Preliminary Archaeological Investigations at the Sierra Diablo Cave Site: Paleoindian and Archaic Occupations in Hudspeth County, Texas

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PRELIMINARY ARCHAEOLOGICAL INVESTIGATIONS AT THE SIERRA DIABLO CAVE SITE: PALEOINDIAN AND ARCHAIC OCCUPATIONS IN HUDSPETH COUNTY, TEXAS

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Dean of the Graduate School
DEDICATION

This thesis is dedicated to my mother, Patricia Vasquez. Last year, I watched her battle cancer to the bitter end. Nothing has been harder. Like kids do, I was always in the dirt, pockets full of rocks, and always looking for the next adventure. My zeal for discovery was never discouraged. I love you ma.

My wife, Linda, is the reason this thesis was completed. Every man needs a good woman to tell him what to do. Her support has no bounds …I love you Lin! My children are my inspiration, Lukas Pascal and baby-girl on-the-way. Several people have helped me along the way. Jesse Clark was my right hand throughout the excavations. My TRC Environmental colleagues and bosses have been nothing less than fantastic. Friends and family have come to the rescue when needed, from even 5,000 miles away in the Netherlands. Dr. David Carmichael provided encouragement, experience, knowledge, and all of his field gear to make this all possible! Dr. Arthur Harris was instrumental in initiating the MOU and analyzing the bones. Drs. Richard Langford (Geological Sciences) and Tim Collins (Sociology and Anthropology) are always appreciated and were a pleasure to have on my committee. Without permission and support from Circle Ranch, this research was not possible. I am grateful to all.

This thesis introduces the Sierra Diablo Cave Site. The task of truly understanding the site has just begun. The work we did sets a foundation for future endeavors in the central Trans-Pecos region of western Texas, where archaeology is profoundly present and scarcely documented. We took a glimpse through a prehistoric window and saw shadows of the natives and the objects of their lives. It was awesome.

*It’s not what you find; it’s what you find out.*

*David Hurst Thomas*
PRELIMINARY ARCHAEOLOGICAL INVESTIGATIONS AT THE
SIERRA DIABLO CAVE SITE: PALEOINDIAN AND ARCHAIC
OCCUPATIONS IN HUDSPETH COUNTY, TEXAS

by

JOSE JAVIER VASQUEZ, B.A.

THESIS

Presented to the Faculty of the Graduate School of
The University of Texas at El Paso
in Partial Fulfillment
of the Requirements
for the Degree of

MASTER OF ARTS

Department of Sociology and Anthropology
THE UNIVERSITY OF TEXAS AT EL PASO

December 2010
ACKNOWLEDGEMENTS

Put simply, I would not have been able to produce this thesis without the help of a hard-working crew. Next to each volunteer’s name is a brief description of their efforts. Each field session was unique and exciting. Neither sweat, nor dirt, or angry cows could stop them. Thank you all.

Ignacio Ibarra (surface mapping and collections)

Angela Chavez (Assistant field supervisor; screening)
Jesse Clark (Assistant field supervisor; participated in all activities)
Pamela Manning (Cataloged all artifacts, excavation, screening, and surface mapping)
Luis Sierra (Surface mapping, excavation, screening)

Field Session 2 (2.19.2010 through 2.21.2010)
Angela Chavez (Assistant field supervisor; screening)
Jesse Clark (Assistant field supervisor; participated in all activities)
Francisco Enriquez (Excavation and screening)
Leslie Landin (Excavation and screening)
Pamela Manning (Cataloged all artifacts, excavation, and screening)
Dave McKenny (Excavation and screening)
Sandra Nevarez (Video and photography, excavation, and screening)
Nicole Ronquillo (Excavation and screening)
Aurelio Saldaña (Excavation and screening)

Field Session 3 (4.9.2010 through 4.11.2010)
Angela Chavez (Assistant field supervisor; screening)
Jesse Clark (Assistant field supervisor; participated in all activities)
Peter Diaz (Excavation and screening)
Pamela Manning (Cataloged all artifacts, excavation, and screening)
Dave McKenny (Excavation and screening)
Sandra Nevarez (Video and photography, surface mapping, excavation, and screening)
Aurelio Saldaña (Excavation and screening)
Ruben Silva (Video and photography, surface mapping, excavation, and screening)

Field Session 4 (6.25.2010 through 6.27.2010)
Phil Alig (Excavation and screening)
Angela Chavez (Assistant field supervisor; screening)
Jesse Clark (Assistant field supervisor; participated in all activities)
Peter Condon (Consultant; excavation and screening)
Peter Diaz (Excavation and screening)
Gema Gonzalez (Screening)
Dylan Jacobs (Excavation and screening)
Pamela Manning (Cataloged all artifacts, excavation, and screening)
Dave McKenny (Excavation and screening)
Aurelio Saldaña (Excavation and screening)
Ruben Silva (Video and photography, excavation, and screening)

Special thanks to Circle Ranch Foreman,
Evidencio Seijas, for great hospitality and insight.
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CHAPTER I INTRODUCTION

This research was undertaken in partial fulfillment of the requirements of the University of Texas at El Paso Graduate School and Department of Sociology and Anthropology for a Master of Arts in Sociology. Circle Ranch owner, Christopher Gill Sr., contacted UTEP hoping to retrieve data pertaining to prehistoric environmental conditions, including plants and animals, at the ranch location. An MOU was drawn up by Dr. Arthur Harris and ultimately approved by UTEP and Circle Ranch Management (Appendix A). Thereupon, it was determined that the Sierra Diablo Cave Site (SDC), located within the ranch, likely contained significant archaeological and paleontological materials (Figure 1.1). Typically, it is rare to find sites in the Southwest that retain the type of contextual integrity that the Sierra Diablo Cave exhibits. Furthermore, sites with intact and extensive stratigraphic integrity are rare to find. In this case, we found both, in addition to an extremely well pronounced Late Archaic Period assemblage and a Late Pleistocene/Early Holocene deposit in a lower stratum. The study was conducted as a concerted multidisciplinary effort between UTEP PhD (Biology) student Angela Chavez, Dr. Arthur H. Harris from the Biological Sciences Department at UTEP, Dr. David L. Carmichael from the Department of Sociology and Anthropology at UTEP, and myself.

With the exception of some of the southern portions of the Guadalupe Mountains and Salt Flats, the central and northern half of the Trans-Pecos, including the Davis Mountains, Rustler Hills, Delaware Mountains, Apache Mountains, and Sierra Diablo, remains largely unexplored archaeologically to this day (Vierra et al. 2006).
This thesis is structured as a four-chapter manuscript. This chapter introduces the project, gives environmental and location information, and a regional chronology of the Trans-Pecos region in western Texas for temporal contextualization of the data presented in this document. Chapter 2, the methods chapter, provides detailed information about the excavations and other procedures involved throughout the project. Chapter 3 presents site stratigraphy and discusses the relationships between cultural manifestations within a three-dimensional framework according to excavation unit, quadrant, and stratum. The final chapter provides synthesized overviews and interpretations of the data within the geographic and cultural parameters of the study. It also answers the fundamental research questions about the site and provides recommendations for future work. The following questions guided the research: 1) When was the Sierra Diablo Cave occupied? How do we know? 2) What types of activities were people engaging in at the Sierra Diablo Cave Site?
1.1 Location and Environment

The cave is in far eastern Hudspeth County, Texas, on Circle Ranch’s private property, northwest of Van Horn, Texas. The Sierra Diablo, or dominant mountain mass of this region, is about 25 miles long and has extensive summit areas more than 6,000 feet in altitude; its highest peak (at North Diablo triangulation station) attains 6,638 feet. West of the crest the summit areas descend 2,000 feet in about 10 miles, and the range merges with the lower, less diversified Diablo Plateau. The southern portion of the Sierra Diablo Mountains, where the Sierra Diablo Cave is located (Figure 1.2), is a succession of north-tilted faulting blocks (King 1965). The mountain appears as karst topography, featuring the Hueco Limestone formation which overlies a homogenous stratum of red sandstone at the base of the mountain.

Figure 1.2. Map showing the location of the Sierra Diablo Cave Site in a regional context.
1.2 Previous Investigations at the Sierra Diablo Cave Site

The Sierra Diablo Cave Site, located on the eastern edge of the Sierra Diablo Plateau in eastern Hudspeth County, Texas, had not been researched by archaeologists prior to this investigation. R.S. Reading (1960) notes the following about the Sierra Diablo Cave Site in *Arrows Over Texas*:

“The author located a site (approximately in 1940) in a cave in the side of the Sierra Diablo Mountains in the eastern part of Hudspeth County and a few miles north of Allemore. This cave probably was occupied long before any other known Indian camp sites in the county. The inhabitants of this cave probably were some of the Late Basket Makers. It is assumed that valuable artifacts are in the cave, but to get to them out provision would have to be made to cope with dust arising from the floor of this dry cave. The roof is blackened by smoke from fires, and there are layers of ashes on the floor. Above the ashes are rat and bat dung along with dust and many sticks which had been carried in by rats. The cave is in solid rock. There is no moisture in it except that absorbed from the desert atmosphere, and one knows that the relative humidity of the desert air is very low. Dust arises just from walking in the cave. The author did some sifting and recovered two dart points and two pieces of twine which had been made by these prehistoric people. One piece of twine was about 3/16 inch in diameter and was rather crudely made from coarse yucca fiber. The other was about 1/8 inch in diameter, made from softer material, and as perfect as anything turned out by machines today. No effort was made to put dates on the Basket Maker periods as there is nothing upon which to base dates. It is likely, however, that all Basket Maker periods were prior to the time of Christ. It is stated that True Basket Makers were semi-hunters and semi-agriculturalists. They did have darts, however. Some stone points were found in the cave just mentioned, but these were dart points and not arrowheads. The objects out of the cave are quite old, maybe 2,500 years.”

The location and description of this site, as provided by the author, indicates that this is likely the Sierra Diablo Cave Site. Although the information is interesting, the manner in which the author proceeded to excavate was without proper scientific methods or documentation. The term “Basket Maker” (equivalent to the Late Archaic), as used by Reading, is antiquated within the current chronological sequence for the Trans-Pecos region.
The site is located on private land and is well protected; however, large looter pits were excavated prior to current ownership (primarily into Stratum A). Furthermore, these excavations were not documented and some excavation tools, including a shovel, large crank, and a screen, were recklessly left behind. Fortunately, the site still retains large portions of intact archaeological deposits despite the current investigations and especially in the lower levels.

William Strain and John Elder from the University of Texas at El Paso made a surface sample collection of this disturbed material on or around 4 July 1966, which consisted of burned and unburned bones. The collection is housed in the UTEP Laboratory for Environmental Biology Paleobiology Collections and contains evidence of camel, extinct horse, badger, coyote, extinct American lion, mountain lion, grey fox, extinct rabbit, and bat to name a few. The management at Circle Ranch contacted UTEP and requested a study to be done on the Sierra Diablo Cave in its current condition. Thereupon, Dr. Harris of the Biological Sciences Department at UTEP and PhD student Angela Chavez visited the site twice to investigate and collect surface bones.

Three other visits were subsequently made to the cave in 2007: one on 17 February to meet with the owners and inspect the site, a second trip on 15 March by Angela Chavez and Dr. Arthur H. Harris, and a third on July 6th with Dr. David Carmichael to examine the archaeological material at the site.

In the spring of 2008, a site files search through the interactive TARL database (Texas Archaeological Research Laboratory) was implemented prior to field work in order to become familiarized with the site types documented, the density of sites in the area, and the extent of archaeological work. Naturally, archaeological investigations often depend on data from other archaeological investigations. In particular, sites that have been evaluated or excavated facilitate
comparative research and define the nature and extent to which a particular landscape has been used. The interpretation of these patterned systems is of paramount importance in archaeology. Regionally, and at a site-specific scale, behavior can be observed. Therefore, in order to present a more comparative and synthesized conclusion about past cultures, an attempt was made to retrieve information about other caves and rock shelters that share the same geographical environment and cultural histories. The Texas Historical Commission website was accessed several times to summarize the archaeological record of the immediate area, as well as any information regarding the site. No information was found regarding the Sierra Diablo Cave Site. ESRI’s ArcGIS 9.2 and 9.3 software was used to create a kernel density map to show the frequency distribution of sites of all temporal affiliations within the immediate area (Figure 1.3 and Table 1.1). If taken at face value, these data speak to the increase in population frequency regionally during Late Archaic and Early Formative times. More than half of the sites (65.0 percent) did not have a recognizable cultural component.

Many of the site inventory descriptions are outdated and could benefit from reinvestigation. The most apparent fact is that the region needs better and more extensive documentation. Two likely reasons for the lack of data are: 1) many private land owners have historically not allowed access to their property and 2) older sites are deeply buried beneath alluvial deposits (Miller and Kenmotsu 2004). In particular, this lack of data handicaps researchers from developing dependable diachronic interpretations about change and continuity in Archaic and Paleoindian subsistence adaptations. In other words, variability cannot be analyzed with a high level of confidence because the sample population remains low.
Figure 1.3. Kernel density map showing the distribution of archaeological resources within the immediate vicinity of the Sierra Diablo Cave Site (TARL data accessed in Spring 2008).

Table 1.1. Types of Sites Encountered within the immediate vicinity of the Sierra Diablo Cave Site (TARL, Spring 2008)

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<th>Frequency (%)</th>
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<td>12.5</td>
</tr>
<tr>
<td>Formative</td>
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<td>1.0</td>
</tr>
<tr>
<td>Unknown Prehistoric</td>
<td>130</td>
<td>65.0</td>
</tr>
<tr>
<td>Grand Total</td>
<td>200</td>
<td>100</td>
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</table>
1.3 Regional Chronology/Cultural History of Main SDC Occupations

The following section will provide a brief overview of the cultural components of the Sierra Diablo Cave Site. These cultural components are indicated by the material culture of the cave. According to projectile point typologies and other relative dating methods, such as stratigraphic analysis and diagnostic faunal remains, the overall cultural assemblage indicates extensive occupation(s) during the Late Archaic Period and the Early Paleoindian Period.

1.3.1 Paleoindian Cultures

Paleoindian research is quite extensive in general; however, the ways in which the issues have been addressed have largely been through an outdated paradigm that focused on large mammal predation by these early North American hunter-gatherer groups. Clovis and Folsom cultures have largely been associated with megafauna from the terminal Pleistocene. However, researchers have shown that there was also a reliance on smaller prey including a variety of mammals, birds, reptiles, amphibians, and fishes (Cannon and Meltzer 2008). Currently, the Trans-Pecos area has been understudied and Paleoindian sites have only been scarcely documented. The following section presents the results of previous investigations that pertain specifically to Paleoindian occupations within the current research area.

A site search was performed using the Texas Historical Commission’s interactive database to isolate Paleoindian components within the Trans-Pecos region and an extensive literature search was also done. The general lack of data supports these arguments: 1) archaeology has been understudied as these sites are hardly evident in the archaeological record, 2) Paleoindian groups only ephemerally occupied the region and/or did not prefer the environmental conditions, or 3) Paleoindian occupations are buried in deep alluvial deposits. Any of these possibilities or any combination of these may be true.
Early Paleoindian sites (Clovis and Folsom cultures; ca. 10,000 to 8,000 B.C.) are rare in the Trans-Pecos region of Texas (Seebach 2004). Most of what is known has come in the form of isolated occurrences (relative dating methods) and open-air campsites with limited data sets (e.g., Chispa Creek, Shirey Site, and Padre Canyon). According to Miller and Kenmotsu (2004), radiocarbon dates have not been obtained from contexts or features in undeniable association with Paleoindian materials in the Trans-Pecos.

1.3.2 Clovis Culture (ca. 10,000 to 9,000 B.C.)

The Clovis tradition is typically identified by the presence of the distinctive fluted Clovis point. Clovis is the earliest Paleoindian, big-game hunting culture of North America, and is one of the complexes making up the Llano tradition (Shaw and Jameson 2002). These sites are rarely found; however, the distribution of Clovis points reaches as far north as Canada and Alaska and as far south as South America (Justice 2002). Erosion has likely disturbed a large amount of cultural materials associated with Clovis across the Southwest, making it difficult to find locales as significant as Blackwater Draw, Mockingbird Gap, and Lubbock Lake. No subsistence data are available in the Trans-Pecos region.

1.3.3 Folsom Culture (9000 to 8000 B.C.)

A total of 18 Folsom sites have been documented across the Trans-Pecos region. Five have been identified in El Paso County, three in Hudspeth County, six in Culberson County, three in Reeves County, and one in Jeff Davis County (Andrews et al. 2008). Two large Folsom sites have been documented in the Trans-Pecos. According to J. Seebach, during the Society for American Archaeology’s conference in 2009, “the Trans-Pecos post-Clovis Paleoindian record can be thought of as two large Folsom sites (Shirey Site and the Chispa Creek site) anchoring a
plethora of small sites and isolates”. Furthermore, no subsistence data are available for the eastern portion of the Trans-Pecos region.

The Paleoindian Period was characterized by constant cultural changes in response to environmental pressures. Therefore, early occupants of the region acclimated over millennia as the Holocene got under way. Myles Miller and Nancy Kenmotsu note the following in The Prehistory of Texas (2004: 218):

*Environmental changes during the early Holocene brought about several changes in human adaptation at the close of the Paleoindian period. The persistent drying trend continued, with a resultant demise of large game mammals, expansion of plant communities adapted to drier conditions, and constriction of perennial water sources. These changes undoubtedly contributed to large-scale changes in subsistence strategies, requiring a diversification of the Paleoindian subsistence base with a greater focus on exploitation of plant foods. Such changes, and accompanying shifts in settlement and technology, mark the onset of the Archaic Period at ca. 6000 B.C.*

1.3.4 The Late Archaic Period (ca. 1000 to 900 B.C.)

The Late Archaic is well represented in the Sierra Diablo Cave’s top strata (A and B). Mallouf offers an excellent synthesis of the Late Archaic in Across the Borderlands: From Foraging to Farming (Vierra 2005), as it pertains to the eastern Trans-Pecos, providing a framework with which to contextualize the material culture manifested within the site. He notes that sources of potable water from arroyos and springs were probably much more prevalent which would have made the area inhabitable. Additionally, he writes that the Rio Grande and the Pecos rivers are the most important perennial streams in the region. With an increase in moisture during the start of the Late Archaic came an abundance of biotic resources. This occurred in-tandem with the presence of a combination of favorable resources such as tool stone availability and various landform settings that likely served as specific plant and animal resource-bearing environments. This region was an optimal foraging locale that offered Late
Archaic people several options in terms of settlement, mobility, subsistence strategies, and technology adaptations (Mallouf et al. 2006).

It is important to note that the eastern and western Trans-Pecos saw different cultural adaptations and that the Sierra Diablo Cave is somewhat centralized, geographically, between the two regions. In the east, the Late Archaic ends when bow and arrow technology replaces, or begins to replace, the atlatl (Mallouf 2005). Furthermore, the dating of the end of the Archaic Period in the eastern Trans-Pecos stands in contrast to interpretations of the western Trans-Pecos region, where the dawning of agricultural practices and production of ceramics serve as well-established end markers (e.g., O’Laughlin 1980).

Radiocarbon dating the Late Archaic strata in the Sierra Diablo Cave will show that the aceramic assemblage, which contains a corn cob fragment in its lower stratum and at least three diagnostic projectile points, either corroborates with the chronological sequence to the east or to the west. This author plans to investigate other caves in the immediate area that will hopefully add to the knowledge of the central Trans-Pecos region, a hypothetical transitional area where the cultural fringes of Late Archaic hunter-gatherers may have coalesced or diverged. Figure 1.4 is taken directly from Miller and Kenmotsu’s (2004) discussion in The Prehistory of Texas (Pertulla 2004). The authors illustrate the overlap between the Middle Archaic Period in the eastern Trans-Pecos and the Late Archaic in the western Trans-Pecos as well as the Late Archaic in the eastern Trans-Pecos and the Early Formative in the western Trans-Pecos. In short, the Late Archaic Period starts and ends later in the eastern Trans-Pecos region for reasons previously mentioned.
Figure 1.4. Late Archaic through Spanish Colonial, and Paleoindian through Archaic cultural sequence of the eastern and western Trans-Pecos. Adapted from Miller and Kenmotsu (2004).
1.4 Theoretical Orientation

Behavioral archaeology provides the theoretical perspective for this investigation. Behavioral archeology is the “study of the relationships between human behavior and material culture through all times and all places” (Reid et al. 1975). This theoretical approach addresses a general understanding of the diverse processes of both people and nature that interact to form the archeological record (Schiffer 1987). Principal to this interpretation is the awareness that
cultures consistently produce behavioral patterns that are evident in the archeological record. These manifestations take on many forms and include artifacts, features, temporary camps and larger habitation areas. Each of these in turn reflects the broader spectrum of prehistoric behavior across a given region.

Understanding the relationship between the environment and culture allows the researcher to create justifiable inferences about the past. This theoretical approach focuses on context and ultimately, the development of inferential statements concerning the past. Excavations during the current project were critically performed as to maintain all horizontal and vertical context as it occurred. By doing so, human material culture can be linked to other human material culture and environment, exposing patterns of human behavior in prehistory.
Chapter II Methods

The chapter details the methods employed throughout the testing investigation. The project was approached as a three-phase plan. Phase I consisted of site file searches for the region involving an extensive review of archaeologically significant sites, including caves and rock shelters, for the cultural Trans-Pecos region. Phase I also consisted of an initial site assessment, surface mapping, and surface artifact collecting. Phase II consisted of four field sessions in which systematic data recovery efforts investigated a total of 17 1-m by 1-m excavation units. Phase III was the analysis of recovered cultural and environmental materials and the production of this manuscript. I supervised and initiated all field and laboratory work, under the guidance of Dr. David L. Carmichael, for the archaeological investigations.

2.1 Phase I

Phase I was the initial site assessment. This included a complete survey of TARL site forms within the surrounding counties in order to become familiarized with the types of sites that have been documented in the region. The first visit to the cave involved a preliminary survey that was performed on Saturday, 16 February 2008, consisting of a 1-m grid system placed over the site, surface recordation, and a low impact subsurface investigation. Also, a test trench was excavated to evaluate the site stratigraphy. Surface features were also investigated and recorded. Thereupon, it was determined that the site retained a high degree of contextual integrity and would likely contain the types of materials that would contribute to a better understanding of prehistoric human behavior in the Trans-Pecos.

A research proposal was drafted and delivered to Circle Ranch, hoping that access and full permission to excavate the site would be granted. After reviewing the planned work proposal, Circle Ranch and UTEP (facilitated by Dr. Arthur H. Harris) drew up a memorandum
of understanding that outlines the scope of work, liability issues, and other legalities that both parties deemed significant. The MOU clearly demonstrates the willingness of both entities to advance scientific archaeological research in the region (Appendix A). Furthermore, it specifies the management of excavated cultural materials and the curatorial facility (UTEP). The MOU serves as a gateway, by example, for archaeologists who desire to undertake projects in western Texas private lands. Once the MOU was signed and access was granted, the thesis proposal document was created for the thesis committee and the Graduate school of the University of Texas at El Paso in order to comply with departmental requirements, and receive authorization to begin fieldwork.

2.1.1 Mapping and Surface Collections

The first stage of the approach involved mapping and collecting artifacts on the surface of the cave. Spatially, the artifacts observed on the talus are likely to represent a series of occupations that may have spanned thousands of years; therefore, unless they are chronologically diagnostic (i.e., projectile point types), they are contextually limited. A 1-m by 1-m resolution grid was established over the entire site in order to facilitate spatial control and documentation of cultural materials. Since an accurate site map did not yet exist for this site, one was created and served as a guide for subsequent investigations (i.e., block unit placement, trenching, testing). The site was partitioned into northeast, southeast, northwest, and southwest quadrants during the mapping process. The centralized site datum, consisting of a wooden stake with a stringed line level (0.69 m above ground surface), was placed at the intersection of the four quadrant corners and served as the point from which all subsequent investigations derived measurement data. All surface artifacts were collected and mapped into the overall site grid. Catalogue numbers
were assigned in the field and all artifacts were separated into a series of categories (Figure 2.1). This same system was used in Phase II excavations for collections.

![Field Bag List](image)

Figure 2.1. Collections log used during the four field sessions.

2.2 Phase II

As was explained previously, the Phase II portion of the research involved the recovery of all archaeological data, according to plan. All Excavation Units were excavated during this phase, which consisted of four field sessions. The particular implemented strategies are explained below, including excavation methods.

2.2.1 Hand Excavations

Hand excavations accounted for 100 percent of the total excavation (Table 2.1). Shovels, trowels, a hand auger, picks, brushes, dust pans, line levels, string, nails, tin foil, and tape
measures were used during excavations. Mechanized excavation tools were not used. In order to successfully attain horizontal control, each square meter was excavated separately. Vertical control was achieved by excavating natural and cultural levels individually. Otherwise, 5- to 10-cm arbitrary levels were excavated until obvious breaks in stratigraphy became apparent. Stratigraphic profiles were drawn, photographed, and video recorded. All sediments not collected for flotation or further analysis were screened through a 1/8\(^{th}\) inch, 1/16\(^{th}\) inch, and/or 40 micron hardware mesh screen outside the cave entrance. Feature excavations attained detailed information, including Munsell color, morphology, depth, associated materials, and location. Feature samples were collected from all features found within excavation units. Artifacts likely to contain residues for analyses, such as projectile points, were wrapped in tin foil. Extra care was taken not to contaminate samples by using gloves, tweezers, and carefully separating cultural materials.

Table 2.1. Summary of Phase II Excavations performed at the Sierra Diablo Cave Site between October 2009 and June 2010.

<table>
<thead>
<tr>
<th>Session</th>
<th>Excavation Unit</th>
<th>Quadrant/Square</th>
<th>Quadrant Size (m(^{2}))</th>
<th>Excavation Stratum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session 1</td>
<td>1</td>
<td>NE</td>
<td>1.0</td>
<td>A</td>
</tr>
<tr>
<td>Session 1</td>
<td>1</td>
<td>SE</td>
<td>1.0</td>
<td>A</td>
</tr>
<tr>
<td>Session 1</td>
<td>2</td>
<td>SE</td>
<td>1.0</td>
<td>A, B</td>
</tr>
<tr>
<td>Session 2</td>
<td>1</td>
<td>NE</td>
<td>1.0</td>
<td>A</td>
</tr>
<tr>
<td>Session 2</td>
<td>1</td>
<td>NW</td>
<td>1.0</td>
<td>A</td>
</tr>
<tr>
<td>Session 2</td>
<td>1</td>
<td>SE</td>
<td>1.0</td>
<td>A</td>
</tr>
<tr>
<td>Session 2</td>
<td>1</td>
<td>SW</td>
<td>1.0</td>
<td>A, B</td>
</tr>
<tr>
<td>Session 2</td>
<td>2</td>
<td>NE</td>
<td>1.0</td>
<td>A, B, C, D</td>
</tr>
<tr>
<td>Session 2</td>
<td>2</td>
<td>SE</td>
<td>1.0</td>
<td>C</td>
</tr>
<tr>
<td>Session 2</td>
<td>2</td>
<td>SW</td>
<td>1.0</td>
<td>A, B</td>
</tr>
<tr>
<td>Session 3</td>
<td>1</td>
<td>NE</td>
<td>1.0</td>
<td>A</td>
</tr>
<tr>
<td>Session 3</td>
<td>1</td>
<td>NW</td>
<td>1.0</td>
<td>A</td>
</tr>
<tr>
<td>Session 3</td>
<td>1</td>
<td>SE</td>
<td>1.0</td>
<td>A</td>
</tr>
<tr>
<td>Session 3</td>
<td>1</td>
<td>SW</td>
<td>1.0</td>
<td>A</td>
</tr>
<tr>
<td>Session 3</td>
<td>2</td>
<td>NE</td>
<td>1.0</td>
<td>D, E, F, G</td>
</tr>
<tr>
<td>Session 3</td>
<td>3</td>
<td>NE</td>
<td>0.5</td>
<td>A, B</td>
</tr>
<tr>
<td>Session 3</td>
<td>3</td>
<td>NW</td>
<td>0.5</td>
<td>A, B</td>
</tr>
</tbody>
</table>
2.2.2 Auger Excavations

Two auger excavations were placed within Excavation Unit 2. Each hand auger bucket load measured 18 vertical centimeters. These excavations were intended to determine the depth from surface to bedrock in the cave. A sample was collected from each bucket load to the bottom of the cave. Those samples received measurement data indicating depth range. Through this method, the lowest known depth of the cave was recorded at 3.24 m below datum elevation (datum was set to 0.69 m above ground surface), or 2.55 m below ground surface. At this depth, the hand auger hit impenetrable solid rock.

2.2.3 Judgmentally Placed Excavation Units

The placement of excavation units was determined according to the anticipated depths, artifact densities, and relative disturbance. It became apparent during the initial mapping that the looter pits were primarily intrusive into the upper strata, although lower strata were obviously disturbed with the presence of Pleistocene deposits on a Late Archaic surface. During the excavation of Stratum A in the various excavation units, it became clear that the individuals who excavated these pits reached Stratum B, a stratum that bears a significantly lower frequency of
archaeological items, and probably stopped digging (because materials were likely no longer showing up in their screens). Many of the pits were excavated in the eastern portion of the site and along the cave walls, and all of them only reached the bottom of Stratum A (Figure 2.2).

![Figure 2.2. Photograph showing an example of contextual disturbance (yellow arrows) from probable looting in the cave (photo by D. Carmichael, 2007). Photo is facing directly northeast to the tunnel. Note the winch in the back that was used to excavate into the tunnel. Trench 2 was excavated through the backpile of sediments surrounding the winch.](image)

Excavations proceeded to investigate the undisturbed areas adjacent to the looter pits where it was possible to sample, essentially, spatially (vertically and horizontally) similar units such as those lost due to uncontrolled excavations. Consequently, Excavation Unit 1 was established between looter pits in the eastern portion of the site. Excavation Unit 2 was extended from the initial Trench 1, an exploratory trench excavated to determine the extent and types of underlying deposits present. Excavation Unit 3 was established near the alcove in the eastern portion of the site, near Excavation Unit 1 in a relatively undisturbed area. The second trench, and possibly the most important linear excavation for stratigraphic data, was excavated through much of the backfill discarded by looters.
The area in the northeastern section of the cave was heavily disturbed, leading into the bifurcating tunnel in the northeastern corner of the cave. This trench was excavated in 1-m by 1-m units, removing mostly disturbed sediments that did not exhibit proper archaeological context.

2.2.4 Safety

Sierra Diablo Cave is located on the edge of the Diablo Plateau. Several precautions were taken that are usually not required in basin, open-air archaeological sites. In order to maintain a healthy field crew, the following safe-guards were implemented. The three primary concerns were animal encounters, hiking up and down safely, and breathing clean/filtered air.

It can be difficult to predict the movement of snakes or other dangerous animals in the field. Several mountain lions have been spotted in the Sierra Diablo Mountains and tracks were observed within the cave (and a deer carcass had been dragged in as supper). However, with a large upbeat crew, we were likely able to forewarn any mountain lions prior to our arrival in the cave. A path was quickly established from vehicles to the cave. Deviation from the path was infrequent, probably making the hike easier and safer each time it was walked. Crew members always traveled in pairs, at minimum. Finally, all field crew members were required to wear high quality breathing masks in the cave and outside while screening sediments. No problems occurred.

2.2.5 Photographic Documentation

One crew member was responsible for all photography during each session. Print photos were taken with a Canon Rebel 2000 35 mm camera using color film. All photos taken were developed at Walgreens and completely funded by the author. Digital photography was used in the field and in the laboratory. Picture resolution ranged from 7.2 million to 12 million pixels. All original, unaltered, digital photos are categorically (date and excavation unit) divided into
subdirectories for easy access in zipped (compressed) folders and stored in two external hard drives.

2.2.6 Features

Features were treated as discrete archaeological entities representing episodes of human activity. All features were excavated as they were encountered within the excavation units. Portions of each excavated feature were collected for water flotation. Any apparent charcoal was collected into an aluminum foil pouch that was created specifically for that collection. Feature data collected included morphology, size, composition, and associated artifacts. Also, the associated stratum was noted in addition to any anomalies.

2.3 Phase III

The possibilities for artifact analyses with the collected artifact assemblage are extensive. Consequently, only certain attributes were measured and sampling was employed. Excavation Units 1 and 4 artifacts were analyzed for raw material types, dorsal cortical data, and artifact types. Plant material types, including seed types, were also analyzed from these two excavation units using a variety of resources for identification (United States Department of Agriculture Plants Database, Texas Plant Information Database [Figure 2.3], etc.).
Faunal analysis was carried out by Dr. Arthur H. Harris. Projectile point typologies were determined by cross-checking works such as Justice (2002), Turner and Hester (1993), and Carmichael (1986). Special artifacts, such as a small leather pouch, also received more in-depth descriptions. Several diagnostic/special artifacts were photographed. The following section describes the sampling and analysis methods.

2.3.1 Raw Materials

The distribution of raw materials resource types across the Trans-Pecos landscape likely influenced procurement strategies employed by hunter-gatherer groups in the Trans-Pecos. Quartzite, for example, does not occur with any significant frequency in the Sierra Diablo Mountains; however, a quartzite tool was located in the talus of the cave, indicating movement.
of material across miles of desert terrain. The most abundant rock type, and the largest formation of the Sierra Diablo Mountains, is the Hueco Limestone (King 1965). Prehistoric people manufacturing bifacial tools would have favored finer-grained stones such as obsidian, chert, or quartzite alternatively to the abundant limestone/dolomite resources. Lithic artifacts from Excavation Units 1 and 4 were selected as a sample population (n=165) of the major archaeological deposit in the cave, the Late Archaic (Stratum A). The two excavation units represent two distinct sections of the cave and combine for 8.0 m² of horizontal excavations.

2.3.2 Flaked-Stone Debitage Analyses

In keeping with the sampled population for Late Archaic raw materials selection from Excavation Units 1 and 4, other variables were measured from the flaked-stone artifacts within that same lithic artifacts assemblage. Those variables are cortex, color, and flaked-stone artifact type. Dorsal-cortex analysis is commonly used as an alternative measure for identifying reduction stage and trajectory (Andrefsky 1998). A percentage of cortical material on the dorsal side of the flake or flake fragment was estimated. The results of these analyses are explained in Chapter 4.

2.3.3 Faunal Remains

Faunal remains supplied some of the most valuable data to this research project. In order to determine the species types recovered during the course of field investigations, Dr. Arthur H. Harris, director of the Laboratory for Environment Biology (LEB), conducted the analysis of all specimens collected. Variables recorded included number of elements, provenience, and identification to the lowest taxonomic level possible. Comments fields were available in the database for cultural modifications in the assemblage such as burning or butchering. Future excavations and analyses will add to this data set, which will likely be used to answer more
involved research questions about subsistence strategies in the central portion of the prehistoric Trans-Pecos region.
CHAPTER III RESULTS AND DISCUSSION

A large amount of archaeological and paleontological data was recovered during the current investigation. The results are presented as preliminary findings that will be incorporated into the ongoing dataset. As such, they should be treated as a representative sample from judgmentally placed data recovery excavation units and other subsurface testing (see Chapter 3, methods). Two facts should be considered: 1) cave sites contain unique artifact assemblages compared to non-cave sites; 2) many of the items recovered require expert opinions or highly sophisticated (expensive) analytical techniques for identification of composition. Where further analysis was warranted, more generalized categorical nomenclature was utilized (e.g., unknown seed, fibrous material, weaved plant fibers, etc.). This chapter presents the results of the phased research investigations. Part of Phase I, as previously explained in Chapter 2, consisted of TARL research, surface mapping, and low impact subsurface testing (Trench 1). Preliminary surface inspections consisted of site mapping all surface features and artifacts in addition to rock spalls and disturbances.

3.1 Phase I Investigations

Site mapping was based off of a central datum (0.69 m above ground surface), located at 0, 0. The site measures approximately 20-m by 20-m. Figure 3.1 shows all excavation units, disturbances, surface features, and a color ramped elevation grid to show the relatively flat topography of the site. An elevation measurement was taken at the southwest corner of each 1-m by 1-m grid square.
Figure 3.1. Site map showing four excavation units, two trenches, boulders, and disturbance to the site.

3.1.1 Surface Features

Three features were observed on the surface of the cave. Some of the looter pits may have excavated through features; consequently, they are no longer extant. The following section describes them and their associations.

3.1.1.1 Surface Feature 1

Surface Feature 1 (Figure 3.2) was observed in the western portion of the Sierra Diablo Cave as a surface manifestation of limestone fire-cracked rocks (n=75). The rocks are positioned
in a circular fashion with a central area that appears ashy and disturbed. Sticks, ranging in length from 0.01 m to 0.65 m were also observed throughout the feature and the immediate feature area. Although it is possible that the wood represents the remnants of a wickiup structure, it is unlikely. Artifacts were not observed in direct association with the feature. The feature may be interpreted as the remains of an historic camp since several metal wires were present.

Figure 3.2. Photograph showing the surface oblique view of Surface Feature 1 facing west. The blue flags are positioned at 1-m increments.

3.1.1.2 Surface Feature 2

Surface Feature 2 (Figure 3.3), located in the central portion of the northwest quadrant and on the edge of a previously excavated pit, was observed as an amorphous concentration of carbon-stained sediments. Trowel probing indicated that the stain may reach a maximum depth of 0.10 m below the surface of the cave. Surface sediments consisted of clay/fine silt throughout most of the cave, including the feature. It is likely that this feature, although disturbed, will contain datable materials associated with a Late Archaic prehistoric occupation. Artifacts were not observed in direct associated with the feature.
Figure 3.3. Photograph showing the surface oblique view of Surface Feature 2 facing northwest. A dotted circle was drawn to show the extent of the stained sediments.

3.1.1.3 Surface Feature 3

A small circular mortar hole was located near the entrance of the cave (Figure 3.4), indicating processing/grinding of food stuffs. The mortar measured 10 cm by 9 cm and exhibited a maximum depth of 3 cm. Other cultural materials were not directly associated with the feature.

Figure 3.4. Photograph showing Surface Feature 3, a small mortar hole.
3.1.2 Summary of Artifacts Observed

Fifty-four artifacts were observed on the surface of the Sierra Diablo Cave Site. Of those, 28 were collected for further analysis (Table 3.1). This assemblage consisted of 15 quids (wads of crumpled, masticated, shredded leaves) (LeBlanc 2007), nine pieces of lithic debitage, two core fragments, one micaceous El Paso brownware sherd, and one unifacial tool with possible Paleoindian attributes (Figure 3.5). Also, a sandal fragment was collected in the southeastern portion of the site (Figure 3.6). A single charcoal sample was collected during the excavation of Shovel Trench 1.

It should be noted, however, that a number of artifacts have been observed out of context. Approximately 20 pieces of lithic debitage of a variety of materials were encountered on a large boulder by the cave entrance. Similarly, ground stone fragments and a whole mano, totaling five, were neatly stacked in a corner by the cave entrance. The large crank/winch in the back of the cave was used to extract tunnel sediments. Recently excavated pits are extensive (last 50 years or so). A shovel, probably historic, was also found by the mouth of the cave alongside a screen with a ¾-inch hardware mesh.

![Figure 3.5. Unifacial flaked-stone tool (dorsal view) with steep edge.](image-url)
Figure 3.6. Sandal fragment recovered from the surface near Excavation Unit 1.

<table>
<thead>
<tr>
<th>Artifact Type</th>
<th>Quantity</th>
<th>Cave Quadrant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lithic Debitage</td>
<td>9</td>
<td>A, B, D</td>
</tr>
<tr>
<td>Flaked-Stone Tool</td>
<td>1</td>
<td>Mouth</td>
</tr>
<tr>
<td>Quid</td>
<td>15</td>
<td>A, B, C, D</td>
</tr>
<tr>
<td>Core</td>
<td>2</td>
<td>B, C</td>
</tr>
<tr>
<td>Sandal</td>
<td>1</td>
<td>D</td>
</tr>
<tr>
<td>Ceramic</td>
<td>1</td>
<td>C</td>
</tr>
<tr>
<td>Total</td>
<td>28</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 3.1 Artifacts Recovered during Phase I Investigations

3.2 Phase II Investigations

Phase II investigations consisted of four excavation units, one trench, and two hand augers. In order to maintain horizontal and vertical control over the excavations, levels were excavated as 0.05 m or 0.10 m arbitrary levels depending on changes in stratigraphy or artifact types and densities. Once the stratum was fully exposed in one quadrant, subsequent excavations were performed accordingly in other 1-m by 1-m quadrants. All levels were measured at their beginning and termination and all artifacts were assigned point provenience based on an X, Y, and Z grid at square meter resolution.
3.2.1 Site Stratigraphy and Time-Diagnostic Materials

The generalized stratigraphy of the Sierra Diablo Cave is relatively uncomplicated. A total of seven strata was observed and partially excavated (A-G). Letter designations of strata do not indicate soil horizons in this study (e.g., O, A, B, or C soil horizons). Instead, the letters were assigned to strata as they were encountered vertically, descending sequentially, starting at A. The strata are defined as accumulations of natural, biological, and cultural deposits with distinct variations in composition, consistence, and/or color (Figure 3.7).

Figure 3.7. Generalized site stratigraphy of cave from Excavation Unit 2, west wall profile of northwest quadrant.

Those seven depositional events span at least 10,000 years based on the *in situ* faunal remains of an extinct black vulture (Howard 1968; Harris, personal communication) in Stratum
F. None of the strata have been radiocarbon dated, yet. The following sections will describe each of the strata and highlight the chronological associations per excavation unit. The sedimentology of dry caves is particularly interesting for at least three reasons: 1) they are essentially time-capsules because they act as sediment traps (Stewart 2002); 2) the preservation of materials is excellent due to the lack of moisture and sunlight, and 3) unless looted/vandalized, they are less likely to be impacted (with or without intent) by modern human activities.

3.2.1.1 Stratum A

Stratum A (Excavation Levels 1, 2, and 3 from 0.54 to 0.75 m below datum at EU-2) was observed in each of the four excavation units, the two trenches, and the mouth of the cave. In fact, Stratum A is essentially the surface of the cave to a depth of approximately 0.20 m below surface (10YR 5/4, yellowish brown). The composition of the stratum is variable and extensive as it traverses the entire length and width of the cave. It includes clay to silt-sized particles that made it difficult to breathe without breathing filters. Clouds of the surface sediments became suspended in the cave air with each step. The most distinctive characteristic of this deposit was the high density of organic material (Figure 3.8). Again, screening of this deposit was difficult without breathing filters. On a 1/8\textsuperscript{th} inch hardware mesh screen, a high density of grassy material usually resided after sifting. Gravels, as expected, other than roof spalls, were not present.
This stratum contained the bulk of the archaeological deposits collected through four field sessions and dates to the Late Archaic Period (ca. 1000 to 900 B.C.) based on the presence of time-diagnostic projectile points. This assemblage consisted of a crudely manufactured San Pedro-type specimen (Justice 2002), and a Gypsum/Augustin-type specimen (Justice 2002). Another Gypsum/Augustin variant projectile point was found in Stratum B. The descriptions follow.

The San Pedro-variant point, although without proper stratigraphic context (found on surface at mouth of cave), also dates to the Late Archaic and into the Early Formative Period (Figure 3.9). The chronological extent of the San Pedro-type point dates between 1500 B.C. and A.D. 300 (Justice 2002). This point type is usually not associated with ceramic-age sites, suggesting it drops out of the archaeological record at the end of the Late Archaic. Again, the point was crudely manufactured, exhibiting asymmetrical geometry. It is made of white chert and exhibited a length of 2.7 cm and a width of 1.5 cm.
Figure 3.9. San Pedro-type projectile point recovered near the mouth of the cave on the surface. The artifact does not retain archaeological context although it dates roughly to the Late Archaic Period.

The Gypsum/Augustin-type projectile points recovered are characterized by a short contracting stem and a triangular blade (Huckell 1996). Gypsum-type projectile points, according to Justice (2002), date from roughly 2000 to ca. 800 B.C., placing them chronologically into the Late Archaic Period. The point in Figure 3.10 is made of a reddish chert and exhibited a length of 4.1 cm in length and 1.9 cm in width. In *The Archaic Prehistory of the North American Southwest* (1996: 339), Huckell writes the following about this projectile point type:

“the Augustin point (Dick 1965), was named from Bat Cave in west-central New Mexico. Both type names see use in the Southwest, but Gypsum is used here. Morphologically, Gypsum and Augustin points are distinguished by a short, contracting stem, either pointed or rounded, and a triangular blade. Indications are that Gypsum points are at least in part younger than either Chiricahua or San Jose, although again dates are few over most of the region.”
Figure 3.10. Gypsum/Augustine-type projectile point (Stratum A) recovered from Excavation Unit 3 dating to the Late Archaic Period.

3.2.1.2 Stratum B

Stratum B (Excavation Levels 4, 5, and 6 from 0.76 to 1.03 m below datum at EU-2) was observed in each of the four excavation units and both trenches. Although this stratum exhibited the same principal Munsell color as Stratum A (10YR 5/4, yellowish brown), it consisted of extremely compacted sediments, ash, and a general lack of organic material (e.g. grasses, twigs). Loose deposits of silt were present throughout; however, the overall consistence of the stratum required the use of picks since trowel scraping was often futile. Samples of this stratum were collected for future analyses. Two projectile points were found within the stratum. The point shown in Figure 3.11 is made of a black/purple banded chert and exhibits a length of 4.8 cm and a width of approximately 3.5 cm. This point is interpreted as a reworked Gypsum/Augustine variant. The figure shows the artifact in its current state on the right and the way it may have looked prior to reworking on the left. The projectile point was collected with associated sediments next to and around it and the impression of the projectile point can be observed in those hardened sediments.
Figure 3.11. Gypsum/Augustine-type projectile point, likely reworked as a cutting tool during the Late Archaic Period. Image on left shows the estimated morphology prior to breaking and reworking of projectile point. Image on right is the artifact in its current condition.

The Carlsbad-type projectile point (Figure 3.12) is dated to the Late Archaic with age estimates that range between 1000 B.C. and A.D. 300. They are related to the pre-ceramic Hueco Phase. This projectile point type is described by Justice (2002) as a basal notched point with a convex base and a highly variable blade. The projectile point measures 3.9 cm in length and 2.4 cm in width. Several organic samples were collected in association with the projectile point for future radiocarbon analysis. Charcoal fragments were found in direct association.
3.2.3 Stratum C

Stratum C (Excavation Levels 7, 8, 9, and 10 from 1.03 to 1.54 m below datum at EU-2) was observed as a loose deposit of coarse silt to fine-grained sand. This was the thickest of all strata observed. The beginning of Stratum C is one of the most obvious stratigraphic breaks in the cave. The termination of the compacted Stratum B sediments rests over the unconsolidated light colored sandy deposit (10YR 6/4 light yellowish brown). Aside from the geomorphological differences, Stratum B also exhibited a significantly lower density of associated artifacts. Throughout the excavation of Excavation Unit 2, large portions of the thick stratum were notably culturally sterile. No time-diagnostic artifacts were recovered here.

3.2.4 Late Pleistocene/Early Holocene Deposits

Three of the strata are likely associated with the Early Holocene/Late Pleistocene epochs. Stratum D, E, and F are photographed below and described individually (Figure 3.13). The assemblage types associated with each are also included. It should be stressed that Stratum D did not contain time-diagnostic artifacts and was not radiocarbon dated. Stratum D borders Stratum F in many instances where the very ephemeral Stratum E pinches out of the sequence,
giving Stratum D a relative temporal association that dates just before Stratum F. The white chalky inclusions that appear in Stratum D are also present in Stratum F.

Figure 3.13. Close up photograph and drawing showing Strata D, E, and F. Note the dark soil break between Strata E and F.

### 3.2.1.5 Stratum D

Stratum D (Excavation Levels 11 and 12 from 1.54 to 1.88 m below datum elevation at EU-2) was observed as a semicompact deposit composed of silt-sized particles (7.5YR 5/4 light yellowish brown). A major inclusion was noted in the stratum as chalky white circular deposits (Figure 3.14). These white deposits appear with low frequencies in Stratum E and F as well, indicating a general association between the three strata. Gravels were noted as small rock spalls. Grasses were noted in low frequencies. Cultural materials were few, including only flaked-stone debitage. A single *Yucca elata* leaf was collected.
3.2.1.6 Stratum E

Stratum E (Excavation Level 13 from 1.88 to 1.93 m below datum elevation) was observed as a shallow layer between the well-defined strata above and below it (D and F). It is entirely possible that Stratum E was sparsely deposited throughout the cave surface before Stratum D began to accumulate. Or, Stratum E could be an ephemeral extension of F, appearing as a brown (10YR 4/4, dark yellowish brown) transitional zone between the two well defined stratigraphic units. It is different primarily in color and shares textural and compositional characteristics with the underlying Stratum F deposit explained below.

3.2.1.7 Stratum F

This stratum (Excavation Level 13) was initially observed as a dark gray deposit of carbon-stained sediments in the northeast quadrant of Excavation Unit 2 (10YR 2/2, very dark brown). The deposit was so much darker than the preceding strata that it was labeled as Feature
C, a possible hearth feature. Horizontal excavation of the carbon-stained sediments revealed the manifestation to be extensive, appearing in the profiled stratigraphy of the quadrant walls. Thereafter, it was designated as Stratum F rather than Feature C (Figure 3.15). The depth of the stratum, at Excavation Unit 2, measured 0.13 m from 1.93 to 2.06 m below datum elevation.

Figure 3.15. Planview photograph of cultural Stratum F, looking straight down, in the northwestern 1-m by 1-m quadrant within Excavation Unit 2 (distinct carbon-stained sediments with charcoal fragments). Photoboard is resting on a large boulder.

3.2.1.8 Stratum G

Stratum G is a distinct deposit of silt-sized sediment (7.5YR 5/4, light yellowish brown) that directly underlies the dark sediments associated with Stratum F. The stratum was only partially excavated during the process of determining the vertical extent of Stratum F. This deposit did not contain datable cultural materials or lithic artifacts. The stratum is generally unconsolidated and homogenously distributed without gravel inclusions. Measurements are only established for the top of the stratum (2.06 m below datum elevation) since excavations have not fully exposed it vertically or horizontally.
3.2.2 Test Excavation Units

A total of four excavation units, two trenches, and two hand auger excavations was excavated during four field sessions. Several hundred artifacts were collected during the excavations. A summation of those items is provided below. Specific counts are not given for the fragmented remains of gourd, seeds, pine cones, and various miscellaneous items (e.g., 10 pine cone fragments may have originated from one or more pine cones). Culturally sterile quadrant strata are not described. The faunal assemblage is explained at the end of each description although only a few bones exhibited cultural modifications.

3.2.2.1 Excavation Unit 1

Excavation Unit 1 was placed in the western portion of the site in an area that was relatively undisturbed. The block unit was established as a 2-m by 2-m test excavation unit (southwest corner located at: 2.0, -4.0). The following section explains the results of the excavation according to stratum and quadrant provenience. The surface elevation of all strata was measured at all corners of every quadrant. Averages are provided. One feature was observed, intrusive to Stratum A, in the northeast quadrant.

Stratum A (northeast quadrant)

The excavation of Stratum A in the northeast quadrant began at an average elevation of 0.59 m below datum. This deposit yielded flaked-stone debitage (n=56), flaked-stone tools (n=4), coprolites (n=3), core/core fragments (n=5), perishables (n=6), several plant remains, and 20 samples (soil and charcoal samples). The lithic artifact assemblage consisted of angular debris (n=6), bifacial thinning flakes (n=5), core-reduction flakes (n=45), biface fragments (n=2), and three unimarginal tools (Figure 3.16). The perishable artifact assemblage contained one
piece of yucca matting, one square knot (two elements), whittled wood shavings, and cordage/netting (n=2). The plant remains assemblage contained a considerable amount of gourd, pine cone debris, and yucca seeds. Mesquite pods and seeds were also present in addition to unknown seeds and nut shell fragments. A single burned human molar was recovered from within Feature 1A.

![Figure 3.16. Examples of chert unimarginal tools found within Stratum A. The three pictured here were collected from the northeast quadrant of Excavation Unit 1.](image)

3.2.2.1.1 Feature 1A (Stratum A/northeast quadrant)

Feature 1A was observed in the northeast quadrant of Excavation Unit 1 (Figure 3.18). The feature measured 0.35 by 0.45 m, exhibited an oval shape, and began vertically at 0.68 m below datum elevation. Feature composition was observed as a silty loam carbon-stained sediment matrix, bisected along a southwest-northeast oriented axis line. The southeastern half of the feature was collected, exposing a shallow northwest wall profile. Feature 1A reached a maximum depth of 0.03 m and contained associated fire-cracked rocks (n=5) and two bifacial thinning flakes. This feature also contained one charred molar that measured 9 mm in length, 6 mm in width, and 6 mm in depth, although only the upper portion of the tooth remains. The cusps all appear to be ground fairly evenly. One small cavity was noted although the tooth appeared to be in fairly good condition (Figure 3.17). Organics samples collected, including charcoal fragments, can provide AMS radiocarbon dates which will associate the tooth fragment.
(can be submitted to a laboratory for residue analyses) in addition to the rest of the northeast quadrant assemblage.

Figure 3.17. Burned human molar found in Feature 1A in the northeast quadrant of Excavation Unit 1, Stratum A.

Figure 3.18. Oblique view of Feature 1A in the northeast quadrant of Excavation Unit 1, facing south. Note the fire-cracked rock and ash/carbon-stained sediment matrix.
Stratum A (northwest quadrant)

The excavation of Stratum A in the northwest quadrant began at an average elevation of 0.61 m below datum. This section of the stratum contained flaked-stone debitage (n=22), one flaked-stone tool, nine pieces of human/animal feces, three manufacturing tools, 21 perishable artifacts, several plant remains, 11 quids, and many samples for radiocarbon analysis (n=38). The perishable artifact assemblage consisted of one complete sandal, cordage/netting (n=2), fibrous material, matting fragments (n=3), a carved/shaped wood stick, and 12 whittled Yucca stalk shavings (Figure 3.19). Several other plant remains were recovered in this quadrant as well, including pine cone fragments, gourd seeds and shell, pine nut shell, prickly pear seeds, and yucca seeds. A piece of rolled cactus was also observed within the assemblage.

![Figure 3.19. Wood whittling station shavings on left (probable yucca stalk) and experimental yucca stalk shavings by author on right for comparative analysis.](image)
Another remarkable find was a small, seamless, leather pouch. The pouch measures 3 cm in length and 2 cm in width with two small holes and a two-ply cord used as a draw string, and secure the contents inside (Figure 3.20). Once found, it was immediately placed in a sterile vial. The only opening to the pouch was closed enough to keep the contents from exiting. Only very fine dust could have entered. The contents of the bag included nine sub-centimeter white pebbles and dust that likely entered the bag after it was deposited. The composition of these stones is speculative at this point, without mineral analysis. Furthermore, the function or purpose attached to these stones is also anybody’s guess at this point. The number nine may be significant.

Lentz (2006) identified 25 urinary calculi, with striking similarity to the stones found in the pouch. In a discussion about the possible explanation for the occurrence of these stones at High Rolls Cave, Lentz (2006) entertains the idea that these objects may have been keepsakes or “lucky charms” as modern hunters collect them. Clearly, the pouch was created and kept to place important items inside. The idea of value/importance is subjective and projecting our own cultural ideas of value can be problematic; however, placing an item in a location where it is less likely to be lost, such as a casing or enclosure, indicates that the item was granted cultural significance by the individual.
Figure 3.20. Leather Pouch containing nine stones.

Stratum A (southeast quadrant)

The excavation of Stratum A in the southeast quadrant began at an average elevation of 0.58 m below datum elevation. This deposit yielded flaked-stone debitage ($n=23$), one ground-stone fragment, human/animal feces ($n=4$), cores ($n=2$), perishable artifacts ($n=26$), several plant remains, quids ($n=6$), and seven soil/charcoal samples for radiocarbon dating. The perishable artifacts assemblage consisted of bundled fibers ($n=7$), one complete sandal (left foot), three pieces of cordage/netting, a drilled wood fragment exhibiting burns on two ends (probable pipe fragment), three square knots (two elements), two overhand knots, whittled yucca stalk shavings, and one sandal fragment (distal portion). The plant remains found in association with this
assemblage consisted of gourd seed and shell, mesquite seed/pods, pine cone fragments, and yucca seeds.

Stratum A (southwest quadrant)

The excavation of Stratum A in the southwest quadrant began at an average elevation of 0.63 m below datum elevation. This deposit yielded two cores, 45 pieces of flaked-stonedebitage, one flaked-stone tool, one pieces of human/animal feces, 58 perishable artifacts, several plant remains, 13 quids, and several samples including fire-cracked rock, soil, and charcoal fragments.

The perishable artifacts assemblage consisted of two complete sandals and two proximal sandal fragments, three fibrous bundles, one fire-stick (burned tip suggests fire prodding), knotted fibers, one matting portion, two square knots (two elements), a burned stick fragment, and 43 yucca stalk shavings from a wood whittling episode. Plant remains found in association with this assemblage included cactus, gourd seeds and shell, mesquite seeds and pods, “onion” skin (unknown type), pine cone fragments, pine nut and pine nut shells, and a significant number of yucca seeds. Samples were collected for radiocarbon dating including charcoal fragments.

Stratum A Faunal Assemblage

Several diagnostic disarticulated faunal remains were recovered during the excavation of Stratum A in Excavation Unit 1. Among the species identified were coyote/domestic dog, Black-tailed Prairie Dog, Cottontail Rabbit, and White-toothed Woodrat. None of those remains exhibited cultural modifications. Several small unidentifiable burned and unburned fragmented bones were present.
Stratum B (northeast quadrant)

The excavation of Stratum B in the northeast quadrant began at an average elevation of 0.70 m below datum. This deposit yielded two flakes and a charcoal sample. No other cultural materials were observed. Diagnostic faunal remains were not encountered.

Stratum B (northwest quadrant)

The excavation of Stratum B in the northwest quadrant began at an average elevation of 0.70 m below datum. This deposit yielded flaked stone debitage, yucca stalk shavings from a wood whittling episode, pine cone fragments, and other miscellaneous plant debris. A charcoal sample was collected from this stratum. Diagnostic faunal remains were not encountered.

Stratum B (southeast quadrant)

The excavation of Stratum B in the southeast quadrant began at an average elevation of 0.70 m below datum. This deposit yielded flaked-stone debitage, a complete Carlsbad-type projectile point (see Figure 3.12), a core, a knot, and various pieces of plant debris. Diagnostic faunal remains were not encountered.

Stratum B (southwest quadrant)

The excavation of Stratum B in the southwest quadrant began at an average elevation of 0.70 m below datum. This deposit yielded a high density of organic material. Several different types of seeds were observed. Many were not identifiable by this author. Burned bone was also moderately present. A reworked projectile point/knife tool (see Figure 3.11) was also recovered from this deposit. Charcoal was recovered, directly associated with the in-situ projectile point, for radiocarbon dating. The hardened sediments surrounding the projectile point were also collected. They bear the impression of one blade side and edge. Other associated artifacts included 13 pieces of flaked-stone debitage, one unimarginally modified flake, one core, four
perishable artifacts, and one quid. Several soil and charcoal samples were collected for radiocarbon dating analysis (n=22). Diagnostic faunal remains were not encountered.

The perishable artifacts assemblage consisted of only of three yucca stalk shavings from wood whittling. Plant remains found within this quadrant included yucca seeds, gourd seeds and shell, an indeterminate bean-like fragment, and several indeterminate pieces of plant debris.

### 3.2.2.2 Excavation Unit 2

Excavation Unit 2 was placed near the central portion of the site over an area that appeared to be relatively undisturbed. The block unit was established as a 2-m by 2-m test excavation unit in the northwest quarter of the site (southwest corner located at: -5.0, 0.0). The following section explains the results of the excavation according to stratum and quadrant. The surface elevation of all strata was measured at all corners of every quadrant, including center points. Averages are provided. A total of three features was observed during the excavation of EU-2. These were labeled Feature 2A, 2B, and 2C. Four artifacts were observed on the surface of the unit. This surface assemblage included a purple quartzite hammerstone fragment, one calcite core fragment, one limestone core fragment, and one z-twist type piece of cordage (Figure 3.21).

![Figure 3.21](image)

**Figure 3.21. Photograph showing an example of a cord found within Excavation Unit 2 at the surface level.**
Stratum A (northeast and southeast quadrants)

The excavation of Stratum A in the northeast quadrant began at an average elevation of 0.54 m below datum elevation. This deposit yielded flaked-stone debitage (n=10), core fragments (n=2), one unimarginally modified flake tool, perishable artifacts (n=6), and several plant remains. The perishable artifacts assemblage consisted of one piece of cordage, two knotted fibers, one quid, and two pieces of modified wood. Plant remains included yucca seeds, gourd fragments, and twig-like plant debris. Charcoal samples were collected for radiocarbon dating from this stratum and quadrants.

Auger 1 (northeast quadrant)

This hand auger excavation was excavated in the center of the northeast quadrant of Excavation Unit 2. The excavation was performed in 18 cm loads to a depth of 2.96 m below datum elevation (datum was set to 0.69 m above ground surface). A soil sample was collected from each of the auger loads. Faunal remains of Coragyps occidentalis were found during the excavation; however, the real context was unknown (recovered between 1.43 and 2.96 m below datum elevation). No artifacts were recovered.

Stratum A (northwest quadrant)

The excavation of Stratum A in the northwest quadrant began at an average elevation of 0.54 m below datum elevation. This deposit yielded a small assemblage that included one complete sandal, knotted fibers (n=6), one piece of flaked-stone debitage, one fire-cracked rock, and a coprolite. Charcoal was collected for radiocarbon dating.

Stratum A (southwest quadrant)
The excavation of Stratum A in the southwest quadrant began at an average elevation of 0.54 m below datum elevation. This deposit yielded eight pieces of flaked-stonedebitage, one unimarginally modified flake tool, one knot, a bundle tie, and a quid. Plant remains included one burned cholla fragment, a pine cone fragment, and yucca seeds. Charcoal and soil samples were collected for radiocarbon dating.

**Stratum A Faunal Assemblage**

Several diagnostic disarticulated faunal remains were recovered during the excavation of Stratum A in Excavation Unit 2. The species identified included Cottontail Rabbit and Whitetoothed Woodrat. None of those remains exhibited cultural modifications. Several small unidentifiable burned and unburned fragmented bones were present.

**Auger Test 2 (southeast quadrant)**

This hand auger excavation was excavated in the southeast quadrant of Excavation Unit 2. The excavation was performed in 18 cm loads to a depth of 3.24 m below datum elevation (datum was set to 0.69 m above ground surface). A soil sample was collected from each of the auger loads. No cultural materials were recovered.

**Stratum B (northeast/southeast quadrants)**

The excavation of Stratum B in the northeast/southeast quadrants began at an average elevation of 0.75 m below datum elevation. This deposit yielded 10 pieces of flaked-stone debitage, one core fragment, a piece of cordage, knotted fibers, a complete sandal, and a corn cob fragment. The corn cob fragment was collected from Stratum B in the southeast quadrant of Excavation Unit 2 (Figure 3.22). The fragment exhibits eight rows at the thickest portion. Associated soil samples were collected for further analyses.
3.2.2.2.1 Feature 2A (Stratum B/southeast quadrant)

Feature 2A was observed during the excavation of the southwest quadrant at EU-2 (Figure 3.23). The feature exhibited a maximum depth of 8 cm, between 94 cm and 101 cm below datum elevation with a slightly basin-shaped profile, not extending into the underlying Stratum C deposit. The feature length and width measured 57 cm and 30 cm, respectively. The Munsell color chart nomenclature for the primary feature matrix was observed as dark brown (7.5YR 3/2). Artifacts were not found in the feature; however, artifacts were found in association (same stratigraphic context) with Stratum B as previously mentioned.
Stratum B (northwest quadrant)

The excavation of Stratum B in the northwest quadrant began at an average elevation of 0.75 m below datum elevation. This deposit yielded four pieces of flaked-stone debitage and plant debris. Charcoal and soil samples were available for collection. No other cultural materials were observed.

Stratum B (southwest quadrant)

The excavation of Stratum B in the southwest quadrant began at an average elevation of 0.75 m below datum elevation. This deposit yielded one flake, one quid, a sandal fragment, one piece of cordage, a piece of daub, and one bone fragment exhibiting diagonally incised patterned lines. The bone has become encrusted with fine sediments, concealing the entire pattern, and was drawn and photographed as it was found (Figure 3.24). Samples of soil and carbon stained sediments were collected for radiocarbon dating.

![Figure 3.24. Drawing (top) and photograph (bottom) of incised bone exhibiting parallel diagonal lines, found in Stratum B/Excavation Unit 2 (southwest quadrant).](image)
Stratum B Faunal Assemblage

Several diagnostic disarticulated faunal remains were recovered during the excavation of Stratum B in Excavation Unit 2. Cottontail Rabbit remains were present. Faunal analysis of the bones recovered from this excavation area also concluded that a possibly burned humerus was present. The diagnostic bone is suggestive of frog or a frog-related amphibian and was found in association with the corn cob fragment. The burned bone suggests human consumption of amphibians. Several small unidentifiable burned and unburned fragmented bones were present.

Stratum C (northeast/southeast quadrants)

The excavation of Stratum C in the northeast/southeast quadrants began at an average elevation of 1.03 m below datum elevation. This deposit yielded six pieces of flaked-stone debitage, and one core. A soil sample was collected for future analyses. No other cultural materials were observed.

Stratum C (northeast quadrant)

The excavation of Stratum C in the northeast quadrant began at an average elevation of 1.03 m below datum elevation. This deposit yielded three flakes, one core, and one gourd shell fragment. Two charcoal samples were recovered in addition to two soil samples. No other cultural materials were observed.

Stratum C (northwest quadrant)

The excavation of Stratum C in the northwest quadrant began at an average elevation of 1.03 m below datum elevation. This deposit yielded one piece of flaked-stone debitage and one charcoal sample. No other cultural materials were observed.

Stratum D (northwest quadrant)

The excavation of Stratum D in the northwest quadrant began at an average elevation of 1.54 m below datum elevation. This deposit yielded one piece of flaked-stone debitage. Feature
B was observed within this quadrant as well. A soil sample was collected for future analyses. No other cultural materials were observed.

### 3.2.2.2.2 Feature 2B (Stratum D/northwest quadrant)

Feature 2B was observed as a concentration of carbon-stained sediments in the northwest quadrant of Excavation Unit 2 within Stratum D (Figure 3.25). The top of the feature measured 1.66 m below datum elevation. The feature dimensions measured 0.36 m in length (north to south) and 0.30 m in width (east to west). The Munsell color chart nomenclature for the primary feature matrix was observed as a dark brown (7.5YR 3/2). The feature reached a depth of 0.03 m vertically with a very irregular profile. The entire feature was collected for flotation and sampling.

![Figure 3.25. Plan view photograph of Feature 2B within Stratum D in the Northwest Quadrant of Excavation Unit 2.](image-url)
Stratum D (northeast quadrant)

The excavation of Stratum D in the northeast quadrant began at an average elevation of 1.54 m below datum. This deposit yielded four pieces of flaked stone-debitage, a unimarginally modified flake tool, burned bone, and organic/grassy material that appeared layered. Several samples were obtained during excavations including soil samples, charcoal samples, a small stalactite, and plant debris. No other cultural materials were observed.

Stratum E

As was explained previously, this stratum was shallow and sporadic. No cultural materials were observed within the stratum. The only items collected from this deposit were a bone fragment from the northeast quadrant and a soil sample.

Stratum F

Stratum F is potentially a very important archaeological resource to the region. There is very strong evidence to suggest that the deposit dates to the terminal Pleistocene/Early Holocene and more importantly, that the few cultural items that were found are in direct association. The most obvious cultural material is charcoal and carbon-stained sediments. Unfortunately, the time-diagnostic cultural evidence, such as projectile points, that would have corroborated the age estimate was not present in the excavated areas. The excavation of Stratum F in Excavation Unit 2 was limited to three quadrants. Large plastic sample bags were used to collect deposit fill for future analyses when funding is available. The southwestern quadrant, where Stratum F was not investigated, was excavated to the top of Stratum C, stabilized with plywood and long wooden stakes as a bench to exit the excavation unit.
Stratum F (southeast quadrant)

The excavation of Stratum F in the southeast quadrant began at an average elevation of 1.93 m below datum elevation (1.39 m below ground surface). This deposit did not yield artifacts. A large boulder limited excavation of the stratum.

Stratum F (northwest quadrant)

The excavation of Stratum F in the northwest quadrant began at an average elevation of 1.93 m below datum elevation (1.39 m below ground surface). This deposit yielded three pieces of flaked-stone debitage. All three pieces are identified as limestone core-reduction flakes, measuring an average of 2.9 cm in length and 2.56 cm in width. No other cultural materials were found. Several samples were collected for radiocarbon dating including charcoal and soil samples.

Stratum F (northeast quadrant)

The excavation of Stratum F in the northeast quadrant began at an average elevation of 1.93 m below datum elevation (1.39 m below ground surface). This deposit yielded no artifacts. A large boulder was also present in this quadrant, limiting the excavation to the area around it (approximately half of the 1-m by 1-m square).

3.2.2.3 Excavation Unit 3

Excavation Unit 3 was placed in the far eastern portion of the site in an area that was relatively undisturbed at the mouth of an alcove (Figure 3.26). The block unit was established as a 1-m by 1-m test excavation unit (southwest corner located at: 7.0, -3.0). The following section explains the results of the excavation according to stratum. The surface elevation of all strata was measured at all corners of every quadrant; however, averages will be provided for the sake of brevity. One small hearth feature/fire pit was present within the excavation unit.
Stratum A

The excavation of Stratum A began at an average elevation of 0.65 m below datum elevation. This stratum measured 0.06 m in thickness. Cultural materials included seven pieces of flaked-stone debitage (five flakes and two pieces of angular debitage/shatter), two pieces of z-spun twine (Figure 3.27), various pieces of fibrous material, a square knot (possibly from a sandal), a completely burned human middle phalanx from an index finger (Figure 3.28), five sandal/sandal fragments (see Figure 4.5), and one complete projectile point (see Figure 3.10). Several coprolite fragments were also observed and some appear to be human. Soil samples and charcoal were collected here which make this stratum datable in the far eastern portion of the cave as well. Feature 3A was intrusive into this stratum and is explained below.
Stratum A Faunal Assemblage

Several identifiable disarticulated faunal remains were recovered during the excavation of Stratum A in Excavation Unit 3. The species identified were Bobcat, Conkling’s Pronghorn, Cotton Rat, Cottontail Rabbit, Coyote, Diminutive Pronghorn, Eagle, Gray Fox, Horse, Jackrabbit, Northern Grasshopper Mouse, Pocket Mouse, Vole, and Extinct Black Western Vulture (*Coragyps occidentalis*). The presence of the proximal fifth left radius of a *Coragyps occidentalis* is an interesting find in this context. Even more interesting is that it was stratigraphically related to the human finger bone pictured above (see Figure 3.28). The vulture is dated to the terminal Pleistocene/Early Holocene (Miller 1957) and was found in a stratum that is interpreted as Late Archaic in age. The deposit did not appear to be disturbed although if it
had been, I would expect to see mixed materials from upper strata in lower strata (not vice versa) since the movement of materials is dictated largely by gravity. Several small unidentifiable fragmented bones were present.

3.2.2.3.1 Feature 3A (Stratum A)

Feature 3A was noted during the excavation of Stratum A, at 0.66 m below datum elevation, along the eastern wall of Excavation Unit 3 (Figure 3.29). The feature measured approximately 0.30 m in diameter, although a portion of it remained unexcavated to the east. The feature reached a maximum depth of 0.10 m, intrusive into Stratum B. The entire feature portion that was excavated was collected for flotation/analyses. Artifacts found in direct association with the feature include Stratum A artifacts described in the preceding Stratum A description.

![Figure 3.29](image.jpg)

Figure 3.29. Photograph showing an excavated fire pit, Feature 3A, in Excavation Unit 3, intrusive to Stratum B, facing east (note that the feature extends into the east wall of the unit).

Stratum B

The excavation of Stratum B began at an average elevation of 0.71 m below datum. The only artifact collected from this stratum was a flake. Feature 3A was encountered within Stratum
A, intrusive into a portion of it, but also intrusive into Stratum B (see Figure 3.29). The second excavation level began at Excavation Unit 3 with Level 4, as seen on the photo board. This Stratum was not completely excavated.

Stratum B Faunal Assemblage

Several diagnostic disarticulated faunal remains were recovered during the excavation of Stratum B in Excavation Unit 3. The three species identified in the assemblage were Baird’s Grasshopper Mouse, Desert Cottontail, and Nutcracker. None of those faunal remains exhibited cultural modifications. Several small unidentifiable fragmented bones were present.

3.2.2.4 Excavation Unit 4

Excavation Unit 4, measuring 2-m by 2-m, was placed in the southwestern quarter of the site (southwest corner located at: -5.0, -2.0). The northern boundary of this unit is the southern boundary of Excavation Unit 2. The unit was excavated according to the stratigraphy observed at Excavation Unit 2. This area was chosen for excavation because although it did exhibit surface disturbances, the anticipated west-wall profile would extend the existing west-wall profile at Excavation Unit 2, providing a more comprehensive stratigraphic window. Also, to maintain a safe working environment, it was excavated to facilitate entry and exit into excavation areas. Strata A and B were excavated in all four quadrants while Stratum C was also excavated in the northern quadrants. Stratum A was disturbed, exhibiting an excavated pit area and recent large mammal activity.

Stratum A (northeast quadrant)

The excavation of Stratum A in the northeast quadrant began at an average elevation of 0.54 m below datum. This deposit consisted of 10 pieces of flaked-stone debitage, four perishable artifacts, several plant remains, five quids, and soil/charcoal samples. The perishable
artifacts assemblage consisted of two burned agave needles, a 30-cm long wood stick with dulled ends, and one piece of burned fibrous material. The plant remains assemblage consisted of gourd seed and shell fragments, one possible hackberry fruit, pine cone fragments, wood twigs, yucca seeds, and other miscellaneous plant debris. Four pieces of fire-cracked rocks were also collected. Two charcoal samples were recovered in association with all of these items.

Stratum A (northwest quadrant)

The excavation of Stratum A in the northwest quadrant began at an average elevation of 0.54 m below datum. This deposit yielded eight pieces of flaked-stone debitage, two perishable artifacts, and several plant remains. The perishable artifacts assemblage consisted of one piece of cordage and one 16-cm long wood stick with dulled ends. The plant remains assemblage contained two cholla fragments, several gourd shell fragments, yucca seeds, and other pieces of miscellaneous plant debris.

Stratum A (southeast quadrant)

The excavation of Stratum A in the southeast quadrant began at an average elevation of 0.60 m below datum. This deposit yielded 22 pieces of flaked-stone debitage, two flaked-stone tools, 10 perishable artifacts, a large quantity and diversity of plant remains, five quids, and nine samples for radiocarbon dating and other analyses. The perishable artifacts assemblage consisted of two piece of cordage, three pieces of weaved fibers, four bundles of fibrous material, and one piece of cut wood. The plant remains assemblage consisted of yucca seeds, pine cone fragments (one piece burned), gourd shell fragments, an unknown bean, an acorn, onion-like skins, and miscellaneous pieces of plant debris.
Stratum A (southwest quadrant)

The excavation of Stratum B in the southwest quadrant began at an average elevation of 0.60 m below datum elevation. This deposit yielded five pieces of flaked-stone debitage, one quid, and several plant remains. The plant remains assemblage consisted of gourd shell fragments and fibers, an unknown seed pod, yucca seeds, and other pieces of fibrous material. Rabbit feces were present.

Stratum B (northeast quadrant)

The excavation of Stratum B in the northeast quadrant began at an average elevation of 0.75 m below datum elevation. This deposit yielded one piece of flaked-stone debitage, a cholla fragment, a high density of gourd shell fragments, pine-nut shell, a twig, and yucca seeds. No other cultural materials were observed.

Stratum B (southeast quadrant)

The excavation of Stratum A in the southeast quadrant began at an average elevation of 0.75 m below datum elevation. This deposit yielded one piece of flaked-stone debitage, two bimarginally-flaked stone tools, one piece of cordage, a quid, and several plant remains. The plant remains assemblage consisted of gourd shells fragments and seeds and yucca seeds. A charcoal sample was collected for radiocarbon dating analysis.

Stratum B Faunal Assemblage

The only identifiable faunal remains were of a Hispid Pocket Mouse within Stratum B in Excavation Unit 4. Several small unidentifiable burned and unburned pieces of fragmented bone were present.
Stratum C (northeast quadrant)

The excavation of Stratum C in the northeast quadrant began at an average elevation of 1.50 m below datum elevation. This deposit yielded one flake. No other cultural materials were found and no samples were recovered.

Stratum C Faunal Assemblage

Several identifiable faunal remains were recovered within Stratum C of Excavation Unit 4. All remains were situated in the northeastern quadrant. The assemblage includes the remains of Aztlán Rabbit, Kit Fox cf., Rattlesnake, Rock Mouse, and Yellow-faced Pocket Gopher. Several small unidentifiable burned and unburned pieces of fragmented bone were present. The presence of Aztlán Rabbit, dated to the Late Pleistocene at Dry Cave, Anthony Cave, and U-Bar Cave (Russell and Harris 1986), does not appear to fit the chronological sequence. At U-Bar Cave, in extreme southwestern New Mexico, age estimates approach 31,150 and 35,890 BP. The deposit found at Anthony Cave in the Franklin Mountains near El Paso Texas was associated with a fossil biota suggesting a Late Pleistocene age estimate. Dry Cave remains were radiocarbon dated to 25,000 BP and 34,000 BP (Russell and Harris 1986), but probably are older (personal communication, A.H. Harris).

3.2.2.5 Trench 1

Trench 1 was excavated during Phase I investigations to determine the depth and character of subsurface deposits. The trench was subsequently expanded to a 2-m by 2-m excavation unit (EU-2). Refer to the description in Phase I results above for cultural materials recovered.
3.2.2.6 Trench 2

Trench 2 was excavated diagonally, as a succession of 1-m by 1-m excavation units, beginning at 4.0 m north and 4.0 m east of the central datum and ended in the tunnel at the northeastern bend of the site. The primary objective of trenching was to excavate through disturbed sediments (from apparent winch/metal bucket excavations) in order to investigate the extent of the stratigraphy observed in Excavation Units 1, 2, and 3 (EU-4 had not yet been excavated). Figure 3.30 is a photograph of a metal Phillip’s 66 bucket used to extract sediments from the tunnel area where the trench was placed. This bucket was found above Stratum F, completely buried from collapsed sediments, and was collected as an historic artifact from the 1960’s. One other unidentifiable metal bucket was located on the talus of the cave.

![Figure 3.30. Photograph of Phillip’s 66 metal oil can bucket used to extract sediments from the northeastern corner (tunnel) of the cave.](image)

The trench was excavated in 1.0-m units, in ramped fashion, until undisturbed stratigraphy was observed. The resulting stratigraphic cross-section is critical to the investigations because it indicated the presence and absence of cultural and natural deposits in a long profile. Stratum A clearly pinched out, becoming increasingly shallower as it reached the
back wall of the cave. Stratum B, the hardened level, was only mildly pronounced, but present. Stratum C, the loose deposit of coarse silt, was also present and contained a human maxillary incisor in Excavation Unit T2-6 (Figure 3.31).

![Human maxillary incisor from Excavation Unit T2-6, near the northeastern tunnel.](image)

Stratum D was ephemeral and the chalky substance that defined the stratum in Excavation Unit 2 was absent. Stratum E was absent. Stratum F was present, although not as pronounced as observed in EU-2.
CHAPTER IV CONCLUSIONS AND RECOMMENDATIONS

Excavations at the Sierra Diablo Cave Site have provided a plethora of meaningful data. The current investigations excavated a total of 17.0 square meters, horizontally. Seven strata were documented. A total of seven features was observed. Three features were observed on the surface and were not investigated. Four features were noted during excavations, with good archaeological context, and were all excavated. This research has unearthed the types of artifacts that connect the researcher to the people who actually walked, talked, played, and ate during prehistoric times. Items such as a tiny sandal belonging to a child or a small tied-up pouch allow us to relate across thousands of years in a way that the more common flaked-stone debitage or burned rocks do not. A man kneels with his spear in the northwest quadrant of Excavation Unit I with a freshly flaked scraping tool in one hand and an atlatl spear in the other. Whittled wood shavings fall to the ground where we found them. The items people craft with their hands, including flaked-stone tools, are the items that display culture. Human teeth, an eaten corn cob fragment, hundreds of pieces of gourd, pine cones and pine nuts, a fire board used to start a fire, and a split bone with designs carved into it are some of the interesting finds that allow us to see the essence of life in the Trans-Pecos region before ceramic times, sometime around 3,000 years ago. The culture of the Late Archaic people is on display at the Sierra Diablo Cave Site in Strata A and B. It is expected, or rather hoped, that future excavations will bring to light more of the known and some of the unknown about the Archaic as well as the Paleoindian Period occupations. Large intact portions of the cave remain untouched.

4.1 Research Questions

1) When was the Sierra Diablo Cave occupied? How do we know?
Late Archaic Period (Strata A and B). Late Archaic artifacts were found in both strata. Also, a lack of Formative Period artifacts (e.g., ceramics, projectile points) supports this interpretation.

Early Paleoindian Period (Stratum F and probably D and E). Very few artifacts (three core-reduction flakes) and dark carbon-stained sediments were directly associated with *Coragyps occidentalis* (presumably are at least 10,000 years old).

2) What types of activities were people engaging in at the Sierra Diablo Cave Site?

The cave appears to have served as a multi-use residence during the Late Archaic Period. The presence of discarded sandals, projectile points, flaked-stone debitage, cordage, gourd, pinecone, a corn cob fragment, and quids suggests a wide range of activities. Only a few ground-stone fragments were recovered indicating grain and seed processing was usually done elsewhere. More spatial data and radiocarbon dates are required to accurately define the assemblage in a time-specific context.

### 4.2 Chronology

All chronological interpretations attempted in this thesis were done though relative dating techniques. No radiocarbon dates are available, currently; however, investigations continue at the site and literally hundreds of items are available for AMS radiocarbon dating. Once funding becomes available, the exact age ranges of the seven strata can be known. At this point, it is safe to say that there is one well pronounced cultural component, the Late Archaic, identified in two strata (A and B). The Paleoindian stratum is extremely dark in relation to everything else. Charcoal was collected for radiocarbon dating. Only a handful of non-diagnostic artifacts and the remains of *Coragyps occidentalis* are available. Radiocarbon dating of this stratum is critical and more excavation sessions are planned.
4.3 Contextualizing the Archaic Tradition

A series of cultural adaptations and environmental changes have occurred since the arrival of humans in North America. The Paleoindian Period is succeeded by the Archaic Period, a time of increasingly drier conditions with larger populations of humans. The Archaic Period spans approximately six thousand years in the Trans-Pecos region of Texas. This cultural period is a long transition in prehistory from extremely mobile people to semi-sedentary farmers (Miller and Kenmotsu 2004). Time diagnostic evidence does not exist at the site for the Early or Middle Archaic traditions. Or, at least, the literature does not indicate that any items within the site assemblage are consistent with cultural resources that are generally associated with the Early or Middle Archaic Periods in the Trans-Pecos region of Texas.

However, the Late Archaic Period is glaringly present in the cave. In fact, most of the excavated items from 17 1-m by 1-m units are associated with the Late Archaic stratum (Strata A and B). Some of the significant finds have already been discussed in the preceding chapter, such as the presence of corn, flaked-stone tools, and miscellaneous artifacts such as the small leather pouch and the bone fragment bearing incised decorative elements. Because the assemblage became so large (mostly perishables), two of the four excavation units received in-depth artifact analyses and serve as a representative sample for raw material selection and artifact type frequency percentages, specifically for the upper Late Archaic occupation. Also, all sandals (Figures 4.3, 4.4, and 4.5) are photographed and discussed here. The site’s sandal assemblage offers a variety of research opportunities for future study.

Judging from the types of plant remains that are present, it is likely that Late Archaic occupation(s) were present during the fall. This is inferred based on the presence of mesquite
pods and seeds, Buffalo Gourd shells and seeds, and pinyon nut shell fragments and pine cones. Gourd (buffalo gourd) matures in the fall, as do mesquite pods (Bohrer 2007).

4.3.1 Late Archaic Artifact Assemblages

The lithic artifact assemblage associated with the Late Archaic/Strata A and B deposit was sampled (Figure 4.1). Excavation Units 1 and 4 were chosen because they represent different portions of the site and contained higher frequencies of lithic artifacts than Excavation Units 2 and 3, combined. Lithic artifacts from Excavation Units 1 and 4 were analyzed for type. By far, the most common lithic artifact is the flake (without cortex). The lithic artifacts assemblage consists mostly of flaked-stone debitage (n=138). The most frequently occurring lithic artifact types are flakes (n=95) followed by angular shatter/debris (n=43), and bifacial thinning flakes (n=11). Other lithic artifact types included one biface, three biface fragments, two cores, two core fragments, one hammerstone, two projectile points, and three unimarginally modified flake tools. Interestingly, ground stone was absent from this sample (n=165). The density of plant material would suggest that processing is occurring in the cave using grinding implements; however, ground stone was only observed fragmented and infrequently within the entire sites’ assemblage.
4.3.2 Raw Materials

The selection of raw materials for lithic and nonlithic artifact types is evidently related to the availability of those materials within the geographic range of any given population. Put simply, people use what they have around them as much as they can. A look at the site's artifact assemblage confirms this idea. The most prominent plant used to construct necessary living items such as footwear, matting, and cordage was *Yucca elata*. This plant is ubiquitous throughout Trans-Pecos Texas in the vast Chihuahuan Desert. Inspection of several lithic artifacts \((n=165)\) shows the assemblage is dominated by chert (Figure 4.2). Chert is a very inclusive category that brackets all high-grade, fine-grained cryptocrystalline rock. It accounted for nearly 60 percent \((n=97)\) of all lithic artifact material types.

![Lithic Artifact Types](image)

Figure 4.1. Lithic artifact types found in Excavation Units 1 and 4.
Other frequently occurring material types were limestone (n=22) and felsite (n=17). Felsite is a commonly occurring igneous rock, available in most of the eastern Trans-Pecos counties, including Culberson (SDC is near the Culberson County line). It is a highly knappable, fine grained igneous rock with few impurities. This raw material source can be found in cobble or boulder form, ideal for expedient tool manufacture (http://www.texasbeyondhistory.net/trans-p/nature/rocks.html, accessed 10/5/2010). It is apparent that Late Archaic hunter-gatherers who occupied the cave relied on a variety of different tool stones and raw material resource locales. The sample’s raw material diversity does more to represent the types of materials available than it does in emphasizing the minute differences in frequency. Clearly though, high-grade cherts were favored for the production of flaked-stone tools.

![Figure 4.2. Frequency percentage bar graph of raw materials selected for stone tool manufacture from Excavation Units 1 and 4.](image)

Figure 4.2. Frequency percentage bar graph of raw materials selected for stone tool manufacture from Excavation Units 1 and 4.
4.3.3 Dorsal-Cortex Analysis

Dorsal-cortex analysis is commonly used as an alternative measure for identifying reduction stage and trajectory (Andrefsky 1998). A percentage of cortical material on the dorsal side of the flake or flake fragment was estimated (1-25, 26-50, 51-75, and 76-100 percent). The results show that the sampled flaked-stone debitage assemblage within the two excavation units (EU-1 and 4), at Stratum A, either have very little cortex or none at all (Table 4.1). The various material types are also shown below with the percentage of cortical material present on the artifact. Chert, felsite, and limestone account for 74.55 percent of all late-stage reduction flaked-stone debitage with no cortex.

Table 4.1. Frequency Percentage of Cortical Material on Flaked-stone Artifacts for Excavation Units 1 and 4

<table>
<thead>
<tr>
<th>Material type</th>
<th>Frequency (n=)</th>
<th>Frequency (%)</th>
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</thead>
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<tr>
<td>No Cortical Surface</td>
<td>142</td>
<td>86.06</td>
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<tr>
<td>Calcite</td>
<td>2</td>
<td>1.21</td>
</tr>
<tr>
<td>Chert</td>
<td>89</td>
<td>53.94</td>
</tr>
<tr>
<td>Dolomite</td>
<td>4</td>
<td>2.42</td>
</tr>
<tr>
<td>Felsite</td>
<td>15</td>
<td>9.09</td>
</tr>
<tr>
<td>Limestone</td>
<td>19</td>
<td>11.52</td>
</tr>
<tr>
<td>Quartzite</td>
<td>1</td>
<td>0.61</td>
</tr>
<tr>
<td>Rhyolite</td>
<td>6</td>
<td>3.64</td>
</tr>
<tr>
<td>Silicified dolomite</td>
<td>1</td>
<td>0.61</td>
</tr>
<tr>
<td>Siltstone</td>
<td>7</td>
<td>4.24</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1-25 Percent Cortical Surface</th>
<th>11</th>
<th>6.67</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chert</td>
<td>7</td>
<td>4.24</td>
</tr>
<tr>
<td>Dolomite</td>
<td>1</td>
<td>0.61</td>
</tr>
<tr>
<td>Felsite</td>
<td>2</td>
<td>1.21</td>
</tr>
<tr>
<td>Rhyolite</td>
<td>1</td>
<td>0.61</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>25-50 Percent Cortical Surface</th>
<th>10</th>
<th>6.06</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chert</td>
<td>1</td>
<td>0.61</td>
</tr>
<tr>
<td>Dolomite</td>
<td>4</td>
<td>2.42</td>
</tr>
<tr>
<td>Limestone</td>
<td>3</td>
<td>1.82</td>
</tr>
<tr>
<td>Quartzite</td>
<td>1</td>
<td>0.61</td>
</tr>
<tr>
<td>Sandstone</td>
<td>1</td>
<td>0.61</td>
</tr>
</tbody>
</table>

| Grand Total                  | 165 | 100.00 |
4.3.4 Woven Fishtail Sandals

The footwear people constructed in the Trans-Pecos region is a fascinating research area. With the samples recovered, many types of analyses can be performed to better understand the environment during the Late Archaic in the Trans-Pecos. For example, many of the sandals and sandal fragments exhibit encrusted sediments on the bottom portion that made contact with the ground while in use. The bottom of those sandals could reveal interesting facts about environmental conditions. The sandals themselves can be radiocarbon dated for chronometric context.

A total of 15 *Yucca elata* sandals was found during the current investigations. The nearest cave with extensive documentation is located in the northeastern portion of Culberson County, in the Rustler Hills area. Excavations at Granado Cave (Hamilton 2006) report the presence of fish-tail sandals similar to those found at the Sierra Diablo Cave. At the Sierra Diablo Cave, all 15 complete and fragmented specimens were constructed completely out of *Y. elata*. Excavation Unit 1 contained seven specimens associated with Stratum A, a Late Archaic Deposit (Figure 4.3). Excavation Unit 2 contained two specimens, also associated with Stratum A (Figure 4.4). Excavation Unit 3, contained several specimens (n=5) within a small 1-m by 1-m excavation area (Figure 4.5). The five sandals are associated with the reddish chert Late Archaic projectile point shown in Chapter 3 under the Excavation Unit 3 description (see Figure 3.10). One sandal fragment was recovered during the initial site assessment from near Excavation Units 1 and 3 (see Figure 3.6).
Figure 4.3. Plate 1: Excavation Unit 1 sandals and sandal fragments. All sandals were recovered from Stratum A, associated with the Late Archaic Period.
Figure 4.4. Plate 2: Excavation Unit 2 sandals and sandal fragments. These sandals were recovered from the Stratum A/B interface, associated with the Late Archaic Period.
Figure 4.5. Plate 3: Excavation Unit 3 sandals and sandal fragments. All sandals were recovered from Stratum A, associated with the Late Archaic Period.

4.4 Contextualizing the Paleoindian Occupation

Prior to any excavations during the current investigations, several Pleistocene-age mammal remains were noted on the surface. The most logical explanation for Late Pleistocene materials on top of a well-pronounced Late Archaic deposit is that looter excavations near the northeast corner of the site (the tunnel location) brought these bones to the surface. The winch in the back of the cave was used to extract sediments for sifting from the tunnel. In fact, the metal bucket used with the winch was collected exactly where they ended excavations in the tunnel, filled with sediments. Other disturbances were noted as well. However, no vertical excavation
in the cave has been observed that reached beyond Stratum F (with the exception of a few centimeters into Stratum G in Excavation Unit 2). This is extremely important to note because it contextualizes all of the faunal material into a broad but bracketed stratigraphic sequence (Strata A through F). In essence, we are able to confidently assert that all faunal material that has been excavated, no matter the context, during the current investigation or prior to it, is as old as or younger than Stratum F. Age estimates for much of the faunal assemblage are absolutely Late Pleistocene, supported by the presence of several well persevered diagnostic specimens.

The assemblage of bones includes several remains of extinct Pleistocene fauna (Table 4.2). The presence of these materials, in disarticulated form, indicates that the animal likely did not die in the cave. In the case of *Coragyps occidentalis*, the remains were semi-articulated. Also, it was probably not carried in whole by other animals, unlike the deer carcass that was recently brought in by a mountain lion near the center of the cave.

```
Table 4.2. Pleistocene Faunal Remains

<table>
<thead>
<tr>
<th>Species</th>
<th>Common Name</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Phrynosoma hernandesi</em></td>
<td>Mountain Short-horned Lizard</td>
</tr>
<tr>
<td>†Coragyps occidentalis</td>
<td>Western Black Vulture</td>
</tr>
<tr>
<td><em>Cynomys gunnisoni</em></td>
<td>Gunnison's Prairie Dog</td>
</tr>
<tr>
<td><em>Microtus mogollonensis</em></td>
<td>Mogollon Vole (cf.)</td>
</tr>
<tr>
<td><em>Microtus pennsylvanicus</em></td>
<td>Meadow Vole</td>
</tr>
<tr>
<td><em>Neotoma cinerea</em></td>
<td>Bushy-tailed Woodrat</td>
</tr>
<tr>
<td><em>Sigmodon ochrognathus</em></td>
<td>Yellow-nosed Cotton Rat</td>
</tr>
<tr>
<td>†Aztlanolagus agilis</td>
<td>Aztlán Rabbit</td>
</tr>
<tr>
<td><em>Sylvilagus nuttallii</em></td>
<td>Mountain Cottontail (cf.)</td>
</tr>
<tr>
<td>†Notiosorex dalquesti</td>
<td>Dalquest's Shrew</td>
</tr>
<tr>
<td>†Desmodus stocki</td>
<td>Stock's Vampire Bat</td>
</tr>
<tr>
<td>†Panthera atrox</td>
<td>American Lion</td>
</tr>
</tbody>
</table>
```
The Paleoindian deposit was sampled in two locations. Initially, a dark concentration of carbon-stained sediments was observed at 1.93 m below datum elevation (1.39 m below surface) in the northwest quadrant of Excavation Unit 2. The staining was observed as a circular manifestation, labeled and photographed as Feature C. Subsequent trowel scraping revealed it to be a widespread deposit that extended into the each quadrant wall. Flaked-stone debitage and charcoal fragments were found in association with the bones. The following section will discuss the findings and their implications.

The Paleoindian occupational level, primarily Stratum F (consisting of Strata D, E, and F in Excavation Unit 2), has been noted in two portions of the cave. First, Excavation Unit 2 investigations yielded very dark semicompact sediments that included charcoal fragments, flaked-stone debitage, a chert unimarginal scraping tool, and several diagnostic remains from an extinct Western Black Vulture (*Coragyps occidentalis*) (Figure 4.6). The carbon stained sediments were first noticed at a depth of 164 cm (top of Level 12) below datum elevation (datum elevation is 69 cm above ground surface). A new excavation level (Level 13) was started at 188 cm below datum when slight variations in soil coloration were noted. Level 13 was excavated until staining was no longer observed and artifacts were no longer present (to a depth of 206 cm below datum or 137 cm below ground surface). Thereafter, Trench 2 was excavated in the north east portion of the cave towards the tunnel. At the termination of Session 3, carbon-stained sediments were observed at 175 cm below datum in association with a core (felsite) and
several bone fragments. The depth of the carbon-stained sediments is approximately 0.10 m. It should be stressed that further inquiry will reveal that Paleo-1 is either a single occupational event or a series of occupations over time.

When compared to specimens from Dry Cave (Harris personal communication 2010), Harris found that comparatively, the size and morphology are the remains of *Coragyps occidentalis* (extinct western black vulture) and presumably are at least 10,000 years old (Figure 4.6). Love (1957:61) states the following about this vulture:

“The species seems to have dropped out along with the Pleistocene camel, horse and ground sloth at about the time of man’s first appearance in the southwest.”

Figure 4.6. Photograph showing the surface of Excavation Unit 2 at a depth of 194 cm below datum (note the dark carbon-stained sediments, Stratum F, in direct association with the extinct Black Vulture – *Coragyps occidentalis* - remains).
4.4.1 Relevant Data from Other Cave Sites

Very few Paleoindian sites have been documented within and around the Trans-Pecos. Of particular interest is Burnet Cave, located approximately 75 miles to the northeast of the Sierra Diablo Cave, in the Guadalupe Mountains of New Mexico. The extinct faunal record of this cave resembles the current assemblage at the Sierra Diablo Cave Site (e.g., *Coragyps occidentalis* - Extinct Black Vulture [Howard 1968; Schultz and Howard 1935], *Equus* sp. – Extinct Horse [Schultz and Howard 1935], and *Stockoceros conklingi*—Conkling’s Pronghorn [Schultz and Howard 1935] have been found in both locales). Howard (1968) notes that the Burnet Cave specimen is equivocal and appears to be close to the maximum for *Coragyps atratus* and the minimum for *Coragyps occidentalis*. Furthermore, lithic artifacts (including a fluted projectile point) and charcoal were found in association with extinct mammal remains at Burnett Cave. A radiocarbon date obtained from cave materials returned a date of 7432 ± 300 BP (Schultz and Howard 193) although Hester (1967) believed it to be much older. Despite this, a clear association between the extinct faunal remains, projectile point, and radiocarbon age was not clearly established at Burnet Cave (Hester 1960, Miller and Kenmotsu 2004). The Clovis layer at Burnet Cave, the deposit containing the fluted point, was 4-feet below the lowest layer containing Archaic material (Boldurian and Cotter 1999:7). There is also about a 4-foot difference (1.18 m or 3.87 ft) between the dense Archaic deposit in Stratum A and Paleoindian Stratum F in the Sierra Diablo Cave. Hermit Cave, also located in the Guadalupe Mountains, yielded Late Pleistocene radiocarbon dates and faunal remains (Schultz 1968); however, the hearth feature contained no artifacts in association.

Based on the existing assemblage of extinct mammal remains, it can be inferred that Paleoindians inhabiting the cave may have depended on a balanced subsistence economy that featured diverse dietary practices including insects, reptiles, rodents and other small ground
mammals, ungulates, and birds. This would stand in contrast to the long-held contention that early Paleoindian people were specialized hunters of megafauna as Cannon and Meltzer argued (2008).

Without radiocarbon dates in hand, assigning temporal affiliations to stratigraphic units can only be done with well documented, well preserved materials that have strong cultural associations from previous work or logical interpretations derived by applying the law of superpositioning (unless disturbed, deposits at the bottom are older). Near the Stratum D/E interface was a small chert flake with marginal modifications, likely to have been used as a cutting implement (Figure 4.7). The artifact was found within the lowest portions of Stratum D (1.8 m below datum), less than 0.10 m above the known Pleistocene deposit that also contained a higher percentage of stalactites, suggestive of a wetter climate such as what the Trans-Pecos experienced during the Late Pleistocene. Stratum D did not bear any diagnostic remains although it is expected that many of the Pleistocene faunal remains were excavated from this stratum. This assertion is made in part because Stratum F was hardly, if at all, disturbed by prior excavations in any portion of the cave. Radiocarbon dating will resolve the true ages of Strata D, E, and F.

![Extensive marginal flaking](image)

**Figure 4.7.** Photograph of a unimarginally modified flaked-stone tool found in the lower portion of Stratum D, Excavation Unit 2.
4.5 Geoarchaeological Context

Throughout the excavations several geoarchaeological questions were raised. These questions are briefly addressed in this section. Because stratigraphic interpretation is critical to site formation processes interpretations, detailed descriptions and observations were demanded. Site formation processes refer to the cultural and natural events (C and N-Transforms) that shape the site into its most current condition (Schiffer 1987). Answers to these types of questions are largely beyond the scope of the current investigation; however, conclusions were tentatively reached out of necessity.

Does sedimentation occur at a constant rate in the cave? How can we determine what that rate is? Were some strata deposited quicker than others?

Answering these types of questions requires data about each stratum. Ideally, it would have been convenient to estimate the amount of deposition for every century in evenly distributed strata from ground surface to Stratum F; however, deposition in this cave appears to have been highly variable. It is likely, however, that Stratum C was deposited at a faster rate than all of the other excavated strata. This is hypothesized because it is observed as the loosest deposit, indicating that compaction, perhaps by human and animal activity, did not occur as it did in the two strata that were deposited subsequently. Compaction may be a function of time.

How have rodents disturbed the stratigraphy and contextual integrity at the site?

Observations at the four excavation units and two trenches do not indicate that rodent activity has disturbed the contextual integrity of the site. Only minor rodent burrowing was noted on the cave surface.
*Have earthquakes in the area contributed to spalls and large section roof falls over the last 10,000 years?*

Large boulders were observed in many portions of the cave’s surface and subsurface. It is possible that the earthquake that rocked the area in 1931 (Figure 4.8) may have caused large sections of the cave roof to descend, concealing cultural materials (USGS [http://earthquake.usgs.gov/regional/neic/](http://earthquake.usgs.gov/regional/neic/)). Earthquakes in the area may have also dislodged rock sections in the cave in prehistoric times.

4.6 Recommendations for Future Investigations

As this thesis states in its title, this is a preliminary assessment of the site’s potential to address high impact questions about Archaic and Paleoindian cultural traditions in the Trans-Pecos region of the North American Southwest. It has been demonstrated here that the site contains high frequencies of perishable prehistoric materials, diagnostic lithic artifacts, and well-preserved stratigraphic integrity. In addition, dateable organic materials, including charcoal, are abundant. The excavated sediment volume from the cave during this investigation is roughly 4.25 percent, horizontally, of the entire surface area. Vertically, it is unknown how much sediment remains; however, it is clear that future excavations will require a strong and coordinated effort to expose the lower strata.

Several items should be addressed in the following investigation. First and foremost, radiocarbon dating of the strata should precede any excavation efforts. Once the ages of the deposits are known, a comprehensive approach can be designed to deal with the different cultural components presented. An in-depth look at the stratigraphy, by one or more experienced geoarchaeologists, should also be a priority for future investigations.

Another recommendation for future studies would be the use of ground penetrating radar (GPR) to establish excavation areas. It is possible that human remains are present as they have been found in caves historically. GPR can help identify cultural features and other anomalies that may exist below, including significant paleontological data.

It would be wise to conduct a wide area survey of the land near the cave. The extent of our survey during field work was the limited journey between the cave and the vehicles. If possible, and only with land-owner permission, survey data in this portion of the Trans-Pecos would be a great contribution to Trans-Pecos archaeology.
Finally, it was truly a great experience to be able to work at the ranch. Mr. Christopher Gill and his family made this all possible by allowing us to come on their land. I would like to praise them for their contribution to archaeology and encourage other land owners in Trans-Pecos Texas to follow the Gills’ lead. After all, we all want to know about the human past. The Circle Ranch family and staff did more for us than we could have asked for. I plan to continue to tell the story of the Sierra Diablo Cave Site.
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APPENDIX A: MEMORANDUM OF UNDERSTANDING

MEMORANDUM OF UNDERSTANDING BETWEEN

Circle Ranch, by its Manager, Christopher Gill

AND

The University of Texas, Laboratory for Environmental Biology

The University of Texas El Paso, Laboratory for Environmental Biology (hereinafter referred to as UTEP) and Circle Ranch by its Manager, Christopher Gill (hereinafter referred to as Circle Ranch) enter into an agreement of cooperation to establish a program of collaboration in areas of interest and benefit to both entities.

I.

The purposes of the cooperation between UTEP and Circle Ranch are as follows:

- to facilitate research into the archaeological and paleontological prehistory of the ranch, and
- provide opportunities for UTEP students to collect data for graduate research.

II.

To achieve these goals, UTEP and Circle Ranch will, insofar as the means of each allow:

- access to the Circle Ranch and the research site known here as Sierra Diablo Cave provided that advance notice is given to the ranch prior to arrival;
- excavation of archaeological and paleontological material, with removal of these materials to UTEP’s Laboratory for Environmental Biology for conservation and research, but with ownership residing with Circle Ranch;
- conduct research on these materials with the aim of reconstructing the prehistory of ranch to the degree allowed by the nature of the material and the resources of UTEP;
- collection by UTEP of modern small vertebrates (amphibians, reptiles, and mammals), subject to any limitations set by Circle Ranch;
- produce written results of the research, including the right of UTEP students and personnel to publish the results in scientific outlets;
- store the materials securely and under such storage conditions as to maintain their physical integrity under a 3-year loan agreement to UTEP,
with Circle Ranch able to designate what material will be returned to Circle Ranch at the end of the loan period and what material, if any, will have ownership transferred to UTEP; the loan period may be extended by mutual consent.

III.

Each party shall designate a coordinator to oversee and facilitate the implementation of this Agreement. The coordinators for UTEP will be David Carmichael, responsible for overseeing the archaeological portion of the research, and Arthur H. Harris, responsible for overseeing the paleontological research and security of the research material. UTEP, working with the coordinator of Circle Ranch, shall have the responsibility of insuring that the UTEP actions as detailed in Section II are carried out in a professional manner; The Circle coordinator will facilitate entry to the ranch and research site.

IV.

Indemnification: Circle Ranch shall indemnify and defend UTEP and UTEP shall indemnify Circle Ranch against all claims, demands, actions, suits or causes of action arising from any negligent or willful act or omission of the party.

V.

This general Agreement of Cooperation shall be identified as the parent document of any program agreement executed between the parties. Further agreements concerning any program shall provide details concerning the specific commitments made by each party and shall not become effective until they have been reduced to writing and executed by the duly authorized representatives of the parties. The scope of the activities under this agreement shall be determined by the funds regularly available at both institutions for the types of collaboration undertaken and by financial assistance as may be obtained by either party from external sources.

VI.

All travel, living, and research expenses will be the responsibility of UTEP unless otherwise agreed.

VII.

Upon approval by each party, this agreement shall remain in effect for a period of three (3) years, unless extended for an additional year by mutual agreement. The agreement may be terminated in less than three (3) years by either party. Such termination by one party shall be effected by giving the other party at least ninety (90) days advanced written notice of its intention to terminate. If such
notice is given, this agreement shall terminate: (a) at the end of such ninety (90) days; or (b) when the students dependent upon the agreement for their thesis or dissertation have completed their research under the agreement, whichever event occurs last. Termination shall be without penalty. If this agreement is terminated, neither UTEP nor Circle Ranch shall be liable to the other for any monetary or other losses which may result.

EXECUTED by The University of Texas at El Paso and Circle Ranch in duplicate copies, each of which shall be deemed an original.

The University of Texas at El Paso

By: [Signature]

Title: Vice President for Research

Date: 5/1/09

Circle Ranch

By: [Signature]

Title: Manager, Sustainable Ass. (Circle Ranch)

Date: 5/14/09
CURRICULUM VITA

Jose Javier Vasquez was born in El Paso, Texas. The son of Patricia Vasquez, he graduated from Socorro High School, El Paso, Texas, in the spring of 1999 and entered The University of Texas at El Paso in the fall. He earned his Bachelor’s degree from UTEP in 2005, majoring in Anthropology with a minor in Geology. Since then, he has worked as an archaeologist in Texas and New Mexico for TRC Environmental out of the El Paso, Texas office. He has served on several projects including survey, site testing, and excavation. His areas of interests include cave sites, the application of GIS in archaeological investigations, and geoarchaeology. He plans to continue working as a professional archaeologist in the Trans-Pecos region.

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This thesis was typed by Jose Javier Vasquez.