A.D. 1100.

The final point is a very small, triangular point or preform from Level 5 (Figure 39c). The tool is made from a grayish tan chert and measures 1.5 x .06 cm and is 0.2 cm thick. Bifacial pressure flaking is apparent along each of the margins. The base is straight and one blade is straight while the other is slightly convex. The point has a cross section shape that is elliptical; it appears to resemble those projectile points in Anderson's (1989) P49 class. According to Anderson (1989:173-174), there are no examples of this point type from dated contexts in the PCMS area. She does mention that some specimens of P49 type points in other areas of Southeastern Colorado range in date from A.D. 1070 to A.D. 1360. More recently, a P49 type projectile point is illustrated by Loendorf et al. (1996:179; Figure 6.11d). They suggest that a regional comparison with other P49 type points indicates that they date to between A.D. 800 and A.D. 1750.

The projectile points are a relatively diverse group of artifacts with dimensions ranging from 1.5 x .6 cm to 2.4 x 1.4 cm. This diversity is difficult to understand given the relatively small size of the shelter. The shelter is somewhat isolated relative to the other shelters investigated in this report. 5LA6569 is the northern most of all the sites tested in the 1996 field season. It is also located at the headwaters of a somewhat narrow drainage and the next nearest site of those tested in 1996 is 5LA6599 located 2.8 km to the Southwest. Even though the degree of variation in the plant communities across this area is low, it is possible that a slightly different set of resources that required a greater diversity of projectile point types may have been available at 5LA6569. Another possible explanation for the diversity of projectile points at 5LA6569 is that the deposits were badly mixed and disturbed. There was also ample evidence for woodrat disturbance. Woodrats may have been the responsible for redepositing artifacts from several different contexts to Shelter 1 of 5LA6569.

The hafted biface comes from Level 4 of Unit 1 (Figure 39d). The tool was made from a light grayish tan sandstone and measures 3.1 x 1.9 cm and is 0.9 cm thick. The point is side-notched and weighs 4.9 g. The base is somewhat convex and one of the blade edges is relatively straight while the other is convex. The tip of the point is somewhat rounded and may have been retouched. The blade length is 2.3 cm and the base is 0.9 x 1.4 cm. The cross section of the point is somewhat diamond shaped. This particular tool may be an incomplete projectile point, however, it cannot be classified into any of Anderson's (1989) projectile point classes.

Two unifacially flaked pieces were also recovered from Unit 1. The first piece comes from Level 2. This specimen is made from a dark red chert cobble and measures 3.7 x 3.1 cm and is 0.9 cm thick. It weighs 9.9 g and is retouched along several of the margins on the ventral side (Figure 39e).

A final worked piece appears to be a core fragment that may have been used as an end scraper. The specimen comes from Level 3, is made from quartzite, and measures 3.5 x 2.2 cm and is 1.0 cm thick. It weighs 9.2 g and has five negative flake scars on the dorsal side. The distal end appears to have use wear (Figure 39f).

Wooden Artifacts

Of special note is the recovery of a wooden artifact from Level 1 (Figure 40). This artifact resembles an arrow shaft and is constructed of two pieces of wood tied together with a piece of what appears to be sinew, most likely that of a deer. The larger piece of wood is broken and measures 15.2 cm. The smaller piece fits into a small bored out opening in the lower piece. It too is broken, or more accurately gnawed away, and extends out 1.7 cm from the larger piece. The total length of the artifact is 16.9 cm and it has a diameter of 0.9 cm. The shaft does not appear to have been worked. A small knot is evident near the end of the larger piece. The end where the small piece fits into the larger piece is splitting and cracking. The remaining sinew is wrapped around the shaft at least four times and at one time covered the top 3.2 cm of the larger piece.

Vertebrate Fauna

The vertebrate fauna recovered from the site includes a total of 76 pieces of bone. Seventeen of these come from dry screening and the remaining 59 are from the water screening procedures. None of the bones recovered from this unit showed signs of burning. The majority of the vertebrate faunal materials recovered were unidentified (NISP = 51), followed by otherwise unidentified mammal remains (NISP = 13). The identified remains include two specimens of cottontail, one of the white-footed mouse, three of woodrat, and four of herpetofauna. One humerus of the horned lark (*E. alpestris*) was also recovered (Level 2). This specimen is one of only three recovered from the 1996 PCMS test excavations. Interestingly, no examples of the horned lark were observed in the assemblages studied by Andrefsky et al. (1990). This is somewhat unexpected in that *E. alpestris* has a broad range and is common in grassland areas with low plant density.

The vertebrate remains of this site demonstrate the utility of water screening in the recovery of both micromammals, such as the white-footed mouse, and non-mammalian fauna. All examples of herpetofauna (NISP = 4) were identified from the water screened materials, as well as the one example of *Peromyscus* sp.

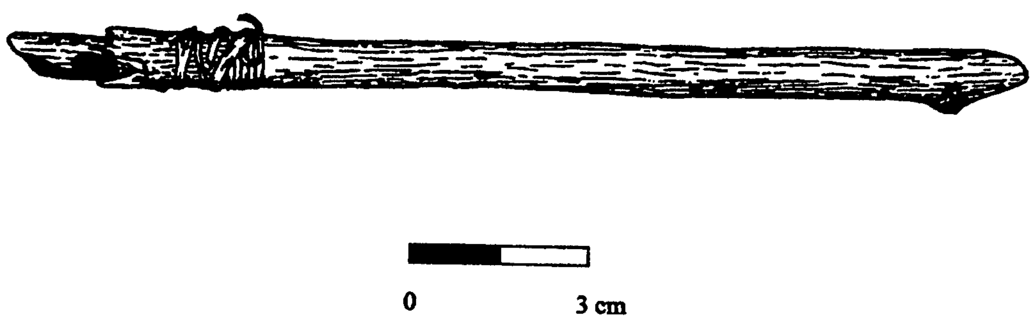


Figure 40: Wooden artifact from Unit 1 of 5LA6569.

Eligibility Recommendation

Excavations at 5LA6569 yielded a high proportion of formal tools relative to the amount of chipped stone debitage. Apparently, a mixture of reduction strategies was employed at the site and it is not unreasonable to assume that some of the tools were manufactured or maintained at the site. The wooden artifact resembling an arrow shaft is a unique item that represents the only such artifact known at the PCMS. Unfortunately the inverted radiocarbon dates and the presence of extensive animal disturbance call into question the integrity of the deposits. The likelihood that intact deposits will be found in the shelter is somewhat low and therefore the site does not meet eligibility requirements for the National Register.

CHAPTER VI: 5LA6575

This rockshelter site is located at the head of a small side canyon in the northern reaches of Welsh Canyon (Figure 41a-b). The site is situated on the eastern side of the canyon and is nestled in a narrow, amphitheater shaped draw. The site elevation is approximately 1512 m (4960 ft) above sea level. An intermittent stream (a tributary of Welsh Canyon) is located approximately 48 m down slope from the site. The dense vegetation in the area near the rock shelter suggests it retains a considerable amount of run-off and it was near a seep or spring.

The site is made up of a large rockshelter with large chunks of roof fall littering the shelter floor. The site dimensions are based on the dimensions of the rockshelter and measure approximately 23 x 9 m. The opening of the shelter measures 23 m across and the maximum distance from the back of the shelter to the drip line measures approximately 9 m (Figure 42). The larger pieces of roof fall measure approximately 3.75 x 2.9 m. There is no soil accumulation evident on the shelter floor and no portable artifacts were found within the confines of the shelter. Any small debris or portable artifacts could have easily been wash down slope in a series of heavy rainfalls.

The surfaces of the sandstone rocks resting on the shelter floor contain several ground depressions or metates of varying shapes and depths. Fieldwork at this site consisted of preparing a fairly detailed map showing the location, dimensions, and orientations of the metates (Figure 43). A total of 93 metates or milling surfaces and 41 abrading grooves are recorded for the site.

Measurements of length, width, and depth were taken on a non-randomly selected sample of the metates (Figure 44; Table 6.1). A histogram of the metate widths indicates that there are perhaps three shape/size classes (Figure 45). The narrow class contains metates with widths of between approximately 7 and 10.5 cm. The second class contains the majority of the metates and has an average width of approximately 20 cm. Finally, there are rather large metates that are shaped similarly to the second class of metates but with widths in excess of 30 cm. Based on the currently available data it is difficult to determine if these different metate classes have functional differences.

Apparently, the metates were used for grinding grains from plants such as rice grass (*Oryzopsis hymenoides*). However, these shallow depressions also may have been used to parch the seeds. Alternatively, they may have served to partially bake or dry out prepared cakes of flour and water. These activities seem plausible since summer time temperatures have been recorded as exceeding 110 degrees in this rockshelter (Chomko 1997, personal communication).

Three areas of petroglyphs are present (Figure 46). Panel 1 is located in the northern part of the rockshelter and consists of several milling surfaces, abraded grooves, petroglyphs, and graffiti (Figure 47). These figures are worked into the surface of a rock measuring approximately 1.75 x 1.0 m. Panel 1 contains several milling surfaces essentially in two

Figure 41a: Site 5LA6575, general view of site taken facing northeast.

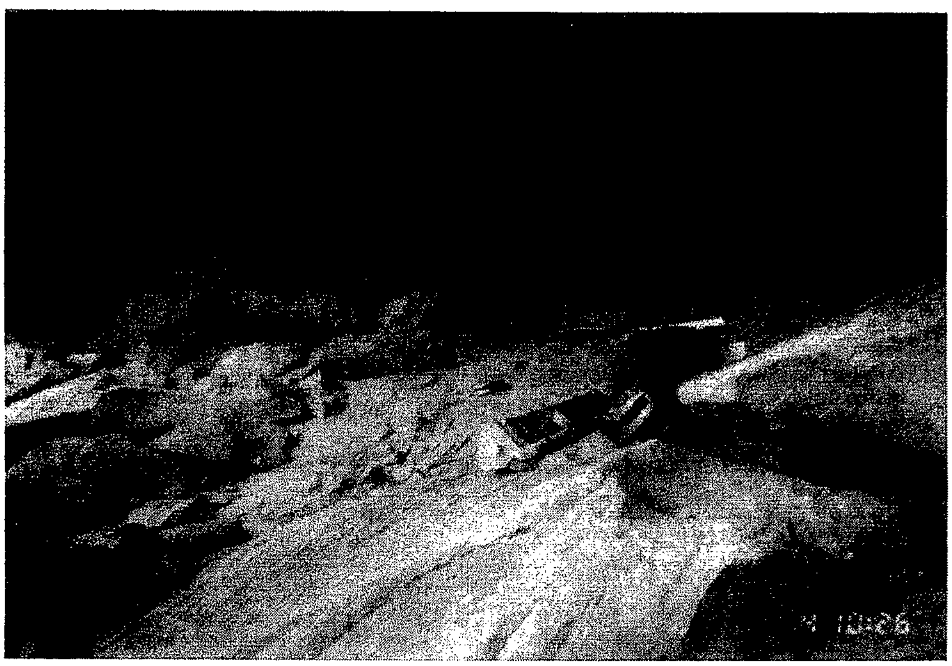


Figure 41b: Site 5LA6575, interior view of rockshelter taken facing north.

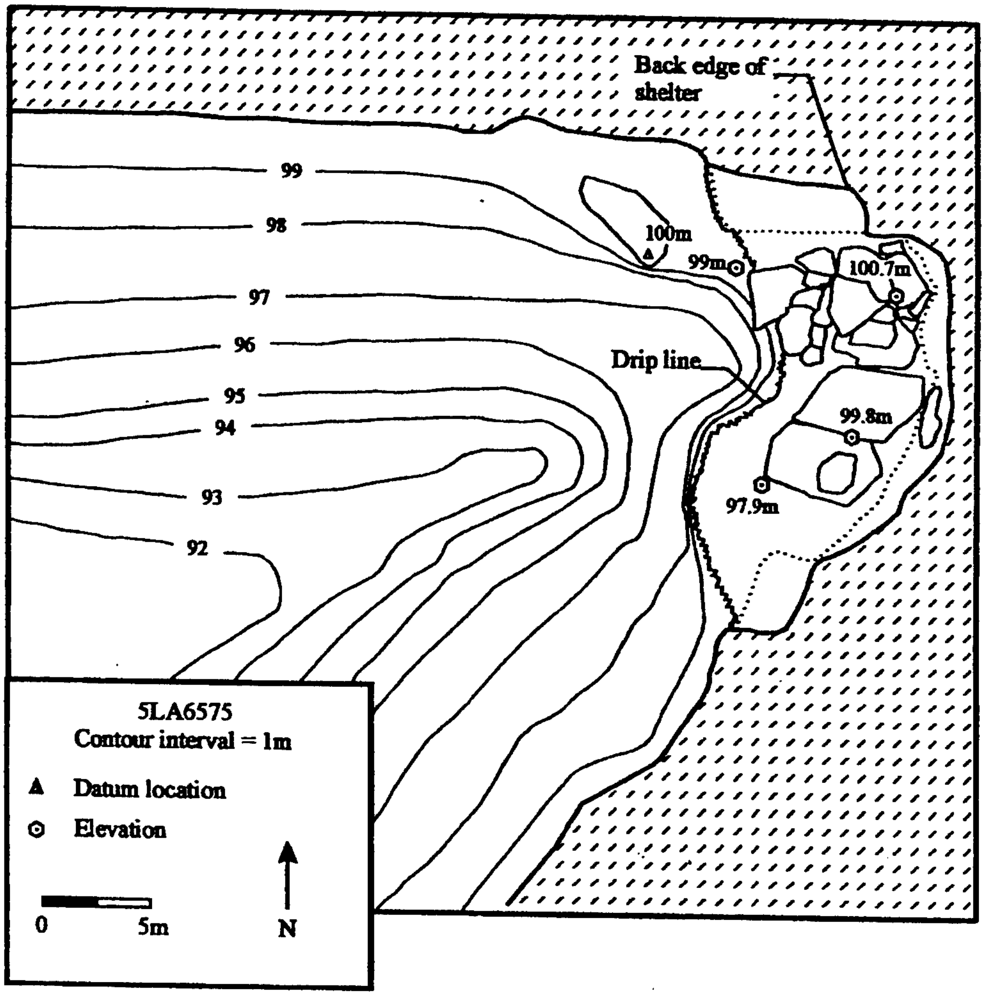


Figure 42: General Site map of 5LA6575.

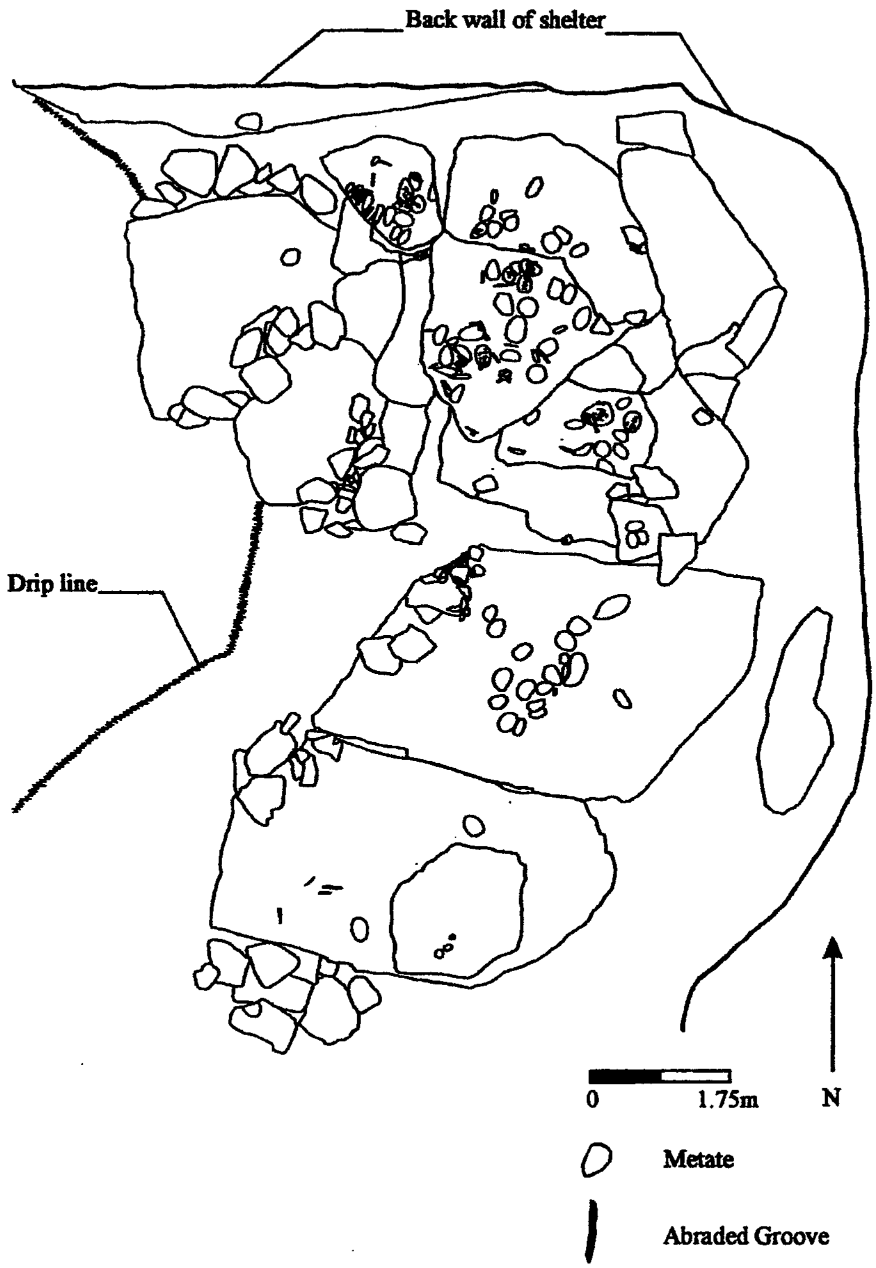


Figure 43: Site 5LA6575, detail of rockshelter interior.

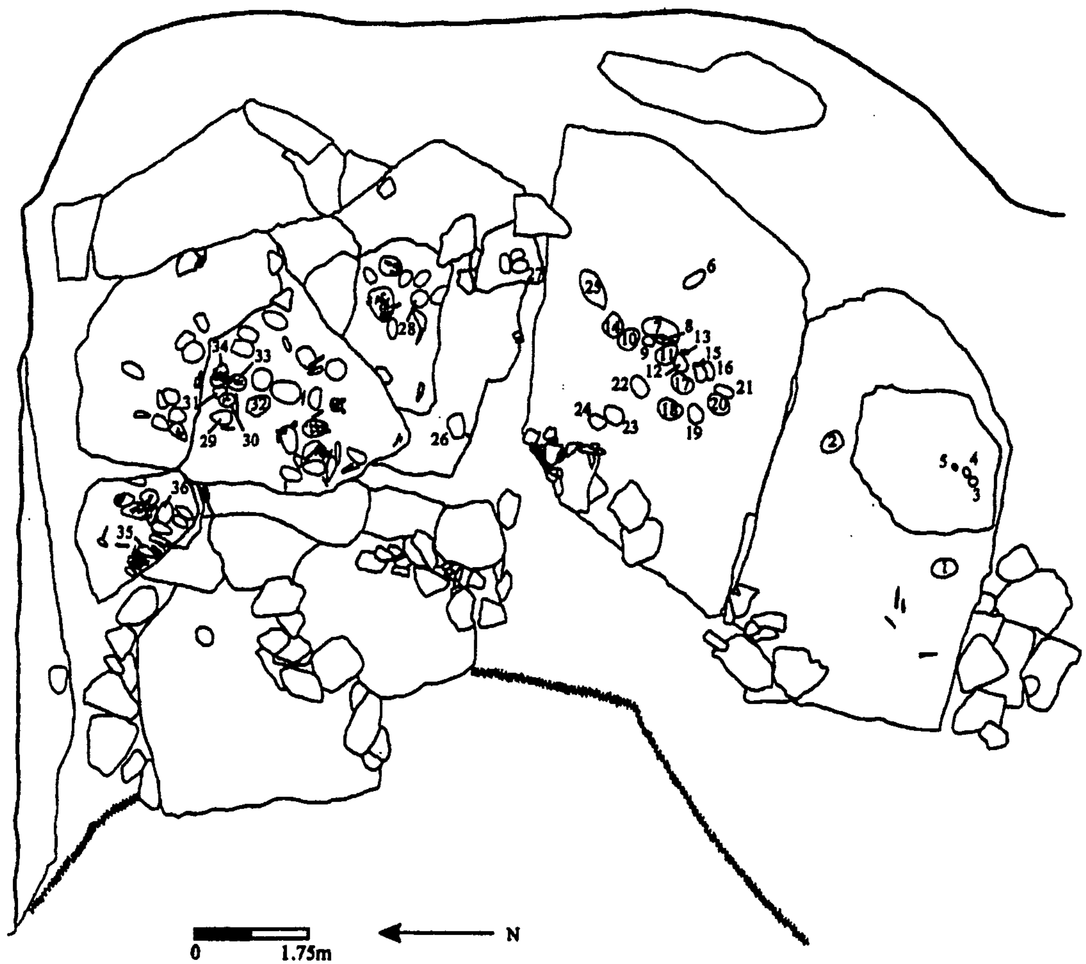


Figure 44: Site 5LA6575, metates with length, width, and depth measurements.

Table 6.1. Sample of Metates From 5LA6575.

Number	Length	Width	Depth
1	32.9	26	3.2
2	30	23	1.4
3	11	8	0.4
4	10	7	0.3
5	5.2	5	0.2
6	30.5	16	2.7
7	51.2	22.6	2.9
8	14.4	10	0.7
9	9.5	9	1
10	20.5	16.2	14.4
11	19.3	18.4	1.5
12	18	13.5	0.8
13	8	4.3	0.3
14	24	22.8	2
15	22.5	10	1.5
16	15.5	8.7	0.6
17	23.3	17.5	1.2
18	30	26.2	3.6
19	20.5	17.4	2
20	36.2	35.9	3.5
21	17.5	13.6	0.2
22	34.1	22.6	2.2
23	23	20.6	2
24	23	18	2.4
25	41	34	3.5
26	30	24	2.7
27	22	13	1.8
28	22	21	2.9
29	23.5	17	2.7
30	19.9	18.2	1.8
31	22	18	0.3
32	22.5	20	2.5
33	22	18	2.7
34	26	21	2
35	28	21.2	1.9
36	26	22	4.2

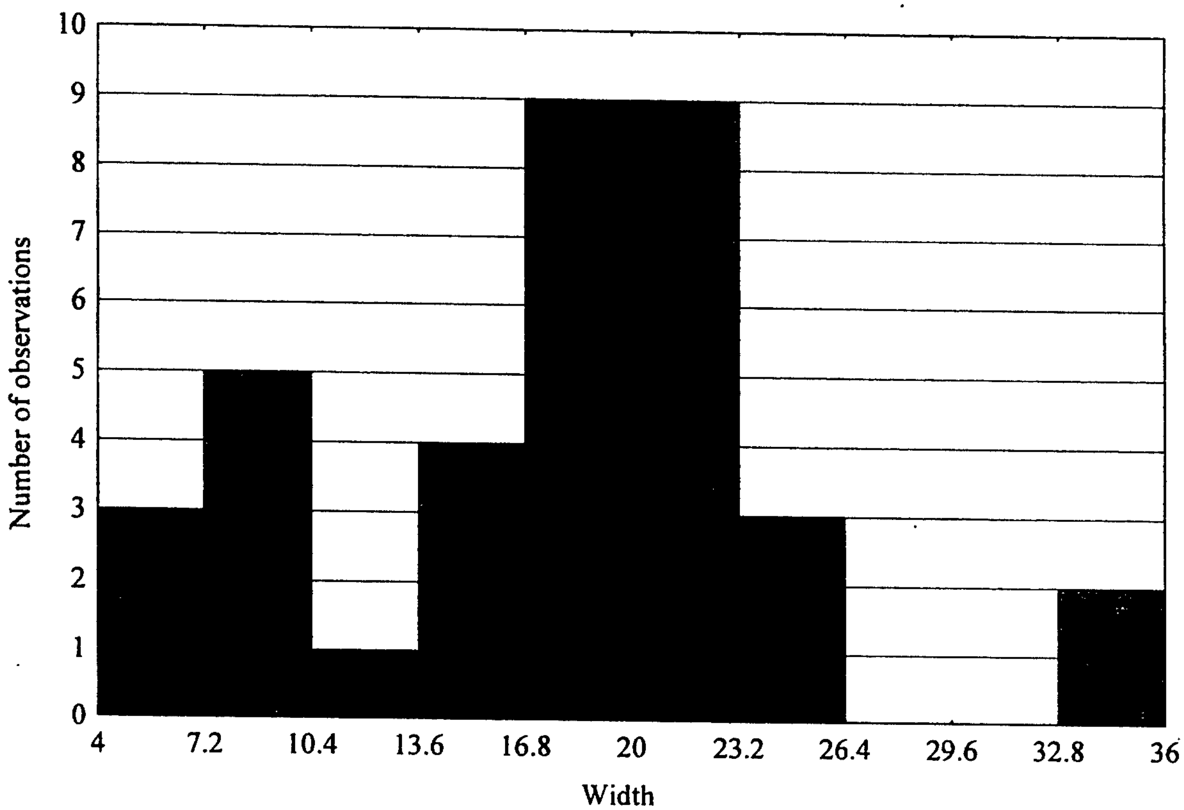


Figure 45: Histogram of metate widths from 5LA6575.

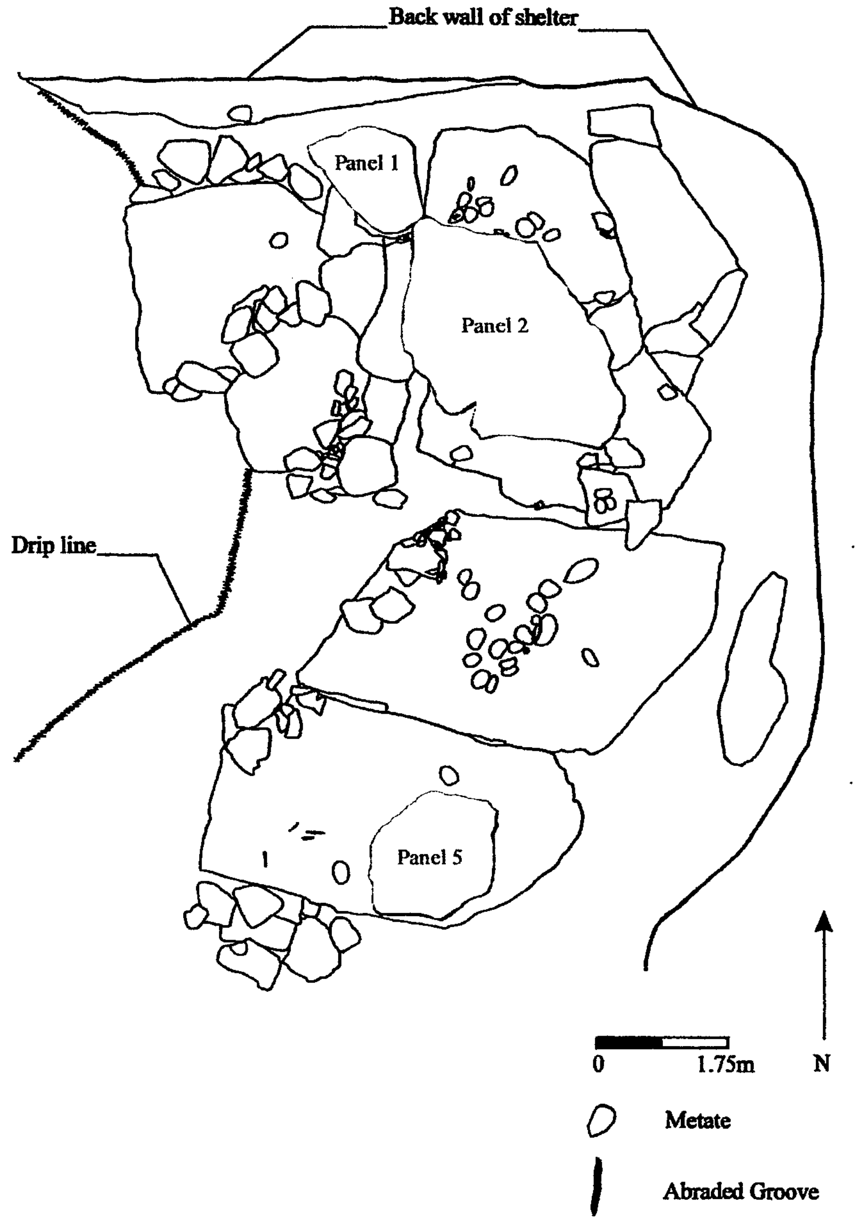


Figure 46: Interior of 5LA6575 showing locations of panels discussed in this report.

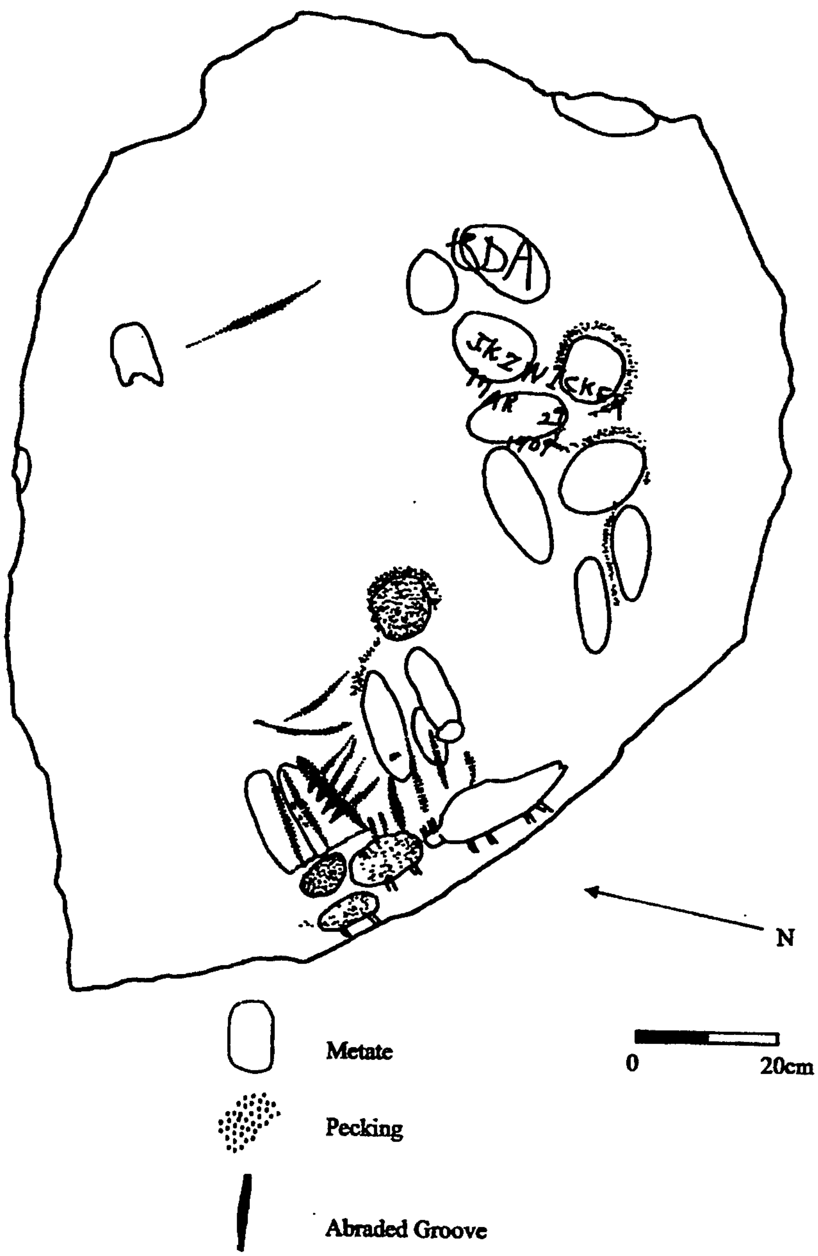


Figure 47: Panel 1 at 5LA6575.

main clusters. The first cluster has nine metates, three of which exhibit some pecking around their edges. Graffiti is also present. The letters J.K. Zwicker MAR 29 1909 are cut into three of the metates. Another three letters (S(?)DA) are carved into yet another metate of this cluster. The second cluster consists of approximately 15 abraded grooves and several metates. Three of the metates are used to help compose animal forms. Incised lines are added to the bottoms of the grinding areas to form legs. On the figure furthest to the right, incised lines are placed as to form what appear to be horns on a bovine.

Panel 2 is also located in the northern part of the rockshelter (Figure 48). It is situated adjacent to the southeast corner of Panel 1. Panel 2 measures 2.6 x 2.3 m. This panel contains approximately 43 metates, seven abraded grooves, graffiti, and several petroglyphs. This panel can be divided into three main areas. The first area is located furthest to the right and set off from the rest of the panel by a large crack in the rock. This area has 10 metates, three of which have some light pecking in the central parts of the grinding surfaces. The two metates at the top are vandalized with the letters Roy Moygan June 1902 carved into their grinding surfaces. The large metate at the bottom is also damaged by what appear to be the up side down letters SL.

The main portion of Panel 2 contains 23 metates, several abraded grooves and several rock art elements. The most predominant figure is a large pecked line running the length of the rock (approximately 1.8 m). The line is fairly straight with a slight bend near the top. Several smaller pecked lines branch off the main one at right angles. The lowest branch comes off the right side of the main pecked line and terminates in a small circle. The next branch comes off the left side of the main pecked line and terminates in at a small perpendicular element. The top most branch resembles a running animal, but it may be only two small pecked lines terminating in semi-circular elements. To the left of this principal petroglyph is a metate with two, perhaps three, associated pecked curvilinear elements. The remaining petroglyphs are located on the left side of the panel and these consist of at least six pecked cupules. Several of these are linked together so as to form what resembles a chain. This panel is also vandalized with several incidents of graffiti. Two metates located just left of the main petroglyph have the letters RMM June 18 1902 carved into them. Below this, another metate is carved with AL(?) in its grinding surface. Another metate on the right side of the panel is vandalized with the letters J.B. Cordova 4-7-1920. The letters CL PATT 3-27 87 are carved into the rock just to the right of this metate.

The third area of Panel 2 is located at the top of the sketch map. This area contains nine metates, a series of incised lines, and graffiti. Two of the metates are vandalized. The large metate to the right has the letters JAC and C.A. Zwicker Mar 29 1909 carved into it. Right below are the initials M.M. and K.K.(?). Another large metate at the top of the illustration has the letters J.A. Cordova 4/7 1929 cut into its grinding surface.

Panel 5 is located in the southern part of the rockshelter. This panel has several figures pecked into the surface of the rock (Figure 49). Three animal figures are clustered near the top of the panel surrounding a small grinding slick. A figure with long, linear appendages is located to the left and below the animal figures. This figure has a u-shaped head with another element nested within. Another smaller linear petroglyph is located

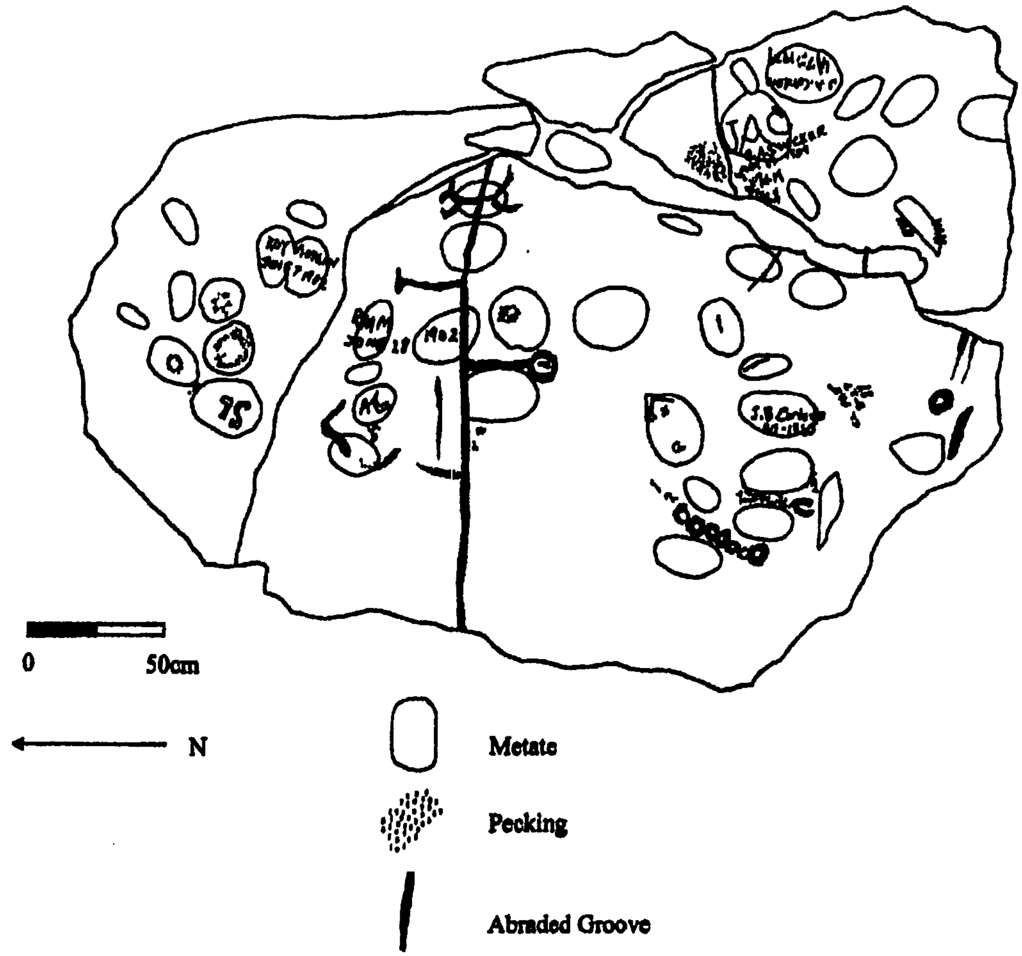


Figure 48: Panel 2 at 5LA6575.

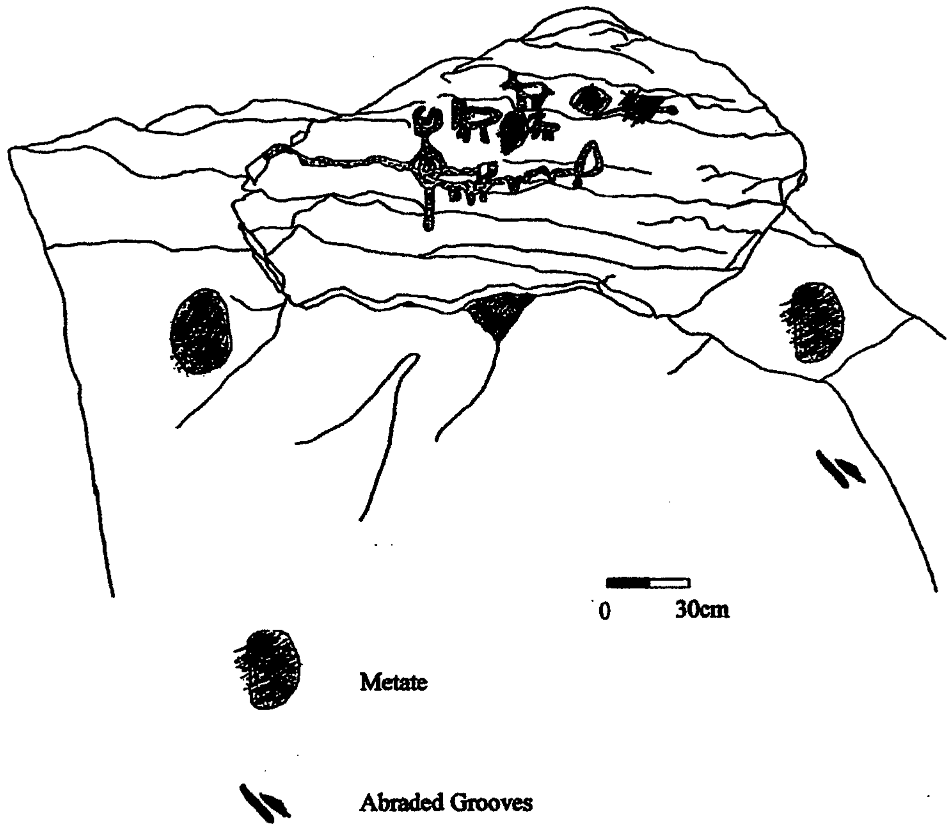


Figure 49: Panel 5 at 5LA6575.

beneath a milling surface to the upper right side of the panel. This figure is a linear element terminating in a deeply pecked cupule. An abraded area covers the mid-section of this figure.

Eligibility Recommendation

Even though there are a lack of deposits in the rockshelter, this site, placed in its broader settlement system, can address at least three research domains and therefore is considered eligible for the National Register. Site 5LA6575 represents a unique site type in the area. Fieldwork there has revealed an extensive array of metates, abrading grooves, grinding slicks, and rock art highly localized within a single rockshelter. The site has the highest density of metates than any other site within Welsh Canyon.

The presence of metates and grinding slicks makes this site suitable for addressing questions regarding the research domain of subsistence-settlement. The high frequency of metates within such a confined area necessitates explanation. It seems possible that some of these metates may have been used for purposes other than grinding such as parching seeds, or even to partially bake or dry out prepared cakes of flour and water. Furthermore, questions regarding the research domain of paleoenvironment can be addressed if the plants that were processed in these metates can be determined.

While not a stated research domain, the presence of rock art on Panels 1, 2, and 5 indicate the potential for the site to address questions of ideology and cosmology. Abstract designs and animal figures are common themes represented at this site. More detailed information of this rock art and others like it can lead to a better understanding of the world view of the ancient inhabitants of the PCMS.

Finally, the site is in immediate need of protection from vandals. Several instances of graffiti have been documented. One of these (CL PATT 3-27 87) may be quite recent. Additional incidents of graffiti could impair our ability to address the research domains discussed above.

CHAPTER VII: 5LA6576

Site 5LA6576 is an open air site located on the eastern side of Welsh Canyon near its headwater (Figure 50a-b). The site consists of several slab wall structures and lithic debris scattered along the top of the canyon in an area measuring approximately 210 x 135 m (Figure 51). Site elevation is 1521 m (4990 ft) above sea level. The nearest source of water is an unnamed tributary of Welsh Canyon located approximately 60 m down slope.

At least five structures were identified from surface remains. The good preservation of the structures and evidence of some deposition in the rooms are enough evidence to qualify the site for the National Register, hence no subsurface testing was conducted. Field work consisted of preparing the site map and scaled drawings of each structure and its relation to the surrounding topography.

Kalasz (1989) has carried out a detailed classification of architectural remains at the PCMS. In this work, structural remains can be divided into six classes of architectural remains that include: cliff edge placement structure; stone alignments; concentric structures; spaced rock wall units; contiguous rock wall, isolated units; and contiguous rock walls, agglutinated units. Most of these kinds of structures date to the Ceramic Stage (A.D. 200 to 1750), but some rather simple rock alignments may have earlier dates.

Structure 1 is located 20 m southwest of the site datum. It is situated next to a low ridge on top of the canyon rim. The structure consists of one large room to the northeast (Figure 52). Soil is eroding down slope and there does not seem to be much cultural deposition within the structure. The rocks visible on the surface within the large room block are difficult to interpret. They may be internal dividing walls delineating as many as three rooms, or they may be wall fall from the outside walls of a single large structure. Another possibility is that there are two spatially separate stone rings with some wall fall between them.

For the sake of description, the large room block is interpreted as having two contiguous rooms. Both rooms are somewhat rectangular. The larger of these measures approximately 6.5 x 6 m and the smaller one is 5 x 4 m. The two rooms combine to form a single structure measuring approximately 10 x 6 m (exterior dimensions). The walls may have been composed of upright slabs of uncut tabular sandstone: approximately seven of these are still apparent. According to Kalasz (1989), the two rooms of Structure 1 would fall into his Class VI or continuous rock wall, agglutinated units.

A small room is located just off the northeast corner of the larger room block. It is a small circular structure measuring approximately 4 m in diameter (Figure 53a). There were no extant upright slabs in the walls making up this structure. According to the Kalasz (1989) classification, this room is actually a separate Class V unit or contiguous rock wall, isolated unit.

Figure 50a: Site 5LA6576, general site view taken facing northwest.

Figure 50b: Site 5LA6576, general site view taken facing northeast.

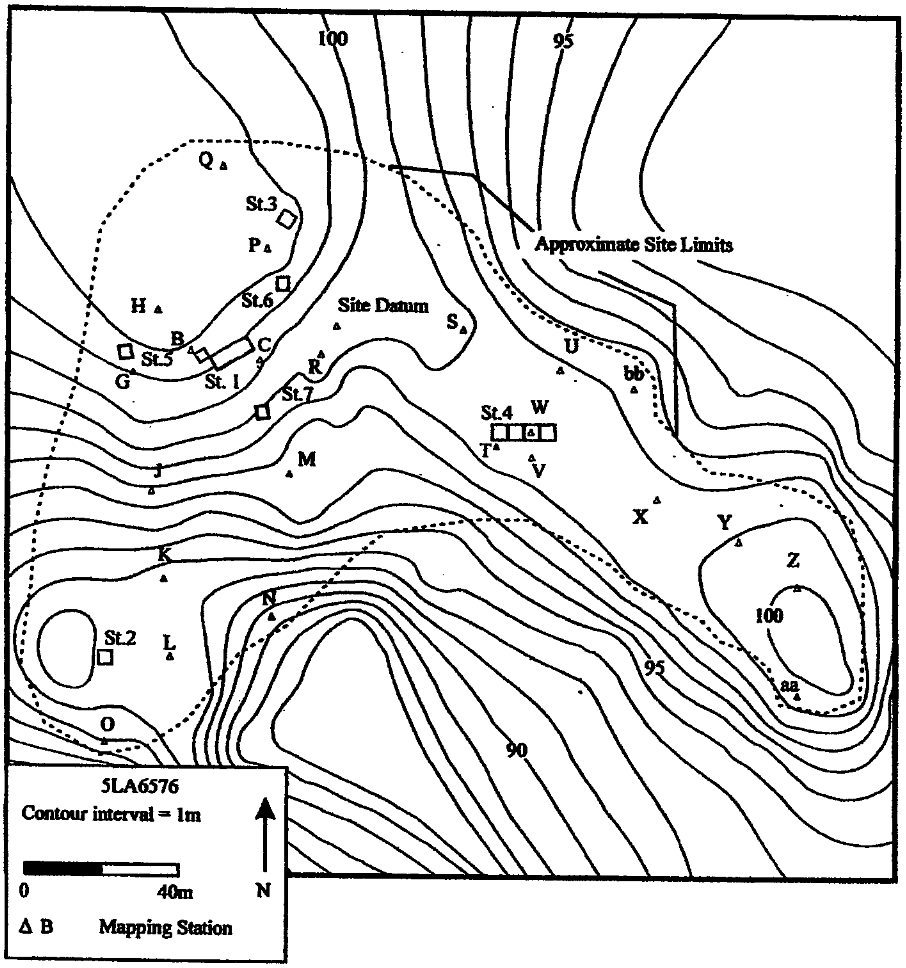


Figure 51: General site map of 5LA6576.

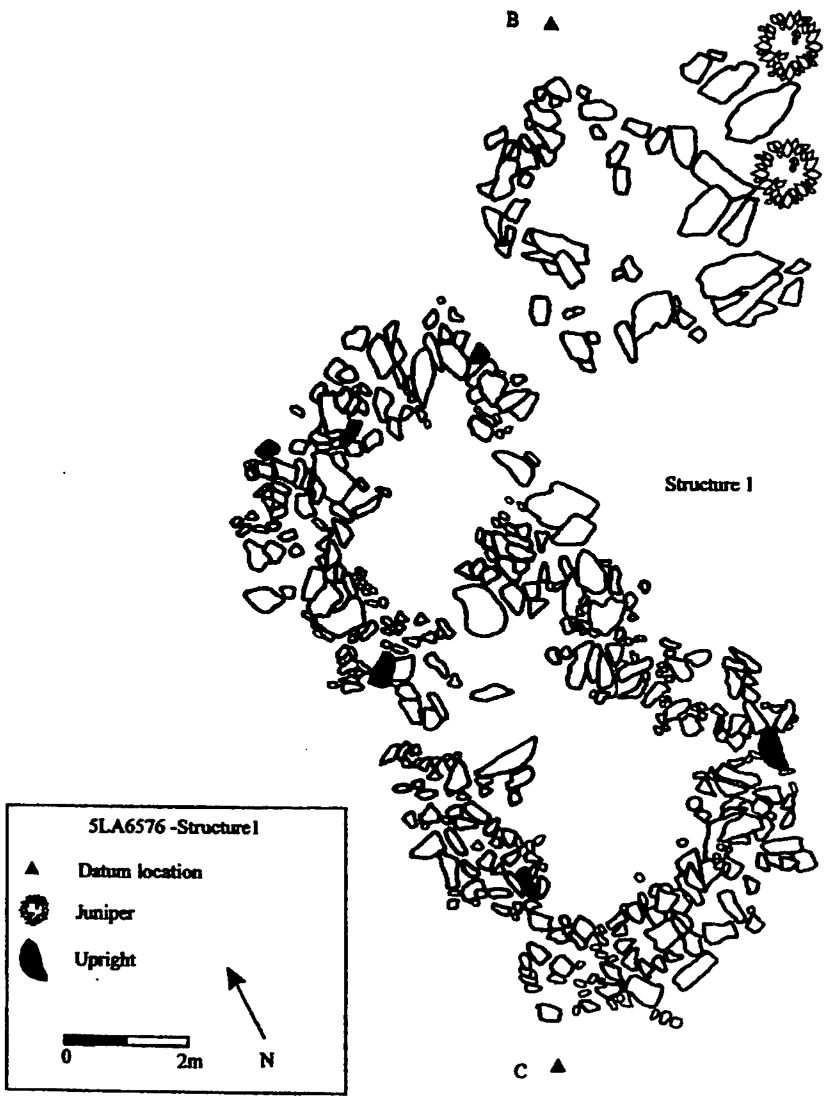


Figure 52: Structure 1 at 5LA6576.

Figure 53a: Site 5LA6576, Structure 1taken facing southwest. Note large rocks in foreground that make up the walls of the small room on northwest corner of room block.

Figure 53b: Site 5LA6576, Structure 4 taken facing southeast. The structure is located underneath junipers on the right.

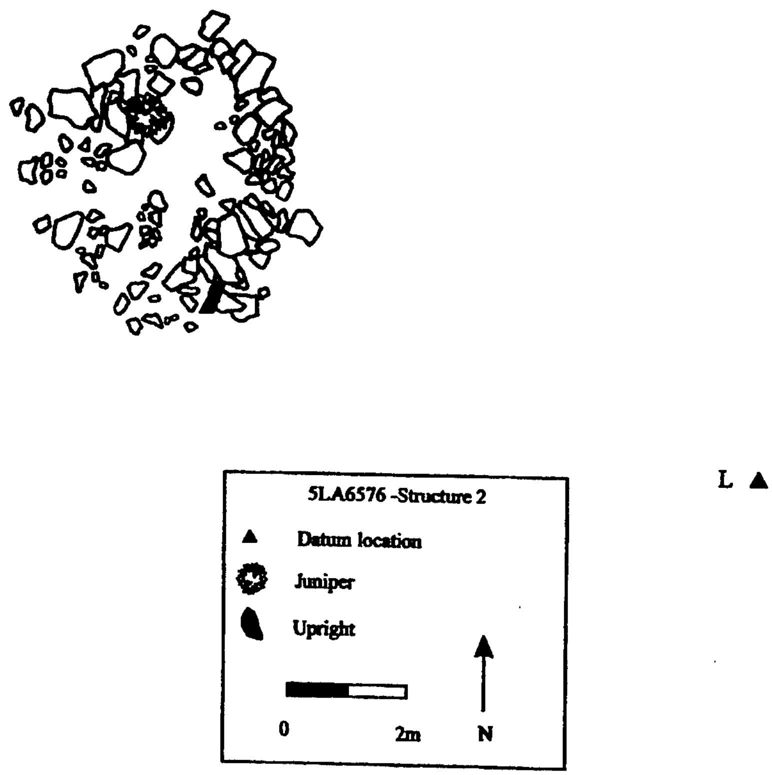


Figure 54: Site 5LA6576, Structure 2.

Structure 2 is located approximately 108 m southwest of the site datum and is situated on a small flat area surrounded on the south and west by steep washes. It consists of a small circular room with an exterior diameter of approximately 4 m (Figure 54). There were two upright slabs in the walls making up this structure. The structure is also subject to erosional processes and there appears to be little more than 20 cm of soil accumulated within the structure walls. According to the Kalasz (1989) classification, this room is a Class V unit or contiguous rock wall, isolated unit.

Structure 3 is a small stone circle located at the eastern corner of the same low ridge that Structure 1 is near. This structure is located 30 m northwest of the site datum. Structure 3 consists of a single circular room with a diameter of approximately 4 m (Figure 55). There were no extant upright slabs in the walls making up the structure. This structure is badly eroded and there is little cultural deposition reaming within its walls. According to the Kalasz (1989) classification, this room is a Class V unit or contiguous rock wall, isolated unit.

Structure 4 is located approximately 47 m southeast of the site datum and is situated on a narrow ridge that extends approximately 105 m to the southwest (Figure 53b). The structure is composed of at least four contiguous rooms and perhaps a fifth (Figure 56). Several upright, sandstone slabs are in the walls making up the structure. Room A measures 4.5 m in external diameter. Several upright slabs are found in its western wall. Room B is to the south and adjacent to Room A. At least seven more uprights are located in its south and east walls. Room C is a small room south of Room B that measures approximately 3 m in external diameter. Room D shares its northern wall with Room C. This room measures approximately 4 m in external diameter. Two upright slabs are found in its north wall, while a single upright can be found along the eastern wall of the room. Only small remnants of Room E are visible on the surface. This room is located east of Room C and may share some of its southern wall with Room D. The extant remains of this room measure approximately 3.5 m in external diameter.

Structure 4 is the best preserved of all the recorded structures of 5LA6576. The presence of about 18 upright slabs indicates that its walls are fairly well preserved. Soil accumulation within the walls is difficult to estimate without excavation or probing, but there appears to be at least 30-40 cm of cultural deposit within the individual rooms. Deeper cultural deposits are found in this structure that any other on the site. According to the Kalasz (1989) classification, the rooms of Structure 4 would fall into his Class VI or continuous rock wall, agglutinated units.

Structure 5 is a badly eroded small stone circle located approximately 55 m west southwest of the site datum. This structure is somewhat ephemeral and was difficult to delineate from its surface remains. No detail map of this structure was made during the 1996 field season. The external measurement of the structure is approximately 3 m in diameter. There are no extant upright slabs and most of the cultural deposition within this structure has been eroded away. According to the Kalasz (1989) classification, this room is a Class V unit or contiguous rock wall, isolated unit.

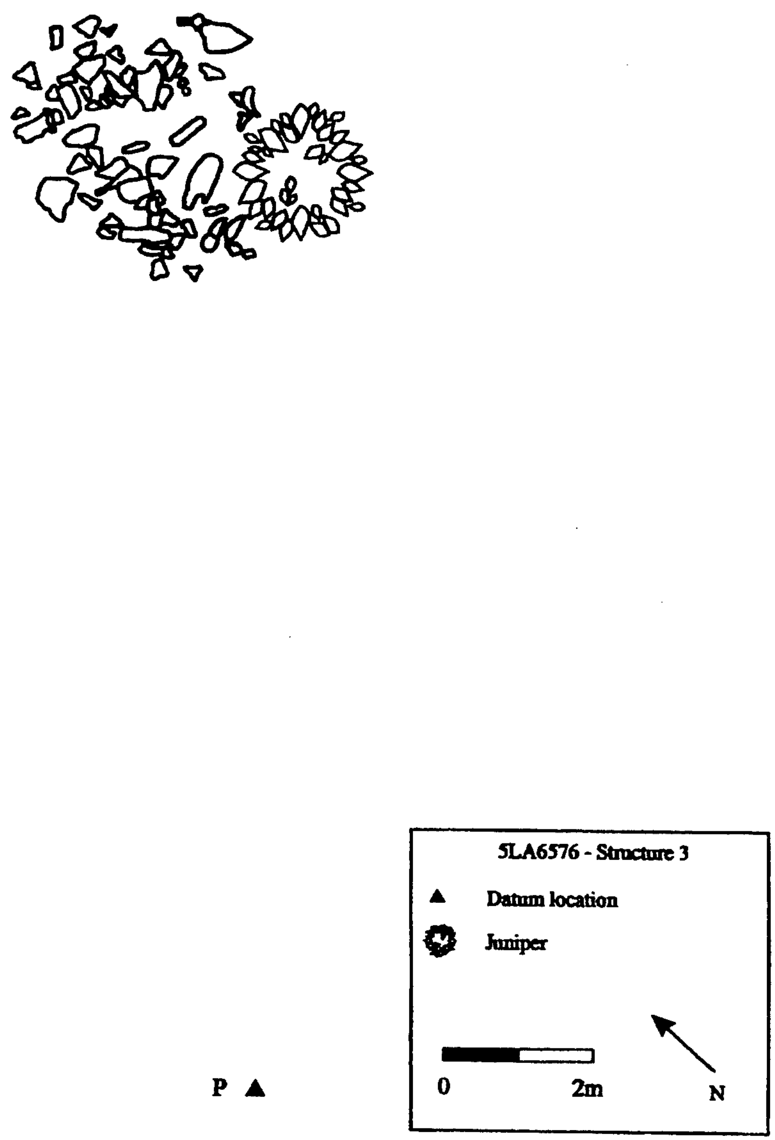


Figure 55: Site 5LA6576, Structure 3.

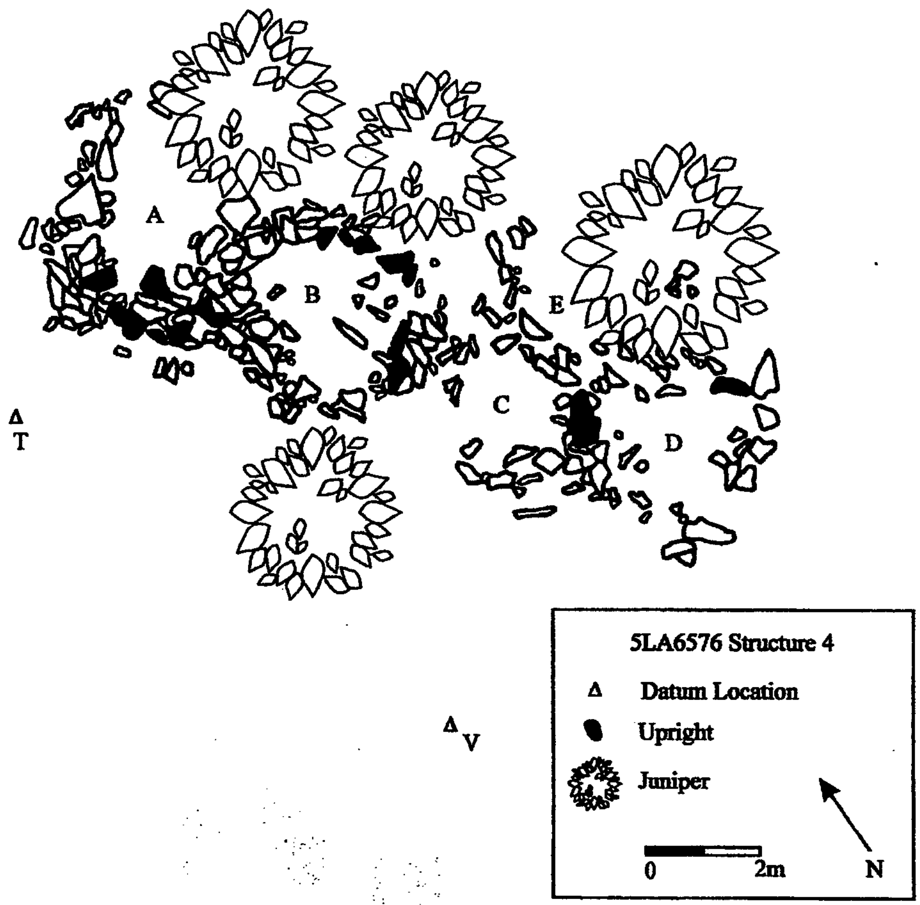


Figure 56: Site 5LA6576, Structure 4.

A possible seventh structure is located approximately 30 m to the southwest of the site datum. This particular structure was noted in the 1995 field notes as being somewhat ephemeral and difficult to delineate. It has an approximate external measurement of 3 m in diameter and was not mapped in the 1996 field season. According to the Kalasz (1989) classification, this room is a Class V unit or contiguous rock wall, isolated unit.

The structures present at 5LA6576 appear to be smaller versions of those described by Gunnerson (1989) and they likely date to the Aspishapa Focus/Period (between A.D. 750 and A.D. 1400). However, the structures described by Gunnerson tend to be large substantially built structures. One at the Cramer site has a diameter of approximately 7 to 7.6 m and is composed of large, upright slabs. These sites are also associated with bison remains. The structures at 5LA6576 are much smaller. The average size of the rooms is approximately 3.5 m in exterior diameter. The actual floor space within these structures would be considerably smaller yet. The structures described by Gunnerson are somewhat permanent and represent high cost facilities, while the structures at 5LA6576 are less substantial and likely required less effort in their construction.

A non-random sample of chipped stone debitage and diagnostic artifacts was noted during the 1995 reconnaissance of the site. Lithic scatter 1 is located approximately 20 m north of Structure 4. Lithic scatter 2 is found approximately 5 m west of Structure 2. A total of 58 flakes was recorded from the surface. In addition, one quartzite biface, two obsidian projectile point fragments, a scraper, a chopper tool, and a retouched/utilized flake were recorded from surface contexts. Two milling slabs and two ground stone fragments make up the rest of the artifact inventory recorded by the 1995 reconnaissance team.

A total of three pieces of obsidian has been recovered from the surface of 5LA6576. A fragment of an obsidian biface was recovered from the surface while mapping the site in the 1996 field season and two obsidian projectile point fragments were collected from the surface during the 1995 reconnaissance. The first specimen is a small fragment of a biface that measure 1.4 x 1.3 x 0.5 cm. The piece has snap fractures along three of its margins. One side of the artifact is somewhat flat while the other side is somewhat convex. The second piece is a thinly flaked projectile point fragment or blank. This specimen measures 2.3 x 1.7 x 0.3 cm and has breaks at the proximal and distal ends. The obsidian is light gray and very translucent. A fracture is also apparent near the lower left corner of the specimen. This fracture may actually be an attempted notch. If so, it seems likely that the piece broke during manufacture. The third obsidian piece is the small tip portion of a biface or projectile point. This specimen measures 1.0 x 1.0 x 0.2 cm. Flakes were removed entirely across one side of the artifact. The other side exhibits scars that indicate that flakes were removed only partially across the width of the artifact. None of these bifaces are complete enough to place within any of Anderson's (1989) projectile point classes. Each piece of obsidian was submitted for X-ray fluorescence and source determinations (Appendix 2). All three obsidian samples are determined to have come from the Cerro Medio source of the central part of the Jemez Mountains of New Mexico.

ELIGIBILITY RECOMMENDATIONS

Site 5LA6576 is the only known site in the upper reaches of Welsh Canyon with open air structures and may represent a dispersed Apishipa village. This type of site has great potential to yield important information about the past and it is therefore recommended as eligible for the National Register of Historic Places. Excavations conducted at some of the structures at 5LA6576 may uncover floor deposits or even trash pits. These types of deposits are excellent for the recovery of pollen, macrobotanical remains, and faunal materials. Each of these classes of data is required to complete a study of an area's paleoenvironment. Fragments of diagnostic artifacts, such as the obsidian projectile points, have been recovered from the surface of 5LA6576. Site and regional chronologies can be developed if these types of artifacts can be found associated with datable contexts such as floor surfaces or trash deposits. Data from the site can also aid in the study of subsistence-settlement. As already mentioned, floor surfaces and trash deposits are good contexts for pollen, macrobotanical, and faunal materials. The presence of structures indicates that some type of residential stability was achieved by the site's inhabitants and that 5LA6576 likely had a special function within the broader settlement system of Welsh Canyon. Finally, the presence of three pieces of obsidian has been useful in illustrating some of the possible trade relations in which the inhabitants of the site participated. Excavated deposits are likely to yield even more nonlocal raw materials such as obsidian and exotic cherts.

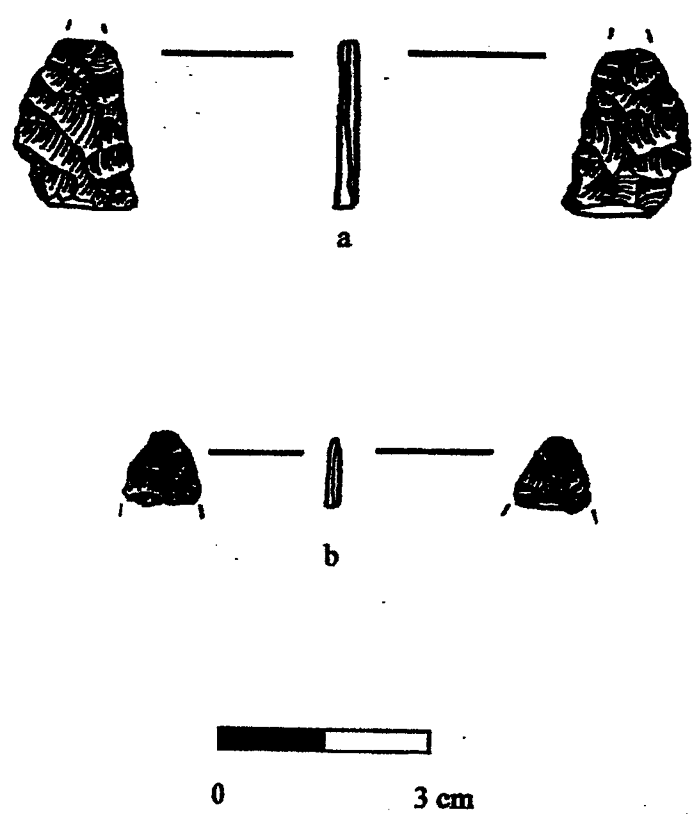


Figure 57: Obsidian bifaces from 5LA6576.

CHAPTER VIII: 5LA6592

Site 5LA6592 is a rockshelter located on the southern side of a large tributary of Welsh Canyon (Figure 58a-b). The site elevation is approximately 1481 m (4860 ft) above sea level. An unnamed, intermittent, tributary of Welsh Canyon is located approximately 100 m down slope from the site. The site is located in the cliff face overlooking a historic period pond (5LA6602).

Two rockshelters make up the site, but only Shelter 1 received subsurface evaluative testing (Figure 59). Shelter 2 is better classified as a low overhang and has little deposition. Shelter 1 has an opening of approximately 8 m and the maximum distance from the back of the shelter to the drip line measures approximately 4 m (Figure 60). The shelter ceiling is approximately 2.5 m above the shelter floor near the center of the shelter. A stone enclosing wall is found near the southwestern edge of the shelter floor and extends nearly 3 m from the cliff edge. The northern most stone of the wall is set in an upright position. Another upright stone is situated in the central portion of the shelter floor near the drip line.

A rather large scatter of artifacts is found at the mouth of Shelter 1 and extends down the talus slope approximately 25 m from the back of the shelter. The site size, as indicated by the extent of the surface lithic scatter, measures approximately 43 x 27 m. These artifacts were recorded in the 1995 reconnaissance and the chipped stone debitage and tools are summarized in Table 8.1.

Numerous abraded grooves and bedrock metates are located on a low sandstone shelf toward the back of the shelter. The metates are concentrated near the southwest part of the shelter just above the stone enclosing wall, while the abraded grooves are concentrated at the western edge of the shelter. The 1995 reconnaissance team recorded the presence of five bedrock metates in the ledge at the back of the shelter (Figure 61). All the metates are unshaped, shallow, basin metates worked into the yellowish sandstone bedrock that makes up the parent material of the rockshelter. Metate A measures 21 x 15 cm and is 2 cm deep. It is oval and exhibits pitting/pecking along the edges. Use wear is light and no striations are visible. Metate B measures 21 x 13 cm and is 3 cm deep. It is oval and has moderate use wear. No evidence of pitting/pecking or striations was visible. Metate C measures 19 x 12.5 cm and is 1.5 cm deep. It is rectangular and longitudinal striations are visible. Metate D measures 22 x 23.5 cm and is 3 cm deep. It is circular with longitudinal and transverse striations. Pitting/pecking is visible on the edges of the metate and use wear is moderate. Metate E measures 20 x 13 cm and is 3 cm deep. It is rectangular with no visible striations. Pitting/pecking is seen on the edges of the metate and its use wear is moderate.

Five other metates and two manos were found lying on the surface of the site. Metate F is complete and measures 39 x 28 and 4 cm deep. It is oval and exhibits pitting/pecking across the entire surface. No striations are visible and its use wear is light. Metate G is complete and measures 37 x 25 cm. It is rectangular and has pitting/pecking over its entire surface. No striations are visible and its use wear is moderate. Metate H is complete and

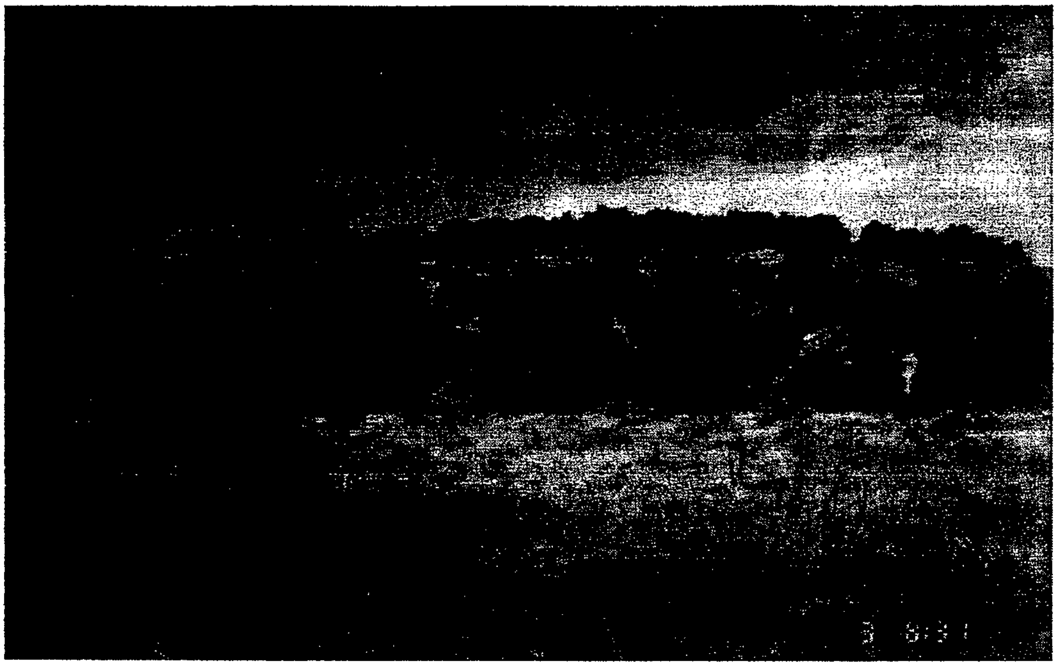


Figure 58a: Site 5LA6592, general view of site taken facing southwest.

Figure 58b: Site 5LA6592, view of Shelter 1, taken near site datum facing southwest.

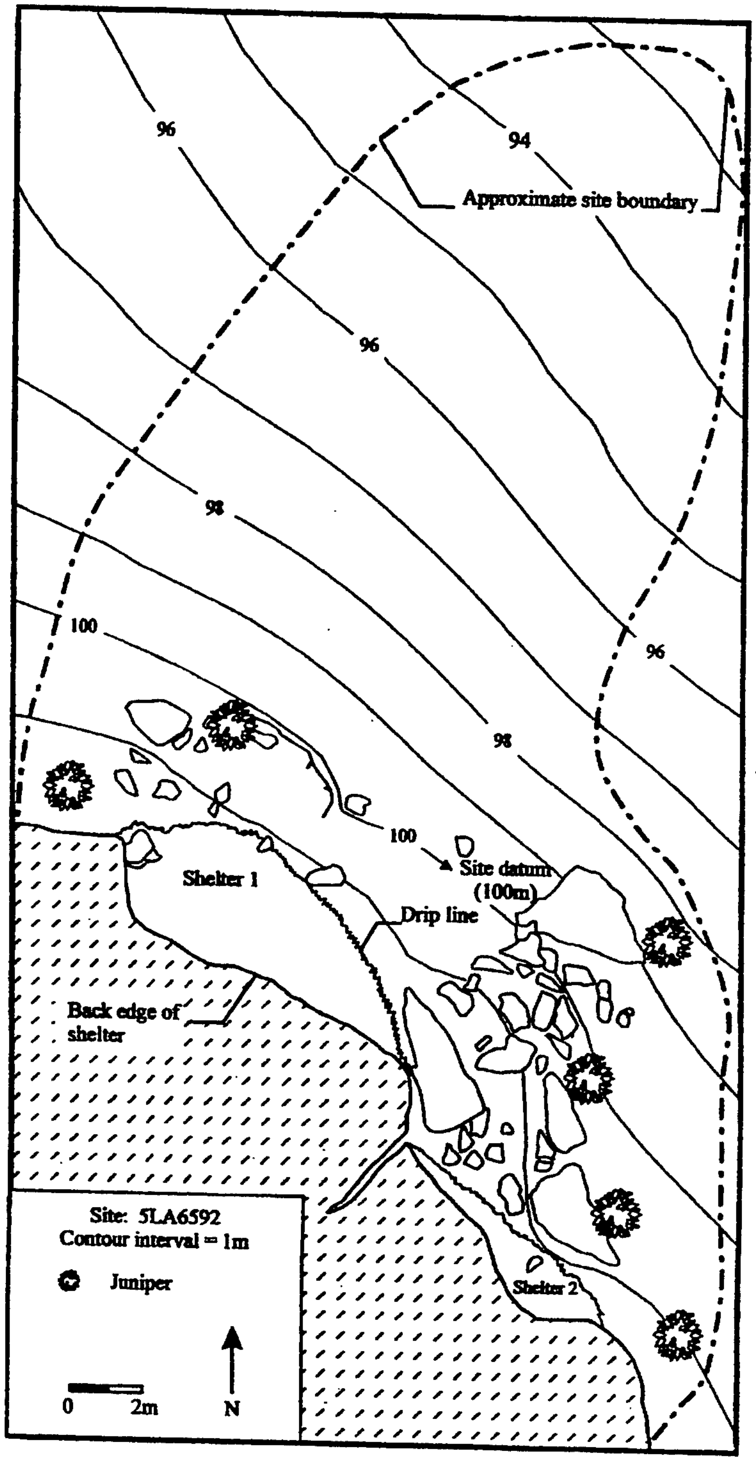


Figure 59: General site map of 5LA6592.

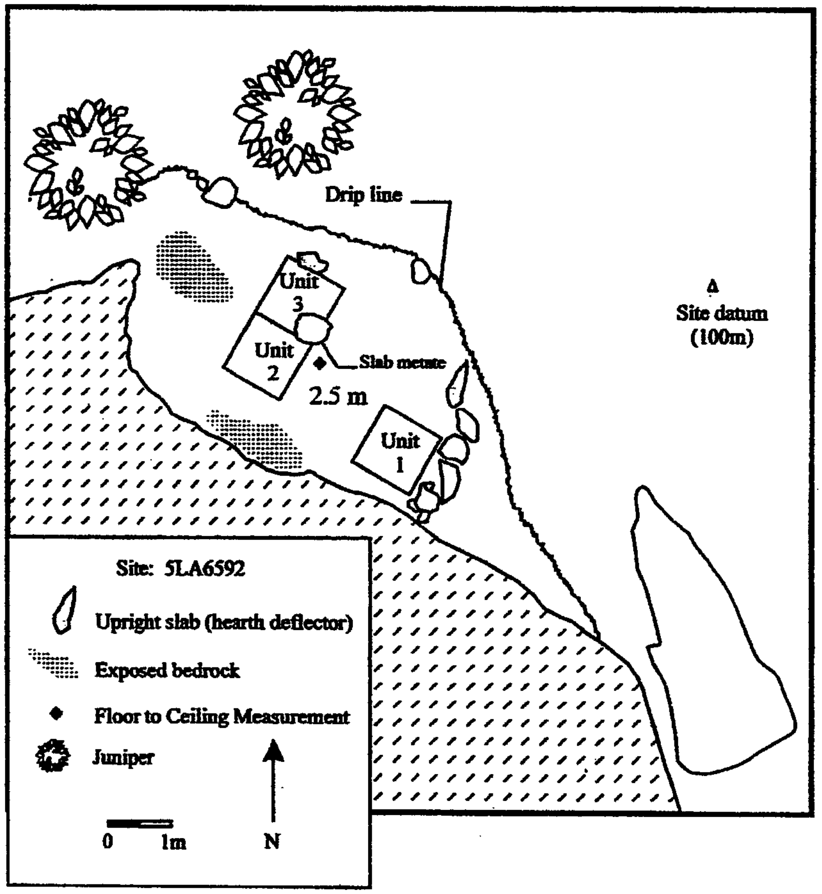


Figure 60: Site 5LA6592, Shelter 1, Units 1-3.

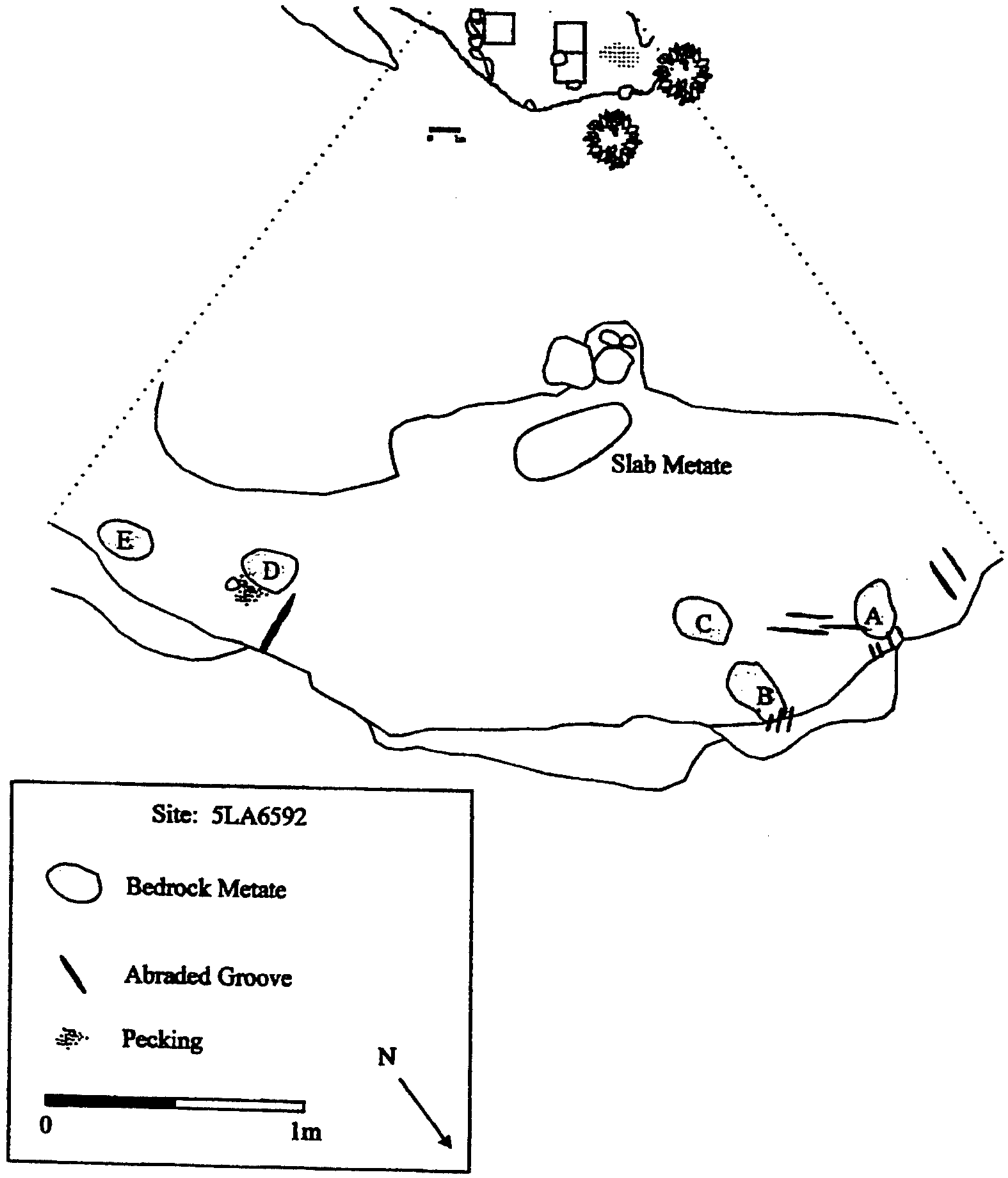


Figure 61: Site 5LA6592, bedrock metates and tool grooves in Shelter 1.

measures 43 x 33 cm. It is rectangular and has no visible striations. This metate exhibits central pitting/pecking and its use wear is heavy. Metate I is broken, but greater than 50% remains. It measures 33 x 28 and is rectangular. There are no striations visible and pitting/pecking is seen in the central portion of the metate. Its use wear is moderate. Metate J is complete and measures 27 x 15 cm. It is rectangular with transverse striations visible. Pitting/pecking is seen on the edges of the ground surface and its use wear is light.

Table 8.1. Summary of Chipped Stone Debitage and Tools From 5LA6592 Recorded in the 1995 Reconnaissance.

Artifact Type	Material	Quantity
Primary Flake	Quartzite	3
Primary Flake	Argillite	1
Secondary Flake	Quartzite	24
Secondary Flake	Argillite	2
Tertiary Flake	Quartzite	5
Tertiary Flake	Chalcedony	1
Tertiary Flake	Chert	2
Retouched Flake	Argillite	1
Biface	Quartzite	2
Biface (projectile point)	Quartzite	1
Core/Tested Cobble	Quartzite	4

Mano A is complete and has a single grinding surface. This surface measures 7.5 x 6.5 cm and is oval. There are no visible striations, but pitting/pecking is seen in the central portion of the grinding surface. Its use wear is moderate. Mano B is broken, but greater than 50% remains. This mano has two grinding surfaces. The first surface measures 9 x 10 cm The second surface measures 9.5 x 7 cm. Both surfaces are oval. No striations are visible and the piece exhibits pitting/pecking across the entire surface. Its use wear is heavy.

A pair of matched shaft abraders or shaft straighteners were found during the 1995 reconnaissance of the site. Matched pieces of shaft abraders such as these are uncommon. They were both found on a ledge at the back of the shelter at an angle of 250 degrees and 8.5 m from the site datum. The first shaft abrader weighs 119.3 g, is rectangular, and measures

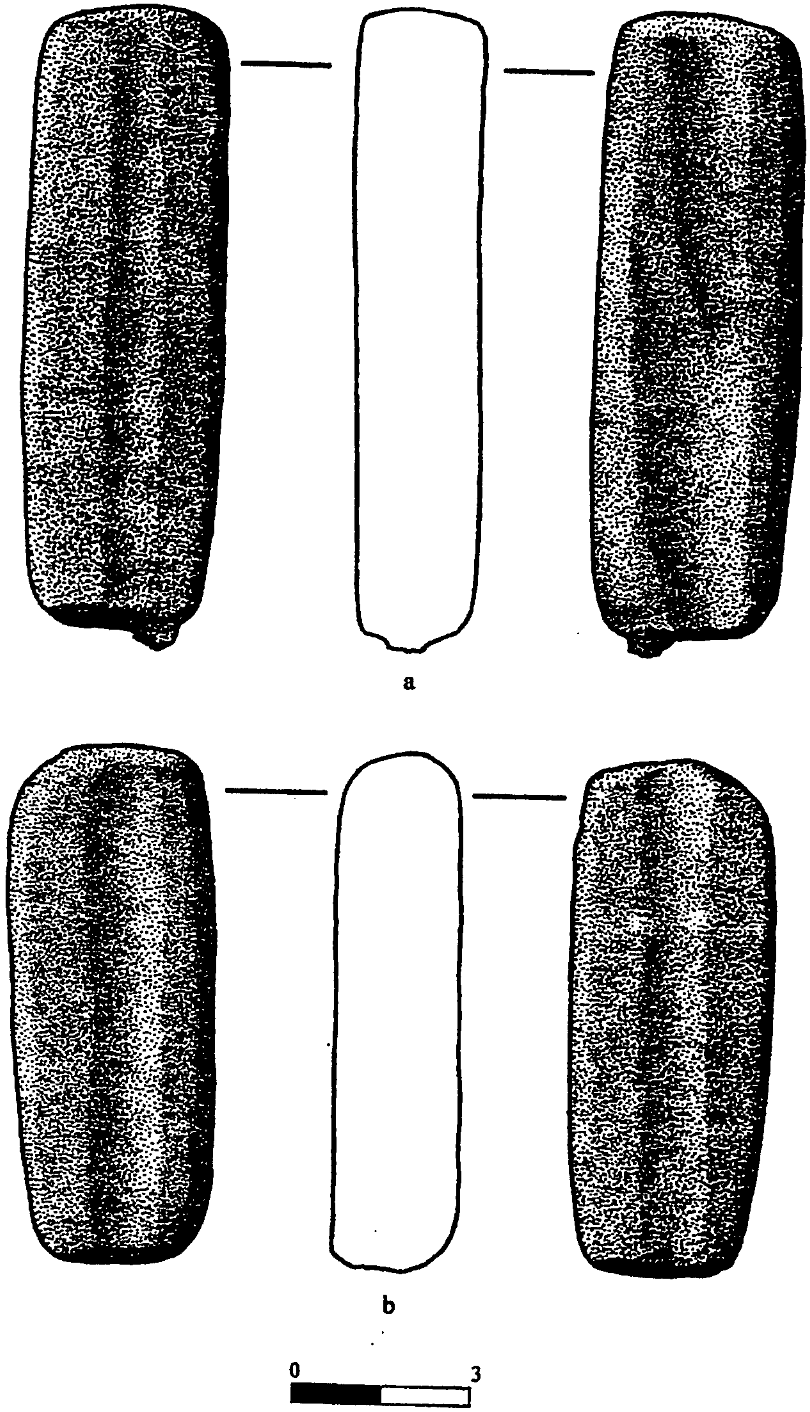


Figure 62: Pair of shaft abraders found on ledge at back of Shelter 1 at 5LA6592.

10.2 x 3.4 cm and is 2.1 cm thick (Figure 62a). This piece has at least two abrading grooves, one on each side. Both grooves are 9.9 cm long; however, the wider groove measures 1.4 cm and appears to have two distinct grooves, one superimposed upon the other. The narrower groove on the other side of the abrader measures 0.9 cm. Some burning is apparent on the side with the wider groove and, unfortunately, no striations could be discerned in the grooved areas.

The second shaft abrader is made from a coarse sandstone (Figure 62b). It measures 8.7 x 3.4 cm and is 2.1 cm thick. The artifact weighs 94.7 g and has two grinding surfaces. The piece is somewhat rectangular, but with rounded corners. The first groove measures 7.2 x 1.0 cm, while the other is slightly longer 8.4 x 10 cm. No striations can be seen in either groove, but their shapes indicate grinding along the long axes. There is also evidence of minor burning on this piece.

Depositional History of Units 1-3

Three 1 x 1 m units were excavated into the deposits of Shelter 1. Unit 1 was placed just west of the stone wall enclosure while Units 2 and 3 were situated in the central area of the shelter floor. Excavations reached bedrock in Units 1 and 2. Excavation of Unit 3 was halted after Level 4, at which time it was determined that enough data had been recovered to adequately assess the site's eligibility for the National Register. Apparently bedrock gently slopes from northwest to southeast since it was reached at a depth of 77 cm below present ground surface in Unit 1 but was somewhat higher (71 cm) in Unit 2. Exposed bedrock also appears just northeast of Units 2 and 3, towards the back of the shelter.

The close proximity of the test units makes it likely that all three units share similar depositional histories and they will therefore be treated together. Three depositional strata are identified (Figures 63 to 65; Table 8.2). The information on depths of the strata given in the table is derived from Units 2 and 3; however, the strata are somewhat thicker in Unit 1.

Table 8.2. List of Strata for 5LA6592 Units 1-3

Strata	Unit 1-2 Levels	Unit 3 Levels	Description
1	1	1	topsoil and mixed cultural debris
2	2-5	2-4	cultural deposits
3	6-7		mostly culturally sterile deposits

Lying directly above bedrock, Stratum 3 is composed of two or three layers of brown (10YR 6/3) pale brown silty clay, which may be degrading bedrock. Stratum 3 contained no cultural materials in Unit 2. In Unit 1, most of the artifacts found in the layers associated with Stratum 3 may have worked their way down owing to animal disturbance. Some small amounts of carbon were noted in this stratum in Unit 2.

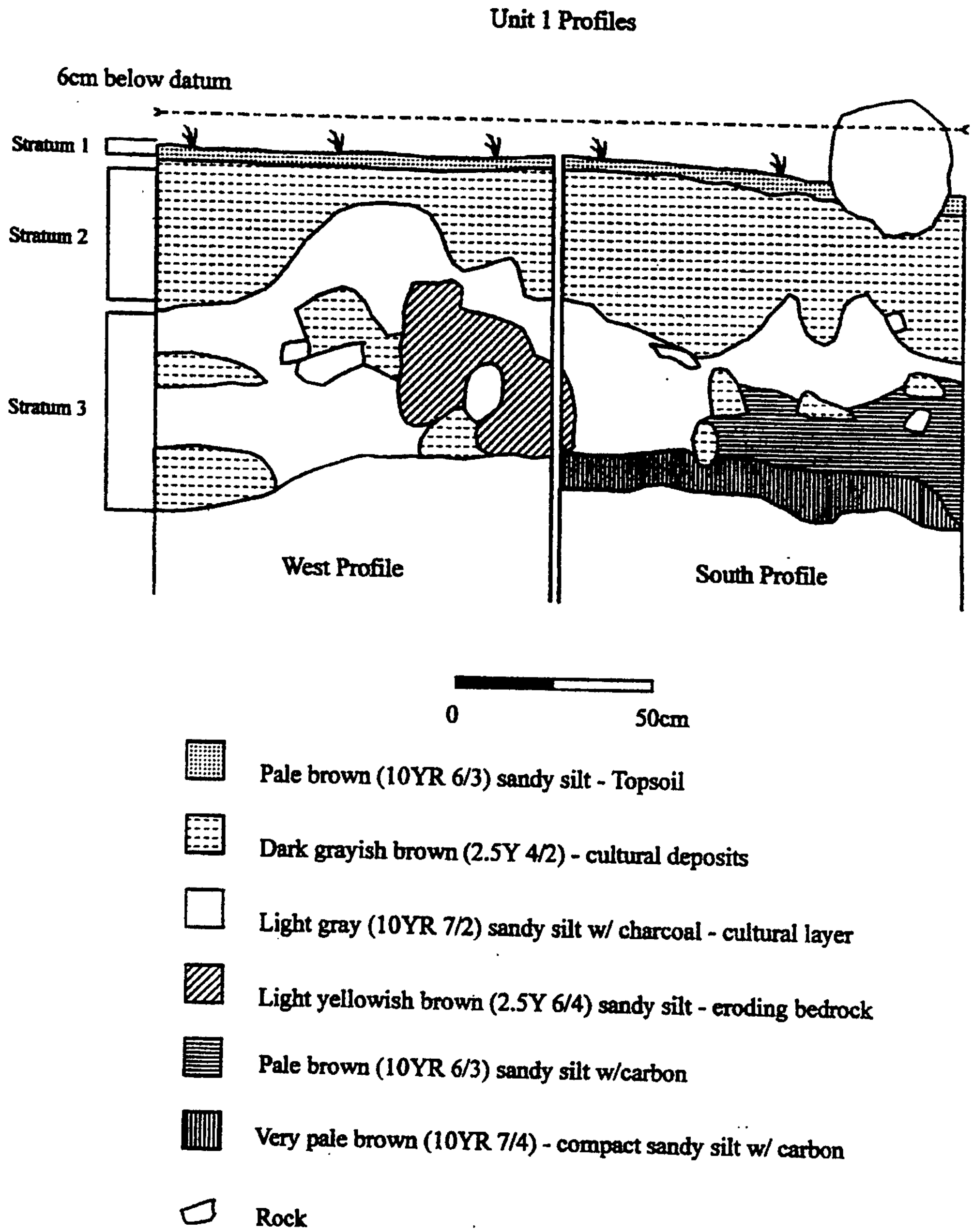


Figure 63: Site 5LA6592, Unit 1 west and south wall profiles.

Unit 2 Profiles

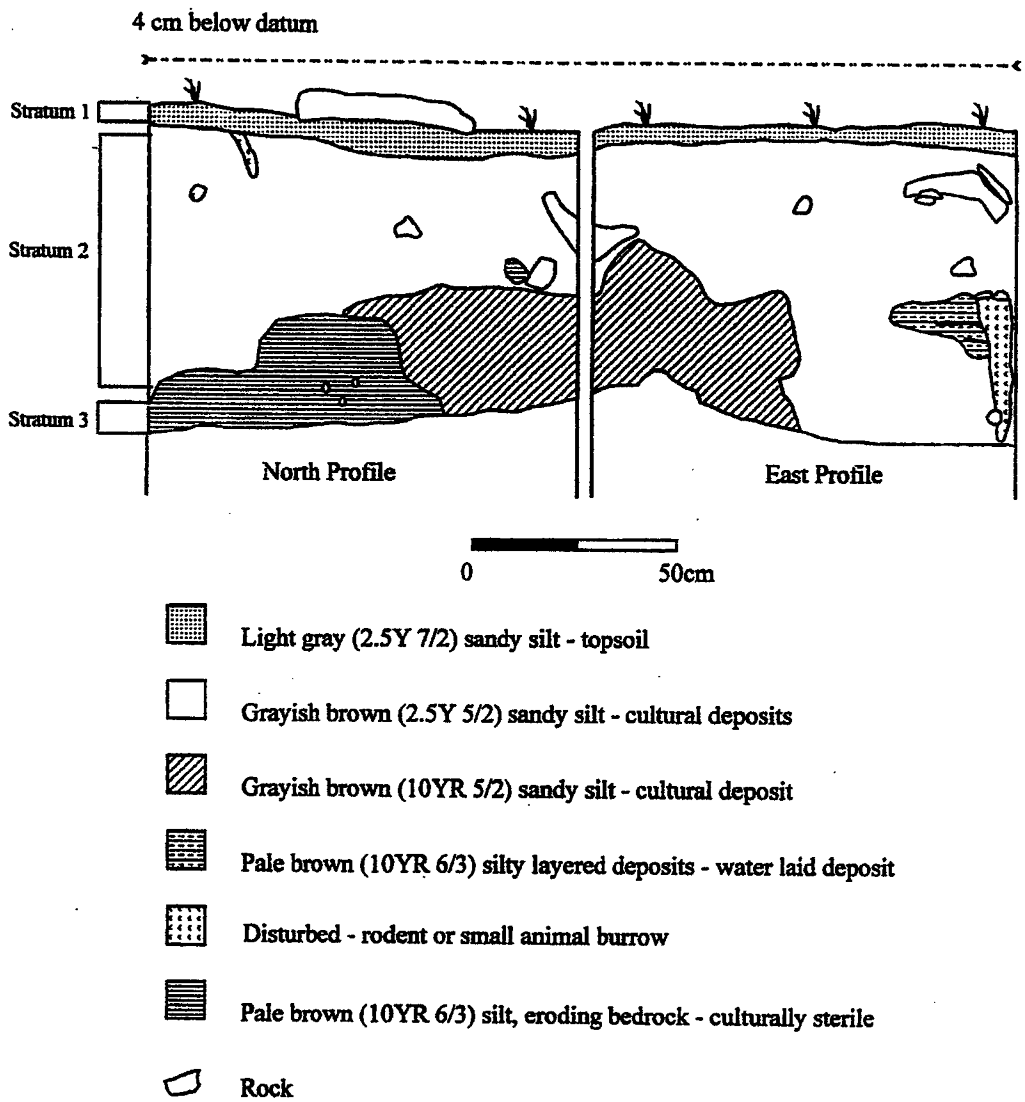
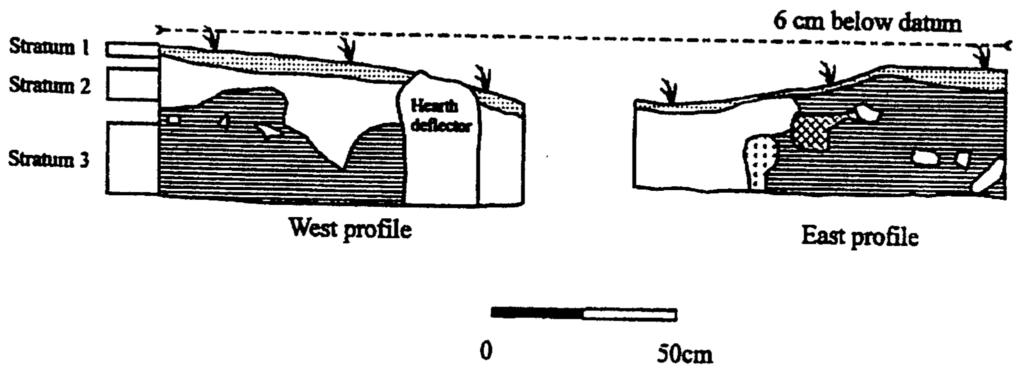


Figure 64: Site 5LA6592, Unit 2 north and east wall profiles.

Unit 3 Profiles



Light gray (2.5YR 7/2) sandy silt - topsoil

Grayish brown (10YR 5/2) sandy silt - cultural deposit

Light brownish gray (10YR 6/2) sandy silt - cultural layer

Very dark gray (10YR 3/1) silty ash w/ carbon - Feature 2

Disturbed - rodent or small animal burrow

Rock

Figure 65: Site 5LA6592, Unit 3 west and east wall profiles.

Stratum 2 is apparent in all three units. It is composed of a grayish brown (2.5Y 5/2) sandy silt soil. In Unit 1, this stratum contains patches of a dark grayish brown (2.5Y 4/2) sandy silt and a light yellowish brown (2.5Y 6/4) sandy silt. Most of the artifacts that derive from Unit 1 come from this stratum (Figure 66). Substantial amounts of fire altered rocks was also noted for Unit 1. There was a small concentration of thermally altered rocks along the northern wall of the unit found along with small patches of ashy soil and higher than normal amounts of carbon. It is possible that this debris may have been parts of a hearth located nearby, but outside of the excavated units.

In Unit 2, this stratum contains an area of grayish brown (10YR 5/2) sandy silt. Also seen in the east profile of the Unit is a small area of pale brown (10YR 5/2) silty layered deposits situated right next to an animal burrow. Within these layered deposits were two thin lenses of dark ash.

In Unit 3, Stratum 2 contained two thermal features or hearths (Figure 67). These hearths were located near the upper part of the stratum approximately 15 cm below the present day ground surface (Figure 68a-b). Feature 1 is situated in front of a large (44 x 25 cm) sandstone deflector slab near the northwest corner of the unit. The hearth is circular with a semicircular ring of small rocks lining its edges. The rocks do not extend to the southern edge of the hearth. This may be the result of erosional processes or these rocks may have been accidentally removed during excavation. The outside diameter of the hearth measures approximately 35 cm. The hearth fill was composed of a very dark gray (10YR 3/1) silty sand with ash and charcoal. A small mano was found on the east side of the hearth in the ashy fill. Feature 2 is located approximately 30 cm to the east southeast of Feature 1. It is another hearth that extends part way into the eastern wall of the Unit. Excavations uncovered perhaps slightly more than half of the entire hearth. The visible portion of the hearth measures approximately 30 cm in diameter. Thermally altered rocks are found throughout the fill of the hearth and two or three of these may be lining its edges, but there does not appear to be a circular ring of rocks around the hearth as with Feature 1. The hearth fill is the same very dark gray (10YR 3/1) silty sand with ash and charcoal as seen in Feature 1.

Stratum 1 is the uppermost and most recently laid deposits. It is comprised of a loosely packed, light gray (2.5Y 7/2) sandy silt. This stratum is a mixture of degrading cultural deposits from Stratum 2 and natural aeolian deposits. This stratum is disturbed and mixed from recent pedestrian traffic and animal activities.

Radiocarbon Dates

Two radiocarbon dates were run on samples from 5LA6592. The first date comes from a carbon sample taken from Feature 2 of Unit 3. This sample yielded a date of 880 ± 60 B.P. (Beta-100209; wood charcoal; $^{13/12}C$ -24.4 $^{0}/_{00}$). The second date comes from a general sample in Level 3 of Unit 1. This sample gave a date of 1160 ± 60 B.P. (Beta-100208; wood charcoal; $^{13/12}C$ -24.0 $^{0}/_{00}$). The probability distribution of the two dates is distinctly bimodal and suggests two temporally distinct occupations during the Middle

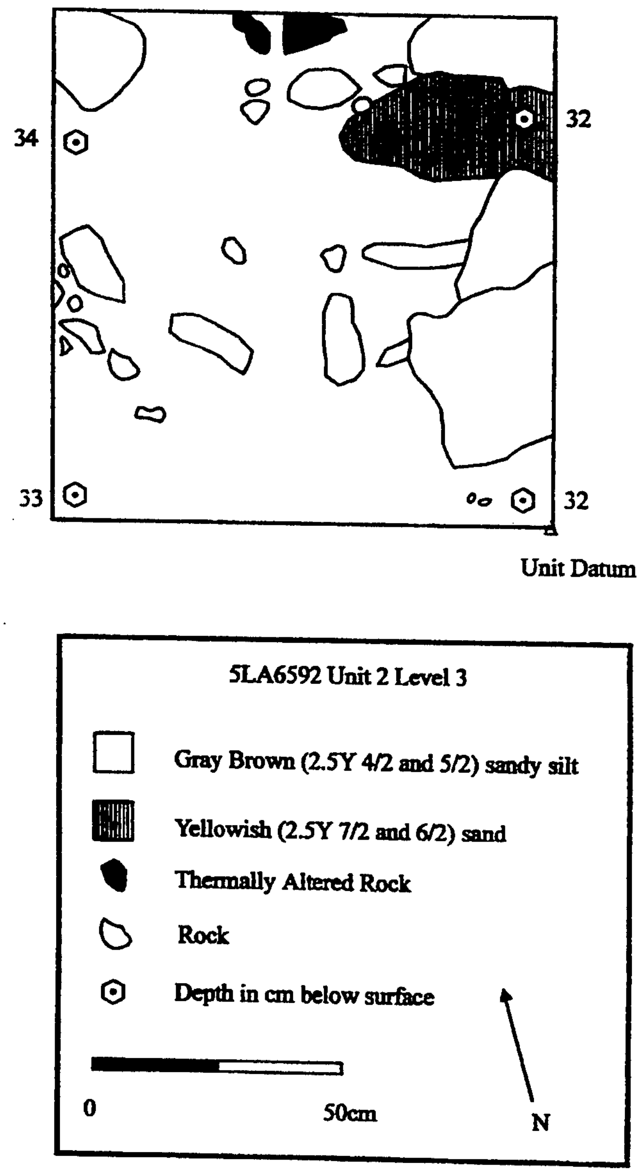


Figure 66: Site 5LA6592, Unit 2 plan view of Level 3.

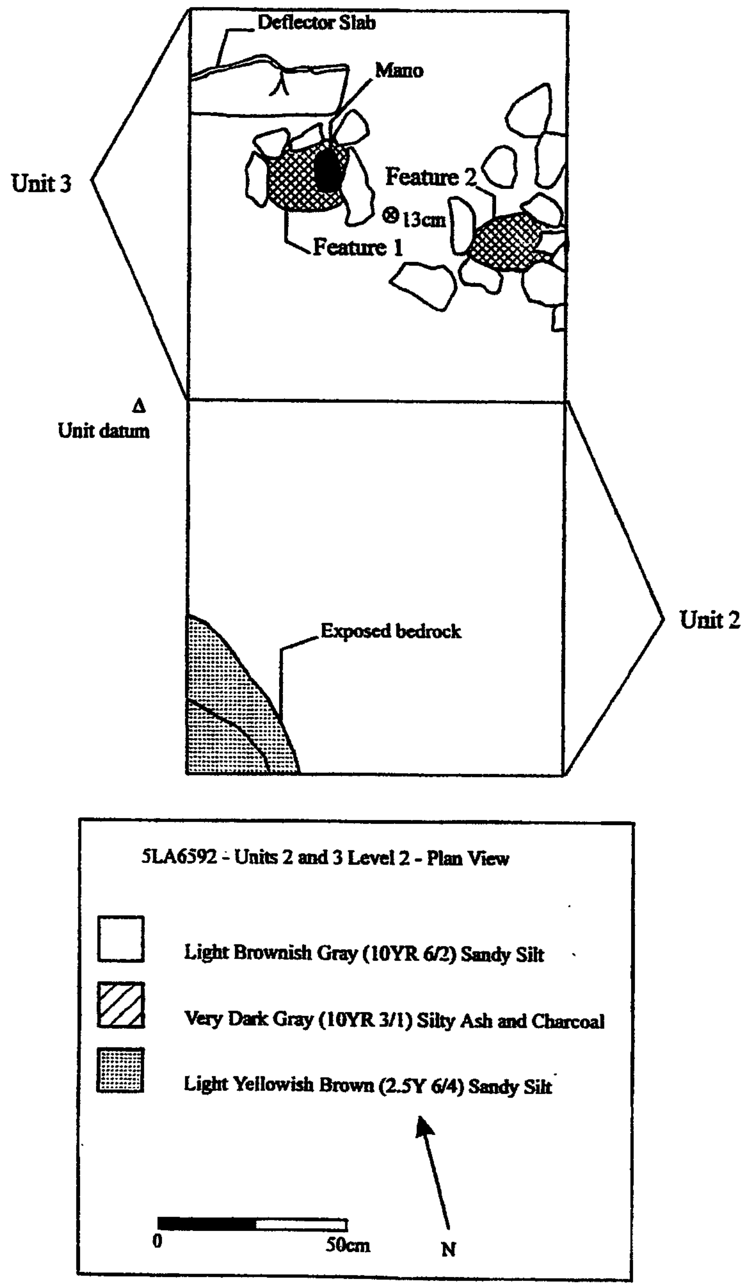


Figure 67: Site 5LA6592, Unit 2 and 3 plan view of Level 3.

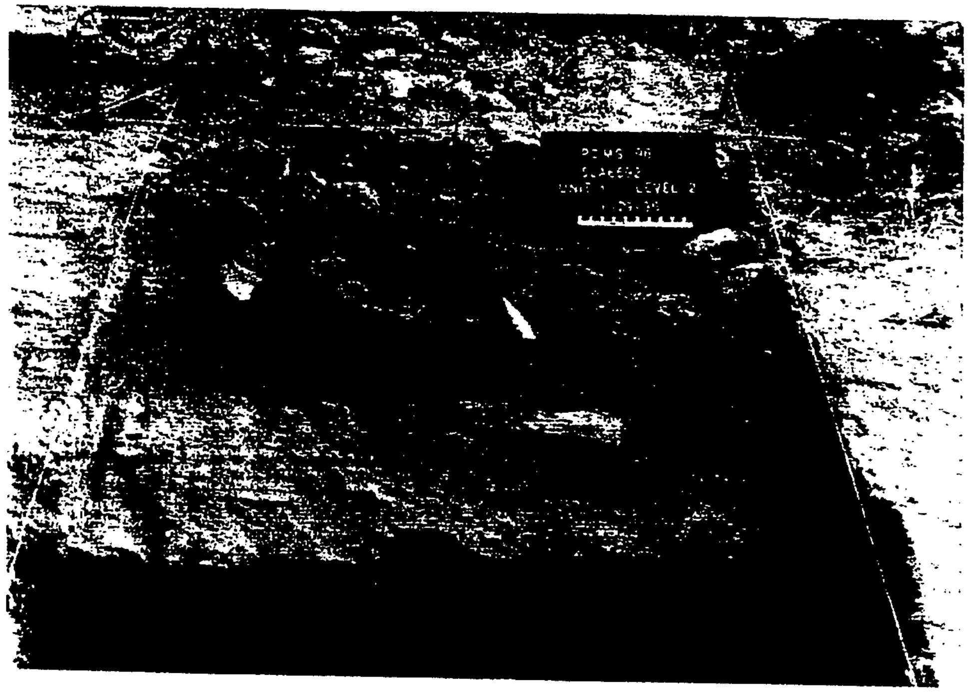


Figure 68a: Site 5LA6592, Features 1 and 2 of Unit 3, trowel points to magnetic north.

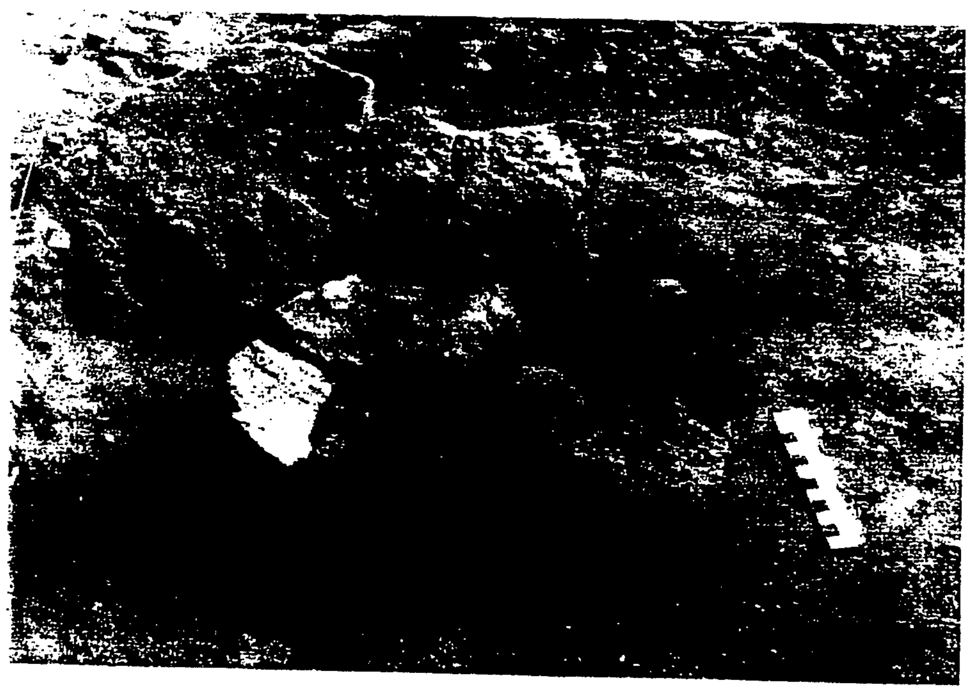


Figure 68b: Site 5LA6592, close-up of Feature 1, top of scale points to magnetic north.

Ceramic Stage (A.D. 800/1000 to A.D. 1500) (Figure 69). However, the two samples come from approximately the same level of the same stratum. Furthermore, Units 1 and 3 are only approximately 1.4 m apart, making it unlikely that both dates are correct. The projectile point found on the surface has a fairly wide date range (A.D. 600 to A.D. 1200) and could support either one of the radiocarbon dates. The 'old wood' problem (Schiffer 1987) may account for the discrepancies in the dates. If this were the case then we would expect the later date of A.D. 1180 from Unit 3 (Beta-100209) to be a more accurate estimate of the shelter's actual use. Additional support for this interpretation can be suggested based on the faunal evidence. A distally unfused *Bison bison* metapodial bone is identified from Level 2 of Unit 1. There is a chance that this bone is from the same individual found at 5LA6595 in Level 9 located at approximately 1 km up stream. As discussed below, this level has an associated radiocarbon date of around A.D. 1195. This date compares favorably with the calibrated date of A.D. 1180 from Unit 3. If the identification of the bones is accurate and the two contexts are coeval, than it appears that an occupation date for 5LA6592 ranges between approximately A.D. 1045 and 1235 and the early date of A.D. 885 from Unit 1 (Beta-100209) is the result of the 'old wood' problem.

Chipped Stone

A total of 87 pieces of chipped stone debitage was recovered from excavations at 5LA6592. Five different raw material types are represented by the chipped stone debitage (Figure 70). Quartzite (57.5%) is the most common type followed by chert (36.8%), argillite (2.3%), chalcedony (2.3%), and obsidian (1.2%). Of the entire chipped stone assemblage, 57.5% are simple flakes, 34.5% are complex flakes, 5.8% are shatter, and 2.3% are bifacial thinning flakes (Figure 71).

Size grade data indicate similar reduction strategies for quartzite and chert. Quartzite has a low small to large flake ratio of 0.8:1, which indicates a pure freehand core reduction strategy was important for that raw material. For a fine grained material, chert also has a low small to large flake ratio (4.1:1) that indicates freehand core reduction was important in generating the chert debitage. That freehand core reduction was an important lithic reduction activity at the site is supported, in part, by the high frequencies of cortical flakes recovered from excavations. Thirty-four percent of both the quartzite and chert flakes exhibit cortex. Even the surface artifacts support this interpretation. Of the 38 pieces of chipped stone debitage recorded from surface contexts, 78.9% exhibit cortex. Frequencies of argillite, chalcedony, and obsidian from excavated contexts are too low for a meaningful analysis. The piece of obsidian debitage from Unit 1 Level 4 was submitted for sourcing and it was determined to come from an unknown source (Appendix 2).

A total of six chipped stone tools was recovered from excavated contexts. These include three retouched/utilized flakes and three bifaces. A side notched projectile point was recovered from the surface by the 1995 reconnaissance team at 5.4 m directly north of the site datum (Figure 72a). This point is made of gray quartzite and measures 5.3 x 1.5 cm and is 0.5 cm thick. The specimen weighs 2.7 g and it is nearly complete except that a small

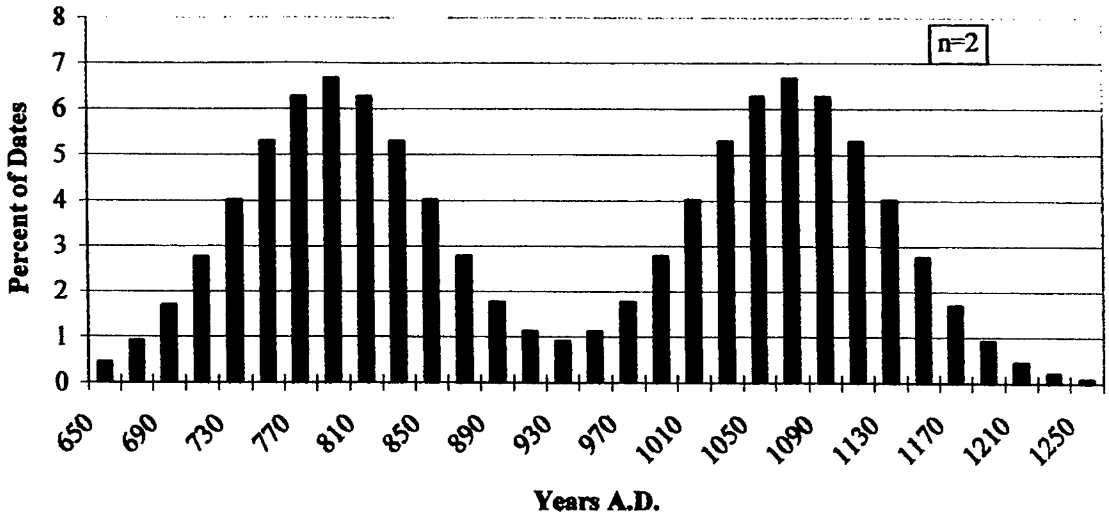


Figure 69: Site 5LA6592, probability distribution for all radiocarbon dates from site.

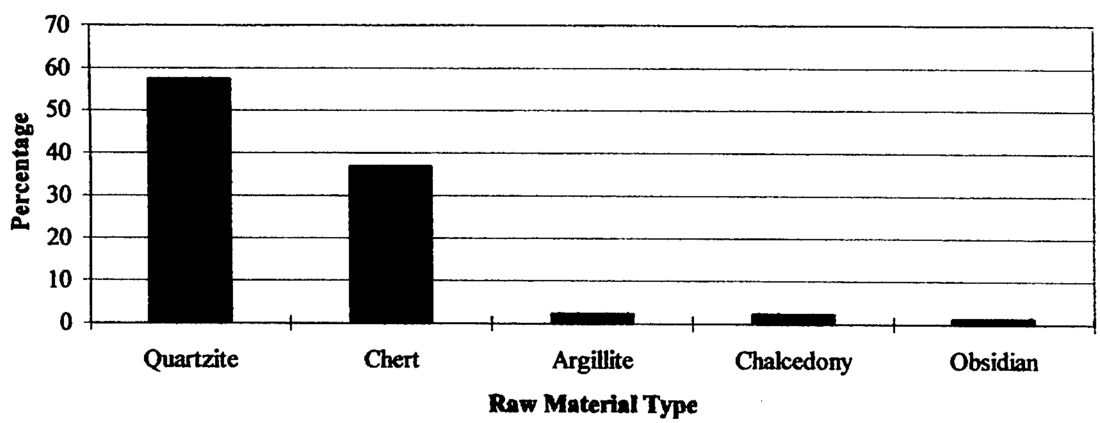


Figure 70: Bar chart of raw material types from all units at 5LA6592.

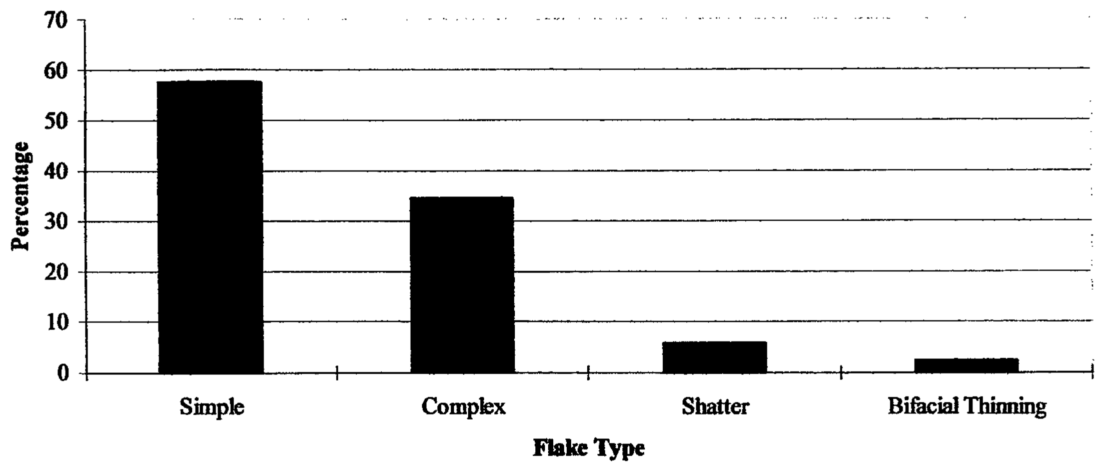


Figure 71: Bar chart of flake types for the chipped debitage from all units of 5LA6592.

portion of the base is snapped off. There is bifacial retouch along each of the margins. The blade edges are slightly convex and measure 2.6 cm. The notches are approximately 0.2 cm deep and the point's cross section is flat and elliptical. This projectile point does not seem to fit comfortably within any of the projectile point categories, but it resembles some of the projectile points in the P58 class (Anderson 1989:184-187). This type of point is not associated with any dated contexts within the PCMS. However, several of this type of projectile point have come from dated contexts outside the PCMS and most date to between A.D. 600 and A.D. 1200.

Of the three bifaces, the first comes from the wall cleaning of Unit 1. This specimen is made from a gray quartzite and measures 3.7 x 3.0 x 1.3 cm (Figure 72b). The piece weighs 12.6 g and it is irregularly shaped indicating that it is perhaps an unfinished piece.

The second biface comes from Unit 1 Level 3 and is made from a reddish quartzite that may be burned (Figure 72c). The piece has a snap fracture at the distal end, measures 3.3 x 3.1 x .8 cm, and weighs 8.2 g. The specimen may have broken during manufacture. The third biface comes from Level 2 of Unit 2 and is made from a coarse grained quartzite (Figure 72d). This specimen is also broken at the distal end (top part in illustration).

The piece measures 6.4 x 4.7 x 1.5 cm and weighs 52.5 g. The dorsal side retains a considerable amount of cortex. The transverse snap at the distal end indicates that perhaps it broke during reduction and remains unfinished.

The three retouched/utilized flakes are all made of a fine grained cherts. One fragmentary specimen comes from Level 1 of Unit 1. The piece weighs 5.1 g and measures 2.9 x 2.3 cm and is 0.8 cm thick. Retouch or use wear is seen on both of the margins. The fragmentary nature of the piece makes it difficult to assign a function.

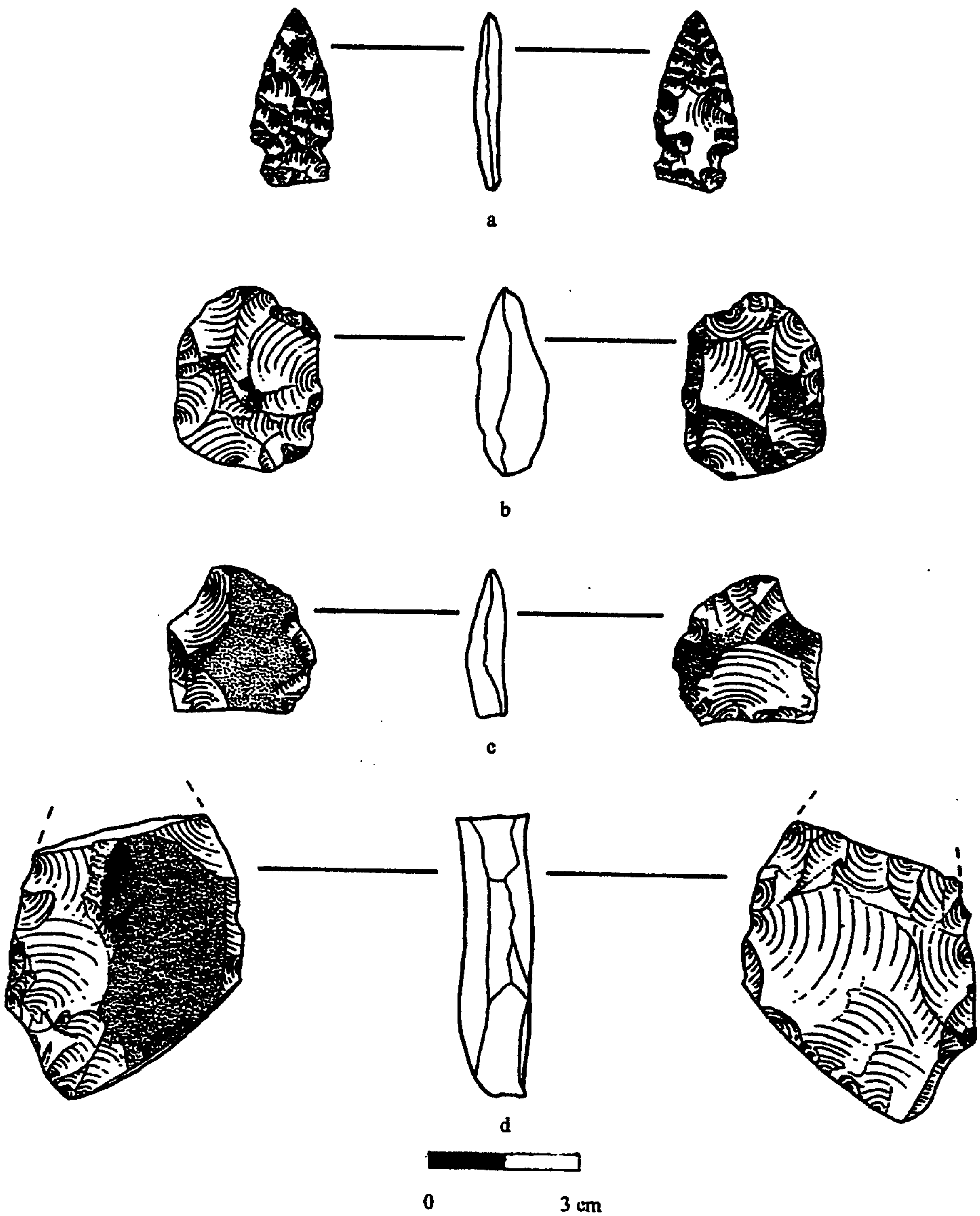


Figure 72: Chipped stone artifacts from 5LA6592.

The second retouched/utilized flake is a small specimen that comes from Level 2 of Unit 2. It measures 1.8 x 0.9 x 1.8 cm and weighs only 0.9 g. The piece is broken along three of its margins. The intact margin exhibits fine retouch. The specimen is too fragmentary to assign a function.

The final retouched/utilized flake comes from Level 5 of Unit 2. It measures 1.6 x .8 x .5 cm and weighs only .7 g. The piece exhibits retouch or use wear along its intact margin. The other margins are formed by snap fractures. The specimen is too fragmentary to assign a function.

Ground Stone

One piece of ground stone was recovered from the excavations at 5LA6592. A complete, one hand mano was found in Level 3 of Feature 1 in Unit 3 (Figure 73a). The mano is made from sandstone, has two grinding surfaces, and weighs 263.5 g. The entire piece is oval and measures 9.4 x 6.2 cm and is 3.1 cm thick. The two grinding surfaces are also oval with the first surface measuring 8.3 x 4.9 cm and the second, slightly smaller surface measuring 7.4 x 5.1 cm. Unfortunately the striations are not discernible on either surface, most likely owing to the coarseness of the raw material and the fact the object is burned. It is possible that one of the surfaces was produced after the mano had been burned.

A pollen wash and analysis was performed on the mano from Feature 1 with the intent of determining the types of materials on which the mano was used (Appendix 1). Unfortunately, the results of this analysis were inconclusive. The pollen signature from the namo was similar to the one from the control sample. Apparently, the pollen that may have been present on the mano after its use was mostly burned off, likely as a result of its being exposed to extreme heat generated by Feature 1.

Wood

A worked piece of wood was also recovered during the 1996 field season (Figure 73b). This artifact was found inserted into a small recess in the rockshelter ceiling located approximately 2.42 m above the shelter floor. The artifact measures 14.5 x 1.8 cm. The one end is broken while the other end is smoothed down on one side to form a blunt point. The worked end was inserted into the hole in the ceiling and may be fire hardened. Without additional contextual information, its function is difficult to determine, however, this piece may have served as a fire stick or a digging stick.

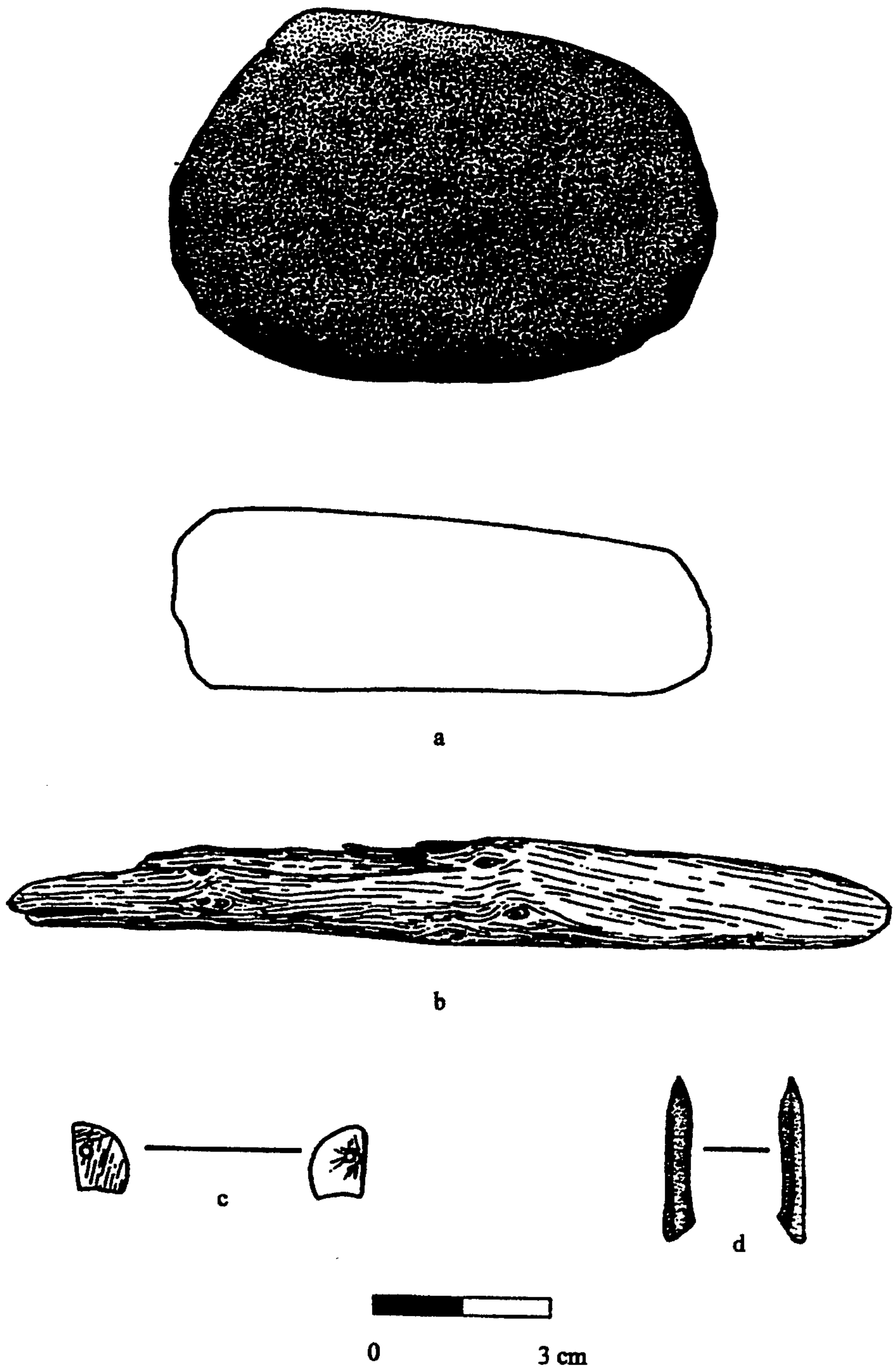


Figure 73: Ground stone, wood, shell, and bone artifacts.

Shell

5LA6592 yielded the 11 pieces of shell from eight objects representing the highest quantity of shell of all sites tested in the 1996 field season (Appendix 3). All the shell is from freshwater mollusks, more likely *Uniomerus tetralasmus*. All the shell is in poor condition, but at least four of the eight specimens appear to have been from pendants. One shell specimen shows clear evidence that it was broken during manufacture, most likely when it was being perforated. In addition, a fragment of a perforated shell pendant was recovered from Level 3 of Unit 1 (Figure 70c). This piece measures 1.1 x .9 cm and is ground and perforated. The shell assemblage indicates that shell pendant production was an activity carried out at the site.

Vertebrate Fauna

A total of 404 pieces of non-artifactual bone was recovered from excavated deposits at 5LA6592. One hundred and eighty-four of these came from dry screening and 220 came from wet screening procedures. These remains demonstrate a high proportion of cottontail and jackrabbit bones along with woodrat, cotton rat, prairie dog, and northern grasshopper mouse, among others. A distally unfused *Bison bison* metapodial bone was recovered. This element may have been exploited for its marrow content rather than its relatively low quantity of meat (Marshall and Pilgram 1991).

All three units and a single feature excavated at 5LA6592 yielded faunal remains (NISP = 404). Unit 1 contains the greatest number of materials. The first level of this unit is composed of leporids (cottontails and jackrabbits) and a high proportion of unidentified materials. The high degree of fragmentation in the unidentified bones suggests that this first level was disturbed.

However, Level 2 also yielded one of the few instances of bison bone in the entire PCMS assemblage presented here. The specimen is distally unfused *Bison bison* metapodial, which indicates a relatively young individual, as bison metapodials do not fuse until the end of the fourth year. (Duffield 1973:133). Total NISP for bison at 5LA6592 and 5LA6595 is five, and this represents no more than two individuals, and possibly only one. Andrefsky et al. (1990) report a much greater occurrence of bison than that observed at 5LA6595 and 5LA6592. Total NISP reported by Andrefsky et al. (1990:62) is "more than 20." At least nine of the 32 sites (over 28%) studied by Andrefsky et al. (1990) yielded some bison remains. Additionally, one of the prehistoric petroglyphs at 5LA5255 probably represents a bison; five bison elements were identified at the same site (Andrefsky et al 1990:277, 288-291).

Bison presents an interesting contrast to the use of small mammals at sites in southeast Colorado. Although the present analysis and that conducted by Andrefsky et al.

(1990) both conclude that the exploitation of small mammals (primarily cottontail) formed the subsistence base. large mammals such as bison may have provided a supplemental food source. Simpson (1976) concluded that bison was among the most highly exploited large mammal for the purposes of both subsistence and tool manufacture. Guthrie (1979) reported at least one bison at the Torres Cave site (5LA1310). Although Guthrie drew no conclusions about subsistence, his data appears to support the hypothesis that bison contributed only marginally to overall diet. Rather, leporids, rodents and otherwise unidentified small mammals represent the bulk of identified mammal remains.

Levels 3 through 6 yielded what may be a questionable date of AD 800-900. Various rodent genera, as well as *Sylvilagus* sp. (cottontail), prairie dog (*Cynomys* sp.), woodrat (*Neotoma* sp.), cotton rat (*Sigmodon* sp.), and the northern grasshopper mouse (*Onychomys leucogaster*) as well as otherwise unidentified heteromyid rodent are all observed in these levels. *Cynomys* sp. (prairie dog) as well as some otherwise unidentified sciurid (squirrels and allies) remains were recovered in Levels 2 through 4 in Units 2 and 3. Cotton rat and the northern grasshopper mouse were not identified at any other sites analyzed for this study. *Sigmodon* sp. (cotton rat) remains were identified from Unit 1, Level 5 and Unit 2, Level 2, while *Onychomys* cf. *leucogaster* was noted to occur in Unit 1, Level 6 (innominate) and Unit 2, Level 3 (mandible). The kangaroo rat (*Dipodomys* sp.) occurs for the first time in Unit 2, Level 3, and reappears in Level 7. This is the only occurrence of *Dipodomys* in the entire seven site faunal assemblage.

Nearly eight percent of the total faunal assemblage of Levels 3 through 6 is composed of cottontail remains. This high percentage is in part due to the numerous *Sylvilagus* remains from Level 4; most if not all of these cottontail specimens probably belonged to a single individual. Three right hind foot bones were recovered, all of which are unfused, indicating that the individual was a juvenile. Additionally, a right cottontail tibia and femur were recovered from the same provenience. This evidence suggests that the entire right hind leg may have been present at one time. No burning is apparent on any of these cottontail elements. Several of the water screened specimens display evidence of burning, however only an order-level identification could be made on a single burned small mammal calcaneus.

Two small hearths were located in Level 3 of Unit 3. This level is dated to AD 1000-1200 and adequately dates the upper deposits of Unit 2 and 3. Only one hearth (Feature 2) yielded faunal remains. Unfortunately, neither of the two bones recovered from this feature are identifiable and only one of these is burned. Some burned specimens were recovered from non-hearth contexts in Levels 2 through 4. Although most of these specimens are unidentified, a burned large mammal bone was recovered from Unit 3, Level 3 and a burned jackrabbit femur is noted in Unit 3, Level 4.

Overall, 5LA6592 had the most diverse rodent fauna of those sites yielding vertebrate fauna. Two sciurid rodents were identified: *Cynomys* sp. and *Spermophilus* sp. The remains of *Cynomys* sp. represent a total of 2.2% of the total vertebrate fauna recovered from this site. The heteromyid rodent *Dipodomys* sp. is represented by two elements, while at least three genera of the subfamily Sigmodontinae (Murid rodent family) are present: *Peromyscus* sp. (white-footed mice), *Onychomys* sp. and *Sigmodon* sp. Finally, the virtually omnipresent woodrat (*Neotoma* sp.) comprises 0.7% of the total vertebrate fauna from this site.

While several of these rodents were present at sites studied by Andrefsky et al. (1990:61), no *single* site had as diverse a rodent fauna as 5LA6592. Andrefsky et al. (1990) did recover at least three genera not observed in the present analysis: *Perognathus* sp. (Pocket mouse), *Geomys bursarius* (Plains pocket gopher), and *Tamias* sp. (Chipmunk). Therefore, the overall diversity of rodent fauna recorded by these two studies is comparable, despite the significantly greater number of identified specimens recovered by Andrefsky et al. (1990).

Four pieces of artifactual bone were also recovered from excavations at 5LA6592. All four pieces come from the upper three levels of Unit 1. Three of the pieces are bone tubes or bone beads. One of these tubes was made from the tibia of a jackrabbit (*Lepus* sp.). The tube was broken longitudinally into two pieces, and displayed evidence of polish on both ends. Additionally, one end exhibited cut marks made using a beveled implement. The other two bone tubes are of indeterminate taxonomic origin; both display polishing on the ends. A pointed bone implement, perhaps an awl (Figure 70d), measuring 2.8 x .5 cm, was recovered from Unit 1, Level 1. This piece was highly polished at the point and along the exterior of the bone.

Discussion

One of the interesting findings of the testing excavations at 5LA6592 deals with the interpretation of upright slabs in wall elements within rockshelters. It is commonly thought that these uprights represent the foundations of walls in a structure. In many reconstructions, these upright functioned to shore up poles or sticks forming a wall closing off the opening of the shelter. The upright slab noted along the northern wall of Unit 2 was initially supposed to be part of such a structural feature. However, the presence of a hearth (Feature 1) located at its base clearly indicates its use as a hearth deflector or windbreak. It is also possible that the charcoal flecks and ash seen in Unit 1 indicate that a hearth is located in the immediate vicinity of the rock alignment to the east of that unit. These data indicate that the interpretation of upright slabs and rock alignments in rockshelters as wall foundations may require some revision. It is still possible that some of these features were part of larger, more substantial walls, but consideration also needs to be given to the possibility that they functioned as windbreaks or hearth deflectors.

Eligibility Recommendation

The subsurface testing conducted at 5LA6592 has provided sufficient data to recommend that the site is eligible for the National Register. The data that were recovered from excavations can be used to address each of the four research domains of chronology, paleoenvironment, trade and exchange, and subsistence-settlement patterns. The domain of chronology can be addressed with a combination of radiocarbon dating and the presence of temporally sensitive projectile points, however, tests show these to be rare. Two radiocarbon dates have been run from carbon found at the site. It seems likely that only one of these dates is acceptable. More excavations coupled with additional radiocarbon dates may yield good associations of projectile points with datable deposits, thus aiding in the building and strengthening of the area's chronology.

With good preservation of hearths (such as Features 1 and 2), macrobotantical and faunal data can be recovered that can be useful in addressing questions regarding paleoenvironment. The presence of obsidian, although its sourcing was inconclusive, can aid in reconstructing the area's trade network. Excavations also indicate that shell pendant production was an activity carried out at the site. Although the production process was conducted on locally available shell resources, the finished products may have been used in a local or interregional trade networks.

Finally, several classes of data from 5LA6592 can be used to examine the domain of settlement-subsistence patterns. The presence of *Bison bison* at 5LA6592 indicates the utilization of a resource not commonly seen at other sites in Welsh Canyon. The high frequencies of bedrock metates and ground stone indicate that vegetal or seed processing was an important activity carried out at the site. Further excavations may more precisely reveal the functions of these ground stone implements.

Chapter IX: 5LA6595

Site 5LA6595 is an open air site located on the northern side of a small unnamed tributary of Welsh Canyon (Figure 74a-b). The site elevation is approximately 1494 m (4900 ft) above sea level. A small intermittent stream is located approximately 3 m down slope from the site datum. The site is a concentration of artifacts and dark, organically stained soil visible on the surface measuring approximately 50 x 24 m (Figure 75). The site appears to be a midden deposit located between the cliff edge and stream channel.

The 1995 reconnaissance team recorded the presence of several artifacts from the surface of the site (Table 9.1). A total of 63 pieces of chipped stone debitage was recorded from surface contexts. In addition, six retouched/utilized flakes, one biface, five cores/tested cobbles, one core tool, one metate and mano were recorded.

Table 9.1. Summary of Chipped Stone Debitage and Tools From 5LA6595 Recorded in the 1995 Reconnaissance.

Artifact Type	**Material**	**Quantity**
Primary Flake	Quartzite	3
Secondary Flake	Quartzite	48
Tertiary Flake	Quartzite	3
Tertiary Flake	Chert	4
Shatter	Quartzite	3
Shatter	Argillite	1
Shatter	Chert	1
Retouched/Utilized Flake	Quartzite	5
Retouched/Utilized Flake	Chert	1
Biface	Chert	1
Core/Tested Cobble	Quartzite	3
Core/tested Cobble	Chert	1
Core Tool	Quartzite	1
Pottery Sherd	Ceramic	1
Metate Fragment	Sandstone	1
Mano Fragment	Sandstone	2

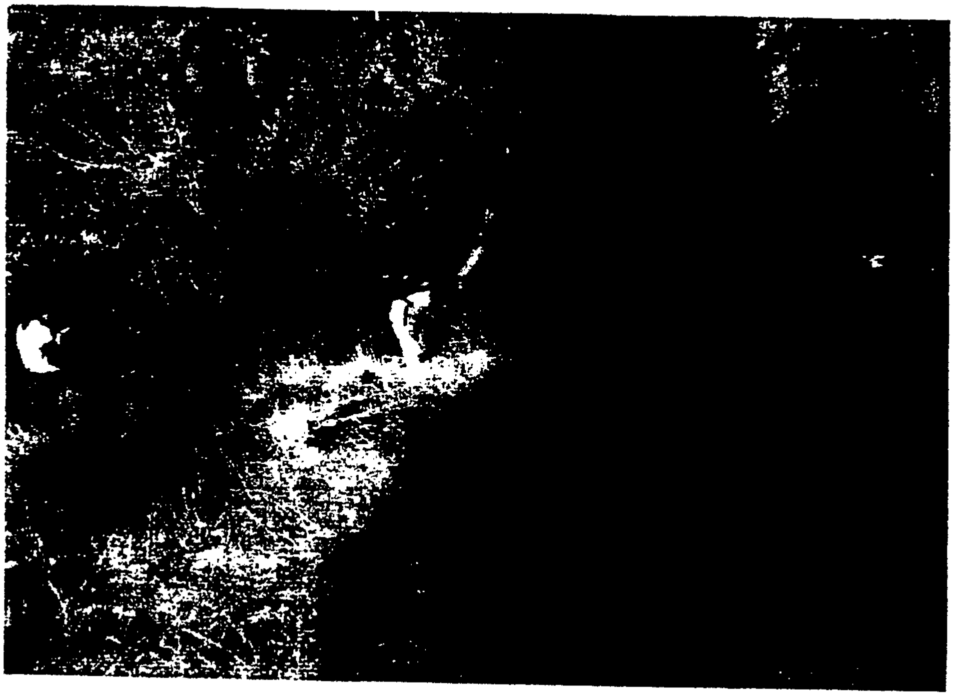


Figure 74a: Site 5LA6595, general view of the site taken facing west.

Figure 74b: Site 5LA6595, general view of the site taken facing east.

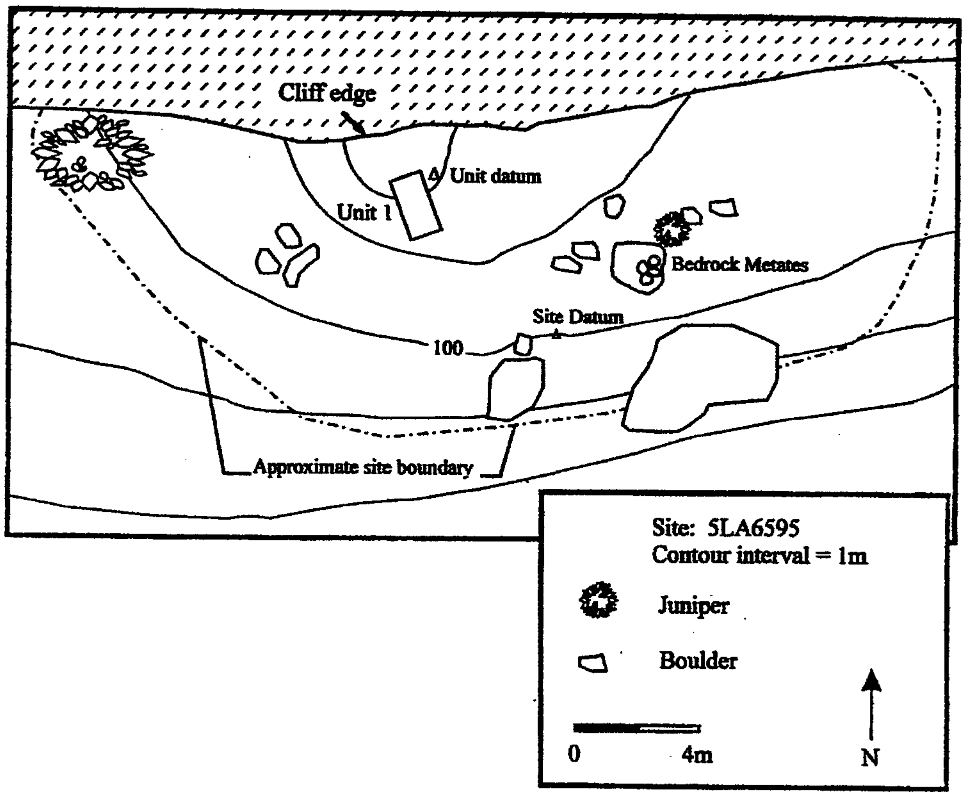


Figure 75: General site map of 5LA6595.

A boulder located approximately 7 m to the north-northeast of the site datum is also recorded as having four metates worn into its surface (Figure 76). Metate A measures 20 x 15 cm and is 0.5 cm deep. It is circular in shape and no striations are visible. The metate has pitting/pecking within its grinding surface and its use wear is moderate. Metate B measures 25 x 12 and is 0.3 cm deep. It is rectangular and no striations are visible. The metate has pitting/pecking within its grinding surface and its use wear is moderate. Metate C measures 20 x 20 cm and is 0.3 cm deep. It is circular in shape and no striations are visible. The metate has pitting/pecking across the entire grinding surface and its use wear is light. Metate D measures 40 x 30 cm and is 1.1 cm deep. It is oval and no striations are visible. The metate has pitting/pecking within its grinding surface and its use wear is light.

A single 1 x 2 m unit was placed approximately1.5 m south of the cliff face on an elevated area of the site. The unit extends down slope along its long axis. After the first four levels of excavation the unit was divided into two 1 x 1 m loci to insure adequate horizontal control. Deeper than expected deposits were encountered (over 2 m) and bedrock was reached only in Locus 2. The surface of the bedrock was irregular and formed a shallow crevice at the bottom of Locus 2. At its lowest point, bedrock was 2.36 m below the ground surface located near the unit datum.

Three depositional strata are identified for Unit 1 (Figure 77; Table 9.2). Lying directly above bedrock, Stratum 3 is composed of 2 or 3 layers of brown (10YR 5/3 and 10YR 4/3) and yellowish brown (2.5Y 6/4) sand with coarse gravel. These sandy layers are stream laid deposits containing no cultural material. Stratum 3 formed the layers on which later cultural occupations took place.

Table 9.2. List of Strata for 5LA6595 Unit 1

Strata	Levels	Description
1	1-3	topsoil and mixed cultural debris
2	4-18	cultural deposits
3	19-24	culturally sterile stream laid deposits

Stratum 2 is contains the earliest evidence of human occupation in Unit 1. It is a relatively thick deposit (140 cm) composed mainly of a dark grayish brown (10YR 4/2) silty sand. Stratum 2 displayed several small animal burrows and pockets of rodent disturbance. The lens of dark grayish brown (2.5Y 4/2) silty sand just above the cliff face visible in the north wall profile is disturbed and probably represents one of these animal burrows which was dug along the cliff face when the ground surface was much lower than today. The deposits of Stratum 2 can be divided into upper and lower analytical units based on the radiocarbon dates discussed in more detail below. The upper deposits include Level 1-9 and have radiocarbon dates that indicate a range of occupation between approximately A.D. 1300 and A.D. 1050. The lower deposits include Levels 10-18 and have radiocarbon dates that indicate a range of occupation between ca. A.D. 600 and A.D. 100. It is also within Stratum 2 that a cache of four manos were uncovered (Figure 78). These manos were recovered in Level 12 nestled up against a large boulder near the southeast corner of the unit.

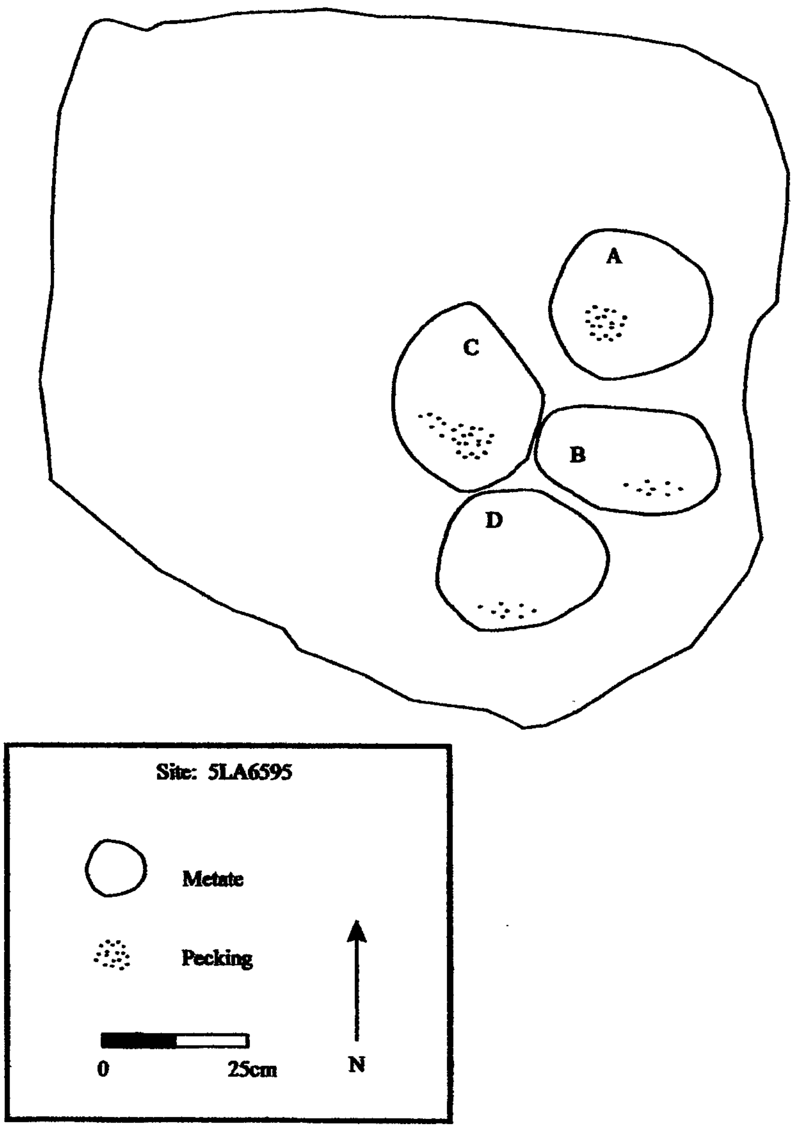


Figure 76: Bedrock metates at 5LA6595.

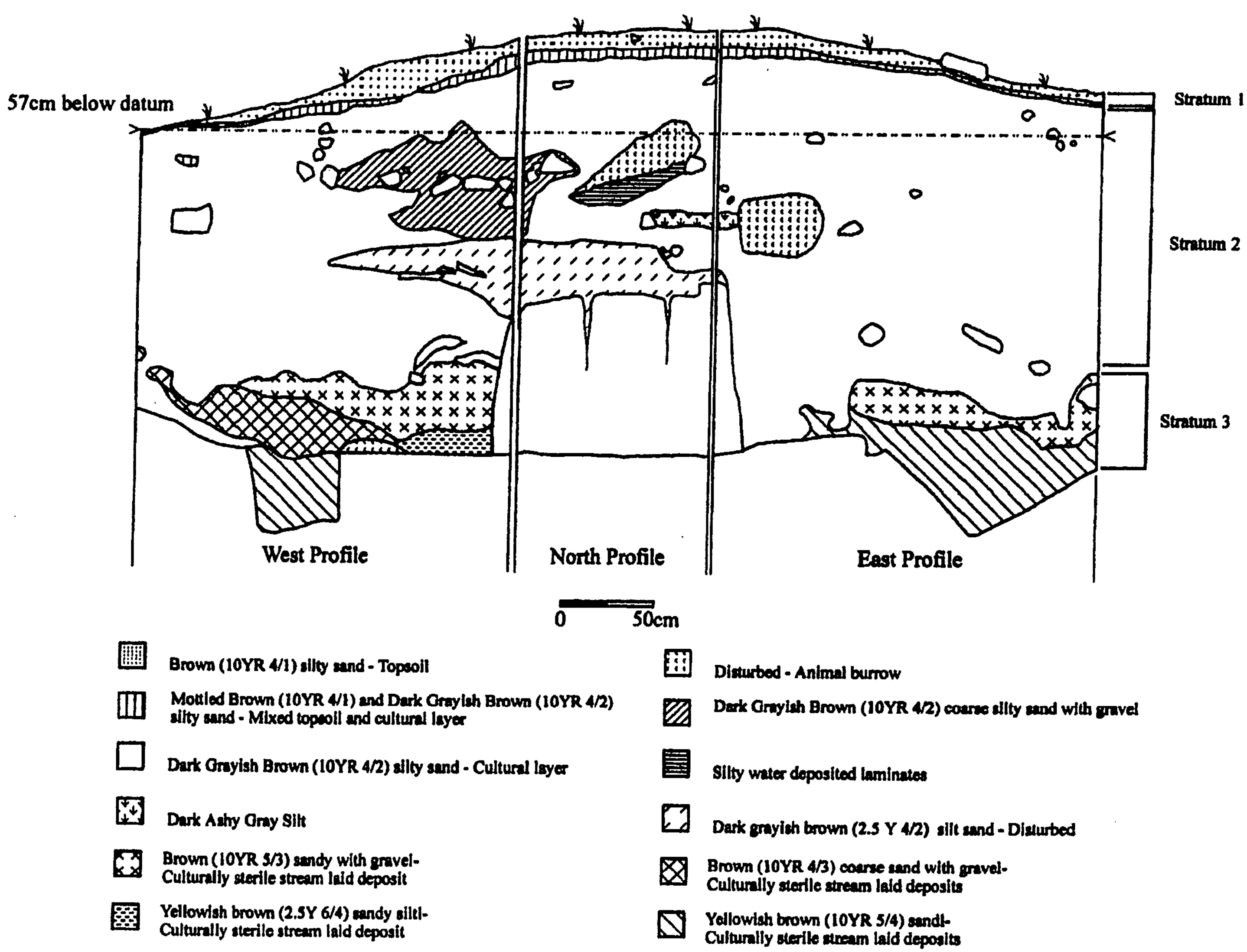


Figure 77: Site 5LA6595, Unit 1 west, north, and east wall profiles.

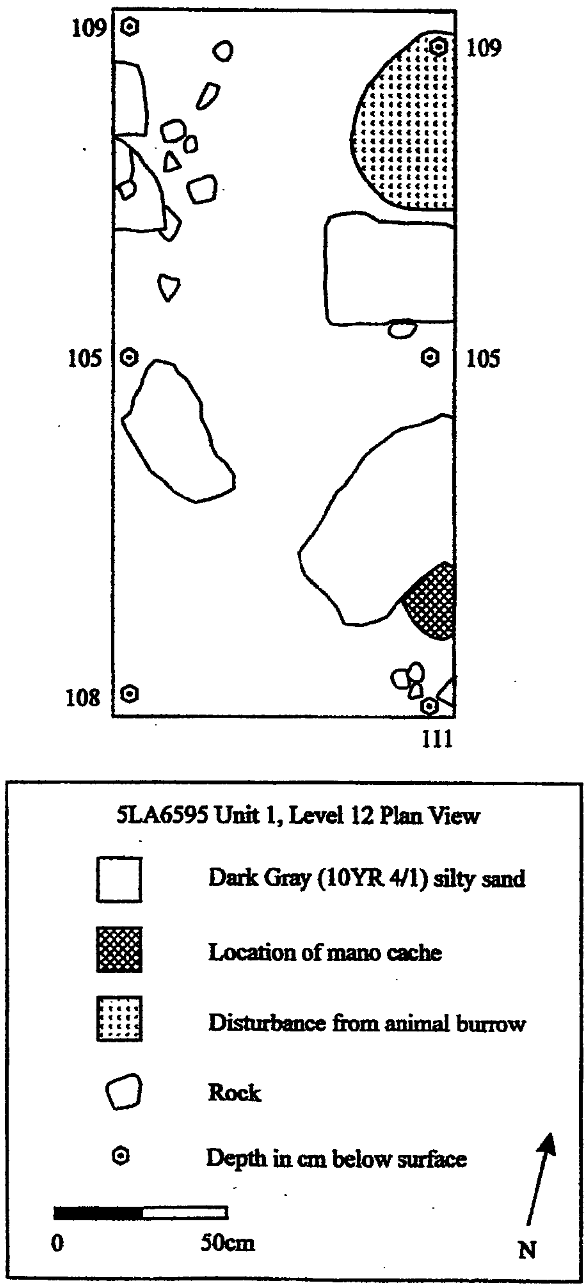


Figure 78: Site 5LA6595, Unit 1 plan view of Level 12.

Stratum 1 is the uppermost and most recently laid deposits. It is comprised of two layers: a mottle brown (10YR 4/1) and dark grayish brown (10YR 4/2) silty sand and the brown (10YR 4/1) silty sand topsoil. This stratum is disturbed and mixed from recent pedestrian traffic and animal activities.

Chipped Stone

A total of 134 pieces of chipped stone debitage was recovered from 5LA6595. Chipped stone debitage was found in most of the top 18 levels of Unit 1 (Figure 79). Only three different raw material types were recovered from Unit 1 (Figure 80). Quartzite is the most common material (59.7%) followed by chert (32.1%) and argillite (8.2%). No obsidian was recovered from Unit 1 and it appears as though all the raw materials found in the unit were locally available. There is not much change in terms of material types used through time. The proportion of quartzite and argillite debitage is slightly higher in the lower deposits, while chert increases in proportion in the upper deposits (Figure 81).

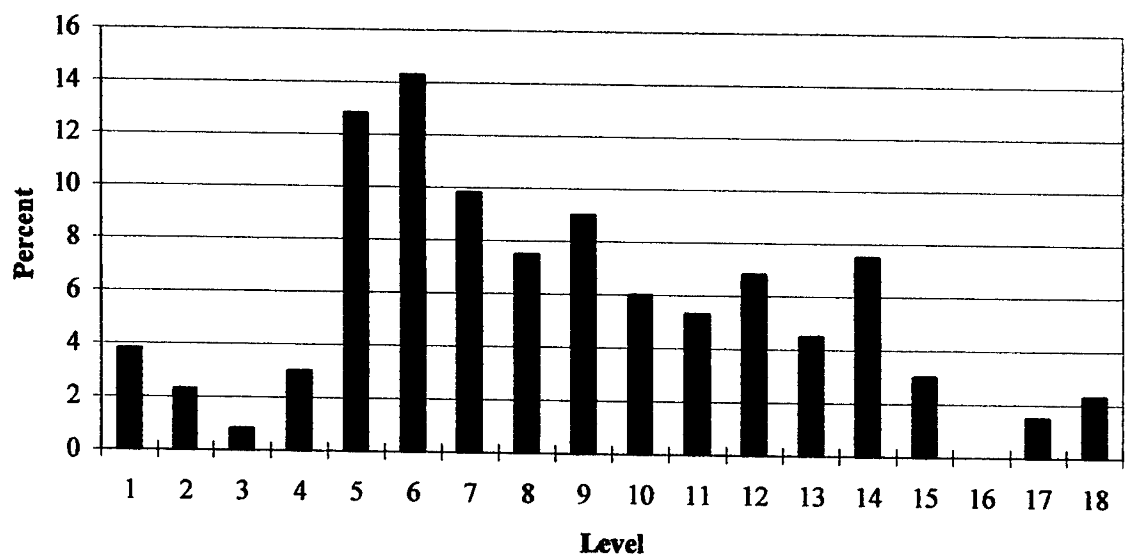


Figure 79: Bar chart of the proportions of chipped stone debitage by level at 5LA6595.

The majority of the flakes are simple flakes (61.9%) followed by complex flakes (30.6%), shatter (6.7%), and bifacial thinning flakes (0.8%). Once again there is not much evidence for a change in the proportions of flake types through time (Figure 82). Simple flakes and shatter are slightly more common in the upper levels, while the proportions of complex flakes and bifacial thinning flakes increases slightly in the lower levels.

The size grade information strongly suggests that freehand core reduction was responsible for generating the quartzite and chert debitage in both the upper and lower levels. The small to large flake ratio for quartzite in the upper levels is 0.2:1 and 0.6:1 in the lower levels. These ratios are very low and suggest that pure freehand core reduction was an important lithic reduction strategy for quartzite. The small to large flake ratio for chert is

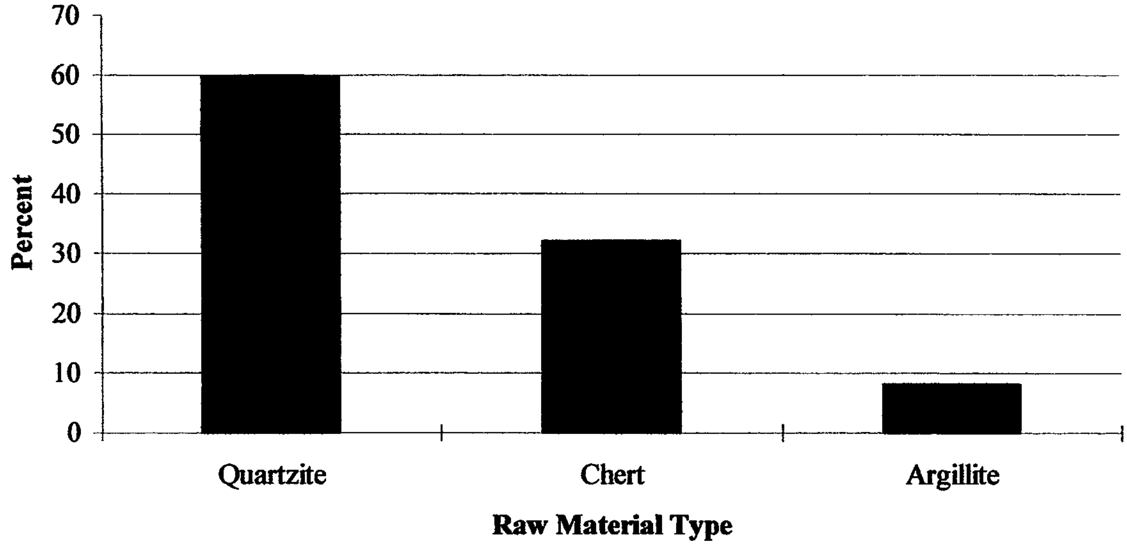


Figure 80: Bar chart of raw material types for the chipped stone debitage at 5LA6595.

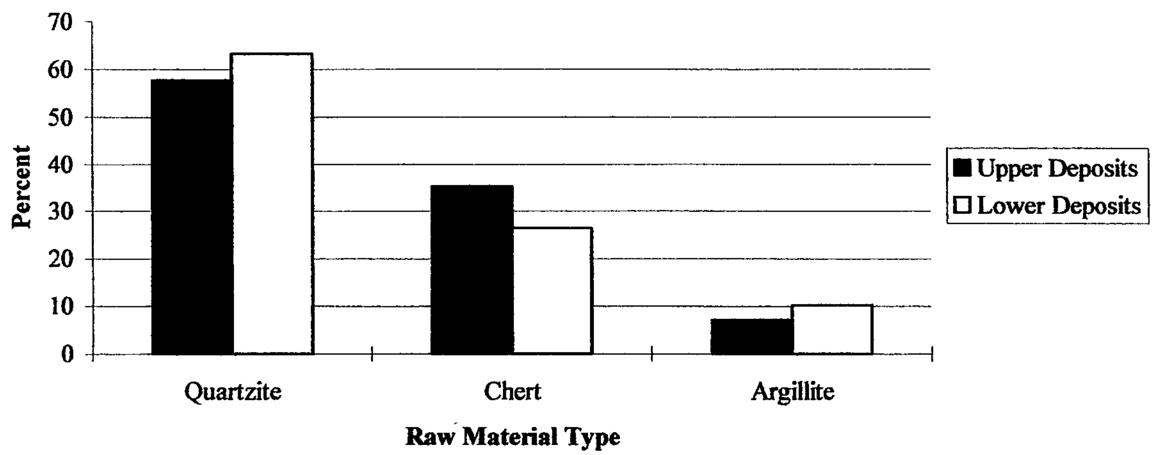


Figure 81: Bar chart of raw material types for the upper and lower levels at 5LA6595.

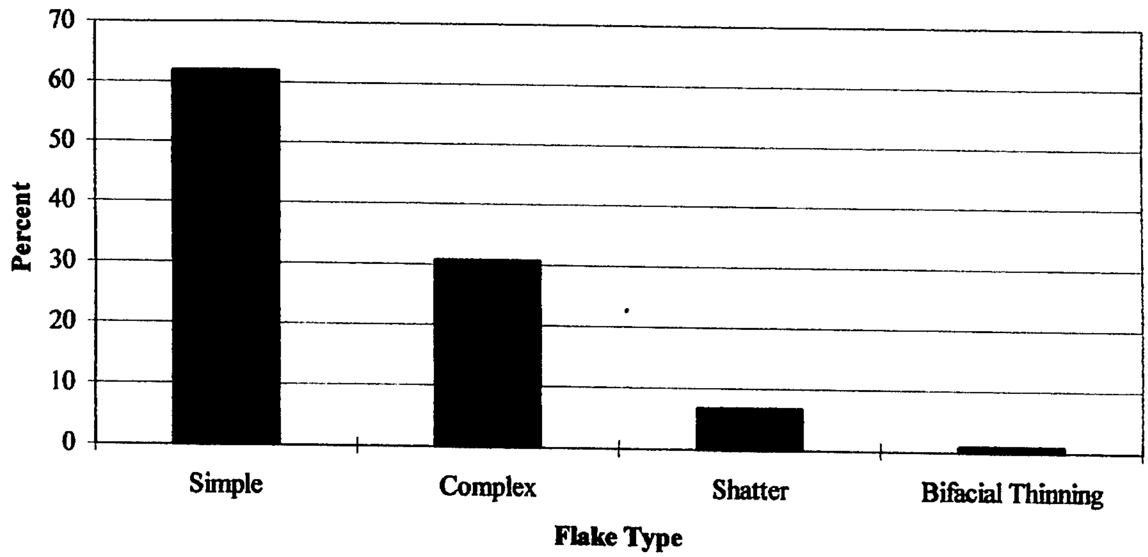


Figure 82: Bar chart of flake types for the chipped stone debitage at 5LA6595.

somewhat higher than for quartzite (upper - 2.7:1, lower - 3.2:1), which is expected for a finer grained material, but they are still in the range expected for freehand core reduction. The frequencies of argillite are too low for meaningful analysis.

The chipped and ground stone tool repertoire from 5LA6595 is highly diverse with the presence of manos, metates, unifacial retouched tools, bifaces and projectile points, ceramics, and core/tools. The presence of five cores or tested cobbles recorded from the 1995 reconnaissance and an additional four cores from excavated deposits are additional support for the idea that freehand core reduction was responsible for the chipped stone debitage seen at the site.

The first of the four cores from excavated deposits comes from Level 9 (Figure 83a). The artifact is made from a thermally altered argillite. It measures 5.4 x 4.4 x 2.7 cm and weighs 50.9 g. Approximately 10 negative flake scars are removed from two sides of the artifact; seven flakes were removed from one side and three from the other side. The second core comes from Level 10 and is composed of a gray quartzite with a reddish cortex (Figure 83b). Only two flakes are removed from the dorsal surface of the artifact, therefore it is technically speaking a core, but a relatively expedient one. The specimen measures 5.4 x 4.1 x 2.1 cm and weighs 39.3 g. The third core comes from Level 14 and is composed of an orange colored chert with inclusions at the distal end (Figure 83c). On one side, three flake scars originate from a platform at the proximal end and on the other side at least three flake scars can be seen running perpendicular to the flake scar on the other side of the artifact. The specimen measures 2.7 x 2.4 x 1.2 cm and weighs 7.4 g. The fourth core comes from Level 16 and is composed of an orange colored silicified wood. The specimen may have been broken while in use and still retains the presence of at least four flake scars. The specimen measures 5.6 x 4.6 x 2.0 cm and weighs 42.9 g. Three of the cores mentioned come from the lower levels (10-18) of the unit.

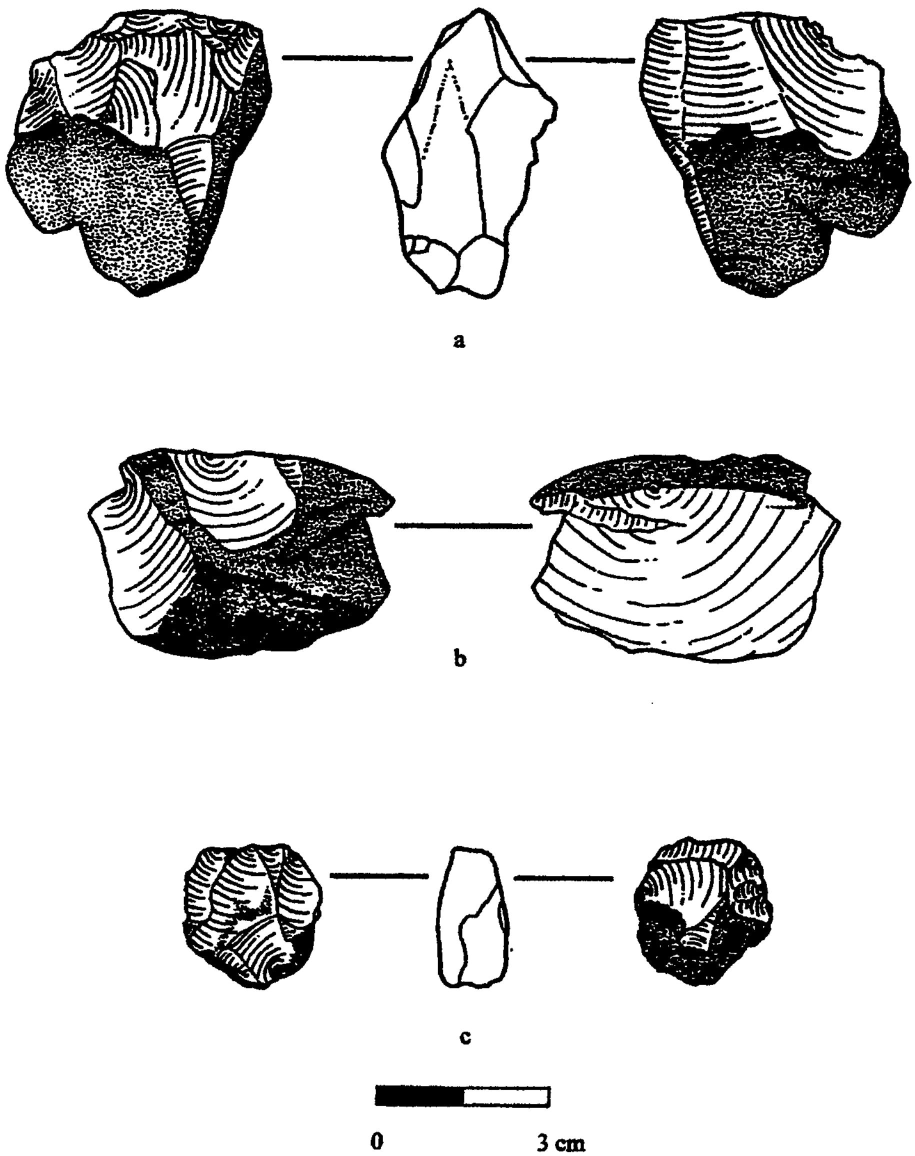


Figure 83: Lithic cores from 5LA6595.

Five retouched/utilized flake tools come from Levels 3-16. As a group they are a highly diverse assemblage of different formal characteristics and made from different materials. The first comes from Level 3 and is made from a reddish quartzite that is likely thermally altered (Figure 84a). The piece is worked along the top edge to form a steep sided scraper. The specimen measures 4.9 x 3.5 x 1.9 cm and weighs 31.4 g. The second of these tools comes from Level 6. It is a small (3 x 2.1 cm) scraper made from a secondary chert flake (Figure 84b). Use wear is evident on the top and right hand margin of the tool. The third retouched/utilized flake comes from Level 9. It is a small side scraper made from silicified wood (Figure 84.c). It measures 2.3 x 2.2 x .9 cm and weighs 4.8 g. The specimen is broken at the distal end. Several small flakes were removed from dorsal side of the bottom margin and extensive use wear is present on the top margin of the ventral side of the tool. Another unifacially retouched tool comes from Level 10. This artifact is made from a water worn cobble, measures 3.5 x 2.5 cm and exhibits the removal of three flakes along the its top margin (Figure 84d). The final unifacial retouched tool comes from Level 16. It is made from a secondary flake of a fine chert and measures 2.7 x 1.5 cm (Figure 84e). This tool is retouched on the dorsal side along the left hand and upper margins. The right hand margin does not exhibit any retouching but does show evidence of use wear.

Two bifacially flaked tools come from Level 6. Both are made from chert tertiary flakes. The first of these measures 2.1 x 1.6 x .5 cm and weighs 1.9 g (Figure 85a). This specimen may be a projectile point fragment, but it is somewhat thicker than expected along the fracture at the distal end. The second biface from Level 6 measures 2.4 x 1.1 x .4 cm and weighs 1.1 g (85b). This specimen is crescent shaped and may be a projectile point reworked into a cutting tool. A third bifacial tool comes from Level 10. This artifact is made from a thick (2.2 cm) secondary quartzite flake (Figure 85c). The specimen weighs 55.4 g and its large size (4.3 x 4.1 cm) makes it unlikely that it was a finished tool. A fourth biface comes from Level 9 and is a rather large (5.8 x 5.4 x 2.3 cm and weighs 53.5 g) scraper (Figure 85d). Flakes have been removed from the dorsal side of the tool and there are small notches along both margins (but especially along the right hand margin). The notched areas of the tool may have served to shave or whittle shafts or similar wood artifacts. The final biface comes from Level 14. This specimen is made from chert, measures 3.7 x 2.5 x 1.9 cm, and weighs 15.3 g (Figure 85e). The piece is crudely retouched along the top margin and may have be an exhausted core or cutting tool.

One intact projectile point and three projectile point fragments were recovered from 5LA6595. The intact projectile point comes from Level 9. It is a small (2 x 1.2 x .4 cm and weighs .9 g), side notched point made from chert (Figure 86a). This projectile point fits the criteria of size and form for Anderson's P83 category. According to Anderson (1989:218), "these small triangular points have very sharp tips, straight to slightly convex blade edges, abrupt shoulders, straight flanged stems, rounded to pointed tangs, and straight to concave bases which are wider than the blade." She also states that there are three radiocarbon dates associated with this projectile point type from the PCMS area that range from A.D. 570 ± 60 to A.D. 1230 ± 70.

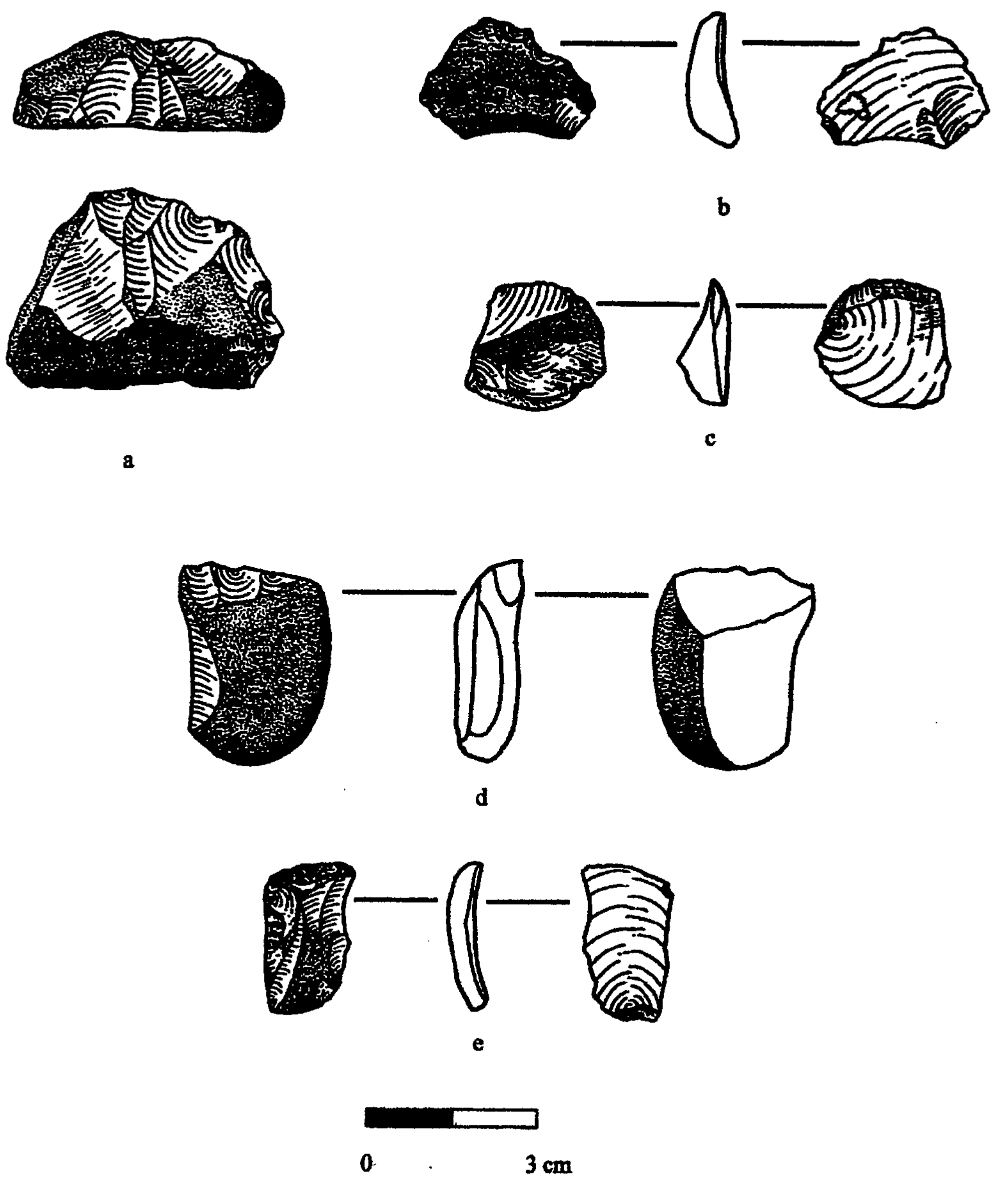


Figure 84: Retouched/utilized flake tools from 5LA6595.

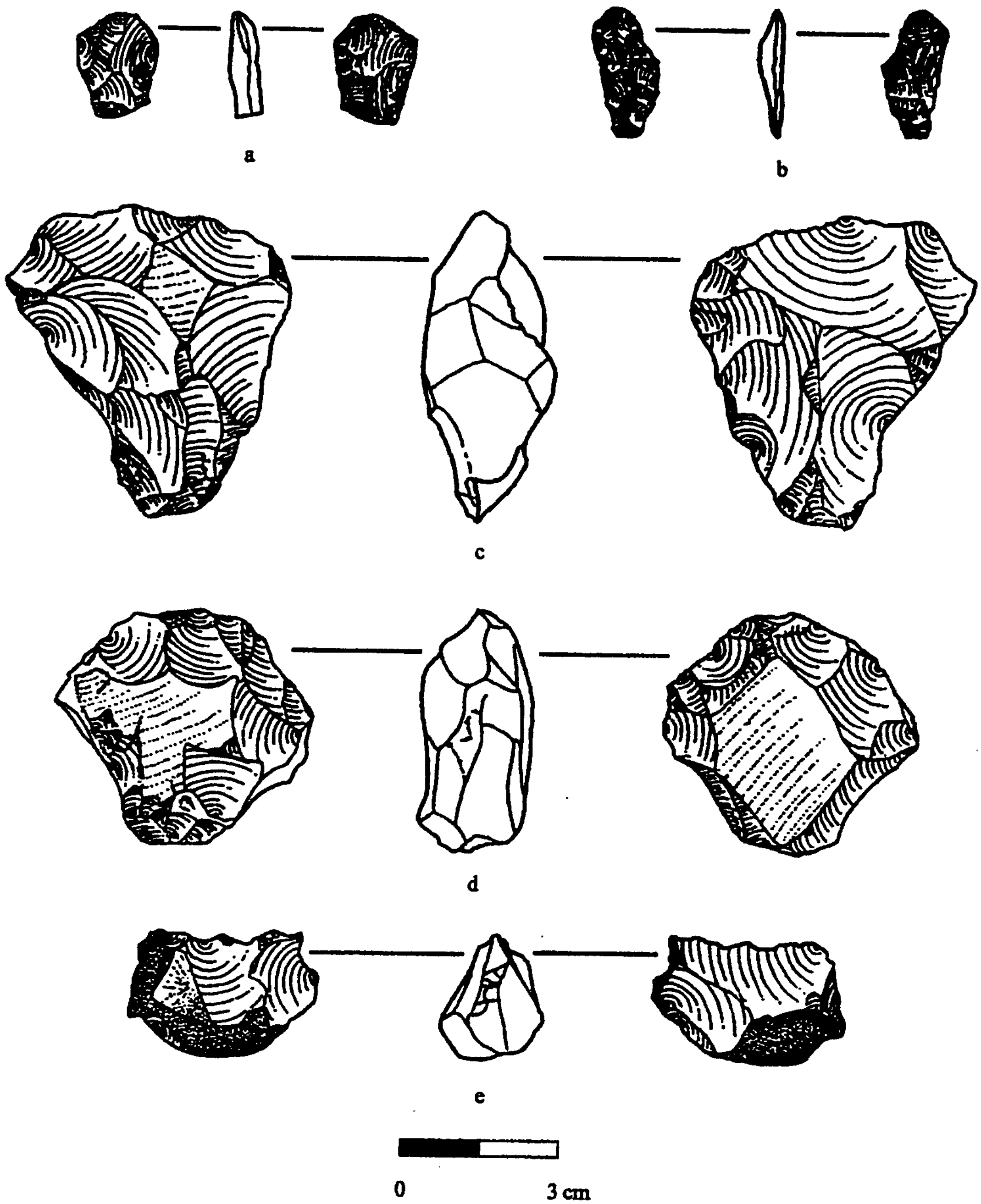


Figure 85: Bifacially worked chipped stone tools from 5LA6595.

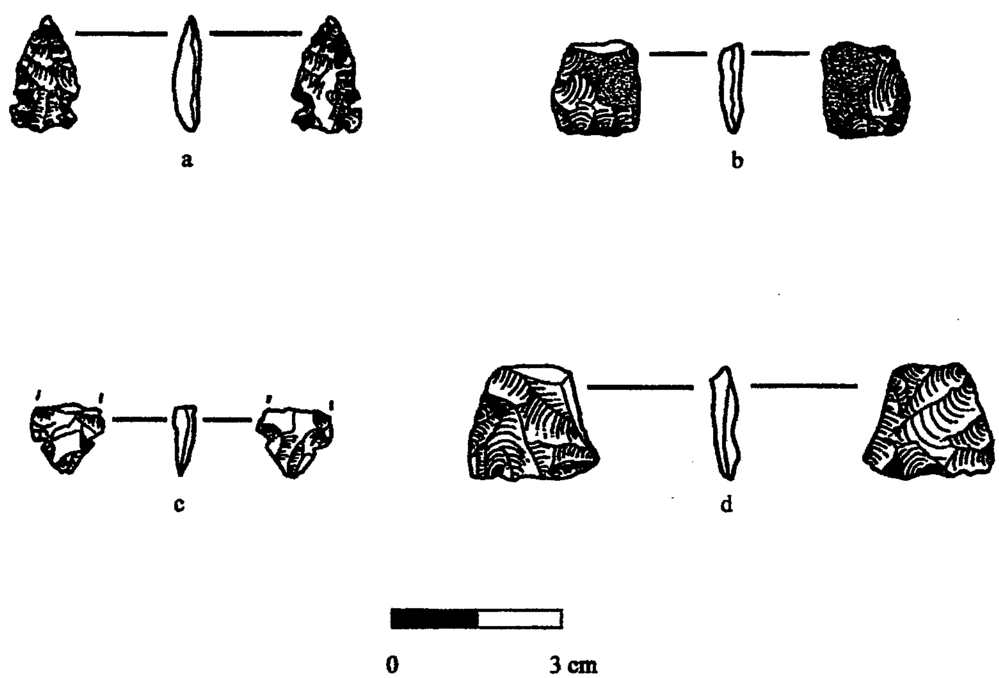


Figure 86: Projectile points and projectile point fragments from 5LA6595.

A fragment of a projectile point comes from Level 3. It is made from a fine chert, measures 2.0 x 1.8 x .5 cm, and weighs 1.5 g (Figure 86b). This point is broken at near the tip, but it appears to be a small triangular point that may conform to the criteria of Anderson's P49 category. According to Anderson (1989:173-174), there are no examples of this point type from dated contexts in the PCMS area. However, she does mention that some specimens of P49 type points in other areas of Southeastern Colorado range in date from A.D. 1070 to A.D. 1360. More recently, a P49 type projectile point is illustrated by Loendorf et al. (1996:179; Figure 6.11d). They indicate that a regional comparison with other P49 type points suggests a date of between A.D. 800 and A.D. 1750.

Two more projectile point fragments were recovered from 5LA6595, but these are two fragmentary to place in any of Anderson's categories. The first of these is a small, (1.3 x 1.2 x .4 cm and weighs .5 g) fragment of a base made from chert (Figure 86c). The specimen comes from Level 7 and may be the base of a side-notched projectile point. Unfortunately, the base is broken at both of its margins making classification tenuous. The final projectile point fragment was recovered from Level 17. This particular fragment is broken along the top as well as the right hand margin (Figure 86d). The fragment measures 2.5 x 2.3 x .5 cm, weighs 2.3 g, and is made from chert. The artifact may have been a relatively large triangular point perhaps at the larger end of Anderson's (1989:173-174) P49 category, but it is too fragmentary to say with any certainty.

Ground Stone

A total of nine ground stone specimens was recovered from the 1996 field season excavations. The first specimen comes from Level 1. It is made from sandstone and has two grinding surfaces. The mano is broken with perhaps slightly less than 50% of the total artifact remaining. The entire specimen measures 6.7 x 5.7 x 3.5 cm. The first surface has no identifiable striations, light use wear, and the grinding surface measures 3.5 x 2.9 cm. The second surface has longitudinal striations, exhibits heavy use wear and measures 6.0 x 4.7 cm (Figure 87a). The piece shows evidence of burning. The second ground stone specimen comes from Level 5 and is a small fragment of a sandstone grinding slab. The piece measures 5.1 x 3.7 x 2.0 cm (Figure 87b). The single grinding surface exhibits heavy use wear and appears to be crazed owing to burning. The grinding surface measures 4.9 x 3 cm. The third specimen is a sandstone mano from Level 8. The specimen has two grinding surfaces and it is broken with less than 50% of the entire artifact remaining. The size of the extant piece measures 6.8 x 4.9 x 3.9 cm. Portions of the outer surface of this mano are eroding off and striations are not seen on either surface. The first surface measures 4.6 x 3.7 cm and exhibits moderate use wear. The second grinding surface measures 5.4 x 4.5 cm and exhibits moderate use wear (Figure 87c). Pecking can be seen along the outer edges of the specimen and along the edges of the grinding surfaces. Evidence for burning is also present. The fourth piece of ground stone is a sandstone mano from Level 9. The specimen is broken and less than 50% of the entire piece and only one grinding surface remains. The extant piece measures 7.1 x 6.1 x 2.6 cm and exhibits moderate use wear. The single grinding surface measures 7.0 x 3.5 cm. Pecking is apparent along the sides of the mano and along the edges of the grinding surface. Some pitting is also present across the grinding surface. The

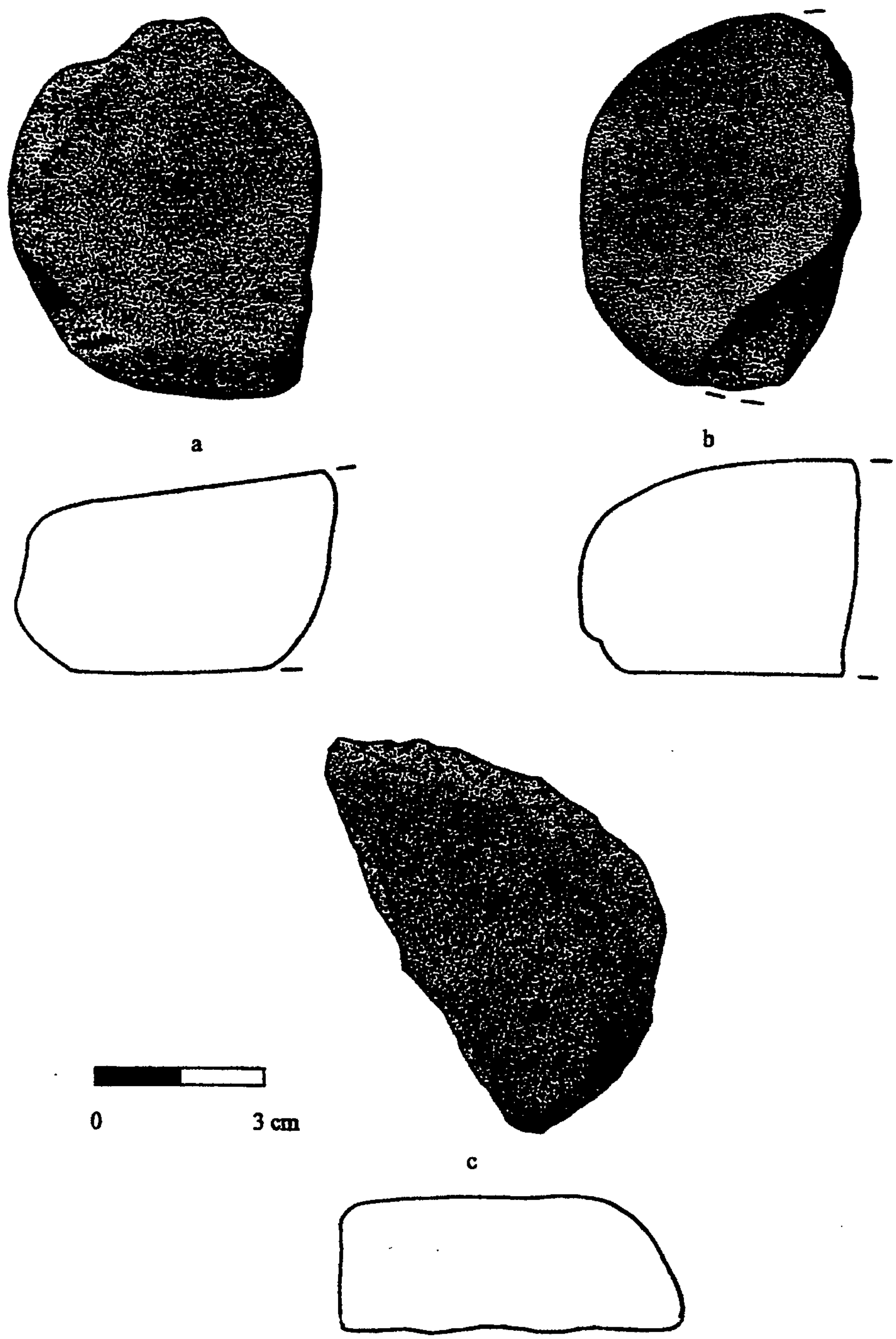


Figure 87: Ground stone from 5LA6595, upper levels.

specimen also exhibits evidence of being burned. The fifth ground stone specimen comes from Level 10. This specimen is broken into 15 pieces. It was a mano that at some time was thermally altered which likely caused the specimen to fracture into several pieces. Any measurement of the artifact is impossible owing to its fragmentary nature. The grinding surface seen on the extant pieces is crazed and cracked from being exposed to extreme heat and the surface appears to have had heavy use wear.

The remaining four specimens of ground stone are all sandstone manos that come from a small cache located near the southeast corner of the unit in Level 12. The first of these measures 9.0 x 7.7 x 3.6 cm (Figure 88a). The mano is complete, but it is possible that one side has completely eroded away leaving behind only one extant grinding surface. This grinding surface measures 7.1 x 5.7 cm and exhibits moderate use wear. Pecking is observed along the sides of the artifact, along the edges of the grinding surface, and in some small areas within the confines of the grinding surface. Striations run transversely across the grinding surface. The opposite side of the artifact is extremely pitted. The entire artifact appears to have been burned. The second mano from the cache is complete and measures 11.4 x 9.2 x 3.6 cm (Figure 88b). This specimen has two grinding surfaces. The first, lightly used, surface is somewhat patchy and measures approximately 7.9 x 7.5 cm. No striations can be seen on this surface, but pecking is evident within the confines of the grinding surface and along its edges. There are some indications that part of this grinding surface may have eroded off. The second surface (the one illustrated) exhibits heavy use wear and measures 9.1 x 8.5 cm. Striations are difficult to see, but they may be running along the short axis of the grinding surface. The third mano from the cache is made from a denser sandstone that the others. It is complete and measures 12.4 x 7.9 x 6 cm (Figure 89a). Only one grinding surface with light use wear is apparent. The surface is somewhat patchy and measures approximately 11.6 x 7.6 cm. Pecking is evident along the sides of the artifact, at the edges of the grinding surface, and within the confines of the grinding surface. No striations can be discerned and there is evidence that the specimen is burned. The fourth mano from the cache measures 8.1 x 8.0 x 3.4 cm (Figure 89b). There is one primary grinding surface that measures 6.1 x 6.1 cm and exhibits heavy use wear. Striations can be seen running longitudinally across the surface. Two of the artifact edges also indicate some slight use wear. The opposite side of the artifact is heavily pitted and it is possible that this side also had a grinding surface that has eroded away. There is also some evidence that the specimen is burned.

A pollen wash and analysis was performed on the four manos from the cache described above. The intention of this analysis was to determine the kinds of plant or vegetal materials that were ground by the manos (Appendix 1). Unfortunately, the results of this analysis were inconclusive. The pollen signatures from the manos are similar to the one from the control sample. Apparently, the pollen that may have adhered to the manos from use was burned away when the manos were exposed to heat.

Ceramics

Two ceramic sherds have been recovered from the field work conducted at 5LA6595. The first sherd was found on the surface during the 1995 reconnaissance. It was located at 15

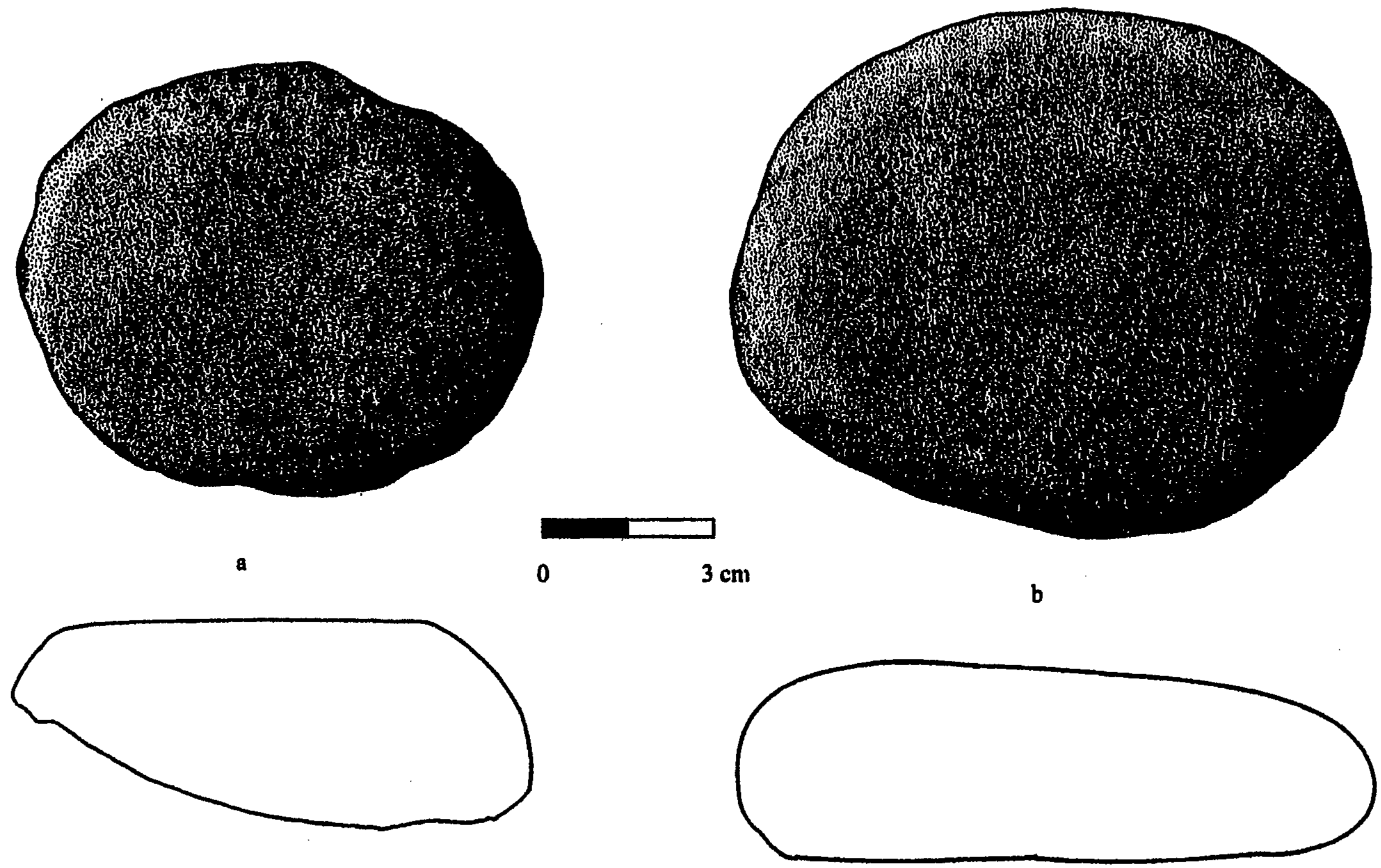


Figure 88: Ground stone manos from cache in Level 12 at 5LA6595.

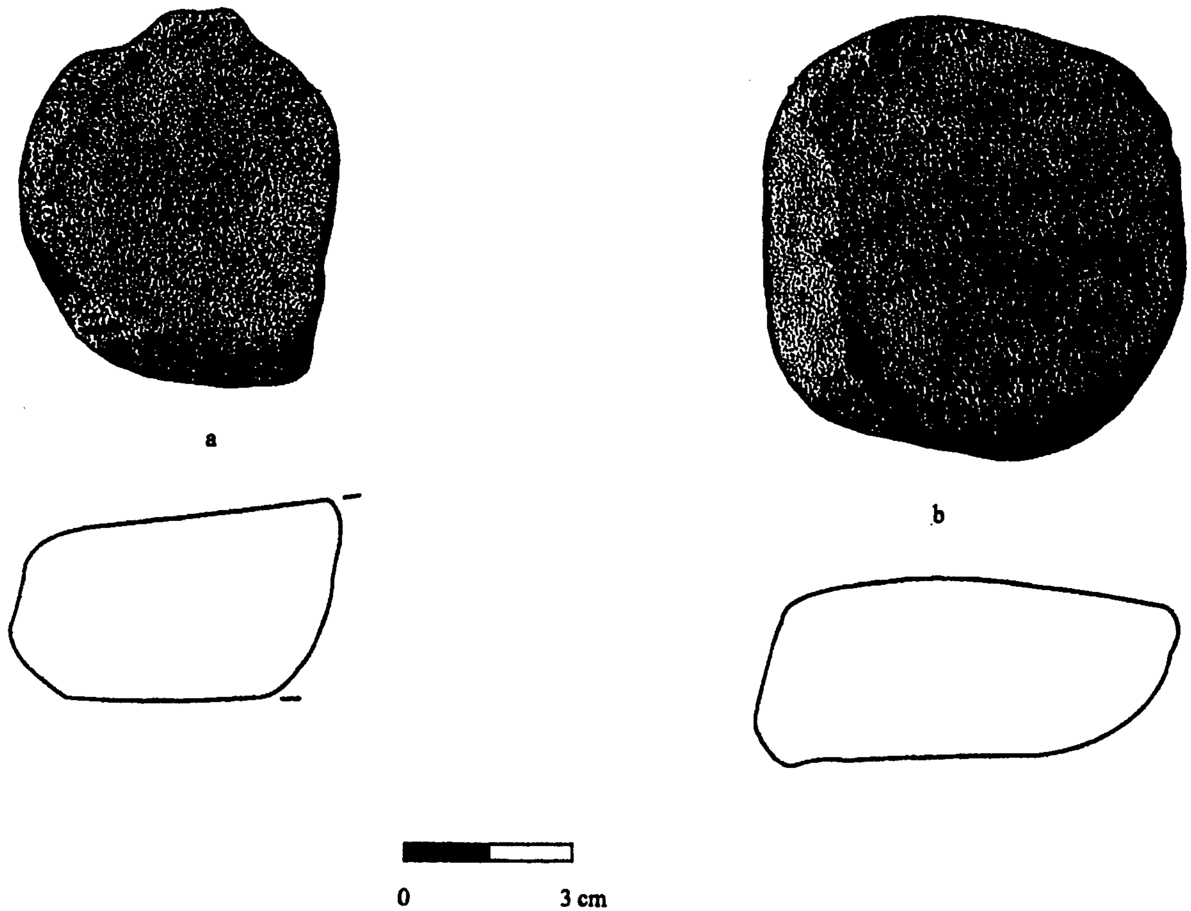


Figure 89: Additional ground stone manos from cache in Level 12 at 5LA6595.

degrees and 8 m from the site datum. It is a body sherd that measures 2.9 x 2.4 x .7 cm. It is a burned gray ware with somewhat ephemeral cord impression on its exterior surface. The interior surface appears to be smoothed. The second sherd was recovered from Level 5. It is a small body sherd measuring 1.7 x 1.2 x .6 cm. It is also a gray ware with ephemeral cord impressions on its exterior surface. The interior surface is smoothed. Both sherds may come from the same vessel and appear to fall within Hummer's (1989) cordmarked category 3 ceramic classification.

Vertebrate Fauna

This is the only open air site excavated during the 1996 project to yield faunal remains. As such, it presents an interesting assemblage to compare with the remains recovered in rockshelter contexts. The vertebrate fauna from 5LA6595 includes 426 pieces of bone; 79 came from dry screening and 347 were recovered from water screening. Most of the bone recovered from Unit 1 comes from the upper levels (1-11) with only a small amount coming from the lower levels (12-24). No fauna was recovered below Level 15 in Locus 1 using the dry screening method, however tiny pieces of vertebrate fauna were noted as deep as Level 20 using water screening. In Locus 2, water screening yielded fauna as deep as Level 20. Burned bone was recovered from these lower levels as well, although these pieces are of indeterminate taxonomic origin.

Cottontail, jackrabbit, and woodrat were observed in Levels 4 thorough 9. Several specimens representing herpetofauna (amphibians or reptiles) were also identified. Herpetofauna vertebra were noted from Levels 5 and 6. Additionally, a distally unfused left *Bison bison* tibia is identified from Locus-2, Level 9, which has been dated to the Middle Ceramic Stage (A.D. 800/1000 to A.D. 1500). Like the bison metapodial recovered from 5LA6592, this tibia represents a relatively young individual. The distal tibiae of bison do not fuse until the middle of the fourth year of life (Duffield 1973:133). This site and 5LA6592 are only about 1 kilometer apart, and it is possible that both the tibia and metapodial belonged to the same individual.

In both cases in which bison bone was recovered (5LA6592 and 5LA6595), the distal ends of long bones were identified. It is possible that the presence of these bones represents the exploitation of marrow nutrients. Marshall and Pilgram (1991) have suggested that body part representation at archaeological sites may be related to within-bone nutrients, including marrow and bone grease, rather than meat content. The metapoidial, in particular, is not an element with abundant meat. Thus, the recovery of this element may indicate the preferential transport of bones with a high marrow content to the rockshelter context.

While the bison tibia does not display either cut marks or evidence of burning, there are numerous unidentified burned materials from Levels 5 through 9. Two cottontail elements also display burn damage: a premolar and a third metatarsal, both from Level 6. Despite this evidence of a burn event, no hearths or other thermal features are noted in this unit.

Levels 12 through 18 yielded comparatively less faunal material than the upper levels. *Neotoma* sp. and *Sylvilagus* sp. are the only two genus-level identifications made. As above, burning is noted throughout these lower levels, primarily on unidentified specimens; however, no thermal features were noted during excavation. Level 12 is dated to the Early Ceramic Stage (A.D. 200 to A.D. 800/1000), relatively early given the late thirteenth century date from Level 9. A cache of several manos was recovered from Level 12 as well. Unfortunately, this level yielded no identified bone, although a *Sylvilagus* mandible and radius were recovered from Level 13.

Relative to sites with comparable numbers of vertebrate fauna recovered [i.e., 5LA6592 (NISP = 404) and 5LA6603 (NISP = 472)], 5LA6595 contained the least diverse faunal assemblage. Twenty-four specimens were identifiable to a total of four genera from this site (NISP = 426), whereas eight genera are represented at 5LA6568 (NISP = 1635), ten at 5LA6592 (NISP = 404) and eight at 5LA6603 (NISP = 472). Only cottontail (*Sylvilagus* sp.), jackrabbit (*Lepus* sp.), woodrat (*Neotoma* sp.), and bison (*Bison bison*) are present. Because recovery bias is not a significant factor in the vertebrate faunal assemblage of this site, the less diverse fauna observed here may be related to site function. If this is the case, 5LA6595 represents a qualitatively different depositional phenomenon than that occurring in rockshelter contexts.

Furthermore, the assemblage from 5LA6595 may be more representative of prehistoric subsistence than that of other sites. The fauna from 5LA6595 comes from midden or trash deposits, whereas all of the other fauna comes from a variety of contexts in rockshelters. Caves and rockshelters are well known for having numerous depositional agents affecting the archaeological context. The activities of predatory or scavenging birds and mammals may be especially problematic, making the faunal fraction that is due to human behavior difficult to identify (Grayson 1979:229). These depositional agents are not active to the same extent at midden sites.

Given the possibility that this site is more representative of prehistoric subsistence, it is notable that *Sylvilagus* sp. (cottontail), *Lepus* sp. (jackrabbit), *Neotoma* sp. (woodrat), and *Bison bison* are the only fauna conclusively identified here. Without comparative information from other open air or midden sites, it is impossible to conclude that this sample is truly representative of prehistoric human subsistence behaviors, yet it certainly implies that rockshelters *are not*.

Three pieces of artifactual bone were recovered from excavated deposits of 5LA6595. The first piece, a polished bone fragment, is unidentifiable as to taxa and measures 1.1 cm long. It was recovered from Unit 1, Level 5. The other two pieces appear to be bone beads or tubes; both were recovered from Unit 1. Only one of these two pieces was identified to genus; the other is of indeterminate origin. Unit 1, Level 6 yielded a complete and unbroken bone tube measuring only 0.6 cm in length; it is otherwise unidentifiable.

Unit 1, Level 8 yielded the distal end of a cottontail (*Sylvilagus* sp.) metapodial; the shaft of this piece has been cut using a tool with a bevelled edge. This piece is the only instance of a culturally modified metapodial in this assemblage. Metapodials are the bones of the front and hind feet of mammals with which the phalanges articulate. In leporids, these bones are round in cross-section and of uniform diameter along their longitudinal axis.

All other artifactual bone recovered from PCMS sites tested in 1996 was either leporid tibiae or indeterminate. However, Andrefsky et al. (1990:912) found evidence at 5LA5503 for the use of cottontail metapodials during their test excavations of the PCMS area. It appears, based on both the present assemblage and that of Andrefsky et al. (1990), that leporid metapodials were used with less frequency than leporid tibiae. Simpson (1976:141-143) has also reported on the use of leporid metapodials from southeastern Colorado; she indicates that long bones, especially tibiae, were used with the greatest frequency. It is unlikely that the pattern of metapodial vs. tibia use observed here is the result of recovery bias. Much of the materials from both sets of excavations were water screened. It is unlikely that artifactual metapodials were lost at a significantly higher rate than tibiae during the recovery process.

Radiocarbon Dates

Five radiocarbon dates were run from carbon samples recovered in Unit 1. The first sample comes from Level 4 and yielded a date of 750 ± 70 B.P. (Beta-103153; wood charcoal; $^{13/12}C$ -23.7 $^{0}/_{00}$). The second date is from a sample in Level 9 and it yielded a date of 720 ± 50 B.P. (Beta-100210; wood charcoal; $^{13/12}C$ -23.6 $^{0}/_{00}$). Another date also comes from a sample taken in Level 9. This sample yielded a date of 870 ± 50 B.P. (Beta-103151; wood charcoal; $^{13/12}C$ -24.9 $^{0}/_{00}$). The fourth dated sample comes from Level 12 and gave a date of 1410 ± 90 B.P. (Beta-100211; wood charcoal; $^{13/12}C$ -23.6 $^{0}/_{00}$). The final date comes from fairly deep in the unit at Level 18, in the earliest level in which cultural materials were recovered. This sample gave a date of 1840 ± 80 B.P. (Beta-103152; wood charcoal; $^{13/12}C$ 22.5 $^{0}/_{00}$).

When the probability distribution of these dates is viewed, a trimodal distribution is apparent (Figure 90). It appears that perhaps three temporally distinct occupations may be represented at 5LA6595. The earliest use of the site is represented by a single date (Beta-103152) and likely ranges from between A.D. 55 and A.D. 160. This period of occupation fits within the Late Archaic Stage (B.C. 1000 to A.D. 200). Only three pieces of chipped stone debitage are associated with this dated deposit.

The middle occupation is also represented by a single date (Beta-100211) and ranges from between A.D. 590 and A.D. 685. These dates fall within the Early Ceramic Stage (A.D. 200 to A.D. 1000). The cache of four manos is directly associated with this date and suggests that plant processing was an important activity carried out at that time. None of the diagnostic projectile points come from these deposits. Three of the four cores, two retouched/utilized flakes, and two bifaces come from the Early Ceramic deposits of 5LA6595.

The latest use of the site is represented by three dates (Beta-100210, 103151, and 103153) and ranges between A.D. 1065 and A.D. 1300. This time span falls within the

Middle Ceramic Stage (A.D. 800\1000 to A.D. 1500). All the estimated dates of the diagnostic projectile points found at the site fit within the Middle Ceramic Stage. The P83 projectile point (Figure 86a) was found in Level 9 and is associated with two radiocarbon dates. The first sample has a calibrated intercept of A.D. 1195 and a one sigma range of A.D. 1065 to A.D. 1075 and A.D. 1155 to A.D. 1235. The second associated date has a calibrated intercept of A.D. 1285 and a one sigma range of A.D. 1270 to A.D. 1300. The one convincing P49 projectile point (Figure 86b) comes from Level 3. This is approximately 10 cm above a radiocarbon date from Level 4. This date has a calibrated intercept of A.D. 1275 and a one sigma range of A.D. 1235 to A.D. 1295. The ceramic sherd from Level 5 is also associated with this stage. This sherd is between the date associated with Level 4 (A.D. 1275) and those from Level 9 (A.D. 1195 and A.D. 1285). It is also likely that the surface sherd also belongs to this Middle Ceramic Stage occupation.

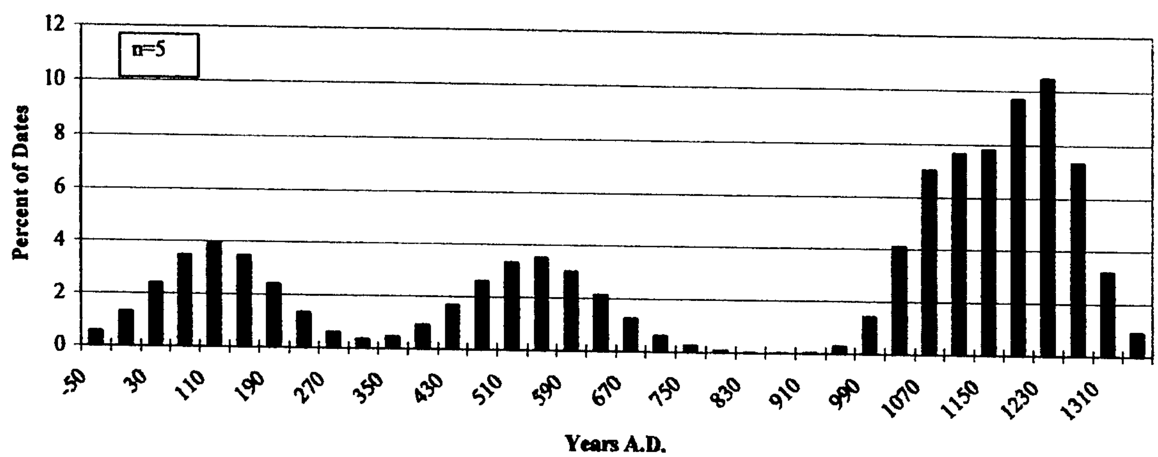


Figure 90: Site 5LA6595, probability distribution for all radiocarbon dates from site.

Discussion

It is likely that all the debris present at 5LA6595 is trash redeposited from its original context of use. A high diversity of tool types made from several material types may be expected if the site was formed through several dumping episodes. Further evidence suggesting redeposition comes the vertebrate fauna assemblage. A *Bison bison* tibia found in Level 9 may have come from the same individual represented by the *Bison bison* metapodial bone identified from Unit 1, Level 2 of 5LA6592. Both of these bones are distally unfused and come from a juvenile. The size the elements are consistent with the interpretation, but not conclusive proof, that the bones come from the same individual. These two sites (5LA6595 and 5LA6592) are located approximately 1 km apart. Moreover, rather high frequencies of the bone found in Unit 1 show some evidence of burning as does much of the ground stone, however, there were no indications of intact thermal features in any of the excavated levels indicating that *in situ* burning did not occur. The lack of thermal features coupled with the presence of high frequencies of burned artifacts suggest that hearths located at other areas of the site may have been cleaned of their contents and dumped at the midden locale of 5LA6595.

The fact that some of the materials found at the midden area of 5LA6595 may be redeposited means that the lithic reduction activities inferred from the chipped stone debitage and tool analysis may have occurred at some other area of the site. It is also possible that several intervening, and as of yet unknown, factors may have been partly responsible for the particular patterning observed in the chipped stone debitage and tool assemblages.

Eligibility Recommendation

The subsurface testing conducted at 5LA6595 has provided sufficient data to determine that the site is eligible for the National Register. The data that was recovered from excavations can be used to address three of the four research domains including chronology, paleoenvironment, and subsistence-settlement patterns. The domain of chronology can be addressed with a combination of radiocarbon dating and the presence of temporally sensitive projectile points. Five radiocarbon dates have already been run from carbon found at the site. These dates indicate a range of occupation between approximately A.D. 55 and A.D. 1300. More excavations coupled with additional radiocarbon dates may yield good associations of projectile points with datable deposits, thus aiding in the building and strengthening of the area's chronology.

Good preservation of pollen except on burned manos is apparent and the initial steps to building a substantial, stratified pollen sequence has already been initiated. These data can be used to address questions regarding subsistence and paleoenvironment. The pollen analysis conducted on the manos from Level 12 was inconclusive because the manos had been burned which destroyed any of the pollen that may have adhered to the manos. However, the deposits are thick enough and represent sufficient temporal span to allow the construction of a pollen column much like the one from Unit 3 of 5LA6568. A comparison of these two pollen sequences would help refine the currently available reconstruction of the region's paleoenvironment.

Finally, several classes of data from 5LA6595 can be used to examine the domain of settlement-subsistence patterns. The pollen evidence has already been discussed in terms of how it can be used to reconstruct subsistence. The rather extensive presence of burned deposits increases the likelihood the well preserved macrobotanical remains could be recovered from future excavations. The faunal data were adequately well preserved to allow inferences on the use and processing of animals such as cottontail rabbit, jackrabbit, and bison. Site 5LA6595 has yielded one of the few instances of *Bison bison* bone known for Welsh Canyon. Further work at the site can focus on seasonality and how resource and land use of the area around 5LA6595 fits into a broader settlement system.

Chapter X: 5LA6599

Site 5LA6599 is a rockshelter and lithic scatter located on the northern side of the main branch of Welsh Canyon (Figure 91a-b). The site elevation ranges from approximately 1487 m (4880 ft) to 1454 m (4770 ft) above sea level. The stream channel is located approximately 25 m down slope from the site datum. The rockshelter is located in the cliff face and artifacts were recorded on the talus slope below. The site size measures 250 x 100 m and is determined by the extent of lithics visible on the surface (Figure 92).

The rockshelter faces south southeast and has an opening of 6.25 m and the maximum distance from the back of the shelter to the drip line measures 2.25 m. The shelter ceiling is approximately 1.66 m above the shelter floor from a central point on the shelter floor and 4.05 m at the drip line (Figure 93). There is no stone enclosing wall at this site, but a large boulder (2.1 x 1.1 m) with a small pile of stacked rocks rests at the mouth of the shelter. The cliff face immediately above (1.95 m above present day ground surface) the boulder has a small pictograph of a quadrupedal animal and an anthropoid figure (Figure 94). Both figures are rendered in black paint or charcoal. The quadruped is located on a naturally occurring smoothed surface of the cliff face and the anthropoid figure appears to be more weathered than the quadruped.

The 1995 reconnaissance team also recorded the presence of several artifacts from surface contexts (Table 10.1). A total of 82 pieces of chipped stone debitage was recorded along with the presence of two bifacially worked projectile points, five metates, two manos, and 1 piece of unidentified ground stone.

A bifacial fragment was recovered from the surface during the 1995 reconnaissance. This specimen was found approximately 10 m northeast of the site datum and is the remains of a distal portion of a small projectile point (Figure 95a). This artifact was likely a corner-notched point with the stem, tip, and one of the corners snapped off. The fragmentary piece measures 1.8 cm diagonally and 1.5 cm wide. The piece is 0.2 cm thick and weighs 0.6 g. What remains of the blades indicate that they were somewhat straight and the point in cross section is flat and elliptical. Owing to the fragmentary nature of the artifact, it cannot be placed within one of Anderson's (1989) projectile point categories.

An additional formal tool was collected in 1996 during the mapping of the site. This artifact is a bifacially flaked drill that was located 14.5 m to the north northeast of the site datum. This specimen is nearly complete and only missing its tip (Figure 95b). It is made of a gray chert, measures 2.6 x 1.9 x .7 cm and weighs 3.0 g.

Two 1 x 1 m units were excavated at 5LA6599. Unit 1 was centrally placed within the shelter area just south of the large boulder. Unit 2 was placed approximately 28 m down slope on the talus in an area of a relatively dense, surficial artifact scatter. The unit is located just up slope of a large boulder that may have acted as a catchement area for debris being washed down from higher up on the talus. Excavations reached a depth of 1.16 m below

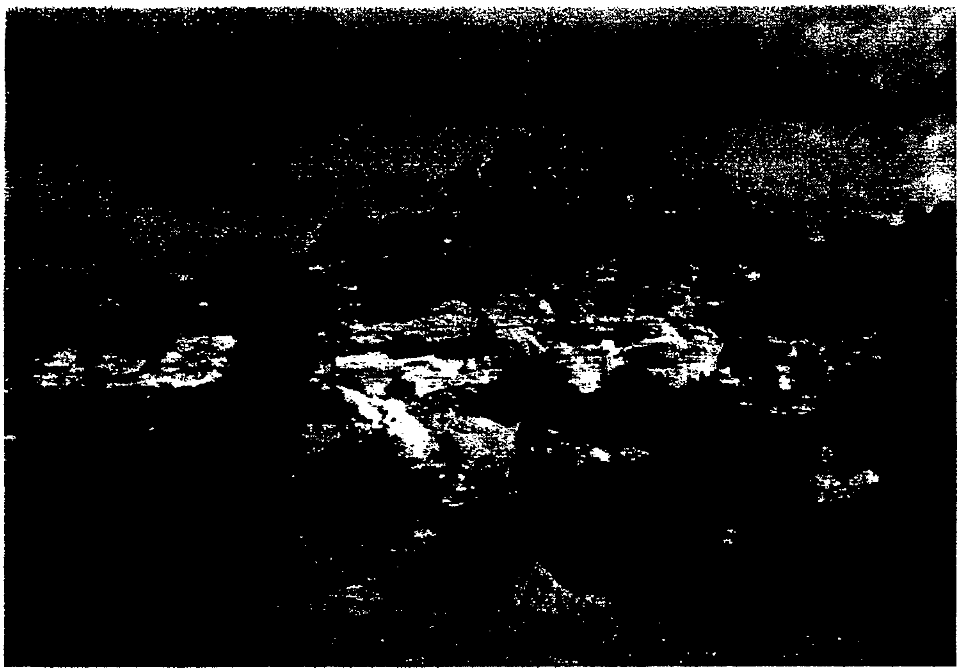


Figure 91a: Site 5LA6599, general view of the site taken facing northwest.

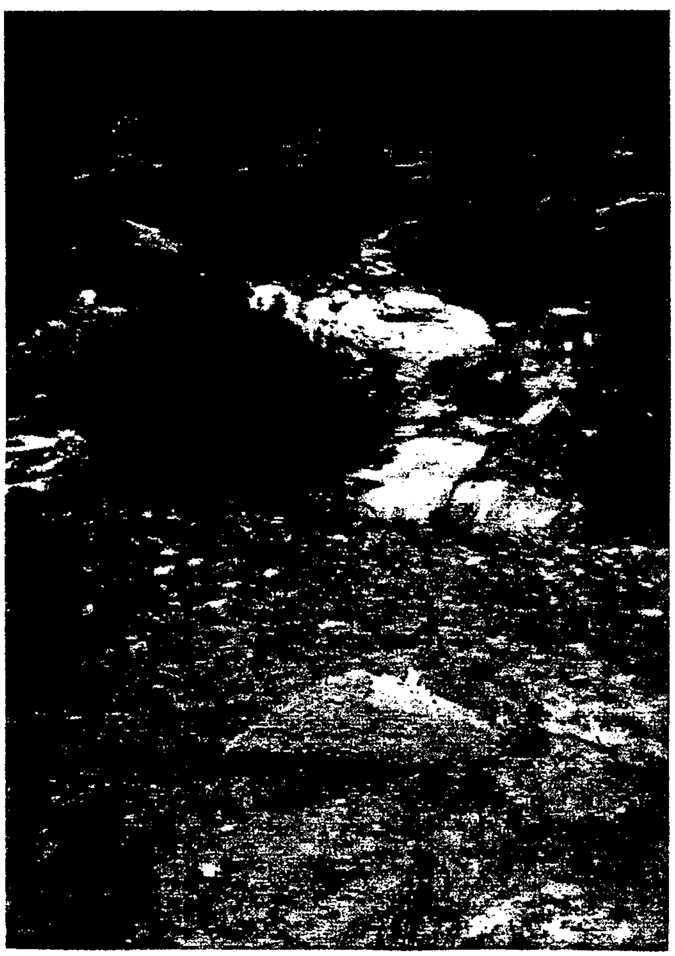


Figure 91b: Site 5LA6599, general view of the site taken facing northwest, area of Unit 2 in foreground.

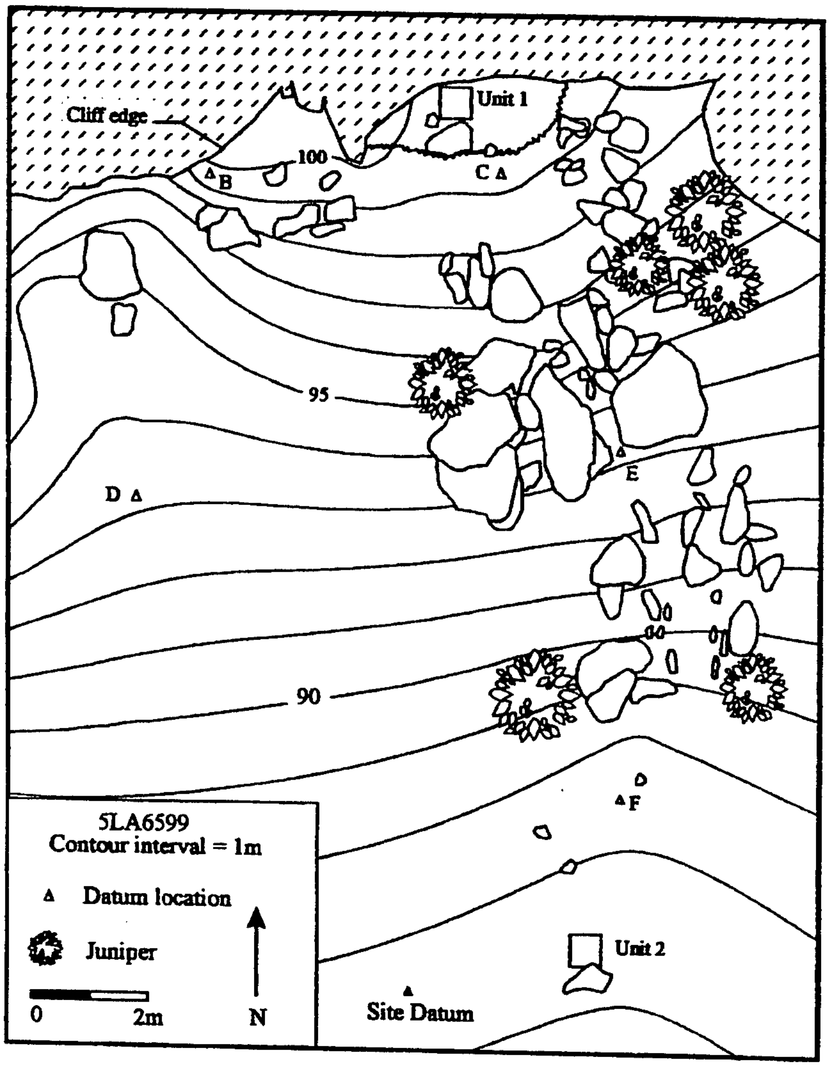


Figure 92: General site map of 5LA6599.

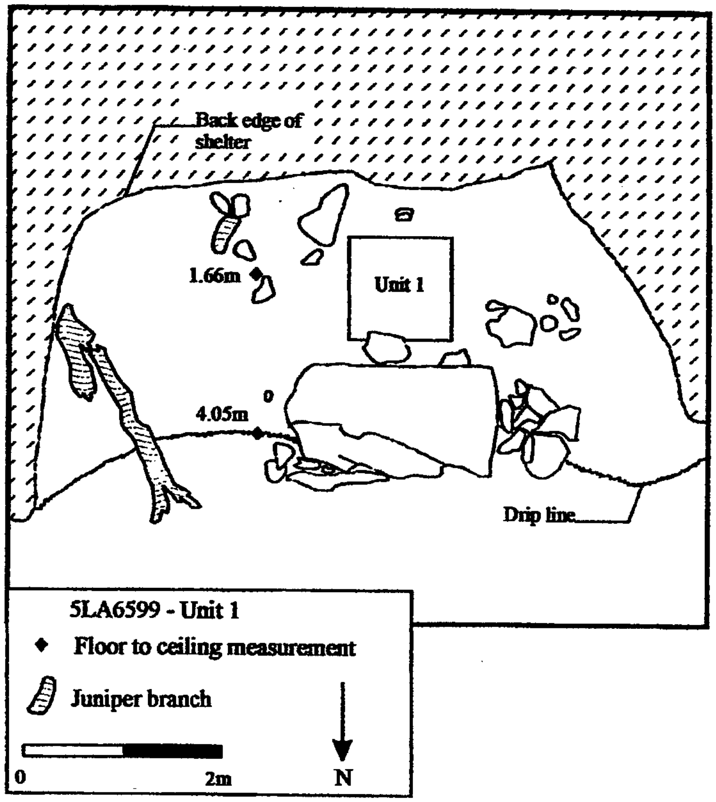


Figure 93: Site 5LA6599, Unit 1 location.

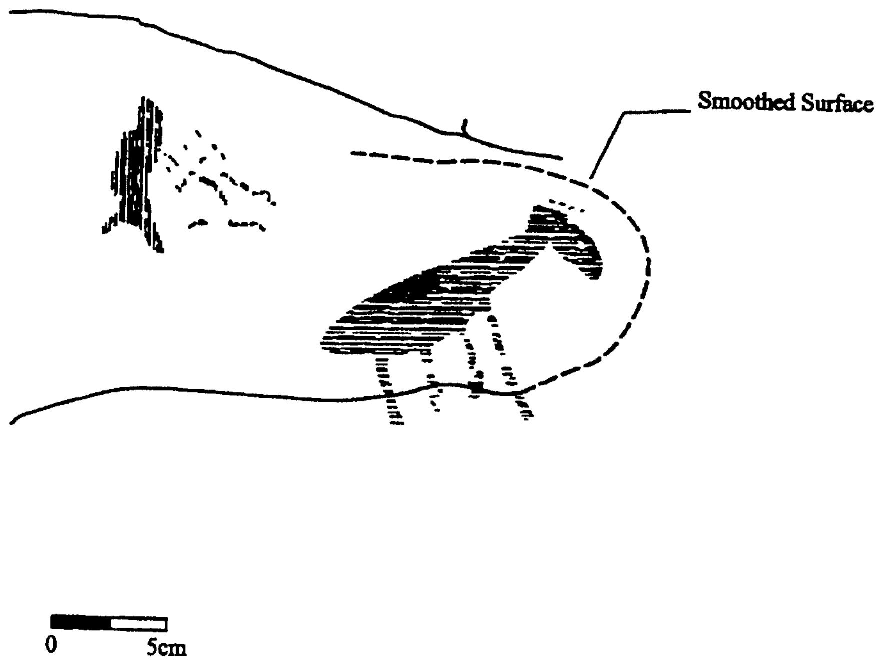


Figure 94: Pictograph above Unit 1 at 5LA6599.

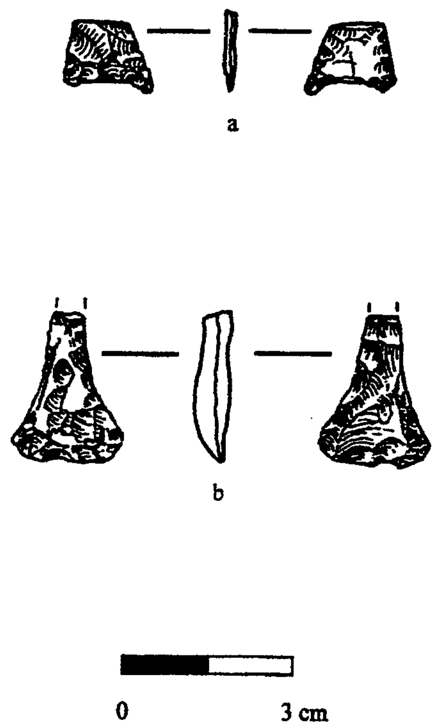


Figure 95: Surface artifacts found at 5LA6599.

ground surface and bedrock was not reached. Excavations in Unit 2 were terminated after three sterile levels had been dug and it had been determined that enough data had been recovered from the site to make an adequate determination of its National Registry eligibility. Owing to their different setting, the depositional histories of Units 1 and 2 will be treated separately.

Table 10.1. Summary of Chipped Stone Debitage and Tools From 5LA6599 Recorded in the 1995 Reconnaissance.

Artifact Type	Material	Quantity
Cortical Flake	Quartzite	24
Cortical Flake	Chert	5
Non cortical Flake	Quartzite	33
Shatter	Quartzite	19
Shatter	Hornfels	1
Biface (projectile point)	Quartzite	1
Core Tool	Quartzite	1
Metate	Sandstone	4
Metate	Quartzite	1
Mano	Quartzite	2
Ground stone Fragment	Sandstone	1

Depositional History of Unit 1

Three depositional strata are identified for Unit 1 (Figure 96; Table 10.2). Unit 1 was dug to bedrock, which was reached at a depth of approximately 40 cm below ground surface. Lying directly above bedrock, Stratum 3 is composed of a dark gray (10YR 4/1) loose silty sand. A thin lens of yellow soil (10YR 8/6) that may be eroding bedrock can be seen in the east and west profiles. Artifacts were found lying directly on bedrock which indicates that the shelter was either cleared of deposits prior to its occupation or that the shelter floor was naturally deflated prior to its occupation. This stratum contains a relatively high density of artifacts along with an abundance of carbon. Several interesting artifacts also came from this stratum including a small abrading stone, a worked piece of wood, a worked bone tool, and bone beads. Feature 1 is also in this stratum (Figure 97). It is located near the west wall of the unit and consisted of a concentration of thermally altered rocks, charcoal, and lithic debitage. The feature extends into the west wall of the unit and its visible dimensions are 25 x 15 cm. A fairly dense concentration of lithic debris was also noted situated near the southeast corner at the bottom of Level 3. Most of the lithic material from this area consisted of quartzite and may have been generated by the reduction of a single quartzite core.

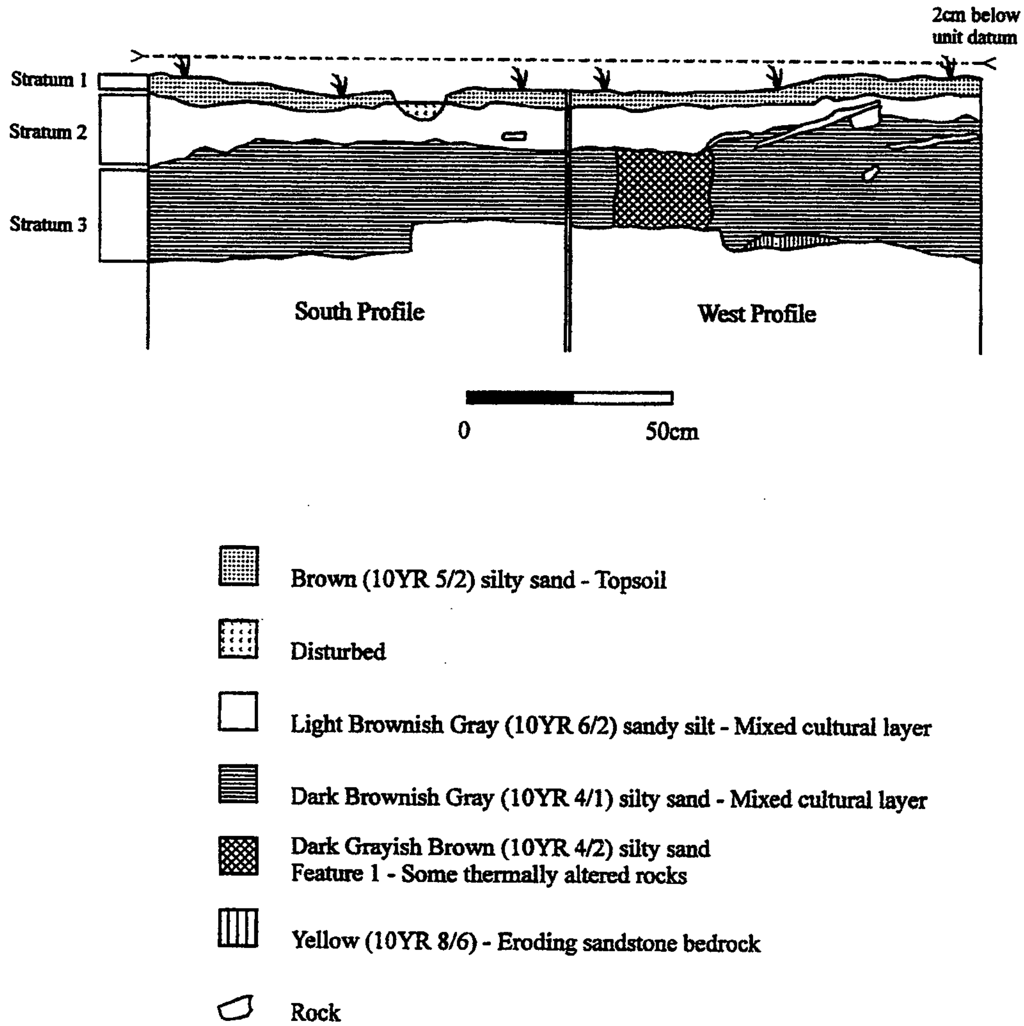


Figure 96: Site 5LA6599, Unit 1 south and west wall profiles.

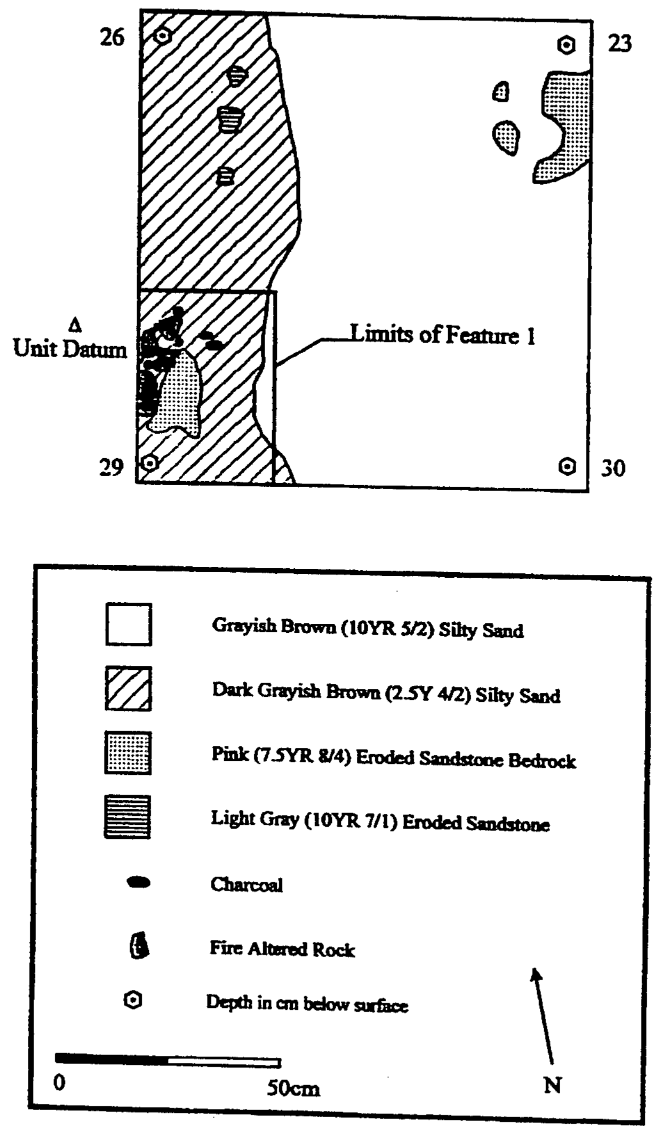


Figure 97: Site 5LA6599, Unit 1 plan view of Level 3 and Feature1, Level 4.

Table 10.2. List of Strata for 5LA6599 Unit 1

Strata	Levels	Description
1	1	topsoil and mixed cultural debris
2	2	mixed cultural deposits
3	3-5	cultural deposit

Stratum 2 is composed of a light brownish gray (10YR 6/2) sandy silt. This stratum was confined mostly to the southern half of the unit, although some of this stratum is visible in the west portion of the north wall profile. The soil of this stratum was more densely compact than Stratum 3. Artifact density is also lower and the stratum may be mixed and partially disturbed owing to surface pedestrian traffic.

Stratum 1 is the upper most and most recently deposited stratum. This stratum consisted of brown (10YR 5/3) very loose silty sand. A few patches of carbon were noted and the stratum is disturbed and mixed from recent pedestrian traffic and animal activities.

Radiocarbon Dates

A single radiocarbon date was run from a sample that comes from Level 3 of Unit 1. This sample yielded a date of 940 ±60 B.P. (Beta-100212; wood charcoal; $^{13/12}C$ -25.0 $^{0}/_{00}$). This date has three intercepts with the calibration curve (A.D. 1045, 1105, and 115). If the one sigma range is used, then it is reasonable to assume that he shelter was used some time between A.D. 1020 to A.D. 1180.

Chipped Stone

A total of 278 pieces of chipped stone debitage was recovered from excavations in Unit 1. Only three different raw material types were recovered from the excavations (Figure 98). Quartzite (88.1%) is overwhelmingly the most common type followed by chert (11.2%), and hornfels/basalt (0.7%). Of the entire chipped stone assemblage 63.7% are simple flakes, 24.8% are complex flakes, 10.1% are shatter, and 1.4% are bifacial thinning flakes (Figure 99a).

Size grade data demonstrate slightly different reduction strategies across two material types. Quartzite has a somewhat low small to large flake ratio of 4.7:1, which indicates that freehand core reduction operations were responsible for much of the quartzite debitage. Chert has a high small to large flake ratio of 22:1 indicating that late-stage tool finishing/maintenance was important in generating the chert debitage.

Compared to the number of pieces of chipped stone debitage, there is a paucity of formal chipped stone tools that come from Unit 1. A rather informal, bifacially retouched piece of chert comes from Level 4. The specimen is broken across the midsection and appears to be badly burned. The remains of this artifact measure 3.2 x 3.1 x 1.0 cm and weighs 8.9 g. It almost certainly is part of a larger biface and perhaps broke owing to its exposure to intense heat.

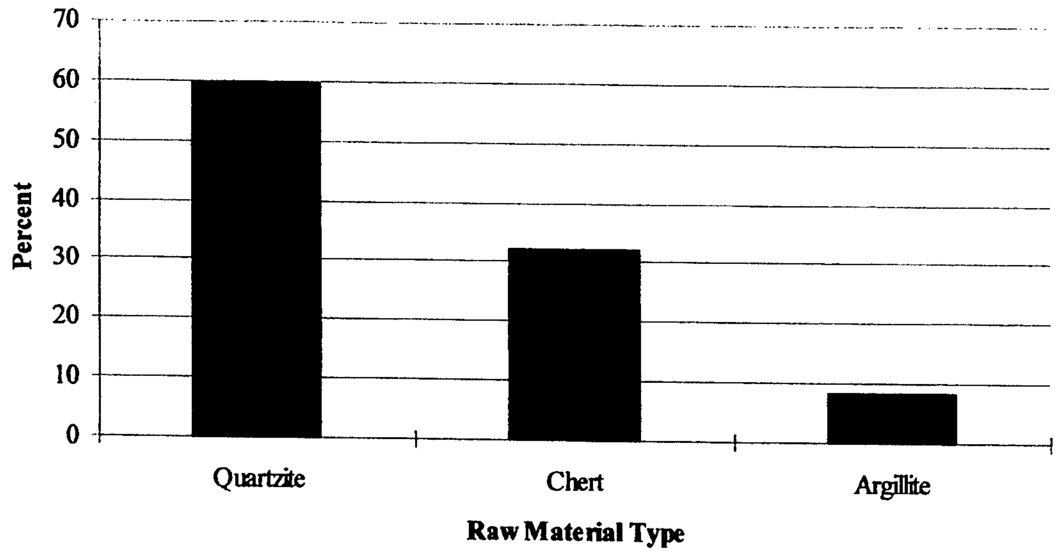


Figure 98: Bar chart of raw material types for the chipped stone debitage from 5LA6599.

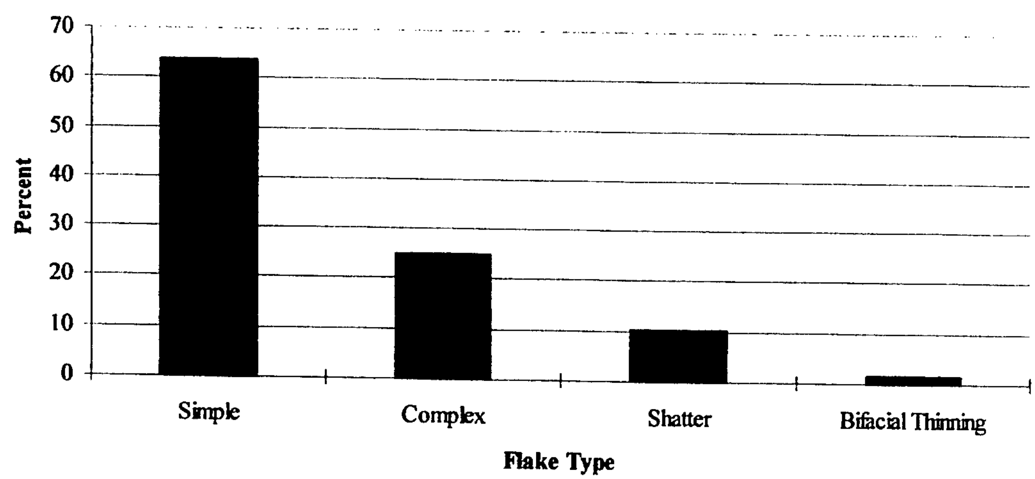


Figure 99: Bar chart of flake types for the chipped stone debitage from 5LA6599.

Ground Stone

Only one piece of ground stone was recovered from Unit 1. This specimen is a small shaft abrader or straightener (Figure 100). It measures 5.3 x 2.6 x 1.2 cm and weight 25.6 g. The abrader has gooves on both sides. The first side has a groove measuring 5.3 x .5 cm. The opposite side has a very ephemeral groove measuring 5.0 x .2 cm. This fainter groove is slightly curved, possibly since this side of the abrader is somewhat convex. There are some indications that the artifact is burned.

Vertebrate Fauna

Unit 1 yielded a total of only 53 vertebrate faunal remains, 19 of which are burned. Fifteen of the total came from dry screening and 38 came from wet screening procedures. Two cottontail elements and one jackrabbit element were recovered from Unit 1, Levels 3 and 4. A single woodrat mandible was excavated from Unit 1, Level 3; it was recovered in the waterscreened materials. Large mammal remains are noted in Levels 2 and 4; one of these specimens is burned. It is possible that the burned faunal remains are associated with a thermal feature excavated in Level 4.

Despite the small number of non-artifactual vertebrate fauna recovered, three pieces of artifactual bone were identified from Unit 1. The first piece, from Level 2, is half of a bone tube made from the tibia of a cottontail (*Sylvilagus* sp.) The bone apparently split longitudinally, possibly during manufacture. Several cut marks have been made across the shaft of the bone. No polishing is evident on this piece and both ends are rough, suggesting that the piece was left unfinished. The second bone artifact from 5LA6599 was recovered from Level 3. This piece is a complete bone tube with cut marks across the shaft. The ends appear smooth and polished. It was impossible to determine either taxon or element. The third piece of artifactual bone, from Level 4, is a pointed implement. The bone is probably from a medium or large mammal, however it was impossible to determine what element was used.

Depositional History of Unit 2

Three depositional strata are identified for Unit 2 (Figure 101; Table 10.3). Stratum 3 is the lowest stratum excavated in this unit. Bedrock was never reached. The unit was excavated to a depth of approximately 1.6m. The last three levels were culturally sterile and sufficient data had been recovered from the site to allow adequate determination of its National Register eligibility. Stratum 3 consists of a very compact yellowish brown (10YR 5/4) sandy silt with small rocks and pebbles and contained no artifacts.

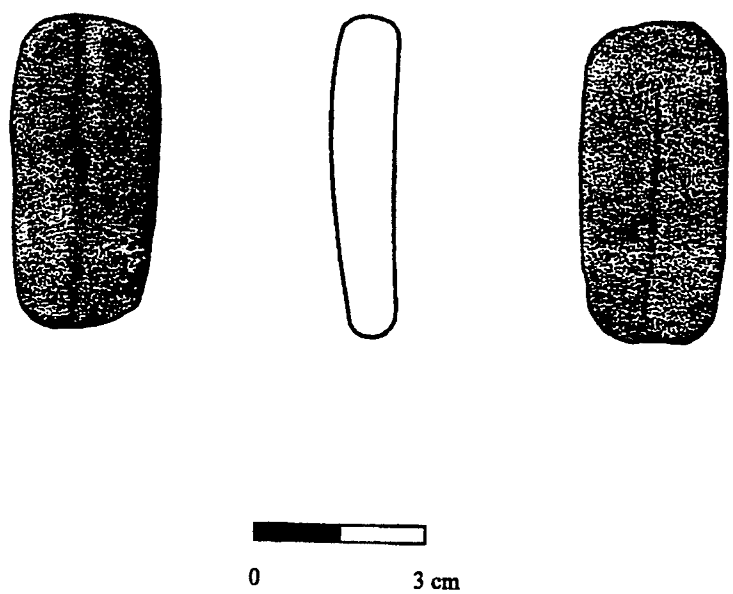
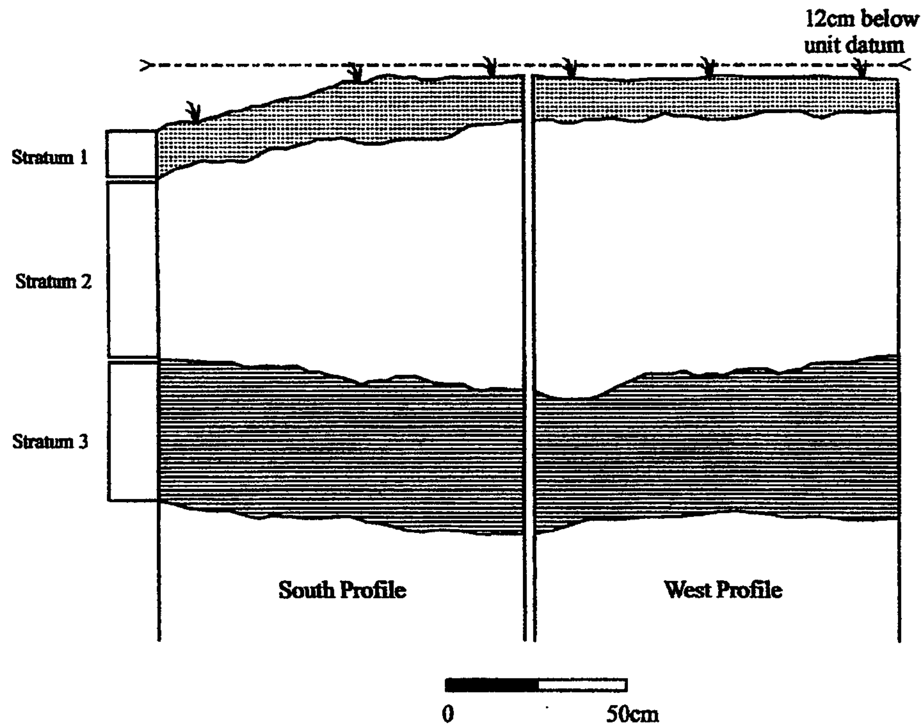


Figure 100: Shaft abrader from Unit 1, 5LA6599.



Pale Brown (10YR 6/3) sandy silt with small roots - Topsoil

Dark Brown (10YR 4/3) hard packed sandy silt - Mixed cultural layer

Light Brow (10YR 5/4) extremely compact sandy silt - Culturally sterile layer

Figure 101: Site 6599, Unit 2, south and west wall profiles.

Table 10.3. List of Strata for 5LA6599 Unit 2.

Strata	Levels	Description
1	1	topsoil and mixed cultural debris
2	2-6	cultural deposits, colluvial deposits
3	7-11	cultural deposits, colluvial deposits

Stratum 2 contains the earliest evidence of human occupation in Unit 2. The soil change differentiating Stratum 3 from Stratum 2 is somewhat subtle. Stratum 2 is a dark brown (10YR 4/3) sandy silt. Cultural materials are present in this stratum, but in relatively low numbers. However, artifact density did increase toward the upper part of this stratum. The soil is still compact, but not nearly as much as the soil of Stratum 3 (Figure 102). The artifacts found in this level probably washed down slope from the shelter and talus slope above and are not *in situ.*

Stratum 1 is the uppermost and most recently laid deposit. It is comprised of a loosely compacted pale brown (10YR 6/3) sandy silt with small roots from the surface vegetation. Artifact counts are highest in this stratum, but again the deposits were formed through colluvial processes and are redeposited from contexts situated farther up the talus slope. It should also be noted that there were high frequencies of different artifact types, including manos and metates, visible on the surface around Unit 2.

Chipped Stone

A total of 242 pieces of chipped stone debitage was recovered from excavations in Unit 2. Only three different raw material types were recovered from the excavations (Figure 103). Quartzite (81.8%) is the most common type followed by chert (17.4%), and argillite (0.8%). Of the entire chipped stone assemblage 45.5% are simple flakes, 35.1% are complex flakes, 19.0% are shatter, and 0.4% are bifacial thinning flakes (Figure 104).

Size grade data demonstrate similar reduction strategies for quartzite and chert material types. Quartzite has a somewhat low small to large flake ratio of 1.5:1, which indicates that freehand core reduction operations were responsible for much of the quartzite debitage. Chert has a very low small to large flake ratio of 1.2:1 also indicating that pure freehand core reduction was important in generating the chert debitage.

The inferences generated from the lithic debitage analysis need to be taken with a grain of salt. It is important to note that Unit 2 is located near the base of the talus slope and that the lithic debris recovered there is likely redeposited from above.

Unit 2 also yielded a relatively low count of formal tools. Only one bifacially worked projectile point was recovered from Level 1 of Unit 2. This specimen is the basal portion of a corner-notched projectile point that has a transverse fracture across its midsection (Figure 105). The artifact is made of a fine grained, banded quartzite. It measures 2.1 x 1.4 x .4 cm and weighs 1.5 g.

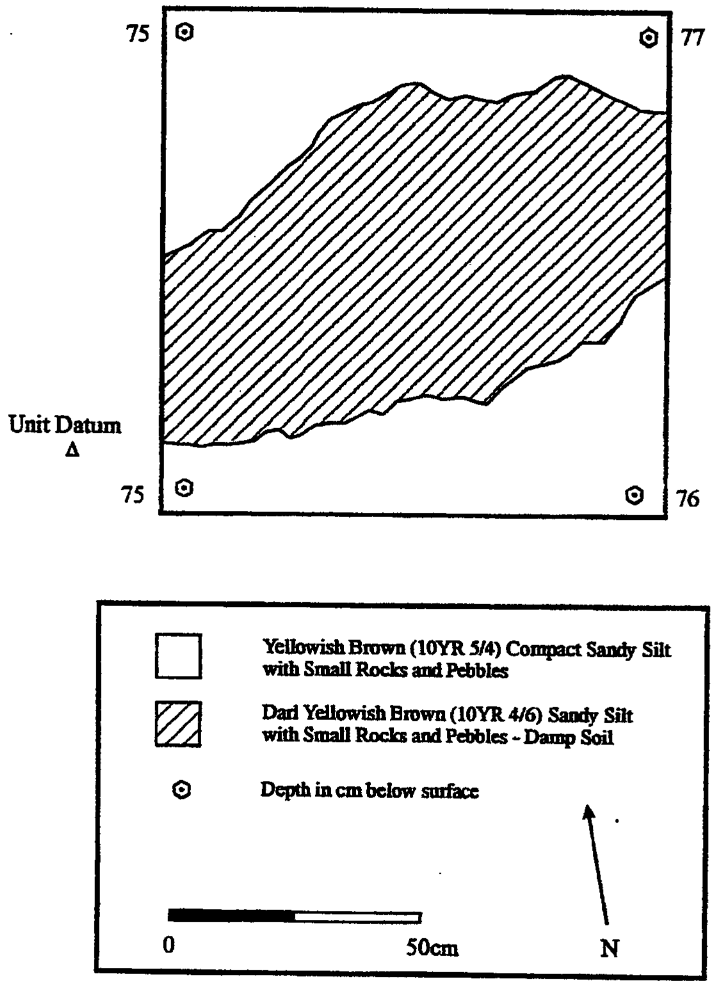


Figure 102: Site 6599, Unit 2, plan view of Level 7.

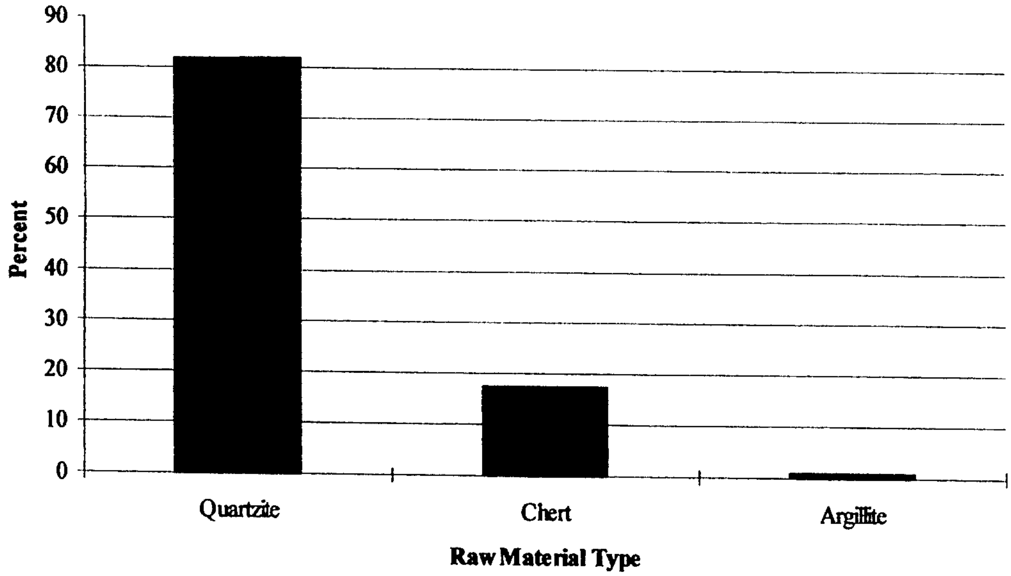


Figure 103: Bar chart of raw material types from Unit 2 at 5LA6599.

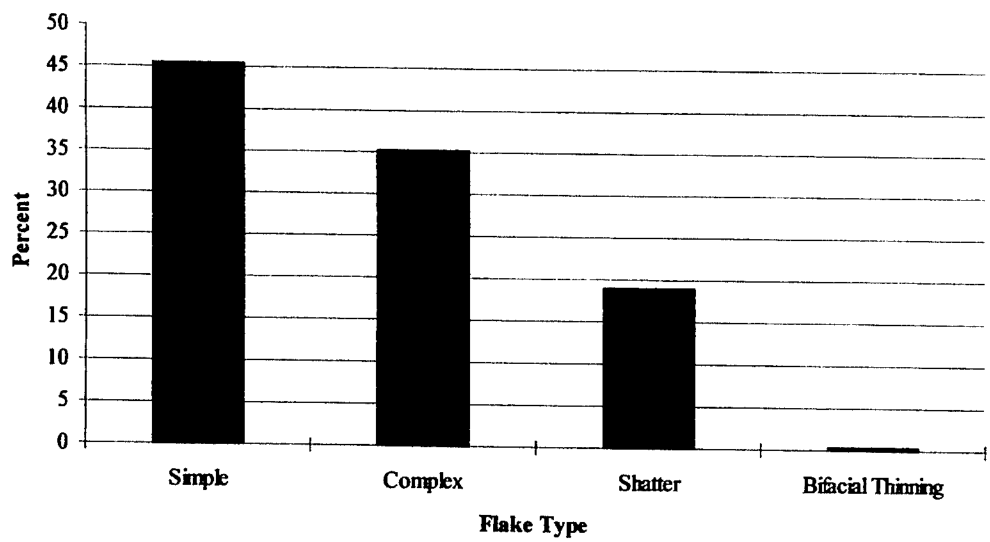


Figure 104: Bar chart of flake types from Unit 2 at 5LA6599.

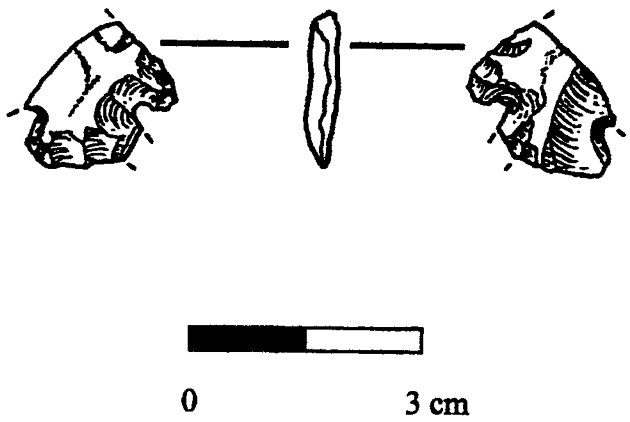


Figure 105: Projectile point from Unit 2 at 5LA6599.

Eligibility Recommendation

The subsurface testing conducted at 5LA6599 has provided sufficient data to determine that the site is eligible for the National Register. The data that was recovered from excavations can be used to address three of the four research domains including chronology, paleoenvironment, and subsistence-settlement patterns. The domain of chronology can be addressed with a combination of radiocarbon dating and the presence of temporally sensitive projectile points. One radiocarbon date has been run from carbon found at the site. It indicates a range of occupation that brackets approximately 160 years between A.D. 1020 and A.D. 1180. More excavations could yield additional datable carbon samples in good associations with projectile points or other temporally diagnostic artifacts. These kinds of associations would help in the building and strengthening of the area's chronology.

While no hearths were uncovered from our excavated sample, there is a strong possibility that at least one hearth remains within the unexcavated deposits of the shelter. With good preservation of hearths, macrobotantical and faunal data can be recovered that can be useful in addressing questions regarding paleoenvironment and subsistence. The high frequency of chipped stone debris uncovered at the site suggests that lithic reduction strategies were an important activity. Future excavations at 5LA6599 could reveal the full range of lithic reduction strategies employed at the site and therefore aid in a better understanding of the Welsh Canyon settlement system.

While not a formal research domain, the presence of rock art indicates the potential for the site to address questions of ideology and cosmology. A possible human figure and a quadrupedal animal are themes represented at this site. More detailed information of this rock art and others like it can lead to a better understanding of the world view of the ancient inhabitants of the PCMS.

Chapter XI: 5LA6602

5LA6602 is a historic site with a small prehistoric component located at the confluence of a northeast flowing tributary and the Mary Doyle branch of Welsh Canyon (Figure 106a). The site is situated at an elevation of 1372 m (4500 ft) and encompasses a prehistoric lithic scatter, a historic period, multi-course stone wall, two connecting ponds, a large earth work or dam, and the remains of a masonry structure that can be seen in the profile of the cutbank between the two ponds (Figure 106b). The site dimensions are determined by the extent of artifacts and architectural element visible on the surface. By these criteria, the site measures 200 x 150 m.

The two ponds have a roughly figure eight shape and are divided by a narrow channel or cutbank (Figure 107). The pond to the east measures approximately 64 x 30 m and the pond to the west measures approximately 50 x 42 m. The ponds held perhaps two or three feet of water when field work was begun in June of 1996, but they dried out in a month's time.

The large earthen dam flanks the north side of the western pond and measures approximately 75 m long and 13 m wide. The dam curves in towards the area between the two ponds and ends on the north side of the cut bank. It is likely that the earthen dam was built up from the fill removed from the ponds during their construction. This earthwork functioned to divert the natural course of the two streams flowing into the are from the north and southwest.

The main part of the prehistoric component is located in an area between the eastern pond and a two track skirting the northeast side of the site. It is described as a scatter of lithics and fire cracked rock. The area measures 53 x 28 m. Just west of the prehistoric component is a large pile of rubble (16 m in diameter) likely associated with the construction of the earthen dam. Historic debris is scattered through the northeast side of the site and extends into the prehistoric component and the eastern pond.

The masonry structure seen in the cut bank is constructed of shaped slabs of sandstone. Two walls situated at 3.8 m apart are seen in the cut bank profile. The western wall is preserved to a height of approximately 1.8 m while the eastern wall is 1.25 m high. The area between the two walls consists of a sandy silt fill and a good deal of sandstone slab rubble. Some charcoal, glass and other fragments of historic debris are also in the fill. Initially, it was believed that the walls of this structure were then remains of a masonry dam or some type of flood gate.

The 1995 reconnaissance team recorded the presence of a small quantity of prehistoric lithic debris (Table 11.1). A total of seven pieces of chipped stone debitage is recorded along with one core and 10 pieces of fist-sized thermally altered rocks.

Several historic period artifacts were also noted (Table 11.2). These artifacts include 16 pieces of glass, 28 pieces of ceramic, one fragment of a sanitary can, and a plate handle fragment from a cast iron stove burner.

Figure 106a: Site 5LA6602, general view of site taken facing north.

Figure 106b: Masonry structure seen in cutbank at 5LA6602 taken facing southwest.

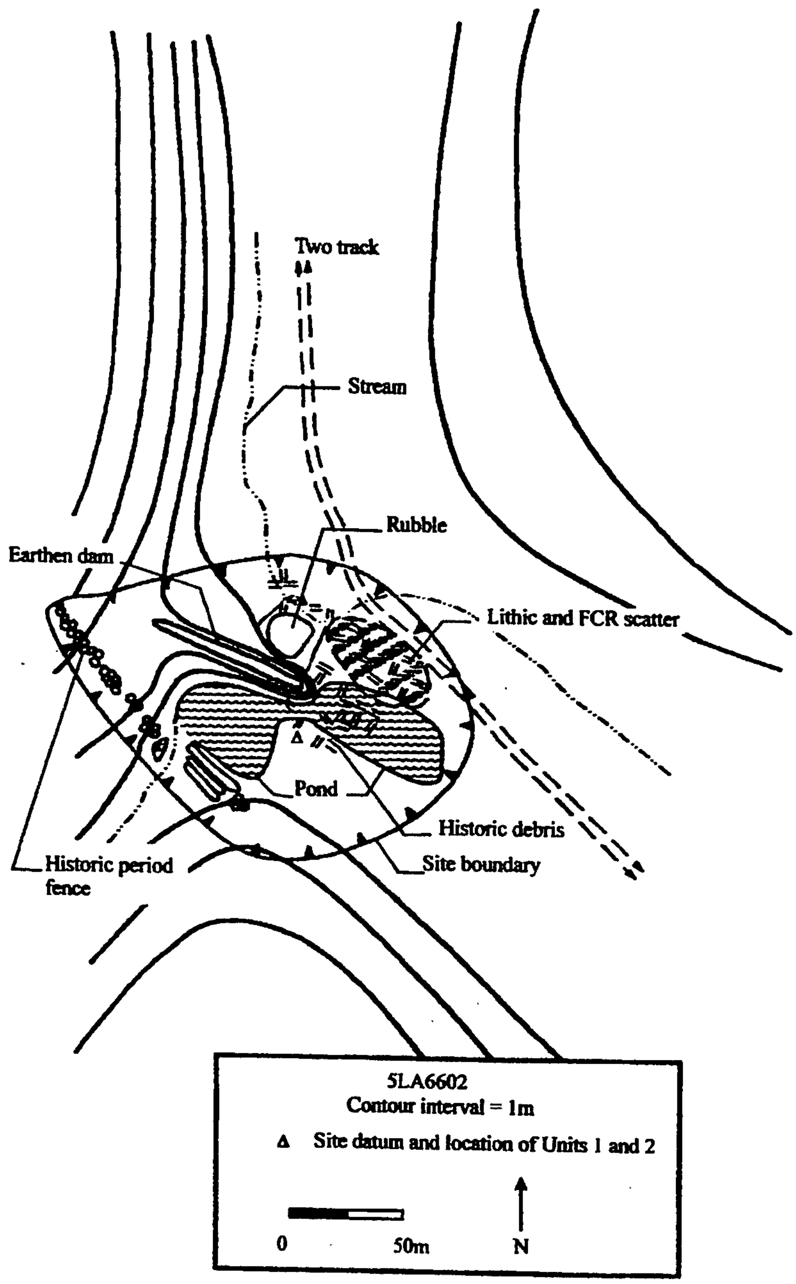


Figure 107: General site map of 5LA6602.

Table 11.1. Summary of Chipped Stone Debitage and Tools From 5LA6602 Recorded in the 1995 Reconnaissance.

Artifact Type	Material	Quantity
Primary Flake	Argillite	1
Secondary Flake	Argillite	1
Secondary Flake	Quartzite	3
Tertiary Flake	Quartzite	1
Shatter	Quartzite	3
Core	Quartzite	1
Thermally Altered Rock	N/A	10

Table 11.2. Summary of Historic Debris From 5LA6602 Recorded in the 1995 Reconnaissance.

Material	Description	Quantity
Glass		
	Bottle	9
	Window	5
	Other	2
Ceramic		
	Earthenware	21
	Stoneware	1
	Porcelain	6
Cans		
	Sanitary	1
Miscellaneous		
	Fragment from a cast iron stove	1

Subsurface testing was conducted in order to determine the function of the masonry structure noted in the cut bank. Two 1 x1 m units were excavated into the level area on top of the cut bank on the south side of the ponds. The two units were placed adjacent to one another in order to open up a relatively wide area that would allow the delineation of the walls of the structure seen in the cut bank. Excavations were terminated after three levels. The presence of historic debris such as nails, glass, and large wooden beams indicated that the structure was likely a residence or storage building rather than a dam. Detailed examination of the stratigraphy in the cut bank also supported this notion.

Depositional History of Units 1 and 2

The close proximity of the test units makes it likely that they both share the same depositional history and will therefore be treated together. Two depositional strata are identified for Units 1 and 2 (Figure 108; Table 11.3). These units were excavated approximately 25 cm deep and bedrock was not reached. By Level 3, sufficient construction debris had been recovered to indicate that the structure was likely a dugout serving as a residence or storage building and excavations were halted. Stratum 2 consists of a dark brown (10YR 10/3) sandy silt. The stratum was filled with large (ca. 20 x 15 cm) sandstone slabs, most likely rubble from the structure. A possible linear alignment of these rocks was noted in Level 3 (Figure 109). The alignment runs east to west through both Units 1 and 2. A second possible alignment was noted only in the western part of Unit 1. This alignment extends roughly north to south and may be a continuation of the structure wall seen in the cut bank located just north of Unit 1. A considerable amount of charred and partially burned wood was noted for both units. Artifacts are characterized as construction and residential debris and include metal fragments, wire cut nails, window glass, and brick fragments.

Table 11.3. List of Strata for 5LA6602 Units 1 and 2

Strata	Levels	Description
1	1	topsoil and mixed cultural debris
2	2-3	structure fill and cultural deposits

Stratum 1 is the topsoil. It is the most recently laid deposit and consists of a brown (10YR 3/3) sandy loam humus layer with considerable amounts of grass roots. This stratum is disturbed and mixed from recent pedestrian traffic and animal activities.

Analysis and Interpretation

Initially, it was thought that the masonry walls of the structure were structural elements in the dam with the space between the two walls filled with earth. Supposedly, the structure was placed across the stream channel in order to stem the flow of water acting as a floodgate and creating the two small reservoirs.

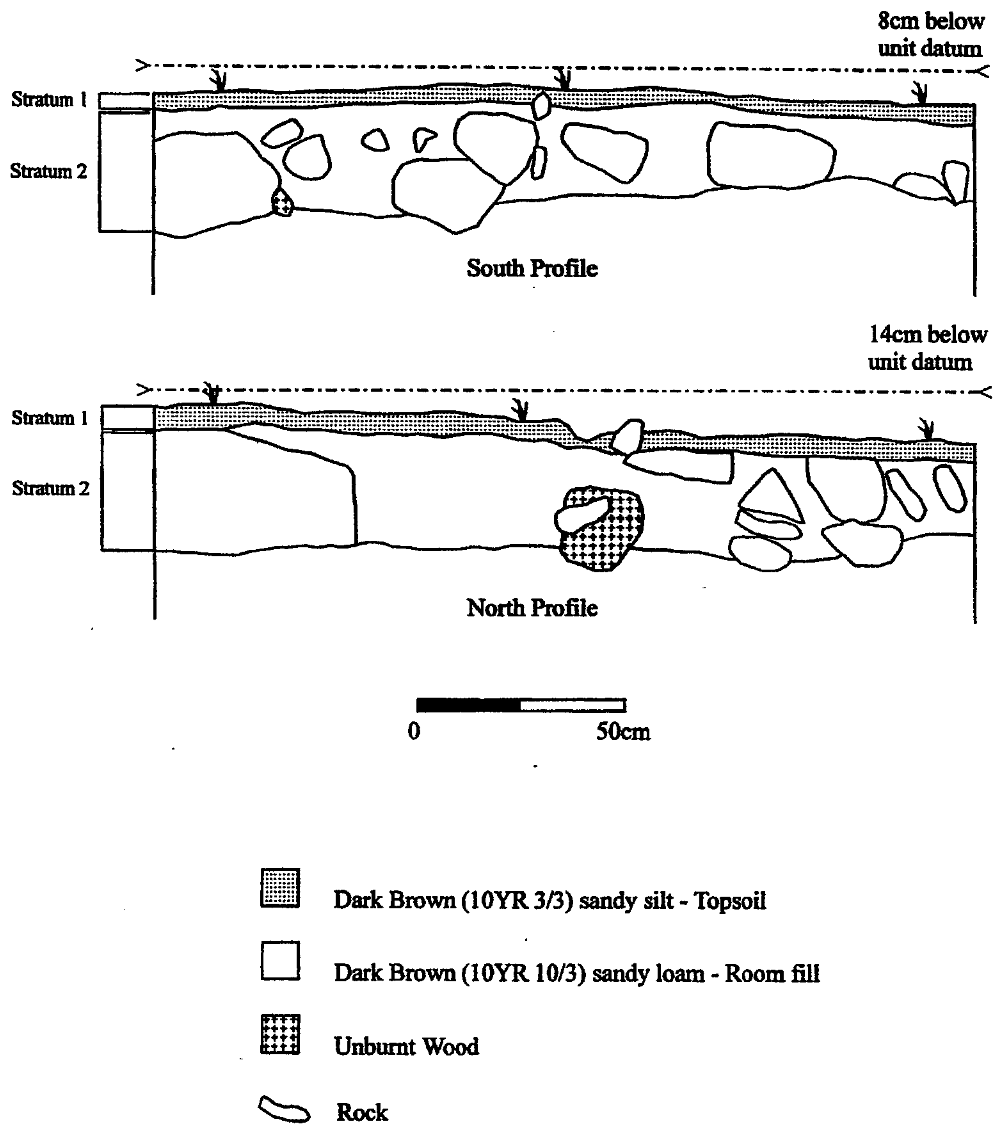


Figure 108: Site 5LA6602, Units 1 and 2 south and north wall profiles.

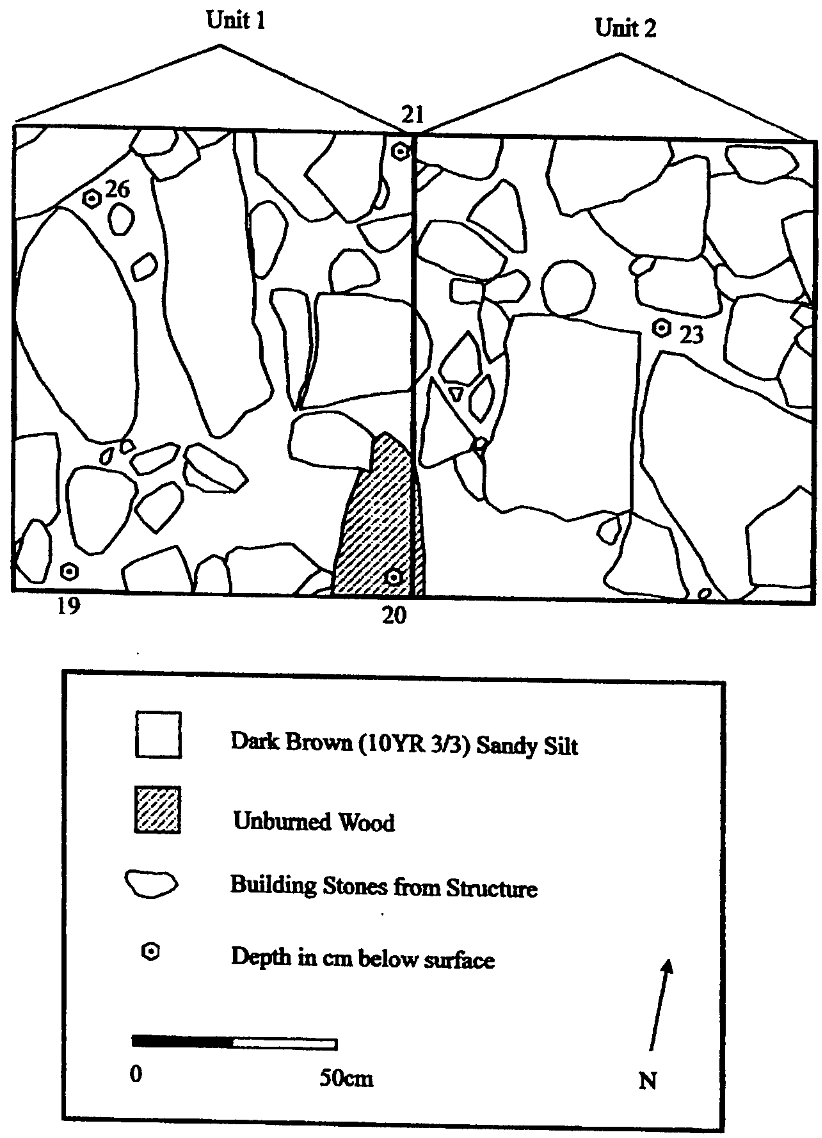


Figure 109: Site 5LA6602, Units 1 and 2 plan view of Level 3.

There are several problems with the interpretation of this structure as a dam. First, earthen fill alone would suffice to hold back the water and create the two ponds. There would have been no apparent reason to fill in a masonry structure to fulfill this function. Second, there is wall fall located within the space between the two masonry walls. It is unlikely that a dam would have a roof. Furthermore, it is also unlikely that the fill within the two walls of the structure was intentionally deposited. Support for this idea comes from the presence of numerous thin, silty laminated lenses in the profile of the cut bank (Figure 110a). These laminates suggest that water from the two ponds breached the walls of the structure and deposited relatively fine silts within the confines of the structure. Finally, the debris uncovered from the excavations suggests that the structure was either used as a residence or outbuilding rather than a dam.

In all likelihood, the masonry structure was a building constructed in the form of a dugout that belonged to the Mary Doyle Ranch located less than 1 km to the north. Other possibilities include that it was part of a coal mining operation located approximately 1 km upstream or it may have been an independent residence or storage facility.

There are dugout structures at the Mary Doyle Ranch that are very similar in form and style to the masonry structure. The structure at 5LA6602 has what appears to be a wing wall abutting against the western wall. This same feature is apparent on a dugout structure at the Mary Doyle Ranch (Figure 110b). The two structures share enough stylistic similarities to suggest a temporal association.

The Mary Doyle Ranch dates to the last quarter of the nineteenth century. Artifacts from the excavated units at 5LA6602 suggest that the masonry structure there dates to the last quarter of the nineteenth century and the first quarter of the twentieth century (Table 11.4). The ponds likely date more recently, perhaps from the first quarter to the middle of the twentieth century.

The construction of the ponds and the large earthen berm must have postdated the construction of the masonry structure seen in the cutbank. Masonry tabular blocks, similar to those used in the construction of the structure, are found along the eastern end of the earthen dam. Furthermore, domestic debris similar to that recovered from Units 1 and 2 was also located there. Apparently, part of the masonry structure was destroyed and incorporated into the fill of the earthen berm during the digging of the ponds.

Eligibility Recommendation

Excavations at 5LA6602 have determined that the masonry structure seen in the cut bank between the two ponds is a dugout that was either a residence or perhaps a storage facility perhaps related the Mary Doyle ranch. Since this structure is not considered to be a dam or water diversion facility related to the two ponds, it is no longer thought to be a unique site type in the region and therefore it is not recommended as eligible for the National Register.

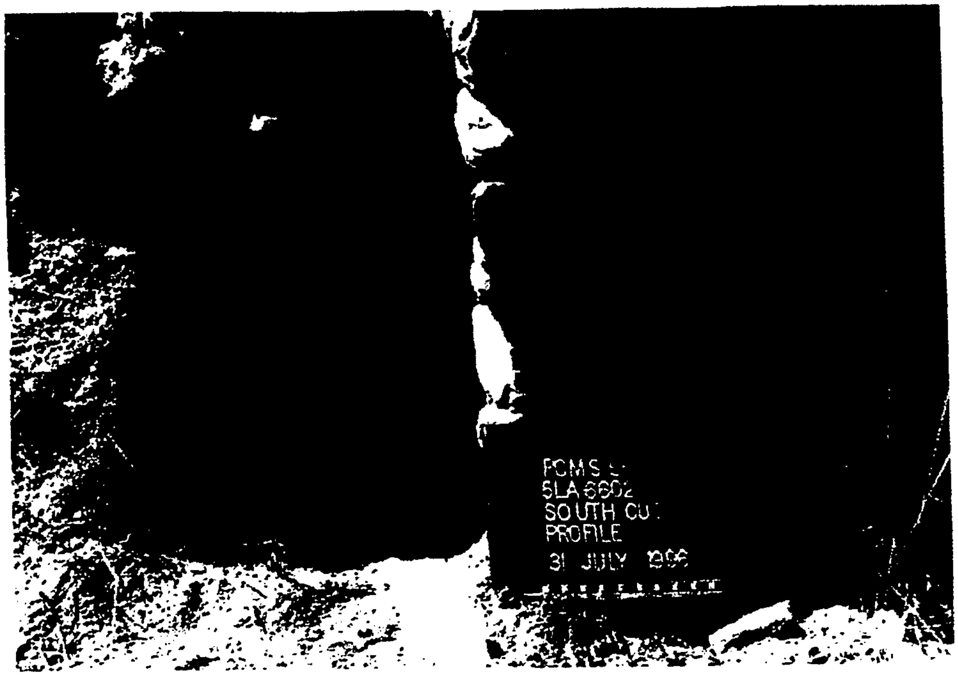


Figure 110a: Site 5LA6602, profile within structure showing silty water deposited lenses.

Figure 110b: Dugout masonry structure at the Mary Doyle Ranch.

Table 11.4. List of Artifacts Recovered From Excavations at 5LA6602 by Unit and Level.

Unit	Level	Clear Bottle Frag.	Clear Bottle Base	Brown Bottle Frag.	Aqua Bottle Frag.	Wire Nail	Metal Frag.	Aluminum Foil	Seed Case	Brick Frag.	Bone
1	1	13	0	0	0	0	0	0	0	0	0
1	2	9	0	0	0	0	0	0	0	0	0
1	3	21	1	0	1	14	2	1	0	20	0
2	Surface	0	0	0	10	1	0	0	0	0	0
2	1	0	0	0	15	0	0	0	0	0	0
2	2	0	0	2	17	13	5	0	0	0	1
2	3	0	0	0	2	11	2	0	2	42	0
Cut bank	-	0	0	0	23	1	0	0	0	0	0
Total		43	1	2	68	40	9	1	2	62	1

Chapter XII: 5LA6603

Site 5LA6603 is a large rockshelter located on the southeastern side of a large tributary of Welsh Canyon (Figure 111a-b). The site lies at the base of the lowest sandstone outcrop. The site elevation is approximately 1490 m (4887 ft) above sea level. The nearest location of water is the unnamed tributary of Welsh Canyon located about 10 m down slope from the rockshelters. Permanent springs are found at several locations along the canyon wall within a kilometer of the site. The site dimensions are based on the extent of the rockshelters and the artifacts visible on the surface and using these criteria the site measures approximately 70 x 42 m, extending from the rockshelters down the talus slope to the wash below.

The 1995 reconnaissance team recorded several artifacts from surface contexts (Table 12.1). A total of 63 pieces of chipped stone debitage was recorded along with seven retouched/utilized flakes, one biface fragment, one core, and two metate fragments.

Table 12.1. Summary of Chipped Stone Debitage and Tools From 5LA6603 Recorded in the 1995 Reconnaissance.

Artifact Type	Material	Quantity
Primary Flake	Quartzite	11
Primary Flake	Siltstone	1
Secondary Flake	Quartzite	32
Secondary Flake	Argillite	1
Tertiary Flake	Quartzite	10
Shatter	Quartzite	8
Retouched/Utilized Flake	Quartzite	6
Retouched/Utilized Flake	Chert	1
Biface	Quartzite	1
Core	Quartzite	1
Metate Fragment	Sandstone	2

Three rockshelters make up the site, but only Shelters 2 and 3 received subsurface evaluative testing (Figure 112). Shelter 1 has an opening of approximately 6 m and the maximum distance from the back of the shelter to the drip line measures approximately 3 m. There is a rather large pile of rocks at the shelter's opening that may be a stone enclosing wall. This particular shelter had little in the way of accumulated deposits on the shelter floor, therefore no subsurface testing was conducted there. A piece of ground stone lying in the

Figure 111a: Site 5LA6603, general view of site taken facing southwest.

Figure 111b: Site 5LA6603, enclosure wall of Shelter 2 taken facing south, note upright slab.

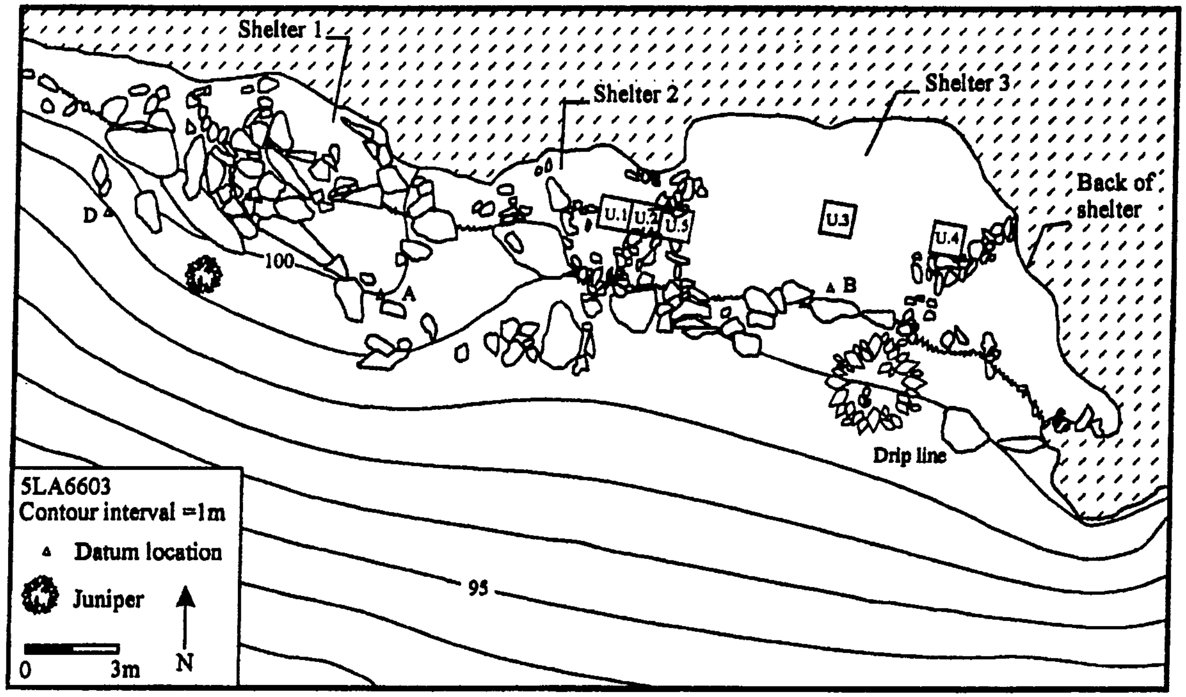


Figure 112: General site map of 5LA6603.

shelter was recorded by the 1995 reconnaissance team. It is a flat, slab metate made of sandstone. Its overall size is 37 x 24 x 6 cm and has a single grinding surface. This surface measures 12 x 8 cm and is oval. Transverse striations are visible and it exhibits light use wear.

Shelter 2

Shelter 2 is a small alcove or niche measuring 6 m along the long axis of the shelter's interior and with a maximum distance of 4.5 m from the back wall of the shelter to the drip line (Figure 113). A boulder sits at the mouth of the shelter and several smaller sandstone rocks litter the area inside the shelter. An enclosing wall delineates the eastern edge of Shelter 2. This wall measures approximately 4.5 m long and is composed of tabular sandstone slabs, three of which are uprights (See Figure 111b). A juniper branch lies between the large boulder and enclosing wall. The shelter ceiling is low measuring only 1 m high. Two units (Units 1 and 2) were placed within Shelter 2. These units were placed adjacent to one another with Unit 1 being in a central location within the shelter and Unit 2 being placed along the west side of the enclosing wall. Unit 5 was placed along the eastern side of the enclosing wall and is technically within Shelter 3. Only one level of Unit 5 was excavated owing to time constraints. Since Units 1, 2, and 5 are analytically similar they will be discussed together.

Depositional History of Units 1, 2, and 5

Four depositional strata are identified for Units 1, 2, and 5 (Figure 114; Table 12.2). Lying directly above bedrock, Stratum 4 consists mainly of light brownish gray (2.5Y 6/2) silty sand with charcoal. Artifacts and carbon are present in this stratum but in low frequencies. Several lenses were also noted within this stratum and are most apparent in the south profile. Two thin lenses are located near the bottom of the stratum approximately 5 cm above bedrock and appear to form a shallow basin. The lower of these is dark gray (2.5Y 4/2) sandy silt with charcoal. The second is composed of a light gray (2.5Y 6/2) clay.

Table 12.2. List of Strata for 5LA6603 Units 1, 2, and 5

Strata	Unit 1 Levels	Unit 2 Levels	Unit 5 Levels	Description
1	1	1	1	topsoil and mixed cultural debris
2	2-6	2-6	-	cultural deposits
3	7-8	7	-	cultural deposits

These two lenses are covered by a relatively thick layer of a gray brown (2.5Y 5/2) very compact clayey soil. This layer may be a specially prepared surface that served to level off the irregular surface of the bedrock. Another relatively thick layer was noted above the clay surface forming the upper most part of the stratum. This layer consists of pale yellow (2.5Y 8/4) loosely consolidated sand, permeated with what appear to be gypsum crystals. These crystals are found to adhere to the ventral surfaces of chipped stone debitage, which

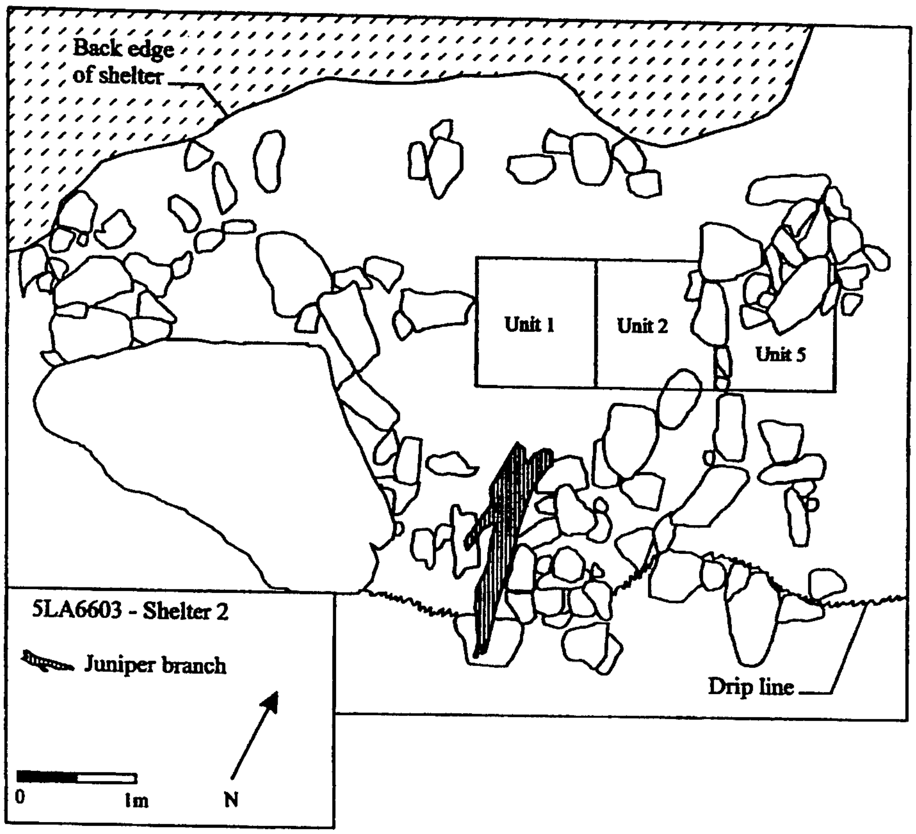


Figure 113: Site 5LA6603, Shelter 2, Units 1, 2, and 3 plan view.

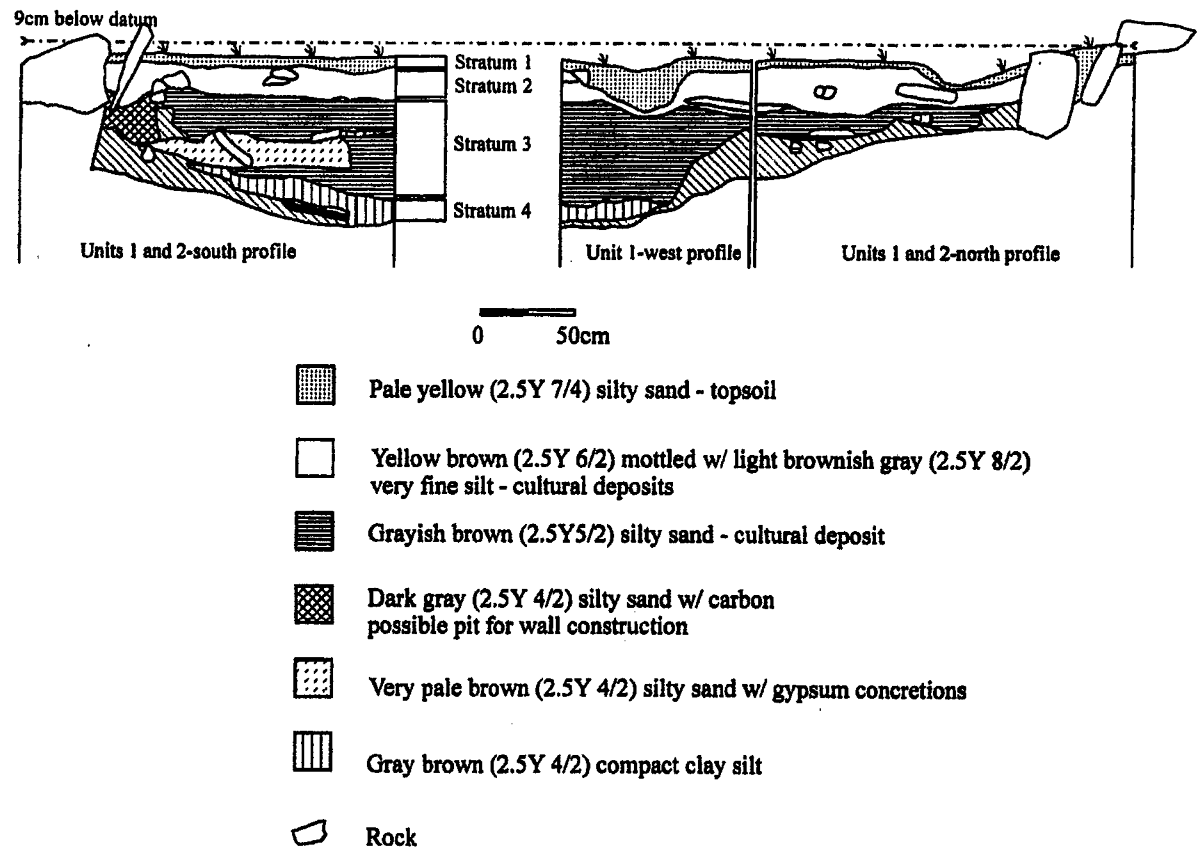


Figure 114: Site 5LA6603, Units 1 and 2 north, west, and south wall profiles.

seems to indicate that the crystals formed some time after the layer was deposited. Deposits rich in gypsum are seen on the surface of the shelter floor. The gypsum crystals of Stratum 4 may have formed after a period of weathering and water percolation during a period of time when gypsum rich deposits were allowed to accumulate on the surface without much disturbance owing to human activities in the shelter. If this is the case than the presence of these crystals may indicate a hiatus in occupation between the lower levels and upper levels of shelter.

Stratum 3 is comprised mainly of a light brown (10YR 7/3) silty sand. No gypsum crystals are associated with this Stratum but powdery, gypsum enriched soils are present. Two thermal features are associated with Stratum 3. Feature 1 is a possible hearth consisting of a dark gray (2.5Y 4/2) loose silty sand located near the northeast corner of Unit 1. There were no clearly defined edges to the feature and no thermally altered rocks were found to line its edges. It is likely that Feature 1 is an ephemeral, perhaps even a single use hearth. Feature 2 is located in the northeast corner of Unit 1 just 10 cm below Feature 1. This feature is a circular, dark gray (2.5Y 4/2) sandy silt stain that extends in the north and east walls of the unit (Figure 115). The fill of the feature contained burned rock and charcoal. The excavated portion of Feature 1 measures 40 x 30 cm and is likely an ephemeral hearth or perhaps even a burned juniper branch.

Stratum 2 consists primarily of a light gray (2.5Y 6/2) silty sand mottled with a brownish white (2.5Y 8/2) silty sand that may be composed mostly of a powdery gypsum. The majority of the artifacts that were recovered from this shelter came from this stratum. It also seems likely that the rock enclosure was constructed at some time pertaining to the deposition of this stratum. The rocks of the enclosure were placed in a shallow pit or trench that cut down into the upper part of Stratum 3. The fill of this pit is a dark grayish brown (2.5Y 4/2) sandy silt with charcoal.

Stratum 1 is the uppermost and most recently laid deposit. It is comprised of a very loose pale yellow (2.5Y 7/4) silty sand. In Unit 2, there is considerable evidence for animal disturbance. Within the rocks of the enclosure, many wood and bone splinters were noted along with the presence of woodrat burrows. These disturbances extend down to Level 4 of the unit. In general, this stratum is disturbed and mixed from recent pedestrian traffic and animal activities.

Radiocarbon Dates

Three radiocarbon dates were run on samples from these units. The first is a general sample collected from Level 5 of Unit 1 and is associated with Feature 2 and the lower levels of Stratum 3. This sample yielded a date of 1500 ±60 B.P. (Beta-100214; wood charcoal; $^{13/12}$C -25.0 $^{0}/_{00}$). The second sample comes from Level 4 of Unit 1 and is associated with Feature 1 of Stratum 3. This sample yielded a date of 1150 ±80 B.P. (Beta-100215; wood charcoal; $^{13/12}$C -23.7 $^{0}/_{00}$). The third sample comes from Level 5 of Unit 2. This sample was taken from the shallow trench into which was placed the enclosing wall and should date that structure. The sample yielded a date of 980 ±50 B.P. (Beta-103154; wood charcoal;

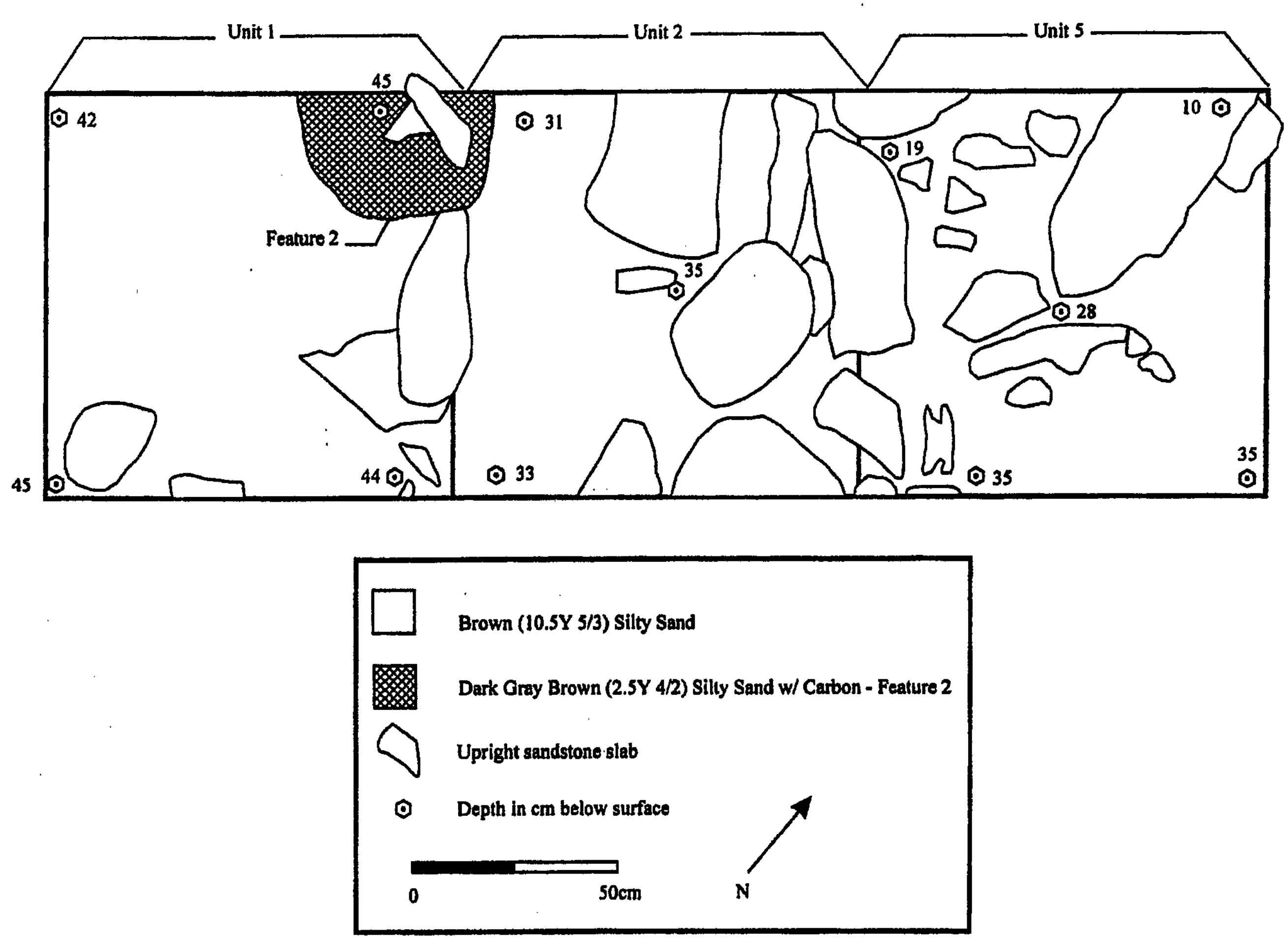


Figure 115: Site 5LA6603, Units 1, 2, and 5 plan view.

$^{13/12}C$ -23.8 $^0/_{00}$). The probability distribution of these three samples is somewhat bimodal and suggests at least two separate occupations (Figure 116). The early occupation centers is represented by one date (Beta-100214) and based on the calibration (1 sigma), ranges from approximately A.D. 590 to A.D. 685. Levels 5-8 of Unit 1 and Level 7 of Unit 2 yield data that are associated with this date. A second occupation is represented by two dates (Beta-200212 and 103154). Based on the calibration (1 sigma), this occupation may have ranged from between approximately A.D. 790 and A.D. 1150. This later occupation is associated with Levels 1-4 of Unit 1, Levels 1-6 of Unit 2 and Level 1 of Unit 5.

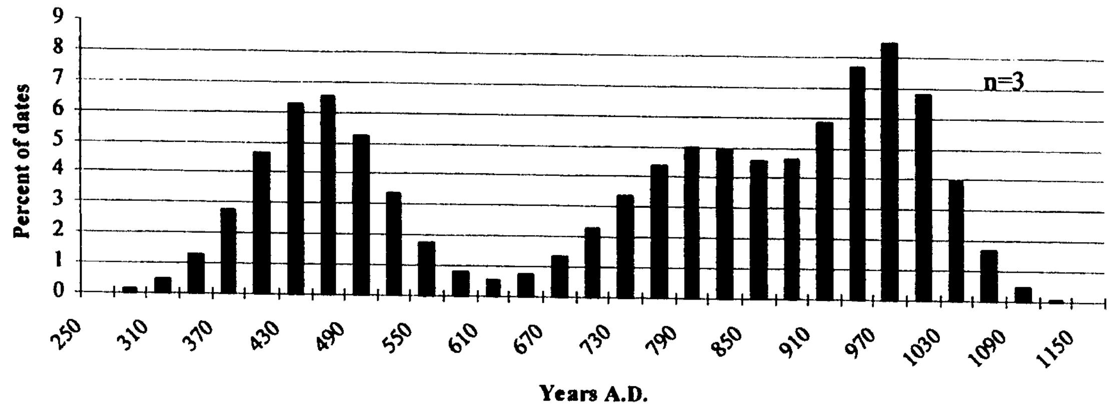


Figure 116: Site 5LA6603, probability distribution for all radiocarbon dates from site.

Chipped Stone

A total of 213 pieces of chipped stone debitage was recovered from Units 1, 2, and 5 of 5LA6603. Six different raw material types were recovered from these units (Figure 117). Quartzite is the most common material (73.7%) followed by chert (23.0%) and argillite (1.9%). No obsidian was recovered from Shelter 2 and it appears as though all the raw materials found in these units were locally available. The chipped stone debitage from Units 1, 2, and 5 can be divided into early and late occupations and then compared. The main difference is that the use of chert increases as the use of quartzite decreases in the late occupation (Figure 118). When both occupations are grouped, the majority of the flakes are simple flakes (61.9%) followed by complex flakes (30.6%), shatter (6.7%), and bifacial thinning flakes (0.8%). There is some evidence for a change in the proportions of flake types through time (Figure 119). Simple flakes, shatter, and bifacial thinning flakes are slightly more common in the late occupation while the proportion of complex flakes decreases by more than 50% from the early to the late occupation.

The size grade information suggests that the final stages of tool production or maintenance were responsible for generating the quartzite and chert debitage in both the early and late occupations. The small to large flake ratio for quartzite in the upper levels is 7.8:1 and 5.1:1 in the lower levels. These ratios are somewhat high for quartzite and suggest that the later stages of lithic reduction were mostly responsible for generating the quartzite debitage. The small to large flake ratio for chert is even higher than for quartzite. The small to large flake ratio in the late occupation is 19.3:1, indicating that the final stages of tool production/maintenance were mostly responsible for the chert debitage in upper levels.

Unfortunately, the frequency of chert is too low in the lower levels to conduct a meaningful analysis.

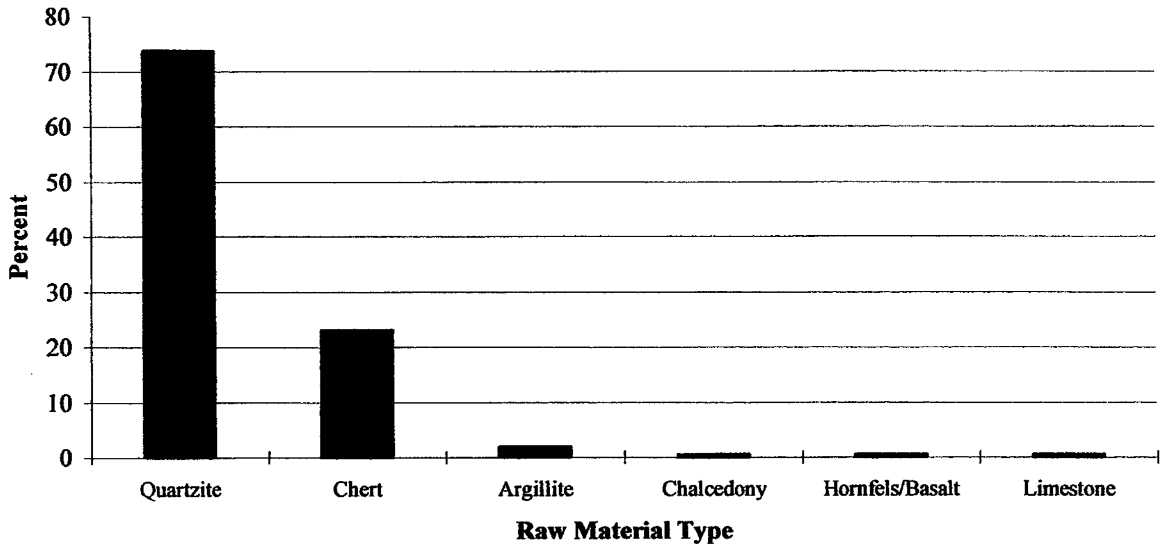


Figure 117: Bar chart of raw material types for the debitage in Units 1, 2, and 5 at 5LA6603.

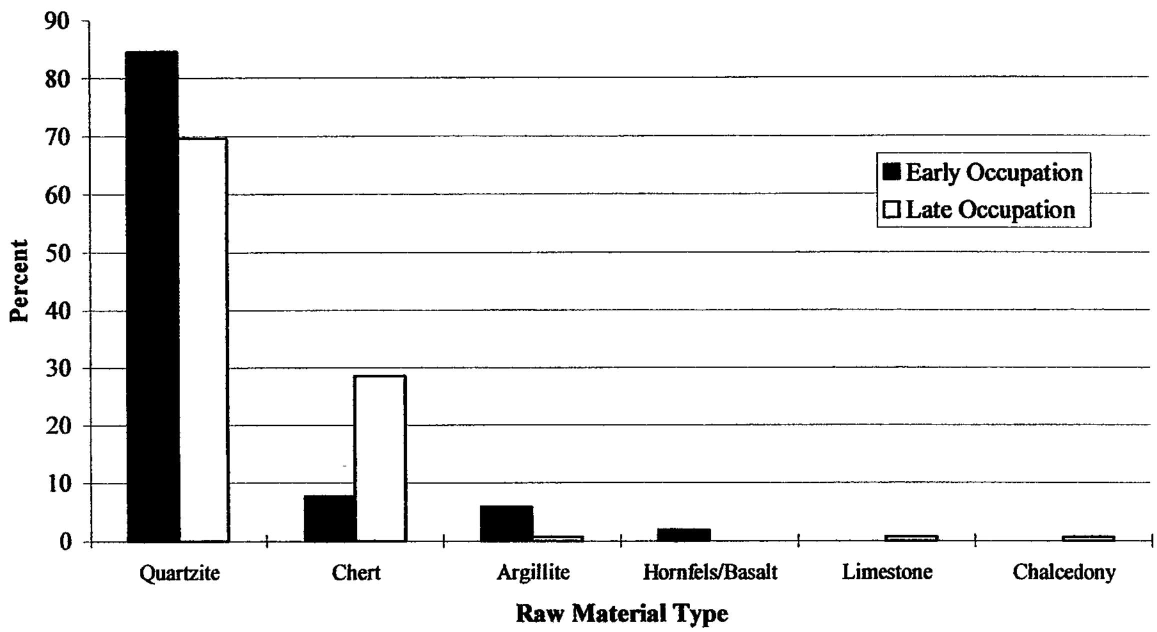


Figure 118: Bar chart of raw material types for the early and late occupations at 5LA6603.

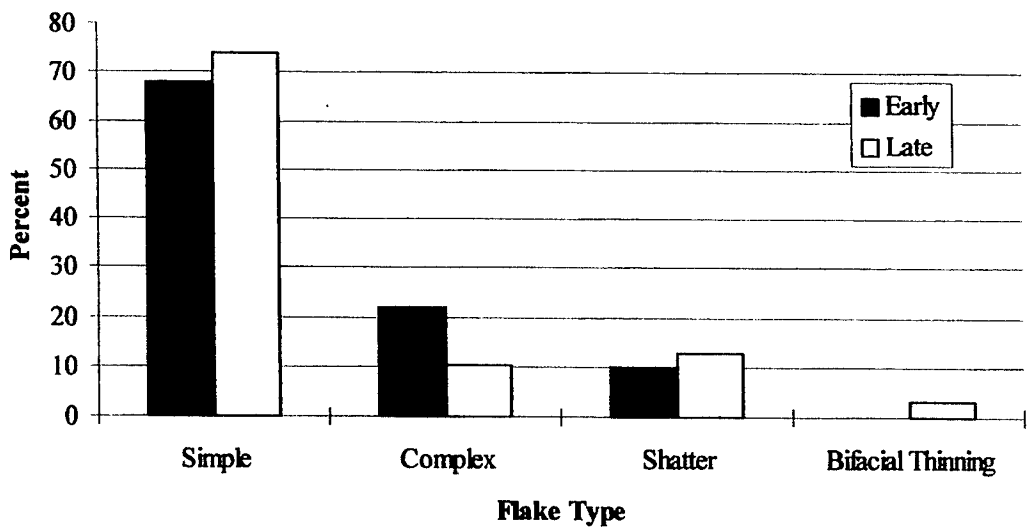


Figure 119: Bar chart of flake types for the early and late occupations at 5LA6603.

Three bifaces were uncovered in Unit 1 and 2. The first is a complete, side-notched projectile point made of chert that was found in Level 3 of Unit 2 (Figure 120a). The specimen measures 2 x 1.3 x .2 cm and weighs .6 g. The blades each measure approximately 1.4 cm and the base measures .8 cm long by 1.3 cm wide. The base is slightly concave and the specimen is morphologically similar to several of Anderson's (1989) projectile point classes including P70, P79, P80, and P83. The second biface is a bifacially flaked corner-notched projectile point made of a fine grained quartzite (Figure 120b). The specimen was found while cleaning the walls of Units 1 and 2. It measures 2.8 x 1.5 x .4 cm and weighs 1.3 g. The specimen is nearly complete and only missing one of the corner tangs. The blade edges are somewhat convex and measure approximately 2.2 cm. The base measures .6 long and .7 cm wide. The notches are approximately .14 cm deep. This specimen does not fit comfortably within any of Anderson's projectile point classes. However, it may be a variant of a P59 (Anderson 1989:187) which are most common in dated contexts of between A.D. 500 and A.D. 1200, but they may have persisted until A.D. 1450. The third biface comes from Level 1 of Unit 2. This specimen is made of a coarse grained quartzite and measures 3.8 x 2.9 x 1.2 cm (Figure 120c). The specimen weighs 122.4 g and has a fracture that likely occurred during its manufacture.

Three retouched/utilized flakes were also recovered from Units 1 and 2. The first of these is a patterned tool that comes from Level 3 of Unit 1. It is a small end scraper made of chert (Figure 121a). The specimen measures 2.3 x 1.9 x .9 cm and weighs 4.9 g. The scraping end has a relatively steep angle and there is one incidental flake removed from the ventral surface of the artifact. The second retouched/utilized flake comes from Level 3 of Unit 2 and measures 7.4 x 5.6 x 2.9 cm (Figure 121b). The specimen weighs 115.4 g and exhibits some cortex on its dorsal surface. An attempt to shape the artifact into a more formal tool may have been impeded owing to the presence of rather large inclusions and

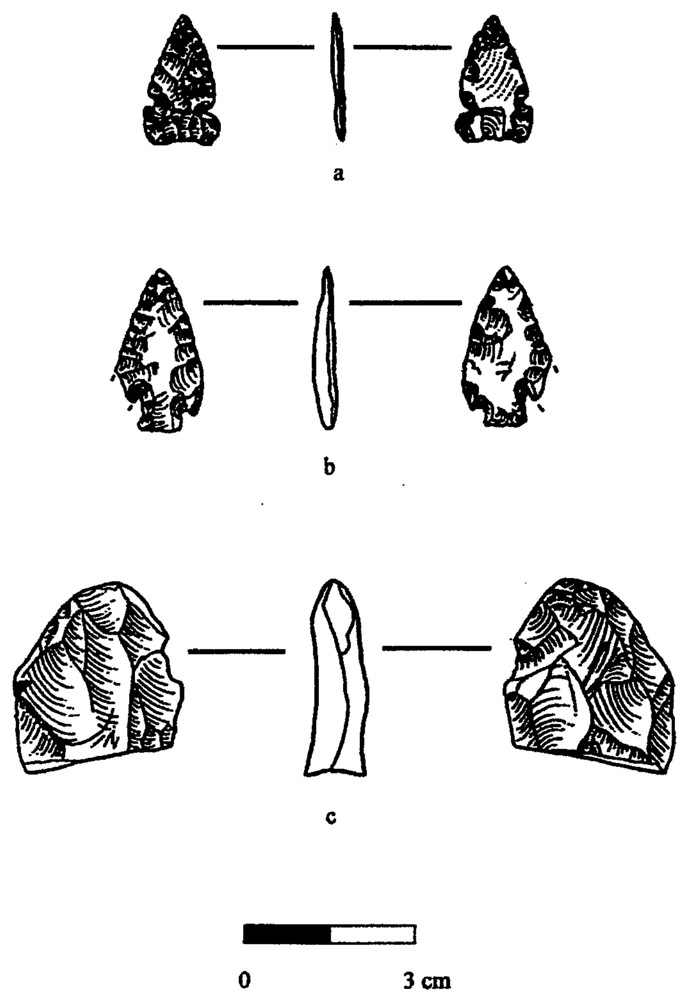


Figure 120: Bifacially chipped stone tools from Units 1 and 2 at 5LA6603.

imperfections in the parent material. A third retouched flake comes from Level 5 of Unit 1. This piece measures 4.9 x 3.4 x 1.3 cm and weighs 18.6 g (Figure 121c). This artifact is made of quartzite, has approximately seven flakes removed from its dorsal side, and no flakes taken from the ventral surface. Approximately 2/3 of the dorsal side exhibits cortex.

Unit 1 also yielded a single core from Level 3. This specimen is made of quartzite and measures 6.3 x 4.4 x 3.6 cm. The core weighs 118.9 g and has approximately 19 flakes removed from various platforms.

Ground Stone

Two specimens of ground stone were recovered from Units 1 and 2. The first comes from Level 3 of Unit 1 and is a fragment of a sandstone mano (Figure 122a). This artifact is less than 50% complete and the extant fragment measures 7.3 x 5.1 x 3.5. The specimen has two grinding surfaces. The principle surface measures 5.8 x 3.3 cm and no striations are visible. Use wear is moderate and some slight pecking/pitting is visible within the grinding surface. The second grinding surface exhibits light use wear. The surface measures 5.7 x 3.7 cm and no striations are visible. Pecking/pitting is not apparent within this grinding surface, but are apparent on the sides of the artifact. The piece is burned. The second ground stone specimen comes from Level 3 of Unit 2 and is a complete sandstone mano (Figure 122b). The artifact measures 11.8 x 7.4 x 49 cm and has one grinding surface. This surface measures 9.7 x 6.4 cm and striations can be seen extending across the width of the grinding surface. Use wear is moderate and slight pecking/pitting is apparent within the grinding surface and along the sides and ends of the entire artifact. The other side of the mano, at one time, may have had a second grinding surface, but this side is badly exfoliated and no distinct evidence of smoothing or polish is now apparent.

Ceramics

A total of 16 fragments of pottery was recovered from Level 4 of Unit 2. All 16 pieces of pottery are badly burned, extremely friable, and appear to derive from the same vessel. The largest sherd measures 2.4 x 2.0 x .7 cm while the smallest measures approximately .4 cm in diameter. The vessel appears to have been a plain brown ware and the exterior surface of the pot was smoothed. No sherds have retained any of the interior surface. Vessel shape or size is difficult to assess given the fragmentary nature of the sample, but the vessel may fit within Hummer's (1989) Polished Category 3.

Vertebrate Fauna

A total of 472 pieces of vertebrate fauna was recovered from 5LA6603. Two hundred and forty-seven of this total were recovered from dry screening and 225 came from wet screening procedures. Cottontail dominates the identifiable portion of the faunal assemblage, representing over 12% of the vertebrate fauna from this site (NISP = 57). Jackrabbit, woodrat and prairie dog are other mammalian genera represented. This site is unique from

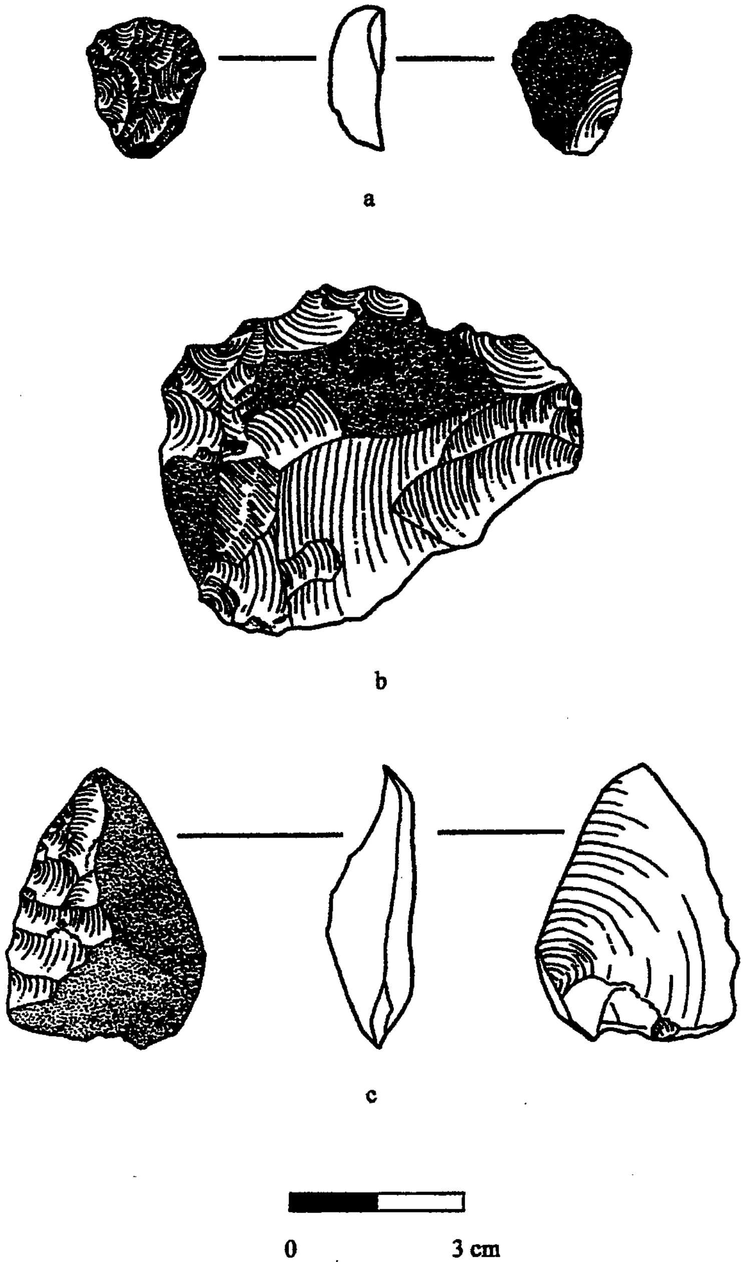


Figure 121: Unifacially flaked chipped stone tools from Units 1 and 2 at 5LA6603.

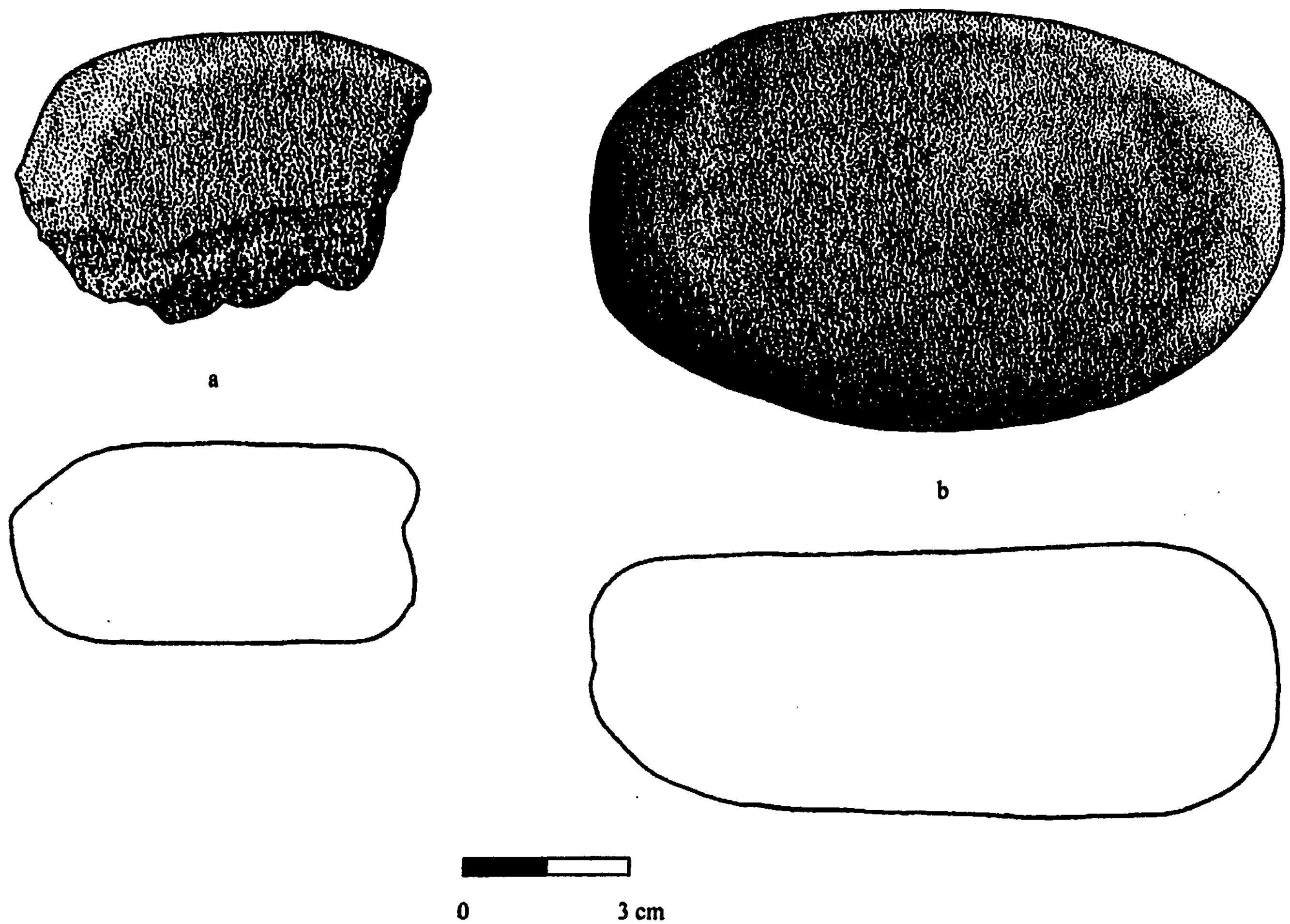


Figure 122: Ground stone artifacts from Units 1 and 2 at 5LA6603.

those excavated in 1996 in that Unit 1, Level 2 yielded the only specimen (right carpometacarpus) of mourning dove (*Zenaida macroura*) represented in the entire assemblage. A second bird species, the horned lark (*Eremophila alpestris*), was also present. This species was identified by a single element, a complete right humerus recovered from Unit 2, Level 3. Although the mourning dove was recovered from the dry screened materials, the horned lark element came from water screened samples, as did one of only two other elements of the horned lark identified in this assemblage (a right humerus from 5LA6568). Significantly, neither the mourning dove (*Z. macroura*) nor horned lark (*E. alpestris*) was identified in test excavations conducted by Andrefsky et al. (1990). The only two species of class Aves identified in their analysis were the great horned owl (*Bubo virginianus*) and the Canada goose (*Branta* cf. *canadensis*) (Andrefsky et al. 1990:61, 751-756). Both of these species were recovered from 5LA5402, a site consisting of nine rockshelters located in a canyon wall and adjacent slope of Van Bremer Arroyo (Andrefsky et al. 1990:773).

One piece of artifactual bone was recovered from Unit 1, Level 3. This specimen is made from the right tibia of a cottontail rabbit (*Sylvilagus* sp.). The distal end has been worked, creating a bevelled edge.

Shelter 3

Shelter 3 is the largest of the rockshelters recorded at the site. It measures approximately 15 m along its opening and approximately 6.75 m from the back of the shelter to the drip line (Figure 123). The shelter ceiling (at a central location) is 2.4 m above the present day ground surface. A rather long, well constructed, retaining wall is located approximately one third the distance from the eastern edge of the shelter. This wall measures 6.3 m long and a little over 1 m wide and is constructed of similar sized sandstone slabs. At least three courses still remain of the wall and it is likely a historic period feature. Two units (Units 3 and 4) were placed within Shelter 3. The units exhibit sufficiently different depositional histories and therefore will be treated separately.

Depositional History of Unit 3

Three depositional strata are identified for Unit 3 (Figure 124; Table 12.3). Lying directly above bedrock, Stratum 3 is composed of a pink (7.5YR 8/4) sand that likely consists mostly of eroding bedrock. Some carbon was found scattered in this deposit, but no artifacts were recovered.

Table 12.3. List of Strata for 5LA6603 Unit 3

Strata	Levels	Description
1	1	topsoil and mixed cultural debris
2	2	mixed cultural deposits
3	3	mixed cultural deposits

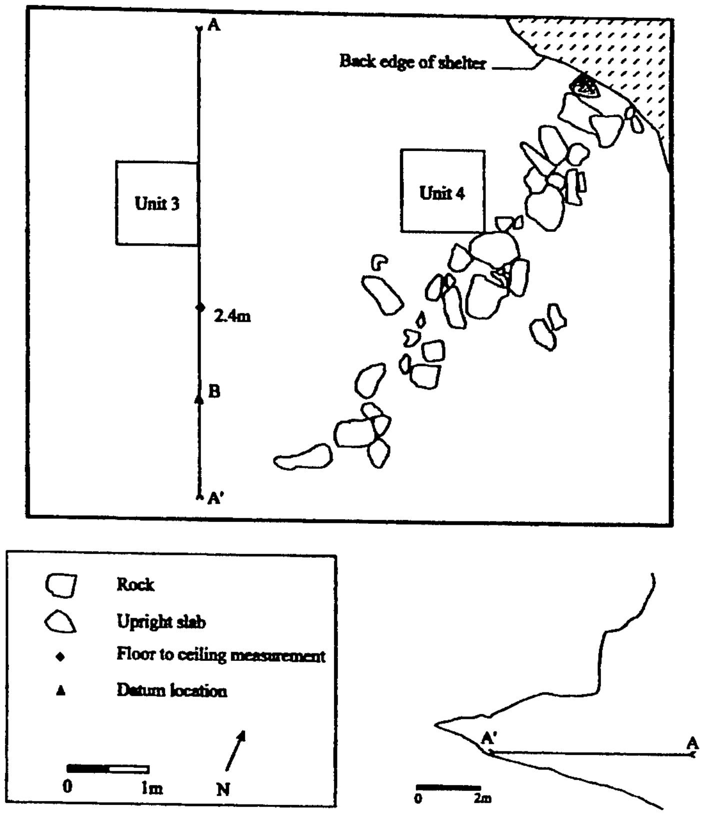


Figure 123: Site 5LA6603, Shelter 3, Unit 3 and 4 plan view.

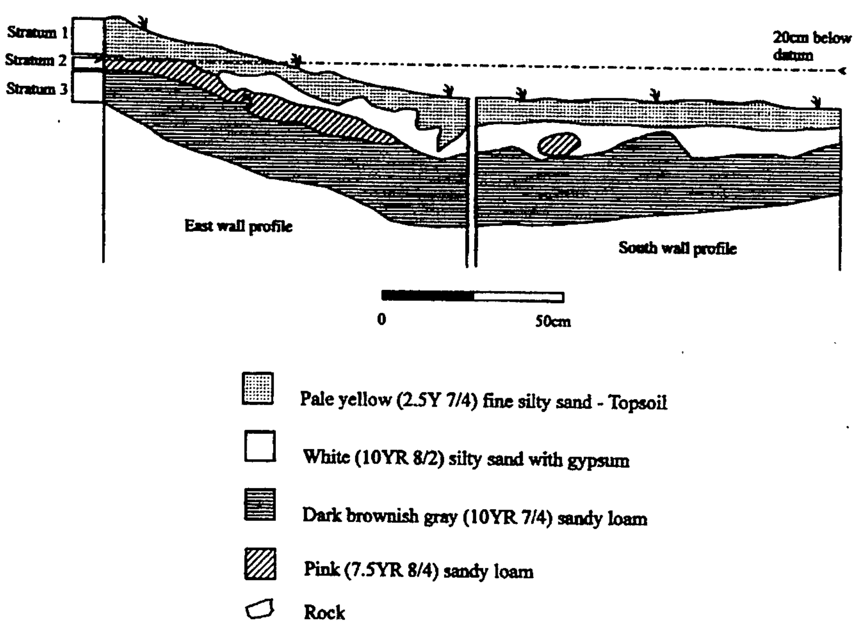


Figure 124: Site 5LA6603, Unit 3 east and south wall profiles.

Stratum 2 consists of a white (10YR 8/2) silty sand with gypsum mottled with a very pale brown (10YR 7/4) sand. This stratum contains the earliest evidence of human occupation in Unit 3. Only two pieces of chipped stone debitage were recovered from this stratum. Bone and carbon were found, but it is uncertain whether they are culturally or naturally occurring.

Stratum 1 is the uppermost and most recently laid deposit. It is comprised of a pale yellow (2.5Y 7/4) silty sand with some lightly burned or ashy areas. No definitive cultural materials were recovered from this stratum. Bone and carbon were found, but it is uncertain as to whether these were culturally or naturally deposited. This stratum is disturbed and mixed from recent pedestrian traffic and animal activities.

Chipped Stone and Vertebrate Fauna

Only two pieces of chipped stone debitage were recovered from Unit 3 of 5LA6603. Both pieces were large, non-cortical, simple, quartzite flakes. A more detailed analysis of the chipped stone debitage from this unit is impractical given the small sample size. No formal or informal tools were recovered from the excavated levels of Unit 3 nor were there faunal remains. Only two pieces of unburned vertebrate fauna were recovered from Unit 3. Neither piece was identifiable to genus or species.

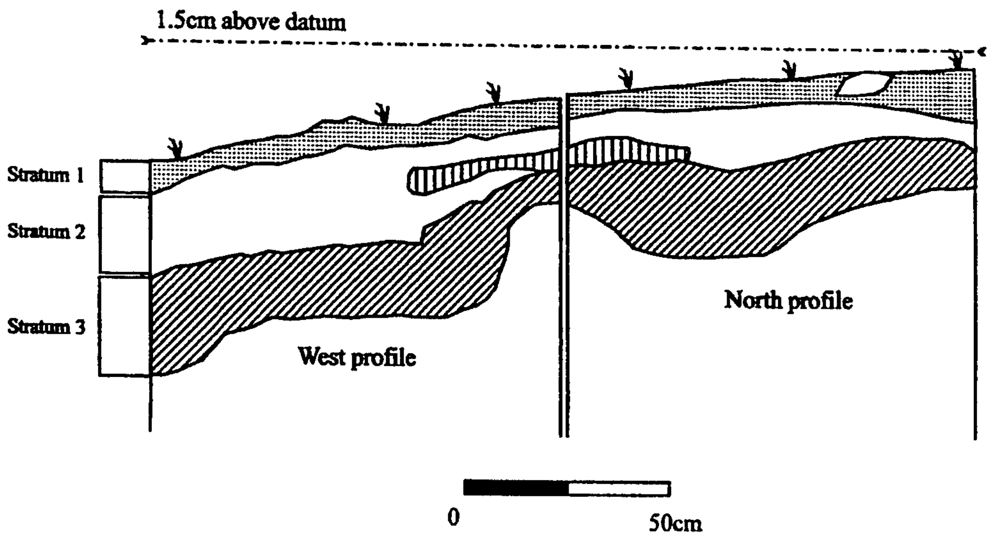
Depositional History of Unit 4

Four depositional strata are identified for Unit 4 (Figure 125; Table 12.4). Lying directly above bedrock, Stratum 4 is composed of a mottled sand with various colors that range from pink to reddish brown (7.5YR 84/ 8/6, 7/4, 7/6, and 7/8). Some carbon was noted for this stratum, but it occurred only in small quantities. This stratum likely represents eroding bedrock. No definitive cultural material was recovered from this stratum. Several unburned legume seeds were located, but these may have been deposited through a rodent burrow.

Table 12.4. List of Strata for 5LA6603 Unit 4

Strata	**Levels**	**Description**
1	1	topsoil and mixed cultural debris
2	2	mixed cultural deposits
3	3	cultural deposits
4	4-5	cultural deposits

Stratum 3 consists of a grayish brown (2.5Y 5/2) sand. Some lithic debitage, bone, and thermally altered rocks were uncovered, but in small quantities. Feature 1 is associated with this stratum (Figure 126). It is located in the east corner of the unit and extends into the northeast and southeast walls of the unit. The exposed portion of the feature measures approximately 40 cm in diameter. The feature fill consists of a dark grayish brown (2.5Y 5/2) silty sand with small fragments of thermally altered rocks and some carbon. The feature



Light gray (10YR 7/2) silty sand - topsoil

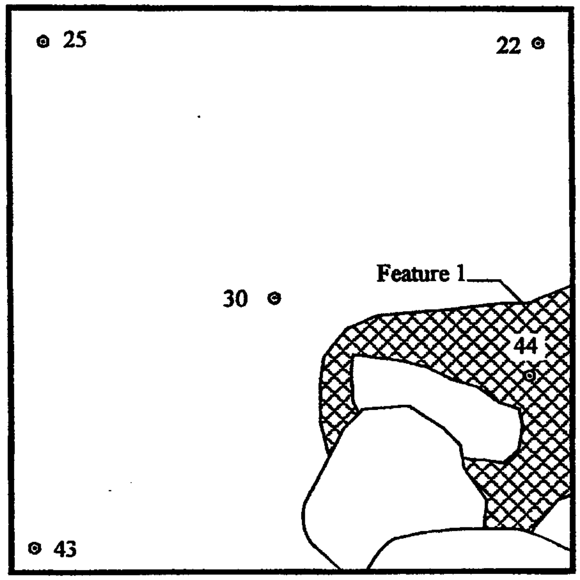
Grayish brown (2.5Y 5/2) silty sand - cultural deposit w/ evidence of rodent disturbance

Gray (7.5YR 6/2) compact sand - cultural deposit

Pink to reddish yellow (7.5YR 8/4, 8/6, 7/4, 7/6, and 7/8) mottled sand
eroded bedrock

Rock

Figure 125: Site 5LA6603, Unit 4 west and north wall profiles.



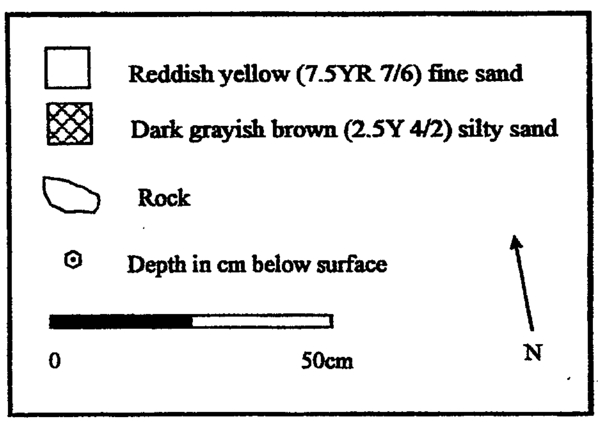


Figure 126: Site 5LA6603, Unit 4 plan view of Level 3.

fill was not very different from the soil in the rest of the unit. The feature may be an ephemeral hearth or simply a concentration of thermally altered rocks. Some animal disturbance was also noted along the northeastern edge of the feature.

Stratum 2 is a dark grayish brown (2.5Y 4/2) silty sand with organic debris. Most of the cultural material recovered from this unit came from this stratum. A projectile point, bone, unburned seeds, and relatively large amounts of carbon came from this stratum.

Stratum 1 is the uppermost and most recently laid deposit. It is comprised of a light gray (10YR 7/2) loose compacted silty sand and had evidence of rodent burrowing. This stratum is disturbed and mixed from recent pedestrian traffic and animal activities.

Chipped Stone

A total of 3 pieces of chipped stone debitage were recovered from Unit 4 of 5LA6603. The three flakes are made from different raw materials. One flake is a large, simple, non-cortical, quartzite flake. The second flake is a large, complex, non-cortical chert flake. The third piece is a large, complex, non-cortical argillite flake. Frequencies of chipped stone debitage from Unit 4 are too low for meaningful analysis.

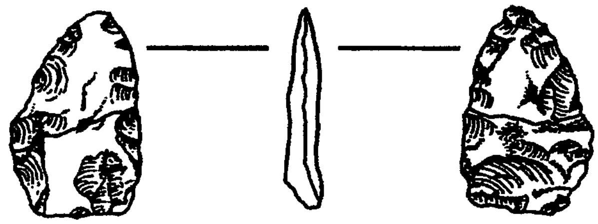
One bifacial tool was recovered from Level 2 of Unit 4. This specimen appears to be a projectile point blank made of chert and measuring 3.5 x 2.2 x .6 cm (Figure 127a). The piece weighs 5.0 g and is somewhat irregularly shaped with one of its margins markedly more convex than the other. If this specimen represents a completed projectile point then it most closely resembles Anderson's (1989) P49 class.

Ground Stone

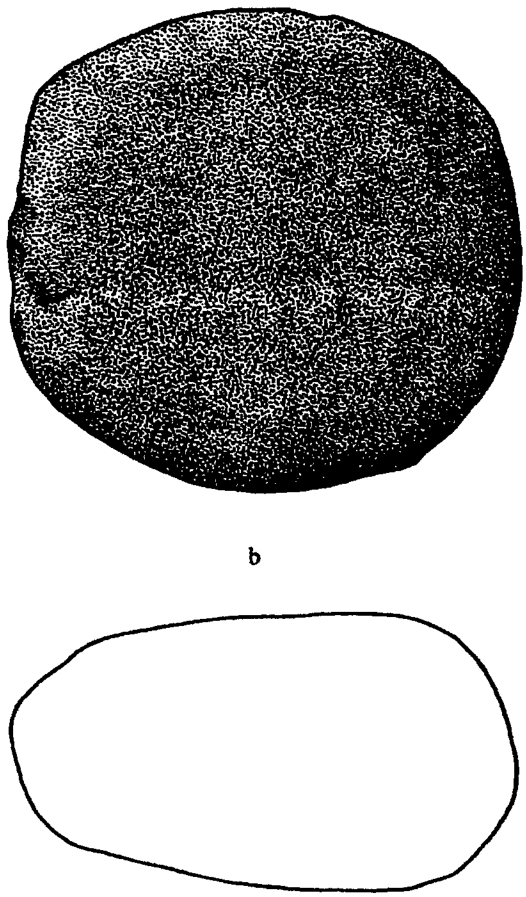
One piece of ground stone was also recovered from the surface 1.88 m from the southwest corner of Unit 4. This specimen is a complete, one-handed mano made of coarse sandstone (Figure 127b). The artifact measures 8.9 x 8.3 x 4.9 cm and has a single grinding surface. This surface measure 6.7 x 6.5 cm and exhibits light use wear. No striations are visible and pecking/pitting may be present along the sides of the artifact, but the specimen is too badly eroded for absolute identification.

Vertebrate Fauna

A total of 30 pieces of vertebrate fauna was recovered from Unit 4. Despite the small amount of faunal material recovered from Unit 4, two genera not found at any of the other sites tested in the 1996 field season were identified. *Sceloporus* sp. (prairie lizard) was identified from Level 1. This specimen represents the only example of herpetofauna identified to either the genus or species level of taxonomic inclusion from the entire assemblage. In contrast, Andrefsky et al. (1990) report several instances of the western rattlesnake (*Crotalis viridis*) at 5LA5383 and 5LA5403 (Andrefsky et al. 1990:661,789). Additionally,



a



b

0 3 cm

Figure 127: Bifacially flaked chipped stone tool and ground stone from Unit 4 at 5LA6603.

two elements of the turtle (*Terrapene* sp.) were identified from fauna recovered at 5LA5262 (Andrefsky et al. 1990:382-383, 387). Neither rattlesnake nor turtle elements were identified from those materials recovered during the 1996 excavations.

In addition to the prairie lizard, the right mandible of *Thomomys* sp. (pocket gopher) was recovered from Level 3. Site 5LA6603 is the only site excavated in 1996 in which *Thomomys* sp. was identified. However, Andrefsky et al. (1990) report that pocket gopher remains were present at nine of the 32 sites that yielded vertebrate fauna. These sites include 5LA5402, which yielded a very diverse fauna, including two species of birds not identified elsewhere, 5LA5403 and 5LA5503 (Andrefsky et al. 1990:751-756, 789-792, 918-924). The diversity evident at least two of these sites (5LA5402 and 5LA5503) may be attributable to the recovery method. Waterscreening through 0.16 cm mesh, while time-consuming, consistently yields significantly greater numbers of identifiable species than less exacting methods (Payne 1972).

Eligibility Recommendation

The subsurface testing conducted at 5LA6603 has provided sufficient data to recommend that the site is eligible for the National Register. The data that was recovered from excavations can be used to address three of the four research domains including chronology, paleoenvironment, and subsistence-settlement patterns. The domain of chronology can be addressed with a combination of radiocarbon dating and the presence of temporally sensitive projectile points. Three radiocarbon dates from the site indicate that there were possibly two separate occupations within the rockshelter. The first occupation likely dates to between A.D. 590 and A.D. 685 and the second occupation probably dates between A.D. 790 and A.D. 1150. A multi-occupational site such as this has good potential for providing data that could be useful for determining changes in artifact assemblage through time. More excavations coupled with additional radiocarbon dates may yield good associations of projectile points with datable deposits, thus aiding in the building and strengthening of the area's chronology.

Several classes of data from 5LA6603 can be used to examine the domains of paleoenvironment and settlement-subsistence patterns. The presence of two hearths indicates that burned macrobotanical remains are likely to be present in the unexcavated deposits at the site. The presence of ground stone implements in excavated levels also may indicate the importance of plant process. The faunal data were adequately well preserved to allow inferences on the use and processing of animals such as cottontail rabbit, jackrabbit, woodrat, and even perhaps some bird species. The high proportions of cottontail bones may be useful for indicating the seasonality of occupation of the site if this information can be combined with more data on the availability of certain kinds of herbaceous plants. Further work at the site can focus on seasonality and how resource and land use of the area around 5LA6603 fits into a broader settlement system.

Chapter XIII: 5LA6612

Site 5LA6612 is an open air site located on the ridge top above Welsh Canyon (Figure 128a-b). The site consists of a large lithic scatter that is situated at an elevation of approximately 1530 m (5020 ft) above sea level. The ridge top on which the site is situated overlooks Welsh Canyon to the north and an unnamed tributary of Welsh Canyon to the northeast (Figure 129). The tributary is located approximately 214 m down slope from the site and the nearest known source of permanent water is in a side canyon on the eastern boundary of the site. The site boundaries were determined by the extent of lithic artifacts visible on the surface. Based on this criterion, the site measures approximately 240 x 100 m.

Three features were recorded in the 1995 reconnaissance of the site. Feature 1 is located at 17 degrees and 17 m from the site datum and is composed of an area of burned earth and stone measuring 2.2 x 3.5 m. This feature may be nothing more than a burned juniper stump rather than an exposed hearth. Feature 2, located at 70 degrees and 70 m from the site datum, is a large, roughly circular area of burned earth, rock and lithic debitage measuring 15 x 11 m. The area within the feature has been disturbed recently as evidenced by the presence of tire tracks. Feature 3 is located near the edge of the canyon rim in the southwestern extreme of the site at 88 degrees and approximately 140 m from the site datum. This feature was mapped in detail during the 1996 field season (Figure 130). Fifteen pieces of chipped stone debitage were recorded from the area around Feature 3. One of these specimens was an obsidian flake, a material type that is not local to the PCMS. In addition to the chipped stone debitage, two mano fragments and a retouched/ utilized flake were recorded. The feature also consists of a small pile of 'stacked' rocks measuring approximately 1.6 x 1.2 m.

In the 1995 reconnaissance, transects at 15 m intervals were walked across the site in an effort to record the surface artifacts. Table 13.1 presents those artifacts recorded. A total of 40 pieces of chipped stone debitage was recorded. Nine ground stone items were recorded. Six of these are manos, one is a slab metate made from sandstone and measuring 20 x 16 cm, and two of these are battered or ground cobbles.

Three bifaces, two retouched unifaces, two cores, and two projectile points were recorded. The projectile points were collected. The first is a triangular projectile point found 2 m at 160 degrees from the site datum (Datum A). The artifact weighs 1.2 g and is made from white and orange chert (Figure 131a). The piece measures 2.4 x 1.3 cm and is 0.4 cm thick. A small portion of the tip is broken off. The base is slightly convex and there are no notches. One of the blades is rather straight while the other is convex. The length of the blades is approximately 2.4 cm and the base is 1.3 cm wide. The cross section is plano-convex and the point seems to fit the criteria of Anderson's (1989) P49 category. According to Anderson (1989:173-174), there are no examples of this point type from dated contexts in the PCMS area. She does mention that some specimens of P49 type points in other areas of southeastern Colorado range in date from A.D. 1070 to A.D. 1360. More recently, a P49 type projectile point is illustrated by Loendorf et al. (1996:179; Figure 6.11d). They suggest that a regional comparison with other P49 type points indicates that they date to between A.D. 800 and A.D. 1750.

Figure 128a: Site 5LA6612, general view of site taken facing south southwest.

Figure 128b: Site 5LA6612, general view of site taken facing east.

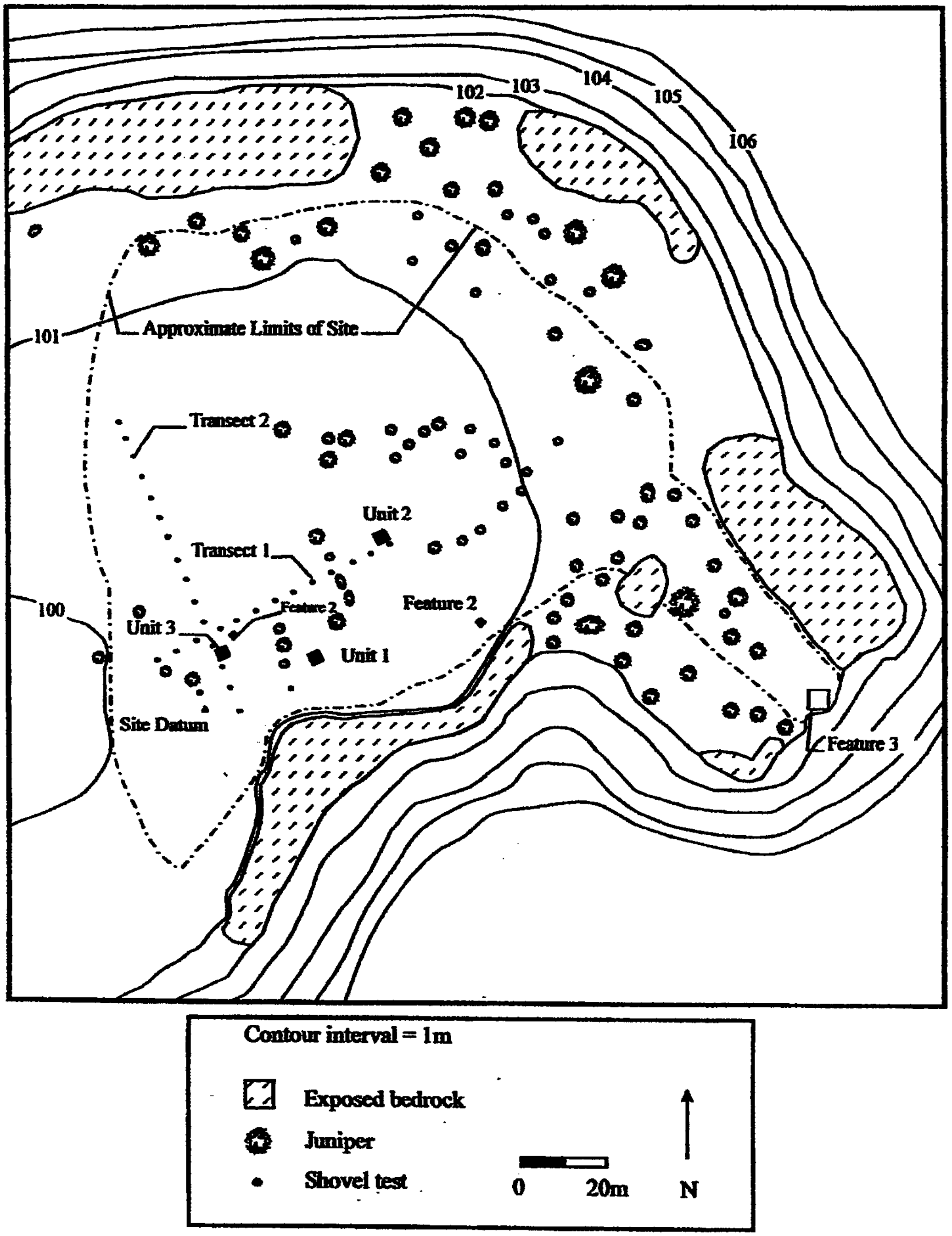


Figure 129: General site map of 5LA6612.

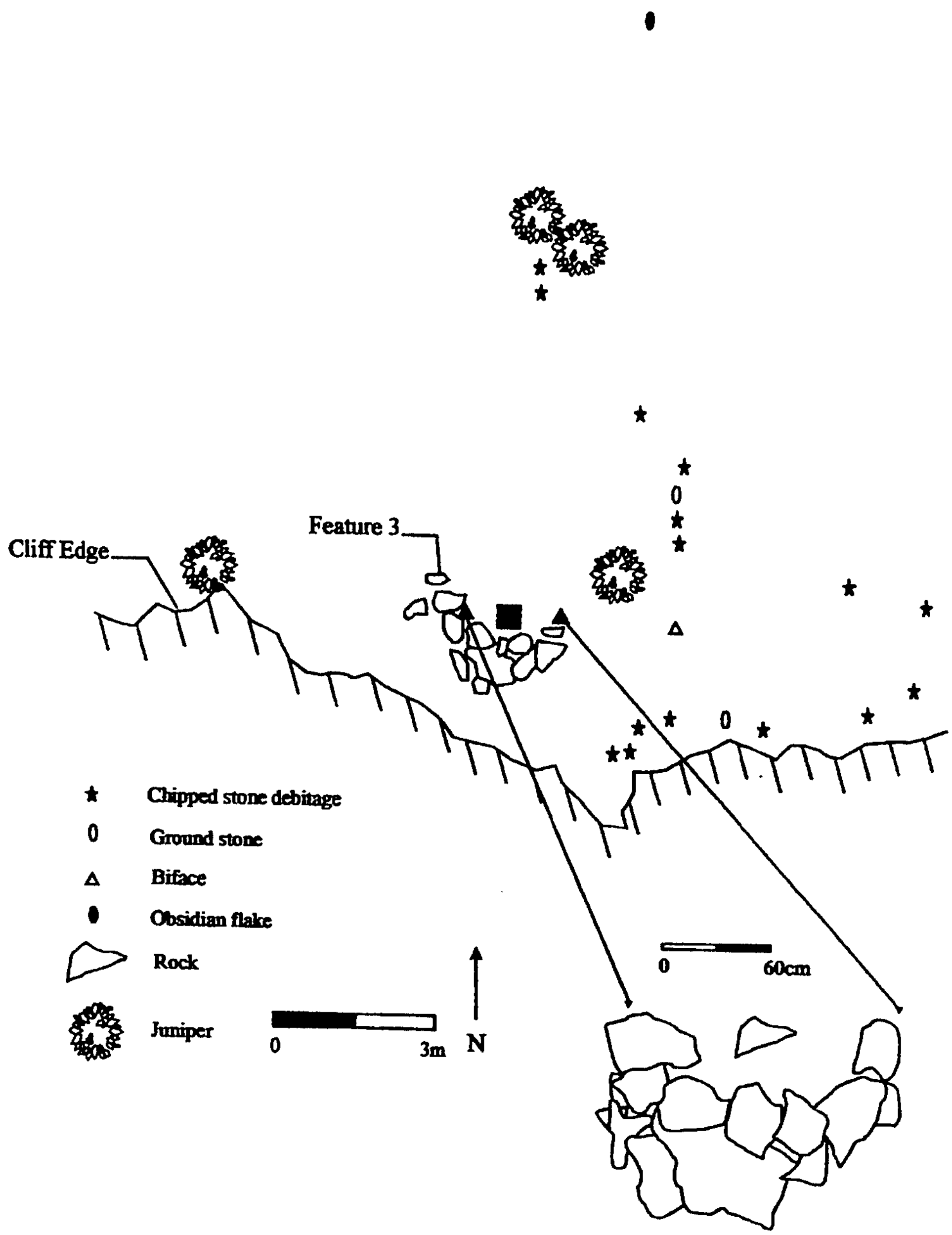


Figure 130: Site 5LA6612, detail of Feature 3.

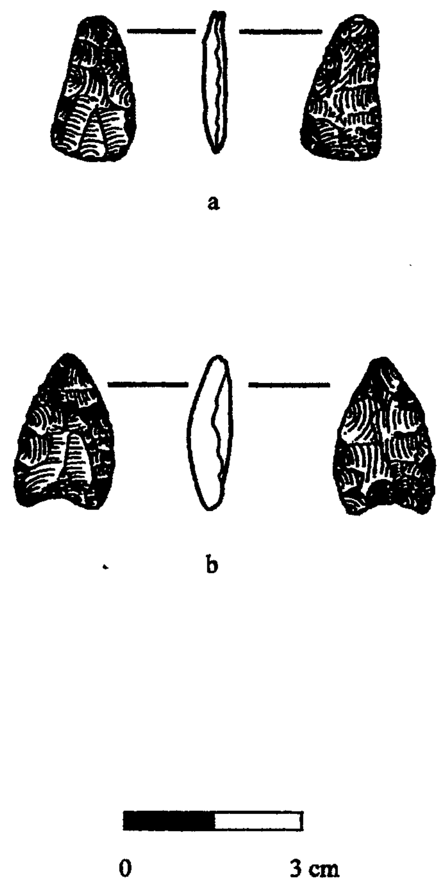


Figure 131: Bifacially worked chipped stone tools from 5LA6612.

Table 13.1. Summary of Chipped Stone Debitage and Tools From 5LA6612 Recorded in the 1995 Reconnaissance.

Artifact Type	Material	Quantity
Primary Flake	Quartzite	8
Secondary Flake	Quartzite	19
Secondary Flake	Chert	1
Secondary Flake	Argillite	1
Secondary Flake	Basalt	1
Tertiary Flake	Quartzite	5
Tertiary Flake	Chert	1
Tertiary Flake	Chalcedony	1
Retouched/Utilized Flake	Quartzite	2
Biface (Projectile Point)	Chert	1
Biface (Projectile Point)	Chalcedony	1
Biface	Quartzite	2
Biface	Chert	1
Core	Quartzite	1
Metate	Sandstone	1
Mano	Sandstone	3
Mano	Granite	1
Mano	Quartzite	1
Edge Ground Cobble	Quartzite	1
Battered Cobble	Quartzite	1

The second projectile point was found at 23 m and 240 degrees from the site datum (Datum A). This point is made of a light gray chalcedony and measures 2.7 x 1.7 cm and is 0.7 cm thick (Figure 131b). The specimen weighs 3.0 g and is bifacially worked along each margin. The point is triangular and the base is concave. Blade length matches the point length at 2.7 cm, and the base width is 1.5 cm. In cross section, the point is plano-convex and the point most closely resembles those in the P50 class in Anderson's (1989:175) typology. These points date to between approximately A.D. 1000 and A.D. 1750.

Three test units were excavated at the site. The units were placed in their locations based on information derived from shovel tests. The shovel tests were excavated in order to determine the depth of cultural deposits and areas of high artifact density across the main portion of the site. A total of 28 shovel tests was excavated. Each of these tests was approximately 45 cm in diameter and dug to depths ranging from 10 cm to 53 cm. Only two pieces of chipped stone debitage were recorded from this testing. Unit 1 was placed at 63 degrees and 28 m from the site datum. This area was selected because of the relatively high frequency of flaked debitage visible on the surface. Unit 2 was placed at 45 degrees and 56 m from the site datum and adjacent to Shovel Test 1.13. This unit was selected because of the presence of chipped stone debitage from the shovel tests. Unit 3 was placed at 17 degrees and 13 m from the site datum and adjacent to Shovel Test 2.4. This area was selected because it was somewhat elevated above the surrounding area and because it was close to Shovel Test 2.1 which had the deepest deposits (53 cm) of any other shovel test. Even though the three units share similar depositional strategies there are located far enough apart to warrant their individual treatments with regards to depositional histories.

Depositional History of Unit 1

Three depositional strata are identified for Unit 1 (Figure 132; Table 13.2). Lying directly above bedrock, Stratum 3 is composed of a pale brown (10YR 6/3) silty sand which primarily represents eroding bedrock. Large fragments of eroding bedrock coated in caliche were noted in Level 4. A depression in the bedrock was apparent in the west corner of the unit. No artifacts were found associated with this stratum. Stratum 3 formed the layers on which later cultural occupations took place.

Table 13.2. List of Strata for 5LA6612 Unit 1

Strata	Levels	Description
1	1	topsoil and mixed cultural debris
2	2	cultural deposits
3	3-4	culturally sterile deposits

Stratum 2 contains the earliest evidence of human occupation in Unit 1. It is composed of a light yellowish brown (2.5Y 6/3) sandy silt. The soil was moderately compact and contained only a small quantity of cultural material.

Stratum 1 is the uppermost and most recently laid deposit. It consists of a compact, brown (10YR 5/3) sandy silt with small gravels and grass roots from the surface. The majority of the cultural material derived from this stratum, however, is disturbed and mixed from recent pedestrian traffic and animal activities.

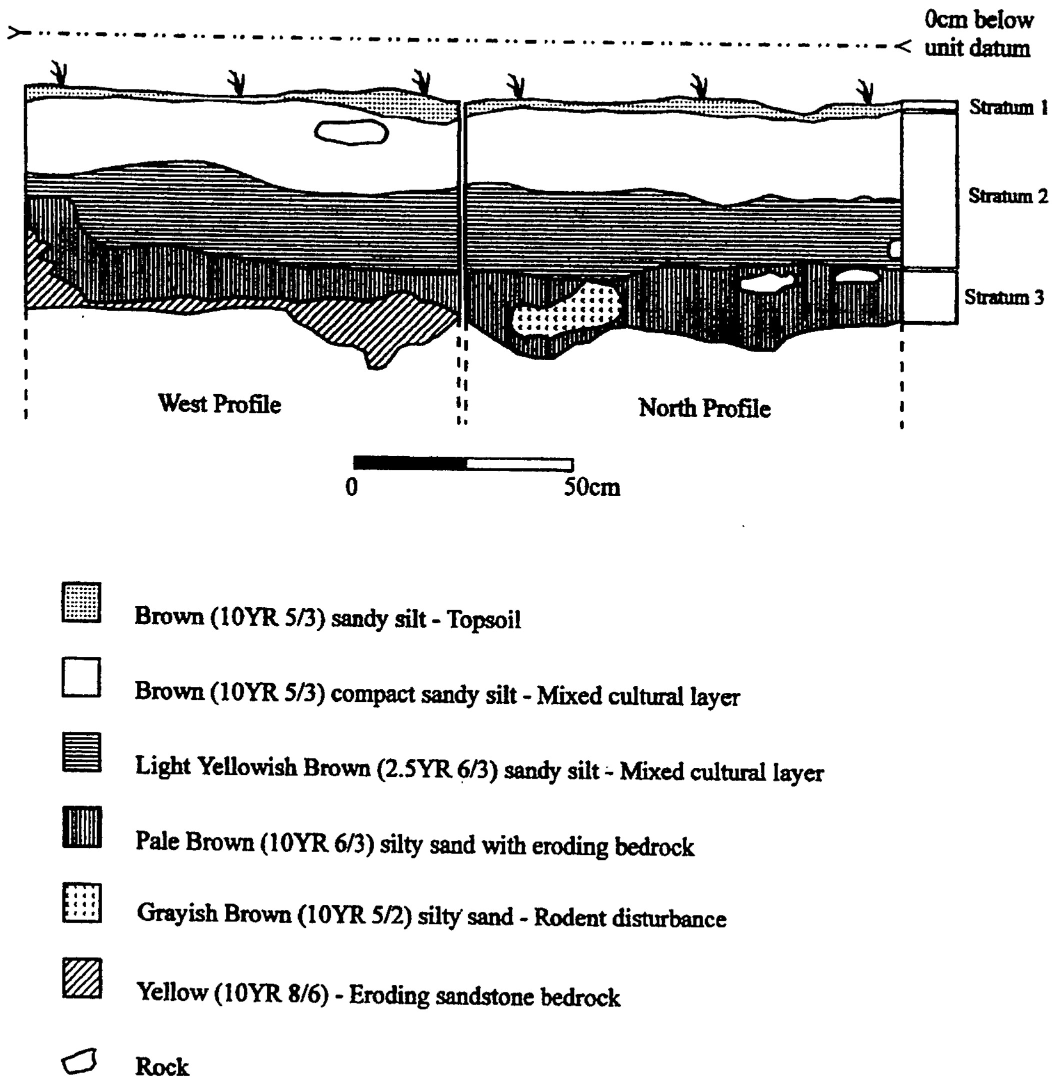


Figure 132: Site 5LA6612, Unit 1 west and north wall profiles.

Chipped Stone and Vertebrate Fauna

A total of 29 pieces of chipped stone debitage was recovered from the excavation of Unit 1. Only two raw material types are represented by the assemblage: quartzite and vein quartz. The vein quartz is represented by a single piece. Except for a few pieces all the chipped stone debitage from this unit appears to come from the same dark purplish quartzite core and it is likely that the debitage is the result of the reduction of that core. No faunal remains were recovered from Unit 1.

Depositional History of Unit 2

Two depositional strata are identified for Unit 2 (Figure 133; Table 13.3). Lying directly above bedrock, Stratum 2 consists of a dark brown (10YR 4/3) sandy silt. Large fragments of eroding bedrock were noted throughout the stratum. The soil is slightly lighter in color (very pale brown - 10YR 3/4) near its contact with bedrock. No cultural material was found associated with this stratum.

Table 13.3. List of Strata for 5LA6612 Unit 2

Strata	Levels	Description
1	1	topsoil and mixed cultural debris
2	2-4	culturally sterile deposits

Stratum 1 is the uppermost and most recently laid deposits. It consists of a dark grayish brown (10YR 4/2) sandy silt with grass roots from the surface. All the cultural material found in this unit came from the upper portion of this stratum. However, these deposits are disturbed and mixed from recent pedestrian traffic and animal activities.

Chipped Stone and Vertebrate Fauna

Only three pieces of chipped stone debitage were recovered from the excavation of Unit 2. Two of these are large, quartzite complex flakes and the other is a large, chert complex flake. Only two raw material types are represented by the assemblage (quartzite and chert) and even though the sample size is small, the presence of only large flakes suggests the possibility that pure freehand core reduction was the primary activity that conditioned the chipped stone assemblage from Unit 2. No faunal remains were recovered from Unit 2.

Depositional History of Unit 3

Two depositional strata are identified for Unit 3 (Figure 134; Table 13.4). Lying directly above bedrock, Stratum 2 consists of a light olive brown (2.5YR 5/3) silty sand with fragments of eroding bedrock and small gravels. No cultural material was found associated with this stratum.

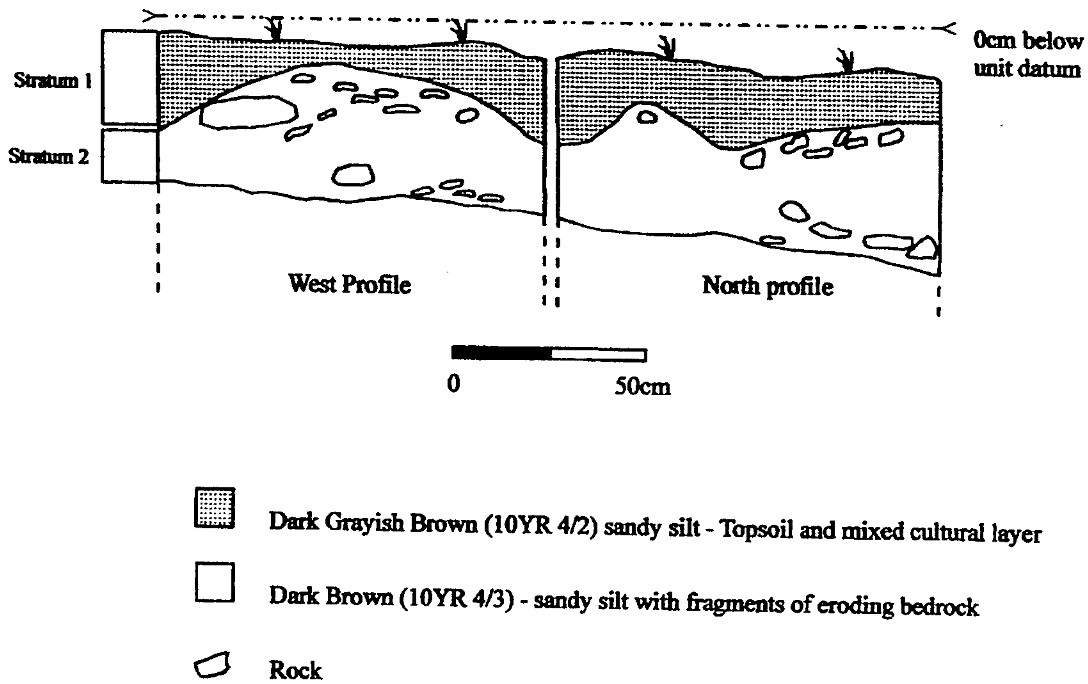
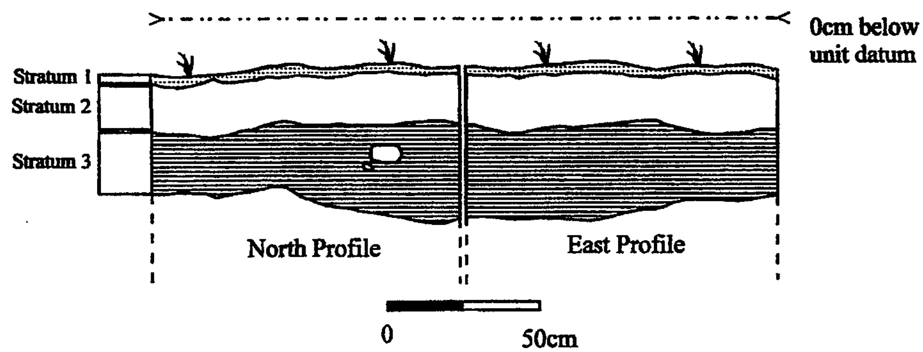


Figure 133: Site 5LA6612, Unit 2, west and north wall profiles.



Light Yellowish Brown (2.5Y 6/3) sandy silt - Topsoil

Light Olive Brown (2.5Y 5/3) silty sand - Mixed cultural layer

Light Olive Brown (2.5Y 5/3) silty sand with fragments of eroding bedrock

Rock

Figure 134: Site 5LA6612, Unit 3 north and east wall profiles.

Table 13.4. List of Strata for 5LA6612 Unit 3

Strata	Levels	Description
1	1	topsoil and mixed cultural debris
2	2-4	cultural deposits

Stratum 1 is the uppermost and most recently laid deposit. It consists of a light yellowish brown (2.5Y 6/3) loosely compacted sandy silt with roots from grass on the surface. The small amount of lithics recovered from this unit came from this stratum. This stratum is disturbed and mixed from recent pedestrian traffic and animal activities.

Chipped Stone and Vertebrate Fauna

Only one piece of chipped stone debitage was recovered from the excavation of Unit 3. It is a large, quartzite simple flake. The frequency of chipped stone debitage from this unit is too low for a meaningful analysis. No faunal remains were recovered from Unit 3.

Discussion

Excavations of the three units at 5LA6612 yielded a total of eight pieces of chipped stone debitage. The total absence of small flakes may indicate that pure freehand core reduction was responsible for generating the chipped stone debitage uncovered at the site. However, the sample size is too small to make any confident inferences regarding the lithic operations conducted at the site. The quantities of excavated artifacts were very low relative to the amount of cultural material recorded from surface contexts. This pattern seems to indicate that the site is primarily confined to the surface debris. The rather shallow deposits as indicated by the shovel tests and the presence of exposed bedrock in several areas of the site suggests that buried deposits are unlikely to be located at this site.

Eligibility Recommendation

The low frequencies of artifacts recovered from excavation of Units 1-3 at this site, along with the absence of thermal features, the lack of faunal materials, and evidence for shallow deposits across the site indicate that 5LA6612 will not produce significant data to address any of the research domains discussed in this report. Based on this information 5LA6612 is recommended as not eligible for the National Register.

Chapter XIV: 5LA6618

Site 5LA6618 is a rockshelter with a large lithic scatter component located on the southern side of Welsh Canyon on the southeast facing slopes of an unnamed tributary (Figure 135a-b). The site elevation is approximately 1526 m (5007 ft) above sea level. The stream channel of the tributary is located approximately 65 m down slope from the site datum. The lithic component of the site is situated primarily on top of the canyon rim while the rockshelter is located along the face of the canyon's cliff. The site dimensions were calculated based on the extent of lithic debris visible on the surface and measures approximately 50 x50 m (Figure 136).

The rockshelter is located at approximately 70 degrees and approximately 44 m from the site datum. This shelter is rather large with an opening of approximately 14 m. The maximum distance from the back of the shelter to the drip line measures approximately 5.6 m. The shelter ceiling is approximately 2.6 m above the shelter floor near the drip line east of Unit 1 (Figure 137). The shelter is divided into two areas by an interior, low wall. This wall extends from the back of the shelter roughly to the south approximately 3 m. The wall is preserved to a height of approximately .4 m. The area to the south is deflated and retains very shallow deposits. The area to the north of the dividing has considerably thicker cultural deposits of approximately 40 cm. Unit 1 was placed within this southern area of the shelter.

Several features were noted by the 1995 reconnaissance team. Feature 1 is located roughly 45 degrees and 5 m from the site datum. It is described as a series of deflated hearths composed of thermally fractured rocks, burned soil, and flaking debris confined to an area that measures approximately 10 x 5 m. Feature 2 is described as a lithic scatter measuring approximately 12 x 12 m and it is located at approximately 20 degrees and 12 m from the site datum. Feature 3 is another lithic scatter located at 90 degrees and approximately 30 m from the site datum and measuring 10 x 7 m. Feature 4 consists of a deflated hearth with thermally fractured rocks and burned soil. It is located at 200 degrees and 8 m from the site datum and measures 3.5 x 2.5 m. Feature 5 is what is described as a wall remnant located at 195 degrees and 35 m from the site datum. This feature is located adjacent to the eastern edge of Feature 3. The wall extends out from a low sandstone ledge a total of 3.5 m. It is only one course high and approximately .6 m wide. Unit 2 was placed along the eastern side of this wall remnant (Figure 138).

Table 14.1 presents the artifacts from the surface recorded when the site was surveyed in 1995. One primary flake, four secondary flakes, and 18 tertiary flakes were recorded from surface contexts at the site. In addition to the chipped stone debitage, two projectile points, two other bifaces, a scraper, and a shatter core were recorded.

Figure 135a: Site 5LA6618, general view of site taken facing southwest.

Figure 135b: Site 5LA6618, general view of rock shelter taken facing west.

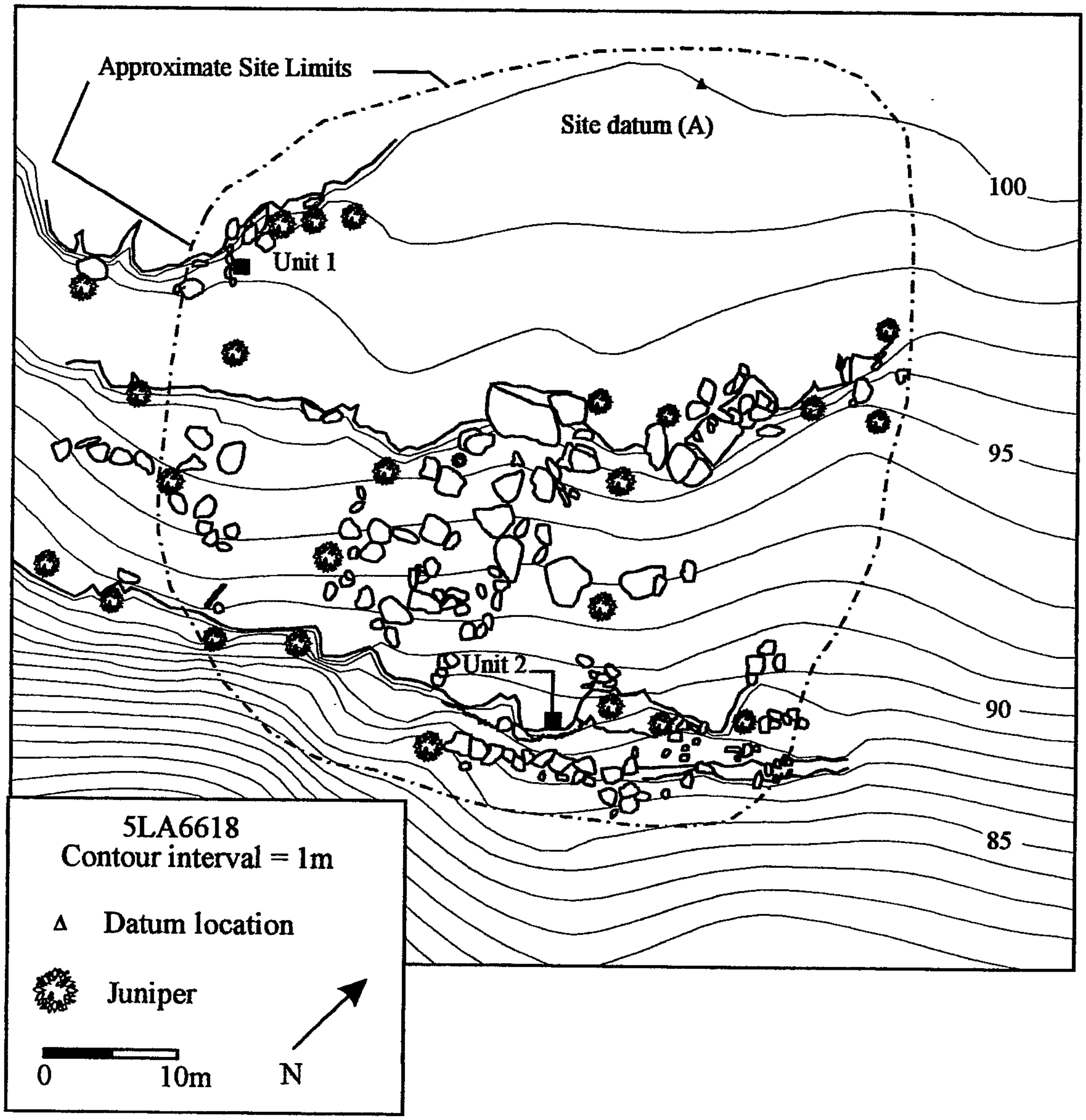


Figure 136: General site map of 5LA6618.

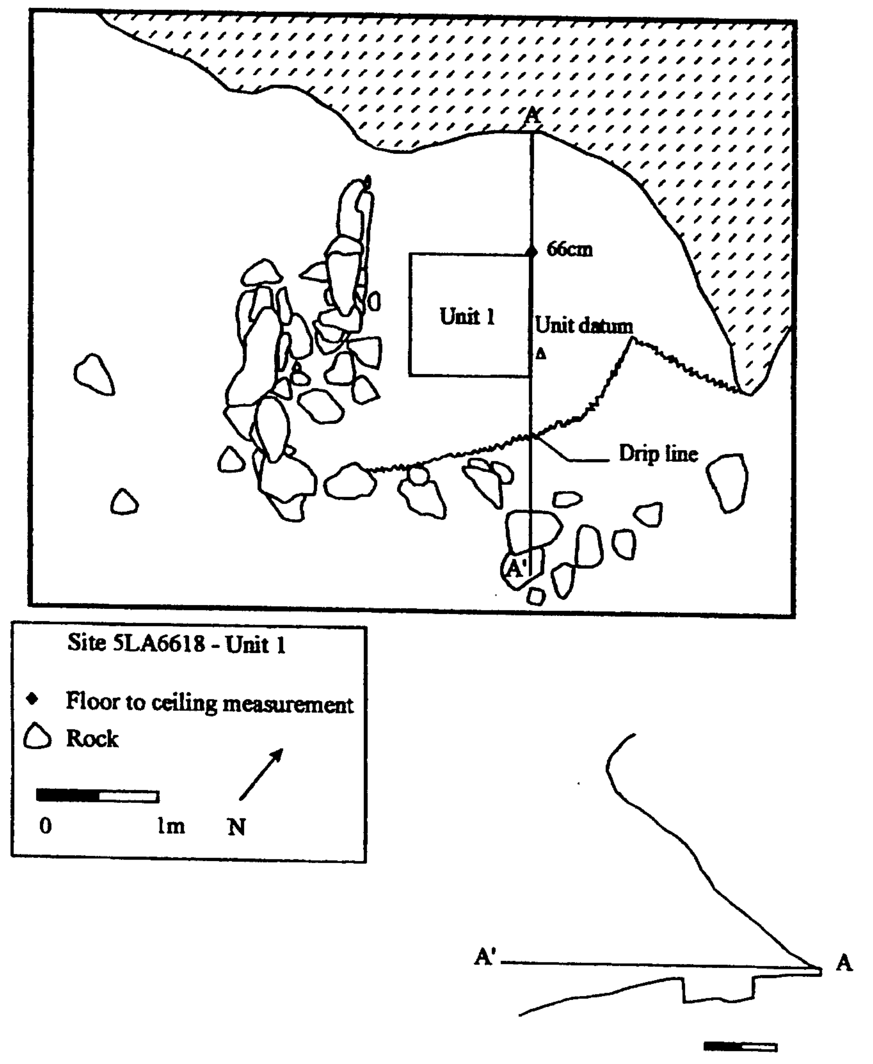


Figure 137: Site 5LA6618, Shelter 1, Unit 1 plan view.

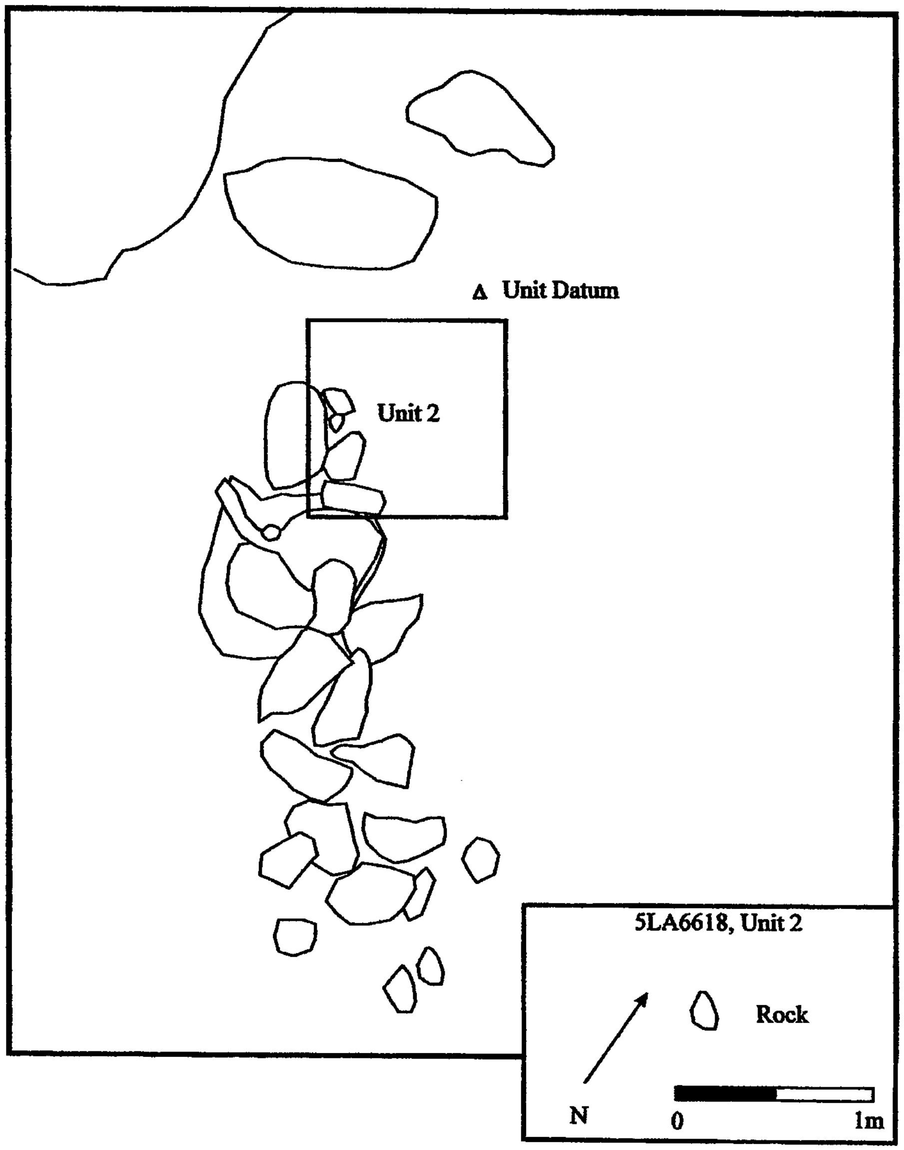


Figure 138: Site 5LA6618, Unit 2 plan view.

Table 14.1. Summary of Chipped Stone Debitage and Tools From 5LA6618 Recorded in the 1995 Reconnaissance.

Artifact Type	Material	Quantity
Primary Flake	Quartzite	1
Secondary Flake	Argillite	2
Secondary Flake	Hornfels/Basalt	2
Tertiary Flake	Argillite	10
Tertiary Flake	Chert	5
Tertiary Flake	Quartzite	2
Tertiary Flake	Hornfels/Basalt	1
Biface (Projectile Point)	Chalcedony	1
Biface (Projectile Point)	Quartzite	1
Biface	Quartzite	1
Biface	Chert	1
Scraper	Chert	1
Shatter Core	Quartzite	1

One of the projectile points was recovered from Feature 3. This specimen is a small side-notched projectile point made of chalcedony (Figure 139a). One of the notches and the margin of the base are broken. The specimen measures 2.3 x 1.1 x .4 cm and weighs 1.0 g. The preserved blade length is approximately 1.4 cm long and is slightly convex. The bottom of the base is flat and measures .9 cm. This projectile point resembles Anderson's (1989) classes of P79 and P83. The second projectile point came from Feature 1. This specimen is somewhat fragmentary and measures 3.2 x 1.9 x .4 cm and weighs 2.3 g (Figure 139b). What remains appears to be the lateral portion of a quartzite, side-notched projectile point with a triangular base. It appears to fit within Anderson's (1989:217) P83 class of projectile points. A biface figment was also collected from Feature 1. This specimen is bifacially worked along each of the extant margins and has a single notch (Figure 139c). The proximal end of the artifact is broken and the remaining portion measures 4.4 x 2.1 x .9 cm. The specimen weighs 7.6 g and it may have been a projectile point broken in manufacture, but it seems more plausible that it was a cutting tool.

A ground stone artifact was also collected from the surface of Feature 3 during the 1996 field season. This specimen is an edge ground cobble or keeled mano. The entire specimen measure 12.5 x 7.2 x 4.5 cm and has a single grinding surface (Figure 140). This surface

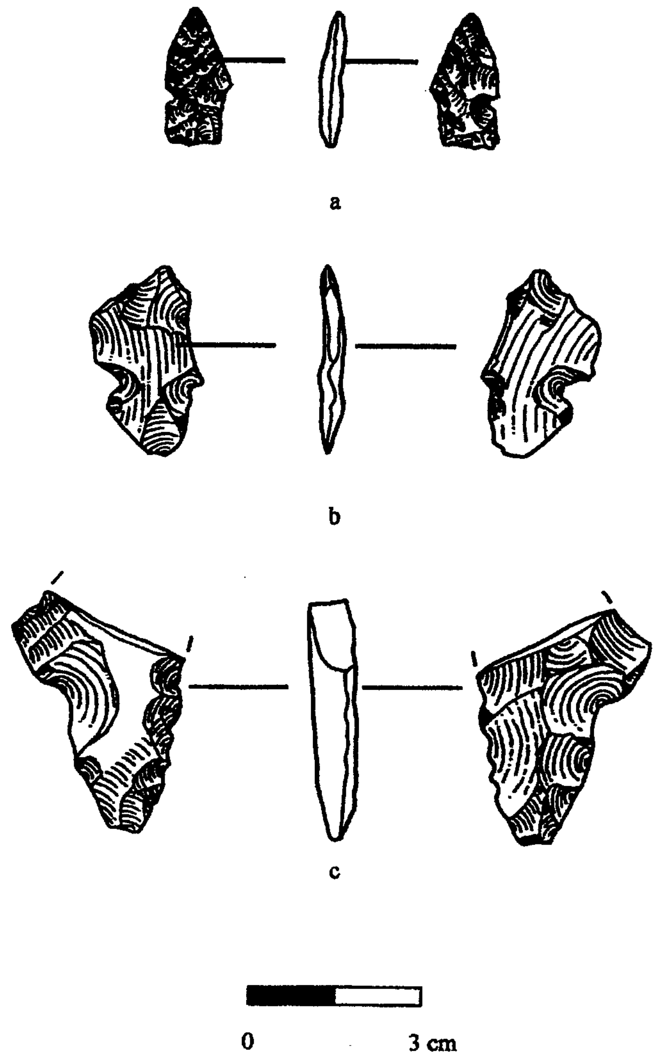


Figure 139: Bifaces recovered from surface contexts at 5LA6618.

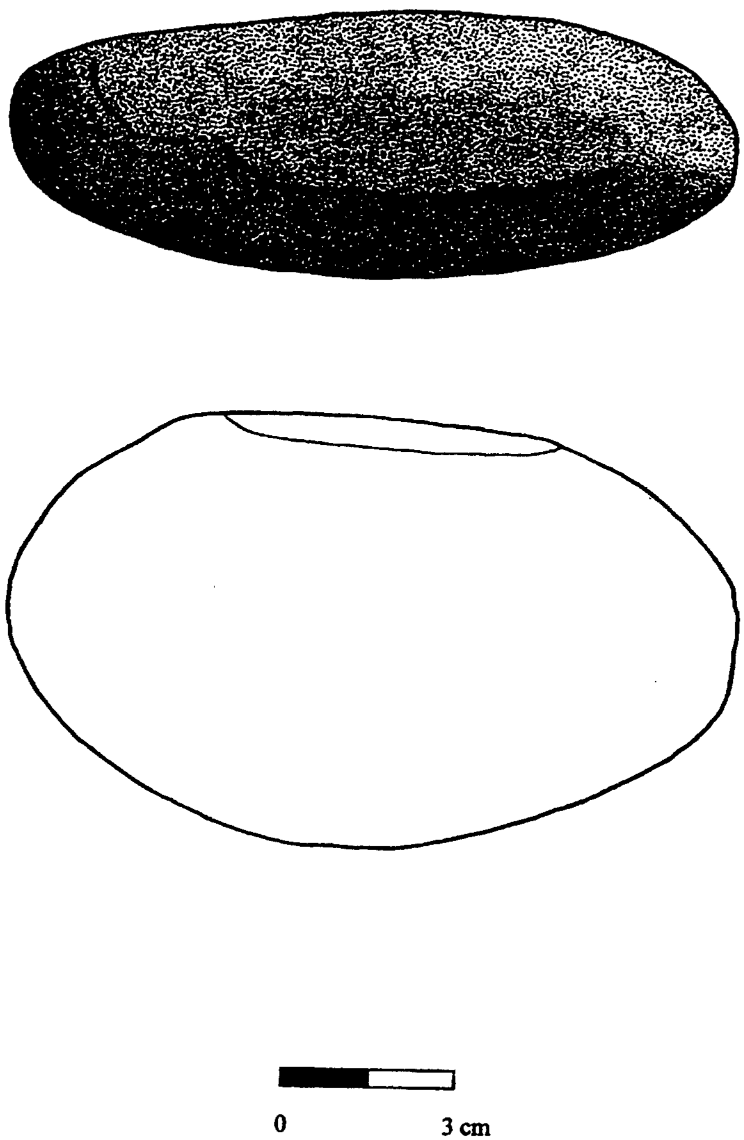


Figure 140: Ground stone from surface context at 5LA6618.

measures 6.7 x 1.8 cm and displays moderate use wear. No pecking/pitting is evident, but some battering appears on one of its ends.

Units 1 and 2 are located approximately 40 m apart. The placements of Unit 1 in the rockshelter and Unit 2 near the wall remnant above the canyon rim suggest that the depositional histories of the two units are sufficiently distinct to warrant their separate discussion.

Depositional History of Unit 1

Three depositional strata are identified for Unit 1 (Figure 141; Table 14.2). Unit 1 was excavated to bedrock at a depth of approximately 42 cm below the surface. Lying directly above bedrock, Stratum 3 is composed of a dark brownish gray (2.5Y 4/2) silty sand with some carbon flecks. This stratum primarily represents eroding bedrock. No artifacts were found associated with this stratum. Stratum 3 formed the layers on which later cultural occupations took place.

Table 14.2. List of Strata for 5LA6618 Unit 1

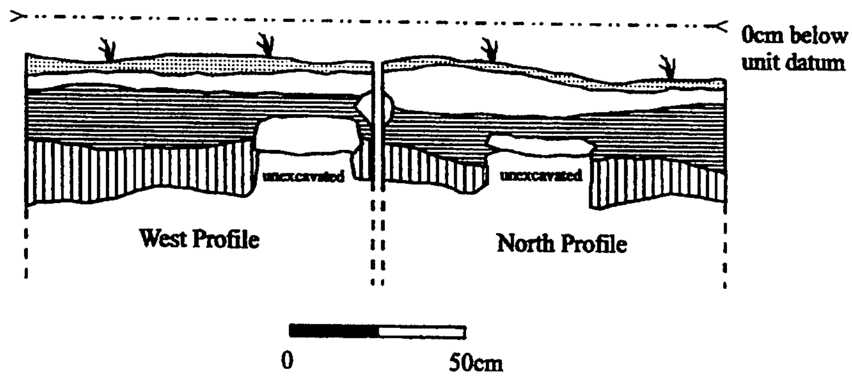
Strata	Levels	Description
1	1	topsoil
2	2-3	cultural deposits - probably mixed
3	4	culturally sterile deposits

Stratum 2 is contains the earliest evidence of human occupation in Unit 1. It is composed of a light brownish gray (2.5Y 6/2) sandy silt. The soil was moderately compact and two metate fragments were exposed at the bottom of Level 2 (Figure 142).

Stratum 1 is the uppermost and most recently laid deposit. It consists of a loose, light olive brown (2.5Y 5/3) sandy silt. No cultural material derived from this stratum and this deposit is disturbed and mixed from recent pedestrian traffic and animal activities.

Chipped Stone and Vertebrate Fauna

Only five pieces of chipped stone debitage were recovered from excavations in Unit 1. Three material types are represented including quartzite, chert, and hornfels/basalt. All the flakes are large which, even though the sample size is small, indicate that pure freehand core reduction may have been responsible for generating the lithic assemblage. Only 19 pieces of vertebrate fauna were recovered from Unit 1. The only identifiable genus is *Sylvilagus* (cottontail).



Light Olive Brown (2.5Y 5/3) silty sand - Topsoil

Light Olive Brown (2.5Y 5/3) silty sand - Mixed cultural layer

Light Brownish Gray (2.5Y 6/2) silty sand - Mixed cultural layer

Dark Brownish Gray (2.5Y 4/2) silty sand with carbon flecks

Rock

Figure 141: Site 5LA6618, Unit 1 west and north wall profiles.

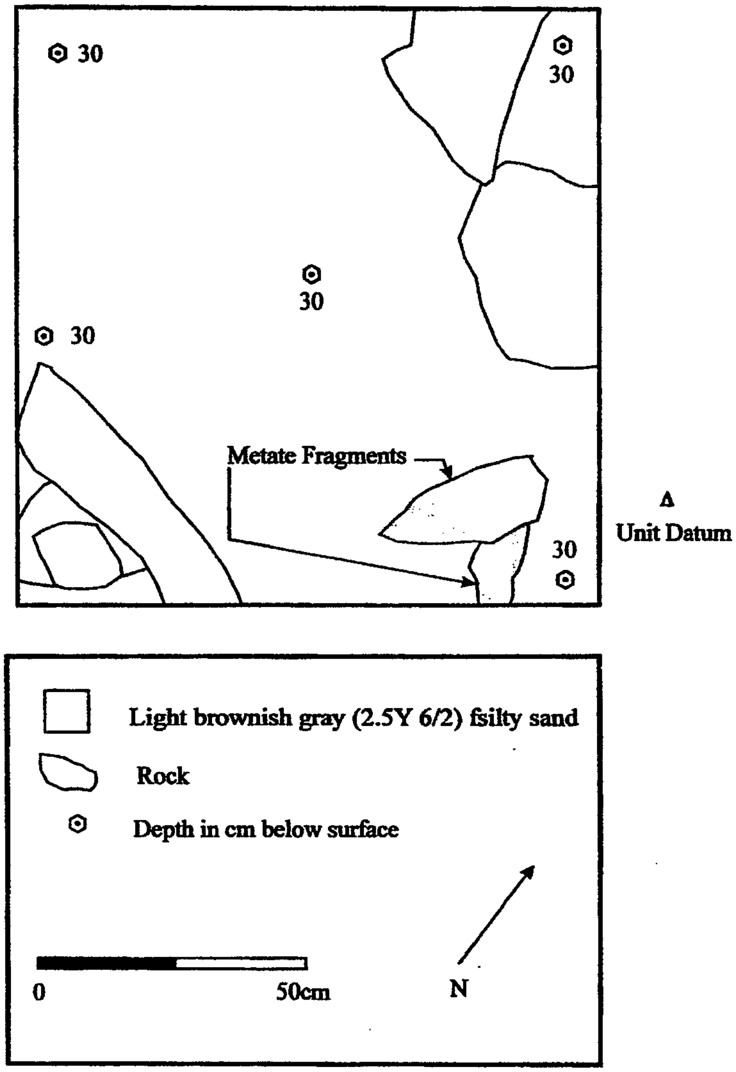


Figure 142: Site 5LA6618, Unit 1 Level 2 plan view.

Depositional History of Unit 2

Three depositional strata are identified for Unit 2 (Figure 143; Table 14.3). Unit 2 was excavated to bedrock at a depth of approximately 40 cm below the surface. Lying directly above bedrock, Stratum 3 is composed of a dark grayish brown (10YR 5/2) clayey silt with shale. No artifacts were found associated with this stratum. Stratum 3 formed the layers on which later cultural occupations took place.

Table 14.3. List of Strata for 5LA6618 Unit 2

Strata	Levels	Description
1	1	topsoil
2	2-3	culturally sterile deposits
3	4	culturally sterile deposits

Stratum 2 is contains the earliest evidence of human occupation in Unit 1. It is composed of a grayish brown (10YR 4/2) compact sandy silt with cobbles. This stratum contains no material culture and there was no evidence to indicate that the wall remnant visible on the surface extended into this stratum (Figure 144).

Stratum 1 is the uppermost and most recently laid deposit. It consists of a light brownish gray (2.5Y 6/2) silty sand. No cultural material derived from this stratum. This deposit is disturbed and mixed from recent pedestrian traffic and animal activities.

Chipped Stone and Vertebrate Fauna

No chipped stone debitage or faunal materials were recovered from the excavations of Unit 2.

Eligibility Recommendations

The low frequencies of artifacts recovered from excavation of Units 1 and 2 at this site, along with the absence of thermal features from excavated deposits, the low frequencies of faunal materials, and evidence for shallow deposits across the site indicate that 5LA6618 will not produce significant data to address any of the research domains discussed in this report. Based on this information 5LA6618 is recommended as not eligible for the National Register.

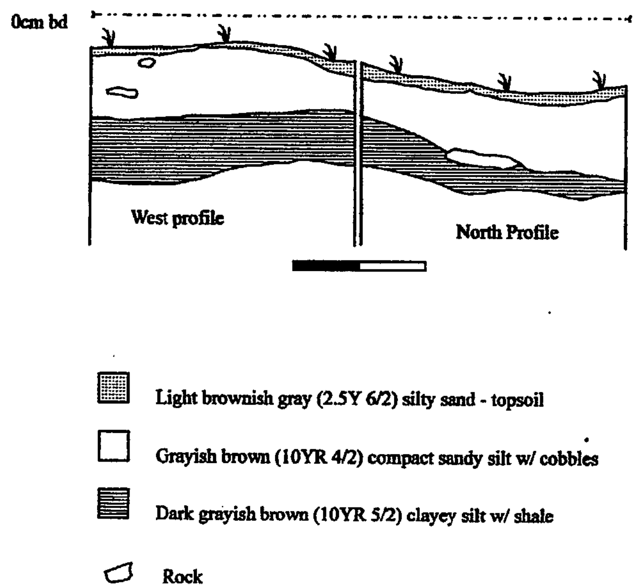


Figure 143: Site 5LA6618, Unit 2, west and north wall profiles.

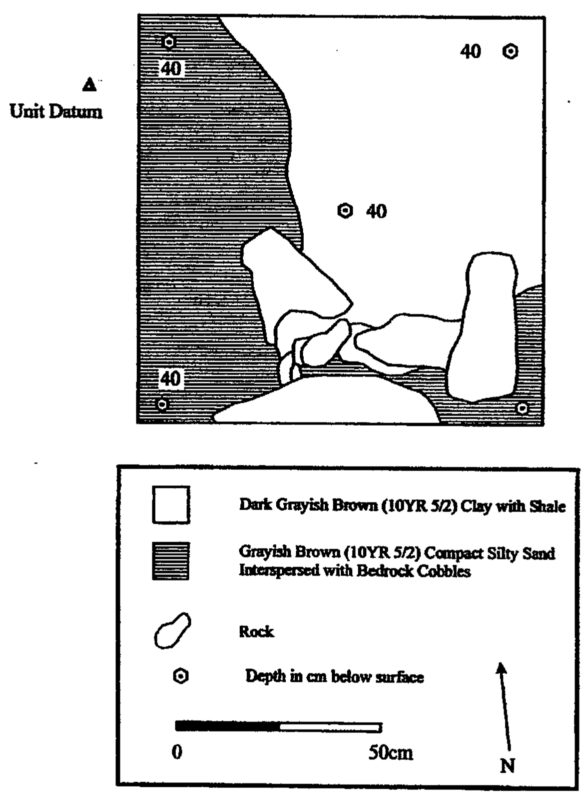


Figure 144: Site 5LA6618, Unit 2 Level 2 plan view.

Chapter XV: Conclusions

Management Summary

In the summer of 1996 archaeological fieldwork was conducted by New Mexico State University (NMSU) at 11 sites in Welsh Canyon at the Piñon Canyon Maneuver Site (PCMS). The fieldwork was funded by the U.S. Army and administered by the National Parks Service (NPS). The goal of the work discussed here is to evaluate the 11 sites based on the criteria set by the National Register of Historic Places (NRHP) in order to identify important archaeological and historical resources located in a predetermined area of the PCMS and provide the appropriate recommendations to insure their protection.

Eleven sites are evaluated in this report. They include: 5LA6568, 5LA6569, 5LA6575, 5LA6576, 5LA6592, 5LA6595, 5LA6599, 5LA6602, 5LA6603, 5LA6612, and 5LA6618. Nine of these sites were mapped and received subsurface testing while two of them were only mapped. The excavations were conducted in order to locate any subsurface features such as hearths or pits and to collect a sample of artifacts that could aid in determining the National Register eligibility of each site.

Results from the fieldwork indicate that seven of the eleven sites are recommended as eligible for the National Register. The sites recommended as eligible include: 5LA6568, 5LA6575, 5LA6576, 5LA6592, 5LA6595, 5LA6599, and 5LA6603. Sites not recommended as eligible for the National Register include: 5LA6569, 5LA6602, 5LA6612, and 5LA6618 (Table 16.1).

Vertebrate Fauna

Artifactual Vertebrate Fauna

A total of nineteen bone artifacts was identified; all sites yielded at least one such artifact. Twelve of the bone artifacts (63.2%) were bone tubes. Their use is unclear, but they may have been used as beads, although the only evidence supporting this idea is the prevalence of polishing on the ends.

Three artifactual specimens (15.8% of the total artifactual bone assemblage) were pointed implements; one displayed evidence of polishing. Commonly referred to as awls, similar pointed implements have been excavated at other sites in southeastern Colorado, including Upper Plum Canyon (Rhodes 1984) and Trinchera Cave (Simpson 1976:177) as well as at numerous sites reported by Andrefsky et al. (1990) and Ireland (1971).

A total of eight specimens of artifactual bone was made from either cottontails or jackrabbits. Either leporid tibiae or metapodials were the preferred skeletal elements. This use of leporid tibiae and metapodials parallels that encountered at the Upper Plum Canyon site. Rhodes (1984:125) notes that two-thirds of the bone beads from the site were made using the midsection of desert cottontail long bones; five smaller beads were made from small mammal metapodials.

Table 15.1 List of Sites Tested in the 1996 Field Season and Their Eligibility Recommendations.

Site Number	Site Area (m^2)	Number of Test Units	Recommended as Eligible	Recommended as Not Eligible
5LA6568	2860	3	X	
5LA6569	851	1		X
5LA6575	207	0	X	
5LA6576	28350	0	X	
5LA6592	1161	3	X	
5LA6595	1200	1	X	
5LA6599	25000	2	X	
5LA6602	30000	2		X
5LA6603	2940	5	X	
5LA6612	24000	3		X
5LA6618	2500	2		X
Totals	**119071**	**22**	**7**	**4**

Four bone implements could not be categorized as either tubes or awls. One example of these is a cut *Sylvilagus* sp. metapodial. A second specimen with evidence of human modification was recovered from 5LA6603; this artifact is the heavily calcined distal end of a cottontail tibia. The bevelled end of the tibia suggests that stone tools (with bevelled edges) were used to make the cuts that separated the distal end from the rest of the bone. Simpson (1976:143) recovered large numbers of epiphyseal ends in her excavations at Trinchera Cave. She referred to these pieces of bone as "discards" from bone bead-making. The discards came from cottontail tibiae, humeri, and radiae as well as jackrabbit metapodials and tibiae (Simpson 1976:143). Andrefsky et al. (1990) encountered a similar assemblage of artifactual bone in their excavations at fifty PCMS sites. They report the use of leporid tibiae (Andrefsky et al. 1990:532, 764, 912), humeri (p. 532) and metapodials (p. 912).

The only piece of artifactual bone conclusively from a large mammal was a bone flake "scraper," with rounded edges and what appeared to be use-wear along the margins. A final bone artifact was a polished fragment that could not be otherwise identified.

Although these artifacts were the only pieces of bone that displayed conclusive evidence of human modification, several specimens listed in the general list of fauna were snapped distal ends or long bone diaphyses. In particular, snapping was evident in cottontail metapodials and tibiae. These specimens were probably humanly modified in preparation for the manufacture of bone beads. However, there is no way to distinguish between bones snapped by humans and those snapped through non-cultural means. These may be the kinds of remains that Simpson (1976) identified as "discards."

Non-artifactual Vertebrate Fauna

A total of 3084 specimens of non-artifactual bone was analyzed for this study. Almost 79% of this assemblage (NISP = 2438) is unidentified bone, while about 21% (NISP = 656) was identified to at least the level of class. Fifteen genera or species were identified: one genus of reptile; two species of bird; and twelve genera or species of mammal. Neither amphibians nor carnivore taxa were identified. A list of all identified taxa is presented below.

Class Reptilia
- Order Squamata
  - *Sceloporus* sp. — Prairie lizard

Class Aves
- Order Columbiformes
  - *Zenaida macroura* — Mourning dove
- Order Passeriformes
  - *Eremophila alpestris* — Horned lark

Class Mammalia
- Order Lagomorpha
  - *Sylvilagus* sp. — Cottontails
  - *Lepus* sp. — Jackrabbits
- Order Rodentia
  - Family Sciuridae
  - *Spermophilus* sp. — Ground squirrels
  - *Cynomys* sp. — Prairie dogs
  - Family Geomyidae
  - *Thomomys bottae* — Botta's pocket gopher
  - *Pappogeomys castanops* — Yellow-faced pocket gopher
  - Family Heteromyidae
  - *Dipodomys* sp. — Kangaroo rats
  - Family Muridae

Family Muridae	
Peromyscus sp.	White-footed mice
Onychomys leucogaster	Northern grasshopper mouse
Sigmodon hispidus	Hispid cotton rat
Neotoma sp.	Woodrats
Order Artiodactyla	
Family Bovidae	
Bison bison	Bison or Buffalo

This assemblage of vertebrate faunal materials from seven sites in southeastern Colorado clearly illustrates heavy reliance upon small game animals by the prehistoric inhabitants of the area. Of taxa identified to either the genus or species level, leporids (*Sylvilagus* sp., *Lepus* sp.) represent the greatest contribution in terms of NISP to this assemblage (NISP = 189), followed by *Neotoma* sp. (NISP = 55). In comparison, artiodactyls were sparsely represented (NISP = 13). While a significant proportion (42%) of bone artifacts were manufactured using leporid skeletal elements, no artifacts were conclusively identified as artiodactyl, indicating that leporids were intensively utilized mammals for both subsistence and tool manufacturing purposes.

Sylvilagus sp., *Lepus* sp., and *Neotoma* sp. are consistently represented at the four sites with the largest faunal assemblages (5LA6568, 5LA6592, 5LA6595 and 5LA6603). This pattern persists whether the assemblage is derived from an open air or a rockshelter context. *Cynomys* sp. is present at three out of four of these sites in relative abundance (this genus is not represented at 5LA6595, which is an open air midden site). Two rockshelter sites in the same region have yielded similar assemblages. The most numerous identified genus from the Torres Cave Site (5LA1310) in southeastern Colorado was *Sylvilagus* sp. (7.2% of the total assemblage), followed by *Cynomys* sp. (4.6%) (Guthrie 1979). At Upper Plum Canyon Rockshelter (5LA2158), *Sylvilagus audubonii* (desert cottontail) and *Cynomys ludovicianus* (black-tailed prairie dog) together made up 82% of the identified bone or one-fifth of the total assemblage (Rhodes 1984:114). Andrefsky et al. (1990) report similar findings, indicating that the patterns observed represent subsistence practices focused upon small mammal gathering.

While *Sylvilagus* sp. (cottontail) formed a significant component of all seven faunal assemblages, this genus was most abundant at 5LA6603, comprising 12.1% of the total assemblage at this site (NISP of cottontail at 5LA6603 = 57). As discussed above, this high proportion of cottontail remains could represent only one or two individuals; however, the leporid-based pattern observed at 5LA6603 persists through the assemblages of the other six sites analyzed for this study, as well as at other reported sites (e.g., Andrefsky et al. 1990).

Cynomys sp. was relatively well represented at three of the six rockshelter sites in this assemblage (NISP = 21). However, as noted above, this genus was notably absent at the midden site (5LA6595). This difference could be attributed to the predatory birds that prey upon prairie dogs and then deposit their remains within rockshelter contexts. Numerous members of the family Accipitridae (hawks, kites and eagles) presently inhabit southeastern Colorado; like prairie dogs, these raptors are diurnal (Rappole and Blacklock 1994:53). Species such as the red-tailed (*Buteo jamaicensis*) and ferruginous hawks (*Buteo regalis*) are the primary avian predators of prairie dogs (Fitzgerald et al. 1994:191). The presence of these raptors in rockshelters may explain why the remains of prairie dogs are recovered in abundance from these contexts, but not from the open air site.

Cynomys sp. was recovered in abundance at the sites tested by Andrefsky et al. (1990). *Cynomys ludovicianus* was second in abundance (NISP = 288), after *Sylvilagus* sp. (Andrefsky et al. 1990:62), and was identified in 16 out of the 32 sites that yielded vertebrate fauna. *Cynomys* sp. was fourth in abundance (NISP = 21) in the assemblage presented here, after *Sylvilagus* sp., *Neotoma* sp. and *Lepus* sp. respectively. Despite the relative abundance of *Cynomys* sp. at both the sites analyzed in this study and those of Andrefsky et al. (1990), there is no evidence that the bone of this genus was used for tool manufacture. No artifactual remains that could be conclusively identified as prairie dog were noted in either of these PCMS assemblages.

Otherwise indeterminate mammal remains (i.e., those that could be identified only to the level of family) dominated the NISP counts from all seven sites that yielded faunal remains. Large mammals, artiodactyls, and bovids formed a comparatively low proportion of all assemblages; artiodactyls and bovids were represented at only three sites: 5LA6568, 5LA6592, and 5LA6595. At each of these sites, the total percentage of these mammals was either close to or less than 1%.

Unlike rodents and cottontails, artiodactyls do not have the advantage of rapid population growth, and they require several times more land per individual than do leporids. These factors may have contributed to the high exploitation rate of leporids relative to large mammals. For these reasons, leporids in particular, but possibly other small mammals such as woodrat *(Neotoma* sp.*)* and prairie dog (*Cynomys* sp.) may have provided a more stable and reliable food source than large mammals in Welsh Canyon.

Evidence of burned woodrat (*Neotoma* sp.) is especially interesting. While it is quite possible that *Neotoma* sp. was eaten prehistorically (Szuter 1991:Chapter 5), evidence for consumption has been sparse in the archaeological record. There is abundant ethnographic evidence for the consumption of rodents, however rodent bones rarely, if ever, display cut or chop marks, but this may be a consequence of the way in which the rodent was prepared for eating. Rodents are small enough to not need much butchering. Perhaps the best evidence for human consumption of rodents would be the presence of identifiable rodent bone in human coprolites.

Even if rodents such as *Neotoma* were being consumed, they probably were cooked in such a way as to avoid evidence of human use. For example, whole rodents may be used as part of a stew, in which case there would be little or no evidence of de-boning. Ethnographic accounts indicate that small mammals and birds were often cooked by placing the animal in the hearth and covering it with ashes and coals. In this case, the flesh and skin would protect skeletal elements from burning, with the exception of peripheral elements such as incisors, metapodials, carpi, tarsi, phalanges, and caudal vertebrae (Morlan 1994:139; Szuter 1991:167). This interpretation contrasts with that of Rhodes (1984:121), who has reported on one of the few complete archaeological investigations in southeastern Colorado, and states that the lack of burn damage on woodrat remains "[indicates] that these specimens probably were residents of the shelter or the vicinity and the one burned bone represents an accidental occurrence."

Woodrat (*Neotoma* sp.) was identified at 44% (14 out of 32) of the sites yielding vertebrate fauna studied by Andrefsky et al. (1990), and at six out of seven sites analyzed for this study. Whether rodent remains such as woodrat are intrusive or cultural must be determined on the basis of context (Szuter 1991), in addition to evidence of modification.

Bison presents an interesting contrast to the presence of small mammals such as *Neotoma* sp. and *Cynomys* sp. at sites in southeastern Colorado. Although the present analysis and that conducted by Andrefsky et al. (1990) conclude that the exploitation of small mammals (primarily cottontail) formed the subsistence base, large mammals such as bison may have provided a supplemental food source. Simpson (1976) concluded that bison was among the most highly exploited large mammal for the purposes of both subsistence and tool manufacture. Guthrie (1979) reported at least one bison at the Torres Cave site (5LA1310). Although Guthrie drew no conclusions about subsistence, his data appears to support the hypothesis that bison contributed only marginally to overall diet. Rather, leporids, rodents and otherwise unidentified small mammals represent the bulk of identified mammal remains.

One site may be regarded as largely representative of the rockshelter faunal assemblages in this region: 5LA6568. This site yielded the greatest number of faunal materials: 1635 total specimens, or 52.8% of the total non-artifactual assemblage. This site contained several genera of rodents, including *Cynomys*, *Pappogeomys* sp., *Peromyscus* sp., and *Neotoma* sp. Leporid remains (NISP = 78), including *Sylvilagus* sp., *Lepus* sp., and otherwise unidentified leporid, comprised 4.9% of the total assemblage, whereas unidentified mammals formed 10.2% (NISP = 166). Artiodactyl and bovid remains (NISP = 7) amounted to only 0.5% of the total assemblage.

Based on this evidence, and upon the evidence from other sites in the same region (i.e., Andrefsky et al. 1990, Guthrie 1979; Simpson 1976), large mammals such as bison and artiodactyls formed a comparatively small proportion of the diet. However, in contrast to the evidence from other PCMS sites, and sites such as Trinchera Cave (Simpson 1976) and Torres Cave (Guthrie 1979), no carnivore remains were identified from the vertebrate remains presented here. Below is a list of genera and species identified by Andrefsky et al. (1990) that *were not identified* from the assemblage presented here.

Class Reptilia	
Crotalis viridis	Western rattlesnake
Terrapene sp.	Terrapin
Class Aves	
Bubo virginianus	Great horned owl
Branta cf. *canadensis*	Canada goose
Class Mammalia	
Order Rodentia	
Tamias sp.	Chipmunk
Spermophilus tridecemlineatus	Thirteen-lined ground squirrel
Geomys cf. *bursarius*	Plains pocket gopher
Class Mammalia	
Order Carnivora	
Canis latrans	Coyote
Canis lupus	Wolf
Mustela frenata	Long-tailed weasel
Taxidea taxus	Badger
Mephitis mephitis	Striped skunk
Lynx rufus	Bobcat

The diverse carnivore assemblage recovered by Andrefsky et al. (1990) may be due, in part, to the greater overall size of that assemblage versus that presented here. Generally, the relative diversity of an assemblage is a function of sample size (Grayson 1984). Thus, diversity generally increases as sample size increases. For this reason, the fauna recovered by Andrefsky et al. (1990) may be more representative of the vertebrate fauna *population* than that of the seven sites presented here (assuming comparable recovery and analysis methods). However, it is interesting to note that despite the greater sample size presented in Andrefsky et al. (1990), several taxa, namely *Sceloporus* sp. (Prairie lizards), *E. alpestris* (horned lark), *Z. macroura* (mourning dove), *Pappogeomys* sp. (Yellow-faced pocket gopher), *Dipodomys* sp. (Kangaroo rats) and *Sigmodon hispidus* (Hispid cotton rat) were identified in this study but not in that of Andrefsky et al. (1990). The reason for this disparity between two assemblages from the same region is unclear.

In conclusion, the general fauna as well as the artifactual component of this assemblage indicates primary reliance upon cottontail, with exploitation of jackrabbit occurring concurrently. The use of small mammals such as *Neotoma* sp. and *Cynomys* sp., although probable, has not been conclusively demonstrated, as no evidence of cultural modification has been observed on elements of these genera. Although leporids have long been acknowledged as a primary subsistence resource prehistorically, closer attention to small mammals, such as the woodrat, may reveal that they too formed part of the subsistence base

base (see Szuter 1991). A greater understanding of the role of small mammals in prehistoric subsistence can be greatly facilitated by the use of small screen water sieving techniques, such as that employed here.

Chronology

Several of the sites investigated in the 1996 field season yielded information useful for refining the prehistoric chronology of Welsh Canyon and the PCMS. A total of 18 radiocarbon dates was run on samples from excavated contexts. The probability distribution of all these dates indicates three, or perhaps four, main occupational periods (Figure 145).

The earliest period is represented by two dates. The first date (Beta-102658) comes from 5LA6568 and has an intercept with the calibration curve of A.D. 100 (conventional date of 1910 B.P.). It comes from Level 15 of Unit 3 and is associated with a single chert flake. However, it is important to note that several pieces of chipped stone debitage were recovered from Levels 13-17, so it is likely that the early date represent a real human occupation of the rockshelter. Unfortunately, no temporally diagnostic artifacts are associated with this date. The second date (Beta-103152) comes from Level 18 of Unit 1 at 5LA6595. This date comes from a stratum that has only three pieces of chipped stone debitage and no temporally diagnostic artifacts. These two dates are consistent with a Late Archaic Stage (1000 B.C. to A.D. 200) occupation.

The paucity of Late Archaic Stage material remains from the sites investigated in the 1996 field season suggest that occupation of Welsh Canyon at that time was not very intensive. It also perhaps indicates low population densities compared to the Middle Ceramic occupations. The high proportion of large, cortical flakes and the high frequency of cores from the Late Archaic deposits at 5LA6568 seem to suggest that one activity at Shelter 3 was freehand core reduction.

Unfortunately, there are not many faunal remains from the excavated Late Archaic deposits examined in this report. However, some observations on the Late Archaic Stage environment are possible based on the pollen data (Appendix 1). The pollen from the lower levels of Unit 3 at 5LA6568 suggests that there was less juniper than at present and relatively the same amount of pine. In general, the environment during the Late Archaic appears to be quite similar to the modern setting. However, toward the end of the Late Archaic Stage, the pollen data indicate an increase in pine with a decrease in sagebrush and an increase in grasses. This pattern may indicate an increase in moisture. Since the two dates that represent this occupation are near the end of the period (ca. A.D. 100), moister or wetter conditions may have been an important factor in the Late Archaic Stage occupation of Welsh Canyon.

According to the probability distribution of the radiocarbon dates there seems to be a break in occupation centering at around 1650 B.P. (conventional radiocarbon date). It is difficult to know if this pattern represents a true hiatus in the human occupation of Welsh

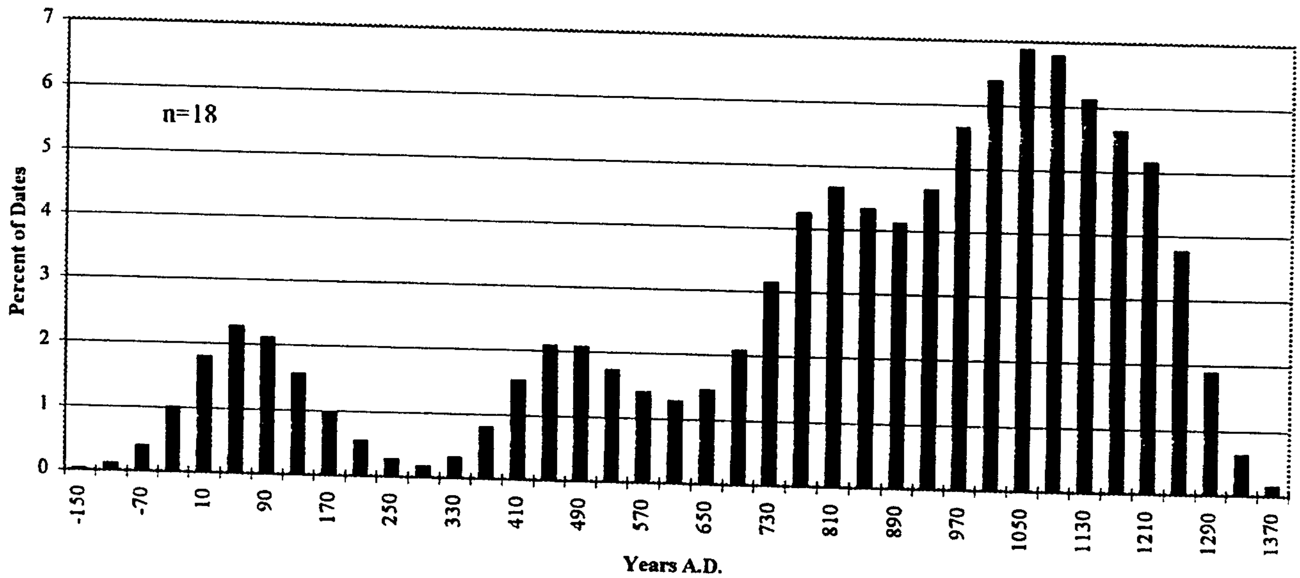


Figure 145: Probability distribution of all radiocarbon dates from tested sites.

Canyon or if it represents a sampling error. Only more radiocarbon dates from a statistically valid sample of excavated contexts can answer this question.

A second occupation centering at around 1500 B.P. is indicated by the probability distribution. This occupation is also represented by only two radiocarbon dates. One of these dates (Beta-100211) is from Level 12 of Unit 1 at 5LA6595. The second date (Beta-100214) comes from Level 5 Unit 1 at 5LA6603. Unfortunately, no temporally diagnostic artifacts were recovered in association with the dates from this occupation. The two dates from this second occupation are consistent with the middle part of the Early Ceramic Stage (A.D. 200 to A.D. 800/1000).

As with the Late Archaic Stage occupation, there are only two sites that have evidence for Early Ceramic Stage deposits. However, artifact counts are higher for the Early Ceramic Stage and may indicate a slightly more intensive occupation or one with greater time depth than the Late Archaic Stage occupation of Welsh Canyon.

A cache of four manos from 5LA6595 is associated with the Early Ceramic Stage. No ground stone was recovered from the Late Archaic deposits. The absence of ground stone could be the result of sampling error. However, this pattern at least allows us to set forth the hypothesis that plant processing was a more important subsistence activity in the Early Ceramic Stage than in the Late Archaic Stage.

Unfortunately, the pollen data were inconclusive for the Early Ceramic deposits. Pollen analysis was conducted on the manos from the cache at 5LA6595, but the results indicate that the recovered pollen was not significantly different from the control sample. Since each of the manos had evidence of being burned, it seems likely that the any pollen that may have adhered to the manos was burned away. Furthermore, we have no pollen that was analyzed with direct radiocarbon dates falling within the middle part of the Early Ceramic Stage. However, we do have this time period bracketed and according to Scott Cummings (Appendix 1) the period between approximately 1910 B.P. and 980 B.P. is characterized by some fluctuations with the period just prior to 980 B.P. being somewhat average in terms of available moisture.

The faunal information indicates that *Sylvilagus* was the predominate identifiable genus recovered from the Early Ceramic deposits. Small frequencies of *Lepus*, *Neotoma,* and *Cynomys* were also recovered from these deposits. Several unidentified small mammal remains and herpetofauna were also recovered.

The bulk of the dates from the 1996 field season (n=14) post date 1250 B.P. The probability distribution is open to two different interpretations. One way to read the distribution is to suggest that there is no distinct bimodalism and all the dates represent a single period of occupation with a span of between approximately 1250 B.P. to 650 B.P. Another interpretation would suggest that there were two separate occupations, one centering at around 1140 B.P. and another at around 850 B.P. Given the relatively large number of radiocarbon dates and the fact that the more dates used the flatter the distribution, the latter interpretation seems to be a bit more tenable than the former.

The one sigma range of the calibrated dates of the third occupation span a period between A.D. 695 and A.D. 1050 and is consistent with the end of the Early Ceramic Stage. The occupations of this period appear to be more intensive or they have greater time depth than the occupations of the second period dating to the middle of the Early Ceramic Stage. Figure 146 shows the proportions of chert and quartzite chipped stone debitage for the four occupations. The values used in this figure are the percentages of the two different material types based on all the material types present from only those contexts in which there is a relatively good association with a radiocarbon date. According to this figure, the use of chert increases in the later part of the Early Ceramic Stage as compared with the middle part of the Early Ceramic Stage and the Late Archaic Stage. This time period is also when obsidian may first shows up at any of the tested sites. One piece of obsidian was recovered from Level 4 of Unit 1 at 5LA6592. Unfortunately, it is argued above (Chapter VIII) that the radiocarbon date associated with this deposit may be somewhat earlier than the actual date of occupation. The obsidian specimen was determined to come from an unknown source (Appendix 2).

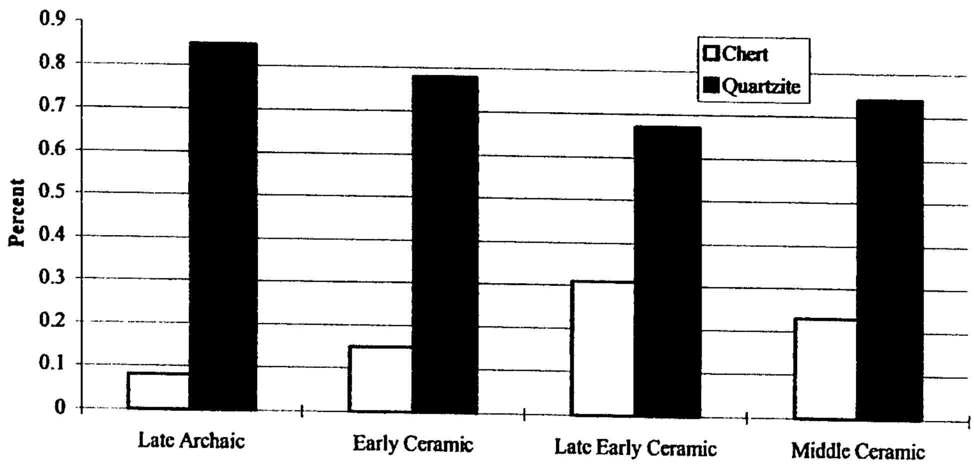


Figure 146: Bar chart of the proportions of chert and quartzite from the four periods.

The faunal materials associated with the Late Early Ceramic Stage deposits indicate that *Sylvilagus* continues to be the most prevalent identifiable genus. Interestingly, some species of bird (i.e. *Eremophila alpestris* and *Zenaida macroura*) are also found at 5LA6603 in the Late Early Ceramic Stage deposits.

Pollen analysis from the Sue Site (5LA5255) indicates that beginning at approximately 980 B.P. there was a period of less effective moisture. According to Scott Cummings (Appendix 1), the Welsh Canyon sites exhibit less variability than the Sue Site, but the period of decreased effective moisture is still apparent based on a decrease in the counts of arboreal pollen in both the Late Early Ceramic and Middle Ceramic deposits from 5LA6568. Apparently, the climate for both of these periods was more arid than today's or during the early to middle part of the Early Ceramic Stage. Scott Cummings adds that even though there was less moisture, vegetation communities would not be drastically affected and the main difference would be less ground cover during these periods of "moisture stress".

One interesting discovery during this period is the high percentage of *Opuntia* pollen from Level 9 at Shelter 3 of 5LA6568. The only artifact noted from Level 9 is an end scraper and based on this evidence it is reasonable to infer that *Opuntia* processing was a relatively important activity for this part of the shelter and that, perhaps, the end scraper was utilized in the processing of that resource. *Opuntia* may be a marginal food resource - used when other food sources have failed or are no longer available (Minnis 1991).

The most recent occupation centers at approximately 850 B.P. and is represented by 10 radiocarbon dates. This occupation falls within the early portion of the Middle Ceramic Stage (A.D. 800/1000 to A.D. 1500). This final occupation is likely still suffering from the period of less effective moisture described for the Late Early Ceramic Stage. The occupations of this period appear to be more intensive or perhaps they have greater time depth than at any other time in Welsh Canyon.

Compared with the earlier occupations, the Middle Ceramic Stage exhibits the greatest diversity in chipped stone debitage and tool types. A total of six different material types is represented in the chipped stone debitage and the presence of obsidian sourced to the Jemez Mountains of northern New Mexico is securely dated to this period.

The vertebrate fauna from the Middle Ceramic deposits is also very diverse. In addition to *Sylvilagus*, *Lepus*, and *Neotoma*, these deposits yielded prairie dog (*Cynomys* sp.), cotton rat (*Sigmodon* sp.), *Eremophila alpestris* (horned lark), and *Bison bison* and other artiodactyls among others. Apparently a wider range of animal taxa was being utilized in the Middle Ceramic Stage than in any other previous period of occupation.

In general, the data from the tested sites indicate that the time period from approximately A.D. 950-1200 was characterized by more arid conditions than the previous periods or modern conditions. These degraded conditions do not appear to have been severe and likely only slightly diminished vegetative ground cover. However, these conditions are associated with several interesting trends. It is during this dryer climatic period that the population of Welsh Canyon appears to increase. Based on the testing information, there are more sites with greater depth of cultural deposits. The combination of increased population and conditions that are more arid may have created an environmental and social context that required some new types of adaptive responses.

The faunal analysis suggests the utilization of a greater number of species than in the earlier periods. This pattern may indicate a diversification of subsistence practices, which, is in part, supported by the evidence for the human use of *Opuntia* in Level 9 of Shelter 3 at 5LA6568. The use of *Opuntia* may be an adaptive response by the inhabitants to experiment or intensify their use of more marginal food products.

It also appears that there was a diversification in the types of raw materials used in the production of stone tools. This may have been an attempt to make to chipped stone tools more efficient and affect subsistence production. Finally, the presence of obsidian during this period may indicate an increase in exchange with groups outside the PCMS. The forging of exchange networks was likely tied to social alliances that could be used to spread out risk of subsistence stress.

The data from the tested sites provide some interesting insights into the prehistoric lives of the inhabitants of Welsh Canyon. The cultural processes outlined above are only suggested by the available data. Additional testing and excavation at Welsh canyon sites (i.e. 5LA6576) and analyses integrated with survey data are required in order to more conclusively test hypotheses about changing social and environmental conditions.

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APPENDIX 1:
POLLEN ANALYSIS AT THREE ARCHAEOLOGICAL SITES (5LA6568, 5LA6592, AND 5LA9595) IN THE PINON CANYON MANEUVER SITE, SOUTHEASTERN COLORADO

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INTRODUCTION

Twenty-one pollen samples were examined from three sites in Welsh Canyon within the Piñon Canyon Maneuver Site in southeastern Colorado. A stratigraphic record was examined at 5LA6568 to provide information to compare with previous paleoenvironmental studies at the Sue Site (5LA5255) and a playa (Scott 1984), as well as geomorphic interpretations of paleoclimate (Schuldenrein 1985). Groundstone was abundant at some of the sites in Welsh Canyon. One hearth fill and six groundstone washes and associated sediment control samples were examined to provide information on plant processing by occupants of 5LA6568, 5LA6592, and 5LA6595.

METHODS

A chemical extraction technique based on flotation is the standard preparation technique used in this laboratory for the removal of the pollen from the large volume of sand, silt, and clay with which they are mixed. This particular process was developed for extraction of pollen from soils where preservation has been less than ideal and pollen density is low.

Hydrochloric acid (10%) was used to remove calcium carbonates present in the soil, after which the samples were screened through 150 micron mesh. The samples were rinsed until neutral by adding water, letting the samples stand for 2 hours, then pouring off the supernatant. A small quantity of sodium hexametaphosphate was added to each sample once it reached neutrality, then the beaker was again filled with water and allowed to stand for 2 hours. The samples were again rinsed until neutral, filling the beakers only with water. This step was added to remove clay prior to heavy liquid separation. At this time, the samples are dried then pulverized. Zinc bromide (density 2.1) was used for the flotation process. The samples were mixed with zinc bromide and centrifuged at 1500 rpm for 10 minutes to separate organic from inorganic remains. The supernatant containing pollen and organic remains is decanted and diluted. Zinc bromide is again added to the inorganic fraction to repeat the separation process. After rinsing the pollen-rich organic fraction obtained by this separation, all samples received a short (20 minute) treatment in hot hydrofluoric acid to remove any remaining inorganic particles. The samples were then acetolated for 3 minutes to remove any extraneous organic matter.

A light microscope was used to count the pollen to a total of 100 to 200 pollen grains at a magnification of 400-600x. Pollen preservation in these samples varied from good to poor. Comparative reference material collected at the Intermountain Herbarium at Utah State University and the University of Colorado Herbarium was used to identify the pollen to the family, genus, and species level, where possible.

Pollen aggregates were recorded during identification of the pollen. Aggregates are clumps of a single type of pollen, and may be interpreted to represent pollen dispersal over short distances, or the introduction of portions of the plant represented into an archaeological setting. Aggregates were included in the pollen counts as single grains, as is customary. The presence of aggregates is noted by an "A" next to the pollen frequency on the pollen diagram. A plus (+) on the pollen diagram indicates that the pollen type was observed outside the regular count while scanning the remainder of the microscope slide.

Indeterminate pollen includes pollen grains that are folded, mutilated, and otherwise distorted beyond recognition. These grains are included in the total pollen count, as they are part of the pollen record.

Groundstone were washed with distilled water and dilute hydrochloric acid to recover any pollen from the ground surfaces. Concentrations of pollen from the ground surfaces may represent plants ground using manos and metates. The ground surfaces had no appreciable quantity of dirt adhering to them. All ground surfaces were cleaned using pressurized air to remove modern contaminants. The ground surfaces were washed with distilled water and dilute hydrochloric acid, and scrubbed with a brush to release all trapped pollen. The resulting liquid was saved, and processed in a similar manner to the soil samples, with the exception that the zinc bromide separation was not used.

ETHNOBOTANICAL REVIEW

It is a commonly accepted practice in archaeological studies to reference ethnological (historic) plant uses as indicators of possible or even probable plant uses in prehistoric times. It gives evidence of the exploitation, in historic times, of numerous plants, both by broad categories, such as greens, seeds, roots, and tubers, etc. and by specific example, i.e., seeds parched and ground into meal which was formed into cakes and fried in grease. Repetitive evidence of the exploitation of resources indicates a widespread utilization and strengthens the possibility that the same or similar resources were used in prehistoric times. Ethnographic sources outside the study area have been consulted to permit a more exhaustive reviews of potential uses for each plant. Ethnographic sources do document that with some plants the historic use was developed and carried from the past. A plant with medicinal qualities very likely was discovered in prehistoric times and the usage persisted into historic times. There is, however, likely to have been a loss of knowledge concerning the utilization of plant resources as cultures moved from subsistence to agricultural economies and/or were introduced to European foods during the historic period. The ethnobotanic literature serves only as a guide indicating that the potential for utilization existed in prehistoric times--not as conclusive evidence that the resources were used. Pollen and macrofloral remains, when compared with the material culture (artifacts and features) recovered by the archaeologists, become indicators of use. Plants represented by pollen and charred macrofloral remains will be discussed in the following paragraphs in order to provide an ethnobotanic background for discussing the remains.

Opuntia (prickly pear, Indian fig) occur as shrubs or herbaceous perennial plants. Some species have flattened, fleshy joints that produce edible fruit. The fruits were eaten raw, stewed, or dried for winter use. Young stems or pads were peeled and eaten raw or roasted. The seeds were eaten in soups, or dried, parched, and ground into a meal to be used in gruel or cakes. The peeled pads were used as a dressing on wounds, and a tea made from the pads was used to treat lung ailments. Juice from the fruit was applied to warts (Foster and Duke 1990:88). Prickly pear cactus are found throughout the western United States on arid, rocky, or sandy soils. They are occasionally found growing east to New York and Massachusetts, and west to British Columbia and Washington (Harrington 1964:382-384; Kirk 1975:50-52; Kovasch 1979:61; Medsger 1966:61; Muenscher 1987:317).

Cucurbita (squash, pumpkin) produces both fruit and flowers that may contribute to the subsistence base. The fruit may be prepared while still green, or cooked in a variety of ways (boiled, fried, or roasted over night). The flowers may be prepared in pats or cakes, or fried. The seeds also may be roasted and eaten. Buffalo-gourd (*C. foetidissima*) produces an edible fruit that may be cooked for immediate consumption, or dried for winter use. The seeds of this gourd also are edible. Both the fruit and seeds are noted to have been used by Indians of Arizona (Castetter and Bell 1942:188-191, 200-201; Cushing 1920:208, 228: Kearney and Peebles 1960:822; Robbins et al. 1916:100-102; Stevenson 1915:44-45, 66-67; Whiting 1939:93).

DISCUSSION

Three sites in Welsh Canyon were selected for pollen analysis. All three sites were located near the headwaters of Welsh Canyon. Both the 5LA6595 and the 5LA6568 exhibited stratigraphic sediments representing nearly 2,000 years. Stratigraphic samples and a hearth were examined from the 5LA6568 (Table 1). In addition, groundstone was examined from two sites (5LA6592 and 5LA6595). The pollen records will be discussed separately by site.

5LA6568

Site 5LA6568 is a series of rockshelters situated on the east side of the main drainage near the headwaters of Welsh Canyon. Cultural deposits were noted to a depth of at least 145 cm. A corrected AMS date of 1910 $\pm$ 60 BP is reported near the base of these deposits, and the corresponding base of the pollen record. Local vegetation includes juniper (*Juniperus*), cholla (*Cylindropuntia*), prickly pear cactus (*Opuntia*), mullein (*Verbascum*), chenopodia (Cheno-ams), tall bunch grasses (Poaceae), and low forbs. An intermittent, unnamed stream channel, with associated riparian vegetation, is noted about 20 m from this site (Schiavitti, personal communication, January 17, 1997).

A stratigraphic profile was sampled in Unit 3, a shelter with a stone enclosure. Samples were collected at 10 cm intervals. The upper portion of the stratigraphic profile was examined at 10 cm intervals, while the lower portion of the record was examined at 20 cm intervals, due to budgetary restraints. Most cultural levels exhibited chipped lithic debris with the exception of Level 9 in which was found a single scraper. Levels above Level 9 contained primarily small lithic debris, indicating late stage lithic production or lithic tool maintenance. Levels below Level 9 exhibited primarily large lithic debris and cores, perhaps indicating core reduction or the initial stages of tool production (Schiavitti, personal communication, April 24, 1997).

The stratigraphic pollen record from 5LA6568 provides a general record of vegetation between approximately 1900 BP and 1000 BP, topped by a modern sample. Level 2 yielded a corrected radiocarbon age of 1050 $\pm$ 80 BP. Prehistoric pollen remaining in this level appears to have been mixed with relatively modern or historic pollen.

The stratigraphic pollen record suffers from a few deficiencies. First, a corrected radiocarbon age of 1050 $\pm$ 80 BP is reported for Level 2, a mere 10-20 cm below the present surface. This indicates that the time period of approximately 1000 BP to nearly the present is not represented in this record. It is likely that this pollen sample is affected by mixing with modern or historic pollen, given the shallow depth. To attempt to compensate for this loss of sediments between approximately 1000 BP and the present, a second pollen diagram was constructed. Figure 1 presents the pollen record grouping samples from individual sites and excavation units in the standard manner. Figure 2 presents pollen data by interfingering the stratigraphic samples and control samples from all sites by radiocarbon age. The control sample examined from Unit 1 is associated with a hearth that yielded a corrected radiocarbon age of 770 $\pm$ 60 BP, representing a slightly younger sediment, which might assist in interpreting the paleoenvironment for the time period after 1000 BP. The single exception for sample insertion is Sample 2 with a corrected age of 1410 BP, which could not be inserted accurately into the stratigraphic record due to the absence of dates between 1170 and 1910 BP for the column. Finally, the lower levels of this stratigraphic column are not as well represented as the upper levels, since only the odd numbered levels are represented below Level 7, making the interval 20 cm between pollen samples below this depth.

The modern pollen record, represented by Sample 7, is dominated by *Juniperus* pollen, representing local juniper trees (Figures 1 and 2, Table 2). Other characteristics of the modern sample include a relatively small quantity of *Pinus* pollen and very small quantities of *Abies*, *Picea*, and *Pseudotsuga* pollen, representing long distance transport from pine communities associated with rock outcrops and/or from the foothills and montane vegetation communities to the west. The most prominent elements of the local vegetation community in the pollen record are *Artemisia* (sagebrush), Low-spine and High-spine Asteraceae (members of the sunflower family), Cheno-ams (chenopodia), and Poaceae (grasses). Small quantities of *Ephedra*, cf. *Marrubium*, Onagraceae, *Opuntia*, *Rhus aromatica*-type, and *Sphaeralcea* pollen represent other local plants. Recovery of a small quantity of *Sporormiella* fungal spores is consistent with the fact that this sample represents modern deposition.

The fungal spore, *Sporormiella*, represents a dung fungus that becomes more abundant in Historic Period sediments following the historic introduction of grazing animals. Its increasing presence in historic samples has been noted in numerous palynological studies (Davis, 1987). *Sporormiella* fungal spores are not confined to the dung of introduced grazers, but also occur in dung from moose, wild sheep, deer, elk, caribou, and rabbits. The increase of *Sporormiella* spores in historic sediments may relate to changing land use patterns and increase in the length of time that herds of animals occupy any given area.

The base of the pollen record (Sample 65) exhibits a similar *Pinus* pollen frequency to that in the modern sample, suggesting similar local and/or regional populations of pine to those of the present. The *Juniperus* pollen frequency is significantly less and a small amount of

Quercus pollen is present, indicating that both juniper and oak were present in small quantities in the region. The *Artemisia* pollen frequency was elevated compared with the modern sample, suggesting that sagebrush were more abundant around 1910 BP. Quantities of Low-spine and High-spine Asteraceae, Cheno-am, and Poaceae pollen were similar to those noted in the modern sample. Small quantities of *Ephedra, Psoralea, Boerhaavia, Mirabilis,* Onagraceae, *Opuntia, Gilia*-type, *Eriogonum, Polygonum sawatchense*-type, *Prunus*-type, and *Sphaeralcea* pollen attest to the presence of these plants in the local vegetation. In addition, a single *Cucurbita* pollen was recorded during the scan of this sample. *Cucurbita* pollen may represent the native *Cucurbita foetidissima* (buffalo gourd) or the cultivated *Cucurbita* (squash/pumpkin). These pollen cannot be distinguished using a light microscope. Recovery of *Cucurbita* pollen may represent growth of buffalo gourd in or at the edge of this shelter or use of either buffalo gourd or a cultivated squash/pumpkin by occupants of the shelter. A single starch granule was noted in this sample and probably represents the deterioration of grass seeds.

Samples 61 through 65 represent the lower levels that exhibited larger lithic flakes indicating the early stages of tool production or core reduction. Samples 63 and 61 exhibit increasing *Pinus* pollen frequencies. Other differences between these two samples and Sample 65 include a reduction of *Artemisia* pollen and an increase in Poaceae pollen in Sample 61. This suggests replacement of some of the sagebrush with grasses, which is a likely result of increased moisture. Pollen types that are noted in small quantities and represent long distance transport of pollen from the mountains include *Abies, Picea,* and *Pseudotsuga.* Small quantities of *Juniperus* and *Quercus* pollen indicate the continued presence of juniper and oak in the general vicinity of Welsh Canyon. Small quantities of Liguliflorae pollen represent the presence of a dandelion-type composite. These plants thrive in riparian and disturbed conditions. In general, Cheno-am frequencies decline from Sample 65 to Sample 61. If this pollen type represents primarily *Atriplex*, this decline may be in response to increased moisture that makes other plants more competitive in the local vegetation. If the Cheno-am pollen represents herbaceous *Chenopodium,* it could signal the growth of fewer weedy annuals in the immediate vicinity of this shelter. Small quantities of *Sarcobatus, Tidestroemia, Ephedra, Psoralea, Lonicera,* Liliaceae, *Boerhaavia*-

type, *Mirabilis*-type, Onagraceae, *Opuntia*, *Gilia*-type, *Eriogonum*, *Polygonum*, *Prunus*-type, *Sphaeralcea*, and *Typha* pollen attest to the presence of a wide variety of local plants. The Liliaceae pollen aggregate displayed pollen grains the same size as *Allium*, but with a slightly more robust reticulation. Therefore, these pollen could not be confirmed as *Allium*. The pollen were much smaller than *Calochortus*, which also grows in the area. Again, the *Cucurbita* pollen might represent either local growth of native buffalo gourd or the use of buffalo gourd or the cultivated squash/pumpkin. A hollow starch granule noted in Sample 61 might represent deterioration of grass seeds. The total pollen concentration for these samples varies from 355 to 551 pollen per ml of sediment, which is very appropriate for archaeological deposits that have been exposed to weathering.

Pollen Sample 58 represents Level 9, the only level that did not yield any lithic flakes. This sample is different in pollen content from the samples above and below it. It exhibited the largest quantity of *Opuntia* pollen noted in any of the samples from this study. Previous examination of modern surface samples from the Pinon Canyon Maneuver Site (Scott 1984) indicates that *Opuntia* pollen can be expected in 0-1% frequencies in sediment samples from areas in which prickly pear cactus grows. Therefore, recovery of *Opuntia* pollen in a frequency larger than 20% is an extreme anomaly. The most likely explanation is that this area was used to process prickly pear cactus. The abundance of prickly pear cactus is responsible for a slight depression of other pollen types. However, the reduction in *Pinus* pollen noted in this sample is accompanied by an increase in *Juniperus* pollen, indicating that there was a real decrease in local/regional pines and an increase in local junipers at this time. The *Artemisia* pollen frequency is slightly elevated when compared with Samples 57 and 61 representing Levels 7 and 11, respectively, suggesting that the sagebrush population increased slightly. This sample exhibited fewer pollen types than were noted in most other samples and also a relatively low pollen concentration. These factors might be the result of greater pollen destruction in this level or might reflect a time period when plant variety was reduced and/or sedimentation rate was increased. No other elements of the pollen record in this sample are remarkable.

Samples 57 to 10 represent Levels 7 through 4 at 5LA6568, respectively. *Juniperus* pollen increases in the lower three of these samples, then declines in Level 4. In contrast, *Pinus* pollen frequencies are highest in Levels 7 and 4, where *Juniperus* frequencies are low, and depressed in Levels 6 and 5, when *Juniperus* pollen frequencies are higher. Pine trees are noted today on the Big Arroyo Hills and elsewhere in the Pinyon Canyon Maneuver Site. This fluctuation in *Pinus* pollen frequency is interpreted to represent changes in the local pine populations in the Big Arroyo Hills and similar locations, as well as changes in long distance transport from the mountains to the west. Therefore, pines likely were more abundant during time periods represented by Levels 7 and 4 than during time periods represented by Levels 6 and 5, when junipers became more abundant locally. Habitats for pinyon and juniper usually include areas that receive between 10 and 15 inches of precipitation per year.

> "Pinyon-juniper growth is dependent mostly upon soil moisture stored from winter precipitation, mainly snow... Droughts are common. Tap roots of pinyon and juniper, however, have a relatively rapid rate of root elongation and are thus able to endure until precipitation alleviates the condition (Emerson 1932)... Pinyon and juniper vary in their susceptibility to drought. The order of increasing water requirements is *P. cembroides*, *J. monosperma*, *P. edulis* and *J. scopulorum* (Woodin and Lindsey 1954)" (Tueller and Clark 1975:34).

Both *Pinus* and *Juniperus* pollen fluctuate through time in this record from Welsh Canyon. Specific conditions have not been identified that would account for an increase in local pines and a decline in juniper, or vice versa.

Surprisingly the frequencies of *Artemisia*, Low-spine and High-spine Asteraceae pollen remain relatively stable in these four samples. Cheno-ams increase in Levels 7 through 5, then declines in Level 4, mirroring the increase and decline in *Juniperus* pollen. Fluctuations in Poaceae pollen do not exhibit a similar pattern. The increase noted from Level 7 to Level 6 is followed by a decline in Level 5, then a slight increase in Level 4. Long distance pollen transportation includes *Picea* and *Pseudotsuga*. *Quercus* pollen has become rare, indicating that the population of oaks had declined. Small quantities of Liguliflorae, *Tidestroemia* Cyperaceae, *Ephedra*, *Euphorbia*, cf. *Petalostemon*, *Psoralea*, *Lonicera*-type, cf. *Marrubium*, *Boerhaavia*-type, *Mirabilis*-type, Onagraceae, *Opuntia*, *Phlox*-type, *Eriogonum*, *Rhus glabra*-type, and

Sphaeralcea pollen indicate the presence of a wide variety of herbaceous and shrubby plants in the vicinity of this shelter. Again, the *Cucurbita* pollen noted may represent either growth of native buffalo gourd or use of buffalo gourd or the cultivated squash/pumpkin. Total pollen concentration for these samples varied from 934 to 239 pollen per ml of sediment, which is consistent with buried deposits that have undergone organic decomposition.

Samples 9 and 8 represent Levels 3 and 2, respectively. Corrected radiocarbon ages for Levels 3 and 2 are 1170 $\pm$ 130 BP and 1050 $\pm$ 80 BP, respectively. The intercept dates overlap for these date, indicating that they represent a very similar time period. The major elements of the pollen records are very similar between these two samples. Both exhibit moderately low quantities of *Juniperus* and *Pinus* pollen, suggesting that the local juniper and pine populations were reduced at this time. The *Artemisia*, High-spine Asteraceae, and Cheno-am pollen frequencies all were elevated, indicating that these shrubby and herbaceous plants had increased in number in the local vegetation. This reduction of trees and increase in drought-tolerant shrubs is common in cycles of decreased moisture. In addition, the Liguliflorae pollen frequencies have declined compared with the previous group of samples. The plants represented by this group of composite pollen commonly grow in riparian areas; therefore, this reduction is consistent with a reduction in local riparian habitat. The Poaceae pollen frequency is similar to that noted in the upper samples in the last group, suggesting little change in the total grass population. Small quantities of *Picea* and *Pseudotsuga* pollen indicate long distance transport of these grains from mountainous communities. A small quantity of *Quercus* pollen observed in Sample 8 indicates the regional presence of oak. Small quantities of Low-spine Asteraceae, *Sarcobatus*, Cyperaceae, *Ephedra*, *Psoralea*, Onagraceae, *Opuntia*, *Gilia*-type, *Eriogonum*, cf. *Claytonia*, *Rhus glabra*-type, *Sphaeralcea*, and *Typha* pollen documents the presence of a wide range of local shrubs and herbaceous plants. Recovery of *Typha* pollen indicates that while the riparian community might have decreased at this time, it was still present. The presence of *Cucurbita* pollen may reflect either local growth of buffalo gourd or utilization of buffalo gourd or cultivated squash/pumpkin. Sample 9, collected at a depth of 20-25 cm in Level 3, exhibited approximately 1556 pollen per ml of sediment, while Sample 8, collected at a depth of 10-20 cm in Level 2, displayed approximately 4222 pollen per ml of sediment. Apparently, Level 2 is a mixture of prehistoric and more recent pollen. The concentration of pollen in Level 3 might reflect some modern or more recent intrusion, but the majority of the pollen appears to have undergone a process of degradation.

Three samples dating between 770 and 720 BP were inserted into the modified regional stratigraphic record (Figure 2) due to the absence of sediments younger of similar age in the area sampled stratigraphically at 5LA6568. These samples include the hearth (F. 5) and control sample from Unit 3 at 5LA6568 and a control sample from 5LA6592. The hearth sample was included with the control sample from 5LA6568 because it exhibited a very similar pollen signature to the control sample from 5LA6592 and probably contains primarily pollen that accumulated following use of the hearth.

These three samples (4, 5, and 6) exhibit *Juniperus* frequencies slightly higher than did the samples that dated to approximately 1050 BP and 1170 BP. The *Pinus* pollen frequencies were not significantly different. *Quercus* pollen was noted more regularly in samples representing 770-720 BP, indicating that oaks probably were more abundant. Evidence of long distance transport included *Abies*, *Picea*, and *Pseudotsuga* pollen. A small quantity of probable *Salix* pollen was noted in Sample 4, indicating that willow probably was present in the riparian area of Welsh Canyon. *Artemisia* is observed in smaller quantities in Samples 4 and 5, but not 6, suggesting that the sagebrush population was similar to or slightly smaller than it was around 1050-1170 BP. The quantities of High-spine Asteraceae pollen fluctuate in these samples, and do not produce a clear signal concerning abundance of shrubby or herbaceous plants in the sunflower family. The quantities of Liguliflorae pollen recovered remain low, indicating that this portion of the riparian community has not recovered. The Cheno-am frequencies were equal to or possibly slightly greater than those noted in samples representing the interval 1170-1050 BP. This Cheno-am signal might be very closely tied to human activity rather than being a response to climatic conditions. The Poaceae pollen frequencies were similar to those in previous levels. These samples exhibit a reduction in types of pollen represented. Small quantities of Low-spine

Asteraceae, Brassicaceae, Caryophyllaceae, *Sarcobatus*, Onagraceae, *Opuntia*, *Eriogonum*, *Portulaca*, Rosaceae (scabrate), *Sphaeralcea*, and *Typha* pollen indicate the presence of these plants near the headwaters of Welsh Canyon. Total pollen concentration was low, as expected, in Sample 6, the control for Feature 5, a hearth. Total pollen concentration was relatively high (2801-5252 pollen per ml of sediment) for Feature 5 (Sample 5) and the control from 5LA6592 (Sample 4). Sample 4 was collected at a depth of 14-24 cm below the present ground surface. It is possible that modern/historic pollen is present in this sample because of its shallow depth. Sample 5 was collected at a depth of 52-57 cm and exhibited roughly half the pollen concentration of Sample 4, but approximately five times the concentration of its associated control sample (6). This increased pollen concentration in Sample 5 might represent factors of pollen accumulation relating to the filling of the hearth and the possibility that better conditions existed for preservation. Alternatively, it is possible that this feature was attractive for rodent or other disturbance, which introduced more recent pollen.

In general, starch granules are rare in stratigraphic samples from 5LA6568. The types of starches recovered are consistent with those produced in grass seeds and probably represent the deterioration of grass seeds in these sediments.

Samples collected from Feature 5 and its associated control were discussed relative to their contributions of pollen representing local and regional vegetation communities above. This discussion focuses on the interpretation of these pollen records with respect to human activity at the site. Feature 5, a hearth, was associated with a living surface and yielded a corrected radiocarbon age of 770 $\pm$ 60 BP. Sample 5 was collected from fill within the hearth. The accompanying control sample was recovered from the same unit and level, but approximately 90 cm away from the hearth and approximately 10 cm below the living surface. This control sample might represent a time period different from the hearth. Differences noted in the pollen records between these two samples are the type of differences expected in samples of different ages. Feature 5 yielded the largest quantity of *Juniperus* pollen, which probably reflects the growth of juniper in the vicinity of the shelter. Pollen types recovered in this sample are very consistent with pollen types recovered from stratigraphic samples from this site. No starch granules were noted. The control sample exhibited similar types of pollen. Noteworthy differences include the larger quantity of Cheno-am pollen and aggregates in the control sample. Normally, an increase in Cheno-am pollen is assumed to represent an increase in weedy plants as a result of human activity, use or processing of Cheno-ams, or a change in local vegetation in response to environmental conditions. Since this control sample probably represents a different time period than the hearth, interpretation of the significance of the difference in Cheno-am pollen is not possible. A small quantity of Brassicaceae pollen was recovered in the control sample (6) and might be present as the result of food processing activities or growth of weedy plants in response to human disturbance.

5LA6592

Site 5LA6592 is a shelter situated on the southern side of the canyon approximately 200 m from an unnamed, intermittent stream channel, which supports riparian vegetation. Local vegetation at the site includes juniper, cholla, rabbitbrush, *Rhus trilobata*, chenopodia, prickly pear cactus, and mixed bunch grasses. Grinding surfaces and grooves are worn into the rock at the back edge of the shelter. A smaller shelter nearby has bedrock metates. A linear arrangement of rocks also was noted inside the shelter, as was a hearth. A concentration of fire-cracked rocks was uncovered at a depth of approximately 18 cm below the surface and may represent the corner of a hearth. A single mano recovered from the fill of Feature 1, a hearth that yielded a corrected radiocarbon age of 720 $\pm$ 50 BP, was washed for pollen. A control sample was collected outside a neighboring hearth (Feature 2). Both hearths were excavated in Unit 3.

Samples 3 and 4, representing the mano wash and control sample, are very similar to one another. Both yielded large frequencies of *Juniperus* pollen and moderately small quantities of *Pinus* pollen. Pollen present through long distance transport was noted only in the control sample and included *Abies*, *Picea*, and *Pseudotsuga*. Small quantities of *Quercus* and probable *Salix* pollen indicate that oak and willow grew in the general vicinity. Quantities of Cheno-am pollen were similar in both samples. The High-spine Asteraceae pollen frequency was higher in the control sample and Liguliflorae pollen was present only in the control sample. Both *Opuntia* and *Physalis*-type pollen, which represent economically important plants, were noted only in the control sample. The Poaceae pollen frequency was slightly elevated in the mano wash sample, but was well within the range of Poaceae pollen noted in stratigraphic samples at nearby 5LA6568. No starch granules were recovered in either sample. This mano was recovered from a hearth and had likely been burned. It is probable that all pollen adhering to it as a result of grinding had been burned off and that all of the pollen recovered from the ground surface of this mano reflected local and regional pollen rain.

5LA6595

Site 5LA6595 is an open site situated near the head of a small draw approximately 100 m from 5LA6592. The site is located in a protected area with high canyon walls, a fresh water seep nearby, and a steep streambed. The site is described as a midden since cultural material was mixed with a dark, organic-enriched soil that appears to have been piled near the cliff face. Animal disturbance was noted in all levels at this site. A cache of four manos was recovered at a depth of 80 cm below the surface. All four manos were washed to recover pollen. The control sample was collected from sediment in the same unit and level as the manos, but 5-10 cm higher in Level 12. In addition, another mano, represented by Sample 14, was recovered from Level 8, at a depth of 46 cm.

The control sample exhibited a moderate quantity of *Juniperus* pollen and a small amount of *Pinus* pollen. Pollen expected only through long distance transport was rare and included only *Picea* pollen. Quantities of *Artemisia* and High-spine Asteraceae pollen were moderately low, while quantities of Low-spine Asteraceae and Liguliflorae pollen were low. The Cheno-am frequency was elevated compared with that recorded in other samples from nearby sites. Small quantities of *Sarcobatus*, *Opuntia*, *Eriogonum*, and *Portulaca* complete the pollen spectrum, indicating the presence of these plants, several of which might have been exploited economically.

Recovery of *Cucurbita* pollen might reflect local growth of buffalo gourd or utilization of either buffalo gourd or a cultivated squash/pumpkin.

Sample 14 represents a mano recovered from Level 8, which is more recent than the control sample. This mano exhibits a pollen signature more typical of the more recent sediment samples in that the *Juniperus* pollen frequency was slightly elevated. A small quantity of *Portulaca* pollen was noted in this sample and a single angular starch with multiple fissures and an "X" under cross-polar illumination was recorded. It is possible that the starch granule was present as a result of grinding grass seeds; however, this mano, like the others, was burned. Therefore, it is more likely that all pollen relating to the use of this mano for grinding was removed during the burning and that pollen recovered in this wash represents pollen introduced subsequent to burning.

Samples 1, 13, 15, and 16 represent manos recovered from the cache. These manos exhibit nearly uniform pollen records. Differences include the small quantities of *Opuntia* pollen recorded in Samples 15 and 16, the absence of Poaceae and *Eriogonum* pollen in Sample 1, and the presence of *Rhus glabra*-type pollen in Sample 16. These pollen types represent edible resources and might reflect their discard in the midden. All four of these manos were burned and it is likely that this burning removed pollen associated with grinding using these manos. Therefore, recovery of these pollen types representing potentially edible resources is ambiguous.

SUMMARY AND CONCLUSIONS

Pollen analysis at three sites in Welsh Canyon within the Pinyon Canyon Maneuver Site provides a modified stratigraphic record from sediments dating between approximately 2000 BP and 700 BP. Examination of additional control samples from sediments younger than 1,000 years and at depths greater than this time period in the stratigraphic column increase the interpretability of this record.

Previous pollen studies in the Pinyon Canyon Maneuver Area noted periods of moisture stress or drought, as well as periods of more abundant moisture (Scott 1984). Periods of increased effective aridity were noted at depths of 30 cm, 130-150 cm (a dated interval of approximately 980 BP), 230-250 cm, and at 290 cm below the surface (a dated interval immediately after 2470 BP) at the Sue Site (5LA5255). Brief periods of increased effective moisture, reflected by increased arboreal pollen frequencies, are noted near the surface, and at depths of 160-180 cm (prior to 1000 BP), and at 300 cm (around 2470 BP). While these changes were noted in effective moisture levels, they were not severe enough to alter the local vegetation communities significantly. It is likely that vegetation was more dense and bare ground less obvious during periods of increased effective moisture.

A review of the previous pollen records that represent approximately the past 2500 years at the Sue Site and approximately 2000 years at a playa sampled previously (Scott 1984) indicates agreement of the records at these locations until the upper portion of the stratigraphic record. Dates from these areas are reported in their original terms and have not been converted to a standard BP or AD. The lowest sample from the Sue Site indicates increased effective moisture and correlates with a warm, moist episode in the southern Colorado mountains at approximately 2400 BP. Fluctuations in effective moisture are recorded for the period between 2470 BP and AD 970. An unknown interval of time preceding AD 970 appears to have been average to more mesic in effective moisture at the Sue Site and nearly average in effective moisture at the playa. Both localities record a drought or period of less effective moisture at AD 970. The Sue Site records more extreme conditions than did the playa. Following this, conditions return to approximately average or slightly more mesic in the AD 1200s, particularly at the playa.

> "The late AD 1100s are interpreted as displaying evidence of increased westerlies resulting in the decrease in summer precipitation by 30-50% in the prairie peninsula. However, the atmosphere does not produce changes in similar direction and magnitude throughout the world, or even on a single continent. The same westerlies that would result in decreased precipitation in the prairie peninsula would generate increased precipitation in southeastern Colorado and the

panhandles of Oklahoma and Texas (Bryson et al. 1970). It is perhaps this phenomenon of increased precipitation that is being recorded in the pollen records of the playa and Sue Site in the sediments dating to the early AD 1200s" (Scott 1984:21-22).

Trees require more time than herbaceous plants to respond to changes in moisture levels since their cycles of growth are longer. For this reason, identification of change in relative moisture interpreted from fluctuations in tree pollen may lag slightly behind interpretations of paleoclimatic conditions interpreted from other data.

The stratigraphic records from the Sue Site and the playa represent slightly different accumulations of pollen. The Sue Site, like the sites at Welsh Canyon, exhibit pollen from local pine and juniper, as well as that from long distance transport. The playa, however, was situated in a flat area that did not support trees. It is likely that a larger portion of the arboreal pollen recovered from the playa represented long distance transport from the mountains to the west.

"The paleoenvironment during the last 2500 or fewer years (dated from the base of the stratigraphy at 5LA5255) has not witnessed significant changes in the composition of the vegetation within the project area. While both the playa and Sue Site deposits exhibit evidence of paleoenvironmental fluctuations in the same direction, the magnitude of change is not in agreement. The playa deposits appear to represent the accumulation of arboreal pollen primarily from the foothills to the west, while the Sue Site contains a mixture of arboreal pollen from the foothills and the intervening Big Arroyo Hills. This factor may account for some of the discrepancy in the magnitude of the variations between the playa and the Sue Site. A pattern of paleoenvironmental fluctuations has emerged from this study indicating that the period from approximately 2500 to 2000 or 1800 BP was one of average to less than average available moisture. The period from 2000 or 1800 BP to approximately AD 970 was one of increased available moisture and/or cooler conditions. A short interval of warmer and/or drier conditions was noted about AD 970, ameliorating again to more mesic and/or cooler conditions during the AD 1200s. Another short-lived period of warmer and/or drier conditions was noted following the AD 1200s and was followed by a period of increased moisture and/or cooler temperatures until approximately historic times" (Scott 1984:22-23).

Fluctuations in arboreal pollen frequencies are less dynamic in samples examined from these three sites at the mouth of Welsh Canyon than at either the Sue Site or the playa. The drought of approximately AD 970 is difficult to ascertain from the stratigraphic record at 5LA6568; however, is apparent when control samples are interfingered with the stratigraphic record. Samples 8 and 9, representing Levels 2 and 3, respectively, exhibit much lower arboreal pollen frequencies than do samples that are more recent or older. Radiocarbon ages for these samples are reported as 1050 BP and 1170 BP, indicating that the same event of less available moisture or drought observed at the Sue Site is represented here. The interval of time near the base of the record (1910 BP) also appears to have been drier. By Level 11, the moisture level appears to be more moderate. Fluctuations in conditions appear to have occurred in this lower portion of the record, but cooler and/or more mesic conditions appear to have become more stable between Levels 7 and 4, immediately before the drought.

Pollen analysis of washes from manos recovered at 5LA6592 and 5LA6595 did not yield evidence for food processing because all the manos submitted for analysis had been burned after being used. Burning destroys pollen in most instances. Only in some protected proveniences does pollen survive burning. Pollen analysis of hearths, for instance, may recover pollen from foods that were not in the fire. Pollen may be deposited at the edges of hearths where the heat is not as intense. Food preparation around hearths may introduce pollen after the fire has cooled, so pollen representing food processing may be recovered. However, pollen adhering to the grinding surfaces of manos or fire-cracked rock is destroyed during the heating process if the fire was hot enough to alter the rock. The only good evidence of probable plant processing at these sites comes from Level 9 (Sample 58) at 5LA6568, which yielded over 20% *Opuntia* (prickly pear cactus) pollen. The absence of lithic debris in this portion of the column strengthens an interpretation that this area of the shelter might have been used for plant processing at this time.

Table 1. Provenience Data For Samples From Sites 5LA6568, 5LA6592, And 5LA6595.

Site No.	Sample No.	Depth (in cm bpgs)	Unit	Feature No. & Description	Provenience and Corrected Radiocarbon Age (BP	Pollen Counted
5LA6568	7	0-10	3/1	2.5Y 4/4 olive brown silty sand	Topsoil and mixed cultural deposits	201
	8	10-20	3/2	10YR 4/2 dark grayish brown sandy silt	Cultural deposits, 1050 ± 80	202
	9	20-25	3/3	10YR 4/2 dark grayish brown sandy silt	Cultural deposits just above living surface, 1170 ± 130	201
	10	25-35	3/4	10YR 4/6 dark yellowish brown sandy silt	Cultural deposits, possible living surface	101
	11	35-46	3/5	2.5Y 6.2 light brownish gray clay silt	Cultural deposits just below living surface	201
	12	46-55	3/6	2.5Y 6.2 light brownish gray clay silt	Cultural deposits	201
	57	55-65	3/7	2.5Y 6/4 light yellowish brown silt clay	Cultural deposits	201
	58	75-85	3/9	10YR 5/4 yellowish brown silt	Cultural deposits	101
	61	97-107	3/11	10YR 5/4 light brownish gray clay silt	Cultural deposits	202
	63	117-127	3/13	10YR 4/3 yellow brown sandy silt	Cultural deposits	201
	65	135-145	3/15	10YR 6/4 yellow brown silt	Cultural deposits	201

Site No.	Sample No.	Depth (in cm bpgs)	Unit	Feature No. & Description	Provenience and Corrected Radiocarbon Age (BP	Pollen Counted
5LA9568 Cont=	5	52-57	1/5	Feature 5, a deep hearth, soil is 10YR 4/2 gray brown sandy silt	Hearth fill, associated with a living surface, 770 ± 60	201
	6	37-49	1/5	10YR 7/4 very pale brown sandy silt	Control, sediment from same unit and level, but ca. 90 cm away from hearth and ca. 10 cm below living surface, 770 ± 60	201
5LA9592	4	14-24	3	10YR 6/2 light brownish gray	Control, outside hearth, (F.2) 720 ± 50 BP	101
	3	11	3	Feature 1, a small hearth. Soil 10YR3/1 very dark gray silty ash and charcoal	Mano from hearth fill, Level 3 (F.2) 720 ± 50 BP	201
5LA6595	2	70-75	1/12	2.5YR dark gray silty sand	Control, sediment from same unit and level as mano, 30 cm away (and 5-10 cm higher), Level 12, 1410 ± 90 BP	201
	14	46	1/8	2.5 YR dark gray silty sand	Mano from cache in midden deposit, Level 9 dates: 720 ± 50 & 870 ± 50	102
	1	80	1/12	2.5YR dark gray silty sand	Mano from a cache in midden deposit, Level 12, 1410 ± 90 BP	101
	13	80	1/12	2.5YR dark gray	Mano from cache in	101

Site No.	Sample No.	Depth (in cm bpgs)	Unit	Feature No. & Description	Provenience and Corrected Radiocarbon Age (BP	Pollen Counted
				silty sand	midden deposit	
5LA6595 Cont=	15	80	1/12	2.5YR dark gray silty sand	Mano from a cache in midden deposit	101
	16	80	1/12	2.5YR dark gray silty sand	Mano from a cache in midden deposit	101

Table 2. Pollen Types Observed In Samples From Welsh Canyon, Colorado.

Scientific Name	Common Name
ARBOREAL POLLEN:	
Juniperus	Juniper
Pinaceae	Pine family
Abies	Fir
Picea	Spruce
Pinus	Pine
Pseudotsuga	Douglas fir
Quercus	Oak
Salix	Willow
NON-ARBOREAL POLLEN:	
Asteraceae:	Sunflower family
Artemisia	Sagebrush
Low-spine	Includes ragweed, cocklebur, etc.
High-spine	Includes aster, rabbitbrush, snakeweed, sunflower, etc.

Liguliflorae	Includes dandelion and chicory
Brassicaceae	Mustard family
Caryophyllaceae	Pink family
Cheno-am	Includes amaranth and pigweed family
Sarcobatus	Greasewood
Tidestromia	Tidestromia
Cyperaceae	Sedge family
Ephedra nevadensis-type	Mormon tea
Ephedra torreyena-type	Mormon tea
Euphorbia	Spurge
Fabaceae	Bean or Legume family
cf. *Petalostemum*	Prairie clover
Psoralea	Scurf pea
Liliaceae	Lily family
Lonicera	Honeysuckle
cf. *Marrubium*	Horehound
Nyctaginaceae	Four o'clock family
Boerhaavia	Spiderling
Mirabilis	Four o'clock
Onagraceae	Evening primrose family
Opuntia	Prickly pear cactus
Physalis	Groundcherry
Poaceae	Grass family
Polemoniaceae	Phlox family
Gilia	Gilia
Phlox	Phlox
Polygonaceae	Knotweed/smartweed family

Eriogonum	Wild buckwheat
Polygonum	Knotweed
Portulacaceae	Purslane family
cf. *Claytonia*	Spring beauty
Portulaca	Purslane
Rhus glabra-type	Smooth sumac
Rhus trilobata-type	Lemonade berry
Rosaceae	Rose family
Prunus-type	Chokecherry, plum
Sphaeralcea	Globemallow
Typha angustifolia	Cattail
Typha latifolia	Cattail
Cucurbita	Squash, pumpkin, gourd

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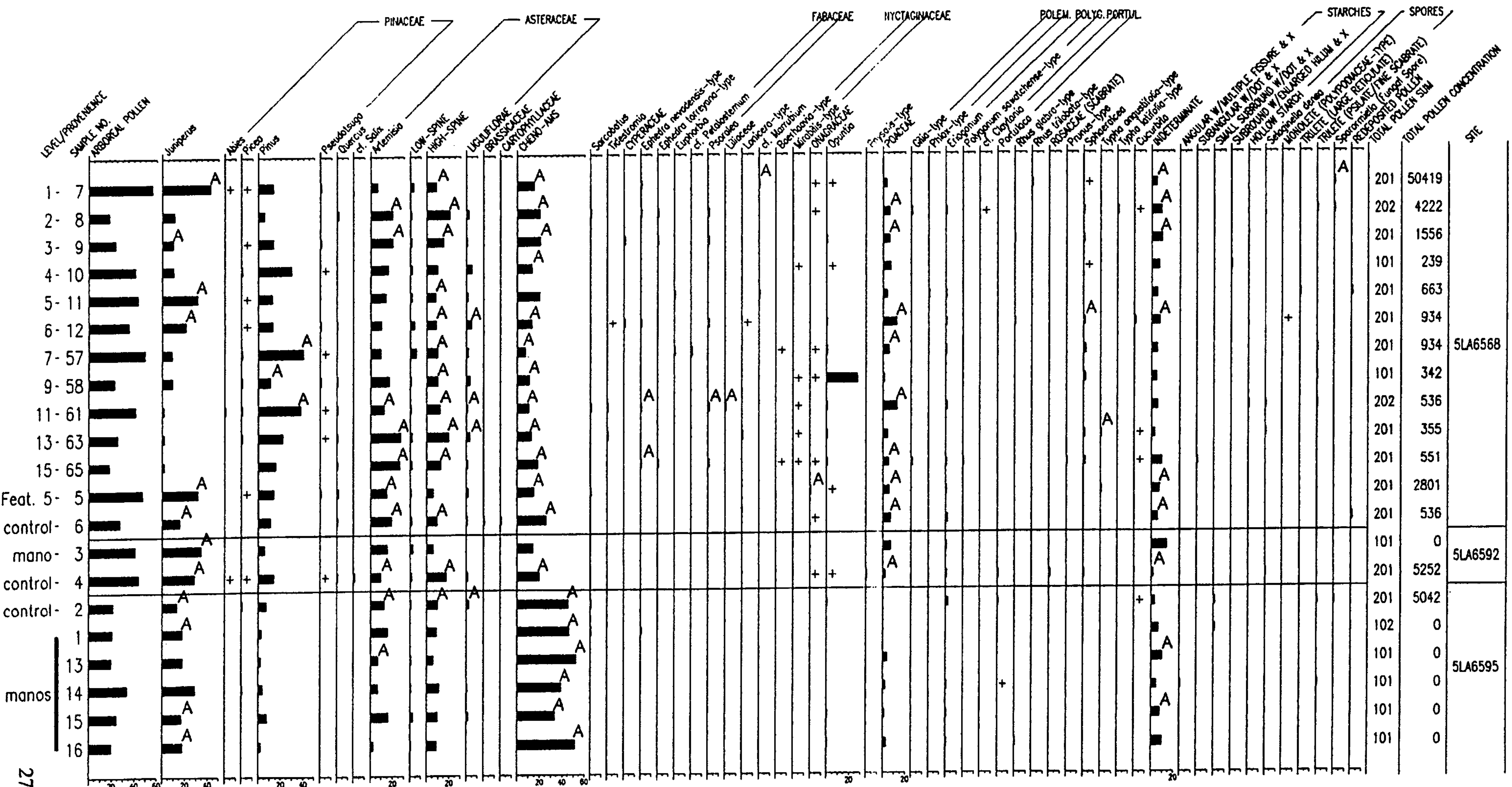

FIGURE 1. POLLEN DIAGRAM FOR SITES 5LA6568, 5LA6592, & 5LA6595.

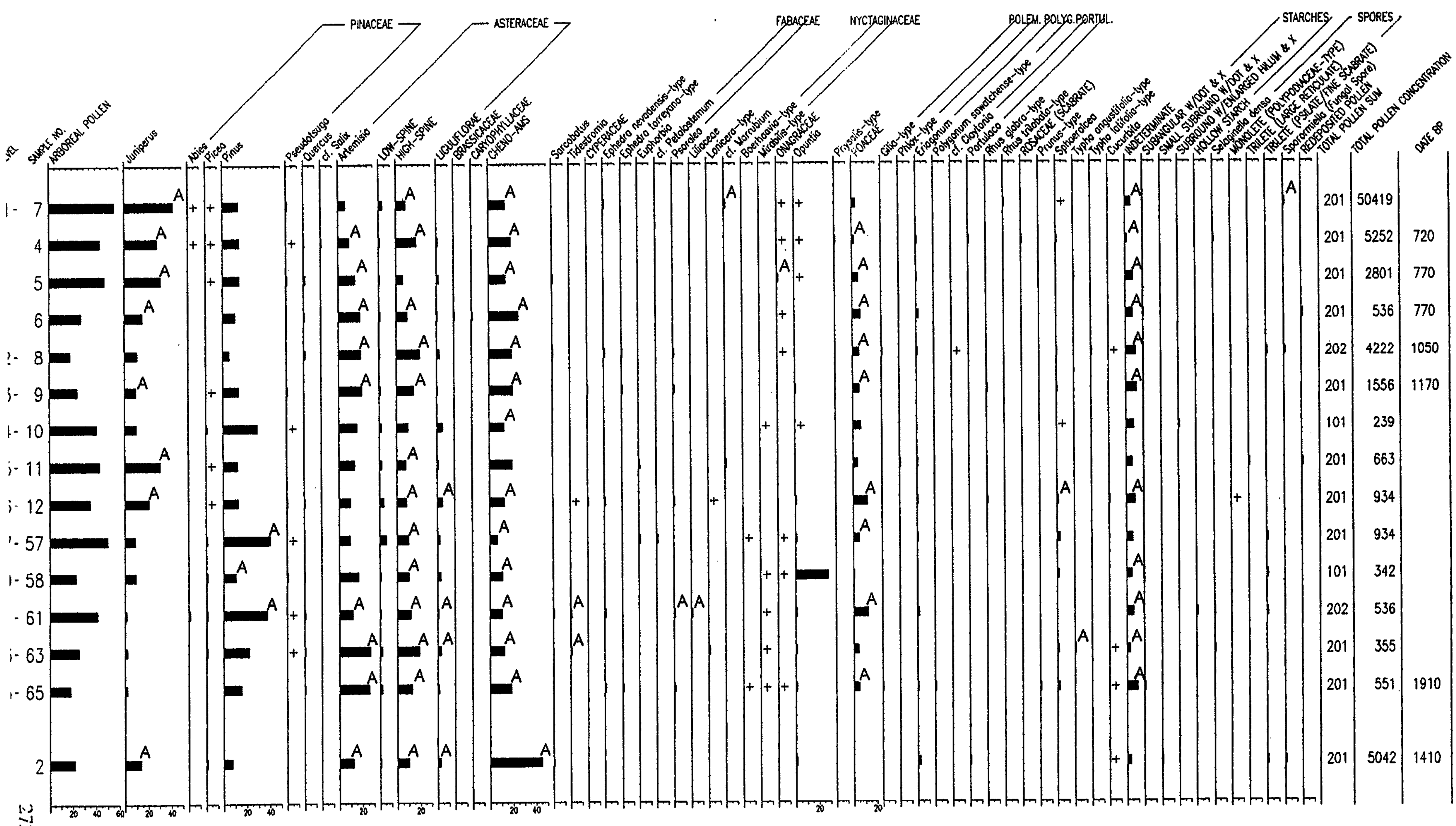

FIGURE 2. MODIFIED STRATIGRAPHIC POLLEN DIAGRAM FOR WELSH CANYON.

APPENDIX 2:
UWXRF LETTR REPORT 97.1

Prepared by:
Raymond Kunselman

UWXRF Letter Report 97.1

January 29, 1997

Larry Loendorf
Department of Sociology and Anthropology
New Mexico State University
Las Cruces, NM 88003

Dear Larry,

This letter details the results of the X-ray fluorescence (XRF) analysis of the seventeen obsidian source samples from your excavation on the Puratoire River south of La Junta.

The chemical data of the obsidian samples was performed on a commercially available Phillips Co. wave-length dispersive XRF spectrometer. The apparatus for this laboratory analysis is operated by Chris McKee at New Mexico School of Mines in Socorro, New Mexico. Phillips provided pure glass with trace elements and their X40 Software for microprocessor control, calibration, stabilization, and data analysis. All lines are used to correct for drift and the comparison of K-alpha to K-alpha Compton is used to determine a mass absorption correction. The data as provided by the computer control includes the element concentrations converted to ppm (parts per million).

The output includes 16 elements and the 5 chosen as adequately diagnostic are rubidium (Rb), strontium (Sr), yittrium (Y), zirconium (Zr), and niobium (Nb).

While the normal procedure is for the lab to grind and press the material into a tablet for analysis, I visited the lab to determine if a non-destructive analysis could be performed. I submitted a sample of known source material from Obsidian Cliff in Yellowstone National Park to be ground and analyzed in the normal manner used by the lab for geological samples. The element concentrations were in agreement with measurements from my apparatus at the University of Wyoming, with flakes from the same nodule, and with values in the literature. A comparison is given in Table 1.

Table 1. Comparison of element concentrations from selected Obsidian Cliff, Yellowstone National Park source material, using different laboratory preparation methods. The XRF wave-length dispersion method or XRF energy dispersion method is listed.

	Chemical composition in ppm						XRF	Specimen
	Rb	Sr	Y	Zr	Nb	Fe	method	form
1	241	nd	86	193	50	9024	wave-length	pellet
2	241	2	83	172	49	nd	wave-length	pellet
3	224	2	77	159	41	nd	wave-length	flake
4	239	3	79	160	40	nd	wave-length	flakes
5	251	9	66	189	33	9442	wave-length	pellet
6	257	1	80	226	65	8572	energy	flakes
7	243	5	88	211	46	9512	wave-length	pellet

[1] Ground, powder pellet, ID 129.2, wave-length dispersion.
[2] Ground, powder pellet, ID 130A.15, wave-length dispersion.
[3] Flake, ID 130A.11, wave-length dispersion.
[4] Four flakes, ID 130A.1,3,4,5, wave-length dispersion.
[5] Four pressed powder pellets, Nelson 1984, wave-length dispersion.
[6] Nine flakes, ID 950201, energy dispersion at the University of Wyoming.
[7] Eight pressed powder pellets, Anderson 1986, wave-length dispersion.

Matches between unknown artifacts and known obsidian source chemical groups are made on the basis of correspondence between the element concentrations of the samples. Multivariate analysis methods provide incorrect assignments unless the whole universe of sources is included. A 90% confidence level (2 standard deviations) matching is made for each element. When no matching source group is found in my collection, published data are searched for a matching source and its variation (Nelson 1984, Anderson 1986), many sources are well known.

The artifact matches to a geochemical source type are very interesting for your samples and are given in the data table (Table 2). I am not surprised by the appearance of obsidian source material from the three main sources of the Jemez Mountains: Polvadera Peak in the north part of the Jemez area, Cerro Medion in the central, and Rabbit Mountain/Obsidian Ridge from the south part of the mountains. The Idaho material was utilized far from where the source occurs, and is not as much of a surprise as the two unknown sources. I have searched for a match among all the usual suspects as well as all source information, and I will be working further on this so that I may obtain a match. There may have been itmes that were quartzite rather than obsidian in the collection, ie cat. no. 14. I have enclosed a bivariate scatter plot of the data that may be of use. These sources and are mentioned in the References listed.

Yours truly,

Ray K

Raymond Kunselman
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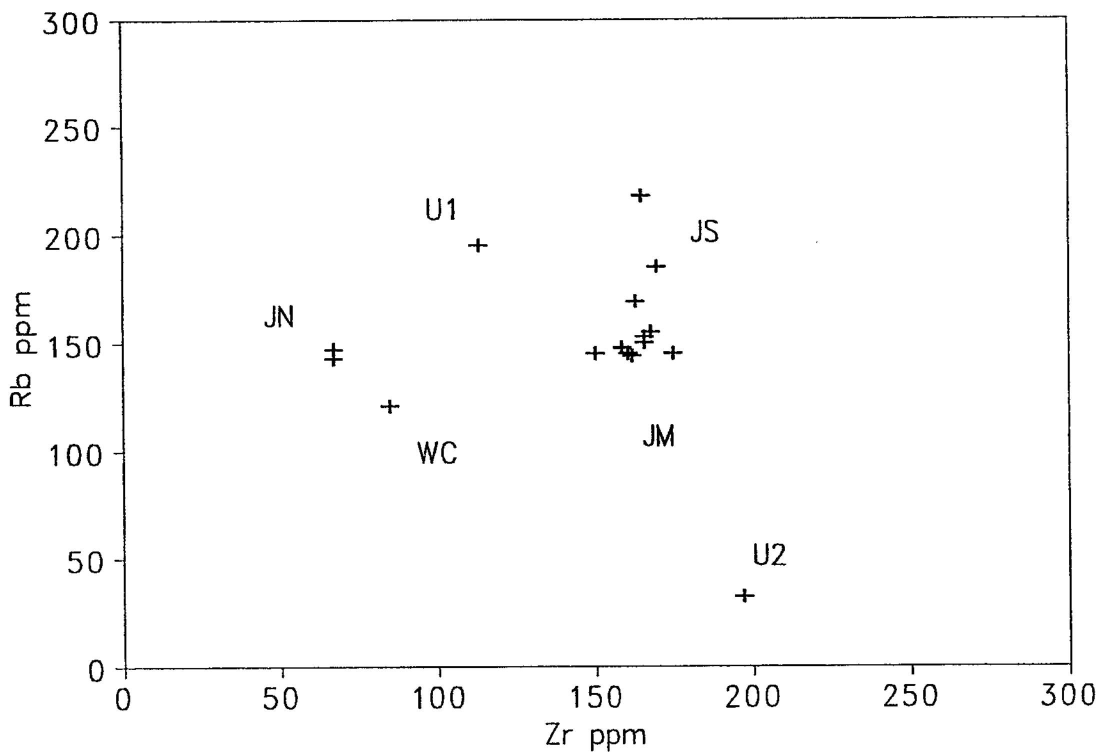
Table 2. Element concentrations in ppm. The errors for single counts are about 5 ppm for Rb and Sr, 7 for Y and Zr, 9 for Nb, and 140 for Fe.

Cat. number	Rb	Sr	Y	Zr	Nb	Chemical source
Polvadera Peak, northern Jemez Mountains, NM						**JN**
11	147	4	21	67	46	JN
7	143	4	21	67	46	JN
Cerro Medio, central Jemez Mountains, NM						**JM**
1a	145	3	35	150	51	JM
1b	169	5	40	163	53	JM
2	150	4	44	166	54	JM
4	145	4	48	175	57	JM
6	145	3	43	161	53	JM
8	148	3	42	159	53	JM
9	144	4	42	162	52	JM
10	155	4	43	168	55	JM
15	153	4	46	166	54	JM
Rabbit Mountain, southern Jemez Mountains, NM						**JS**
5	185	1	62	170	92	JS
1c	218	1	56	165	88	JS
Wright Creek, near Malad, Idaho						**WC**
13	121	68	31	85	15	WC
Unknown						**U**
3	32	5	66	197	95	U1
12	195	39	19	113	26	U2
Quartzite						**Q**
14	1	4	1	21	1	

Artifact Sources



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UWXRF Letter Report 97.1 UPDATE of January 29, 1997 report

June 9, 1997

Larry Loendorf
Dept. of Sociology and Anthropology
New Mexico State University
Las Cruces, NM 88003

Dear Larry,

In the report of January 29, 1997 there were two unknowns that I hope to eventually identify. Recently I had source material analyzed from southern Colorado locations of Cochetopa Dome, and Beaver Creek.

The unknown artifact with Cat. number 12 agrees with 4 of the 5 trace elements of the source sample from Cochetopa Dome. However, it does not agree with the concentration of Sr and is not a match. The Fe (iron) concentration is also in disagreement. However, the reason for noting some similarity is that there may be other nearby and related flows. It may serve as a guide for proceeding further in tracking down the source.

The unknown with catalog number 3 seemed so unrelated as to give me no hints.

If I learn anything further I will update your report.

Yours truly,

Ray K

Raymond Kunselman
Department of Physics
University of Wyoming
Laramie, WY 82071-3905

APPENDIX 3: SHELL ARTIFACTS

Prepared by:

Victoria D. Vargas
Arizona State University

Very little shell was recovered during excavation: ten objects, most with several associated fragments. All shell fragments were determined to be from freshwater mollusks, but were in such poor condition and so fragmented that only a suggestion as to their genera can be made. Three possibilities exist given the region of Colorado in which the shell was retrieved and the general character of the fragments: *Anodonta grandis grandis, Anodontoides ferussacianus,* or *Uniomerus tetralasmus.* The latter is the most likely as it still occurs in the southeastern portion of Colorado, while the others appear to be more to the north (Brandauer and Shi-Kuei Wu 1978). However, without any remnants of the hinge or sufficient remnants of the cortex portion of the shells, a confident identification cannot be made.

Evidence for shell jewelry production exists with two of the shell artifacts. Both appear to have been in the process of being perforated when they broke. One derives from site 5 LA 6568 and the other from 5 LA 6592. Both appear to have been in-process pendants. Breakage must have been a common occurrence in shell jewelry manufacture, especially during the perforation stage due to the fragile nature of the shell being used. It is thin and extremely flaky when dry. That neither of these pieces had been ground into their final desired shaped prior to perforating provides a clue that breakage during this stage of manufacture was common.

The Shell Artifact Table provides the results of the analysis. The fragments included in each bag, unless otherwise indicated in the table, were weighed together on an electronic scale to the milligram. However, measurements were only recorded for the largest fragment in the bag as the smaller fragments were determined to have broken off of the larger piece. One exception to this exists: Bag 1 from Site 5 LA 6592, Unit 2, Level 7 contains two distinct artifact fragments and thus were measured and weighed seperately and given bag number 1.1 and 1.2 designations. Metric calipers were used for measuring height, width, and thickness in centimeters for the fragments.

Little can be said regarding so small a sample other than a couple of very general observations. First, the presence of in-process artifacts indicates on-site production of at least these pieces. Second, given this, it is highly likely that all of this type of shell jewelry was produced locally. Also, given that this region of Colorado readily provides fresh water shell, it is likely that the shell utilized came from local sources.

Reference Cited

Brandauer, Nancy and Shi-Kuei Wu

1978 *Natural History Inventory of Colorado No.2: The Bivalvia of Colorado.* University of Colorado Museum, Boulder.

Notes on the Analysis

Site 5 LA 6568:

Unit 1, Level 3, Bag 5: In terribly poor condition. More tiny flakes and fragments than could be counted. One larger fragment, the likely source of the small fragments, shows evidence of grinding on one edge. Likely a fragment of a finished piece; probably a pendant.

Unit 1, Level 3, Bag 14: Small fragment with a piece of the cortex still adhering to the surface. An in-process pendant which appears to have been broken during the perforation process. Edges are unworked.

Site 5 LA 6592:

Unit 1, Level 3, Bag 10: Three fragments; the largest is ground on two edges with the other edges fractured. Appears to be a fragment from some larger finished piece, but is too fragmentary to identify its form.

Unit 1, Level 4, Bag 4: One fragment. Unclassified fragment. No ground edges, 2 edges fractured.

Unit 1, Level 4, Bag 5: Two fragments. Unclassified object assignment. Indeterminate modification. Fragments are flakes and thus it is unclear if they are from an unfinished or finished piece. No smooth or ground edges.

Unit 1, Level 1, Bag 7: One fragment. Unidentified Finished Object Fragment. One edge is ground into a curve; the other edges are broken off. Possible pendant fragment.

Unit 2, Level 3, Bag 5: Pendant Fragment. Perforated near curved edges. Side and bottom of piece are broken away. Perforation diameter = .2 cm.

Unit 2, Level 5, Bag 1: In-process Pendant. Appears to have been broken during perforation stage. All edges of the piece are unshaped.

Unit 2, Level 7, Bag 1.1: Unclassified Fragment. One edge partially ground. Unclear if part of finished piece or possibly production debris. Small piece of cortex still adhering to surface.

Unit 2, Level 7, Bag 1.2: One fragment. Unclassified Fragment. Possible slight grinding along one edge; too eroded to be certain.

Site #	Unit	Level	Bag #	Object	MOD.	CON.	WT. (mg.)	L (cm.)	W (cm.)	TH (cm.)	# of frags
5LA6568	1	3	5	ONI	P	F	500	2.3	0.94	0.15	TNTC
5LA6568	1	3	14	P	SPE	P	150	1.22	0.89	0.09	1
5LA6592	1	3	10	ONI	P	F	140	1.12	1.11	0.05	3
5LA6592	1	4	4	FNC	N	F	60	1.1	0.81	0.045	1
5LA6592	1	4	5	FNC	IN	F	40	0.97	0.86	0.02	2
5LA6592	1	1	7	ONI	SP	F	120	1.3	1	0.025	1
5LA6592	2	3	5	P	PP	F	130	1.14	0.85	0.05	1
5LA6592	2	5	1	P	SPE	P	350	1.98	1.22	0.06	1
5LA6592	2	7	1.1	FNC	SP	F	124	1.37	0.88	0.03	1
5LA6592	2	7	1.2	FNC	IN	F	136	1.27	1.03	0.08	1

Key for Shell Artifact Table

Column Title:

Object:

ONI = Unidentified finished object

PT = Workshop debris

FNC = Unclassified fragment

P = Pendant

MOD. (Modification):

P = ground

SPE = Semi perforated

N = no evidence of modification

IN = Modification indeterminate

SP = semi-ground

PP = ground and perforated

CON. (Condition)

F = Fragmented

P = In-process

# of frags: TNTC = Too numerous to count.

APPENDIX 4:
DESCRIPTION OF THE RAW MATERIAL TYPES FOR THE CHIPPED STONE DEBITAGE

Prepared by:
Stanley A. Ahler

Raw Material Types

Hornfels and Basalt. Any dark gray to black dense, opaque stone, dull to medium luster, coarse-grained to fine-grained, often resembling chert. Combines the specific types hornfels, coarse hornfels, and basalt which all derive from stream sources (having waterworn cortex) and which cannot be fully distinguished from one another without magnification.

Limestone. Dull, opaque, fine to coarse-grained massive sedimentary rock. Color varies from dark gray to gray, pale gray, or dull red with surfaces weathered to yellow or brown often (including archaeological scars). Reacts strongly to 10% Hcl.

Quartzite, Local. A catchall group which includes fine to coarse grained, opaque metaquartzites and orthoquartzites and which includes a wide range of colors from white to off-white, light gray, gray, dark gray, reddish gray, deep red, purple, etc., for which there is no reason to suspect non-local origin based on color or composition. This group is intended to encompass all locally derived quartzites including the specific types quartzite, Dakota quartzite, white quartzite, and purple quartzite in the more specific type descriptions.

Exotic Quartzite. Medium to fine-grained, opaque orthoquartzites (ones in which the fracture planes expose or pass through discrete quartz particles cemented by other silica) which exhibit single or multiple colors which are usually bright or distinctive and potentially indicative of non-local origin such as bright pink, lavender, yellow, or brown. This group combines the discrete types mixed and exotic quartzite in the more specific type system.

Chert, Local. Includes all opaque to mildly translucent, medium to fine grained cherts which frequently are mottled in structure and have any color or color pattern which conforms to the broad range in locally available cherts (see type samples). The following chert types (6-8) are used to isolate other cherts which may be non-local in origin. Note that any black chert is probably best classified as hornfels, and argillite should be considered for any gray banded chert-like stone.

Dendritic Chert. A fine-grained opaque to mildly translucent chert usually yellow, brown, pink, or red in color with distinctive black dendritic inclusions. These stones may derive from the Hartville Uplift area in Wyoming or from other non-local source locations in Colorado.

Non-local Chert. Any distinctive fine-grained chert which does not conform to the broad range of local varieties and which based on color or mottling and any other reason is thought to be of potential non-local origin. This would include potential Alibates chert (TX), Pedernal chert (NM), Kay County chert (OK), Tecovas chert/jasper (TX/OK), and other possibilities not immediately namable.

Chalcedony. This is a general group used to include cryptocrystalline, translucent stone types, generally clear to white, light gray or gray in color. May include both local as well as non-local stones which cannot readily be distinguished in the field.

Silicified Wood. This includes any opaque to translucent medium to fine-grained stone which exhibits any distinctive wood structure. Color is expected to be highly variable. A few examples seen so far are brown and translucent in the interior.

Argillite. This is a metamorphosed claystone which formed through contact metamorphism in proximity to the basalt dike structure which cuts through the southern part of the PCMS. Argillite is earthy and dull in luster, usually banded gray in color. It is a soft stone, and artifact surfaces are often weathered or eroded to a pitted, porous, dull gray patina. For those familiar with stones from the Northern Plains, argillite resembles gray porcellanite.

Obsidian. Volcanic glass of any source origin.

Vein Quartz. Semitranslucent vein or bull quartz usually gray to colorless and semitranslucent with very poor conchoidal properties. Usually occurs naturally in the form of heavily rounded alluvial lag gravels or cobbles on upland surfaces.

Black Forest Silicified Wood. A distinctive silicified wood which is predominantly opaque and yellow and/or brown in color, mottled, and with wood structure evident in larger pieces. Small pieces may appear to be yellow/brown chert, with wood structure not being so evident. Better description of this type awaits examination of comparative source samples, but it is almost certainly non-local raw material.

Sandstone. Sedimentary rock composed predominantly of cemented quartz sand. Abundant in the local area, and grades into the local quartzites.

Felsite. A fine-grained, apanitic light-colored extrusive igneous rock, distinguished from granite by its finer texture.

Granite. Any coarsely crystalline, light colored igneous rock.

APPENDIX 5:

DATABASE REPORT OF THE CHIPPED STONE DEBITAGE USED IN ANALYSIS

Prepared by:

Vincent W. Schiavitti

SITE 5LA6568

UNIT 1

FEATURE 0

LEVEL 0

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Simple	Small	1
Quartzite	Simple	Small	1

LEVEL 1

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Complex	Large	1
Chert	Complex	Small	1
Chert	Shatter	Large	1
Chert	Simple	Large	4
Chert	Simple	Small	4
Quartzite	Complex	Large	5
Quartzite	Complex	Small	2
Quartzite	Shatter	Large	1
Quartzite	Simple	Large	8
Quartzite	Simple	Small	1

LEVEL 2

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Bifacial Thinning	Small	1
Chert	Complex	Large	1
Chert	Complex	Small	2
Chert	Shatter	Large	2
Quartzite	Bifacial Thinning	Small	1
Quartzite	Complex	Large	7
Quartzite	Shatter	Large	1
Quartzite	Shatter	Small	2

Quartzite	Simple	Large	7
Quartzite	Simple	Small	1

LEVEL 3

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Bifacial Thinning	Large	1
Chert	Bifacial Thinning	Small	3
Chert	Complex	Large	1
Chert	Complex	Small	2
Chert	Shatter	Large	2
Chert	Shatter	Small	5
Chert	Simple	Large	6
Chert	Simple	Small	7
Hornfels/Basalt	Shatter	Large	1
Hornfels/Basalt	Simple	Large	1
Quartzite	Bifacial Thinning	Large	2
Quartzite	Complex	Large	15
Quartzite	Shatter	Large	4
Quartzite	Shatter	Small	8
Quartzite	Simple	Large	40
Quartzite	Simple	Small	18

LEVEL 4

Material	*Flake Type*	*Size Grade*	*Total*
Argillite	Shatter	Small	1
Chert	Bifacial Thinning	Small	8
Chert	Complex	Small	9
Chert	Shatter	Large	3
Chert	Shatter	Small	10
Chert	Simple	Small	18

Obsidian	Complex	Small	1
Obsidian	Simple	Small	1
Quartzite	Complex	Large	8
Quartzite	Complex	Small	3
Quartzite	Shatter	Large	6
Quartzite	Shatter	Small	12
Quartzite	Simple	Large	24
Quartzite	Simple	Small	15

LEVEL 5

Material	*Flake Type*	*Size Grade*	*Total*
Argillite	Complex	Large	1
Chert	Complex	Large	2
Chert	Complex	Small	1
Chert	Shatter	Large	1
Chert	Shatter	Small	2
Chert	Simple	Large	2
Chert	Simple	Small	2
Quartzite	Bifacial Thinning	Large	1
Quartzite	Complex	Large	8
Quartzite	Complex	Small	1
Quartzite	Shatter	Large	3
Quartzite	Simple	Large	23
Quartzite	Simple	Small	11

LEVEL 6

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Simple	Small	1
Quartzite	Simple	Large	2

LEVEL 8

Material	*Flake Type*	*Size Grade*	*Total*

Quartzite	Simple	Large	1

LEVEL 12

Material	*Flake Type*	*Size Grade*	*Total*
Quartzite	Simple	Large	1

LEVEL 50

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Complex	Large	1
Quartzite	Complex	Large	2
Quartzite	Shatter	Large	2
Quartzite	Shatter	Small	1
Quartzite	Simple	Large	9

FEATURE 1
LEVEL 3

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Bifacial Thinning	Small	2
Chert	Complex	Small	1
Chert	Shatter	Small	2
Chert	Simple	Small	21
Quartzite	Bifacial Thinning	Small	3
Quartzite	Complex	Large	1
Quartzite	Complex	Small	1
Quartzite	Shatter	Large	2
Quartzite	Simple	Large	8
Quartzite	Simple	Small	34

LEVEL 4

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Bifacial Thinning	Small	3
Chert	Complex	Small	2
Chert	Shatter	Large	1
Chert	Shatter	Small	5
Chert	Simple	Small	8

Hornfels/Basalt	Simple	Small	1
Quartzite	Bifacial Thinning	Small	2
Quartzite	Complex	Large	2
Quartzite	Complex	Small	3
Quartzite	Shatter	Large	1
Quartzite	Shatter	Small	8
Quartzite	Simple	Large	5
Quartzite	Simple	Small	13

FEATURE 2
LEVEL 6

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Simple	Large	1
Chert	Simple	Small	8
Quartzite	Shatter	Large	3
Quartzite	Simple	Large	6
Quartzite	Simple	Small	9

FEATURE 5
LEVEL 6

Material	*Flake Type*	*Size Grade*	*Total*
Quartzite	Complex	Large	1
Quartzite	Simple	Large	1
Quartzite	Simple	Small	2

UNIT 2

FEATURE 0

LEVEL 0

Material	*Flake Type*	*Size Grade*	*Total*
Obsidian	Complex	Large	1

LEVEL 1

Material	*Flake Type*	*Size Grade*	*Total*
Argillite	Simple	Small	1
Quartzite	Bifacial Thinning	Large	1
Quartzite	Simple	Large	1

LEVEL 2

Material	*Flake Type*	*Size Grade*	*Total*
Argillite	Bifacial Thinning	Large	2
Argillite	Complex	Large	3
Argillite	Complex	Small	1
Argillite	Simple	Large	4
Argillite	Simple	Small	2
Chalcedony	Simple	Large	1
Chert	Bifacial Thinning	Large	6
Chert	Bifacial Thinning	Small	2
Chert	Complex	Large	1
Chert	Complex	Small	6
Chert	Shatter	Large	1
Chert	Simple	Large	1
Chert	Simple	Small	19
Obsidian	Simple	Large	3
Obsidian	Simple	Small	1
Quartzite	Complex	Large	2
Quartzite	Shatter	Small	1
Quartzite	Simple	Large	7

Quartzite	Simple	Small	4

LEVEL 3

Material	*Flake Type*	*Size Grade*	*Total*
Argillite	Simple	Small	2
Chalcedony	Simple	Large	1
Chert	Bifacial Thinning	Large	1
Chert	Complex	Large	1
Chert	Simple	Large	1
Quartzite	Complex	Small	1
Quartzite	Simple	Small	1

LEVEL 4

Material	*Flake Type*	*Size Grade*	*Total*
Argillite	Complex	Large	1
Chert	Complex	Large	1
Chert	Simple	Large	1

UNIT 3
FEATURE 0
LEVEL 0

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Complex	Large	1
Quartzite	Simple	Large	1

LEVEL 1

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Simple	Small	2
Quartzite	Complex	Large	3
Quartzite	Simple	Large	3

LEVEL 2

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Shatter	Small	1
Chert	Simple	Small	2
Quartzite	Complex	Large	3
Quartzite	Shatter	Large	1

Quartzite	Simple	Large	10
Quartzite	Simple	Small	4

LEVEL 3

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Simple	Small	1
Quartzite	Complex	Large	1
Quartzite	Shatter	Large	1
Quartzite	Simple	Large	5

LEVEL 4

Material	*Flake Type*	*Size Grade*	*Total*
Hornfels/Basalt	Shatter	Large	1
Quartzite	Simple	Large	3

LEVEL 5

Material	*Flake Type*	*Size Grade*	*Total*
Argillite	Shatter	Large	1
Quartzite	Complex	Large	1
Quartzite	Simple	Large	1

LEVEL 6

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Complex	Large	1
Quartzite	Simple	Large	1

LEVEL 7

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Complex	Large	1
Chert	Shatter	Small	1
Chert	Simple	Small	2
Quartzite	Simple	Large	1

LEVEL 8

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Simple	Large	1

LEVEL 10

Material	*Flake Type*	*Size Grade*	*Total*

Quartzite	Simple	Large	2

LEVEL 11

Material	*Flake Type*	*Size Grade*	*Total*
Quartzite	Simple	Large	1

LEVEL 12

Material	*Flake Type*	*Size Grade*	*Total*
Argillite	Complex	Large	1
Quartzite	Simple	Large	1

LEVEL 13

Material	*Flake Type*	*Size Grade*	*Total*
Quartzite	Complex	Large	1
Quartzite	Simple	Large	2

LEVEL 14

Material	*Flake Type*	*Size Grade*	*Total*
Quartzite	Simple	Large	2

LEVEL 15

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Simple	Small	1

LEVEL 16

Material	*Flake Type*	*Size Grade*	*Total*
Quartzite	Simple	Large	1

LEVEL 17

Material	*Flake Type*	*Size Grade*	*Total*
Quartzite	Complex	Large	1

LEVEL 50

Material	*Flake Type*	*Size Grade*	*Total*
Argillite	Complex	Large	1
Chert	Bifacial Thinning	Large	1
Hornfels/Basalt	Simple	Large	1

Quartzite	Complex	Large	1
Quartzite	Shatter	Large	1
Quartzite	Simple	Large	3
Quartzite	Simple	Small	1

SITE 5LA6569

UNIT 1

FEATURE 0

LEVEL 2

Material	*Flake Type*	*Size Grade*	*Total*
Quartzite	Simple	Large	1

LEVEL 3

Material	*Flake Type*	*Size Grade*	*Total*
Quartzite	Simple	Small	1

LEVEL 4

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Complex	Large	1
Quartzite	Complex	Large	3
Quartzite	Simple	Large	6
Quartzite	Simple	Small	1

LEVEL 5

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Bifacial Thinning	Small	2
Chert	Complex	Large	1
Chert	Complex	Small	1
Chert	Shatter	Small	1
Chert	Simple	Large	2
Chert	Simple	Small	7
Quartzite	Complex	Large	1
Quartzite	Complex	Small	2
Quartzite	Shatter	Small	1

Quartzite	Simple	Large	2
Quartzite	Simple	Small	10

LEVEL 50

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Shatter	Large	1
Chert	Simple	Large	1
Quartzite	Complex	Large	2
Quartzite	Shatter	Large	2
Quartzite	Simple	Large	1

SITE 5LA6576

UNIT 0

FEATURE 0

LEVEL 0

Material	*Flake Type*	*Size Grade*	*Total*
Obsidian	Complex	Large	1

SITE 5LA6592

UNIT 1

FEATURE 0

LEVEL 1

Material	*Flake Type*	*Size Grade*	*Total*
Argillite	Complex	Large	1
Chalcedony	Simple	Small	1
Chert	Complex	Large	2
Chert	Shatter	Large	1
Chert	Simple	Large	2
Chert	Simple	Small	1
Quartzite	Complex	Large	2
Quartzite	Shatter	Large	1
Quartzite	Simple	Large	6
Quartzite	Simple	Small	3

LEVEL 2

Material	*Flake Type*	*Size Grade*	*Total*
Quartzite	Complex	Large	2

LEVEL 3

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Complex	Large	2
Chert	Shatter	Large	1
Chert	Simple	Large	1
Quartzite	Shatter	Large	1
Quartzite	Simple	Large	1

LEVEL 4

Material	*Flake Type*	*Size Grade*	*Total*
Obsidian	Simple	Small	1
Quartzite	Complex	Large	1

LEVEL 5

Material	*Flake Type*	*Size Grade*	*Total*
Chalcedony	Simple	Small	1
Chert	Bifacial Thinning	Large	1
Chert	Simple	Large	2

LEVEL 6

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Simple	Large	1

LEVEL 7

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Complex	Large	1

UNIT 2
FEATURE 0
LEVEL 1

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Complex	Large	1
Chert	Simple	Large	1

Quartzite	Complex	Large	2
Quartzite	Simple	Large	5

LEVEL 2

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Complex	Large	1
Chert	Complex	Small	1
Chert	Simple	Large	1
Chert	Simple	Small	2
Quartzite	Complex	Large	1
Quartzite	Simple	Large	1
Quartzite	Simple	Small	1

LEVEL 3

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Bifacial Thinning	Small	1
Chert	Simple	Large	1
Quartzite	Complex	Large	1
Quartzite	Simple	Large	1

LEVEL 4

Material	*Flake Type*	*Size Grade*	*Total*
Quartzite	Simple	Large	2

LEVEL 5

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Complex	Large	1
Chert	Complex	Small	1
Quartzite	Simple	Large	2

LEVEL 7

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Complex	Small	1
Quartzite	Complex	Small	1

UNIT 3
FEATURE 0
LEVEL 1

Material	*Flake Type*	*Size Grade*	*Total*
Quartzite	Complex	Large	3
Quartzite	Simple	Large	3

LEVEL 2

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Complex	Large	1
Chert	Simple	Small	1
Quartzite	Complex	Large	2

LEVEL 3

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Simple	Large	1
Quartzite	Simple	Large	3

LEVEL 4

Material	*Flake Type*	*Size Grade*	*Total*
Argillite	Simple	Large	1
Chert	Shatter	Small	1
Chert	Simple	Small	1
Quartzite	Complex	Large	2
Quartzite	Simple	Large	2
Quartzite	Simple	Small	1

SITE 5LA6595
UNIT 1
FEATURE 0
LEVEL 0

Material	*Flake Type*	*Size Grade*	*Total*
Quartzite	Complex	Large	1

LEVEL 1

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Simple	Large	1

Quartzite	Complex	Large	1
Quartzite	Simple	Large	3

LEVEL 2

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Shatter	Large	1
Chert	Simple	Large	1
Quartzite	Simple	Large	1

LEVEL 3

Material	*Flake Type*	*Size Grade*	*Total*
Quartzite	Simple	Large	1

LEVEL 4

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Complex	Large	1
Quartzite	Complex	Large	2
Quartzite	Simple	Large	1

LEVEL 5

Material	*Flake Type*	*Size Grade*	*Total*
Argillite	Complex	Large	1
Chert	Complex	Large	1
Chert	Shatter	Large	2
Chert	Simple	Large	2
Chert	Simple	Small	3
Quartzite	Complex	Large	3
Quartzite	Simple	Large	4
Quartzite	Simple	Small	1

LEVEL 6

Material	*Flake Type*	*Size Grade*	*Total*	
Argillite	Simple	Large	1	
Argillite	Simple	Small	1	
Chert	Complex	Large	3	
	Chert	Complex	Small	1
Chert	Shatter	Large	1	

Chert	Simple	Large	3
Quartzite	Complex	Large	1
Quartzite	Simple	Large	8

LEVEL 7

Material	*Flake Type*	*Size Grade*	*Total*
Argillite	Simple	Large	1
Chert	Shatter	Large	1
Chert	Simple	Small	2
Quartzite	Complex	Large	2
Quartzite	Simple	Large	7

LEVEL 8

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Complex	Small	2
Chert	Simple	Large	3
Quartzite	Complex	Large	1
Quartzite	Simple	Large	4

LEVEL 9

Material	*Flake Type*	*Size Grade*	*Total*
Argillite	Complex	Large	1
Argillite	Simple	Large	1
Chert	Complex	Large	1
Chert	Shatter	Large	1
Quartzite	Complex	Large	2
Quartzite	Simple	Large	6

LEVEL 10

Material	*Flake Type*	*Size Grade*	*Total*
Argillite	Simple	Small	1

Chert	Bifacial Thinning	Small	1
Chert	Simple	Large	1
Quartzite	Complex	Large	2
Quartzite	Simple	Large	2
Quartzite	Simple	Small	1

LEVEL 11

Material	*Flake Type*	*Size Grade*	*Total*
Argillite	Simple	Large	1
Chert	Complex	Large	1
Chert	Complex	Small	1
Quartzite	Complex	Large	2
Quartzite	Simple	Large	2

LEVEL 12

Material	*Flake Type*	*Size Grade*	*Total*
Argillite	Complex	Large	1
Chert	Shatter	Large	1
Chert	Simple	Large	1
Chert	Simple	Small	1
Quartzite	Complex	Large	2
Quartzite	Simple	Large	2
Quartzite	Simple	Small	1

LEVEL 13

Material	*Flake Type*	*Size Grade*	*Total*
Argillite	Complex	Large	1
Chert	Complex	Large	1
Chert	Simple	Large	1
Quartzite	Complex	Large	2
Quartzite	Simple	Large	1

LEVEL 14

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Shatter	Large	1
Chert	Simple	Large	2
Quartzite	Complex	Large	1
Quartzite	Shatter	Large	1
Quartzite	Simple	Large	5

LEVEL 15

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Simple	Large	1
Quartzite	Complex	Large	2
Quartzite	Simple	Large	1

LEVEL 17

Material	*Flake Type*	*Size Grade*	*Total*
Argillite	Complex	Large	1
Quartzite	Simple	Large	1

LEVEL 18

Material	*Flake Type*	*Size Grade*	*Total*
Quartzite	Simple	Large	3

SITE 5LA6599

UNIT 0

FEATURE 0

LEVEL 0

Material	*Flake Type*	*Size Grade*	*Total*
Quartzite	Simple	Large	1

UNIT 1

FEATURE 0

LEVEL 1

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Complex	Large	1
Quartzite	Complex	Large	5

Quartzite	Shatter	Large	2
Quartzite	Simple	Large	4
Quartzite	Simple	Small	2

LEVEL 2

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Bifacial Thinning	Large	1
Chert	Bifacial Thinning	Small	1
Chert	Complex	Small	2
Chert	Shatter	Large	1
Chert	Shatter	Small	2
Chert	Simple	Large	2
Chert	Simple	Small	4
Quartzite	Complex	Large	34
Quartzite	Complex	Small	5
Quartzite	Shatter	Large	6
Quartzite	Shatter	Small	4
Quartzite	Simple	Large	49
Quartzite	Simple	Small	37

LEVEL 3

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Bifacial Thinning	Small	2
Chert	Complex	Large	1
Chert	Shatter	Large	1
Chert	Simple	Small	5
Hornfels/Basalt	Complex	Large	1
Hornfels/Basalt	Shatter	Large	1
Quartzite	Complex	Large	10
Quartzite	Shatter	Large	1

Quartzite	Shatter	Small	4
Quartzite	Simple	Large	26
Quartzite	Simple	Small	23

LEVEL 4

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Complex	Large	1
Chert	Complex	Small	1
Chert	Shatter	Small	1
Chert	Simple	Large	1
Chert	Simple	Small	3
Quartzite	Complex	Large	6
Quartzite	Complex	Small	1
Quartzite	Shatter	Large	3
Quartzite	Shatter	Small	2
Quartzite	Simple	Large	13
Quartzite	Simple	Small	6

LEVEL 5

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Complex	Small	1
Quartzite	Simple	Large	2

UNIT 2
FEATURE 0
LEVEL 0

Material	*Flake Type*	*Size Grade*	*Total*
Argillite	Simple	Large	1
Chert	Complex	Large	1
Chert	Shatter	Large	1
Quartzite	Complex	Large	8
Quartzite	Shatter	Large	5
Quartzite	Simple	Large	3

Quartzite	Simple	Small	2

LEVEL 1

Material	*Flake Type*	*Size Grade*	*Total*
Argillite	Simple	Large	1
Chert	Complex	Large	1
Chert	Shatter	Large	1
Chert	Simple	Large	2
Quartzite	Complex	Large	16
Quartzite	Shatter	Large	5
Quartzite	Shatter	Small	6
Quartzite	Simple	Large	14
Quartzite	Simple	Small	4

LEVEL 2

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Complex	Large	2
Chert	Shatter	Large	1
Chert	Simple	Large	2
Chert	Simple	Small	2
Quartzite	Complex	Large	9
Quartzite	Shatter	Large	3
Quartzite	Simple	Large	5
Quartzite	Simple	Small	5

LEVEL 3

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Complex	Large	1
Chert	Shatter	Large	2
Chert	Simple	Large	3
Quartzite	Complex	Large	18
Quartzite	Complex	Small	2

Quartzite	Shatter	Large	4
Quartzite	Simple	Large	24
Quartzite	Simple	Small	2

LEVEL 4

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Complex	Large	2
Chert	Shatter	Large	4
Chert	Simple	Large	3
Chert	Simple	Small	1
Quartzite	Complex	Large	11
Quartzite	Shatter	Large	3
Quartzite	Shatter	Small	1
Quartzite	Simple	Large	15
Quartzite	Simple	Small	4

LEVEL 5

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Bifacial Thinning	Small	1
Chert	Complex	Large	3
Chert	Shatter	Large	4
Chert	Simple	Large	2
Quartzite	Complex	Large	4
Quartzite	Shatter	Large	4
Quartzite	Simple	Large	10

LEVEL 6

Material	Flake Type	Size Grade	Total
Quartzite	Complex	Large	1
Quartzite	Simple	Small	2

LEVEL 7

Material	Flake Type	Size Grade	Total
Quartzite	Complex	Large	1
Quartzite	Simple	Large	1

LEVEL 8

Material	Flake Type	Size Grade	Total
Chert	Complex	Large	2
Chert	Shatter	Small	1
Quartzite	Complex	Large	2
Quartzite	Shatter	Small	1
Quartzite	Simple	Large	1

LEVEL 10

Material	Flake Type	Size Grade	Total
Quartzite	Complex	Large	1
Quartzite	Simple	Large	1

UNIT 5
FEATURE 0
LEVEL 0

Material	Flake Type	Size Grade	Total
Chert	Shatter	Large	1

SITE 5LA6603
UNIT 1
FEATURE 0
LEVEL 1

Material	Flake Type	Size Grade	Total
Limstone	Complex	Large	1
Quartzite	Shatter	Large	1
Quartzite	Simple	Large	1

LEVEL 2

Material	*Flake Type*	*Size Grade*	*Total*
Chert	bifacial thinning	Small	3
Chert	Complex	Small	2
Chert	Shatter	Small	1
Chert	Simple	Large	1
Chert	Simple	Small	3
Quartzite	Bifacial thinning	Small	2
Quartzite	Complex	Small	2
Quartzite	Shatter	Large	2
Quartzite	Shatter	Small	4
Quartzite	Simple	Large	3
Quartzite	Simple	Small	17

LEVEL 3

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Complex	Large	2
Chert	Simple	Large	1
Chert	Simple	Small	3
Quartzite	Complex	Large	2
Quartzite	Shatter	Large	4
Quartzite	Simple	Large	8
Quartzite	Simple	Small	3

LEVEL 4

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Shatter	Large	1
Chert	Simple	Large	1
Chert	Simple	Small	5
Quartzite	Complex	Large	1
Quartzite	Complex	Small	1

Quartzite	Simple	Large	5
Quartzite	Simple	Small	7

LEVEL 5

Material	*Flake Type*	*Size Grade*	*Total*
Argillite	Simple	Small	1
Chert	Shatter	Small	1
Chert	Simple	Small	1
Hornfels/Basalt	Simple	Large	1
Quartzite	Complex	Large	7
Quartzite	Shatter	Large	2
Quartzite	Simple	Large	9
Quartzite	Simple	Small	16

LEVEL 6

Material	*Flake Type*	*Size Grade*	*Total*
Quartzite	Complex	Large	1
Quartzite	Simple	Large	4

LEVEL 7

Material	*Flake Type*	*Size Grade*	*Total*
Argillite	Shatter	Large	1
Quartzite	Complex	Large	3

LEVEL 8

Material	*Flake Type*	*Size Grade*	*Total*
Argillite	Shatter	Large	1
Quartzite	Simple	Large	2

LEVEL 50

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Complex	Small	1
Chert	Simple	Large	1
Quartzite	Complex	Large	1
Quartzite	Simple	Large	2

UNIT 2

FEATURE 0

LEVEL 1

Material	*Flake Type*	*Size Grade*	*Total*
Argillite	Complex	Large	1
Quartzite	Complex	Large	1
Quartzite	Simple	Large	3

LEVEL 3

Material	*Flake Type*	*Size Grade*	*Total*
Chalcedony	Simple	Small	1
Chert	Complex	Large	1
Chert	Simple	Large	1
Chert	Simple	Small	2
Quartzite	Complex	Large	1
Quartzite	Simple	Large	3

LEVEL 4

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Shatter	Large	1
Chert	Shatter	Small	3
Chert	Simple	Large	5
Chert	Simple	Small	5
Quartzite	Shatter	Large	1
Quartzite	Shatter	Small	1
Quartzite	Simple	Large	9
Quartzite	Simple	Small	7

LEVEL 5

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Simple	Small	4
Quartzite	Complex	Large	1
Quartzite	Shatter	Large	1
Quartzite	Simple	Large	11

Quartzite	Simple	Small	7

UNIT 3
FEATURE 0
LEVEL 2

Material	*Flake Type*	*Size Grade*	*Total*
Quartzite	Simple	Large	2

UNIT 4
FEATURE 0
LEVEL 2

Material	*Flake Type*	*Size Grade*	*Total*
Argillite	Complex	Large	1
Chert	Complex	Large	1

LEVEL 3

Material	*Flake Type*	*Size Grade*	*Total*
Quartzite	Simple	Large	1

LEVEL 6

Material	*Flake Type*	*Size Grade*	*Total*
Quartzite	Simple	Large	1

UNIT 5
FEATURE 0
LEVEL 1

Material	*Flake Type*	*Size Grade*	*Total*
Quartzite	Simple	Large	1

SITE 5LA6612
UNIT 1
FEATURE 0
LEVEL 1

Material	*Flake Type*	*Size Grade*	*Total*
Quartz	Simple	Large	1
Quartzite	Complex	Large	3
Quartzite	Shatter	Large	2

Quartzite	Simple	Large	10
Quartzite	Simple	Small	9

LEVEL 2

Material	*Flake Type*	*Size Grade*	*Total*
Quartzite	Complex	Large	2
Quartzite	Simple	Large	2

UNIT 2
FEATURE 0
LEVEL 1

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Complex	Large	1
Quartzite	Complex	Large	2

UNIT 3
FEATURE 0
LEVEL 1

Material	*Flake Type*	*Size Grade*	*Total*
Quartzite	Simple	Large	1

SITE 5LA6618
UNIT 1
FEATURE 0
LEVEL 3

Material	*Flake Type*	*Size Grade*	*Total*
Chert	Simple	Large	1
Hornfels/Basalt	Shatter	Large	2
Quartzite	Complex	Large	1
Quartzite	Simple	Large	1

APPENDIX 6:
FAUNAL ANALYSIS: MATERIALS AND METHODS

Prepared by:
Erica Hill

INTRODUCTION

The vertebrate faunal materials analyzed in this study were all recovered from sites in Welsh Canyon, Las Animas County, in southeastern Colorado. A total of 3113 faunal specimens was analyzed. Of this total, 19 were artifactual bone. In addition, one specimen of eggshell was recovered. Of the 3094 non-artifactual specimens analyzed, 290 (9.4%) could be positively identified to either the genus or species level of taxonomic inclusion or compared favorably with a given genus or species.

The faunal materials represent the remains from seven different sites, spanning both historic and prehistoric periods. With the exception of 5LA6595, which is an open air midden, all sites that yielded faunal remains had a rockshelter component. The rockshelter sites are all situated along the Welsh Canyon wash, which drains from the northwest into the Purgatoire River. Today, while the Purgatoire River runs perennially, there is rarely running water in Welsh Canyon itself. Pools of standing water occasionally form in the Canyon as a result of rainfall runoff from May through October (von Guerard et al. 1987). An additional source of water may be provided by a nearby spring, which is located near the head of the Canyon.

MATERIALS AND METHODS

All taxonomic identifications were made using the collections of the Museum of Southwestern Biology, University of New Mexico, Albuquerque. Identifications were made to the most precise taxonomic level possible. When species-level identifications were not possible, genus-level identifications were made. No attempt was made to identify ribs and phalanges to taxon since these elements display considerable similarities across taxa.

Fragmentary specimens that could not be identified to family, genus or species were assigned to small, medium and large categories when possible. Small mammals refers to all those mammals that are smaller than *Sylvilagus* (cottontail). Medium refers to mammals ranging in size between *Sylvilagus* and *Canis* (coyote, dog). Large mammals are those larger than *Canis*. Small rodent refers to those genera smaller than *Neotoma* (woodrat). In addition to taxon identification, all specimens were examined for burning, cut marks, and mineral deposition. Fusion was noted on those specimens with articular surfaces, and right or left side designations were recorded when possible. Finally, all specimens were weighed to the nearest hundredth of a gram and measured across the longest axis to the nearest millimeter.

Throughout this analysis, NISP was the unit of quantification employed. NISP refers to number of identified specimens. At its most fundamental level, the identified specimen is the single bone or tooth fragment assigned to some taxonomic unit (Grayson 1984:17), often genus. A complete list of faunal taxa by provenience is provided in an appendix.

Bone count and bone weight, while included in this study, are problematic in that both reflect post-depositional processes (Lyman 1994). Several post-depositional factors that may affect context, preservation and later identification of faunal remains were evident in this assemblage; the bone itself may be burned, calcined or encrusted (Reitz and Scarry 1985:19). Numerous specimens displayed mineral deposition or concretions on exterior, and occasionally interior, surfaces of skeletal elements, which made identification of both element and taxon difficult. Additionally many specimens were highly fragmented, probably resulting from a combination of factors, including scavenging, burrowing, weather and soil conditions (Grayson 1979:229; Reitz 1987:102).

Several studies have discussed the effects of screen size on faunal samples (e.g., Gordon 1993; Payne 1972; Stahl 1996). Because materials for this project were collected using two different techniques--quarter-inch dry screening and water-sieving through window screen--the issue of differential recovery of faunal materials can be addressed. Not surprisingly, the water-sieved materials yielded a greater number of herpetofauna and all four identified specimens of *Peromyscus* sp., a very small mouse found throughout the region.

Materials that were recovered using water sieving through window screen were weighed in bulk, so that a total weight is given. For example, the burned unidentified materials from a specific provenience were weighed in bulk, as were the small mammal tooth fragments, and so forth. Weight and length measurements were recorded only for specimens identified to the genus level.

In the following section, I will discuss habitat, current distribution and some behavioral characteristics of each genus or species identified in this assemblage. This section is followed by descriptive information on the materials recovered from each site. Inter-site assemblages will then be compared. Finally, the artifactual materials and conclusions will be presented.

DESCRIPTIVE SUMMARY

For all identified taxa, modern distributional information is given. Although some species could potentially be identified on the basis of distribution, identifications were made using skeletal morphology alone. Additionally, size distinctions refer to average size of species. Considerable individual variation both within and between species makes identification of the basis of size problematic. Further variation is generated by sexual dimorphism.

Class Reptilia
Order Squamata (Lizards and Snakes)
Suborder Sauria (Lizards)
Family Phrynosomatidae
(Zebratail, Earless, Spiny, Tree, Side-blotched, and Horned Lizards)
Sceloporus sp. (Prairie or Fence Lizard)

One species of *Sceloporus* presently inhabits the study area: *S. undulatus*. This species occurs in 32 states and northern Mexico (Degenhardt et al. 1996:178) and is found throughout

Colorado, except at higher elevations (Hammerson 1981:141-142). Its preferred habitat is piñon-juniper woodland and sagebrush or desert grasslands (Degenhardt et al. 1996:180), however *Sceloporus undulatus* is a habitat generalist and may live in rocky, wooded, sandy or shrubby environments at elevations up to nearly 10,000 feet (Williamson et al. 1994:93).

Class Aves
Order Columbiformes
Family Columbidae (Doves and Pigeons)
Zenaida macroura (Mourning Dove)

The mourning dove *Zenaida macroura* is presently an abundant spring/fall migrant and summer resident of southeastern Colorado. This species prefers grasslands and shrublands as well as lowland or foothill riparian forests (Andrews and Righter 1992:165). Its range extends from southern Canada through the United States and as far south as the highlands of central Mexico (Rappole and Blacklock 1994:120).

Order Passeriformes (Perching Birds)
Family Alaudidae (Larks)
Eremophila alpestris (Horned Lark)

Like *Z. macroura*, the horned lark (*E. alpestris*) inhabits prairies, preferring grasslands, sagebrush and semidesert shrublands. In general, larks occur in areas of low plant density where there is abundant exposed soil (Andrews and Righter 1992:230). *E. alpestris* has a broad range, breeding in North America south to southern Mexico (Rappole and Blacklock 1994:162).

Class Mammalia
Order Lagomorpha (Hares, Rabbits and Pikas)
Family Leporidae (Rabbits and Hares)
The Leporid family is comprised of rabbits (genus *Sylvilagus*) and hares (genus *Lepus*). Members of the genus *Lepus* are the largest of the lagomorphs.
Sylvilagus sp. (Cottontails and Allies). Lifespan is less than two years (Chapman and Willner 1978)

The genus *Sylvilagus* is extremely diverse, albeit restricted to the Americas. Of the three species of *Sylvilagus* presently found in Colorado, only one species, *S. audubonii* (Desert cottontail), inhabits the study area (Fitzgerald et al. 1994:139-145). *S. audubonii* is found throughout eastern Colorado at elevations below 2135 meters (7000 ft); the species typically inhabits elevations from below sea level to at least 1830 meters (6000 ft) (Chapman and Willner 1978). *S. nuttallii* (Mountain cottontail) inhabits the mountainous western region of the state at elevations of between 1830 and 3500 meters. *S. floridanus* (Eastern cottontail) presently inhabits northeastern Colorado, an area that forms the western border of the distribution of this species in the United States.

These species are impossible to distinguish on the basis of post-cranial skeletal remains. However, based on present distributions, it is likely that the specimens identified in this assemblage represent *S. audubonii*. *S. audubonii* displays a preference for desert, semi-desert and montane shrubland regions of the western U.S. (Chapman et al. with 1982:83), and is particularly common in areas dominated by piñon-juniper (Chapman and Willner 1978; Findley 1987:57). In contrast to most species of *Lepus*, *S. audubonii* prefers dense coverage of the landscape, as opposed to treeless ranges with limited vegetation. This species employs heavy brush or grass cover for concealment when pursued (whereas *Lepus* sp. flees when pursued, and so prefers less floral coverage). *S. audubonii* is one of the larger members of the genus

Cottontails are well-documented in the faunal assemblages of the greater Southwest, Utah and Colorado (e.g. Akins 1985; Guthrie 1979; Hockett 1994; Leonard 1989; Rhodes 1984) and probably formed a major component of the prehistoric subsistence base. In addition to their dietary contribution, skeletal elements of *Sylvilagus* are commonly sharpened for use as awls. Skeletal elements are also frequently recovered in tubular form, possibly for use as beads (Hockett 1994:110-111; Rhodes 1984:125). An additional use that has been observed prehistorically at a site in Utah is sets of leporid metapodials bound together with sagebrush bark (Aikens 1970:91, 95). Notably, similar caches of bone were recovered from Upper Plum Canyon rockshelter in southeastern Colorado (Rhodes 1984:117).

Lepus sp. (Jackrabbits)

Only *Lepus californicus* (Black-tailed jackrabbit) presently inhabits the region of Colorado under study. This species of hare inhabits arid regions characterized by desert shrubs such as juniper and sagebrush (Dunn et al. 1982:133), however under ecologically favorable conditions, the black-tailed jackrabbit may expand considerably beyond these regions both altitudinally and latitudinally. *L. californicus* demonstrates a preference for open, treeless areas with limited shrubs (Findley 1987:55-56) where it is able to outdistance predators. *L. californicus* prefers elevations below 2150 meters (7000 ft.).

Two other species of jackrabbit are presently found in Colorado: *L. americanus* (Snowshoe hare), which prefers montane regions, and *L. townsendii* (White-tailed jackrabbit, found throughout Colorado except in the extreme southeastern and southwestern corners (Fitzgerald et al. 1994:145-152).

Order Rodentia (Rodents)
Family Sciuridae (Squirrels and Relatives)

The Sciurid rodents are quite common in the study area and include semifossorial, terrestrial and volant species (Hall 1981:336-337). Chipmunks, marmots and prairie dogs, as well as squirrels, compose the Sciurid family.

Spermophilus sp. (Ground squirrels)

The study area falls within the habitats of three species of the genus *Spermophilus*: *S. tridecemlineatus* (13-lined ground squirrel), *S. spilosoma* (Spotted ground squirrel) and *S. variegatus* (Rock squirrel) (Hall 1981:381-401). Of these species, *S. variegatus* is by far the largest. This species inhabits regions ranging from Ponderosa pine to desert and prefers rocky areas such as arroyos and hillsides (Findley 1987:70-71) as well as piñon-juniper woodland. In contrast, *S. tridecemlineatus* and *S. spilosoma* prefer grasslands or semidesert shrublands. Today, *S. spilosoma* is widely distributed on the eastern plains of Colorado, and occurs primarily in areas of sandy soil (Fitzgerald et al. 1994:176-177). Conversely, *S. tridecemlineatus* avoids sandy soils in favor of heavier soils such as clays, loams or sandy loams.

Cynomys sp. (Prairie dogs)

C. ludovicianus (Black-tailed prairie dog) is the only species of prairie dog that presently inhabits eastern Colorado. Well distributed across the eastern plains. *C. ludovicianus* prefers arid prairie regions (Findley 1987:67). This species digs complex burrow systems and can move significant amounts of soil (Fitzgerald et al. 1994).

Family Geomyidae (Pocket gophers)

Several species of pocket gophers inhabit southeastern Colorado, including, *Thomomys bottae* (Botta's pocket gopher), *Geomys bursarius* (Plains pocket gopher) and *Pappogeomys castanops* (Yellow-faced pocket gopher, also known as *Cratogeomys castanops*).

Characteristic of pocket gophers is their fossorial adaptation (subterranean, burrowing). As a result, they generate considerable soil disturbance in the form of tunnels, trenches and mounds (Douglas 1969; Hall 1981:454). Pocket gophers prefer areas where soil has been disturbed or where the soils are porous, well-drained and light in texture (Chase et al. 1982:245), particularly grassy areas or where sagebrush occurs (Douglas 1969:149).

Thomomys bottae (Botta's pocket gopher)

Thomomys bottae prefers sandy soils in riparian areas, but can be found in a number of different vegetational areas, including grasslands, piñon-juniper woodlands, and semidesert shrublands (Fitzgerald et al. 1994:202). The diet of *Thomomys bottae* consists of seeds, forbs and grasses.

Pappogeomys castanops (Yellow-faced pocket gopher)

Ten species of the genus Pappogeomys inhabit the region from southeastern Colorado to southern Mexico. The only species that occurs north of Mexico is *P. castanops* (Hollander 1990). Slightly larger than other Colorado pocket gophers, *Pappogeomys castanops* inhabits sandy or silty soils. Hollander (1990:9) has characterized *Pappogeomys* as a habitat and dietary generalist. Found primarily on grasslands, this species of pocket gopher feeds on roots as well as green vegetation.

Family Heteromyidae (Pocket mice, Kangaroo rats) *Dipodomys* sp. (Kangaroo Rats)

One species of *Dipodomys* presently inhabits the study area: *D. ordii* (Ord's kangaroo rat) (Fitzgerald et al. 1994). *Dipodomys* sp. is a nocturnal rodent, well adapted to the arid or semiarid scrub and grasslands in which it lives and demonstrating a particular preference for open, sandy areas (Ribble and Samson 1987:299). Like pocket gophers, kangaroo rats are fossorial and may generate an extensive burrow system underground (Langford 1983:342). *Dipodomys* sp. has a limited need for moisture, relying primarily upon a dry seed diet (Csuti 1979:4).

Family Muridae (Rats, Mice and Voles)
Subfamily Cricetinae/Sigmodontinae (New World Rats and Mice)
Peromyscus sp. (White-footed mice)

Peromyscus is one of the most widespread and geographically variable genera of rodents (Hall 1981:655). Five species of *Peromyscus* occupy the area of study: *P. maniculatus* (deer mouse), *P. leucopus* (white-footed mouse), *P. boylei* (brush mouse), *P. truei* (piñon mouse), and *P. nasutus* (northern rock mouse) (Fitzgerald et al. 1994). These mice inhabit a variety of environments, including arid and semiarid grasslands and rocky terrain, as well as wooded or brushy areas (Hall 1981:685; Baker 1968:100-110). Species within the genus *Peromyscus* demonstrate microhabitat preferences. *P. leucopus* and *P. maniculatus* can be characterized as microhabitat generalists, while *P. truei* prefers areas with extensive piñon-juniper vegetation (Ribble and Samson 1987). Even so, there may be considerable overlap between species within a single region.

Identifications to the species level are made primarily on the basis of pelage (Hall 1981:656), although Thompson and Conley (1983) have reported that discriminate function analysis on the basis of eight variables, including several cranial measurements, enables correct species-level identification in 90% of the specimens examined.

Onychomys leucogaster (Northern Grasshoper Mouse)

Grasshopper mice occur predominantly in semiarid grasslands as well as open semidesert shrublands; in Colorado, this rodent is presently common in all semiarid regions at lower elevations. This species has a notably carnivorous diet, including insects and small vertebrates. Life span is usually less than two years. *O. leucogaster*, like most other rodents, lives a fossorial existence in burrows that have small openings. Their burrows have a vertical entrance that angles after several inches (Fitzgerald et al. 1994:247-249).

Sigmodon hispidus (Hispid Cotton Rat)

S. hispidus is common in grasslands and prairies; it apparently prefers moister areas when they are available. Thus, this species may be found in riparian zones. Populations experience cyclic peaks and crashes. The life span of this species is significantly shorter than that of *O. leucogaster*; most animals live about two months, with very few living longer than 10 months. While this rodent is now a common inhabitant of suitable regions of Colorado, it has been expanding its range as long as it has been recorded in the state (Fitzgerald et al. 1994:249-251).

Neotoma sp. (Woodrats)

Four species of the genus *Neotoma* presently occupy the study area: *N. micropus* (Southern Plains woodrat), *N. albigula* (White-throated woodrat), *N. mexicana* (Mexican woodrat) and *N. floridana* (Eastern woodrat) (Fitzgerald et al. 1994:252-264). While both *N. micropus* and *N. albigula* prefer deserts and semiarid plains (Rogers and Schmidly 1981:167), *N. mexicana* is found in mountainous or rocky areas, especially piñon-juniper woodlands. Unlike other species of woodrats in Colorado, *N. mexicana* builds its dens and nests under rocky ledges or in cliff crevices; *N. mexicana* prefers elevations below 2600 meters (8500 ft) (Fitzgerald et al. 1994:260-261). Populations of *N. floridana* in Colorado are marginal, as this region is much drier than their preferred habitat, which is further east. In Colorado, *N. floridana* occupies the eastern plains where rocky draws, riparian woodlands or dense shrublands are present (Fitzgerald et al. 1994:256).

Species of the genus *Neotoma* are rarely subjected to heat stress, since they are nocturnal and spend most of the day in nests constructed of debris and branches (Schmidt-Nielsen 1979). Because of similar morphology (and possibly hybridization), it is difficult, if not impossible, to distinguish between species of *Neotoma* on the basis of skeletal remains.

Order Artiodactyla

Because most of the artiodactyl material was highly fragmentary, genus-level identifications were made only in the case of *Bison bison*, which is distinctive in both size and robusticity. A synopsis of artiodactyls that presently inhabit the study region is provided below. Family Cervidae (Deer and Allies)*Odocoileus* sp.

Two species of the genus *Odocoileus* inhabit southeastern Colorado: *O. hemionus* (Mule deer) and *O. virginianus* (White-tailed deer). Both are medium-sized cervids; they have neither upper incisors nor canines. The lower incisors and canines are spatulate (Fitzgerald et al. 1994:386-393). Both *O. hemionus* and *O. virginianus* are heterodont (Mackie et al. 1982).

O. hemionus is broadly adapted throughout the western U.S., however this species is found most frequently in semi-arid brush or shrubland, preferring abundant browse and cover. *O. hemionus* is also known to inhabit prairies and mountainous areas in several different altitudes and latitudes. Males have antlers that are round in cross-section; these antlers are shed each year in late February or March (Fitzgerald et al. 1994:387).

O. virginianus is an extremely wide-ranging species, and inhabits numerous habitats in Colorado. This species prefers riparian woodlands and associated agricultural lands today. Usually only males of the species have antlers, which, as in the case of *O. hemionus*, are shed in late February or March (Fitzgerald et al. 1994:390).

Family Antilocapridae (Pronghorns)
Antilocapra americana (Pronghorn)

Antilocapra americana is widespread throughout the western United States, including southeastern Colorado (Fitzgerald et al. 1994; Hall 1981:1106-1108). This species prefers prairie or shrubby areas with abundant forbs and browse. Pronghorns, as small ruminants, may coexist with bison since they are not in competition for the same resources (Reynolds et al. 1982:983). Pronghorn teeth are hypsodont and selenodont; that is, they have long crowns and either no roots or roots that develop well after tooth eruption (Kitchen and O'Gara 1982) and have a distinctive crescent shape characteristic of ruminants.

Both males and females may have horns, which are composed of bony cores protruding from the frontal bones. While females have short nubs, the horns of males are longer and forked (Fitzgerald et al. 1994:397). Pronghorn are one of the fastest mammals in North America, making them elusive to human predators.

Family Bovidae (Sheep, Goats, Cattle)
Bison bison (Bison, Buffalo)

Bison inhabit primarily semiarid plains or prairies with extensive grasses, however they are also found in piñon-juniper woodlands. Thus, they may inhabit the same ecological niche as mule deer and pronghorn (Reynolds et al. 1982:983). Bison compose the largest species of terrestrial mammal in North America. Bovids, of which *Bison bison* is a member, possess permanent horns that are never shed (Reynolds et al. 1982). Both males and females of the species *Bison bison* may possess horns. Lower incisors and canines are spatualate; cheekteeth are slenodont and hypsodont (Fitzgerald et al. 1994:400). There are no upper incisors or canines. Free-ranging bison are migratory, and those herds that inhabited eastern Colorado probably moved along an east-west migration route (Fitzgerald et al. 1994:404).

Ovis canadensis (Mountain sheep)

Mountain sheep inhabit mountainous and arid regions, especially rocky cliff and canyon areas. Despite a preference for shrubs and grasses, *O. canadensis* has probably never lived extensively on the plains. Rather, rocky mountainsides provide a relatively uncontested source of vegetation. These sheep are sparsely scattered across southeastern Colorado today.

Dental morphology includes spatulate incisors and long, broad molars (Lawson and Johnson 1982:1037). Permanent dentition takes four years to develop. Like bison, both male and female mountain sheep may possess permanent horns. In males, the horns sweep up and back, forming weighty curls that may exhibit extensive wear and breakage; in females and subadults, horns are shorter and more slender (Fitzgerald et al. 1994:408).

ABUNDANCE OF TAXA ACROSS SITES

	5LA6568	5LA6569	5LA6592	5LA6595	5LA6599	5LA6603	5LA6618	TOTAL
herpetofauna	8 (0.5%)	4 (5.3%)	2 (0.5%)	5 (1.2%)	1 (1.8%)	1 (0.2%)		21 (0.7%)
Sceloporus sp.						1 (0.2%)		1
eggshell						1 (0.2%)		1
bird					1 (1.8%)	2 (0.4%)		3 (0.1%)
Eremophila alpestri	1 (0.1%)	1 (1.3%)				1 (0.2%)		3 (0.1%)
Zenaida macroura						1 (0.2%)		1
mammal	166 (10.2%)	13 (17.1%)	73 (18.1%)	26 (6.1%)	8 (14.3%)	24 (5.1%)		310 (10.0%)
Leporid	1 (0.1%)			1 (0.2%)				2
Sylvilagus sp.	63 (3.9%)	2 (2.6%)	23 (5.7%)	15 (3.5%)	2 (3.6%)	57 (12.1%)	3 (12.0%)	165 (5.3%)
Lepus sp.	14 (0.9%)		5 (1.2%)	2 (0.5%)	1 (1.8%)	2 (0.4%)		24 (0.8%)
rodent	11 (0.7%)	1 (1.3%)				1 (0.2%)		13 (0.4%)
Sciurid	1 (0.1%)		3 (0.7%)			2 (0.4%)		6 (0.2%)
Cynomys sp.	8 (0.5%)		9 (2.2%)			4 (0.8%)		21 (0.7%)
Spermophilus sp.			1 (0.2%)					1
Thomomys sp.						2 (0.4%)		2
Pappogeomys sp.	1 (0.1%)							1
Heteromyidae			1 (0.2%)					1
Dipodomys sp.			2 (0.5%)					2
Sigmodontinae			1 (0.2%)					1
Peromyscus sp.	2 (0.1%)	1 (1.3%)	1 (0.2%)					4 (0.1%)
Onychomys sp.			2 (0.5%)					2
Sigmodon sp.			3 (0.7%)					3 (0.1%)
Neotoma sp.	35 (2.1%)	3 (3.9%)	3 (0.7%)	3 (0.7%)	1 (1.8%)	10 (2.1%)		55 (1.8%)
Artiodactyl	6 (0.4%)							6 (0.2%)
Bovidae	1 (0.1%)			1 (0.2%)				2
Bison bison			1 (0.2%)	4 (0.9%)				5 (0.2%)
UNID	1317 (80.6%)	51 (67.1%)	274 (67.8%)	369 (86.6%)	42 (75.0%)	363 (76.9%)	22 (88.0%)	2438 (78.8%)
TOTAL	1635	76	404	426	56	472	25	3084

ARTIFACTUAL BONE

Site	Unit	Level	Taxon	Element	Weight	Length	Description
5LA6568	1	2	cf. Lepus sp.	tibia	1.19	23	Two halves of bone tube, split longitudinally. Polished shaft and polished, rounded ends. Many cut marks across shaft. Radius 6-7mm.
5LA6568	1	3	cf. Sylvilagus sp.	tibia	.16	15	Half of bone tube, broken longitudinally.
5LA6568	1	4	indeterminate	indeterminate	.22	14	Half of bone tube, broken longitudinally. One end bevelled and rounded; the other end ragged and broken. Shaft displays slight polish.
5LA6568	1	4	large mammal	indeterminate	2.45	38	Bone flake "scraper" with rounded edges and the appearance of use-wear.
5LA6568 (Feature 1)	1	4	indeterminate	indeterminate	.27	17	Half of bone tube, split longitudinally; rounds ends; some polishing evident, but difficult to determine due to calcining. Radius approx. 5mm.
5LA6568	1	5	indeterminate	indeterminate	.12	11	Complete bone tube, with longitudinal crack. Overall, highly polished; smooth, polished, bevelled ends. Radius 3-4mm.
5LA6569	1	4	*Sylvilagus* sp.	left tibia	.36	16	Bone tube, polished at both ends. Cut marks evident across shaft made by a bevelled implement. Proximal end of tibia diaphysis used.
5LA6592	1	1	indeterminate	indeterminate	.21	23	Half of bone tube; broken longitudinally. Polishing or smoothing evident on both ends. Radius approx. 3mm.
5LA6592	1	1	indeterminate	indeterminate	.25	28	Pointed bone implement; flake removed at point, possibly during excavation. Highly polished at point and on exterior surface.

ARTIFACTUAL BONE (continued)

Site	Unit	Level	Taxon	Element	Weight	Length	Description
5LA6592	1	2	indeterminate	indeterminate	.18	11	Complete bone tube; highly polished on shaft and on ends. Possible cut or chop marks. Radius 3-4mm.
5LA6592	1	3	cf. *Lepus* sp.	tibia-fibula	1.63	37	Bone tube, broken longitudinally into two pieces. Highly polished on one end, to a lesser degree on the other end. Numerous cut marks made by a bevelled implement are evident on the highly polished end. Radius approx. 7mm.
5LA6595 (Locus 1)	1	6	indeterminte	indeterminate	.03	6	Complete and unbroken bone tube. Radius approx. 2mm.
LA6595 (Locus 1)	1	8	Sylvilagus sp.	metapodial	.10	10	Distal end of metapodial with shaft cut by a bevelled tool. Radius approx. 3mm.
5LA6595	1	5	indeterminate	indeterminate	.02	11	Polished bone fragment.
5LA6599	1	2	cf. *Sylvilagus* sp.	tibia-fibula	.38	20	Half of bone tube; tube is split longitudinally, possibly during manufacture. Radius approx. 5 mm. Numerous cut marks evident across shaft of bone. No polishing evident; the ends are rought, appearing unfinished.
5LA6599	1	3	indeterminate	indeterminate	.20	14	Complete bone tube with numerous cut or chop marks across shaft. Polishing or smoothing evident on both ends. Radius approx. 3-4mm.
5LA6599	1	4	indeterminate	indeterminate	1.34	45	Pointed implement, probably made from bone of a medium to large mammal.

ARTIFACTUAL BONE (continued)

Site	Unit	Level	Taxon	Element	Weight	Length	Description
5LA6603	1	3	*Sylvilagus* sp.	right tibia	.38	17	Bevelled distal end of *Sylvilagus* right tibia. Heavily calcined, no cut marks evident. Bevelled edge suggests stone tool use.
5LA6618	1	3	Sylvilagus sp.	left tibia	.88	61	Sharpened diaphysis; polish evident. Distal end and partial shaft present.

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DATABASE SUMMARY OF FAUNAL REMAINS

Dry screen remains

Site 5LA6568

Unit 1

Level	Taxon	Element	Side	Fused	Wgt (g)	Len (mm)	Comment
1	UNID				0.13	9	
1	UNID				0.03	7	
1	UNID				0.07	15	
1	UNID				0.16	17	
1	UNID				0.07	16	
1	UNID				0.26	15	
1	UNID				0.26	14	
1	UNID				0.35	30	
1	UNID				0.22	16	
1	cf. Sylvilagus sp.	scapula	L		0.17	22	
1	Sylvilagus sp.	mandible	L		0.2	15	
1	UNID				0.09	16	
2	Cynomys sp.	innominate	R		0.4	30	
2	UNID				0.11	18	
2	UNID				0.21	31	
2	UNID				0.07	11	
2	large mammal	tooth fragment			0.03	12	
2	med to large mammal				0.32	16	
2	small mammal	molariform			<.01	5	
2	rodent	incisor			0.07	22	
2	Pappogeomys cast.	mandible	L		0.98	29	
2	Sylvilagus sp.	radius	R		0.13	28	proximal end
2	Sylvilagus sp.	humerus	R		0.28	20	distal end
2	rodent	mandible	L		0.15	15	
3	UNID				0.25	14	
3	UNID				0.12	24	
3	UNID				0.02	22	
3	UNID				0.32	22	
3	UNID				0.15	19	

3	UNID	0.1	10
3	UNID	0.1	10
3	UNID	0.1	15
3	UNID	0.01	12
3	UNID	0.14	18
3	UNID	0.07	10
3	UNID	0.33	18
3	UNID	0.05	9
3	UNID	0.21	18
3	UNID	0.1	17
3	UNID	0.06	16
3	UNID	0.24	17
3	UNID	0.14	16
3	UNID	0.19	20
3	UNID	0.1	19
3	UNID	0.09	22
3	UNID	0.15	22
3	UNID	0.13	23
3	UNID	0.08	15
3	UNID	0.18	16
3	UNID	0.11	19
3	UNID	0.09	17
3	UNID	0.08	11
3	UNID	0.05	21
3	UNID	0.14	17
3	UNID	0.03	12
3	UNID	0.15	15
3	UNID	0.01	10
3	UNID	0.03	12
3	UNID	0.05	13
3	UNID	0.11	10
3	UNID	0.13	11
3	UNID	0.07	19

3	UNID	0.07	16
3	UNID	0.04	8
3	UNID	0.16	23
3	UNID	0.14	15
3	UNID	0.11	18
3	UNID	0.04	6
3	UNID	0.04	17
3	UNID	0.1	20
3	UNID	0.08	16
3	UNID	0.09	14
3	UNID	0.03	9
3	UNID	0.2	11
3	UNID	0.1	23
3	UNID	0.04	9
3	med to large mammal	1.03	28
3	UNID	0.36	17
3	UNID	0.07	16
3	UNID	0.19	15
3	UNID	0.1	24
3	UNID	0.12	15
3	UNID	0.13	15
3	UNID	0.12	18
3	UNID	0.17	20
3	UNID	0.07	7
3	UNID	0.1	19
3	UNID	0.13	19
3	UNID	0.22	15
3	UNID	0.08	15
3	UNID	0.12	13
3	UNID	0.08	7
3	UNID	0.19	9
3	UNID	0.21	14
3	UNID	0.07	10

3	UNID			0.12	17	
3	Cynomys sp.	auditory bulla	R	0.32	14	
3	small mammal	tibia-fibula		0.08	17	
3	small mammal	mandible	L	0.14	13	
3	small mammal	tooth frag.		0.01	7	
3	small mammal	incisor frag.		<.01	11	
3	small mammal	innominate frag.	R	0.18	21	
3	small mammal	scapula		0.04	15	
3	small mammal	scapula	L	0.12	21	
3	small mammal	mandible/maxilla		0.06	17	
3	Neotoma sp.	mandible	L	0.29	25	no intact molars
3	Neotoma sp.	molar		<.01	6	
3	Neotoma sp.	mandible	L	0.22	19	M1 intact
3	small mammal	molariform		0.01	7	
3	cf. Cynomys sp.	ulna		0.19	18	proximal end
3	Sylvilagus sp.	alveolar process	L	0.26	13	
3	Sciurid	maxilla frag.	L	0.18	18	
3	Lepus sp.	III metatarsal	L	0.14	10	proximal end
3	Lepus sp.	humerus	R	0.37	17	distal end
3	Lepus sp.	IV metacarpal	R	0.15	21	proximal end
3	Lepus sp.	III metacarpal	R	0.25	29	complete
3	Sylvilagus sp.	ulna	L	0.21	22	
3	UNID			0.1	18	
3	Sylvilagus sp.	IV metatarsal	R	0.12	29	complete
3	UNID			0.03	7	
3	Sylvilagus sp.	II metatarsal	L	0.25	33	
3	Sylvilagus sp.	scapula	R	0.34	38	
3	Neotoma sp.	mandible	R	0.26	22	
3	UNID	rib		0.04	17	
3	Sylvilagus sp.	maxilla fragment	L	0.07	12	
3	small to med mam.	sacrum		0.12	16	
3	UNID	phalanx		0.07	14	
3	UNID	rib		0.05	37	

3	UNID	rib	0.04	20
3	UNID	rib	0.03	13
3	med to large mammal		0.27	24
3	med to large mammal		0.29	17
3	med to large mammal		0.2	10
3	med to large mammal		0.44	22
3	med to large mammal		0.44	22
3	med to large mammal		0.63	25
3	med to large mammal		0.76	24
3	med to large mammal		1.04	52
3	med to large mammal		0.82	29
3	med to large mammal		0.5	20
3	med to large mammal		1.38	33
3	med to large mammal		1.32	34
3	med to large mammal		0.93	26
3	med to large mammal		0.75	37
3	med to large mammal		1.04	18
3	med to large mammal		0.28	39
3	med to large mammal		0.27	15
3	med to large mammal		0.83	22
3	med to large mammal		0.62	23
4	UNID		0.12	11
4	UNID		0.35	17
4	UNID		0.06	15
4	UNID		0.16	17
4	UNID		0.27	17
4	UNID		0.2	14
4	UNID		0.3	19
4	UNID		0.33	20
4	UNID		0.22	11
4	UNID		0.51	17
4	UNID		0.27	28
4	UNID		0.1	21

4	UNID	0.25	29
4	UNID	0.68	19
4	UNID	0.44	23
4	UNID	0.12	15
4	UNID	0.12	10
4	UNID	0.11	19
4	UNID	0.13	10
4	UNID	0.28	14
4	UNID	0.25	19
4	UNID	0.25	12
4	UNID	0.29	21
4	UNID	0.1	17
4	UNID	0.48	21
4	UNID	0.07	11
4	UNID	0.13	17
4	UNID	0.15	15
4	UNID	0.15	14
4	UNID	0.19	19
4	UNID	0.11	10
4	UNID	0.09	15
4	UNID	0.09	16
4	UNID	0.25	13
4	UNID	0.1	10
4	UNID	0.23	15
4	UNID	0.1	25
4	UNID	0.11	20
4	UNID	0.21	15
4	UNID	0.13	15
4	UNID	0.12	11
4	UNID	0.16	13
4	UNID	0.1	12
4	UNID	0.16	14
4	UNID	0.12	20

4	UNID			0.37	17	
4	UNID			0.13	15	
4	Lepus sp.	calcaneus	R	0.25	15	fragment
4	UNID	phalanx		0.42	21	
4	UNID			0.27	15	
4	Sylvilagus sp.	innominate	L	0.47	29	ischium
4	Sylvilagus sp.	tibia	L	0.29	13	distal
4	Sylvilagus sp.	calcaneus	L	0.26	18	
4	Lepus sp.	calcaneus	R	0.76	26	complete
4	Neotoma sp.	zygomatic process	L	0.04	14	
4	rodent	incisor fragment		<.01	7	
4	Artiodactyl	tooth fragment		0.76	24	
4	Artiodactyl	tooth fragment		0.41	19	
4	med to large mammal			1.06	29	
4	med to large mammal			0.61	21	
4	med to large mammal			1.39	49	
4	med to large mammal			0.19	17	
4	Sylvilagus sp.	mandible	L	0.36	20	body
4	med to large mammal			1.62	49	
4	med to large mammal			0.58	28	
4	UNID	rib		1.01	67	
4	med to large mammal			0.86	21	
4	med to large mammal			1.22	23	
4	med to large mammal			1.85	27	
4	med to large mammal			0.89	20	
4	med to large mammal			0.66	35	
4	med to large mammal			0.48	25	
4	med to large mammal			0.83	42	
4	med to large mammal			1.66	35	
4	med to large mammal			0.66	19	
5	UNID			0.08	19	
5	UNID			0.08	11	
5	small mammal			0.07	15	

5	UNID			0.08	23	
5	UNID			0.03	10	
5	UNID			0.57	29	
5	UNID			0.25	23	
5	UNID			0.18	13	
5	UNID			0.25	29	
5	UNID			0.43	12	
5	UNID			0.24	25	
5	UNID			0.03	12	
5	UNID	metapodial		0.32	26	distal end
5	UNID			0.1	13	
5	UNID			0.09	18	
5	UNID			0.11	13	
5	UNID			0.02	10	
5	Sylvilagus sp.	maxilla	R	0.48	16	
5	UNID			0.31	41	
5	UNID			0.13	25	
5	small mammal	auditory bulla		0.22	12	
5	UNID			0.02	13	
5	UNID			0.01	13	
5	UNID			0.01	17	
5	UNID			0.03	11	
5	UNID			0.1	17	
5	UNID			0.07	15	
5	UNID			0.09	21	
5	UNID			0.04	18	
5	UNID			0.03	6	
5	UNID			0.03	9	
5	UNID			0.02	12	
5	UNID			0.02	17	
5	Cynomys sp.	atlas		0.17	17	
5	cf. Sylvilagus sp.	molariform		0.04	6	
5	cf. Sylvilagus sp.	scapula	R	0.29	32	

5	Sylvilagus sp.	III metatarsal	L		0.13	26	
5	Sylvilagus sp.	mandible	L		0.35	22	
5	Sylvilagus sp.	tibia	L		0.33	23	distal end
5	UNID				0.31	35	
5	Artiodactyl	tooth fragment			0.62	19	
6	UNID				0.19	25	
6	UNID				0.07	12	
6	UNID				0.07	20	
6	cf. Sylvilagus sp.	articular portion of mandible			0.01	4	
6	cf. Sylvilagus sp.	mandible fragment			0.09	14	
6	Sylvilagus sp.	mandible	R		1.5	43	
50	Neotoma sp.	mandible	R		0.31	25	
50	large mammal	tooth fragment			0.2	16	
50	rodent	incisor			0.01	10	
50	rodent	incisor			0.02	12	
50	UNID				0.07	13	
50	UNID				0.04	7	
50	UNID				0.02	6	
50	UNID				<.01	7	
50	Sylvilagus sp.	radius	R		0.12	20	proximal end
50	Lepus sp.	humerus	L		0.32	11	distal end

Unit 2

Level	Taxon	Element	Side	Fused	Wgt (g)	Len (mm)	Comment
2	Artiodactyl	tooth fragment			0.34	14	
2	UNID				0.04	16	
2	UNID				0.2	16	
2	UNID	metapodial			0.02	12	
2	Neotoma sp.	innominate	R		0.13	28	
2	UNID				0.06	14	
3	UNID				<.01		
3	UNID				<.01		
3	UNID				<.01		

3	Sylvilagus sp.	femur	L	0.37	16	proximal end
3	cf. Neotoma sp.	radius		0.01		proximal end
3	UNID			<.01		
3	med-large mam.	tooth fragment		0.01		
3	large mammal			1.56	24	
3	UNID	phalanx		<.01		
3	UNID			0.16	16	
3	UNID			<.01		
3	UNID			<.01		
3	UNID			0.38	17	
3	UNID			<.01		
3	UNID			<.01		
3	UNID			<.01		
3	UNID	vertebra		<.01		
3	UNID			<.01		
3	UNID			<.01		
3	UNID			<.01		
3	UNID			<.01		
3	UNID			<.01		
3	UNID			<.01		
3	UNID			<.01		
3	UNID			<.01		
3	UNID			<.01		
3	UNID			<.01		
3	UNID			<.01		
3	UNID			<.01		
3	UNID			<.01		
3	UNID			<.01		
4	Artiodactyl	incisor fragment		0.43	15	
4	UNID	rib		0.05	22	
4	UNID			0.06	8	
4	UNID			0.1	10	
4	UNID			0.12	11	

4	UNID				0.1	13	
4	UNID				0.11	20	
4	large mammal				0.19	11	
4	large mammal				0.17	15	
4	large mammal				0.28	15	
4	large mammal				0.79	23	
4	small to med. mam.	scapula fragment			0.16	42	
4	Artiodactyl	incisor fragment			0.79	40	
4	small to med. mam.	scapula fragment			0.17	33	

Unit 3

Level	Taxon	Element	Side	Fused	Wgt (g)	Len (mm)	Comment
1	UNID				0.05	13	
1	UNID	maxilla fragment			0.14	15	
1	UNID				0.05	18	
1	Neotoma sp.	tibia	L		0.1	21	
1	Neotoma sp.	tibia-fibula	R		0.1	26	
1	med to large mam.				0.46	28	
1	UNID				0.15	20	
2	UNID				0.1	9	
2	UNID				0.17	18	
2	UNID				0.34	17	
2	UNID				0.47	27	
2	UNID				0.11	17	
2	UNID				0.04	11	
2	UNID				0.13	14	
2	UNID				0.1	11	
2	UNID				0.1	11	
2	UNID				0.18	19	
2	UNID				0.65	33	
2	Lepus sp.	mandible	L		0.8	25	
2	UNID				0.02	6	
2	UNID				0.64	30	

2	Sylvilagus sp.	mandible	R		0.72	22	
2	Sylvilagus sp.	II metatarsal	R		0.15	23	
2	cf. Sylvilagus sp.	mandible	R		0.15	14	
2	Neotoma sp.	mandible	L		0.32	22	
2	Lepus sp.	mandible	L		1.05	25	
2	Neotoma sp.	ascending ramus	L		0.06	13	
2	small to med. mam.	mandible fragment			0.09	15	
2	large mammal				1.89	32	
2	UNID				0.41	24	
2	Sylvilagus sp.	lower molar			0.03	9	
3	Lepus sp.	calcaneus			0.28	18	
3	UNID				0.05	17	
3	UNID				0.04	10	
3	UNID				0.07	10	
3	UNID				0.06	13	
3	large mammal				1.99	25	
3	Lepus sp.	radius	L		0.71	46	
3	UNID				0.42	30	
4	UNID				0.13	14	
4	UNID				0.42	23	
4	UNID				0.64	29	
12	UNID				0.39	32	
12	Neotoma sp.	humerus			0.06	11	distal
50	UNID				0.07	8	
50	UNID				0.22	15	
50	UNID				0.17	14	
50	Neotoma sp.	femur	R	unf	0.06	6	distal end
50	UNID				0.31	23	
50	med to large mammal				0.58	19	
50	med to large mammal				0.87	29	
50	UNID				0.08	11	
50	Neotoma sp.	femur	R	unf	0.04	9	shaft

Site 5LA6569

Unit 1

Level	Taxon	Element	Side	Fused	Wgt (g)	Len (mm)	Comment
2	small mammal	diaphysis		unf	0.01	10	
2	UNID				0.01	19	
2	small mammal	incisor			0.11	25	
2	Eremophila alpestri	humerus	L		0.08	23	complete
3	small mammal	scapula fragment			0.01	11	
3	UNID	vertebra fragment			0.11	10	
3	UNID				0.26	26	
3	Sylvilagus sp.	IV metatarsal	L	fus	0.18	34	complete
4	UNID				0.02	14	
4	UNID				0.02	15	
4	UNID				0.01	14	
4	UNID				0.03	15	
4	UNID				0.18	18	
4	small mammal	incisor fragment			0.05	18	
4	cf. Neotoma sp.	molar			0.04	7	
4	UNID				0.03	17	
4	UNID				0.02	13	

Site 5LA6592

Unit 1

Level	Taxon	Element	Side	Fused	Wgt (g)	Len (mm)	Comment
1	Lepus sp.	humerus	L		1.19	48	distal end
1	UNID				0.25	27	
1	UNID				0.14	23	
1	UNID				0.05	19	
1	UNID				0.11	20	
1	UNID				0.1	25	
1	UNID				0.06	18	
1	UNID				0.05	19	

1	UNID				0.03	14	
1	UNID				0.04	13	
1	UNID				0.04	12	
1	UNID				0.09	15	
1	UNID				0.03	8	
1	UNID				0.03	9	
1	UNID				0.03	15	
1	UNID				0.01	11	
1	UNID				0.02	9	
1	UNID				0.01	8	
1	small mammal	mandible/maxilla fragment			0.16	15	
1	Sylvilagus sp.	tibia	R		0.62	39	distal end, partial shaft
1	Sylvilagus sp.	humerus	L	unf	0.25	21	distal end
1	UNID	phalanx			0.07	14	
1	Sylvilagus sp.	tibia	L		0.19	12	distal end
1	UNID				0.07	22	
1	UNID				0.17	30	
1	UNID				0.17	25	
1	UNID				0.04	21	
1	UNID				0.14	20	
1	UNID				0.14	32	
1	UNID				0.1	22	
1	UNID				0.06	18	
1	UNID				0.09	10	
1	small mammal	tibia-fibula			0.19	23	
2	UNID				0.05	16	
2	UNID	rib			0.08	31	
2	UNID				0.16	23	
2	UNID				0.06	19	
2	UNID				0.03	9	
2	UNID				0.17	35	
2	UNID				0.02	14	
2	UNID				0.03	8	

2	UNID				0.13	21	
2	UNID				0.03	15	
2	UNID				0.02	12	
2	UNID				0.03	17	
2	UNID				0.02	9	
2	large mammal				0.47	18	
2	UNID				0.03	12	
2	Sylvilagus sp.	scapula	R		0.39	41	
2	small mammal	incisor			0.07	20	
2	Sylvilagus sp.	radius	R		0.3	48	proximal end
2	small mammal	incisor			0.01	7	
2	Lepus sp.	tibia		unf	0.62	22	
2	Cynomys sp.	mandible	L		1.69	44	
2	Bison bison	metapodial		unf	127.55	124	distal end, partial shaft
2	large mammal				0.51	20	
2	large mammal				0.41	22	
2	large mammal				0.3	26	
2	large mammal				0.35	15	
2	med-large mammal				0.46	20	
2	small mammal	incisor			0.08	16	
2	large mammal				0.74	18	fragment
2	Sylvilagus sp.	ulna	R		0.17	26	proximal end
3	large mammal				5.46	40	
3	UNID	rib			0.06	24	
3	small mammal	scapula			0.05	10	
3	small-med mammal	innominate			0.21	19	
3	UNID				0.02	11	
3	small-med mammal	incisor			0.08	15	
3	UNID	rib			0.01	14	
3	med-large mammal				0.8	21	
3	cf. Cynomys sp.	humerus		unf	0.31	20	proximal end
3	med-large mammal				0.49	15	
3	UNID				0.04	9	

3	UNID				0.07	14	
3	UNID				0.02	5	
3	UNID				<.01	10	
3	UNID				0.01	9	
3	UNID				0.24	22	
3	UNID				0.03	11	
3	UNID				0.08	21	
3	UNID				0.1	28	
3	UNID				0.01	16	
3	UNID				0.09	18	hole probably caused by non-human action
3	UNID				<.01	4	
4	UNID				0.01	9	
4	UNID				0.15	11	
4	UNID				0.06	14	
4	UNID				0.01	10	
4	UNID				0.11	28	
4	UNID				0.02	12	
4	UNID				0.02	10	
4	UNID				0.27	24	
4	UNID				<.01	9	
4	UNID	rib			0.04	16	
4	UNID				0.07	13	
4	UNID				0.01	8	
4	Sylvilagus sp.	femur	R		0.53	21	proximal end
4	UNID			unf	0.07	25	
4	Sylvilagus sp.	III metatarsal	R	unf	0.12	25	
4	UNID	rib			0.07	32	
4	Sylvilagus sp.	tibia	R		0.15	10	distal end
4	Sylvilagus sp.	IV metatarsal	R	unf	0.11	24	
4	Sylvilagus sp.	V metatarsal	R	unf	0.08	22	
4	Cynomys sp.	mandible	L		1.61	47	
4	Cynomys sp.	radius		unf	0.24	32	
4	Cynomys sp.	tibia		unf	0.32	34	distal end

4	Sigmodontinae	tibia-fibula			0.04	23	
4	small mammal	incisor			0.04	11	
4	small mammal	femur	L		0.07	17	
4	small mammal	mand/maxilla fragment			0.03	10	
4	Sylvilagus sp.	innominate	L		0.33	18	ischium fragment
5	Cynomys sp.	frontal fragment	R		0.08	14	supraorbital process
5	cf. Cynomys sp.	maxilla fragment	R		0.25	21	
5	cf. Neotoma sp.	tibia-fibula	L		0.13	25	
5	small mammal	upper incisor	R		0.17	20	
6	UNID				0.03	16	
6	UNID				0.33	20	
6	UNID				0.13	23	
6	small mammal	molariform			0.03	9	
6	Neotoma sp.	scapula	R		0.03	12	
6	Onychomys cf. leucogaster	innominate	L		0.02	16	ilium, acetabulum
6	small mammal	innominate	R		0.13	21	ischium fragment
6	UNID				<.01	7	

Unit 2

Level	Taxon	Element	Side	Fused	Wgt (g)	Len (mm)	Comment
1	UNID				0.05	15	
1	Sylvilagus sp.	scapula	R		0.16	27	
1	Sylvilagus sp.	maxilla	L		0.08	9	spina masseterica
1	Lepus sp.	scapula	L		0.19	15	glenoid cavity
1	small mammal	vertebra			0.26	15	
1	UNID				0.04	20	
1	UNID				0.12	20	
1	UNID				0.16	20	
2	UNID				0.05	18	
2	UNID				0.08	23	
2	Sciurid	radius			0.25	24	
2	cf. Sigmodon sp.	humerus		unf	0.03	16	
3	UNID				0.21	20	

3	Dipodomys sp.	maxilla		0.26	16	
3	UNID			0.26	30	no evidence of work
3	UNID			0.12	16	
3	UNID			0.17	20	
3	UNID			0.15	32	
3	UNID			0.11	10	
3	UNID			0.07	14	
3	UNID	skull fragment		0.2	13	
3	small mammal	mandible fragment		0.38	17	
3	Sylvilagus sp.	mandible	R	0.92	40	
3	Onychomys cf. leuc.	mandible	L	0.06	15	
3	UNID			0.24	24	
3	med to large mammal			0.66	30	
4	UNID			0.14	16	
4	UNID			0.07	15	
4	UNID			0.04	15	
4	UNID			0.09	21	
4	UNID			0.15	33	
4	UNID			0.51	35	
4	med-large mammal			1.03	20	
4	Sciurid	humerus	L	0.51	37	distal end
4	UNID			0.19	37	
5	UNID			0.28	23	
5	Sylvilagus sp.	maxilla fragment	L	0.1	12	spina masseterica
5	UNID			0.06	25	
5	small mammal	tibia-fibula		0.07	14	
5	cf. Spermophilus sp.	humerus	L	0.34	23	
6	UNID			0.1	17	
6	UNID			0.02	12	
7	cf. Dipodomys sp.	femur	L	0.06	18	

Unit 3

Level	Taxon	Element	Side	Fused	Wgt (g)	Len (mm)	Comment
1	Sciurid	nasal			0.17	21	
1	large mammal				2.2	47	
1	med-large mammal				0.48	18	
1	UNID				0.14	11	
3	UNID				0.1	12	
3	UNID				0.29	18	
3	UNID				0.03	8	
3	small mammal	innominate	R		0.35	30	ilium
3	UNID				0.12	11	
3	UNID				0.16	23	calcined
3	large mammal				8.63	44	
3	UNID				0.31	19	
3	UNID				0.3	20	
4	Sylvilagus sp.	tibia-fibula	R	unf	0.57	33	proximal end
4	Lepus sp.	femur	R		1.46	23	distal end
4	UNID				0.09	16	

Site 5LA6595

Unit 1

Level	Taxon	Element	Side	Fused	Wgt (g)	Len (mm)	Comment
2	Sylvilagus sp.	scapula	R		0.64	39	
2	UNID				0.14	37	
2	UNID				0.04	15	
3	UNID				0.1	31	
3	UNID				0.09	31	
5	Lepus sp.	tibia	R		1.16	21	distal end
5	UNID				0.33	18	
5	UNID				0.27	17	
5	UNID				0.9	25	
5	UNID				0.07	12	
5	UNID				0.17	12	
6	UNID				0.09	18	
6	UNID				0.1	14	

6	Sylvilagus sp.	scapula	L		0.32	43	neck; axillary border
6	Neotoma sp.	humerus	L		0.16	25	distal end
7	UNID				0.08	8	
7	UNID				<.01	4	
7	UNID				0.01	7	
7	small mammal	scapula	R		0.04	16	neck
7	UNID				0.74	26	
7	UNID				0.29	13	
7	UNID				0.13	14	
7	UNID				0.24	14	
7	UNID				0.08	9	
7	cf. Lepus sp.	scapula			0.21	25	
7	UNID				0.34	18	
8	cf. Neotoma sp.	mandible	R		0.12	20	
8	UNID				0.23	16	
8	UNID				0.61	24	
8	small mammal	incisor			0.06	19	
8	small mammal	tibia-fibula			0.58	35	
8	UNID				0.25	23	
9	med to large mammal				0.41	29	
9	Bovidae				25.39	78	
9	cf. Bison bison	tibia	L	unf	38.1	84	distal end
9	cf. Bison bison	tibia	L	unf	4.64	46	distal end
9	cf. Bison bison	tibia	L	unf	7.14	55	distal end
9	cf. Bison bison	tibia	L	unf	2.98	34	distal end
9	large mammal				1.84	35	
9	Sylvilagus sp.	tibia fragment	R		0.33	28	
9	med to large mammal				0.69	29	
9	Sylvilagus sp.	tibia-fibula	R		0.08	21	
9	UNID				0.22	27	
9	UNID				0.35	23	
9	UNID				0.07	15	
9	UNID				0.26	20	

9	UNID			0.21	21	
9	UNID			0.18	29	
9	med to large mammal			0.93	42	
12	UNID			0.02	10	
12	UNID			0.03	12	
12	UNID			0.06	24	
12	UNID			0.11	24	
12	UNID			0.01	8	
13	UNID			0.2	15	
13	Sylvilagus sp.	radius	R	0.12	22	proximal end
13	UNID			0.29	22	
13	UNID			0.05	10	
13	UNID			0.45	18	
13	UNID			0.08	14	
13	UNID			0.12	12	
13	Sylvilagus sp.	mandible	R	0.25	17	
14	Sylvilagus sp.	II metatarsal	L	0.1	15	proximal end; shaft
14	UNID			0.2	12	
14	UNID	rib		0.57	35	
14	small-med mammal	innominate frag.	L	0.14	14	
14	UNID			0.96	28	
14	UNID			0.05	17	
14	UNID			0.01	5	
14	UNID			0.05	6	
14	small-med mammal	innominate frag.	L	0.23	17	
15	UNID			0.05	14	
15	UNID			0.08	12	
15	UNID			0.12	15	
15	UNID			0.27	16	
15	UNID			0.15	16	
17	UNID			0.09	17	
50	UNID			0.09	13	
50	UNID			0.16	11	

Site 5LA6599

Unit 1

Level	Taxon	Element	Side	Fused	Wgt (g)	Len (mm)	Comment
2	large mammal				1.42	25	
2	UNID				0.04	20	
2	UNID				0.15	16	
2	med to large mammal				0.47	18	
2	large mammal				0.24	18	
2	UNID				0.01	6	
2	large mammal				2.88	38	
3	herpetofauna	vertebrae			0.02	11	6 articulated vertebrae
3	Sylvilagus sp.	radius	R		0.34	47	
3	Lepus sp.	radius	L		1.48	67	distal end
3	small mammal	scapula	L		0.12	28	
4	UNID				0.04	10	
4	UNID				0.14	8	
4	UNID				0.01	7	
4	med to large mammal				0.46	19	
4	large mammal				0.82	30	
4	Sylvilagus sp.	ulna	R		0.25	45	distal end and shaft
4	UNID				0.02	12	

Site 5LA6603

Unit 1

Level	Taxon	Element	Side	Fused	Wgt (g)	Len (mm)	Comment
1	Sylvilagus sp.	radius-ulna	L		0.55	45	distal end
1	eggshell				.08 tw		
1	UNID				0.13	19	
2	Sylvilagus sp.	premolar			0.09	16	
2	UNID				0.01	10	
2	UNID				0.05	10	
2	UNID				0.01	16	

2	UNID				0.17	29	
2	small mammal	ulna		unf	0.03	24	
2	Sylvilagus sp.	scapula	L	unf	0.39	44	
2	Sylvilagus sp.	tibia-fibula	R	unf	1.88	80	
2	Zenaida macroura	carpometacarpus	R		0.11	23	
2	UNID				0.1	14	
3	UNID				0.07	8	
3	UNID				0.07	23	
3	UNID				0.16	17	
3	UNID				0.06	21	
3	UNID				0.09	19	
3	UNID				0.12	16	
3	UNID				0.19	33	
3	UNID				0.01	14	
3	UNID				0.11	23	
3	UNID				0.01	17	
3	UNID				0.06	13	
3	UNID				0.24	25	
3	UNID				0.06	26	
3	UNID				0.01	15	
3	UNID				0.24	31	
3	UNID				0.06	16	
3	UNID				0.05	27	
3	UNID				0.05	17	
3	small mammal	incisor			0.01	5	fragment
3	UNID				0.01	15	
3	UNID				0.08	16	
3	UNID				0.01	10	
3	UNID				0.06	19	
3	UNID				0.01	9	
3	UNID				0.01	13	
3	UNID				0.01	14	
3	UNID				0.01	10	

3	UNID				0.01	9	
3	UNID				0.03	12	
3	UNID				0.01	9	
3	Sylvilagus sp.	III metatarsal	R		0.08	19	proximal end
3	small mammal	scapula	R		0.03	11	fragment
3	UNID				0.01	12	proximal end
3	Lepus sp.	upper incisor	L		0.15	14	
3	Sylvilagus sp.	metapodial			0.12	29	distal end
3	Sylvilagus sp.	IV metatarsal	R		0.07	21	proximal end
3	Sylvilagus sp.	radius	L		0.21	38	shaft fragment
3	Sylvilagus sp.	parietal	R		0.12	18	
3	Sylvilagus sp.	mandible	R		1.78	51	complete
3	Sylvilagus sp.	scapula	L		0.48	43	
3	Sylvilagus sp.	palatine	R		0.08	11	fragment
3	cf. Cynomys sp.	scapula	L	unf	0.25	30	
3	Neotoma sp.	mandible	L		0.3	26	
3	small mammal	incisor			0.01	11	fragment
3	small mammal	fibula			0.03	23	proximal end
3	UNID	rib			0.05	17	fragment
3	Sylvilagus sp.	metapodial		unf	0.11	23	distal end
3	small mammal	innominate			0.06	16	fragment
3	UNID				0.16	21	
3	UNID				0.07	12	
3	UNID				0.03	12	
3	UNID	rib			0.08	29	fragment
3	UNID	rib			0.09	33	fragment
3	UNID	skull fragment			0.07	12	
3	small mammal	scapula			0.05	18	
3	small mammal	tooth fragment			0.04	13	
3	UNID	rib			0.04	18	fragment
3	UNID	phalanx			0.04	10	
3	UNID	rib			0.07	30	
3	UNID	rib			0.04	31	

3	UNID	rib			0.05	17	fragment
4	UNID				0.06	17	
4	UNID				0.06	14	
4	UNID				0.06	13	
4	UNID				0.1	18	
4	UNID				0.04	14	
4	Sylvilagus sp.	tibia	L	unf	0.38	35	proximal end, calcined
4	UNID				0.32	29	calcined
4	UNID				0.31	35	calcined
4	UNID				0.11	14	calcined
4	UNID				0.58	44	
4	UNID				0.05	16	
4	UNID				0.01	10	
4	UNID				0.01	7	
4	UNID				0.22	26	
4	UNID				0.16	38	
4	UNID				0.01	3	
4	UNID				0.03	9	
4	UNID				0.01	17	
4	UNID				0.08	17	
4	UNID				0.01	8	
4	UNID				0.05	18	
4	UNID				0.01	13	
4	UNID				0.25	25	calcined
4	UNID				0.2	23	
4	UNID				0.01	6	
4	Sylvilagus sp.	upper 2nd incisor			0.01	7	
4	Sylvilagus sp.	femur	R		0.91	42	shaft, proximal end
4	small mammal	incisor			0.04	10	
4	UNID	rib fragment			0.03	11	
4	UNID				0.13	24	
4	UNID				0.11	19	
4	UNID				0.06	13	calcined

4	UNID				0.1	22	calcined
4	UNID				0.01	9	
4	bird	sternum fragment			0.13	23	
4	UNID				0.15	27	
4	Sylvilagus sp.	scapula	R		0.39	43	
4	UNID				0.02	7	
4	UNID				0.2	40	
4	UNID				0.01	5	
4	UNID				0.03	14	
4	UNID				0.05	12	
4	UNID				0.08	13	
4	UNID				0.03	14	
4	UNID				0.03	19	
5	Sylvilagus sp.	III metatarsal	R		0.23	33	complete
5	UNID				0.01	6	
5	small rodent	tibia-fibula			0.01	13	
5	Lepus sp.	lower incisor	L		0.21	25	
5	Sylvilagus sp.	IV metatarsal	R		0.23	33	complete
5	UNID				0.01	16	
5	UNID				0.45	27	
5	Sylvilagus sp.	V metatarsal	R	fus	0.19	30	complete
5	Sylvilagus sp.	II metatarsal	R	fus	0.28	34	
5	UNID				0.1	30	
5	Sylvilagus sp.	II metatarsal	R		0.26	33	complete
6	UNID				0.14	13	
6	UNID				0.01	12	
6	small mammal	incisor			0.23	18	broke into pieces
6	small mammal	tibia			0.17	34	fragment
6	Sylvilagus sp.	ulna	R		0.15	34	distal end
6	Sylvilagus sp.	radius	R		0.27	37	calcined
6	Sylvilagus sp.	ulna	R		0.33	49	calcined
6	UNID				0.15	39	calcined
50	Sylvilagus sp.	parietal	L		0.08	17	

50	UNID				0.08	21	
50	UNID				0.11	23	
50	UNID				0.06	20	

Unit 1 and 2

Level	Taxon	Element	Side	Fused	Wgt (g)	Len (mm)	Comment
50	UNID				0.01	5	
50	UNID				0.01	24	
50	UNID				0.04	9	
50	UNID				0.03	9	
50	UNID				0.01	27	
50	UNID				0.04	8	
50	UNID				0.07	17	
50	small mammal	incisor			0.04	10	
50	Sylvilagus sp.	scapula	L		0.43	40	
50	Sylvilagus sp.	tibia	L	unf	0.97	41	proximal end
50	UNID				0.13	15	

Unit 2

Level	Taxon	Element	Side	Fused	Wgt (g)	Len (mm)	Comment
2	Sylvilagus sp.	mandible	R		1.06	46	
2	Sylvilagus sp.	1st lower incisor	R		0.1	17	
2	Sylvilagus sp.	metapodial			0.12	17	distal end
2	Sylvilagus sp.	tibia-fibula	L	fus	2.05	86	
2	UNID				0.27	21	
3	UNID				0.02	18	
3	UNID				0.1	24	
3	UNID	rib			0.11	40	
3	UNID				0.03	18	
3	UNID				0.08	15	
3	UNID				0.05	18	
3	UNID				0.1	40	
3	UNID				0.24	25	
3	UNID				0.05	27	

3	UNID			0.06	19	
3	UNID			0.1	13	
3	UNID			0.01	7	
3	UNID			0.05	18	
3	UNID	rib		0.07	28	
3	UNID			0.04	14	
3	UNID			0.1	18	
3	UNID			0.03	18	
3	Sylvilagus sp.	tibia	L	0.33	19	distal end
3	bird	mandible		0.26	43	
3	Sylvilagus sp.	tibia-fibula	L	1.13	60	prox. end, shaft
3	UNID			0.03	26	
3	Sylvilagus sp.	ulna	R	0.46	61	
3	UNID	rib		0.06	22	
3	Sylvilagus sp.	calcaneus	R	0.29	17	
3	Sylvilagus sp.	scapula	L	0.22	27	
3	Sylvilagus sp.	V metatarsal	R	0.1	26	
3	cf. Sylvilagus sp.	ilium		0.21	23	fragment
3	Neotoma sp.	mandible	R	0.22	21	
3	Neotoma sp.	innominate	R	0.24	36	complete
3	small mammal	scapula	L	0.13	31	
3	small mammal	humerus		0.39	31	shaft
3	small mammal	scapula		0.12	29	
3	small mammal	scapula		0.08	26	
3	UNID	rib		0.08	37	
3	Neotoma sp.	molar	R	0.01	4	
3	UNID	rib		0.06	26	
4	UNID			0.04	31	
4	UNID			0.57	31	
4	UNID			0.03	22	
4	UNID			0.03	19	
4	UNID			0.02	7	
4	UNID			0.02	10	

4	UNID			0.07	18	
4	UNID			0.02	7	
4	UNID	rib		0.04	27	
4	UNID			1.52	68	
4	UNID			0.01	6	
4	UNID			0.05	32	
4	UNID			0.03	17	
4	UNID			0.08	19	
4	UNID			0.02	14	
4	UNID			0.04	13	
4	Sylvilagus sp.	III metatarsal	R	0.24	34	
4	UNID	skull fragment		0.06	13	
4	UNID			0.04	17	
4	Sylvilagus sp.	II metatarsal	R	0.25	33	
4	Sylvilagus sp.	III metatarsal	L	0.1	24	proximal end; shaft
4	Sciurid	scapula	R	0.36	33	
4	cf. Cynomys sp.	frontal	L	0.17	24	
4	cf. Cynomys sp.	frontal	R	0.15	26	
4	UNID			0.09	28	
4	UNID			0.06	30	
4	UNID			0.03	11	
4	UNID			0.09	14	
4	UNID			0.08	22	
4	UNID			0.1	16	
4	UNID	scapula fragment		0.12	18	
4	Sylvilagus sp.	scapula	R	0.37	40	
5	Sciurid	clavicle		0.15	24	calcined
5	UNID			0.02	17	
5	UNID			0.09	19	calcined
5	Cynomys sp.	parietal		0.73	27	
5	Sylvilagus sp.	radius	L	0.29	40	proximal end; shaft
5	small mammal	incisor		0.08	19	

Unit 3

Level	Taxon	Element	Side	Fused	Wgt (g)	Len (mm)	Comment
1	UNID				0.13	27	
2	UNID				0.3	29	

Unit 4

Level	Taxon	Element	Side	Fused	Wgt (g)	Len (mm)	Comment
1	Neotoma sp.	mandible	L		0.3	27	
1	UNID				0.25	25	
1	Sceloporus sp.	cranium			0.03	12	
1	Neotoma sp.	innominate	L		0.26	34	ilium; acetebulum
1	herpetofauna	articulated verts.			0.06	27	
2	UNID				0.05	21	
2	Sylvilagus sp.	scapula	R		0.53	48	
2	Sylvilagus sp.	ascending ramus	L		0.25	26	post-dep. damage
2	Neotoma sp.	lower molar			0.01	5	
2	small mammal	axis			0.05	13	
2	UNID	vertebra			0.05	7	
2	UNID				0.02	12	
2	UNID				0.75	40	
3	UNID				0.02	27	
3	UNID	phalanx			0.23	22	
3	Thomomys sp.	mandible	R		0.18	13	
3	Sylvilagus sp.	vertebra			0.43	21	
3	UNID				0.11	26	

Unit 5

Level	Taxon	Element	Side	Fused	Wgt (g)	Len (mm)	Comment
1	UNID				0.49	32	

Site 5LA6618

Unit 1

Level	Taxon	Element	Side	Fused	Wgt (g)	Len (mm)	Comment
3	Sylvilagus sp.	tibia	L	unf	1.06	53	proximal end and shaft
3	Sylvilagus sp.	scapula	L		0.22	30	
3	UNID				0.27	21	
3	UNID				0.22	26	

DATABASE SUMMARY OF FAUNAL REMAINS

Water screen remains

Site 5LA6568

Unit 1

Level	Taxon	Element	No.	Side	Fused	Wgt (g)	Len (mm)	Comment
1	small mammal	incisor fragments	5			.14 tw		
1	cf. Eremophila sp.	humerus	1	R		0.02	7	proximal end
1	UNID		7			.37 tw		
1	UNID	phalanges	4			.01 tw		
1	UNID	ribs	2			.01 tw		
1	UNID	caudal vertebra	2			.04 tw		
1	med to large mam.		1			0.71		
1	med to large mam.	tooth fragments	2			.05 tw		
1	small mammal	astragali	2			0.08		
1	small mammal	tibia	1			0.04		distal end
1	small mammal	articular surfaces	2			.05 tw		
1	small mammal	metapodials	5			.08 tw		
1	UNID		36			1.29 tw		
1	Neotoma sp.	molars	4			0.11		enamel worn down
1	herpetofauna	mand/maxilla fragments	3			.01 tw		
1	Sylvilagus sp.	tibia	1	L		0.1	12	distal end
1	cf. Sylvilagus sp.	humerus	1	R	unf	0.1	13	proximal end
1	small mammal	fibula	1			0.01		
1	Neotoma sp.	molars	10			.32 tw		
1	small mammal	mand/maxilla fragment	3			.06 tw		
1	small rodent	mandible	1	L		0.01		
1	small rodent	mandible	1	L		<.01		
1	small mammal	calcaneus	1	L		0.02		
1	small mammal	calcaneus	1	R		0.02		
1	small mammal	tooth fragment	1			0.04		
1	small mammal	mandible fragment	1			0.02		
1	Peromyscus sp.	mandible	1	L		0.03	13	
2	small mammal	tooth fragment	1			<.01		
2	UNID		12			.28 tw		

2	UNID		1		0.03		
2	UNID	phalanges	3		.08 tw		
2	small mammal	incisors	3		.15 tw		
2	Sylvilagus sp.	astragalus	1	R	0.13	10	
2	small mammal	scapula	1		0.01		
2	Neotoma sp.	molar fragments	3		.07 tw		
3	UNID	caudal vertebra	1		<.01		
3	cf. Neotoma sp.	molar	1		0.03		
3	large mammal	tooth fragment	1		0.5		
3	small mammal	mand/maxilla fragment	1		0.08		
3	large mammal		3		4.38 tw		
3	small mammal	scapulae	2		.17 tw		
3	small mammal	calcaneus	1		0.05		
3	small mammal	astragalus	1		0.02		
3	small mammal	incisor	1		0.01		
3	small mammal	incisor	1		0.01		
3	UNID	caudal vertebrae	2		0.03		
3	UNID	axis	1		0.01		
3	UNID	phalanges	4		0.03		
3	UNID	phalanges	3		0.01		
3	UNID		110		6.45 tw		
3	UNID		95		4.68 tw		
3	small rodent	tibia	1		0.01		distal end
3	Lepus sp.	humerus	1	L	0.35	10	distal end
3	small mammal	innominate	1		0.07		
3	Cynomys sp.	mandible	1	L	0.2	12	
3	small mammal	art. portion of mand.	1		0.03		
3	cf. Sylvilagus sp.	metapodial	1		0.09	19	snapped
3	Sylvilagus sp.	molariforms	2		.09 tw		
3	rodent	mand/maxilla fragment	1		0.01		
3	small mammal	zygomatic arch	1		0.05		
3	mammal	tooth fragments	6		.14 tw		
3	UNID	vertebra	1		0.02		

3	UNID	caudal vertebra	1		<.01		
3	UNID	phalanx	1		0.03		
3	Sylvilagus sp.	molariform	1		0.05	10	
3	UNID		61		1.90 tw		
3	Sylvilagus sp.	tibia	1	L	0.24	15	distal end
3	Sylvilagus sp.	scapula	1	L	0.12	15	
3	Sylvilagus sp.	molariform	1		0.02	7	
3	Sylvilagus sp.	ulna	1		0.13	16	
3	Sylvilagus sp.	III metatarsal	1	L	0.1	16	
3	Sylvilagus sp.	tibia	1	R	0.14	9	distal end
3	UNID		3		.05 tw		
3	Sylvilagus sp.	radius	1	R	0.02	8	proximal end
4	small mammal	femur	1		0.01		shaft
4	small mammal	IV metatarsal	1	R	0.04	10	
4	small mammal	scapula	1		0.03		
4	small rodent	femur	1		0.04	6	distal end
4	small mammal	metapodials	5		0.05		
4	small rodent	femur	1	R	0.03	6	distal end
4	small mammal	tooth fragment	1		0.01		
4	small mammal	calcaneus	1		0.05		
4	small mammal	calcaneus	1		0.02		
4	small mammals	incisors	2		0.13		
4	UNID	phalanges	3		0.02		
4	UNID		79		3.13		
4	Sylvilagus sp.	molariforms	2		0.04		
4	small mammal	incisor	1		0.02		
4	UNID		55		1.81		
4	small mammal	astragalus	1		0.02		
4	Bovidae	skull fragment	1		3.89	37	
4	Sylvilagus sp.	tibia	1	R	0.34	22	distal end
4	UNID	phalanx	1		0.04		
4	cf. Neotoma sp.	ulna	1	R	0.03	9	
4	Sylvilagus sp.	humerus	1	R	0.08	7	

4	small mammal	tooth fragments	4		0.01		
4	small mammal	innominate	1		0.07		
4	small mammal	metapodial	1		0.01		
4	small mammal	innominate	1		0.06	10	acetabulum
4	small mammal	mand/maxilla fragment	1		0.04		
4	UNID	rib	1		0.03		
4	UNID		34		1.46		
4	UNID		85		5.51		
4	Sylvilagus sp.	femur	1	R	0.12	9	
4	small mammal	maxilla	1		0.1	9	
4	Peromyscus sp.	femur	1	L	0.01	7	
5	small mammal	metapodial	1		0.05		Snapped; distal end
5	small mammal	incisor	1		0.03		
5	small mammal	incisor	1		0.01		
5	small mammal	art. portion mand.	1		0.05		
5	medium mammal	metapodial	1		0.11	8	distal end
5	Leporid	art. portion mand.	1	L	0.11	13	
5	UNID	phalanges	2		0.02		
5	UNID		99		2.65		
5	UNID		122		4.06		
5	herpetofauna	vertebra	1		0.02		
5	cf. Cynomys sp.	innominate	1	R	0.19	20	ischium, acet.
5	Cynomys sp.	zygomatic arch	1	R	0.08	15	
5	cf. Sylvilagus sp.	ulna	1	R	0.14	22	proximal end
5	Sylvilagus sp.	molariforms	2		0.07		
5	Sylvilagus sp.	II metatarsal	1	L	0.05	9	proximal end
5	Sylvilagus sp.	tibia	1	R	0.18	17	distal end
5	Sylvilagus sp.	mandible	1	L	0.22	19	possible abcess
5	small mammal	metapodial	1		0.15		
6	small mammal	incisor	1		0.07		
6	small mammal	tooth fragment	1		0.04		
6	small mammal	tooth fragment	1		0.01		
6	UNID		34		1		

6	small mammal	tooth fragment	1			0.03		
6	small mammal	radius	1			0.03		
6	UNID		11			0.19		
6	UNID	caudal vertebra	1			0.02		
6	UNID		18			0.67		
6	small mammal	metapodial	1			0.04		
6	small mammal	scapulae	2			0.1		
6	small-med mam.	tooth fragments	3			0.07		
6	med-large mammal		1			0.9		
6	UNID		63			2.27		
6	Cynomys sp.	scapula	1	L		0.29	26	
6	Sylvilagus sp.	IV metatarsal	1	R		0.2	35	
6	Sylvilagus sp.	humerus	1	R		0.35	27	distal end
6	Sylvilagus sp.	calcaneus	1	R		0.27	17	
6	herpetofauna	mand/maxilla frag.	1			0.02		
6	small mammal	ulna	1			0.05		
8	Sylvilagus sp.	molariform	1			0.05	8	
11	UNID		1			<.01		
13	UNID		1			<.01		
14	UNID		1			0.01		

Unit 2

Level	Taxon	Element	No.	Side	Fused	Wgt (g)	Len (mm)	Comment
1	Sylvilagus sp.	III metatarsal	1	R		0.09	23	
1	UNID		1			0.02		
2	cf. Sylvilagus sp.	molariform	1			0.06		
2	small mammal	metapodial	1			0.04		
2	UNID		5			0.07		
4	Sylvilagus sp.	astragalus	1	L		0.12		
4	UNID		27			0.83		
5	UNID		16			0.52		

Unit 3

Level	Taxon	Element	No.	Side	Fused	Wgt (g)	Len (mm)	Comment
1	UNID		12			0.47		
1	UNID		6			0.16		
1	UNID	phalanx	1			0.03		
1	small mammals	mand/maxilla frag.	2			0.04		
1	small mammal	ulna	1			0.03		
2	small mammal	phalanx	1			0.03		
2	UNID		22			0.8		
2	medium mammal	ulna	1			3.46	121	eroded
2	Sylvilagus sp.	IV metatarsal	1	L		0.06		Snapped
2	herpetofauna	vertebra	1			0.04		
2	UNID		5			0.16		
2	Sylvilagus sp.	III metatarsal	1	R		0.03		
3	Sylvilagus sp.	lower premolar	1	R		0.07	11	
3	UNID		2			0.12		
3	UNID		4			0.07		
7	UNID		1			0.03		
8	UNID		2			0.05		
10	UNID		2			0.25		
10	UNID		1			0.01		
13	UNID		1			0.01		
13	Sylvilagus sp.	upper molar	1			0.02	4	
13	Neotoma sp.	molar	1			0.02	5	
15	herpetofauna	vertebra	1			0.01		
15	small mammal	tooth fragments	2			0.08		

Site 5LA6569

Unit 1

Level	Taxon	Element	No.	Side	Fused	Wgt (g)	Len (mm)	Comment
2	herpetofauna	mand/maxilla fragments	1			0.01	10	
2	small mammal	incisor fragment	1			0.04		
2	small mammal	incisor fragment	1			0.03		
2	small mammal	femur	1	R	unf	0.01		

2	small mammal	diaphysis	1		unf	0.01		
2	UNID		3			.06 tw		
3	small mammal	metapodial	1			0.01		
3	UNID	vertebra	1			<.01		
3	UNID	rib fragment	1			0.01		
3	UNID	phalanx	1			0.01		
3	cf. Neotoma sp.	humerus	1	R		0.02	6	distal end
3	UNID	caudal vertebrae	2			.03 tw		
3	UNID		8			.12 tw		
3	small rodent	innominate	1	L		0.01	9	acetabulum, partial ischium
3	Neotoma sp.	mandible frag.	1	R		0.03		
3	Peromyscus sp.	femur	1	R	unf	0.04	16	unf distally
3	herpetofauna	vertebrae	3			0.02		
3	small mammal	incisor fragment	1			0.02		
3	small mammal	tooth fragment	1			0.03		
4	UNID		8			.14 tw		
4	Sylvilagus sp.	mandible	1	R		0.4	23	
4	small mammal	molariform	1			0.03		
4	small mammal	tooth fragment	1			0.01		
4	UNID	vertebra frag.	1			0.01		
5	UNID	phalanx	1			0.01		
5	UNID		15			.24 tw		

Site 5LA6592

Unit 1

Level	Taxon	Element	No.	Side	Fused	Wgt (g)	Len (mm)	Comment
1	Lepus sp.	scapula	1	L		0.25	21	neck
1	small mammal	tooth fragments	3			.08 tw		
1	small mammal	tibia-fibula	1		unf	0.02		
1	small mammal	fenur	1			0.03		distal end
1	small mammal	mandible	1	R		0.01		
1	small mammal	metapodial	1		unf	0.05		SNAPPED
1	UNID		3			.09 tw		
1	UNID		20			.48 tw		

2	UNID		3			.06 tw		
2	med-large mammal		1			0.63		
2	med-large mammal		1			0.18		
2	UNID		9			.15 tw		
2	UNID	rib	1			0.05		
3	UNID		1			0.01		
3	UNID		9			.12 tw		
3	small mammal	skull fragments	4			.22 tw		
3	small mammal	mandible	1	L		<.01		
3	small mammal	metapodial	1			0.01		
3	small mammal	incisor fragment	1			0.05		
3	Sylvilagus sp.	ulna	1	L		0.21	40	distal end
4	UNID		11			.13 tw		
4	small mammal	scapula fragment	1			0.01		
4	small mammal	incisor fragment	1			<.01		
4	small mammal	calcaneus	1			0.09	9	
4	UNID	vertebra	1			<.01		
4	UNID		2			.07 tw		
4	Heteromyidae	humerus	1	L	unf	0.02	14	distally unfused
5	UNID		1			0.03		
5	UNID		8			.16 tw		
5	Sigmodon cf. hispidus	tibia-fibula	1			0.09	23	
5	UNID	diaphysis	1			0.6		
6	Sylvilagus sp.	II metatarsal	1	L		0.21	31	
6	Sylvilagus sp.	upper first incisor	1			0.07	12	
6	UNID		7			.10 tw		

Unit 2

Level	Taxon	Element	No.	Side	Fused	Wgt (g)	Len (mm)	Comment
1	UNID		3			.24 tw		
1	UNID		14			.42 tw		
1	small mammal	calcaneus	1			0.11	12	
1	cf. Cynomys sp.	maxilla fragment	1			0.26	13	

2	cf. Sigmodon sp.	tibia-fibula	1			0.07	22	
2	small mammal	astragalus	1			0.02	6	
2	UNID		8			.25 tw		
2	Sylvilagus sp.	mandibular fossa	1	L		0.09	12	
3	small mammal	tooth fragments	2			<.01 tw		
3	UNID		6			.76 tw		
3	UNID		2			.03 tw		
3	Cynomys sp.	lower molar	1	R		0.05	8	
3	herpetofauna	vertebra	1			0.01		
3	Sylvilagus sp.	upper first incisor	1	L		0.02	8	
4	UNID		9			.07 tw		
5	small mammal	tooth fragments	2			<.01 tw		
5	small mammal	innominate fragment	1			0.01		
5	small mammal	incisors	2			.02 tw		
5	small mammal	mandible/maxilla fragment	1			0.02		
5	Peromyscus sp.	femur	1	L		0.03	16	
5	UNID		15			.16 tw		
6	herpetofauna	vertebra	1			0.02		
6	small mammal	tooth fragments	7			.03 tw		
6	UNID		2			0.09		
7	UNID		2			<.01 tw		

Unit 3

Level	Taxon	Element	No.	Side	Fused	Wgt (g)	Len (mm)	Comment
2	small mammal	incisor	1			0.04		
2	UNID		9			.25 tw		
2	UNID		4			.07 tw		
2	small mammal	femur	1			0.04		head of femur
2	small mammal	tooth fragment	1			.01 tw		
3	UNID	phalanx	1			0.03		
3	UNID		1			<.01		
3	UNID		2			0.02		
4	Sylvilagus sp.	upper first incisor	1	L		0.03	9	

4	cf. Neotoma sp.	molar	1			0.01	4	
4	small mammal	epiphysis	1			0.03		
4	UNID	condyle	1			0.01		
4	UNID	phalanx	1			<.01		
4	UNID		1			0.04		
4	UNID		7			.28 tw		

Site 5LA6595

Unit 1

Level	Taxon	Element	No.	Side	Fused	Wgt (g)	Len (mm)	Comment
2	UNID		4			.05 tw		
2	small mammal	tooth fragment	1			0.05	8	
2	UNID		1			.01 tw		
4	UNID		24			.92 tw		
4	Leporid	ascending ramus	1	L		0.1	11	
4	Sylvilagus sp.	humerus	1	L		0.1	7	distal end
4	Sylvilagus sp.	III metatarsal	1			0.02	5	
4	UNID	phalanx	1			0.01		
5	UNID		6			.05 tw		
5	UNID		9			.22 tw		
5	UNID		32			.57 tw		
5	small mammal	tooth fragments	4			.05 tw		
5	small mammal	scapula	1	R		0.15		
5	small mammal	astragalus	1			0.01		
5	herpetofauna	vertebra	1			0.01		
6	UNID		6			.03 tw		
6	herpetofauna	vertebrae	2			.04 tw		
6	Sylvilagus sp.	III metatarsal	1	L		0.1	16	snapped
6	medium mammal	innominate	1	R		0.58		part. acetabulum
6	medium mammal	innominate	1	R		1.04		part. ilium
6	small mammal	tooth fragment	1			<.01		
6	UNID	phalanx	1			<.01		
6	UNID		5			.31 tw		

6	UNID		28		1.25 tw		
6	Sylvilagus sp.	III metatarsal	1	R	0.05	8	proximal end
6	UNID		35		1.15 tw		
6	UNID	tooth fragments	3		.02 tw		
6	UNID	caudal vertebra	1		<.01		
6	cf. Sylvilagus sp.	premolar	1		0.03	8	
6	UNID	incisor fragment	1		0.01		
7	Sylvilagus sp.	tibia	1	L	0.45	30	distal end
7	UNID		10		.16 tw		
7	UNID		4		.07 tw		
7	small mammal	incisor fragment	1		0.05		
7	UNID		4		.11 tw		
7	Sylvilagus sp.	III metatarsal	1	R	0.1	9	proximal end
7	small mammal	tooth fragment	1		0.01		
7	UNID		2		.07 tw		
7	small mammal	incisor fragment	1		0.01		
8	small mammal	incisor fragment	1		0.01		
8	UNID		1		<.01		
8	UNID		11		.26 tw		
8	UNID		14		.29 tw		
9	UNID	rib	1		0.01		
9	UNID		14		.30 tw		
9	med to large mammal		1		0.7		
10	UNID		6		.12 tw		
10	UNID		5		.13 tw		
10	UNID		7		.18 tw		
10	small mammal	incisor fragment	1		0.02		
10	UNID		5		.12 tw		
10	UNID	rib	1		<.01		
11	UNID		2		.08 tw		
11	Sylvilagus sp.	tibia	1	R	0.26	18	distal end
11	UNID		3		.07 tw		
11	UNID		7		.06 tw		

12	UNID		1			.01 tw		
12	UNID	phalanx	1			0.01		
12	UNID		2			.05 tw		
12	UNID		9			.16 tw		
12	UNID		6			.08 tw		
13	UNID		2			.01 tw		
13	small mammal	tooth fragment	1			<.01		
13	UNID		1			.01 tw		
13	UNID		1			.01 tw		
14	UNID		4			.09 tw		
15	UNID		1			<.01		
15	herpetofauna	mand/maxilla fragment	1			<.01	7	
16	UNID		1			.01 tw		
16	UNID		1			.04 tw		
16	herpetofauna	vertebra	1			0.01		
16	UNID		4			.06 tw		
16	UNID	phalanx	1			0.02		
17	UNID		8			.10 tw		
17	UNID		2			.17 tw		
18	Neotoma sp.	mandible	1	R		0.29	24	
18	UNID		3			.04 tw		
18	UNID		4			.15 tw		
19	UNID	phalanx	1			0.01		
19	UNID		1			.05 tw		
20	UNID		4			.06 tw		
20	UNID		1			.01 tw		
50	UNID		1			.01 tw		
50	UNID		1			.02 tw		

Site 5LA6599

Unit 1

Level	Taxon	Element	No.	Side	Fused	Wgt (g)	Len (mm)	Comment
2	UNID		2			.06 tw		

2	UNID		3			.03 tw		
2	small bird	humerus	1			0.02	7	distal end
3	small mammal	incisor	1			<.01		
3	UNID		8			.19 tw		
3	UNID		4			.07 tw		
3	cf. Neotoma sp.	mandible	1	R		0.09	15	
4	UNID		1			0.02		
4	UNID		6			.14 tw		
5	UNID		4			.13 tw		
5	UNID		4			.08 tw		

Unit 2

Level	Taxon	Element	No.	Side	Fused	Wgt (g)	Len (mm)	Comment
3	UNID		1			0.04		
7	UNID		1			0.02		
8	UNID		1			0.05		

Site 5LA6603

Unit 1

Level	Taxon	Element	No.	Side	Fused	Wgt (g)	Len (mm)	Comment
2	UNID		3			.06 tw		
2	UNID		2			.03 tw		
3	Sylvilagus sp.	scapula	1	R		0.1	22	
3	cf. Sylvilagus sp.	skull	1			0.02	9	indeterminate skull frag.
3	cf. Sylvilagus sp.	humerus	1	R		0.03	5	proximal end
3	UNID	tooth fragment	1			0.04		
3	UNID		26			.71 tw		
3	UNID		10			.15 tw		
4	UNID	scapula	1			0.01		
4	UNID		15			.21 tw		
4	UNID		44			.87 tw		
4	UNID	caudal vertebra	1			0.01		
5	Sylvilagus sp.	III metatarsal	1	R	fus	0.27	35	

5	UNID		2			.10 tw		
5	UNID		6			.37 tw		
6	UNID		5			.19 tw		
7	UNID		1			0.14		

Unit 2

Level	Taxon	Element	No.	Side	Fused	Wgt (g)	Len (mm)	Comment
2	small mammal	calcaneus	1			0.04		
3	Sylvilagus sp.	II metatarsal	1	L	fus	0.28	35	
3	UNID		25			1.11 tw		
3	UNID	phalanx	1			<.01		
3	UNID	phalanx	1			<.01		
3	UNID	rib	1			0.1		
3	UNID		3			<.01 tw		
3	small mammal		1		unf	0.07		distal end
3	cf. Sylvilagus sp.	scapula	1	L		0.1	21	fragment
3	Sylvilagus sp.	molariform	1			0.07	11	
3	Sylvilagus sp.	scapula	1	R		0.57	44	
3	Eremophila alpestri	humerus	1	R		0.07	23	complete
3	Sylvilagus sp.	fibula	1	L		0.09	33	
4	small mammal	tooth	1			0.05		
4	UNID		4			.10 tw		
4	Neotoma sp.	mandible	1	R		0.4	28	
4	UNID	rib	1			0.02		
4	small mammal	metatarsal	1		fus	0.05	13	
5	UNID		6			.25 tw		
5	UNID		33			.62 tw		

Unit 4

Level	Taxon	Element	No.	Side	Fused	Wgt (g)	Len (mm)	Comment
1	UNID		2			.16 tw		
3	small mammal	mand/maxilla	1			0.04		
3	UNID		3			.03 tw		
3	small mammal	mand/maxilla	1			0.02		

3	cf. Neotoma sp.	maxilla	1	R		0.03	10	fragment
3	cf. Neotoma sp.	mandible	1	L		0.09	9	
3	cf. Thomomys sp.	scapula	1	L		0.03	14	fragment
3	Sylvilagus sp.	metapodial	1			0.05	12	
3	UNID	phalanx	1		fus	0.06		complete

Site 5LA6618

Unit 1

Level	Taxon	Element	No.	Side	Fused	Wgt (g)	Len (mm)	Comment
2	UNID		2			.03 tw		
2	UNID	diaphysis	1		unf	0.01		
2	UNID	diaphysis	1		unf	0.01		
2	UNID	diaphysis	1		unf	0.01		
3	cf. Sylvilagus sp.	scapula	1	L		0.22	33	
3	UNID	tooth fragment	1			0.02		
3	UNID		8			.39 tw		

Unit 2

Level	Taxon	Element	No.	Side	Fused	Wgt (g)	Len (mm)	Comment
1	UNID		4			.15 tw		
1	UNID	tooth fragments	2			.02 tw		