A MICROSTRATIGRAPHIC APPROACH TO EVALUATING SITE FORMATION PROCESSES AT EAGLE CAVE (41VV167)

by

Christina Nielsen, B.A.

A thesis submitted to the Graduate Council of
Texas State University in partial fulfillment
of the requirements for the degree of
Master of Arts
with a Major in Anthropology
August 2017

Committee Members:

Stephen L. Black, Chair

C. Britt Bousman

Kevin Hanselka

Charles Frederick

FAIR USE AND AUTHOR'S PERMISSION STATEMENT

Fair Use

Duplication Permission

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to all of the individuals who offered support throughout this project. First, I would like to thank Jack and Wilmuth Skiles, and the Skiles family, for their stewardship and enthusiasm for continued archaeological research in the ENC. On many occasions, they kindly invited our (stinky) crew into their home, for refreshments and a dip in the pool after a long, hot day in the field.

I would very much like to thank my committee chair, Dr. Stephen Black, for his guidance and moral support throughout this process and for his patience when my chapters were always a day (or more) later than promised. I am extremely grateful to the Ancient Southwest Project (ASWT), headed by Dr. Black, for providing me with the means to complete my research including equipment, funding for analysis, room and board, and logistical support.

I could not have completed this thesis without the help of my committee members and the many individuals who offered up their time and analytical expertise. Dr. Charles Frederick not only provided incredible support and training during the geoarchaeolgical analyses, but gave me free range of his guest house and lab equipment, and kindly footed the bill for many of the special analyses. I am also very grateful to Ken Lawrence who graciously provided lab equipment and supplies so I could conduct some of the geoarchaeoogical analyses in Austin, taught me all I ever wanted to know about phosphorus and magnetic susceptibility, and fixed the calcimeter gauge for me when I could not for the life of me figure out where the leak was coming from.

Many thanks to Dr. Kevin Hanselka and Dr. Leslie Bush who took on the arduous task of sorting and analyzing the botanical remains from a dry rockshelter. I am grateful to Dr. Bousman for providing statistical support and helping me sort through the plethora of data I accumulated over the course of my thesis. My appreciation goes to Dr. Chris Jurgens for taking the time to sort through and analyze the hundreds of tiny bone fragments I recovered from the 4 mm size sieve. I would like to thank Dr. Ray Mauldin at CAR for processing the radiocarbon samples collected from UT North, and to all who contributed to the ASWT radiocarbon crowdfunding campaign, without which I would may not have been able to submit a second set of samples from UT North.

My gratitude goes out to all of the core 2014 ASWT crew and innumerous volunteers that helped with the field work and post-field processing, especially Charles Koenig, Jacob Sullivan, Brooke Bonorden, and Bryan Heisinger. An extra special thank you to Jacob, who volunteered his free time to help me with the first rounds of geoarchaeological analysis.

I would also like to thank my graduate cohort, especially the rest of the “Nutria” (inside joke), Amanda Castañeda and Spencer Lodge, for providing encouragement and often much needed comic relief that helped me to maintain my sanity through this process. A special thank you to my rock sorting helpers, Ashley Eyeington, Amy Gray, and Alex Soto, I owe you all one! I would also like to thank all of my coworkers at SWCA and the many supervisors I have had over the last four years for being extremely flexible and patient and allowing me to take off time to conduct my fieldwork, analyses, and writing.

Most importantly, I would like to express my deepest gratitude to my parents, John and Mary Nielsen, for providing moral support and financial help (and some last minute formatting help) and to the rest of my family and friends who encouraged me every step of the way.

TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

Figure **Page**

ABSTRACT

Dry rockshelters in the Lower Pecos Canyonlands (LPC) provide a unique setting for archaeological research, preserving otherwise perishable artifacts and organic materials within the site deposits. However, many of the excavations done in the LPC were conducted during the 1930s and 1960s when the focus was recovering unique prehistoric items and/or chronology. The excavation methods during these times were unrefined, data was not reported in great detail, and little effort was made to discuss or interpret site formation processes. My thesis research focused on the northern sector of Eagle Cave, which was first sampled during the 1963 excavations by the University of Texas at Austin. The goal of my thesis research was to use a "microstratigraphic" approach to evaluate the natural and cultural processes that led to the accumulation of the strata in this sector of Eagle Cave, focusing on the source of sediments in each stratigraphic layer, methods of transport of the sediments, and the specific natural and cultural processes responsible for forming and/or reorganizing the deposits.

The microstratigraphic approach included recording stratigraphy in high resolution (i.e., "splitting" rather than "lumping" strata) and the collection and analysis of micromorph samples to examine in situ stratigraphy. Multiple lines of evidence, including data derived from the stratigraphic documentation, geoarchaeological sampling, macrobotanical and faunal identification, constituent size distribution, and radiocarbon dating, were used to evaluate the various formation processes.

The 75 stratigraphic layers defined, recorded, and sampled in UT North were categorized into general strat types such as discrete ash lenses, thick ash deposits, refuse midden, earth oven heating element remnants, and limestone spall deposits. The results of the analyses revealed that some of our initial impressions of the deposits were incorrect, the most significant being that the "thick ash deposits" contained far less wood ash than what was initially though. The results of the analyses indicate that the deposits in UT North are comprised of natural sediments derived from both inside and outside the shelter (e.g., limestone spall, aeolian silt- and sand-sized grains), biogenic deposits derived from animals (e.g., feces), and anthropogenic materials brought in to the shelter by humans for plant processing and baking (e.g., rock, fuel, foodstuffs, alluvium to cap earth oven), animal butchering, consumption, and tool manufacture (i.e., faunal remains), and stone tool production (i.e., lithics debris and tools). The reorganization of deposits through time in this portion of the rockshelter is primarily a result of prehistoric cleanout activities and pit digging, although bioturbation from animal burrowing also contributed a substantial amount of reorganization.

This thesis provides an initial evaluation of the formation processes that led to the accumulation of the strata in Eagle Cave. However, my research focused on one small area of the shelter and additional analyses need to be completed on the samples from the central portion of the shelter to get a better picture of the various formation processes at play. Subsequent 2015–2016 Eagle Cave investigations have done just this and have benefitted from my hard-won lessons.

I. INTRODUCTION

Eagle Cave (41VV167) is a large dry rockshelter in the Lower Pecos Canyonlands (LPC) of southwest Texas with deep stratified deposits spanning the Middle Archaic through the Late Prehistoric periods. The LPC region is centered on the mouth of the Pecos River in Val Verde County and extends approximately 150 km north and south of the Rio Grande (Turpin 2004). The semi-arid climate supports plants such as yucca, prickly pear cactus, lechuguilla, and sotol. One of the hallmarks of the region's archaeology is the dry rockshelter and cave sites, which have preserved otherwise perishable cultural materials generally lost in more mesic settings.

My thesis research focuses on the deposits in the north sector of the shelter (UT North) that was first sampled during the 1963 excavations by the University of Texas at Austin (UT-Austin) (Figure 1.1). I conducted excavations in UT North in 2014 through Texas State University during the Ancient Southwest Texas (ASWT) project (Figure 1.2). In this thesis I use several lines of evidence to evaluate the natural and cultural formation processes that led to the complexly stratified, culturally rich deposits present in Eagle Cave. Data developed from stratigraphic documentation, geoarchaeological sampling, artifact analysis, macrobotanical and faunal identification, constituent size distribution, and radiocarbon dating are used to develop a protocol for understanding the site formation processes evident at Eagle Cave and many other rockshelters in the region.

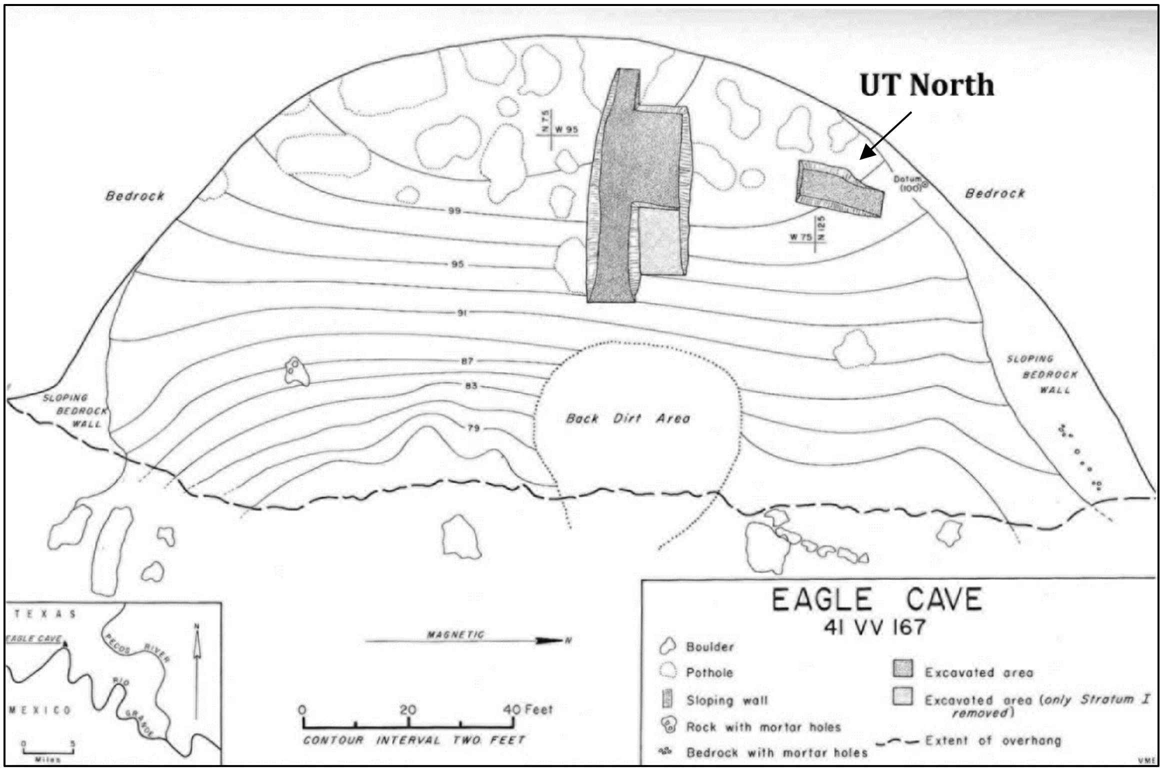


Figure 1.1. Plan map of 1963 Eagle Cave investigations showing excavation areas and disturbances areas (Ross 1965:12; Figure 2).

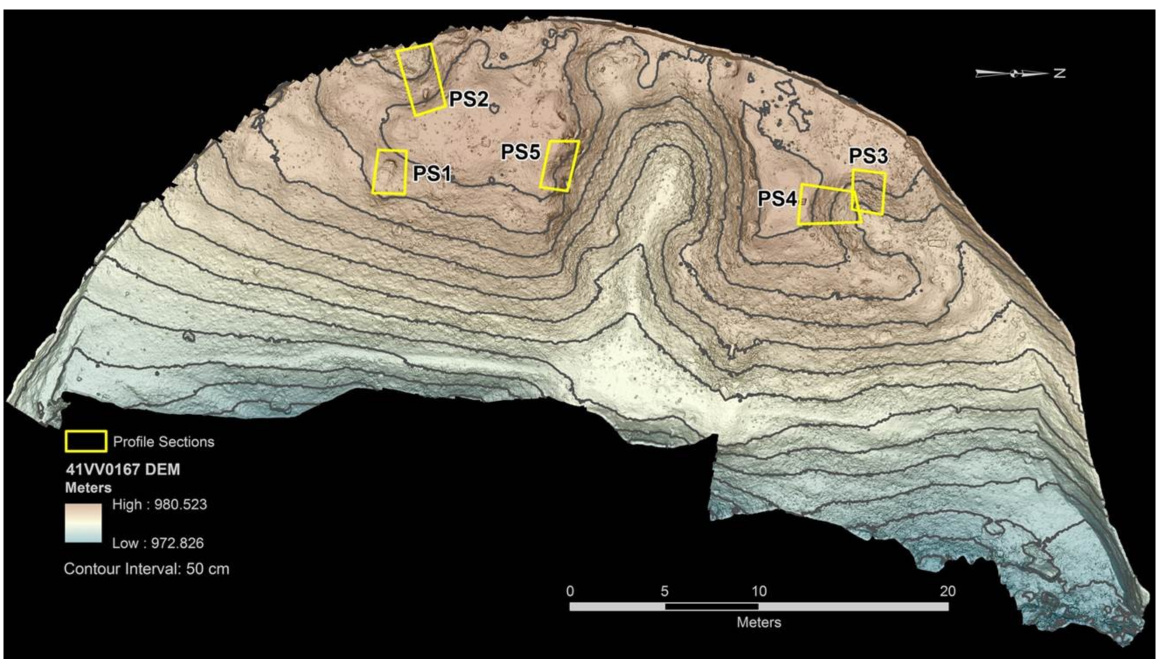


Figure 1.2. 2014 ASWT investigations at Eagle Cave, map by Charles Koenig. PS3 and PS4 are the subject of this thesis.

Research Goals

As will be discussed in greater detail in Chapters 3 and 4, many of the large-scale excavations that have been conducted in the LPC were done during the Museum (1930s) and Amistad Reservoir (1960s) eras when the focus was on chronology and/or recovering unique prehistoric objects (Black 2013). The excavation methodologies were unrefined and data was not reported in great detail. At Eagle Cave, for example, efforts were made to keep horizontal and vertical controls and document stratigraphy during excavations there in the 1930s and 1960s; however, layers were often lumped and recorded as generalized “zones” (Davenport 1938; Ross 1965). Little attempt was made to understand the various formation processes at play in the shelter.

The main goal of my thesis work is to create a detailed model of the natural and cultural processes that led to the accumulation of the strata in UT North. Specifically, I want to determine the source of sediments in each stratigraphic layer and whether the reorganization of many of the deposits can be attributed to mostly anthropogenic (cultural) processes, natural processes, or both. In addition, it is important to determine what specific types of processes were responsible in forming and/or reorganizing the deposits. Chapter 2 provides an in-depth review of the various processes as they relate to rockshelter formation. I am also interested in how the use of this area of the shelter changed over time. Was this area of Eagle Cave consistently used for plant baking or are other types of cooking and/or activities evident? A brief overview of earth oven technology is presented below, followed by expected characteristics of deposits associated with earth oven cooking and other types of activities that likely occurred in UT North.

Earth oven cooking technology has been utilized by peoples across western North America and in many other regions worldwide to bake foods that would be otherwise indigestible, and sometimes toxic, to humans (Black et al. 1997; Thoms 2008, 2009; Wandsnider 1997). Prolonged heat treatment (e.g., 36–48 hours for sotol and lechuguilla) and retention of moisture are both needed to render the food digestible, and to keep the food from charring or burning (Black and Thoms 2014: 209; Dering 1999:661; Thoms 2008:444; Wandsnider 1997:4). The typical construction of an earth oven is described by Black and Thoms.

> In its moist-heat baking mode, typical earth oven consists of seven layers, from top to bottom: (1) prepared surface (i.e., basin or deeper pit); (2) fire (reduced to glowing coals and ashes when oven is sealed); (3) layer of hot rocks; (4) lower layer of green plant material, which we call packing; (5) food being baked; (6) upper packing layer; and (7) earthen cap. [Black and Thoms 2014:208]

Earth oven cooking produces a variety of refuse including fire-cracked rock (FCR), charcoal, ash, and packing material waste. The pits and ovens are often rebuilt and reused, resulting in quite the accumulation of debris, often referred to as burned rock middens (BRMs) or earth oven facilities (Black et al. 1997; Black and Thoms 2014; Thoms 2008, 2009). Not surprisingly, over time the pits are often repurposed as trash pits.

Earth oven cooking leaves a distinctive archaeological signature (Black and Thoms 2014; Thoms 2008, 2009). Intact heating elements used in earth ovens consist of relatively large, clast-supported or closely spaced FCR that are often fractured in situ. Close-aired cooking (e.g., earth ovens) prevents full combustion of wood, so dark matrix, charcoal, and/or charred botanicals found in association with burned rocks are indicative of this type of cooking. In contrast, fuel used in open-aired fires combust more completely, leaving predominantly residual ash rather than large quantities of charcoal fragments, if any trace is left at all (Black and Thoms 2014:218). Wood ash is composed primarily of calcium carbonate and silt-sized grains of calcite crystal aggregates displaying rhombic, triangular, or lozenge-like morphologies under high magnifications (Mentzer 2012:626). Reworked combustion features exhibit rounded charcoal; whereas charcoal from an in situ combustion feature retain sharp broken edges (Mentzer 2012). In addition, bioturbation and pit digging may cause extensive homogenization of burned materials in combustion features. Other activities such as food processing are likely to have occurred around cooking features and may be evident by the presence of plant processing tools such as unifaces, modified flakes, and grinding stones.

A secondary goal of my research is to develop a protocol for how to evaluate formation processes in dry rockshelter settings. Technological and methodological advances continually improve archaeological recordation, excavation, and collection techniques as is evidenced by the continuing work being done on the ASWT project. Many lines of evidence and types of analyses were used to investigate UT North, but some proved more helpful than others. The use of Structure from Motion Photogrammetry (SfM), for example, allows stratigraphy to be recorded much more efficiently and accurately than was possible in the 1930s and 1960s.

As with all archaeological projects, there are limitations and constraints within which we must conduct our research. With respect to my thesis, two caveats must be acknowledged: 1) all samples and data obtained from analysis are from one small area of Eagle Cave (PS3 and PS4) and may not be representative of the rest of the deposits within the shelter, and 2) large-scale excavations were not conducted as part of this research; rather, all data was obtained from small sampling units. The goal of this thesis is not to evaluate the overall formation and structure of the entire shelter; however, many similar processes likely occurred in other areas within Eagle Cave. It is my hope, however, that the results of this study will serve as a good foundation for later research. As for the latter, the sampling strategy used is evaluated for its effectiveness to provide adequate data to investigate formation processes in this type of setting in Chapter 9.

Analytic Methods

Rockshelter deposits are characteristically palimpsests and without fine-grained excavation methods, the variety of formation processes that contributed to the deposits are extremely difficult to discern. In addition, postdepositional processes such as aboriginal pit digging and reuse, as well as bioturbation and decades of pothunting have redistributed and/or removed important data further complicating attempts to study the deposits. To help elucidate these processes, detailed sediment units or "microstratigraphy" (Butzer 1982:38) within each exposed profile were defined and sampled during the ASWT investigations. These exposed profiles were referred to as Profile Sections (PS) and were assigned distinct PS numbers in the field. Additional profile recordation methodology will be presented in Chapter 5. I use the term “microstratigraphy” to emphasis that our goal was to record stratigraphy in high resolution and “split” rather than “lump” strata as previous researchers have done in the past. This microstratigraphic approach is detailed (and critiqued) throughout this thesis.

Several methods were used to create a model of the natural and cultural processes that are responsible for the accumulation of the deposits in PS3 and PS4 and described in detail in Chapter 5. This model follows the principles of formation processes and transformation theory put forth by Schiffer (1972, 1987). According to Schiffer (1987:11) formation processes:

> (1) transform items formally, spatially, quantitatively, and relationally, (2) can create artifact patterns unrelated to the past behaviors of interest, and (3) exhibit regularities that can be expressed as (usually statistical) laws.

Geoarchaeological sampling and analysis was used to document the physical characteristics of each visible stratum and obtain specific data such as bulk mineralogy, sediment particle size, and chemical and organic constituents such as phosphorus, magnetic, organic carbon and calcium carbonate contents. These data helped determine sediment sources, thus giving insight into methods of transport and/or introduction of sediments into the shelter whether by natural or human agents. The analysis of micromorphological thin sections provided additional information such as the size, orientation, sorting, and mineral composition of grains, organics, and artifacts as well as post-depositional disturbances of sediments (Farrand 2001a:57).

Short-lived economic species were submitted for radiocarbon dating to determine the age of the deposits and link the strata to the overall site chronology as no radiocarbon dates were obtained from UT North during the 1963 investigations. The selection of samples were strategically distributed vertically and horizontally within PS3 and PS4 and targeted intact cultural features and discrete, seemingly intact lenses.

Cultural Formation Processes

Specific characteristics of artifacts that aid in deciphering overall formation processes were recorded during analysis including artifact type, material, size, thermal alteration, damage, and density of specific artifact types within each stratum. As Schiffer (1987:267) points out, artifact size effects occur because formation processes can reduce the size of artifacts and sort or winnow them by size. In rockshelters with loose deposits like Eagle Cave, processes like trampling would sort artifacts by size. Experiments by Nielsen (1991:489) have shown how small-sized lithics are more susceptible to vertical displacement especially in loose substrata. Observed damage from trampling included breakage, microflaking, and abrasion, though breakage was more frequent on harder surfaces. McBrearty et al. (1998) agree that substrata compaction and grain size are important factors of vertical displacement and breakage, however, coarse inclusions (i.e., rock and lithic artifacts) within substrata also increase the likelihood of breakage. Microflaking from trampling generally produces a random distribution of flake scars along sharper edges of flakes but the scars sometimes exhibit a more uniform pattern that can easily be mistaken for intentional retouch (McBrearty et al. 1998; Nielsen 1991). Villa (1982:278) emphasizes that vertical displacement of artifacts may occur even when the matrix is not perceptibly disturbed or displaced at the macroscopic level. Villa suggests that the presence and extent of these disturbances can be ascertained by refitting conjoinable pieces of bone and lithics. Given our sampling method at Eagle Cave, this type of analysis may not be productive; however, the micromorphological thin section analysis helped identify some of these potentially imperceptible disturbances.

Tani (1995:232) argues that cultural formation processes are not entirely destructive to behavioral information in the archaeological record. They are associated with, and confined by, certain characteristics of activities and leave behind significant information than can be used for behavioral inference. One product of cultural formation processes are refuse deposits, such as the fiber-filled pit and earth oven cleanout deposits encountered in UT North. Artifacts discarded at their location of use are referred to as "primary refuse" and items discarded or moved elsewhere are considered "secondary refuse" (Schiffer 1987:58). Larger debris is removed in regularly maintained activity areas; however, smaller debris is often left behind. Schiffer (1987:64) suggests that large areas of primary refuse are rare as the accumulation of debris in a repeatedly used activity area would get in the way and hinder work. Conversely, if the duration of occupation is relatively short, the need for activity area maintenance would not be as crucial. In other words, primary refuse deposits may indicate brief occupations and secondary refuse deposits suggest a more prolonged (but not necessarily permanent) inhabitation.

Stevenson (1991) suggests a slightly different model for refuse related to exterior hearth use of mobile hunter-gatherers. Activities typically conducted around hearths (i.e., food preparation and/or processing, tool manufacturing, etc.) would generate refuse that would be subject to size-sorting and other dispersal processes (Stevenson 1991:277).

Scuffage and children's play would displace larger objects away from the areas adjacent to hearths in "displacement zones" while trampling would bury smaller objects within the "drop zone" immediately adjacent to the hearth (Binford 1983:145; Stevenson 1991:277). Larger items may also be selectively moved to activity peripheries or sides of hearths or conversely, accumulations of refuse near hearths may undergo expedient clearing and be pushed toward the edge of activity areas by hand or foot. Over time, new refuse deposits as well as earlier refuse deposits would continue to undergo size sorting and dispersal. Stevenson (1991:272, 279) suggests that more vertical and horizontal displacement would be seen in older deposits than in later deposits, however, vertical separation of deposits can sometimes be attributed to scavenging and reuse by later inhabitants. O'Connell (1987:90) postulates that since refuse accumulates continuously and facilities such as hearths and cooking features are often repositioned within the site, clusters of facilities and associated refuse should therefore increase through time. The separation between clusters of facilities and refuse can become difficult to discern over time as these features begin to merge together, resulting in a palimpsest.

There is no question that prehistoric hunter-gatherers played a significant role in the formation and reorganization of the deposits in Eagle Cave. This thesis explores what specific types of cultural and natural processes were at play in UT North and how the use of this portion of the shelter changed over time. Equally important, this thesis examines just how effective the various methodologies and analyses used were in trying to make sense of the complexly stratified deposits in UT North.

Thesis Organization

The remaining thesis chapters are organized as follows: Chapter 2 provides details on the environmental setting and rockshelter formation processes. Chapter 3 summarizes the archaeological work that has been conducted in Eagle Nest Canyon, with special focus on previous investigations in Eagle Cave, and provides a brief cultural background and context. Chapter 4 provides models of rockshelter use presented by previous researchers based on excavations conducted at other rockshelters in the region. Chapter 5 discusses the methodology used in the field and in the laboratory during the various analyses. Chapter 6 provides the stratigraphic and feature descriptions and radiocarbon assays. Chapter 7 presents the results of the bulk matrix sort and macrobotanical and faunal analyses. Chapter 8 discusses the results of the geoarchaeological analyses. Chapter 9 discusses the natural and cultural formation processes evident in UT North and interpretations of how these processes have worked in tandem to form the complex deposits we see in the archaeological record. In addition, Chapter 9 provides concluding statements regarding the validity of results, critique of methods and applicability for other rockshelter studies, as well as suggestions for future research.

The appendices present much of the data used for the various analysis discussions and interpretations in this thesis. Appendix A is an example of the Strat Sampling Form used in the field during stratigraphic recording and sampling. Appendix B contains the results of the bulk matrix sort and the rock sort data obtained in the field. Appendix C provides the results of the macrobotanical analysis conducted by Dr. Leslie Bush and Dr. Kevin Hanselka and Appendix D contains the results of the faunal analysis conducted by

Dr. Christopher Jurgens. Appendix E contains all of the results from the various geoarchaeological analyses and photographs of each of the micromorph samples and associated thins section slides. Finally, Appendix F provides the cluster analysis data and statistical results presented in Chapter 9.

II. ENVIRONMENTAL CONTEXT AND ROCKSHELTER FORMATION

The LPC region is centered on the mouth of the Pecos River in Val Verde County and extends approximately 150 km north and south of the Rio Grande (Figure 2.1). Turpin (2004:266) defines these boundaries based on the extent of the Pecos River style rock art and similarities of the cultural materials recovered from within the dry rockshelters. The region encompasses three major rivers: the Devils, the Pecos, and the Rio Grande. The eastern extent of the region lies on the southwestern edge of the Edwards Plateau along the eastern side of the Devils River (Shafer 2013a:6). The region extends west past Langtry, Texas onto the Stockton Plateau. The southern limits remain unclear, but the southernmost sites are located on the north face of Sierra Santa Rosa and southeast of the Rio Grande crossing, Boquillas del Carmen (Turpin 2004:266).

Eagle Cave, is located in the north-central portion of the LPC region within Eagle Nest Canyon (ENC), a narrow, box canyon just east of Langtry, Texas, which is also known as Mile Canyon (Figure 2.2). Eagle Nest Creek flows into a plunge pool at the head of the ENC. From there, the intermittent creek snakes through the canyon and joins the Rio Grande to the south. Tinajas are present throughout the canyon, capturing water in the rainier times of the year. The ENC is incised into the Early Cretaceous-age Devils River Limestone formation (Barnes 1977). The soils in the ENC vary depending on the

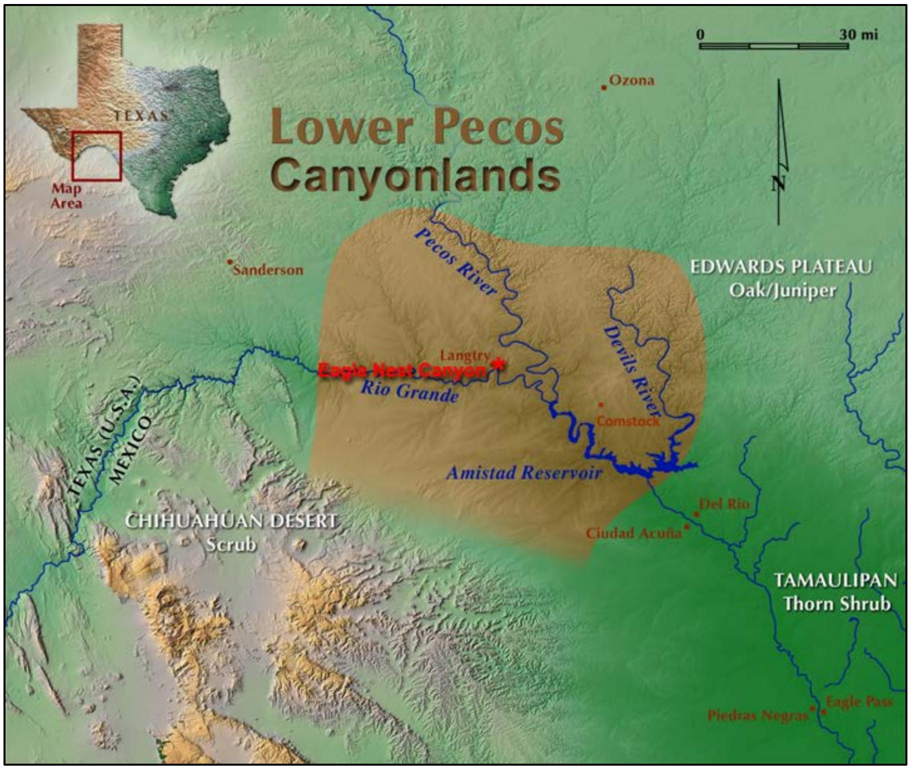


Figure 2.1. Lower Pecos Canyonlands and Eagle Nest Canyon location map, base map by Kerza Prewitt.


Figure 2.2. Photograph taken from the canyon bottom in Eagle Nest Canyon. Eagle Cave is pictured on the left just before the canyon snakes to the right.

setting, which will broadly be defined here as the uplands, canyon edge and slope, and canyon bottom.

The upland soils surrounding Eagle Cave are mapped as Lozier-Shumla Association and are characterized as very gravelly loam overlying shallowly buried limestone bedrock (NRCS 2016). Shallow, dark grayish brown gravelly loams of the Langtry soil series and rock crops are found along the canyon edges and steep slopes leading down into the canyons. Along the canyon and river bottom, deposits are mostly light brownish gray to pale brown silty Rio Grande alluvium.

Flora and Fauna

The LPC sits at the junction of three biotic provinces–the Chihuahuan, Balconian, and Tamaulipan (Blair 1950:98). This position allows for an extremely diverse environmental setting. The northeastern edge of the LPC is characterized as a juniper-oak savannah, to the south and southeast is mesquite-acacia savannah, and to the west, more arid shrubs and semi-succulent plants such as creosote bush, lechuguilla, sotol, and prickly pear cactus occupy the uplands and canyon slopes of the Devils River, the Pecos River, and the Rio Grande (Blair 1950; Dering 2002: Figure 2.2; Griffith et al. 2004:56).

Given the LPC's position at this convergence, elements from each of the three biotic provinces are seen in the flora and fauna (Dering 2002:2.3). The vegetation in the area is a mixture of woody plants like mesquite (*Prosopis glandulosa*), whitebrush *(Aloysia gratissima),* Texas persimmon (*Diospyros texana*), blue sage (*Salvia ballotiflora*), lotebush (*Ziziphus obtusifolia*), spiny hackberry (*Celtis pallida*), and various species of acacia (*Acacia* sp.) in the uplands, and smaller trees such as Littleleaf walnut (*Juglans microcarpa*), Mexican ash (*Fraxinus greggi*), and several species of oaks (*Quercus* sp.) along the narrow canyons and on terraces (Dering 2002:2.4). Succulents and rosette-stemmed evergreens such as prickly pear and tasajillo (*Opuntia* sp.) are found along the upper reaches of the canyons along with several types of yucca (*Yucca* sp.) and lechuguilla (*Agave lechuguilla*). Fauna in the LPC includes white-tailed and mule deer, cotton-tailed rabbit, javelina, mountain lion, coyote, fox, raccoon, beaver, porcupine, and other small mammals such as mice and squirrels (Blair 1950; Davis and Schmidly 1994). Other wildlife in the area includes a large variety of snakes, amphibians, and aquatic life within the rivers and streams, including fresh-water mussels. Bird varieties include black-throated sparrow, hawks, eagles, and doves (Blair 1950; Davis and Schmidly 1994; Griffith et al. 2004).

Rockshelter Formation

Long-inhabited limestone rockshelters with deeply stratified deposits, such as Eagle Cave, can be difficult for an archaeologist to interpret. The natural degradation of shelters, combined with human modification and natural forces create often complicated stratigraphic deposits. Goldberg and Mandel (2008) and others (Collins 1991; Farrand 2001a; Goldberg and Macphail 2006) have highlighted general patterns of rockshelter development. A common mechanism of rockshelter formation is the differential weathering of less resistant layers in the bedrock. Rockshelters can also form by fluvial undercutting of bedrock valley walls or less commonly, as a result of karstic processes.

As rockshelters are exposed to the elements more than caves, they are subjected to atmospheric weathering activities such as hydration (solution weathering) and cryoclastism (freeze-thaw) (Goldberg and Macphail 2006:174). These types of processes gradually deepen the back wall of a shelter. The rockshelter ceiling becomes increasingly unstable as the shelter deepens and portions of the ceiling break off (in the form of spalls) and are deposited on the floor of the shelter. The rate and character of this degradation varies based on environmental conditions such as temperature and moisture. For example, comparing against results from pollen analysis by Bryant (1969), Bryant and Holloway (1985) and Scott-Cummings (1992), Robinson (1997:41) noted that the variations in particle sizes and coarse fractions in the sediments at Bonfire Shelter were an indication of fluctuating temperature and humidity. In general, larger and more numerous spalls were observed in the Late Pleistocene deposits, whereas the accumulation of finer sediments was more prevalent in the Holocene.

Similar to the deep deposits at Bonfire Shelter, Late Glacial age deposits containing limestone frost spalls or eboulis sec (dry talus) are present near the bottom of the profile in the main trench at Eagle Cave. Frederick (2017) notes that although the overall large quantity of spalls is consistent with Robinson's observations from Bonfire Shelter, the character of the rock fragments is different (i.e., rounded with micropitting) suggesting different processes occurred in Eagle Cave. Frederick (2017) further notes that the pitting and rounding was most likely a result of dissolution of the limestone by exposure to water rather than cryoturbation (i.e., mixing of strata due to freezing and thawing).

Farrand (2001a:31) notes that similar limestones may have different susceptibilities to weathering that would affect the rate of degradation. Once on the shelter floor, the spalls can be subjected to weathering or covered by sediments, other spalls, and/or cultural debris (Collins 1991:159). At rockshelters such as Baker Cave, the weathering of the roof and walls result in the accumulation of what was perceived to be limestone dust on the shelter floor (Hester 2013). These layers of "dust" can become fairly thick if the shelters are not occupied for long periods of time.

The sediments that accumulate within a rockshelter can originate from a variety of sources. Sediments may originate inside (endogenic) or outside (exogenic) of the shelter (Table 2.1). Examples include sediments derived from roof spalling and collapse, in washing of colluvium and soil through the mouth of the shelter or fissures in the ceiling, and windblown (eolian) sand- or silt-sized dusts (Butzer 1982; Farrand 2001b; Goldberg and Macphail 2006). Other sources include biogenic sediment components derived from animals and plants that inhabit the cave, and anthropogenic components derived from intentional and unintentional human acts. Humans, for instance, intentionally bring in materials such as foodstuffs, rock, fuel, and soil to construct earth ovens, and unintentionally bring in soil and vegetation on their feet and clothing. As will be discussed in Chapter 9, a vast majority of the deposits in UT North contain primarily anthropogenic components.

Physical and chemical processes work to modify rockshelter deposits after they have been transported into the shelter (Table 2.2). In addition to contributing to th

Table 2.1. Types and Origination of Rockshelter Sediments.

Sediment Type		Endogenous	Exogenous
Clastic Sediments	**Weathering detritus**	H	
	Block breakdown (éboulis)	H	
	Grain breakdown by dissolution, abrasion of rock walls by humans	H	
	Entrance talus	H	H
	Infiltrates (drip)	H	H
	Fluvial deposits		H
	Glacial deposits		H
	Aeolian deposits		H
	Biogenic debris		
	bird and bat guano	H	L
	gastroliths	H	L
	carnivore coprolites and bone	H	H
	wood, grass	L	H
	humus	L	H
	Anthropogenic deposits		
	artifacts (bone, shell, lithics, etc.)	L	H
	transported soil/sediment	L	H
	wood/charcoal	L	H
	ash	L	H
Chemical Sediments	**Travertines**	H	
	Evaporites	H	
	Guano, phosphate, and nitrate minerals	H	
	Resistates	H	
	Ice	H	

Note: Adapted from Goldberg and Macphail (2006:175, Table 8.2); H = high probability, L = low probability.

sediments on the shelter floors, humans often modify and redistribute the existing deposits through activities such as pit digging, trampling, artifact recycling, and through cleaning and discard activities (Schiffer 1987). Animal activities, such as burrowing can also alter and redistribute deposits. Both pit digging and burrowing have played a big role in the retribution of deposits in UT North, and will be discussed in Chapters 6 and 9. A drape (talus) is created in front of the shelter by numerous processes such as collapse events, slopewash, and redistribution of sediments from human and animal activities mentioned above (Collins 1991; Farrand 2001b).

Natural forces such as wind and water can also play a large role in the formation of rockshelter deposits. For example, flood deposits can cap a cultural layer or conversely, strong floodwaters can wash out or displace cultural deposits within a rockshelter. At Arenosa Shelter, flood events deposited thick layers of silt that separated numerous episodes of human occupation (Patton and Dibble 1982). In Eagle Nest Canyon, obvious flood deposits can be seen in and below Skiles Shelter downstream from Eagle Cave (Rodriguez 2015). At present, no fine-grained alluvial deposits have been defined at Eagle Cave. This may be due to the fact that the shelter lies at a higher elevation than the other shelters in the canyon. It is also possible that alluvial deposits are present but the reorganization of sediments from natural and cultural processes have made it impossible to discern at the macroscopic level.

Table 2.2. Rockshelter Modification Processes.

Agent	Deposition	Alterations/Diagnostic features
Cryoclastism	Frost slabs, spalls, grain-by-grain accumulation	Split/fissured stone, smaller-sized spalls, debris
Collapse	Large blocks and shattered fragments	Crushed debris (of all kinds)
Solifluction	Hillslope sludge (exogenous), colluvium	Displacement of earlier deposits inside cave
Cryoturbation	None	Churning of strata, rounding of stones
Flowing Water	Flood deposits, karstic imports, surface runoff	Erosion, gullying, travertine
Wind	Well-sorted sand and silt; loess	None
Solution (including hydration, weak acids)	Hydration spalls, grain-by-grain disaggregation; dripstone, travertine	Leaching of calcium carbonate, rounding of stones, cementation
Pedogenesis	None	Chemical/mineralogical changes, leaching, cementation, root disturbance
Humans and Animals	Artifacts, bones, garbage, body wastes, imported rocks (manuports) and dirt, structures, hearths	Physical disturbance, digging, burrowing, house cleaning, chemical alteration; decreased pH

Note: Adapted from Farrand (2001:40, Table 2.1).

III. ARCHAEOLOGICAL BACKGROUND

The dry rockshelter and cave sites in the LPC have preserved otherwise perishable materials generally lost in more mesic settings (Turpin 2004). The preservation of these organic materials presents an ideal setting for archaeological research on subjects such as subsistence and diet, habitation, technology, and burial practices of the prehistoric people of the LPC (e.g., Alexander 1974; Chadderon 1983; McGregor 1992; Saunders 1986; Turpin et al. 1986). Not surprisingly, the cave and rockshelter sites have been the focus of many of the archaeological investigations in the region. This focus has long biased our interpretations of how the prehistoric inhabitants of the LPC utilized their surrounding landscape (Hall and Black 2010; Rodriguez 2015). More recent research exploring the innumerous open-aired sites in the LPC and their associated features have provided new insight as to how these prehistoric people exploited the landscape (Saunders 1992; Dering 1999, 2002; Koenig 2012). Unfortunately, the preservation of perishable artifacts in rockshelters have also attracted looters over the years, and as a result, many of the LPC rockshelter sites contain numerous potholes or have been completely disturbed by artifact hunters.

Much of the archaeological research in the LPC was done during three eras: the museum era of the 1930s, the salvage program between 1958 and 1969 prior to the construction of Amistad Reservoir, and more recent individual and privately funded projects (Black 2013; Turpin 2004). In the 1930s, the primary driver was to obtain museum-worthy objects to display at places such as the Witte Museum in San Antonio.

The overarching goal of investigations in the LPC shifted during the Amistad Reservoir period as investigators sought to understand the cultural history of the region (Black 2013). Excavation and recording techniques had vastly improved since the 1930s and archaeologists took great care to correlate radiocarbon samples and diagnostic artifacts to distinct stratigraphic layers recorded at the various sites (Black 2013:144). Toward the latter part of the Amistad era, Dee Ann Story realized the preservation in the rockshelters and deep terraces sites held great potential for ecologically-oriented research. With the increased interest in cultural ecology, disciplines such as zoology and palynology were slowly incorporated into research designs to explore subjects such as the climate and diets of prehistoric people of the LPC (Alexander 1974; Story and Bryant 1966). During this period, investigators sought to salvage as much data as possible from sites threatened by the upcoming construction of the reservoir. However, due to inadequate funding, most of the sites were not thoroughly reported and many artifacts and samples remain unanalyzed (Black 2013:147).

Research in the LPC since the 1980s has focused on documenting, interpreting, and dating the vast rock art on the canyon and rockshelter walls. New technologies and disciplines are continually being integrated into survey and excavation projects in an effort to better understand the prehistoric people's relationship to their surrounding landscapes. Many researchers and institutions have also made efforts to educate the public on the importance of these archaeological resources by way of websites, blogs, tours, and volunteer opportunities (e.g., www.texasbeyondhistory.net, ASWT Project blog: https://aswtproject.wordpress.com).

Overview of Investigations in Eagle Nest Canyon

The subject of this thesis, Eagle Cave, is located in the LPC within Eagle Nest Canyon (ENC). A brief history of archaeological investigations in the ENC is reviewed below, with special focus on those conducted within Eagle Cave (Table 3.1). The earliest recorded investigations in the ENC were in the early 1930s. In 1931, the Witte Museum sent a small group to West Texas to inspect prehistoric sites, including 10 in the Langtry area, and assess their archaeological content (McGregor 1985:127). During this expedition, artist Mary Virginia Carson sketched many of the pictographs found in the rockshelter sites, including those visible on the walls in Eagle Cave.

In 1932, E. B. Sayles visited both Eagle Cave and Kelley Cave in the ENC as part of his archaeological "survey" of Texas on behalf of the Gila Pueblo Archaeological Foundation (Sayles 1935; Table 3.1). The ultimate purpose of this reconnaissance was to locate sites that could be sampled in order to gain new insight into the prehistory of Texas (Black 2013). Sayles returned later that year with J. Charles Kelley and conducted test excavations at Kelley and Eagle Caves (Figure 3.1). Kelley's field notes best summarize the work at Eagle Cave (Kelley 1932). Kelley and Sayles excavated a roughly 4 meter long test trench in the center of the shelter where a surface fiber layer was present. The trench was 1.5 meters deep and contained alternating layers of fiber, charcoal, and ash throughout. Kelley stated that six layers were encountered showing "no change of

Table 3.1. Previous Investigations in Eagle Nest Canyon from 1930 to 1984.

Trinomial	Site Name	Other Site Names	Year(s) of Investigations	Investigators	Type of Work
41VV167	Eagle Cave	Sayles Langtry B: Tex:X:2:9	1932	E. B. Sayles	Site visit; extensive excavations
		Kirkland's Langtry Site #1	1935	Forrest Kirkland	Rock art recording
		"Big Cave" in Eagle Nest Canyon	1936; 1938	J. Walker Davenport	Extensive excavations
			1939	George C. Martin	Unknown digging
			1958	John Allen Graham and William A. Davis	Documented shelter and surface collections
			1962	Mark Parsons	Test pit in north part of shelter
			1963	Richard E. Ross	Extensive excavations
41VV218	Bonfire Shelter	Bone Cave	1958	Michael B. Collins	Shovel test.
		Ice Box Cave	1962	Mark L. Parson	Limited "probe"/test excavations
			1964	David S. Dibble	Deep excavation
			1983; 1984	Leland C. Bement	Extensive excavations
41VV164	Kelley Cave	Sayles Langtry A; Tex:X:2:8; Tex:X:2:1	1932	T. Sayles and J. Charles Kelley	Excavated two small trenches and trench along back wall
		Kirkland's Langtry Site #2	1935	Forrest Kirkland	Rock art recording
		H.C. Taylor's Site #42	1939-1940	George C. Martin	Extensive excavations
		Martin's "Little Shelter"	1949	G. Mear	Extensive excavations
		Mear's "Mile Canyon Shelter"	1958	John Allen Graham and William A. Davis	Documented shelter and surface collections
41VV165	Skiles Shelter	Kirkland's Langtry Site #4	1958	John Allen Graham and William A. Davis	Documented shelter and surface collections
		H.C. Taylor's Site #43?			
41VV166	Horse Trail Shelter	None	1958	John Allen Graham and William A. Davis	Documented shelter and surface collections
41VV2163	Mile Spring Shelter	Taylor's "Skiles Cave" Site #44	1947	Herbert C. Taylor, Jr.	Excavated trench(es) of unknown dimension

Note: Table adapted from Rodriguez (2015:20, Table 2.1).

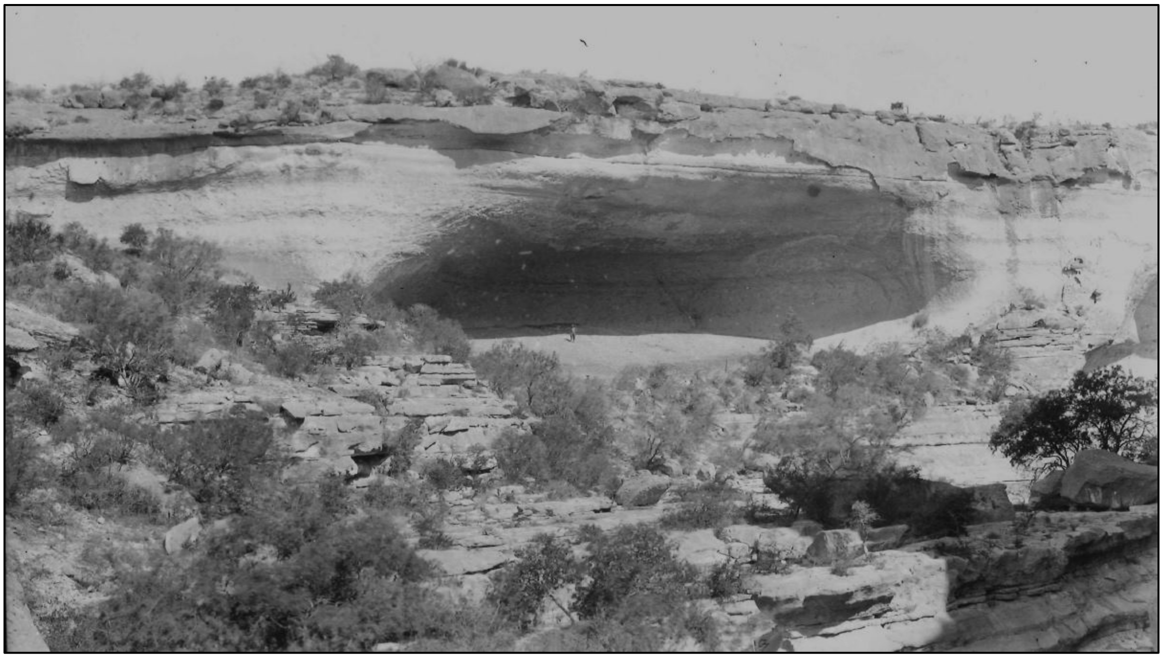


Figure 3.1. Overview of Eagle Cave from Sayles 1932, courtesy of Texas Archeological Research Laboratory.

Culture." Kelley (1932:63) characterized the inhabitants as hunters and fishers who also utilized sotol and fiber. In Sayles' discussion of the "Pecos River Cave Dwellers" in *An Archaeological Survey of Texas*, he argues that many rockshelters near the Pecos River appear to represent long-term occupations and that the inhabitants of the shelters were the same people who lived in the open sites in the uplands (Sayles 1935:63).

In August of 1935, illustrator Forrest Kirkland visited the Lower Pecos and painted water colors of the rock art in some of the shelters in the area including Eagle Cave, Kelley Cave, and Skiles Shelter (Kirkland and Newcomb 1967). Kirkland (1937:110) attributed the rock art in "One Mile Canyon" (Eagle Nest Canyon) to a single culture, which he termed the "Val Verde County Basket Maker Culture." He hypothesized that the prehistoric people who painted this art always occupied the dry rockshelters, selecting them due to their location high up on the canyon walls. He also suggested that these same shelters were not usually occupied by later groups and the art remain “unmixed”.

Kirkland (1937:48) also investigated the relationship between rock art and the presence of middens, noting that when middens were present in rockshelters containing rock art, the rock art was always of the “Val Verde Dry Shelter type”. Kirkland did not excavate at any of the sites, however, he saw similarities with many of the materials he observed (fragments of basketry, knotted grass, pieces of twine, etc.) both on the surface of the rockshelters and around the many looters pits. These correlations led him to believe that the rock art, middens, and cultural materials were created and/or deposited by the same group of people.

In September of 1935, Walker Davenport and Harding Black began excavations in Eagle Cave on behalf of the Witte Memorial Museum. During the 1935-1936 work, Davenport and Black excavated an 8-foot-wide east-to-west trench through the center of the Eagle Cave deposits. Each major stratigraphic zone or “layer” in the exposed profile was recorded. Excavations were conducted by removing each of these defined zones or “layers” (Davenport 1938). The main objective of these investigations was to recover museum-worthy objects to display at the Witte Museum. A small report with a synopsis of the work done and brief quaint descriptions of each of the artifact classes recovered during the excavations was published as part of the Witte Museum’s Big Bend Basket Maker Papers.

Davenport (1938) defined four cultural occupation zones overlying what he determined to be sterile rockshelter deposits. The deepest layer (Layer 4) was interpreted to be a short-term occupation, though the reason for this determination was not discussed. Layer 3 was described as a longer-term occupation with “slightly better quality” of lithic tools (Davenport 1938:23). Davenport encountered what he interpreted to be a retaining wall of large rocks in Layer 2 and suggested that the wall was constructed to level off the back of the shelter. Behind the wall were five sub-layers of alternating burned rock and ash followed by sandy deposits. Davenport (1938:24) hypothesized the sand was brought into the shelter to be used as a floor covering similar to those found in Pueblo sites in the Southwest. The latest occupation (Layer 1) contained the densest cultural material including finely worked lithic tools.

George C. Martin dug into several shelters in Val Verde County in 1939 and 1940, including Kelley Cave located in the ENC. It is not clear what other shelters were dug into during this period, or to what extent. Aside from a photo album titled *Photographic Record of the Material Culture of the Big Bend Basket-maker* found at TARL by Daniel Rodriguez (2015:27), little detail is known about these investigations. Rodriguez also discovered that work done by Herbert C. Taylor in 1947 in “Skiles Cave,” which later archaeologists assumed was the site commonly known today as Skiles Shelter (41VV165), was actually conducted at an unrecorded site just downstream and across the canyon from Eagle Cave. Taylor did not conduct analysis of the materials recovered during his work due to “poor excavation techniques” (Taylor 1949:65). Rodriguez officially recorded the site (41VV2163), naming it Mile Springs Shelter, (Rodriguez 2015:28).

In 1949, Gene Mear, a geologist form the Texas Memorial Museum at the University of Texas at Austin conducted limited excavations at Kelley Cave to look for Paleoindian cultural remains (Rodriguez 2015:28). Mear excavated three 4-x-4-foot units in the southern portion of the shelter over the span of a week, but was unable to find any Paleoindian cultural remains or Pleistocene fauna (Mear 1949).

In 1958, John Graham and William Davis conducted a reconnaissance survey of sites to be affected by the proposed Diablo Reservoir (Amistad Reservoir) (Graham and Davis 1985). During this project, surface surveys and minor surface collections were conducted at four of the ENC rockshelters (Eagle Cave, Kelley Cave, Skiles Shelter, and Horse Trail Shelter) in an effort to evaluate their potential for future archaeological research. This initial survey led to further investigations of Eagle Cave.

Bonfire Shelter was first professionally tested by Mark L. Parsons in 1962 and major excavations were carried out in 1963 under the supervision of David Dibble at Bonfire Shelter (Dibble and Lorrain 1968). At Bonfire Shelter, a bison "jump" site, two bison bone deposits were identified during the 1963 excavations. The lower bed contained Folsom and Plainview projectile points and extinct Pleistocene bison (possibly *Bison antiquuas*). Modern bison (*Bison bison*) were recovered from the upper bone bed along with Late Archaic stemmed, triangular points (Dibble and Lorrain 1968).

In September of 1963, excavations also began in Eagle Cave by Richard E. Ross and Parsons on behalf of the Texas Archeological Salvage Project (TASP) of UT-Austin. When the Witte Museum left the site in 1936, at least the upper portion of the trench was left open and over time the trench walls had collapsed, partially re-filling the trench. Richard Ross and Mark Parsons re-excavated the central trench and cut back the walls until intact deposits were encountered (see Figure 1.1). Ross and Parsons then created a scale drawing of the north profile noting the stratigraphic layers and areas of previous disturbance. Horizontal and vertical controls were established at the site using a five-foot square grid pattern and an arbitrary datum point at the northern end of the shelter designated "100 feet" (Ross 1965). To investigate the cultural chronology of the site, a roughly 6-x-3 m (20-x-10 foot) block was then excavated off the north side of the central trench. Units were usually 1.5 m (5 feet) squares and were excavated in stratigraphic layers. Thicker layers were subdivided into sub-layers in order to maintain a tighter provenience for the material recovered. Data such as soil color, floor elevations, artifacts recovered, samples collected, and disturbances such as rodent burrows were recorded on "level report forms."

In addition to the Witte trench in the central portion of the shelter, a pothole towards the north end of the shelter was cleaned out and squared off and the stratigraphy visible in the east, west, and south walls was recorded (Figures 3.2 and 3.3). In his 1963 field notes, Parsons refers to this unit as Test Excavation II, but will herein be referred to as UT North (Parsons 1963). Ross noted that while all the major zones except for Zone 4 seemed to be present in UT North, the stratigraphy did not correlate exactly to that in the main trench. There are no discussions of "zones" in the 1965 report, however, it is assumed that Ross was referring to the major stratigraphic layers recorded in the main trench. Aside from these vague comments, no discussion or interpretations of the UT

Figure 3.2. UT North in Eagle Cave, facing south, 1963, courtesy of the Texas Archeological Research Laboratory.

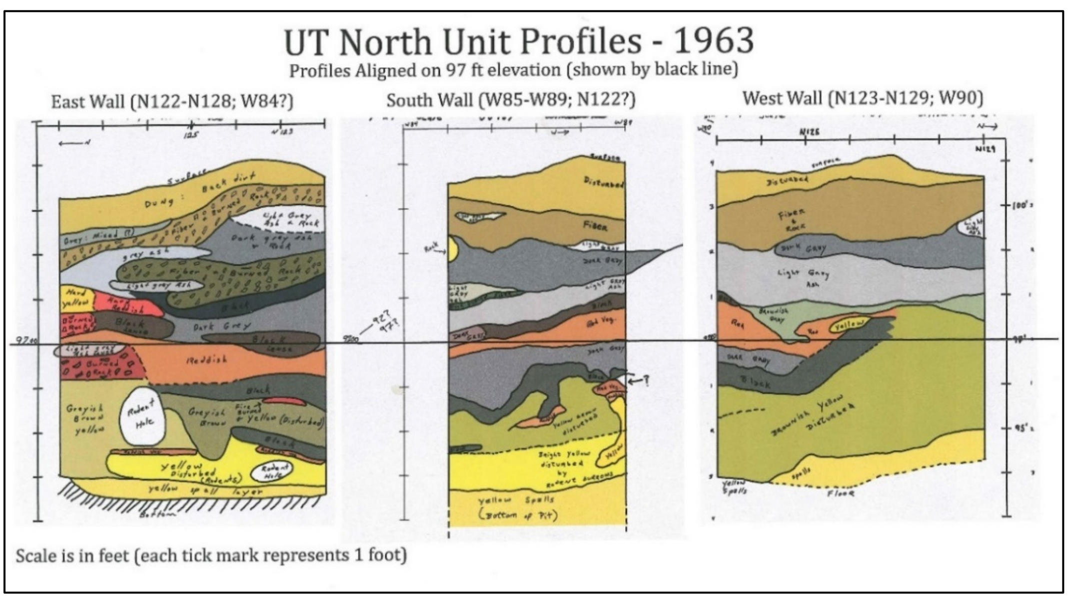


Figure 3.3. UT North profiles from Eagle Cave, digitized and colorized by Charles Koenig 2014. 1963 Site Files, courtesy of Texas Archeological Research Laboratory.

North investigations were included in the field notes or 1965 report (Parsons 1963; Ross 1965). In addition, although a few charcoal samples were collected from UT North, Ross did not obtain any radiocarbon dates from the area.

All artifacts were collected in paper bags and labeled with associated provenience information. According to the report, charcoal samples were collected from every horizontal excavation unit and every soil stratum possible and placed into aluminum foil; however, many of the samples had an adverse chemical reaction with the foil resulting in a rapid disintegration of the samples (Ross 1965:13). Soil samples were also collected from each horizontal excavation unit as well as from the profile of the central trench. Soil samples that were collected in foil had a chemical reaction similar to the charcoal samples. Pollen samples were collected from each stratum by pressing glass test tubes into a clean profile to avoid soil mixing. In instances where soil conditions did not allow for this method, a clean spoon or knife was used instead.

All artifacts and ecofacts were sorted into classes based on typological similarities. The dart points from Eagle Cave were also grouped into several projectile point series (Parida, Pecos, Devils, and Rio Bravo) following a system that was being developed during the Amistad era. Dart points that did not seem to fall into one of these series were split into four general groups: Contracting Stem, Expanding Stem, Parallel Stem, and Lanceolate. The arrow points were not sorted into any group or series due to the small overall assemblage. Ross (1965:27) explained that the purpose of grouping the projectile points into the emerging new series was:

> (1) To emphasize resemblances between certain types and to present these resemblances as unifying characteristics of a larger group; (2) To use the characteristics of the larger classes to facilitate the sorting and describing of the collection of projectile points; (3) To see if these unifying characteristics point out broader relationships and traits than is possible when dealing with the few characteristics of one projectile point type

In the report, Ross (1965:28-45) included general descriptions of each series and descriptions and photographs of the various projectile point types included in each series Ross's classification of point types was based on Suhm, Krieger, and Jelks (1954). For brevity, I will not describe each series in detail but the projectile points included in each series were Pandale and Nolan (Parida series); Langtry and Val Verde (Pecos Series); Shumla (Devils Series); and Ensor, Frio, Paisano, Marcos, and Williams (Rio Bravo Series). The artifact percentages of each artifact class and the projectile point series were presented in the report using a series of bell graphs organized by strata. All artifacts, samples, and records from the 1963 excavations are curated at TARL.

Ross developed a projectile point sequence based on the stratigraphic super-imposition of projectile points and incorporated 14 radiocarbon dates obtained from samples from the different strata at the site. Based on these data, Ross (1965:139) defined five periods of cultural occupation at the site (Table 3.2). Ross characterized the Early Period as a hunting and gathering subsistence pattern. A date obtained from a charcoal sample from the bottom of Stratum V indicates occupation at Eagle Cave began at least by 8,700 radiocarbon years before present [RCYBP]) (Ross 1965:161). Two varieties of early-barbed projectile point types were recovered from this stratum. Four lanceolate dart points were also recovered from Stratum V suggesting a Paleoindian component may be present at the site, however, Ross regarded the sample as small and inconclusive and did not discuss the subject further (Ross 1965:137).

The Second Period began by 6,050 RCYBP, based on a radiocarbon date from Stratum IV, and was characterized by a general decrease in artifact densities. Ross's Third Period showed a decrease in most types of artifacts except for the Parida Series projectile points. Radiocarbon dates from Stratum III were said to indicate that this period was established by 4,500 RCYBP. A Lanceolate point was recovered from Stratum III, however Ross (1965:62) remarks that the artifact does not have the distinguishing characteristics and is "cruder than the general run of Paleo points and smaller". The Fourth Period was said to begin by 3,400 RCYBP and is characterized by the Pecos Series projectile points. The Fifth Period, the uppermost deposits at the site, yielded the highest density of artifacts; however, this layer also showed severe mixing and disturbance from historic sheep and goat ranching and looting activities.

Turpin (1991; 2004) used over 300 radiocarbon dates from sites in the region, including 14 from Eagle Cave, in conjunction with other archaeological data to define the most widely used chronology for the LPC, which is described below. Turpin's (1991) calibrated radiocarbon dates for Eagle Cave place Stratum IV and V in the Early Archaic and Stratum II-a, II-d, and III in the Middle Archaic. One sample from Stratum II dated to the Early Archaic; however, the sample was collected from a screen and Ross (1965:162) believed it may be from a mixed context. No dates were obtained from

Table 3.2. Eagle Cave Cultural Periods and Strata Descriptions (Ross 1965:15-19).

Ross (1965) Cultural Periods	Stratum	Zone	Thickness (feet)	Color	Description
Fifth Period	I	1	0.6-3.0	Light gray	Disturbed layer with potholes, dung, and straw mixed with burned rock. Distinct lower boundary.
Fourth Period	IIa	2	0.4-1.6	Grayish Brown	Relatively undisturbed layer with large burned rock and fiber. Some pothole disturbances observed. Distinct lower boundary.
Fourth Period	IIb		0.2-0.6	Light gray	Relatively undisturbed layer with small limestone rock and fine dust. Some rodent and pothole disturbances observed towards base of layer. Clear lower boundary towards back wall, gradual to diffuse toward dripline.
Fourth Period	IIc		0.2-0.8	Brown	Burned rock, burned fiber and charcoal-rich layer. Gray lens from 0.1 to 0.3 feet with a fire-blackened area on top. Lots of burrows and pothole in northwest portion of trench. Distinct lower boundary.
Fourth Period	IId		0.2-0.7	Light gray	Coarse to very coarse limestone spalls mixed with dust. Alternating lenses of grayish brown sediment, burned rock, dust and charcoal throughout.
Third Period	III	3	0.2-2.0	Grayish brown	Coarse burned rock to fine limestone particles mixed with charcoal. Occasional rodent burrows throughout. Clear to distinct lower boundary.
Second Period	IV	4	0.6-2.6	Light color	Burned rock, ash, and oxidized limestone layer with rare charcoal fragments. No obvious disturbances noted.
Early Period	V	5	1.0-2.6	Light yellowish brown	Small limestone spalls and charcoal with a thin lens of vegetal material and charcoal at base of layer. Some mixing with Stratum IV.

Stratum I, likely due to the disturbed nature of the deposits. The dated bulk wood charcoal samples were all obtained from the central trench at Eagle Cave.

Excavations at Eagle Cave, one of the main focuses of the ASWT research, have been ongoing since my thesis field season in the spring of 2014. Unlike previous excavations, the goal of the ASWT investigations at Eagle Cave was to carefully document and sample the stratigraphic layers within the shelter utilizing small sampling units rather than conduct large-scale excavations. A detailed synopsis of the methods employed during the ASWT work at Eagle Cave is presented in Chapter 4.

Cultural Chronology of the Lower Pecos

This section is a brief summary of the widely accepted chronology for the LPC, divided into Early Paleoindian, Late Paleoindian, Early Archaic, Middle Archaic, Late Archaic, and Late Prehistoric periods (see Dering 2002 and Turpin 2004 for additional detail). Turpin (1995; 2004) further subdivides this sequence into a more detailed 12-part chronology with subperiods, however, only a broad chronology is reviewed here.

The Paleoindian period (ca.12,000-9,800 RCYBP) spans the Pleistocene/ Holocene transition, a time of relatively rapid climatic, floral, and faunal changes (Turpin 2004:268-269). At Bonfire Shelter, a bison “jump” site dating to 10,250 RCYBP, Folsom and Plainview points were found in association with extinct bison bones (possibly *Bison antiquus*), some of which exhibit butchering marks (Dibble and Lorrain 1968). During the Late Paleoindian period (9,800–8,800 RCYBP), the climate shifted towards a more xeric setting (Turpin 2004:269). Large game hunting of the earlier Paleoindian period was replaced by an economic subsistence focused more on small game and xeric plants as evidenced as sites like Baker Cave (Hester 1983).

The long Archaic era (8,800-1,300 RCYBP) is usually characterized as a generalized subsistence pattern marked by the intensification in the exploitation of locally available resources indicated by the appearance of burned rock middens, various ground stone features and artifacts, and the production of spatially specific artifact styles (Turpin 2004). The Early Archaic (8,800-5,500 RCYBP) coincided with a widespread drying trend. Fiber artifacts, coprolite analysis, and evidence for plant baking in rockshelters indicate an increased adaptation to the arid conditions (Brown 1991:119; Saunders 1992; Sobolik 1991; Turpin 2004:269).

The subsequent Middle Archaic period (5,500-3,200 RCYBP) is interpreted as a period of increasing intensification in resource exploitation and an inferred increase in population (Turpin 2004:270). Rock art flourished on a grand scale during this time, marked by the polychromatic Pecos River style. The Pandale, Langtry, Val Verde, and Arenosa point types also emerged during this period. The first evidence of burial interment in rockshelter deposits also occurred during this period (Turpin 1994, 2004).

The beginning of the Late Archaic period (3,200-1,300 RCYBP), was marked by two significant shifts: a brief mesic interval, evidenced by increases in grass and pine pollen; and the return of bison herds to the region (Bement 1989; Bryant and Holloway 1985; Dering 2002). Central Texas dart point styles (Montell, Ensor, Frio, Marshall, and

Castroville) also appeared in the region. Turpin (2004:272) argues that the Red Linear style rock art was introduced to the region by plains bison hunters migrating to the region during this time. Boyd et al. (2013) have recently shown Red Linear style to be earlier or at least contemporaneous with the Pecos River style, indicating the regional rock art chronology should be reevaluated.

During the Late Prehistoric period (ca. 1,300–250 RCYBP) new technologies such as the bow and arrow were introduced (Turpin 2004:274). Burned rock midden sites became more frequent in upland settings, though rockshelters were still being utilized (Turpin 2004:274). Brown suggests cooking facilities were being relocated closer to plant resources during this period (1991:27). A shift in mortuary practices is also seen with the appearance of rock cairn burials on promontories overlooking the canyons (Turpin 1986).

IV. ROCKSHELTER USE

Rockshelter Occupation Models

Many Lower Pecos researchers have discussed rockshelter occupation models (Brown 1991; Dering 1999 and 2002; Shafer 2013b; Turpin 2004). Shafer (1986, 2013b) and Turpin (2004) have argued that larger rockshelters served as home bases and/or logistical processing stations for foraging bands. Bands would not have lived in the rockshelters permanently, but evidence such as the latrines found at Hinds Cave suggest they may have resided in the shelters for relatively long periods of time (Shafer 2013b:99). Others (Brown 1991; Dering 1999 and 2002) suggest that occupations were much more punctuated, especially when low cost-high return resources such as deer and prickly pear fruits were scarce. In times of food stress, high cost-low return foods such as desert succulents, like sotol and lechuguilla, would have been relied on more heavily.

By analyzing the spatial distribution of stone tools and cooking features associated with hunting and gathering activities around Hinds Cave, Saunders (1986) developed a model of land use suggesting more intensive plant collecting and initial processing was conducted closer to the canyons and rockshelters, while hunting activities were less spatially limited. The rapid depletion of local resources (i.e., firewood and plants) in the canyons surrounding the rockshelters would have resulted in frequent movement of foraging bands. In contrast, Koenig's (2012:232) study of the distribution of burned rock middens along Dead Man's Creek revealed that more earth oven plant baking was occurring further away (3–6 km) from the major river canyons, suggesting that people spent a lot more time away from the river canyons and rockshelters than previously thought.

Rockshelter Use

Contrasting ideas on the use of LPC rockshelters over time have been advanced. Sayles (1935:63) suggested that many of the shelters were long-term occupations and that the inhabitants of the shelters were the same people who lived in the open sites in the uplands. Martin, who explored nine caves in the Rio Grande Region west of the Pecos River in 1933, interpreted the Shumla Caves to be all-purpose rooms for single-family residence (Martin 1933:9). He also described the caves as all from the same culture and "the description of one of them suffices for that of any other" (Martin 1933:10). Martin believed the inhabitants were sedentary and divided their time between the shelters and open sites on the cliffs above the shelters. Somewhat contradictory to his previous statement, Martin observed that some caves contained evidence for specialized tasks like art, hunting, or fishing. In the "Artist's Cave," for example, pictographs and painted pebbles were abundant but other types of artifacts were scarce (Martin 1933:10).

Later researchers have discussed some of the specialized activities occurring within the rockshelters (Bement and Turpin 1988, Boyd 1996, Dering 2005, Saunders 1992, Sobolik 1991, Turpin et al. 1986). Desert succulents, such as sotol, and lechuguilla were being processed in earth ovens in rockshelters beginning in the Early Archaic and continuing into the Protohistoric (Dering 2005). Analysis of unifaces and modified flakes with sickle sheen, macrobotanical remains, pollen, and coprolites recovered in dry rockshelters such as Arenosa Shelter, Baker Cave, Hinds Cave, and Parida Cave provide further evidence for the processing and consumption of these plants (Saunders 1992; Sobolik 1991). Boyd (1996:161) argues that pictographs present on many of the rockshelter walls venerated the cosmologies and ideologies of the Archaic peoples in the region. These representations suggest shamanistic ritual or religious events likely took place in the shelters containing rock art. Many rockshelters contain both rock art and evidence of human occupation, but some shelters (e.g., White Shaman) contain mainly rock art. Shelters were also sometimes used for burials including cremation and "bundled-burial" interments (Bement and Turpin 1988; Turpin et al. 1986).

Activity Areas and Spatial Organization

Based on the discussion of LPC rockshelter use cited above, many types of activities could potentially occur within rockshelter spaces including hearth construction, sleeping, latrine use, weaving, food preparation, cooking, flintknapping, woodworking, hide preparation, trash disposal, and burial interment as well as ritual or religious activities. Shafer (2013b) argued that the spaces within shelters such as Hinds Cave and Conejo Shelter were divided into specific activity areas including sleeping areas, latrines, cooking areas, and trash toss zones (Figure 4.1). Shafer et al. (2005) do not suggest that Hinds Cave or any other shelter were used for all these purposes during every occupation, but simply that activities seem to occur in the same general areas within the

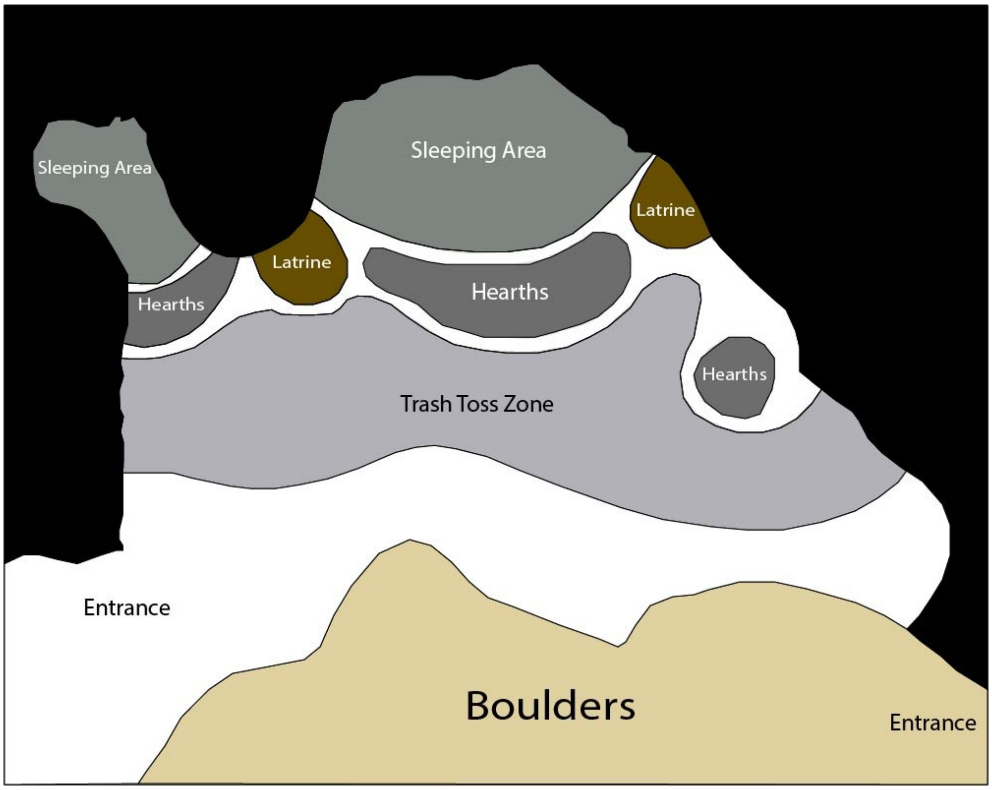


Figure 4.1. Inferred activity areas at Hinds Cave (Adapted from Shafer et al. 2005).

shelters. For example, the majority of cooking, and discard are focused towards the central and front portions of shelters while sleeping and latrine use occur near the back of shelters.

An extensive study of the use of rockshelters by hunter-gatherer groups in Papua New Guinea by Gorecki (1991) revealed some patterns that strongly correlate to Shafer's model. Sleeping areas are usually located near the rear walls of shelters and are associated with hearths. Maintenance activities (i.e., tool resharpening) are conducted toward the front of shelters where the lighting is good throughout the day and are most intensive toward the center of the shelter. Cooking activities sometimes overlap with maintenance activity areas and are usually conducted out toward the front of the shelter under the dripline or outside of the shelter depending on the slope of the talus. Discard or trash zones are more prominent out towards the talus slope. A study of 60 rockshelters in Western Australia showed that cooking hearths were usually placed in the center of the shelter near the front and refuse was most dense towards the talus (Nicholson and Crane 1991). In Western Cape San groups in South Africa, grass-lines pits used for sleeping were encountered near the back walls of the shelters and were associated with hearths while the majority of artifacts and food remains were recovered towards the front of the shelters (Parkington and Mills 1991).

Though many rockshelters have been at least partially excavated in the LPC, few have been reported in sufficient detail to allow for an in-depth discussion of this type of patterning. Rockshelters containing evidence for all or most of the same activities that took place at Hinds Cave (Baker Cave, and Conejo Shelter) and one LPC cave (Moorehead Cave) allow for a more direct comparison to Shafer's model of spatial organization. In addition, recent work by Rodriguez (2015) at Skiles Shelter and Kelly Cave in the ENC as well as ongoing research at Eagle Cave provide some contrasting ideas as to how rockshelters were used.

Hinds Cave. Hinds Cave is located on a small side canyon off the lower Pecos River. The northeast facing shelter is approximately 37 m wide and 23 m deep and is steeply sloped in the front (Shafer et al. 2005). The site was investigated in 1975 and 1976 by Harry J. Shafer and Vaughn M. Bryant from Texas A&M. Seven areas were excavated within the shelter including a continuous excavation block from the rear of the shelter out towards the center, and units at the eastern and western ends of the shelter.

Pits at the back of the shelter that were lined with twigs and leaves and covered with layers of grass, mat fragments, and worn out sandals were interpreted to be sleeping areas (Shafer 2013b). Deposits of white ash were encountered throughout the site and Shafer et al. (2005) suggest these are likely remnants of warming fires. Latrine deposits were recorded north and south of the sleeping area, along the west wall west of the shelter (Shafer et al. 2005). Earth ovens and burned rock middens were encountered out towards the mouth of the shelter and at the north end of the shelter. Portions of the floor in Hinds Cave were covered with plant materials possibly in an effort to keep down the dust prevalent in many dry rockshelters. In the Early Archaic, despined prickly pear pads seemed to have been used in to cover the floors while at later times, grasses, and oak leaves were used instead.

Conejo Shelter. Conejo Shelter is located approximately 0.25 miles north of the Rio Grande, 2 miles north of the confluence of the Rio Grande and Pecos River. The large shelter is located high on the north wall of a small dry canyon. On the surface, the shelter was comprised of a large burned rock midden (BRM) with a large amount of vegetal debris mounded up near the center of the shelter (Alexander 1974). A large excavation block in the central portion of the shelter and test units at the eastern and western ends of the shelter were excavated in 1967 during the Texas Archeological Salvage Project. The excavations revealed four major types of fill that had “definite structural and distributional characteristics”: vegetal fill, fine ash fill, burned rock, and unsustained limestone dust and roof spalls (Alexander 1974:82). The vegetal fill was comprised of mostly Agave lechuguilla leaves, though other plants, bone, and lithic artifacts were recovered. Thin lenses of vegetal fill were encountered throughout the shelter, but the main concentration was located in the central portion of the shelter.

Wood ash and limestone dust concentrations were focused west of the vegetal concentration and along the rear of Conejo Shelter. Alexander (1974:85) interpreted the ash to be residual from in situ fires based on the burned nature of all the materials within the deposits. Two human burials were also recovered from within this ash fill, though Alexander does not specify if these were located at the rear of the shelter or on the east and/or west ends. Burned rock fill containing charcoal and limestone dust was located at the front of the shelter under the dripline and east and west of the vegetal concentration No patterning or discernible structure was noted in the profile exposures and Alexander (1974:86) concluded that it resembled a “Central Texas BRM to which it is undoubtedly related.” The underlying deposits within the central portion of the shelter consisted of limestone dust and roof spalls mixed with few charcoal flecks, vegetal remains, and other artifacts. These deposits were also located at the eastern and western ends of the shelter from bedrock to surface but absent along the rear wall of the shelter.

Alexander (1974:148) notes a distinct difference in the spatial distribution of unifacial artifacts (unifaces and utilized flakes) and bifacial artifacts (projectile points and bifaces). Unifacial tools were more concentrated in the vegetal deposits in the central portion of the shelter suggesting this area was utilized for plant processing. Both vegetal remains and unifacial tool densities increase in Period V and VI (100 B.C.–A.D. 1000) suggesting more intensive plant processing occurred during the later occupations of the site (Alexander 1974:97, 151). Bifacial artifacts were more concentrated within the ashy deposits at the east and west ends of the shelter. Alexander (1974) did not provide an interpretation as to why the bifaces and projectile points were concentrated in these areas.

Baker Cave. Baker Cave is located on a high bluff overlooking Phillips Creek, a dry tributary of the Devils River. The northeast facing rockshelter is approximately 27 m wide and 15 m deep. Extensive excavations were conducted at Baker Cave in 1962, 1968, 1976, 1984, and in 1986 (Hester 1982; Chadderon 1983; Word and Douglas 1970). Based on the cumulative data obtained from these investigations, certain spatial patterns are apparent. Like many rockshelters in the region, the talus slope consists of extensive burned rock immediately in front of and below the shelter. Concentrations of burned rock in units near the mouth of the shelter suggests that more cooking activities were conducted in this area the shelter (Word and Douglas 1970:104). Furthermore, a series of superimposed cooking pits found towards the front of the shelter date from 9,000 to around 1,500 years ago, suggesting people were using and reusing that specific area for cooking activities for thousands of years (Hester 1982, 2013).

Less burned rock was recovered in the central portion of the shelter though all other artifact types increased in number in this area. Word and Douglas (1970:104) vaguely state that this portion of shelter-was utilized for “all other types of activities other than cooking." Trimmings from harvested plants and bone fragments were most common toward the back of the shelter suggesting this area was probably used for food processing. Similar to Hinds Cave, Chadderon (1983:40, 93) hypothesized that thin layers of fiber covering broad areas towards the back of the shelter may have served as floor coverings to create surfaces for food preparation and consumption and/or for sleeping areas. Chadderon (1983:40) noted a prominent increase in the presence of quids in association with the fiber layers, supporting the idea that food preparation and consumption took place on fiber-floored surfaces. The very back of the shelter was likely used as a latrine and for general site refuse as coprolites were mostly recovered from this portion of the shelter along with trash and worn out or broken artifacts (Word and Douglas 1970).

Moorehead Cave. Moorehead Cave is a solution cave located on the east wall of the Pecos River Canyon 0.5 miles south of the Pecos River Bridge. The cave is roughly 12 m (40 feet) wide at the mouth and 70 m (227 feet) deep (Maslowski 1978:21). Moorehead Cave was excavated by Frank Setzler between 1931 and 1938 and the data was analyzed by Robert Maslowski in 1978 for his dissertation. Setzler recorded 14 burials, 4 "grass pockets", and 2 caches during his investigations (Maslowski 1978:39). The burials were classified into three types including cremations, flexed burials, and disturbed burials and all were located along the rear and side walls of the cave.

Two caches containing food processing tools (e.g., unifaces and metates) were located between the talus slope and the mouth of the cave near bedrock mortars. Maslowski (1978:39) hypothesized that the primary food processing activities occurred at the mouth of the cave and the caches served as storage pits for food processing tools. No cooking features were discussed; however, the west side of the talus slope was covered with stones and a thin layer of dust with gray ashes underneath (Maslowski 1978:31). This could represent earth oven cooking debris suggesting cooking activities were occurring at or near the mouth of the cave close to the food processing area, however without more data this hypothesis is tenuous.

Four grass pockets, inferred as sleeping areas, were encountered just beyond the food processing area as you enter deeper into the cave. This area also contained thick fiber layers and the majority of perishable artifacts of wood, fiber, skin and hide. Maslowski (1978:306) states that this area was likely used for storage and "light manufacturing or food processing" as well as a sleeping area. A thick layer of dasylirion stalk and coprolites were present along the east wall of the cave suggesting this was at least one location for latrine use (Maslowski 1978:31).

Skiles Shelter and Kelley Cave. Skiles Shelter (41VV165) and Kelley Cave (41VV164) are adjoining rockshelters located on the eastern canyon wall within the ENC. Rodriguez (2015) conducted small-scale excavations at the shelters in 2013–2014. Results of his analyses indicate the sites were used concurrently from the Early Archaic to the Late Prehistoric and Rodriguez (2015:176, 190) hypothesized that the two adjacent sites, although used for different activities, represent a single occupational locus.

Rodriguez (2015:191) postulated the wide variety of materials and features in Kelley Cave (grinding facets, discrete burning/cooking events, repeat use cooking features, possible storage cyst) were representative of a broad range of occupation activities and habitation, whereas the materials and features in Skiles Shelter were primarily related to food preparation and processing (i.e., grinding facets, earth ovens) with very little evidence of other occupational activities. Though Rodriguez (2015:194) was unable to determine whether the sites were used seasonally or semi-sedentarily, he importantly notes "the results of comparative analysis between Kelley Cave and Skiles Shelter show a complex use of rockshelters not just as individual sites, but as portions of a larger occupation locus: Eagle Nest Canyon."

Eagle Cave. Eagle Cave contains an immense amount of cultural debris, much of which appears to be from plant processing (e.g., burned rock, vegetal debris, and charred botanicals). However, evidence for a much wider array of activities is present at the site. Pictographs are present on the southern wall of the shelter. Davenport (1938:10) and Ross (1965:21) both discovered burials along the rear wall of the shelter. Davenport (1938:8) noted that baskets and matting were primarily recovered at the eastern end of the central trench, in the central portion of the shelter. Ross (1965:21-23) describes several "hearths" encountered toward the central portion of the shelter. Most of these hearths contained burned rock, charcoal, blackened matrix, and vegetal remains, suggesting that these were actually remnants of earth ovens. A basin-shaped depression filled with leaves, grass, seeds, nuts, bones, and flakes was also encountered in this area (Ross 1965:21). During the 2015 ASWT season, over 120 coprolites were recovered from the central trench at Eagle Cave (Black et al. 2015). Most of these specimens were located towards the front of the rockshelter, which is in contrast to Shafer's model suggesting latrines were typically located at the back of rockshelters.

Discussion and Conclusions

There is some supporting evidence for Shafer's model of the organization of space within rockshelters; however, there is too much variability in the types of activities that occur (or do not occur) at certain rockshelters to be able to come up with a standard model of spatial use. Many of the excavations done in the LPC were conducted during the Museum and Amistad Reservoir eras when the focus was on chronology and/or locating unique prehistoric objects. The excavation methodologies were unrefined and data was not reported in great detail. Furthermore, rockshelter deposits are often palimpsests and without fine-grained excavation methods, behavioral patterns can be extremely difficult to discern. In addition, postdepositional processes such as pit digging and reuse combined with decades of pothunting have redistributed and/or removed important data further complicating attempts at studying spatial patterning.

Variability in the use of rockshelters may be attributable to factors such as amount of living space, quality of living space, morphology of the shelter, lighting, location on landscape, aspect (i.e., facing direction of shelter mouth), and proximity to water. The selection of a rockshelter for habitation as opposed to more specialized use would seem to be related to size and location. In theory, large rockshelters would provide a fairly large living space that can support a wide variety of activities whereas smaller shelters would be more spatially limiting. It would also seem logical that larger rockshelters would be prime locales for earth oven facilities, however, Koenig's (2012:106) thesis research of BRMs in the LPC found no statistical correlation between sizes of shelters and presence of BRMs.

Greer and Greer (2009) suggest that lighting and the morphology of caves and rockshelters play important roles in where cultural activities take place. Greer and Greer (2009:91) divide the natural light zones within caves into four categories: daylight, twilight, transitional dark, and dark zones. As rockshelters are wider than they are deep, only the first two categories are applicable. The most common (and logical) location for cultural activities is within the daylight zone as this area receives direct sunlight during the day and can be illuminated by moonlight at night. The twilight zone is an area that would be in permanent shadow, but still maintains adequate light for visibility throughout the daylight hours. As rockshelters are quite varied in their morphology, some shelters may or may not have a true twilight zone. At Eagle Cave, for example, direct sunlight completely fills the shelter at one point in the day but portions of the shelter are in shadow for a good majority of the day. Factors such as these may influence which cultural activities occur in various locations within the rockshelters.

Numerous postdepositional processes can disturb the integrity of deposits within rockshelters. As mentioned in Chapter 1, humans often modify and redistribute deposits through cultural activities (e.g., pit digging, trampling, cleaning, discard) however, animal activities (e.g., burrowing) can also alter and redistribute deposits (Schiffer 1987). As with many archaeological sites, pothunting is a prevalent and destructive occurrence in the LPC. It seems to be common knowledge that cached items, the best-preserved fiber artifacts, and burials (if present), are usually located along the back walls of shelters as the backs of almost all rockshelters have been dug out. Assuming for now that Shafer's model is correct, the sleeping areas and latrines located along the back walls of shelters would be most impacted by looting activities. This not only hinders subsequent spatial analysis but also removes data that could help answer other research questions such as seasonality of use, diet, and paleoclimate.

There is certainly data that supports Shafer's argument that inhabitants of rockshelters divided their space into activity areas and specific areas within the rockshelters were preferred for certain types of activities. Rockshelters were not all used for the same purposes though, and a much more extensive study would need to be done comparing the varieties of activities occurring at rockshelters to attributes such as cave morphology and location on the landscape. Unfortunately little of this data is available due to poor excavation methods and reporting, looting activities, and other postdepositional processes. Excavation methods have and are still improving and evolving as more researchers recognize the complex nature of rockshelters deposits and the vast potential they hold for behavioral studies. My research area only focuses on one small area within Eagle Cave, so an evaluation of the overall spatial patterning within Eagle Cave is not feasible. However, in Chapters 6, 7 and 9, I will discuss the variety of activities that occurred in this portion of the shelter over time so this information can be tied into future discussions of the use of the rockshelter as a whole.

V. FIELD AND LABORATORY METHODOLOGY

The methods and objectives employed for my thesis work were designed to gather sufficient information to interpret the depositional context of the cultural deposits and identify the various site formation processes at play. The site stratigraphy documentation and sampling of this area was conducted during the 2014 ASWT field season from December to July 2014. The various laboratory analyses were conducted intermittently from August 2014 to October 2016. This chapter presents the methodology used in the field to document and sample these deposits, followed by the methods and techniques used for the subsequent laboratory processing and analysis.

Field Methods

As discussed in Chapter 3, UT North was previously investigated in 1963 by Ross and Parsons. The excavated area was not completely backfilled and as a result was infilled with disturbed fill and slump. In 2014, this fill was removed to locate seemingly intact stratigraphy. Each exposed wall profile was assigned a "Profile Section" (PS) number; the west wall was designated PS3 and the south wall was designated PS4 (Figure 5.1). The profiles were stepped to make sure the profile remained stable during recording and sampling; the steps also provided us with an area to stand and sit while we conducted our sampling. The profiles were then cleaned and photographed using Structure from Motion (SfM) photogrammetry (Koenig et al. 2017; Willis et al. 2016). This allowed the photographs to be stitched together and converted into 3-D models. Ground control

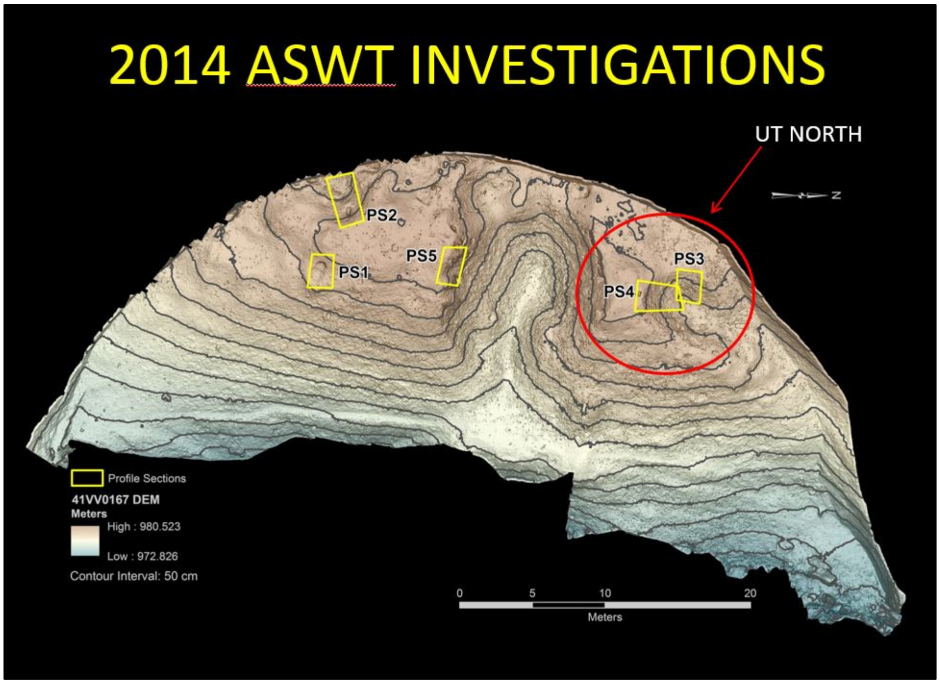


Figure 5.1. Location of all Profile Sections exposed and sampled during the 2014 ASWT investigations at Eagle Cave and location of UT North.

points (GCPs) were included in every SfM set so the 3-D models could then be spatially referenced within the overall site.

Stratum and Physical Characteristic Documentation. Each stratigraphic layer within the profile was defined to the best of our ability and annotated on print-out images from the 3-D models (Figure 5.2). Some of the criterion used to differentiate between stratigraphic layers included soil color, texture, structure, and artifact content. Total Data Station (TDS) points were taken for all stratigraphic layers, which will herein be referred to as "strats." Each strat was assigned a unique field number (FN) and initial observations for each strat including thickness, intrusions, dry (and sometimes wet) Munsell color, inclusions, etc. were recorded on "Strat Sampling Forms" (Appendix A).

Figure 5.2. Jacob Sullivan annotating 3-D print-out of PS3 Unit 6, facing north.

Approximately 75 strats were defined, recorded, and sampled in PS3 and PS4. These strats vary greatly in composition, and include discrete lenses of ash, charcoal, and/or fiber, thick ash deposits, midden/refuse, disturbed fill, earth oven heating elements (e.g., relatively large fire-cracked rocks believed to be intact portions of thermal storage arrangements), and limestone spall. Several distinct cultural features were noted including a fiber-filled pit and three heating element remnants. Typical strats encountered within the features included dark-colored feature fill with burned organics, heating elements, and oxidized soil. Features were assigned an overall feature number and FN and then each strat defined within the features were assigned a unique FN number to help maintain provenience.

Strat Sampling. Unlike previous excavations, the goal of the ASWT investigations at Eagle Cave was to carefully document and sample the stratigraphic layers within the shelter utilizing small sampling units rather than to conduct more typical larger-scale block or trench excavations. As such, after initial annotation and recording was completed, small sampling units were laid out instead of more traditional 1-x-1m excavation units. The size, layout, and position of each sampling unit was determined based on factors such as the width of the overall PS, distribution of strats, and location of potential cultural features. The sampling unit sizes were flexible, however most were approximately 40–50 cm by 20–30 cm, with the longer axis along the profile wall. The sampling strategy included collecting as much intact matrix as possible from each strat exposed within the small sampling units, to be later split and used for a variety of analyses.

Additional strats and features encountered during the sampling process were recorded in the same fashion as described above. Diagnostic artifacts and special samples, such as burned rocks for residue analysis, were recorded with the TDS, assigned an FN, and collected. As each strat was sampled and removed, a new set of SfM photographs were taken to provide a detailed photographic record of the entire sampling and excavation process. The rocks within each layer were sorted by burned and unburned and then quantified by type (pitted, round, spall, other-igneous or metamorphic) and by size category (<7.5 cm, 7.5–11 cm, 11–15 cm, or 15>cm).

Geoarchaeological Sampling. The geoarchaeological investigations included the collection of cube column and geomatrix samples. These samples were used to conduct a variety of analyses including: magnetic susceptibility, Loss-on-Ignition (LOI) for organic carbon content, calcium carbonate analysis, phosphorus analysis, and particle size analysis. The cube column and geomatrix samples were collected from the bottom upward in each profile using plastic and/or wooden implements. Collecting samples in this fashion is essential as disturbance and potential contamination during sampling only affects the previously sampled section below (Goldberg and Macphail 2006:328). For the cube column, a small sample (10–20 g of matrix) from each visible strat was collected in roughly 2 to 4 cm intervals; however, the interval spacing varied depending on the thickness and location of each strat. Multiple samples were collected from thicker strats. For the geomatrix samples, a single sample (half a quart-size bag) was collected from each visible strat. The samples were then placed into clean plastic bags and labeled with provenience information to be transported back to the lab. The boundaries of the removed samples were mapped into the respective profiles utilizing the annotated photographs of each profile to correlate them to site stratigraphy and excavation elevation.

Micromorphological Sampling. In additional to the geoarchaeological samples mentioned above, a series of micromorphological (micromorph) samples were also collected. A micromorph sample is a block of intact, undisturbed sediment that has been removed from a soil profile for micromorphological analysis (Goldberg and Macphail 2006:328). The deposits in Eagle Cave, like many other LPC rockshelters, are very dry and often have a loose consistency. This posed many challenges during initial recordation of stratigraphy and with the subsequent sampling. PS walls became enveloped in a film of dust with the slightest breeze or movement. Despite considerable efforts to clean walls prior to all documentation using blown air, observations during strat recording were somewhat hindered by the persistent dust. The collection and analysis of micromorph samples, however, allows for a more detailed examination of in situ stratigraphy and the relationships between various deposits. Characteristics that aid in deciphering formations processes, such as boundaries between strats, are especially difficult to determine when obstructed by dust.

The overall sampling strategy for the micromorph sample placement was fairly simple: capture representative samples of as many of the main strat types visible within the PS3 and PS4 profiles. As archaeological and geoarchaeological sampling had already occurred prior to the micromorph collection, some strats identified during the initial profile recordation were no longer visible in the profile. Specific types of strats that were especially important to capture in the micromorphs included microstratigraphy such as thin lamina and lenses as well as strats that were associated with cultural features. Using this strategy, the 13 relevant micromorph samples captured approximately 27 of the 76 total stratigraphic layers identified in the field. A total of 22 thin section slides were made from the 13 micromorph samples.

After the micromorph sample areas were selected, a section of profile was carefully cut back with a knife and trowel to expose a protruding block of soil (Figure 5.3). When successful, the blocks were carefully removed, wrapped in toilet paper, tightly wrapped in tape, and labelled with provenience information and a north arrow. The samples were then placed in plastic Tupperware or a sturdy container and very carefully carried out of the canyon up to a nearby shed. There, the samples were impregnated with a polyester resin mixture, consisting of 700 ml of non-promoted polyester resin, 300 ml of styrene, and 7 ml of methyl ethyl ketone peroxide (MEKP). The polyester resin mixture was poured into the container around each micromorph sample and allowed to dry. Additional polyester resin was added into the containers over the next few days as needed until the samples were sufficiently covered and impregnated with the resin. The micromorphs were then transported to Frederick's lab in Dublin, Texas. At the lab, the micromorphs were placed in a low temperature oven overnight to completely set the polymerization prior to slabbing. The slabbing methods for the micromorphs will be discussed in the laboratory methods section below.

However, field collection is not always successful in loose deposits such as these and many first (and second) attempts at the micromorph collection failed. Two alternative methods of micromorph collection were tested at the end of the 2014 ASWT field season. The first method involved inserting an open-ended metal box into the sediment we wanted to sample and then pouring the resin into the box to cure. This method proved problematic as coarse fractions in the sediments made insertion into the sediment difficult. The second method was to pour the polyester resin into small wells cut into the sediments we wanted to sample, and then leave the sample to dry for a few weeks. This second method ended up working quite well and was adapted as the preferred collection methodology for the subsequent field seasons.

Figure 5.3. Charles Frederick cutting back a block of sediment in PS4 in preparation for micromorph collection, facing southwest.

Laboratory Methods

A large volume of samples was collected during the PS3 and PS4 sampling, however, not all types of analysis were conducted on every sample collected. Each section below describes the sampling methodology used for that specific type of analysis. In general, the analyses were conducted using samples from strats identified within the profiles (rather than unit/layers) and samples associated with cultural features.

Bulk Matrix and Artifact Sort. The bulk matrix samples from each strat were first mixed together to make sure the constituents had not settled during transport, and then screened through 1-inch mesh to remove the coarse fractions (e.g., burned rock, large flakes). The samples were then split into individual one L matrix samples. One liter of matrix from each strat was then screened through 5 size grades, including ½-inch, 4 mm, 2 mm, 1 mm and 500 μm sieves. The exceptions to this were: 1). Strats with only 1–1.4 L of matrix were reserved for curation and not sieved, and 2). Strats with 1.5–1.9 L of matrix were split evenly for curation and analysis and therefore a smaller amount (<1.0 L) of matrix was sieved.

A total of 31 bulk matrix samples were sieved including 10 from PS3 and 21 from PS4. All artifacts and ecofacts recovered from the 1-inch screen used during initial matrix processing and from the ½-inch and 4-mm sieves were sorted into classes, tabulated, and weighed (Appendix B). The 2 mm and smaller sized sieved matrix was visually inspected for presence/absence of the various artifact and ecofacts classes, but were not quantified aside from total weight. Diagnostic tools (e.g., arrow and dart points) were identified and typed when possible. Individual lithic tool analysis was limited to recording qualitative data such as heat alteration, breakage, and use-wear. Rocks from the ½-inch and 4 mm sieve were quantified by type (burned, unburned limestone spall, and pebble) and by weight.

Macrobotanical Analysis. The macrobotanical analysis was conducted by Leslie Bush and Kevin Hanselka. Macrobotanical analysis was conducted on a total of 18 samples, including 4 samples from PS3 and 14 samples from PS4 (Appendix C). Sub-sampling was conducted due to the overabundance of organic materials in the samples. The sampling strategy was adapted from Karen Adam's methods used at Crow Canyon (Adams 2004). The methods employed maximized taxon representation and recorded signs of use wear, processing marks, and damage to aid in the identification of formation processes and discussion of potential plant processing activities evident in this sector of the shelter. A discussion of the macrobotanical results can be found in Chapter 6 and 7.

Faunal Analysis. The faunal assemblage was sorted and analyzed by Christopher Jurgens (Appendix D). The analysis included taxon identification with additional emphasis on recording signs of use wear, processing marks, thermal alteration, and post-depositional damage (e.g., rodent gnawing, breakage). Prior to analysis, the faunal materials were cleaned using distilled water and a soft-bristle toothbrush or carefully dry-brushed if the specimen was friable. If deemed necessary, specimens that were encrusted with carbonate or oxalate-rich sediment were soaked in a 9.9percent acetic solution buffered with calcium phosphate, followed by a soak in distilled water and air-dried. If needed, fragile bone was repaired and consolidated using a B-72 acryloid solution. The faunal remains were analyzed using low power microscopic examination and low-angle directional lighting. A Baush & Lomb 7–30x stereoscope microscope was used to detect cut-marks, chop-marks, blow marks, and carnivore damage. Cut marks on bone fragment are an indication of human processing of the animal, such as butchering, skinning, or dismemberment. Roasting-type or discard burn patterns were also noted for all burned bones. Bones that were roasted during cooking would have more partial burning, whereas bones intentionally or unintentionally discarded into a thermal feature would become more completely burned or calcined. Faunal identifications were made by Jurgens using comparative collections and osteology reference materials, such as Klein and Cruz-Uribe's *The Analysis of Animal Bones from Archeological Sites* (1984), Lyman's *Vertebrate Taphonomy* (1994), Olsen's *Mammal Remains from Archaeological Sites* (1973) and Reitz and Wing's *Zooarchaeology* (2008).

Radiocarbon Analysis. A total of 18 samples targeting short-lived economic species from PS3, PS4, and U19 were sent to Ray Mauldin at the Center for Archaeological Research at the University of Texas at San Antonio for radiocarbon dating analysis. The samples were strategically selected both vertically and horizontally within the profiles to target intact cultural features and/or discrete intact lenses. As no radiocarbon dates were obtained from the north sector of the shelter during the 1963 investigation, this analysis was essential to determine the age of the deposits and link the strata to the overall site chronology. All samples submitted were identified to taxon by Leslie Bush prior to submittal. Ten samples, two from PS3, seven from PS4, and one from Unit 19 which was excavated in the floor below the two Profile Sections, were initially sent for radiocarbon analysis. However, the results of the initial radiocarbon analysis raised a few questions that additional radiocarbon assays could potentially clarify, so an additional eight samples were later selected and sent for radiocarbon analysis. Of the 18 total samples submitted, four were selected from PS3 which extended roughly 60 cm below surface, 12 were selected from the PS4 exposure that extended almost 2 m below surface, and two were collected from Unit 19 which was excavated into the floor below PS3 and 4.

Geoarchaeological Analysis.

Geoarchaeological investigations were also conducted in UT North at Eagle Cave with the goal of determining site formation processes. The data collection specific to the geoarchaeological analysis was conducted in June and July of 2014 by Christina Nielsen, Jacob Sullivan, Ken Lawrence and Dr. Charles Frederick. The subsequent laboratory analyses were conducted intermittently from August 2014 to October 2016 at Frederick's lab and the SWCA laboratory by Nielsen, who was assisted occasionally by Sullivan, and supervised by Frederick and Lawrence. The results of the various geoarchaeological analyses are presented in Appendix E.

Magnetic Susceptibility (MS). The magnetic susceptibility of a sediment or soil is based on the amount of magnetic minerals present; these minerals are common in the natural environment and are susceptible to environmental changes (Gale and Hoare 1991:201-202). Initial susceptibility values are influenced by factors such as the mineralology, the size and shape of the grains, internal stresses (Dearing 1999a, 1999b; Gale and Hoare 1991:204). During soil development, surface soils become magnetically "enhanced" in comparison to the soils and sediments below (Dalan 2006:162). Cultural activities involving burning and/or the deposition of organic materials further enhances the magnetic properties, though the actual amount of enhancement is dependent of factors such as climate, soil type, quantity of organic materials, and type of and duration of cultural activities (Dalan 2006:164; 2008:22). Regardless, sediments associated with cultural features and activities tend to have higher MS susceptibility values than the surrounding non-cultural sediments. As a result, MS analysis can be used to help identify cultural activity areas that may not be visible at the macro level and if the analysis is applied vertically, they can be used in recognizing and defining cultural horizons (e.g., Frederick 2010, 2012).

Each geomatrix sample was screened through an American Society for Testing and Materials (ASTM) size 14 mesh sieve (1.41mm) before the matrix was placed in a plastic cube. The samples were then analyzed using a Bartington MS2 meter and MS2b sensor to examine both low (χlf) and high (χhf) frequency MS. The values for each cube sample were collected twice at both the low and high frequencies to provide an average value using the Système International (SI) scale. Each of the χlf, χhf, and the average values were recorded as well as each sample's weight in an Excel table. After every five readings, the Bartington MS2 meter was zeroed out to recalibrate the meter. As discussed in methods outlined by Gale and Hoare (1991:223–226), the primary metric for recognizing magnetic susceptibility values of interest is the coefficient of frequency dependency (χfd):

$$\chi fd = 100\,[(\chi lf - \chi hf)/\,\chi lf]$$

Loss-on-Ignition (LOI). Studies have shown that magnetic susceptibility values can be skewed due to the presence of organic matter (Gale and Hoare 1991:209). Therefore, an LOI analysis was conducted along with the MS analyses to determine if samples with elevated MS values could be attributed to organic materials. The LOI method was used to calculate a proxy measurement of organic matter content for each of the sediment samples. This method involves heating a dried sample for an extended amount of time at a high temperature in order to burn off any organic matter present within the sediment (Schulte and Hopkins 1996; Schumacher 2002). The organic matter percentage is essentially the difference in sample mass quantified by percentage before and after the heating of the sample. The methods used for the LOI analysis were adopted from Storer (2005) and used a Temco Thermolyne Electric Furnace (Model FA1415M) and an American Weigh Milligram scale (Gemini-20 model) with 0.001g accuracy. Each screened sample was placed in a crucible and weighed. The samples were then dried for two hours at 150° C, allowed to cool in a dessicator, and then weighed again (accounting for the crucible) to calculate the moisture content. The samples were then placed in the muffle furnace for two hours at 450° C, allowed to cool in a dessicator, and then reweighed. The approximate percentage of organic matter for each sample was calculated by determining the difference before and after the heating of the sample. After the organic matter content was calculated, 2 g of sediment were removed from each sample to be used in the phosphorus analysis.

Calcium Carbonate Analysis. Calcium carbonate occurs as aragonite, calcite, and dolomite and is a common component of limestone. Wood ash is composed primarily of calcium carbonate and silt-sized grains of calcite crystal aggregates (Mentzer 2012:626). The calcium carbonate percentage of each sediment sample was determined using the Standard Test Method for Rapid Determination of Carbonate Content of Soils (ASTM 2014). The calcium carbonate (calcite equivalent) is determined by treating a 1-gram dried soil sample with hydrochloric acid (HCl) in an enclosed reaction cylinder (reactor). The acid reacts with the carbonate in the sample, giving off carbon dioxide (CO_2). The resulting pressure produced in the closed reactor is proportional to the calcite equivalent in the specimen, and is measured using a pressure gauge that is pre-calibrated using reagent grade calcium carbonate.

Phosphorus Analyses. Phosphorus is a naturally occurring element present in water, living organisms, sediments, and soils (Brady and Weil 2008; Busman et al. 2016; Kuo 1996; Sims and Pierzynski 2005:151). Cultural activities such as food processing, cooking, and disposal of organic refuse and human waste cause an increase in the amounts of phosphorus, as well as other elements (e.g., carbon and nitrogen), in soil and sediments (e.g., Eidt 1973, 1984; Garrison 2003; Macphail et al. 2000; Parnell et al. 2002a and 2002b; Quine 1995; Schlezinger and Howes 2000; Skinner 1986; Sjöberg 1976; Wilson et al. 2008, 2009). Unlike nitrogen and carbon which deplete quickly from leaching and oxidation processes, phosphorus tends to combine with other elements (e.g., iron, calcium, or aluminum) after deposition creating stable chemical compounds (Skinner 1986:51-52). In this form, Phosphorus is resistant to vertical and horizontal migration and does not dramatically decrease over time, rather is "locked in" once deposited (Eidt 1985:180–181; Holliday and Gartner 2007; Parnell et al. 2002b:332; Skinner 1986). Brady and Weil (2008:594) note that since phosphorus naturally occurs in such low amounts, "archaeologists use elevated amounts as an indicator of prehistoric activity". In contrast, researchers have noted that low levels of phosphorus (compared to a normal baseline) in a soil or sediment could be a result of high traffic (i.e., pathways) or repeated, systematic cleaning activities (Roos and Nolan 2012). In other words, human activities tend to cause an increase in the amount of phosphorus in soil and those amounts remain stable over time unless they are physically removed.

The analysis of phosphorus used Mehlich III extraction solution to extract the phosphorus and a Hach DR 890 Colorimeter for the measurements. The methods for extraction followed Sims (2009:16–17), which combines 2 grams of matrix sample with

20 mL Mehlich III solution. Each 2 gram sample was removed from the crucible after they were cooked for two hours at 450° C in the muffle furnace during the LOI analysis. Once the 2 grams were allowed to cool, they were each combined with the Mehlich III solution. The measurement of phosphorus followed the methods outlined by several researchers (e.g., López Varela and Dore 2010; Parnell et al. 2002a, 2002b; Terry et al. 2000) with some modifications.

The matrix and solution were agitated for approximately five minutes and then filtered. From the filtered extract, 5 mL was collected and placed in the Hach Test ‘N Tube (TNT) analysis containers, which measure the High Range (1.0–100.0 mg/L) mg/L PO4. Since the reaction of phosphorus to the reagent is temperature sensitive (e.g., 7 minutes at 23° C and 15 minutes at 13° C), the ambient temperature during each sample analysis was measured and accounted for in the readings. Each sample was placed in the Hach DR 890 cell chamber and analyzed using Program 86 and calibrated to read mg/L PO4. Three readings were recorded at appropriate intervals (6, 6.5, and 7 minutes) based on the temperature and the results were recorded in an excel spreadsheet with the average of the three runs used for the interpretation. A “blank sample” was also run with the samples to provide a baseline transmittance curve and used with the internal calibration for phosphate measurements of the Hach Colorimeter (Roos and Nolan 2012).

Particle Size Analysis. Sediment particle size was measured for each sample using a LS 13 320MW laser diffraction particle size analyzer. Polarization Intensity Differential Scattering (PIDS) technology was used in conjunction with low-angle scattering technology to size the sub-micron particles more accurately (Becker Coulter 2009). To make sure organic carbon content did not affect the readings, only samples that had already undergone LOI for organic carbon were used in the analysis. To remove any calcium carbonate content, samples were digested in hydrochloric acid (HCl) until only silica remained. A dispersant (sodium hexametaphosphate or Calgon) was then added to each sample before placed in the aqueous liquid module (ALM) to help keep the clays from flocculating (sticking together). Once in the ALM chamber, the samples were sonicated for 30 seconds followed by a 30 second pause and then a reading was taken over a period of 90 seconds.

X-Ray Diffraction (XRD). A total of 19 samples were sent for bulk mineralogy analysis using XRD. When possible, samples were selected from strats captured in the micromorph samples so the mineralogical component present could be compared against minerals observed in thin sections as well as the results of the particle size analysis. Of these, seven samples were chosen from PS3, ten from PS4, and two from U19. This analysis was semi-quantitative, using weight percentage, and determined rock-forming minerals and total clay minerals present within each sample. Minerals identified during this analysis included quartz, K-feldspar, plagioclase, calcite, dolomite, halite, sylvite, gypsum, anhydrite and hematite.

Micromorph Sample Processing. After completely solidified, the micromorphs were transported to Frederick's lab in Dublin, Texas to be slabbed. The samples were removed from their containers and the north orientation immediately notched in the block. The outer casing of solidified MEKP, tape, and toilet paper was removed using an oil-based rock saw to expose the intact soil block inside. After all the casing was removed, each side of the micromorph block was scanned at a high resolution. The blocks were then cut into 1 cm thick slabs to be used for thin section production, curation, and macroscopic analysis. The thin section slabs were further cut into 4 x 6 cm sections to be sent to Spectrum Petrographics, Inc. to be made into thin section slides. As with the stratigraphic documentation in the field, printed out scans of each slab were utilized to demarcate where each thin section was cut.

Thin Section Analysis. Thin section analysis can provide information crucial to the study of formations processes such as the size, orientation, sorting, and mineral composition of grains, organics, and artifacts as well as post-depositional disturbances of sediments. A total of 22 thin sections slides were made from the 13 micromorph samples. The thin section slides were each examined under a petrographic microscope using plain-polarized light (PPL), cross-polarized light (XPL), and UV fluorescent light (UVL). For purposes of this thesis, my thin section examination focused on identifying overall percentages and types of coarse fractions (e.g., rock, lithics, botanical remains, animal feces, etc.), noting presence/absence of wood ash, identifying percentages of fuel vs. food type organics (i.e., wood charcoal vs. other botanical remains), and characterizing the interfaces between strats (e.g., diffuse vs. abrupt lower boundary).

VI. STRATIGRAPHIC LAYER AND FEATURE DESCRIPTIONS AND RADIOCARBON ASSAYS

As discussed in Chapter 5, two Profile Sections (PS3 and PS4) were cleaned, stepped, and photographed using SfM followed by stratigraphic documentation and sampling. Within PS3, strat sampling was conducted within sampling unit U6 (Figure 6.1). Within PS4, three sampling units were initially set up; U5 in PS4A, U11 (upper) in PS4B, and U14 in PS4C (Figure 6.2). During sampling of U14, extensive disturbances from the previous UT excavations were encountered so an additional Profile Section (PS4D) was documented and sampled as U11 (lower).

Approximately 75 strats were defined, recorded, and sampled within UT North. As mentioned in Chapter 5, the composition of each of these strats is quite varied. In general, the strat types identified in the field include: discrete ash, fiber, and charcoal lenses, thick ash deposits, pockets of ash or charcoal, refuse midden, disturbed fill, earth oven heating elements, baked surfaces, and limestone spall. Relatively thin (<2 cm), discrete layers of ash, charcoal, and fiber with fairly distinct lower boundaries were called “lenses.” In contrast, thicker (>2 cm) deposits appearing to contain predominantly ash were termed “thick ash deposits.” Charcoal and ash “pocket” deposits are called such as they have been truncated by numerous burrows and appear as small pockets. Below is a discussion of the stratigraphic documentation and general strat types encountered within each PS, followed by the results of the radiocarbon analysis and descriptions of the features recorded during sampling.

Figure 6.1. Overview of PS3 and Unit 6 location after sampling had been completed.

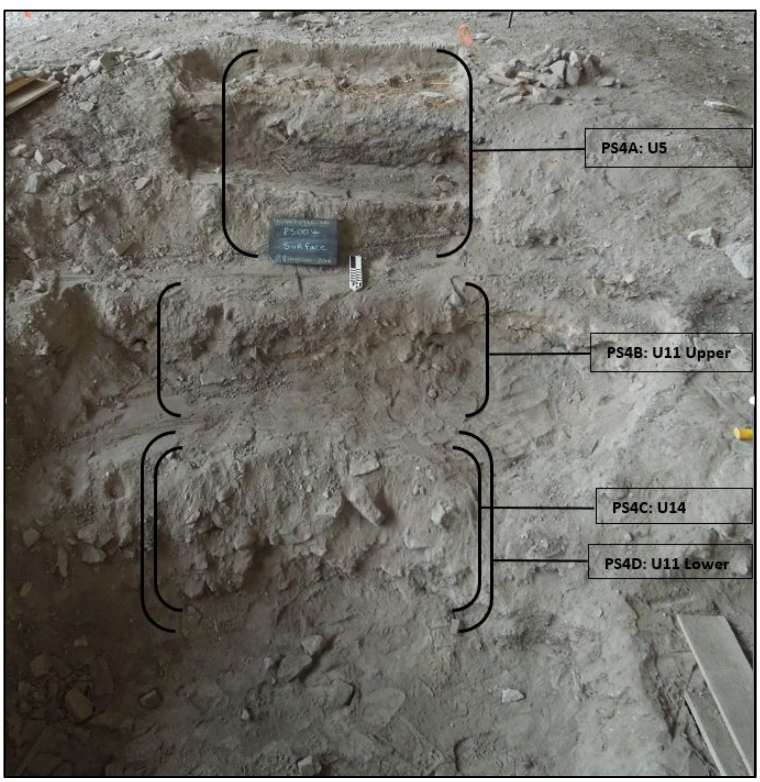


Figure 6.2. Overview of PS4 and approximate locations of sampling units.

Stratigraphic Documentation

PS3A U6. A total of 18 strats were identified and sampled within PS3A (Figure 6.3; Table 6.1). Two features were also encountered during excavation of U2 (F1 and F3) and are included on Table 6.1 and discussed below. The uppermost strats (S25 and S49) are disturbed deposits containing prevalent goat and sheep dung mixed with a variety of cultural material (e.g., lithics, burned and unburned botanical remains, bone, FCR, and a Frio dart) (Figure 6.4). Below the disturbed deposits are several alternating layers of discrete ash lenses and thick ash deposits. The lower half of PS3A contains additional discrete deposits including remnants of a baked surface (S61), heating element (S46/F7), discrete charcoal lens (S47), and numerous discrete fiber and charcoal lenses at the base of the Profile Section (S48 and S90–92). Several deposits characterized as refuse middens (S44 and S44) are also present within the Profile Section. The S44 matrix contained a dart point base that strongly resembles a Langtry (see Figure 6.4; Turner and Hester 1999:143).

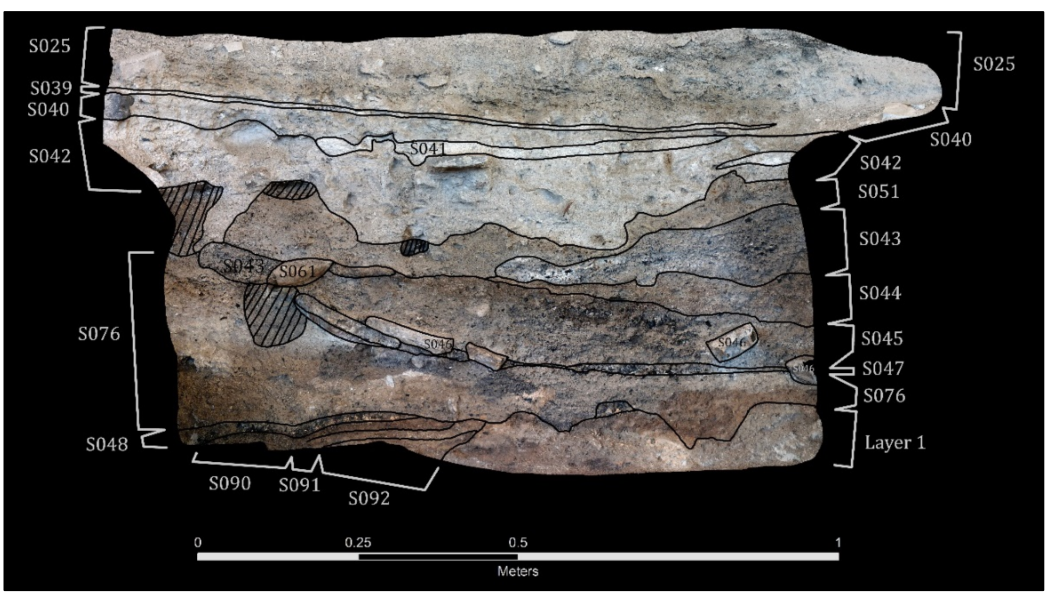


Figure 6.3. Annotated profile of PS3A.

Table 6.1. PS3 Strat Summary Table.

Unit	Strat	General Strat Type	Strat Description	Analysis Conducted
6	25	Disturbed	Disturbed surface layer with prevalent goat and sheep dung	S, F
6	49	Disturbed	Heavily disturbed deposit with animal dung and a variety of cultural materials	M, F, O, MS, P, C, PS, MM
6	39	Discrete Ash Lens	Thin, white, ash lens	S, F, O, MS, P, C, PS, MM
6	40	Thick Ash Deposit	Light gray-colored, ash deposit that sits between white ash lenses: S39 and S41	S, C-14, M, F, O, MS, P, C, PS, XRD, MM
6	41	Discrete Ash Lens	Thin, white ash lens that runs horizontally across the unit	S, F, MM
6	42	Thick Ash Deposit	Light gray ash deposit with rodent burrow disturbance along its lower boundary	S, F, D, O, MS, P, C, PS, MM
6	51	Disturbed	Animal burrow	O, MS, P, C, PS, XRD, MM
6	61	Baked Surface	Hard, cemented matrix in in the southeast corner of S44	N
2	F1 (L2)	Refuse Midden	Edge of a small pit feature with botanical remains	N
6	43	Thick Ash Deposit	Fairly thick deposit of charcoal and ash	C-14, O, MS, P, C, PS, XRD, MM
6	44	Refuse Midden	Light brown sandy/silty loam with sparse, micro-charcoal flecks	S, F, D, O, MS, C, PS, XRD, MM
6	45	Thick Ash Deposit	Thick ash layer with large charcoal chunks and fiber material	S, F, D, O, MS, P, C, PS, XRD, MM
6	46 (F3)	Heating Element	Stacked and sloping cluster of flat, slab-like FCR (F3)	N
2	F3 (L7)	Heating Element	Shallow basin feature lined with flat, tabular burned rock (F3)	F
6	47	Discrete Charcoal Lens	Thin charcoal lens that runs horizontally underneath a cluster of FCR (S46)	S, C-14, M, F, O, MS, P, C, PS, MM
6	76	Refuse Midden	Marbleized matrix with baked sediment, charcoal, and cultural material	S, M, F, O, MS, P, C, PS, XRD, MM
6	48	Discrete Fiber/ Charcoal Lens	Decomposing fiber deposit with rare charcoal flecking and small, angular FCR	S, C-14, F, O, MS, P, C, PS, MM
6	90	Discrete Fiber/ Charcoal Lens	Thin brown (probably decomposing fiber) deposit with charcoal and small FCR	N
6	91	Discrete Fiber/ Charcoal Lens	Thin decomposing fiber deposit with small charcoal and FCR	N
6	92	Discrete Fiber/ Charcoal Lens	Thin brown (probably decomposing fiber) deposit with charcoal and small FCR	N

*Feature 1 and 3 were encountered during the excavations of the PS3 profile steps and were not give strat numbers.
**S=Bulk Matrix Sort, C-14=Radiocarbon Analysis, M=Macrobotanical Analysis, F=Faunal Analysis, O=Loss-on-Ignition Analysis, MS= Magnetic Susceptibility Analysis, P=Phosphorus Analysis, C=Calcium Carbonate Analysis, PS=Particle Size Analysis, XRD=XRD Analysis, MM=Micromorph Sample Collected, N=None

Figure 6.4. Projectile Points recovered from PS3A; (left) Frio Dart point from S49, and (right) possible Langtry point base from S44.

PS4A U5. A total of 15 strats were identified and sampled within PS4A (Figure 6.5; Table 6.2). Similar to PS3A, the uppermost strats (S25, S26, and S27) are disturbed deposits; S25 and S27 contain the same mixture of animal dung and cultural materials as in PS3A and S26 is a layer of hay, presumably deposited in historic times when sheep and goat were penned up in Eagle Cave prior to shearing. Thick ash deposits (S37 and S33) containing a mixture of cultural materials are present below the disturbed deposits and at the base of PS4A. Two discrete lenses were identified and sampled towards the upper portion of PS3A; S28 is a discrete fiber and charcoal lens in between two thick ash deposits and S31 is a series of (~16) discrete, alternating lenses of decomposing fiber and ash. Aside from S33, the remaining strats in PS4A are associated with F2, a fiber-filled pit overlying and enveloping a cluster of FCR and is discussed in detail later in this chapter.

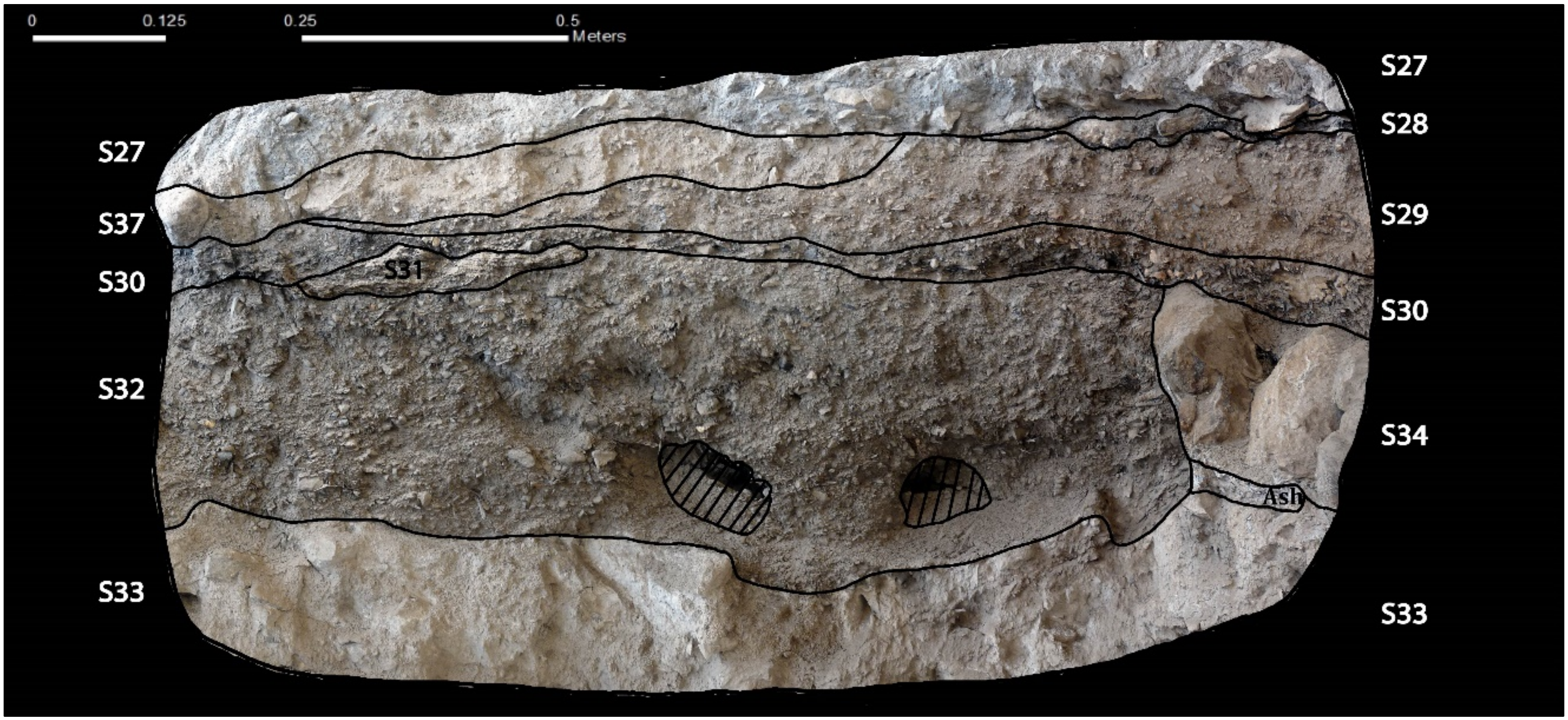


Figure 6.5. Annotated profile of PS4A (S25, 26, 35, 36, 172, and 173 not depicted).

Table 6.2. PS4A Strat Summary Table.

Unit	Strat	General Strat Type	Strat Description	Analysis Conducted*
5	S25	Disturbed	Disturbed surface layer with prevalent goat and sheep dung	O, MS, P, C, PS
5	S26	Disturbed	Disturbed hay layer	S, F, O, MS, P, C, PS
5	S27	Disturbed	Thick ash deposit with charcoal, lithics, fiber, bone, and FCR and lots of burrows	F, O, MS, P, C, PS, XRD
5	S28	Discrete Fiber/Charcoal Lens	Thin charred fiber and charcoal lens below S27 rock sloping slightly toward the back of the shelter	N
5	S37	Thick Ash Deposit	Thick ash deposit with charcoal, lithics, fiber, bone, and FCR	S, M, F, O, MS, P, C, PS, XRD
5	S29 (F2)	Refuse Midden	Reddish brown deposit with lots of decomposing fiber and some charcoal, lithics, and bone (upper fill of F2)	S, C-14, F, O, MS, P, C, PS, XRD
5	S30	Refuse Midden	Thick fiber deposit near F2	S, F, O, MS, P, C, PS
5	S31	Discrete Fiber/Ash Lenses	Strat contains ~16 alternating lenses of decomposing fiber and ash	S, C-14, M, F
5	S173	Refuse Midden	Charcoal and fiber-rich lens within S32	O, MS, P, C, PS
5	S35 (F2)	Refuse Midden	Fiber enveloping F2 rocks (probably contiguous with S30); within and covered by S29	M, F
5	S172	Refuse Midden	Charcoal and fiber-rich lens within S32	O, MS, P, C, PS
5	S32	Refuse Midden	Thick fiber-rich deposit with charcoal, lithics, ash, bone, and FCR	S, C-14, M, F, O, MS, P, C, PS
5	S34 (F2)	Heating Element	Cluster of subangular FCR, some inclined toward inferred central area of pit (F2)	N
5	S36 (F2)	Discrete Ash/Charcoal Lens	Charcoal and ash under lower feature rocks	C-14
5	S33	Thick Ash Deposit	Thick ash deposit with FCR	S, M, F, O, MS, P, C, PS, XRD

*S=Bulk Matrix Sort, C-14=Radiocarbon Analysis, M=Macrobotanical Analysis, F=Faunal Analysis, O=Loss-on-Ignition Analysis, MS= Magnetic Susceptibility Analysis, P=Phosphorus Analysis, C=Calcium Carbonate Analysis, PS=Particle Size Analysis, XRD=XRD Analysis, MM=Micromorph Sample Collected, N=None

PS4B U11 Upper. Within PS4B, a total of 12 strats were identified and sampled including two features (Figure 6.6; Table 6.3). The features consist of a baked surface (S53/F4) overlying a lens of oxidized soil (S62), encountered at the top of the Profile Section and remnants of a heating element (S72/F7) at the base of PS4B. Both features are discussed later in this chapter. The remaining strats include a mix of discrete fiber, charcoal, and ash lenses, thick ash deposits (S69, S63, S64, and S68), and refuse midden deposits (S65 and S66). The discrete lenses include a thin charcoal and fiber lens (S70) directly overlying a thin fiber lens (S71) towards the upper portion of PS4B and a thin ash lens (S67) at the western edge of the unit, which has been truncated by animal burrowing activities. Large disturbed areas were also noted along the eastern and western edges of PS4.

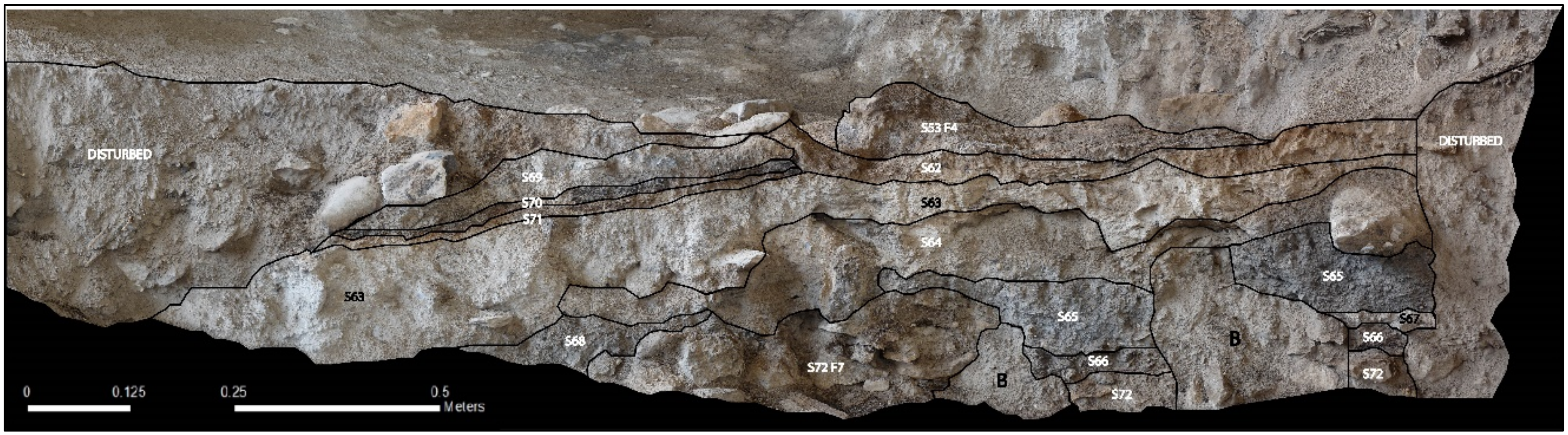


Figure 6.6. Annotated profile of PS4B.

Table 6.3. PS4B Strat Summary Table.

Unit	Strat	General Strat Type	Strat Description	Analysis Conducted*
11	S53 (F4)	Baked Surface	Baked earth and fiber surface with slight basin shape (F4)	S, C-14, M, F, MM
11	S62	Discrete Lens of Oxidized Soil	Compact oxidized soil with charcoal, below baked surface (F4)	MM
11	S69	Thick Ash Deposit	Thick ash deposit with charcoal, sloping down towards dripline	O, MS, P, C, PS
11	S70	Discrete Charcoal and Fiber Lens	Thin lens of charcoal and charred and/or decomposing fiber, sloping down towards dripline	N
11	S71	Discrete Fiber Lens	Thin lens of charred and/or decomposing fiber, sloping down towards dripline	N
11	S63	Thick Ash Deposit	Thick ash deposit with FCR, sloping down towards dripline	S, F, O, MS, P, C, PS, XRD, MM
11	S64	Refuse Midden	Thick silt loam deposit with charcoal and very few other inclusions	S, F, O, MS, P, C, PS, XRD, MM
11	S65	Refuse Midden	Thick deposit of fiber and charcoal with some ash	S, F, O, MS, P, C, MM
11	S67	Discrete Ash Layer	Thin white ash layer	N
11	S68	Thick Ash Deposit	Thick ash deposit with charcoal flecking, sloping down towards dripline	N
11	S66	Refuse Midden	Fiber- and charcoal-rich deposit with some bone	N
11	S72 (F7)	Heating element	Clast-supported FCR (F7) surrounded by fiber- and charcoal-rich matrix	S, C-14, M, F, O, MS, P, C, PS

*S=Bulk Matrix Sort, C-14=Radiocarbon Analysis, M=Macrobotanical Analysis, F=Faunal Analysis, O=Loss-on-Ignition Analysis, MS= Magnetic Susceptibility Analysis, P=Phosphorus Analysis, C=Calcium Carbonate Analysis, PS=Particle Size Analysis, XRD=XRD Analysis, MM=Micromorph Sample Collected, N=None

PS4C U14 and PSD U11 Lower. As mentioned, the lower deposits in PS4 exhibited extensive disturbance from the previous UT excavations. As a result, the lowest deposits were very unstable and the wall of PS4C collapsed before all sampling could be completed. A second profile section (PS4D) was then exposed, and the strats were documented and sampled as U11 Lower. Some of these strats were contiguous with those identified and sampled in PS4C, however, numerous additional strats were encountered. Since both PS4C and PS4D are from the lower exposure of PS4, both Profile Sections are discussed together.

Within these two Profile Sections, a total of 29 strats were identified and subsequently sampled (Figure 6.7 and 6.8; Table 6.4). In order of predominance, the strat types include: seven limestone deposits, four discrete lenses, four disturbed deposits, four ash pockets, three charcoal pockets, four refuse midden deposits, two thick ash deposits, and one baked surface,. Both the disturbed deposits and the limestone deposits were located near the base of the profile, and continued into the floor of PS4. The discrete lenses were located near the base of PS4D near the western edge of the sampling unit. The charcoal and ash pocket deposits are called such as they have been truncated by numerous burrows and appear as small pockets. The refuse midden deposits are near the top of the profile below S72/F7 from PS4B. The baked surface (S104) was directly overlying, and partially adhering to the discrete fiber lens (S105) towards the base of the profile so the two strats were sampled together. Three diagnostic projectile points were recovered from PS4C/D (Figure 6.9). The S94 matrix contained a Pandale and a Val Verde Point, which date to the Early Archaic and Middle Archaic, respectively (Turner and Hester 1999:168, 192). A Langtry point was recovered from S98, which also dates to the Middle Archaic (Turner and Hester 1999:143).

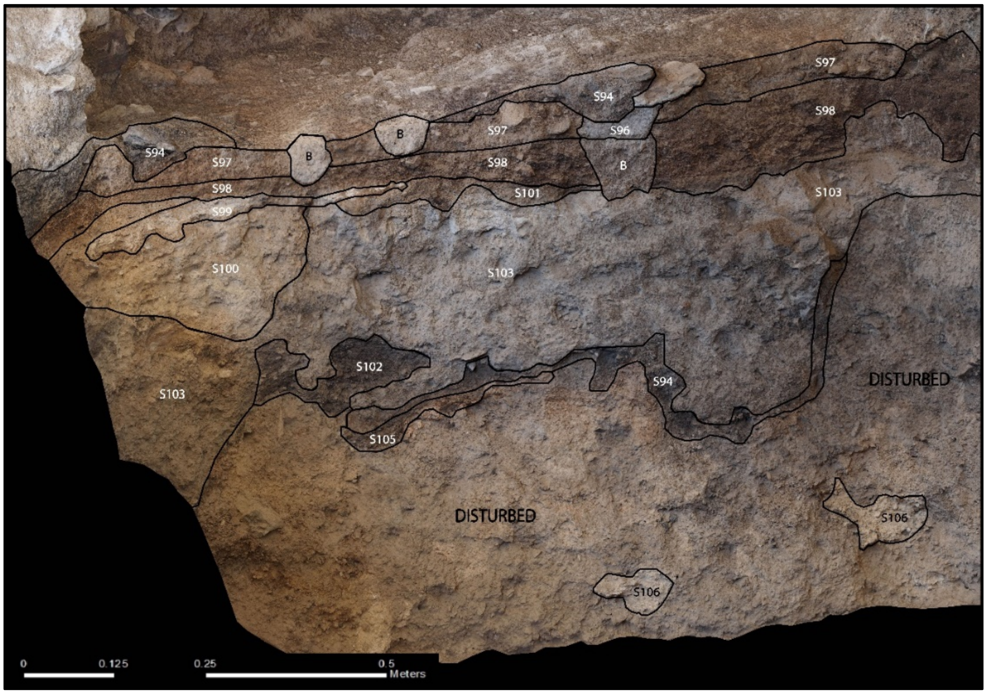


Figure 6.7. Annotated profile of PS4C U14.

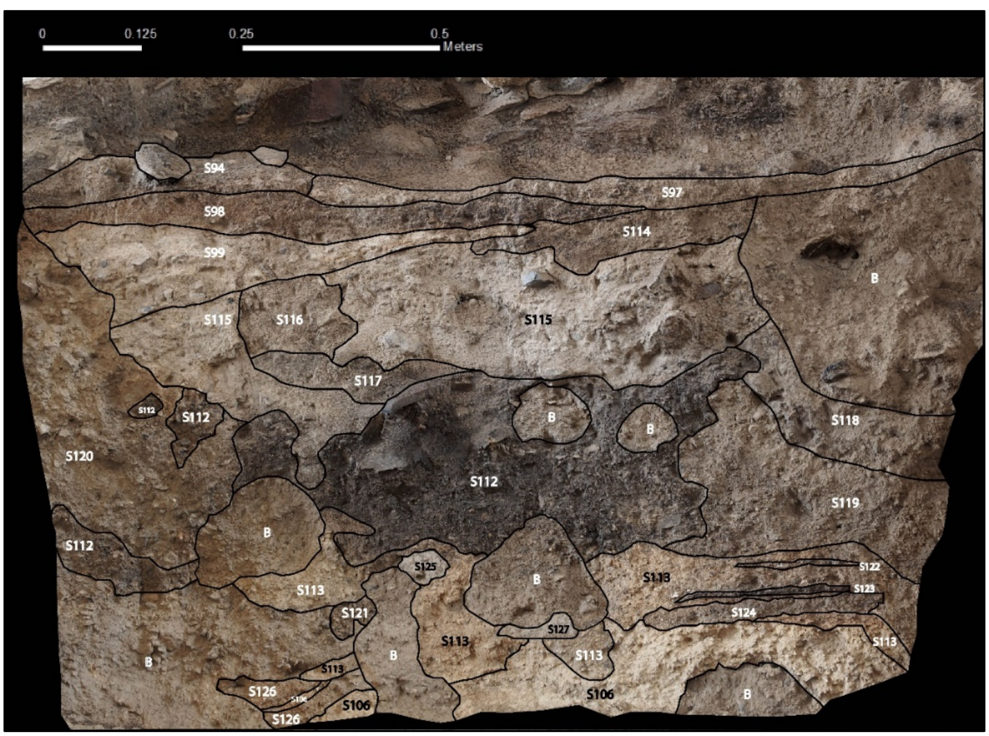


Figure 6.8. Annotated profile of PS4C U11.

Table 6.4. PS4C/D Strat Summary Table.

Unit	Strat	General Strat Type	Strat Description	Analysis Conducted*
14/11	S94	Refuse Midden	Charcoal-rich deposit with fiber, lithics, and FCR	F, O, MS, P, C, PS, MM
14/11	S97	Refuse Midden	Loose brown silt loam with numerous cultural inclusions and burrows	S, F
14	S96	Ash Pocket	Small pocket of loose ash with rare charcoal, possibly truncated by burrows	F
14/11	S98	Refuse Midden	Loose fiber deposit with charcoal, lithics, bone, and small FCR	S, M, F, O, MS, P, C, PS, XRD, MM
14/11	S99	Discrete Ash Lens	Thin ash lens with charcoal, lithics, bone, and occasional FCR; possibly truncated by burrows	S, F
11	S114	Discrete Charcoal Lens	Thin charcoal and fiber rich lens with slight basin shape	O, MS, P, C, PS, MM
11	S115	Thick Ash Deposit	Thick ash deposit	S, F, O, MS, P, C, PS, MM
14	S100	Limestone Spall	Ashy looking deposit with pea-sized, subangular gravels	N
11	S117	Ash Pocket	Very small pocket of ash layer in east corner of the profile	N
14	S101	Discrete Fiber Lens	Thin lens of degraded fiber	S, C-14, F
11	S118	Disturbed	No discernable difference between S118, S119, and the surrounding burrows; lumped together as part of a large disturbed zone	N
11	S120	Disturbed	Disturbed deposit along east edge of U11	N
14	S102	Charcoal Pocket	Irregular pocket of charcoal with fiber; truncated by burrow	S, F
14	S104	Baked Surface	Semi-compacted silt loam/possible baked surface with charred and/or decomposing fiber and charcoal flecks	N
14/11	S112	Charcoal Pocket	Large basin-shaped layer of sizable chunks of charcoal	S, C-14, F, O, MS, P, C, PS, XRD
14	S105	Discrete Fiber Lens	Discontinuous, thin fiber lens with charcoal and bone; heavily disturbed and probably truncated by burrows	N
11	S119	Disturbed	Disturbed-burrow/intrusion	O, MS, P, PS

*S=Bulk Matrix Sort, C-14=Radiocarbon Analysis, M=Macrobotanical Analysis, F=Faunal Analysis, O=Loss-on-Ignition Analysis, MS= Magnetic Susceptibility Analysis, P=Phosphorus Analysis, C=Calcium Carbonate Analysis, PS=Particle Size Analysis, XRD=XRD Analysis, MM=Micromorph Sample Collected, N=None

Table 6.4. PS4C/D Strat Summary Table continued.

Unit	Strat	General Strat Type	Strat Description	Analysis Conducted*
11	S125	Unknown	Constant weathering of the profile completely removed the strat prior to recordation. Sampling was not possible.	N
11	S122	Limestone Spall Deposit	Degraded limestone spall, charcoal, and rock	O, MS, P, C, PS, MM
11	S156	Charcoal Pocket	Charcoal and ash wedge, pinches out towards east, near middle of S123	O, MS, P, PS, MM
11	S123	Discrete Charcoal Lens	Thin charcoal lens	N
11	S157	Limestone Spall Deposit	Thin silt/disintegrated spall layer that appears to have some thermal alteration near the interface with S123. Truncated to the west by disturbed zone	N
11	S121	Limestone Spall Deposit	Combined with S113 and S126	N
11	S124	Discrete Charcoal and Ash Lens	Thin ash and charcoal lens with thermally altered lower boundary; truncated to the west by disturbed zone	O, MS, P, C, MM
11	S127	Ash Pocket	Very small ash pocket below large burrow; could not separate from burrow matrix during sampling	N
11	S103	Disturbed	Heavily disturbed by animal burrowing activities	S
14/11	S106	Limestone Spall Deposit	Disturbed-degraded limestone spall deposit; heavily disturbed by burrows	S, C-14, F, O, MS, P, C, PS, XRD, MM
14/11	S113	Limestone Spall Deposit	Disturbed-degraded limestone spall deposit; heavily disturbed by burrows	F, O, MS, P, C, PS, XRD, MM
11	S126	Limestone Spall Deposit	Combined with S113 and S121	N
*S=Bulk Matrix Sort, C-14=Radiocarbon Analysis, M=Macrobotanical Analysis, F=Faunal Analysis, O=Loss-on-Ignition Analysis, MS= Magnetic Susceptibility Analysis, P=Phosphorus Analysis, C=Calcium Carbonate Analysis, PS=Particle Size Analysis, XRD=XRD Analysis, MM=Micromorph Sample Collected, N=None				

Figure 6.9. Projectile Points recovered from PS4C and PS4D; (left) Pandale point from S94, (center) Val Verde point from S94, and (right) Langtry point from S98.

Radiocarbon Analysis

A total of 18 radiocarbon assays were obtained from UT North; four from PS3 which extended roughly 60 cm below surface, 12 from the PS4 exposure that extended almost 2 m below surface, and two from Unit 19 which was excavated into the floor below PS3 and P4 (Table 6.5; Figures 6.10 and 6.11). All of the assays were calibrated using OxCal 4.2.4 and will be discussed using the OxCal median age in calibrated years Before Present (cal B.P.).

From PS3, three samples (FN30227, 30263, and 30277) were initially sent for radiocarbon analysis, however, after treatment it was determined that FN30263 was to

Table 6.5. UT North Radiocarbon Assays with Corrected RCYBP and Calibrated BP Results.

PS	FN	Strat	Ftr	Dated Material	δ13C	Corrected RCYBP Date and 1σ	OxCal V4.2.4 median (cal yr BP)	Calibrated Probability Ranges (cal yr BP)
PS3	30209	40	n/a	Uncarbonized Lechuguilla leaf	-19.4	2202±33	2232±54	2320–2133 (95.4%)
PS3	30227	43	n/a	Carbonized Agave leaf base	-8.1	1916±31	1863±38	1946–1810 (93.2%), 1795–1783 (1%), 1755–1742 (1.2%)
PS3	30277	47	F3	Carbonized wood bark	-24.5	2148±27	2140±78	2304–2239 (27.6%), 2182–2041 (67.8%)
PS3	30301	48	n/a	Carbonized Lotebush wood	-38.8	3771±32	4139±60	4240–4078 (88.6%), 4036–3998 (6.8%)
PS4A	30158	29	F2	Carbonized Yucca seed	-23	695±32	660±40	689–637 (71.5%), 594–562 (23.9%)
PS4A	30166	31A	n/a	Carbonized Mesquite seed	-21.7	481±22	519±8	536–504 (95.4%)
PS4A	30172	31G	n/a	Carbonized Torrey's yucca seed	-14.1	549±32	555±39	640–590 (40.7%), 564–516 (54.7%)
PS4A	30174-1	32A	n/a	Carbonized Yucca seed	-23.2	666±27	637±40	674–631 (51.1%), 599–560 (44.3%)
PS4A	30174-2	32A	n/a	Carbonized Yucca seed	-11.3	798±22	710±17	740–678 (95.4%)
PS4A	30178	32C	n/a	Carbonized Yucca seed	-22.9	675±25	650±41	676–636 (58.4%), 594–561 (37%)
PS4A	30149	36	F2	Carbonized Sotol leaf base	-31.2	803±29	714±24	768–677 (95.4%)
PS4B	30264	53	F4	Carbonized White Oak group wood	-30.1	579±21	606±32	642–588 (64%), 565–537 (31.4%)
PS4B	30258	72	F7	Carbonized Torrey's yucca seed	-21.6	1198±28	1124±45	1230–1209 (4.2%), 1184–1056 (90.3%), 1020–1012 (0.9%)
PS4C	30404	101	n/a	Carbonized Walnut nutshell	-32.6	3698±38	3941±59	4081–4033 (12.3%), 4004–3841 (83.1%)
PS4D	30612	106	n/a	Carbonized cf. Torrey's yucca leaf base	-19.5	3728±24	4076±52	4150–4062 (53.1%), 4052–3986 (42.3%)
PS4D	30566	112	n/a	Carbonized Texas Persimmon wood	-25.7	5053±29	5822±51	5901–5733 (95.4%)
n/a	30713	n/a	F6	Carbonized Texas Persimmon wood	-23.1	4708±40	5437±81	5582–5508 (26.4%), 5487–5437 (21.2%), 5421–5321 (47.8%)
n/a	30621	n/a	L1	Semi-carbonized Little walnut nutshell				Modern

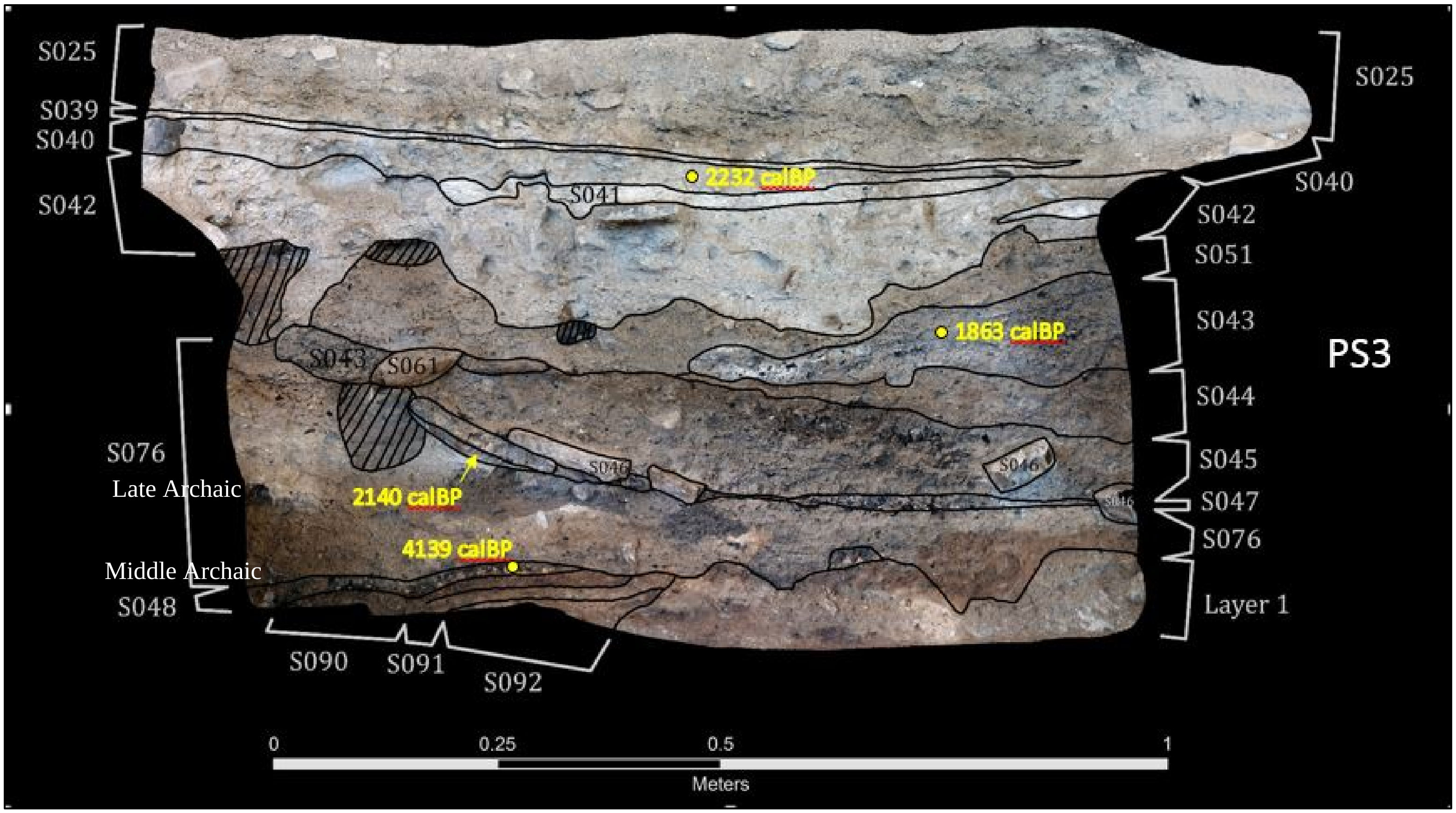


Figure 6.10. Profile of PS3, U6 with location of radiocarbon samples and obtained assays. Dates are given in median cal B.P. (OxCal V4.2.4).

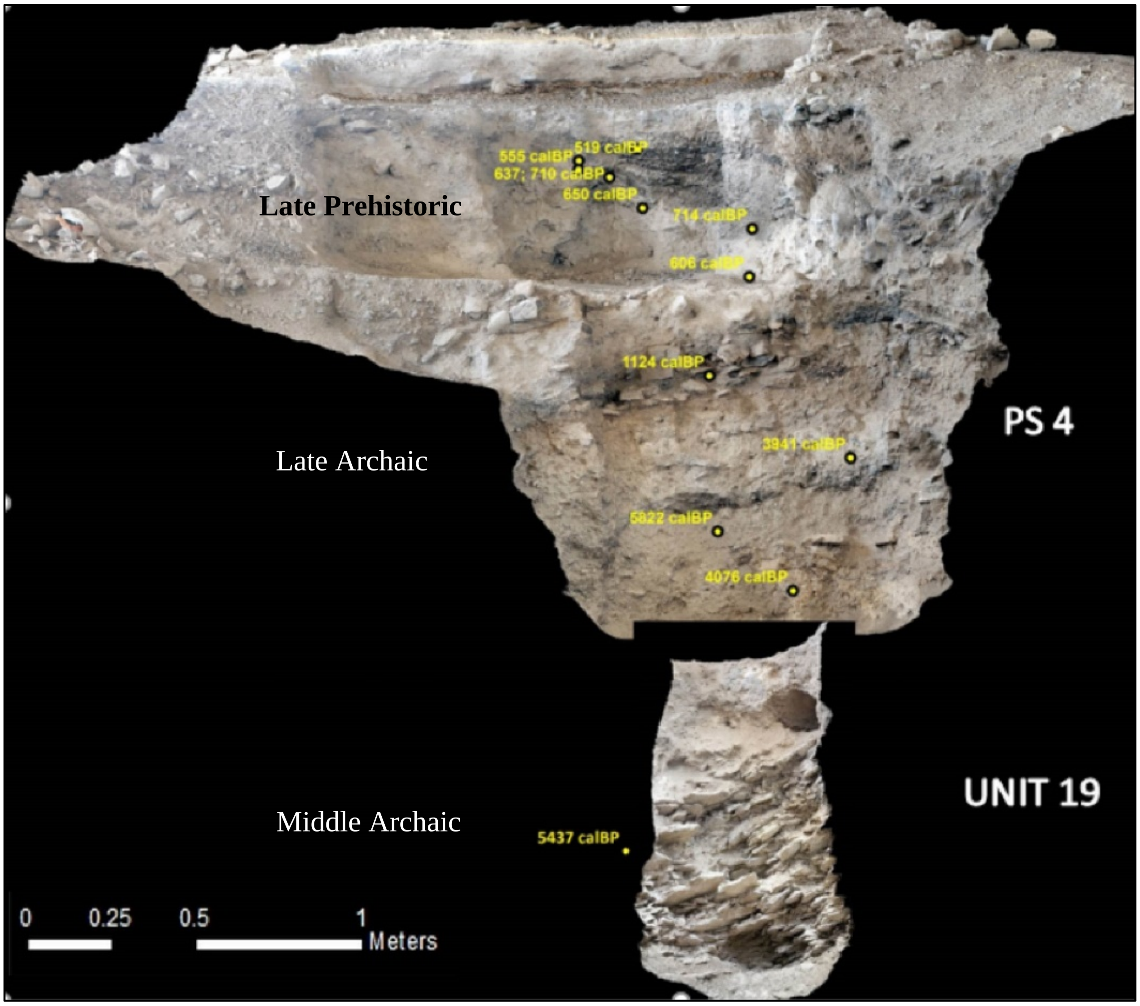


Figure 6.11. Profile of PS4 with location of radiocarbon samples and obtained assays. Dates are given in median cal B.P. (OxCal V4.2.4).

small and the analysis could not be completed. Two additional samples (FN30209 and 30301) were subsequently sent for radiocarbon analysis to supplement the two initial assays. Three of the four assays (FN30227, 30277, and 30301) fit into an expected chronological order, with dates become increasingly older with depth. Sample FN 30209, however, did not fit this sequence and will be discussed below.

Sample FN30209 dates to 2232±54 cal B.P. and was collected from a thick ash deposit (S40) located between two discrete ash lenses. Stratigraphically, S40 is located above both S43 and S47, yet the assay is older than the two samples below. The ash deposit is a homogenized mix of ash, charcoal, fiber, lithics, and animal bone suggesting the deposit was secondarily deposited as a result of prehistoric pit digging and/or cleanout from a different area of UT North. FN30227 was collected from S43, a thick ash deposit with charcoal and fiber located approximately 26 cmbs. Sample FN30277 was collected from a discrete charcoal lens (S47) running horizontally below a cluster of FCR designated F3, approximately 43 cmbs. Sample FN30301 was collected from a discrete charcoal lens (S48) towards the base of U6. These later three assays date to 1863±38 cal B.P., 2140±78, and 4139±60 cal B.P., respectively. Overall, the radiocarbon results suggest the cultural deposits within U6 span from the Late Archaic to the Middle Archaic periods.

Twelve samples were sent for radiocarbon analysis from PS4. Seven of the samples (FN30158, 30149, 30166, 30172, 30174-1, 30174-2, and 30178) were selected from PS4A, two (FN30264 and 30258) were from PS4B, one (FN30404) was from PS4C, and two (FN30612 sand 30566) were from PS4D (see Table 6.5).

Within PS4A, all of the radiocarbon assays date to within the Late Prehistoric period but some reorganization of the deposits is evident. Both FN30158 and FN30149 are associated with F2, a thick fiber-filled pit overlying burned rock. The pit contained a reddish brown matrix with fiber and small pockets and lenses of ash, suggesting the pit was not filled all at once. Sample FN30158 was collected from the fiber-filled pit (S29) located above the F2 rocks while FN30149 was collected from the thin charcoal and ash lens (S36) underlying the F2 rocks. The assay from S29 dates to 660±40 cal B.P. while the underlying S36 assay dates to 714±24 cal B.P.

FN30166 and FN30172 were collected from S31, which consisted of a series of (~16) discrete, alternating lenses of decomposing fiber and ash. The individual lenses were difficult to separate, so spot samples of each fiber lens and subsequent ash lens were collected as a single spot sample, resulting in the collection of eight total samples (S31 and 31A–G). A radiocarbon sample from the uppermost (S31A-FN30166) spot sample dates to 519±8 cal B.P. while a sample from the lowermost (S31G-FN30172) spot sample assay dates to 555±39 cal B.P., indicating the fiber and ash lenses were deposited in a relatively short amount of time.

FN30174 and F30178 are from S32, a thick homogenized layer of ash and dense cultural remains (charcoal, fiber, lithics, bone, etc.). The gray color in S32 is likely due to the admixture of charred materials and ash, possibly from cleanout of cooking features. The strat was divided into three sampling sections (A–C), each approximately 7 cm thick. Two samples from FN30174 (S32A) were ultimately run because the first sample (30174-1) came back with a questionable 13C- value (-23.2 13C-), suggesting the sample was sotol, even though the sample was clearly identified as a yucca seed. The assays from the upper 7 cm of S32 (FN30174-1 and 30174-2) date to 637±40 cal B.P. and 710±17 cal B.P., respectively. The sample from S32C (FN30178) dates to 650±41 cal B.P., suggesting some reorganization of the ash deposits occurred.

Two radiocarbon assays were collected from PS4B, one dates to within the Late Archaic period (FN30258) and the other dates to the Late Prehistoric period (FN30264). FN30258 F7 (S72), was collected from the matrix surrounding remnants of a heating element located below a surface and ash layer and dates to 1124±45 cal B.P. These features are discussed in further detail in the section below.FN30264 was collected from F4 (S53), a thin baked surface overlying a thin oxidized soil lens and dates to 606±32 cal B.P.

The lower deposits in PS4 (PS4C and PS4D) and in U19 exhibited extensive disturbances from animal burrowing and the previous UT excavations, therefore discrete lenses were rare and no intact features were encountered. As such, radiocarbon samples from this portion of the Profile Section were not all obtained from discrete/intact contexts. FN30404 was collected from S101, a discrete fiber lens located below a small pocket of ash and dated to 3941±59 cal B.P., within the Middle Archaic period. FN30566 was collected from S112, a thick basin-shaped deposit of large fragmented pieces of charcoal almost 1.5 meters below the surface. The radiocarbon assay dates to 5822±51 cal B.P. and also falls within the Middle Archaic period. FN30612 was collected from the limestone spall deposit at the base of S106 and dates to 4076±52 cal B.P., which is a younger than that from S112 above. There were numerous burrows present throughout this strat, so it is not surprising that this date is out of chronological order with the previous two dates.

One sample was sent for radiocarbon analysis from Unit 19 which was excavated into the floor below PS3 and PS4. FN30713 was collected from feature (F6) encountered in the east wall of the unit, approximately 2.4 m below surface. F6 consists of a layer of thermally altered sediment directly underlying a charcoal-rich layer. The radiocarbon assay dates to 5437±81 cal B.P. Although this sample was collected from almost 1 m below sample FN30566, the deposit appears to be almost 400 years younger. An additional sample from the same layer as F6 (FN30621) was sent for radiocarbon analysis to confirm this date, however, the radiocarbon analysis revealed that sample to be modern in age. Furthermore, a Late Prehistoric Perdiz point was encountered in the U19 L1 matrix which supports the conclusion that U19 has been disturbed from the previous UT excavations and subsequent burrowing activities.

Reorganization of deposits from both cultural and natural processes was evident throughout PS3, PS4, and U19. Bioturbation from animal and rodent burrowing was most prevalent towards the surface and at the base of the profiles. Since we stepped back the profiles, the lowest profile face was in proximity to the previously excavated UT unit providing an easy access point for critters. Much smaller intrusions from insects and rodents were noted throughout, but the primary mixing of deposits in the upper deposits, can be attributed to humans cleaning out and reusing pits and earth ovens.

Feature Descriptions

A total of six features were identified within UT North. Two of the features (F1 and F3) were recorded during excavation of Unit 2 in PS3 and three features (F2, F4, F7) were encountered during excavation of Unit 6 and/or during strat sampling of PS4 (Table 6.6). The last feature (F6) was encountered in the wall of Unit 19 after the heavily disturbed Layer 1 had been excavated.

Table 6.6. UT North Feature Summary Table.

Feature No.	FN	PS	Unit	Layer	Strat(s)	Feature Description	Dimensions
F1	30109	PS3	2	2	n/a	Small pit feature	35 cm E-W by 14 cm N-S, 3–5 cm thick
F3	30141	PS3A	2/6	7	S46	Shallow basin feature lined with flat, tabular burned rock	81 cm N-S by 32 cm E-W, 8–13 cm thick
F2	30124	PS4A	4	3	S29, 34, 35, 36	Pit feature with charred fiber overlying a burned rock cluster	42 cm E-W, 28 cm thick
F4	30229	PS4D	11	n/a	S53, 63	Baked surface 2 mm thick overlying oxidized soil	65 cm E-W by 50 cm N-S, 3 cm thick
F7	30334	PS4B/D	11	n/a	S72, 94	Heating element	56 cm E-W by 30 cm N-S, 19 cm thick
F6	30713	n/a	19	1	n/a	Thermally altered layer underlying charcoal-rich layer	Unknown

Feature 1. F1 (FN30109) consisted of the edge of a small pit feature in PS3 U2, measuring approximately 35 cm east-to-west by 14 cm north-to-south and 3–5 cm thick. The feature appeared to be intact, although a rodent burrow ran east from the west wall of U2 over the top of F1. A small concentration of botanical remains including two charred prickly pear cactus pads, cut yucca leaf bases, a quid, and a modified flake were initially encountered on the surface of U2 L2 (Figure 6.12). Aside from the botanical remains within the pit feature, little to no fiber material was recovered from the rest of the layer. In addition, very few artifacts and no burned rock were recovered in association with F1 suggesting the feature was used solely for the discard of plant remains.

Figure 6.12. Exported photo of 3-D model of F1, showing close-up of prickly pear cactus pads, cut yucca leaf bases, and quid.

Feature 3. F3 (FN30141) was initially encountered in U2, L7 and consisted of a shallow basin feature lined with flat, tabular burned rock overlying a bed of ash and charcoal (Figure 6.13). The feature was located in the northwest corner of U2 and presumably continues into the north and west walls. The visible portion of the feature measured approximately 81 cm north-to-south by 32 cm east-to-west and ranged from 8–13 cm thick. Most of the burned rock toward the southern half of U2 were tilted with a northwest aspect. No obvious disturbances were noted during the excavation of the F3. The ash fill and burned rock directly overlying F3 was removed before the intact basin feature was visible, therefore only a very small matrix sample (0.25 L) was collected and subsequently curated. No additional analyses were conducted on the feature matrix, however, two spiny softshell turtle carapace fragments and three pieces of debitage were recovered during the feature sampling (Appendix C).

Figure 6.13. Overview of F3 showing the shallow basin feature lined with flat, tabular burned rock overlying a bed of ash and charcoal, facing west.

Feature 2. F2 (FN30124) was encountered in U5 and consisted of a pit feature with charred fiber overlying a burned rock cluster. The burned rock cluster sloped to the northeast and continued into the southwest wall of the unit (Figure 6.14). The upper fill of the pit was defined by a distinct reddish brown matrix (S29). The pit was comprised of mostly small slabs of burned rock (S34) steeply inclined toward the apparent center of the pit. The rocks were on top of and enveloped by a thick (~28 cm) layer of fiber (S35) consisting of mainly charred leaf bases, leaves, and assorted channel plant parts including twigs and seeds. Amid the lower part of the fiber fill were small pockets and lenses of ash indicating the pit did not fill in all at once. The lower rocks were resting on a 2 cm-thick layer of charcoal and ash (S36). Some additional rocks to the north/northwest were lying on top of a baked surface designated as F4 (see Figure 6.12). The northern portion of the feature was not extant, as the edge of the profile was disturbed from the previous UT excavations and had sloughed off. In addition, some goat and sheep dung and hay were encountered within the upper feature fill (S29) indicating there has been some bioturbation with the disturbed layers (S25 and S26) above.

As mentioned, two radiocarbon dates were obtained from samples associated with F2; FN30158 was collected from the fiber-filled pit (S29) above the F2 rocks and FN30149 was collected from the thin charcoal and ash lens (S36) underlying the F2 rocks. The assays date to 660±40 cal yr BP and 714±24 cal yr BP, strongly overlapping at two sigma, and both fall within the Late Prehistoric period (see Table 6.5). A Perdiz point (Late Prehistoric) was also within the feature matrix supporting the date of the feature (Turner and Hester 1999:227; Figure 6.15).

Figure 6.14. Cross-section of F2, showing the thick layer of fiber fill (a.) overlying a burned rock cluster (b.); the baked surface (c.) underlying the northernmost feature rocks, designated F4, is depicted at the bottom of the photo.

Figure 6.15. Perdiz point recovered from F2 matrix.

A bulk matrix sort was conducted on a matrix sample from S29, the fiber fill of F2. The 1” size sieve was completed on all of the matrix collected from S29, however, the ½” and 4 mm size sieves were conducted on a 1 L bulk matrix sample from S29. Based on overall mass, the coarse fraction (1” and ½” sieves) contained predominantly burned rock fragments with less than five percent charred and uncharred botanical remains and bone fragments (Appendix B). Cultural artifacts recovered within the 4 mm size sieve included burned rock (72 percent), charred botanical remains (21 percent), pebbles (4 percent), and less than five percent lithics, bone, and shell. Since charred plant remains do not weigh very much, the overall percentages are a bit skewed, however, the charred botanical remains visually appeared to constitute 50–75 percent of the inclusions during the matrix sort and in the field. No limestone spall was recovered from any of the bulk matrix size sieves.

Macrobotanical analysis was conducted on a bulk matrix sample collected from the fiber fill (S29) of F2 (Appendix C). The primary constituents of the fill include seeds and fruits (N=1107), wood and wood charcoal (N=668), and leaves (N=228). The seeds and fruit category consisted of mainly yucca seed (*Yucca* sp.) (N=557), chenopodium seed (*Chenopodium* sp.) (N=288), and mesquite endocarps and seeds (*Prosopis* sp.) (N=238). Other less common plant remains recovered include Texas persimmon (*Diospyros texana*) fruit tops, prickly pear (*Opuntia* sp.) seeds, hackberry (*Celtis* sp.) seeds, cactus seed similar to but smaller than prickly pear, and grass seed (*Poaceae, cf. Setaria* sp.). The most common leaves recovered were general large desert rosettes (*Agavaceae/Liliaceae*) (N=193), followed by lesser quantities of sotol (*Dasylirion* *texanum*), lechuguilla (*Agave lechuguilla*), yucca, and a fiber that is likely Agavaceae/Liliaceae. Less common plant remains present in the feature matrix included nut resources (three Little Walnut [*Juglans cf. microcarpa*] nutshell, one acorn [*Quercus* sp.] nutshell, and one acorn cap), other food or cooking materials (nine prickly pear pad fragments, four burned carbohydrates, and one leaf base [*Agavaceae*]), and 79 miscellaneous plant parts or indeterminate botanical remains.

Analysis of the 38 faunal remains recovered from the associated feature matrixes identified fish (N=19), deer (N=6), rabbit (N=3), lizard or snake (N=1), dog or fox (N=1), and a variety of indeterminate mammals (five small-sized, one medium-sized, and one large-sized) (Appendix D). The analysis of burn patterns indicates all of the faunal remains from F2 had burn patterns consistent with discard, which would be expected in a refuse midden. In addition, one bone tool (FN30135 Specimen 02.B.1) was identified during the faunal analysis. The bone tool is a Spatulate tool manufactured from a deer (Odocoileus sp.) mesial metapodial diaphysis fragment (Appendix D). The blank was extracted by grooving and snapping techniques and subsequently shaped by scraping and grinding. Macroscopic and 10x microscopic analysis identified remnant silica-rich plant residue and use-wear (numerous transverse to oblique fine striations on the bone tool).

Feature 4. F4 was encountered in PS4B U11 and consists of a baked surface with a slight basin shape that dates to 606±32 cal B.P. (see Table 6.5). The feature measured approximately 65 cm east-to-west by 50 cm north-to-south and was approximately 2 mm thick (Figure 6.16). The compacted/baked surface (S53) consisted of a fine silt loam with dense inclusions of charred fiber and wood charcoal, giving it a reddish brown color, as

Figure 6.16. Cross-section of F4, showing the compacted/baked surface (a.) and underlying oxidized soil layer, S62 (b.); a heating element remnant, designated as F7 is visible below F4 (c.).

well as some bone and rabdotus snail shell fragments. S53 was overlying a 2–3 cm thick layer of light yellowish brown oxidized soil (S62) that contained a few charred botanical remains. The charred botanical materials in S53 continued down into S62 without a clear break making it hard to discern the separation between the two strats during sampling. As such, portions of both S53 and S62 are present in the matrix sample for F4. The feature was truncated along the north edge by the previous UT excavations and other small portions of the feature had been cut into, some of which during our excavations, as evidenced by the discontinuous layer of baked earth/fiber.

Similar to F2, a bulk matrix sort was conducted for the matrix from S53; the 1" size sieve was conducted on all of the matrix and the ½" and 4 mm size sieve were done using a 1 L bulk matrix sample from S53 (Appendix B). The 1" size sieve contained mostly burned rock fragments (83 percent) with some charred botanical remains (18.7 percent) and a few flakes (1 percent). The recovery from the ½" sieve was sparse and consisted solely of burned rock. The 4 mm size sieve recovered mostly burned rock fragments (82 percent) with a few larger charred botanical remains (14 percent) and less than five percent lithics, bone, and shell. No limestone spall or pebbles were recovered from any of the bulk matrix size sieves.

Macrobotanical analysis was conducted on a combined bulk matrix sample collected from S53 and S62 (Appendix C). The primary constituents of the fill is carbonized wood and wood charcoal (N=101), however a few seeds and fruit (N=11) as well as miscellaneous plant parts or indeterminate botanical remains (N=8) were also recovered. The seeds and fruit category consisted of mainly Chenopodium seed (60percent carbonized), Yucca seed (50 percent carbonized), Prickly pear seed (50percent carbonized), Hackberry seed (uncarbonized), and carbonized Mesquite endocarps with attached pericarp and seeds. The faunal analysis identified rabbit (N=5), fish (N=1), and deer (N=1); however, the remaining faunal remains from F4 could not be identified to taxa and were only identified down to mammal size (1 small, 11 medium, and 3 large) (Appendix D). A few of the rabbit bone as well as the deer bone had roasting-type burn patterns (i.e., partially burned), but the majority of the bone had burn patterns more consistent with discard (i.e., calcined or more completely burned). Aside from debitage, no lithic artifacts were recovered from the associated feature matrix.

Feature 7. F7 was initially encountered in PS4B U11 and consists of a heating element (S72) underlying a baked surface (S53/F4) (see Figure 6.16; Figure 6.17). F7 consisted of medium-sized burned rock (~5–11 cm in diameter) and midden fill (homogenized mix of fiber, bone, charcoal, and dark-colored matrix). The feature was truncated on the west edge by animal burrowing activities and on the east edge by the previous UT excavations. Upon initial inspection, the associated burned rock did not appear to have an intentional configuration or layering (rocks were not clast-supported) and was presumed to be midden fill rather than an intact heating element.

However, after the profile wall of PS4C collapsed, a new profile (PS4D) was exposed, revealing somewhat more intact exposure and the feature was redefined as an intact heating element (see Figure 6.17). The overall feature measured approximately 56 cm east- to-west by 30 cm north-to-south and was approximately 19 cm thick. There were three apparent layers of burned rocks which were fractured in situ. The surrounding feature matrix contained angular charcoal and charred fiber and a layer of angular charcoal was also present directly beneath the feature rocks. The feature is interpreted to be remnants of several heating elements that were built in succession. A radiocarbon sample obtained from the matrix surrounding the heating elements dates to 1124±45 cal B.P., within the Late Archaic period (see Table 6.5).

A bulk matrix sort was conducted for the S72 matrix surrounding the feature rock of F7 (Appendix B). The 1” size sieve conducted for the entire feature matrix contained mostly burned rock fragments (96 percent) with very sparse bone, lithics, and charred

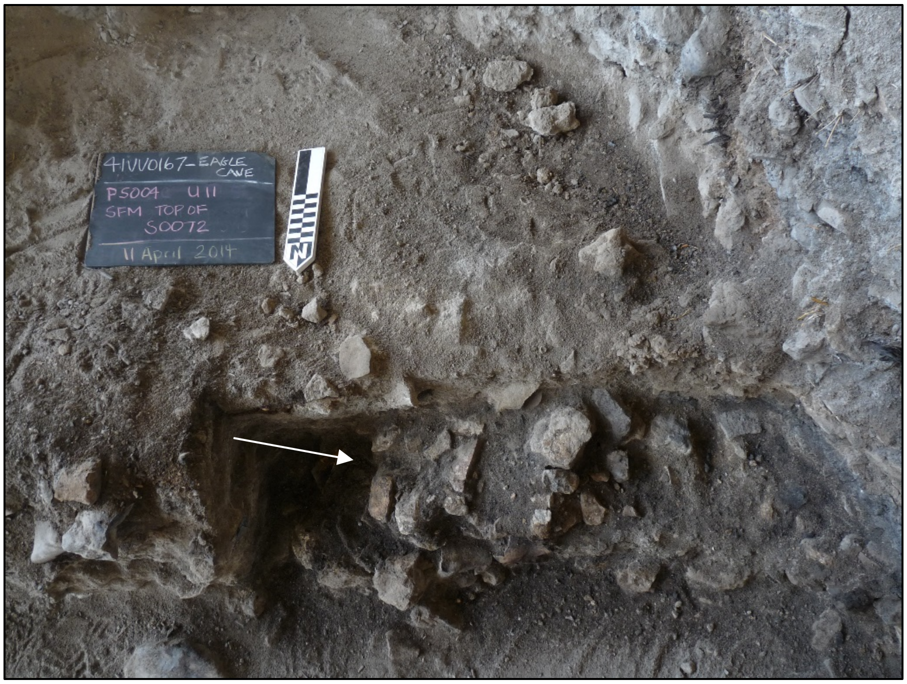


Figure 6.17. Plan view of F7, showing the uppermost layer of burned rocks.

botanical remains. The recovery from the ½" sieve conducted from a 1 L matrix sample was sparse and consisted of burned rock (92 percent) and charred botanicals (8 percent).The 4 mm size sieve recovered predominantly burned rock fragments (75 percent), followed by charred botanical remains (19 percent) and less than five percent uncharred botanical remains, lithics, bone, and shell. Similar to F2, the charred botanicals visually appeared to comprise 50 to 75 percent of the matrix inclusions even though the overall mass indicates the charred botanical percentage is lower than the burned rock. No limestone spall or pebbles were recovered from any of the bulk matrix size sieves.

Macrobotanical analysis was conducted on a matrix sample collected from the matrix surrounding the burned rock of F7 (Appendix C). The primary constituents of the fill include carbonized wood and wood charcoal (N=470), seeds and fruits (N=104), nut fragments (N=50), and leaves (N=47). The seeds and fruit category consisted of mainly yucca seed (N=68), only two of which were carbonized. Other less common plant remains recovered include prickly pear seeds (66 percent carbonized), carbonized mesquite endocarps with attached pericarp and seeds, carbonized chenopodium seed, carbonized Texas persimmon fruit tops, uncarbonized hackberry seeds, and carbonized coyotillo (*Karwinskia humboldtiana*) seed. The majority of leaves present within the feature matrix were lechuguilla (N=44; 90 percent carbonized), however, three additional uncarbonized fiber leaves (likely *Agavaceae/Liliaceae*) were also recovered. All 50 of the recovered nut fragments were identified as Little Walnut nutshell, 95 percent of which were carbonized. In addition, 13 miscellaneous carbonized plant parts or indeterminate botanical remains were also recovered. Only a few faunal remains were recovered from F4, and consist of eight indeterminate small mammal, three rabbit, and two deer (Appendix D). All of the burn patterns on the faunal remains were consistent with a discard pattern.

Feature 6. F6 consisted of a thermally altered layer directly underlying a charcoal rich layer. The observable stratigraphy within L1 and L2 of U19 was heavily disturbed and F6 was not recognized until after the unit had been excavated down to bedrock. After U19 excavations were complete, the feature was observed in the east wall profile of Unit 19 L1. The feature was not sampled aside from the collection of a single spot sample. However, a radiocarbon sample was taken from the spot sample and returned a date of 5437±81 cal B.P, which falls within the Middle Archaic period (see Table 6.5).

VII. BULK MATRIX SORT AND MACROBOTANICAL AND FAUNAL ANALYSIS RESULTS

The bulk matrix sort and macrobotanical and faunal analyses were conducted on select strats within PS3 and PS4. The bulk matrix sort was conducted on a total of 31 strats from within PS3 and PS4 focusing on features and samples from each of the general strat types within both profile sections (Appendix B). The macrobotanical analysis focused on strats associated with cultural features and strats which appeared to contain an abundance of botanical remains; however, several strats that did not appear to contain many botanical remains (i.e., thick ash deposits) were also analyzed to determine if our visual assessments were accurate (Appendix C).

The faunal analysis was conducted on all faunal materials recovered from feature contexts as well as the faunal materials recovered from the 1-inch, ½-inch, and 4-mm size sieves during the bulk matrix sort (Appendix D). Both the macrobotanical and faunal analyses methods focused on taxon identification with additional emphasis on recording cultural and natural modification (e.g., use wear, thermal alteration, and post-depositional damage). Appendix B provides the results of the bulk matrix sort, Appendix C contains the results of the macrobotanical analysis conducted by Leslie Bush and Kevin Hanselka, and Appendix D contains the results of the faunal analysis conducted by Christopher Jurgens. The discussion of the bulk matrix sort and macrobotanical and faunal analyses are presented below.

Bulk Matrix Sort

The bulk matrix sort was conducted on a total of 31 strats from within PS3 and PS4 including three features, eight refuse midden deposits, seven thick ash deposits, seven discrete lenses of ash, fiber, and charcoal, three disturbed deposits, two charcoal pockets, and one limestone deposit (Appendix B). The bulk matrix sort for each of the three features was discussed in Chapter 6, therefore, only a summary of the bulk matrix sort for the other general strat types is presented below. As mentioned in Chapter 5 and 6, the 1" size sieve was conducted before the bulk matrix samples were split into separate ~1 L samples, so the 1" sieve data is for the entire strat. In contrast, the ½" and 4 mm size sieves were conducted on ~1 L bulk matrix samples. The ½" size sieve recovery was very limited, and usually only contained a few artifacts, therefore the summary presented below focuses on the 1" and 4 mm size sieve results. Of note, the percentages below are based on overall mass (g) of the matrix sample, therefore the percentages of rock are a bit skewed and may appear higher than the botanical remains, as the latter are usually very light.

Refuse Middens. The bulk matrix sort for the refuse midden deposits (S30, 32A, S64, S65, S76, S97, S98) revealed quite a bit of difference in the composition of these strats. The majority of the refuse midden deposits (S30, S32A, S44, S64) were dominated by burned rock (85 to 100 percent in the 1" sieve and 55 to 67 percent in the 4 mm sieve) and charred botanical remains (11 to 42 percent in the 4 mm sieve) with lesser amounts of other types of inclusions (e.g., lithics and bone). The 1" fraction of S98 consisted of primarily burned rock (88 percent), however the 4 mm sieve contained a mix of unburned limestone spall (36 percent), burned rock (21 percent), lithic debris (11 percent), charred botanical remains (10 percent), and a few bone and shell. S65 contained primarily charred botanical remains (70 percent in the 4 mm sieve) and burned rock (24 percent in the 4 mm sieve). Occasional pebbles were noted in all but one (S30) of the refuse midden deposits in the 4 mm sieve. Most notably, the bulk matrix sort of S97 revealed that over 90 percent of the deposit is comprised of unburned limestone spall in both the 1” and 4 mm size sieves and almost no other inclusions, which does not support our field observation that this strat is a refuse midden.

Thick Ash Deposits. Similar to the refuse midden deposits, the thick ash deposits contained a wide variety of inclusions, which was not expected given the presumed predominance of ash observed in the field. Five of the seven thick ash deposits (S33A, S37, S40, S63, S99) contained primarily burned rock fragments (e.g., 60 to 95 percent in the 4 mm sieve) and charred botanical remains. One deposit (S45) consisted of a mixture of unburned limestone spall (50 percent in 4 mm sieve), charred botanical remains (28 percent), burned rock (13 percent), and sparse quantities of lithics, bone, shell, and pebbles. Three of the thick ash deposits (S37, S40, and S42) contained animal feces indicating some animal burrowing activities occurred in these deposits. Over 90 percent of the 4 mm fraction for the S42 bulk matrix sample consisted of charred botanical remains which, again, does not support the field observation that this strat was a thick deposit of ash.

Discrete Lenses. Similar to the thick ash deposits, the discrete ash lenses (S39, S41, S115) contained high percentages of burned rock (58 to 90 in 1" sieve and 56 to 80 percent in 4 mm sieve) followed by lithics (5 to 25 percent in both sieves), unburned limestone spall (1 to 17 percent in both sieves), and occasional pebbles, bone, shell, and charred botanical remains. The percentages of inclusions in the fiber and charcoal lenses (S31, S47, S48, S101) varied quite a bit; S31 and S47 contained mostly charred botanical remains (49 to 57 percent in 4 mm sieve), S48 was dominated by burned rock (77 percent in 4 mm sieve), and S101 contained a mixture of unburned limestone spall (47 percent in 4 mm sieve), burned rock (38 percent in 4 mm sieve), charred botanical remains (10 percent in 4 mm sieve), and a few uncharred botanicals, bone, lithics, and pebbles.

Disturbed Deposits. The disturbed deposits consisted of a mixture of cultural materials (e.g., burned rock, botanical remains, lithics), natural limestone spall, and animal feces (only in S25 and S26). S 25 was the uppermost disturbed deposit in UT North and contained mostly burned rock (70 percent). S26, directly below S25, contained the most animal feces (40 percent in 4 mm sieve) and a large quantity of hay (18 percent in 4 mm sieve). S103, located towards the base of PS4, contained over 67 percent of limestone spall in the 4 mm sieve, 19 percent burned rock, 10 percent charred botanical remains, and occasional lithics, bone, shell, and pebbles.

Charcoal Pockets. Both of the charcoal pockets (S102 and S112) contained a mixture of burned rock (23 to 26 percent in 1" sieve) and unburned limestone (53 to 66 percent in 1" sieve) and charred botanical remains (9 to 19 percent in 1" sieve and 33 to

37 percent in 4 mm sieve). Only burned rock was identified in the 4 mm sieve for S102 (66.6 percent), but both burned rock (23 percent) and unburned limestone spall (38 percent) were present in the 4 mm sieve for S112.

Limestone Deposits. A bulk matrix sort was only conducted on one strat categorized in the field as a disturbed limestone deposit (S106). Unburned limestone spall comprised over 99 percent of the 1" size sieve, however only 50 percent of the 4 mm sieve contained unburned limestone. The rest of the 4 mm sieve consisted of burned rock (22 percent), lithics (13 percent), charred botanical remains (11 percent), and less than five percent uncharred botanical remains, bone, shell, and pebbles. The fact that cultural remains were only present in the fine fraction (i.e., 4 mm size sieve) supports the idea that these materials were introduced into the strat as a result of disturbances, rather than cultural activities.

Macrobotanical Analysis

Macrobotanical analysis was conducted on ~1 L bulk matrix samples and spot samples from four strats within PS3 and eight strats from within PS4 (Appendix C). The macrobotanical analysis was conducted by Leslie Bush and Kevin Hanselka. A total of 18 samples were analyzed, including four samples from PS3 and 14 samples from PS4. The 14 samples from PS4 included seven spot samples from S31, which contained a series of ~16 alternating lenses of decomposing fiber and ash which were spot sampled in couplets.

Wood and wood charcoal, nut fragments, and seeds and fruits were identified in the highest quantity in most of the samples. The most common nut type identified was

Little Walnut nutshell with 50 out of the 64 specimens recovered from the matrix surrounding F7 (S72), followed by acorn nutshell. In order of predominance, the most common seeds and fruit types consisted of yucca seed (unspecified but probably Torrey's yucca [*Yucca torreyi*]), chenopodium seed, and mesquite endocarps with the pericarp and seeds attached. The vast majority of the fruit and seeds were recovered from the fiber fill (S35) that enveloped the F2 rocks. Identified leaves included desert rosettes from the Agavaceae or Liliaceae families, primarily lechuguilla or yucca. Similar to the seed and fruit category, the majority of leaves were identified from within the fiber fill of F2 (S35). Within the "other food or cooking material" category, prickly pear pad fragments were most common. Almost all of the prickly pear was recovered from within the S31 spot samples (S31 and S31A–G). A discussion of the macrobotanical recovery based on general strat type will be presented in Chapter 9.

Faunal Analysis

PS3 Faunal Analysis. Faunal remains recovered from within 1 L bulk matrix samples were analyzed by Chris Jurgens from 11 strats within PS3A U6 and one layer within U2 which contained F1 (Appendix D.1). The Number of Identified Specimen (NISP) analyses indicates the overall faunal assemblage in PS3 is comprised of mostly small- and medium-sized mammals (Appendix D.2). Based on density calculations, rabbits and deer comprise the vast majority of identifiable individuals in the PS3 faunal assemblage (Appendix D.3). The highest density of rabbit was recovered in S40, a thick ash deposit, and the highest density of deer was recovered in S76, a midden refuse deposit (Figure 7.1). In order of predominance, other animal classes present in PS3

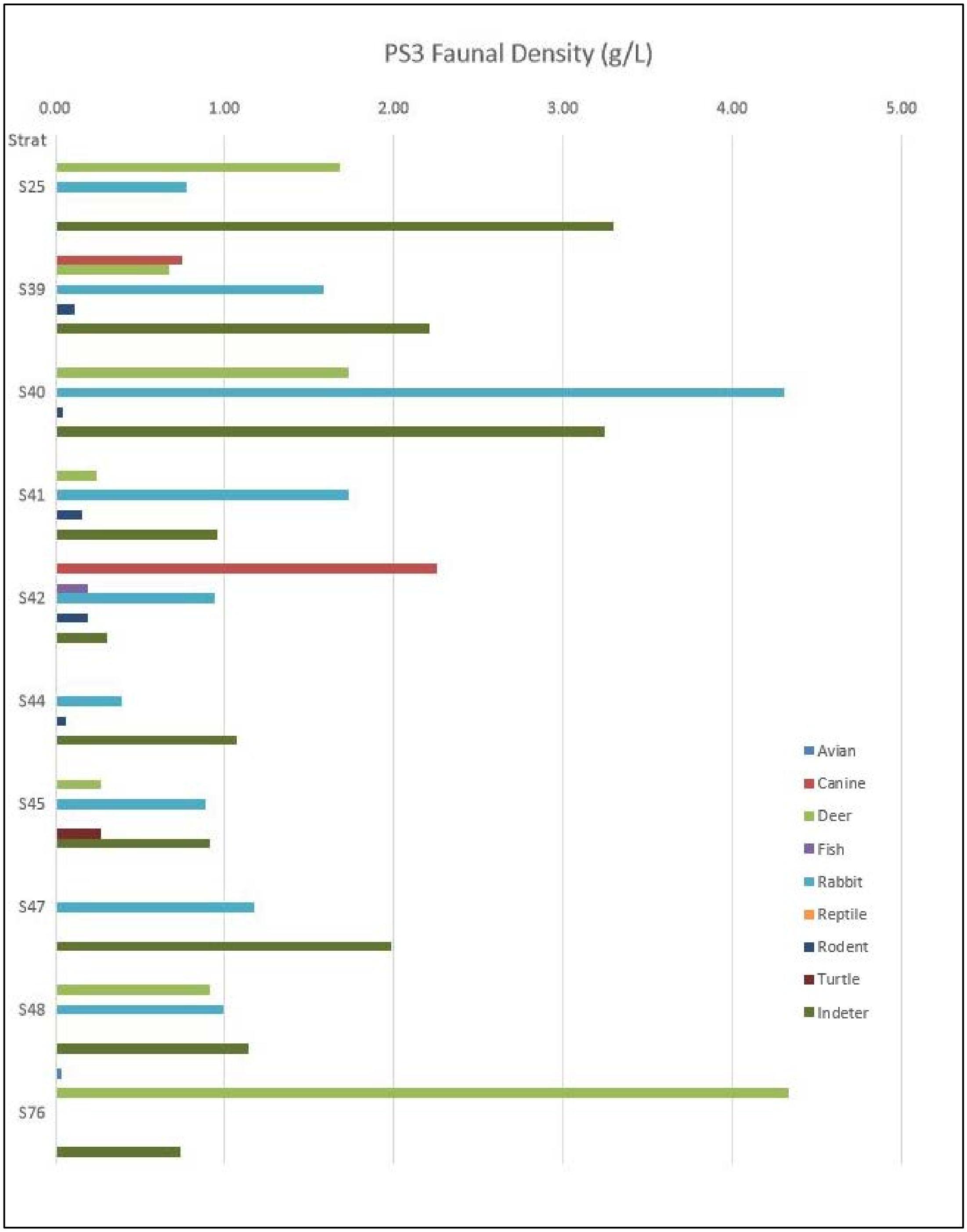


Figure 7.1. Faunal density of general animal classes within PS3. Only faunal remains recovered from the matrix sort are included in this chart.

include rodents, canine, fish, turtle, and bird. In addition, 106 specimens were not identifiable to taxon and were classified based on approximate size including 44 medium-sized mammals, 32 small-sized, and 30 large-sized mammals

Of the 404 bones analyzed, 349 were determined to have been culturally modified. The cultural modifications included burning, cut marks, polish, scoring, and manufacturing debris (see Appendix D.1). Almost all (N=345) of the modified bones had some evidence of burning; 322 exhibited burn patterns consistent with a discard pattern, while 23 were exhibited evidence more indicative of roasting. Cutmarks were identified on five of the specimens as a result of defleshing (N=4) or from skinning/dismemberment (N=1). Four of the specimens were identified as bone tools manufactured from deer bones and a single black-tailed jackrabbit (*Lepus californicus*) fragment was determined to represent bone bead manufacturing debris.

PS4 Faunal Analysis. Faunal remains were analyzed from 25 strats within PS4 including nine strats from PS4A, five from PS4B, and 11 from PS4C/D (Appendix D.1). Overall, the results of the NISP indicate the PS4 faunal assemblage consists of mostly small- and medium-sized mammals (Appendix D.4). The faunal density calculations indicate that deer make up the vast majority of the identifiable PS4 faunal assemblage followed by rabbit (Figure 7.2 and Appendix D.5). The highest density of deer was recovered from F2 (S29), a fiber-filled pit, F7 (S72), matrix surrounding remnants of a heating element, and S115, a thick ash deposit. The highest density of rabbit was recovered from S63, a thick ash deposit. Less common, but still present in the PS4

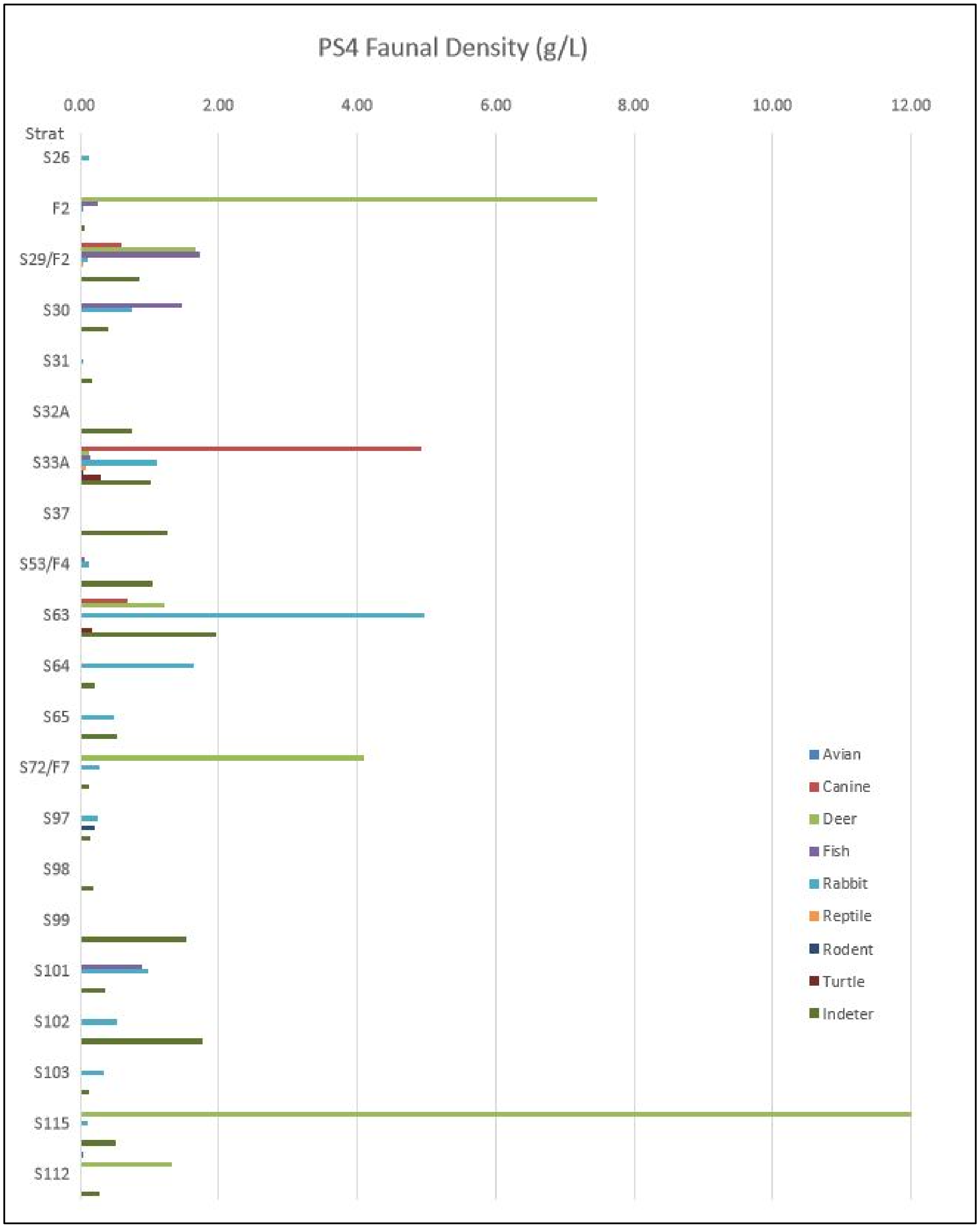


Figure 7.2. Faunal density of general animal classes within PS4. Only faunal remains recovered from the matrix sort are included in this chart.

assemblage, are canine, reptile, turtle, rodent and bird. In addition, 58 specimens were not identifiable to taxon and were classified based on approximate size including 33 small-sized, 13 large-sized mammals, and 12 medium-sized mammals.

Of the 387 bones analyzed in PS4, 320 were culturally modified. Similar to PS3, nearly all (N=314) of the modified bones had some evidence of burning; 289 had discard pattern burning, 15 had roasting pattern burning, and one specimen was burned and covered with desert succulent exudate residue, therefore a distinct burning pattern could not be discerned. Cutmarks were identified on 11 of the specimens as a result of defleshing (N=6), dismemberment (N=2), or indeterminate purposes (N=3). Three bone tools manufactured from deer (*Odocoileus sp*.) bones were also identified within the PS4 assemblage, including one from F2 which was previously discussed in Chapter 6.

VIII. RESULTS OF GEOARCHAEOLOGICAL ANALYSES

Geoarchaeological investigations in UT North were conducted to help determine the source of sediments in each stratigraphic layer and elucidate what types of processes (i.e., cultural, natural, or both) were responsible for forming and/or reorganizing the deposits. The geoarchaeological investigations in UT North included the collection of 104 cube column samples, 68 geomatrix samples, and 13 micromorph samples. There was enough sediment in the cube column samples to conduct the Loss-on-Ignition (LOI) for organic carbon content, magnetic susceptibility, phosphorus analysis, calcium carbonate analysis, and particle size analysis, so the geomatrix samples were not used for my thesis analysis. A total of 22 thin sections were made from the 13 micromorph samples. Expected physical characteristics and chemical signatures for each of the general strat types observed in UT North are presented below (Table 8.1). In a few cases, some of these expectations did not hold true and will be discussed below.

Magnetic Susceptibility (MS) and Loss-on-Ignition (LOI)

Two noncontiguous vertical cube columns, totaling 104 samples were collected for Magnetic Susceptibility (MS) analysis in UT North. A total of 53 samples were collected from PS3, 40 samples were collected from PS4, and 11 samples were collected from U19 (Figures 8.1 and 8.2). However, of the 53 samples from PS3, only 19 were associated with strats identified and sampled during the 2014 ASWT work. Results for the MS analysis conducted on the 19 samples from PS3 and all 51 samples from PS4 and U19 are presented in Appendix E.1, and are discussed below.

Table 8.1. Expected Physical and Chemical Signatures for General Strat Types.

General Strat Type	**Expected Physical Characteristics**	**Expected Chemical Signatures**			
		Organic Carbon	**Magnetic Susceptibility**	**Phosphorus**	**Calcium Carbonate**
Thick Ash Deposit	Charcoal flecking (few large fragments), homogenized matrix, possible burned lithics and bone	Low to Moderate	High	High	High
Thin Ash Lens	Charcoal flecking (few large fragments), possible burned lithics and bone, ash lamina	Low to Moderate	High	High	High
Heating Element (in situ, closed-air)	Clast-supported burned rock, dark, charcoal-rich matrix, possible oxidized soil below	High	High	High	Low
Refuse Midden	Diverse artifact assemblage, rounded charcoal from bioturbation, homogenized matrix	High	High	High	Low
Limestone Spall Deposit	Small artifacts from vertical displacement, high density of unburned limestone spall	Low	Low	Low	High
Disturbed Context (burrow, intrusion)	Small artifacts from vertical displacement, diverse artifact assemblage, homogenized matrix, distinct color difference from surrounding strats	Moderate to High	High	Moderate to High	Low

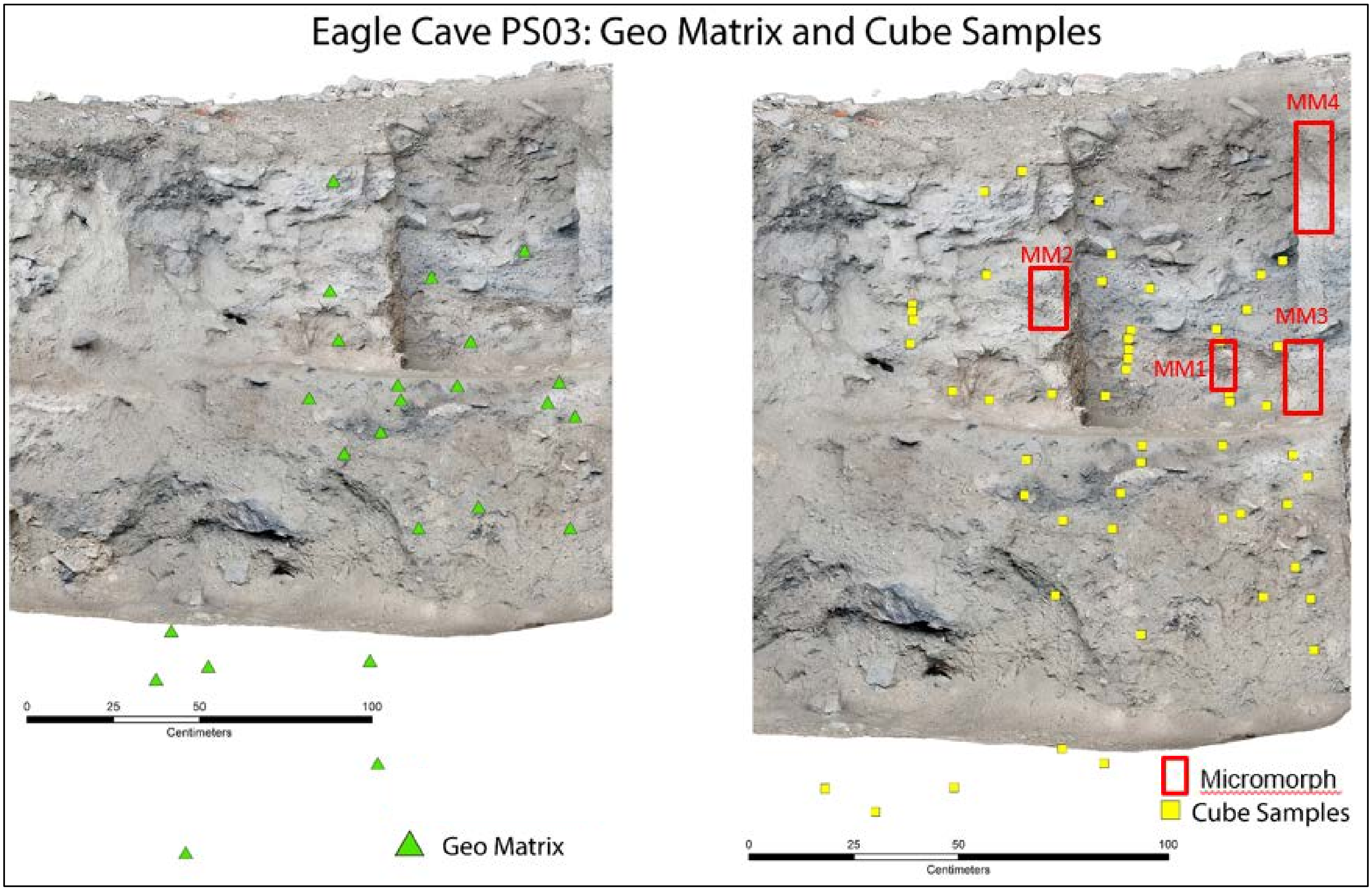


Figure 8.1. Location of PS3 and U19 (west wall) geomatrix samples, vertical cube column samples, and micromorph samples.

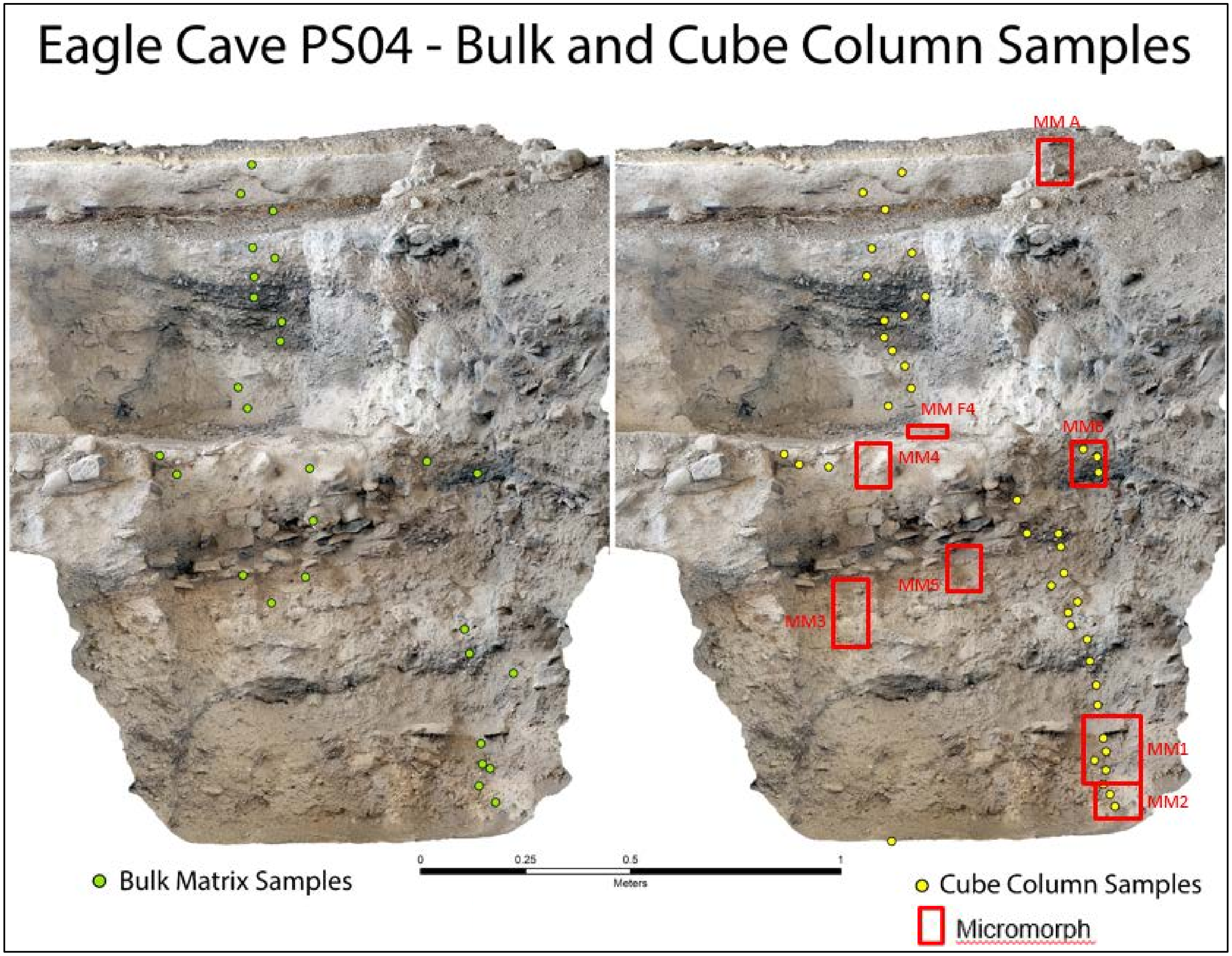


Figure 8.2. Location of PS4 and U19 (south wall wall) geomatrix samples, vertical cube column samples, and micromorph samples.

PS3 MS and LOI. In PS3, the χlf values had several spikes, most of which were associated with ash and charcoal deposits (e.g., S40, S43, and S48) (Figure 8.3). The highest χlf value was for one of the samples collected from S76. This strat consisted of a marbleized matrix (i.e., not homogenized) of baked sediment, charcoal, and cultural materials. The MS data from four of the samples from S76, however, show dynamic fluctuations within the strat which would be expected in a marbleized matrix. The χfd values for the profile exhibited similar fluctuations, with the highest peaks in the discrete ash lenses and thick ash deposits.

Comparing the MS values with the percentage of organic carbon from the LOI analyses in PS3, there appears to be lower percentages of organic carbon in deposits characterized as ash lenses or thick ash deposits and higher organic carbon percentages in the other types of deposits (e.g., refuse midden) (see Figure 8.3). To get a more accurate assessment of correlation between the LOI and MS values in the PS3 column, the results were compared using the Pearson Product-Moment Correlation Coefficient (Table 8.2). This statistical analysis compares two values to assess if there is a positive or negative relationship between the data (Madrigal 1998). The variables are compared and the coefficient *r* ranges between -1 and 1 in value; a negative value implies a negative correlation, a positive value suggests a positive correlation, and a zero value indicates no relationship. The higher or lower the coefficient *r* value, the stronger or weaker the

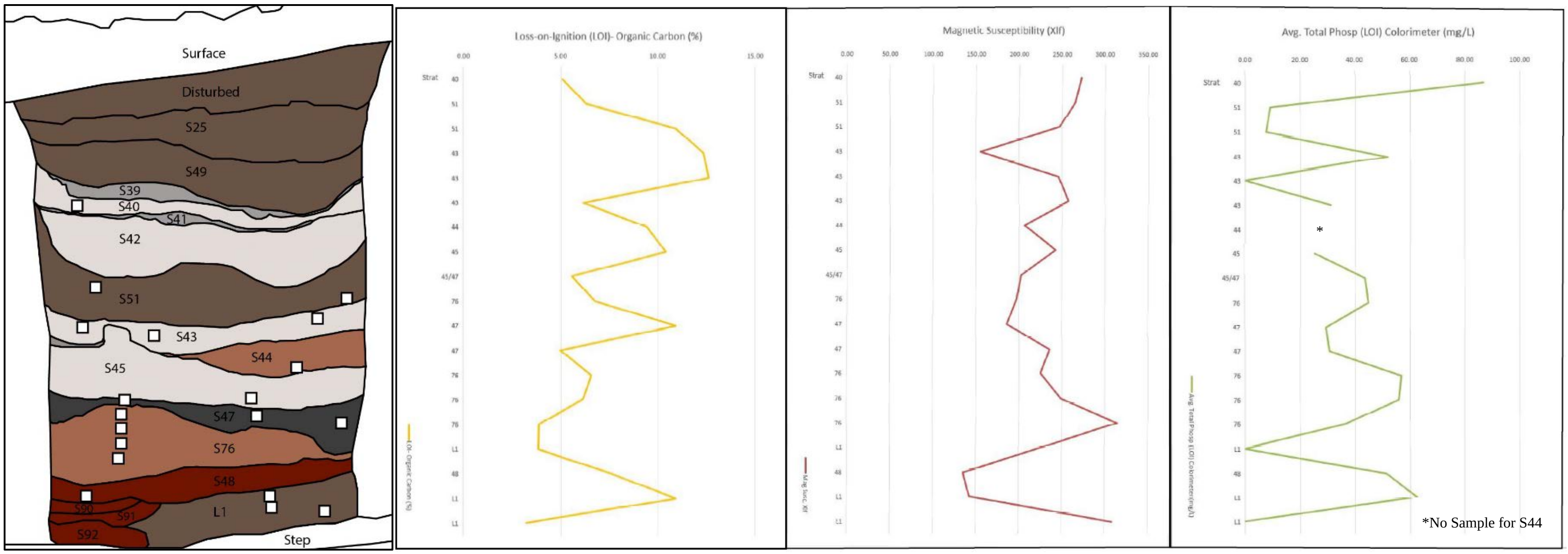


Figure 8.3. Results of the LOI, MS, and P analyses for PS3. General strat type colors: brown-disturbed, gray-discrete ash lens, light gray-thick ash deposit, dark gray-discrete charcoal lens, reddish orange-midden refuse, and dark red-discrete fiber/ charcoal lens.

For the χlf values and LOI, the correlation value is (*r*= -0.426) which is approaching a negative correlation, but technically is in the realm of no measurable relationship. The χfd values and LOI results were also compared and had a correlation value (*r*=0.002). Based on these data in both the χfd and χlf values, there is no demonstrable correlation between the MS and LOI values within PS3.

Table 8.2. Pearson Product-Moment Correlation Coefficient for LOI and MS values.

	LOI- Organic Carbon (percent)	*Mag Susc. Xlf*	*Mag Susc. Xfd*
LOI- Organic Carbon (percent)	1		
Mag Susc. Xlf	-0.43	1	
Mag Susc. Xfd	0.002	0.64	1

Note: n=21, df=19, cv=0.433

PS4 and U19 MS and LOI. In PS4, the χlf and χfd values exhibited dynamic fluctuations, but values generally decreased with depth (Figure 8.4). Similar to PS3, the highest χlf values were associated with thick ash deposits (S33, S115). Not surprisingly, the lowest values are associated with the limestone deposits that had little to no evidence of cultural activity (S106, Unit 19 L2). As mentioned in Chapter 5, the magnetic properties in a sediment are enhanced by activities such as burning and/or the deposition of organic materials (Dalan 2006:164; 2008:22). The spike in MS values in U19 L1 correlates with F6, a layer of thermally altered sediment directly underlying a charcoal-rich layer. Other spikes in U19 may be attributed to the disturbances from the previous UT excavations. As previously mentioned in Chapter 6, one of the radiocarbon assays

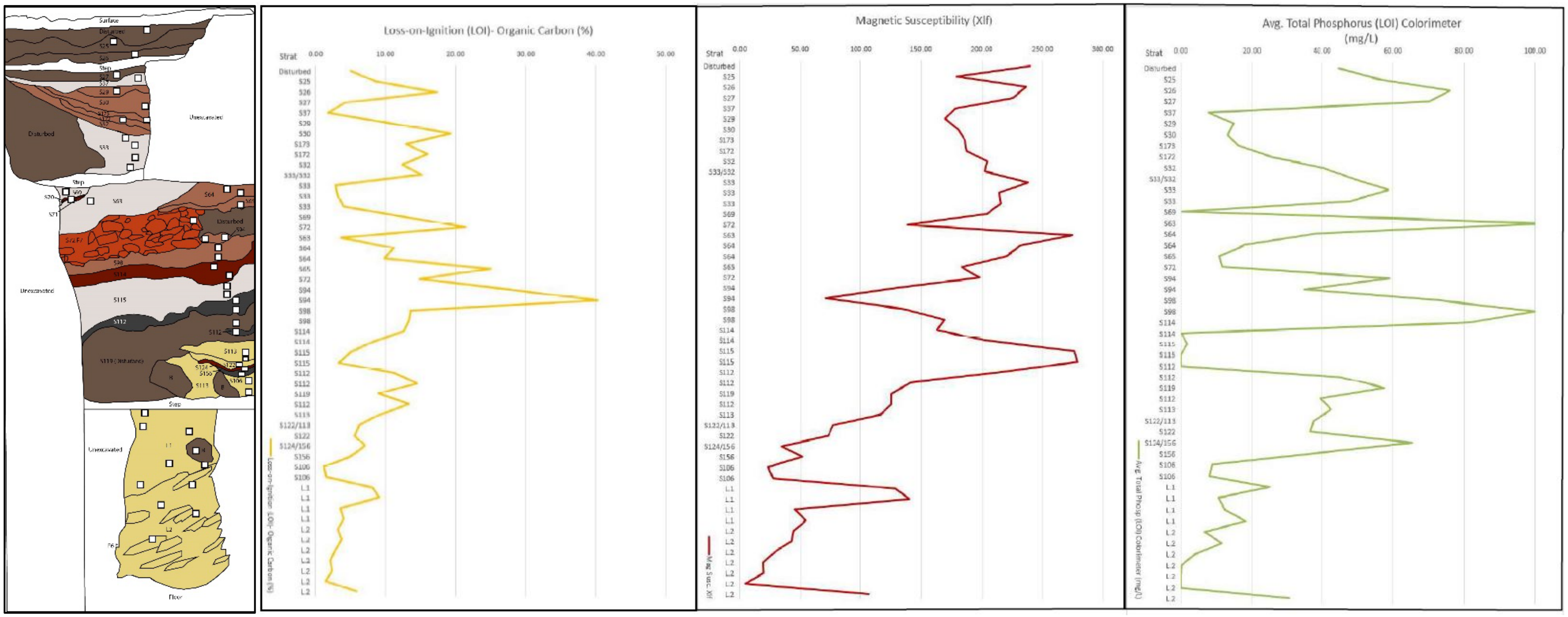


Figure 8.4. Results of the LOI, MS, and P analyses for PS4 and U19. General strat type colors: brown-disturbed, gray-discrete ash lens, light gray-thick ash deposit, dark gray-discrete charcoal lens, reddish orange-midden refuse, orange-heating element, dark red-discrete fiber/ charcoal lens, and yellow-limestone spall.

from U19 L1 indicated a relatively recent age, which supports the interpretation that the area has been disturbed

Unlike PS3, there is a positive correlation between the MS and LOI values in PS4 and U19 (Table 8.3). For the χlf values and LOI, the correlation value is (r= 0.316) which indicates a positive, albeit weak, correlation between the recorded organic carbon and χlf values. Similarly, the χfd values and LOI results were compared which had a correlation value (r=0.363). Based on these data in both the χfd and χlf values, there is a weak positive correlation between the MS and LOI values within PS4.

Table 8.3. Pearson Product-Moment Correlation Coefficient for PS4 and U19 LOI and MS values.

	LOI- Organic Carbon (percent)	*Mag Susc. Xlf*	*Mag Susc. Xfd*
LOI- Organic Carbon (percent)	1		
Mag Susc. Xlf	**0.32**	1	
Mag Susc. Xfd	**0.36**	**0.76**	1

Note: n=43, df=41, cv=0.304. Significant values in bolded red.

Phosphorus Analyses

The phosphorus analyses were conducted using the same samples as those used in the MS analyses. The results of the analyses in PS3, PS4, and U19 do not appear to correlate with the results of the MS analysis (see Appendix E.1 and Figures 8.3 and 8.4). Most notably, numerous strats containing ash, charcoal, and other plant remains had extremely low values or a value of zero, which was not expected in these types of deposits. As mentioned in Chapter 5, low levels of phosphorus are possibly a result of repeated, systematic cleaning activities (Roos and Nolan 2012). However, as these deposits contained high percentages of ash and organic matter, this may not explain a complete absence of phosphorus.

In PS3, the phosphorus amounts were fairly erratic (see Figure 8.3). The most apparent spikes are dramatic increases in S49, a disturbed deposit with animal dung and a mixture of cultural materials, and in S40, which was characterized in the field as a thick ash deposit. Surprisingly, five of the samples had no phosphorus at all (S39, S42, S43, S76, and S48). S39 was characterized as a discrete lens of ash, S42 and S43 were both characterized as thick ash deposits, S76 was a refuse midden with a marbleized matrix, and S48 was a discrete fiber and charcoal lens.

In PS4, similar trends were observed with the most prominent spikes were in a thick ash deposit (S63), and in a refuse midden with high percentages of charcoal (S98) (see Figure 8.4). Very low readings were observed in S69, S114, and in U19 L2 and several of the samples did not contain any phosphorus at all (S115, S112, and U19 L2). S69 and S115 were both characterized as thick ash deposits but contained charred botanical remains and other debris, S114 was a discrete charcoal lens, S112 was a charcoal pocket, and U19 L2 contained limestone spalls. A low phosphorus level would be expected in a limestone deposit with little or no cultural deposits or organics, but not in deposits containing ash and charcoal.

Of note, a second set of readings were taken on all samples that had no phosphorus. A “blank sample” was run prior to the second readings to make sure the machine was still properly calibrated. However, the second readings provided the same results as the first. The only other possibility is that these samples were not agitated properly prior to filtration and as a result, the phosphorus did not fully extract from the sample.

X-Ray diffraction and Calcium Carbonate Analysis

X-Ray diffraction (XRD) was conducted on 19 sediment samples from UT North including seven from PS3, 10 from PS4, and two from UT North. Results of the XRD analysis identified high percentages (63 to 78 percent) of calcite in all 19 samples (see Appendix E.1; Figures 8.5 and 8.6). Some of this of this can be attributed to the wood ash present in some of the deposits in UT North, however, much of the high calcite percentage (especially in U19) is reflective of the thick limestone spall layer. High amounts of quartz, K-feldspar, and plagioclase were also identified in the samples. These minerals do not occur in the Devils River limestone within which Eagle Cave formed, therefore they must have been brought in by other means (i.e., wind, water, people, or animals). Unlike Skiles Shelter and Kelley Cave, there are no obvious flood drapes to indicate these externally derived minerals were a result of flooding (Rodriguez 2015:110). The percentages of Rio Grande alluvium in the samples from Eagle Cave are much lower than those of Skiles and Kelley though, suggesting the alluvium was brought in by humans intentionally (e.g., to cap earth ovens) and/or by other means (e.g., wind) rather than by flooding (Rodriguez 2015:110). However, Frederick (2017) has determined that there is a possibility that Rio Grande flood waters reached Eagle Cave in the Holocene, so there is a possibility that the alluvium in UT North came from flood deposits that have been reworked over time from cultural activities (e.g., use and reuse of pits).

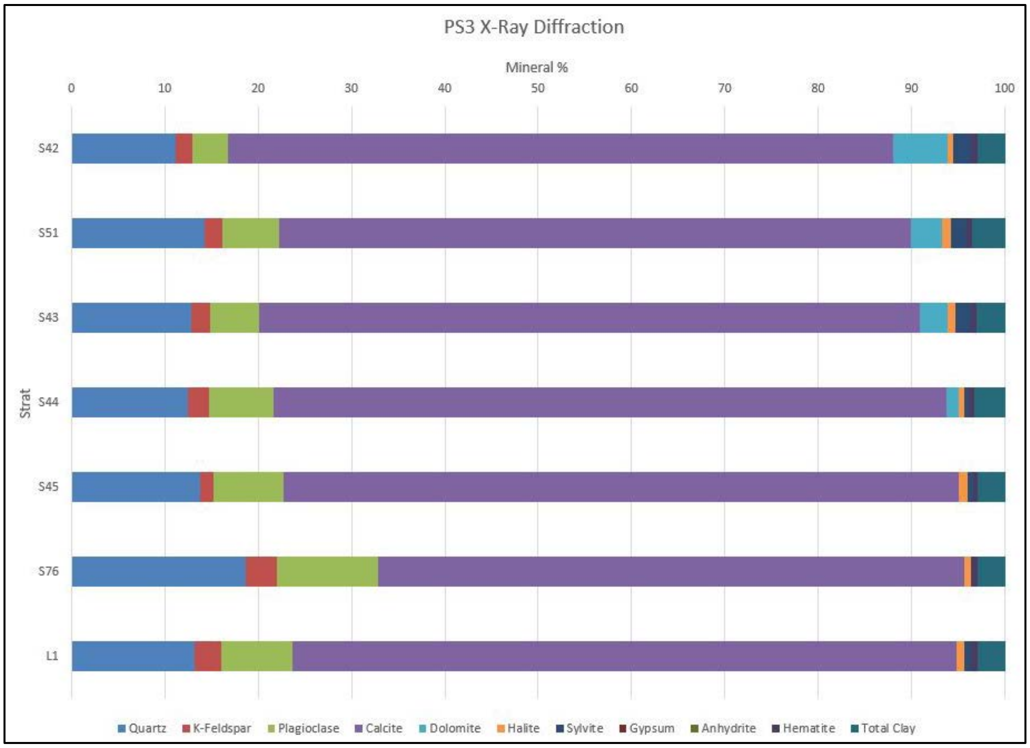


Figure 8.5. PS3 XRD results.

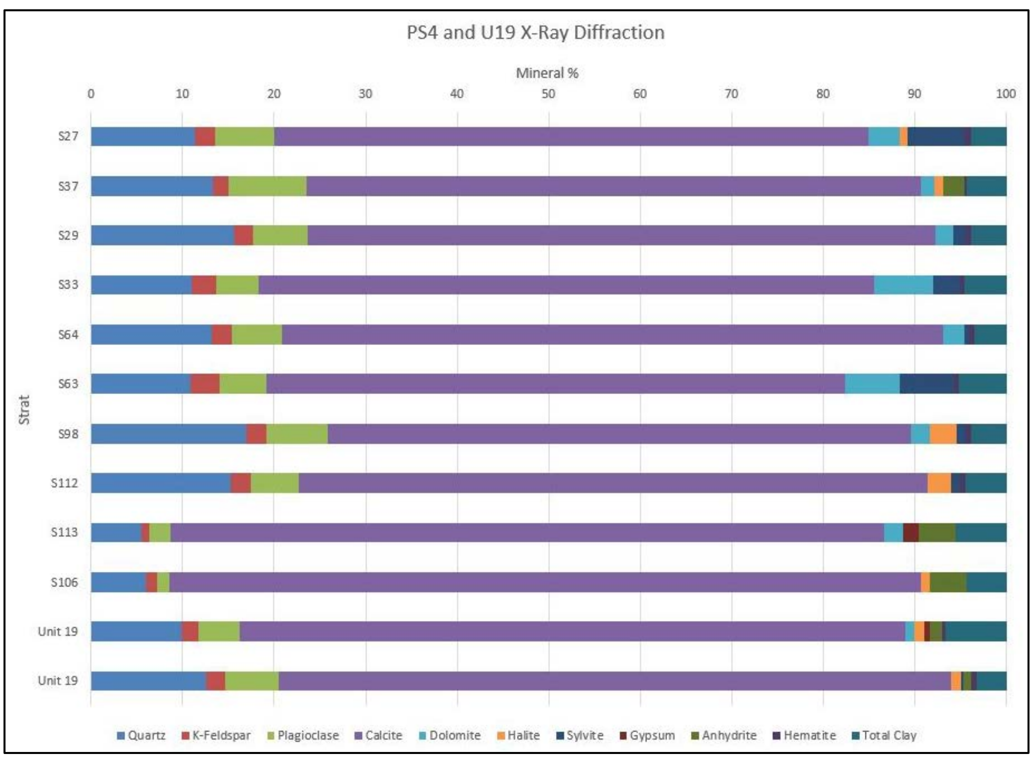


Figure 8.6. PS4 and U19 XRD results.

Calcium carbonate equivalent percentages were calculated for all the PS3 and PS4/U19 cube column samples (see Appendix E.1). Similar to the XRD analysis, high percentages of calcium carbonate were identified in all of the samples (Figures 8.7 and 8.8). The highest percentages (63 to 85 percent) were encountered in strats containing primarily limestone spalls (i.e., S106, S113, and S122 in PS4; L1 and L2 in Unit 19) with little to no artifacts or organic materials. Throughout the rest of PS3 and PS4, calcium carbonate percentages ranged from 48 to 68 percent, with the highest amounts within ash deposits (e.g., S43 and S45 in PS3, S64 and S115 in PS4).

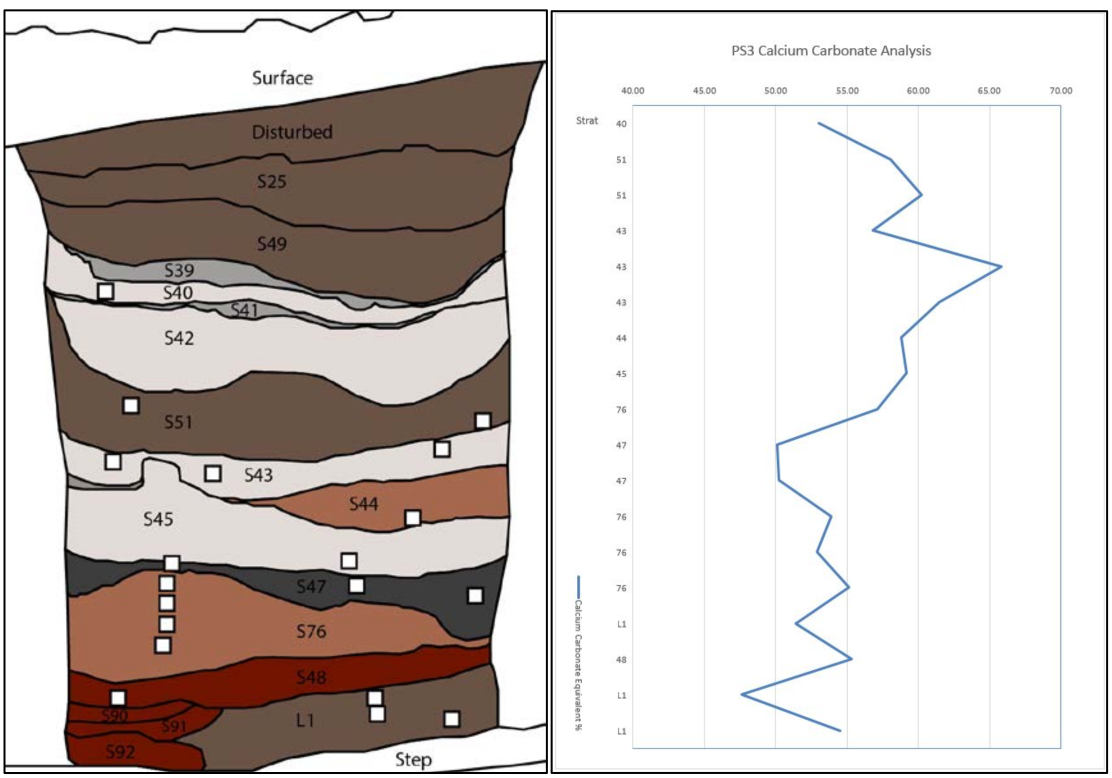
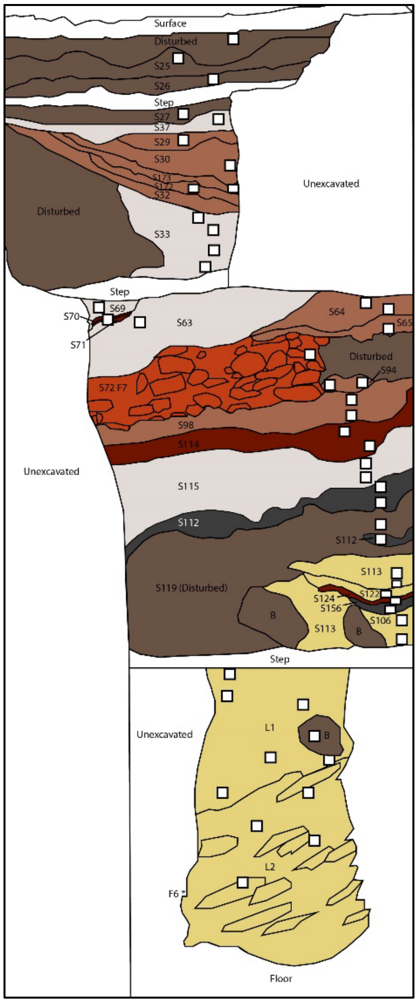


Figure 8.7. PS3 calcium carbonate analysis results showing calcium carbonate equivalent percentages. General strat type colors: brown-disturbed, gray-discrete ash lens, light gray-thick ash deposit, dark gray-discrete charcoal lens, reddish orange-midden refuse, and dark red-discrete fiber/ charcoal lens.



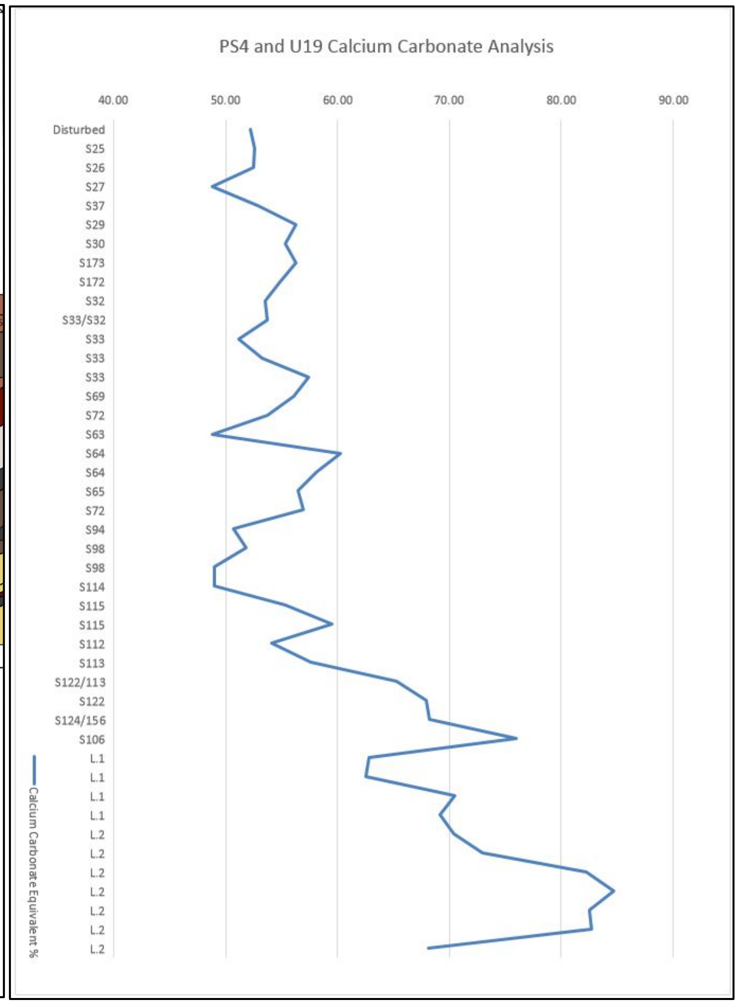


Figure 8.8. PS4 and U19 calcium carbonate analysis results showing calcium carbonate equivalent percentages. General strat type colors: brown-disturbed, gray-discrete ash lens, light gray-thick ash deposit, dark gray-discrete charcoal lens, reddish orange-midden refuse, orange-heating element, dark red-discrete fiber/ charcoal lens, and yellow-limestone spall.

Particle Size Analysis

The overall particle size analysis yielded coarse-skewed, moderate to poorly sorted grain size distributions in PS3 and U19 and only poorly sorted distributions in PS4 (see Appendix E.1). Coarse silt and very fine sand are the dominant fractions in all the samples. The samples from PS3 have a median size range from 1.03-4.84 (medium sand to coarse silt) (Figure 8.9). The size distributions vary between single, bi- or poly-modal. In PS3 for example, a sample from S45 (thick ash deposit) has a single modal peak near 3.3 phi (very fine sand), which may be an indication that the deposit contains alluvium. In contrast, the sample from S48 (discrete fiber and charcoal lens) had a poly-modal distribution with a major peak at 4.05 phi (coarse silt) and minor peaks at 1.2 phi (medium sand) and 0.07 phi (very coarse sand), suggesting both alluvium and aeolian sediments are present.

In PS4 and U19, the median grain sizes are a little finer and range from 2.62-5.45 phi (fine sand to medium silt) in PS4 and 3.86-5.22 phi (very fine sand to medium silt) (Figures 8.10). Some notable differences in the size grain distributions can be seen in comparing the matrix from a heating element (S72 F7) and that of a refuse midden (S98). S72 had a single mode at 3.8 phi (very fine sand) which may represent alluvium brought in for capping an earth oven. In contrast, S98 had a poly-modal distribution with prominent peaks at 2.6 phi (fine sand) and at 3.1 phi (very fine sand) as well as minor peaks between 0.6 and 1.4 phi (very coarse sand to medium sand).

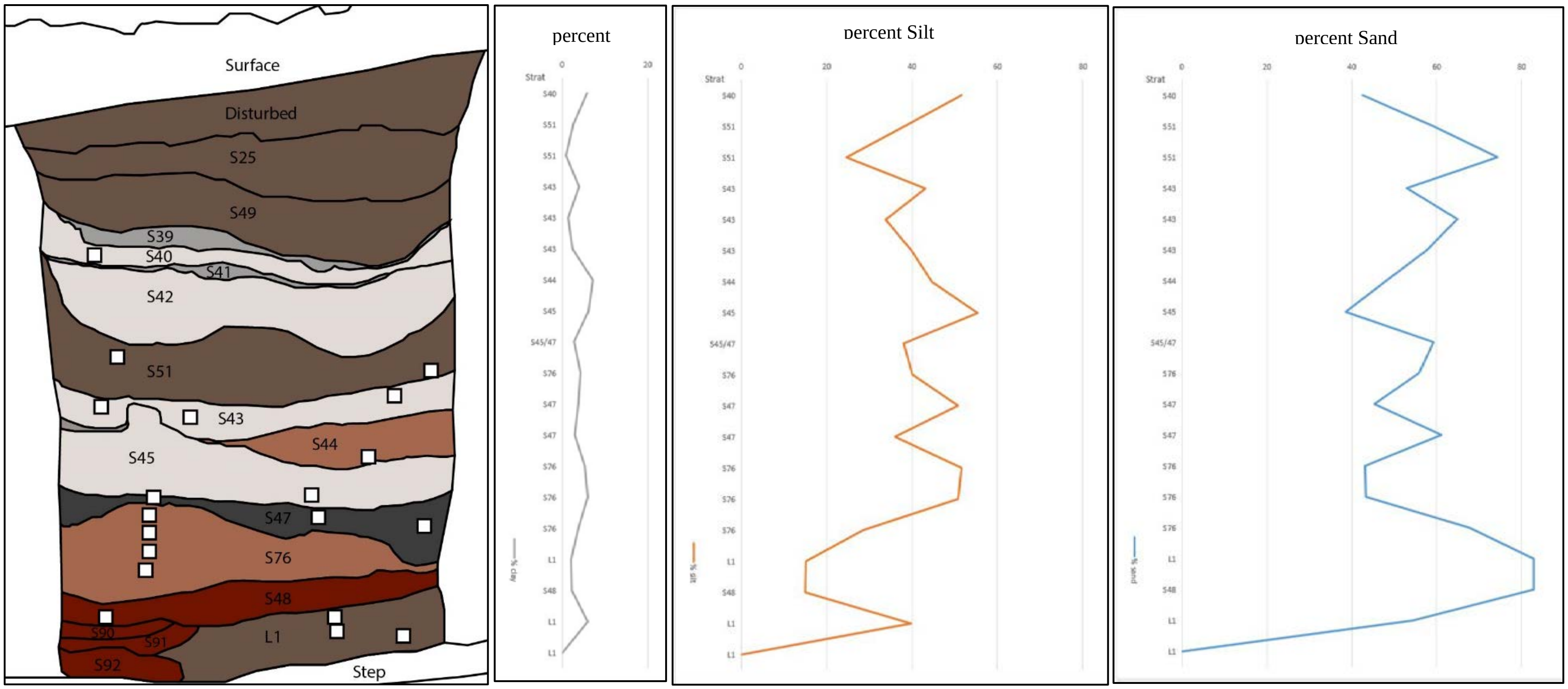


Figure 8.9. PS3 particle size analysis results. General strat type colors: brown-disturbed, gray-discrete ash lens, light gray-thick ash deposit, dark gray-discrete charcoal lens, reddish orange-midden refuse, and dark red-discrete fiber/ charcoal lens.

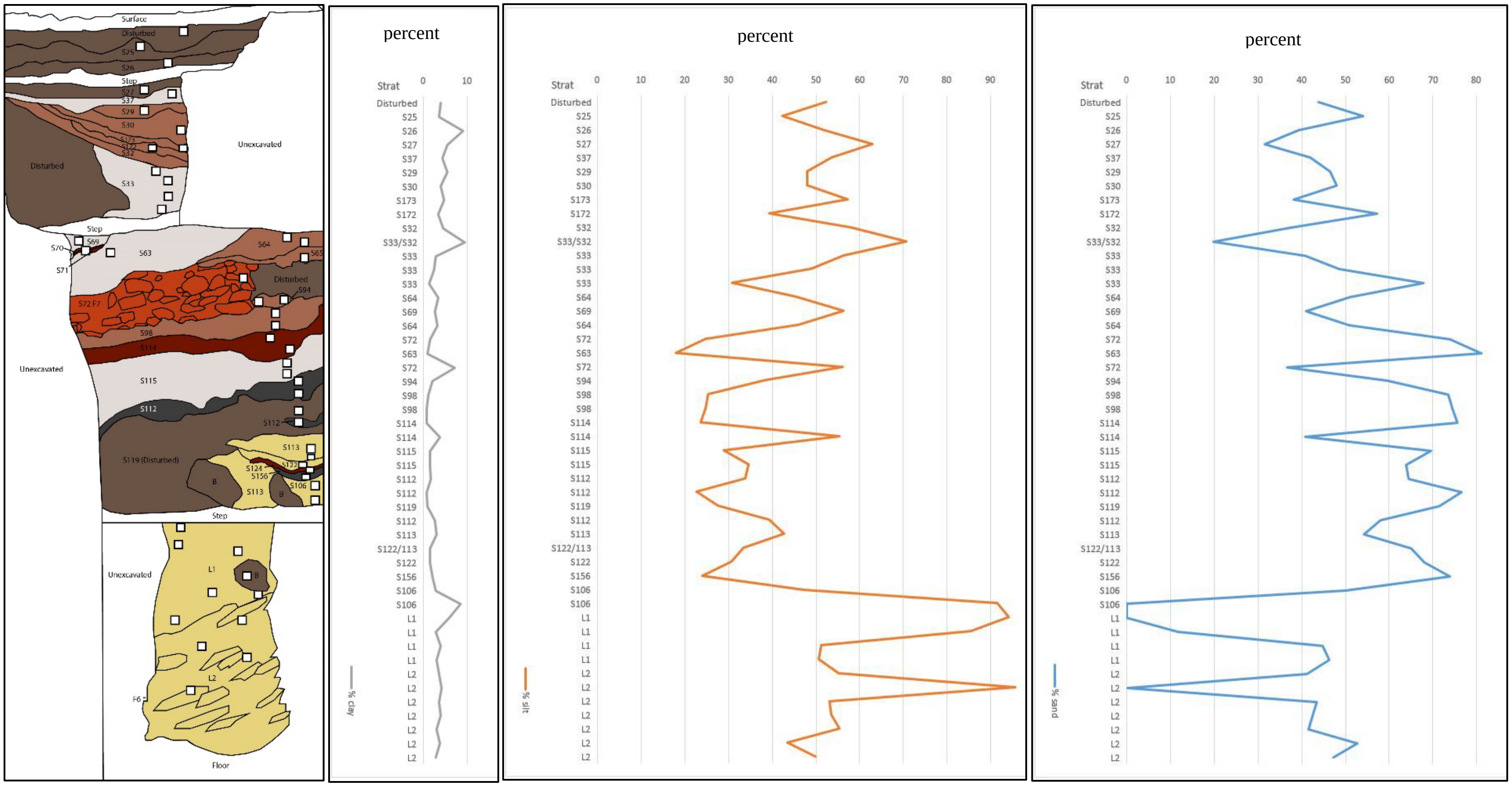


Figure 8.10. PS4 and U19 particle size analysis results. General strat type colors: brown-disturbed, gray-discrete ash lens, light gray-thick ash deposit, dark gray-discrete charcoal lens, reddish orange-midden refuse, orange-heating element, dark red-discrete fiber/ charcoal lens, and yellow-limestone spall.

Micromorph and Thin Section Analysis

As mentioned in Chapter 5, micromorph samples were collected to provide a clearer examination of stratigraphy and the relationships between the various deposits. The 13 relevant micromorph samples captured approximately 27 of the 75 total stratigraphic layers identified in the field (Table 8.4). A total of 22 thin section slides were made from the 13 micromorph samples. For purposes of this thesis, my thin section examination focused on identifying overall percentages and types of coarse fractions (e.g., rock, lithics, botanical remains, animal feces, etc.), noting presence/absence of wood ash, identifying percentages of fuel vs. food type organics (i.e., wood charcoal vs. other botanical remains), and characterizing the interfaces between strats (e.g., diffuse vs. abrupt lower boundary). Results of the thin section analysis are presented in Appendix E.2, along with photographs of all micromorph slabs and thin section slides.

As expected, not all field observations matched what was observed in the clean thin sections. Not only did some strats appeared very different in thin section such as having different color, inclusions, and level of mixing, but additional stratigraphic layers were also identified in thin section that were not visible at all during recording and sampling (Figures 8.11 and 8.12). Similar to the bulk matrix sort and macrobotanical analysis results, the most notable difference observed in the thin section analysis is that many of the deposits characterized in the field as “thick ash layers” contained wood charcoal and other charred plant remains and other coarse fractions that were not visible during field recording and sampling.

Table 8.4. Micromorph Samples and Thin Section Summary Table

FN Number	Profile Section	Micromorph No.	Associated Strats	No. of Thin Sections
30123	PS3	–	Unit 2, Layer 4	0
30744	PS3A	MM1	S45, S47, S48, S47, S76	3
30745	PS3A	MM2	S43, S44, S45	2
30746	PS3A	MM3	S47, S48, S76	3
30747	PS3A	MM4	S49, S39, S40, S41, S42	2
30748	PS4A	A	S25, S26	0
30273	PS4B	Feature 4	S53, S62	2
30694	PS4D	MM2	S106	2
30693	PS4E	MM1	S113, S122, S124, S156	2
30698	PS4E	MM3	S94, S98, S114, S115	3
30701	PS4E	MM4	S63	2
30702	PS4E	MM5	S72, S94, S98	0
30703	PS4E	MM6	S64, S65	1

Figure 8.11. Close-up of PS3 MM4 (FN30747) isolated micromorph block in situ.

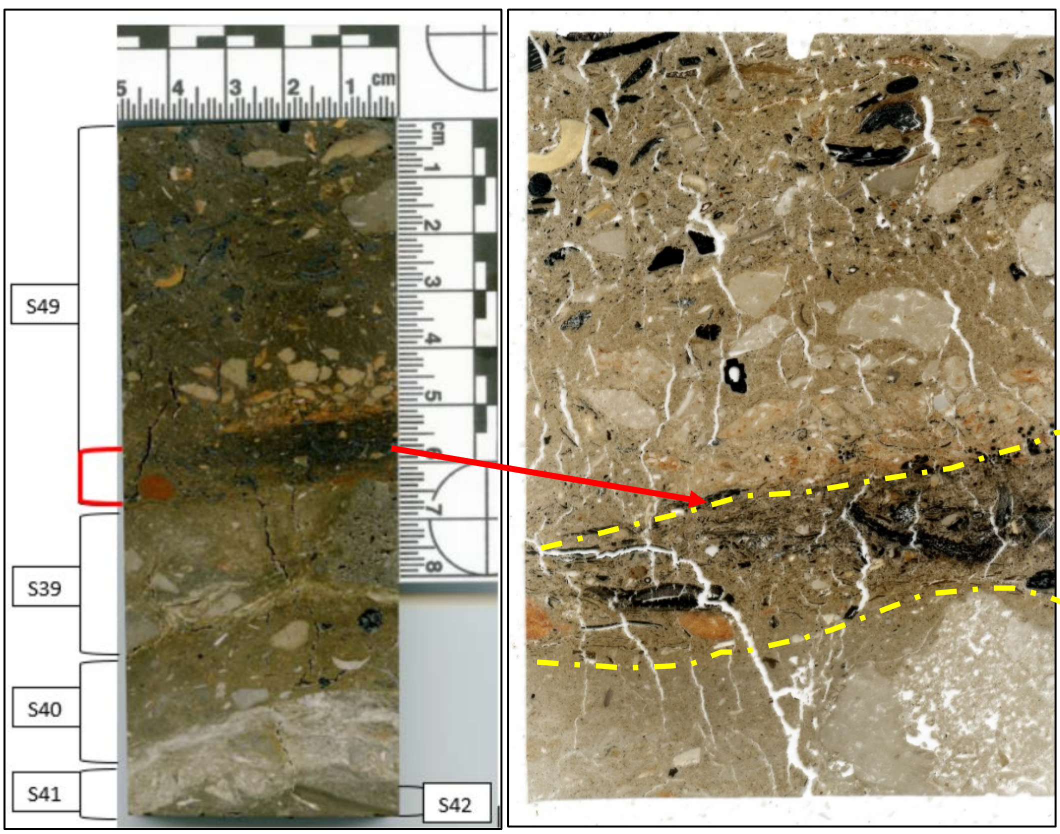


Figure 8.12. PS3 MM4 (FN30747) micromorph after slabbed and cut and photo of thin section slide (30747-1). Red area on micromorph slide denotes a discrete fiber lens that was not recognized during strat recording and sampling. This lens is outlined in yellow on the thin section slide.

Refuse Middens and Discrete Fiber Lenses. Thin sections from six strats (S44, S65, S76, S94, S98, and S114) characterized as refuse middens in the field were examined. Most of these deposits contained a homogenized matrix with abundant (20-30percent) rounded charcoal, charred plant remains, occasional burned bone and/or shell fragments, and wood ash and gypsum mixed throughout (Figure 8.13). However, S76 and S98 contained discrete lenses of ash and fiber that were not apparent during strat sampling and recording. For example, S98 contained three 2 mm- to 1 cm-thick layers of charred plant remains in between thicker (1 to 2 cm) layers of ash containing a variety of coarse fractions (i.e., chert, subangular limestone, and rounded charcoal) (Figure 8.14). The presence of these interior lenses suggests that S98 is a refuse pit that was not filled in all at once, but in several episodes.

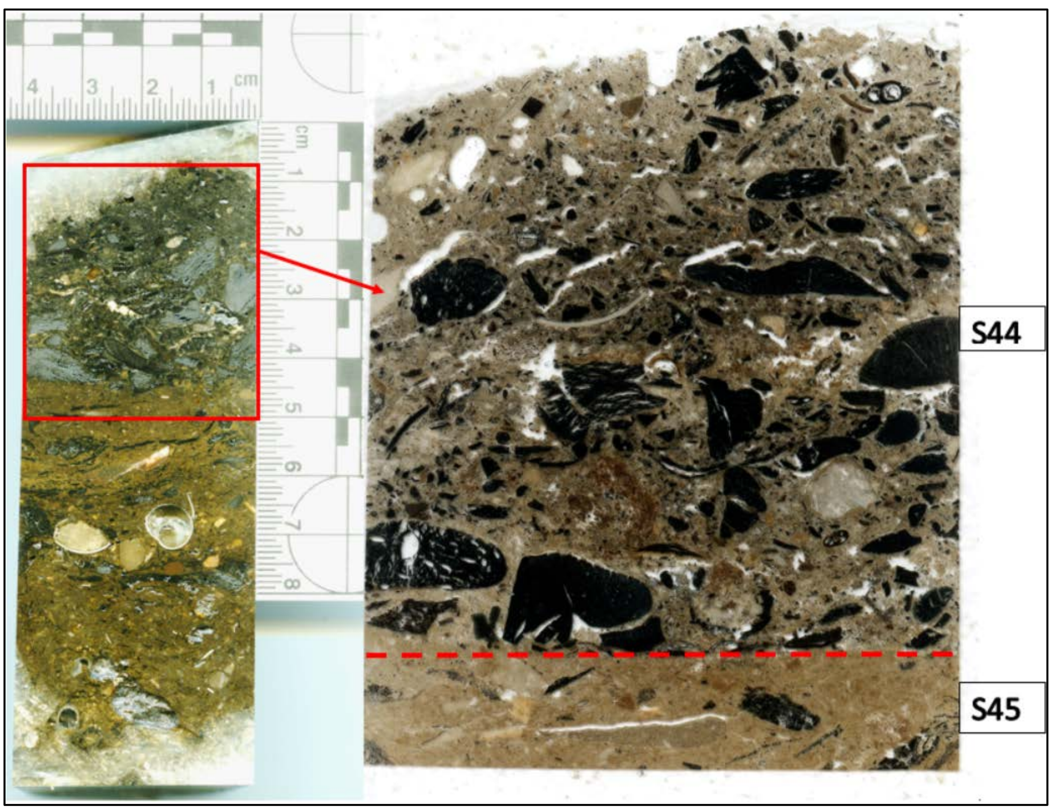


Figure 8.13. PS3 MM2 (FN30745) micromorph after slabbed and cut and photo of thin section slide (30745-1). Example of typical refuse midden fill with homogenized matrix with predominant rounded charcoal.

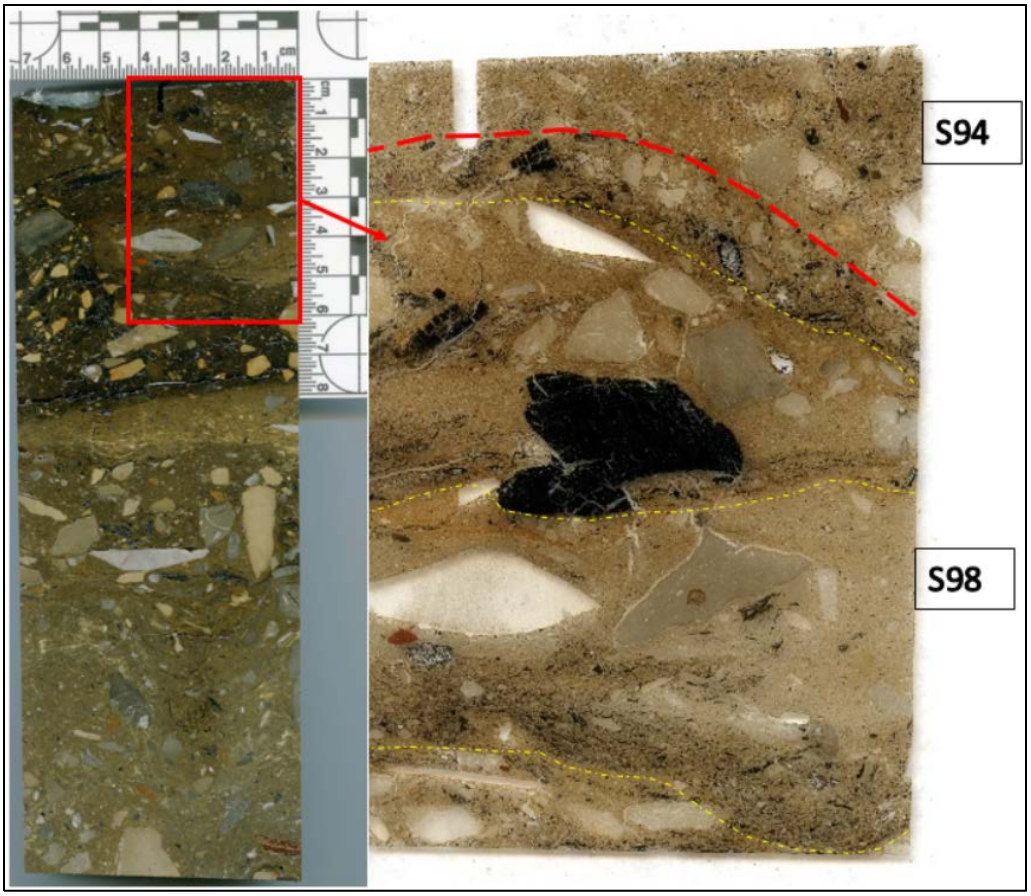


Figure 8.14. PS4 MM3 (FN30698) micromorph after slabbed and cut and photo of thin section slide (30698-1). Example of discrete, charred fiber lenses (lower boundaries in yellow) within midden fill.

Thick Ash Deposits and Discrete Ash Lenses. Thin sections from seven strats (S40, S42, SS45, S63, S64, and S115) characterized as thick as deposits and two (S39, S41) discrete ash lenses were examined. Aside from S63 which had 50 percent wood ash, the “thick ash deposits” were very similar to the refuse midden deposits in thin section and contained a fairly homogenized matrix with scattered wood ash (1 to 5 percent) and a mix of charcoal (1 to 2 percent), charred plant remains, and burned bone and shell. The discrete ash lenses (S39 and S41) contained almost no coarse fractions and had interior lamina of wood ash suggesting these are in situ deposits (Figure 8.15).

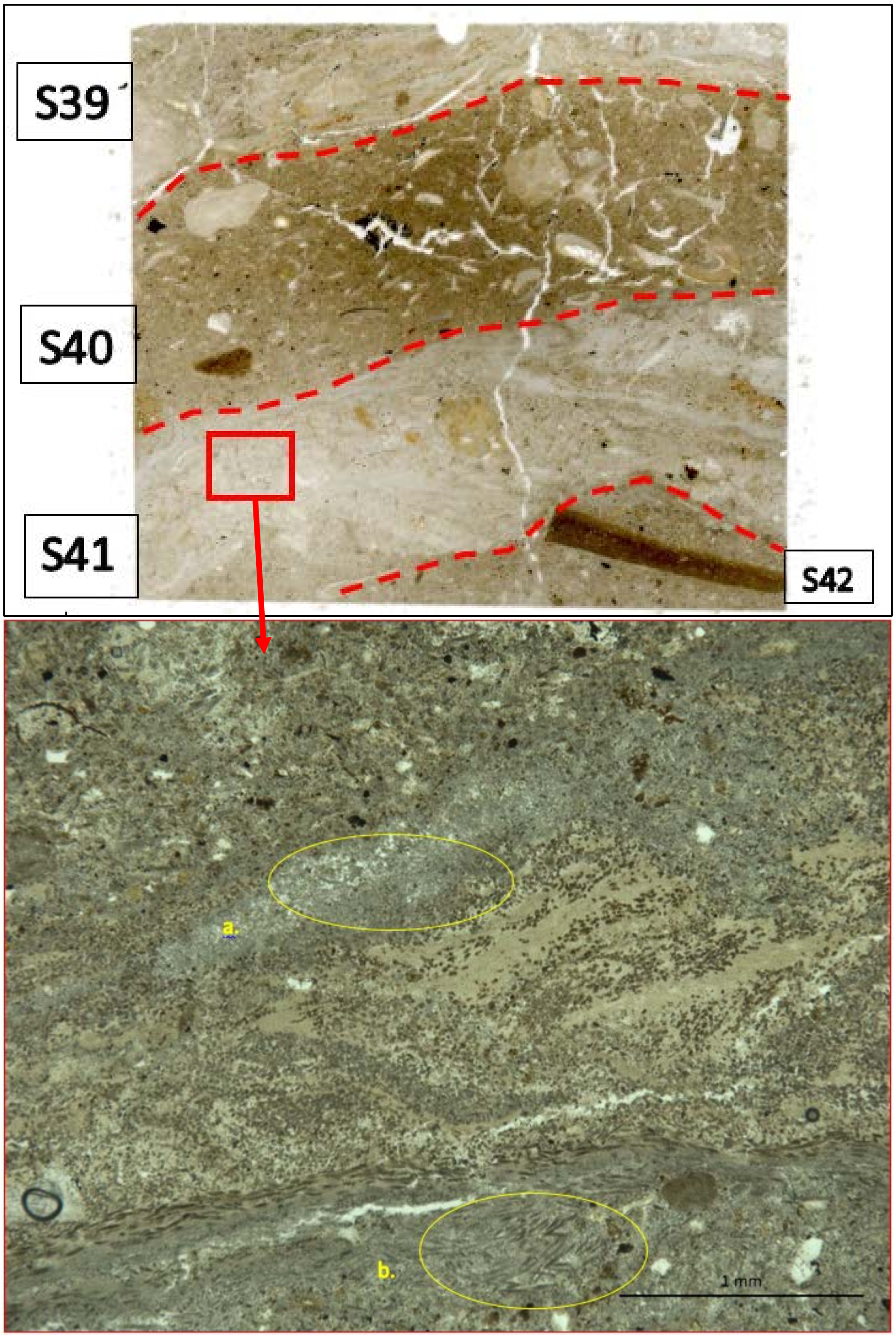


Figure 8.15. PS3 MM4 (FN30747) photo of thin section slide (30747-1), top; and micrograph image under plain polarized light (scale is 1 mm), bottom. Example of discrete, ash lenses with lamina of wood ash (a.) and gypsum (b).

Limestone Deposits. Three of the micromorph strats (S106, S113, and S122) were described in the field as limestone deposits, however, only one of these (S106) was determined to be limestone. Examination of the micromorph slabs and thins sections indicate that S113 is a refuse midden deposit and S122 is a discrete ash lens. S106 is comprised of approximately 50 percent subangular to subrounded limestone fragments ranging from 5 to 10 mm thick and 30 percent smaller subangular limestone fragments (2 to 4 mm). There are very few inclusions other than limestone, however, a thin reddish lens is present towards the top of thin section slide 30694-1 (Figure 8.16). Under magnification, this appears to be an unburned, decomposing plant fiber.

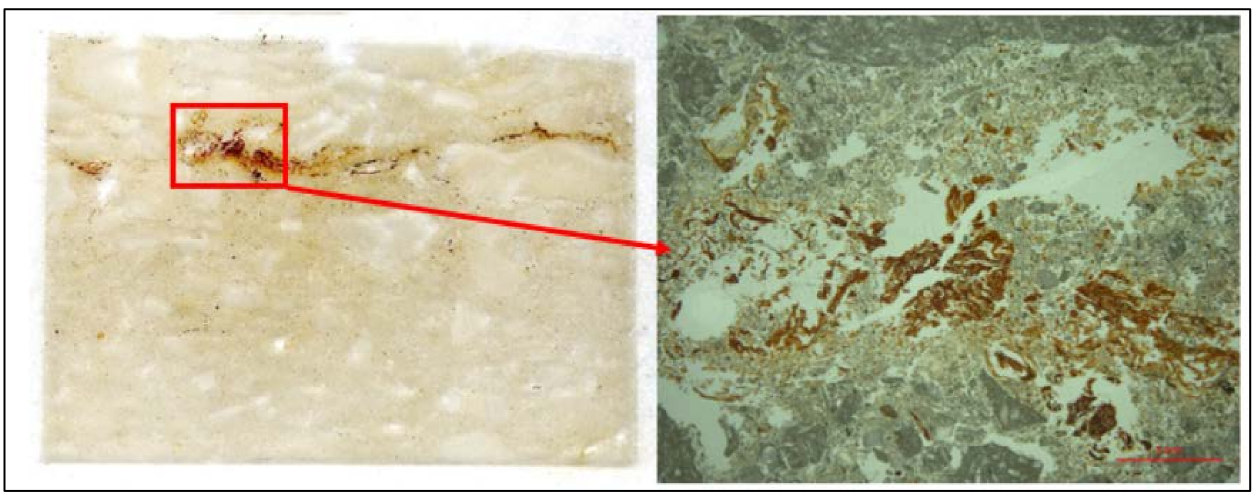


Figure 8.16. PS4 MM2 (FN30694) photo of thin section slide (30694-1) and micrograph image under plain polarized light (scale is 2 mm). Image depicts limestone deposit (S106) with a thin, decomposing fiber lens towards the top of the slide.

The last three chapters have been a presentation of all of the data collected in the field and results of the various analysis conducted as part of my thesis. Chapter 9 will provide some reinterpretations of the general strat types identified in the field based on the results of the various analyses, a discussion of both the sources of sediments that comprise the deposits and the methods of transport of the sediments, and a discussion of the various cultural and natural formation processes that formed and/or reorganized the deposits in the northern sector of Eagle Cave, followed by some overall conclusions. In addition, the various methods used during the recording, sampling, and analyses will be critiqued for their efficacy and usefulness in this type of research.

IX. FORMATION PROCESSES DISCUSSION AND CONCLUSIONS

The overall goal of my thesis work was to use a "microstratigraphic" approach to create a model of the natural and cultural processes that led to the accumulation of the strata in the northern sector of Eagle Cave. Specifically I wanted to try and determine the source of sediments in each stratigraphic layer (i.e., exogenic and/or endogenic), the methods of transport of the sediments (e.g., wind, water, and/or people), and determine what specific processes were responsible for forming and/or reorganizing the deposits (natural, anthropogenic, or both). The microstratigraphic approach involved recording stratigraphy in high resolution (i.e., "splitting" rather than "lumping" strata). In addition, the collection and analysis of micromorph samples allowed for a more detailed examination of in situ stratigraphy and the relationships between various deposits.

The formation processes responsible for the accumulation and reorganization in this area were evaluated using data from stratigraphic documentation, geoarchaeological sampling, artifact analysis, macrobotanical and faunal identification, and radiocarbon dating results. This chapter discusses the various processes evident in the northern sector of Eagle Cave and interpretations of how these processes have worked in tandem to form the complex deposits we see in the archaeological record. In addition, a cluster analysis was conducted using all of the geoarchaeological results from the UT North samples to help identify patterns in the data and aid in redefining some of the general strat types identified in the field. Harris Matrices were also used as a way to organize and illustrate the horizontal and vertical stratigraphic relationships of the deposits and the distribution of the clusters.

In Chapter 1, I introduced the goals of my thesis research, analytic methods used during the strat recording and sampling, and an overview of earth oven technology. Chapter 2 provided an overview of the natural environment (e.g., setting, geology, flora, fauna) and discussed rockshelter formation processes. In Chapter 3, I reviewed previous rockshelter studies conducted in the LPC, with emphasis on previous work conducted within ENC, followed by an overview of the generally accepted cultural chronology for the region. Chapter 4, reviewed models of rockshelter formation and use with emphasis on previous explanations and interpretations of LPC shelters. In Chapter 5, I provided the methodologies used in both the field and in the laboratory during the various analyses. In Chapter 6, I presented a summary of the strat recording and sampling, characterization of the general strat types identified in the field, descriptions of the cultural features identified, and results of the radiocarbon analysis. The results of the bulk matrix sort, macrobotanical conducted by Kevin Hanselka and Leslie Bush, and faunal analysis performed by Christopher Jurgens were presented in Chapter 7 and the results of the geoarchaeological analyses were discussed in Chapter 8. The appendices at the back of this thesis present much of the data used for the various analysis discussions and interpretations in this thesis.

Cluster Analysis

A cluster analysis was done on the raw geoarchaeological data (MS, LOI, P, calcium carbonate, and particle size analysis) to look for patterns within the various strats. In general, a cluster analysis divides data into groups (clusters) that share common characteristics and are different from the other groups (Tan et al. 2006). The analysis requires that you predetermine the number of clusters, so six clusters was arbitrarily picked for the analysis. The ANOVA test run along with cluster analysis indicated that only the MS and particle size analysis data were significant (Appendix F). Additional data (e.g., matrix sort, macrobotanical, faunal analysis data) was not included in the cluster analysis as these types of analyses were only conducted on select strats and the cluster analysis excludes entries (in this case strats) with incomplete data sets.

Overall, the cluster analysis did not work as well as I hoped for two main reasons. First, many of the strats identified in the field were not included in the cluster analysis. Six of the strats were omitted because there was data missing for one of the analyses, however, the remaining strats were not included as they were no longer visible/present in the profiles when the geoarcheological sampling occurred, therefore no geoarchaeological samples were collected. Second, there were some strata that were sampled multiple times (e.g., 2 to 4 cube column samples were collected from thicker deposits) and not all of the samples from the same strat fell within the same cluster. This could be an indication that there was an unidentified strat not visible during the sampling, which would not be surprising as additional strats were occasionally identified during thin section analysis that were not visible in the field. Or, this could reflect the fact that some of the deposits were not homogenized (e.g., the marbleized matrix in S76) and the cube column samples came from parts of the stratum containing different types of sediments and inclusions.

Regardless, the cluster analysis did identify some general patterns within the six different clusters (Figures 9.1 and 9.2; Appendix F). The samples within Cluster 1 (red) were a sandy loam with moderately high MS values. These deposits had a relatively high charcoal and/or charred botanical remains content based on the results of the matrix sort, macrobotanical analyses, and thin section analysis. The Cluster 1 samples are mostly associated with fiber and charcoal lens and refuse middens which have been recategorized as post-oven plant processing and earth oven cleanout refuse as will be discussed in the section below. The sand content is interpreted to derive from sediment intentionally brought in to the shelter to cap earth ovens. The samples from S98, which has been recategorized as a general refuse deposit, also fall within Cluster 1. Although S98 had a lower density of charred botanical remains overall, interior lenses of fiber were identified within S98 during thin section analysis which might explain why the two samples from this strat falls within Cluster 1 (See Figure 8.14). In addition, two samples from limestone spall deposits (S113 and U19 L2) fall within Cluster 1. Disturbances from the previous UT North excavations and subsequent burrowing activities were noted throughout S113 and U19 L2 was collected near F6, a thermally altered layer directly underlying a charcoal rich layer, which may explain the increased MS values for the samples from these strats.

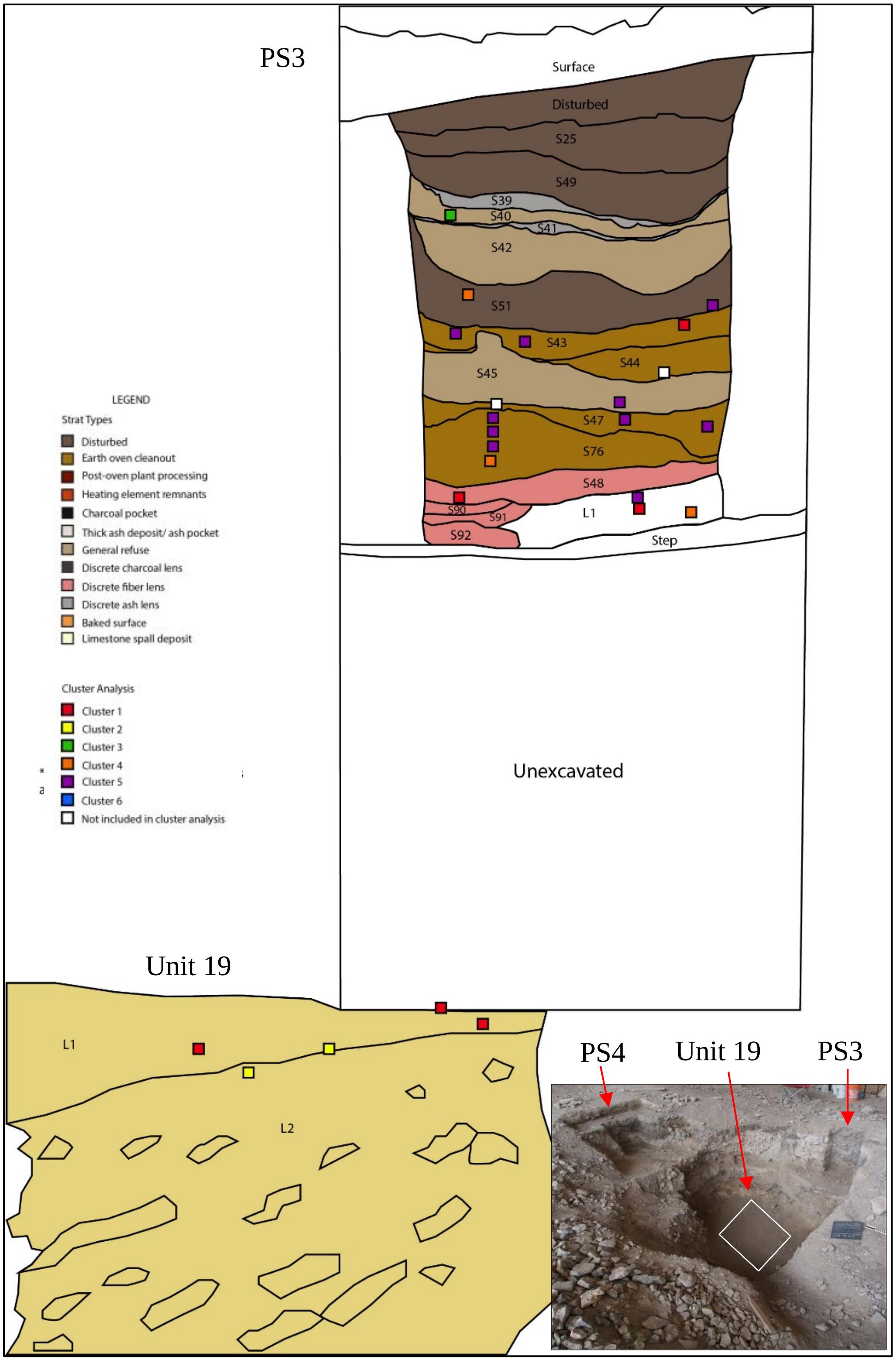


Figure 9.1. Annotated profile of PS3 and U19 depicting recategorized strat types, location of cube column samples, and results of cluster analysis.

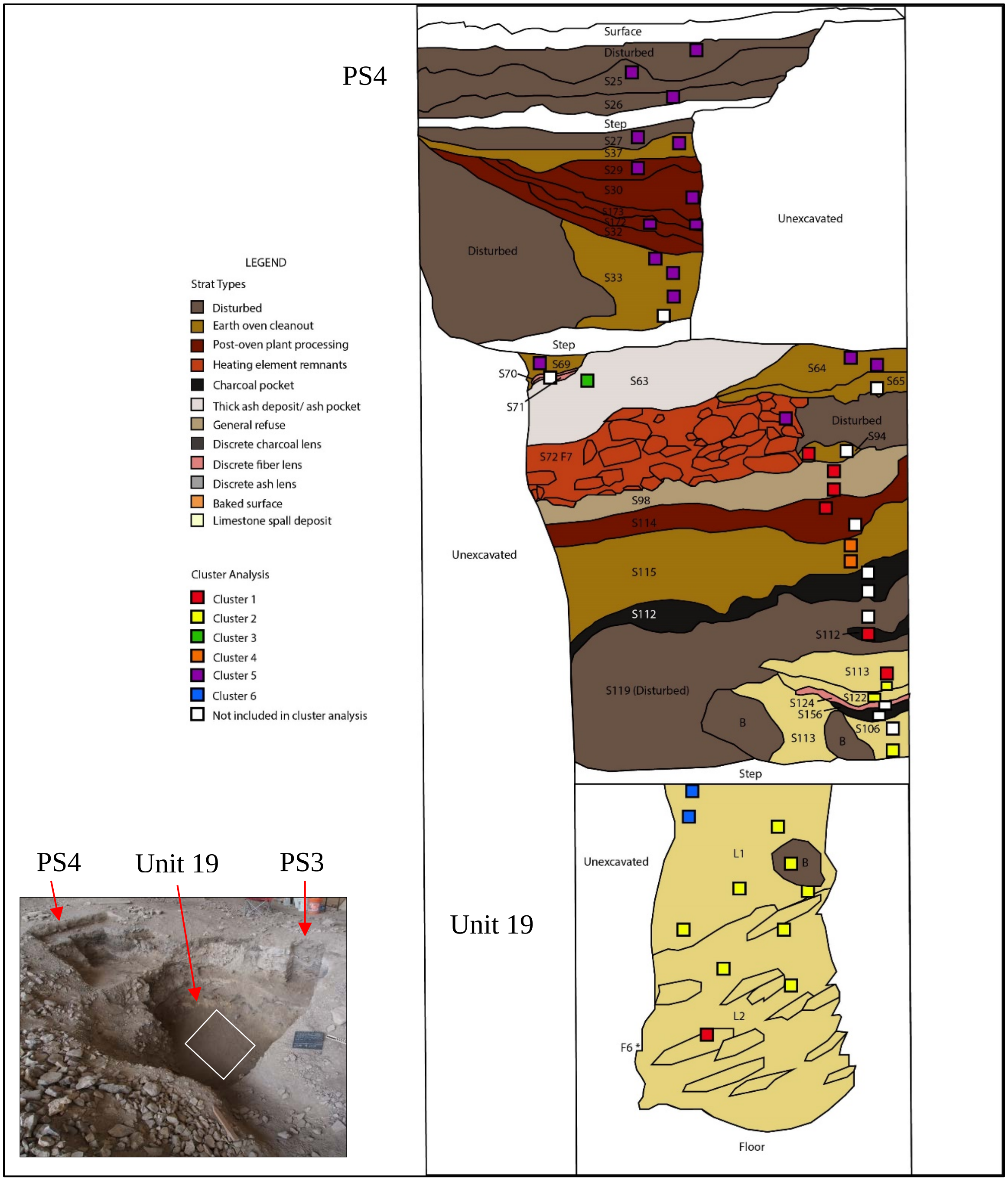


Figure 9.2. Annotated profile of PS4 depicting recategorized strat types, location of cube column samples, and results of cluster analysis.

The samples within Cluster 2 (yellow) were a silt loam with low MS values. These deposits are associated with the limestone spall deposits located towards the base of UT North which contained very little organic material. Only two samples fell within Cluster 3 (green) which was a sandy loam with moderately high MS values. One of these strats (S63) was the only "thick ash deposit" that actually contain significant amounts of ash (~50 percent) based on the thin section analysis, although charred botanical remains and other cultural materials were present within the matrix, which will be discussed in detail below. The second sample was from S40, which was initially characterized as a thick ash deposit but has now been recategorized as a general refuse deposit due to the low ash content (~15 percent) observed in the thin section analysis and low density of burned rock and charred organics. However, this strat is situated between two discrete ash lenses (S39 and S41) and it is possible that some of the matrix may have mixed during sampling which may account for why this sample falls within a cluster with a deposit containing lots of wood ash. Additional cluster analyses incorporating samples from other areas in Eagle Cave could help test if this cluster is grouping deposits with high wood ash content.

The samples from Cluster 4 (orange) were also a sandy loam with moderately high MS values, though the samples in Cluster 3 contained more sand content. The Cluster 4 samples fall within two different strat types including disturbed deposits and refuse middens which have been redefined as earth oven cleanout refuse. Both of these types of deposits contained wood charcoal, charred organic materials, and a mixture of silt- and sand- sized particles. The samples from Cluster 5 (purple) were a silt loam with high MS values. Similar to Cluster 4, there was quite a bit of variability in the types of deposits within this cluster, however most of the deposits were refuse middens or thick ash deposits recategorized as post-oven plant processing or earth oven cleanout refuse with variable amounts of sand- and silt- sized particles. Finally, Cluster 6 (brown) was sandy loam with very high MS value. The only two samples that fall within this cluster are from limestone spall deposits at the top of U19 L1 that exhibited extensive disturbance from the previous UT North excavations.

General Strat Types Redefined

The approximately 75 strats defined, recorded, and sampled in UT North, which I have described and illustrated in Chapter 6, were initially categorized into "general strat types" to allow for easier comparison during the various analyses, and all of the preceding chapters and appendices used these initial strat categorizations. The general strat types identified in the field included: 15 refuse middens, 16 discrete charcoal/fiber lenses, 10 thick ash deposits, 3 ash pockets, 4 discrete ash lenses, 3 charcoal pockets, 3 earth oven heating elements, 3 baked surfaces, 8 disturbed fill deposits, and 9 limestone spall deposits (Table 9.1). As discussed in Chapters 7 and 8, the results of the various analyses revealed that some of the general strat types, namely the "thick ash deposits", were not valid characterizations of the deposits. In addition, the "refuse midden deposit" strat type was a broad category used for deposits containing a myriad of inclusions including earth oven cleanout debris, post-oven plant processing debris, and general refuse related to other activities (e.g., lithic reduction, faunal processing). A brief discussion of the expected and observed physical and chemical characteristics of each

Table 9.1. General Strat Type and Recategorized Strat Type Summary Table.

General Strat Type	No. of Strats Identified	Associated Strat Numbers Based on Field Observations	Recategorized Strat Type	No. of Recategorized Strats	Associated Strat Numbers Based on Recategorizations
Thick Ash Deposit	10	S33, S37, S40, S42, S43, S45, S63, S68, S69, S115	**Thick Ash Deposit**	1	S63
Discrete Ash Lens	4	S39, S41, S67, S99	**Discrete Ash Lens**	4	S39, S41, S67, S99
Ash Pockets	3	S96, S117, S127	**Ash Pockets**	3	S96, S117, S127
Heating Element	3	S34 (F2), S46 (F3), S72 (F7)	**Heating Element**	3	S34 (F2), S46 (F3), S72 (F7)
Refuse Midden	15	S29 (F2), S30, S32, S35 (F2), S44, S64, S65, S66, S76, F1, S94, S97, S98, S172, S173	**Earth Oven Cleanout**	14	S33, S37, S43, S44, S47, S64, S65, S66, S68, S69, S76, S94, S98, S115
			Post-oven Plant Processing Refuse	7	S29 (F2), S30, S32, S35 (F2), F1, S172, S173
			General Refuse	4	S40, S42, S45, S97
Limestone Spall	9	S100, S106, S113, S121, S122, S126, S157, U19 L1, U19 L2	**Limestone Spall**	9	S100, S106, S113, S121, S122, S126, S157, U19 L1, U19 L2
Disturbed Context	8	S25, S26, S27, S49, S51, S118, S119, S120	**Disturbed Context**	9	S25, S26, S27, S49, S51, S105, S118, S119, S120
Baked Surface	3	S53 (F4), S61, S104	**Baked Surface**	5	S53 (F4), S61, S62, S104, S124
Charcoal Pockets	3	S102, S112, S156	**Charcoal Pockets**	3	S102, S112, S156
Discrete Charcoal/Fiber	16	S28, S31, S36 (F2), S47, S48, S62, S70, S71, S90, S91, S92, S101, S105, S114, S123, S124	**Discrete Charcoal**	3	S36 (F2), S101, S123
			Discrete Fiber	9	S28, S31, S48, S70, S71, S90, S91, S92, S114

general strat type is presented below along with a recategorization of the strats initially defined in the field (Table 9.2; see Figures 9.1 and 9.2).

Refuse Middens. The refuse midden deposit was a catchall category for deposits composed of a mixture of cultural materials (e.g., burned rock, charcoal, fiber, lithics, and/or wood ash). A total of 15 refuse midden deposits were initially recorded in the field (see Table 9.1). These deposits appeared darker in color than the thick ash deposits and were presumed to contain large quantities of charred botanical remains. However, as will be discussed below, all but one of the 10 "thick ash deposits" contained a similar mixture of cultural materials, large quantities of charred botanical remains, and very little wood ash and were more indicative of refuse midden deposits than of an ash deposit. Based on these recategorization, a total of 25 refuse midden deposits were identified within UT North. However, as this strat type encompasses a wide variety of types of refuse, the strat type has been further divided into three types including: earth oven cleanout refuse, post-oven plant processing refuse, and general refuse (see Table 9.2).

Earth Oven Cleanout Refuse. A total of 14 strats were redefined as earth oven cleanout refuse deposits (see Table 9.2). In general, these deposits contained a high to moderate density of burned rock and angular to subangular wood charcoal with a low density of other artifact classes. For example, the density of burned rock in S37 was 210 g/L while other artifact classes (e.g., debitage and bone) were less than 3 g/L. As

Table 9.2. Recategorized Strat Type Summary Table.

Recategorized Strat Type	Associated Strat Numbers Based on Recategorizations	Observed Physical Characteristics	Observed Chemical Signatures			
			Organic Carbon	**Magnetic Susceptibility**	**Phosphorus**	**Calcium Carbonate**
Thick Ash Deposit	S63	Low charcoal density in bulk matrix sort, small (<4mm) charcoal and charred botanical remains, 50percent wood ash and some wood ash lamina in thin section	Low to Moderate	High	High	High
Discrete Ash Lens	S39, S41, S67, S99	Charcoal flecking (few large fragments), few burned lithics and bone, wood ash lamina present	Low to Moderate	High	High	High
Ash Pockets	S96, S117, S127	Homogenized matrix, wood ash mixed throughout,	Low to Moderate	High	High	High
Heating Element Remnant	S34 (F2), S46 (F3), S72 (F7)	Clast-supported burned rock, dark, charcoal-rich matrix, charred botanical remains	High	High	High	Low
Earth Oven Cleanout	S33, S37, S43, S44, S47, S64, S65, S66, S68, S69, S76, S94, S98, S115	High density burned rock, angular to subangular charcoal, charred botanical remains	Moderate to High	Moderate to High	Variable	Low
Post-oven Plant Processing Refuse	S29 (F2), S30, S32, S35 (F2), F1, S172, S173	High density charred botanical remains, low density burned rock and wood charcoal, interior lenses of charred botanical in thin section	Moderate to High	Moderate to High	Variable	Low
General Refuse	S40, S42, S45, S97	Diverse artifact assemblage, rounded charcoal from bioturbation, homogenized matrix	Moderate to High	Moderate to High	Variable	Variable
Limestone Spall	S100, S106, S113, S121, S122, S126, S157, U19 L1, U19 L2	Small artifacts from vertical displacement, high density of unburned limestone	Low	Low	Low	High
Disturbed Context (burrow, intrusion)	S25, S26, S27, S49, S51, S105, S118, S119, S120	Small artifacts from vertical displacement and/or diverse artifact assemblage, homogenized matrix, distinct color difference from surrounding strats	Moderate to High	High	Moderate to High	Variable
Baked Surface	S53 (F4), S61, S62, S104, S124	Compacted sediment with fiber and charcoal	Moderate to High	High	High	Moderate
Charcoal Pockets	S102, S112, S156	Subangular to subrounded wood charcoal	High	High	High	Moderate
Discrete Charcoal Lens	S36 (F2), S101, S123	Thin lenses of charcoal	High	High	High	Moderate
Discrete Fiber Lens	S28, S31, S48, S70, S71, S90, S91, S92, S114	Thin lenses of fiber similar to post-oven plant processing refuse	High	High	High	Moderate

mentioned in Chapter 7, the faunal analysis conducted on materials from refuse midden deposits (now earth oven cleanout refuse deposits) revealed burning patterns consistent with discard activities. In other words, the bones were thermally altered subsequent to discard, rather than intentionally heated. Wood ash was identified mixed in with the other constituents in the thin section analysis of some of the earth oven cleanout refuse deposits, however no lamina or evidence of in situ burning was observed (see Appendix E.2). As discussed in Chapter 8, there was some variation in the MS and Phosphorus values in the refuse midden deposits, however in general, these values were elevated in comparison to deposits containing little organic material and lacking evidence of thermal alteration (i.e., limestone spall deposits).

Post-oven Plant Processing Refuse. A total of seven strats were recategorized as post-oven plant processing refuse deposits (see Table 9.2). In contrast to the earth oven cleanout refuse, these deposits contained high densities of charred botanical remains and subrounded to rounded charcoal, and lower densities of burned rock and other inclusions. Prime examples of these types of deposits are the strats associated with F2 (S29, S30, S35, S172, and S173) discussed in Chapter 6. F2 is a fiber-filled pit with layers of charred and partially charred botanical remains. The density of the botanical remains is a bit misleading (only 2.7 g/L based on the S29 matrix sort) as the remains do not weigh very much, but based on visual assessment of the strats in the field and during the bulk matrix sorts, the botanical remains appeared to comprise 50 to 75 percent of the inclusions within the matrix.

General Refuse. The four strats recategorized as general refuse deposits included those strats that contained high densities of lithics and bone and lower densities of burned rock and charred botanicals (as compared to the earth oven cleanout deposits) (see Table 9.2). An example of a general refuse deposit is S42, a strat initially defined as a thick ash deposit due to its ashy appearance in the field. The matrix sort of S42 revealed a high density of debitage (36 g/L), lithic tools (31g/L) and pebbles/manuports (60 g/L) along with a low density of bone, snail shell, charcoal, and limestone spall. Burned rock was present (33 g/L), however the low charcoal density (0.93 g/L) and lack of botanical remains within the matrix suggest the rocks were a result of discard rather than cleanout of an earth oven feature (see Appendix B).

Discrete Charcoal and Fiber Lenses. Based on the results of the analyses, the discrete charcoal and fiber lenses appear to be <2 cm thick layers of refuse resulting from the infilling of pits. A total of 16 discrete charcoal and fiber lenses were initially recorded in the field, however two of these (S62 and S124) were redefined as baked surfaces, one (S47) was redefined as an earth oven cleanout deposit, and one (S105) was determined to be from a disturbed context (see Tables 9.1 and 9.2). After recategorization, the 12 discrete charcoal and fiber lenses were further split into two strat types: discrete charcoal lenses and fiber lenses based on the presence of primarily charcoal or charred fiber and botanical remains. The discrete charcoal lenses are hypothesized to be remnants of earth oven cleanout deposits and the fiber lenses are associated with post-oven plant processing. As discussed in Chapter 8, the thin section analysis revealed the lenses contained approximately 50 to 75 percent wood charcoal and/or fiber (charred or partially charred) with 1 to 15 percent wood ash and very few other inclusions (e.g., limestone spall, burned rock, bone).

Thick Ash Deposits. A total of 10 strats were characterized as thick ash deposits in the field based on the presumed predominance of wood ash. However, the results of the various analyses determined that the constituents within the thick ash deposit matrix to be very similar to the refuse midden deposits (e.g., burned rock, charcoal, and fiber). In addition, the thin section analysis discussed in Chapter 8, revealed that the actual percentages of wood ash within all but one of the 10 strats characterized as "thick ash deposits" was quite low (5 to 15 percent). As such, 9 of the 10 thick ash deposits have been recategorized as refuse midden deposits (see Tables 9.1 and 9.2). The only strat that is now classified as a thick ash deposit is S63.

The thin section analysis of S63 revealed over 50 percent wood ash in the deposit along with 5 to 15 percent rounded to subrounded limestone, 1 to 5 percent rounded wood charcoal, and 1 to 5 percent calcined bone, burned rabdotus shell, and charred and decomposing fiber (see Appendix E.2). Not surprisingly, S63 had one of the lowest LOI percentages, as the majority of organic materials were already ashed, and high MS and Phosphorus values indicative of cultural activities involving thermal alteration.

Similarly, the bulk matrix sort identified a wide variety of inclusions in the deposits thought to be mostly ash. Burned rock fragments were common (60 to 95 percent in 4 mm sieve) in most of these deposits along with charred botanical remains suggesting these deposits are more likely refuse midden deposits resulting from cleanout of thermal features (e.g., earth ovens). Our estimations of ash content in the various strats during field recording was skewed due to the prevalent dust at the site, however, the bulk matrix sort and thin section analyses helped to recategorize these deposits.

Discrete Ash Lenses. A total of four discrete ash lenses were identified in the field (see Table 9.1). Unlike the thick ash deposits, the thin section analysis of the discrete ash lenses (<2 cm) determined that these deposits contained over 50 percent wood ash. As illustrated and discussed in Chapter 8, lamina of ash were observed in thin section under magnification suggesting these deposits are remnants of in situ open-aired heating events rather than residual from cleanout like the thick ash deposits. Similar trends were seen in the LOI, MS, and Phosphorus results with LOI values being on the lower scale and higher MS and Phosphorus signatures. The best documented examples of discrete ash lenses were S39 and S41 (see Figure 8.15). In thin section, both strats (S39 and S41) contained almost no coarse fractions and had interior lamina (~ 2 mm thick) of wood ash representative of in situ burning (see Appendix E.2).

However, the bulk matrix sort identified high percentages of burned rock (55 to 80 percent) in the discrete ash lenses, followed by lithics (5 to 25 percent), unburned limestone spall (1 to 17 percent), and occasional pebbles, bone, shell, and charred botanical remains (see Appendix B). During strat sampling, it was sometimes difficult to separate the thin ash lenses from the thicker "ash" deposits, so it is quite likely that some of the bulk matrix samples are a mixture of the two types of deposits, which would explain the presence of high quantities of burned rock not observed in the thin section analysis.

Heating Elements. The three earth oven heating element remnants identified in the field consisted of relatively large, clast-supported or closely spaced FCR enveloped by a dark, charcoal-rich matrix. All of the heating elements encountered in UT North had been truncated either by prehistoric pit digging or previous excavations. The best example of this type of deposit was S72 (F7), which is discussed in the Feature Description section in Chapter 6. The feature was comprised of medium-sized burned rock (~5–11 cm in diameter) enveloped by a dark-colored, homogenized midden fill with fiber, bone, and charcoal (see Figure 6.17). The feature had been truncated on the west edge by animal burrowing activities and on the east edge by the 1963 UT excavations. The remaining portion of the feature consisted of three layers of clast-supported burned rocks, some of which were fractured in situ, that sloped down to the east towards the apparent center of the oven pit. Angular charcoal was present both above and below the feature rocks, suggesting F7 is an in situ combustion feature rather than a reworked combustion feature which would contain more rounded charcoal (Mentzer 2012). The feature is interpreted to represent remnants of several heating elements that were built in succession.

Baked Surfaces. Three strats were initially identified as baked surfaces in the field, however, two additional strats (S62 and S124) were recategorized from discrete fiber/charcoal lens to baked surfaces, for a total of five baked surfaces identified (see Tables 9.1 and 9.2). The baked surface deposits consisted of compacted, thermally altered sediments that are interpreted to be surfaces on which open-aired fires were built. Strats S62 and S124 were described in the field as oxidized soils with fiber and charcoal inclusions so they were initially placed in the discrete fiber/charcoal lens category. However, as these are thermally altered sediments, the baked surface category seems more appropriate.

The best example of a baked surface is S53, as discussed in Chapter 6. The baked surface of S53 (F4) was a reddish brown fine silt loam with dense inclusions of charred fiber and wood charcoal, bone, and burned rabdotus snail shell fragments (see Figure 6.16). In thin section, a concentration of subrounded to subangular wood charcoal (25–50 percent) was noted in the upper portion of the strat and wood ash (5–15percent) was observed below the charcoal lens (see Appendix E.2). The bulk matrix sort of S53 identified burned rock fragments (approximately 80 percent) in the 1” the 4 mm size sieves along with charred botanical remains (14 to 19 percent) and a few flakes, bone, and shell (1 to 5 percent) (see Appendix B). However, as mentioned in Chapter 6, it was difficult to discern the separation between S53 and the underlying S62 during sampling, therefore portions of both S53 and S62 were included in the matrix sample for F4.

Pockets. The “pocket” category was used for deposits that were truncated by disturbance (e.g., animal burrowing) and thus appeared in profile as isolated pockets of either ash, fiber, or charcoal. A total of three ash pockets and three charcoal pockets were identified in the field (see Table 9.1). As mentioned in Chapter 6, these essentially represent truncated versions of the other various strat types and had similar characteristics. Unfortunately not many of the pockets were sampled as most were in proximity to burrows, and intact matrix was difficult to separate from the disturbed matrix.

Limestone Spall Deposits. The limestone deposits are naturally formed, basal deposits above which all the other strats previously discussed were formed. These deposits contain primarily limestone spall in varying stages of degradation and very few, if any, cultural inclusions. A total of nine limestone deposits were identified in the field (see Table 9.1).

The lowest deposits at the site (i.e., U19 L2, which is ~3 m below surface) consisted primarily of large, clast-supported angular limestone spalls. However, at the base of PS3 and PS4, the clasts in the limestone deposits are much finer. For example, as illustrated and discussed in the Micromorph and Thin Section Analysis section of Chapter 8, the coarse fraction of S106 observed in thin section analysis contained two limestone rock populations, approximately 50 percent were 5 to 10 mm thick subangular to subrounded limestone fragments and 30 percent were smaller 2 to 4 mm subangular limestone fragments (see Appendix E.2). A decomposing fiber lens and some very small fiber flecks were observed in thin section as well as a few small animal bone fragments (<4mm), but no other cultural inclusions were identified. The bone and fiber may have been introduced into the deposits from bioturbation as S106 was surrounded by both burrows and disturbance from the previous UT North excavations. The limestone deposits had significantly lower LOI, MS, and Phosphorus levels in comparison to the other deposits, as there was little organic material or cultural materials aside from those introduced by burrowing activities and other disturbances (e.g., 1963 UT excavations).

Of note, the bulk matrix sort for S106 revealed over 9 percent of the 1” size sieve consisted of unburned limestone spall, however the 4 mm size sieve consisted of 50 percent spall and 50 percent cultural materials (e.g., burned rock, botanical remains, lithics) suggesting more disturbance occurred than what was observed in the thin section (see Appendix B). The micromorph samples were collected after the strat sampling was completed, so it is likely that that the micromorph sample is from a somewhat more intact portion of S106 while the bulk matrix sample was from a more disturbed context.

Formation Processes

The following section reviews the various processes related to the formation of the UT North deposits. An overview of the source of the sediments in UT North and the methods of transport into the rockshelter is presented, followed by a brief overview of the Harris Matrix method utilized and a discussion of the cultural and natural processes responsible for forming and/or reorganizing the deposits.

Sources of Sediments and Methods of Transport. As discussed in Chapter 2, sources of sediments in a rockshelter can originate from within (endogenous) the shelter itself (e.g., minerals and attrition from the shelter walls) or from outside (exogenous) the shelter (e.g., aeolian, biogenic, or anthropogenic deposits) (Goldberg and Macphail 2006:175). Sediments are transported into rockshelters by agents such as wind, water, humans, and animals. Anthropogenic sediment components (e.g., charcoal, lithics, foodstuffs) are transported into the shelter by people and biogenic sediments (e.g., feces, plant materials) are derived from animals that inhabit the rockshelters. Other common transportation processes include wind (silt- and clay-sized grains) and water (small gravels, sand, silt, and clay) (Butzer 1982; Farrand 2001b; Goldberg and Macphail 2006; Stein 2001:12).

The sediments in UT North originated from a mixture of these sources. Internally derived sediments (limestone spall and silt-sized particles) were present in varying quantities in many of the deposits but were most prominent in the lower limestone spall deposits (e.g., S106, U19) in the northern sector of Eagle Cave (approximately 2 to 3 m below surface). As mentioned in Chapter 5, calcium carbonate is a common component of both limestone and wood ash. As such, the high percentages of calcite identified in the XRD and calcium carbonate analysis samples can be attributed to two processes; weathering of the naturally occurring limestone and cultural activities resulting in residual wood ash (i.e., heating events) (see Appendix E.1; Figures 8.6 and 8.8). As discussed, the amount of wood ash in the UT North deposits was not at prevalent as initially thought, so while some of the calcite can be attributed to residue from cultural heating events, most of the calcite was likely internally derived from the limestone of the rockshelter walls.

Results of the XRD and particle size analyses also indicate that many of the minerals and grains in the sediments are externally derived. For example, the minerals quartz, K-feldspar, and plagioclase identified in the XRD do not occur in the limestone in Eagle Cave but are present in Rio Grande alluvium and could have arrived in the shelter a number of ways (i.e., wind, water, people, or animals). As mentioned in Chapter 5, Frederick (2017) has determined that Rio Grande flood waters could have reached Eagle Cave in the Holocene and if so it is possible that the alluvium in UT North came from flood deposits that have been reworked and reorganized through biological and anthropogenic processes. Given the lack of obvious flood drapes like those observed in Skiles Shelter and Kelley Cave, and the presence of large quantities of refuse associated with earth oven cooking (e.g., heating elements, charred botanicals, burned rock), the external minerals were probably derived from alluvium brought in by humans intentionally to cap earth ovens. As discussed in Chapter 6, rounded pebbles, which do not naturally occur in the shelter, were identified in many of the 4 mm size sieve bulk matrix fractions which would support the idea that humans were intentionally bringing sediment into the shelter.

As Stein (2001:13) points out, size is one of the most useful attributes in a sediment used to determine transport; in general, the larger the size of an object, the more force it takes to pick it up and move it (i.e., overcome gravity). Stein (2001:14) further notes that you have to compare the sizes of all of the particles in a deposit to fully understand the transportation processes. The particle size analysis of the UT North deposits support the fact that the sediments are derived from different sources and were introduced into the shelter by a variety of methods. The particle size analysis identified a trend of bi-modal peaks in the very fine sand range (3.9 phi), which may represent alluvium brought in by people, and coarse silt ranges (4.05 and 4.18 phi), suggesting eolian processes (i.e., wind) have also contributed to the accumulation of the deposits.

The surface of the rockshelter and nearly all of the stratigraphic layers (aside from the natural spall layers) contain a myriad of cultural artifacts (e.g., rock, fuel, transported sediment, botanical remains, faunal remains, lithics debris and tools). Animals have also contributed to the sediments in UT North as evidenced by fecal matter observed both during strat sampling and in some of the thin section slides. During strat sampling, goat and sheep dung was observed mixed in with cultural material (e.g., lithics, fiber, bone, FCR) in the uppermost disturbed deposit in both PS3 and PS4 (S25 and S26). Since we knew this excrement was deposited during historic times when sheep and goat were penned up in Eagle Cave, we were able to use the dung as an indicator of more recent disturbances which helped in our efforts to remove the disturbed fill and locate seemingly intact stratigraphy. During the thin section analysis, excrement was observed in many of the slides (i.e., S40, S42, S45, S47, S76, S53, S63, S65), most was fairly small (size) and are probably small-sized mammal feces, probably from the rodents that likely inhabited the cave heavily at times when humans were not present (e.g., Rodriguez 2015:166).

Harris Matrix

Due to the amount of pit digging, cleanout, and bioturbation in the northern sector of Eagle Cave, the site stratigraphy is not what anyone would call “layer-cake stratigraphy” (i.e., older stratigraphic layers continuously covered by younger deposits resulting in a “layer-cake” that can be taken apart in layers to determine the stratigraphic sequence). Instead, the reorganization of deposits from cultural activities and bioturbation, can lead to older artifacts and botanical remains being redeposited into younger cultural deposits, making correlation of the site stratigraphy and temporal relationships difficult to understand. To aid in this, the Harris Matrix approach developed by Edward C. Harris in 1973, was used to organize the stratigraphic data and show the horizontal and vertical relationships of each stratum in UT North (Harris et al. 1993). Temporally diagnostic artifacts and radiocarbon data corresponding to each stratum were included in order to visually depict strata that may have been stratigraphically displaced. As Goldberg and Macphail (2006:40–41) point out, it can be difficult to create an accurate representation of the true complexities, ambiguities, and relationships of stratigraphic deposits in intensively occupied sites using the Harris Matrix. This is very true, and while the Harris Matrix I have produced is by no means a perfect representation of the stratigraphic relationships exposed in UT North, it serves as a useful tool to visualize the relationship of the various deposits (Figure 9.3 and 9.4).

The symbology used in the Harris Matrix Composer program is fairly simple. The ground surface is denoted as a green circle with a "T". Each subsequent stratigraphic layer is depicted in boxes color coded according to strat type with strat numbers labeled (and feature number if applicable). The gray box indicates the portion of the site that has not been excavated, and the "G" denotes the underlying geologic formation (e.g., bedrock). The arrows indicate the relationships between the deposits and consist of only two valid stratigraphic relations: they are in superposition (i.e., A is above or below B), or they are not in superposition (no stratigraphic relationship) (Harris et al. 1993). The

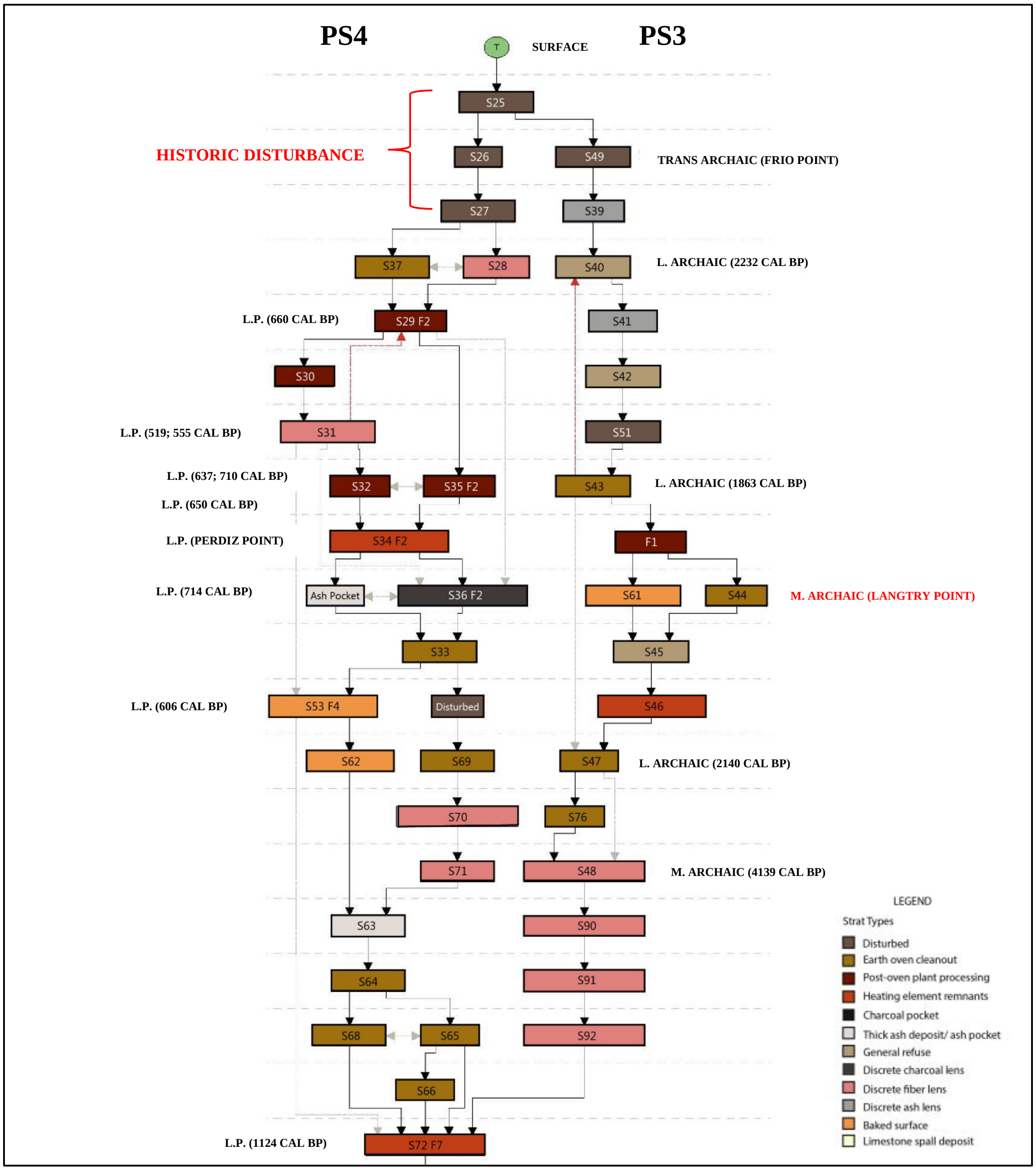


Figure 9.3. Harris Matrix of UT North, upper deposits in PS3 and PS4. Dates are given in median cal BP (OxCal V4.2.4). Location of historic disturbances are bracketed in red. Time periods and dates in red represent apparent later materials (i.e., projectile points or dated organic materials) that have been introduced into lower deposits through disturbance.

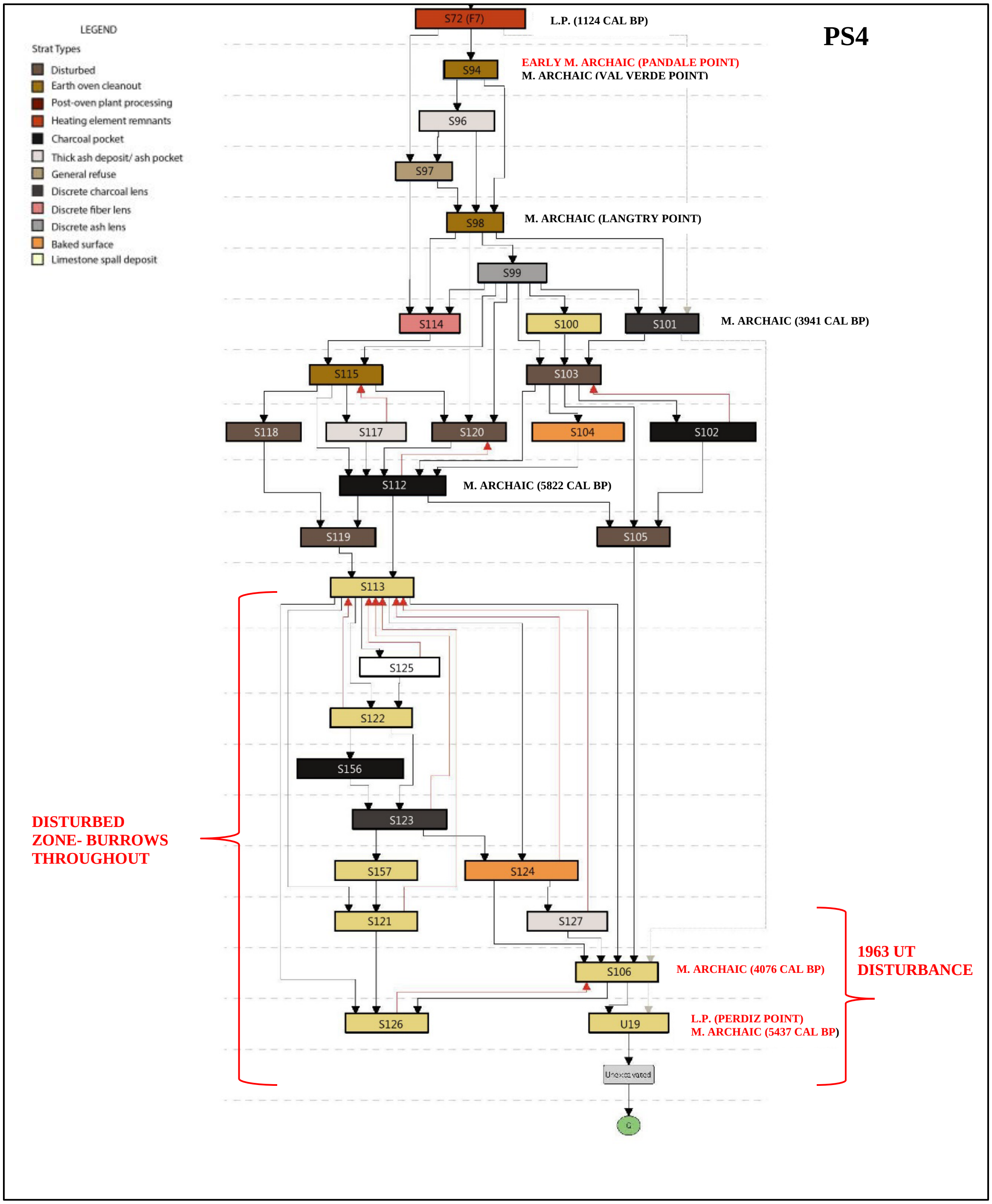


Figure 9.4. Continuation of Harris Matrix of UT North, lower deposits in PS3. Dates are given in median cal BP (OxCal V4.2.4). Locations of extensive disturbances from the previous UT excavations and area with the most animal burrowing disturbances are bracketed in red. Time periods and dates in red represent apparent later materials (i.e., projectile points or dated organic materials) that have been introduced into lower deposits through disturbance.

black arrows are an indication of the superposition and point down to the underlying strat(s). The red arrows indicate “invalid” stratigraphic relationships, such as deposits determined to be out of stratigraphic order based on diagnostic artifacts and radiocarbon dates. Due to the immense amount of burrowing in the lower portions of the profile, many of the strats appeared as discontinuous pockets completely engulfed by another strat. These pockets were also deemed “invalid” and are also denoted with red arrows.

Natural and Cultural Formation Processes

Results of the analysis discussed in Chapters 6, 7, and 8, indicate the deposits are comprised of natural sediments derived from inside and outside the shelter (e.g., limestone spall, aeolian silt- and sand-sized grains), biogenic deposits derived from animals (e.g., feces, bone), and anthropogenic materials brought in to the shelter by humans (e.g., rock, fuel, botanical remains, faunal remains, lithics debris).

The lowest deposits in the northern sector of Eagle Cave (approximately 3 m below surface) in U19 are a result of natural formation processes (i.e., differential weathering of the limestone). Large, angular limestone spalls (éboulis) that have detached from the rockshelter wall accumulated on the floor of the shelter (Figure 9.5). Above the roughly 1-m-thick layer of angular spalls in U19 L1, smaller limestone fragments and finer sediments (i.e., limestone dust) have accumulated. As mentioned in Chapter 5, Robinson (1997:41) argued that due to fluctuating temperature and humidity, larger and more numerous spalls were observed in the Late Pleistocene deposits at Bonfire Shelter, whereas the accumulation of finer sediments was more prevalent in the

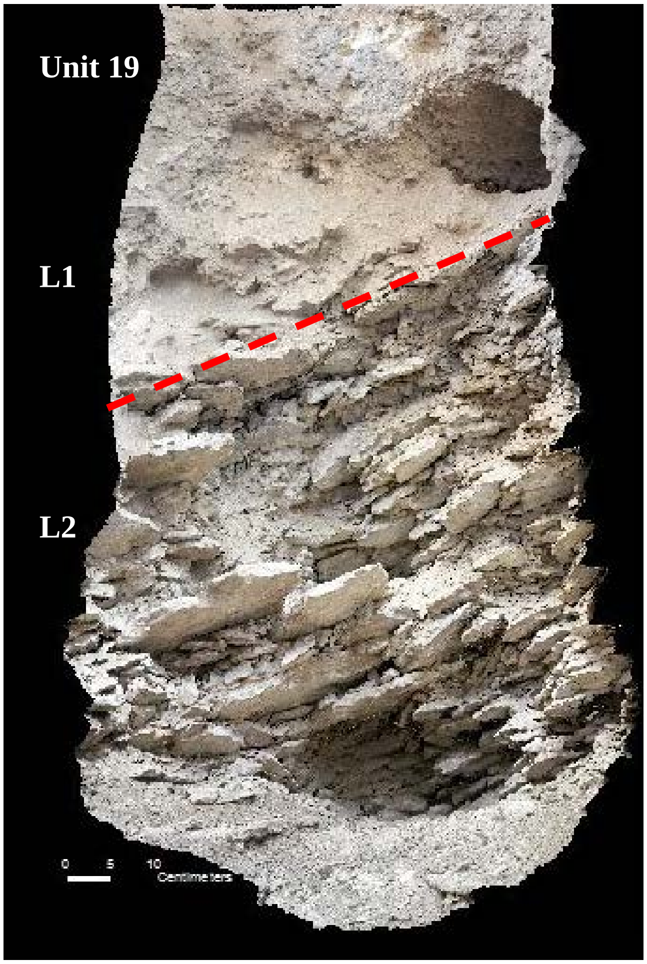


Figure 9.5. Ortho photo of south wall of Unit 19 located approximately 2–3 meters below surface. Photo depicts finer limestone fragments and sediments in L1 and large angular limestone clasts in L2. These deposits were characterized as limestone spall deposits in the field.

Holocene and likely related to weathering activities such as hydration (solution weathering). The deposits in Layer 1 have been dated to the Holocene, however it is unknown if the limestone spall in Layer 2 are Holocene or Late Pleistocene-age deposits. Results of the bulk matrix sort and rock sort indicate that natural limestone spall is present in a vast majority of the rest of the deposits in UT North, however the natural spall is mixed with cultural materials and comprises much small percentages of the overall deposits as compared to the lower deposits (see Appendix B).

In addition, bioturbation from animal and rodent burrowing was observed in both of the Profile Sections. The most prevalent burrowing disturbances were noted toward the surface and at the base of the profiles, however smaller intrusions from insects and rodents were observed throughout both PS3 and PS4. As mentioned in Chapter 6, the lowest profile face in PS4 was in proximity to the previously excavated UT unit providing an easy entrance point for burrowing animals over the past 50 years. Schiffer (1987:259) points out that since animals live and die in all types of environments, their bones also find their way into archaeological site deposits. Rodent bones were identified in several strats (S33, S39, S40, S41, S42, S49, S97), all of which were either ash deposits, refuse midden deposits, or disturbed deposits (see Appendix D). Some of these bones may have been discarded by humans after consumption of the rodents, however, S39, S40, S42, and S49 also contained rodent-sized animal dung, suggesting the rodent bones in those strats may not have been deposited from cultural processes. In addition, animals often bring in plant materials and other materials (e.g., seeds), which may account for some of the unburned seeds and acorns identified in some of the matrix samples (e.g., S49, S35) (see Appendix B).

The anthropogenic materials in the sediments in UT North were brought into the shelter by humans to use in the construction of earth ovens and other types of fires (e.g., rock, fuel, alluvium to cap earth oven), for plant baking and processing (i.e., botanical remains), for animal butchering, consumption, and tool manufacture (i.e., faunal remains), and stone tool production (i.e., lithics debris and tools). All of these activities produce refuse that may be discarded at the location of use (i.e., primary refuse) or may be discarded or moved elsewhere (i.e., secondary refuse) (Schiffer 1987:58). Evidence of both types of refuse are present in the deposits in the north sector of Eagle Cave. For example, discrete ash lenses are remnants of in situ heating events that have not undergone cleanout and would be primary refuse. Heating element remnants, consisting of rocks that fractured in situ after being used in an earth oven, are also an example of primary refuse. In contrast, cleanout from thermal features such as the earth oven cleanout deposits are secondary refuse as the debris has been removed from the initial earth oven pit and redeposited elsewhere. The reorganization of deposits in the northern portion of the rockshelter is primarily a result of prehistoric cleanout activities and pit digging, although bioturbation from animal burrowing has contributed a substantial amount of reorganization, especially in the lower deposits. These specific types of cultural activities leave a distinctive signature in the archaeological record and have been summarized in the previous discussion of strat types.

The results of the macrobotanical analysis, presented in Chapter 7, revealed wood and wood charcoal, nut fragments, and seeds and fruits were the most common plant materials identified in the deposits in the northern sector of Eagle Cave (see Appendix C). The matrix surrounding heating elements and the earth oven cleanout refuse deposits contained primarily wood charcoal, indicative of fuel refuse from earth oven cooking. The majority of the walnut fragments were also recovered in association with heating element feature matrix, and almost all were completely carbonized suggesting they were burned subsequent to discard rather than intentionally roasted. The general refuse deposits contained mixtures of carbonized, partially carbonized, and uncarbonized seeds and fruits with some wood charcoal and smaller miscellaneous plant materials, which is consistent with a mixed cleanout deposit. The fiber fill of F2 (a rock-lined fiber filled pit) contained mostly semi-carbonized leaves (lechuguilla or yucca) and fruit and seeds (yucca and sotol) indicative of plant processing discard.

As discussed in Chapter 7, the analysis of the faunal remains recovered from the deposits in the northern sector of Eagle Cave indicate a range of small- and medium-sized mammals were being consumed, with rabbit and deer comprising the bulk of the identifiable assemblage through time followed by fish, canine, reptile, turtle, rodent, and bird (Appendix D). The vast majority of the faunal remains exhibited signs of human modification which consisted primarily of burning consistent with discard patterns. As mentioned in Chapter 5, bones intentionally or unintentionally discarded into a thermal feature would become more completely burned or calcined. Cutmarks on 14 specimens 27, S40, S49, S102, S115) within the assemblage indicates butchering was also occasionally occurring in this area of the shelter. In addition, deer bones were being used for the manufacture of bone tools (i.e., S29, S39, S45, S48, S76, and S115) and black-tailed jackrabbit bones were being used to make beads (S39).

As discussed in Chapter 6, the lower deposits in the northern sector of Eagle Cave exhibited extensive disturbance from the 1963 excavations and from animal burrowing (see Figures 6.7 and 6.8). As a result, the majority of deposits appeared as discontinuous pockets of ash, fiber, and charcoal (e.g., S96, S117, S156; see Table 6.4). It is not clear to what degree these deposits may have been dug into by cultural activities prior to the burrowing and UT excavation disturbances. However, there is evidence that pit digging, refuse disposal, and cleanout of thermal features did occur.

The deposits in the northern sector of Eagle Cave span the Middle Archaic through the Late Prehistoric (see Radiocarbon Analysis discussion in Chapter 6). The types of deposits encountered within the north sector of Eagle Cave and the cultural and natural processes implicated by those types of deposits have been discussed in detail in this chapter and previous chapters, however, below is a brief narrative of the how the deposits in the northern sector of Eagle Cave formed over time beginning at the lowest natural limestone deposits and ending at the surface within the disturbed deposits. As a full range of analysis was not conducted on every strat identified within the UT North deposits, this discussion will focus on the deposits most thoroughly analyzed.

As mentioned earlier in this chapter, the lowest deposits in the northern sector of Eagle Cave were formed by natural formation processes (Figure 9.6). Large, angular limestone spalls detached from the rockshelter wall and accumulated on the floor of the shelter (U19 L2). Although it is not clear how old these deposits are, smaller limestone fragments and finer aeolian sediments accumulated on top of the angular debris (U19 L1) sometime in the Holocene. A radiocarbon date obtained from a thermally altered feature (F6) intruding into the angular limestone deposits dates to 5437±81 cal B.P. in the Middle

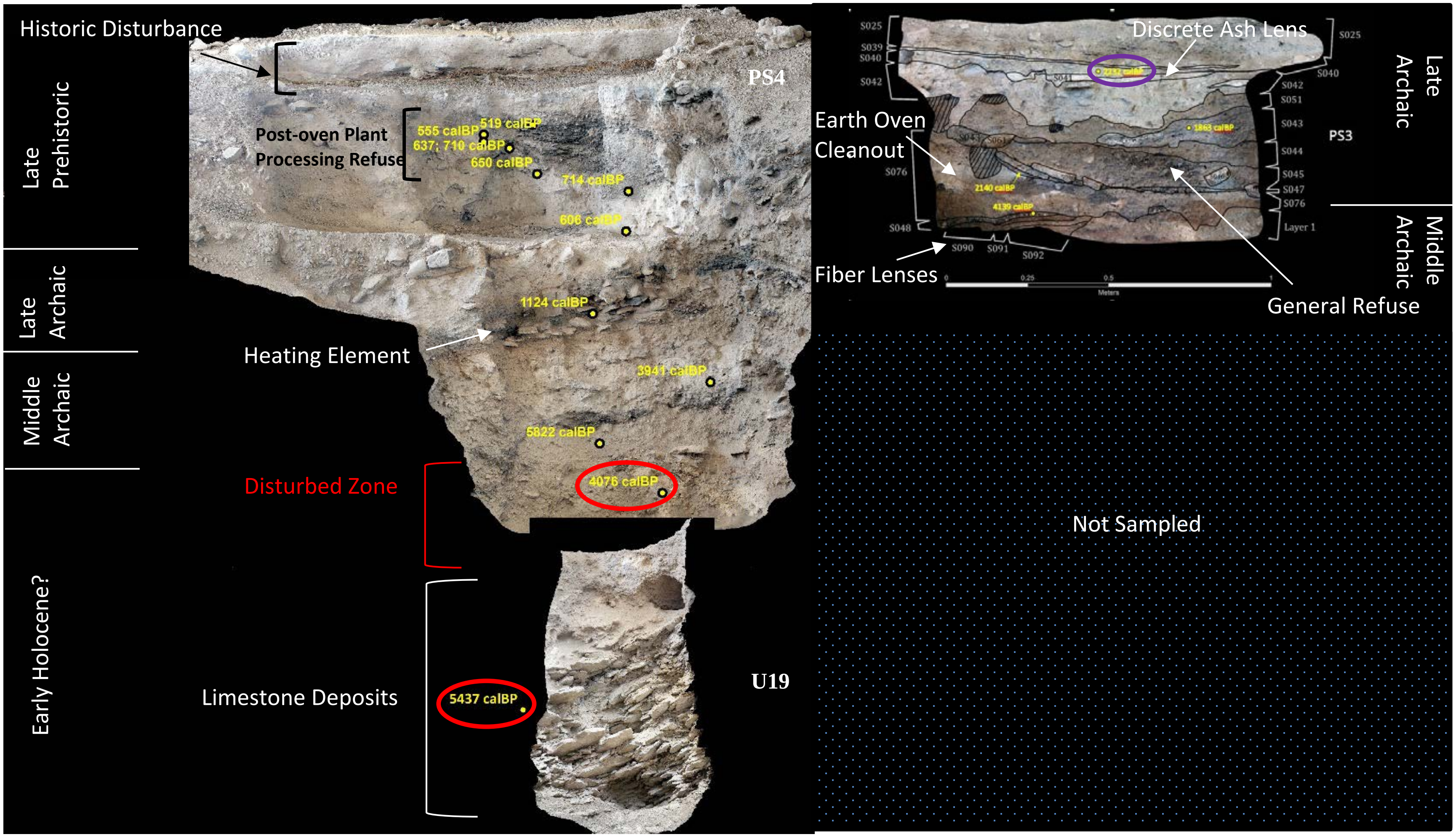


Figure 9.6. Profiles of PS4 and U19 (south wall of UT North) and PS3 (west wall) with radiocarbon dates (OxCal V4.2.4 median cal yr B.P.) with time periods and select strat types depicted (see Chapter 6 for the individual annotated profiles and a zoomed in profile of PS3 with radiocarbon dates plotted). Radiocarbon dates circled in red represent apparent later materials that have been introduced into lower deposits through disturbance. Radiocarbon date circled in purple represents apparent earlier material that has been redeposited from cleanout activities.

Archaic (6300–3420 cal B.P.). Above and intruding into the finer Holocene limestone deposits are a series of charcoal and ash pockets, which were likely remnants of refuse pits containing cleanout from thermal features. These deposits have been truncated by animal burrows, presumably after the UT North Unit was left open after the 1963 excavations. In addition, more recent artifacts (e.g., Late Prehistoric Perdiz point recovered from U19 L1) and plant remains (e.g., modern-age radiocarbon date from U19 L1) have been introduced into the earlier (Early Holocene?) limestone deposits, probably also as a result of the UT North walls collapsing after the excavation unit was left open (see Figure 9.4).

As mentioned in Chapter 6, an assay obtained from S112, a thick (~22 cm) basin-shaped deposit of large, fragmented pieces of charcoal interpreted to be earth oven cleanout dated to 5822±51 cal B.P (Figure 9.4; Table 6.5). However, a radiocarbon date from a sample within the limestone spall deposit at the base of S106 dated to 4076±52 cal B.P., which is almost 1800 years younger than that from S112 located approximately 30 cm above. There were numerous animal burrows present throughout this strat, so it is not surprising that this date is out of chronological order. An early Middle Archaic Pandale point dating to the Eagle Nest subperiod (6300–4680 cal B.P.) was recovered in an earth oven cleanout deposit (S94), located approximately 30 cm above S112. A later Middle Archaic Val Verde point dating to the San Felipe subperiod (4680–3420 cal B.P.) was found within this same context suggesting the Pandale was redeposited as a result of prehistoric pit digging in the Middle Archaic (see Figure 9.4).

The majority of the Middle Archaic deposits in the western portion of the UT North area (i.e., PS3) appear to be related to earth oven clean out activities and reuse of pits for refuse. For example, a series of discrete fiber lenses (e.g., S92, S91, S90, S48) are interpreted to be layers of refuse resulting from the infilling of pits (see Figures 9.1 and 9.3). The bulk matrix sort conducted on S48 revealed that the deposit was dominated by burned rock and charred botanical remains, however limestone spall was also present indicating both anthropogenic and internally derived components comprise the deposit. Directly overlying the fiber and charcoal lenses was a thick refuse pit (S76) with a marbleized matrix interpreted to have been cleanout from a baking feature which is supported by the presence of baked sediment, burned rock, pebbles, sand-sized grains, externally derived minerals (i.e., quartz, feldspar, and plagioclase), ash, and charred botanical remains within the matrix. In addition to the anthropogenic components, limestone spall was also present (42 percent in the 4 mm sieve) indicating that the deposit was mixed with internally derived sediments.

The Late Archaic (3420–1270 cal B.P.) deposits appear to be related to earth oven cooking and clean out from thermal features and general refuse. For example, a pit was dug into S76 for the construction of an earth oven as evidenced by the remnant heating element (S46) (see Figures 9.1 and 9.3). This feature (F3) was dated to 2140±78 cal B.P., within the Late Archaic. After the foodstuffs were removed, the F3 pit was filled in by layers of earth oven cleanout refuse (e.g., S44, and S43) and general refuse (S45).

The radiocarbon assays suggest a fair amount of reorganization occurred in the Late Archaic. For example, as discussed in Chapter 6, the assay from S43 dates to 1863±38 cal B.P., but the date from S40 (which is 20 cm above S43) dates to 2232±54 cal B.P., roughly 370 years older (see Figures 9.1 and 9.3). S40 is located in between two thin ash laminas (S41 and S39) that appeared in thin section to be residual from in situ heating events. In addition, a Middle Archaic Langtry point was recovered between these deposits in the S44 matrix and a Transitional Archaic Frio point was recovered from the upper disturbed matrix (S49). Based on these data, there is strong evidence that all of the upper deposits above F3 in the western portion of UT North (aside from S41 and S39) were a result of cleanout from elsewhere.

In the Late Prehistoric (1270–300 cal B.P.) there appears to be an increase in the use and reuse of pits both for earth oven cooking and for post-oven plant processing discard in UT North (see Figures 9.2 and 9.3). The radiocarbon dates range from 1124±45 cal B.P. to 519±8 cal BP, however most of the dates obtained fall between 519±8 and 714±24 cal B.P. suggesting an intensified use of this portion of the shelter in this period (see Table 6.5). An example of the use and reuse of earth oven pits, illustrated and discussed in Chapter 6, is F7 (S72) interpreted to be remnants of several heating elements that were built in succession. The F7 pit was subsequently infilled with earth oven cleanout refuse deposits (S64, S65, S66) containing predominantly burned rock, ash, pebbles, and charred botanical remains. Very little (less than 3 percent) limestone spall was present in the refuse deposits, so the sand- and silt-sized grains identified in the particle size analysis were likely deposits as a result of aeolian processes and intention transport of sediments to use in earth oven cooking. Above the thicker refuse deposits were discrete lenses of fiber (S70 and S71) that sloped down toward the east. The lenses were truncated by the previous UT excavation disturbances but appeared to be microlenses of plant processing refuse.

On top of the refuse deposits was a baked surface (S53/F4) with a slight basin shape directly overlying a layer of oxidized sediment (S62). The bulk matrix sort identified small burned rock fragments, charred botanical remains, and other cultural materials, however no limestone or pebbles were recovered. The feature was interpreted to be the surface on which an open-aired fire was built, which is supported by the fact that lamina of wood ash was identified in the thin section analysis. Above the baked surface was a rock-lined pit (F2), heating element remnant, that had been infilled with post-oven processing debris consisting mostly of layers of fiber and ash along with burned rock and pebbles and other discarded cultural debris (e.g., burned bone and debitage). The lower portions of the fill contained microlenses of fiber and ash as well as pockets of ash, indicating the pit did not fill in all at once. The feature had been disturbed from the previous UT excavations and was truncated on the northern edge. Goat and sheep dung and hay were recovered from within the upper feature fill (S29) indicating there has been some bioturbation with the disturbed layers above. The uppermost deposits in the northern sector of Eagle Cave contained evidence of historic disturbances including a layer of hay (S26) underlying a very homogenized deposit of cultural debris (e.g., burned rock, lithics, fiber), natural debris (i.e., limestone spall), and large quantities of sheep and goat feces (biogenic debris).

Conclusions and Future Research

This thesis has attempted to tease out the various natural and cultural formation processes that led to the complexly stratified, culturally rich deposits in UT North. The results of the analyses indicate this portion of the shelter was used intermittently from the Middle Archaic to the Late Prehistoric for a variety of activities, most of which were related to plant processing and cooking of desert succulents (e.g., earth oven cooking, discard of refuse). Other activities included production of bone tools, biface manufacture, and consumption of small- to medium-sized animals, primarily rabbit. The reorganization of the deposits was determined to be primarily a result of use and reuse of pits and cleanout activities, with additional mixing due to bioturbation of animals.

The “microstratigraphic approach” used for the documentation, sampling, and analysis proved to be invaluable for this thesis. The stratigraphy in UT North, as in the rest of Eagle Cave, is very complex so the use of SfM to record the stratigraphy was extremely useful. I have drawn many sketch maps in my career and if I had attempted to hand draw the profiles in UT North with as much accuracy as the SfMs allowed, I might still be out there now. However, at the same time, I feel like we relied on the SfMs a bit too much and I often forgot to take additional overview photos of features. Even with such high resolution documentation, the prevalent dust in dry rockshelters obscured the majority of constituents within the deposits. Even when we wet the profiles prior to the photo documentation, frequent winds often blew additional dust onto the profiles before all photographs had been taken. The use of micromorph sampling allowed for a clearer examination of stratigraphy and the relationships between various deposits and helped identify discrete lenses and lamina not visible at the macro scale. However, the collection and preparation of micromorph samples is a time consuming process and takes a considerable amount of training and practice to be able to conduct a thorough analysis of the thin sections made from the micromorphs.

As my thesis field work was conducted during the first ASWT season at Eagle Cave, there were definitely some lessons learned. We conducted the strat recording and sampling first and then went back weeks (and in some cases months) later and collected the geoarchaeological samples. This was quite challenging as some of the strats we had sampled were no longer present and additional strats were identified that had not been previously sampled. In addition, since many of the strats did not have both bulk matrix and cube column samples, it was sometimes difficult to correlate and interpret the results of the various analysis. A better strategy, which was implemented during the next field season at Eagle Cave, would have been to collect the cube column samples and micromorph samples immediately after recording the stratigraphy and then begin the strat sampling.

In addition, we had quite a bit of trial and error with the micromorph collection. Field collection is not always successful in primarily loose deposits such as these and many first (and second) attempts at collection failed. The difficulties encountered during these attempts led to the development of in situ micromorph block impregnation (i.e., partially impregnating the sediments in situ prior to removal) used in later field seasons.

The collection of some of these partially impregnated samples from the main trench in Eagle Cave, although not perfect, helped keep the majority of the soil block intact.

There are many things I would have done differently both during the field work and during my analyses. The lower deposits in UT North were very disturbed and even after the second round of sampling, burrows and other disturbances made sampling stratigraphy very difficult and what initially appeared to be intact stratigraphy in field exposures of the lowest deposits, were shown by analysis to be slumped deposits. We should have saved ourselves a lot of headache and cut the profiles back until we got to solidly intact stratigraphy, but we were reluctant to be more aggressive in cutting back the profile sections in part due to our "low impact, high resolution" approach. In addition, we should have recorded and sampled the profile in between PS3 and PS4 to see which, if any, of the strats continued across the profiles and would have helped with the interpretations of the formation processes in this area. In addition, we had many different people (crew and volunteers) work in UT North, and I should have done a better job of taking my own notes and writing down observations along the way instead of relying so heavily on notes recorded by others in the strat sampling forms.

As for the laboratory analyses, there are two main things I would have done differently. First, the matrix sort size grades (½-inch, 4 mm, 2 mm, 1 mm and 500 µm sieves) were picked because those were the size grades used by the macrobotanical analysts. However, since we were conducting our analyses simultaneously, the macrobotanical analysts usually used their own 1 L matrix sample for their analyses so the size grades were not as useful for my own analyses. What would have been a better plan, was to do my analyses first and then pass on the sorted matrix to the analysts. This would have also provided me with better quantitative data as my botanical percentages were based off a different set of samples. Second, I conducted a variety of analyses on a selection of matrix samples from strats that were not captured in the geoarchaeological sampling. If I had focused my analyses more on strats samples during both the strat sampling and the geoarchaeological sampling, I would have had a better data set to be able to use in the cluster analyses.

The cluster analysis would also greatly benefit from the inclusion of additional data sets from the analysis of samples collected from the main trench in Eagle Cave to determine if there are any distinct trends or correlations. Additionally, some of the UT North samples did not contain any phosphorus; this may have been due to a misstep during the laboratory processing, however, determining if any of the samples from the main trench are devoid of phosphorus would provide an additional data set for future research. Ken Lawrence, one of the geoarchaeologists helping with the ASWT project and the Texas State University Experimental Archaeology club, has set up an experimental site to see how phosphorus levels changes after specific cultural activities are conducted (e.g., earth oven cooking, animal butchering, flintknapping). Other aspects to add to this ongoing research would be to see just how drastic the reduction in phosphorus levels are after various cleanout activities (e.g., earth oven cleanout, open-air fire cleanout).

As I have been writing this last chapter, the ASWT crew has just finished backfilling the main trench in Eagle Cave. Although a little bittersweet, that means that the collection of data is complete and there is a plethora of samples and micromorphs to analyze for future researchers. As my thesis focused on one small area within Eagle Cave, the data I've presented is just a glimpse of a much bigger picture. I look forward to see how the results of the analysis of the deposits in UT North compare to the results of the deposits in the main trench in Eagle Cave.

APPENDIX SECTION

APPENDIX A: STRAT SAMPLING FORM

Stratigraphic Documentation and sampling conducted in Eagle Cave during the 2014 ASWT field season (December to July 2014) utilized the new 2014 ASWT Eagle Nest Canyon Strat Sampling Form. The form contains places to record strat provenience information, general strat observations and descriptions, SfM Data, strat sampling methods and notes, collected artifacts and samples, FCR and unburned limestone data, and a graph for hand-drawn plan maps or cross-section maps.

ENC Expedition 2014: **Eagle Cave Strat Sampling Form**

ASWT
Texas State University

Site: Eagle Cave - 41VV0167

Excavation Area:

Sampling Unit:

Profile Section:

Strat:

Field Number:

Recorder 1:

Recorder 2:

Date Started:

Date Completed:

QAQC: Yes ○ No ● Initials:

General Strat Observations

Layer Type: Other

Initial Observation?: Yes ○ No ●

Elevation of uppermost portion of strat:

Elevation of lowermost portion of strat:

Max Thickness of Strat:

Briefly characterize strat (e.g., thin sandy deposit sloping down toward the dripline):

Does Strat appear to continue beyond the section? Yes ○ No ● Unknown ○

If "Yes," is the strat present in other sections? Yes ○ No ● Unknown ○

Munsell Color: Wet Dry

Page 1 of 7

Figure App A.1. 2014 ASWT Eagle Cave Strat Sampling Form.

Strat Sampling Form

Stratigraphic Observations

List any Strats directly overlaying and contacting the current Strat in this exposure:

List any Strats intruding into the current Strat in this exposure:

List any Strats originating from the current Strat in this exposure:

List any Strats directly underlying and contacting the current Strat in this exposure:

Strat Description

How distinct is the lower strat boundary? Very Abrupt ☐ Abrupt ☐ Clear ☐ Gradual ☐ Diffuse ☐ Unobserved ☐

What is the topography of the lower strat boundary? Smooth ☐ Wavy ☐ Irregular ☐ Broken ☐ Sloping ☐ Unobserved ☐

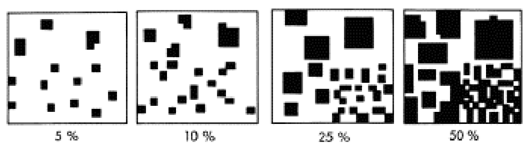
Matrix Texture (circle all that apply): Sand ☐ Sandy-Loam ☐ Loam ☐ Silt Loam ☐ Clay Loam ☐ Clay ☐

Matrix Consistency (circle all that apply): Extremely Firm ☐ Firm ☐ Friable ☐ Loose ☐

Matrix Mixing: (Homogenous) 1 ◉ 2 ○ 3 ○ 4 ○ 5 (Heterogenous) ○

Matrix Coarse Fragments %: ☐

(% FCR, Spalls, Pebbles, etc.)



Matrix Coarse Fragment Shape (circle all that apply): Angular ☐ Sub Angular ☐ Sub Round ☐ Round ☐

Cultural Matrix Inclusions (circle all that apply): FCR ☐ Charcoal ☐ Lithics ☐ Fiber ☐ Animal Bone ☐ Mussel Shell ☐ Snail Shell ☐ Other ☐

Natural Matrix Inclusions (circle all that apply): Spalls ☐ Roots ☐ Insect/Worm Burrows ☐ Animal Burrows ☐ Dung ☐ $CaCO_3$ ☐ Other ☐

Describe inclusions (e.g., for burrows describe size, frequency, and orientation):

Page 2 of 7

Figure App A.1. continued.

Strat Sampling Form

Strat Description Continued

Describe the matrix: ____________________

Strat Sampling

Recorder 1: ________

Recorder 2: ________

Date Started: ________

Date Completed: ________

Sampling Protocols:

Collect at least 1 Spot Sample

Collect as much un-screened matrix as possible

Screen any un-collected matrix through 1/4"

Take SfM of the top of each strat being sampled

Diagnostic lithics as well as fiber, bone, and wood artifacts should be shot with the TDS prior to removal.

Sample Measurements

Opening Dimensions		Closing Dimensions	
North	East	North	East
South	West	South	West

Opening SfM Model

Camera: ________

SfM Photo Ranges:

4 Required GCPs

1st GCP: ________

2nd GCP: ________

3rd GCP: ________

4th GCP: ________

Optional GCPs

GCPs: ________

Associated Features FN#s: ________

Page 3 of 7

Figure App A.1. continued.

Strat Sampling Form

General Collection

Artifact Type	Present	
	Yes	No
Debitage	○	●
Chipped-Stone Tools	○	●
Non-Chipped Stone Tools	○	●
Faunal Remains	○	●
Botanical Remains	○	●
Bone Tools	○	●
Wood Tools	○	●
Fiber Artifacts	○	●
1/8" Screen Material	○	●
Other	○	●

Point-Provenienced Artifacts

Artifact Type	FN#
None	
None	
None	
None	
None	
None	
None	
None	
None	
None	
None	

Special Samples

Matrix Samples

Present: Yes ○ No ● # Bags Collected: ______

FN#s: ______

Notes: ______

Spot Samples

Present: Yes ○ No ● # Bags Collected: ______

FN#s: ______

Notes: ______

Charcoal Samples

Present: Yes ○ No ● # Bags Collected: ______

FN#s: ______

Notes: ______

Other Samples

Present: Yes ○ No ● # Bags Collected: ______

FN#s: ______

Notes: ______

Page 4 of 7

Figure App A.1. continued.

Strat Sampling Form

Describe excavation methods, sequence, and problems.

Additional Strat Notes: ______________________________

Page 5 of 7

Figure App A.1. continued.

Strat Sampling Form

FCR Data

	<7.5 cm	7.5 - 11 cm		11 - 15 cm		15> cm	
	Mass (kg)	Count	Mass (kg)	Count	Mass (kg)	Count	Mass (kg)
Pitted Limestone							
Round Limestone							
Spall Limestone							
Other Limestone							
Igneous or Metamorphic							

Unburned Limestone Data

	<7.5 cm	7.5 - 11 cm		11 - 15 cm		15> cm	
	Mass (kg)	Count	Mass (kg)	Count	Mass (kg)	Count	Mass (kg)
Pitted Limestone							
Round Limestone							
Spall Limestone							
Other Limestone							

Camera: ____________________

Rock Sort Photos taken? ◯ Yes ◯ No Photo Range: ____________________

Rock Sort Notes: ____________________

Page 6 of 7

Figure App A.1. continued.

Strat Sampling Form

Site: ________________ Excav Area: ___________________ Unit: ______________ Layer: _____________

Date: ____________________ Scale: ___________________________ Recorder: _______________________

Page 6 of 7

Figure App A.1. continued.

APPENDIX B: ROCK SORT AND BULK MATRIX SORT DATA

Rock Sort

The rocks within each stratigraphic layer recorded and sampled were sorted by burned and unburned and then quantified by type (pitted, round, spall, other-igneous or metamorphic) and by size category (<7.5 cm, 7.5–11 cm, 11–15 cm, or 15>cm) and recorded on the Strat Sampling Form. Of note, many of the strats recorded in the field were not sampled for various reason, as such, these no rock sort data is provided.

Bulk Matrix Sort

A total of 31 bulk matrix samples were sieved including 10 from PS3 and 21 from PS4. All artifacts and ecofacts recovered from the 1-inch screen used during initial matrix processing and from the ½-inch and 4-mm sieves were sorted into classes, tabulated, and weighed. Rocks from the ½-inch and 4 mm sieve were quantified by type (burned, unburned limestone spall, and pebble) and by weight.

Table App B.1. Rock Sort Data.

		FCR Data														
Profile	Strat	<7.5 cm Mass (kg)					7.5-11 cm Count					7.5-11 cm Mass (kg)				
		Pitted Limestone	Round Limestone	Spall Limestone	Other Limestone	Igneous or Metamorphic	Pitted Limestone	Round Limestone	Spall Limestone	Other Limestone	Igneous or Metamorphic	Pitted Limestone	Round Limestone	Spall Limestone	Other Limestone	Igneous or Metamorphic
3	L4	0.01					1					0.01				
3	F1	0.01		0.01	0.01											
3	F3				0.01											
3	25	0.26		0.10	0.20	0.01	2		2			0.01		0.01		
3	39	0.08	0.01	0.02												
3	40	0.06	0.01	0.01												
3	41	0.03			0.02											
3	42	0.12	0.03	0.01	0.10											
3	44	0.10	0.01	0.01		0.01										
3	45	0.53		0.08	0.48		1		1	3		0.34		0.20	0.63	
3	46				0.41		3					0.71				
3	47	0.18	0.02	0.01												
3	48	0.05	0.01													
3	49	0.01		0.01												
3	61	0.01														
3	76	0.50	0.05	0.07	0.20											
3	90	0.16														
3	91				0.09											
3	92	0.05														
4	26	0.02														
4	29	0.10														
4	30	0.08														
4	31	0.03														
4	32	1.70														
4	33	1.60		0.50												
4	35	no rock														
4	37	0.02														
4	53	0.26														
4	62	no rock														
4	63			0.01	0.12		4		2			0.06		0.02		
4	64	0.05														
4	65	0.06														
4	70	no rock														
4	71	no rock														
4	72	5.06		0.73	2.29		27	3	3	3		7.70	0.92	0.35	0.64	
4	94	0.19	0.28	0.53	0.73		1			1		0.39			0.33	
4	96															
4	97	0.04		0.10	0.24											
4	98			0.08												
4	99				1.80	0.01		1					0.21			
4	100				0.27					1					0.11	
4	101				1.75					5					0.93	
4	102	0.03		0.03												
4	103	0.04			0.01											
4	104	no rock														
4	106															
4	112		0.67	0.87	0.02				3					0.42		
4	114				0.01											
4	115				1.87				3					0.53		

		FCR Data																				Unburned Limestone Data			
Profile	Strat	11-15 cm Count					11-15 cm Mass (kg)					>15 cm Count					>15 cm Mass (kg)					<7.5 cm Mass (kg)			
		Pitted Limestone	Round Limestone	Spall Limestone	Other Limestone	Igneous or Metamorphic	Pitted Limestone	Round Limestone	Spall Limestone	Other Limestone	Igneous or Metamorphic	Pitted Limestone	Round Limestone	Spall Limestone	Other Limestone	Igneous or Metamorphic	Pitted Limestone	Round Limestone	Spall Limestone	Other Limestone	Igneous or Metamorphic	Pitted Limestone	Round Limestone	Spall Limestone	Other Limestone
3	L4																								
3	F1																								
3	F3																								
3	25																							0.01	0.01
3	39																					0.01			
3	40																					0.01			
3	41																					0.01			
3	42																					0.01			
3	44																					0.02			
3	45																								
3	46				1.00					0.50															
3	47																								
3	48																								
3	49																					0.01			
3	61	1.00					0.01																		
3	76																					0.01		0.01	
3	90																								
3	91																								
3	92																								
4	26																							0.01	
4	29																							0.01	
4	30																								
4	31																							0.02	
4	32																							1.30	
4	33																							0.80	
4	35																								
4	37																								
4	53																								
4	62																								
4	63																								
4	64																							0.02	
4	65																							0.03	
4	70																								
4	71																								
4	72	2.00		2.00			0.95		0.67																
4	94			1.00					0.36																
4	96																								
4	97																								0.01
4	98																								
4	99																								0.02
4	100																								
4	101		1.00		2.00			0.33		0.86					2.00					2.02					
4	102																							0.02	
4	103																								
4	104																								
4	106																							2.90	
4	112																								
4	114																								
4	115																								

Table App B.2. Matrix Sort - 1" Size Sieve.

Profile Section	Unit	Strat	General Strat Type	Biface Count	Core Count	Modified Flake Count	Projectile Point Count	Debitage Count	Bone Artifact Count	Ochre Count	Quid Count	Botanical Remains mass (g)	% Botanical Remains	Charred Botanical Remains mass (g)	% Charred Botanical Remains
PS3A	6	S25	Disturbed	0	1	0	0	31	0	0	0	1.97	0.04	5.34	0.12
PS3A	6	S39	Discrete Ash Lens	0	0	0	0	17	0	0	0	0.00	0.00	1.25	0.34
PS3A	6	S40	Thick Ash Deposit	0	0	0	0	16	0	0	0	0.00	0.00	0.67	0.13
PS3A	6	S41	Discrete Ash Lens	0	0	0	0	2	0	0	0	0.00	0.00	0.00	0.00
PS3A	6	S42	Thick Ash Deposit	0	0	1	0	14	0	0	0	0.00	0.00	0.00	0.00
PS3A	6	S44	Refuse Midden	0	0	0	1	4	0	0	0	0.00	0.00	4.71	1.74
PS3A	6	S45	Thick Ash Deposit	0	0	0	0	5	0	0	0	0.00	0.00	51.49	1.15
PS3A	6	S47	Discrete Charcoal Lens	0	0	0	0	5	0	0	0	0.00	0.00	20.40	11.24
PS3A	6	S48	Discrete Fiber/ Charcoal Lens	0	0	0	0	13	0	0	0	0.00	0.00	2.50	0.64
PS3A	6	S76	Refuse Midden	0	0	0	0	11	1	0	0	0.00	0.00	2.44	0.09
PS4A	5	S26	Disturbed	0	0	0	0	0	0	0	0	9.89	1.18	0.27	0.03
PS4A	5	S29 (F2)	Refuse Midden	0	0	0	0	0	0	0	0	2.70	0.59	0.53	0.12
PS4A	5	S30	Refuse Midden	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00
PS4A	5	S31	Discrete Fiber/Ash Lenses	0	0	0	0	0	0	0	0	0.00	0.00	0.40	0.33
PS4A	5	S32A	Refuse Midden	0	0	0	0	0	0	1	0	21.20	0.60	2.29	0.06
PS4A	5	S33A	Thick Ash Deposit	0	0	0	0	0	0	0	1	16.87	1.06	0.00	0.00
PS4A	5	S37	Thick Ash Deposit	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00
PS4B	11	S53 (F4)	Baked Surface	0	0	0	0	1	0	0	0	0.00	0.00	18.69	15.52
PS4B	11	S63	Thick Ash Deposit	1	0	0	0	33	0	0	0	0.00	0.00	2.83	0.12
PS4B	11	S64	Refuse Midden	0	0	0	0	0	0	0	0	0.00	0.00	4.44	3.02
PS4B	11	S65	Refuse Midden	0	0	0	0	0	0	0	0	0.00	0.00	37.90	33.61
PS4B	11	S72 (F7)	Heating element	0	0	0	0	7	0	0	0	0.00	0.00	37.93	1.28
PS4C	14	S101	Discrete Fiber Lens	1	0	0	0	16	0	0	0	0.00	0.00	68.16	7.20
PS4C	14	S102	Charcoal Pocket	0	0	0	0	0	0	0	0	0.00	0.00	28.58	19.10
PS4C	14	S103	Disturbed	0	0	0	0	1	0	0	0	0.00	0.00	6.46	1.88
PS4D	11	S106	Degrading Limestone	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00
PS4D	11	S112	Charcoal Pocket	1	0	0	0	1	0	0	0	0.00	0.00	103.70	8.90
PS4D	11	S115	Thick Ash Deposit	1	0	2	0	34	1	0	0	0.00	0.00	6.68	0.40
PS4D	11	S97	Refuse Midden	0	0	0	0	10	0	0	0	0.00	0.00	2.42	0.45
PS4D	11	S98	Refuse Midden	0	0	0	1	14	0	0	0	0.00	0.00	0.00	0.00
PS4D	11	S99	Discrete Ash Lens	0	0	0	0	18	0	0	0	0.00	0.00	7.66	0.95

Table App B.2. Matrix Sort - 1" Size Sieve continued.

Profile Section	Unit	Strat	General Strat Type	Lithic mass (g)	% Lithic	Faunal Remains mass (g)	% Faunal Remains	Burned Rock mass (g)	% Burned Rock	Unburned Limestone Spall mass (g)	% Unburned Limestone Spall	Pebbles mass (g)	% Pebbles	Total Matrix Sample Mass (g)
PS3A	6	S25	Disturbed	320.58	7.10	14.04	0.31	4140.00	91.66	0.00	0.00	34.90	0.77	4516.83
PS3A	6	S39	Discrete Ash Lens	72.35	19.61	5.43	1.47	290.00	78.58	0.00	0.00	0.00	0.00	369.03
PS3A	6	S40	Thick Ash Deposit	195.27	37.93	5.45	1.06	240.00	46.61	0.00	0.00	73.48	14.27	514.87
PS3A	6	S41	Discrete Ash Lens	28.29	23.56	1.80	1.50	70.00	58.29	20.00	16.65	0.00	0.00	120.09
PS3A	6	S42	Thick Ash Deposit	98.64	3.20	17.37	0.56	2870.00	92.98	30.00	0.97	70.80	2.29	3086.81
PS3A	6	S44	Refuse Midden	19.31	7.13	2.31	0.85	230.00	84.96	10.00	3.69	4.37	1.61	270.70
PS3A	6	S45	Thick Ash Deposit	18.54	0.41	4.73	0.11	40.00	0.89	4370.00	97.44	0.00	0.00	4484.76
PS3A	6	S47	Discrete Charcoal Lens	7.90	4.35	3.23	1.78	130.00	71.61	20.00	11.02	0.00	0.00	181.53
PS3A	6	S48	Discrete Fiber/ Charcoal Lens	27.63	7.08	0.00	0.00	340.00	87.15	20.00	5.13	0.00	0.00	390.13
PS3A	6	S76	Refuse Midden	31.87	1.11	7.04	0.25	940.00	32.85	1880.00	65.70	0.00	0.00	2861.35
PS4A	5	S26	Disturbed	0.00	0.00	0.00	0.00	830.00	98.79	0.00	0.00	0.00	0.00	840.16
PS4A	5	S29 (F2)	Refuse Midden	0.00	0.00	0.60	0.13	440.00	96.95	10.00	2.20	0.00	0.00	453.83
PS4A	5	S30	Refuse Midden	0.00	0.00	0.00	0.00	90.00	100.00	0.00	0.00	0.00	0.00	90.00
PS4A	5	S31	Discrete Fiber/Ash Lenses	0.00	0.00	0.00	0.00	110.00	91.36	10.00	8.31	0.00	0.00	120.40
PS4A	5	S32A	Refuse Midden	0.00	0.00	3.30	0.09	3480.00	98.67	20.00	0.57	0.00	0.00	3526.79
PS4A	5	S33A	Thick Ash Deposit	0.00	0.00	4.06	0.26	1560.00	98.06	10.00	0.63	0.00	0.00	1590.93
PS4A	5	S37	Thick Ash Deposit	0.00	0.00	0.00	0.00	8560.00	100.00	0.00	0.00	0.00	0.00	8560.00
PS4B	11	S53 (F4)	Baked Surface	1.71	1.42	0.00	0.00	100.00	83.06	0.00	0.00	0.00	0.00	120.40
PS4B	11	S63	Thick Ash Deposit	155.77	6.76	34.57	1.50	1970.00	85.48	60.00	2.60	81.41	3.53	2304.58
PS4B	11	S64	Refuse Midden	0.00	0.00	2.69	1.83	130.00	88.36	10.00	6.80	0.00	0.00	147.13
PS4B	11	S65	Refuse Midden	0.00	0.00	4.85	4.30	60.00	53.22	10.00	8.87	0.00	0.00	112.75
PS4B	11	S72 (F7)	Heating element	62.87	2.13	5.58	0.19	2850.00	96.40	0.00	0.00	0.00	0.00	2956.38
PS4C	14	S101	Discrete Fiber Lens	34.31	3.63	3.96	0.42	330.00	34.87	510.00	53.89	0.00	0.00	946.43
PS4C	14	S102	Charcoal Pocket	0.00	0.00	1.09	0.73	40.00	26.73	80.00	53.45	0.00	0.00	149.67
PS4C	14	S103	Disturbed	6.31	1.84	0.00	0.00	40.00	11.67	290.00	84.60	0.00	0.00	342.77
PS4D	11	S106	Degrading Limestone	0.00	0.00	4.21	0.85	0.00	0.00	490.00	99.15	0.00	0.00	494.21
PS4D	11	S112	Charcoal Pocket	8.42	0.72	0.77	0.07	270.00	23.18	770.00	66.10	12.04	1.03	1164.93
PS4D	11	S115	Thick Ash Deposit	171.95	10.29	12.01	0.72	1040.00	62.23	440.00	26.33	0.52	0.03	1671.16
PS4D	11	S97	Refuse Midden	42.25	7.90	0.00	0.00	0.00	0.00	490.00	91.65	0.00	0.00	534.67
PS4D	11	S98	Refuse Midden	43.54	12.32	0.00	0.00	310.00	87.68	0.00	0.00	0.00	0.00	353.54
PS4D	11	S99	Discrete Ash Lens	36.17	4.50	10.53	1.31	730.00	90.76	20.00	2.49	0.00	0.00	804.36

Table App B.3. Matrix Sort - 0.5" Size Sieve.

Profile Section	Unit	Strat	General Strat Type	Botanical Remains mass (g)	% Botanical Remains	Charred Botanical Remains mass (g)	% Charred Botanical Remains	Lithic mass (g)	% Lithic	Faunal Remains mass (g)	% Faunal Remains	Burned Rock mass (g)	% Burned Rock	Unburned Limestone Spall mass (g)	% Unburned Limestone Spall	Total mass of 1/2" Size Sieve Sample (g)
PS3A	6	S25	Disturbed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.80	100.00	0.00	0.00	1.80
PS3A	6	S39	Discrete Ash Lens	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PS3A	6	S40	Thick Ash Deposit	0.00	0.00	0.00	0.00	1.96	100.00	0.00	0.00	0.00	0.00	0.00	0.00	1.96
PS3A	6	S41	Discrete Ash Lens	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PS3A	6	S42	Thick Ash Deposit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.36	100.00	0.00	0.00	8.36
PS3A	6	S44	Refuse Midden	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.93	100.00	0.00	0.00	5.93
PS3A	6	S45	Thick Ash Deposit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.35	100.00	0.00	0.00	2.35
PS3A	6	S47	Discrete Charcoal Lens	0.00	0.00	0.41	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.41
PS3A	6	S48	Discrete Fiber/ Charcoal Lens	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PS3A	6	S76	Refuse Midden	0.00	0.00	0.00	0.00	1.02	45.33	1.23	54.67	0.00	0.00	0.00	0.00	2.25
PS4A	5	S26	Disturbed	9.89	97.34	0.27	2.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.16
PS4A	5	S29 (F2)	Refuse Midden	0.00	0.00	0.53	5.69	0.00	0.00	0.00	0.00	8.78	94.31	0.00	0.00	9.31
PS4A	5	S30	Refuse Midden	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PS4A	5	S31	Discrete Fiber/Ash Lenses	0.00	0.00	0.40	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40
PS4A	5	S32A	Refuse Midden	0.00	0.00	2.29	21.62	0.00	0.00	0.00	0.00	8.30	78.38	0.00	0.00	10.59
PS4A	5	S33A	Thick Ash Deposit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.70	100.00	0.00	0.00	2.70
PS4A	5	S37	Thick Ash Deposit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17.20	100.00	0.00	0.00	17.20
PS4B	11	S53 (F4)	Baked Surface	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.60	100.00	0.00	0.00	8.60
PS4B	11	S63	Thick Ash Deposit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.31	100.00	0.00	0.00	2.31
PS4B	11	S64	Refuse Midden	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.78	100.00	1.78
PS4B	11	S65	Refuse Midden	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PS4B	11	S72 (F7)	Heating element	0.00	0.00	0.35	8.10	0.00	0.00	0.00	0.00	3.97	91.90	0.00	0.00	4.32
PS4C	14	S101	Discrete Fiber Lens	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.30	55.62	7.42	44.38	16.72
PS4C	14	S102	Charcoal Pocket	0.00	0.00	1.02	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.02
PS4C	14	S103	Disturbed	0.00	0.00	0.87	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.87
PS4D	11	S106	Degrading Limestone	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.81	100.00	2.81
PS4D	11	S112	Charcoal Pocket	0.00	0.00	1.54	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.54
PS4D	11	S115	Thick Ash Deposit	0.00	0.00	0.42	2.06	1.54	7.56	0.00	0.00	18.40	90.37	0.00	0.00	20.36
PS4D	11	S97	Refuse Midden	0.00	0.00	0.89	59.73	0.60	40.27	0.00	0.00	0.00	0.00	0.00	0.00	1.49
PS4D	11	S98	Refuse Midden	0.00	0.00	0.00	0.00	0.66	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.66
PS4D	11	S99	Discrete Ash Lens	0.00	0.00	0.00	0.00	0.70	6.58	0.00	0.00	7.94	74.62	2.00	18.80	10.64

Table App B.4. Matrix Sort - 4 mm Size Sieve.

Profile Section	Unit	Strat	General Strat Type	Animal Feces mass (g)	% Animal Feces	Botanical Remains mass (g)	% Botanical Remains	Charred Botanical Remains mass (g)	% Charred Botanical Remains	Lithic mass (g)	% Lithic
PS3A	6	S25	Disturbed	3.20	1.39	1.33	0.58	7.90	3.42	9.33	4.04
PS3A	6	S39	Discrete Ash Lens	0.30	0.39	0.00	0.00	0.55	0.72	9.56	12.55
PS3A	6	S40	Thick Ash Deposit	0.92	1.10	0.08	0.10	2.04	2.45	13.52	16.23
PS3A	6	S41	Discrete Ash Lens	0.00	0.00	0.00	0.00	0.30	0.72	10.39	24.98
PS3A	6	S42	Thick Ash Deposit	0.53	0.06	0.00	0.00	834.50	91.40	6.69	0.73
PS3A	6	S44	Refuse Midden	0.00	0.00	0.00	0.00	13.17	11.19	5.66	4.81
PS3A	6	S45	Thick Ash Deposit	0.00	0.00	0.00	0.00	33.31	27.87	4.09	3.42
PS3A	6	S47	Discrete Charcoal Lens	0.00	0.00	0.00	0.00	65.78	48.91	2.49	1.85
PS3A	6	S48	Discrete Fiber/ Charcoal Lens	0.00	0.00	0.00	0.00	6.87	5.61	7.94	6.49
PS3A	6	S76	Refuse Midden	0.00	0.00	0.00	0.00	13.65	14.63	5.36	5.74
PS4A	5	S26	Disturbed	27.20	39.47	12.47	18.10	1.66	2.41	2.04	2.96
PS4A	5	S29 (F2)	Refuse Midden	0.00	0.00	0.00	0.00	31.40	21.00	0.36	0.24
PS4A	5	S30	Refuse Midden	0.00	0.00	0.00	0.00	31.26	42.25	0.19	0.26
PS4A	5	S31	Discrete Fiber/Ash Lenses	0.00	0.00	0.00	0.00	57.62	59.78	0.75	0.78
PS4A	5	S32A	Refuse Midden	0.00	0.00	0.00	0.00	47.73	31.66	1.00	0.66
PS4A	5	S33A	Thick Ash Deposit	0.00	0.00	0.00	0.00	6.11	5.24	0.00	0.00
PS4A	5	S37	Thick Ash Deposit	0.72	0.35	0.00	0.00	3.05	1.50	2.59	1.28
PS4B	11	S53 (F4)	Baked Surface	0.00	0.00	0.00	0.00	22.53	14.21	3.37	2.13
PS4B	11	S63	Thick Ash Deposit	0.00	0.00	0.00	0.00	0.78	0.61	4.54	3.58
PS4B	11	S64	Refuse Midden	0.00	0.00	0.57	1.33	10.32	24.02	1.79	4.17
PS4B	11	S65	Refuse Midden	0.00	0.00	0.31	0.36	60.81	70.43	1.72	1.99
PS4B	11	S72 (F7)	Heating element	0.25	0.14	2.66	1.51	32.68	18.57	5.71	3.24
PS4C	14	S101	Discrete Fiber Lens	0.00	0.00	0.07	0.04	17.55	9.94	5.91	3.35
PS4C	14	S102	Charcoal Pocket	0.00	0.00	0.00	0.00	50.38	37.54	0.33	0.25
PS4C	14	S103	Disturbed	0.00	0.00	0.00	0.00	20.93	9.71	2.70	1.25
PS4D	11	S106	Degrading Limestone	0.00	0.00	0.83	0.64	14.19	11.00	17.04	13.21
PS4D	11	S112	Charcoal Pocket	0.00	0.00	0.00	0.00	67.53	33.36	0.00	0.00
PS4D	11	S115	Thick Ash Deposit	0.00	0.00	0.00	0.00	3.49	2.50	9.65	6.92
PS4D	11	S97	Refuse Midden	0.00	0.00	0.00	0.00	1.08	0.26	0.00	0.00
PS4D	11	S98	Refuse Midden	0.00	0.00	0.72	0.36	9.63	4.76	11.00	5.43
PS4D	11	S99	Discrete Ash Lens	0.00	0.00	0.00	0.00	4.98	2.57	9.30	4.79

Table App B.4. Matrix Sort - 4 mm Size Sieve continued.

Profile Section	Unit	Strat	General Strat Type	Faunal Remains mass (g)	% Faunal Remains	Shell mass (g)	% Shell	Burned Rock mass (g)	% Burned Rock	Unburned Limestone Spall mass (g)	% Unburned Limestone Spall
PS3A	6	S25	Disturbed	1.89	0.82	5.89	2.55	161.20	69.77	34.60	14.98
PS3A	6	S39	Discrete Ash Lens	5.75	7.55	2.11	2.77	57.90	76.01	0.00	0.00
PS3A	6	S40	Thick Ash Deposit	7.10	8.53	2.59	3.11	50.45	60.58	3.08	3.70
PS3A	6	S41	Discrete Ash Lens	2.42	5.82	2.60	6.25	23.59	56.71	0.29	0.70
PS3A	6	S42	Thick Ash Deposit	2.88	0.32	2.49	0.27	42.76	4.68	0.33	0.04
PS3A	6	S44	Refuse Midden	1.18	1.00	0.61	0.52	78.34	66.59	13.64	11.59
PS3A	6	S45	Thick Ash Deposit	2.27	1.90	1.43	1.20	15.20	12.72	59.82	50.05
PS3A	6	S47	Discrete Charcoal Lens	1.59	1.18	0.65	0.48	51.56	38.33	9.59	7.13
PS3A	6	S48	Discrete Fiber/ Charcoal Lens	3.02	2.47	0.12	0.10	94.63	77.32	5.27	4.31
PS3A	6	S76	Refuse Midden	0.79	0.85	0.73	0.78	31.80	34.07	40.10	42.97
PS4A	5	S26	Disturbed	0.12	0.17	0.25	0.36	22.06	32.01	2.78	4.03
PS4A	5	S29 (F2)	Refuse Midden	2.83	1.89	1.91	1.28	107.10	71.62	0.00	0.00
PS4A	5	S30	Refuse Midden	1.56	2.11	0.47	0.64	40.50	54.74	0.00	0.00
PS4A	5	S31	Discrete Fiber/Ash Lenses	0.26	0.27	0.30	0.31	33.37	34.62	2.21	2.29
PS4A	5	S32A	Refuse Midden	0.89	0.59	1.57	1.04	99.00	65.68	0.00	0.00
PS4A	5	S33A	Thick Ash Deposit	2.11	1.81	3.01	2.58	100.71	86.42	3.20	2.75
PS4A	5	S37	Thick Ash Deposit	1.33	0.66	2.18	1.07	193.00	95.13	0.00	0.00
PS4B	11	S53 (F4)	Baked Surface	1.27	0.80	1.41	0.89	129.93	81.97	0.00	0.00
PS4B	11	S63	Thick Ash Deposit	3.50	2.76	3.58	2.82	90.78	71.53	15.12	11.91
PS4B	11	S64	Refuse Midden	0.13	0.30	0.23	0.54	26.44	61.55	1.16	2.70
PS4B	11	S65	Refuse Midden	0.76	0.88	0.14	0.16	21.20	24.55	1.20	1.39
PS4B	11	S72 (F7)	Heating element	0.52	0.30	0.91	0.52	133.29	75.72	0.00	0.00
PS4C	14	S101	Discrete Fiber Lens	1.03	0.58	0.00	0.00	66.92	37.91	83.03	47.03
PS4C	14	S102	Charcoal Pocket	0.37	0.28	0.17	0.13	30.71	22.88	51.43	38.32
PS4C	14	S103	Disturbed	0.41	0.19	0.95	0.44	40.52	18.79	146.60	67.99
PS4D	11	S106	Degrading Limestone	0.20	0.16	0.39	0.30	28.18	21.85	65.58	50.84
PS4D	11	S112	Charcoal Pocket	0.00	0.00	0.00	0.00	134.92	66.64	0.00	0.00
PS4D	11	S115	Thick Ash Deposit	2.27	1.63	0.00	0.00	94.00	67.38	25.60	18.35
PS4D	11	S97	Refuse Midden	0.16	0.04	12.90	3.11	0.00	0.00	400.82	96.56
PS4D	11	S98	Refuse Midden	0.31	0.15	0.16	0.08	42.40	20.94	73.50	36.31
PS4D	11	S99	Discrete Ash Lens	0.65	0.33	1.20	0.62	154.80	79.78	22.00	11.34

Table App B.4. Matrix Sort - 4 mm Size Sieve continued.

Profile Section	Unit	Strat	General Strat Type	Pebbles mass (g)	% Pebbles	Total mass of 4 mm Size Sieve Sample (g)
PS3A	6	S25	Disturbed	5.70	2.47	**231.04**
PS3A	6	S39	Discrete Ash Lens	0.00	0.00	**76.17**
PS3A	6	S40	Thick Ash Deposit	3.50	4.20	**83.28**
PS3A	6	S41	Discrete Ash Lens	2.01	4.83	**41.60**
PS3A	6	S42	Thick Ash Deposit	22.81	2.50	**912.99**
PS3A	6	S44	Refuse Midden	5.05	4.29	**117.65**
PS3A	6	S45	Thick Ash Deposit	3.39	2.84	**119.51**
PS3A	6	S47	Discrete Charcoal Lens	2.84	2.11	**134.50**
PS3A	6	S48	Discrete Fiber/ Charcoal Lens	4.53	3.70	**122.38**
PS3A	6	S76	Refuse Midden	0.90	0.96	**93.33**
PS4A	5	S26	Disturbed	0.33	0.48	**68.91**
PS4A	5	S29 (F2)	Refuse Midden	5.93	3.97	**149.53**
PS4A	5	S30	Refuse Midden	0.00	0.00	**73.98**
PS4A	5	S31	Discrete Fiber/Ash Lenses	1.88	1.95	**96.39**
PS4A	5	S32A	Refuse Midden	0.55	0.36	**150.74**
PS4A	5	S33A	Thick Ash Deposit	1.39	1.19	**116.53**
PS4A	5	S37	Thick Ash Deposit	0.00	0.00	**202.87**
PS4B	11	S53 (F4)	Baked Surface	0.00	0.00	**158.51**
PS4B	11	S63	Thick Ash Deposit	8.62	6.79	**126.92**
PS4B	11	S64	Refuse Midden	2.32	5.40	**42.96**
PS4B	11	S65	Refuse Midden	0.20	0.23	**86.34**
PS4B	11	S72 (F7)	Heating element	0.00	0.00	**176.02**
PS4C	14	S101	Discrete Fiber Lens	2.03	1.15	**176.54**
PS4C	14	S102	Charcoal Pocket	0.81	0.60	**134.20**
PS4C	14	S103	Disturbed	3.52	1.63	**215.63**
PS4D	11	S106	Degrading Limestone	2.58	2.00	**128.99**
PS4D	11	S112	Charcoal Pocket	0.00	0.00	**202.45**
PS4D	11	S115	Thick Ash Deposit	4.50	3.23	**139.51**
PS4D	11	S97	Refuse Midden	0.16	0.04	**415.12**
PS4D	11	S98	Refuse Midden	1.90	0.94	**139.62**
PS4D	11	S99	Discrete Ash Lens	1.10	0.57	**194.03**

APPENDIX C: MACROBOTANICAL ANALYSIS RESULTS

The macrobotanical analysis was conducted by Leslie Bush and Kevin Hanselka. Macrobotanical analysis was conducted on a total of 18 samples, including 4 samples from PS3 and 14 samples from PS4. Sub-sampling was conducted due to the overabundance of organic materials in the samples. The sampling strategy was adapted from Karen Adam's methods used at Crow Canyon (Adams 2004). The methods employed maximized taxon representation and recorded signs of use wear, processing marks, and damage to aid in the identification of formation processes and discussion of potential plant processing activities evident in this sector of the shelter.

This appendix includes a summary table of the macrobotanical analysis results followed by the individual analysis tables.

Table App C.1. Summary Table of Macrobotanical Analysis Results.

FN	**30209**	**30276**	**30259**	**30282**	**30162**	**30166**	**30167**	**30168**	**30169**	**30170**	**30171**	**30172**
Area	**PS3**	**PS3**	**PS3**	**PS3**	**PS4A**	**PS4A**	**PS4A**	**PS4A**	**PS4A**	**PS4A**	**PS4A**	**PS4A**
Unit	**6**	**6**	**6**	**6**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**
Strat	**S0040**	**S0047**	**S0049**	**S0076**	**S0031**	**S0031A**	**S0031B**	**S0031C**	**S0031D**	**S0031E**	**S0031F**	**S0031G**
Feature	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**
Strat Description	Thick Ash Deposit	Discrete Charcoal Lens	Disturbed	Midden/ Refuse	Discrete Fiber/Ash Lenses	Discrete Fiber/Ash Lenses	Discrete Fiber/Ash Lenses	Discrete Fiber/Ash Lenses	Discrete Fiber/Ash Lenses	Discrete Fiber/Ash Lenses	Discrete Fiber/Ash Lenses	Discrete Fiber/Ash Lenses
Volume	0.5	1	1.1	1								
Leaves (Desert rosettes)												
General large desert rosettes (Agavaceae/Liliaceae)		3								2		
Lechuguilla or yucca (Agavaceae)							1		1			12
Lechuguila (Agave lechuguilla)	1	2	4	4				2				9
Sotol (Dasylirion texanum)		2										
Yucca (Yucca sp.)		2			2							
Fiber, prob. Agavaceae/Liliaceae	1			2		1						19
Total	**2**	**9**	**4**	**6**	**2**	**1**	**1**	**2**	**1**	**2**	**0**	**40**
Seeds and fruits												
Mesquite endocarps with attached pericarp and seeds (Prosopis sp.)	3					1						5
Mesquite seeds (Prosopis sp.)												
Persimmon fruit tops (Diospyros texana)												
Cactus family seed (Cactaceae, dimpled)												
Cactus seed (coiled, Opuntia-like but small)												
Chenopodium seed (Chenopodium sp.)	3		7	8	4	18	1	9	5	1	1	3
Cheno-am seed (Chenopodium sp. OR Amaranthus sp.)	40		10									
Coyotillo seed (Karwinskia humboldtiana)	1											
Croton sp. seed	1											
Grass seed (Poaceae)												
Grass seed (Poaceae, cf. Setaria sp.)	2		1									
Grass seed (Poaceae, NOT Setaria sp.)	1			1								
Hackberry seed (Celtis sp.)	2	3	1	5								5
Legume seed (Fabaceae)						1						
Persimmon seed (Diospyros texana)												
Pitaya seed (Echinocereus sp.)	4		2									
Prickly pear seed (Opuntia sp.)	10	4	11	1								2
Prickly pear embryo (Opuntia sp.)			7	6								
Purslane (Portulaca sp.)												
Torrey yucca seed (Yucca torreyi)					1	2						6
Yucca seed, unspecified probably torrey's (Yucca sp.)												
Yucca seed, thin (Yucca sp.)						1						
Yucca pod fragment (Yucca sp.)							1					
Yucca seed (Yucca sp.)	5		1									
Unknown seeds	2		1									
Fruit, spherical, unknown												
Total	**74**	**7**	**41**	**21**	**5**	**23**	**2**	**9**	**5**	**1**	**1**	**21**
Nut resources												
Little walnut nutshell (Juglans cf.			1	1								
Acorn nutshell (Quercus sp.)			1									
Acorn cap (Quercus sp.)												
Total	**0**	**0**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Other food or cooking materials												
Leaf base (Agavaceae)												
Burned carbohydrate												
Prickly pear pad fragments (Opuntia sp.)					79	6	4	71	174	2	1	36
Total	**0**	**0**	**0**	**0**	**79**	**6**	**4**	**71**	**174**	**2**	**1**	**36**
Miscellaneous plant parts												
Juniper leaf scale (Juniperus sp.)												3
Oak or persimmon leaf fragment (Quercus/Diospyros)												
Leaf epidermis												
cf. Plant gall		1										
Pedicel												
Peduncle												1
Root												
Bud												1
Bark						1						
Catkin, prob. oak												
Catkin				1								
Cactus spine												
Cactus spine, prob. prickly pear	2											
Partial flower												
Flower stalk (Agavaceae/Liliaceae)		3	7	7								
Grass stems (Poaceae)									1		1	7
Herbaceous stems									3		3	3
Tip, unknown monocot	1											
Unknown, poss. pod parts						4						
Unknown, woody receptacle												
Total	**3**	**4**	**7**	**8**	**0**	**5**	**0**	**0**	**4**	**0**	**4**	**15**
Botanical, indeterminable		**3**				**1**						**1**
Wood and wood charcoal	**24**	**609**	**399**	**88**	**3**	**3**	**2**	**1**	**3**		**5**	**10**
Wooden tool fragment												

***Probably not archeological**

Table App C.1. Summary Table of Macrobotanical Analysis Results continued.

FN	30173	30144	30155	30179	30233	30332	30459	
Area	**PS4A**	**PS4A**	**PS4A**	**PS4A**	**PS4B**	**PS4B**	**PS4C/D**	
Unit	**5**	**5**	**5**	**5**	**11**	**11**	**11**	
Strat	**S0032a**	**S0035**	**S0037**	**S0033A**	**S0053**	**S0072**	**S0098**	
Feature	**n/a**	**2**	**n/a**	**n/a**	**4**	**7**	**n/a**	
Strat Description	Midden/ Refuse	Fiber Fill Surrounding Heating Element	Thick Ash Deposit	Thick Ash Deposit	Baked Surface	Matrix Around Heating Element	Midden/ Refuse	**Total**
Volume	1	1.3	1	0.97	1	1	1	
Leaves (Desert rosettes)								**Leaves (Desert rosettes)**
General large desert rosettes (Agavaceae/Liliaceae)	18	193						216
Lechuguilla or yucca (Agavaceae)			5					19
Lechuguila (Agave lechuguilla)	4	6		6		44		82
Sotol (Dasylirion texanum)	12	27		1				42
Yucca (Yucca sp.)	1	1						6
Fiber, prob. Agavaceae/Liliaceae		1				3		27
Total	**35**	**228**	**5**	**7**	**0**	**47**	0	392
Seeds and fruits								**Seeds and fruits**
Mesquite endocarps with attached pericarp and seeds (Prosopis sp.)	16	238	10	7	1	11		292
Mesquite seeds (Prosopis sp.)				3				3
Persimmon fruit tops (Diospyros texana)	1	15	1					17
Cactus family seed (Cactaceae, dimpled)	2							2
Cactus seed (coiled, Opuntia-like but small)		1						1
Chenopodium seed (Chenopodium sp.)	6	288	6	25	5	4	5	399
Cheno-am seed (Chenopodium sp. OR Amaranthus sp.)				3				53
Coyotillo seed (Karwinskia humboldtiana)						1		2
Croton sp. seed								1
Grass seed (Poaceae)	4	1			1*			5
Grass seed (Poaceae, cf. Setaria sp.)								3
Grass seed (Poaceae, NOT Setaria sp.)								2
Hackberry seed (Celtis sp.)	1	2	3	1	1	2	1	27
Legume seed (Fabaceae)								1
Persimmon seed (Diospyros texana)	2			3		3		8
Pitaya seed (Echinocereus sp.)	4		1	4				15
Prickly pear seed (Opuntia sp.)	10	4	8	3	2	15		70
Prickly pear embryo (Opuntia sp.)								13
Purslane (Portulaca sp.)				1				1
Torrey yucca seed (Yucca torreyi)								9
Yucca seed, unspecified probably torrey's (Yucca sp.)	166	557	11		2	68	1	805
Yucca seed, thin (Yucca sp.)								1
Yucca pod fragment (Yucca sp.)								1
Yucca seed (Yucca sp.)				7				13
Unknown seeds	4							7
Fruit, spherical, unknown		1						1
Total	**216**	**1107**	**40**	**57**	**11**	**104**	7	1752
Nut resources								**Nut resources**
Little walnut nutshell (Juglans cf.	6	3		3		50		64
Acorn nutshell (Quercus sp.)		1						2
Acorn cap (Quercus sp.)		1						1
Total	**6**	**5**	**0**	**3**	**0**	**50**	0	67
Other food or cooking materials								**Other food or cooking materials**
Leaf base (Agavaceae)		1						1
Burned carbohydrate		4	3					7
Prickly pear pad fragments (Opuntia sp.)		9						382
Total	**0**	**14**	**3**	**0**	**0**	**0**	0	390
Miscellaneous plant parts								**Miscellaneous plant parts**
Juniper leaf scale (Juniperus sp.)	1*		1*					3
Oak or persimmon leaf fragment (Quercus/Diospyros)		1						1
Leaf epidermis				4				4
cf. Plant gall								1
Pedicel	1	1						2
Peduncle								1
Root		1						1
Bud								1
Bark						10		11
Catkin, prob. oak		1						1
Catkin								1
Cactus spine		1			1			2
Cactus spine, prob. prickly pear				4				6
Partial flower								0
Flower stalk (Agavaceae/Liliaceae)								17
Grass stems (Poaceae)		3*		7		1		17
Herbaceous stems								9
Tip, unknown monocot								1
Unknown, poss. pod parts								4
Unknown, woody receptacle		1						1
Total	**1**	**6**	**0**	**15**	**1**	**11**	0	84
								Botanical, indeterminable
Botanical, indeterminable	**32**	**73**	**5**	**3**	**7**	**2**		127
								Wood and wood charcoal
Wood and wood charcoal	**396**	**668**	**35**	**68**	**101**	**470**	25	2910
								Wooden Tool Fragment
Wooden tool fragment						**1**		1

***Probably not archeological**

Table App C.2. FN 30209 S40 Macrobotanical Analysis Results.

Lot 30186, FN30209				**Splits**	
PS3A U6 S40				**Size (mm)**	**#**
Volume: 0.5L				2.0	5
				1.0	3
				0.5	6
Category	**Identification**	**Count**	**Weight (g)**	**% carbonized**	**Comments**
Rocks			17.14		
Poss. flakes		26	3.09		
Examined residue		55 ml	43.03		
Fauna		21	0.97	0	bone
Fauna		18	1.15	0	gastropod
Fauna		5	0.55	0	goat dung
Leaf	Agave sp.	1	0.03	100	
Fiber	Agave sp.	1	0.00	0	
Flower stalk	Agave/sotol	1	0.00	100	
Spine	Cactus	2	0.00	100	miniscule
Tip	Unknown monocot	1	0.00	0	broken for analysis
Endocarp	Prosopis sp.	3	0.00	0	
Seed	Yucca sp.	5	0.00	80	
Seed	Opuntia sp.	10	0.10	20	
Seed	Echinocereus sp.	4	0.00	100	
Seed	Chenopodium sp.	3	0.00	100	
Seed	Cheno-am	40	0.00	100	4 whole, 36 fragments
Seed	Celtis sp.	2	0.00	0	fragments
Seed	Grass (cf. Setaria sp.)	2	0.00	50	carbonized grain, uncarbonized palea
Seed	Grass (NOT Setaria sp.)	1	0.00	0	elongated
Seed	Karwinskia humboldiana	1	0.00	0	coyotillo
Seed	Croton sp.	1	0.00	0	C. dioicus and C. incanus have been seen in Eagle Nest Canyon
Seed	Unknown	2	0.00	100	one is possibly a woody legume
Wood charcoal (>4 mm)		20	1.10		
	No identification	4	0.05		
	Prosopis sp.	13	0.78		
	Acacia sp.	1	0.00		
	Rhamnaceae	1	0.10		
	Fouquieria splendens	1	0.00		

Table App C.3. FN 30276 S47 Macrobotanical Analysis Results.

Lot 30193, FN30276				**Splits**	
PS3A U6, S47				**Size (mm)**	**#**
Volume: 1 L				2.0	2
				1.0	1
				0.5	3
Category	**Identification**	**Count**	**Weight (g)**	**% carbonized**	**Comments**
Botanical, indeterminable		3	0.10	100	
cf. Gall		1	0.02	100	
Examined residue			16.02		
Fauna			0.91		gastropod, rodent tooth frags
Leaf	Agavaceae/Liliaceae	3	0.03	100	
Leaf	Agave sp.	2	0.07	100	
Leaf	cf. Yucca sp.	2	0.04	100	thick-leafed yucca. fragile
Leaf	Dasylirion sp.	2	0.02	100	
Poss. flakes		7	0.41		
Rocks			49.31		
Seed	Celtis sp.	3	0.01	0	
Stalk	Agavaceae/Liliaceae	3	0.07	100	
Wood charcoal		607	58.89	100	
Wood charcoal		2	0.38	100	poss. modified

Table App C.4. FN 30259 S49 Macrobotanical Analysis Results.

Lot 30191, FN 30259				**Splits**	
PS3A U6 S49				**Size (mm)**	**#**
Volume: 1 L				2.0	6
				1.0	5
				0.5	8
Category	**Identification**	**Count**	**Weight (g)**	**% carbonized**	**Comments**
Rocks			121.53		
Chert/possible flakes		12	2.48		
Examined residue			46.64		<4.0 mm
Fauna		20	4.27		bone, 1 burned
Fauna		18	1.14		gastropods
Fauna		1	0.00		dung (rodent pellet)
Fauna	Insect frass	1	0.00	100	fused mass
Leaf	Agavaceae	4	0.25	100	fragments
Flower stalk	Agave/sotol	7	0.07	100	
Nutshell	Juglandaceae	1	0.06	100	
Nutshell	Quercus sp.	1	0.00	100	acorn
Embryo	Opuntia sp.	7	0.00	100	
Seed	Celtis sp.	1	0.04	0	
Seed	Echinocereus sp.	2	0.00	100	1 fragment
Seed	Opuntia sp.	11	0.03	91	10 carb, 1 partially
Seed	Setaria sp.	1	0.00	100	
Seed	Yucca sp.	1	0.00	100	
Seed	Chenopodium sp.	7	0.00	15	3 halves
Seed	Cheno-am	10	0.00	100	4 halves
Seed	Unidentifiable	1	0.00	0	fragment
Wood charcoal (>4 mm)		399	31.96		
Wood charcoal angularity: subangular	No identification	5	1.93		
	Acacia sp.	11	2.49		
	Prosopis sp.	2	0.58		
	Fouquieria splendens	1	0.10		
	Larea tridentata	1	0.69		

Table App C.5. FN 30282 S76 Macrobotanical Analysis Results.

Lot 30278, FN 30282 **PS3A U6 S76** **Volume: 1 L**				**Splits** **Size (mm)** 2.0 1.0 0.5	**#** 2 7 2
Category	**Identification**	**Count**	**Weight (g)**	**% carbonized**	**Comments**
Rocks			129.57		
Poss. flakes		33	5.24		
Examined residue			50.24		< 4.0
Fauna		2	0.38	0	gastropods
Fauna		2	0.21	0	bone (small mammal?)
Fiber	prob. Agavaceae/Liliaceae	2	0.00	0	
Nutshell	Juglans microcarpa	1	0.07	100	
Embryo	Opuntia sp.	6	0.00	100	
Flower		1	0.00	0	probably from a catkin; tiny (<1cm); incl. pedicel, calyx, and stamens
Seed	Celtis sp.	5	0.05	0	1 whole, 4 fragments
Seed	Chenopodium sp.	8	0.00	100	4 whole (carbonized), 4 frag (unknown)
Seed	Opuntia sp.	1	0.00	100	
Seed	Poaceae	1	0.00	100	tiny and degraded; long (NOT Setaria)
Wood charcoal (>4 mm)		88	7.33		
Wood charcoal angularity: subangular	No identification	7	0.75		
	Acacia sp.	6	1.02		
	Prosopis sp.	4	0.70		
	Fouquieria splendens	2	0.32		
	Rhamnaceae	1	0.10		

Table App C.6. FN 30162 S31 Macrobotanical Analysis Results.

Lot 30162, FN 30162 **PS4A U5 S31** **Volume: Spot Sample**					**Splits** > 4 mm completely sorted Residue > 0.5 mm examined for material not present > 4 mm One tray of residue < 0.5 mm checked for additional material	
Category	**Identification**		**Count**	**Weight (g)**	**% carbonized**	**Comments**
Internode	Opuntia sp.	Prickly pear	79	0.31	90	> 2 mm
Seed	Yucca torreyi	Torrey yucca	1	0.03	100	
Leaf	Yucca sp.	Yucca	2	0.01	100	
Seed	Chenopodium sp.	Chenopodium	4	0.01	50	
Wood			3	0.04	100	1 > 4 mm, 2 > 2 mm
Examined residue				3.68		
Wood charcoal angularity: subangular						

Table App C.7. FN 30166 S31A Macrobotanical Analysis Results.

Lot 30166, FN 30166
PS4A U5 S31A
Volume: Spot Sample

Splits
> 4 mm completely sorted
Residue > 0.5 mm examined for material not present > 4 mm
One tray of residue < 0.5 mm checked for additional material

Category	Identification		Count	Weight (g)	% carbonized	Comments
Wood			3	0.06	100	1 > 4 mm, 2 > 2 mm
Internode	Opuntia sp.	Prickly pear	6	0.15	70	
Indeterminable			1	0.03	100	
Seed	Yucca torreyi	Torrey yucca	2	0.04	100	
Seed	Yucca sp.	Yucca	1	0.02	100	
Seed	Fabaceae	Legume	1	0.01	100	
Fiber	Agavaceae	Agave family	1	0.01	0	
Seed	Chenopodium sp.	Chenopodium	18	0.01	0	
Unknown			4	0.01	100	
Bark			1	0.01	100	
Examined residue				6.32		
Seed	Prospois sp.	Mesquite	1	0.01	100	Pulled for 14C dating from this FN May 2016.
Wood charcoal angularity: subangular						

Table App C.8. FN 30167 S31B Macrobotanical Analysis Results.

Lot 30167, FN 30167 **PS4A U5 S31B** **Volume: Spot Sample**					**Splits** > 4 mm completely sorted Residue > 0.5 mm examined for material not present > 4 mm One tray of residue < 0.5 mm checked for additional material	
Category	**Identification**		**Count**	**Weight (g)**	**% carbonized**	**Comments**
Internode	Opuntia sp.	Prickly pear	4	0.07	100	
Wood			2	0.01	10	> 2 mm
Seed	Chenopodium sp.	Chenopodium	1	0.01	0	
Pod	Yucca sp.	Yucca	1	0.01	0	
Leaf	Agavaceae	Agave family	1	0.01	100	
Examined residue				4.93		
Wood charcoal angularity: subangular						

Table App C.9. FN 30168 S31C Macrobotanical Analysis Results.

Lot 30168, FN 30168
PS4A U5 S31C
Volume: Spot Sample

Splits
> 4 mm completely sorted (1 Agave leaf base)
Residue > 0.5 mm examined for material not present > 4 mm
One tray of residue < 0.5 mm checked for additional material

Category	Identification		Count	Weight (g)	% carbonized	Comments
Leaf	Agave lechuguilla	Lechuguilla	2	0.05	100	
Internode	Opuntia sp.	Prickly pear	71	0.2	70	> 2 mm
Wood			1	0.01	100	> 2 mm
Seed	Chenopodium sp.	Chenopodium	9	0.01	0	
Examined residue				2.19		
Wood charcoal angularity: subrounded						

Table App C.10. FN 30169 S31D Macrobotanical Analysis Results.

Lot 30169, FN 30169
PS4A U5 S31D
Volume: Spot Sample

Splits
No material > 4 mm
> 2 mm completely sorted
Residue > 0.5 mm examined for material not present > 2 mm
One tray of residue < 0.5 mm checked for additional material

Category	Identification		Count	Weight (g)	% carbonized	Comments
Wood			3	0.01	100	> 2 mm
Internode	Opuntia sp.	Prickly pear	174	0.4	60	> 2 mm
Seed	Chenopodium sp.	Chenopodium	5	0.01	0	
Stem	Poaceae	Grass family	1	0.01	0	
Stem	Herbaceous		3	0.01	80	
Leaf	Agavaceae	Agave family	1	0.01	99	> 1 mm
Examined residue				4.78		
Wood charcoal angularity: subrounded						

Table App C.11. FN 30170 S31E Macrobotanical Analysis Results.

Lot 30170, FN 30170 PS4A U5 S31E Volume: Spot Sample					Splits > 4 mm completely sorted (2 Opuntia internodes) Residue > 0.5 mm examined for material not present > 4 mm One tray of residue < 0.5 mm checked for additional material	
Category	**Identification**		**Count**	**Weight (g)**	**% carbonized**	**Comments**
Internode	Opuntia sp.	Prickly pear	2	0.06	70	
Leaf	Agavaceae/Liliaceae	Desert rosette	2	0.01	100	1 > 1 mm, 1 > 0.5 mm
Seed	Chenopodium sp.	Chenopodium	1	0.01	0	
Examined residue				1.97		
Wood charcoal angularity: not found						

Table App C.12. FN 30171 S31F Macrobotanical Analysis Results.

Lot 30171, FN 30171
PS4A U5 S31F
Volume: Spot Sample

Splits
> 4 mm completely sorted (1 Opuntia internode)
Residue > 0.5 mm examined for material not present > 4 mm
One tray of residue < 0.5 mm checked for additional material

Category	Identification		Count	Weight (g)	% carbonized	Comments
Wood			5	0.02	99	
Internode	Opuntia sp.	Prickly pear	1	0.01	60	
Seed	Chenopodium sp.	Chenopodium	1	0.01	0	
Stem	Poaceae	Grass family	1	0.01	50	
Stem	Herbaceous		3	0.01	100	
Examined residue				3.15		
Wood charcoal angularity: subangular						

Table App C.13. FN 30172 S31G Macrobotanical Analysis Results.

Lot 30172, FN 30172 **PS4A U5 S31G** **Volume: Spot Sample**					**Splits** > 4 mm completely sorted (wood charcoal, leaves, indeterminable) Residue > 0.5 mm examined for material not present > 4 mm One tray of residue < 0.5 mm checked for additional material	
Category	**Identification**		**Count**	**Weight (g)**	**% carbonized**	**Comments**
Wood			10	0.68	100	> 4 mm
Leaf	Agave lechuguilla	Lechuguilla	9	0.66	90	> 4 mm
Leaf	Agavaceae	Agave family	12	0.62	90	> 4 mm
Internode	Opuntia sp.	Prickly pear	36	0.09	40	> 4 mm
Indeterminable			1	0.07	100	> 4 mm
Seed	Opuntia sp.	Prickly pear	2	0.01	50	
Seed	Yucca torreyi	Torrey yucca	3	0.03	100	
Seed	Celtis sp.	Hackberry	5	0.02	100	
Seed	Prosopis sp.	Mesquite	5	0.05	90	some endocarp frags attached
Seed	Chenopodium sp.	Chenopodium	3	0.01	0	
Fiber	Agavaceae	Agave family	19	0.01	100	loose fibers with raphides
Leaf	Juniperus sp.	Juniper	3	0.01	0	
Stem	Herbaceous		3	0.02	100	
Stem	Poaceae	Grass family	7	0.01	10	
Bud			1	0.01	10	
Peduncle			1	0.01	0	
Examined residue				7.57		
Seed	Yucca torreyi	Torrey yucca	3	0.11	100	Pulled for 14C dating from this FN May 2016.
Wood charcoal angularity: subrounded						

Table App C.14. FN 30173 S32A Macrobotanical Analysis Results.

Lot 30138, FN30173 PS4A U5 S32A Volume: 1L				Splits Size (mm) # 2.0 6 1.0 10 0.5 4	
Category	**Identification**	**Count**	**Weight (g)**	**% carbonized**	**Comments**
Botanical, indeterminable		32	3.33	10	
Endocarp	Prosopis glandulosa	16	0.31	60	
Examined residue			54.88		
Fauna			1.27		gastropods, bone
Fruit pedicel		1	0.01	0	
Leaf	Agavaceae/Lilicaeae	18	0.58	90	
Leaf	Agave lechuguilla	4	1.21	90	
Leaf	cf. Yucca sp.	6	0.28	90	thin-leafed
Leaf	Dasylirion sp.	12	1.28	95	
Leaf	Juniperus sp.	1	0.01	0	scale
Nutshell	Juglans sp.	6	0.27	100	
Pedicel and sepals	Diospyros texana	1	0.05	0	
Poss. flakes		4	0.71		
Rocks			90.52		
Seed	Cactaceae	2	0.01	0	
Seed	Celtis sp.	1	0.01	100	
Seed	Diospyros texana	2	0.10	80	1 whole (carbonized), 1 frag (uncarbonized)
Seed	Echinocereus sp.	4	0.01	0	2 sizes
Seed	Opuntia sp.	10	0.03	100	7 whole, 3 frag
Seed	Panicoidea	4	0.01	75	cf. Setaria, 3 dark brown but in good condition, 1 carbonized
Seed	Yucca sp.	166	6.63	95	
Seed	Chenopodium sp.	6	0.01	15	1 carbonized, 5 uncarbonized
Seed	Unknown	3	0.01	0	like tiny morningglory
Seed	Unknown	1	0.01	0	poss same as other unknown but small specimen
Wood		4	0.35	0	
Wood charcoal		392	26.79	99	1 semi-carbonized

Table App C.15. FN 30179 S33A Macrobotanical Analysis Results.

Lot 30139, FN30179				Splits	
PS4A U5 S33A				Size (mm)	#
Volume: 0.97 L				2.0	3
				1.0	3
				0.5	4
Category	**Identification**	**Count**	**Weight (g)**	**% carbonized**	**Comments**
Rocks			59.70		
FCR			2.83		
Chert/possible flakes			2.38		
Examined residue			26.84		<4.0 mm
Fauna			3.32		gastropod
Fauna			0.78		bone
Fauna	Insect frass	1	0.00	100	fused mass
Botanical, indeterminable		3	0.06	0	thin, bark-like
Stem	Poaceae	7	0.00	14	
Leaf	Agave sp.	6	0.29	100	clear raphides and/or vascular bundles
Leaf	Dasylirion sp.	1	0.00	0	
Leaf epidermis fragment	Indeterminate	4	0.00	0	monocot
Spine	Cactaceae	4	0.00	75	two joined at base
Endocarp	Prosopis sp.	7	0.11	0	3 whole, 4 fragments
Nutshell	Juglandaceae	3	0.04	100	possibly Juglans microcarpa, but small fragments
Seed	Prosopis sp.	3	0.04	0	
Seed	Portulaca sp.	1	0.00	100	
Seed	Diospyros texana	3	0.07	100	2 whole, 1 fragment
Seed	Celtis sp.	1	0.06	0	
Seed	Chenopodium sp.	25	0.00	12	2 whole, 23 fragments
Seed	Cheno-am	3	0.00	33	degraded and fragmentary
Seed	Echinocereus sp.	4	0.00	100	2 whole, 1 fragment
Seed	Opuntia sp.	3	0.00	66	one smaller than others
Seed	Yucca sp.	7	0.28	0	5 whole, 2 fragments
Wood charcoal (>4 mm)		68	3.26	100	
Wood charcoal angularity: subrounded	No identification	7	0.38		
	Quercus sp.	2	0.40		
	Prosopis sp.	4	0.39		
	Acacia sp.	5	0.36		
	Fouquieria splendens	1	0.06		
	Rhamnaceae	1	0.06		

Table App C.16. FN 30144 S35 F2 Macrobotanical Analysis Results.

Lot 30124, FN30144
PS4A U5 S35 F2
Volume: 1.3 L

Splits	
Size (mm)	**#**
2.0	4
1.0	3
0.5	4

Category	Identification	Count	Weight (g)	% carbonized	Comments
Botanical, indeterminable		73	3.95	3	
Botanical, unknown		1	0.08	100	woody receptacle
Carbohydrate		4	0.10	100	
Catkin		1	0.01	100	
Cupule	Quercus sp.	1	0.04	0	cap
Endocarps	Prosopis glandulosa	238	7.60	1	includes other adhering pos parts; insect damage
Examined residue			21.32		< 4.0
Fauna			1.67		gastropods, fish verts, fish rib, bone
Feces		1	0.03	0	
Fibers		1	0.03	0	loosely twisted, poss. cordage
Fruit		1	0.06	0	spherical, 5-6 mm diameter, poss. lobed seed
Internode frags	Opuntia sp.	9	0.43	10	Re-check this.
Leaf	cf. Yucca sp.	1	0.06	100	thin-leafed yucca. raphides but morphology inconsistent with Agave
Leaf		2	0.01	0	Quercus/Diospyros
Leaf base	Agavaceae	1	0.03	100	beautifully preserved epidermal cells best match is Agave americana. Camas cells ok but not gross morphology. Re-check A. lechuguilla
Leaves	Agave sp.	6	0.99	60	most pieces semi-carbonized or humifying
Leaves	Dasylirion sp.	27	0.82	60	most pieces semi-carbonized or humifying
Leaves	Liliaceae/Agavaceae	193	3.94	60	most pieces semi-carbonized or humifying
Nutshell	Juglans sp.	3	0.23	100	
Nutshell	Quercus sp.	1	0.01	0	
Pedicel		1	0.03	100	fruit stem. shattered
Pedicel and sepals	Diospyros texana	15	1.63	0	
Poss. flakes		3	0.43		
Rock		`	0.36		Spall(?) with residue
Rocks			51.02		
Root		1	0.04	100	poss. Agaveaceae/Liliaceae
Seed	Cactaceae	1	0.01	100	coiled, Opuntia-style, small
Seed	Celtis sp.	2	0.06	0	
Seed	Chenopodium sp.	288	0.02	2	
Seed	Opuntia sp.	4	0.03	100	
Seed	Panicodae	1	0.01	0	humifying
Seed	Prosopis sp.	1	0.01	100	
Seed	Yucca sp.	557	28.38	1	
Spine	Cactaceae	1	0.01	0	cf. Opuntia
Stems	Poaceae	3	0.01	0	suspiciously good condition but too long for goat feces
Wood		11	0.28	0	Twigs
Wood		1	0.08	0	
Wood charcoal		656	45.66	100	

Table App C.17. FN 30155 S37 Macrobotanical Analysis Results.

Lot 30151, FN 30155				**Splits**	
PS4A U5 S37				**Size (mm)**	**#**
Volume: 1 L				2.0	2
				1.0	2
				0.5	4
Category	**Identification**	**Count**	**Weight (g)**	**% carbonized**	**Comments**
Botanical, indeterminable		5	0.79	0	
Carbohydrate		3	0.01	100	
Endocarp	Prosopis sp.	10	0.08	95	1 semi-carbonized
Examined residue			40.79		
Fauna			1.55		gastropod, bone, fish scale
Feces			0.89	20	
Leaf	Agavaceae	5	0.99	95	some semi-carbonized spots
Leaf	Juniperus sp.	1	0.01	0	suspiciousy good condition; from feces?
Pedicel and sepals	Diospyros texana	1	0.27	100	a little robust for Diospyros. Recheck.
Rocks			162.61		
Seed	Celtis sp.	3	0.02	0	
Seed	Chenopodium sp.	6	0.01	50	all semi-carbonized
Seed	Echinocereus sp.	1	0.01	0	
Seed	Opuntia sp.	8	0.03	100	
Seed	Yucca sp.	11	0.19	100	
Wood charcoal		35	1.82	100	

Table App C.18. FN 30233 S53 F4 Macrobotanical Analysis Results.

Lot 30230, FN30233					**Splits**	
PS4B U11 S53 F4					**Size (mm)**	**#**
Volume: 1 L					2.0	3
					1.0	7
					0.5	3
Category	**Identification**		**Count**	**Weight (g)**	**% carbonized**	**Comments**
Wood	Quercus sect. Quercus	White group oak	8	0.78	100	
Wood	Fouquieria splendens	Ocotillo	3	0.11	100	
Wood	Colubrina texensis	Snakewood	1	0.09	100	
Wood	Ziziphus sp.	Lotebush	2	0.18	100	
Wood	Castela sp.	Allthorn	2	0.17	100	
Wood	Hardwood	Hardwood	4	0.15	100	Prob. Castela/Condalia
Wood	Sideroxylon lanuginosum	Gum bully	1	0.03	100	
Wood	Not examined	Not examined	79	6.03	100	
Botanical	Indeterminable		7	0.01	90	1 partially carbonized
Wood	Juniperus sp.	Juniper	1	0.01	100	
Spine	Unknown		1	0.01	0	
Seed	Opuntia sp.	Prickly pear	2	0.01	50	c. 4 mm long
Seed	Chenopodium sp.	Chenopodium	5	0.01	60	
Seed	Yucca torreyi	Torrey yucca	2	0.06	50	
Seed	Celtis laevigata	Sugar hackberry	1	0.06	0	
Seed	Poaceae	Grass family	1	0.01	0	small, as Eragrostis
Seed	Prosopis sp.	Mesquite	1	0.01	100	fragment
Examined residue < 4 mm				40.81		
Wood charcoal angularity: subangular						

Table App C.19. FN 30332 S72 F7 Macrobotanical Analysis Results.

Lot 30258, FN30332
PS4B U11 S72 F7
Volume: 1L

Splits

Size (mm)	#
2.0	7
1.0	2
0.5	3

Category	Identification		Count	Weight (g)	% carbonized	Comments
Wood	Acacia sp.	Acacia	2	0.15	100	Diffiuse-porous
Wood	Juniperus sp.	Juniper	1	0.20	100	
Wood	Fouquieria splendens	Ocotillo	1	0.04	100	
Wood	Quercus sect. Quercus	White group oak	1	0.07	100	
Wood	Colubrina texensis	Snakewood	2	0.13	100	
Wood	Acacia/Prosopis	Acacia/Mesquite	2	0.11	100	Latewood poorly expressed
Wood	Castela sp.	Allthorn	2	0.11	100	
Wood	Baccharis neglecta	Povertyweed	1	0.01	100	
Wood	Prosopis sp.	Mesquite	4	0.27	100	
Wood	Ziziphus sp.	Lotebush	3	0.12	100	
Wood	Diospyros texana	Texas persimmon	1	0.02	100	
Wood	Not examined	Not examined	450	27.19	99	Some semi-carbonized
Botanical	Indeterminable		2	0.04	100	
Bark			10	0.33	50	
Stem	Poaceae	Grass family	1	0.01	80	Exterior carbonized
Wood (tool)			1	0.13	100	18.5 mm long, oval cut end is 7.0 x 4.5 mm
Nutshell	Juglans sp.	Walnut/butternut	50	1.78	95	largest has estimated diameter of 12 mm
Endocarp	Prosopis sp.	Mesquite	10	0.14	0	
Fiber			3	0.01	0	
Leaf	Agave lechuguilla	Lechuguilla	44	1.12	90	
Seed	Diospyros texana	Texas persimmon	3	0.08	100	
Seed	Celtis laevigata	Sugar hackberry	2	0.08	0	1 whole
Seed	Karwinskia humboldtiana	Coyotillo	1	0.01	100	fragment
Seed	Yucca torreyi	Torrey yucca	68	2.44	3	2 carbonized
Seed	Opuntia sp.	Prickly pear	15	0.06	66	10 carbonized
Seed	Chenopodium sp.	Chenopodium	4	0.01	100	
Seed	Prosopis sp.	Mesquite	1	0.01	100	
Examined residue				36.82		

Table App C.20. FN 30459 S98 Macrobotanical Analysis Results.

Lot 30459, FN 30534 **PS4B U11 S98** **Volume: 1 L**					**Splits** **Size (mm) #** 2.0 3 1.0 2 0.5 3	
Category	**Identification**		**Count**	**Weight (g)**	**% carbonized**	**Comments**
Seed	Yucca torreyi	Torrey yucca	1	0.01	0	fragment
Seed	Chenopodium sp.	Chenopodium	5	0.01	20	fragments
Seed	Celtis laevigata	Sugar hackberry	1	0.05	0	
Wood	Prosopis sp.	Mesquite	2	0.18	100	
Wood	Ziziphus sp.	Lotebush	4	0.15	100	
Wood	Castela sp.	Allthorn	3	0.15	100	
Wood	Hardwood	Hardwood	6	0.26	100	
Wood	Acacia sp.	Acacia	1	0.21	100	diffuse-porous
Wood	Colubrina texensis	Snakewood	2	0.33	100	
Wood	Acacia sp.	Acacia	1	0.04	100	ring-porous
Wood	Juniperus sp.	Juniper	1	0.01	100	
Wood	Not examined	Not examined	5	0.14	100	
Examined residue				34.33		
Wood charcoal angularity: subangular						

APPENDIX D: FAUNAL ANALYSIS RESULTS

Faunal analysis was conducted by Christopher Jurgens. The faunal analysis was conducted on all faunal materials recovered from feature contexts in PS3 and PS4 as well as the faunal materials recovered from the 1-inch, ½-inch, and 4-mm size sieves during the strat bulk matrix sort. Faunal identification was made using his previous experience identifying bones at Arenosa Shelter as well as osteological books listed in Chapter 5. The faunal inventory below was created by Jurgens and modified slightly by the author. The faunal inventory is also on file with the ASWT at Texas State University and will be curated at the Center for Archaeological Studies (CAS).

Table App D.1. Master Faunal Analysis Table.

Lot	FN	Spec No.	PS	U	S/F	Object Name	Artifact Material	Artifact Count	Weight (g)	Taxon	Common Name	Artifact Description	Burning Pattern	NISP	MNE	Adult/ Juvenile	Skeletal Element	Portion of Element Present	Weathering Stage	Zooarchaeological Description	Culturally Modified (Y/N)	Modfication
30295	30295		PS3A	6	S76	Bone Tool	Bone	1	1.9	Odocoileus sp.	deer	Spatulate tool, distal fragment, minor mfg residue, use-wear, medium burning (discard pattern)	Discard pattern	1	1	A	metartasal, right	disto-cranial fragment	I	Spatulate tool, distal fragment. Source material: Odocoileus sp. metartasal, right, disto-cranial fragment. Blank extraction method unclear. Shaping by scraping and grinding. Max length 59 mm, max. width 9 mm, max thickness 5 mm. Tip morphology W>T. Macroscopic use-wear bright and invasive (silica-rich plants). 10x microscopic use-wear is bright and invasive (silica-rich plants), with transverse to oblique fine striations. Burned (discard pattern).	Y	Blank extraction method unclear. Shaping by scraping and grinding. Max length 59 mm, max. width 9 mm, max thickness 5 mm. Tip morphology W>T. Macroscopic use-wear bright and invasive (silica-rich plants). 10x microscopic use-wear is bright and invasive (silica-rich plants), with transverse to oblique fine striations. Burned (discard pattern).
30474	30474		PS4D	11	S115	Bone Tool	Bone	1	3.16	Odocoileus sp.	deer	Spatulate tool, mesial fragment, use-wear, medium burning (discard pattern)	Discard pattern	1		A	metapodial	mesial diaphysis fragment	I	Spatulate tool, mesial fragment. Source material: Odocoileus sp. mesial metapodial. Blank extraction method unclear. Shaping by scraping and grinding. Max length 40 mm, max. width 12 mm, max thickness 6 mm. Macroscopic use-wear bright and invasive (silica-rich plants). 10x microscopic use-wear is bright and invasive (silica-rich plants), with numerous transverse to oblique fine striations. Burned (discard pattern).	Y	Blank extraction method unclear. Shaping by scraping and grinding. Max length 40 mm, max. width 12 mm, max thickness 6 mm. Macroscopic use-wear bright and invasive (silica-rich plants). 10x microscopic use-wear is bright and invasive (silica-rich plants), with numerous transverse to oblique fine striations. Burned (discard pattern).
30545	30545		PS4D	11	S115	Bone Tool	Bone	1	4.51	Odocoileus sp.	deer	Spatulate tool, distal fragment; remnant mfg residue and use-wear; burned (discard pattern)	Discard pattern	1	1	A	metacarpal, right	disto-lateral fragment	I	Spatulate tool, distal fragment. Source material: Odocoileus sp. metacarpal, right, disto-lateral fragment. Blank extracted by grooving & snapping. Distal half shaped by scraping and grinding. Max. length 87 mm, max. width 9 mm, max. thickness 5 mm. Distal tip truncated approx. 2-3 mm from end. Tip morphology: W=T. Macroscopic use-wear is bright and invasive (silica-rich plants). 10x microscopic use-wear is bright and invasive (silica-rich plants), with transverse to oblique fine striations. Burned (discard pattern).	Y	Blank extracted by grooving & snapping. Distal half shaped by scraping and grinding. Max. length 87 mm, max. width 9 mm, max. thickness 5 mm. Distal tip truncated approx. 2-3 mm from end. Tip morphology: W=T. Macroscopic use wear is bright and invasive (silica-rich plants). 10x microscopic use-wear is bright and invasive (silica-rich plants), with transverse to oblique fine striations. Burned (discard pattern).
30124	30128	02.A.1	PS4A	5	F2	Faunal Remains	Bone	1	1.23	cf. Odocoileus sp.	deer	cf. Odocoileus sp., tibia diaphysis fragment, calcined (discard pattern)	Discard pattern	1	1	A	tibia	diaphysis fragment	II	cf. Odocoileus sp., tibia diaphysis fragment, calcined (discard pattern)	Y	burned (discard pattern)
30124	30128	02.A.2	PS4A	5	F2	Faunal Remains	Bone	1	2.12	Odocoileus sp.	deer	Odocoileus sp., phalange III, burned (discard pattern)	Discard pattern	1		A	phalange III		I	cf. Odocoileus sp., tibia diaphysis fragment, calcined (discard pattern)	Y	burned (discard pattern)
30124	30128	02.A.3	PS4A	5	F2	Faunal Remains	Bone	3	4.12	Odocoileus sp.	deer	Odocoileus sp., rib fragment, distal, cutmarks, burned	Discard pattern	1		A	rib	distal fragment	II	Odocoileus sp., rib fragment, distal, 2 cutmarks on medial facies, burned (discard pattern)	Y	2 cutmarks on medial facies, burned (discard pattern)
30124	30128	02.B.1	PS4A	5	F2	Faunal Remains	Bone	1	0.06	small mammal	small mammal	Small mammal, skull fragment, calcined (discard pattern)	Discard pattern	1	1	A	skull fragment		I	Small mammal, skull fragment, calcined (discard pattern)	Y	calcined (discard pattern)
30124	30128	02.B.2	PS4A	5	F2	Faunal Remains	Bone	1	0.08	Osteichthyes	boney fish	Osteichthyes, vertebra fragment, burned (roasting pattern) encrusted with desert succulent residue	Roasting pattern	1		A	vertebra	posterior abdominal fragment	I	Osteichthyes, vertebra, posterior abdominal fragment, burned (roasting pattern) encrusted with desert succulent residue	Y	burned (roasting pattern) encrusted with desert succulent residue
30124	30128	02.B.3	PS4A	5	F2	Faunal Remains	Bone	1	0.03	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., radius, left, distal fragment, burned (roasting pattern)	Roasting pattern	1	1	Y	radius, left	distal epiphysis fragment	I	Sylvilagus sp., radius, left, distal epiphysis fragment, burned (roasting pattern)	Y	burned (roasting pattern)
30124	30128	02.B.4	PS4A	5	F2	Faunal Remains	Bone	1	0.03	Lepisosteus sp.	garfish	Lepisosteus sp., ganoid scale, burned (discard pattern)	Discard pattern	1		A	ganoid scale		I	Lepisosteus sp., ganoid scale, burned (discard pattern)		burned (discard pattern)

Table App D.1. Master Faunal Analysis Table continued.

Lot	FN	Spec No.	PS	U	S/F	Object Name	Artifact Material	Artifact Count	Weight (g)	Taxon	Common Name	Artifact Description	Burning Pattern	NISP	MNE	Adult/ Juvenile	Skeletal Element	Portion of Element Present	Weathering Stage	Zooarchaeological Description	Culturally Modified (Y/N)	Modfication
30124	30128	02.B.5	PS4A	5	F2	Faunal Remains	Bone	7	0.14	Osteichthyes	boney fish	Osteichthyes, indeterminate bone fragments, burned (discard pattern)	Discard pattern	7		A	indeterminate bone fragment		II	Osteichthyes, indeterminate bone fragments, burned (discard pattern)	Y	burned (discard pattern)
30135	30157	02.A.1	PS4A	5	S29/F2	Faunal Remains	Bone	1	0.29	Artiodactyla	even-toed ungulate	Spatulate tool, mesial fragment, remnant mfg residue and use-wear. Burned (discard pattern).	Discard pattern	1		A	long bone		I	Spatulate tool, mesial fragment. Source material: Artiodactyla long bone. Blank extraction method unclear. Shaping by scraping and grinding. Max length 21 mm, max. width 4 mm, max thickness 4 mm. Macroscopic use-wear bright and invasive (silica-rich plants). 10x microscopic use-wear is bright and invasive (silica-rich plants). Burned (discard pattern).	Y	Macroscopic use-wear bright and invasive (silica-rich plants). 10x microscopic use-wear is bright and invasive (silica-rich plants). Burned (discard pattern).
30135	30157	02.A.2	PS4A	5	S29/F2	Faunal Remains	Bone	2	0.35	Artiodactyla	even-toed ungulate	Artiodactyla, rib fragments, unmodified	Unburned	1		A	rib fragments		II	Artiodactyla, rib fragments (conjoin, post-excavation breakage), unmodified	N	
30135	30157	02.A.3	PS4A	5	S29/F2	Faunal Remains	Bone	1	0.65	Ictaluridae	catfish	Ictaluridae, hyoid fragment, burned (discard pattern)	Discard pattern	1	1	A	hyoid fragment, left		II	Ictaluridae, hyoid fragment, left, burned (discared pattern).	Y	burned (discard pattern)
30135	30157	02.A.4	PS4A	5	S29/F2	Faunal Remains	Bone	1	0.43	Ictaluridae	catfish	Ictaluridae, cleithrum fragment, burned (discard pattern)	Discard pattern	1	1	A	cleithrum, left	mesial fragment	II	Ictaluridae, cleithrum fragment, mesial, left burned (discard pattern)	Y	burned (discard pattern)
30135	30157	02.A.5	PS4A	5	S29/F2	Faunal Remains	Bone	1	0.32	Ictaluridae	catfish	Ictaluridae, skull fragment, burned (discard pattern)	Discard pattern	1		A	skull fragment		II	Ictaluridae, skull fragment, burned (discard pattern)	Y	burned (discard pattern)
30135	30157	02.A.6	PS4A	5	S29/F2	Faunal Remains	Bone	2	0.03	Ictaluridae	catfish	Ictaluridae, skull fragment, burned (discard pattern)	Discard pattern	2		A	skull fragment		II	Ictaluridae, skull fragment, burned (discard pattern)	Y	burned (discard pattern)
30135	30157	02.B.1	PS4A	5	S29/F2	Bone Tool	Bone	1	1.02	Odocoileus sp.	deer	Spatulate tool, mesio-lateral fragment, remnant mfg residue and use-wear	Unburned	1		A	metapodial	mesial diaphysis fragment	I	Spatulate tool, mesio-lateral fragment. Source material: Odocoileus sp. mesial metapodial diaphysis fragment. Blank extracted by grooving & snapping. Shaping by scraping and grinding. Max length 20 mm, max. width 9 mm, max thickness 6 mm. Macroscopic use-wear bright and invasive (silica-rich plants). 10x microscopic use-wear is bright and invasive (silica-rich plants), with numerous transverse to oblique fine striations.	Y	Blank extracted by grooving & snapping. Shaping by scraping and grinding. Max length 20 mm, max. width 9 mm, max thickness 6 mm. Macroscopic use-wear bright and invasive (silica-rich plants). 10x microscopic use-wear is bright and invasive (silica-rich plants), with numerous transverse to oblique fine striations.
30135	30157	02.B.2	PS4A	5	S29/F2	Faunal Remains	Bone	1	0.07	Lepus californicus	black-tailed jackrabbit	Lepus californicus, metatarsal III, right, fragment, unmodified	Unburned	1	1	SA	metatarsal III	right proximal epiphysis fragment	I	Lepus californicus, metatarsal III, right, proximal epiphysis fragment, unmodified	N	
30135	30157	02.B.3	PS4A	5	S29/F2	Faunal Remains	Bone	1	0.1	small mammal	small mammal	small mammal, indeterminate long bone fragment, unmodified	Unburned	1		SA	indeterminate long bone	mesial diaphysis fragment	I	small mammal, indeterminate long bone diaphysis fragment, mesial, unmodified	N	
30135	30157	02.B.4	PS4A	5	S29/F2	Faunal Remains	Bone	1	0.59	Canidae (dog or fox-size)	dog or fox	Canidae (dog or fox-size), humerus, left, proximal fragment, burned (discard pattern)	Discard pattern	1	1	A	humerus, left	proximal epiphysis fragment w/lesser tubercle	I	Canidae (dog or fox-size), humerus, left, proximal epiphysis fragment with lesser tubercle, burned (discard pattern)	Y	burned (discard pattern)
30135	30157	02.B.5	PS4A	5	S29/F2	Faunal Remains	Bone	1	0.33	Large mammal	large mammal	Large mammal, skull fragment, burned (discard pattern)	Discard pattern	1		A	skull fragment		I	Large mammal, skull fragment, burned (discard pattern)	Y	burned (discard pattern)
30135	30157	02.B.6	PS4A	5	S29/F2	Faunal Remains	Bone	1	0.02	small mammal	small mammal	small mammal, scapula fragment, mesial, unmodified	Unburned	1		A	scapula	mesial fragment	I	small mammal, scapula fragment, mesial, unmodified	N	
30135	30157	02.B.7	PS4A	5	S29/F2	Faunal Remains	Bone	1	0.04	Squamata	lizard or snake	Squamata, vertebra, unmodified	Unburned	1		A	vertebra		I	Squamata, vertebra, unmodified	N	
30135	30157	02.B.8	PS4A	5	S29/F2	Faunal Remains	Bone	1	0.03	Leporidae	rabbit	Leporidae, skull fragment, unmodified	Unburned	1		A	skull fragment		I	Leporidae, skull fragment, unmodified	N	
30135	30157	02.B.9	PS4A	5	S29/F2	Faunal Remains	Bone	14	0.1	Aplodinotus grunniens	freshwater drum	Aplodinotus grunniens, vertebra, burned (discard pattern)	Discard pattern			A	vertebra, caudal	centrum fragment	I	Aplodinotus grunniens, vertebra caudal, centrum, burned (discard pattern)	Y	burned (discard pattern)

Table App D.1. Master Faunal Analysis Table continued.

Lot	FN	Spec No.	PS	U	S/F	Object Name	Artifact Material	Artifact Count	Weight (g)	Taxon	Common Name	Artifact Description	Burning Pattern	NISP	MNE	Adult/ Juvenile	Skeletal Element	Portion of Element Present	Weathering Stage	Zooarchaeological Description	Culturally Modified (Y/N)	Modfication
30135	30157	02.B.10	PS4A	5	S29/F2	Faunal Remains	Bone	2	0.23	medium mammal	medium mammal	medium mammal, indeterminate long bone fragment, burned (discard pattern)	Discard pattern	2		A	indeterminate long bone diaphysis fragment		II	medium mammal, indeterminate long bone diaphysis fragments, burned (discard pattern)	Y	burned (discard pattern)
30135	30157	02.B.11	PS4A	5	S29/F2	Faunal Remains	Bone	1	0.19	Osteichthyes	boney fish	Osteichthyes, rib fragment, burned (discard pattern)	Discard pattern	1		A	rib fragment		II	Osteichthyes, rib fragment, burned (discard pattern)	Y	burned (discard pattern)
30135	30157	02.B.12	PS4A	5	S29/F2	Faunal Remains	Bone	2	0.17	small mammal	small mammal	small mammal, indeterminate bone fragments, calcined (discard pattern)	Discard pattern	2		A	indeterminate bone fragment		II	small mammal, indeterminate bone fragments, calcined (discard pattern)	Y	calcined (discard pattern)
30124	30144	02.A.1	PS4A	5	S35/F2	Faunal Remains	Bone	1	0.46	cf. Osteichthyes	boney fish	cf. Osteichthyes, vertebra, anterior, burned (discard pattern)	Discard pattern	1		A	vertebra, anterior abdominal		I	cf. Osteichthyes, vertebra, anterior abdominal, burned (discard pattern)	Y	burned (discard pattern)
30124	30144	02.A.2	PS4A	5	S35/F2	Faunal Remains	Bone	1	1.31	cf. Osteichthyes	boney fish	cf. Osteichthyes, urohyal, burned (discard pattern)	Discard pattern	1	1	A	urohyal		I	cf. Osteichthyes, urohyal, burned (discard pattern)	Y	burned (discard pattern)
30124	30144	02.A.3	PS4A	5	S35/F2	Faunal Remains	Bone	4	0.22	Osteichthyes	boney fish	Osteichthyes, rib fragments, burned (discard pattern)	Discard pattern	1		A	rib fragments		I	Osteichthyes, rib fragments, burned (discard pattern)	Y	burned (discard pattern)
30124	30144	02.A.4	PS4A	5	S35/F2	Faunal Remains	Bone	1	0.28	Osteichthyes	boney fish	Osteichthyes, skull fragment, burned (discard pattern)	Discard pattern	1	1	A	skull fragment		I	Osteichthyes, skull fragment, burned (discard pattern)	Y	burned (discard pattern)
30141	30141	02.A.1	PS3A	2	F3	Faunal Remains	Bone	2	0.35	Apalone spiniferus	softshell turtle	Apalone spiniferus, carapace fragment, unmodified	Unburned	1		A	carapace	costal fragments	I	Apalone spiniferus, carapace, costal fragments, unmodified	N	
30229	30229	02.A.1	PS4B	11	F4	Faunal Remains	Bone	1	2.46	Lepus californicus	black-tailed jackrabbit	Lepus californicus, pelvis fragment, right, unmodified	Unburned	1	1	A	pelvis, right		I	Lepus californicus, pelvis fragment, right, unmodified	N	
30229	30229	02.A.2	PS4B	11	F4	Faunal Remains	Bone	1	1.54	cf. Artiodactyla	even-toed ungulate	cf. Artiodactyla, indeterminate long bone fragment, burned (roasting pattern)	Roasting pattern	1		A	indeterminate long bone epiphysis fragment		I	cf. Artiodactyla, indeterminate long bone epiphysis fragment, burned (roasting pattern)	Y	burned (roasting pattern)
30229	30229	02.A.3	PS4B	11	F4	Faunal Remains	Bone	1	1.18	Large mammal	large mammal	Large mammal, long bone fragment, burned (discard pattern)	Discard pattern	1		A	indeterminate long bone diaphysis fragment		I	Large mammal, indeterminate long bone diaphysis fragment, burned (discard pattern)	Y	burned (discard pattern)
30229	30229	02.A.4	PS4B	11	F4	Faunal Remains	Bone	1	0.21	medium mammal	medium mammal	medium mammal, rib fragment, mesial, unmodified	Unburned	1		A	rib	mesial fragment	II	medium mammal, rib fragment, mesial, unmodified	N	
30229	30229	02.A.5	PS4B	11	F4	Faunal Remains	Bone	1	0.24	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., femur, left, mesial fragment, calcined (discard pattern)	Discard pattern	1	1	A	femur, left	mesial diaphysis fragment	II	Sylvilagus sp., femur, left, mesial diaphysis fragment, calcined (discard pattern)	Y	calcined (discard pattern)
30229	30229	02.A.6	PS4B	11	F4	Faunal Remains	Bone	1	0.17	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., scapula, left, ventral fragment, burned (roasting pattern)	Roasting pattern	1	1	A	scapula, left	ventral fragment	II	Sylvilagus sp., scapula, left, ventral fragment, burned (roasting pattern)	Y	burned (roasting pattern)
30229	30229	02.A.7	PS4B	11	F4	Faunal Remains	Bone	1	0.2	cf. Leporidae	rabbit	cf. Leporidae, tibia, proximal fragment, burned (roasting pattern)	Roasting pattern	1		A	tibia	proximal diaphysis fragment	II	cf. Leporidae, tibia, proximal diaphysis fragment, burned (roasting pattern)	Y	burned (roasting pattern)
30230	30233	02.B.1	PS4B	11	S53/F4	Faunal Remains	Bone	1	0.04	Osteichthyes	boney fish	Osteichthyes, vertebra, centrum fragment, unmodified	Unburned	1		A	vertebra	centrum fragment	I	Osteichthyes, vertebra, centrum fragment, unmodified	N	

Table App D.1. Master Faunal Analysis Table continued.

Lot	FN	Spec No.	PS	U	S/F	Object Name	Artifact Material	Artifact Count	Weight (g)	Taxon	Common Name	Artifact Description	Burning Pattern	NISP	MNE	Adult/ Juvenile	Skeletal Element	Portion of Element Present	Weathering Stage	Zooarchaeological Description	Culturally Modified (Y/N)	Modfication
30230	30233	02.B.2	PS4B	11	S53/F4	Faunal Remains	Bone	10	0.32	medium mammal	medium mammal	medium mammal, indeterminate bone fragment, burned (discard pattern)	Discard pattern	10		A	indeterminate bone fragment		II	medium mammal, indeterminate bone fragment, burned (discard pattern)	Y	burned (discard pattern)
30230	30233	02.B.3	PS4B	11	S53/F4	Faunal Remains	Bone	2	0.33	Large mammal	large mammal	Large mammal, indeterminate bone fragment, burned (discard pattern)	Discard pattern	2		A	indeterminate bone fragment		II	Large mammal, indeterminate bone fragment, burned (discard pattern)	Y	burned (discard pattern)
30230	30233	02.B	PS4B	11	S53/F4	Faunal Remains	Bone	1	0.03	small mammal	small mammal	small mammal, indeterminate bone fragment, unmodified	Unburned	1		A	indeterminate bone fragment		I	small mammal, indeterminate bone fragment, unmodified	N	
30230	30233	02.B	PS4B	11	S53/F4	Faunal Remains	Bone	1	0.08	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., humerus, distal fragment, burned (roasting pattern)	Roasting pattern	1	1	A	humerus	distal fragment	I	Sylvilagus sp., humerus, distal fragment, burned (roasting pattern)	Y	burned (roasting pattern)
30258	30332	02.A.1	PS4B	11	S72/F7	Faunal Remains	Bone	1	2.86	cf. Odocoileus sp.	deer	cf. Odocoileus sp., femur, right, distal fragment, burned (discard pattern)	Discard pattern	1	1	A	femur, right	disto-caudal facies fragment	I	cf. Odocoileus sp., femur, right, disto-caudal facies fragment, burned (discard pattern)	Y	burned (discard pattern)
30258	30332	02.A.2	PS4B	11	S72/F7	Faunal Remains	Bone	1	1.24	cf. Artiodactyla	even-toed ungulate	cf. Artiodactyla, ulna, left, proximal fragment, calcined (discard pattern)	Discard pattern	1	1	A	ulna, left	olecranon process, ventral fragment	I	cf. Artiodactyla, ulna, left, olecranon process, ventral fragment, calcined (discard pattern)	Y	calcined (discard pattern)
30258	30332	02.B.1	PS4B	11	S72/F7	Faunal Remains	Bone	1	0.1	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., metatarsal IV, right, unmodified	Unburned	1	1	J	metarsal IV, right		I	Sylvilagus sp., metatarsal IV, right, unmodified	N	
30258	30332	02.B.2	PS4B	11	S72/F7	Faunal Remains	Bone	1	0.11	Sylvilagus sp.	cottontail rabbit	Sylvilagus, tooth, left, upper P4, burned (discard pattern)	Discard pattern	1	1	J	tooth, upper left P4		I	Sylvilagus, tooth, left, upper P4, burned (discard pattern)	Y	burned (discard pattern)
30258	30332	02.B.3	PS4B	11	S72/F7	Faunal Remains	Bone	1	0.05	small mammal	small mammal	small mammal, long bone fragment, calcined (discard pattern)	Discard pattern	1		A	long bone	diaphysis fragment	I	small mammal, long bone diaphysis fragment, calcined (discard pattern)	Y	calcined (discard pattern)
30258	30332	02.B.4	PS4B	11	S72/F7	Faunal Remains	Bone	7	0.08	small mammal	small mammal	small mammal, indeterminate bone fragments, burned (discard pattern)	Discard pattern	7		A	indeterminate bone fragment		I	small mammal, indeterminate bone fragments, burned (discard pattern)	Y	burned (discard pattern)
30258	30332	02.B.5	PS4B	11	S72/F7	Faunal Remains	Bone	1	0.06	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., rib fragment, burned (discard pattern)	Discard pattern	1		J	rib fragment		I	Sylvilagus sp., rib fragment, burned (discard pattern)	Y	burned (discard pattern)
30132	30111	02.B	PS4A	5	S26	Faunal Remains	Bone	1	0.12	Lepus californicus	black-tailed jackrabbit	Lepus californicus, illium fragment, unmodified	Unburned	1		A	illium	disto-ventral fragment	I	Lepus californicus, illium, disto-ventral fragment, unmodified	N	
30133	30133	02.A.1	PS4A	5	S27	Faunal Remains	Bone	2	1.04	Large mammal	large mammal	Large mammal, long bone fragments, burned (discard pattern)	Discard pattern	2		A	indeterminate long bone diaphysis fragment		II	Large mammal, indeterminate long bone diaphysis fragments, burned (discard pattern)	Y	burned (discard pattern)
30133	30133	02.A.2	PS4A	5	S27	Faunal Remains	Bone	1	0.15	medium mammal	medium mammal	medium mammal, long bone fragment, burned (discard pattern), cutmarks (defleshing)	Discard pattern	1		A	indeterminate long bone diaphysis fragment		II	medium mammal, indeterminate long bone diaphysis fragment, burned (discard pattern), 6 oblique cutmarks (defleshing)	Y	burned (discard pattern), 6 oblique cutmarks (defleshing)
30133	30133	02.A.3	PS4A	5	S27	Faunal Remains	Bone	1	0.33	cf. Canidae	dog, fox, or coyote	cf. Canidae, radius fragment, burned (discard pattern)	Discard pattern	1	1	A	radius	mesial diaphysis fragment	II	cf. Canidae, radius, mesial diaphysis fragment, burned (discard pattern)	Y	burned (discard pattern)
30136	30159	02.B.1	PS4A	5	S30	Faunal Remains	Bone	1	0.13	Ictaluridae	catfish	Ictaluridae, caudal vertebra, hypoural plate, burned (discard pattern)	Discard pattern	1	1	A	caudal vertebra	includes hypoural plate	I	Ictaluridae, caudal vertebra, hypoural plate, burned (discard pattern)	Y	burned (discard pattern)

Table App D.1. Master Faunal Analysis Table continued.

Lot	FN	Spec No.	PS	U	S/F	Object Name	Artifact Material	Artifact Count	Weight (g)	Taxon	Common Name	Artifact Description	Burning Pattern	NISP	MNE	Adult/ Juvenile	Skeletal Element	Portion of Element Present	Weathering Stage	Zooarchaeological Description	Culturally Modified (Y/N)	Modfication
30136	30159	02.B.2	PS4A	5	S30	Faunal Remains	Bone	1	0.17	Ictaluridae	catfish	Ictaluridae, caudal vertebra, burned (discard pattern)	Discard pattern	1		A	caudal vertebra		I	Ictaluridae, caudal vertebra, burned (discard pattern)	Y	burned (discard pattern)
30136	30159	02.B.3	PS4A	5	S30	Faunal Remains	Bone	1	0.13	Ictaluridae	catfish	Ictaluridae, skull fragment, burned (discard pattern)	Discard pattern	1	1	A	skull fragment		I	Ictaluridae, skull fragment, burned (discard pattern)	Y	burned (discard pattern)
30136	30159	02.B.4	PS4A	5	S30	Faunal Remains	Bone	4	0.13	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., maxilla, right, burned (discard pattern)	Discard pattern	4	1	A	maxilla, right	includes zygomatic arch	I	Sylvilagus sp., maxilla, right, w/zygomatic arch, calcined (discard pattern)	Y	burned (discard pattern)
30136	30159	02.B.5	PS4A	5	S30	Faunal Remains	Bone	1	0.05	small mammal	small mammal	Ictaluridae, caudal vertebra, burned (discard pattern)	Discard pattern	1		A	vertebra fragment		I	Ictaluridae, caudal vertebra, burned (discard pattern)	Y	burned (discard pattern)
30136	30159	02.B.6	PS4A	5	S30	Faunal Remains	Bone	1	0.28	Lepus californicus	black-tailed jackrabbit	Lepus californicus, skull fragment, burned (discard pattern)	Discard pattern	1		A	skull fragment		I	Lepus californicus, skull fragment, burned (discard pattern)	Y	burned (discard pattern)
30136	30159	02.B.7	PS4A	5	S30	Faunal Remains	Bone	7	0.39	Ictaluridae	catfish	Ictaluridae, caudal vertebra fragments, burned (discard pattern)	Discard pattern	7	1	A	caudal vertebra	hypoural fragments	I	Ictaluridae, caudal vertebra, hypoural fragments, burned (discard pattern)	Y	burned (discard pattern)
30136	30159	02.B.8	PS4A	5	S30	Faunal Remains	Bone	13	0.13	Ictaluridae	catfish	Ictaluridae, indeterminate bone fragments, burned (discard pattern)	Discard pattern	13		A	indeterminate bone fragment		I	Ictaluridae, indeterminate bone fragments, burned (discard pattern)	Y	burned (discard pattern)
30136	30159	02.B.9	PS4A	5	S30	Faunal Remains	Bone	4	0.21	small mammal	small mammal	small mammal, indeterminate bone fragments, burned (discard pattern)	Discard pattern	4		SA	indeterminate long bone fragment		II	small mammal, indeterminate long bone fragments, burned (discard pattern)	Y	burned (discard pattern)
30136	30159	02.B.10	PS4A	5	S30	Faunal Remains	Bone	2	0.08	cf. Sylvilagus sp.	cottontail rabbit	cf. Sylvilagus sp., scapula fragments, burned (discard pattern)	Discard pattern	2	1	SA	scapula fragments		I	cf. Sylvilagus sp., scapula fragments, burned (discard pattern)	Y	burned (discard pattern)
30137	30165	02.B.1	PS4A	5	S31	Faunal Remains	Bone	1	0.04	small mammal (rabbit-size)	small rabbit size mammal	small mammal (rabbit-size), humerus, proximal, unmodified	Unburned	1		J	humerus	proximal epiphysis	I	small mammal (rabbit-size), humerus, proximal epiphysis, unmodified	N	
30137	30165	02.B.2	PS4A	5	S31	Faunal Remains	Bone	1	0.01	small mammal	small mammal	small mammal, indeterminate bone fragment, unmodified	Unburned	1		A	indeterminate bone fragment		I	small mammal, indeterminate bone fragment, unmodified	N	
30137	30165	02.B.3	PS4A	5	S31	Faunal Remains	Bone	1	0.1	medium mammal	medium mammal	medium mammal, indeterminate long bone fragment, burned (discard pattern)	Discard pattern	1		A	indeterminate long bone	diaphysis fragment	I	small mammal, indeterminate long bone diaphysis fragment, burned (discard pattern)	Y	burned (discard pattern)
30137	30165	02.B.4	PS4A	5	S31	Faunal Remains	Bone	1	0.08	medium mammal	medium mammal	medium mammal, rib fragment, proximal, burned (discard pattern)	Discard pattern	1		J	rib fragment	proximal	I	medium mammal, rib fragment, proximal, burned (discard pattern)	Y	burned (discard pattern)
30138	30138	02.A.2	PS4A	5	S32	Faunal Remains	Bone	1	0.08	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., maxilla, left, burned (discard pattern)	Discard pattern	1	1	A	maxilla, left		II	Sylvilagus sp., maxilla, left, burned (discard pattern)	Y	burned (discard pattern)
30138	30138	02.A.3	PS4A	5	S32	Faunal Remains	Bone	3	0.06	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., maxilla, right, burned (discard pattern)	Discard pattern	1	1	A	maxilla, right		II	Sylvilagus sp., maxilla, right, burned (discard pattern)	Y	burned (discard pattern)
30138	30138	02.A.4	PS4A	5	S32	Faunal Remains	Bone	1	0.48	cf. Lepus californicus	black-tailed jackrabbit	cf. Lepus californicus, skull fragment, burned (discard pattern)	Discard pattern	1	1	A	skull fragment	frontal	II	cf. Lepus californicus, skull, frontal fragment, burned (discard pattern)	Y	burned (discard pattern)
30138	30138	02.A.5	PS4A	5	S32	Faunal Remains	Bone	1	0.1	cf. Lepus californicus	black-tailed jackrabbit	cf. Lepus californicus, radius, right, distal fragment, unmodified	Unburned	1	1	A	radius, right	distal diaphysis fragment	I	cf. Lepus californicus, radius, right, distal diaphysis fragment, unmodified	N	

Table App D.1. Master Faunal Analysis Table continued.

Lot	FN	Spec No.	PS	U	S/F	Object Name	Artifact Material	Artifact Count	Weight (g)	Taxon	Common Name	Artifact Description	Burning Pattern	NISP	MNE	Adult/ Juvenile	Skeletal Element	Portion of Element Present	Weathering Stage	Zooarchaeological Description	Culturally Modified (Y/N)	Modfication
30138	30175	02.B.1	PS4A	5	S32A	Faunal Remains	Bone	2	0.1	small mammal	small mammal	small mammal, long bone fragment, unmodified	Unburned	2		A	indeterminate long bone fragment		I	small mammal, indeterminate long bone fragment, unmodified	N	
30138	30175	02.B.2	PS4A	5	S32A	Faunal Remains	Bone	2	0.09	small mammal	small mammal	small mammal, long bone fragment, burned (discard pattern)	Discard pattern	2		A	indeterminate long bone fragment		II	small mammal, indeterminate long bone fragment, burned (discard pattern)	Y	burned (discard pattern)
30138	30175	02.B.3	PS4A	5	S32A	Faunal Remains	Bone	2	0.56	medium mammal	medium mammal	medium mammal, long bone fragment, burned (discard pattern)	Discard pattern	2		A	indeterminate long bone fragment		II	medium mammal, indeterminate long bone fragment, burned (discard pattern)	Y	burned (discard pattern)
30138	30177	02.A.1	PS4A	5	S32C	Faunal Remains	Bone	1	1.66	Artiodactyla (cf. Odocoileus sp.)	even-toed ungulate, deer	Artiodactyla (cf. Odocoileus sp.), humerus, epiphysis fragment, calcined (discard pattern)	Discard pattern	1	1	A	humerus, right	proximal epiphysis fragment	II	Artiodactyla (cf. Odocoileus sp.), humerus, right, proximal epiphysis fragment, calcined (discard pattern)		calcined (discard pattern)
30139	30179	02.A.1	PS4A	5	S33A	Faunal Remains	Bone	1	3.05	Canidae (dog or small coyote-size)	dog or coyote	Canidae (dog or small coyote-size), calcaneum, right, cutmarks and burned (discard pattern)	Discard pattern	1	1	A	calcaneum, right		II	Canidae (dog or small coyote-size), calcaneum, right, 5 transverse cutmarks on proximal medial aspect (dismemberbment), burned (discard pattern)	Y	5 transverse cutmarks on proximal medial aspect (dismemberbment), burned (discard pattern)
30139	30179	02.A.2	PS4A	5	S33A	Faunal Remains	Bone	1	0.53	Canis cf. latrans or familiaris	dog or coyote	Canis cf. latrans or familiaris, femur, left proximal epiphysis, unmodified	Unburned	1	1	J	femur, left	proximal epiphysis	II	Canis cf. latrans or familiaris, juvenile, femur, left proximal epiphysis, unmodified	N	
30139	30179	02.A.3	PS4A	5	S33A	Faunal Remains	Bone	1	0.48	Lepus californicus	black-tailed jackrabbit	Lepus californicus, femur, right, distal epiphysis, unmodified	Unburned	1	1	J	femur, right	distal epiphysis	II	Lepus californicus, femur, right, distal epiphysis, unmodified	N	
30139	30179	02.A.4	PS4A	5	S33A	Faunal Remains	Bone	1	1.34	Canis cf. latrans or familiaris	dog or coyote	Canis cf. latrans or familiaris, femur, left, diaphysis fragment, burned (discard pattern)	Discard pattern	1		J	femur, left	mesio-caudal diaphysis fragment	II	Canis cf. latrans or familiaris, femur, left, mesio-caudal diaphysis fragment, burned (discard pattern)	Y	burned (discard pattern)
30139	30179	02.B.1	PS4A	5	S33A	Faunal Remains	Bone	1	0.12	Artiodactyla (cf. Odocoileus sp.)	even-toed ungulate, deer	Artiodactyla, humerus, right, proximal epiphysis fragment, calcined	Unburned	1	1	A	humerus, right	right proximal epiphysis fragment	II	Artiodactyla (cf. Odocoileus sp.), humerus, right, proximal epiphysis fragment, calcined (discard pattern)	Y	calcined (discard pattern)
30139	30179	02.B.2	PS4A	5	S33A	Faunal Remains	Bone	1	0.07	Ictaluridae	catfish	Ictaluridae, cleithrum fragment, unmodified	Unburned	1		A	cleithrum	mesial fragment	I	Ictaluridae, cleithrum fragment, mesial, unmodified	N	
30139	30179	02.B.3	PS4A	5	S33A	Faunal Remains	Bone	1	0.3	Apalone spiniferus	softshell turtle	Apalone spiniferus, carapace fragment, unmodified	Unburned	1		A	carapace	costal fragment	I	Apalone spiniferus, carapace, costal fragment, unmodified	N	
30139	30179	02.B.4	PS4A	5	S33A	Faunal Remains	Bone	1	0.1	Lepus californicus	black-tailed jackrabbit	Lepus californicus, scapula fragment, right, unmodified	Unburned	1	1	A	scapula, right	mesial fragment	I	Lepus californicus, scapula, right, mesial fragment, unmodified	N	
30139	30179	02.B.5	PS4A	5	S33A	Faunal Remains	Bone	1	0.22	Lepus californicus	black-tailed jackrabbit	Lepus californicus, metatarsal IV fragment, right, burned (discard pattern)	Discard pattern	1	1	SA	metarsal IV, right	mesial diaphysis fragment	II	Lepus californicus, metatarsal IV, right, mesial diaphysis fragment, burned (discard pattern)	Y	burned (discard pattern)
30139	30179	02.B.6	PS4A	5	S33A	Faunal Remains	Bone	1	0.39	Large mammal	large mammal	Large mammal, long bone fragment, burned (discard pattern)	Discard pattern	1		A	indeterminate long bone	epiphysis fragment	II	Large mammal, indeterminate long bone epiphysis fragment, burned (discard pattern)	Y	burned (discard pattern)
30139	30179	02.B.7	PS4A	5	S33A	Faunal Remains	Bone	3	0.06	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., premaxilla, right, burned (discard pattern)	Discard pattern	3	1	J	premaxilla, right	distal fragments	II	Sylvilagus sp., premaxilla, right, distal fragments, burned (discard pattern)	Y	burned (discard pattern)
30139	30179	02.B.8	PS4A	5	S33A	Faunal Remains	Bone	1	0.05	small mammal	small mammal	small mammal, indeterminate bone fragment, unmodified	Unburned	1		A	indeterminate bone	epiphysis fragment	I	small mammal, indeterminate bone epiphysis fragment, unmodified	N	
30139	30179	02.B.9	PS4A	5	S33A	Faunal Remains	Bone	1	0.06	Osteichthyes	boney fish	Osteichthyes, skull fragment, unmodified	Unburned	1		A	skull fragment		I	Osteichthyes, skull fragment, unmodified	N	
30139	30179	02.B.10	PS4A	5	S33A	Faunal Remains	Bone	1	0.05	Sylvilagus sp.	cottontail rabbit	Squamata, vertebra, unmodified	Unburned	1		A	vertebra		I	Squamata, vertebra, unmodified	N	

Table App D.1. Master Faunal Analysis Table continued.

Lot	FN	Spec No.	PS	U	S/F	Object Name	Artifact Material	Artifact Count	Weight (g)	Taxon	Common Name	Artifact Description	Burning Pattern	NISP	MNE	Adult/ Juvenile	Skeletal Element	Portion of Element Present	Weathering Stage	Zooarchaeological Description	Culturally Modified (Y/N)	Modfication
30139	30179	02.B.11	PS4A	5	S33A	Faunal Remains	Bone	1	0.03	small mammal	small mammal	small mammal, indeterminate bone fragment, unmodified	Unburned	1		A	indeterminate bone	cancellous fragment	I	small mammal, indeterminate bone fragment, cancellous, unmodified	N	
30139	30179	02.B.12	PS4A	5	S33A	Faunal Remains	Bone	2	0.09	Squamata	lizard or snake	Squamata, vertebra, burned (discard pattern)	Discard pattern	2		A	vertebra		I	Squamata, vertebra, burned (discard pattern)	Y	burned (discard pattern)
30139	30179	02.B.13	PS4A	5	S33A	Faunal Remains	Bone	1	0.03	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., humerus, left, distal fragment, burned (discard pattern)	Discard pattern	1	1	J	humerus, left	distal epiphysis	II	Sylvilagus sp., humerus, left, distal epiphysis fragment, burned (discard pattern)	Y	burned (discard pattern)
30139	30179	02.B.14	PS4A	5	S33A	Faunal Remains	Bone	1	0.02	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., femur, left, distal fragment, burned (discard pattern)	Discard pattern	1	1	J	femur, left	distal epiphysis	II	Sylvilagus sp., femur, left, distal epiphysis fragment, burned (discard pattern)	Y	burned (discard pattern)
30139	30179	02.B.15	PS4A	5	S33A	Faunal Remains	Bone	1	0.02	Osteichthyes	boney fish	Osteichthyes, vertebra fragment, calcined (discard pattern)	Discard pattern	1		A	vertebra fragment		I	Osteichthyes, vertebra fragment, calcined (discard pattern)	Y	calcined (discard pattern)
30139	30179	02.B.16	PS4A	5	S33A	Faunal Remains	Bone	1	0.04	Rodentia	rodent	Rodentia, skull fragment, burned (discard pattern)	Discard pattern	1		A	skull fragment		I	Rodentia, skull fragment, burned (discard pattern)	Y	burned (discard pattern)
30139	30179	02.B.17	PS4A	5	S33A	Faunal Remains	Bone	1	0.04	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., mandible, left, diastema fragment, unmodified	Unburned	1	1	J	mandible, left	medial diastema fragment	I	Sylvilagus sp., mandible, left, medial diastema fragment, unmodified	N	
30139	30179	02.B.18	PS4A	5	S33A	Faunal Remains	Bone	1	0.04	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., phalange I, burned (discard pattern)	Discard pattern	1		J	phalange I		I	Sylvilagus sp., phalange I, burned (discard pattern)	Y	burned (discard pattern)
30139	30179	02.B.19	PS4A	5	S33A	Faunal Remains	Bone	1	0.02	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., scapula, left, proximal fragment, unmodified	Unburned	1	1	J	scapula, left	proximal fragment w/glenoid fossa	I	Sylvilagus sp., scapula, left, proximal fragment w/glenoid fossa, unmodified	N	
30139	30179	02.B.20	PS4A	5	S33A	Faunal Remains	Bone	1	0.05	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., molar, left, lower, burned (discard pattern)	Discard pattern	1	1	A	molar	lower left M1	I	Sylvilagus sp., molar, left, lower, M1, burned (discard pattern)	Y	burned (discard pattern)
30139	30179	02.B.21	PS4A	5	S33A	Faunal Remains	Bone	46	0.56	small mammal	small mammal	Small mammaml, bone fragments, calcined (discard pattern)	Discard pattern	46		A	indeterminate bone fragment		I	Small mammal, indeterminate bone fragments, calcined (discard pattern)	Y	calcined (discard pattern)
30139	30139	02.A.1	PS4A	5	S33	Faunal Remains	Bone	1	0.15	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., scapula, left, proximal fragment, burned (roasting pattern)	Roasting pattern	1	1	A	scapula, left	proximal fragment w/glenoid fossa	II	Sylvilagus sp., scapula, left, proximal fragment w/glenoid fossa, burned (roasting pattern)	Y	burned (roasting pattern)
30139	30139	02.A.2	PS4A	5	S33	Faunal Remains	Bone	1	0.39	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., mandible, left, burned (discard pattern)	Discard pattern	1	1	A	mandible, left	edentulous	II	Sylvilagus sp., mandible, left, edentulous, burned (discard pattern)	Y	burned (discard pattern)
30139	30139	02.A.3	PS4A	5	S33	Faunal Remains	Bone	1	0.15	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., maxilla, left, calcined (discard pattern)	Discard pattern	1	1	A	maxilla, left	w/zygomatic arch	II	Sylvilagus sp., maxilla, left, w/zygomatic arch, calcined (discard pattern)	Y	burned (discard pattern)
30139	30139	02.A.4	PS4A	5	S33	Faunal Remains	Bone	1	0.65	Lepus californicus	black-tailed jackrabbit	Lepus californicus, mandible, right, diastema, unmodified	Unburned	1	1	A	mandible, right	diastema	II	Lepus californicus, mandible, right, diastema, unmodified	Y	unmodified
30139	30139	02.A.5	PS4A	5	S33	Faunal Remains	Bone	1	0.09	Cypriniformes	carp-like fish	Cypriniformes, caudal vertebra, unmodified	Unburned	1		A	vertebra, caudal		II	Cypriniformes, vertebra, caudal unmodified	Y	unmodified
30139	30139	02.A.6	PS4A	5	S33	Faunal Remains	Bone	1	0.06	Aplodinotus grunniens	freshwater drum	Aplodinotus grunniens, skull fragment, unmodified	Unburned	1	1	A	skull fragment	pharyngeal arch w/remnant teeth	II	Aplodinotus grunniens, skull fragment, pharyngeal arch w/remnant teeth, unmodified	Y	unmodified
30139	30139	02.A.7	PS4A	5	S33	Faunal Remains	Bone	1	0.32	Emydidae	pond turtle or slider	Emydidae, carapace, burned (discard pattern)	Discard pattern	1	1	A	carapace	pygal bone	I	Emydidae, carapace, pygal bone, burned (discard pattern)	Y	burned (discard pattern)
30139	30139	02.A.8	PS4A	5	S33	Faunal Remains	Bone	1	0.08	Ictaluridae	catfish	Ictaluridae, skull fragment, calcined (discard pattern)	Discard pattern	1		A	skull fragment		I	Ictaluridae, skull fragment, calcined (discard pattern)	Y	burned (discard pattern)

Table App D.1. Master Faunal Analysis Table continued.

Lot	FN	Spec No.	PS	U	S/F	Object Name	Artifact Material	Artifact Count	Weight (g)	Taxon	Common Name	Artifact Description	Burning Pattern	NISP	MNE	Adult/ Juvenile	Skeletal Element	Portion of Element Present	Weathering Stage	Zooarchaeological Description	Culturally Modified (Y/N)	Modfication
30139	30139	02.A.9	PS4A	5	S33	Faunal Remains	Bone	1	0.24	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., tibia, left, mesial diaphysis fragment, burned (discard pattern)	Discard pattern	1	1	SA	tibia, left	mesial diaphysis fragment	I	Sylvilagus sp., tibia, left, mesial diaphysis fragment, burned (discard pattern)	Y	burned (discard pattern)
30139	30139	02.A.10	PS4A	5	S33	Faunal Remains	Bone	1	0.17	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., humerus, left, distal diaphysis fragment, cutmarks (defleshing), burned (discard pattern)	Discard pattern	1	1	A	humerus, left	distal diaphysis fragment	II	Sylvilagus sp., humerus, left, distal diaphysis fragment, 3 transverse cutmarks on posterior facies (defleshing), burned (discard pattern)	Y	3 transverse cutmarks on posterior facies (defleshing), burned (discard pattern)
30139	30139	02.A.11	PS4A	5	S33	Faunal Remains	Bone	1	0.6	Lepus californicus	black-tailed jackrabbit	Lepus californicus, femur, left, diaphysis fragment, cutmarks, burned (discard pattern)	Discard pattern	1	1	A	femur, left	disto-cranial diaphysis fragment	I	Lepus californicus, femur, left, disto-cranial diaphysis fragment, 2 oblique cutmarks (dismemberment), burned (discard pattern)	Y	2 oblique cutmarks (dismemberment), burned (discard pattern)
30139	30139	02.A.12	PS4A	5	S33	Faunal Remains	Bone	1	1	Large mammal	large mammal	Large mammal, long bone fragment, burned (discard pattern)	Discard pattern	1		A	indeterminate long bone fragment		II	Large mammal, indeterminate long bone diaphysis fragment, burned (discard pattern)	Y	burned (discard pattern)
30139	30181	02.A.1	PS4A	5	S33B	Faunal Remains	Bone	1	0.76	Ictaluridae	catfish	Ictaluridae, vertebra, posterior abdominal fragment, unmodified	Unburned	1		A	vertebra, posterior abdominal		II	Ictaluridae, vertebra, posterior abdominal fragment (11 growth annuli), unmodified	N	
30139	30181	02.A.2	PS4A	5	S33B	Faunal Remains	Bone	1	5.68	Artiodactyla (cf. Odocoileus sp.)	even-toed ungulate, deer	Artiodactyla (cf. Odocoileus sp., small), astragalus, right, unmodified	Unburned	1	1	SA	astragalus, right		II	Artiodactyla (cf. Odocoileus sp., small), astragalus, right, unmodified	N	
30139	30181	02.A.3	PS4A	5	S33B	Faunal Remains	Bone	1	0.75	Artiodactyla	even-toed ungulate	Artiodactyla, skull fragment, unmodified	Unburned	1		A	skull fragment		II	Artiodactyla, skull fragment, unmodified	N	
30151	30155	02.B.1	PS4A	5	S37	Faunal Remains	Bone	1	0.99	Large mammal	large mammal	Large mammal, long bone fragment, unmodified	Unburned	1		A	indeterminate long bone diaphysis fragment		II	Large mammal, indeterminate long bone diaphysis fragment, unmodified	N	
30151	30155	02.B.2	PS4A	5	S37	Faunal Remains	Bone	1	0.05	small mammal	small mammal	small mammal, long bone fragment, unmodified	Unburned	1		A	indeterminate long bone diaphysis fragment		II	Small mammal, indeterminate long bone diaphysis fragment, unmodified	N	
30151	30155	02.B.3	PS4A	5	S37	Faunal Remains	Bone	5	0.22	small mammal	small mammal	small mammal, long bone fragment, burned (discard pattern)	Discard pattern	5		A	indeterminate long bone fragment		II	small mammal, indeterminate long bone fragment, burned (discard pattern)	Y	burned (discard pattern)
30249	30274	02.A.2	PS4B	11	S63	Faunal Remains	Bone	1	1.22	Artiodactyla	even-toed ungulate	Artiodactyla, metapodial fragment, calcined (discard pattern)	Discard pattern	1		A	metapodial	mesial diaphysis fragment	III	Artiodactyla, metapodial, mesial diaphysis fragment, dry-state fractures, calcined (discard pattern)	N	
30249	30274	02.A.3	PS4B	11	S63	Faunal Remains	Bone	1	1.09	Lepus californicus	black-tailed jackrabbit	Lepus californicus, femur, left, proximal fragment, burned (discard pattern)	Discard pattern	1	1	A	femur, left	proximal diaphysis fragment	II	Lepus californicus, femur, left, proximal diaphysis fragment, burned (discard pattern)	Y	burned (discard pattern)
30249	30274	02.A.4	PS4B	11	S63	Faunal Remains	Bone	1	0.67	cf. Canidae (fox or small dog-size)	dog or fox	cf. Canidae, femur fragment, left, helical fracture, burned (discard pattern)	Discard pattern	1	1	A	femur, left	proximal diaphysis fragment	II	cf. Canidae (fox or small dog size), femur, left, proximal diaphysis fragment, helical fractures (potential marrow removal), burned (discard pattern)	Y	helical fractures (potential marrow removal), burned (discard pattern)
30249	30274	02.A.5	PS4B	11	S63	Faunal Remains	Bone	1	0.58	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., maxilla, left, calcined (discard pattern)	Discard pattern	1	1	A	maxilla, left	includes 2 teeth still in place and 2 loose teeth	II	Sylvilagus sp., maxilla, left (includes 2 teeth still in place and 2 loose teeth), calcined (discard pattern)	Y	calcined (discard pattern)
30249	30274	02.A.6	PS4B	11	S63	Faunal Remains	Bone	2	0.32	Lepus californicus	black-tailed jackrabbit	Lepus californicus, skull fragments, burned (discard pattern)	Discard pattern	2	1	A	skull, frontal, right	posterior fragments	I	Lepus californicus, skull fragments, frontal, right, posterior, burned (discard pattern)	Y	burned (discard pattern)
30249	30274	02.A.7	PS4B	11	S63	Faunal Remains	Bone	1	0.14	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., scapula, left, proximal fragment, unmodified	Unburned	1	1	A	scapula, left	proximal fragment w/gelnoid fossa	II	Sylvilagus sp., scapula, left, proximal fragment w/gelnoid fossa, unmodified	N	

Table App D.1. Master Faunal Analysis Table continued.

Lot	FN	Spec No.	PS	U	S/F	Object Name	Artifact Material	Artifact Count	Weight (g)	Taxon	Common Name	Artifact Description	Burning Pattern	NISP	MNE	Adult/ Juvenile	Skeletal Element	Portion of Element Present	Weathering Stage	Zooarchaeological Description	Culturally Modified (Y/N)	Modfication
30249	30274	02.A.8	PS4B	11	S63	Faunal Remains	Bone	8	0.91	medium mammal	medium mammal	medium mammal, indeterminate long bone fragments, unmodified	Unburned	8		A	indeterminate long bone fragment		II	medium mammal, indeterminate long bone fragments, carbonate encrusted, unmodified	N	
30249	30274	02.A.9	PS4B	11	S63	Faunal Remains	Bone	1	0.23	Lepus californicus	black-tailed jackrabbit	Lepus californicus, humerus, left, proximal fragment, calcined (discard pattern)	Discard pattern	1	1	A	humerus, left	proximal epiphysis fragment	II	Lepus californicus, humerus, left, proximal epiphysis fragment, calcined (discard pattern)	Y	calcined (discard pattern)
30249	30274	02.A.10	PS4B	11	S63	Faunal Remains	Bone	5	0.32	small mammal	small mammal	small mammal, long bone fragment, burned (discard pattern)	Discard pattern	5		A	indeterminate long bone fragment		II	small mammal, long bone fragment, burned (discard pattern)	Y	burned (discard pattern)
30249	30274	02.B.1	PS4B	11	S63	Faunal Remains	Bone	1	1.01	Lepus californicus	black-tailed jackrabbit	Lepus californicus, mandible, right, diastema, unmodified	Unburned	1	1	A	mandible, right	diastema	II	Lepus californicus, mandible, right, diastema, unmodified	N	
30249	30274	02.B.2	PS4B	11	S63	Faunal Remains	Bone	1	0.35	Lepus californicus	black-tailed jackrabbit	Lepus californicus, femur, right, proximal fragment, unmodified	Unburned	1	1	A	femur, right	proximo-medial diaphysis fragment	I	Lepus californicus, femur, right, proximo-medial diaphysis fragment, unmodified	N	
30249	30274	02.B.3	PS4B	11	S63	Faunal Remains	Bone	1	0.44	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., maxilla, right, burned (discard pattern)	Discard pattern	1	1	A	maxilla, right		II	Sylvilagus sp., maxilla, right,with associated tooth fragments, burned (discard pattern)	Y	burned (discard pattern)
30249	30274	02.B.4	PS4B	11	S63	Faunal Remains	Bone	1	0.33	Lepus californicus	black-tailed jackrabbit	Lepus californicus, mandible, right, diastema fragment, burned (discard pattern)	Discard pattern	1	1	A	mandible, right	ventral diastema fragment	I	Lepus californicus, mandible, right, ventral diastema fragment, burned (discard pattern)	Y	burned (discard pattern)
30249	30274	02.B.5	PS4B	11	S63	Faunal Remains	Bone	1	0.16	cf. Apalone spinifera	softshell turtle	cf. Apalone spinifera, pleural bone fragment, unmodified	Unburned	1		A	pleural bone fragment		I	cf. Apalone spinifera, pleural bone fragment, unmodified	N	
30249	30274	02.B.6	PS4B	11	S63	Faunal Remains	Bone	1	0.06	Lepus californicus	black-tailed jackrabbit	Lepus californicus, humerus, mesio-lateral fragment, burned (roasting pattern)	Roasting pattern	1		J	humerus	mesio-lateral diaphysis fragment	II	Lepus californicus, humerus, mesio-lateral diaphysis fragment, burned (roasting pattern)	Y	burned (roasting pattern)
30249	30274	02.B.7	PS4B	11	S63	Faunal Remains	Bone	2	0.16	cf. Leporidae	rabbit	cf. Leporidae, long bone fragments, calcined (discard pattern)	Discard pattern	2		J	indeterminate long bone diaphysis fragment		II	cf. Leporidae, indeterminate long bone diaphysis fragments, calcined (discard pattern)	Y	calcined (discard pattern)
30249	30274	02.B.8	PS4B	11	S63	Faunal Remains	Bone	2	0.19	medium mammal	medium mammal	medium mammal, long bone fragment, burned (discard pattern)	Discard pattern	2		A	indeterminate long bone epiphysis fragment		I	medium mammal, indeterminate long bone epiphysis fragments, burned (discard pattern)	Y	burned (discard pattern)
30249	30274	02.B.9	PS4B	11	S63	Faunal Remains	Bone	14	0.46	small mammal	small mammal	small mammal, indeterminate bone fragments, burned (discard pattern)	Discard pattern	14		A	indeterminate long bone fragment		I	small mammal, indeterminate long bone fragments, burned (discard pattern)	Y	burned (discard pattern)
30249	30274	02.B.10	PS4B	11	S63	Faunal Remains	Bone	4	0.08	small mammal	small mammal	Small mammaml, long bone fragments, calcined (discard pattern)	Discard pattern	4		A	indeterminate long bone fragment		I	Small mammaml, indeterminate long bone fragments, calcined (discard pattern)	Y	calcined (discard pattern)
30249	30274	02.B.11	PS4B	11	S63	Faunal Remains	Bone	6	0.26	cf. Leporidae	rabbit	cf. Leporidae, skull fragments, burned (discard pattern)	Discard pattern	6		A	skull fragment		I	cf. Leporidae, skull fragments, burned (discard pattern)	Y	burned (discard pattern)
30250	30306	02.A.2	PS4B	11	S64	Faunal Remains	Bone	1	0.21	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., humerus, left, distal fragment, burned (discard pattern)	Discard pattern	1	1	A	humerus, left	distal fragment	I	Sylvilagus sp., humerus, left, distal fragment, burned (discard pattern)	Y	burned (discard pattern)
30250	30306	02.A.3	PS4B	11	S64	Faunal Remains	Bone	1	0.38	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., juvenile, femur, left, diaphysis, burned (roasting pattern)	Roasting pattern	1	1	J	femur, left	mesial diaphysis fragment	II	Sylvilagus sp., juvenile, femur, left, mesial diaphysis, burned (roasting pattern)	Y	burned (roasting pattern)

Table App D.1. Master Faunal Analysis Table continued.

Lot	FN	Spec No.	PS	U	S/F	Object Name	Artifact Material	Artifact Count	Weight (g)	Taxon	Common Name	Artifact Description	Burning Pattern	NISP	MNE	Adult/ Juvenile	Skeletal Element	Portion of Element Present	Weathering Stage	Zooarchaeological Description	Culturally Modified (Y/N)	Modfication
30250	30306	02.A.4	PS4B	11	S64	Faunal Remains	Bone	1	0.39	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., femur, right, mesial fragment, burned (roasting pattern)	Roasting pattern	1	1	A	femur, right	mesial diaphysis fragment, caudal facies	I	Sylvilagus sp., femur, right, mesial diaphysis, caudal facies fragment, burned (roasting pattern)	Y	burned (roasting pattern)
30250	30306	02.B.2	PS4B	11	S64	Faunal Remains	Bone	2	0.13	small mammal	small mammal	small mammal, indeterminate long bone fragment, unmodified	Unburned	2		A	indeterminate long bone fragment		I	small mammal, indeterminate long bone fragment, unmodified	N	
30251	30315	02.B.2	PS4B	11	S65	Faunal Remains	Bone	1	0.32	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., tibia, right, proximal fragment, burned (discard pattern)	Discard pattern	1	1	A	tibia, right	proximal diaphysis fragment	I	Sylvilagus sp., tibia, right, proximal diaphysis fragment, burned (discard pattern)	Y	burned (discard pattern)
30251	30315	02.B.3	PS4B	11	S65	Faunal Remains	Bone	4	0.35	small mammal	small mammal	small mammal, indeterminate bone fragments, burned (discard pattern)	Discard pattern	4		A	indeterminate bone fragment		II	small mammal, indeterminate bone fragments, burned (discard pattern)	Y	burned (discard pattern)
30353	30368	02.A.1	PS4C	14	S94	Faunal Remains	Bone	1	0.45	Large mammal	large mammal	Large mammal, long bone fragment, burned (discard pattern)	Discard pattern	1		A	indeterminate long bone diaphysis fragment		I	Large mammal, indeterminate long bone diaphysis fragment, burned (discard pattern)	Y	burned (discard pattern)
30354	30372	02.A.1	PS4C	14	S96	Faunal Remains	Bone	1	0.16	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., femur, left, proximal fragment, burned (discard pattern)	Discard pattern	1	1	J	femur, left	proximo-medial fragment	II	Sylvilagus sp., femur, left, proximo-medial fragment, burned (discard pattern)	Y	burned (discard pattern)
30355	30370	02.B.1	PS4C	14	S97	Faunal Remains	Bone	1	0.04	small mammal	small mammal	small mammal, long bone fragment, burned (discard pattern)	Discard pattern	1		A	indeterminate long bone diaphysis fragment		I	small mammal, indeterminate long bone diaphysis fragment, burned (discard pattern)	Y	burned (discard pattern)
30355	30370	02.B.2	PS4C	14	S97	Faunal Remains	Bone	1	0.22	Sigmodontinae	cotton rat	Sigmodontinae, mandible, right, burned (discard pattern)	Discard pattern	1	1	A	mandible, right	edentulous w/tooth row and diastema	I	Sigmodontinae, mandible, right, edentulous w/tooth row and diastema, burned (discard pattern)	Y	burned (discard pattern)
30355	30370	02.B.3	PS4C	14	S97	Faunal Remains	Bone	1	0.06	cf. Sylvilagus sp.	cottontail rabbit	cf. Sylvilagus sp., skull fragment, burned (discard pattern)	Discard pattern	1	1	A	skull, temporal fragment, right	w/zygomatic process	I	cf. Sylvilagus sp., skull, temporal, right, fragment w/zygomatic process, burned (discard pattern)	Y	burned (discard pattern)
30355	30370	02.B.4	PS4C	14	S97	Faunal Remains	Bone	1	0.09	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., calcaneum fragment, left, burned (discard pattern)	Discard pattern	1	1	A	calcaneum fragment, left		I	Sylvilagus sp., calcaneum fragment, left, burned (discard pattern)	Y	burned (discard pattern)
30355	30370	02.B.5	PS4C	14	S97	Faunal Remains	Bone	1	0.1	cf. Leporidae	rabbit	cf. Leporidae, tibia, left, proximal fragment, burned (discard pattern)	Discard pattern	1	1	J	tibia, left	proximo-lateral fragment	III	cf. Leporidae, tibia, left, proximo-lateral fragment, burned (discard pattern)	Y	burned (discard pattern)
30355	30370	02.B.6	PS4C	14	S97	Faunal Remains	Bone	4	0.1	small mammal	small mammal	small mammal, indeterminate bone fragments, burned (discard pattern)	Discard pattern	4		A	indeterminate long bone epiphysis fragment		II	small mammal, indeterminate long bone epiphysis fragment, burned (discard pattern)	Y	burned (discard pattern)
30359	30404	02.B.1	PS4C	14	S101	Faunal Remains	Bone	1	0.06	small mammal	small mammal	Small mammal, skull fragment, unmodified	Unburned	1		A	skull fragment		I	Small mammal, skull fragment, unmodified	N	
30359	30404	02.B.2	PS4C	14	S101	Faunal Remains	Bone	1	0.63	Pylodictis olivaris	flathead catfish	Pylodictis olivaris, cerato-hyal, left, distal fragment, unmodified	Unburned	1	1	A	cerato-hyal, left	distal fragment	II	Pylodictis olivaris, cerato-hyal, left, distal fragment, unmodified	N	
30359	30404	02.B.3	PS4C	14	S101	Faunal Remains	Bone	1	0.26	Ictaluridae	catfish	Ictaluridae, rib fragment, burned (discard pattern)	Discard pattern	1		A	rib	mesial fragment	I	Ictaluridae, rib, mesial fragment, burned (discard pattern)	Y	burned (discard pattern)
30359	30404	02.A.1	PS4C	14	S101	Faunal Remains	Bone	1	0.37	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., pelvis, right, burned (discard pattern)	Discard pattern	1	1	A	pelvis, right	acetabulum	I	Sylvilagus sp., pelvis, acetabulum, right, burned (discard pattern)	Y	burned (discard pattern)
30359	30404	02.A.2	PS4C	14	S101	Faunal Remains	Bone	1	0.38	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., femur, right, mesial fragment, burned (discard pattern)	Discard pattern	1	1	J	femur, right	mesial diaphysis fragment	II	Sylvilagus sp., femur, right, mesial diaphysis fragment, burned (discard pattern)	Y	burned (discard pattern)

Table App D.1. Master Faunal Analysis Table continued.

Lot	FN	Spec No.	PS	U	S/F	Object Name	Artifact Material	Artifact Count	Weight (g)	Taxon	Common Name	Artifact Description	Burning Pattern	NISP	MNE	Adult/ Juvenile	Skeletal Element	Portion of Element Present	Weathering Stage	Zooarchaeological Description	Culturally Modified (Y/N)	Modfication
30359	30404	02.A.3	PS4C	14	S101	Faunal Remains	Bone	1	0.22	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., humerus, right, proximal fragment, burned (discard pattern)	Discard pattern	1	1	A	humerus, right	proximo-lateral diaphysis fragment	II	Sylvilagus sp., humerus, right, proximo-lateral fragment, burned (discard pattern)	Y	burned (discard pattern)
30359	30404	02.A.4	PS4C	14	S101	Faunal Remains	Bone	1	0.13	medium mammal	medium mammal	medium mammal, indeterminate bone fragment, burned (roasting pattern)	Roasting pattern	1		A	indeterminate bone fragment		I	medium mammal, indeterminate bone fragment, burned (roasting pattern)	Y	burned (roasting pattern)
30359	30404	02.A.5	PS4C	14	S101	Faunal Remains	Bone	9	0.18	small mammal	small mammal	small mammal, indeterminate bone fragments, burned (discard pattern)	Discard pattern	9					I	Small mammal, indeterminate long bone diaphysis fragment, unmodified	N	
30360	30416	02.B.1	PS4C	14	S102	Faunal Remains	Bone	1	0.32	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., humerus, left, mesial fragment, burned (roasting pattern)	Roasting pattern	1	1	A	humerus, left	mesial diaphysis fragment	I	Sylvilagus sp., humerus, left, mesial diaphysis fragment, burned (roasting pattern)	Y	burned (roasting pattern)
30360	30416	02.A.1	PS4C	14	S102	Faunal Remains	Bone	1	1.06	Large mammal	large mammal	large mammal, long bone fragment, cutmarks, burned (roasting pattern)	Roasting pattern	1		J	indeterminate long bone diaphysis fragment		II	large mammal, indeterminate long bone diaphysis fragment, 4 oblique cutmarks (defleshing), burned (roasting pattern)	Y	4 oblique cutmarks (defleshing), burned (roasting pattern)
30361	30412	02.B.1	PS4C	14	S103	Faunal Remains	Bone	1	0.07	cf. Sylvilagus sp.	cottontail rabbit	cf. Sylvilagus sp., tibia fragment, left, burned (discard pattern)	Discard pattern	1	1	A	tibia, left	caudo-mesial diaphysis fragment	III	cf. Sylvilagus sp., tibia, left, caudo-mesial diaphysis fragment, burned (discard pattern)	Y	burned (discard pattern)
30361	30412	02.B.2	PS4C	14	S103	Faunal Remains	Bone	1	0.26	cf. Leporidae	rabbit	cf. Leporidae, juvenile, humerus, mesial fragment, cutmarks (defleshing)	Unburned	1	1	J	humerus	mesio-lateral diaphysis fragment	III	cf. Leporidae, juvenile, humerus, mesio-lateral diaphysis fragment, 25 oblique cutmarks (defleshing)	Y	25 oblique cutmarks (defleshing)
30361	30412	02.B.3	PS4C	14	S103	Faunal Remains	Bone	2	0.12	small mammal	small mammal	small mammal, long bone fragment, unmodified	Unburned	1		A	indeterminate long bone fragment		I	small mammal, long bone fragment (conjoin), unmodified	N	
30534	30459	02.B.1	PS4D	11	S98	Faunal Remains	Bone	3	0.17	small mammal	small mammal	small mammal, indeterminate bone fragments, burned (discard pattern)	Discard pattern	3		A	indeterminate bone fragment		I	small mammal, indeterminate bone fragments, burned (discard pattern)	Y	burned (discard pattern)
30534	30459	02.B.2	PS4D	11	S98	Faunal Remains	Bone	2	0.02	Squamata	lizard or snake	Squamata, vertebra, unmodified	Unburned	1		A	vertebra fragment		I	Squamata, vertebra, unmodified	N	
30534	30459	02.B.3	PS4D	11	S98	Faunal Remains	Bone	1	0.03	Large mammal	large mammal	Large mammal, indeterminate bone fragment, unmodified	Unburned	1		A	indeterminate bone fragment		I	Large mammal, indeterminate bone fragment, unmodified	N	
30535	30467	02.B.1	PS4D	11	S99	Faunal Remains	Bone	1	0.37	Large mammal	large mammal	Large mammal, long bone fragment, burned (discard pattern)	Discard pattern	1		J	indeterminate long bone fragment		III	Large mammal, indeterminate long bone fragment, burned (discard pattern)	Y	burned (discard pattern)
30535	30467	02.B.2	PS4D	11	S99	Faunal Remains	Bone	2	0.9	Large mammal	large mammal	Large mammal, indeterminate bone fragment, burned (discard pattern)	Discard pattern	1		A	indeterminate bone fragment		III	Large mammal, indeterminate long bone fragment, burned (discard pattern)	Y	burned (discard pattern)
30535	30467	02.B.3	PS4D	11	S99	Faunal Remains	Bone	2	0.11	medium mammal	medium mammal	medium mammal, indeterminate bone fragments, unmodified	Unburned	2		A	indeterminate bone fragment		I	medium mammal, indeterminate bone fragments, unmodified	N	
30535	30467	02.B.4	PS4D	11	S99	Faunal Remains	Bone	5	0.16	small mammal	small mammal	small mammal, indeterminate bone fragments, burned (discard pattern)	Discard pattern	5		A	indeterminate bone fragment		II	small mammal, indeterminate bone fragments, burned (discard pattern)	Y	burned (discard pattern)
30536	30612	02.B.1	PS4D	11	S106	Faunal Remains	Bone	1	0.03	Squamata	lizard or snake	Squamata, vertebra fragment, unmodified	Unburned	1		A	vertebra fragment		I	Squamata, vertebra fragment, unmodified	N	
30536	30612	02.B.2	PS4D	11	S106	Faunal Remains	Bone	4	0.13	small mammal	small mammal	small mammal, indeterminate bone fragment, unmodified	Unburned	4		A	indeterminate bone fragment		II	small mammal, indeterminate bone fragment, unmodified	N	
30537	30554	02.A.1	PS4D	11	S112	Faunal Remains	Bone	1	0.77	cf. Odocoileus sp.	deer	cf. Odocoileus sp., skull, frontal, right, fragment, burned (discard pattern)	Discard pattern	1	1	A	skull, frontal, right	fragment with orbit	I	cf. Odocoileus sp., skull, frontal, right, fragment w/orbit, burned (discard pattern)	Y	burned (discard pattern)

Table App D.1. Master Faunal Analysis Table continued.

Lot	FN	Spec No.	PS	U	S/F	Object Name	Artifact Material	Artifact Count	Weight (g)	Taxon	Common Name	Artifact Description	Burning Pattern	NISP	MNE	Adult/ Juvenile	Skeletal Element	Portion of Element Present	Weathering Stage	Zooarchaeological Description	Culturally Modified (Y/N)	Modfication
30537	30554	02.B.1	PS4D	11	S112	Faunal Remains	Bone	1	0.54	cf. Odocoileus sp.	deer	cf. Odocoileus sp., femur, right, diaphysis fragment, burned (discard pattern)	Discard pattern	1	1	A	femur, right	proximo-medial diaphysis fragment	I	cf. Odocoileus sp., femur, right, proximo-medial diaphysis fragment, burned (discard pattern)	Y	burned (discard pattern)
30537	30554	02.B.2	PS4D	11	S112	Faunal Remains	Bone	1	0.03	Aves	bird	Aves, rib fragment, burned (discard pattern)	Discard pattern	1		A	rib fragment		I	Aves, rib fragment, burned (discard pattern)	Y	burned (discard pattern)
30537	30554	02.B.3	PS4D	11	S112	Faunal Remains	Bone	6	0.2	small mammal	small mammal	small mammal, indeterminate bone fragments, burned (discard pattern)	Discard pattern	6		A	indeterminate bone fragment		I	small mammal, indeterminate bone fragments, burned (discard pattern)	Y	burned (discard pattern)
30537	30554	02.B.4	PS4D	11	S112	Faunal Remains	Bone	3	0.08	small mammal	small mammal	small mammal, indeterminate bone fragments, unmodified	Unburned	3		A	indeterminate bone fragment		III	small mammal, indeterminate bone fragments, unmodified	N	
30611	30611	02.A.1	PS4D	11	S113	Faunal Remains	Bone	1	0.6	Lepus californicus	black-tailed jackrabbit	Lepus californicus, humerus, left, distal fragment, burned and covered with desert succulent exudate residue	Unspecified burning pattern	1	1	SA	humerus, left	disto-cranial facies fragment	II	Lepus californicus, humerus, left, disto-cranial facies fragment, burned and covered with desert succulent exudate residue	Y	burned and covered with desert succulent exudate residue
30428	30471	02.A.1	PS4D	11	S115	Faunal Remains	Bone	2	4.34	cf. Odocoileus sp.	deer	cf. Odocoileus sp., femur, right, fragment, cutmarks, burned/calcined	Roasting pattern	1	1	J	femur, right	caudal facies fragment	II	cf. Odocoileus sp., femur, right, caudal facies fragment, 5+ transverse to olbique cutmarks (defleshing), burned/calcined (roasting pattern)	Y	5+ transverse to olbique cutmarks (defleshing), burned/calcined (roasting pattern)
30428	30471	02.B.1	PS4D	11	S115	Faunal Remains	Bone	1	0.1	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., tibia, left, distal epiphysis fragment, unmodified	Unburned	1	1	A	tibia, right	distal epiphysis fragment	I	Sylvilagus sp., tibia, left, distal epiphysis fragment, unmodified	N	
30428	30471	02.B.2	PS4D	11	S115	Faunal Remains	Bone	3	0.18	small mammal	small mammal	small mammal, indeterminate bone fragments, burned (discard pattern)	Discard pattern	3		A	indeterminate bone fragment		I	small mammal, indeterminate bone fragments, burned (discard pattern)	Y	burned (discard pattern)
30428	30471	02.B.3	PS4D	11	S115	Faunal Remains	Bone	1	0.32	Large mammal	large mammal	Large mammal, long bone epiphysis fragment, calcined (discard pattern)	Discard pattern	1		A	long bone	epiphysis fragment	II	Large mammal, long bone epiphysis fragment, calcined (discard pattern)	Y	calcined (discard pattern)
30164	30196	02.B.1	PS3A	6	S25	Faunal Remains	Bone	1	0.51	Lepus californicus	black-tailed jackrabbit	Lepus californicus, femur, mesial fragment, burned (discard pattern)	Discard pattern	1		A	femur	mesial diaphysis fragment	I	Lepus californicus, femur, mesial diaphysis fragment, burned (discard pattern)	Y	burned (discard pattern)
30164	30196	02.B.2	PS3A	6	S25	Faunal Remains	Bone	2	0.45	Large mammal	large mammal	Large mammal, indeterminate bone fragment, burned (discard pattern)	Discard pattern	2		A	indeterminate long bone fragment		II	Large mammal, indeterminate long bone fragment, burned (discard pattern)	Y	burned (discard pattern)
30164	30196	02.B.3	PS3A	6	S25	Faunal Remains	Bone	1	0.17	Large mammal	large mammal	Large mammal, indeterminate bone fragment, unmodified	Unburned	1		A	indeterminate bone fragment		II	Large mammal, indeterminate bone fragment, unmodified	N	
30164	30196	02.B.4	PS3A	6	S25	Faunal Remains	Bone	1	0.13	Sylvilagus sp.	cottontail rabbit	Sylvilagus, juvenile, femur, right diaphysis fragment, unmodified	Unburned	1	1	J	femur, right	mesial diaphysis fragment	II	Sylvilagus, juvenile, femur, right, mesial diaphysis fragment, unmodified	N	
30164	30196	02.B.5	PS3A	6	S25	Faunal Remains	Bone	1	0.01	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., mandible, burned (discard pattern)	Discard pattern	1		A	mandible fragment		I	Sylvilagus sp., mandible, burned (discard pattern)	Y	burned (discard pattern)
30164	30196	02.B.6	PS3A	6	S25	Faunal Remains	Bone	2	0.13	small mammal	small mammal	small mammal, long bone fragment, burned (roasting pattern)	Roasting pattern	2		A	indeterminate long bone fragment		I	small mammal, long bone fragment, burned (roasting pattern)	Y	burned (roasting pattern)
30164	30196	02.B.7	PS3A	6	S25	Faunal Remains	Bone	1	0.15	Large mammal	large mammal	Large mammal, tooth fragment, burned (discard pattern)	Discard pattern	1		A	tooth fragment		I	Large mammal, tooth fragment, burned (discard pattern)	Y	burned (discard pattern)
30164	30196	02.B.8	PS3A	6	S25	Faunal Remains	Bone	5	0.31	small mammal	small mammal	small mammal, indeterminate bone fragments, burned (discard pattern)	Discard pattern	5		A	indeterminate bone fragment		I	small mammal, indeterminate bone fragments, burned (discard pattern)	Y	burned (discard pattern)

Table App D.1. Master Faunal Analysis Table continued.

Lot	FN	Spec No.	PS	U	S/F	Object Name	Artifact Material	Artifact Count	Weight (g)	Taxon	Common Name	Artifact Description	Burning Pattern	NISP	MNE	Adult/ Juvenile	Skeletal Element	Portion of Element Present	Weathering Stage	Zooarchaeological Description	Culturally Modified (Y/N)	Modfication
30164	30196	02.B.9	PS3A	6	S25	Faunal Remains	Bone	1	0.12	Lepus californicus	black-tailed jackrabbit	Lepus californicus, femur, mesial fragment, burned (discard pattern)	Discard pattern	1	1	A	femur	mesial diaphysis fragment	I	Lepus californicus, femur, mesial diaphysis fragment, burned (discard pattern)	Y	burned (discard pattern)
30164	30196	02.B.10	PS3A	6	S25	Faunal Remains	Bone	1	0.01	cf. Apalone spinifera	softshell turtle	cf. Apalone spinifera, costal bone fragment, unmodified	Unburned	1	1	A	carapace	costal fragment	I	cf. Apalone spinifera, costal bone fragment, unmodified	Y	burned (roasting pattern)
30164	30196	02.A.1	PS3A	6	S25	Faunal Remains	Bone	1	0.82	Odocoileus sp.	deer	Odocoileus sp., phalange I, medial fragment, burned	Discard pattern	1		A	phalange I	medial fragment	I	Odocoileus sp., phalange I, medial fragment, burned (discard pattern)	Y	burned (discard pattern)
30164	30196	02.A.2	PS3A	6	S25	Faunal Remains	Bone	1	1.01	Large mammal	large mammal	Large mammal, long bone fragment, calcined (discard pattern)	Discard pattern	1		SA	indeterminate long bone diaphysis fragment		II	Large mammal, indeterminate long bone diaphysis fragment, calcined (discard pattern)	Y	Large mammal, indeterminate long bone diaphysis fragment, calcined (discard pattern)
30164	30196	02.A.3	PS3A	6	S25	Faunal Remains	Bone	1	1.08	Large mammal	large mammal	Large mammal, long bone fragment, unmodified	Unburned	1		A	indeterminate long bone epiphysis fragment		I	Large mammal, indeterminate long bone epiphysis fragment, unmodified	N	
30164	30196	02.A.4	PS3A	6	S25	Faunal Remains	Bone	3	0.86	Artiodactyla	even-toed ungulate	Artiodactyla, ilium fragments, unmodified	Unburned	1		A	ilium fragments		II	Artiodactyla, ilium fragments, unmodified	N	
30185	30208	02.B.1	PS3A	6	S39	Bone Manufacturing Debris	Bone	1	0.16	Lepus californicus	black-tailed jackrabbit	Bone bead manufacturing debris; remnant mfg residue, calcined (discard pattern)	Discard pattern	1	1	SA	tibia, right	distal diaphysis fragment	II	Bone bead manufacturing debris. Source material: subadult Lepus californicus, tibia, right, distal diaphysis fragment lacking fused epiphysis. Blank extraction method: groove & snap, preceded by scraping to remove periosteum, with remnant transverse cutmark and longitudinal scrape marks evident. Calcined (discard pattern).	Y	Blank extraction method: groove & snap, preceded by scraping to remove periosteum, with remnant transverse cutmark and longitudinal scrape marks evident. Calcined (discard pattern).
30185	30208	02.B.2	PS3A	6	S39	Faunal Remains	Bone	1	0.11	Rodentia	rodent	Rodentia (juvenile), tibia, proximal fragment, burned (discard pattern)	Discard pattern	1	1	J	tibia	proximal diaphysis fragment	III	Rodentia (juvenile), tibia, proximal diaphysis fragment, burned (discard pattern)	Y	calcined (discard pattern)
30185	30208	02.B.3	PS3A	6	S39	Faunal Remains	Bone	1	0.13	cf. Sylvilagus sp.	cottontail rabbit	cf. Sylvilagus sp., tibia fragment, distal, calcined (discard pattern)	Discard pattern	1	1	J	tibia	distal diaphysis fragment	III	cf. Sylvilagus sp., tibia fragment, distal, calcined (discard pattern)	Y	calcined (discard pattern)
30185	30208	02.B.4	PS3A	6	S39	Faunal Remains	Bone	1	0.75	cf. Canidae (dog or coyote-sized)	dog or coyote	cf. Canidae (dog or coyote-sized), metatarsal IV, left, proximal fragment, calcined (roasting pattern)	Roasting pattern	1	1	A	metatarsal IV, left	proximal diaphysis fragment	I	cf. Canidae (dog or coyote-sized), metatarsal IV, left, proximal diaphysis fragment, calcined (roasting pattern)	Y	calcined (roasting pattern)
30185	30208	02.B.5	PS3A	6	S39	Faunal Remains	Bone	2	0.23	Large mammal	large mammal	Large mammal, indeterminate bone fragment, calcined (discard pattern)	Discard pattern	2		A	indeterminate bone fragment, cancellous		II	Large mammal, indeterminate bone fragment, cancellous, calcined (discard pattern)	Y	calcined (discard pattern)
30185	30208	02.B.6	PS3A	6	S39	Faunal Remains	Bone	1	0.34	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., ilium fragment, left, burned (discard pattern)	Discard pattern	1	1	A	ilium, left	proximal fragment	I	Sylvilagus sp., ilium, left, proximal fragment, burned (discard pattern)	Y	burned (discard pattern)
30185	30208	02.B.7	PS3A	6	S39	Faunal Remains	Bone	1	0.53	cf. Odocoileus sp.	deer	cf. Odocoileus sp., phalange II, proximal fragment, calcined (discard pattern)	Discard pattern	1		A	phalange II	proximal fragment	II	cf. Odocoileus sp., phalange II, proximal fragment, calcined (discard pattern)	Y	calcined (discard pattern)
30185	30208	02.B.8	PS3A	6	S39	Faunal Remains	Bone	1	0.17	medium mammal	medium mammal	medium mammal, indeterminate bone fragment, calcined (discard pattern)	Discard pattern	1		A	indeterminate bone fragment		I	medium mammal, indeterminate bone fragment, calcined (discard pattern)	Y	calcined (discard pattern)
30185	30208	02.B.9	PS3A	6	S39	Faunal Remains	Bone	1	0.18	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., humerus, right, distal fragment, burned (discard pattern)	Discard pattern	1	1	A	humerus, right	distal diaphysis fragment	I	Sylvilagus sp., humerus, right, distal diaphysis fragment, burned (discard pattern)	Y	burned (discard pattern)
30185	30208	02.B.10	PS3A	6	S39	Faunal Remains	Bone	1	0.07	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., femur, left, proximal fragment, burned (discard pattern)	Discard pattern	1	1	A	femur, left	proximo-medial diaphysis fragment	I	Sylvilagus sp., femur, left, proximo-medial diaphysis fragment, burned (discard pattern)		burned (discard pattern)

Table App D.1. Master Faunal Analysis Table continued.

Lot	FN	Spec No.	PS	U	S/F	Object Name	Artifact Material	Artifact Count	Weight (g)	Taxon	Common Name	Artifact Description	Burning Pattern	NISP	MNE	Adult/ Juvenile	Skeletal Element	Portion of Element Present	Weathering Stage	Zooarchaeological Description	Culturally Modified (Y/N)	Modfication
30185	30208	02.B.11	PS3A	6	S39	Faunal Remains	Bone	1	0.09	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., tibia, left, mesial diaphysis fragment, burned (roasting pattern)	Roasting pattern	1	1	A	tibia, left	mesial fragment, caudal facies	I	Sylvilagus sp., tibia, left, mesial, caudal facies fragment, burned (roasting pattern)	Y	burned (roasting pattern)
30185	30208	02.B.12	PS3A	6	S39	Faunal Remains	Bone	2	0.16	cf. Sylvilagus sp.	cottontail rabbit	cf. Sylvilagus sp., tibia, left, proximal fragments, calcined (discard pattern)	Discard pattern	2	2	SA	tibia, left	proximal fragment	II	cf. Sylvilagus sp., tibia, left, proximal fragments, calcined (discard pattern)	Y	calcined (discard pattern)
30185	30208	02.B.13	PS3A	6	S39	Faunal Remains	Bone	1	0.25	medium mammal	medium mammal	medium mammal, long bone fragment, calcined (discard pattern)	Discard pattern	1		A	indeterminate long bone diaphysis fragment		I	medium mammal, indeterminate long bone diaphysis fragment, calcined (discard pattern)	Y	calcined (discard pattern)
30185	30208	02.B.14	PS3A	6	S39	Bone Tool	Bone	1	0.14	Artiodactyla	even-toed ungulate	Spatulate tool, medial fragment, remnant mfg residue. Calcined (discard pattern).	Discard pattern	1		A	long bone fragment		II	Spatulate tool, medial fragment. Source material: Artiodactyla long bone. Blank extraction method unclear. Shaping by scraping and grinding. Max length 8 mm, max. width 5 mm, max thickness 4 mm. Calcined (discard pattern), obscuring use-wear.	Y	Blank extraction method unclear. Shaping by scraping and grinding. Max length 8 mm, max. width 5 mm, max thickness 4 mm. Calcined (discard pattern), obscuring use-wear.
30185	30208	02.B.15	PS3A	6	S39	Faunal Remains	Bone	8	0.25	small mammal	small mammal	small mammal, long bone fragment, calcined (discard pattern)	Discard pattern	8		A	indeterminate long bone fragment		I	small mammal, long bone fragment, calcined (discard pattern)	Y	calcined (discard pattern)
30185	30208	02.B.16	PS3A	6	S39	Faunal Remains	Bone	9	0.26	small mammal	small mammal	small mammal, long bone fragment, burned (discard pattern)	Discard pattern	9		A	indeterminate long bone fragment		I	small mammal, long bone fragments, burned (discard pattern)	Y	burned (discard pattern)
30185	30208	02.B.17	PS3A	6	S39	Faunal Remains	Bone	15	0.43	medium mammal	medium mammal	medium mammal, indeterminate bone fragment, calcined (discard pattern)	Discard pattern	15		A	indeterminate bone fragment		II	medium mammal, indeterminate bone fragment, calcined (discard pattern)	Y	calcined (discard pattern)
30185	30208	02.B.18	PS3A	6	S39	Faunal Remains	Bone	4	0.14	medium mammal	medium mammal	medium mammal, indeterminate long bone fragment, burned (discard pattern)	Discard pattern	4		A	indeterminate long bone	epiphysis fragment	II	medium mammal, indeterminate long bone epiphysis fragment, burned (discard pattern)	Y	burned (discard pattern)
30185	30208	02.B.19	PS3A	6	S39	Faunal Remains	Bone	1	0.14	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., ischium, right, fragment, calcined (discard pattern)	Discard pattern	1	1	A	ischium, right	proximal fragment	I	Sylvilagus sp., ischium, right, fragment, calcined (discard pattern)	Y	calcined (discard pattern)
30185	30208	02.B.20	PS3A	6	S39	Faunal Remains	Bone	3	0.16	small mammal	small mammal	small mammal, indeterminate long bone fragments, burned (discard pattern)	Discard pattern	3		A	indeterminate long bone	diaphysis fragment	I	small mammal, indeterminate long bone diaphysis fragment, burned (discard pattern)	Y	burned (discard pattern)
30185	30208	02.B.21	PS3A	6	S39	Faunal Remains	Bone	1	0.09	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., mandible, right, ventral fragment, burned (discard pattern)	Discard pattern	1	1	A	mandible, right	proximal ventral fragment	I	Sylvilagus sp., mandible, right, proximal ventral fragment, burned (discard pattern)	Y	burned (discard pattern)
30185	30208	02.B.22	PS3A	6	S39	Faunal Remains	Bone	1	0.1	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., mandible, right, diastema fragment, burned (discard pattern)	Discard pattern	1	1	A	mandible, right	diastema fragment	I	Sylvilagus sp., mandible, right, diastema fragment, burned (discard pattern)	Y	burned (discard pattern)
30185	30208	02.B.23	PS3A	6	S39	Faunal Remains	Bone	1	0.12	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., mandible fragment, calcined (discard pattern)	Discard pattern	1		A	mandible	tooth row fragment	I	Sylvilagus sp., mandible, tooth row fragment, calcined (discard pattern)	Y	calcined (discard pattern)
30185	30208	02.B.24	PS3A	6	S39	Faunal Remains	Bone	2	0.17	medium mammal	medium mammal	medium mammal, skull fragment, calcined (discard pattern)	Discard pattern	2		A	skull fragment		I	medium mammal, skull fragment, calcined (discard pattern)	Y	calcined (discard pattern)
30185	30208	02.B.25	PS3A	6	S39	Faunal Remains	Bone	1	0.15	medium mammal	medium mammal	medium mammal, indeterminate long bone fragment, calcined (discard pattern)	Discard pattern	1		A	indeterminate long bone	epiphysis fragment	I	medium mammal, indeterminate long bone epiphysis fragment, calcined (discard pattern)	Y	calcined (discard pattern)
30186	30209	02.B.1	PS3A	6	S40	Faunal Remains	bone	1	0.14	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., mandible fragment, left, burned (discard pattern)	Discard pattern	1	1	A	mandible, left	mesial fragment	I	Sylvilagus sp., mandible, left, mesial fragment, burned (discard pattern)	Y	burned (discard pattern)

Table App D.1. Master Faunal Analysis Table continued.

Lot	FN	Spec No.	PS	U	S/F	Object Name	Artifact Material	Artifact Count	Weight (g)	Taxon	Common Name	Artifact Description	Burning Pattern	NISP	MNE	Adult/ Juvenile	Skeletal Element	Portion of Element Present	Weathering Stage	Zooarchaeological Description	Culturally Modified (Y/N)	Modfication
30186	30209	02.B.2	PS3A	6	S40	Faunal Remains	bone	1	0.16	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., mandible, right, proximal fragment, burned (discard pattern)	Discard pattern	1	1	A	mandible, right	proximal fragment	I	Sylvilagus sp., mandible, right, proximal fragment, burned (discard pattern)	Y	burned (discard pattern)
30186	30209	02.B.3	PS3A	6	S40	Faunal Remains	bone	1	0.21	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., pelvis, right, calcined (discard pattern)	Discard pattern	1	1	A	pelvis, right	acetabulum	I	Sylvilagus sp., pelvis, right acetabulum, calcined (discard pattern)	Y	calcined (discard pattern)
30186	30209	02.B.4	PS3A	6	S40	Faunal Remains	bone	1	0.16	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., pelvis, left, burned (discard pattern)	Discard pattern	1	1	A	pelvis, left	acetabulum	I	Sylvilagus sp., pelvis, left acetabulum, calcined (discard pattern)	Y	burned (discard pattern)
30186	30209	02.B.5	PS3A	6	S40	Faunal Remains	bone	1	0.09	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., ilium fragment, left, calcined (discard pattern)	Discard pattern	1	1	A	ilium, left	proximal fragment	I	Sylvilagus sp., ilium, left, proximal fragment, carnivore tooth mark, calcined (discard pattern)	Y	calcined (discard pattern)
30186	30209	02.B.6	PS3A	6	S40	Faunal Remains	bone	1	0.13	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., ischium, left fragment, burned (discard pattern)	Discard pattern	1	1	A	ischium, left	proximal fragment	I	Sylvilagus sp., ischium, left, proximal fragment, calcined (discard pattern)	Y	burned (discard pattern)
30186	30209	02.B.7	PS3A	6	S40	Faunal Remains	bone	1	0.06	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., mandible, right, ventral fragment, calcined (discard pattern)	Discard pattern	1	1	A	mandible, right	proximo-ventral fragment	I	Sylvilagus sp., mandible, right, proximo-ventral fragment, calcined (discard pattern)	Y	calcined (discard pattern)
30186	30209	02.B.8	PS3A	6	S40	Faunal Remains	bone	1	0.07	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., ilium fragment, left, burned (discard pattern)	Discard pattern	1	1	A	ilium, left	proximal fragment	I	Sylvilagus sp., ilium, left, proximal fragment, calcined (discard pattern)	Y	burned (discard pattern)
30186	30209	02.B.9	PS3A	6	S40	Faunal Remains	bone	1	0.03	Lepus californicus	black-tailed jackrabbit	Lepus californicus, mandible, left, articulation, calcined (discard pattern)	Discard pattern	1	1	A	mandible, left	articulation	I	Lepus californicus, mandible, left, articulation, calcined (discard pattern)	Y	calcined (discard pattern)
30186	30209	02.B.10	PS3A	6	S40	Faunal Remains	bone	1	0.07	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., femur, left, proximal fragment, unmodified	Unburned	1	1	A	femur, left	proximal articulation	I	Sylvilagus sp., femur, left, proximal articulation, unmodified	N	
30186	30209	02.B.11	PS3A	6	S40	Faunal Remains	bone	1	0.2	Lepus californicus	black-tailed jackrabbit	Lepus californicus, scapula fragment, left, unmodified	Unburned	1	1	A	scapula, left	disto-ventral fragment	I	Lepus californicus, scapula, left, disto-ventral fragment, unmodified	N	
30186	30209	02.B.12	PS3A	6	S40	Faunal Remains	bone	1	0.13	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., metatarsal III, left, burned (discard pattern)	Discard pattern	1	1	A	metatarsal III, left	proximal diaphysis fragment	I	Sylvilagus sp., metatarsal III, right, proximal diaphysis fragment, burned (discard pattern)	Y	burned (discard pattern)
30186	30209	02.B.13	PS3A	6	S40	Faunal Remains	bone	3	0.13	Carnivora (medium)	medium-size carnivore	Carnivora (medium), tooth, molar fragment, burned (discard pattern)	Discard pattern	1		A	tooth	molar fragment	I	Carnivora (medium), tooth, molar fragment, burned (discard pattern)	Y	burned (discard pattern)
30186	30209	02.B.14	PS3A	6	S40	Faunal Remains	bone	4	0.46	medium mammal	medium mammal	medium mammal, indeterminate long bone fragment, burned (discard pattern)	Discard pattern	3		A	indeterminate long bone	diaphysis fragment	I	medium mammal, indeterminate long bone diaphysis fragment, burned (discard pattern)	Y	burned (discard pattern)
30186	30209	02.B.15	PS3A	6	S40	Faunal Remains	bone	1	0.12	Lepus californicus	black-tailed jackrabbit	Lepus californicus, ulna, right, mesial fragment, unmodified	Unburned	1	1	A	ulna, right	mesial fragment	I	Lepus californicus, ulna, right, mesial fragment, unmodified	N	
30186	30209	02.B.16	PS3A	6	S40	Faunal Remains	bone	9	0.84	medium mammal	medium mammal	medium mammal, indeterminate long bone fragment, calcined (discard pattern)	Discard pattern	9		A	indeterminate long bone	epiphysis fragment	II	medium mammal, indeterminate long bone epiphysis fragment, calcined (discard pattern)	Y	calcined (discard pattern)
30186	30209	02.B.17	PS3A	6	S40	Faunal Remains	bone	1	0.32	cf. Odocoileus sp.	deer	cf. Odocoileus sp., phalange I, proximal fragment, burned (discard pattern)	Discard pattern	1		A	phalange I	proximal epiphysis fragment	II	cf. Odocoileus sp., phalange I, proximal epiphysis fragment, burned (discard pattern)	Y	burned (discard pattern)
30186	30209	02.B.18	PS3A	6	S40	Faunal Remains	bone	1	0.19	Large mammal	large mammal	Large mammal, indeterminate long bone fragment, burned (discard pattern)	Discard pattern	1		A	indeterminate long bone	epiphysis fragment	II	Large mammal, indeterminate long bone epiphysis fragment, burned (discard pattern)	Y	burned (discard pattern)

Table App D.1. Master Faunal Analysis Table continued.

Lot	FN	Spec No.	PS	U	S/F	Object Name	Artifact Material	Artifact Count	Weight (g)	Taxon	Common Name	Artifact Description	Burning Pattern	NISP	MNE	Adult/ Juvenile	Skeletal Element	Portion of Element Present	Weathering Stage	Zooarchaeological Description	Culturally Modified (Y/N)	Modfication
30186	30209	02.B.19	PS3A	6	S40	Faunal Remains	bone	1	0.13	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., metatarsal III, right, burned (roasting pattern)	Roasting pattern	1	1	SA	metatarsal III, left	proximal fragment	I	Sylvilagus sp., metatarsal III, right, burned (roasting pattern)	Y	burned (roasting pattern)
30186	30209	02.B.20	PS3A	6	S40	Faunal Remains	bone	1	0.1	Lepus californicus	black-tailed jackrabbit	Lepus californicus, skull fragment, left temporal, unmodified	Unburned	1	1	SA	skull fragment, left temporal	zygomatic process fragment	II	Lepus californicus, skull, temporal, left, zygomatic process, unmodified	N	
30186	30209	02.B.21	PS3A	6	S40	Faunal Remains	bone	1	0.01	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., metatarsal III, right, calcined (discard pattern)	Discard pattern	1	1	SA	metatarsal III, right	proximal epiphysis fragment	I	Sylvilagus sp., metatarsal III, right, proximal epiphysis fragment, calcined (discard pattern)	Y	calcined (discard pattern)
30186	30209	02.B.22	PS3A	6	S40	Faunal Remains	bone	1	0.03	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., mandible fragment, left, calcined (discard pattern)	Discard pattern	1	1	A	mandible, left	ventral margin fragment	I	Sylvilagus sp., mandible, left, ventral margin fragment, calcined (discard pattern)	Y	calcined (discard pattern)
30186	30209	02.B.23	PS3A	6	S40	Faunal Remains	bone	1	0.06	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., ulna, right, proximal fragment, calcined (discard pattern)	Discard pattern	1	1	SA	ulna, right	proximal fragment w/trochlear fossa	I	Sylvilagus sp., ulna, right, proximal fragment w/trochlear fossa, calcined (discard pattern)	Y	calcined (discard pattern)
30186	30209	02.B.24	PS3A	6	S40	Faunal Remains	bone	1	0.06	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., metatarsal III, right, calcined (discard pattern)	Discard pattern	1	1	SA	metatarsal III, right	proximal fragment	I	Sylvilagus sp., metatarsal III, right, proximal fragment, calcined (discard pattern)	Y	calcined (discard pattern)
30186	30209	02.B.25	PS3A	6	S40	Faunal Remains	bone	1	0.01	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., scapula, left, proximal fragment, calcined (discard pattern)	Discard pattern	1	1	SA	scapula, left	proximal, ventral margin fragment	I	Sylvilagus sp., scapula, left, proximal, ventral margin fragment, calcined (discard pattern)	Y	calcined (discard pattern)
30186	30209	02.B.26	PS3A	6	S40	Faunal Remains	bone	1	0.06	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., tibia, left, proximal fragment, burned (discard pattern)	Discard pattern	1	1	SA	tibia, left	proximal fragment w/tibial tuberosity	I	Sylvilagus sp., tibia, left, proximal fragment w/tibial tuberosity, burned (discard pattern)	Y	burned (discard pattern)
30186	30209	02.B.27	PS3A	6	S40	Faunal Remains	bone	1	0.06	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., metatarsal fragment, burned (discard pattern)	Discard pattern	1		SA	metatarsal	diaphysis fragment	I	Sylvilagus sp., metatarsal diaphysis fragment, burned (discard pattern)	Y	burned (discard pattern)
30186	30209	02.B.28	PS3A	6	S40	Faunal Remains	bone	1	0.01	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., radius, mesial fragment, calcined (discard pattern)	Discard pattern	1		SA	radius	mesial diaphysis fragment	I	Sylvilagus sp., radius, mesial diaphysis fragment, calcined (discard pattern)	Y	calcined (discard pattern)
30186	30209	02.B.29	PS3A	6	S40	Faunal Remains	bone	5	0.08	small mammal	small mammal	small mammal, indeterminate long bone fragments, calcined (discard pattern)	Discard pattern	5		A	indeterminate long bone	diaphysis fragment	I	small mammal, indeterminate long bone, diphysis fragments, calcined (discard pattern)	Y	calcined (discard pattern)
30186	30209	02.B.30	PS3A	6	S40	Faunal Remains	bone	1	0.05	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., scapula, left, proximal fragment, calcined (discard pattern)	Discard pattern	1	1	SA	scapula, left	proximal fragment	I	Sylvilagus sp., scapula, left, proximal, calcined (discard pattern)	Y	calcined (discard pattern)
30186	30209	02.B.31	PS3A	6	S40	Faunal Remains	bone	1	0.04	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., ulna, left, mesial fragment, calcined (discard pattern)	Discard pattern	1	1	SA	ulna, left	mesial diaphysis fragment	I	Sylvilagus sp., ulna, left, mesial diaphysis fragment, calcined (discard pattern)	Y	calcined (discard pattern)
30186	30209	02.B.32	PS3A	6	S40	Faunal Remains	bone	1	0.01	small mammal	small mammal	small mammal, skull fragment, calcined (discard pattern)	Discard pattern	1		A	skull fragment		I	small mammal, skull fragment, calcined (discard pattern)	Y	calcined (discard pattern)
30186	30209	02.B.33	PS3A	6	S40	Faunal Remains	bone	1	0.01	small mammal	small mammal	small mammal, skull fragment, burned (discard pattern)	Discard pattern	1		A	skull fragment		I	small mammal, skull fragment, burned (discard pattern)	Y	burned (discard pattern)
30186	30209	02.B.34	PS3A	6	S40	Faunal Remains	bone	8	0.31	medium mammal	medium mammal	medium mammal, indeterminate long bone fragment, calcined (discard pattern)	Discard pattern	8		A	indeterminate long bone	epiphysis fragment	II	medium mammal, indeterminate long bone epiphysis fragment, calcined (discard pattern)	Y	calcined (discard pattern)
30186	30209	02.B.35	PS3A	6	S40	Faunal Remains	bone	6	0.15	medium mammal	medium mammal	medium mammal, indeterminate long bone fragment, burned (discard pattern)	Discard pattern	6		A	indeterminate long bone	epiphysis fragment	II	medium mammal, indeterminate long bone epiphysis fragment, burned (discard pattern)	Y	burned (discard pattern)

Table App D.1. Master Faunal Analysis Table continued.

Lot	FN	Spec No.	PS	U	S/F	Object Name	Artifact Material	Artifact Count	Weight (g)	Taxon	Common Name	Artifact Description	Burning Pattern	NISP	MNE	Adult/ Juvenile	Skeletal Element	Portion of Element Present	Weathering Stage	Zooarchaeological Description	Culturally Modified (Y/N)	Modfication
30186	30209	02.B.36	PS3A	6	S40	Faunal Remains	bone	1	0.01	Ictaluridae	catfish	Ictaluridae, skull fragment, burned (discard pattern)	Discard pattern	1		A	skull fragment		I	Ictaluridae, skull fragment, burned (discard pattern)	Y	burned (discard pattern)
30186	30209	02.B.37	PS3A	6	S40	Faunal Remains	bone	4	0.04	Rodentia	rodent	Rodentia, incisor fragments, burned (discard pattern)	Discard pattern	1		A	incisor fragment		I	Rodentia, incisor fragments, burned (discard pattern)	Y	burned (discard pattern)
30186	30209	02.B.38	PS3A	6	S40	Faunal Remains	bone	1	0.01	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., tooth, premolar II, left, upper, burned (discard pattern)	Discard pattern	1	1	A	tooth, upper left P2		I	Sylvilagus sp., tooth, premolar II, left, upper, burned (discard pattern)	Y	burned (discard pattern)
30186	30209	02.B.39	PS3A	6	S40	Faunal Remains	bone	1	0.03	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., tooth, premolar II, right, lower, burned (discard pattern)	Discard pattern	1	1	A	tooth, lower right P2		I	Sylvilagus sp., tooth, premolar II, right, lower, burned (discard pattern)	Y	burned (discard pattern)
30186	30209	02.B.40	PS3A	6	S40	Faunal Remains	bone	5	0.09	small mammal	small mammal	small mammal, skull fragment, calcined (discard pattern)	Discard pattern	5		A	skull fragment		I	small mammal, skull fragment, calcined (discard pattern)	Y	calcined (discard pattern)
30186	30209	02.B.41	PS3A	6	S40	Faunal Remains	bone	1	0.11	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., maxilla fragment, left, burned (discard pattern)	Discard pattern	1	1	SA	maxilla, left	zygomatic process fragment	I	Sylvilagus sp., skull, maxilla, left, zygomatic process fragment, burned (discard pattern)	Y	burned (discard pattern)
30186	30209	02.B.42	PS3A	6	S40	Faunal Remains	bone	3	0.04	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., maxilla fragments, burned (discard pattern)	Discard pattern	3		SA	maxilla fragments		I	Sylvilagus sp., maxilla fragments, burned (discard pattern)	Y	burned (discard pattern)
30186	30209	02.B.43	PS3A	6	S40	Faunal Remains	bone	45	0.98	medium mammal	medium mammal	medium mammal, indeterminate bone fragment, calcined (discard pattern)	Discard pattern	45		A	indeterminate bone fragment		II	medium mammal, indeterminate bone fragment, calcined (discard pattern)	Y	calcined (discard pattern)
30186	30209	02.A.1	PS3A	6	S40	Faunal Remains	Bone	6	1.06	Lepus californicus	black-tailed jackrabbit	Lepus californicus, tibia, right, mesial fragment, unmodified	Unburned	6	1	A	tibia, right	mesial diaphysis fragment	I	Lepus californicus, tibia, right, mesial diaphysis fragment, unmodified	N	
30186	30209	02.A.2	PS3A	6	S40	Faunal Remains	Bone	3	0.48	Leporidae	rabbit	Leporidae, tibia, right fragments, calcined (discard pattern)	Discard pattern	3	1	J	tibia, right	mesial diaphysis fragment	I	Leporidae, tibia, right, mesial diaphysis fragments, calcined (discard pattern)	Y	burned (discard pattern)
30186	30209	02.A.3	PS3A	6	S40	Faunal Remains	Bone	2	0.39	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., femur, left, mesial fragment, cutmarks (defleshing), burned (discard pattern)	Discard pattern	2	1	SA	femur, left	mesial diaphysis fragment	I	Sylvilagus sp., femur, left, mesial diaphysis fragment, 10+ oblique cutmarks (defleshing), burned (discard pattern)	Y	10+ oblique cutmarks (defleshing), burned (discard pattern)
30186	30209	02.A.4	PS3A	6	S40	Faunal Remains	Bone	1	1.41	cf. Odocoileus sp.	deer	cf. Odocoileus sp., metatarsal, right, diaphysis fragment, burned (discard pattern)	Discard pattern	1	1	A	metatarsal, right	proximo-cranial diaphysis fragment	I	cf. Odocoileus sp., metatarsal, right, proximo-cranial diaphysis fragment, burned (discard pattern)	Y	burned (discard pattern)
30187	30211	02.B.1	PS3A	6	S41	Faunal Remains	bone	1	0.14	Lepus californicus	black-tailed jackrabbit	Lepus californicus, tooth, upper left M1, calcined (discard pattern)	Discard pattern	1	1	A	tooth, upper left M1		I	Lepus californicus, tooth, M1, upper, left, calcined (discard pattern)	Y	calcined (discard pattern)
30187	30211	02.B.2	PS3A	6	S41	Faunal Remains	bone	1	0.09	Lepus californicus	black-tailed jackrabbit	Lepus californicus, tooth, upper left P2, calcined (discard pattern)	Discard pattern	1	1	A	tooth, upper left P2		I	Lepus californicus, tooth, M1, upper, left, calcined (discard pattern)	Y	calcined (discard pattern)
30187	30211	02.B.3	PS3A	6	S41	Faunal Remains	bone	1	0.12	Lepus californicus	black-tailed jackrabbit	Lepus californicus, mandible, right, condylar process, unmodified	Unburned	1	1	A	mandible, right	condylar process	I	Lepus californicus, mandible, right, condylar process, unmodified	N	
30187	30211	02.B.4	PS3A	6	S41	Faunal Remains	bone	1	0.11	Rodentia	rodent	Rodentia, femur, right, fragment, calcined (discard pattern)	Discard pattern	1	1	A	femur, right	diaphysis fragment	I	Rodentia, femur, right, diaphysis fragment, calcined (discard pattern)	Y	calcined (discard pattern)
30187	30211	02.B.5	PS3A	6	S41	Faunal Remains	bone	4	0.33	Leporidae	rabbit	Leporidae, long bone fragments, calcined (discard pattern)	Discard pattern	4		SA	indeterminate long bone diaphysis fragment		I	Leporidae, indeterminate long bone diaphysis fragments, calcined (discard pattern)	Y	calcined (discard pattern)
30187	30211	02.B.6	PS3A	6	S41	Faunal Remains	bone	1	0.17	cf. Odocoileus sp.	deer	cf. Odocoileus sp., trapezoid-magnum, left, fragment, cutmarks (skinning /dismemberment), calcined (discard pattern)	Discard pattern	1	1	SA	trapezoid-magnum, left		I	cf. Odocoileus sp., trapezoid-magnum, left, fragment, 2 transverse cutmarks (skinning/dismemberment), calcined (discard pattern)	Y	2 transverse cutmarks (skinning/dismemberment), calcined (discard pattern)
30187	30211	02.B.7	PS3A	6	S41	Faunal Remains	bone	1	0.05	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., metatarsal III, right, calcined (discard pattern)	Discard pattern	1	1	SA	metatarsal III, right	proximal fragment	I	Sylvilagus sp., metatarsal III, right, proximal fragment, calcined (discard pattern)	Y	calcined (discard pattern)

Table App D.1. Master Faunal Analysis Table continued.

Lot	FN	Spec No.	PS	U	S/F	Object Name	Artifact Material	Artifact Count	Weight (g)	Taxon	Common Name	Artifact Description	Burning Pattern	NISP	MNE	Adult/ Juvenile	Skeletal Element	Portion of Element Present	Weathering Stage	Zooarchaeological Description	Culturally Modified (Y/N)	Modfication
30187	30211	02.B.8	PS3A	6	S41	Faunal Remains	bone	1	0.09	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., mandible, left, proximal fragment, calcined	Unburned	1	1	SA	mandible, left	proximo-ventral fragment	I	Sylvilagus sp., mandible, left, proximo-ventral fragment, calcined (discard pattern)	Y	calcined (discard pattern)
30187	30211	02.B.9	PS3A	6	S41	Faunal Remains	bone	1	0.24	Lepus californicus	black-tailed jackrabbit	Lepus californicus, maxilla, right, fragment, unmodified	Unburned	1	1	A	maxilla, right	palatine process fragment	I	Lepus californicus, maxilla, right, palatine process fragment, unmodified	N	
30187	30211	02.B.10	PS3A	6	S41	Faunal Remains	bone	1	0.06	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., maxilla fragment, right, unmodified	Unburned	1	1	SA	mandible, right	zygomatic arch fragment	I	Sylvilagus sp., maxilla, right, zygomatic arch fragment, unmodified	N	
30187	30211	02.B.11	PS3A	6	S41	Faunal Remains	bone	2	0.09	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., maxilla fragments, calcined (discard pattern)	Discard pattern	2		SA	maxilla fragments		I	Sylvilagus sp., maxilla fragments, calcined (discard pattern)	Y	calcined (discard pattern)
30187	30211	02.B.12	PS3A	6	S41	Faunal Remains	bone	26	0.67	small mammal	small mammal	small mammal, indeterminate bone fragments, calcined (discard pattern)	Discard pattern	26		A	indeterminate bone fragment		I	small mammal, indeterminate bone fragments, calcined (discard pattern)	Y	calcined (discard pattern)
30188	30214	02.B.1	PS3A	6	S42	Faunal Remains	Bone	1	0.22	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., mandible fragment, right, burned (discard pattern)	Discard pattern	1	1	A	mandible, right	diastema	I	Sylvilagus sp., mandible, right, diastema fragment, burned (discard pattern)	Y	burned (discard pattern)
30188	30214	02.B.2	PS3A	6	S42	Faunal Remains	Bone	1	0.03	Rodentia (small)	small rodent	Rodentia (small), mandible fragment, right, calcined (discard pattern)	Discard pattern	1	1	A	mandible, right	condylar process fragment	I	Rodentia (small), mandible, right, condylar process fragment, calcined (discard pattern)	Y	calcined (discard pattern)
30188	30214	02.B.3	PS3A	6	S42	Faunal Remains	Bone	1	0.15	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., radius, right, distal fragment, burned (roasting pattern)	Roasting pattern	1	1	A	radius, right	distal diaphysis fragment	I	Sylvilagus sp., radius, right, distal diaphysis fragment, burned (roasting pattern)	Y	burned (roasting pattern)
30188	30214	02.B.4	PS3A	6	S42	Faunal Remains	Bone	1	0.33	Lepus californicus	black-tailed jackrabbit	Lepus californicus, humerus, right, proximal fragment, burned (roasting pattern)	Roasting pattern	1	1	J	humerus, right	proximo-caudal fragment	II	Lepus californicus, humerus, right, proximo-caudal fragment, burned (roasting pattern)	Y	burned (roasting pattern)
30188	30214	02.B.5	PS3A	6	S42	Faunal Remains	Bone	1	0.13	Ictalurus sp.	catfish	Ictalurus sp., skull fragment, burned (discard pattern)	Discard pattern	1	1	A	skull	supraethmoid fragment	I	Ictalurus sp., skull, supraethmoid fragment, burned (discard pattern)	Y	burned (discard pattern)
30188	30214	02.B.6	PS3A	6	S42	Faunal Remains	Bone	1	0.11	Ictaluridae	catfish	Ictaluridae, skull fragment, burned (discard pattern)	Discard pattern	1		A	skull fragment		I	Ictaluridae, skull fragment, burned (discard pattern)	Y	burned (discard pattern)
30188	30214	02.B.7	PS3A	6	S42	Faunal Remains	Bone	1	0.07	Rodentia (small)	small rodent	Rodentia (small), incisor, burned (discard pattern)	Discard pattern	1		A	incisor		I	Rodentia (small), incisor, burned (discard pattern)	Y	burned (discard pattern)
30188	30214	02.B.8	PS3A	6	S42	Faunal Remains	Bone	1	0.16	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., femur, right, distal fragment, burned (discard pattern)	Discard pattern	1	1	A	femur, right	distal diaphysis fragment	I	Sylvilagus sp., femur, right, distal diaphysis fragment, burned (discard pattern)	Y	burned (discard pattern)
30188	30214	02.B.9	PS3A	6	S42	Faunal Remains	Bone	2	0.16	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., humerus, left, distal fragment, burned (discard pattern)	Discard pattern	2	2	A	humerus, left	distal diaphysis fragment	I	Sylvilagus sp., humerus, left, distal diaphysis fragment, burned (discard pattern)	Y	burned (discard pattern)
30188	30214	02.B.10	PS3A	6	S42	Faunal Remains	Bone	1	0.03	medium mammal	medium mammal	medium mammal, skull fragment, unmodified	Unburned	1		A	skull fragment		III	medium mammal, skull fragment, unmodified	N	
30188	30214	02.B.11	PS3A	6	S42	Faunal Remains	Bone	2	0.19	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., metatarsal III, left, burned (roasting pattern)	Roasting pattern	1	1	A	metatarsal III, left		I	Sylvilagus sp., metatarsal III, left, burned (roasting pattern)	Y	burned (roasting pattern)
30188	30214	02.B.12	PS3A	6	S42	Faunal Remains	Bone	1	0.06	cf. Lepus californicus	black-tailed jackrabbit	cf. Lepus californicus, rib, mesial fragment, unmodified	Unburned	1		A	rib	mesial fragment	I	cf. Lepus californicus, rib, mesial fragment, unmodified	N	
30188	30214	02.B.13	PS3A	6	S42	Faunal Remains	Bone	1	0.01	cf. Sylvilagus sp.	cottontail rabbit	cf. Sylvilagus sp., scapula fragment, burned (discard pattern)	Discard pattern	1		A	scapula	ventral margin fragment	I	cf. Sylvilagus sp., scapula, ventral margin fragment, burned (discard pattern)	Y	burned (discard pattern)
30188	30214	02.B.14	PS3A	6	S42	Faunal Remains	Bone	2	0.04	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., skull fragments, calcined (discard pattern)	Discard pattern	2		A	skull fragment		I	Sylvilagus sp., skull fragments, calcined (discard pattern)	Y	calcined (discard pattern)
30188	30214	02.B.15	PS3A	6	S42	Faunal Remains	Bone	2	0.1	cf. Muridae	mouse	cf. Muridae, mandible, right, mesial fragment, burned (discard pattern)	Discard pattern	2	2	A	mandible, right	medial fragment	I	cf. Muridae, mandible, right, mesial fragment, burned (discard pattern)	Y	burned (discard pattern)

Table App D.1. Master Faunal Analysis Table continued.

Lot	FN	Spec No.	PS	U	S/F	Object Name	Artifact Material	Artifact Count	Weight (g)	Taxon	Common Name	Artifact Description	Burning Pattern	NISP	MNE	Adult/ Juvenile	Skeletal Element	Portion of Element Present	Weathering Stage	Zooarchaeological Description	Culturally Modified (Y/N)	Modfication
30188	30214	02.B.16	PS3A	6	S42	Faunal Remains	Bone	2	0.06	cf. Muridae	mouse	cf. Muridae, mandible, right, distal fragments, burned (discard pattern)	Discard pattern	2	1	A	mandible, right	distal fragment	I	cf. Muridae, mandible, right, distal fragments (conjoin), burned (discard pattern)	Y	burned (discard pattern)
30188	30214	02.B.17	PS3A	6	S42	Faunal Remains	Bone	1	0.03	cf. Sciuridae	squirrel or ground squirrel	cf. Sciuridae, mandible, left, proximal fragment, calcined (discard pattern)	Discard pattern	1	1	A	mandible, left	proximal fragment, edentulous	I	cf. Sciuridae, mandible, left, proximal fragment, edentulous, calcined (discard pattern)	Y	calcined (discard pattern)
30188	30214	02.B.18	PS3A	6	S42	Faunal Remains	Bone	2	0.11	cf. Leporidae	rabbit	cf. Leporidae, skull fragments, calcined (discard pattern)	Discard pattern	2		A	skull fragment		I	cf. Leporidae, skull fragments, calcined (discard pattern)	Y	calcined (discard pattern)
30188	30214	02.B.19	PS3A	6	S42	Faunal Remains	Bone	3	0.04	small mammal	small mammal	small mammal, axial bone fragments, calcined (discard pattern)	Discard pattern	3		A	axial bone fragments		I	small mammal, axial bone fragments, calcined (discard pattern)	Y	calcined (discard pattern)
30188	30214	02.B.20	PS3A	6	S42	Faunal Remains	Bone	5	0.11	medium mammal	medium mammal	medium mammal, long bone fragment, burned (discard pattern)	Discard pattern	5		A	indeterminate long bone diaphysis fragment		I	medium mammal, indeterminate long bone diaphysis fragment, burned (discard pattern)	Y	burned (discard pattern)
30188	30214	02.B.21	PS3A	6	S42	Faunal Remains	Tooth	1	0.11	Large mammal	large mammal	Large mammal, tooth fragment, burned (discard pattern)	Discard pattern	1	1	A	tooth fragment		I	Large mammal, tooth fragment, burned (discard pattern)	Y	burned (discard pattern)
30188	30214	02.B.22	PS3A	6	S42	Faunal Remains	Bone	6	0.14	small mammal	small mammal	small mammal, long bone fragments, burned (discard pattern)	Discard pattern	6		A	long bone fragments		I	small mammal, long bone fragments, burned (discard pattern)	Y	burned (discard pattern)
30188	30214	02.B.23	PS3A	6	S42	Faunal Remains	Bone	1	0.03	cf. Sylvilagus sp.	cottontail rabbit	cf. Sylvilagus sp., long bone fragment, unmodified	Unburned	1		J	indeterminate long bone diaphysis fragment		II	cf. Sylvilagus sp., indeterminate long bone diaphysis fragment, unmodified	N	
30188	30214	02.B.24	PS3A	6	S42	Faunal Remains	Bone	3	0.05	Osteichthyes	boney fish	Osteichthyes, skull fragment, burned (discard pattern)	Discard pattern	3		A	skull fragment		I	Osteichthyes, skull fragment, burned (discard pattern)	Y	burned (discard pattern)
30188	30214	02.A.1	PS3A	6	S42	Faunal Remains	Bone	1	0.69	cf. Canidae (dog or fox-sized)	dog or fox	cf. Canidae (dog or fox-sized), tibia, right, mesial fragment, juvenile, unmodified	Unburned	1	1	J	tibia, right	mesial diaphysis fragment	III	cf. Canidae (dog or fox-sized), tibia, right, mesial diaphysis fragment, juvenile, unmodified	N	
30188	30214	02.A.2	PS3A	6	S42	Faunal Remains	Bone	1	0.82	Lynx rufus	bobcat	Lynx rufus, ulna, left, proximal fragment, calcined (discard pattern)	Discard pattern	1	1	SA	ulna, left	proximal diaphysis fragment with semilunar notch	II	Lynx rufus, ulna, left, proximal diaphysis fragment with semilunar notch, calcined (discard pattern)	Y	calcined (discard pattern)
30188	30214	02.A.3	PS3A	6	S42	Faunal Remains	Bone	1	0.63	Lynx rufus	bobcat	Lynx rufus, ilium, left, proximal fragment, calcined (discard pattern)	Discard pattern	1	1	SA	ilium, left	proximal	II	Lynx rufus, ilium, left, proximal fragment, calcined (discard pattern)	Y	calcined (discard pattern)
30188	30214	02.A.4	PS3A	6	S42	Faunal Remains	Bone	1	0.2	cf. Lynx rufus	bobcat	cf. Lynx rufus, skull fragment, calcined (discard pattern)	Discard pattern	1		SA	skull fragment		II	cf. Lynx rufus, skull fragment, calcined (discard pattern)	Y	calcined (discard pattern)
30188	30214	02.A.5	PS3A	6	S42	Faunal Remains	Bone	1	1.15	cf. Lynx rufus	bobcat	cf. Lynx rufus, tibia, left, proximal fragment, cutmarks, calcined	Unburned	1	1	SA	tibia, left	proximal epiphysis fragment	II	cf. Lynx rufus, tibia, left, proximal epiphysis fragment, 2 oblique cutmarks (dismemberment), calcined (discard pattern)		2 oblique cutmarks (dismemberment), calcined (discard pattern)
30188	30214	02.A.6	PS3A	6	S42	Faunal Remains	Bone	4	0.04	small mammal	small mammal	small mammal, long bone fragment, calcined (discard pattern)	Discard pattern	4		A	indeterminate long bone fragment		II	small mammal, long bone fragment, calcined (discard pattern)	Y	calcined (discard pattern)
30190	30231	02.B.1	PS3A	6	S44	Faunal Remains	Bone	1	0.31	Lepus californicus	black-tailed jackrabbit	Lepus californicus, tibia, right, distal fragment, burned (roasting pattern)	Roasting pattern	1	1	SA	tibia, right	distal diaphysis fragment	II	Lepus californicus, tibia, right, distal diaphysis fragment, burned (roasting pattern)	Y	burned (roasting pattern)
30190	30231	02.B.2	PS3A	6	S44	Faunal Remains	Bone	4	0.15	small mammal	small mammal	small mammal, indeterminate bone fragments, burned (discard pattern)	Discard pattern	4		A	indeterminate bone fragment		I	small mammal, indeterminate bone fragments, burned (discard pattern)	Y	burned (discard pattern)
30190	30231	02.B.3	PS3A	6	S44	Faunal Remains	Bone	1	0.06	Rodentia (small)	small rodent	Rodentia (small), ulna, left, proximal fragment, unmodified	Unburned	1	1	A	ulna, left	proximal fragment w/trochlear fossa	I	Rodentia (small), ulna, left, proximal fragment w/trochlear fossa, unmodified	N	
30190	30231	02.B.4	PS3A	6	S44	Faunal Remains	Bone	1	0.08	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., humerus, right, distal fragment, unmodified	Unburned	1	1	SA	humerus, right	distal diaphysis fragment	II	Sylvilagus sp., humerus, right, distal diaphysis fragment, unmodified	N	

Table App D.1. Master Faunal Analysis Table continued.

Lot	FN	Spec No.	PS	U	S/F	Object Name	Artifact Material	Artifact Count	Weight (g)	Taxon	Common Name	Artifact Description	Burning Pattern	NISP	MNE	Adult/ Juvenile	Skeletal Element	Portion of Element Present	Weathering Stage	Zooarchaeological Description	Culturally Modified (Y/N)	Modfication
30190	30231	02.B.5	PS3A	6	S44	Faunal Remains	Bone	3	0.09	medium mammal	medium mammal	medium mammal, indeterminate bone fragment, unmodified	Unburned	3		A	indeterminate bone fragment		I	medium mammal, indeterminate bone fragment, unmodified	N	
30190	30231	02.B.6	PS3A	6	S44	Faunal Remains	Bone	1	0.12	Large mammal	large mammal	large mammal, rib fragment, unmodified	Unburned	1		A	rib	mesio-lateral fragment	II	large mammal, rib, mesio-lateral fragment, unmodified	N	
30190	30231	02.B.7	PS3A	6	S44	Faunal Remains	Bone	5	0.71	medium mammal	medium mammal	medium mammal, skull fragment, burned (discard pattern)	Discard pattern	5		A	skull fragment		I	medium mammal, skull fragment, burned (discard pattern)	Y	burned (discard pattern)
30191	30259	02.B.1	PS3A	6	S45	Faunal Remains	Bone	1	0.28	Lepus californicus	black-tailed jackrabbit	Lepus californicus, maxilla, right, fragment, unmodified	Unburned	1	1	A	maxilla fragment, right	w/facial tuber	I	Lepus californicus, maxilla fragment, right, w/facial tuber, unmodified	N	
30191	30259	02.B.2	PS3A	6	S45	Faunal Remains	Bone	1	0.27	Apalone spiniferus	softshell turtle	Apalone spiniferus, carapace fragment, burned (roasting pattern)	Roasting pattern	1		A	carapace	peripheral bone fragment	I	Apalone spiniferus, carapace, peripheral bone fragment, burned (roasting pattern)	Y	burned (roasting pattern)
30191	30259	02.B.3	PS3A	6	S45	Faunal Remains	Bone	1	0.34	Lepus californicus	black-tailed jackrabbit	Lepus californicus, femur, left, mesial fragment, burned (discard pattern)	Discard pattern	1	1	A	femur, left	medio-mesial diaphysis fragment	II	Lepus californicus, femur, left, medio-mesial diaphysis fragment, burned (discard pattern)	Y	burned (discard pattern)
30191	30259	02.B.4	PS3A	6	S45	Faunal Remains	Bone	1	0.46	Large mammal	large mammal	large mammal, rib fragment, unmodified	Unburned	1		A	rib	medial fragment	II	large mammal, rib, mesdial fragment, unmodified	N	
30191	30259	02.B.5	PS3A	6	S45	Bone Tool	Bone	1	0.27	Artiodactyla	even-toed ungulate	Spatulate tool, medial fragment, remnant mfg residue and use-wear	Unburned	1		A	long bone	diaphysis fragment	II	Spatulate tool, medial fragment. Source material: Artiodactyla long bone. Blank extraction method unclear. Shaping by scraping and grinding. Max length 12 mm, max. width 5 mm, max thickness 4 mm. Macroscopic use-wear unclear, partially obscured by carbonate encrustation. 10x microscopic use-wear is bright and invasive (silica-rich plants), with numerous transverse to oblique fine striations.	Y	Blank extraction method unclear. Shaping by scraping and grinding. Max length 12 mm, max. width 5 mm, max thickness 4 mm. Macroscopic use-wear unclear, partially obscured by carbonate encrustation. 10x microscopic use-wear is bright and invasive (silica-rich plants), with numerous transverse to oblique fine striations.
30191	30259	02.B.6	PS3A	6	S45	Faunal Remains	Bone	1	0.12	Lepus californicus	black-tailed jackrabbit	Lepus californicus, femur, disto-medial fragment, burned (roasting pattern)	Roasting pattern	1	1	J	femur	disto-medial diaphysis fragment	III	Lepus californicus, femur, disto-medial diaphysis fragment, burned (roasting pattern)	Y	burned (roasting pattern)
30191	30259	02.B.7	PS3A	6	S45	Faunal Remains	Bone	1	0.13	medium mammal	medium mammal	medium mammal, indeterminate long bone fragment, calcined (discard pattern)	Discard pattern	1		A	indeterminate long bone	diaphysis fragment	I	medium mammal, indeterminate long bone diaphysis fragment, calcined (discard pattern)	Y	calcined (discard pattern)
30191	30259	02.B.8	PS3A	6	S45	Faunal Remains	Bone	1	0.13	medium mammal	medium mammal	medium mammal, indeterminate bone fragment, cutmarks (defleshing), calcined (discard pattern)	Discard pattern	1		A	indeterminate long bone	diaphysis fragment	I	medium mammal, indeterminate long bone diaphysis fragment, 3 transverse to oblique cutmarks (defleshing), calcined (discard pattern)	Y	3 transverse to oblique cutmarks (defleshing), calcined (discard pattern)
30191	30259	02.B.9	PS3A	6	S45	Faunal Remains	Bone	1	0.08	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., ilium fragment, right, burned (roasting pattern)	Roasting pattern	1	1	J	ilium, right	proximal fragment	II	Sylvilagus sp., ilium, right, proximal fragment, burned (roasting pattern)	Y	burned (roasting pattern)
30191	30259	02.B.10	PS3A	6	S45	Faunal Remains	Bone	6	0.19	medium mammal	medium mammal	medium mammal, indeterminate bone fragment, burned (discard pattern)	Discard pattern	6		A	indeterminate bone fragment		II	medium mammal, indeterminate bone fragment, burned (discard pattern)	Y	burned (discard pattern)
30191	30259	02.B.11	PS3A	6	S45	Faunal Remains	Bone	1	0.07	Leporidae	rabbit	Leporidae, long bone fragment, calcined (discard pattern)	Discard pattern	1		J	indeterminate long bone	diaphysis fragment	II	Leporidae, indeterminate long bone diaphysis fragment, calcined (discard pattern)	Y	calcined (discard pattern)
30193	30276	02.A.1	PS3A	6	S47	Faunal Remains	Bone	3	1.7	Large mammal	large mammal	large mammal, long bone fragment, burned (roasting pattern)	Roasting pattern	1		A	indeterminate long bone diaphysis fragment		II	large mammal, indeterminate long bone diaphysis fragment, burned (roasting pattern)	Y	burned (roasting pattern)
30193	30276	02.B.1	PS3A	6	S47	Faunal Remains	Bone	1	0.39	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., ilium fragment, right, unmodified	Unburned	1	1	A	ilium, right	proximal fragment	I	Sylvilagus sp., ilium fragment, right, proximal, unmodified	N	
30193	30276	02.B.2	PS3A	6	S47	Faunal Remains	Bone	1	0.22	Leporidae	rabbit	Leporidae, long bone fragment, unmodified	Unburned	1		A	indeterminate long bone	diaphysis fragment	II	Leporidae, indeterminate long bone diaphysis fragment, unmodified	N	
30193	30276	02.B.3	PS3A	6	S47	Faunal Remains	Bone	1	0.1	Leporidae	rabbit	Leporidae, femur, proximal fragment, burned (discard pattern)	Discard pattern	1		A	femur	proximo-caudal diaphysis fragmen	II	Leporidae, femur, proximo-caudal diaphysis fragment, burned (discard pattern)	Y	burned (discard pattern)

Table App D.1. Master Faunal Analysis Table continued.

Lot	FN	Spec No.	PS	U	S/F	Object Name	Artifact Material	Artifact Count	Weight (g)	Taxon	Common Name	Artifact Description	Burning Pattern	NISP	MNE	Adult/ Juvenile	Skeletal Element	Portion of Element Present	Weathering Stage	Zooarchaeological Description	Culturally Modified (Y/N)	Modfication
30193	30276	02.B.4	PS3A	6	S47	Faunal Remains	Bone	1	0.04	cf. Lepus californicus	black-tailed jackrabbit	cf. Lepus californicus, rib, distal fragment, unmodified	Unburned	1		A	rib	distal fragment	II	cf. Lepus californicus, rib, distal fragment, unmodified	N	
30193	30276	02.B.5	PS3A	6	S47	Faunal Remains	Bone	2	0.09	medium mammal	medium mammal	medium mammal, indeterminate bone fragment, burned (discard pattern)	Discard pattern	2		A	indeterminate bone fragment		II	medium mammal, indeterminate bone fragment, burned (discard pattern)	Y	burned (discard pattern)
30193	30276	02.B.6	PS3A	6	S47	Faunal Remains	Bone	2	0.06	cf. Lepus californicus	black-tailed jackrabbit	cf. Lepus californicus, pubis fragment, unmodified	Unburned	2		SA	pubis fragment		II	cf. Lepus californicus, pubis fragment, unmodified	N	
30193	30276	02.B.7	PS3A	6	S47	Faunal Remains	Bone	1	0.05	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., metatarsal III, left, unmodified	Unburned	1	1	A	metatarsal III, right	proximal fragment	I	Sylvilagus sp., metatarsal III, left, proximal fragment, unmodified	N	
30193	30276	02.B.8	PS3A	6	S47	Faunal Remains	Bone	1	0.13	Lepus californicus	black-tailed jackrabbit	Lepus californicus, tibia, right, mesial fragment, unmodified	Unburned	1	1	A	tibia, right	mesio-lateral diaphysis fragment	I	Lepus californicus, tibia, right, mesio-lateral diaphysis fragment, unmodified	N	
30193	30276	02.B.9	PS3A	6	S47	Faunal Remains	Bone	1	0.06	cf. Sylvilagus sp.	cottontail rabbit	cf. Sylvilagus sp., humerus diaphysis fragment, unmodified	Unburned	1		SA	humerus	mesial diaphysis fragment	I	cf. Sylvilagus sp., humerus, mesial diaphysis fragment, unmodified	N	
30193	30276	02.B.10	PS3A	6	S47	Faunal Remains	Bone	1	0.06	cf. Leporidae	rabbit	cf. Leporidae, tibia fragment, burned (discard pattern)	Discard pattern	1		A	tibia	proximal fragment	I	cf. Leporidae, tibia, proximal fragment, burned (discard pattern)	Y	burned (discard pattern)
30193	30276	02.B.11	PS3A	6	S47	Faunal Remains	Bone	2	0.06	cf. Leporidae	rabbit	cf. Leporidae, skull fragments, unmodified	Unburned	2		A	skull fragment		I	cf. Leporidae, skull fragments, unmodified	N	
30193	30276	02.B.12	PS3A	6	S47	Faunal Remains	Bone	3	0.19	medium mammal	medium mammal	medium mammal, indeterminate bone fragment, burned (discard pattern)	Discard pattern	3		A	indeterminate bone fragment		II	medium mammal, indeterminate bone fragment, burned (discard pattern)	Y	burned (discard pattern)
30194	30301	02.B.1	PS3A	6	S48	Faunal Remains	Bone	1	0.42	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., mandible, left, diastema fragment, burned (discard pattern)	Discard pattern	1	1	A	mandible, left	diastema	I	Sylvilagus sp., mandible, left, diastema fragment, burned (discard pattern)	Y	burned (discard pattern)
30194	30301	02.B.2	PS3A	6	S48	Faunal Remains	Bone	2	1.08	Large mammal	large mammal	Large mammal, indeterminate bone fragment, burned (discard pattern)	Discard pattern	2		A	indeterminate long bone diaphysis fragment		II	Large mammal, indeterminate long bone diaphysis fragment, burned (discard pattern)	Y	burned (discard pattern)
30194	30301	02.B.3	PS3A	6	S48	Faunal Remains	Bone	1	0.15	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., tibia, right, proximal fragment, unmodified	Unburned	1	1	A	tibia, right	proximo-caudal facies fragment	I	Sylvilagus sp., tibia, right, proximo-caudal facies fragment, unmodified	N	
30194	30301	02.B.4	PS3A	6	S48	Bone Tool	Bone	1	0.91	Artiodactyla	even-toed ungulate	Spatulate tool, mesial fragment, remnant mfg residue and use-wear. Burned (discard pattern).	Discard pattern	1		A	long bone		I	Spatulate tool, mesial fragment. Source material: Artiodactyla long bone. Blank extraction method unclear. Shaping by scraping and grinding. Max length 19 mm, max. width 7 mm, max thickness 6 mm. Macroscopic use-wear bright and invasive (silica-rich plants). 10x microscopic use-wear is bright and invasive (silica-rich plants). Burned (discard pattern).	Y	Spatulate tool, mesial fragment. Source material: Artiodactyla long bone. Blank extraction method unclear. Shaping by scraping and grinding. Max length 19 mm, max. width 7 mm, max thickness 6 mm. Macroscopic use-wear bright and invasive (silica-rich plants). 10x microscopic use-wear is bright and invasive (silica-rich plants). Burned (discard pattern).
30194	30301	02.B.5	PS3A	6	S48	Faunal Remains	Bone	1	0.16	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., scapula, left, proximal fragment, burned (roasting pattern)	Roasting pattern	1	1	A	scapula	proximal fragment	I	Sylvilagus sp., scapula, left, proximal fragment, burned (roasting pattern)	Y	burned (roasting pattern)
30194	30301	02.B.6	PS3A	6	S48	Faunal Remains	Bone	3	0.11	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., tooth fragments, burned (discard pattern)	Discard pattern	3		A	tooth	premolar/molar fragments	I	Sylvilagus sp., tooth, premolar/molar fragments, burned (discard pattern)	Y	burned (discard pattern)
30194	30301	02.B.7	PS3A	6	S48	Faunal Remains	Bone	1	0.15	cf. Leporidae	rabbit	cf. Leporidae, rib fragment, burned (discard pattern)	Discard pattern	1		A	rib	mesial fragment	I	cf. Leporidae, rib, mesial fragment, burned (discard pattern)	Y	burned (discard pattern)
30194	30301	02.B.8	PS3A	6	S48	Faunal Remains	Bone	2	0.06	small mammal	small mammal	small mammal, long bone fragment, burned (discard pattern)	Discard pattern	2		A	indeterminate long bone diaphysis fragment		I	small mammal, indeterminate long bone diaphysis fragment, burned (discard pattern)	Y	burned (discard pattern)

Table App D.1. Master Faunal Analysis Table continued.

Lot	FN	Spec No.	PS	U	S/F	Object Name	Artifact Material	Artifact Count	Weight (g)	Taxon	Common Name	Artifact Description	Burning Pattern	NISP	MNE	Adult/ Juvenile	Skeletal Element	Portion of Element Present	Weathering Stage	Zooarchaeological Description	Culturally Modified (Y/N)	Modfication
30198	30200	02.A.1	PS3A	6	S49	Faunal Remains	Bone	1	0.56	Large mammal	large mammal	Large mammal, indeterminate bone fragment, burned (discard pattern)	Discard pattern	1		A	indeterminate bone fragment		I	Large mammal, indeterminate bone fragment, burned (discard pattern)	Y	burned (discard pattern)
30198	30198	02.A.1	PS3A	6	S49A	Faunal Remains	Bone	1	0.54	cf. Artiodactyla	even-toed ungulate	cf. Artiodactyla, humerus, proximal epiphysis fragment, calcined (discard pattern)	Discard pattern	1	1	A	humerus	proximal epiphysis fragment	II	cf. Artiodactyla, humerus, proximal epiphysis fragment, calcined (discard pattern)	Y	calcined (roasting pattern)
30198	30198	02.A.2	PS3A	6	S49A	Faunal Remains	Bone	2	0.58	Large mammal	large mammal	Large mammal, long bone fragment, unmodified	Unburned	2		A	indeterminate long bone	diaphysis fragment	I	Large mammal, indeterminate long bone diaphysis fragment, unmodified	N	
30198	30198	02.A.3	PS3A	6	S49A	Faunal Remains	Bone	1	0.45	Large mammal	large mammal	Large mammal, indeterminate long bone fragment, cutmarks	Unburned	1		A	indeterminate long bone	diaphysis fragment	I	Large mammal, indeterminate long bone diaphysis fragment, 5 transverse cutmarks (defleshing)	Y	5 transverse cutmarks (defleshing)
30198	30198	02.A.4	PS3A	6	S49A	Faunal Remains	Bone	1	0.36	Lepus californicus	black-tailed jackrabbit	Lepus californicus, femur, mesial fragment, carnivore ravaged, unmodified	Unburned	1	1	A	femur	mesio-lateral diaphysis fragment	I	Lepus californicus, femur, mesio-lateral diaphysis fragment, numerous carnivore toothmarks, unmodified	N	
30198	30198	02.A.5	PS3A	6	S49A	Faunal Remains	Bone	1	0.03	Rodentia (small)	small rodent	Rodentia (small), incisor, burned (discard pattern)	Discard pattern	1	1	A	incisor fragment		I	Rodentia (small), incisor, burned (discard pattern)	Y	burned (discard pattern)
30198	30198	02.A.6	PS3A	6	S49A	Faunal Remains	Bone	1	0.17	cf. Sigmodon sp.	cotton rat	cf. Sigmodon sp., mandible, left, unmodified	Unburned	1		A	mandible, left		I	cf. Sigmodon sp., mandible, left, unmodified	N	
30198	30198	02.A.7	PS3A	6	S49A	Faunal Remains	Bone	1	0.17	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., tibia, left, distal fragment, burned (roasting pattern)	Roasting pattern	1	1	A	tibia, left	distal fragment	I	Sylvilagus sp., tibia, left, distal fragment, burned (roasting pattern)	Y	burned (roasting pattern)
30198	30198	02.A.8	PS3A	6	S49A	Faunal Remains	Bone	1	0.2	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., humerus, left, mesial fragment, burned (discard pattern)	Discard pattern	1	1	A	humerus, left	mesial diaphysis fragment	I	Sylvilagus sp., humerus, left, mesial diaphysis fragment, burned (discard pattern)	Y	burned (discard pattern)
30198	30198	02.A.9	PS3A	6	S49A	Faunal Remains	Bone	1	0.09	Sylvilagus sp.	cottontail rabbit	Sylvilagus sp., femur, left, mesial fragment, carnivore ravaged, unmodified	Unburned	1	1	A	femur, left	mesial diaphysis fragment	I	Sylvilagus sp., femur, left, mesial diaphysis fragment, carnivore tooth marks, unmodified	N	
30198	30198	02.A.10	PS3A	6	S49A	Faunal Remains	Bone	2	0.12	small mammal	small mammal	small mammal, long bone fragment, burned (roasting pattern)	Roasting pattern	2		A	indeterminate long bone	diaphysis fragment	I	small mammal, indeterminate long bone diaphysis fragment, burned (roasting pattern)	Y	burned (roasting pattern)
30278	30282	02.A.1	PS3A	6	S76	Faunal Remains	Bone	1	1.26	cf. Artiodactyla	even-toed ungulate	cf. Artiodactyla, ischium, left, distal fragment, burned (roasting pattern)	Roasting pattern	1	1	SA	ischium, left	distal fragment	II	cf. Artiodactyla, ischium, left, distal fragment, burned (roasting pattern)	Y	burned (roasting pattern)
30278	30282	02.A.2	PS3A	6	S76	Faunal Remains	Bone	1	1.17	Artiodactyla	even-toed ungulate	Artiodactyla, humerus fragment, burned (roasting pattern)	Roasting pattern	1		SA	humerus		II	Artiodactyla, humerus fragment, burned (roasting pattern)	Y	burned (roasting pattern)
30278	30282	02.B.1	PS3A	6	S76	Faunal Remains	Bone	1	0.32	medium mammal	medium mammal	medium mammal, indeterminate long bone fragment, unmodified	Unburned	1		A	indeterminate long bone	diaphysis fragment	I	medium mammal, indeterminate long bone diaphysis fragment, unmodified	N	
30278	30282	02.B.2	PS3A	6	S76	Faunal Remains	Bone	3	0.03	Aves	bird	Aves, long bone fragments, unmodified	Unburned	3		A	indeterminate long bone	diaphysis fragment	I	Aves, indeterminate long bone diaphysis fragents, unmodified	N	
30278	30282	02.B.3	PS3A	6	S76	Faunal Remains	Bone	4	0.42	medium mammal	medium mammal	medium mammal, indeterminate long bone fragment, burned (discard pattern)	Discard pattern	4		A	indeterminate long bone	diaphysis fragment	I	medium mammal, indeterminate long bone diaphysis fragment, burned (discard pattern)	Y	burned (discard pattern)

Table App D.2. PS3 Faunal Analysis - Number of Identified Specimens (NISP).

NISP			Avian	Canine					Deer					Fish			Rabbits						Rodents					Turtle		Indeterminate			
Profile	Unit	Strat (S)/Feature (F)	Aves	Carnivora (medium)	cf. Canidae (dog or coyote-sized)	cf. Canidae (dog or fox-sized)	cf. Lynx rufus	Lynx rufus	Artiodactyla	cf. Artiodactyla	cf. Odocoileus sp.	Odocoileus sp.	Odocoileus sp.	Ictaluridae	Ictalurus sp.	Osteichthyes	cf. Leporidae	cf. Lepus californicus	cf. Sylvilagus sp.	Leporidae	Lepus californicus	Sylvilagus sp.	cf. Muridae	cf. Sciuridae	cf. Sigmodon sp.	Rodentia	Rodentia (small)	Apalone spiniferus	cf. Apalone spinifera	Large mammal	Medium mammal	Small mammal	Total Number
3A	2	F3																										1					1
3A	2	25							1			1									2	2							1	5		2	14
3A	2	39			1				1		1								2		1	8				1				1	6	3	25
3A	2	40		1							2			1						1	5	26				1				1	5	4	47
3A	2	41									1									1	4	4				1						1	12
3A	2	42				1	2	2						1	1	1	1	1	2		1	6	2	1			2			1	2	3	30
3A	2	44																			1	1					1			1	1	1	6
3A	2	45							1											1	3	1						1		1	4		12
3A	2	47															2	2	1	2	1	2								1	2		13
3A	2	48							1								1					4								1		1	8
3A	2	49																												1			1
3A	2	49A								1											1	3			1		1			2		1	10
3A	2	76	1						1	1			1																		2		6
Totals			1	1	1	1	2	2	5	2	4	1	1	2	1	1	4	3	5	5	19	57	2	1	1	3	4	2	1	15	22	16	185
Class Totals			1	7					13					4			93						11					3		53			

Table App D.3. PS3 Faunal Density Table.

Profile	S/F	Volume of Sorted Matrix (L)	Avian weight (g)	Avian Density (g/L)	Canine weight (g)	Canine Density (g/L)	Deer weight (g)	Deer Density (g/L)	Fish weight (g)	Fish Density (g/L)	Rabbit weight (g)	Rabbit Density (g/L)	Reptile weight (g)	Reptile Density (g/L)	Rodent weight (g)	Rodent Density (g/L)	Turtle weight (g)	Turtle Density (g/L)	Indeter weight (g)	Indeter Density (g/L)
PS3	**S25**	1		0.00		0.00	1.68	1.68		0.00	0.77	0.77		0.00		0.00	0.01	0.01	3.3	3.30
PS3	**S39**	1		0.00	0.75	0.75	0.67	0.67		0.00	1.58	1.58		0.00	0.11	0.11		0.00	2.21	2.21
PS3	**S40**	1		0.00		0.00	1.73	1.73	0.01	0.01	4.31	4.31		0.00	0.04	0.04		0.00	3.25	3.25
PS3	**S41**	0.7		0.00		0.00	0.17	0.24		0.00	1.21	1.73		0.00	0.11	0.16		0.00	0.67	0.96
PS3	**S42**	1.55		0.00	3.49	2.25		0.00	0.29	0.19	1.46	0.94		0.00	0.29	0.19		0.00	0.47	0.30
PS3	**S44**	1		0.00		0.00		0.00		0.00	0.39	0.39		0.00	0.06	0.06		0.00	1.07	1.07
PS3	**S45**	1		0.00		0.00	0.27	0.27		0.00	0.89	0.89		0.00		0.00	0.27	0.27	0.91	0.91
PS3	**S47**	1		0.00		0.00		0.00		0.00	1.17	1.17		0.00		0.00		0.00	1.98	1.98
PS3	**S48**	1		0.00		0.00	0.91	0.91		0.00	0.99	0.99		0.00		0.00		0.00	1.14	1.14
PS3	**S76**	1	0.03	0.03		0.00	4.33	4.33		0.00		0.00		0.00		0.00		0.00	0.74	0.74

Table App D.4. PS4 Faunal Analysis - Number of Identified Specimens (NISP).

NISP			Avian	Canine					Deer			Fish						Rabbits					Reptiles	s		Turtle		Indeterminate			
Profile	Unit	Strat (S)/Feature (F)	Aves	Canidae (dog or fox-size)	Canidae (dog or small coyote-size)	Canis cf. latrans or familiaris	cf. Canidae	cf. Canidae (fox or small dog-size)	Artiodactyla/ cf. Artiodactyla	Artiodactyla (cf. Odocoileus sp.)	Odocoileus sp./ cf. Odocoileus sp.	Aplodinotus grunniens	Cypriniformes	Ictaluridae	Lepisosteus sp.	Osteichthyes/ cf. Osteichthyes	Pylodictis olivaris	Leporidae or cf. Leporidae	cf. Sylvilagus sp.	Lepus californicus/ cf. Lepus californicus	small mammal (rabbit-size)	Sylvilagus sp.	Squamata	Rodentia	Sigmodontinae	Apalone spiniferus/ cf.Apalone spiniferus	Emydidae	Large mammal	Medium mammal	Small mammal	Total Number
4A	5	F2									3				1	2						1								1	8
4A	5	26																		1											1
4A	5	27					1																					1	1		3
4A	5	29/F2		1					2		1			4		1		1		1			1					1	1	3	17
4A	5	30												5					1	1		1								2	10
4A	5	31																			1								2	1	4
4A	5	32																		2		2									4
4A	5	32A																											2	2	4
4A	5	32C								1																					1
4A	5	33										1	1	1						2		5					1	1			12
4A	5	33A			1	2				1				1		2				3		8	1	1		1		1		3	25
4A	5	33B							1	1				1																	3
4A	5	35/F2														4															4
4A	5	37																										1		2	3
4B	11	F4							1									1		1		2						1	1		7
4B	11	53/F4														1						1						1	1	1	5
4B	11	63						1	1									2		7		3				1			2	3	20
4B	11	64																				3								1	4
4B	11	5																				1								1	2
4B	11	72/F7							1		1											3								2	7
4C	14	101												1			1					3							1	2	8
4C	14	102																				1						1			2
4C	14	103																1	1											1	3
4C	14	94																										1			1
4C	14	96																				1									1
4C	14	97																1	1			1			1					2	6
4D	11	113																		1											1
4D	11	106																					1							1	2
4D	11	112	1								2																			2	5
4D	11	115									3											1						1		1	6
4D	11	98																					1					1		1	3
4D	11	99																										2	1	1	4
Totals			1	1	1	2	1	1	6	3	10	1	1	13	1	10	1	6	3	19	1	37	4	1	1	2	1	13	12	33	186
Class Totals			1	6					19			27						66					4	2		3		58			

Table App D.5. PS4 Faunal Density Table.

Profile	S/F	Volume of Sorted Matrix (L)	Avian weight (g)	Avian Density (g/L)	Canine weight (g)	Canine Density (g/L)	Deer weight (g)	Deer Density (g/L)	Fish weight (g)	Fish Density (g/L)	Rabbit weight (g)	Rabbit Density (g/L)	Reptile weight (g)	Reptile Density (g/L)	Rodent weight (g)	Rodent Density (g/L)	Turtle weight (g)	Turtle Density (g/L)	Indeter weight (g)	Indeter Density (g/L)
PS4	**S26**	1		0.00		0.00		0.00		0.00	0.12	0.12		0.00		0		0.00		0.00
PS4	**F2**	1		0.00		0.00	7.47	7.47	0.25	0.25	0.03	0.03		0.00		0		0.00	0.06	0.06
PS4	**S29/F2**	1		0.00	0.59	0.59	1.66	1.66	1.72	1.72	0.1	0.10	0.04	0.04		0		0.00	0.85	0.85
PS4	**S30**	0.65		0.00		0.00		0.00	0.95	1.46	0.49	0.75		0.00		0		0.00	0.26	0.40
PS4	**S31**	1.1		0.00		0.00		0.00		0.00	0.04	0.04		0.00		0		0.00	0.19	0.17
PS4	**S32A**	1		0.00		0.00		0.00		0.00		0.00		0.00		0		0.00	0.75	0.75
PS4	**S33A**	1		0.00	4.92	4.92	0.12	0.12	0.15	0.15	1.11	1.11	0.09	0.09	0.04	0.04	0.3	0.30	1.03	1.03
PS4	**S37**	1		0.00		0.00		0.00		0.00		0.00		0.00		0		0.00	1.26	1.26
PS4	**S53/F4**	0.65		0.00		0.00		0.00	0.04	0.06	0.08	0.12		0.00		0		0.00	0.68	1.05
PS4	**S63**	1		0.00	0.67	0.67	1.22	1.22		0.00	4.97	4.97		0.00		0	0.16	0.16	1.96	1.96
PS4	**S64**	0.6		0.00		0.00		0.00		0.00	0.98	1.63		0.00		0		0.00	0.13	0.22
PS4	**S65**	0.65		0.00		0.00		0.00		0.00	0.32	0.49		0.00		0		0.00	0.35	0.54
PS4	**S72/F7**	1		0.00		0.00	4.1	4.10		0.00	0.27	0.27		0.00		0		0.00	0.13	0.13
PS4	**S97**	1		0.00		0.00		0.00		0.00	0.25	0.25		0.00	0.22	0.22		0.00	0.14	0.14
PS4	**S98**	1		0.00		0.00		0.00		0.00		0.00	0.02	0.02		0		0.00	0.2	0.20
PS4	**S99**	1		0.00		0.00		0.00		0.00		0.00		0.00		0		0.00	1.54	1.54
PS4	**S101**	1		0.00		0.00		0.00	0.89	0.89	0.97	0.97		0.00		0		0.00	0.37	0.37
PS4	**S102**	0.6		0.00		0.00		0.00		0.00	0.32	0.53		0.00		0		0.00	1.06	1.77
PS4	**S103**	1		0.00		0.00		0.00		0.00	0.33	0.33		0.00		0		0.00	0.12	0.12
PS4	**S112**	1	0.03	0.03		0.00	1.31	1.31		0.00		0.00		0.00		0		0.00	0.28	0.28
PS4	**S115**	1		0.00		0.00	12.01	12.01		0.00	0.1	0.10		0.00		0		0.00	0.5	0.50
PS4	**S106**	1		0.00		0.00		0.00		0.00		0.00	0.03	0.03		0		0.00	0.13	0.13

APPENDIX E: GEOARCHAEOLOGICAL ANALYSIS DATA

This appendix provides all of the results of the geoarchaeological analysis conducted for PS3, PS4, and U19 in UT North. Specifically, this appendix includes a master table with all of the Magnetic Susceptibility (MS)**,** Loss-on-Ignition (LOI) for Organic Content, Phosphorus Analysis**,** X-Ray Diffraction (XRD)**,** Calcium Carbonate Analysis using the calcimeter method, and Particle Size Analysis results.

In addition, the results of the Micromorph and Thin Section Analysis are included along with photo images of the micromorphs and slides.

The methods pertaining to each of these analyses can be found in Chapter 5.

Table App E.1. PS3, PS4, and U19 Georchaeological Analysis Results.

Sample	Strat	Case	6 Clusters	Mag Susc. Xhf	Mag Susc. Xlf	Mag Susc. Xfd	LOI	Avg. Total P (LOI) Colorimeter (mg/L)	Calcium Carbonate Equivalent % (calcimeter)	Particle Size Sand %	Particle Size Silt %	Particle Size Clay %	Particle Size Mean	Particle Size Median	Particle Size Sorting	Particle Size Skewness	Particle Size Kurtosis	XRD Quartz %	XRD K-Feldspar %	XRD Plagioclase %	XRD Calcite %	XRD Dolomite %	XRD Halite %	XRD Sylvite %	XRD Gypsum %	XRD Anhydrite %	XRD Hematite %	XRD Total Clay %
PS3_C01	U19 L.1	1:PS3_C01	1	114.95	124.48	7.66	7.06	49.37	60.45	49.80	46.94	3.26	4.18	3.99	1.26	0.28	1.14	9.90	1.80	4.50	72.80	0.90	1.10	0.00	0.70	1.30	0.30	6.70
PS3_C02	U19 L.1	2:PS3_C02	1	139.60	144.04	3.08	9.29	43.50	61.59	46.40	51.46	2.14	4.12	4.07	1.05	0.12	1.18	–	–	–	–	–	–	–	–	–	–	–
PS3_C03	U19 L.1	3:PS3_C03	2	26.22	26.22	0.00	1.50	2.23	73.99	13.60	78.88	7.52	5.39	5.36	1.30	0.07	1.03	–	–	–	–	–	–	–	–	–	–	–
PS3_C04	U19 L.1	4:PS3_C04	2	54.77	55.53	1.37	3.81	20.80	69.37	52.80	45.70	1.50	3.94	3.92	1.13	0.04	1.21	–	–	–	–	–	–	–	–	–	–	–
PS3_C05	U19 L.1	5:PS3_C05	1	148.79	153.13	2.84	9.67	16.30	56.69	64.70	34.06	1.24	3.52	3.55	1.18	0.01	0.98	12.60	2.10	5.80	73.50	0.00	1.00	0.30	0.00	0.80	0.70	3.20
PS3_C06	S40	6:PS3_C06	3	262.17	272.56	3.81	5.10	86.77	53.04	55.20	42.41	2.39	3.90	3.83	1.31	0.12	1.11	11.20	1.70	3.90	71.20	5.90	0.50	2.00	0.00	0.00	0.70	2.90
PS3_C07	S51	7:PS3_C07	4	255.33	265.30	3.76	6.33	9.00	58.05	42.60	51.66	5.74	4.37	4.18	1.36	0.33	1.30	14.30	1.90	6.00	67.70	3.40	0.90	1.70	0.00	0.00	0.60	3.50
PS3_C08	S43	8:PS3_C08	5	233.78	246.23	5.06	12.63	0.00	65.82	52.90	43.20	3.90	4.00	3.90	1.30	0.22	1.14	–	–	–	–	–	–	–	–	–	–	–
PS3_C09	S51	9:PS3_C09	5	237.35	247.53	4.11	10.94	7.50	60.21	59.20	38.17	2.63	3.72	3.71	1.25	0.12	1.02	–	–	–	–	–	–	–	–	–	–	–
PS3_C10	S43	10:PS3_C10	1	150.60	155.15	2.94	12.36	51.77	56.80	74.40	24.71	0.89	3.03	3.11	1.49	-0.10	1.11	–	–	–	–	–	–	–	–	–	–	–
PS3_C11	S43	11:PS3_C11	5	246.51	258.03	4.47	6.13	31.00	61.47	64.80	33.84	1.36	3.67	3.55	1.12	0.22	1.04	12.80	2.10	5.20	70.80	2.90	0.90	1.70	0.00	0.00	0.60	3.00
PS3_C12	S44			198.34	205.77	3.61	9.45	–	58.80	57.70	39.98	2.32	3.72	3.72	1.53	0.00	1.16	12.50	2.20	6.90	72.10	1.30	0.60	0.50	0.00	0.00	0.60	3.30
PS3_C13	S45	13:PS3_C13	5	231.26	242.72	4.72	10.43	25.10	59.19	48.10	44.69	7.21	4.23	4.06	1.96	0.13	1.23	–	–	–	–	–	–	–	–	–	–	–
PS3_C14	S47	14:PS3_C14	5	228.18	235.27	3.01	4.99	30.70	50.19	45.40	50.79	3.81	4.24	4.11	1.19	0.26	1.17	–	–	–	–	–	–	–	–	–	–	–
PS3_C15	S47	15:PS3_C15	5	179.53	186.28	3.62	10.91	29.30	50.14	55.80	40.01	4.19	3.86	3.80	1.60	0.08	1.36	–	–	–	–	–	–	–	–	–	–	–
PS3_C16	S45/47			193.00	202.80	4.83	5.59	43.43	–	38.60	55.34	6.06	4.44	4.26	1.34	0.34	1.46	13.80	1.40	7.50	72.40	0.00	0.90	0.60	0.00	0.00	0.50	2.90
PS3_C17	S76	17:PS3_C17	5	188.02	197.21	4.66	6.78	44.83	57.09	59.20	38.10	2.70	3.75	3.71	1.29	0.12	1.11	–	–	–	–	–	–	–	–	–	–	–
PS3_C18	S76	18:PS3_C18	5	217.64	224.85	3.21	6.60	56.80	53.91	61.10	36.04	2.86	3.63	3.52	1.47	0.16	0.97	–	–	–	–	–	–	–	–	–	–	–
PS3_C19	S76	19:PS3_C19	5	238.27	249.04	4.32	6.14	55.90	52.88	43.20	51.54	5.26	4.31	4.15	1.26	0.32	1.37	–	–	–	–	–	–	–	–	–	–	–
PS3_C20	S76	20:PS3_C20	4	301.39	314.39	4.14	3.88	36.70	55.15	43.30	50.70	6.00	4.30	4.15	1.30	0.35	1.51	18.70	3.30	10.90	62.70	0.00	0.70	0.00	0.00	0.00	0.80	2.90
PS3_C21	S48	21:PS3_C21	1	131.70	135.52	2.82	7.58	51.40	55.26	82.80	15.20	2.00	2.05	1.90	1.89	0.15	0.88	–	–	–	–	–	–	–	–	–	–	–
PS3_C22	U6 L.1	22:PS3_C22	5	216.76	226.07	4.12	3.84	0.00	51.38	67.80	28.52	3.68	2.77	3.06	2.11	-0.07	0.82	–	–	–	–	–	–	–	–	–	–	–
PS3_C23	U6 L.1	23:PS3_C23	1	138.75	142.86	2.88	10.91	62.70	47.62	82.90	14.90	2.20	1.61	1.04	2.09	0.42	0.83	–	–	–	–	–	–	–	–	–	–	–
PS3_C24	U6 L.1	24:PS3_C24	4	292.83	308.37	5.04	3.22	0.00	54.53	54.30	39.77	5.93	3.69	3.85	1.98	-0.02	1.38	13.20	2.90	7.60	71.10	0.00	0.80	0.70	0.00	0.00	0.80	2.90
PS3_C44	unknown	25:PS3_C44	1	128.70	131.82	2.36	7.61	86.57	58.80	70.70	28.52	0.78	3.47	3.44	1.03	0.05	1.07	–	–	–	–	–	–	–	–	–	–	–
PS3_C45	unknown	26:PS3_C45	5	221.46	227.90	2.82	1.28	0.00	57.20	55.70	42.59	1.71	3.90	3.82	1.16	0.16	1.01	–	–	–	–	–	–	–	–	–	–	–
PS3_C46	unknown	27:PS3_C46	5	195.06	203.99	4.38	3.70	0.00	57.54	0.47	96.65	2.88	4.98	4.81	0.79	0.43	1.06	–	–	–	–	–	–	–	–	–	–	–
PS3_C47	unknown	28:PS3_C47	5	173.65	182.72	4.96	6.34	0.00	59.64	34.80	60.85	4.35	4.49	4.37	1.16	0.26	1.19	–	–	–	–	–	–	–	–	–	–	–
PS3_C48	unknown	29:PS3_C48	5	168.90	176.45	4.28	1.90	35.63	71.64	60.10	37.31	2.59	3.60	3.68	1.69	-0.11	1.54	–	–	–	–	–	–	–	–	–	–	–
PS3_C49	unknown	30:PS3_C49	5	210.40	217.79	3.39	9.71	11.27	55.26	50.80	46.94	2.26	3.93	3.96	1.40	-0.04	1.13	–	–	–	–	–	–	–	–	–	–	–
PS3_C50	unknown	31:PS3_C50	4	267.04	275.09	2.93	5.17	0.00	62.67	39.30	55.40	5.30	4.44	4.29	1.37	0.24	1.24	–	–	–	–	–	–	–	–	–	–	–
PS3_C51	unknown	32:PS3_C51	5	189.02	195.91	3.52	10.01	5.63	52.88	21.70	67.80	10.50	5.13	4.85	1.52	0.38	1.13	–	–	–	–	–	–	–	–	–	–	–
PS3_C52	unknown	33:PS3_C52	5	200.56	209.31	4.18	11.47	49.17	52.21	45.80	51.43	2.77	4.18	4.09	1.10	0.19	1.15	–	–	–	–	–	–	–	–	–	–	–
PS4_C01	S106	34:PS4_C01	2	27.82	27.87	0.19	1.56	8.00	76.04	0.01	91.47	8.52	5.64	5.46	1.02	0.35	1.05	6.00	1.20	1.40	82.10	0.00	0.90	0.00	0.00	4.10	0.00	4.30
PS4_C02	S106			23.44	23.59	0.65	1.20	8.87	–	50.00	47.18	2.82	3.99	3.99	1.42	0.07	0.99	–	–	–	–	–	–	–	–	–	–	–
PS4_C03	S156			50.01	51.76	3.38	5.07	35.83	–	74.00	23.97	2.03	2.86	2.67	1.62	0.24	0.84	–	–	–	–	–	–	–	–	–	–	–
PS4_C04	S124/156			33.94	34.99	3.01	7.11	65.23	68.23	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
PS4_C05	S122	38:PS4_C05	2	70.57	73.20	3.60	5.59	36.50	67.93	68.00	30.59	1.41	3.17	3.16	1.58	0.07	0.85	–	–	–	–	–	–	–	–	–	–	–
PS4_C06	S122/113	39:PS4_C06	2	75.51	77.16	2.14	6.29	37.53	65.26	65.00	33.42	1.58	3.47	3.47	1.36	0.06	0.98	–	–	–	–	–	–	–	–	–	–	–
PS4_C07	S113	40:PS4_C07	1	112.48	116.66	3.58	9.12	42.57	57.60	54.20	42.72	3.08	3.87	3.86	1.58	0.04	1.25	5.50	0.80	2.40	78.00	2.00	0.00	0.00	1.70	4.00	0.00	5.60
PS4_C08	S112	41:PS4_C08	1	120.79	125.56	3.80	13.33	39.47	54.07	58.00	39.36	2.64	3.81	3.73	1.38	0.18	1.02	–	–	–	–	–	–	–	–	–	–	–
PS4_C09	S119			121.13	125.36	3.38	9.02	57.40	–	71.50	27.65	0.85	3.34	3.35	1.20	0.01	1.08	–	–	–	–	–	–	–	–	–	–	–
PS4_C10	S112			134.87	140.94	4.30	14.56	44.83	–	76.60	22.63	0.77	3.03	3.08	1.32	-0.02	1.00	–	–	–	–	–	–	–	–	–	–	–
PS4_C11	S112			207.23	215.98	4.05	11.24	0.00	–	64.40	33.89	1.71	3.47	3.49	1.40	0.04	1.01	15.30	2.10	5.30	68.70	0.00	2.60	0.90	0.00	0.00	0.70	4.40
PS4_C12	S115	45:PS4_C12	4	266.87	278.80	4.28	3.33	0.00	59.52	63.90	34.60	1.50	3.37	3.36	1.47	0.05	0.85	–	–	–	–	–	–	–	–	–	–	–
PS4_C13	S115	46:PS4_C13	4	267.02	276.53	3.44	5.10	2.00	55.26	69.60	28.97	1.43	3.12	2.82	1.54	0.30	0.85	–	–	–	–	–	–	–	–	–	–	–
PS4_C14	S114			193.24	202.20	4.43	8.20	0.10	–	40.80	55.44	3.76	4.38	4.24	1.29	0.21	1.14	–	–	–	–	–	–	–	–	–	–	–
PS4_C15	S114	48:PS4_C15	1	156.97	163.06	3.74	12.57	81.63	49.04	75.70	23.58	0.72	3.08	3.02	1.30	0.08	1.00	–	–	–	–	–	–	–	–	–	–	–
PS4_C16	S98	49:PS4_C16	1	163.55	169.08	3.27	13.29	99.97	49.04	74.50	24.78	0.72	3.06	3.16	1.33	-0.08	0.93	16.90	2.30	6.70	63.70	2.00	3.00	0.90	0.00	0.00	0.60	3.90
PS4_C17	S98	50:PS4_C17	1	131.87	136.94	3.70	13.59	71.87	51.79	73.50	25.39	1.11	2.87	2.96	1.73	-0.10	1.11	–	–	–	–	–	–	–	–	–	–	–
PS4_C18	S94			69.29	70.94	2.33	40.24	34.93	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
PS4_C19	S94	52:PS4_C19	1	126.35	129.90	2.73	27.68	59.03	50.65	59.50	38.45	2.05	3.71	3.71	1.27	0.07	1.07	–	–	–	–	–	–	–	–	–	–	–
PS4_C20	S72	53:PS4_C20	5	191.21	198.04	3.45	14.88	11.73	56.97	36.60	56.21	7.19	4.62	4.43	1.54	0.27	1.15	–	–	–	–	–	–	–	–	–	–	–
PS4_C21	S65			173.84	183.51	5.27	25.04	10.90	56.46	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
PS4_C22	S64	55:PS4_C22	5	211.01	220.27	4.20	9.81	18.00	58.23	50.80	45.98	3.22	3.95	3.96	1.56	-0.01	1.26	–	–	–	–	–	–	–	–	–	–	–

Table App E.1. PS3, PS4, and U19 Geoarchaeological Analysis Results continued.

Sample	Strat	Case	6 Clusters	Mag Susc. Xhf	Mag Susc. Xlf	Mag Susc. Xfd	LOI	Avg. Total P (LOI) Colorimeter (mg/L)	Calcium Carbonate Equivalent % (calcimeter)	Particle Size Sand %	Particle Size Silt %	Particle Size Clay %	Particle Size Mean	Particle Size Median	Particle Size Sorting	Particle Size Skewness	Particle Size Kurtosis	XRD Quartz %	XRD K-Feldspar %	XRD Plagioclase %	XRD Calcite %	XRD Dolomite %	XRD Halite %	XRD Sylvite %	XRD Gypsum %	XRD Anhydrite %	XRD Hematite %	XRD Total Clay %
PS4_C23	S64	56:PS4_C23	5	221.58	232.18	4.56	11.21	38.13	60.27	51.00	45.56	3.44	3.97	3.95	1.64	-0.01	1.32	13.20	2.20	5.50	72.20	2.30	0.00	0.50	0.00	0.00	0.60	3.50
PS4_C24	S63	57:PS4_C24	3	261.45	274.78	4.85	3.67	102.87	48.75	81.10	18.03	0.87	2.75	2.62	1.39	0.19	1.02	10.90	3.10	5.20	63.20	5.90	0.00	6.00	0.00	0.00	0.50	5.20
PS4_C25	S72			133.10	138.52	3.91	21.44	–	53.71	73.90	24.67	1.43	3.04	2.91	1.47	0.18	0.96	–	–	–	–	–	–	–	–	–	–	–
PS4_C26	S69	59:PS4_C26	5	192.80	204.49	5.72	12.88	0.27	56.07	41.10	56.36	2.54	4.32	4.21	1.10	0.22	1.11	–	–	–	–	–	–	–	–	–	–	–
PS4_C27	S33			206.05	215.57	4.42	4.03	–	57.43	67.80	30.87	1.33	3.35	3.25	1.39	0.15	0.93	–	–	–	–	–	–	–	–	–	–	–
PS4_C28	S33	61:PS4_C28	5	204.40	214.32	4.63	3.26	47.87	53.34	48.60	49.02	2.38	4.11	4.02	1.17	0.16	1.14	11.00	2.70	4.60	67.20	6.50	0.00	2.90	0.00	0.00	0.50	4.60
PS4_C29	S33	62:PS4_C29	5	229.68	238.24	3.59	2.89	58.77	51.22	40.90	56.33	2.77	4.32	4.20	1.07	0.26	1.17	–	–	–	–	–	–	–	–	–	–	–
PS4_C30	S33/S32	63:PS4_C30	5	194.12	202.03	3.92	15.26	48.67	53.66	19.90	70.63	9.47	5.28	5.21	1.46	0.16	0.94	–	–	–	–	–	–	–	–	–	–	–
PS4_C31	S32	64:PS4_C31	5	197.83	204.37	3.20	12.45	40.37	53.50	37.50	58.00	4.50	4.48	4.34	1.29	0.24	1.14	–	–	–	–	–	–	–	–	–	–	–
PS4_C32	S172	65:PS4_C32	5	183.11	187.63	2.41	15.97	25.30	54.93	57.30	39.40	3.30	3.65	3.65	1.77	0.05	0.98	–	–	–	–	–	–	–	–	–	–	–
PS4_C33	S173	66:PS4_C33	5	179.49	186.22	3.61	12.96	16.13	56.35	38.10	57.27	4.63	4.39	4.29	1.20	0.26	1.25	–	–	–	–	–	–	–	–	–	–	–
PS4_C34	S30	67:PS4_C34	5	174.46	180.14	3.15	19.32	13.30	55.32	48.10	47.95	3.95	4.17	4.04	1.30	0.23	1.16	–	–	–	–	–	–	–	–	–	–	–
PS4_C35	S29	68:PS4_C35	5	164.75	169.63	2.88	10.69	14.90	56.29	46.50	47.97	5.53	4.24	4.09	1.43	0.26	1.31	15.60	2.10	5.90	68.70	1.90	0.00	1.40	0.00	0.00	0.60	3.80
PS4_C36	S37	69:PS4_C36	5	173.33	178.07	2.66	1.83	7.87	52.93	42.00	53.68	4.32	4.39	4.20	1.25	0.31	1.16	13.30	1.70	8.50	67.20	1.40	1.00	0.00	0.00	2.30	0.30	4.30
PS4_C37	S27	70:PS4_C37	5	215.21	225.38	4.51	4.32	70.13	48.75	31.60	63.00	5.40	4.63	4.52	1.27	0.24	1.16	11.30	2.20	6.50	64.90	3.40	0.90	6.20	0.00	0.00	0.80	3.80
PS4_C38	S26	71:PS4_C38	5	229.56	236.57	2.96	17.38	76.10	52.47	39.30	51.72	8.98	4.73	4.36	1.63	0.40	0.99	–	–	–	–	–	–	–	–	–	–	–
PS4_C39	S25	72:PS4_C39	5	172.53	179.39	3.83	8.66	55.83	52.57	54.10	42.25	3.65	3.81	3.85	1.60	0.01	1.20	–	–	–	–	–	–	–	–	–	–	–
PS4_C40	Disturbed	73:PS4_C40	5	228.85	239.95	4.63	5.06	44.77	52.15	43.80	52.33	3.87	4.27	4.16	1.27	0.21	1.16	–	–	–	–	–	–	–	–	–	–	–
U19_C41	U19 L.1	74:U19_C41	6	124.54	128.32	2.94	8.16	24.83	62.86	0.00	94.16	5.84	5.41	5.23	0.93	0.38	1.01	–	–	–	–	–	–	–	–	–	–	–
U19_C42	U19 L.1	75:U19_C42	6	136.59	140.25	2.61	9.11	10.70	62.54	11.80	85.45	2.75	4.79	4.62	0.85	0.39	1.06	–	–	–	–	–	–	–	–	–	–	–
U19_C43	U19 L.1	76:U19_C43	2	44.72	45.43	1.56	3.60	12.50	70.50	44.80	51.30	3.90	4.26	4.13	1.37	0.16	1.29	–	–	–	–	–	–	–	–	–	–	–
U19_C44	U19 L.1	77:U19_C44	2	54.14	54.77	1.16	4.08	18.40	69.16	46.40	50.64	2.96	4.19	4.09	1.25	0.16	1.16	–	–	–	–	–	–	–	–	–	–	–
U19_C45	U19 L.2	78:U19_C45	2	43.91	44.40	1.09	3.18	6.67	70.36	41.20	55.25	3.55	4.33	4.20	1.21	0.20	1.29	–	–	–	–	–	–	–	–	–	–	–
U19_C46	U19 L.2	79:U19_C46	2	42.17	42.83	1.55	3.79	11.67	73.00	0.19	95.70	4.11	5.18	5.02	0.87	0.37	1.08	–	–	–	–	–	–	–	–	–	–	–
U19_C47	U19 L.2	80:U19_C47	2	28.56	29.38	2.77	2.89	3.90	82.20	42.60	53.40	4.00	4.32	4.21	1.32	0.20	1.13	–	–	–	–	–	–	–	–	–	–	–
U19_C48	U19 L.2	81:U19_C48	2	18.95	19.22	1.40	2.14	0.17	84.72	43.40	53.11	3.49	4.16	4.23	1.62	-0.04	1.11	–	–	–	–	–	–	–	–	–	–	–
U19_C49	U19 L.2	82:U19_C49	2	19.15	19.57	2.12	2.40	0.00	82.53	41.50	55.42	3.08	4.31	4.24	1.26	0.14	1.07	–	–	–	–	–	–	–	–	–	–	–
U19_C50	U19 L.2	83:U19_C50	2	4.90	4.90	0.00	1.49	0.00	82.69	52.80	43.39	3.81	3.87	3.86	1.77	0.04	0.99	–	–	–	–	–	–	–	–	–	–	–
U19_C51	U19 L.2	84:U19_C51	1	103.53	106.79	3.05	5.92	30.53	68.16	47.30	49.97	2.73	4.16	4.05	1.08	0.24	1.14	–	–	–	–	–	–	–	–	–	–	–

Table App E.2. Thin Section Analysis Results.

Provenience				General Observations				Coarse Fraction (>2mm)						Fine Fraction (<2mm)						
Thin Section Number	Profile Section	Micromorph No.	Strats	Genearl Strat Type Based on Field Descriptions	Heterogeneity	Lower Boundary	Lamina	Gneral Strat Type Based on Field A1:U23Observations	Lithic	Bone	Shell	Botanical remains	Dung	Wood Ash	Gypsum	Bone	Shell	Botanical remains	Dung	Additional Comments
30744-1	PS3A	MM1	S45	Thick Ash Deposit	Homogenous	VA		R,L*		B*	B, R*	R,W****		**	*	B*	B*	SR-SA, W****; C*	*	Actually refuse midden deposit
30744-1; 30744-2	PS3A	MM1	S47	Discrete Charcoal Lens	Homogenous	A		R,L*		U*	B, R*		*	**	*			D, C	*	Actually thick ash deposit, may be a strat not observed in field and not S47
30744-2	PS3A	MM1	S48	Discrete Fiber and Charcoal Lens	Homogenous	A		R-SB, L**	C*	U*	B,R*	R,W**; C*		*	*	B*		C****		Charcoal mostly in coarse fraction, charred plant remains mostly fine fraction
30744-2; 30744-3	PS3A	MM1	S76	Refuse Midden	Heterogeneous	U		SR,L*; A, SD*		U*	U,R*	A,W*		**				C***	*	angular wood charcoal towards base of strat, some appear broken in situ
30745-1	PS3A	MM2	S44	Refuse Midden	Homogenous	A		R,L***		U*	U,R*	R,W****; C*	*	**						A few charcoal are angular; much more rock than observed in field
30745-2; 30745-2	PS3A	MM2	S45	Thick Ash Deposit	Heterogeneous	U		R-SR,L*; SD*		U*	B,R**	R,W*; C**		*	*	U*			*	Charcoal mostly rounded but a few have angular breaks
30746-1	PS3A	MM3	S47	Discrete Charcoal Lens	Homogenous	A		R,L*		U*		SA-SR,W*	*	**	**			C*		Actually thick ash deposit, may be a strat not observed in field and not S47
30746-1	PS3A	MM3	S48	Discrete Fiber and Charcoal Lens		A		R-SB, L**	C*	U*		R,W**; C*	*	*	*			C****		Denser lens of small charred botanical remains in top half of strat
30746-1, 30746-2, 30746-3	PS3A	MM3	S76	Refuse Midden	Heterogeneous	U		R-SA,L*	C*	U*	U,R*	A,W*		**	**			C***	*	Upper portion of strat is homogenized but then transitions to more of a thick ash deposit in lower half of strat
30747-1	PS3A	MM4	S49	Disturbed	Homogenous	A		SA-R,L***		U*	B*	SA-SR,W****		**	**			C**		Unidentified charred fiber lens in between S49 and S39
30747-1, 30747-2	PS3A	MM4	S39	Discrete Ash Lens	Heterogeneous	A	Y	R,L*						*****	*****					Wood ash and gypsum lamina
30747-2	PS3A	MM4	S40	Thick Ash Deposit	Homogenous	A		R,L*	C*	U**	U*	SA,C*	*			U**		C*	*	Lots of bone compared to other strats
30747-2	PS3A	MM4	S41	Discrete Ash Lens	Heterogeneous	A	Y	R,L*						*****	*****					Wood ash and gypsum lamina
30747-2	PS3A	MM4	S42	Thick Ash Deposit	Homogenous	U		A,SD*						*	*			C*	*	Not much of strat visible on slide
30273-1, 30273-2	PS4B	Feature 4	S53	Baked Surface	Homogenous	VA		R-SA,L**		B,U*	B*	SA-SR,W****	*	**	**	B**	B*	C**	*	Wood charcoal concentration in upper portion of strat; feldspars, calcite, and plagioclase present
30273-2	PS4B	Feature 4	S62	Discrete Lens of Oxidized Soil	Homogenous	U	Y	SA,L*; SA,SD*		B*	B*	P*		*****	*****			P*		Wood ash and gypsum lamina
30694-1, 30694-2	PS4D	MM2	S106	Degrading Limestone	Homogenous	U		SA-SR,L*****				D*						D*		Larger limestone is mostly (5-10 mm) subrounded, smaller limestone (2-4 mm) is subangular; decomposing fiber lens near top of strat
30693-1, 30693-2	PS4E	MM1	S113	Degrading Limestone	Homogenous	A		SA,L**				R,W*; C***		***	***	B*		C***		Looks more like refuse midden deposit
30693-2	PS4E	MM1	S122	Degrading Limestone	Homogenous	A	Y	SA-SR,L**				A,W*		***	***			C*		Looks more like a thick ash deposit, has some wood ash and gypsum lamina towards top of strat
30693-2	PS4E	MM1	S124	Discrete Charcoal and Ash Lens	Heterogeneous	A		SA,L*		U*		SR,W*; C*****		*	*			C*****		All of the charred organics have a similar orientation (sloping down)
30693-2	PS4E	MM1	S156	Charcoal Pocket	Heterogeneous	U		SA,L***		B*		C**	*	*	*			C**		Looks more like refuse midden deposit; larger limestone concentrated at top of strat
30698-1	PS4E	MM3	S94	Refuse Midden	Heterogeneous	U	Y	R,L*	C*			R,W*; C*	*	**	**			C**		Three interior lenses of charred fiber
30698-1	PS4E	MM3	S98	Refuse Midden	Homogenous	A		A-SR,L**	C*			R,W*	*	*	*			C**		Limestone rocks clustered at base of strat
30698-2	PS4E	MM3	S114	Refuse Midden	Heterogeneous	A	Y	SA,L**	C*			R,W**; C****		*	*			C****		Unidentified strat in between S114 and S115 with lots of wood ash and gypsum lamina
30698-2, 30698-3	PS4E	MM3	S115	Thick Ash Deposit	Heterogeneous	U	Y	R-SR**; SR,Q*	C***	B*		C*	*	**				C*		Upper portion of strat is more homogenized, lower portion of strat has wood ash and gypsum lamina
30701-1	PS4E	MM4	S63	Thick Ash Deposit	Heterogeneous	U	Y	R-SA,L***	C*	C*	B*	R,W*	*	*****	*****	U*		C*,D*	*	Only one strat defined in field, but upper portion of strat has more ash and gypsum (lamina) and less organics and rock
30703-1	PS4E	MM6	S64	Thick Ash Deposit	Homogenous	C		SR-SA,L**				SR,W*; C*	*	*	*			C***		Cluster of rocks towards base of strat on top of charred botanical remains
30703-1	PS4E	MM6	S65	Refuse Midden	Homogenous	U		SA,L*		U*	U*	C*	*			U*	U*	C****	**	Lots of fecal matter in lower, left portion of slide

Key: **Lower Boundary:** Very Abrupt, <1mm (VA), Abrupt, <2.5 cm (A), Unobserved (U); **Morphology**: Rounded (R), Subrounded (SR), Subangular (SA), Angular (A); **Rock:** Limestone (L), Sandstone (SD); **Lithic:** Chert (C); **Bone and Shell:** Burned (B), Calcined (C), Unburned (U); **Botanical remains:** Wood charcoal (W), Charred fiber/plant remains (C), Uncharred plant remains (P), Decomposing plant remains (D); **Percentages:** very few 1-5% (*), few 5-15% (**), frequent 15-25% (***), very frequent 25-49% (****), dominant >50% (*****)

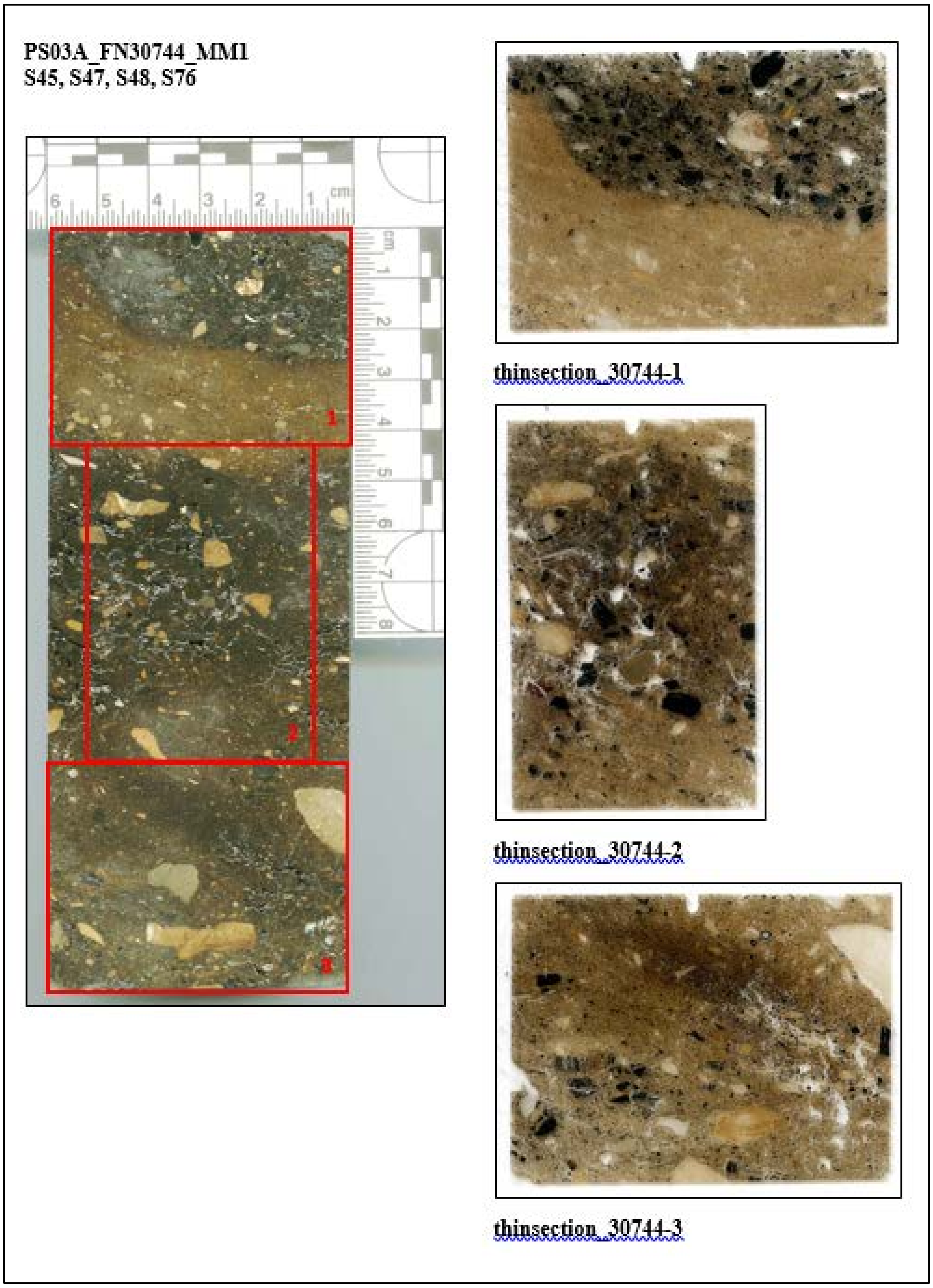


Figure App E.1. PS3A MM1 (FN30744) micromorph and thin section slides 30744-1, 30744-2, and 30744-3.

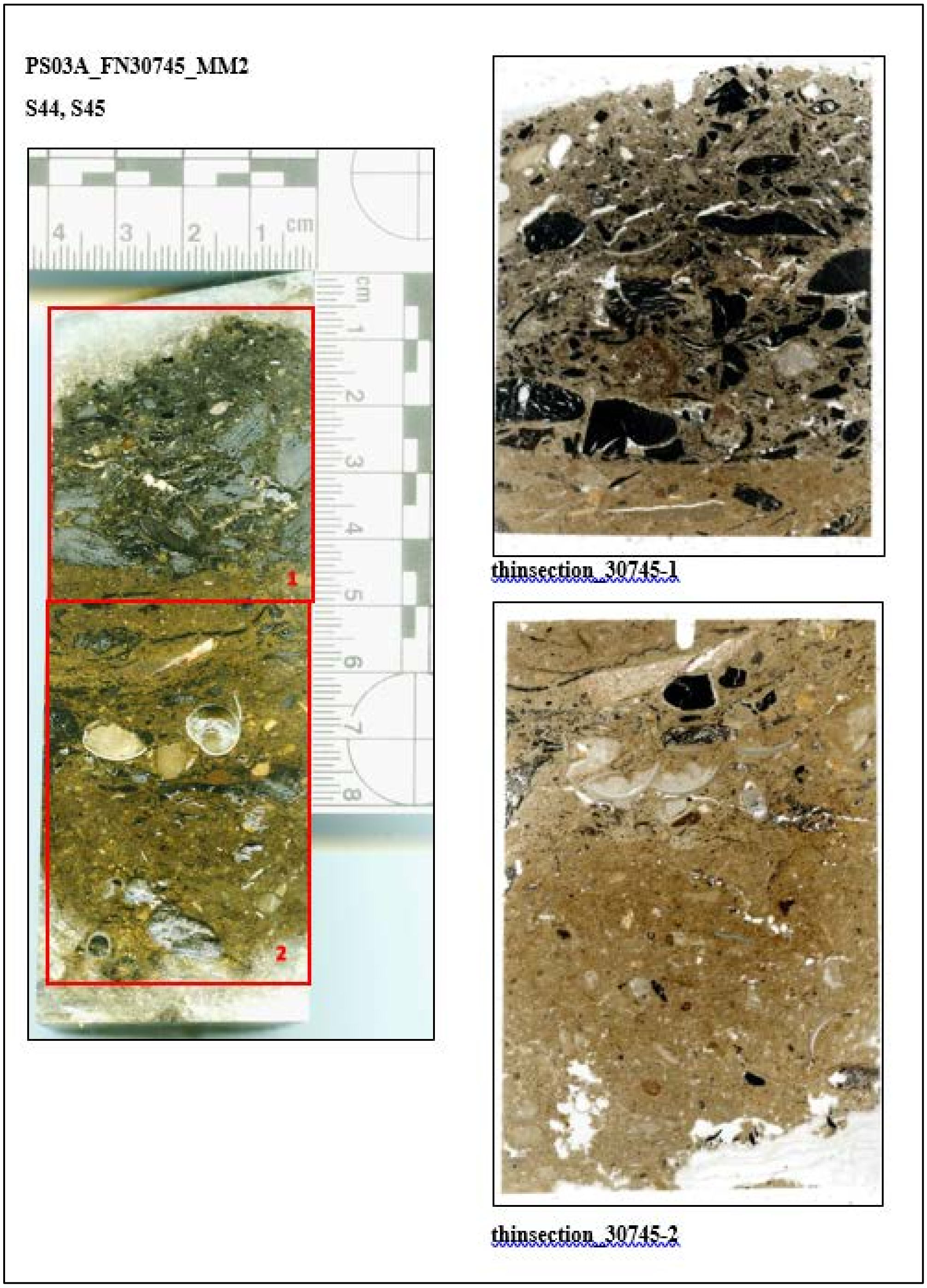


Figure App E.2. PS3A MM2 (FN30745) micromorph and thin section slides 30745-1 and 30745-2.

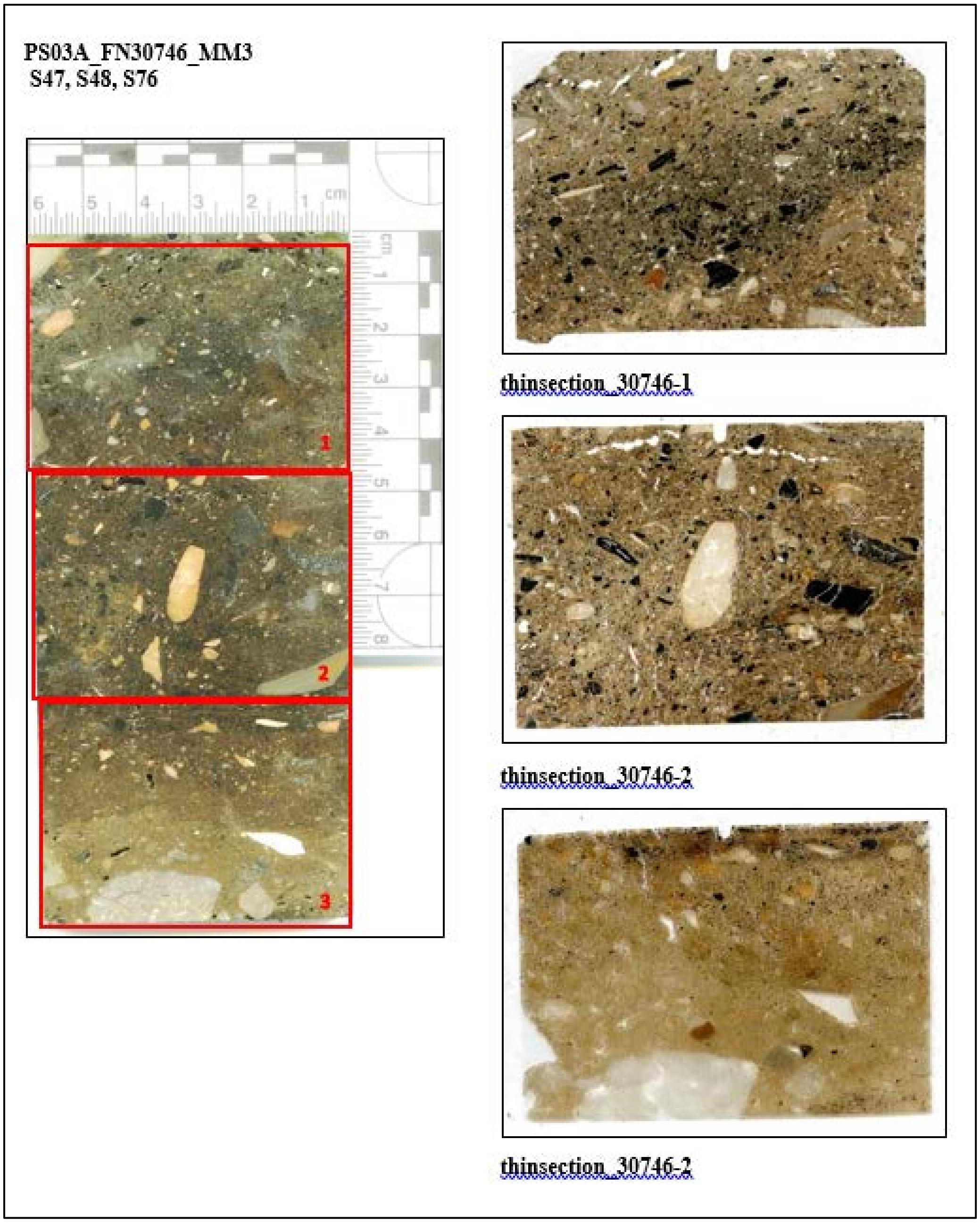


Figure App E.3. PS3A MM3 (FN30746) micromorph and thin section slides 30746-1, 30746-2, and 30746-3.

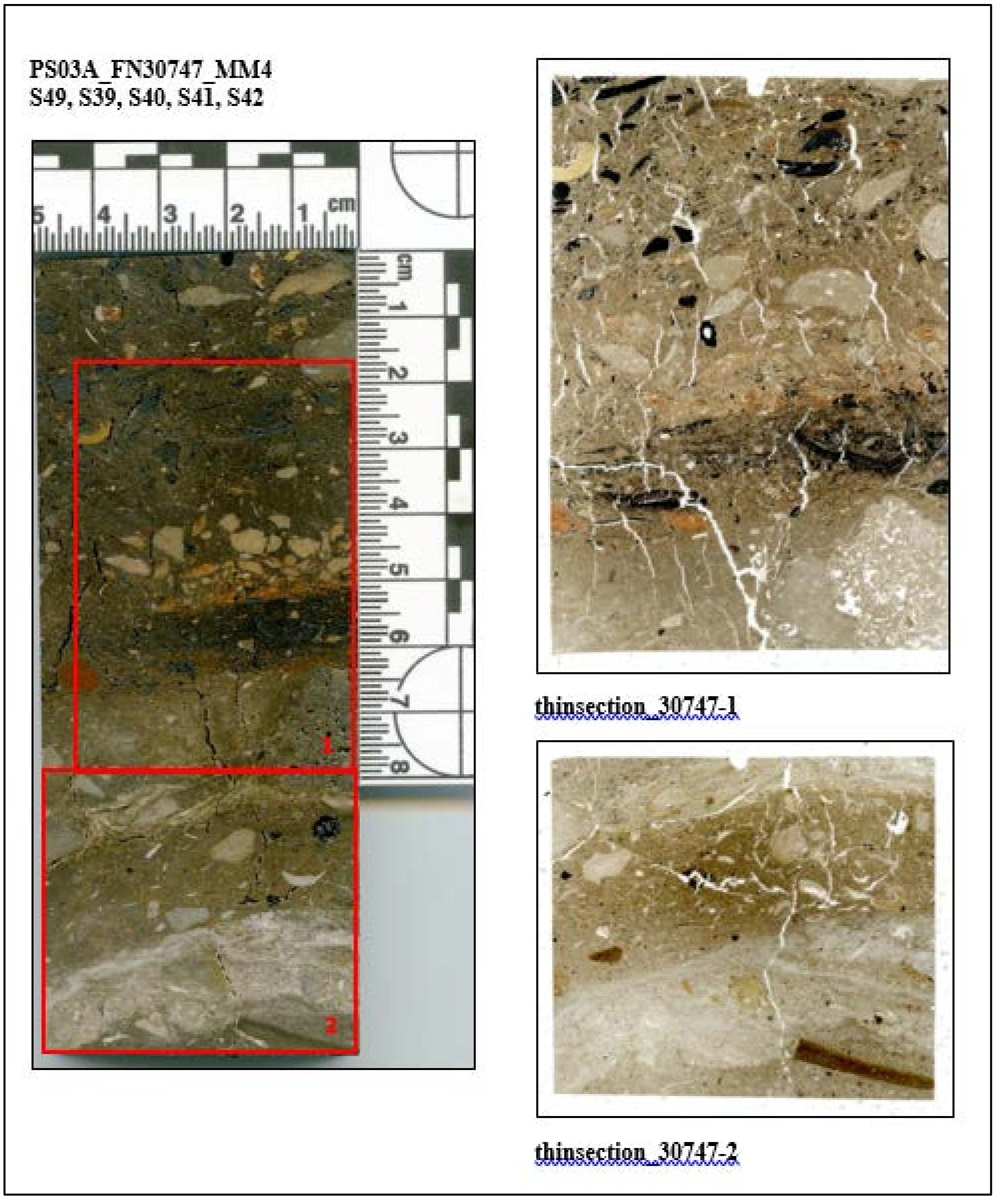


Figure App E.4. PS3A MM4 (FN30747) micromorph and thin section slides 30747-1 and 30747-2.

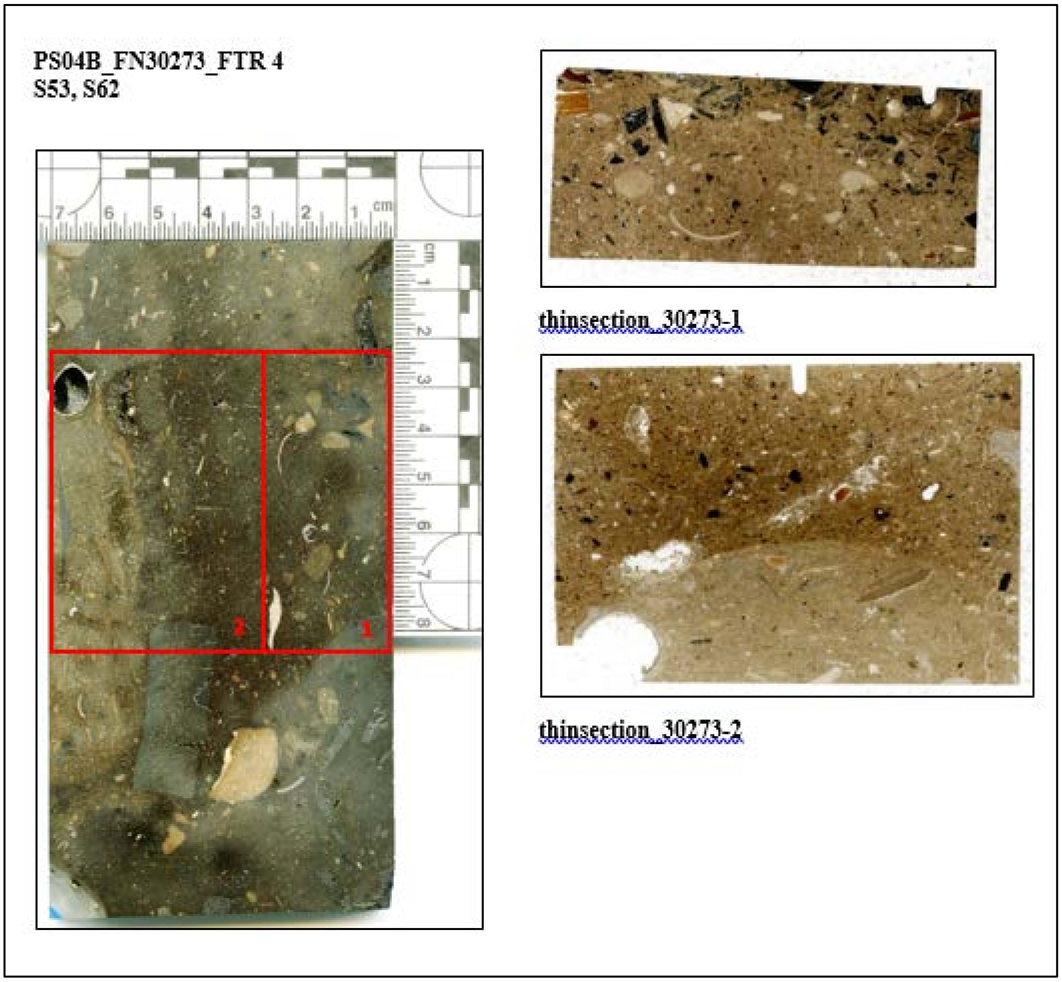


Figure App E.5. PS4B MM F4 (FN30273) micromorph and thin section slides 30273-1 and 30273-2.

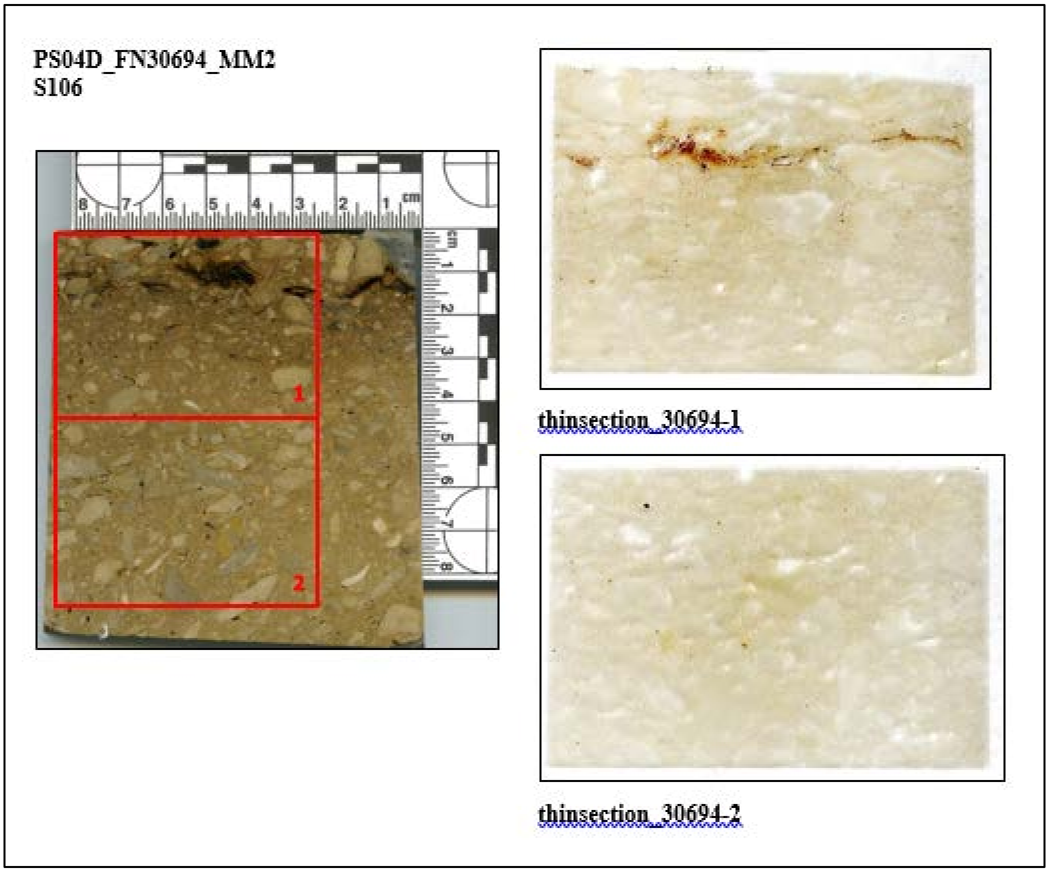


Figure App E.6. PS4D MM2 (FN30694) micromorph and thin section slides 30694-1 and 30694-2.

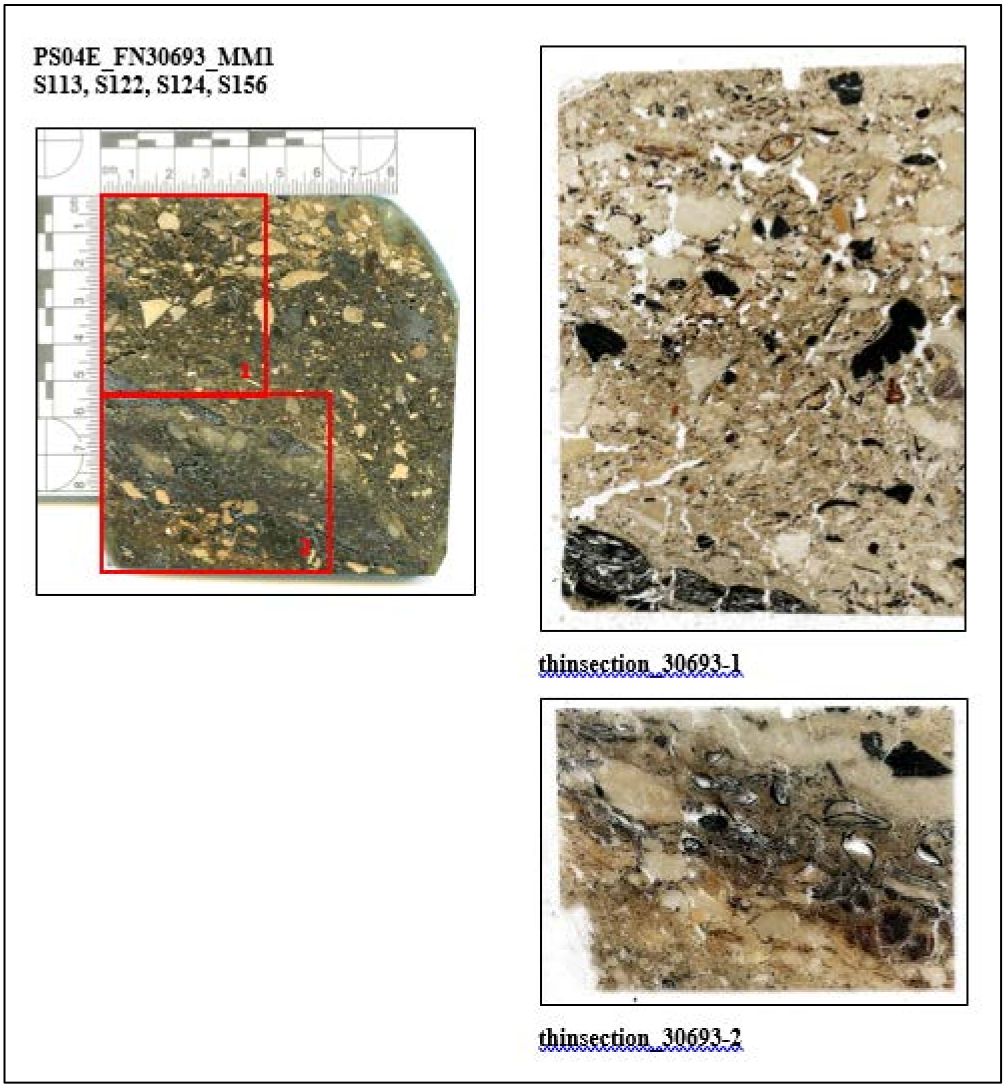


Figure App E.7. PS4E MM1 (FN30693) micromorph and thin section slides 30693-1 and 30693-2.

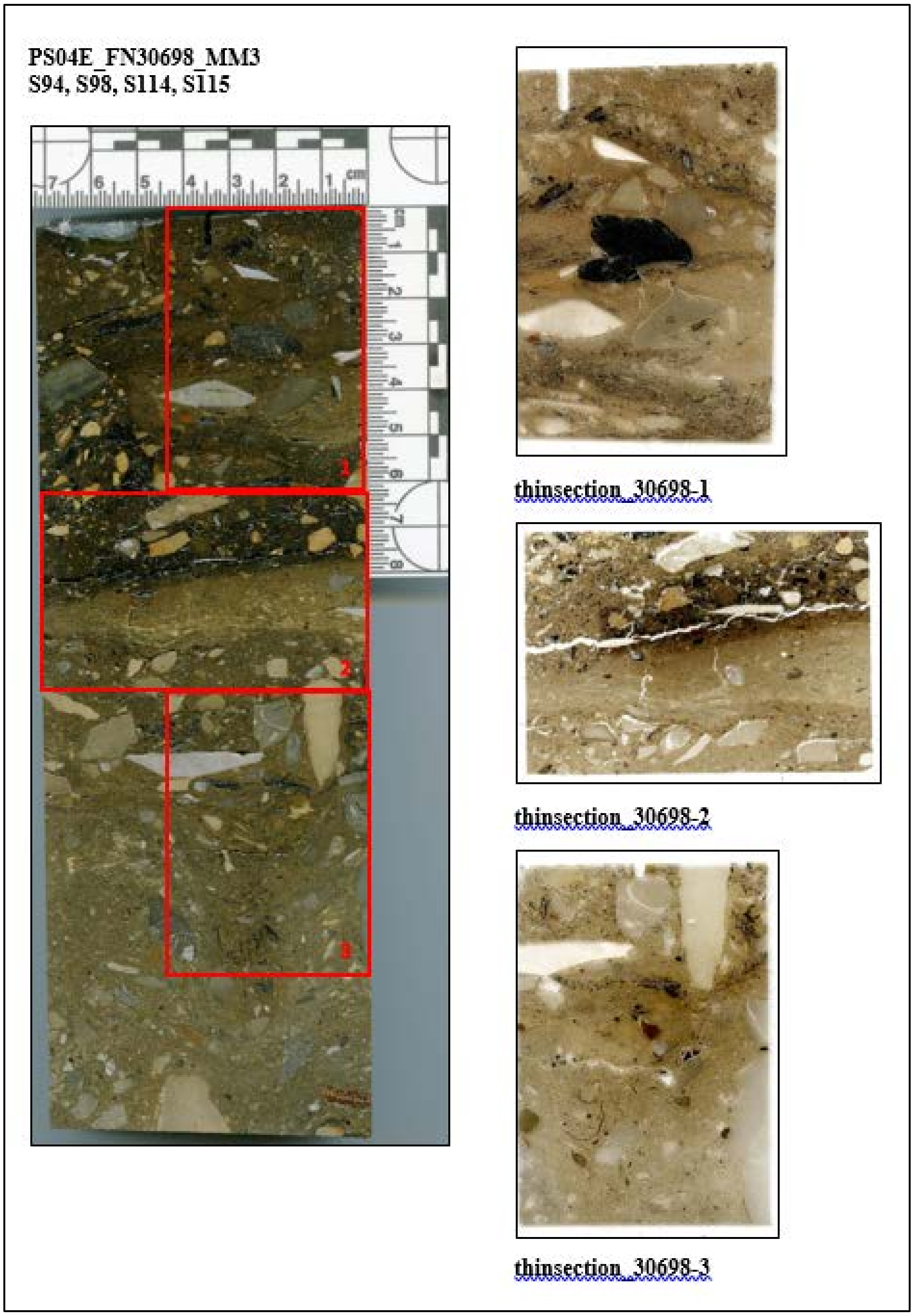


Figure App E.8. PS4E MM3 (FN30698) micromorph and thin section slides 30698-1, 30698-2, and 30698-3.

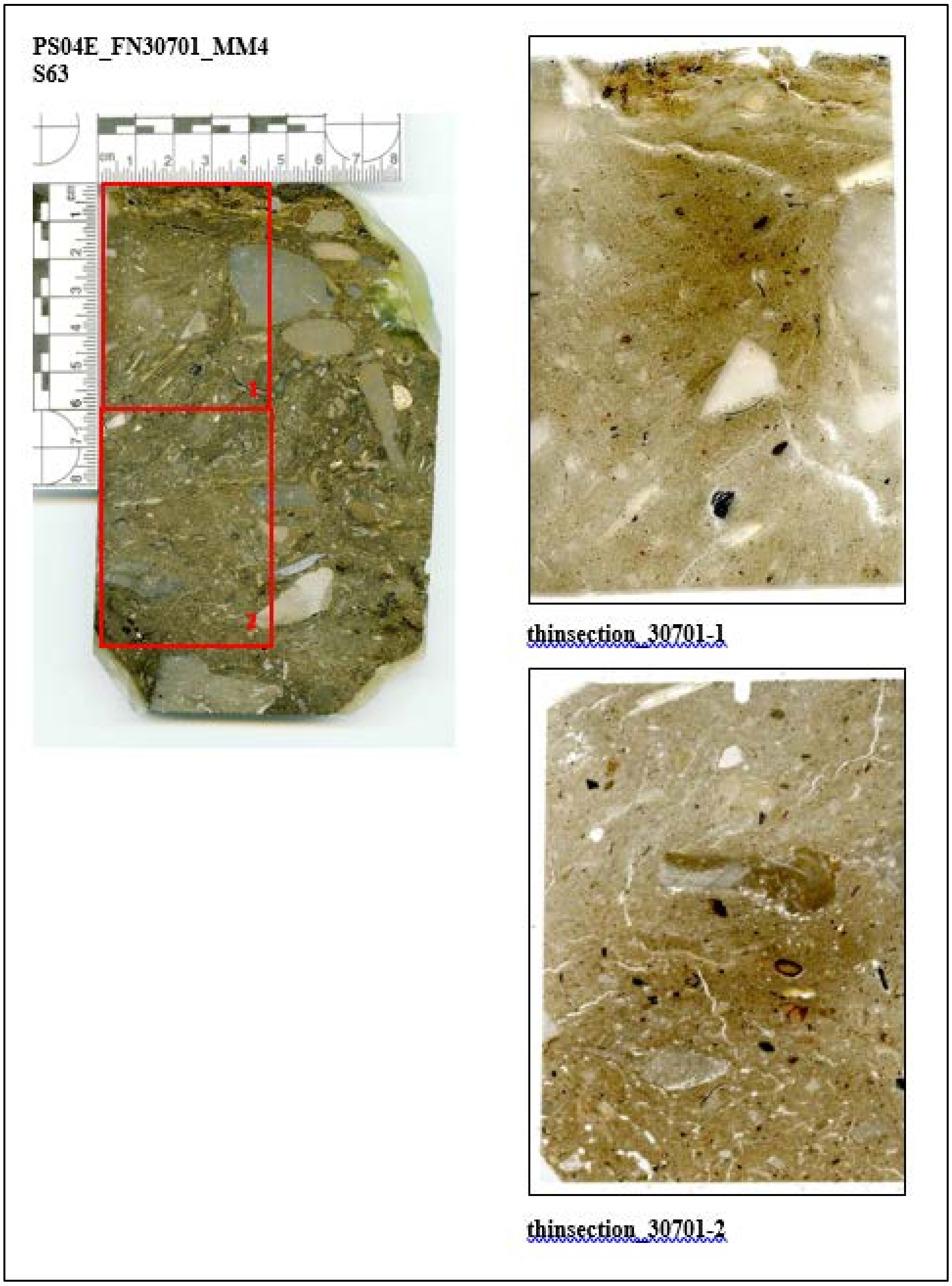


Figure App E.9. PS4E MM4 (FN30701) micromorph and thin section slides 30701-1 and 30701-2.

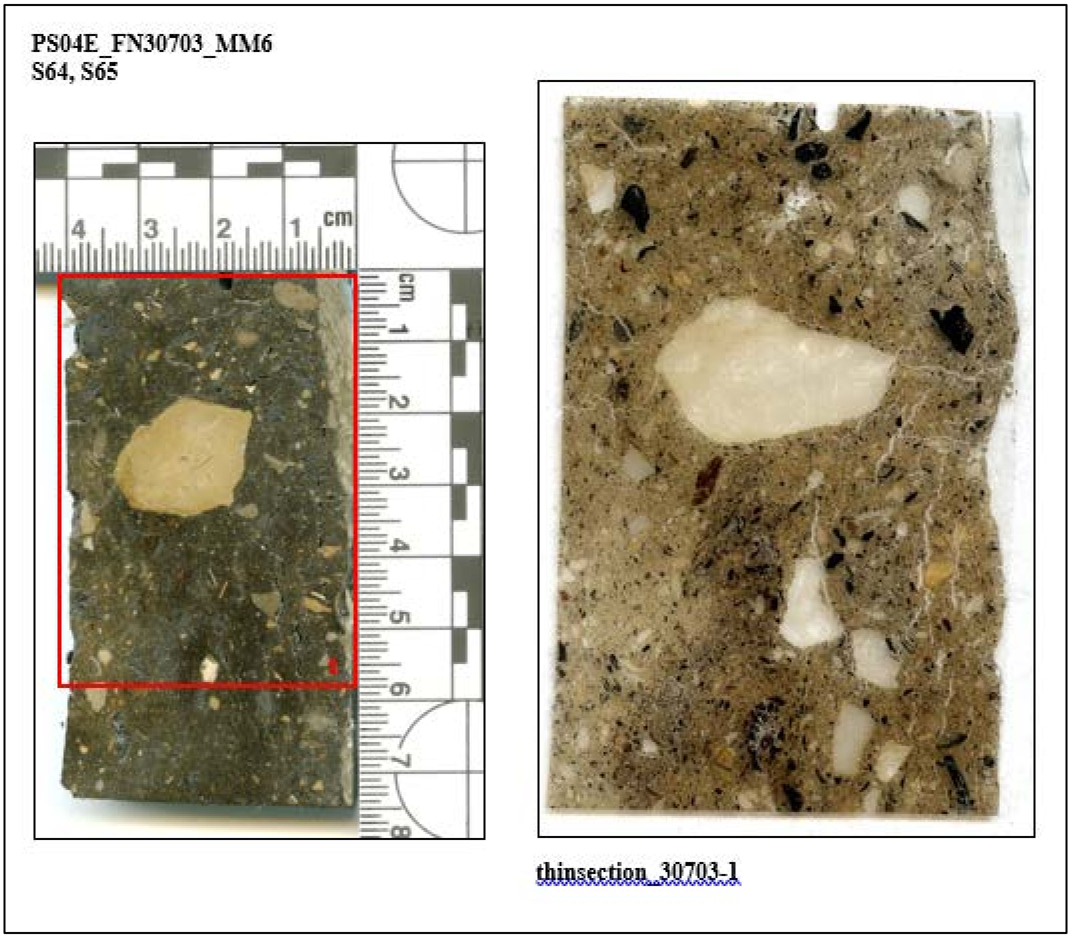


Figure App E.10. PS4E MM6 (FN30703) micromorph and thin section slide 30703-1.

APPENDIX F: CLUSTER ANALYSIS

A cluster analysis was done on the raw geoarchaeological data (MS, LOI, P, calcium carbonate, and particle size analysis) to look for patterns within the various strats. In general, a cluster analysis divides data into groups (clusters) that share common characteristics and are different from the other groups (Tan et al. 2006). The analysis requires that you predetermine the number of clusters, so six clusters was arbitrarily picked for the analysis. This appendix provides the results of the cluster analysis and the ANOVA test.

Table App F.1. Cluster Membership.

Case	6 Clusters	Case	6 Clusters	Case	6 Clusters
1:PS3_C01	1	27:PS3_C46	5	62:PS4_C29	5
2:PS3_C02	1	28:PS3_C47	5	63:PS4_C30	5
3:PS3_C03	2	29:PS3_C48	5	64:PS4_C31	5
4:PS3_C04	2	30:PS3_C49	5	65:PS4_C32	5
5:PS3_C05	1	31:PS3_C50	4	66:PS4_C33	5
6:PS3_C06	3	32:PS3_C51	5	67:PS4_C34	5
7:PS3_C07	4	33:PS3_C52	5	68:PS4_C35	5
8:PS3_C08	5	34:PS4_C01	2	69:PS4_C36	5
9:PS3_C09	5	38:PS4_C05	2	70:PS4_C37	5
10:PS3_C10	1	39:PS4_C06	2	71:PS4_C38	5
11:PS3_C11	5	40:PS4_C07	1	72:PS4_C39	5
13:PS3_C13	5	41:PS4_C08	1	73:PS4_C40	5
14:PS3_C14	5	45:PS4_C12	4	74:U19_C41	6
15:PS3_C15	5	46:PS4_C13	4	75:U19_C42	6
17:PS3_C17	5	48:PS4_C15	1	76:U19_C43	2
18:PS3_C18	5	49:PS4_C16	1	77:U19_C44	2
19:PS3_C19	5	50:PS4_C17	1	78:U19_C45	2
20:PS3_C20	4	52:PS4_C19	1	79:U19_C46	2
21:PS3_C21	1	53:PS4_C20	5	80:U19_C47	2
22:PS3_C22	5	55:PS4_C22	5	81:U19_C48	2
23:PS3_C23	1	56:PS4_C23	5	82:U19_C49	2
24:PS3_C24	4	57:PS4_C24	3	83:U19_C50	2
25:PS3_C44	1	59:PS4_C26	5	84:U19_C51	1
26:PS3_C45	5	61:PS4_C28	5		

Table App F.2. Cluster Analysis Descriptives.

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Mag Susc. Xhf	1	14	128.25	58.15	15.54	94.68	161.83	23.44	238.27
	2	13	152.36	67.78	18.80	111.40	193.32	26.22	215.21
	3	2	264.60	3.43	2.43	233.74	295.45	262.17	267.02
	4	6	160.52	88.99	36.33	67.13	253.91	33.94	255.33
	5	34	199.05	50.94	8.74	181.28	216.83	69.29	301.39
	6	2	217.04	17.88	12.64	56.41	377.67	204.4	229.68
	Total	71	175.64	65.73	7.80	160.08	191.20	23.44	301.39
Mag Susc. Xlf	1	14	132.92	60.42	16.15	98.04	167.81	23.59	249.04
	2	13	157.56	70.83	19.64	114.76	200.36	26.22	225.38
	3	2	274.55	2.81	1.98	249.34	299.75	272.56	276.53
	4	6	166.81	92.53	37.78	69.70	263.92	34.99	265.3
	5	34	207.62	53.60	9.19	188.92	226.32	70.94	314.39
	6	2	226.28	16.91	11.96	74.35	378.21	214.32	238.24
	Total	71	182.69	68.84	8.17	166.39	198.98	23.59	314.39
Mag Susc. Xfd	1	14	3.32	1.51	0.40	2.44	4.19	0.65	7.66
	2	13	2.74	1.43	0.40	1.88	3.60	0	4.51
	3	2	3.63	0.27	0.19	1.23	6.02	3.44	3.81
	4	6	3.66	0.50	0.20	3.14	4.18	3.01	4.28
	5	34	4.04	0.84	0.14	3.74	4.33	2.33	5.72
	6	2	4.11	0.74	0.52	-2.49	10.72	3.59	4.63
	Total	71	3.62	1.18	0.14	3.34	3.90	0	7.66
LOI	1	14	8.89	3.94	1.05	6.61	11.16	1.2	17.38
	2	13	9.32	6.07	1.68	5.65	12.99	1.5	19.32
	3	2	5.10	0.00	0.00	5.07	5.13	5.1	5.1
	4	6	5.23	1.99	0.81	3.14	7.32	1.9	7.11
	5	34	10.78	7.97	1.37	8.00	13.56	1.28	40.24
	6	2	3.07	0.26	0.18	0.78	5.37	2.89	3.26
	Total	71	9.29	6.60	0.78	7.73	10.85	1.2	40.24
Avg. Total P (LOI) Colorimeter (mg/L)	1	14	44.91	17.47	4.67	34.82	54.99	9	76
	2	13	24.81	20.87	5.79	12.19	37.42	2	70
	3	2	44.38	59.94	42.38	-494.15	582.91	2	87
	4	6	33.86	25.63	10.46	6.96	60.76	0	65
	5	31	29.70	31.69	5.69	18.08	41.32	0	103
	6	2	53.32	7.71	5.45	-15.93	122.57	48	59
	Total	68	33.39	27.46	3.33	26.74	40.04	0	103
Calcium Carbonate Equivalent % (calcimeter)	1	11	56.43	4.85	1.46	53.17	59.68	48	65
	2	13	58.17	8.86	2.46	52.82	63.53	49	76
	3	2	54.15	1.57	1.11	40.01	68.29	53	55
	4	6	61.86	8.49	3.47	52.94	70.77	51	72
	5	29	56.26	4.40	0.82	54.59	57.94	49	66
	6	2	52.28	1.50	1.06	38.83	65.73	51	53
	Total	63	57.02	6.12	0.77	55.48	58.57	48	76
Particle Size Sand %	1	14	61.16	14.53	3.88	52.77	69.55	39	83
	2	13	34.99	16.83	4.67	24.82	45.16	0	57
	3	2	62.40	10.18	7.20	-29.08	153.88	55	70
	4	5	59.92	10.35	4.63	47.06	72.78	43	68
	5	32	55.07	16.42	2.90	49.15	60.99	0	81
	6	2	44.75	5.45	3.85	-4.17	93.67	41	49
	Total	68	52.75	17.66	2.14	48.48	57.03	0	83
Particle Size Silt %	1	14	36.06	13.18	3.52	28.45	43.67	15	52
	2	13	59.48	14.63	4.06	50.63	68.32	39	91
	3	2	35.69	9.50	6.72	-49.70	121.08	29	42
	4	5	36.82	9.07	4.05	25.57	48.08	29	52
	5	32	41.94	15.25	2.70	36.44	47.44	18	97
	6	2	52.68	5.17	3.66	6.23	99.12	49	56
	Total	68	43.84	16.01	1.94	39.96	47.71	15	97
Particle Size Clay %	1	14	2.78	2.11	0.56	1.56	4.00	1	9
	2	13	5.53	2.71	0.75	3.90	7.17	2	11
	3	2	1.91	0.68	0.48	-4.19	8.01	1	2
	4	5	3.26	1.61	0.72	1.26	5.25	1	6
	5	32	2.99	1.95	0.34	2.29	3.69	1	7
	6	2	2.58	0.28	0.20	0.10	5.05	2	3
	Total	68	3.41	2.28	0.28	2.86	3.96	1	11

Table App F.3. Cluster Analysis ANOVA Test.

		Sum of Squares	df	Mean Square	F	Sig.
Mag Susc. Xhf	Between Groups	77744.78	5	15548.956	4.499	0.001
	Within Groups	224670.151	65	3456.464		
	Total	302414.932	70			
Mag Susc. Xlf	Between Groups	86206.194	5	17241.239	4.564	0.001
	Within Groups	245561.619	65	3777.871		
	Total	331767.813	70			
Mag Susc. Xfd	Between Groups	17.844	5	3.569	2.918	0.019
	Within Groups	79.495	65	1.223		
	Total	97.339	70			
LOI	Between Groups	288.711	5	57.742	1.361	0.251
	Within Groups	2757.871	65	42.429		
	Total	3046.581	70			
Avg. Total P (LOI) Colorimeter (mg/L)	Between Groups	4274.08	5	854.816	1.146	0.346
	Within Groups	46255.146	62	746.051		
	Total	50529.226	67			
Calcium Carbonate Equivalent % (calcimeter)	Between Groups	239.43	5	47.886	1.309	0.273
	Within Groups	2084.843	57	36.576		
	Total	2324.273	62			
Particle Size Sand %	Between Groups	5832.087	5	1166.417	4.801	0.001
	Within Groups	15062.647	62	242.946		
	Total	20894.733	67			
Particle Size Silt %	Between Groups	4676.488	5	935.298	4.644	0.001
	Within Groups	12487.181	62	201.406		
	Total	17163.669	67			
Particle Size Clay %	Between Groups	75.605	5	15.121	3.422	0.009
	Within Groups	273.992	62	4.419		
	Total	349.597	67			

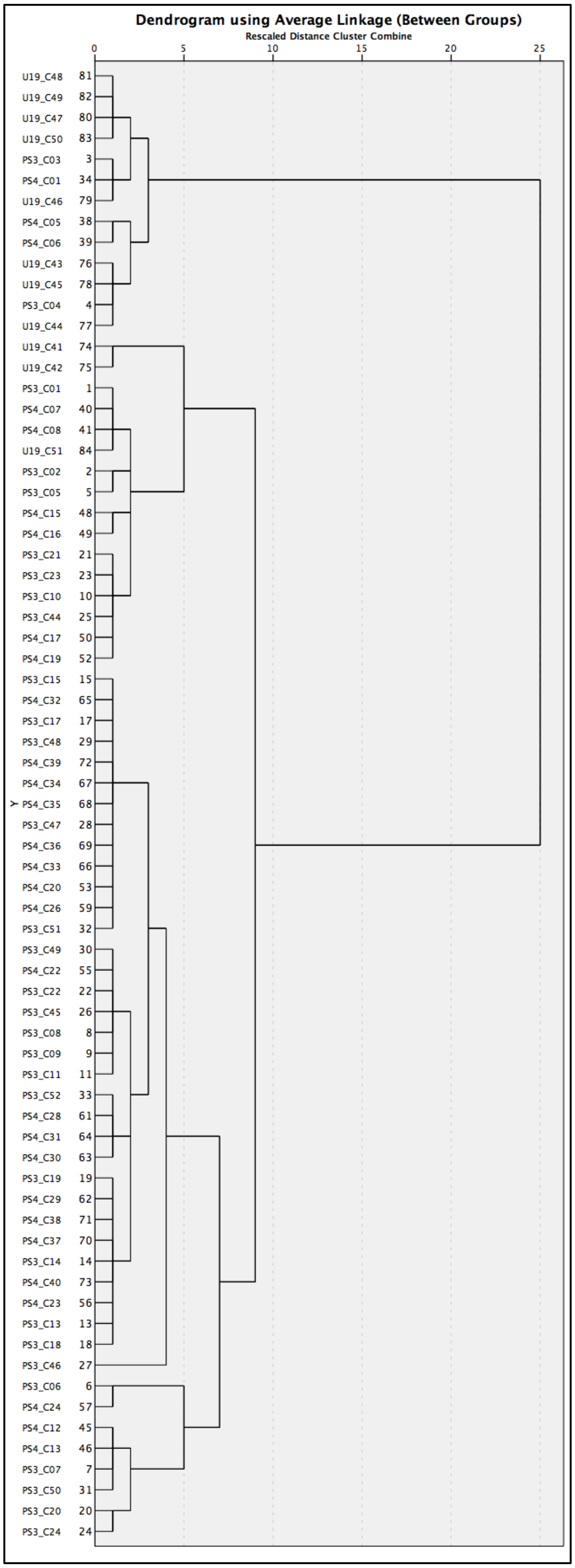


Figure App F.1. Cluster Analysis Dendrogram.

REFERENCES CITED

Adams, Karen R.

2004 Archaeobotanical Analysis: Principles and Methods. Electronic document, http://www.crowcanyon.org/plantmethods, accessed November 30, 2015.

Alexander, Robert K.

1974 *The Archaeology of Conejo Shelter: A Study of Cultural Stability at an Archaic Rockshelter Site in Southwestern Texas*. Unpublished Ph.D. dissertation, Department of Anthropology, The University of Texas at Austin.

American Society for Testing Materials (ASTM)

2014 *Standard Test Method for Rapid Determination of Carbonate Content of Soils*. ASTM International, West Conshohocken, PA.

Barnes, Virgil E.

1977 *Geologic Atlas of Texas, Del Rio Sheet*. Bureau of Economic Geology, The University of Texas at Austin.

Becker Coulter

2009 Polarization Intensity Differential Scattering. In *LS 13 320 Particle Size Analyzer Brochure*, pp. 11.

Bement, Leland C.

1989 Lower Pecos Canyonlands. In *From the Gulf to the Rio Grande: Human Adaptation in Central, South, and Lower Pecos Texas*, edited by T. R. Hester, pp. 63-76. Research Series 33, Arkansas Archaeological Survey, Fayetteville.

Bement, Leland C. and Solveig A. Turpin

1988 A Folsom Point from Hinds Cave, 41VV456, Val Verde County, Texas. *La Tierra* 15(1):5–7.

Binford, L. R.

1983 *In Pursuit of the Past: Decoding the Archaeological Record.* Thames and Hudson, London.

Black, Stephen L.

2013 The Archaeologists. In *Painters in Prehistory: Archaeology and Art of the Lower Pecos Canyonlands*, edited by Harry J. Shafer, pp. 139–152.Trinity University Press, San Antonio.

Black, Stephen. L., Linda W. Ellis, Darrell G. Creel, and Glenn T. Goode
1997 *Hot Rock Cooking on the Greater Edwards Plateau: Four Burned Rock Midden Sites in West Central Texas*. Studies in Archeology 22. Texas Archeological Research Laboratory, The University of Texas at Austin. Archeology Studies Program, Report 2. Environmental Affairs Department, Texas Department of Transportation, Austin.

Black, Stephen L., Emily R. McCuistion, Matthew E. Larsen, and Chase W. Beck
2015 Paleofeces at Eagle Cave: A Preliminary Report of Ongoing Research. Electronic document, https://aswtproject.wordpress.com/category/coprolites/, accessed February 18, 2017.

Black, Stephen L., and Alston V. Thoms
2014 Hunter-Gather Earth Ovens in the Archaeological record: Fundamental Concepts. *American Antiquity* 79 (2):203–226.

Blair, W. F.
1950 Biotic Provinces of Texas. *Texas Journal of Science* 2 (1):93–117.

Boyd, Carolyn E.
1996 Shamanic Journeys in the Otherworld of the Archaic Chichimec. *Latin American Antiquity* 7(2):152–164.

Brady, Nyle C. and Ray R. Weil
2008 *The Nature and Properties of Soils*. Revised 14th Edition. Prentice Hall Publishing, New Jersey.

Brown, Kenneth M.
1991 Prehistoric Economics of Bakers Cave: A Plan for Research. In *Papers on Lower Pecos Prehistory*, edited by Solveig A. Turpin, pp. 87–140. Studies in Archeology 8. Texas Archeological Research Laboratory, University of Texas at Austin.

Bryant, Vaughn M., Jr.
1966 Pollen Analysis: Its Environmental and Cultural Implications for the Amistad Reservoir Area. Master's thesis, Department of Anthropology, University of Texas at Austin.

1969 *Late Fullglacial and Postglacial Pollen Analysis of Texas Sediments*. Ph.D. Dissertation, The University of Texa sat Austin.

Bryant, Vaughn M., Jr. and Richard G. Holloway
1985 A Late-Quaternary Paleoenvironmental Record of Texas: An Overview of the Pollen Evidence. In *Pollen Records of Late Quaternary North American Sediments*, edited by V.M. Bryant, Jr. and R.G. Holloway, pp. 39-70. American Association of Stratigraphic Palynologists.

Busman, Lowell, John Lamb, Gyles Randall, George Rehm, and Michael Schmitt
2016 The Nature of Phosphorus in Soils, Phosphorus in the Agricultural Environment. Electronic document, http://www.extension.umn.edu/distribution/cropsystems/dc6795.html, accessed Dec 16, 2016.

Butzer, Karl W.
1982 *Archaeology as Human Ecology: Method and Theory for a Contextual Approach.* Cambridge University Press, New York.

Chadderon, Mary Francis
1983 *Baker Cave, Val Verde County, Texas. The 1976 Excavations.* Center for Archaeological Research, The University of Texas at San Antonio. Special Report No. 13.

Collins, Michael B.
1991 Rockshelters and the Early Archaeological record in the Americas. In *The First Americans: Search and Research*, edited by Tom D. Dillehay and David J. Meltzer, pp. 157–182. CRC Press, Boca Raton, Florida.

Dalan, R. A.
2006 Magnetic Susceptibility. In *Remote Sensing in Archaeology: An Explicitly North American Perspective*. J. Johnson, M. Giardano, and K. Kvamme (editors), pp. 161–203. University of Alabama Press, Tuscaloosa, Alabama.

2008 A Review of the Role of Magnetic Susceptibility in Archaeologeophysical Studies in the USA: Recent Developments and Prospects. *Archaeological Prospection* 15: 1–31.

Davenport, J. Walker
1938 *Archaeological Exploration of Eagle Cave, Langtry, Texas*. Big Bend Basket Maker Papers No. 4. Witte Memorial Museum, San Antonio.

Davis, W. B. and D.J. Schmidly
1994 *The Mammals of Texas*. Texas Parks and Wildlife Press. Austin, Texas.

Dearing, J.
1999a Magnetic Susceptibility. In *Environmental Magnetism: A Practical Guide*. J.

1999b Environmental Magnetic Susceptibility Using the Bartington MS2 System. Electronic document, http://www.gmw.com/magnetic_properties/MS2_support.html, accessed December 12, 2014.

Dering, J. Phil
1999 Earth Oven Plant Processing in Archaic Period Economies: An Example from a Semi–Arid Savannah in South–Central North America. *American Antiquity* 64(4):659–674.

2002 *Amistad National Recreation Area: Archeological Survey and Cultural Resources Inventory*. Professional Paper No. 68. Intermountain Cultural Resources Management Anthropology Projects, National Park Service, Santa Fe.

2005 Ecological Factors Affecting the Late Archaic Economy of the Lower Pecos River Region. In *The Late Archaic Across the Borderlands, From Foraging to Farming*, edited by Bradley J. Vierra, pp. 247–258. University of Texas Press, Austin.

Dibble, David S. and Dessamae Lorrain
1968 *Bonfire Shelter: A Stratified Bison Kill Site, Val Verde County, Texas.* Part I: The Archaeology (Dibble), Part II: Analysis of the Bison Bones (Lorrain) Miscellaneous Papers 1. Texas Memorial Museum Publications, University of Texas at Austin.

Eidt, Robert C.
1973 A Rapid Chemical Field Test for Archaeological Site Surveying. *American Antiquity* 38: 206–210.

1984 *Advances in Abandoned Settlement Analysis: Application to Prehistoric Anthrosols in Columbia, South America*. University of Wisconsin–Milwaukee, Center for Latin America: Milwaukee, Wisconsin.

1985 Theoretical and Practical Considerations in the Analysis of Anthrosols. In *Archaeological Geology*, by George Rapp, Jr. and John A. Gifford (editors) pp.155–190. Yale University Press, New Haven and London.

Farrand, William R.
2001a Archaeological Sediments in Rockshelters and Caves. In *Sediments in Archaeological Contexts*, edited by Julie K. Stein and William R. Farrand, pp.29–66. The University of Utah Press, Salt Lake City.

2001b Sediments and Stratigraphy in Rockshelters and Caves: A Personal Perspective on Principles and Pragmatics. *Geoarchaeology: An International Journal* 16(5):537–557.

Frederick, C. D.
2010 Geoarchaeological Investigations. In *Archaeological Data Recovery on Three Sites Along the San Antonio River, Bexar County, Texas*, by Antonio E. Padilla and David L. Nickels, pp. 449–462. Ecological Communications, Corporation, Austin, Texas.

2012 Site Formation Processes and Implications for Archeology in the South Fork of the San Gabriel. In *The Siren Site (41WM1126) and the Long Transition from Archaic to Late Prehistoric Lifeways on the Eastern Edwards Plateau, Williamson County, Texas*, by Steve Carpenter, Kevin A. Miller, Brett Houk, Mary Jo Galindo, Charles Frederick, John Lowe, Ken Lawrence, Kevin Hanselka, and Abby Peyton, pp. 8–1–8–24. SWCA, Austin, Texas.

2017 Site Formation and Geoarchaeology. In Eagle Cave section of the *Texas Archeological Society Lower Pecos Canyonlands Academy Guidebook*.

Gale, S. J. and P. G. Hoare
1991 *Quaternary Sediments: Petrographic Methods for the Study of Unlithified Rocks*. Bellhaven Press and Halsted, Press, New York and Toronto.

Garrison, Ervan G.
2003 *Techniques in Archaeological Geology*. Springer, Berlin, Heidelberg, New York, Hong Kong, London, Milan, Paris, Tokyo.

Graham, John Allen and William A. Davis
1958 *Appraisal of the Archeological Resources of Diablo Reservoir, Val Verde County, Texas*. Report prepared by the Archeological Salvage Field Office, Austin, Texas. National Park Service.

Greer, John and Mavis and Greer
2009 Rock Art and Other Archaeological Cave Use on the North American Plains From Canada to Northern Mexico. *Proceedings from the 15th International Congress of Speleology*, 1:90-96. Kerrville, Texas.

Griffith, G. E., S. A. Bryce, J. M. Omernik, J. A. Comstock, A. C. Rogers, B. Harrison, S. L. Hatch, and D. Bezanson
2004 Ecoregions of Texas (color poster with map, descriptive text, and photographs), Reston Virginia, U.S. Geological Survey (map scale 1:2,500,000).

Goldberg, Paul and Richard I. Macphail
2006 *Practical and Theoretical Geoarchaeology*. Blackwell Publishing, Malden, Massachusetts.

Goldberg, Paul, and Rolfe D. Mandel
2008 Caves and Rockshelters. In *Encyclopedia of Archaeology*, edited by Deborah M. Pearsall, pp. 966–974. Academic Press, New York.

Hall, Grant D. and Stephen L. Black
2010 Chronological Bibliography of Lower Pecos Archaeology. *Bulletin of the Texas Archeological Society* 81:205–226.

Harris, Edward C., Marley R. Brown III, and Gregory J. Brown (editors)
1993 *Practices of Archaeological Stratigraphy*. Academic Press Inc., San Diego, California.

Hester, Thomas R.
1983 Late Paleo-Indian Occupations at Baker Cave, Southwestern Texas. *Bulletin of the Texas Archeological Society* 53:101-120.

2013 Baker Cave: A 9,000–Year–Old Hunter–Gatherer Campsite. In *Painters in Prehistory: Archaeology and Art of the Lower Pecos Canyonlands*, edited by Harry J. Shafer, pp. 42–46.Trinity University Press, San Antonio.

Holliday, Vance T. and William G. Gartner
2007 Methods of Soil P analysis in archaeology. *Journal of Archaeological Science* 34:301–333.

Kelley, J. Charles
1932 1932 Area Investigations–Field Notes. Langtry, Val Verde County, Southwest Texas. On file, J. Charles Kelley and Ellen A. Kelley Memorial Library, Center for Big Bend Studies, Sul Ross State University, Alpine, Texas.

Kirkland, Forrest
1937 A Study of Indian Pictures in Texas. *Bulletin of the Texas Archeological and Paleontological Society* 9:89-119.

Kirkland, Forrest and W.W. Newcomb, Jr.
1967 *The Rock Art of Texas Indians*. University of Texas Press, Austin.

Klein, Richard G., and L. Kathryn Cruz–Uribe
1984 *The Analysis of Animal Bones from Archeological Sites*. University of Chicago Press.

Koenig, Charles W.
2012 *Burned Rock Middens, Settlement Patterns, and Bias in the Lower Pecos Canyonlands.* Unpublished Master's Thesis, Department of Anthropology, Texas State University, San Marcos, Texas.

Koenig, Charles W., Mark D. Willis, and Stephen L. Black
2017 Beyond the Square Hole: Application of Structure from Motion Photogrammetry to Archaeological Excavation. *Advances in Archaeological Practice* 5(1):54–70.

Kuo, S.
1996 Phosphorus. In *Methods of Soil Analysis*, Part 3, Chemical Methods, pp. 869–919. Soil Science Society of America Book Series No. 5, Madison, WI.

López Varela, Sandra L. and Christopher Dore
2010 Social Spaces of Daily Life: A Reflexive Approach to the Analysis of Chemical Residues by Multivariate Spatial Analysis. *Journal of Archaeological Method and Theory* 17:249–278.

Lyman, R. L.
1994 *Vertebrate Taphonomy*. Cambridge University Press, Cambridge.

Macphail, Richard, Gill Cruise, Roger Engelmark, and Jöhan Linderholm
2000 Integrating Soil Micromorphology and Rapid Chemical Survey Methods: New Developments in Reconstructing Past Rural Settlement and Landscape Organisation. In *Interpreting Stratigraphy: Site Evaluation, Recording Procedures, and Stratigraphic Analysis*. Papers Presented to the Interpreting Stratigraphy Conferences 1993–1997. Steve Roskams (editor), pp. 71–80. British Archaeological Reports (BAR) Series 910, Archaeopress Publisher, Oxford, England.

Madrigal, Lorena
1998 *Statistics for Anthropology*. Cambridge University Press. Cambridge, United Kingdom.

Martin, George C.
1933 *Archaeological Exploration of the Shumla Caves*. Big Bend Basket Maker Papers No. 3, Bulletin 3. Southwest Texas Archeological Society, Witte Memorial Museum, San Antonio.

Maslowski, Robert F.
1978 The Archeology of Moorehead Cave, Val Verde County, Texas. Ph.D. dissertation, Department of Anthropology, University of Pittsburgh.

McBrearty, Sally, Laura Bishop, Thomas Plummer, Robert Dewar, and Nicolas Conard
1998 Tools Underfoot; Human Trampling as an Agent of Lithic Artifact Edge Modification. *American Antiquity* 63(1):108–129.

McGregor, Roberta
1985 Episodes in the History of Texas Archeology: Excavations at Shumla and Eagle Caves, Witte Memorial Museum. *Bulletin of the Texas Archeological Society* 56:127-142.

1992 *Prehistoric Basketry of the Lower Pecos, Texas.* Monographs in World Archaeology 6. Prehistory Press, Madison, Wisconsin.

Mear, Charles E.
1949 Unpublished Field Notes at Texas Archeological Research Laboratory, the University of Texas at Austin, Texas.

Mentzer, Susan M.
2012 Microarchaeological Approaches to the Identification and Interpretation of Combustion Features in Prehistoric Archaeological Sites. *Journal of Archaeological Method and Theory* 21(3):616–668.

Natural Resources Conservation Service (NRCS)
2016 Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. *Web Soil Survey of Val Verde County*. Electronic document, http://websoilsurvey.nrcs.usda.gov/, accessed September 2, 2016.

Nicholson, A., and S. Crane
1991 Desert Camps: Analysis of Australian Aboriginal Proto-historic Campsites. In *Ethnoarchaeological Approaches to Mobile Campsites*, edited by C. S. Gamble and W. A. Boismier, pp. 263-354. International Monographs in Prehistory, Ann Arbor, Michigan.

Nielsen, Axel E.
1991 Trampling the Archaeological Record: An Experimental Study. *American Antiquity* 56(3):483–503.

O'Connell, James F.
1987 Alyawara Site Structure and Its Archaeological Implications. *American Antiquity* 52(1):74–108.

Olsen, Stanley John
1973 *Mammal Remains from Archaeological Sites.* Papers of the Peabody Museum of Archaeology and Ethnology Volume 56, Issue 1. Harvard University.

Parnell, J. Jacob, Robert E. Terry, and Zachary Nelson
2002a Soil Chemical Analysis applied as an interpretative tool for ancient human activities in Piedras Negras, Guatemala. *Journal of Archaeological Science* 29:379–404.

Parnell, J. Jacob, Richard E. Terry, and Payson Sheets

2002b Soil Chemical Analysis of Ancient Activities in Cerén, El Salvador: A Case Study of a Rapidly Abandoned Site. *Latin American Antiquity* 13 (3):331–342.

Parsons, Mark

1963 September 30, 1963 Field Notes from Eagle Cave Excavations. On file at the Texas Archeological Research Laboratory. University of Texas at Austin.

Patton, Peter C. and David S. Dibble

1982 Archeologic and Geomorphic Evidence for the Paleohydrologic Record of the Pecos River in West Texas. *American Journal of Science* 282:97–121.

Quine, Timothy A.

1995 *Soil Analysis and Archaeological Site Formation Studies*. In Archaeological Sediments and Soils: Analysis, Interpretation, and Management. Papers from The Tenth Anniversary Conference of the Association for Environmental Archaeology. Anthony J. Barham and Richard I. Macphail (editors), pp. 77–98. Institute of Archaeology, University College, London.

Reitz and Wing

2008 *Zooarchaeology*. Cambridge Manuals in Archaeology, second edition.

Robinson, David G.

1997 Stratigraphic analysis of Bonfire Shelter, Southwest Texas; Pilot Studies of Depositional Processes and Paleoclimate. *Plains Anthropologist* 42(159):33–43.

Rodriguez, Daniel P.

2015 *Patterns in the Use of the Rockshelters of Eagle Nest Canyon, Langtry, Texas.* Unpublished Master's Thesis, Department of Anthropology, Texas State University, San Marcos, Texas.

Roos, Christopher I. and Kevin C. Nolan

2012 Phosphates, plowzones, and plazas: a minimally invasive approach to settlement structure of plowed village sites. *Journal of Archaeological Science* 39:23–32.

Ross, Richard E.

1965 *The Archeology of Eagle Cave.* Papers of the Texas Archeological Salvage Project No 7. University of Texas at Austin.

Saunders, Joe W.

1986 *The Economy of Hinds Cave.* Unpublished Ph.D. dissertation Anthropology Department., Southern Methodist University. Dallas, Texas.

1992 Plant and Animal Procurement Sites in the Lower Pecos Region, Texas. *Journal of Field Archaeology* 19(3):335–349.

Sayles, E.B.
1935 *An Archaeological Survey of Texas*. Gila Pueblo. Globe, Arizona.

Schiffer, Michael B.
1972 Archaeological Context and Systematic Context. *American Antiquity* 37(2):156—165.

1987 *Formation Processes of the Archaeological Record*. University of Utah Press.

Schlezinger, David R. and Brian L. Howes
2000 Organic Phosphorus and Elemental Ratios as Indicators of Prehistoric Human Occupation. *Journal of Archaeological Science* 27:479–492.

Schulte, E. E. and B. G. Hopkins
1996 Estimation of Soil Organic Matter by Weight Loss–On–Ignition. In *Soil Organic Matter: Analysis and Interpretation*. F.R. Magdoff, M.A. Tabatabai, and E.A. Hanlon (editors), pp. 21–31. Soil Science Society of America, Special Publication No. 46. Madison, Wisconsin.

Schumacher, Brian A.
2002 *Methods for the Determination of Total Organic Carbon (TOC) in Soils and Sediments*. U.S. Environmental Protection Agency, Ecological Risk Assessment Support Center, Las Vegas, NV.

Scott-Cummings, L.
1992 *Stratigraphic Pollen Analysis at Bonfire Shelter, 41VV218, Southwest Texas*. Unpublished manuscript. Texas Archeological Research Laboratory, The University of Texas at Austin.

Shafer, Harry J.
1986 *Ancient Texans: Rock Art and Lifeways along the Lower Pecos*. Texas Monthly Press, Austin.

2013a The Lower Pecos Environment. In *Painters in Prehistory: Archaeology and Art of the Lower Pecos Canyonlands*, edited by Harry J. Shafer, pp. 5–26. Trinity University Press, San Antonio

2013b Culture and Lifeways of Native Peoples in the Lower Pecos. In *Painters in Prehistory: Archaeology and Art of the Lower Pecos Canyonlands*, edited by Harry J. Shafer, pp. 93–138. Trinity University Press, San Antonio.

Shafer, Harry J., Steve Black, and Vaughn Bryant
2005 "Hinds Cave". Electronic Document, http://www.texasbeyondhistory.net/hinds.html, accessed November 2, 2014.

Sims, J. Thomas
2009 Soil Test Phosphorus: Principles and Methods. In *Methods of Phosphorus Analysis for Soils, Sediments, Residuals, and Waters*. J. L. Kovar and G. M. Pierzynski (editors), pp. 9–19. Southern Cooperative Series, Bulletin No. 408. Southern Extension/Research Activity–Information Group (SERA–IEG) 17. Virginia Tech University, Blacksburg, VA.

Sims, J. Thomas and Gary M. Pierzynski
2005 Chemistry of Phosphorus in Soils. In *Chemical Processes in Soils*. edited by M.A. Tabatabai and D.L. Sparks: 151–192. Soil Science Society of America Book Series 8: Madison, Wisconsin.

Sjöberg, Alf
1976 Phosphate Analysis of Anthropic Soils. *Journal of Field Archaeology* 3:447–454.

Skinner, Shaune M.
1986 Phosphorus as an Anthrosol Indicator. *Midcontinental Journal of Archaeology* 11(1):51–78.

Sobolik, Kristin D.
1991 Prehistoric Diet From the Lower Pecos Region of Texas. *Plains Anthropologist* 36(135):139–152.

Stein, Julie K.
2001 Archaeological Sediments in Cultural Environments. In *Sediments in Archaeological Contexts*, edited by Julie K. Stein and William R. Farrand, pp.1–28. The University of Utah Press, Salt Lake City.

Stevenson, Marc G.
1991 Beyond the Formation of Hearth–Associated Artifact Assemblages. In *The Interpretation of Archaeological Spatial Patterning*, edited by Ellen M. Kroll and T. Douglas Price, pp. 269–299. Plenum Press, New York and London.

Storer, D. A.
2005 *The Chemistry of Soil Analysis*. Terrific Science Press, Middleton, OH.

Story, Dee Ann and Vaughn M. Bryant, Jr.
1966 *A Preliminary Study of the Paleoecology of the Amistad Reservoir Area.* Report to the National Science Foundation by University of Texas at Austin.

Tan, Pang-Ning, Michael Steinbach, and Vipin Kumar
2006 Cluster Analysis: Basic Concepts and Algorithms. In *Introduction to Data Mining,* pp. 487–568. Pearson Publishing.

Tani, Masakazu
1995 Beyond the Identification of Formation Process: Behavioral Inference Based on Traces Left by Cultural Formation Processes. *Journal of Archaeological Methods and Theory* 2(3):231–252.

Taylor, Herbert C., Jr.
1949 A Tentative Cultural Sequence for the Area About the Mouth of the Pecos. *Bulletin of the Texas Archeological and Paleontological Society* 20:73-88.

Thoms, Alston V.
2008 The Fire Stones Carry: Ethnographic Records and Archaeological Expectations for Hot-Rock Cookery in Western North America. *Journal of Anthropological Archaeology* 27(2008):443–460.

2009 Rock of Ages: Propagation of Hot-Rock Cookery in Western North America. *Journal of Archaeological Science* 36(2009):573–591.

Terry, Richard E. Perry J. Hardin, Stephen D. Houston, Sheldon D. Nelson, Mark W. Jackson, Jared Carr, and Jacob Parnell
2000 Quantitative Phosphorus Measurement: A Field Test Procedure for Archaeological Site Analysis at Piedras Negras, Guatemala. *Geoarchaeology* 15(2):151–166.

Turner, E. S., and T. R. Hester
1999 *Field Guide to Stone Artifacts of Texas Indians*. Second edition: Gulf Publishing. Houston, Texas.

Turpin, Solveig A.
1991 Time Out of Mind: The Radiocarbon Chronology of the Lower Pecos Region. In *Papers on Lower Pecos Prehistory*, edited by Solveig A. Turpin, pp. 1–49. Studies in Archeology 8. Texas Archeological Research Laboratory, University of Texas at Austin.

1995 The Lower Pecos River Region of Texas and Northern Mexico. *Bulletin of the Texas Archeological Society* 66:541-560.

1994 Lower Pecos Prehistory: The View From the Caves. In *The Caves and Karst of Texas*, edited by W.R. Elliot and G. Veni, pp. 69-84. National Speleological Society, Huntsville, Alabama.

2004 The Lower Pecos River Region of Texas and Northern Mexico. In *The Prehistory of Texas*, edited by Timothy K. Perttula, pp. 266–280. Texas A&M University Press, College Station.

Turpin, Solveig A., Maciej Henneberg, and David S. Riskind
1986 Late Archaic Mortuary Practices in the Lower Pecos River Region, Texas. *Plains Anthropologist* 31(114):295–315.

Villa, Paola
1982 Conjoinable Pieces and Site Formation Processes. *American Antiquity* 47(2):276–290.

Wandsnider, LuAnn
1997 The Roasted and the Boiled: Food Composition and Heat Treatment with Special Emphasis on Pit-Hearth Cooking. *Journal of Anthropological Archaeology* 16(1997):1–48.

Wilson, Clare A., Donald A. Davidson, and Malcolm S. Cresser
2008 Multi-element Soil Analysis: An Assessment of its Potential as an Aid to Archaeological Interpretation. *Journal of Archaeological Science* 35:412–424.

2009 An Evaluation of the Site Specificity of Soil Elemental Signatures for Identifying and Interpreting Former Functional Areas. *Journal of Archaeological Science* 36:2327–2334.

Willis, Mark D., Charles W. Koenig, Stephen L. Black, and Amanda Casteñada
2016 Archeological 3D Mapping: The Structure from Motion Revolution. *Journal of Texas Archeology and History* 3:1–36.

Word, James H. and Charles L. Douglas
1970 *Excavations at Baker Cave, Val Verde County, Texas*. Bulletin No. 16: Texas Memorial Museum. The University of Texas at Austin.