INTERPRETING FUNCTION AT

ANTELOPE CREEK SITE

41PT283

by

Michael L. Mudd, B.A.

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Committee Members:

C. Britt Bousman, Chair

Stephen L. Black

Michael B. Collins

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DEDICATION

To my daughters, Madilyn and Maya.

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ABSTRACT

The following thesis focuses on site 41PT283, which consists of an Antelope Creek phase (A.D. 1200-1500) occupation located on the Canadian River valley in the Texas Panhandle. The primary objective of my study is an interpretation of the site's function and an improved understanding of settlement pattern variability during the Antelope Creek phase. Much of the archaeological investigation at Antelope Creek phase settlements have fixated on architectural variation; however, a limited number of studies have been devoted to analyzing what the material culture reflects in terms of the variation in human behavior (e.g., site activities, social organization, and trade relationships).

While an analysis of the study site's material culture is the crux of my study, I also seek to characterize its function through comparisons of the archaeological data with those from other Antelope Creek sites with divergent architectural and settlement patterns. I propose new analytical perspectives that consider dispersed single-family residences or "isolated homesteads" and temporary encampments as interdependent elements of an intricate socioeconomic system.

I. INTRODUCTION

Previous investigations at site 41PT283 or the study site have led to its affiliation with the Antelope Creek cultural tradition. This archaeological culture refers to a group of Plains Village period occupations on the Texas and Oklahoma Panhandles in the physiographic region known as the Southern High Plains. From approximately A.D. 1200-1500, numerous settlements of the Antelope Creek culture were present along the Canadian and North Canadian Rivers and their primary tributaries. Antelope Creek sites are typically located atop terraces near main waterways. Using different combinations of vertically placed flagstones, mortar and wooden picket-posts, Antelope Creek peoples built semi-subterranean habitations of various magnitudes. These include stone-adobe and picket-post structures consisting of contiguous multi-room blocks, isolated one to two room houses, and smaller seasonally-occupied single room structures or "field huts." Large contiguous room villages are most common during the early sub-phase (A.D. 1200-1350) and are concentrated around the Alibates Flint National Monument near Fritch, TX. Isolated homesteads dominate the late sub-phase (A.D. 1350-1500) and are generally found radiating southwestward from the quarry area along the Canadian River valley. The degree of permanence reflected in these structures suggests that Antelope Creek groups were for the most part sedentary. Ephemeral encampments occur throughout the phase and are found primarily in lowland settings on the South Canadian and North Canadian River valleys.

The reason behind the transition from contiguous units to isolated structures is unknown but may be attributed to environmental change. Previous studies of the area (Lintz 1986a; Brooks 2004) suggest a shift in population density, architectural style, and subsistence patterns around A.D. 1350. Large early sub-phase villages have been linked with a heavy reliance on bison as a food source. It is commonly believed that marginal horticulture and the hunting of smaller mammals and harvesting of aquatic species supplemented this dietary staple. Some archaeologists have attributed the dispersion of Antelope Creek groups during the late sub-phase to increasingly dry climate conditions, which are thought to have increased the mobility and range of bison (Lintz 1986a:242-243; Duffield 1970:241). According to Lintz (1986a:243), the warmer climate of the late sub-phase may have limited the expansion of agricultural dependency.

The reliance on bison hunting by Antelope Creek people is manifested in the artifact assemblage. Stone tools were constructed primarily from the colorful Alibates silicified dolomite or chert derived from natural outcrops located approximately 22.7 km (14.1 miles) northeast of the study site. Common projectile point types include side and basally notched arrow points. Other chert items include end and side scrapers, beveled knives, awls, and bifacial preforms. Bison scapula tools are also found and have been associated with horticulture activities. However, such tools may have been used in other ways (Huhnke 2000). Plant-processing tools such as manos and metates are also common at Antelope Creek sites. In general, the Antelope Creek tool kit reflects an economy focused on the hunting of bison, and supported by varying degrees of horticulture, wild plant foraging, smaller game mammals, and aquatic species.

Borger Cordmarked ceramics also comprise the diagnostic artifacts of the Antelope Creek phase. Borger ceramic vessels are globular in shape and contain a pronounced neck with a small opening. Sherds typically range from 5 to 6 mm in thickness with rim and necks having the same thickness as the vessel’s body (Suhm and

Jelks 1962:15). The cordmarked surface treatment was applied using paddles with fiber twisted into cords that were impressed into the unfired vessel surface (Lintz 2010). While these cord impressions are characteristic of the Antelope Creek phase, ceramics with smoothed over impressions also occur (Lintz personal communication, 2015).

The historic development of Antelope Creek began as an outgrowth of Alex Krieger's (1946) investigation of the Late Prehistoric relationships between the Puebloan and Caddoan areas. Much of Krieger's knowledge was based on information derived from the previous surveys conducted by Mason (1929), Moorehead (1931), Sayles (1935) and Studer (1931), test excavations directed by Holden (1932), Lowery (1932) and Studer (1934), and brief summaries of the Work Progress Administration (WPA) sponsored excavations at Antelope Creek Ruin 22 and Alibates Ruin 28 (Baker and Baker 1941; Hobbs 1941; Johnston 1939).

The early 20th century excavations typically focused on a single aspect such as architectural form, and lacked comprehensiveness in regards to function (Quigg 2013). This resulted in the categorical lumping of settlements into generalized spatial and temporal groups. For example, the investigations at Alibates Ruin 28 invoked Studer's conviction that the Antelope Creek people accepted an entire southwestern architectural assemblage (Lintz 1986b:116). Prior to Krieger's (1946) efforts to systematize the cultural-taxonomic nomenclature, less pragmatic terms such as "Canadian Valley" and "Panhandle" culture were used to define the Antelope Creek phase (Brooks 2004:333). Others relied on geographical or architectural identifiers such as "Canadian," "Panhandle-Canadian" and "Slab House" culture. The first attempt to link taxonomy to the observed cultural traits was made by Floyd Studer who referred to Antelope Creek sites as “Post-Basketmaker” or “Pueblo” culture, which still surmised a relationship with the Southwest. In his establishment of the “Panhandle Aspect” Krieger more succinctly defined the complicated set of material traits and architecture as the Antelope Creek Focus within the Midwestern Taxonomic system (Brooks 2004:334). Following Krieger’s synthesis, general archaeological interest in the Plains Village period waned until the mid-1960’s when some of the first Cultural Resource Management work was conducted at what is now the Lake Meredith Recreational Area (Etchieson 1981; Etchieson and Couzzourt 1987). The “salvage era” of archaeology in the Texas Panhandle resulted in some of the first radiocarbon dates and systematic analysis of faunal remains at Antelope Creek phase sites, among others.

Lintz’s (1986a) integration of notes, maps, letters, journals, and photographs from the previous fieldwork conducted in the Canadian River Valley uncovered misconceptions and overlooked information regarding Antelope Creek architecture and community patterning. The shortsightedness of the historic-era investigations coupled with non-standardized excavation techniques, gaps in the data, and vagaries in reporting contributed to these early misconceptions (Lintz 1986b). While later excavations along the Chaquaqua Plateau in southeastern Colorado (Campbell 1969); in Oklahoma at the Roy Smith Site (Schneider 1969), McGrath Site (Lintz 1976), Two Sisters Site (Lintz 1979), and in Texas at the Sanford Reservoir (Duffield 1964, 1970; Green 1967) modified minor details of Krieger’s definition, most summaries still accept major portions of his characterization of the Antelope Creek focus (Lintz 1986b:111).

Antecedent and descendant relationships are unknown for the Antelope Creek phase. What is known is that their cultural traditions differ from the manifestations found before, during, and after A.D. 1200-1500. Earlier cultural groups occupying the region such as the Palo Duro and Lake Creek Complexes (Figure 1) have different architectural and ceramic styles than Antelope Creek. According to Boyd (1997:271), the westward spread of Eastern Woodland culture and the eastward spread of Southwestern Puebloan culture had a significant and widespread impact on the peoples of the Southern Plains during the Plains Woodland interval (A.D. 500-1100).

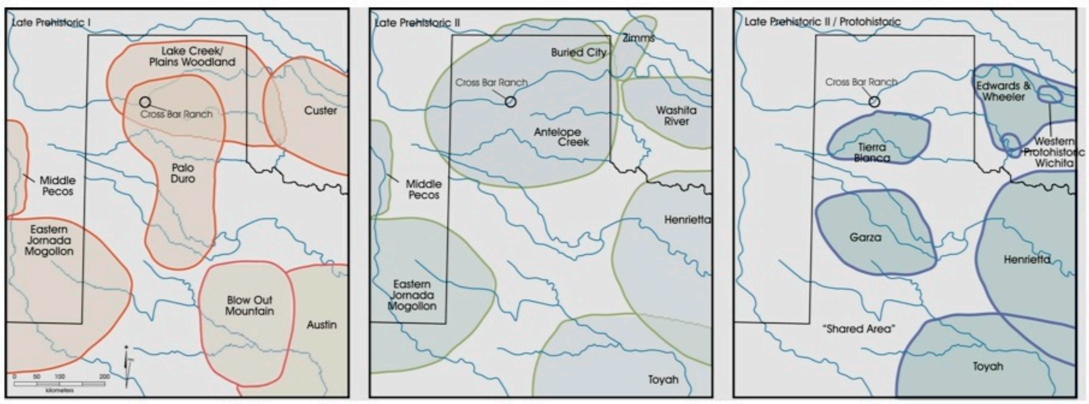

Figure 1. Distribution of the Antelope Creek phase and other cultural affiliations (Bousman and Weinstein 2005).

The Buried City complex is contemporaneous with Antelope Creek and overlaps with the northwestern portion of its geographic span (see Figure 1). Although the two share many similarities, they are differentiated by architecture and ceramic styles. Cultural traditions that postdate Antelope Creek include the Tierra Blanca and Garza phases, whose material assemblages reflect a shift to increased mobility likely in response to increased competition over bison and the advent of the horse. As such, highly mobile groups who established temporary encampments, which covered a much wider territory, replaced the once sedentary lifestyle of the Antelope Creek peoples. It is unclear why and where Antelope Creek peoples migrated from the area around the turn of the

16th century, but their homesteads and villages were vacated prior to discovery by mid-16th century Spanish explorers.

Thesis Organization

This thesis focuses on site 41PT283, which is an Antelope Creek phase site located along West Amarillo Creek in the Canadian River valley. The primary objective of this study is to interpret the site's function and an improve understandings of settlement pattern variability during the Antelope Creek phase. Much of the archaeological investigation at Antelope Creek phase sites have focused on architectural variation, with each subject site treated as a seemingly independent element of a much more complex, yet poorly understood social system. While an analysis of human behavior manifested in the study site's material assemblage is the core of this study, I also seek to characterize its function through comparisons of the archaeological data with those from other Antelope Creek sites with divergent architectural and settlement patterns. In doing so, I propose new analytical models that consider "isolated homesteads" as interactive parts of a complex system of inter-site cultural connectivity.

Chapter Two provides a background overview of the environmental conditions on the Southern High Plains. These include descriptions of the regional physiography, climate, and plant and animal communities. Likewise discussed are the paleoenvironmental data for the Southern Plains with emphasis on the local conditions of the Canadian River valley.

Chapter Three summarizes the cultural background of the Southern Plains and adjacent regions during the Plains Woodland (A.D. 200-1100), Plains Village (A.D. 1100-1541), and Protohistoric (A.D. 1541-1700) periods. Also presented is a synthesis of the literature on the different cultural traditions that comprise these time periods and regions.

Chapter Four introduces the Cross Bar Ranch, the study area, and the study site. The Cross Bar is an 11,833-acre property that is managed by the Bureau of Land Management (BLM). The Cross Bar has played host to several archaeological investigations at Antelope Creek sites that occur within its boundaries. This chapter also discusses the study area, which encompasses a 1,400-acre portion of the ranch and contains six other Antelope Creek phase sites discussed in my analysis at 41PT283.

Chapter Five presents the theoretical perspectives and research hypotheses developed for the interpretation of site function and human behavior at 41PT283. Several research topics are discussed, including collector-foraging systems, horticultural strategies, behavioral ecology, lithic technology, stone fracture mechanics, site formation processes, and settlement-abandonment patterns. A series of research topics and questions, which were formulated using these and other theoretical perspectives, are presented in this chapter.

Chapter Six details the methods used to address the research topics and questions discussed in Chapter five. These methods include field investigations such as previous surveys, test excavations and remote sensing conducted at 41PT283 and other Antelope Creek sites in the study area. Also covered are the laboratory analyses performed on the material assemblage, and their frequency distributions. This chapter concludes with a discussion of the chronometric dating methods selected to refine the chronology at the site.

Chapter Seven presents the results of the analyses and interpretations of these data in terms of the local lithic technology, subsistence practice, site activity areas, occupation history, and settlement-abandonment patterns, which collectively help in characterizing site function. Interpretations of these data are also presented alongside the extant data from one of the study areas sites through a discussion of settlement and functional levels of variability.

Chapter Eight synthesizes these data and presents concluding remarks regarding functionality at the study site. Also discussed are some new perspectives proposed for future research at the study site and study area, as well as novel analytical models for understanding Antelope Creek settlement patterns at the regional level.

II. ENVIRONMENTAL BACKGROUND

This chapter provides an overview of the environmental setting on the Southern High Plains with an emphasis on the Canadian River Valley. The descriptions include a synopsis of the regional physiographic setting, including topography, geology, lithic resources, stratigraphy and hydrology. Also covered are regional climate, animal and plant communities, and the available paleoenvironmental data for the Southern Plains during the late Holocene.

Topography

The Southern Plains, also known as the Llano Estacado, comprises the southernmost portion of the Great Plains Province. It consists of an extensive plateau covering roughly 80,000 km^2 with abrupt escarpments bounding the plateau to the north, east and west. The landscape slopes eastward approximately 8 to 10 feet per mile with a slight gradient towards the Edwards Plateau to the south (Gould 1907:7; Evans and Meade 1945:485). The general topography of the region is characterized by overlapping sequences of alluvial fans trending northwest from the Rocky Mountains to the Edwards Plateau. The surface of the Llano Estacado merges with the surface of the Edwards Plateau with no topographic demarcation.

Sparse dune fields, minor stream valleys, and numerous small lakes or playas that dot the landscape provide slight topographic relief. According to Holliday (1997:8), the Llano Estacado is probably the most environmentally homogenous region of its size in North America, with flat topography, uniform regional geology, and low, smooth environmental gradients. The greater part of the Southern Plains lies at an elevation between 3,500 and 4,500 feet. The lowest elevations are approximately 2,800 feet and occur in the Palo Duro Canyon and Canadian River Valley basins (Gould 1907:8).

According to Lintz (1986a:44), differential erosion of the Canadian River and its tributaries form a dual valley system. The system is characterized by a broad and shallow outer valley containing eroded Tertiary age deposits and a narrow inner valley that has incised into Triassic and Permian age sediments. Outer valley terrain is described as typically rolling topography while inner valleys are characterized by bluffs, escarpments and mesas bordering broad floodplains. Along the Canadian River Valley, Quaternary age deposits occur as eolian sand and silt that form a series of stabilized sheets and dunes (Barnes 1969). The main dune deposits occur on the outer valley Ogallala exposures north and south of the Canadian River.

Geology

From a regional perspective, the physiographic characteristics of the Llano Estacado appear uniform, but locally there are marked differences, especially in terms of geology. During the Late Paleozoic Era, tectonic movements resulted in the Amarillo Uplift, the Cimarron Arch, and the Bravo Dome, and the adjacent Palo Duro, Dalhart and Anadarko Basins (Barnes 1969). By middle Permian times, these basins were essentially filled and the area developed into an extensive marine shelf. The area was differentially uplifted during the succeeding Triassic Period to form the fluviolacustrine basin of the Dockum Group and was uplifted again during the late Cretaceous-early Tertiary period, which resulted in the middle Tertiary erosional surface (Gustavson 1986:459).

The Llano Estacado developed approximately 65 million years ago through eolian, and colluvial processes that eroded the eastern slopes of the Rocky Mountains. Sediments were transported eastward by wind and water during the Tertiary Period creating the Ogallala Formation, which extends northward to South Dakota, as far west as Wyoming and encompasses much of Nebraska (Figure 2). The Ogallala consists of

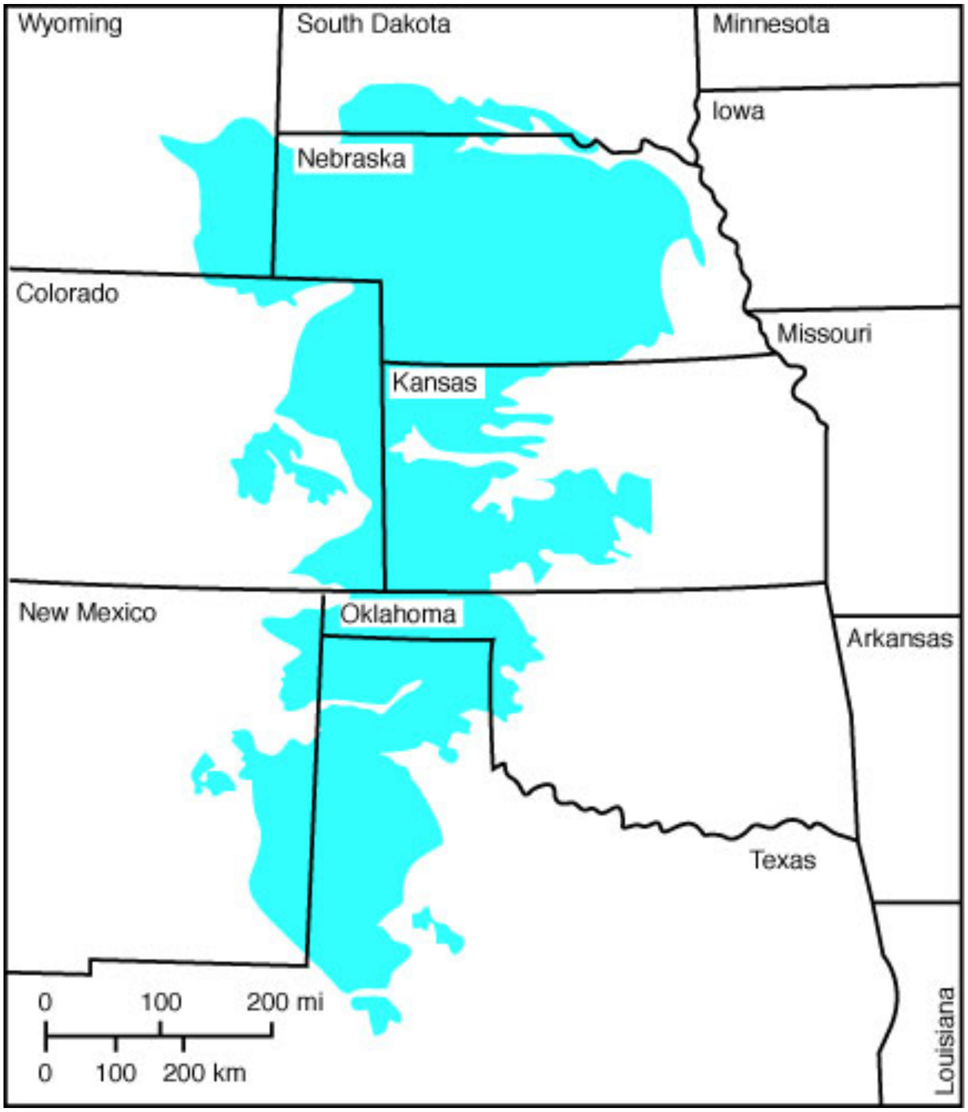

Figure 2. Map of the Ogalla Formation boundary (Kansas Geological Survey 2005).

Miocene-Pliocene age alluvial and eolian sediment with a thick, highly resistant, pedogenic calcrete (Holliday et al. 2008:12). This calcareous "caprock" has slowed the erosion of the eastern and western escarpments, keeping the Southern Plains at a higher elevation than adjacent regions (Rathjen 1998). The Ogallala Formation is a major aquifer for the region and many Tertiary age springs are exposed in the walls of stream valleys throughout the Southern High Plains.

Another extensive deposit is the Pliocene age Blanco Formation. It consists of a layer of lacustrine dolomite and clastic sediment deposited in large basins cut into the Ogallala (Evans and Meade 1945). Other more localized lacustrine deposits include the early Pleistocene age Tule Formation, and the late Pleistocene age Double Lakes and Tahoka Formations (Reeves 1976). The Blackwater Draw Formation is the principle surficial deposit of most of the Southern High Plains and mantles all older units (Holliday 1997:10). It consists of a sheet-like body of eolian sandy to clayey sediments that rest on the Ogallala Formation and locally on lacustrine sediments of the Blanco Formation (Holliday 1989:1598).

The Blackwater Draw eolian sediments were likely derived from the Pecos River Valley to the west and southwest. Well-developed buried Pleistocene age soils have also been recognized in the sediments, indicating that the formation was composed of a number of different layers that were deposited episodically (Holliday 1989:1598). Pleistocene playa lakes underlie, are interbedded with, or are inset against these eolian sediments. The late Quaternary stratigraphic sequences of sediments that overlie the Blackwater Draw Formation contain the *in situ* archaeological record found in draws, playas, salinas and dunes. According to Holiday (1997:11), the late Quaternary stratigraphy of the region is best known from the draws, based largely on archaeological research at sites such as Blackwater Draw and Lubbock Lake.

Lithic Raw Materials

The availability of durable raw stone has long been recognized as a major factor in the mobility of indigenous peoples. However, the geologic deposits on the Llano Estacado have virtually no raw suitable for stone tool manufacture. These outcrops are found on the margins along the escarpments. The archaeological evidence of intensive use of the region dating back to the Late Pleistocene was undoubtedly influenced by the natural occurrence of Alibates outcrops found in the Canadian River valley between the Southern and Central High Plains. Of particular significance is the scarcity of suitable stone tool materials beyond these margins. As such, prehistoric inhabitants on the Llano Estacado had to travel some distance to the outcrops or engage in trade for lithic resources (Holliday 1997:14). In addition to Alibates, other well-known units producing lithic raw materials near the Southern Plains consist of Tecovas jasper, Dakota quartzite, Edwards chert, and Ogallala chert and quartzite.

The Quartermaster Formation is the oldest geologic unit near the Llano Estacado containing suitable material for stone tools (Holliday 1997:244). The Alibates Dolomite Lentil (Luedtke 1992) is in the upper Quartermaster and mapped along the northern escarpment primarily in the Canadian River drainage. The Alibates Dolomite unit produces one of the best-known raw materials in North America for the manufacture of stone tools, the Alibates agate, which is the only material in the Quartermaster Formation suitable for this function (Holliday 1997:245). The elaborate multi-colored bands and marbles of Alibates is the result of silicification of the dolomite. Coloration occurs in vibrant combinations of blues, purples, reds, white, and off-whites (Figure 3). The best-known outcrops are located on Alibates Flint National Monument, while other sources are found along the north bank of the Canadian River near Devil's Canyon (Bowers 1975; Gould 1907).

Figure 3. Various colorations of Alibates chert (Texas Beyond History 2001).

The Dockum Group is Upper Triassic in age and forms the lower portion of the Llano Estacado escarpment. These outcrops occur only along the northwestern, eastern and southeastern margins with beds generally becoming thicker from north to south (Holliday 1997:247). Tecovas or Quitasque jasper of the lower Dockum Group has been found in Palo Duro Canyon and along the Canadian River Valley northwest of Amarillo. Tecovas jasper colors consist of banded reds, browns, and purples with mottles of gray, yellow and white (Banks 1990: 93). Although similar to Alibates in its banded coloration, Tecovas jasper typically has an even red hue whereas Alibates often exhibits faint variations of color within the red (Banks 1990:93).

Distinctions between the materials can also be made under low magnification. According to Banks (1990:93), the major distinction between Tecovas and Alibates is that the former rarely occurs in workable pieces as large as Alibates, and predominates as gravels < 8 cm in size. Tecovas quartzite also occurs in the formation and though it is similar in appearance, it is more coarse-grained than Tecovas jasper.

The Dakota Formation is the primary source for many of the better quartzites on the Great Plains (Banks 1990:89). The formation extends from New Mexico to the Dakotas and is dominated by sandstone. Dakota quartzite has been described as silica-cemented sandstone (Holliday 1997:249). On the Southern Plains, outcrops occur in the Pecos River Valley along the northwestern escarpment and extend into northeastern New Mexico. High-quality Dakota quartzite has also been found in the western Oklahoma Panhandle and southeast Colorado. The quartzite is course-grained and colors vary from reds to brown, making it difficult to differentiate from Tecovas quartzite (Holliday 1997:249).

Although the Edwards Formation predominates in regions to the south and southeast, it is found along the east-central and southeastern margins of the Llano Estacado. Edwards limestone is a Lower Cretaceous deposit that consists of fine to medium grained limestone with occasional chert lenses. Localized outcrops of light gray to tan Edwards cherts are found along the southeastern escarpment of the Llano Estacado. This material is not found in high frequencies at archaeological sites in the region compared to the cherts discussed above. The better known high-quality cherts of the

Edwards Formation become more plentiful to the southeast on the Edwards Plateau and along the Callahan Divide (Banks 1990:109).

The Ogallala Formation is Miocene-Pliocene in age and crops out abundantly along the eastern, northern and western escarpments of the Llano Estacado. Quartzites are the most common knappable materials in the Ogallala and are light-colored and medium to coarse grained, dark grey to black and medium grained, and a distinctive and ubiquitous purple quartzite (Holliday 1997:250). Ogallala gravels also include red, brown and yellow jaspers, and medium to dark gray and dark blue colored chert. Another material produced in the lower Ogallala is Potter chert. It is a dense gray to brown, silica-cemented and fine-grained siltstone. Other materials found amongst the Potter gravel are purple quartzite, some jasper, chert, silicified wood and various quartzites referred to as Potter quartzite (Holliday 1997:250).

Stratigraphy

The generalized stratigraphic profile for the Canadian River valley is characterized by a thick interval of red sandstone, siltstone and shales with more or less persistent beds of dolomite and gypsum (Bowers 1975:14). The Whitehorse Formation consists of a thick layer of red bed sandstones that form the steep slopes beneath the resistant Alibates agate (Bowers 1975:19). At most localities, only a few meters are exposed along the margins of major tributaries.

Overlying the Whitehorse Formation is the distinctive Alibates Formation, which consists of lower and upper gray dolomite separated by an interval of calcareous red mudstone (Bowers 1975:21). The lower dolomite member ranges from 1 to 3 m thick whereas the upper member is approximately 60 cm thick (Bowers 1975:22). Both members thin eastward. Chertification and calcitization have occurred sporadically in both members of the Alibates Formation. The chert replacement of dolomite is best developed in the Alibates Monument area and is also well developed along Bates, Plum and Devil's Canyon (Bowers 1975:22; Lintz 1986a:48). The Quartermaster Formation is the upper most Permian age deposit and mantles the Alibates Formation at some localities. Besides its stratigraphic position, there is little petrographic difference between the Quartermaster and Whitehorse (Bowers 1975:22-23).

The main Cenozoic unit mantling the Permian age deposits consists of the Ogallala Formation. The Ogallala is distinguishable from other formations by its light brown to buff color and carbonate-cemented sandstone and sandy conglomerates (Bowers 1975:23). At most areas along the Canadian River Valley where the Ogallala has been removed and the Alibates Formation caps the bluffs, Ogallala sand has filtered down into fractures in the underlying rocks. A thick, late Pliocene age petrocalcic soil horizon in the upper portion of the formation has formed a resistant caliche known as "caprock" and is prominent along the Canadian River and its southern tributaries (Reeves 1976). This forms the steep eastern and western escarpments bounding the Llano Estacado.

Although stabilized dunes occasionally mantle the inner valley deposits, fluvial deposits along the Canadian River channel comprise the inner valley Quaternary age deposits, which are represented by Pleistocene terraces and Holocene alluvium (Evans and Meade 1945:500). The oldest stream deposits are the higher sand and gravel terraces of the Canadian River. A thick sand fill of the inner river valley represents Late Pleistocene and Holocene deposits whereas the two lowest terraces along the river and its tributary valleys are of Holocene age. In addition to its stratigraphic relationship to the succeeding Holocene deposits, the age of the Late Pleistocene deposit is represented by the presence of *Equus*, mammoth, *Camelops* and *Bison antiquus* (Evans and Meade 1945:501). The Holocene terraces are represented by position, the presence of *Bison bison*, and the absence of Pleistocene fauna in the Blackwater Draw Formation.

Hydrology

The Canadian River, which is entrenched in a deep east-west valley across the Texas Panhandle, is the only well-developed drainage system of the Southern Plains (Evans and Meade 1945:485). The Canadian flows northeastward and has cut a broad and shallow valley that averages 150-200 m deep and 15-50 km wide (Bowers 1975:1). It is fed by numerous north-south trending tributaries that crosscut the plateau of the Texas Panhandle. Shallow valleys of intermittent streams extend at widely spaced intervals across the Plains, providing marginal drainage for areas adjacent to the valleys. Due to the flat terrain, there is little to no run-off; rainfall evaporates, sinks into the soil, or collects in playa lakes. Playa lake water either evaporates in place or drains out in draws or incipient stream channels. In a number of cases, these shallow draws form the beginning of a creek, which flows across the escarpment and eventually becomes a stream of some magnitude (Gould 1907:9).

Lake basins commonly known as playas are inset into the Blackwater Draw Formation and locally into older units. Playas consist of circular to irregularly shaped shallow basins that vary considerably in size. They occur throughout the Llano Estacado along generally flat upland divides of stream valleys. Playas contain terminal Pleistocene and Holocene sediments that consist of relatively homogenous clay fill that accumulated over time. Stratigraphic sequences can alternate between eolian or fluvial sedimentation and periods of stability resulting in soil formation. Such stratified contexts have potential for containing clues to regional landscape evolution and paleoenvironmental changes during the Holocene (Holliday et al. 2008; LaBelle et al. 2003).

There is no consensus on playa formation; however, lines of evidence indicate that most basins resulted from fluvial erosion and deflation. The evidence centers on playa interaction with the Blackwater Formation, including unconformities with basin fills, crosscutting relationships, and variation in playa size and shape relative to the sediment texture of the formation (Gustavson et al. 1995; Holliday et al. 2008). The characteristics of playas contrast with the other principal settings of late Quaternary sedimentation of dunes and dry valleys.

Climate

The Southern Plains experience dramatic temperature shifts from below freezing winters to very warm summers with sporadic rainfall. The average annual precipitation in the northern periphery of the Texas Panhandle amounts to about 16-20 inches, which is the same sum that characterizes the lower valley region of extreme southern Texas (Bomar 1995:56). Given the erratic nature of rainfall and overall lack of topographic relief, the Canadian River Valley is prone to flash flooding. Historic accounts (Gould 1904, cited in Bomar 1995) characterize the Canadian River as either completely dry or becoming a raging torrent without warning. Figure 4 illustrates the effects of dynamic seasonal variation on the Llano Estacado.

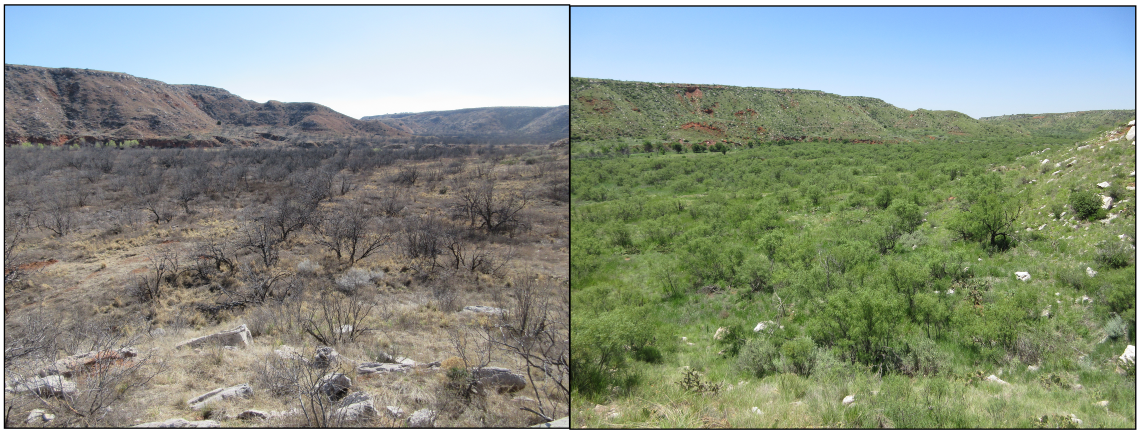

Figure 4. View of the seasonal vegetative settings in West Amarillo Creek valley (Photos taken in March [left] and June [right] of 2016).

In addition to drastic swings in precipitation and temperature, The Llano Estacado also endures episodes of volatile windstorms. In the winter months, polar jet streams furnish severe snow and winds propelling bitterly cold Arctic air into the region (Bomar 1995:38). In spring and autumn, a subtropical jet consisting of moist tropical air becomes the main impetus for extremely windy conditions (Bomar 1995:39). During July and August, heat and aridity are at their annual peaks as southwesterly Marfa fronts usher in arid air from the Mexican and New Mexican deserts (Bomar 1995:180). Sun and wind deplete the soil of the meager water it receives from summer rainfalls.

Plant Communities

A variety of floral communities occupy the Southern Plains including native shortgrass communities, small shrubs, mesquite trees (*Prosopis glandulosa*) and many succulents such as cholla (*Cylindropuntia* acanthocarpa), plains yucca (*Yucca filamentosa*) and prickly pear cactus (*Opunita lindheimeri*). These wild plants served as food sources for prehistoric hunter-gatherer and villager groups. While a few rivers such as Yellow House Draw and Blackwater Draw actually cross the Southern Plains, the water sources along the Canadian and Red Rivers once sustained thriving growths of tall willows and cottonwoods. Historically introduced Old World species like Russian olive and tamarisk have replaced these native trees along the rivers (Diamond 2016).

In pre-European settlement times, the region was primarily shortgrass prairie dominated by blue grama (*Bouteloua gracilis*) and buffalo grass (*Buchloe dactyloides*). Most of the flat landscape of the central and northern High Plains has been converted to irrigated cropland, which utilizes water from the Ogallala Aquifer (Diamond 2016). While the original character of the Southern Plains has been changed by plowing and overgrazing, unique areas still remain including some scattered sand dunes covered with Harvard shin-oak (*Quercus havardii*), wild plum (*Prunus mexicana*), sand sagebrush (*Artemisia filifolia*), and little bluestem (*Schizachyrium scoparium*). As Diamond explains, overgrazing has caused an increase in annual three-awn (*Aristida oligantha*), sand dropseed (*Sporobolus cryptandrus*), tridens species, and sand sagebrush. Hardlands or mixed lands, sandy lands or caliche lakes, vegetation on the Southern Plains varies depending on location within its immense grassland prairie.

Animal Communities

During prehistoric times, mixed grass prairies supported large grazing herds of bison (*Bison bison*) and pronghorn (*Antilocapra americana*) that were widely exploited by hunter-gatherers and Plains villagers. A high frequency of smaller animals such as prairie dogs (*Cynomys ludovicianous*) and jackrabbits (*Lepus californicus*) also occurred and were likely hunted (Schmidly 1994). The inner valley region supported a variety of animals such as mule deer (*Odocoileus hemionus*), bobcat (*Lynx rufus*), skunks (*Mephitis sp.*), ringtails (*Bassarisus astutus*) and elk (*Cervus canadensis*) that were adapted to the steep topography formed by the Canadian River and its tributaries.

Reptile species including the endangered horned lizard (*Phrynosoma cornutum*), western diamondback rattlesnake (*Crotalusatrox*) and desert kingsnake (*Lampropeltis getulus splendida*) also occupy the Southern Plains (Schmidly 1994). The moist and aquatic bottomlands were occupied by opossums (*Didelphis marsupialis*), beavers (*Castor canadensis*), weasels (*Mustela spp.*) and whitetail deer (*Odocoileus virginiana*) that took advantage of spring waters (Lintz 1986a:62). The immediate river basins also support various aquatic species of turtles and fish.

Paleoenvironmental Data

Prehistoric human behavior and mobility patterns are often attributed to environmental conditions, namely changes in climate. Most archaeological interpretations of late-Holocene environments come from indirect evidence such as site faunal assemblages. For example, the Bison Absence Period II proposed by Dillehay (1974) postulates a substantial drought on the Southern Plains around the first millennia A.D. This model associates the marked absence of bison bones at Late Archaic and Plains Woodland period sites with a dramatic decrease in rainfall. However, it is thought that the migration of bison is especially influenced by temperature, followed by rainfall and soil composition (Lohse et al. 2014).

The "rise" of the Antelope Creek phase, "demise" of the Upper Republican culture and influx of people into the Southern Plains around the beginning of the Plains Village period (~A.D. 1100) has also been attributed to climate change (Lintz 2016:148). This late-Holocene climate model (Bryson et al. 1970) postulates severe drought conditions on the central plains and increased precipitation on the Southern Plains during the 12th century. The study was based on radiocarbon dating of wood charcoal collected from several Antelope Creek sites (Baerreis and Bryson 1965). This hypothesis again correlates the movement of people and bison southward with increases in precipitation.

The common application of archaeological data in reconstructing paleoenvironments is reasonable given that most analyses of climate change during the Holocene have focused either on the millennial or multi-century scale of variability using low-resolution ocean sediment cores and tree ring dating (Wanner et al. 2008:1792). Such large-scale studies have afforded little in terms of localized climate change during a relatively brief interval such as the late Holocene.

Investigations by Frederick (2008) and Palacios-Fest (2010) provide the first substantial paleoenvironmental studies on the Southern Plains. These investigations were conducted as part of archaeological testing excavations at site 41PT185 (Quigg et al. 2008), which is located on West Amarillo Creek approximately 23 km (14.3 miles) upstream (south) of site 41PT283. According to Frederick (2008:160), the best paleoenvironmental data within the West Amarillo Creek sequence are available for the late Holocene where there exists nearly continuous sedimentation within the creek valley during this interval. Frederick identified a depositional unit (Unit D) at 41PT185 that shows a significant channel incision sometime after 800 B.P. (~A.D. 1450). The carbon isotopic values of the succeeding depositional unit (Unit E) suggest that the surrounding vegetation was around 80 percent C_4, which gradually shifted to a more C_3 rich assemblage up to the present day (Frederick 2008:161). This indicates an episode of continuous sedimentation at some span during the Antelope Creek phase followed by a period of overall stability.

According to Palacios-Fest (2010:401), the floodplain facies of Unit D appear to be cumulic soils more than 3 m thick that exhibit little lithologic variation until relatively late in the history of the deposit when gravels become more common. Palacios-Fest's paleoenvironmental study compared the paleoenvironmental signatures of land and aquatic mollusks, ostracodes, and charophytes collected from Unit D sediment samples with stable-isotope (δ18O and δ13C) values for an ostracode (*Cypridopsis sp.*) and the gyrogonites of *Chara globularis* and *Nitella flexilis*. The study revealed variable marsh conditions from approximately 2000 to 450 B.P., suggesting that the Upper West Amarillo Creek valley at Unit D remained a year-round aquatic system throughout most of its paleoenvironmental history (Palacios-Fest 2010:418).

These findings indicate that this portion of the Southern Plains was predominantly wet during the Plains Woodland (A.D. 200-1100) and Plains Village (A.D. 1100-1500) period. This not only has implications for the paleoenvironmental conditions of this time period, but also is critical in understanding the relationship between horticulture and settlement patterns during the Antelope Creek phase. An assessment of whether the alluvial deposits of West Amarillo Creek provided long periods of stable landforms for horticulture practice near 41PT283 would be a viable research objective for future studies.

III. CULTURAL BACKGROUND

To demonstrate the taxonomic variability on and around the Southern Plains before, during and following the Antelope Creek phase, this chapter provides descriptions of the various archaeological cultures of these time intervals. A synthesis of the literature on the many different groups occupying the Southern Plains region during the Plains Woodland, Plains Village, and Protohistoric periods also demonstrates the behavioral strategies adapted to local social and environmental conditions and the evolution of the nomenclature archaeologists use to differentiate their material records.

The cultural chronology of the Southern High Plains is divided into six general periods established by Boyd (2004), Hughes (1991), and Johnson and Holliday (2004). Given the temporal and spatial scope of my study, the descriptions that follow are limited to the cultural periods spanning from approximately A.D. 200 to 1750.

Historic Period	A.D. 1750 to 1950
Protohistoric Period	**A.D. 1500 to 1750**
Plains Village Period	**A.D. 1100 to 1500**
Plains Woodland Period	**A.D. 200 to 1100**
Archaic Period	8000 to 1800 B.P. (A.D. 200)
Paleoindian Period	11,500 to 8000 B.P.

Plains Woodland Period (A.D. 200 – 1100)

Also referred to as the Late Prehistoric I period or the Early Ceramic period, the Woodland period on the Southern Plains is marked by changes in the material culture, subsistence base, and socio-political systems of prehistoric groups throughout Midwestern and southeastern North America (Vehik 1984:175). According to Boyd (1997:271), the development of rudimentary horticulture, semi-permanent house structures, widespread use of ceramic vessels, and the bow and arrow are attributed to the

Woodland period. Plains Woodland sites are generally open camps composed of rock-lined earth ovens, middens, and occasionally burials, but pithouses are also found. The marked absence of bison remains at Plains Woodland sites suggests that plants and smaller animals served as the primary food staple.

Distinct cultural complexes such as Lake Creek, Palo Duro, and Jornada Mogollon emerged during the Plains Woodland period. Jack Hughes (1991:26) explains, the Palo Duro Complex is characterized primarily by a combination of Mogollon Plain brown pottery with a distinctive arrow point called Deadman's, which are often accompanied by Scallorn-like arrow points. Palo Duro is best represented in the Red River and Brazos River drainages further south on the Llano Estacado, but outliers occurring as far north as the Canadian Breaks suggests a temporal and spatial relationship with Lake Creek culture (Boyd 2004:297).

The Lake Creek culture of the northeast and Palo Duro culture of the southwest Llano Estacado appear to reflect different elements of regional influence, but the continuance of Archaic features among the assemblages suggests influxes of new ideas rather than new people (Hughes 1991:25). In general, the Plains Woodland tradition is often characterized as a significant transition from mobile hunter-gatherer groups of the Late Archaic period to the more sedentary groups of the subsequent Plains Village period (Boyd 2004). While it is unclear whether Woodland peoples are antecedents of later Plains villagers, similarities in their material assemblages suggest cultural affinities.

Plains Village Period (A.D. 1100 – 1500)

Also known as the Late Prehistoric II period or the Middle Ceramic period, the Plains Village period comprises a number of distinct sedentary and semi-sedentary culture groups that share generally similar lifeways and adaptive strategies. These include an increased emphasis on horticulture, and extensive evidence of permanent stone structures occurring in isolated and aggregate settlements. Plains Village sites are mostly small throughout the Southern Plains and tend to occur along major drainages near floodplains presumably suitable for planting. Evidence for marginal horticulture comes from the presence of tropical cultigens such as maize, beans and squash at sites from this period. In addition to small-scale farming, reliance on wild plant foods was supplemented by a heavy dependence on hunting bison and smaller ungulates. The abundance of bison bone in Plains Village faunal assemblages suggests these animals were numerous on the Plains during this time. This has been linked to a warming trend that resulted in drought conditions near the end of the Plains Woodland period (Lintz 1986a:64-65; Hughes 1991:8-9). These xeric conditions are believed to have led to regional competition over resources and changes in settlement patterns late in the period (Lintz 1986a). Brooks (1989:90) notes that this dry period influenced settlement in riverine settings, which likely fostered experimentation in horticulture.

Plains Village period artifact assemblages consists of cordmarked pottery, small triangular Washita, Harrell and Fresno arrow points, diamond-beveled knives, “guitar pick” scrapers, drills, end scrapers, metate slabs with deep oval basins, and bison and mussel shell tools (Hughes 1991:31). The presence of painted pottery, turquoise, obsidian and *olivella* shell beads reflect trade with Puebloan groups. In return for these items, Plains Villagers may have bartered using bison hides and Alibates chert, a resource central to the Antelope Creek economy as evidenced by the density of settlements in proximity to source areas.

Numerous cultural complexes encompass the Plains Village tradition on and around the Llano Estacado. These distinct traditions generally overlap temporally and exhibit a range of similarities and differences primarily in the categories of architecture, settlement and subsistence. These different manifestations have been lumped into regional variants, which include the Upper Canark, Redbed Plains, and Plains Border Variants. The Antelope Creek phase of the Upper Canark variant was the prevailing cultural tradition on the Southern Plains during most of the Plains Village period. For reasons unclear, Antelope Creek peoples abandoned the Texas and Oklahoma Panhandles prior to European arrival in the mid-16th century and may have joined neighboring Caddoan groups to the northeast.

Protohistoric Period (A.D. 1541 – 1700)

The transition from the Plains Village to the Protohistoric period or the Late Ceramic period on the Southern Plains is marked by the influx of Athapaskan groups from the north around A.D. 1450-1500 and the arrival of Spanish explorers soon thereafter. It is unclear whether the traditions of the Athapaskan and Antelope Creek cultures converged or collided in conflict, though a combination of both is plausible.

Sixteenth and early seventeenth century Spanish accounts of the Plains villagers they encountered indicate an indigenous subsistence strategy based heavily on the hunting of bison. Stone tools reflect this economy and include small triangular and basally notched Garza and Lott arrow points, drills, knives, snub-nosed scrapers and various other end- and side-scrapers. Locally made ceramics consist of thin-walled micaceous wares, while Puebloan glazed wares comprise non-local pottery. Protohistoric culture groups such as the Tierra Blanca and Garza complexes are generally characterized as semi-sedentary to nomadic bison hunters who relied heavily on mutualistic exchange with neighboring horticulturalists from the Southwest (Spielmann 1983). Site categories among these manifestations include base camps located in sheltered terraces or exposed canyon rims, potentially reflecting seasonal occupations (Hughes 1991:35).

Coronado's expedition in 1541 encountered two separate culture groups who occupied the Llana Estacado: the Querechos and the Teyas. Both were historically documented as semi-nomadic groups who roamed the Texas Plains hunting bison and other game. The Querechos and Teyas are thought to correspond with the archaeological evidence at Tierra Blanca and Garza complex sites (Habicht-Mauche 1992). Other Protohistoric culture traditions of the Southern High Plains include the Henrietta and Wheeler phases.

Cultural Traditions of the Southern Plains Region: A.D. 200-1700

This section provides a synthesis of the literature on the cultural traditions that occurred before, during, and after the Antelope Creek phase. The groups occupying the Llano and surrounding regions during this time exhibit many materialistic similarities that suggest antecedent and descendent relationships and inter-cultural influences, as well as marked variability reflecting unique economic and technologic strategies adapted to local social and environmental settings.

Since the early 20th century, archaeologists have sought to flesh out these material differences and characterize each archaeological manifestation into a distinct cultural phase, focus, complex, or tradition that can be mapped onto prehistoric time and space. According to Drass (1999:122), classification of sites into units and phases tends to emphasize similarities rather than variation, but defining cultural traits provides a method to discuss cultural change. Not surprising, a review of the literature on the Plains Woodland, Plains Village, and Protohistoric periods displays a complex evolution of the taxonomic system used to differentiate the prehistoric cultural systems on the Llano Estacado from around A.D. 200-1700. Figure 5 shows the distributions of the cultural traditions discussed below.

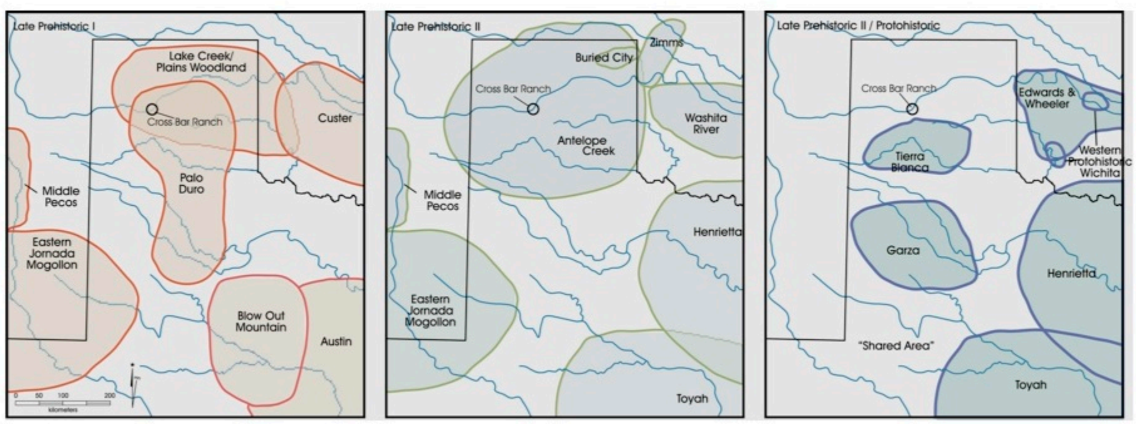

Figure 5. Distribution of the cultural traditions on the Southern Plains and adjacent regions.

Plains Woodland Cultures

On the Southern Plains, three cultural complexes are recognized for the Plains Woodland period. In the Texas Panhandle, the Lake Creek complex is found mainly on the north and south margins of the Canadian breaks extending into western Oklahoma. The Palo Duro complex is found primarily in the Red River drainage and northward along the southern margins of the Canadian River valley. In the southwestern part of the Southern Plains, the Eastern Jornada Mogollon complex occurs mainly in southeastern New Mexico and extends eastward into Texas. In general, the Plains Woodland period is marked by the transition from highly mobile Late Archaic hunter-gatherers to a more sedentary villager lifestyle. According to Hughes (1991:24), this was facilitated by the influx of new innovations like the bow and arrow, pottery, pithouses and gardening under influences from the Mogollon tradition to the southwest and the Woodland tradition to the northeast.

Lake Creek Complex (A.D. 200-900)

This cultural complex was first identified by Hughes (1962) during test excavations on a northern tributary of the Canadian River in Hutchison County, Texas. Chronometric dates are generally lacking for the Texas Panhandle portion of the Lake Creek complex, but radiocarbon dates at several sites in western Oklahoma indicate a span of about A.D. 200 to 800 or 900 (Hughes 1991:25).

Settlement Pattern

Sites attributed to the Lake Creek complex are generally campsites, but the Greenbelt Site (41DY17) and Duncan Ranch Site I (41HC124) contain evidence of village occupations (Boyd 1997:282). This evidence comes in the form of rectangular shaped pithouses with plastered floors and numerous storage pits, indicating intensive occupation of a residential structure. Structural evidence from Plains Woodland sites are often obscured by later occupations by Plains Village period groups (Quigg 2013), complicating the differentiation of these components. The most common site types of the Lake Creek complex are open encampments found in buried zones along the Canadian River and its tributaries. Stone hearths are poorly preserved, but midden deposits consist of mainly hearth stones, boiling pebbles, waste flakes and animal bones (Hughes 1991:25).

Artifact Assemblage

In addition to Scallorn-like arrow points, the chipped stone assemblage consists of simple unifacial end and side scrapers, crude bifaces representing early manufacturing stages, and thinner late-stage preforms (Boyd 1997:292). Material composition consists mostly of local lithic materials such as Alibates, but small quantities of nonlocal materials like Edwards chert, Tecovas jasper and Day Creek are also present, indicating a degree of mobility range and/or trade with distant groups. Other artifact classes, such as grinding stones, choppers, ceramics and modified bone and shells occur in abundance or are completely absent (Boyd 1997:292).

Artifact assemblages at some Lake Creek complex sites indicate a close affinity between the bison hunters of the preceding Late Archaic tradition and local Plains Woodland peoples (Boyd 1997; Hughes 1962, 1991; Thurmond 1991). Although Scallorn-like arrow points eventually replaced corner-notched dart points, the co-occurrence of these different types probably represents a Plains Woodland influence on indigenous Late Archaic peoples in the Texas Panhandle and western Oklahoma rather than a replacement of one group by another (Boyd 1997:282). Though bison kills are common in the Late Archaic, they are absent in the Plains Woodland period, which lends some credence to the bison absence period of A.D. 500-1200 postulated by Dillehay (1974).

Affinities with later Plains Village traditions such as the Antelope Creek phase are also present. According to Hughes (1991:25), cordmarked pottery is diagnostic of the

Lake Creek complex, but is “seldom abundant, usually consisting of a few big thick fragments of large conoidal vessels, tempered with liberal quantities of coarse particles of crushed rocks and/or bone, and boldly impressed with long parallel cordmarks.” While later Plains Village pottery such as Borger Cordmarked vessels have similar surface treatments, the earlier Woodland pottery is generally distinctive based on the aforementioned attributes. Hughes (1991:26) notes that large thick pieces of Mogollon brownware are sometimes present, indicating ties to the Southwest. In addition to similarites in ceramics, Quigg (2013) suggests that influence of the pithouse tradition is manifested in the semi-subterranean houses built by later Antelope Creek peoples.

Mortuary and Violence

Mortuary practice also resembles Plains Village traditions as the few recovered skeletal remains indicate flexed burials sometimes accompanied by tools or cordmarked pottery. A Plains Woodland multiple burial found in western Oklahoma shows clear evidence of violence. An arrow point was found embedded in the ulna of one individual and blunt force trauma was observed on the skull of another (Boyd 1997:290). This suggests that competition over resources and territory may have been heightened due to increasing populations and/or deteriorating environmental conditions.

Palo Duro Complex (A.D. 200-1000)

The Palo Duro complex was defined based on excavations at Deadman’s Shelter (Willey and Hughes 1978). In contrast with the Lake Creek complex, the chronology of Palo Duro complex is known primarily from radiocarbon dates obtained from many different sites. The findings at Deadman’s Shelter prompted Willey and Hughes to propose that the site represented a widespread cultural manifestation characterized mainly by Mogollon brownware pottery and a distinctive basal-notched arrow point called Deadman's that is often accompanied by corner-notched Scallorn-like arrow points (Boyd 1997:295; Hughes 1991:26).

Settlement Patterns

Investigations at Palo Duro sites have resulted in three site type categories- residential bases, campsites, and rockshelters. In addition to settlement pattern, architecture and occupation extent, Palo Duro site types are differentiated by their respective functions inherent in their artifact densities and frequencies. Two Palo Duro sites, Kent Creek (Cruse 1992) and Sam Wahl (Boyd et al. 1994), have been identified as residential bases. These are important given their similarities with later Plains villager sites as well as affinities with earlier traditions of the Late Archaic. The Kent Creek site is located along a spring-fed tributary of the North Pease River and represents the first Palo Duro site where habitation structures were observed. It contains two complete rectangular shaped pithouses interpreted as a habitation with a subfloor burial, and a storage facility with possible water traps (Boyd 1997:295).

Artifact Assemblage

The stone tool assemblage contains mostly Deadman's and Scallorn points, but some dart points are present. In addition to a variety of other tools such as bifaces, unifaces, drills and gouges, several manos and metates were found indicating an importance of plant processing. According to Boyd (1997:299), "the faunal assemblage indicates that the inhabitants killed and ate more deer and/or antelope than any other animals" as only one bison element was recovered. A variety of ceramics from the Southwest were found including Jornada Brown, Roswell Brown, and Middle Pecos Micaceous Brown. Considered the type site for Palo Duro residential bases, Kent Creek consists of a multi-functional village where procurement and processing of a wide range of plants and animals, and the full range of stone tool manufacture and maintenance took place (Boyd 1997:300).

Subsistence

The Sam Wahl site contains a Woodland component, a later Plains Village component, and a burial component of unknown temporal/cultural affiliation. The early component consists of an oval pithouse, storage pits, baking pits and bedrock mortars. The artifact assemblage contains a high frequency of grinding tools which along with storage features, indicates intensive collecting, processing and storage of plant foods and that hunting was of little importance (Boyd 1997:300). The evidence at Sam Wahl suggests that the early component was a small pithouse that was occupied seasonally to harvest wild or cultivated plants, which may have been stored during winter months. According to Boyd (1997:300), the evidence from the later component indicates a dramatic change in site function and subsistence around A.D. 1050-1100 when hunting became increasingly important and the inhabitants may have shifted from pithouse to surface house construction.

Eastern Jornada Mogollon Complex (A.D. 950-1450)

The Plains Woodland period component of this complex consists of the Querecho and Maljamar phases, which represent an eastern extension of the Jornada Mogollon culture (Corley 1965). The Ochoa phase (A.D. 1300-1450) is also part of the Eastern Jornada Mogollon complex and is included with discussions of Plains Village traditions later in this chapter. Sites associated with Eastern Jornada Mogollon are found in southeastern New Mexico, extending eastward into the southwestern portion of the Texas Plains. In general, Eastern Jornada sites are characterized as either campsites or residential house sites. Leslie (1979:179) claimed that the complex represents groups affiliated with the Jornada Branch of the Mogollon that retained a hunter-gatherer lifestyle, did not practice agriculture, and utilized shin oak acorns and mesquite beans as primary subsistence resources. Collins (1971:88) noted the Querecho, Maljamar, and Ochoa phases became "increasingly independent of the more progressive Mogollon development to the west" and maintained a greater reliance on hunting.

The early component, the Querecho phase, dates to around A.D. 950-1100 and is thought to have developed out of the Hueco phase of the Late Archaic Jornada (Collins 1968). The Querecho phase marks the first use of ceramics in the area and is characterized by a variety of locally made brownwares and non-local wares such as Mimbres Black-on-White (Boyd 1997:278). Affinities with earlier Archaic traditions are seen in the occurrence of corner notched dart and arrow points at Querecho phase campsites. Pithouses are not found, reflecting a nomadic lifestyle adapted to hunting and foraging.

Boyd (1997:279) notes the difficulty in differentiating pithouses that might belong to Querecho phase from those of the Maljamar phase. The latter phase dates from A.D. 1100-1300 and spans the transition from pithouses to the surface houses of the Ochoa phase, suggesting a more sedentary lifestyle (Boyd 1997:278). The Maljamar phase also marks the move from corner to side notched arrow points (Hughes 1991:28). Ceramics consist of a variety of local plain and corrugated brownwares as well as Jornada and El Paso brownwares (Boyd 1997:278; Hughes 1991:27).

Discussion

The above descriptions of the Lake Creek, Palo Duro, and Eastern Jornada Mogollon complexes characterize the transitionary nature of the Woodland period on the Southern Plains. Each cultural tradition demonstrates some affinity with earlier hunter-gatherer lifeways of the Late Archaic, and a shift to a more sedentary settlement pattern reflected in the construction of pithouses. The Plains Woodland period also marks the advent of ceramics, innovations in projectile point technologies, and the transition from pithouse to surface structures, although many Plains Village period houses maintained a semi-subterranean construction. In addition, the evidence of inter-regional trade relations during the Plains Woodland laid the groundwork for mutualism that continued into Plains Village times, although evidence of violent conflict is also common (Brooks 1994).

Of particular importance to my study at 41PT283 is the evidence of Woodland period ceramic and arrow point influence during the Antelope Creek phase and the potential for occupations from both components. All in all, the archaeological data from the Plains Woodland cultural traditions discussed above display a variety of adaptive strategies undoubtedly developed in response to changing social and ecological environments on the Southern Plains during the first millenium A.D.

Plains Village Cultures

Several archaeological complexes have been defined for the Southern Plains and adjacent regions during the Plains Village period. Many of these cultural traditions have been grouped into regional variants based on overlapping material assemblages, chronological sequences and physiographic settings. These include the Upper Canark variant (Lintz 1986a) consisting of the Antelope Creek phase of the Texas and Oklahoma Panhandles, the Buried City complex of the northeastern Texas Panhandle, and the Apishapa phase in southeastern Colorado; the Redbed Plains variant (Brooks and Drass 1996; Drass 1999), which includes the Custer and Turkey Creek phases in western Oklahoma, and the Paoli and Washita River phases in central and western Oklahoma; the Plains Border variant (Brosowske 2002; Brosowske and Bevitt 2006), comprising the Zimms Complex in extreme western Oklahoma and the Odessa phase of northwestern Oklahoma. Other Plains Village complexes include the Ochoa phase of the Eastern Jornada Mogollon complex in southeastern New Mexico and west Texas, and the Henrietta complex located in the southernmost portion of the Southern Plains.

The Upper Canark Variant

Lintz (1986a) proposes that the Upper Canark regional variant (A.D. 1100 – 1500) include Plains Village cultures located in the Canadian and Arkansas River basins. This regional variant consists of the Apishapa phase (A.D. 1100 – 1350) of southeast Colorado and the Antelope Creek and Buried City phases (A.D. 1200 – 1500) of the Oklahoma and Texas Panhandles. Such a concept recognizes cultural similarities and implies related origins for the Apishapa and Antelope Creek phases (Baugh 1994:277). Lintz (1986a) notes that certain Antelope Creek and Apishapa phase discontinuities, including less emphasis on farming and a corresponding assemblage difference (e.g., absence of bison scapula hoes) for the Apishapa phase exists. Gunnerson (1989) disagrees with the notion of related origins and maintains that the Apishapa phase represents the culmination of a local development labeled the Los Animas tradition that includes the earlier Granero phase and Apishapa phase. Given the geographic and temporal overlap of the Buried City complex with the Antelope Creek phase, it has been included in the Upper Canark regional variant.

Antelope Creek Phase (A.D. 1200 – 1500)

Antelope Creek refers to a group of Plains Village period sites on the Texas and Oklahoma Panhandles. From approximately A.D. 1200-1500, numerous settlements of the Antelope Creek culture were present along the Canadian and North Canadian Rivers and their primary tributaries. Antelope Creek sites are typically located atop terraces near main waterways. Large contiguous room villages are most common during the early sub-phase (A.D. 1200-1350) and are concentrated around the Alibates Flint National Monument near Fritch, Texas. Isolated homesteads dominate the late sub-phase (A.D. 1350-1500) and are generally found radiating westward from the Alibates quarry area. Temporary or seasonal encampments occur throughout the Antelope Creek phase and are found at lower elevations along inner valleys.

Settlement and Architecture

Antelope Creek architectural variation is categorized at three main levels: hamlets, homesteads, and subhomesteads (Lintz 1986a). The hamlet category consists of contiguous aggregate room forms that are prominent during the early sub-phase.

Examples of this group occur at Alibates Ruin 28 Unit I, Antelope Creek Ruin 22, Black Dog Village, and Saddleback Ruin. The second architectural type is composed of individual units or isolated homesteads that are common during the late sub-phase. This group can be found at the Jack Allen site, Lookout Ruin, 41PT109 on the Cross Bar Ranch (Weinstein 2005), and the Roper site. A third architectural type consisting of small isolated structures or subhomesteads is thought to occur during the early sub-phase. These are described as temporary encampments or “field huts” that may be subsidiaries to nearby permanent residences (Lintz 1986a:260). Features such as storage rooms, pits and cists are found at hamlet and homestead sites throughout the Antelope Creek phase, but are not found at subhomestead sites.

Lintz (1986a:89-133) categorizes Antelope Creek architectural units into eleven unit types and three miscellaneous types (Figure 6). The room structure categories were defined based on architectural variation observed across 28 Antelope Creek sites. The structures’ length-to-width ratios and associated feature attributes served as the main criteria. The individual architectural units occur as either isolated freestanding structures or as components of larger unit aggregates (Lintz 1986a:133). The most common architectural unit design observed at Antelope Creek sites is the Unit 1 Type (Lintz 1986a:89).

Unit Types 1 and 2 are considered habitation structures that served as nucleus rooms of a household cluster (Lintz 1986a:133). These units are semi-subterranean, square-to-rectangular in shape and contain a crouched entry tunnel along the eastern wall. The typical Unit Type 1 has a central depressed channel flanked on the north and south by elevated benches that parallel the structure’s long axis. Type 1 residences contain four central support posts, a prepared central hearth, and a raised platform or "altar" along the west wall. Type 2 Units resemble Type 1 in general external morphology, but differ in their absence of a central channel, flanking bench surfaces, centralized platforms and discrete storage features (Lintz 1986a:102).

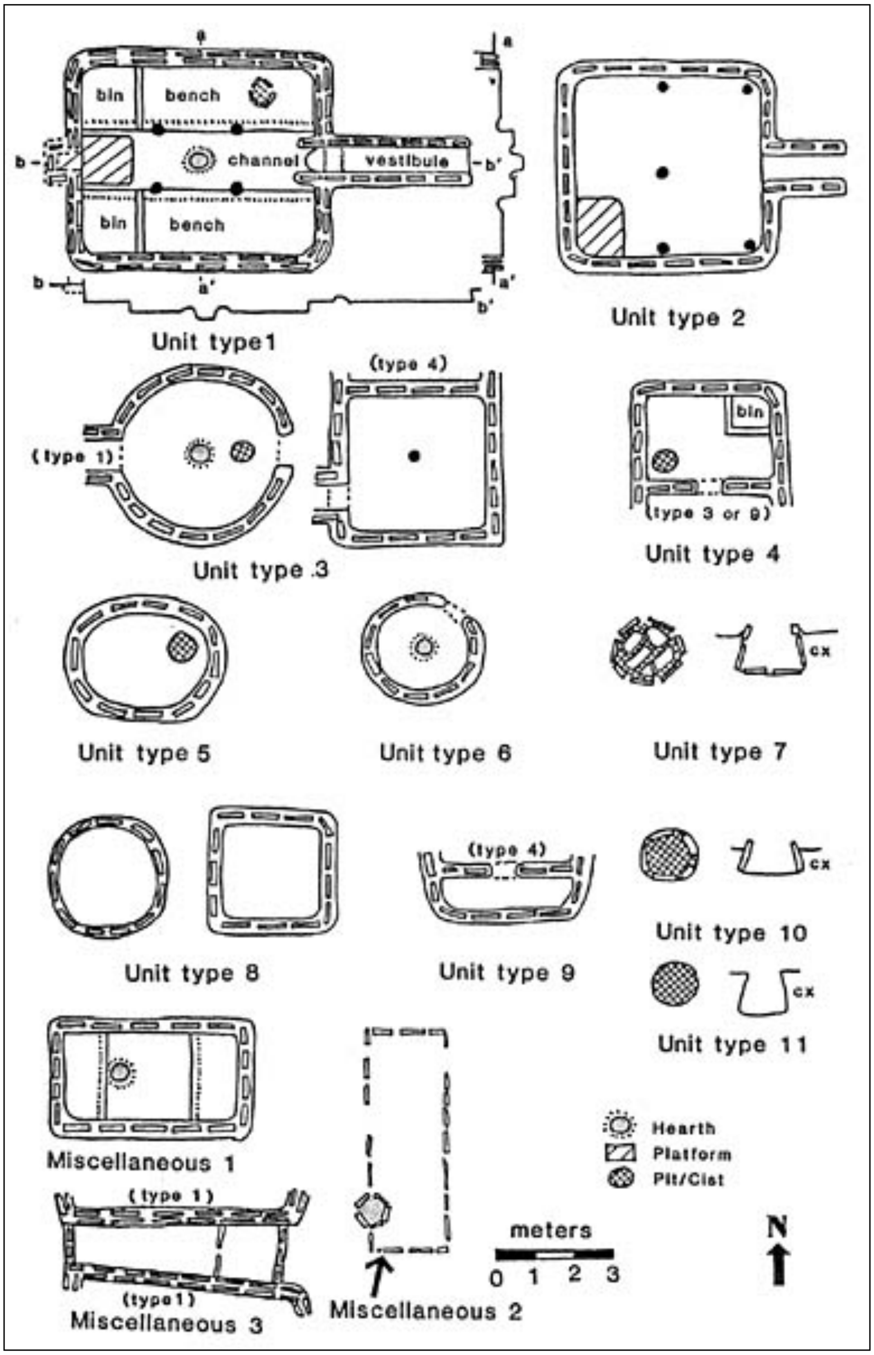

Figure 6. Antelope Creek architectural Unit Types (Lintz 1986:133).

The main living spaces among the large contiguous room hamlets are Unit 1 and 2 Types. According to Lintz (1986a:107), Unit Types 3 and 4 are quadrilateral and occur at subordinate or “anteroom” positions for Unit 1 Types in aggregate contexts. Lintz further explains the spatial positions of contiguous architectural units are rigidly patterned and reflect the basic household structure, which contrasts with the arbitrary nature in which isolated homesteads were erected. Aggregate sites typically have twenty or more habitation rooms. The architectural features found within the Unit Types at contiguous room villages are also found at the isolated structures of the late sub-phase.

Isolated homesteads are typically comprised of Unit Type 1 structures accompanied by smaller pit or storage features (Unit Types 7, 10, or 11). Unit Type 1 construction consists of excavating and preparing the internal floor. Since most of the structural payload occurs at the base of the unit, Antelope Creek peoples employed a range of wall footing styles involving flat dolomite stone slabs, adobe and occasionally picket-posts to reduce this stress point (Lintz 1986a:91). In general, wall foundations were formed with vertical stone slabs set against the wall of an excavated trench in single rows for freestanding structures and double rows for contiguous aggregate units.

Isolated Unit Type 1 and 2 settlements are typically situated atop high terraces, but an additional site category, the subhomestead, is restricted to bottomland areas of the Canadian River Valley. Subhomestead settlements consist of Unit Types 5, 6 or 8 that lack evidence of an associated dominant household room (Lintz 1986a:260). These sites have been dated to the earlier sub-phase. Their low topographic setting has been linked with horticulture activities, possibly serving as summer field camps situated close to crops (Lintz 1986a:260). These sites generally have low artifact densities and tradewares are scarce. Subhomesteads are believed to have been seasonally or continuously used over a relatively short period of time as ancillary sites to the other permanent high order Unit Type residences. According to Lintz (1986a:260) the dependent relationship of these sites is reflected in the faunal remains, indicating food sharing with permanent homestead residences.

Artifact Assemblages

Antelope Creek people made stone tools primarily from Alibates silicified dolomite or chert derived from natural outcroppings that occur in abundance in distinct areas along the Canadian River. Alibates chert is brightly color-banded and is a durable tool stone in its raw form. Common projectile point types include side and basally notched Fresno, Washita and Harrell varieties. Other chert items include end and side scrapers, diamond-beveled knives, awls, and bifacial preforms. Bison scapula tools have been associated with digging activities, but may have been used in other ways (Brosowske 2002:23; Huhnke 2000). The Antelope Creek tool kit indicates an economy focused on the hunting of bison and smaller mammals that was subsidized by wild plant foraging and small-scale horticulture. The occurrence of manos, metates, and fragmented maize cobs and cupules at Antelope Creek sites support this conclusion.

Borger Cordmarked ceramics also comprise the diagnostic artifacts of the Antelope Creek phase. Borger ceramic vessels consist of elongated to globular jars with short vertical to flaring rims that are 20-30 cm in height with orifice diameters ranging between 14-22 cm (Suhm and Jelks 1962:15). Paste tempers vary and are composed mainly of crushed quartz and sand as well as mica, bone, and grog. Borger jars have convex bases, and generally thin walls (5-6 mm) that are thinner near the base than the rim (Pertulla and Lintz 1995:204). Vessel rim and body portions are covered with fine vertically placed cord impressions along the upper body, which overlap near the base. Smoothed over cordmarked sherds are also common in Antelope Creek ceramic assemblages, which could reflect "personal touches by indigenous potters" (Lintz, personal communication 2015).

Borger Cordmarked vessels are considered utilitarian jars used for storage and cooking, which is evidenced by soot residue found on exterior surfaces. Cord marking of vessels may have been done to aid in the thermodynamic principles and strengthen the pot. This process may have also served as a texturing agent to improve handling of the vessel. The globular straight and flared rim vessels were produced by coiling ropes of clay, and the surfaces were treated with cord wrapped paddles when nearly dry. INAA paste sourcing of ceramics found at three Antelope Creek sites shows an overlap between large contiguous hamlets and small isolated homesteads, indicating a degree of intra-group exchange (Meier 2007). In general, Borger Cordmarked ceramics display close similarities with earlier Woodland ceramic traditions and are undeniably related (Pertulla and Lintz 1995:204).

Trade Items

Trade is thought to have increased during the late sub-phase, perhaps in response to environmental and sociopolitical change. However, the bulk of Antelope Creek materials identified as having been derived through trade comes primarily from larger village settlements (Vehik 2002:49). Non-local stone resources are also found at subhomesteads, but Southwestern ceramics and shell disc beads are absent (Lintz 1986a:158). Some of the typed Southwestern sherds found at homesteads and hamlets have been traced to eastern Pueblos and include St. Johns Polychrome, Agua Fria Glaze-on-red and San Lazaro Polychrome (Brosowske 2005:217).

Other exotic items found are turquoise, *olivella* shell beads and obsidian. Sourcing of obsidian from the Jemez Mountains of northern New Mexico links the Antelope Creek phase and the Southwest (Brosowske 2004). Evidence of interaction with Plains Village and Caddoan tradition members is considered to be rare; however, ceramics from the Plains are similar to Borger Cordmarked wares and make circumscribing intra-regional trade difficult (Vehik 2002:49). The increase of Antelope Creek settlement density along the western periphery of Alibates sources after A.D. 1350 may represent the value of this material as an item of trade.

Art and Symbolism

In comparison to architecture and artifact assemblages, little is known of Antelope Creek iconography. The majority of Antelope Creek rock art has been found at the large hamlets such as Alibates Ruin 28 located very near the Alibates Flint National Monument. These include petroglyphs depicting human footprints with six toes, human figures, quadrupeds, and bas-relief turtles. Also found are small rounded depressions or "cupules" inset into large boulders. These have been interpreted as utilitarian mortar basins, celestial representations, and implements for fertility rituals (Katz, personal communication 2016). Elbow and tubular pipes are relatively common along with occasional building stone and thin bifacial knives smeared with red hematite (Lintz 2010).

Mortuary Practice

Sample size and improper documentation of Antelope Creek mortality limits an understanding of their mortuary practices (Brooks 2004:343; Lintz 1984:164). Early surveys (Moorehead 1931) report the presence of cemetery areas near hamlets along Cottonwood, Tarbox and Alibates Creeks, but these have not been confirmed. According to Lintz (1986a:164), cemeteries away from hamlets were likely utilized, but the only detailed burial information currently available is from Big Blue Creek. Lintz observed that roughly half of the recorded Antelope Creek burials are found within or near structures, with the remainder occurring 50 to 100 m from architectural features. Burials within structures are most common in Type 1 architectural units with others occurring in Unit 5 and 8 Types (Lintz 1986a:165). These are found stratigraphically above floor surfaces, indicating they were interred at the time of abandonment.

Typical Antelope Creek burials consist of flexed or semi-flexed individuals in shallow graves below pilings of rocks (Brooks 2004:343). Local grave goods consist of utilitarian materials such as projectile points, cordmarked pots, and bone antler tools. The most common exotic grave goods are *olivella* shell beads, but also include disc shell and turquoise beads from the Southwest (Lintz 1986a:173). Locally made grave goods are equally common with men, women and children, but the vast majority of the exotic goods are found with women and children (Lintz 1986a:173). When present, utilitarian mortuary goods reflect sexual divisions of labor. Tools associated with females reflect hide working and horticultural activities whereas those found with males represent hunting or butchering activities. The mortuary data suggests that Antelope Creek sociopolitical organization was egalitarian with status based on achievement and leadership abilities (Brooks 1994:36).

There is evidence for conflict during the late sub-phase of Antelope Creek (A.D. 1350 – 1500). Bioarchaeological studies of burials from Antelope Creek Ruin 22 and the Footprint Site revealed skeletal trauma suggestive of violent death (Brooks 1994). The possible burning of structures and taking of trophy heads by raiding parties also supports this pattern. However, it remains unclear whether this represents a pervasive pattern or infrequent occurrences (Brooks 1994:38).

Apishapa Phase (A.D. 1000 – 1350)

Sites from the Apishapa phase are found along the Apishapa River, a southern tributary of the Arkansas River in southeastern Colorado. The available absolute dates suggest a span from about A.D. 1000-1350 for the Apishapa phase (Lintz 1986a:27), which is similar to Antelope Creek in the presence of masonry architecture and some aspects of material culture (Brooks 2004:334). The Apishapa phase has been summarized by Campbell (1969), Ireland (1968), Lintz (1986a) and Gunnerson (1987, 1989) and associated with the Plains Village period. However, recent studies (Huffman and Early, in press) argue instead that Apishapa people represent an eastern extension of the Great Basin Desert Culture. Type-sites for this phase include Snake Blakeslee I (Chase 1951), Pyeatt Rockshelter, Umbart Cave and Steamboat Island Fort (Campbell 1969) among others.

Settlement and Architecture

Apishapa phase sites are usually located close to both water and canyon bottomlands (Gunnerson 1987:89). Settlements include rockshelters, temporary camps and open settlements ranging from the more common single room slabhouses to villages of nearly 60 rooms (Brooks 1989:82). Villages are often situated on mesas or in upper canyon areas and are characterized by masonry structures made of contiguous horizontal and vertical stone slabs. Apishapa architectural features are best known from the stone enclosure sites. Lintz (1986a:28) notes that although the stone slab architecture is similar to Antelope Creek house forms, rectangular shaped rooms are rare, consisting mostly of circular designs although oval, semicircular and D-shaped floors also occur to accommodate topography and other existing features. Lintz further explains that structural floors usually correspond to the natural ground surface and few interior features such as hearths and roof supports have been found. Definable entryways are present at only a few rooms, indicating that access may have been gained above the foundation level (Lintz 1986a:28). Several of the stone enclosure sites sit atop steep towers, buttes, vents or occur along isolated mesa points with stone perimeters walls encompassing several structures, adding to the emphasis on defensible or fortified settlements (Campbell 1969; Lintz 1986a; Gunnerson 1987; Brooks 1989; Baugh 1994).

The relationship between the stone enclosures and rockshelters within the Apishapa settlement pattern is unclear, but likely reflect an opportunistic exploitation of the natural landscape. The numerous rockshelters in the Chaquaqua region were used with or without additional modification and only a third of the shelters with Apishapa materials have interior barrier walls (Lintz 1986a:28). These consist of a single course of stone likely used to weight down brush walls or partitions. Little information exists on storage pits or other internal or external features at Apishapa villages, which may be a reflection of only marginal involvement with agriculture (Brooks 1989:82). According to Baugh (1994:278), with the absence of sizable middens, year-round habitation at any one site seems unlikely, but rather represent base camps to which hunter-gatherers were tethered. Others believe these sites may be associated with more efficient plant collection and storage techniques rather than horticultural practices (Zier et al. 1988 cited in Baugh 1994:278).

Subsistence

According to Lintz (1986a:28), Apishapa subsistence practices reflect a combination of generalized foraging and horticultural activities. Brooks (1989:83) suggests hunting and gathering supplemented by small-scale gardening. The reduced importance of horticulture compared to the Antelope Creek people is attested to the small recovered quantities of tropical cultigens, the relative absence of agricultural tools and Apishapa villages' distance from the fertile terrace soils of the river valleys (Brooks 1989:83). Were it not for the recovery of corn, beans and gourds cultigens in rockshelters, inferences regarding Apishapa horticulture would not be possible (Lintz 1986a:28; Brooks 1989:83). Edible wild plants collected consist of choke cherry, wild plum, grape, yucca, cactus, and pinon (Brooks 1989:83). Animals hunted include deer, antelope and occasionally bison and smaller game such as cottontail and jackrabbit, prairie dog, gopher and rat (Lintz 1986a:28; Brooks 1989:83).

Artifact Assemblages

The Apishapa phase stone tool assemblage resembles that of the Antelope Creek in the presence of small side-notched Harrell and Washita types. Fresno projectile points, bifacial and unifacial knives, snub nose scrapers, drills and modified flakes also occur. Notably absent, however, are diamond-beveled knives and the pin and T-shaped drill varieties found in the Antelope Creek phase (Brooks 1989:83; Lintz 1986a:29). Additionally, most of the implements are made of local cherts, jaspers and quartzites with Alibates comprising a small percentage of the stone tool assemblage (Brooks 1989:83). According to Baugh (1994:278-279), the presence of Alibates chert from the Texas Panhandle and Medicine Creek jasper from southern Nebraska attest to intra-Plains trade while small quantities of obsidian provide evidence for interregional exchange with Puebloan groups. The most common bone tool forms are deer metapodial shaft wrenches and a variety of awls including splinter, split metatarsal, modified ulna and a distinctive diamond-shaped awl (Brooks 1989:83).

Brooks (1989:83) explains, ceramics are the major clay items although unfired figurines are also thought to occur at Apishapa phase sites. Typical Apishapa pottery vessels are globular cordmarked jars somewhat similar to Antelope Creek wares although they exhibit less decoration in the form of nodes, appliques strips and lip tabs (Brooks 1989:83). Southwestern traded wares such as Santa Fe and Galisteo Black-on-White sherds and Taos Plain sherds have also been found. Southwestern sherds from the Snake Blakeslee site include Talpa and Rowe Black-on-White (Gunnerson 1989:57).

Apishapa rockshelter occupations in the Chaquaqua Plateau have afforded the preservation of perishable artifacts. Items such as sandals, basketry, mats, feathered blankets, skin bags, cordage, snares and a variety of other goods have been found. In addition to ceramics, other trade goods of Southwestern origin include Olivella and Neogastropodia shell beads and marine shell pendants (Brooks 1989:83).

Mortuary Practice

Based on the few-recorded burials, Apishapa mortuary practices are reminiscent of the Antelope Creek phase and typically represent single interments in a shallow pit (Brooks 1989:83). However, one grave from site 5LA81 contained the remains of two individuals (Lintz 1986a:28). The interred are usually placed in a flexed position and are not generally accompanied by grave goods. Apishapa burials are located in open areas, rockshelters or under house floors. Based on the existing data, there appears to have been little status differentiation within Apishapa populations (Brooks 1989:83).

Buried City Complex (A.D. 1150 – 1400)

As one moves away from the Alibates quarry area, (i.e., the Antelope Creek core area), related but slightly different variations occur (Baugh 1994:280). One variation is found in more northern tributaries of the Canadian River in the Wolf Creek valley known as the Buried City complex. Located in the northeastern corner of the Texas Panhandle, this complex extends from south of present-day Perrytown in Ochiltree County, Texas to western Oklahoma. Hughes and Hughes-Jones (1987:105) suggest a temporal range of A.D. 1150 – 1400 for Buried City, making it contemporaneous with the Antelope Creek. The Buried City complex consists of multiple ruins of villages, including the Handley Ruins, Courson Ruins, Kit Courson Ruins and Gould Ruins that were settled along Wolf Creek.

Much like the Antelope Creek phase, Buried City has undergone an extensive evolution in interpretation and taxonomy since its initial discovery during historic times. The Handley Ruin site was investigated by T.L. Eyerly (1912) during his initial work in the Wolf Creek valley between 1907 and 1912. Eyerly's early work at this site is considered by Hughes to be the first formal archaeological investigations in Texas, and he was also the first to take note of the vertically set stone slabs within the house walls (Brooks 2004:332). Moorehead revisited Buried City in 1921 and interpreted the common characteristics of the stone structures as "the beginning of architecture in stone in the Southwest" (Moorehead 1921:8). He also inferred, "from the use of stone to hold down the tipi or brush covered lodge, to use of more stones, is a step the intelligent Indian soon took" (Moorehead 1921:9). However, Moorehead was cautious to associate the architectural style as purely Pueblo due to the lack of "true Pueblo-Cliff Dweller pottery" found at any of the Canadian River valley sites visited by his party.

Architecture

Buried City architecture differs significantly from that known at other Plains villager sites in the Texas Panhandle and adjacent areas (Hughes 2004). The houses built at Buried City consist of small pithouses 2 to 3 meters in diameter, larger circular pithouses up to 5 meters in diameter, simple surface structures and large stone-based houses. These larger structures were constructed using picket-posts where walls were formed using closely spaced upright pickets set into the walls of a perimeter trench and woven together with thin sticks and vines and then plastered over (Hughes 2004). The pickets were placed in two parallel rows inset along the walls of the trench and the center void was filled with earthen fill, allowing for added structural support.

This architecture style contrasts with the characteristic Antelope Creek Unit Type 1 variety defined by Lintz (1986a). Unit Type 1 wall foundations most often consist of one or two tiers of double rows of vertical stone slabs with rubble-filled cores, a single row of vertical slabs, or lack of evidence of internal adobe support (Lintz 1986a:91). In contrast to stone slabs, Buried City foundations contained boulders along the lower core of the wall to stabilize the walls and keep the pickets from collapsing.

There are also notable differences in the treatments of interior components between the primary Buried City dwellings and Antelope Creek structures. Although both contain eastern entryways, a central channel with a hearth surrounded by four large wooden support posts, and benches along the north, south and western walls, the edges of the Buried City benches were plastered with caliche mud and lack the raised lips that occur along the edges of the benches in many Antelope Creek Phase houses (Hughes 2004). While stone-based structures represent the largest and most elaborate dwelling at Buried City, there are other less intricate variants that occur at the village, which is similar to the variation observed in the lesser unit types described by Lintz (1986a).

While the presence of pithouses were acknowledge at Buried City (Hughes 2001; Brosowske and Maki 2002), Quigg (2013) points out that the term pithouse has also been used to describe dwellings at numerous other Antelope Creek core area sites, like Black Dog Village (Keller 1975). However, there is a notable absence of the term in Lintz's 11 Unit Type descriptions. Quigg has expressed a need for more emphasis on the evidence of pithouses at Plains Village site, indicating its potential for further understanding the variability of settlement patterns over time.

Artifact Assemblages

Baugh (1994:281, 282) denotes similarities in the material assemblages, especially in terms of lithic and bone artifacts, but contends Buried City pottery is the most distinctive artifact in comparison to the Antelope Creek phase. According to Hughes (2002:1), "Buried City pottery includes cordmarked, smooth-surface, and smoothed-over cord marked finishes; vessel forms are globular jars with rounded bottoms and no definable base sherds other than apparent abrasion of the cord impression on vessel bases." Based on his comparison of their site-specific ceramic assemblages, Hughes noted the exclusive presence of Borger Cordmarked ceramics with no decorative elements at Alibates Ruin 28. Out of the 5,780 sherds from six Buried City sites, 52% were cordmarked, 28% were smoothed-over cordmarked, 16% were plainware and 4% were decorated. In his conclusion, Hughes (2002:3) stated, "that Buried City pottery and Borger Cordmarked are similar in the same way that Buried City houses are similar to Antelope Creek houses: only in the broadest outlines." However, Lintz (personal communication 2015) contends that Antelope Creek people also made ceramics with variable surface treatments, including smoothed-over cordmarked surfaces

Discussion

Published information on Upper Canark sites shows a wide diversity in architectural features and village patterns, which are still not well understood. Lintz (1986a) attributes variability in architectural forms to functional differences, engineering constraints and changes in design strategies over time. Although the distinctions that previously existed between the Antelope Creek phase and the Optima focus in Oklahoma (Watson 1950) have been resolved by the placement of the latter phase within the former, additional problems remain. The most critical of these concerns the distinctions in architecture, material culture and subsistence methods between the Buried City complex, the Apishapa phase and the Antelope Creek phase. Brooks (1989:80) suggests, until these problems are more fully resolved, it is perhaps better to view each of these manifestations as a separate entity within the broader context of the Upper Canark regional pattern.

The Redbed Plains Variant

Initial definitions and analysis of the Custer and Washita River complexes were re-evaluated by Drass (1997, 1999) using data from Plains villager sites in central and western Oklahoma. Based on radiocarbon dates, variation in assemblages, settlement patterns and subsistence activities, four temporally and spatially distinct but related complexes have been identified and re-classified. The Paoli phase (A.D. 800 – 1250) represents the initial sedentary occupation of the Washita and Canadian River valleys in central Oklahoma and developed from the local Plains Woodland groups ancestral to the Washita River phase (A.D. 1250 – 1450). The Custer phase represents early village sites in the mixed grass prairies of western Oklahoma that developed into the Turkey Creek phase along a similar continuum as the Washita River and Paoli phases. Drass (1999) proposed the Redbed Plains variant to encompass this four phase cultural continuum into a regional variant that dates from around A.D. 800 to A.D. 1450. The Redbed Plains regional variant represents general interrelationship in the settlement and material culture when compared to other archaeological manifestations in adjacent areas of the Southern Plains such as the Antelope Creek and Zimms complexes.

Paoli (A.D. 800 – 1250) and Washita River (A.D. 1250 – 1450)

The Grant site (Brooks 1989) and Arthur site (Sharrock 1961) are the best-documented Washita River phase sites, but several others are attributed to this period (Drass 1999:123). Excavations at several of these villages located in the Washita River basin revealed artifacts generally associated with earlier Plains villagers. However, instead of presuming a correlation with the earlier Custer sites to the west, evaluations of their diagnostic artifacts such as projectile points and ceramics, combined with radiocarbon dates, revealed a gradual change in styles and technologies from the Woodland period through the Paoli and into the Washita River phase. According to Drass (1999:127), assemblages from the early Paoli phase villages provide some of the best evidence of continuity between early Plains Woodland groups and later Washita River phase groups in central Oklahoma. Drass also notes that the corner-notched arrow and dart points common at Plains Woodland sites become less frequent through time, with triangular side and unnotched arrow points becoming predominant by the Washita River phase. The Paoli phase projectile points fit nicely as an intermediary with predominantly corner and side-notched arrow points while a few dart points and unnotched arrow points are also found.

Pottery also exhibits a similar local evolution throughout the Woodland to Washita components. A gradual move from a representative Woodland cordmarked to smoothed-surfaced Washita River pottery is evident in the Paoli phase assemblages. Drass (1999:129) observes that this change is accompanied by technological and stylistic developments in the use of temper and vessel shape as the unshouldered conical jars of the Woodland period are gradually replaced by rounded and flat-bottomed jars. He also notes that the decrease in use of cordmarked vessels is correlated with an increase in use of crushed stone and shell tempering at later Paoli sites and shell tempered globular jars such as Nocona Plain at many Washita River phase sites. Drass (1999:133) summarizes the Paoli-Washita River phases as related cultural units reflecting the rise and development of a sedentary, bison hunting-horticultural society centered in the middle Washita and nearby Canadian River basins.

Custer (A.D. 800 – 1250) and Turkey Creek (A.D. 1250 – 1450)

To the northwest of the Paoli-Washita River phases lie clusters of the Custer and Turkey Creek phases of the Redbed Plains variant. Hofman (1978) reviewed Bell and Baerreis's (1951) Custer focus and defined it as a phase, refined its temporal range and expanded its distribution eastward towards central Oklahoma. According to Drass (1999:134), this definition of the Custer phase incorporates Hofman's temporal range but otherwise varies little from Bell and Baerreis's original description. Drass explains that although sites such as Linville II, Mouse and Edwards II resemble Paoli phase villages in central Oklahoma, there are apparent differences in artifacts, settlement and subsistence that likely reflect a local adaptation to the mixed grass prairies and influences from other groups further west.

Later villages along the western outskirts of Custer sites have traditionally been lumped with Washita River farther east (Hofman 1978a; Brooks 1989), but Drass's (1999) evaluation of assemblages, features and subsistence activities indicates that these west-central villages differ from those from central Oklahoma. Drass noted parallels between the temporal adaptations observed at central Paoli-Washita River sites and those observed in western Oklahoma. Based on his observations from sites such as Heerwald, McLemore and Goodman I found along Turkey Creek and other west-central streams, Drass classified these Custer phase changes as the Turkey Creek phase.

Drass observed similarities in artifact assemblages between the contemporaneous Turkey Creek and Washita River phases, but also noted some regional variation in regards to ceramics. While changes from thick cordmarked to thin smoothed wares were observed in western villages (e.g., Paoli-Washita River), cordmarking continued as a significant part of ceramic assemblages at Turkey Creek sites dating after A.D. 1300 (Drass 1999:135). This may be a reflection of a western influence given the exclusive presence of cordmarked pottery at many Antelope Creek sites. Projectile point styles are consistent from east to west from corner and side-notched to unnotched arrow points documented through time in both areas; however, Drass (1999:135) claims the Frisco chert used at many Washita River sites is not found at Custer and Turkey Creek phase sites which are dominated by more locally occurring Alibates materials.

A degree of settlement variability has been observed between Custer and Turkey Creek sites. While there is evidence of bison exploitation during both phases, presumably due to the mixed grass prairie setting, settlement patterns over time suggest an increased reliance on the procurement of this animal. Although villages are consistently settled along tributaries and river valleys that provide reliable resources such as bison, good water and arable land, the presence of camps at higher elevations during the Turkey Creek phase may reflect an increased emphasis on bison hunting with camps and processing stations situated closer to upland prairie settings where bison may have been more common (Drass 1999:136).

Discussion

Once believed to be a temporal and spatial transition from Woodland to Custer to Washita River, further comprehensive evaluations incorporating relative and absolute dating methods helped establish the Redbed Plains Variant. This regional variant characterizes the Paoli-Washita River and Custer-Turkey Creek phases in terms of origin, distribution, chronology, and technology. Given the success of such investigations, emphasis has been given for the need for similar relationship studies such as those between the western Oklahoma Zimms complex, which overlaps with the Turkey Creek and Antelope Creek phases.

The Plains Border Variant

The Plains Border Variant is defined for northwest Oklahoma, southwest Kansas and the eastern reaches of the Texas Panhandle (Brosowske 2002; Brosowske and Bevitt 2006). The cultural traditions that comprise this regional variant include the Zimms complex, Odessa phase, and Pratt and Bluff Creek complexes. The temporal span for these groups is A.D. 1100-1500 and is often referred to as the Middle Ceramic period of the Southern Plains (Brosowske and Bevitt 2006). According to Brosowske and Bevitt (2006:180), the Plains Border Variant shares many similarities with the Central Plains village societies and the frequent use of Alibates indicates trade relationships with Antelope Creek populations to the south. The overall material remains left by Plains Border groups suggest that this portion of the region represents an important transitional area. The following descriptions are limited to the Zimms complex and Odessa phase given their temporal and spatial proximities to the Antelope Creek phase.

Zimms Complex (A.D. 1265-1425)

This archaeological complex is found in the Washita River basin along the western edge of the mixed grass prairies in far western Oklahoma. According to Brosowske (2002:20), the Zimms complex is not well understood due to the fact that few sites have been identified and subsequently excavated and studied. The limited evidence available suggests that scattered Zimms groups occupied small seasonal hamlets or isolated homesteads and relied on hunting and gathering possibly supplemented by sporadic gardening to meet subsistence needs (Brooks et al. 1992:61).

In general, the Zimms complex is thought to represent a conglomeration of traits from Antelope Creek groups to the west and the Redbed Plains Variant groups (i.e., Turkey Creek and Washita River) found in the prairies to the east (Drass and Turner 1989:26). According to Brooks et al. (1992:61), four corrected radiocarbon dates and one archaeomagnetic date from the Zimms site place the range of this complex between A.D. 1265 and 1425. Sites attributed to the complex include Zimms (Flynn 1984, 1986), New Smith (Brooks et al. 1992; Moore 1984), Hedding (Shaeffer 1965; Drass 1989, 1995), Wickham #3 (Wallis 1984), Blackketter-Pyeatts (Moore 1984), Chalfant (Briscoe 1993), and Lamb-Miller (Moore 1988).

Although some structures excavated at Zimms and Hedding are semi-subterranean with central, depressed floor channels and a raised platform along the west wall, Zimms houses show an absence of the stone slab characteristic of Antelope Creek architecture. In addition to divergent architecture, the exclusive presence of Quartermaster Plain and absence of cordmarked ceramics at Zimms sites makes them culturally distinct from the coeval Antelope Creek groups to the west.

Mortuary Practice

Distinct mortuary practices of the Zimms Complex have been observed at the New Smith and Wickham #3 sites. The structures observed at these mortuary sites contain no central support posts, prepared floors with domestic debris, hearths or fragments of wall daub. At New Smith, masses of burned grass found atop the remains of one structure indicate a thatched roof and investigations along the margins of both structures yielded no evidence of a wall (Brooks et al. 1992:64). Unaligned structural post molds and charred sections of logs are also reported along structure perimeters at both sites as well as external pits with light loadings of fill, faunal remains, discarded tools and manufacturing debris.

At New Smith, eight shallow pits, oval and circular in outline, were observed outside the structures. Brooks et al. (1992:69) believe that most of the depressions functioned as trash-filled roasting pits while some served as storage facilities that were subsequently filled with trash. These pits yielded several varieties of large and small fauna including bison, white-tailed deer, rabbit, prairie dog, cotton rat, pocket gopher, ornate box turtle, snake, fish and bird. Artifacts recovered from the external pits include small to moderate amounts of lithic and ceramic debris. The observed internal pits contain human burials with grave offerings.

The New Smith excavations recovered one adult male, one adult female and a child buried in individual internal pits. The adult female contained an alternately beveled knife, a plain smooth-surfaced pottery sherd and several fragments of mussel shell. Grave goods associate with the child burial include a necklace of Olivella shell beads, several mussel shell fragments, two quartzite cobble sections, one bison metatarsal and one box turtle humerus (Brooks et al. 1992:67). The child appeared to be covered by a woven big bluestem mat. No artifacts were observed in association with the adult male; however, the burial was badly disturbed from mechanized land clearing, leaving only the lower limbs *in situ*.

Based on the architectural and archaeological evidence, Brooks et al. (1992:59) proposed that two wooden arbors were built over the burial features at New Smith and that the site functioned as a ceremonial center affiliated with the larger Zimms village site located approximately 350 meters to the west. Similar burial features have been documented for historic Wichita and Caddo tribes (Bell et al. 1967; Swanton 1942). According to Brooks (1989:85), Zimms interments are suggestive of a pattern quite different from those of the Antelope Creek or the Washita River/Turkey Creek phase.

Subsistence

Brooks et al. (1992:72) note the only site in western Oklahoma exhibiting similar archaeological context to New Smith is Wickham #3. They explain that the similarities between the two sites have increased significance due to marked similarities in the human remains in respect to skeletal morphology, dental patterns and pathological conditions. The overall indication from the dental pathologies observed at the Zimms Complex burial sites is a primary reliance on game for subsistence. The low rates of dental caries observed in human remains from the New Smith and Wickham #3 sites are similar to that of non-horticultural populations and suggests that horticulture was not important (Brooks et al. 1992:68). However, the primary faunal resources recovered from pits at New Smith are ornate box turtle and cotton rat and not believed to represent subsistence practices, but instead are probably indicative of specialized ceremonies carried out as part of the mortuary activities associated with the burial of the three individuals (Brooks et al. 1992:72). This contrasts with the primary occurrence of bison, deer, prairie dog, and cottontail remains at the neighboring Zimms village site.

Overall, Flynn (1984:276) suggests that the Zimms assemblage indicates a generalized hunting and gathering strategy supplemented by horticulture. Although there is no direct evidence for horticulture in the form of preserved plant remains from the site, the presence of one bison scapula and one bison tibia presumed to be digging tools suggests that horticulture may have been practiced. Given the degree of evidence for game hunting, however, these may have been used as excavation tools, rather than horticultural implements (Brosowske 2002:25).

Lithic Assemblage

Lithic materials represented at the New Smith and Zimms site include Ogallala quartzite, unidentified quartizite, sandstone, unidentified chert, Alibates, Tecovas, Day Creek, Florence-A, Edwards and petrified wood (Brosowske 2002:25). Another feature of the chipped stone assemblage is the preponderance of high quality local Day Creek and Alibates silicified dolomite, and non-local Florence-A and Edwards cherts for the production of stone tools at New Smith (Brooks et al. 1992:69).

The majority of the Alibates and Tecovas material from the Zimms site retain cortex indicative of procurement from local stream cobble sources (Flynn 1986:Table 1). The presence of some fine-grained, nonlocal cherts also suggests important trade networks to the west and northeast. In particular, Florence-A chert originating in north-central Oklahoma and south-central Kansas suggests trade networks or travel to the northeast (Flynn 1986:135). Interaction with groups to the west is also suggested by relatively high frequencies of Alibates and Tecovas cherts obtained from bedrock sources and the presence of obsidian flakes. The occurrence of obsidian, although minimal, provides the only evidence for southwestern trade at the site (Flynn 1986:135).

The Hedding site is dominated by local Day Creek materials and non-local materials including Alibates, Florence-A, Wreford and Edwards cherts (Brosowske 2002:28). Overall, the diagnostic stone tools at Zimms Complex sites are typical Plains Village assemblages, but exhibit a degree of variability of raw material usage. This may reflect high levels of mobility associated with a subsistence economy focused on hunting mobile herds of game and gathering wild seasonal plant foods.

Architecture

The architectural similarities noted at the Zimms and Hedding sites (Drass 1989; Flynn 1986) are representative of the Zimms complex. As mentioned previously, many Zimms complex architecture characteristics overlap with Antelope Creek Unit 1 Types to the west, but discrete details allow a distinction between the two groups' architectural styles. Shaeffer (1965) conducted initial investigations at Hedding and noted a burned wattle and daub structure (House #2) that was rectangular, and subterranean with an eastern entryway. Structural characteristics at the Zimms site that show similarities with Antelope Creek include internal roof supports, a central hearth and raised wall platforms that encompass a depressed channel that runs east-west through the dwelling.

An additional characteristic common to Antelope Creek structures but lacking at the Zimms site is the use of adobe mortar with stone slab reinforcements in wall construction (Flynn 1986:136). However, the use of stone slabs commonly occurs in archaeological remains that are located on or near dolomite out crops in the Texas

Panhandle where such stone is readily available (Flynn 1986:136). While Zimms complex architecture implies a local variation of the Antelope Creek house form, the absence of cordmarked pottery and minimal use of Alibates materials in stone tool production attest to an intensive use of local materials and ceramic traditions.

When compared to neighboring Turkey Creek and Washita River structures to the east, Zimms houses display few similarities beyond the presence of a central hearth, internal support posts and the use of wattle and daub in their construction. However, the material cultures of the two groups share many similarities exhibited by the exclusive use of Quartermaster Plain wares and the presence of small side and unnotched projectile points and scraping tools produced from a variety of local and non-local materials. The similarities and discrepancies observed between the Zimms Complex and its eastern and western neighbors are to be expected given its location in time and space. Given the notion of a conglomeration of traits from Antelope Creek groups to the west and Turkey Creek groups to the east, additional investigations in this region of western Oklahoma are necessary to better understand the extent of these affiliations. Based on the data currently available, the Zimms cultural exclusivity is manifested in the presence of unique and shared individual traits with neighboring groups.

Discussion

Brosowske (2002) notes two possibilities for the observed Zimms complex adaptations. The first is that the area was occupied by indigenous populations that were culturally distinct from those around them but possess material economies or architectural traditions that reflect influence from numerically, economically, and politically more powerful neighboring groups (Brosowske 2002:36, 37). In this scenario, cultural assemblages appear most similar to the closest, the largest or most influential neighboring populations. Another option is that the current Zimms area represents a frontier or buffer zone that was not owned or controlled by any one group, but was available for use by a number of neighboring populations for brief hunting and gathering excursions or relatively short term occupation as populations periodically expanded and contracted (Brosowske 2002:37). In this setting, it is possible that favored site locations, such as resource rich areas near springs, could potentially contain multiple occupations by a number of materially distinct groups. Brosowske (2002:37) claims a similar result could occur if the area represented a shared buffer zone in which different groups periodically occupied the area during times of resource scarcity.

Odessa Phase (A.D. 1250 – 1475)

Odessa phase sites occur from southwest Kansas, across northwestern Oklahoma and into adjacent areas of the Texas Panhandle. Thirty-four radiocarbon dates and systematic excavations at nine different sites indicate an occupation from A.D. 1250 – 1475 (Brosowske and Bevitt 2006:182). Odessa phase sites include Lundeen, Lonker, Odessa Yates, Sprague, Schwab and Miller. According to Brosowske and Bevitt (2006:182), sites attributed to the Buried City complex and previously included in the Antelope Creek phase are also included in the Odessa phase.

Settlement and Subsistence

Odessa phase settlement is comprised of a dual pattern of homesteads and extended villages. Brosowske and Bevitt (2006:182) claim the presence of domestic structures, cache pits, substantial middens and burials support the idea that each of these site types was a permanent settlement. Radiocarbon dates suggest that numerous homesteads and extended villages were contemporaneously occupied between A.D. 1250 and 1350 (Brosowske and Bevitt 2006:184). Odessa phase homesteads are situated atop low terraces overlooking small to large drainages and are invariably located adjacent to perennial springs and small patches of fertile soil (Brosowske and Bevitt 2006:183). Extended villages occur in southern portions of the distribution, consisting of densely concentrated sites of all sizes that occur along the Clear, Duck Pond, Kiowa, Sand and Wolf creeks.

Brosowske and Bevitt (2006:184) contend that aggregate populations along upland margins of distribution areas were also necessary to defend or maintain claims to productive soils, horticultural fields, bison pounds, storage facilities, trade routes and other valued resources. Given their relationships through time and space, Brooks (1994) postulates that Odessa phase groups may not have maintained cordial relations with their Antelope Creek neighbors. Beyond the notions of settlement defensibility, Odessa occupations are likely reflective of economic strategies that made use of a variety of readily available resources, including bison and other game animals, wild edibles, potable water and arable lands for small-scale farming.

The occurrence of Odessa phase habitation sites near agriculturally productive stream terraces supports the notion that these populations depended on horticulture. The floral and faunal evidence from well-dated contexts at Lundeen, Lonker, Odessa Yates, Miller and several other sites along Wolf Creek indicate that while all settlements were reliant on a mixture of cultivated and wild plants, a great deal of variability seems to exist among resident hunting economies (Brosowske and Bevitt 2006:186). The abundance of subterranean storage facilities suggests that all Odessa populations were heavily dependent on horticulture. While groups utilized a variety of wild plants, domesticated species present include corn, beans, squash, marsh elder and sunflower.

Substantial differences in hunting strategies exist among homesteads and large extended villages (Brosowske and Bevitt 2006:186). At small sites, hunting appears to have focused on a broad range of species with nearly every animal found in the region represented in the faunal inventory. In contrast, faunal assemblages from extended villages display little species diversity and are dominated by bison, suggesting that all portions were transported back to villages and intensively processed for marrow and bone grease (Brosowske and Bevitt 2006:187).

Architecture

The primary domestic house forms observed at Odessa phase sites are oval to circular subterranean pit structures (Brosowske and Bevitt 2006:184). According to Brosowske (1999:2), one completely excavated structure at the Odessa Yates is likely typical of the phase. This house contained two large central posts with smaller posts closely spaced around the perimeter and a small basin-shaped hearth along a pit wall (Brosowske and Bevitt 2006:184). A second distinct house form has been identified at several Odessa phase sites and consist of shallow pithouses that have basin-shaped hearths located off center, a central post, and in some cases posts along the perimeter. Roof configurations for this and other Odessa phase houses remain unknown as all of the structures appear to have been dismantled with posts and beams salvaged for future use (Brosowske and Bevitt 2006:184). Following abandonment, houses were typically backfilled with trash, indicating organized movement across the landscape likely reflective of variable food resource availability.

Brosowske and Bevitt (2006:184) suggest that Odessa phase sites occur at the Buried City locality based on the presence of the pithouses described above and large square surface structures outlined in stone. Brosowske and Maki (2002) suggest that pithouses are widespread at Buried City and probably represent the dominant house form. Brosowske and Bevitt (2006:186) claim that given the close proximity of this locality to the Antelope Creek phase area, some form of competitive emulation or simply the diffusion of ideas may be indicated.

Artifact Assemblages

The utilized lithic raw materials, percentages of decorated ceramics and the near ubiquitous presence of Southwestern trade items help differentiate Odessa phase sites from other Middle Ceramic groups to the west, south and southeast (Brosowske and Bevitt 2006:188). While lithic assemblages from Upper Canark and Redbed Variant sites are dominated by Alibates or local materials (Drass 1997; Lintz 1986a), Odessa phase assemblages contain a combination of Alibates and Smoky Hill jasper with various local and nonlocal materials rounding out the remaining portion of the assemblage (Browsowske and Bevitt 2006:188). The usual suite of Plains Village tradition tool forms comprise Odessa inventories and include diamond beveled knives, triangular projectile points, distal endscrapers, drills, bison tibia and scapula digging tools, bone awls and abrading stones.

The Odessa ceramic assemblage is characterized by globular cordmarked vessels with vertical to flaring rims that are frequently decorated using a variety of techniques.

According to Brosowske and Bevitt (2006:188), the most common are finger-pinching or finger-impressed and parallel impressed lines along the neck and rim. Surface treatment varies from unmodified to completely cordmarked, although some examples of corncob impressions are also present. Tempers most often consist of sand but also include bone, crushed stone, grog and grit.

Trade and Exchange

Brosowske and Bevitt (2006:190) observed that the Middle Ceramic period marks the beginning of widespread inter-societal exchange in the region most readily seen in an increased reliance on specialized stone tools produced from high quality materials. This coincides with the establishment of large permanent settlements near important quarries of the region where groups may have laid claim to these valuable resources. Previous research (Brosowske 2002; Lintz 1991) indicates that Antelope Creek groups controlled access, production and distribution rights to the extremely high quality Alibates stone of the Southern Plains. The fact that it naturally occurs over 100 kilometers away from Odessa phase sites suggests that it was acquired through trade and exchange with Antelope Creek groups.

When compared to the variable presence at Odessa sites, the size and frequency of Alibates tools and debitage from Antelope Creek occupations provides important insights into the nature of inter-group regional interaction (Brosowske and Bevitt 2006:190). Additional evidence suggesting Odessa groups had limited access and regular shortages of Alibates lies in the presence of heavily curated chipped stone assemblages and the abundance of non-local Smoky Hill jasper. Brosowske and Bevitt (2006:190) suggest that it is possible that trade relations were established with groups in north-central Kansas as a means of offsetting their dependence on trade with Antelope Creek populations, inferring that such trade interaction was irregular and possibly strained.

Although exchange with other Plains populations is apparent given the presence of stone varieties, nonlocal items of Southwestern origin are also common suggesting direct trade with eastern Pueblos (Brosowske and Bevitt 2006:190). Puebloan trade items include obsidian, marine shell beads and ornaments, turquoise or amazonite, ceramics, Mimbres Valley greenstone, mica and others. Trade items from regions other than the Southwest include conch shell ornaments, a wide variety of nonlocal lithic materials and Kansas and South Dakota pipestone that usually shows up as finished items (Brosowske and Bevitt 2006:190).

Other Plains Village Cultures

Henrietta Complex (A.D. 1450 – 1650)

The Henrietta complex was initially defined by Krieger (1946) and represents the southernmost manifestation of Plains Village culture in Texas. Likely due to the poorly documented nature of its cultural patterns and the large nebulously defined geographic area, this complex is poorly understood. Consequently, it has not been lumped into or subdivided within a regional variant like the cultural complexes previously discussed. The original definition of the Henrietta complex utilized information from several sites but relied primarily on the archeological investigations at the M. D. Harrell site in Young County, Texas that were reported by Hughes (1942). Additional investigations at Henrietta components are reported for sites near the Red River, including the Coyote and Glass sites (Bell et al. 1967a) in Montague County and the Chickenhouse site in Cooke County (Lorrain 1969), but little information has been added since Krieger's initial definition. While radiocarbon evidence is rare and unreliable, the Henrietta complex apparently spans the transition from Late Prehistoric II into Protohistoric times (Boyd 1997:360). Like many other Plains Village cultures, the Henrietta complex may trace its origins to the Plains Woodland tradition.

Settlement and Architecture

Henrietta complex villages are located upon sandy knolls or terraces overlooking river valleys (Brooks 1989:85). Henrietta complex houses at the Glass and Chickenhouse sites and possibly the Dillard site (Martin 1994) in Cooke County are round or oval depressions (Boyd 1997:360). They contain three of four main interior postholes representing superstructure supports and smaller postholes along the perimeter that supported the walls. Although information about houses is scanty, many habitation sites (e.g., the Harrell site) have substantial midden deposits that represent repeated occupations over long periods of time. Village features not only include midden deposits, but numerous rock hearths, storage pits, and burials.

Artifact Assemblages

The most common Henrietta component consist of Fresno, Washita, Harrell and Scallorn points, but Alba, Bonham, Eddy and Perdiz points are also found (Boyd 1997:360). Bifacial knives, scrapers and drills are also common. The diverse arrow point assemblage reflects a significant degree of interaction between neighboring groups to the east and west. According to Boyd (1997:360), exotic materials such as Alibates, obsidian and occasional Southwestern sherds indicate interaction with groups to the west, while celts and other decorated potsherds indicate interaction with Caddoan peoples to the east.

The presence of Nocona Plain ceramics in eastern Washita River phase sites indicates interaction between Henrietta complex groups and people from the north. Martin (1994:190) suggests that the Henrietta complex groups in north-central Texas were semi-sedentary, bison hunting horticulturalists that acted as trade intermediaries between Caddoan and Plains people.

Mortuary and Violence

The Harrell site (Hughes 1942) represents the most extensive and best documented Henrietta complex occupation. Although the deep and stratified occupations at Harrell date from the Middle Archaic, the bulk of the recovered materials came from the Plains Village component. In addition to a substantial midden and numerous hearths, skeletal remains of 32 individuals were found buried within this upper deposit. Observed among the single flexed interments where multiple mass graves containing three to four individuals. The presence of associated arrow points with the mass graves as well as missing mandibles has been interpreted as evidence of violence. The archeological contexts of similar graves at the Dillard site are suggestive of postmortem mutilation and dismemberment (Martin 1994). According to Boyd (1997:361), "violence in Henrietta society is not fully understood, but it must have been considerable if the Harrell and Dillard site cemeteries are any indication."

Whether the evidence of violence was the product of hostile social ties that stemmed from the intermediary nature of the region, competition over resources and social aggregation, or a combination of many factors may never fully be understood. Nevertheless, the available archaeological evidence suggests that the north-central Texas region served as a haven for numerous neighboring groups from all across the region, which may have escalated tensions as groups aggregated and material resources became circumscribed.

Ochoa Phase (A.D. 1300-1450)

The Ochoa phase of the Eastern Jornada Mogollon complex is thought to have developed out of the earlier Maljamar phase (A.D. 1100-1300), which represents a transitional stage from pithouses to surface structures and corner to side notched arrow points. These changes are thought to occur around the beginning of the Plains Village period although there are no absolute chronological data to support this idea and no mention of the earliest surface houses during the late Maljamar phase (Boyd 1997:350).

Boyd (1997:352) point out the questionable nature of the age estimates for the Eastern Jornada sequence based on non-local ceramic types, and Hughes (1991:28) suggests that the sequence may be a century and a half late and is in need of chronometric dates. Although several sites in southeastern New Mexico have been attributed to the Ochoa phase (Leslie 1979), only a few have been excavated, and published data are infrequent. Adding to the confusion is the mixed nature of Ochoa phase components with earlier occupations (Hughes 1991:34).

Settlement and Architecture

The Ochoa phase is marked by the presence of jacal-like surface dwellings of various shapes and sizes. The Salt Cedar site (Collins 1968) provides the best representation of an Ochoa phase residence. Based primarily on the ceramic assemblage, the site dates from around A.D. 1100-1450, although a Late Archaic component occurs in mixed context (Collins 1968:119; 1971:89). The site lies near the confluence of two draws that enter a playa from the west and southwest along a peninsula derived from lacustrine sediments (Collins 1968:46). Numerous features indicative of extensive occupation(s) were found at Salt Cedar, consisting of house structures, stone and clay lined hearths, caches with grinding implements, large mammal bone concentrations, and burials. Jacal construction is evidenced at one of the houses, and Collins (1968:53) notes an "intervening V-shaped trough" containing small amounts of clay separating two rows of structural stones. The size and shape of the Salt Cedar houses are unknown due to partial preservation of adjoining walls.

Artifact Assemblages

Stone tools consist of mostly Fresno and Harrell arrow points, bifacial knives, end- and side-scrapers, and grinding stones. Less common tools consist of Garza, Perdiz and Washita-like arrow points, implements made from bison and deer bones, and Late Archaic dart points. The dominant pottery type of the Ochoa phase is Ochoa Indented Brown, which accounts for the majority of sherds recovered from Salt Cedar (Collins 1968:113). A few imported pottery consisting of Agua Fria Glaze A, San Clemente Glaze A, Chupadero Black-on-White, and El Paso Polychrome indicate interaction with groups to the west and southwest; Nocona Plain wares indicate contact with Henrietta complex groups to the east (Boyd 1997:352). Collins (1968) suggests that the appearance of Southwestern corrugated and indented pottery in pueblo-like villages on the southern Llano could represent an influx of Puebloan peoples during the Ochoa phase.

Subsistence

Although a high frequency of grinding stones, locally made ceramics, and the permanent nature of Ochoa phase houses suggests the practice of horticulture, no direct evidence has been found. As such, plant processing may have been limited to gathered wild plants. The high frequency of projectile points and faunal densities indicates the Ochoa peoples at Salt Cedar were heavily engaged in hunting bison. This differs from the marked absence of this animal at earlier phases of the Eastern Jornada Mogollon complex, suggesting that the return of bison to the Plains villager diet was the main impetus for a more sedentary lifestyle. According to Collins (1968:119), subsistence at Salt Cedar included the hunting of bison, antelope, and deer that was likely enhanced by the gathering of wild plant foods. The nearby playa and adjacent inlet draws were undoubtedly necessary elements of the subsistence economy and intensive occupation at the Salt Cedar site.

Mortuary and Violence

Four burials were found at the Salt Cedar site, two of which (Burials 2 and 3) show evidence of violence and interment near the end of the Ochoa phase occupation. The other two burials may be from earlier in the occupation and consist of an adult male in a flexed position and the incomplete skeleton of an infant, neither of which contained grave goods. The evidence at Burials 2 and 3 suggests that two adult males died from multiple arrow wounds (Collins 1968:63). Both of the burials were in flexed positions and contained burial offerings such as non-lethal projectile points, as well as other stone tools, various animal bone implements and debitage.

In regards to the identity of the victims and assailants, the only evidence comes in the form of the point types used by the slayer(s). These consist of Perdiz- and Washita-like points in Burial 3 and Washita-like types in Burial 2, which complicates a determination of “who-done-it”. Some have speculated that the death of the Burial 3 victim came at the hand of Toyah-culture people using arrows tipped with more than one type of head (Johnson 1994, cited in Boyd 1997:353). Another possibility is that the assailants drew arrows from the victim’s weapon kit. Boyd (1997:353) notes that the violent deaths at Salt Cedar could have been the product of hostilities between groups competing for control of the region’s bison hunting range.

Discussion

This section has demonstrated how we have arrived at many of the current understandings of Plains Village period archaeology on the Southern Plains. While some elements such as the degree of horticultural practice during the Antelope Creek phase are still debated (Boyd 2008), many of the fundamentals discussed above have become widely accepted as Plains villager ways of life. For example, the vast majority of people interested in the prehistory of the Southern Plains accept that Plains villagers hunted and consumed large mammals, namely bison, which was enhanced by consuming foraged plants, cultivated crops and smaller animals and aquatic species. Also well-known is that these groups manufactured highly effective arrow points and other specialized tools from local and non-local stone materials, produced ceramic vessels textured with cordage, participated in inter-regional trade, and built semi-subterranean houses of various magnitudes near prominent water sources using different combinations of stone, earth and vegetation. The macro-level comparisons of the above-discussed Plains villager traditions illustrate the general overlapping of material attributes over large portions of time and space. Taken within a regional context, variability in the material record seems to be the product of resource availability and inter-societal interaction.

These generalized perspectives established for discrete cultural traditions become more complex when site-specific (i.e., micro-scale) data from sites within these manifestations undergo comparisons at the meso-scale. Such comparative studies have potential to reveal a complex system of intra-cultural variability centered on local behavioral ecologies and their intermingling within an overarching social structure (Winterhalder and Kennett 2006). This particular element is important to my study at 41PT283, which looks at the relationships between settlement pattern and site function. Also of importance is the potential inter-dependent relationship between sites with differential functions. These topics are further developed and explained in later chapters.

Protohistoric Cultures

The Protohistoric or Late Ceramic Period was an interval of considerable change marked by the encroachment of Spanish and French explorers into the region. Given the influx of new indigenous and non-indigenous players into the Southern Plains, this period was one of dynamic cultural interaction. According to Drass and Baugh (1997:183), the migration of Apache into the Southern Plains during the Protohistoric has presented problems in determining if changing technologies in the archaeological assemblages resulted from the migration of people or were indigenous adaptations to changing social, economic, and environmental circumstances, or likely a mixture of both. Although the Protohistoric period is characterized by some of the earliest written accounts of life in the Southern Plains, the limited and sporadic nature of these accounts has led to confusion in tying archaeologically derived complexes with historic ethnic groups (Drass and Baugh 1997:183). This phenomenon attests to the importance of documenting both continuity and change between prehistoric archaeological manifestations and historically documented Indian groups.

Research into the variability observed at Protohistoric sites on the Southern Plains (Baugh 1986; Bell and Bastian 1967a, 1967b; Drass and Baugh 1997; Hofman 1989) has fostered a better understanding of the Garza and Tierra Blanca complexes and resulted in the lumping of the Edwards and Wheeler complexes into the Wheeler phase. While such taxonomic classifications and reclassifications have been achieved through the integration of ethno-historical and archaeological studies at key sites, the lumping and splitting caveat has followed the classic formula centered on the degree of inter-group similarities and differences. Drass and Baugh (1997:184) explain, "defining taxonomic units and relating sites to these units in space and time are basic to archaeological studies of cultural continuity and change." In order to better understand the variability of these phases, overviews of the Protohistoric traditions such as the Wheeler phase in west-central Oklahoma, the Garza complex in eastern New Mexico, and the Tierra Blanca complex in the Texas Panhandle are presented.

Wheeler Phase (A.D. 1450 – 1700)

Generally speaking, the Wheeler phase encompasses the region of west-central Oklahoma previously occupied by groups from the Redbed Plains variant (Washita-Paoli and Custer-Turkey Creek). The Wheeler phase was defined by Baugh (1986) on the basis of examination of two archaeological cultures: the Wheeler complex in central Oklahoma and the Edwards complex in southwest Oklahoma. Baugh believes the similarities between the Little Deer site, the type-site for the Wheeler complex and the Duncan site, the Edwards complex type-site, justifies combining the two into the Wheeler phase (A.D. 1450 – 1700).

Hofman (1989:98) disagrees, claiming Wheeler sites have assemblages that are easily distinguishable from Edwards sites and that placing them into two units permits better monitoring of their variability. Nevertheless, the all-encompassing Wheeler phase has become widely accepted due to the many similarities observed in the ceramic and lithic assemblages from Wheeler and Edwards complex sites. In terms of material assemblages, a review of the literature on Wheeler and Edwards provides overviews of their differences as individual complexes (Hofman 1984, 1989) and similarities (Baugh 1982, 1986; Drass and Baugh 1997) used to lump them into the Wheeler Phase.

The Wheeler Complex

The Wheeler complex was initially defined by Bell and Bastian (1967b) in their pilot study of Wichita culture and history based on three sites along the Canadian River in west-central Oklahoma: Little Deer (34CU10) in Custer County, Scott (34CN2) in Canadian County and Wilson Springs (34CD6) in Caddo County. Additional sites were lumped into the Wheeler complex (Wyckoff 1973, 1982), including the Lowrance site (34MR10) in south-central Oklahoma and the Taylor site (34GR8) in far southwestern Oklahoma based on similar ceramic and lithic assemblages (Drass and Baugh 1997:184).

Hofman (1984) revised this assessment and limited the Wheeler complex to the original three sites (Little Deer, Scott and Wilson Springs) recorded by Bell and Bastian (1967), assigning the remainder to the Edwards complex. Drass and Baugh (1997:184) criticize Hofman's reassessment due to the limited evidence collected from only surface materials at Little Deer. Later excavations at Little Deer (Drass 1996) recovered three charcoal samples, one of which dated to the late 17th to early 18th century, indicating a Protohistoric occupation.

Ceramic Assemblage

Perhaps the most characteristic artifact of Protohistoric sites in the Southern Plains is a sandy paste pottery (Drass and Baugh 1997:184). Wheeler complex sites have a predominantly thin, dark, sandy-paste pottery known as Edwards Plain (Baugh 1986:170). The only decoration on this pottery appears on the lip and is represented by incised lines similar to lips from Buried City complex sites in the Texas Panhandle, sites in northwest Oklahoma and Pratt complex sites in southern Kansas (Drass and Baugh 1997:185). The second most common pottery type at Wheeler complex sites is a grog- or clay-tempered pottery referred to as Little Deer Plain and Decorated (Drass and Baugh 1997:186). This ware was named after the Little Deer site where it was first described (Baugh 1986). The sparse Ocate Micaceous and Glazed sherds from Little Deer are easily distinguishable from Plains Village groups by the scraping and/or dragging technique used during coiling that was derived from the eastern frontier Pueblos (Drass and Baugh 1997:186). Plains Village groups mostly utilized a paddle and anvil method for this surface treatment.

Stone Tools and European Items

Though obsidian artifacts are rare at Wheeler complex sites, two obsidian points were reported at Little Deer (Hofman 1978b). The most common lithic material type is Florence A chert quarried from localities in Kay and Osage counties; Alibates and

Edwards chert are also present but to a lesser extent (Baugh 1986:Table 1). Wheeler complex tools include small triangular projectile points of the Fresno unnotched and Washita side-notched varieties. Other stone tools consist of large planoconvex end and side scrapers, backed flake knives, expanding base drills and ensiform pipe reamers (Drass and Baugh 1997:187). Bell and Bastian (1967) and Hofman (1978b) reported possible native-made gunflints from the Little Deer and Scott sites. Other distinguishing artifacts for the Wheeler complex include a limited number of European items such as: gunflints, lead sprues, musket balls and blue glass trade beads (Drass and Baugh 1997:187).

Hofman (1984, 1989) established a chronology for the Wheeler complex ranging between A.D. 1650 and 1750 based on the presence of the large, planoconvex Florence A chert end and side scrapers from Little Deer. This cross-dating method was based on the presence of comparable tools appearing in the Wichita villages of northern Oklahoma and southern Kansas after A.D. 1650. Drass and Baugh (1997:188) explain, "in addition to the frequent occurrence of triangular, unnotched projectile points, serrated metapodial fleshers, tubular pipes of the Pecos style, ensiform pipe reamers, Glaze V Southwestern sherds, possible native-made gunflints, lead sprues, musket balls and glass trade beads suggest a mid-seventeenth to mid-eighteenth century date for this complex."

The Edwards Complex

Hofman (1984, 1989) defined this complex based on four sites: Edwards I (34BK2) in Beckham County, Taylor (34GR8) in Greer County, Goodwin-Baker (34RM14) in Roger Mills County and Duncan (34WA2) in Washita County. Baugh (1982) described the surface collections from the Edwards I site and summarized findings from a number of additional Edwards complex sites in his synthesis of the Wheeler phase.

Artifact Assemblages

Similar to the Wheeler complex, the dominant ceramics at Edwards complex sites are dark, sandy-paste Edwards Plain wares (Drass and Baugh 1997:189). Additional similarities lie in vessel forms where jars with flat circular bases and everted rims comprise both complexes. Other forms of Edwards Plain pottery have a temper that includes small amounts of calcium carbonate mixed with the sandy-paste. This form is found at late Washita River and Turkey Creek sites and early Protohistoric sites such as Edwards I and Goodwin-Baker (Drass and Baugh 1997:189). Shell-tempered Nocona Plain ceramics also occurs at sites of the aforementioned phases and has similar methods of manufacture, surface treatment, forms and most decorations. The association of these pottery types, among others, led Baugh (1986) to conclude that the Edwards and Wheeler complexes represent cultural continuity with the preceding Washita River and Turkey Creek phases.

Non-local utility wares attributed to groups farther west in New Mexico have been identified at several Edwards complex sites. Ocate Micaceous and Cimarron Micaceous ceramics, generally associated with Jicarilla and/or Faraon Apache of northeastern New Mexico, were recovered from Edwards I, Duncan, and Taylor (Drass and Baugh 1997:189). As with the Wheeler complex, Edwards sites have relatively small amounts of Southwestern sherds from eastern frontier Pueblos (Drass and Baugh 1997:189). Contact with the Red River Caddo people is demonstrated by a number of exotic Southeastern ceramic types from Caddoan complexes dated between A.D. 1400 and 1700. (Drass and Baugh 1997:190).

Edwards complex projectile points generally include Fresno, Washita, and Harrell varieties as well as lesser common Garza points (Drass and Baugh 1997:190). The large planoconvex end scrapers Hofman (1978b) associates with the Wheeler complex are present but not common among excavated Edwards complex materials but documented in greater numbers in surface collections from Duncan and Edwards I (Drass and Baugh 1997:190). Runkles (1964:111) also notes that similar large scrapers have been reported from the Garza site in West Texas and thus, appear to be more common on the Southern Plains than previously thought. Though varied at different Edwards complex sites, the large planoconvex scrapers are made from either Alibates or Florence A chert.

As far as the specific function of the large scrapers, Hofman (1978b) claims they are likely hide processing tools. Drass and Baugh (1997:191) postulate that they may also reflect a tool manufactured primarily for trade rather than local use based on the presence of large end scrapers known from early historic Wichita sites in north-central Oklahoma. The location of the Wichita sites, Bryson-Paddock and Deer Creek, near the Florence A quarries suggests that these people may have controlled this resource and manufactured large scrapers and other tools for exchange with other groups (Drass and Baugh 1997:191).

Other lithic tools at Edwards complex sites share many similarities with those reported from Wheeler complex sites and include biface knives, diamond-beveled knives, expanding base drills and ensiform pipe reamers. The materials used for chipped stone tools vary between sites but Alibates is common (Drass and Baugh 1997:191). Other lithic materials include Florence A and Edwards cherts and Jemez Mountains obsidian.

Settlement and Architecture

Little information exists on the settlement distribution of sites from the Wheeler and Edwards complexes primarily due to lack of excavation. While some small camps such as Bell (34BK9) and Fowler (34BK6) may represent temporary occupations, most of the excavated sites relate to large, semisedentary villages (Drass and Baugh 1997:191). Features at these occupations include shallow basin pits, unlined and rock-lined hearths and numerous post molds. Drass and Baugh (1997:191) suggest the absence of deep storage pits at village sites distinguishes them from earlier ones and may indicate a move through time to above ground storage or a change in economic activities.

The only evidence of coherent Edwards complex structures comes from the Goodwin-Baker site where two dwellings were excavated and interpreted as square, wattle-and-daub structures with a central hearth. The hearth in House 1 was lined with clay at two different times. Baugh (1986) interpreted this remodeling as a reflection of house construction techniques similar to several Caddo and Wichita sites in which a central post functioned as a ladder allowing access to the roof and upper portions of the house during construction. Upon completion of the dwelling, the post was removed and replaced by a hearth. Evidence of communal participation is suggested by the presence of large circular ditches at Edwards I and Duncan measuring fifty meters in diameter and up to two meters in depth (Drass and Baugh 1997:191). At Edwards I, this feature was interpreted by Weymouth (1981) as the remains of a parapet where several logs were placed to construct a stockade. According to Drass and Baugh (1997:192), the closest comparison for these circular ditches are fortifications constructed by the historic Wichita that were described by the Spanish as “earthen rampart fortresses” used during invasions for retreat and defense.

Subsistence

As with Wheeler phase architectural patterns, subsistence information is limited and available only from larger villages, including Duncan, Goodwin-Baker and Edwards I. Other than at Goodwin-Baker, evidence of corn and farming tools is minimal at the large fortified sites and may reflect a portion of the subsistence system not related to the cultivation of crops (Drass and Baugh 1997:193-195). Drass and Baugh (1997:195) claim, the small quantity of bison scapula hoes and tibia digging stick tips at Wheeler phase sites compared to earlier Washita River and Turkey Creek sites could reflect a decrease in horticultural activity during the Protohistoric period. However, it could also be an indication of a shift to the use of other tools such as simple wooden implements for cultivation.

Bison bone occurs in abundance at Wheeler phase sites, which suggests hunting played an important role in subsistence. At Duncan and Edwards I, bison represent the majority of identified mammal bone, while at Goodwin-Baker a much a smaller amount of bison was recorded (Drass and Baugh 1997:195). The fortifications at Duncan and Edwards I may have been seasonal occupations oriented primarily toward the communal hunting and processing of bison, whereas Goodwin-Baker appears to be a small village where cultivation of corn and beans as well as the hunting of deer and small mammals were significant.

Discussion

Based on the information available on the Wheeler and Edwards complexes, it is apparent that their similarities outweigh their differences, warranting an amalgamation into the Wheeler phase. The above discussion has shed necessary light on the difficulty of where to draw taxonomic boundary lines as well as the transitional component of Southern Plains cultural groups during the Protohistoric period. Drass and Baugh (1997:198) postulate, “does initial interaction with a new group of people immediately prescribe that a new taxonomic unit be defined, or is it more important to determine the significance of this culture contact upon an indigenous groups to understand the process of culture change?”

Though few and subtle, the differences that can be identified between the Wheeler and Edwards complexes appear to relate to geographical factors or “an east to west clinal variation” (Drass and Baugh 1997:198). Given the dynamic nature of cultural groups during the Protohistoric, attempting to define distinct cultural complexes “results in arbitrary divisions along a continuum” (Drass and Baugh 1997:198). As such, the Wheeler phase is defined by the attributes of the Edwards complex but includes the three sites formerly attributed to the Wheeler complex. It has been proposed that the Wheeler phase derived from previous Washita River and Turkey Creek phase or a coalescence of these groups and Antelope Creek groups in western Oklahoma (Drass and Baugh 1997:201).

Garza Complex (A.D. 1450 – 1650)

This complex occupies the southern extent of the Plains region in West Texas and far eastern New Mexico. The Garza complex is comprised of the Longhorn site in Kent

County (Boyd et al. 1991), the Country Club and Montgomery sites in Floyd County (Word 1963, 1965), the Pete Creek (Parsons 1967) and Bridwell sites (Parker 1982) in Crosby County, the Lubbock Lake site (Johnson et al. 1977), and the Garnsey Spring campsite and bison kill in Chaves County, New Mexico (Parry and Speth 1984). The complex got its name from excavations at the Garza site (Runkles 1964), located in Garza County, Texas. Excavations at the Lott site (Runkles and Dorchester 1986), located less than a mile away from Garza, have radiocarbon dated the Garza occupation levels at A.D. 1440 and 1500. However, research in progress suggests that the occupation dates from A.D. 1643-1665 (Bousman, personal communication 2016). The Longhorn site is the most intensively investigated and best reported Garza complex site and well-represents late Garza phase occupations of the 17^{th} century (Boyd 1997:380).

Settlement and Subsistence

Like other Garza complex sites that lack evidence of permanence, the Lubbock Lake locale is represented by a number of impermanent camps. Generally speaking, architectural evidence at Garza sites, though narrow, indicates the use of temporary circular fortifications and storage pits. This is likely reflective of a subsistence economy primarily reliant on bison and other mobile game. The Longhorn site contains evidence of three separate tipis, numerous activity areas and an abundance of artifacts such as beads, bone tools and European items that indicate the site was a residential base that may have served as a winter encampment (Boyd 1997:380). The stone tool assemblage is representative of specialized activities such as bison-hide processing.

According to Baugh (1986:180), no direct evidence for horticulture is available from Garza complex sites because no methods have been employed to recover plant remains. Hofman (1987:99) also denotes an economy heavily focused on bison hunting and minimal use of horticulture at Garza sites. The only evidence for horticulture practices has been indirect and includes the recovery of bison bone tools believed to be farming implements at the Montgomery site and the presence of metate and mano fragments from Montgomery and Bridwell. Based on this evidence, along with the presence of large quantities of bison bone, Baugh (1986) concluded that the inhabitants of Garza complex sites practiced a mixed economy based on horticulture, bison hunting and trading much like the earlier Antelope Creek villagers to the north.

However, their dependence on bison likely resulted in greater mobility than earlier groups, which is manifested in the evidence of tipi-rings remnant of seasonal encampments. Boyd (1997:380) claims that the paucity of stone projectile points at late Garza complex sites may be because metal arrow tips and possibly firearms were commonly used. Other evidence of European influence at the Longhorn site is the presence of a single longhorn horn core that was used as a tie-down stake in one of the tipi rings, and a single horse bone.

Artifact Assemblages

Cultural characteristics involving mobility and exchange networks can be inferred from Garza complex artifacts. According to Baugh (1986:181), the Bridwell, Montgomery and Pete Creek sites demonstrate continuity in the exchange system between the Southwest and Southern Plains. Hofman (1989:99) claims Garza phase ceramics are distinguished by a high frequency of Southwestern sherds with other materials of Southwestern origin occurring in varying frequency but including obsidian, turquoise and Olivella beads. The predominant utilitarian ceramics at Garza sites includes thin, dark sandy and micaceous paste wares similar to Perdido Plain, which Gunnerson (1987:110) attributes to Plains Apache, and Tierra Blanca Plain attributed to the contemporaneous Tierra Blanca complex located in the Texas Panhandle. Hofman (1989:99) notes that some Garza phase sherds have a micaceous slip similar to some Pueblo utilitarian wares. Other exotic items include Puebloan trade wares and cloud-blower pipes found at the Longhorn site (Bousman, personal communication 2016).

While triple-notched projectile points of the Harrell variety occur at Garza complex sites, a new basally-notched point type was initially observed at the Garza site and thusly termed, Garza point. Both the lateral edges and bases of this point variety vary from straight to concave and the lateral edges are often serrated (Turner et al. 2011). Johnson et al. (1977) claim that Garza points appear to be contemporaneous with the Apache occupation of the Lubbock Lake area and that there is likely a link to Apache culture. Another point type observed in Garza complex contexts is the Lott point. These are basally-notched with expanding stems that have shoulders created by lateral trimming near the base, resulting in "ears" or tangs that vary from pointed to square (Turner et al. 2011). Beyond these two distinct projectile point types, the remaining suite of stone tools resemble assemblages from the Wheeler and Tierra Blanca complexes and include backed blades, expanding base drills, diamond-beveled knives and wedges (Drass and Baugh 1997:187).

Garza Complex and the Teyas

Most researchers generally agree that 16th and 17th century ethnographic accounts support the interpretation that the Garza archaeological complex represents a group of people first recognized by Coronado as the Teyas. Along with the coeval Querechos (i.e., the Tierra Blanca archaeological complex), the Teyas were recognized by contemporary observers as being semi-nomadic, tipi-dwelling bison hunters who utilized dogs for transport. However, the Teyas had painted faces and bodies and were enemies with the Querechos. Ethnographic accounts of their geographic location in the canyons to the southeast of the Llano Estacado and strong economic ties to the eastern Pueblos support the notion of Garza complex affiliation (Boyd 2001:7). Castañeda said of the Teya that "pottery is not made in that locality, nor are gourds found there; they do not cultivate maize either, nor do they eat bread, but they eat either raw or badly roasted meat and fruits" (Hammond and Rey 1940, cited in Habicht-Mauche 1992:250). However, some researchers believe that certain passages in the Coronado documents suggest that the Teyas were also farmers (Baugh 1982).

Although the Teyas have been variously interpreted as being Athapaskan speaking Apaches, unidentified Caddoan speakers, or Jumanos who may have spoken Caddoan, Tanoan, or Uto-Aztecan, Habicht-Mauche's (1992:256-257) Querecho-Teya model identifies the Teyas as likely representing Plains Caddoan people who were later recognized by Spaniards as Jumanos. However, Boyd (2001:8) claims, ascribing ethnic or linguistic affiliation to the Teyas is an unnecessary distraction and matters little in sorting out the archeological evidence.

Tierra Blanca Complex (A.D. 1450 – 1650)

The Tierra Blanca complex (Holden 1931) has been defined for the region just south of Amarillo, Texas along the headwaters of the Red River. This complex reflects a settlement shift southward from the preceding Antelope Creek phase core area. The complex is best known from research at the Tierra Blanca site (41DF2) in Deaf Smith

County, Texas. Although this site has been investigated at two different times, only cursory summaries have been published (Holden 1931; Spielmann 1983) that lack complete documentation of the material findings beyond the site's ceramics (Habicht-Mauche 1987, 1991). Most sites linked to the Tierra Complex complex described by Boyd (1997:368-377) have received only limited excavation and fleeting reporting. The majority of the chronology for this complex is based on cross dates of Southwestern trade pottery recovered from Tierra Blanca. It has been hypothesized (Habitche-Mauche 1992; Boyd 2001) that the historic Querechos encountered by Coronado in A.D. 1541 where the people responsible for the Tierra Blanca complex.

Settlement and Architecture

Two types of Tierra Blanca sites have been described, large village sites like Tierra Blanca and the Blackburn site. Smaller campsites like Fifth Green, Tule Mouth, Cita Mouth, Palisades, Fatheree, and at least one rockshelter at Canyon City Club Cave have all been assigned to this complex. At the Palisades site, a possible wattle and daub structure was encountered. At Tierra Blanca, interpretations of the excavations (Boyd 1997) indicate that at least two components, three structures and a roasting pit are represented. According to Hofman (1989:99), the structures consist of a tipi ring, semi-subterranean slab-lined circular structure and a windbreak or arbor type structure. According to Quigg et al. (2010:98), other structures present at the type-site of Tierra Blanca may relate to Antelope Creek phase masonry dwellings.

Subsistence

The tool assemblages, faunal remains and accounts of early historic contacts imply the people of the Tierra Blanca complex employed a semi-sedentary lifeway that involved hunting bison and growing or trading for corn (Quigg et al. 2010:98). The abundant evidence of trade with Puebloan groups (e.g., glazeware ceramics, obisidian and turquoise) at Tierra Blanca sites likely suggests exchange with these eastern groups played an important role in their subsistence economy. Given the indication of increased specialization and occurrence of bison hunting in the Southern Plains at this time, the products procured from this animal likely served as the primary export of the Tierra Blanca in exchange for a variety of Puebloan agricultural staples and craft items. Though the archaeological evidence at this stage is rather circumstantial, the advent of the horse and resulting increase in mobility likely changed the lifeways of these people dramatically.

Artifact Assemblages

Artifacts associated with the Tierra Blanca complex include side-notched Washita and Harrell arrow points, unnotched Fresno and Talco arrow points and micaceous tempered Perdido plain ceramics and/or Pueblo utility ware pottery (Quigg et al. 2010:98). According to Boyd (2001:8), their material culture represents a wide range of activities, but the most ubiquitous and functionally diagnostic specimens are a suite of arrow points, beveled knives and Plains style end scrapers representing tools used to hunt and process bison. In addition to stone tools, most sites have yielded abundant quantities of Southwestern trade wares, including Rio Grande Glaze C and D wares, and Pecos Glaze Polychromes as well as obsidian and marine shell jewelry.

Indigenous ceramics, called Tierra Blanca Plain, were originally described as thin, dark sherds of Southwestern style striated utility ware, but Habicht-Mauche (1988) added that petrographic analyses indicate a coil construction. These vessels were thinned by scraping, possibly with a dry corn cob, causing visible drag marks on both the interior and exterior surfaces (Quigg et al. 2010:98). Tierra Blanca Plain vessels are typically less than twenty centimeters tall and are squat and globular to slightly elongated jars with rounded bases and gently everted rims (Habicht-Mauche 1991). Petrographic analysis of sherds from three Tierra Blanca complex sites, Tierra Blanca, Fifth Green and Cita Mouth, indicates that the majority of these wares were manufactured from local materials available on the Southern Plains. Based on this evidence in addition to their numerous similarities, Habicht-Mauche (1991) contends that the hunter-gatherer groups of the Southern Plains were producing culinary pottery patterned after coeval Pueblo vessels from north-central New Mexico between A.D. 1500 and 1700. Contrarily, Boyd (1997) contends that the majority of the striated plainware sherds (e.g., Tierra Blanca Plain) are actually Puebloan plainwares. Drass and Baugh (1997:189) suggest, "Tierra Blanca Plain was made by probable Athapaskan groups in northern New Mexico and people of the Tierra Blanca complex in Texas Panhandle."

The ceramic characteristics that distinguish this complex from the coeval Garza complex groups to the south are the occurrence of Glaze wares, thin dark utilitarian ceramics and a general lack of Garza and Lott arrow points (Hofman 1989:99). Habicht-Mauche (1987) suggests a time frame between A.D. 1400 and 1650 for this complex. Her ceramic analysis indicates a close genetic relationship between the Tierra Blanca striated utilitarian wares and the Upper Rio Grande Pueblo faint striated utility wares (Hofman

1989:99). Evidence such as sherds of Spanish majolica, metal tools, gunflints and lead balls also indicates that Tierra Blanca and Garza complex people began to obtain European items in the 1600's (Boyd 2001:9).

Tierra Blanca and the Querechos

Habicht-Mauche (1992) hypothesized that the historic Querechos encountered by the Coronado expedition on the Llano Estacado in A.D. 1541 were the prototypic Plains nomads responsible for the Tierra Blanca archaeological complex. Like their presumed enemies to the south (the Teyas), the Querechos utilized portable hide tipis, dog transport and a well-developed and highly specialized hunting economy focused on the procurement, processing and trade of bison products (Boyd 2001). Their camps consisted of up to two hundred tents made of tanned bison hides that were carried from place to place on the backs of dogs as they continuously moved in pursuit of bison, of which they depended entirely for food, clothing and shelter (Habicht-Mauche 1992:250).

Discussion

Understanding the Protohistoric period in the Southern Plains is challenging given the complexity and scope of the dynamic cultural changes that occurred during the two centuries following initial European contact. Although few would disagree that the Querechos were Athapaskan-speaking Apaches, Boyd (2001:16) suggests that ethnic and linguistic affiliation is meaningless in archaeological contexts and only serves to simplify analyses and bias interpretations such as "Apache pottery" that only attaches "ethnic or linguistic baggage" to the Tierra Blanca and Garza complexes. Boyd also criticizes the Querecho-Teya model's limited amount of detailed ethnohistoric evidence. Nevertheless, the model provides a useful framework for formulating hypotheses that predict subsistence and settlements patterns, and define the relationships between bison-hunting and trading societies (Boyd 2001:16).

Summary

The above synthesis of the literature on Southern Plains culture groups illuminates the breadth of interpretations these archeological manifestations have received over nearly a century worth of stewardship. The literature review also demonstrates the evolution of a taxonomic system archaeologists have developed and altered in attempts to better understand and communicate the variability observed in the material record. Regardless of whether cultural phases are lumped or subdivided, the temporal, spatial and cultural boundaries archaeologists draw in the sand are often at the mercy of previous investigations at key sites. As such, customary perspectives should undergo continuous scrutiny through analyses of the raw archaeological data from which new information regarding subsistence, social organization, and inter-group relationships can be gleaned. A critical element to this approach is continuous propagation of newly gathered information in the archaeological literature as well as reevaluations of uncertain radiocarbon assays.

IV. THE STUDY AREA

This chapter provides a background overview of the study area and a description of the previous investigations conducted at site 41PT283. Also presented are descriptions of other Antelope Creek sites located near the study site and serve as comparative references. Site 41PT283 is located in Potter County, Texas approximately 15 miles northwest of Amarillo. It lies on Bureau of Land Management (BLM) property known as the Cross Bar Ranch (Figure 7).

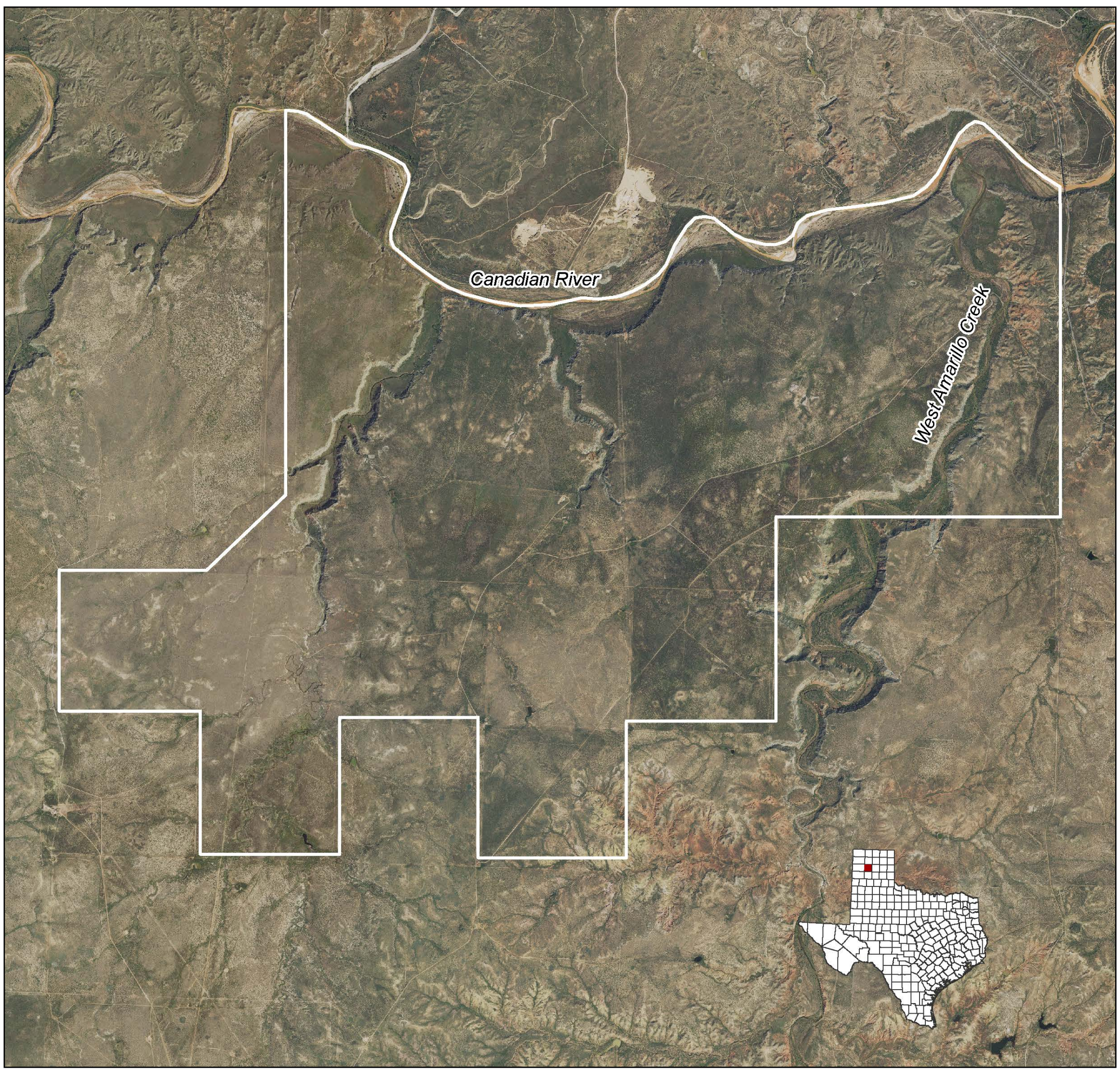

Figure 7. Aerial photograph showing the Cross Bar Ranch boundary.

The 11,833-acre ranch is located on the southern bank of the Canadian River. Despite being located on private property, the Cross Bar Ranch is near a portion of the Canadian River basin that is open to the public. Decades of recreational activities in these areas have resulted in documented damage to archaeological sites. Many of the Antelope Creek sites at the Cross Bar have undergone some degree of damage from looting and other human activities. As such, the BLM has authorized cultural resource investigations in accordance with the Archeological Resource Protection Act (ARPA) in an effort to prevent further destruction to sites. The Cross Bar Ranch has played host to several archaeological field schools conducted by Texas State University. Numerous archaeological surveys have been conducted at the Cross Bar in association with construction and land management projects authorized by the BLM (Table 1).

Table 1. Previous archaeological investigations conducted at the Cross Bar Ranch.

Authors	Report Title	Year	Sites Investigated
Meeks Etchieson	An Archeological Survey of a Portion of Helium Operations Land in Potter County, TX	1993	41PT90-41PT109, 41PT112, 41PT113
Christopher Lintz and Meeks Etchieson	Informal Reconnaissance of the Cross Bar Ranch	1997	41PT173, 41PT174, 41PT175
Charles Haecker and James Rancier	Damage Assessment, 41PT92 and 41PT93, on BLM Land (Previously Property of the U.S. Bureau of Mines, Helium Field Operation) U.S. Marines Reserve Training Area, North of Amarillo, TX (Draft)	1998	Two new sites found (no trinomials)
James Briscoe	Archaeological Survey Report on the Sunlight Exploration, Inc. Tecovas Creek Project, Potter County, Texas	2000	41PT239, 41PT240, 41PT241, 41PT242, 41PT243, 41PT244
John Northcutt	An Archaeological Survey of Proposed Power Line R-O-W on the Cross Bar Property, Potter County, Texas	2000	41PT246, 41PT247, 41PT248

Table 1. Continued

Authors	Report Title	Year	Sites Investigated
James Briscoe	Archeological Survey of the Bureau of Land Management Cross Bar Ranch Fire Lanes Project Potter County, Texas	2002	41PT105, 41PT243, 41PT269, 41PT272, 41PT273, 41PT275, 41PT279, 41PT280-41PT289
Christopher Lintz, Jason Smart, Audrey Scott, and Shane Pritchard	Cultural Resource Class II Survey of a 1,500 Acre Sample of the Cross Bar Ranch Complex, Potter County, Texas	2002	41PT174, 41PT175, 41PT247, 41PT251-41PT275
C. Britt Bousman and Abby Weinstein	Cross Bar Ranch Archaeological Investigations 2004: Interim Report	2004	41PT109, 41PT422-41PT425
C. Britt Bousman	Cross Bar Ranch Archaeological Investigations 2005: Interim Report	2005	41PT109
C. Britt Bousman	Cross Bar Ranch Archaeological Investigations 2007: Interim Report	2008	41PT283
Robert Selden Jr., Michael Mudd and C. Britt Bousman	Ground Penetrating Radar Survey at Antelope Creek Sites, 41PT96, 41PT112, and 41PT283, Potter County, Texas	2016	41PT96, 41PT112, 41PT283

The study area is located along the easternmost portion of the Cross Bar Ranch and consists of a 4.3-km stretch of West Amarillo Creek that extends southward from the mouth of the Canadian River to site 41PT283 (Figure 8). The study area boundary was established by assigning a pragmatic 400 m radius to the West Amarillo Creek channel. The radius boundary encompasses approximately 550 hectares and contains both valley and upland settings. In addition to the study site, a total of six Antelope Creek sites (41PT93, 41PT96, 41PT97, 41PT109, 41PT112, and 41PT257) are located in the study area. This comparative site sample consists primarily of isolated homesteads located along the West Amarillo Creek valley rim. Site 41PT283 is situated along the West Amarillo Creek valley floor and has an ambiguous architectural pattern.

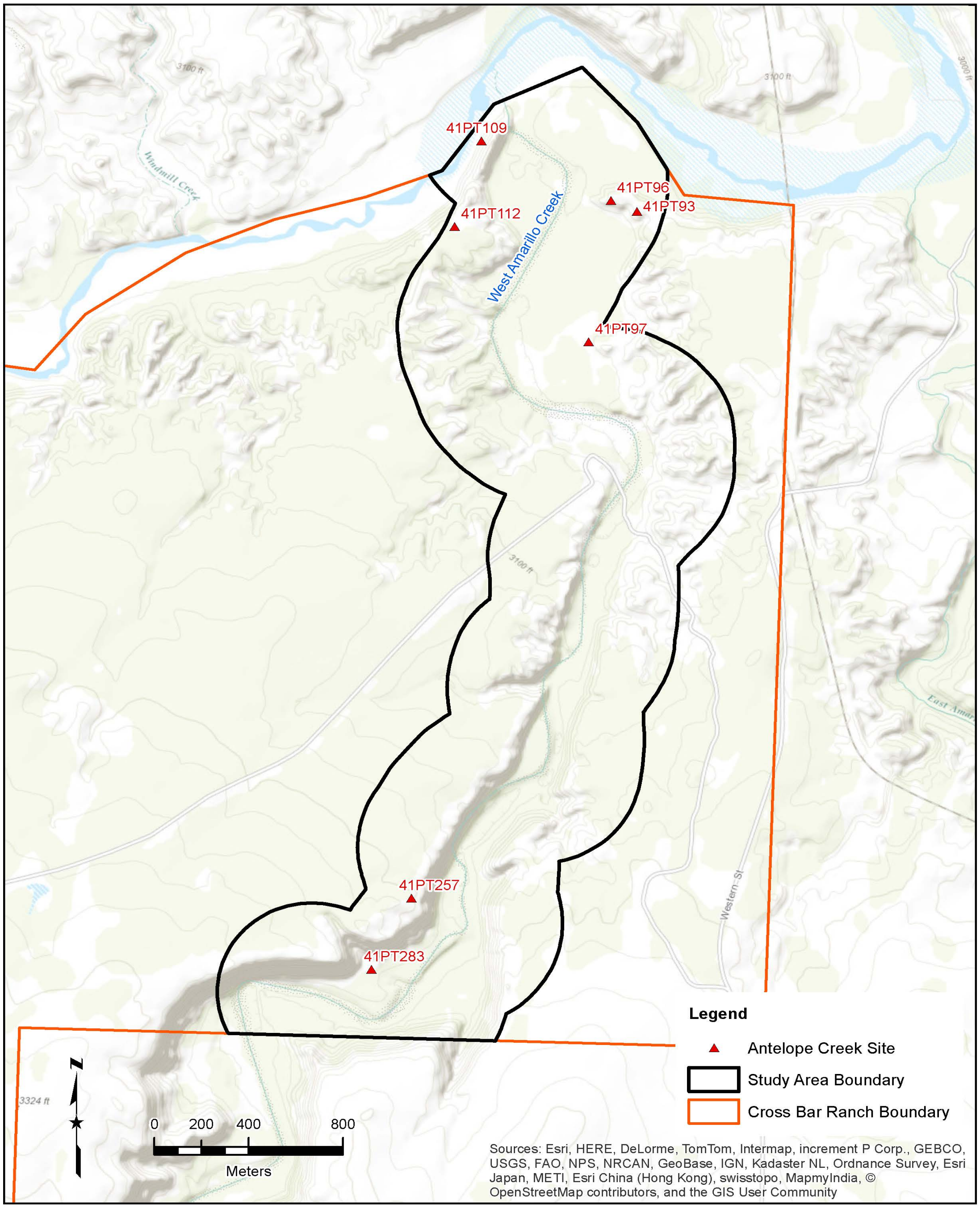

Figure 8. Overview of the study area and associated Antelope Creek sites.

Physiographic Setting

West Amarillo Creek meanders north-south along the base of a broad valley flanked by steep and rocky hillsides and flat mesa tops (Figure 9). Although the active stream channel is relatively narrow, the deeply incised valley consists primarily of floodplain areas that occur along sizeable lower terraces of West Amarillo Creek.

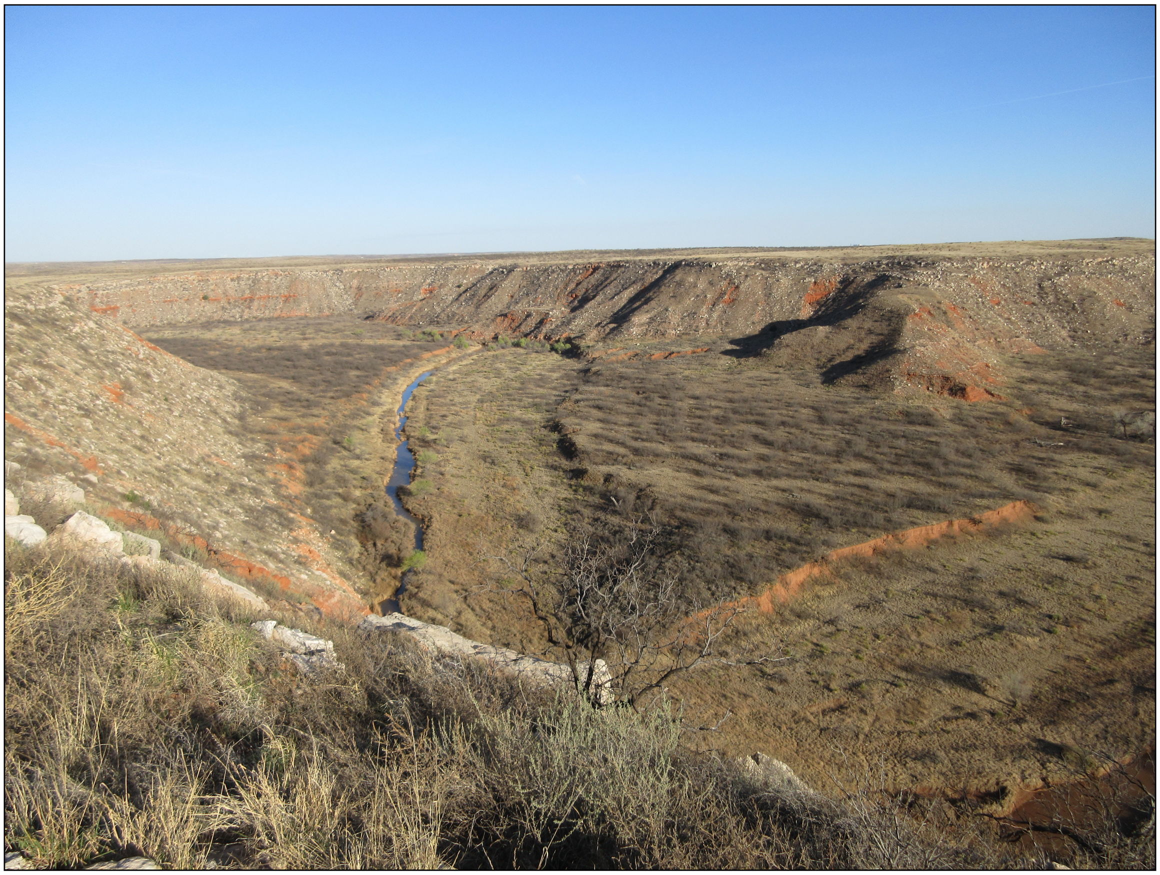

Figure 9. Overview of the West Amarillo Creek valley near 41PT283.

According to the National Resources Conservation Service Web Soil Survey (NRCS 2016), the alluvial soils mapped along the valley floor consist of very fine sandy loam defined as Yomont soils (Yo), frequently flooded. Colluvial soils mapped along the eroded hillsides are composed of the Burson-Quinlan-Rock outcrop association (BQG), steep, which have a parent material of loamy residuum weathered from sandstone and siltstone. The soils found along bluff edges alternate between the Veal-Paloduro association (VPD), undulating, and the Tascosa association (TAF), hilly.

The Study Site: 41PT283

Site 41PT283 lies at the base of a steep and rocky canyon wall. An inner valley knoll bounds the site to the north, while the south, west, and east boundaries are formed by moderate grades that slope down towards the flat lower floodplain terraces (Figure 10). The modern West Amarillo Creek channel is located approximately 150 m to the south of the site.

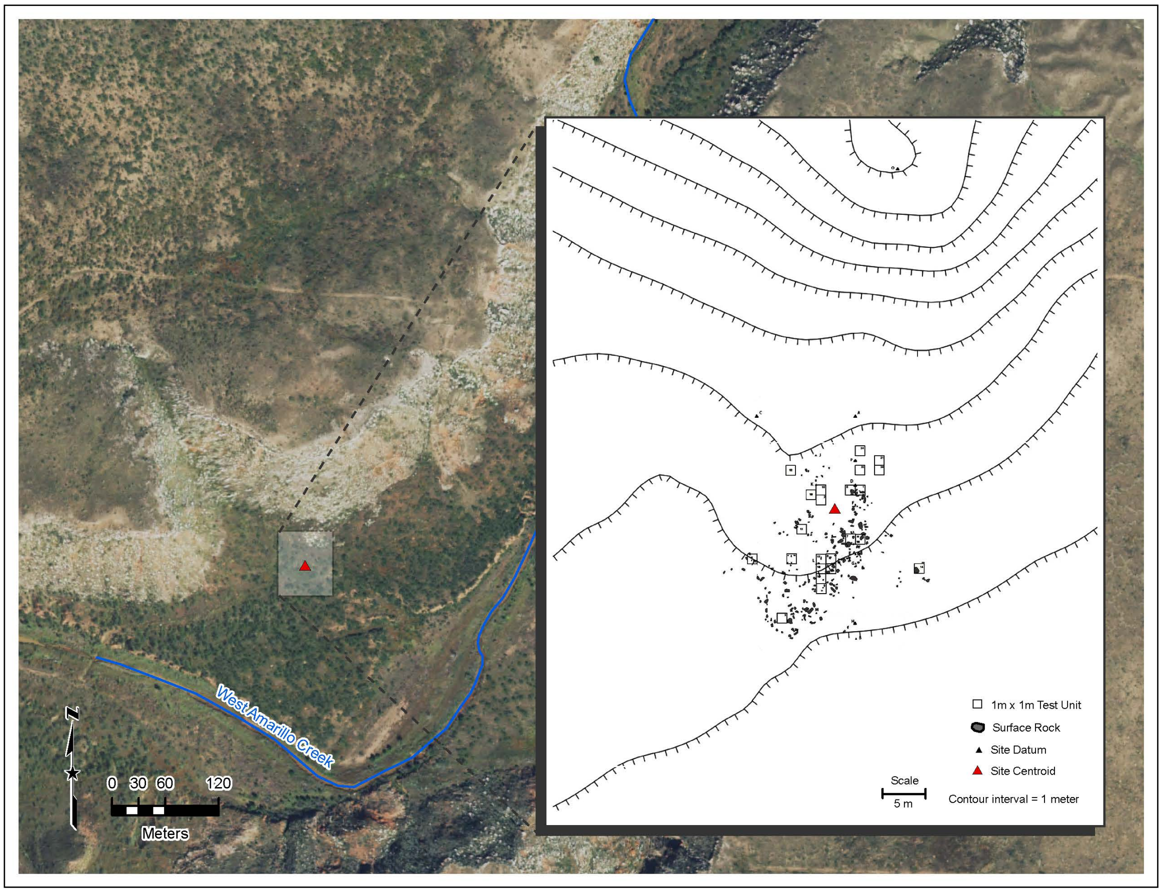

Figure 10. Map showing topography at site 41PT283.

Site 41PT283 was first located by Paul Tanner and initially recorded in February of 2002 by James Briscoe who defined it as a seasonally occupied two-room Panhandle Aspect slabhouse. During the initial recording, a two-track road encroached the site area along its northern boundary, which according to Briscoe (2002:37), "slightly disturbed" one corner of the east room (Figure 11). Briscoe also noted that the road exposed a midden deposit containing clamshell, flint, bone and burned rock around the north and east edges of the house. Following this recording, 41PT283 was designated as eligible for inclusion in the National Register of Historic Places.

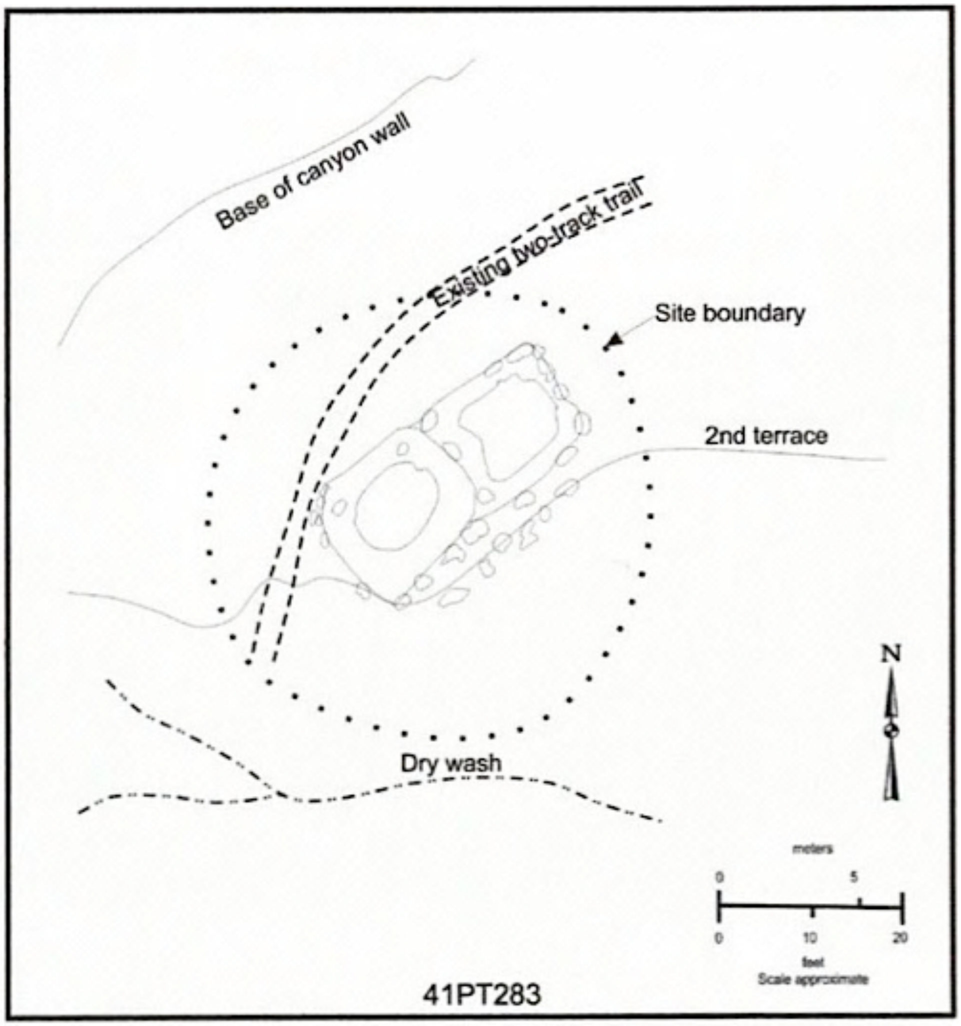

Figure 11. 2002 plan map of site 41PT283 (Briscoe 2002:37).

John Northcutt revisited the site in July of 2005 and expanded the number of rooms based on a cursory surface inspection. He also attributed the site to the Antelope Creek phase, and interpreted the configuration of stones as a large rectangular house structure with as many as three rooms and two isolated stone structures to the east of the main building. According to the 41PT283 site form, Northcutt observed a long undivided rock wall on the east side of the structure, which is represented by a north-south alignment of stones shown in Figure 12. The observation of a long common wall with adjacent rooms led Northcutt to postulate that the site could be a hamlet from the early sub-stage.

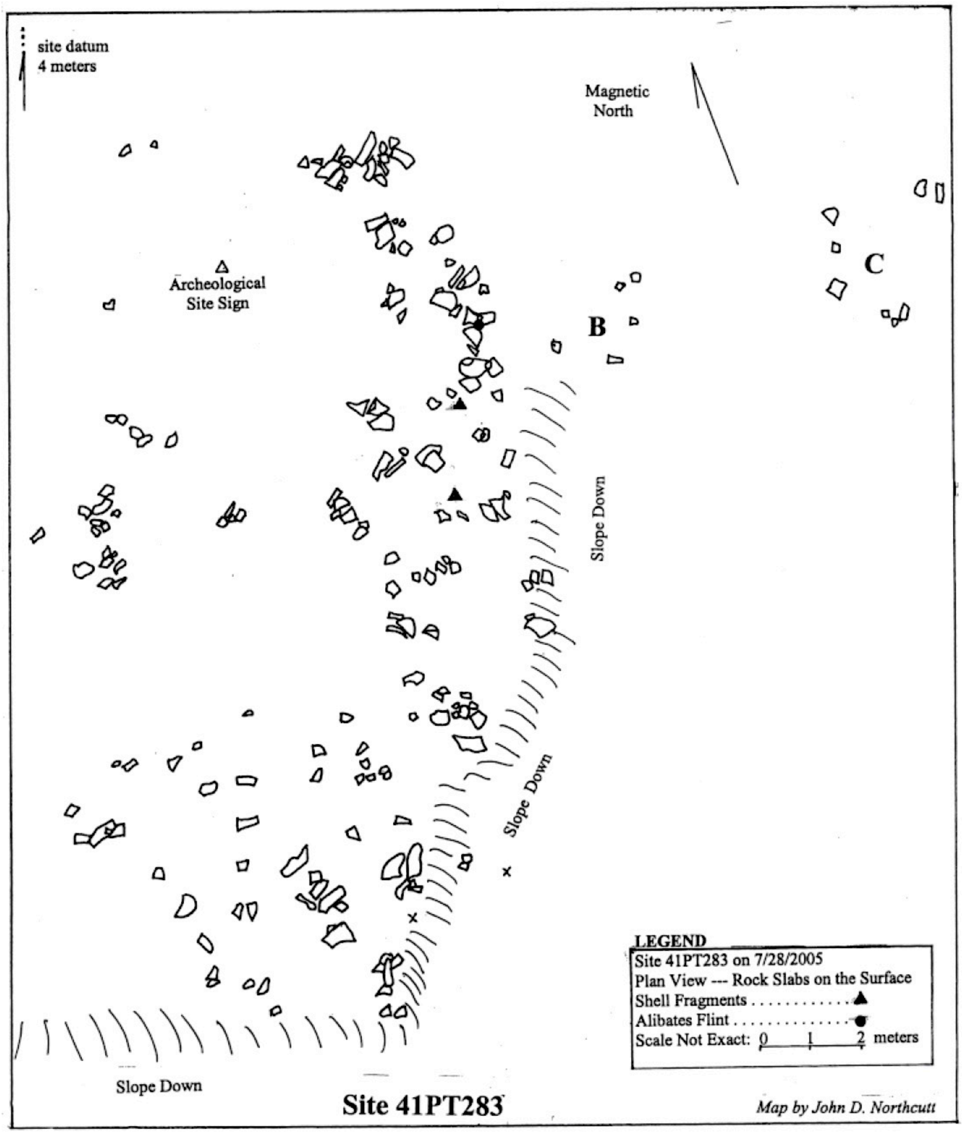

Figure 12. 2005 plan map of site 41PT283 (THC Atlas 2016).

Texas State University conducted archaeological field schools at the site in 2007 and 2008 under the direction of Britt Bousman. The objective of these excavations was to record the depth and extent of cultural remains at the site and document damage caused by vehicle traffic (Bousman 2008). A total of nineteen 1m-x-1m test units were hand excavated during the field schools. These units were situated around surface exposures of large dolomite stones believed to be ruins of a slabhouse structure (Figure 13). Test units

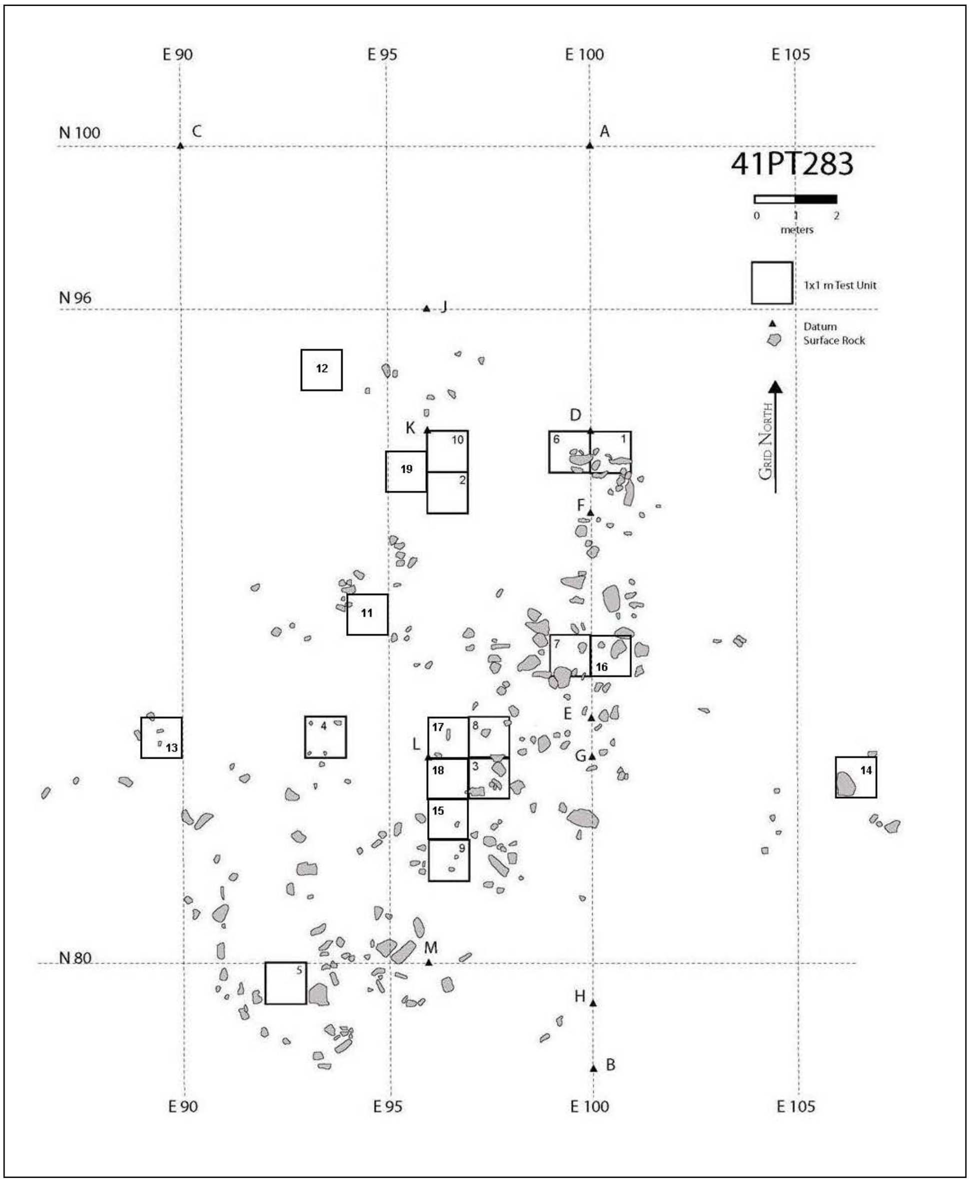

Figure 13. Plan map of 41PT283 with 2007 and 2008 test units.

were placed in these areas to maximize the exposure of possible architectural features and to locate storage/pit features. Based on the topography and distribution of surface stones and other cultural materials, the site covers 500 m^2 and measures approximately 25 m north-south by 20 m east-west.

Although no *in situ* structural features were observed, a variety of cultural materials were recovered including stone tools, lithic debitage, ceramics, grinding stones, burned rock, bone fragments, mussel shells and macrobotanical debris. All of the artifacts and data collected during excavations at the site will be curated at the Center for Archaeological Studies (CAS) located at Texas State University.

Geoarchaeology at West Amarillo Creek

Two soil profiles located on the alluvial terrace deposits of West Amarillo Creek near 41PT283 have been described (Bousman 2008:11-18). Geologic documentation and landform analysis indicates that two terraces (T_1 and T_2) have been deposited by West Amarillo Creek (Figure 14). A series of elevation points taken in the area indicates that the T_2 terrace is 22 cm higher than the T_1 terrace immediately south of the site. The modern floodplain terrace (T_0) is actively eroding and accumulating sediment as well.

Site 41PT283 lies north of the T_1 terrace along an eroded colluvial apron. This deposit was formed by the deposition of water-transported sediments derived from the steep slopes of the canyon wall north of the site. According to Bousman (2008:14), the site does not appear to occupy the alluvial floodplain, although further analyses are warranted. Settlement along the floodplain edge may have been intentional given the potential for fertile soils suitable for horticulture. As such, occupation of the site may have been intermittent based on growing and harvesting seasons. Other factors likely influencing the placement of the site in the low riverine setting include easy access to a variety of wild plants, smaller animals, and aquatic resources, but the primary motive is believed to be horticulture driven.

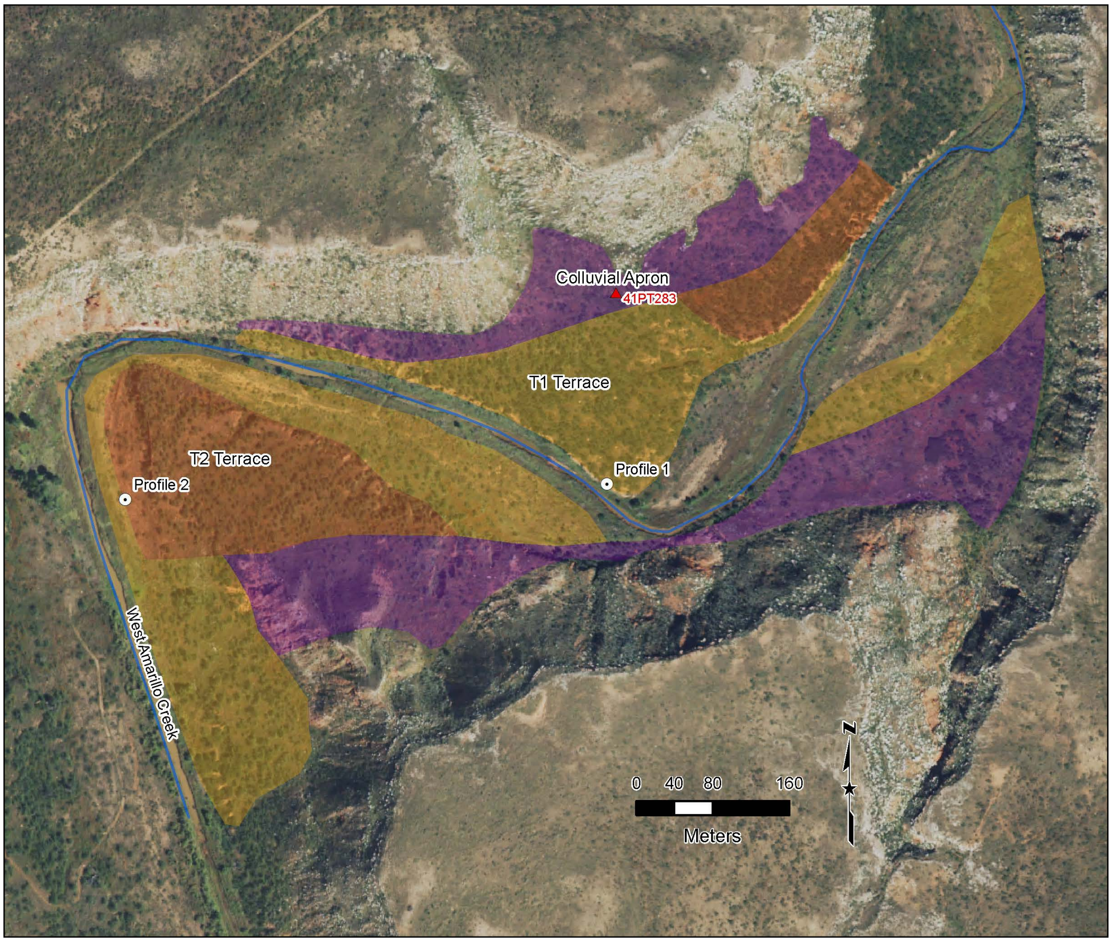

Figure 14. Depositional settings at West Amarillo Creek near 41PT283 (Modified from Bousman 2008).

Site 41PT109

Antelope Creek Site 41PT109 consists of an isolated two-room homestead comprising the Unit Type 1 architectural category and is located 4.3 km (2.7 miles) north of the study site. This site lies along an upland ridgeline overlooking the Canadian River and West Amarillo Creek (see Figure 8). It was investigated in 2004 and 2005 during archaeological field schools conducted by Texas State University under the direction of Britt Bousman. Following the 2004 excavations, the site was analyzed for a Master's Thesis (Weinstein 2005). A total of thirty-one 1m-x-1m test units were excavated at the site. The units were positioned in and around the structure to document architectural, hearth, and pit features (Figure 15), which comprise an area of about 120 m^2. A radiocarbon assay obtained from maize fragments dates the occupation at A.D. 1400-1420. According to Weinstein (2005:98), this timeframe represents the total occupation history at the site.

Figure 15. Plan map of site 41PT109 (Modified from Weinstein 2005).

Although 41PT109 has a diagnostic Antelope Creek artifact assemblage, no formal digging tools associated with horticulture activities were found. This evidence along with the upland setting and scant number of grinding stones suggest that farming occurred off-site. According to Weinstein (2005:98), digging tools and other functional items of value such as stone tools, ceramic vessels and grinding stones may have been removed from the site during abandonment. Additionally, the vast majority of lithic artifacts, ceramics, mussel shells and animal bones were recovered from test units situated outside of the residence. The lack of such materials in habitation areas reflects a high degree of site maintenance and/or organized abandonment of the site.

Site attributes such as architecture, artifact frequencies, occupation history/extent, and settlement/abandonment patterns recorded at 41PT109 are useful comparative data in my interpretation at 41PT283. Of particular interest is how the two sites relate chronologically and whether they functioned in different economic and social environments.

Site 41PT257

Site 41PT257 is located approximately 450 m northeast of the study site and has Antelope Creek structures located on the west rim of the bluff overlooking the West Amarillo Creek floodplain. It was recorded in 2001 during a pedestrian survey conducted by Chris Lintz and Jason Smart of TRC Environmental (Lintz et al. 2002). The survey consisted of non-systematic surface inspection and a general inventory of the artifact assemblage. Although the ruins of three structures were found, the extant artifact assemblage is limited (Figure 16). Lithic raw materials include pieces of Alibates, Tecovas, and quartzite debitage with some showing evidence of having been burned (Lintz et al. 2002:79).

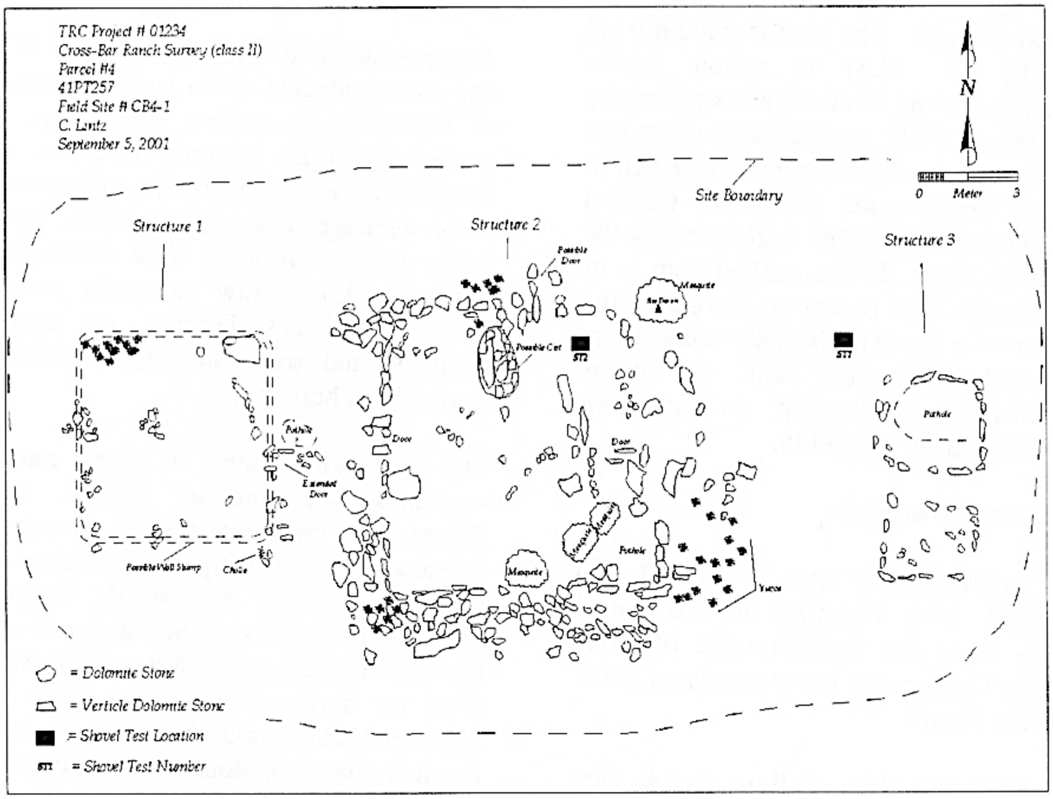

Figure 16. Plan map of site 41PT257 (Lintz et al. 2002).

Structure 1 consists of a square room measuring 5 x 5 m with an east facing entryway. Lintz et al. (2002:79) note that the paucity of slab stones along the north wall suggests that the stones were reused to construct other buildings on site. Structure 2 is a larger square residential structure measuring 7.5 x 7.5 m and is oriented along cardinal directions. The orientation of the stones along the north, east and west walls was interpreted as the remnants of three separate entrances to the structure. A possible burial cist feature was identified in the north-central portion of Structure 2. The easternmost structure (Structure 3) is a smaller non-residential structure consisting of two square rooms each measuring 2.5 m N-S x 2 m E-W. The rooms appear to have been lined with relatively small, vertically set stone slabs.

Subsurface investigations consisted of two shovel tests placed near Structures 2 and 3. Artifacts recovered consist of a distal fragment of an arrow point, mussel shell fragments, burned rock, debitage and a cordmarked sherd. A single piece of mesquite charcoal was recovered, which yielded a calibrated date of A.D. 1290-1420. Lintz et al. (2002:82) contend that the buildings at 41PT257 conform to the late Antelope Creek subphase and the radiocarbon assay "exactly straddles" the A.D. 1350 date commonly used to divide the early and late subphases. The possibility of sequential use of multiple houses at this site is an important element at 41PT257. The proximity of this homestead to 41PT283 is of particular importance given that the two sites could overlap temporally, which would suggest that they might be inter-connected.

Summary

The study area encompasses a 5.5 km^2 portion of West Amarillo Creek located on Cross Bar Ranch. Archaeological investigations at the Antelope Creek sites found in the study area have afforded a degree of useful data that can be referenced in my interpretation at 41PT283. General observations of the comparative site sample display a marked divergence in settlement and architectural patterns when compared to the study site, which begs the question of differential functions and/or occupational histories.

In addition to interpreting function at the study site, an overarching goal of my study is to provide a dataset that can be referenced during detailed analyses at other Antelope Creek sites located on the Cross Bar. Ongoing archaeological investigations are underway at sites 41PT96 and 41PT112, which were initially recorded at the survey level. Tying together the archaeological data from these and other Antelope Creek homesteads found in the study area will foster an improved understanding of the architectural, settlement/abandonment pattern, and functional variability common during the phase (Lintz 1986a). Such a concept can lead to an improved understanding of the potential interconnectivity between isolated homesteads and the poorly understood social framework of Antelope Creek peoples.

V. RESEARCH PERSPECTIVES AND HYPOTHESES

The term "site function" encompasses an array of human behaviors that are manifested in archaeological assemblages. A functional determination rests largely on characterizing the economic systems implemented by Antelope Creek peoples at the study site. These adaptive strategies are observed in the site's settlement pattern, occupational history, technological system, subsistence activities, and abandonment type. These behaviors performed collectively in response to complex suites of environmental and social factors that rarely materialize in the archaeological record.

Models of Antelope Creek Adaptation

The cultural materials found at archaeological sites reflect an array of human behaviors. The diverse cultural patterns observed during the Plains Village period has long been attributed to the unique ecology of the Southern Plains. The distribution of critical resources, such as bison, is considered the driving force behind hunter-gatherer and villager subsistence and settlement patterns in the Plains region of North America. A detailed look into the material assemblage reveals various strategies adapted to offset resource instability or a reliance on a single food resource.

Collector-forager models developed by Binford (1980), and adapted by Boyd and Tomka (1990) and Boyd (1997) have not been applied to cultural groups such as the Antelope Creek given the practice of horticulture and the permanent nature of their habitation structures. However, the evidence of other dietary components common during the phase, such as the hunting of a variety of game animals, and the collection of wild plants and aquatic species, suggests that Antelope Creek peoples exploited a wide range of food resources as a method to avoid risks that groups incur when their major source of protein is obtained from an unpredictable resource such as bison. In addition to horticulture, seasonal foraging and resource acquisition expeditions, and/or mutualistic trade-exchange networks with neighboring Puebloan groups were likely implemented to offset perceived scarcities in local resources.

Though considered inadequate for the Antelope Creek phase (Boyd 1997:58), the fundamental dichotomy of the collector-forager model can be adapted to characterize site type variation (e.g., hamlets, homesteads, and subhomesteads) in terms of discrete economic functions during the Antelope Creek phase. Binford (1980) defines collector systems as those that organize task groups to exploit resources that are brought back to the primary residence. Residential sites within this system are branded as lengthy occupations with high artifact densities and frequent items of trade (Boyd 1997:58). These attributes correlate with the homestead category of the Antelope Creek phase (Lintz 1986a:260).

Forager systems brought residential groups to resource areas, establishing temporary or seasonal base camps across a more limited range. Frequent moves to new resource localities are reflected in low artifact densities, an absence of food storage features, and low percentages of nonlocal lithic materials and exotic trade items. The temporary, intermittent, or seasonal nature of these site types share similarities with the Antelope Creek subhomestead category. When taken in light of the collector-forager dichotomy, subhomesteads can be characterized as temporary hunting/foraging (or horticulture) sites that were likely connected to nearby permanent homesteads. Such a perspective highlights the variability in settlement patterns, and hence the potential diversity of site functionality during the Antelope Creek phase. My analysis at 41PT283 will evaluate the homestead-subhomestead dichotomy in lieu of the economic behavioral patterns exhibited in the site's structural, material, and settlement pattern data.

Settlement Patterns

Settlement patterns in archaeology have been described as the study of "the way in which man disposed himself over the landscape in which he lived" (Willey 1953:1). Theses patterns are best observed in the arrangement and distribution of prehistoric dwellings and other structures through space and time. The nature and distribution of habitation structures on the landscape reflect the natural environment, building technologies, and various institutions of social interaction (Willy 1953:1). As such, settlement pattern studies are essential to the functional interpretation of archaeological cultures. However, little direct attention has been given to what the dispositions of Antelope Creek sites indicate in terms of variable functions over time or the possibility for interdependent relationships between settlements.

The topographic setting, architecture and overall layout at 41PT283 provide baseline data for evaluating Antelope Creek settlement patterns. Lintz (1986a:260-262) defines three general categories of Antelope Creek site types- hamlets, homesteads and subhomesteads. Hamlet sites are thought to have supported many families given the occurrence of multiple structures that were often contiguous. Hamlets tend to be located further from major stream systems than other site types, which correlates with a reliance on inland spring discharge from the Ogallala Formation (Lintz 1986a:261). These aggregate settlements are found primarily along uplands and canyon rims and predominate during the early sub-phase (A.D. 1200-1350).

Homestead sites have a single dominant room with pit and cist features occasionally found in association with subordinate room forms (Lintz 1986a:260). Homesteads are found on inner valley and canyon rim settings. These sites were likely occupied by a single family and are common to the late Antelope Creek sub-phase (A.D. 1350-1500). Variability exists in the proximity of homesteads to the Canadian River. As Lintz (1986a:260) explains, some occur within 1.2 km of the river while others are found at distances exceeding 7.2 km. Like hamlet sites, homesteads typically have high tool densities and varieties, reflecting permanent residences that were continuously occupied prior to abandonment.

Unlike hamlets and homesteads, sites in the subhomestead category lack a dominant household room and instead consist of subordinate room forms with or without pit features (Lintz 1986a:260). Subhomesteads primarily occur on inner valley riverine settings in close proximity to fertile bottomland soils. Having low tool densities and varieties, the sites were utilized intermittently or continuously over a short period of time. Lintz (1986a:260) describes subhomesteads as outlying or subsidiary sites to more permanent site types (e.g., homesteads). Given the low topographic setting of subhomesteads, they are believed to represent horticultural production, and food procurement/processing activities.

Technological Systems

Attempting to understand prehistoric human behavior inherent in technological systems requires consideration of resource availability at the macro-scale. Theoretical models such as foraging theory offer perspectives in studying hunter-gatherer responses to resource instability and adaptive responses to economic risk. These models are often underscored by models based on collector and forager systems (Binford 1980; Boyd 1997; Hayden 1986) microeconomics and game theory (Smith and Winterhalder 1992; Stephens and Krebs 1986), prey and patch models (Charnov 1976) and behavioral ecology (Winterhalder and Kennett 2006) that focus on a host of risk management strategies in acquiring food resources. Such perspectives can also be integrated into behaviors involved with the procurement, transport, production, and maintenance of lithic materials (Bousman 1993; Torrence 1989). Much like food acquisition strategies, the production, use, maintenance and discard of stone tools are economic strategies influenced by their perceived costs and benefits. As such, lithic technologies are not the be all end all of survival, but "one of several strategies devised for increasing access to resources when and where they are acquired and by doing so, decrease the risks involved" (Torrence 1989:58).

In addition to the Alibates Flint National Monument (South Quarry), another source area for this tool stone has been found north of the Canadian River along the east bank of Devil's Canyon (Bowers 1975:88). Previous studies by Bousman et al. (2015) propose that this North Quarry was the preferred Alibates source locality for Antelope Creek peoples settled along West Amarillo Creek given the shorter travel distance (Figure 17). This Alibates source area is located approximately 22.7 km (14.1 miles) northeast of site 41PT283. The method in which the distance to the North Quarry was calculated is discussed in Chapter 6.

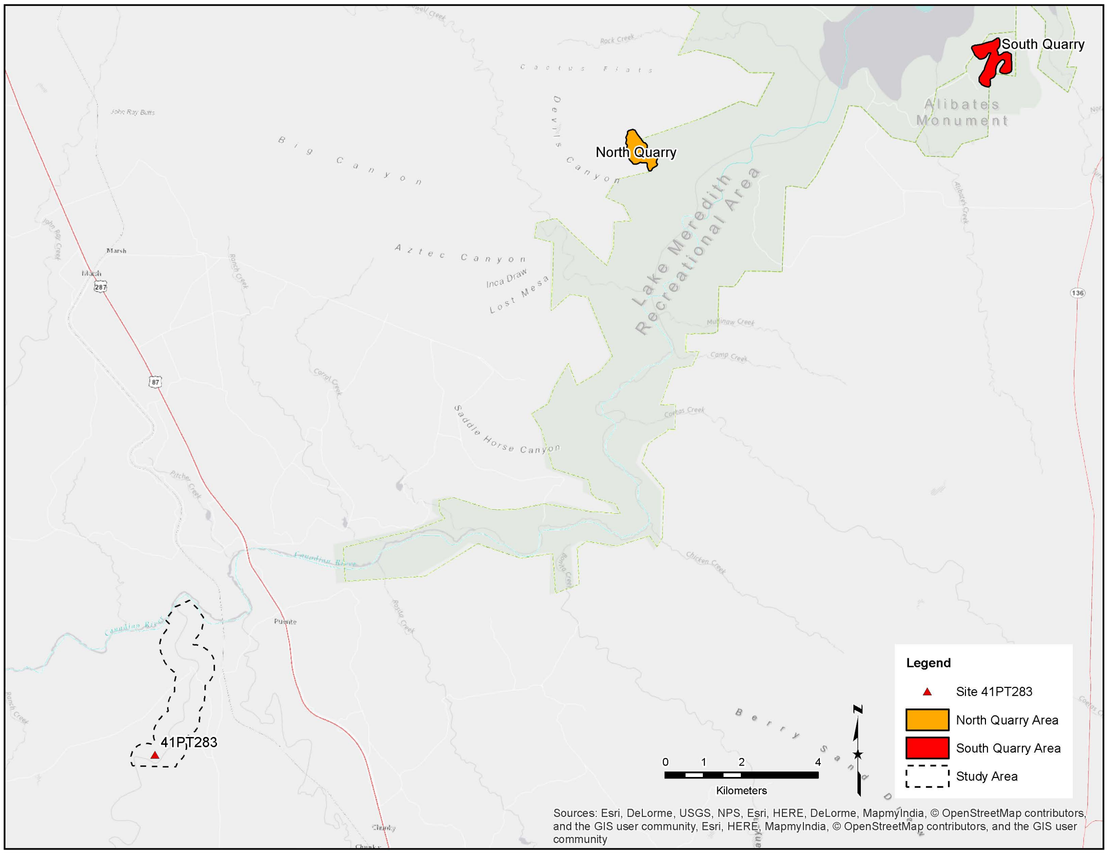

Figure 17. Regional overview of 41PT283 and Alibates source area.

Since the acquisition of high-quality chert resources on the Llano Estacado required time and energy, careful planning was necessary to insure that the availability of time and energy coincided with the availability of resources. One method of gauging such adaptive strategies is by observing the quality of chipped stone in archaeological assemblages (Bousman 1993). For example, in times of resource scarcity and limited mobility, the use of readily available materials, such as quartzite, for tool implements represents a technological response to risk. Additionally, the degree of exhausted cores in the lithic assemblage reflects decreased mobility and limited resource availability.

Identifying stone tool reduction methods such as hard or soft-hammer percussion assists in characterizing what reduction stages were executed at the site. Such attributes provide useful measures to understand the local technological strategies adapted by

Antelope Creek peoples. An understanding of the local lithic technology also provides the basis for inferring procurement behaviors at quarrying areas and the handling of Alibates preforms at secondary localities.

Resource availability can also be deduced from the stone tool types observed at the site (Bleed 1986; Bousman 1993). If the majority of tools are expedient, then it can be inferred that the inhabitants lived in an environment where raw materials were abundant and available resources were relatively predictable. Expedient tools take the form of modified or utilized flakes, and represent mobile groups who extracted food from a variety of resources. Bousman (1993:69) explains, if the lithic assemblage is comprised of maintained or highly specialized tools such as knives, scrapers and projectile points, then it can be hypothesized that the local economy was confined to a narrow scope of predictable resources. In this scenario, great care was taken in the manufacturing of reliable and specialized tools design for finite methods of resource extraction given the increased risks resulting from a constricted biomass. Generally speaking, the relationship between simplified and specialized tool assemblages provides the basis for delimiting between mobile and sedentary societies.

Expedient and specialized tools are typically associated with extracting food from a variety of resources. A method of gauging the degree to which critical food staples such as meat protein were supplemented is to evaluate the frequency of other stone implements such as grinding stones. The riverine environment at 41PT283 likely supported a variety of edible plants that were exploited by Antelope Creek peoples. Additionally, the ecology of West Amarillo Creek sustained species of freshwater clams that, along with foraged and/or cultivated plants that supplemented protein-dependent diets. As such, a synthesis of the stone tool, groundstone, flora and fauna encompasses the gamut of subsistence behaviors at the site.

Stone Fracture Mechanics

When applied in conjunction with foraging theory, analyses of a lithic debitage assemblage “allows archaeologists interested in prehistoric technologies to obtain a greater understanding of the behaviors responsible for the creation and use of stone tools and their waste products” (Bousman 1993:60). The stone tool reduction strategies executed by the 41PT283 artisans is understood through an assessment of the fracturing attributes of the debitage assemblage.

Qualitative methods of analyzing waste flakes are often substituted with a less time-consuming approach such as aggregate or mass analysis that stress, “studying the forest rather than the tree” (Ahler 1989). However, mass analyses are often underscored by indiscriminate quantitative categories that potentially overlook telltale stone fracturing characteristics that reveal the methods they were produced. The importance of such attributes warrants detailed qualitative assessments of individual flakes in order to address such technological trends quantitatively. This method allows for a firmer understanding of what discrete technological system, or systems were executed at the site, which helps characterize adaptive responses to resource instability.

Given the innate subjectivity of a qualitative analysis of waste flakes, an overview of the criteria used in determining the site’s technological system is merited. Early stage reduction typically produces broad and thick flakes with prominent bulbs of force and crushed platforms (Crabtree 1982:22). In these initial stages, hammer stones composed of rigid cobbles such as quartzite are used to detach large flakes that are either discarded or further reduced into various tools in subsequent stages. Early stage reduction is used to produce large bifacial forms that function as expedient tools or preforms for items of trade, or later reduction into specialized tools such as knives or projectiles. Flakes removed in early stage reduction usually retain cortex and contain very few to no flake scars on the dorsal surface. They also tend to have prominent bulbs of force, crushed platforms, and terminations that are stepped or overshot, indicating a heavy striking load.

Secondary or intermediate reduction uses a variety of percussive tools such as hard/soft hammer stones and billets made from the proximal end of an antler tine. This stage of lithic reduction is used in biface shaping and tool maintenance such as edge sharpening or retouch. Also referred to as bifacial thinning flakes, secondary flakes have a tendency to expand in width from platform to termination (Whittaker 1994:185). These flakes are typically flatter and thinner than early stage flakes and generally contain diffuse bulbs of force, lipped platforms and feathered terminations (Crabtree 1982:22).

Another characteristic of secondary reduction is an increased number of flake scars along the dorsal surface of detached pieces. Depending on striking load and angle, hammer stones and billets produce small flakes indicative of tool edge shaping and maintenance, transverse thinning flakes, or broad and thin flakes with sharp edges. The latter can be used as expedient flake tools, whereas stone tools with retouch along their edges are known as maintained or specialized tools. Examples of maintained tools include projectile points, bifacial knives and unifacial scrapers. In addition to tool retouch or maintenance, bifacial preforms prepared during early and secondary stages can be further reduced and shaped into highly specialized tools such as notched projectile points using the pressure flaking method.

As opposed to the removal of flakes with various degrees of percussive force, a late stage reduction method known as pressure flaking detaches pieces through the application of pressure using the pointed or distal end of a billet. This method allows for the precise removal of flakes for a variety of tool production and maintenance purposes. Pressure flaking typically produces extremely small and thin flakes with very diffuse bulbs of force and feathered terminations. Striking platforms show signs of crushing caused by the intense friction applied in their removal. Late stage debris is also referred to as tertiary flakes.

Given tiny size and limited durability, a tertiary flake is characterized as waste debris with no utilitarian purpose. The small size and volume of tertiary flakes also makes them illusive in archaeological contexts. Pressure flaking debris represents late stage reduction and tool retouch, which includes the shaping, sharpening, and serrating of tool edges, although this can also be performed using percussive methods. The pressure method is commonly used in the shaping and notching of arrow points.

Site Formation Processes

Much like the manner in which prehistoric groups retained artifacts through maintenance and reuse, site abandonment plays an important role in the formation of the archaeological record (Schiffer 1987). For example, tools found in archaeological contexts, in some cases, reflect the terminus of use life, whereas maintainable tools involved in the reuse continuum may be removed in systemic contexts such as site abandonment. In terms of natural formation processes, stratigraphic preservation or integrity is also of importance when considering the extent of a single occupation or intermittent reoccupation of a site.

Similar in nature to artifacts, the life cycle of a residential structure involves three basic processes: construction, use/maintenance, and discard (i.e., abandonment). Operating at both aggregate and individual household levels, Plains villagers practiced household abandonment on an episodic, seasonal, and permanent basis (Brooks 1993). These abandonment activities are either carefully planned or the product of unexpected natural or cultural events (Brooks 1993:179).

Systematically planned abandonment can be characterized as an adaptive response to economic risk as it usually occurs when a structure reaches the point of disrepair from physical deterioration wherein the repair costs outweigh construction of a new residence. According to Brooks (1993:179), planned abandonment processes are procedurally linked to the construction of the new lodge. Valuables are salvaged from the old dwelling to be reused at the new residence. These items include structural elements such as wooden posts as well as specialized implements such as knives, scrapers, grinding stones and ceramics that have yet to exceed their use lives. Orderly abandonment is also manifested in the degree of site maintenance, where discarded materials are found concentrated in trash pits located away from cleaned or scavenged living areas.

Unplanned abandonment is the product of a natural or cultural event that disrupts the normal sequence of the residence's life cycle (Brooks 1993:182). Such interruptions can consist of events such as the house catching fire, the intrusion of outside groups, or the unexpected death of a resident. These occurrences disrupt the normal processes of house use and maintenance, resulting in random distributions of artifacts and the leaving behind of items of value. As a result, house floors and other living areas have greater numbers of finished items and by-products deposited in either primary or secondary contexts.

From an archaeological standpoint, the upside to an abrupt abandonment is the potential for preserved spatial patterning of artifacts, which can potentially provide a snapshot of different household activities that occurred in the days prior to abandonment. However, it is plausible that cultural materials were significantly displaced, altered or removed during unforeseen natural and cultural events. Post-abandonment processes such as bioturbation also effect the disposition of cultural materials. As such, assessments of site preservation conditions and stratigraphic integrity must be made prior to analyzing the context and extent of buried occupation zones.

Research Questions

When compared to the homesteads found in the study area, the site setting, architecture, and artifact densities/frequencies at 41PT283 suggest a temporary or seasonal residence established to target a variety of resources. These initial observations prompted questions of whether this evidence reflects a function different than that of homestead residences. In addition to site function, a topic that came to mind was whether the site represents a single occupation as seen at 41PT109, or a series of intermittent occupations over time, thus potentially representing multiple functions. For example, does the data indicate a specialized subsistence economy over a single use period or a series of different economies through the course of multiple intermittent occupations? Also of importance is whether horticulture was the driving force behind settlement along the inner valley.

The theoretical perspectives discussed in the previous sections provide the analytical framework for an interpretation of site function at 41PT283. Of particular interest are settlement patterns, technological systems, subsistence economies and occupational histories, and what these elements indicate in terms of the adaptive strategies used by Antelope Creek peoples along West Amarillo Creek. The following sections elaborate on these topics and present the research questions developed based on the available material data.

Architecture and Occupation Extent

The three Antelope Creek site type categories- hamlet, homestead, and subhomestead demonstrate the variability in settlement pattern throughout the phase. Archaeological background research using the Texas Historical Commission's Sites Atlas indicates six additional Antelope Creek homesteads (41PT93, 41PT96, 41PT97, 41PT109, 41PT112 and 41PT257) located in the study area that occur along the canyon rims of the lower West Amarillo Creek valley. When compared to these sites, the disposition of 41PT283 is significant given its lowland setting. In order to determine whether 41PT283 and 41PT109 have different occupation histories/extents, frequency and density analyses were performed on the artifact assemblages. The following research questions were developed under the premise that topographic setting influences occupation extent and architecture.

- Does the difference in the nature of architectural and archaeological features at the sites reflect different occupation intervals?
- Do the artifact frequencies and densities reflect different degrees of occupation intensity? Is there evidence of multiple occupations at 41PT283? What does the difference in ceramic assemblages and the conditions of ceramic sherds reflect in terms of occupational intensity?

- If 41PT109 is a permanent homestead built of stone and adobe, was 41PT283 constructed using less resilient materials such as picket-posts or smaller limbs with the intent for short-term occupation?

- Does the architectural evidence at 41PT283 represent an undefined architectural Unit Type?

- Do the site chronologies at 41PT109, 41PT257, and 41PT283 overlap, representing a potential network of sites? Do they represent individual occupations and thus a shift in land use during the phase?

- What additional data are needed to address these research topics?

Technology and Subsistence

The 41PT283 material assemblage underwent detailed analyses in order to characterize the economic strategies of the 41PT283 villagers. These consist of stone tool procurement and reduction, and subsistence strategies. The site stone tool frequencies were analyzed to determine whether access to the Alibates quarry was limited or unrestricted, and if the local economy was specialized or diverse. The fracturing characteristics of the debitage were evaluated to determine what lithic reduction strategies were executed at the site. The ratio of expedient versus specialized tools, and projectile points versus grinding stones was analyzed to gauge the importance of hunting versus plant processing activities. The following research questions were formulated with the premise that technology and mobility are influenced by site setting and subsistence activities.

- Is the lithic assemblage composed primarily of high or low quality tool stone? Did the material types undergo differential treatment?

- What lithic reduction strategies were executed at the site and what does this indicate in terms of stone procurement strategies?

- What is the ratio between projectile points and grinding stones (i.e., hunting and plant processing activities)?
- Does the stone tool assemblage consist primarily of specialized or expedient tools? What does this suggest in terms of the local economy?
- What additional data are needed to address these topics?

Settlement and Abandonment

Antelope Creek homesteads have been branded as isolated single-family units, implying economically and socially independent occupations. However, the settlement patterns of the study area sites suggest potential for site interdependence. Lintz (1986a:85, 260) proposes an interrelationship between homesteads and subhomesteads or seasonal “field-hut” structures. The latter are believed to be situated close to crops and functioned as outlying or subsidiary sites to the more permanent homesteads.

According to Lintz (1986a:260), the dependent relationship of these sites is reflected in the faunal remains, as indicated by food sharing. In this scenario, resources acquired at upland homesteads were shared with ancillary subhomesteads. However, it is proposed that a degree of mutualism could have existed where food resources exploited from different topographic settlings were exchanged between camps. For example, Antelope Creek peoples tethered to lowland activities such as plant processing were provided with protein extracted from larger mammals occupying the nearby plateaus. Similarly, smaller animals such as pocket gophers, rabbits, fish, turtles, and freshwater clams were harvested from lowlands, and along with harvested crops, brought to permanent upland habitations as needed.

While the dataset required for a detailed study of site interdependence is currently lacking at all of the study area sites, the available data from 41PT109 and 41PT283 were cross-compared to analyze the settlement-abandonment and occupational levels of variability. The spatial distributions of artifacts were compared to those observed at site 41PT109 to evaluate abandonment. At this homestead, living areas were almost completely devoid of cultural materials, which were found heavily concentrated in external trash pit features. The occupation history at 41PT283 was assessed through analyses of the vertical contexts of diagnostic cultural materials such as ceramics and projectile points and discrete separation between artifact concentrations. Stratigraphic integrity was evaluated to determine whether such occupation zones are discernible or altered by site formation processes. The following research questions were developed with the premise that site setting and degree of occupation influence site settlement and abandonment patterns.

- Is the distribution and condition of artifacts indicative of an organized or abrupt abandonment at 41PT283?
- Do the types, densities and depositional contexts of cultural materials suggest multiple episodes of abandonment and re-occupation at the site?
- Is the vertical context of artifacts sufficiently preserved or has the stratigraphic integrity been compromised by cultural and/or natural formation processes?
- What additional data are needed to address these research questions?

Summary

The aforementioned research questions were formulated based on analyses of the available site data, and how these compare to the variability observed during the Antelope Creek phase. Research perspectives pertaining to settlement and abandonment patterns, prehistoric technological systems and adaptive responses to economic risk, chipped stone fracture mechanics, and site formation processes serve as the theoretical framework in addressing the research topics.

The scope of my interpretation of these data seeks an improved understanding of the human behavior exhibited at the study site, which is necessary for a characterization of site function or functions over time. The core of this interpretation lies in the economic strategies manifested in the technological and subsistence data, and the settlement/abandonment patterns. The proceeding chapter discusses in detail the methods used to address the research questions.

VI. INVESTIGATIVE AND ANALYTICAL METHODS

This chapter is divided into three main sections: field methods, laboratory methods, and dating methods. These were performed to address the research topics and collect additional archaeological data from the study site. The field investigations consist of the field schools conducted by Texas State University in 2007 and 2008 as well as follow-up Ground Penetrating Radar survey and test excavations conducted in an effort to supplement the previously gathered archaeological data. In addition to a thorough review of the field school records and data, detailed lab analyses were performed on the lithic, ceramic, faunal, and botanical assemblages recovered from the study site. I performed the lithic analysis, and the ceramics analysis with consultation from Chris Lintz. The faunal collection was analyzed by Chris Jurgens and Haley Rush, and the botanical samples were examined by Phil Dering.

I conducted frequency distribution studies on various artifact categories to identify discrete site activity areas, address the occupational history, and evaluate stratigraphic preservation conditions at the site. In addition to analyzing the site records and materials on their own merit, these data were compared alongside the information gathered from site 41PT109 (Weinstein 2005) in order to characterize inter-site variability of a number of attributes. The available chronological data from 41PT109 and 41PT257, and the settlement patterns from these and the remaining Antelope Creek sites found in the study were also referenced in my analysis at 41PT283. This chapter concludes with descriptions of the chronometric dating analyses used to refine the chronology at the study site and the methods used in the sample selection.

Field Methods

Field School Excavations

As discussed in Chapter 4, the Texas State University Anthropology Department archaeological field school conducted test excavations at site 41PT283 (Bousman 2008). During the 2007 excavations, the surface distributions of large stones forming discontinuous linear distributions were mapped. A total of ten 1m x 1m test units were placed in these areas in order to maximize the exposure of potential architectural features, and recover diagnostic artifacts.

The site was mapped using a Sokkia Total Data Station (TDS) and the data points were downloaded into an electronic data collector. An arbitrary grid and north direction were established at the site along with a number of permanent and temporary points identified by letters A through M. Two permanent points consisting of Datum A and Datum B were set in concrete. Datum A was assigned an arbitrary three-dimension location of North 100 meters, East 100 meters and Elevation 100 meters, and all TDS measurements are in relation to this point (Bousman 2008:3). In addition to the mapping efforts conducted on-site, a series of elevation data points were taken from the surrounding area to record the topography and assist in the geoarchaeological study at West Amarillo Creek near the site (see Chapter 4).

Each test unit (TU) was placed in areas with surface depressions and stone distributions interpreted as individual rooms of a possible house structure. These units are located in the northern portion (TU 1, 2, 6, and 10) and central portion (TU 3, 4, 7, 8, and 9) of the site (Figure 18). Student excavators were responsible for screening, mapping, and recording the data for each arbitrary 10 cm unit level. The 2007 test units reached an average depth of 50 cm.

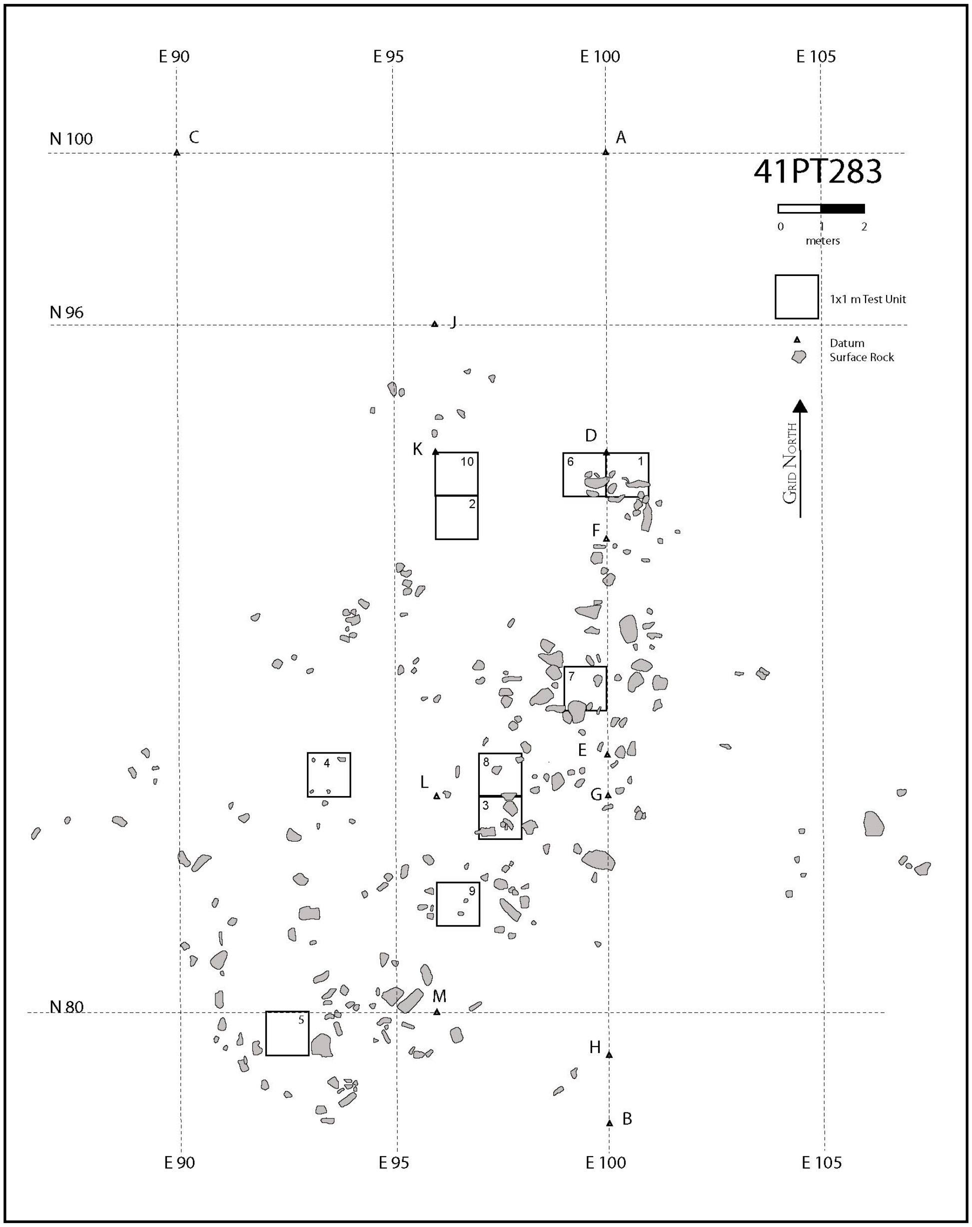

Figure 18. Plan map of site following 2007 excavations (Bousman 2008:6).

All sediment was screened using ¼ inch steel mesh. The artifacts were bagged by type according to their respective unit and level. Unit level artifact bags were assigned a unique catalog or lot number. At the end of the field season, all of the test units were lined with black polyurethane sheets and backfilled using the screened dirt. Many of the large stones that were removed during the excavations were used to weight down the plastic lining along the perimeter of the test units.

The 2008 field school season consisted of further excavations at all of the 2007 test units except for TU-3. These excavations increased the average depth of Test Units 1-10 to approximately 75 cm. A total of nine additional test units (TU's 11-19) were excavated at the site during the 2008 field school (Figure 19). Test Units 11-14 were dug in areas away from the main surface stone concentrations, whereas units 15-19 were dug adjacent to the previously excavated units. Student excavators used the same excavation and recording methods as those conducted during the 2007 field school, and the unit level and lot numbering convention continued in succession from the previous season. The 2008 test units reached an average depth of approximately 50 cm, although TU-12 and TU-13 were abandoned at respective depths of 20 cm and 30 cm, and TU-11 and TU-16 were excavated to 80 cm.

Although the nineteen test units excavated at 41PT283 failed to produce any *in situ* evidence of structural features such as walls, floors, or postholes, a number of cultural materials were found. The recovered materials consist of chipped stone tools, lithic cores and debitage, ceramics, grinding stones, mussel shell fragments, animal bones, charred organic debris and burned rocks. Detailed descriptions of these materials and analyses of their frequencies and distributions are provided in Chapter 7.

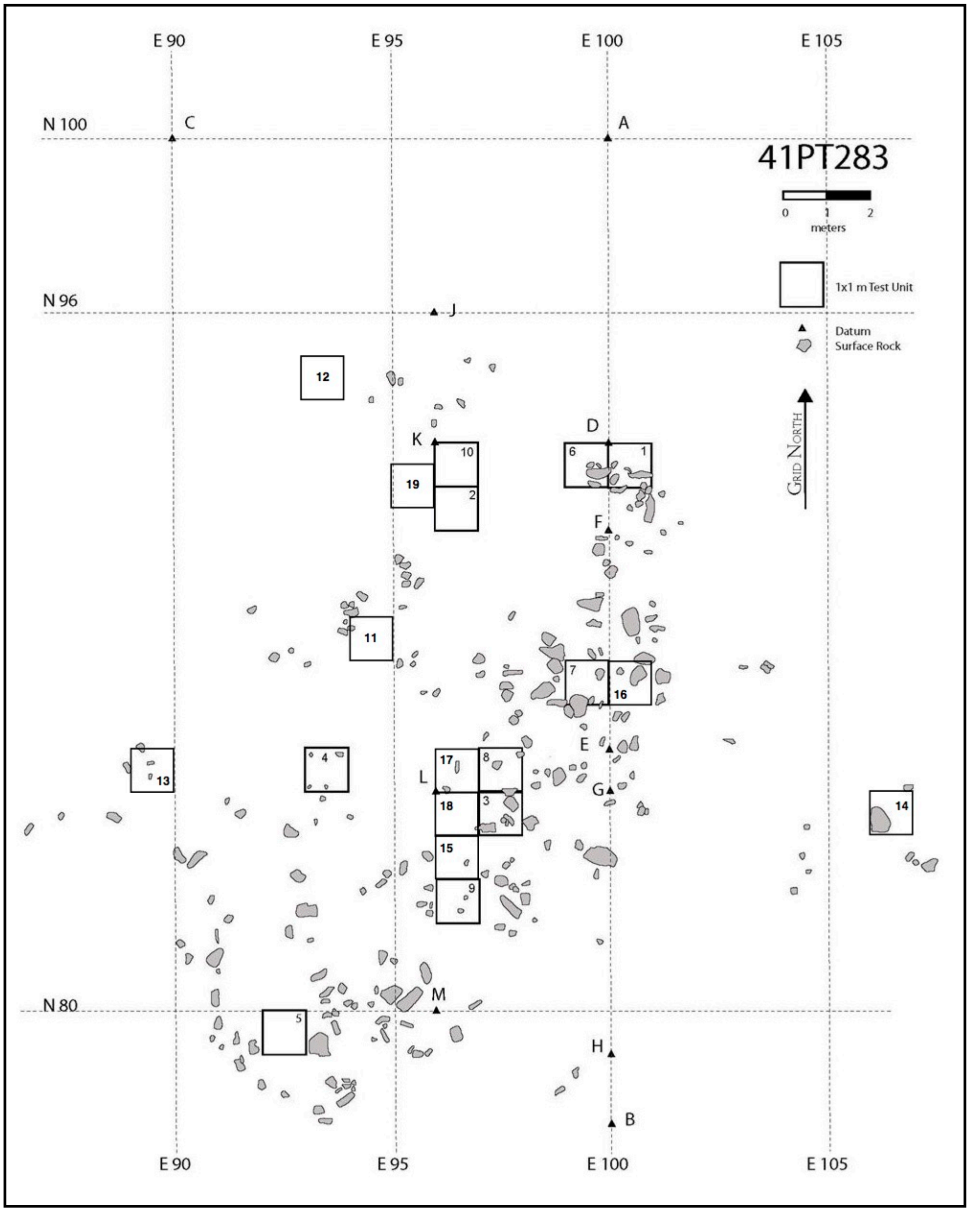

Figure 19. Plan map of site following 2008 excavations (Modified from Bousman 2008:6).

Ground-Penetrating Radar

Ground-Penetrating Radar (GPR) investigations were conducted along a 182-m^2 portion of the study site (Mudd and Selden 2015). The primary purpose of the survey was to locate architectural and archaeological features in unexcavated areas. Following the identification of buried anomalies located by the GPR equipment, I formulated an excavation strategy to ground-truth these areas with additional 1m x 1m test units.

To map the GPR survey area, Datum A from the 2007 field school was used as the origin point to plot the grid atop a 13 m (X-axis) x 14 m (Y-axis) section of the site (Figure 20). The mapping of grid corners and boundaries was done using a Sokkia Set 6 Total Station. Closure with the original grid was within 1 cm at the southwest corner of the GPR grid. Wooden stakes were used to mark the corners of the grid, then a string was run along the Y-axis on the east and west boundaries of the grid. Along the western Y-axis, flagging tape was used to mark 50 cm increments along the 14 m boundary. A survey tape was strung along the eastern axis and a stadia rod was used to mark the endpoint of each transect. Five large mesquite shrubs were hand-cleared to allow the GPR cart an unimpeded path along each transect.

The GPR unit was a SIR3000 with a 400MHz antenna mounted in a cart from Geophysical Survey Systems, Inc. A TerraSIRch unit was used for data collection. Prior to surveying the 50 cm transects, the radar was set to 400 MHz with no global positioning system and the cart was arbitrarily pushed around the survey block to locate the strongest signal. When the area with the strongest signal was identified, the gains were reset. This helps ensure that the readings fall within an acceptable range. A total of five gain points were used in the GPR survey. These were GP1 (-12.00 dB), GP2 (-12.00 dB), GP3 (37.00 dB), GP4 (37.00 dB) and GP5 (47.00 dB).

Data collection began at the northwest corner of the site proceeding along the X-axis to the northeast boundary where those data were saved. The second transect ran parallel and 50 cm south of the first, from the eastern to western boundary. This pattern

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was repeated a total of 29 times, ending in the southeast corner of the grid. The raw data was processed using GPR imaging software know as SLICE, which creates 2D/3D subsurface images from the reflection data. Following analysis of the processed data, an excavation strategy was developed to ground-truth the GPR results.

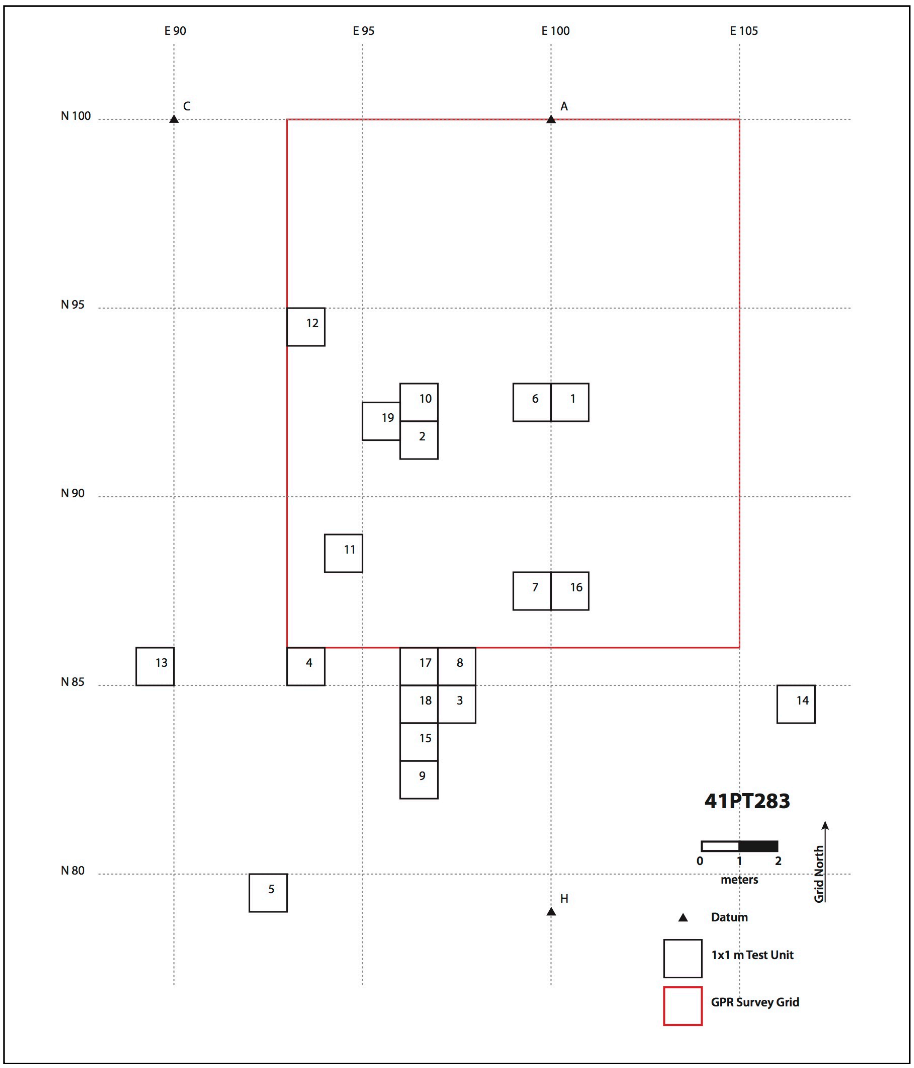

Figure 20. Plan map of GPR survey grid at 41PT283.

Follow Up Excavations

Five 1m x 1m test units were placed atop select GPR anomalies using the existing site grid. The purpose of the excavations was to ground-truth the buried anomalies in these areas as well as collect additional archaeological materials and stratigraphic data. Test Units 20-24 were placed in the northeast portion of the site away from previously excavated areas (Figure 21).

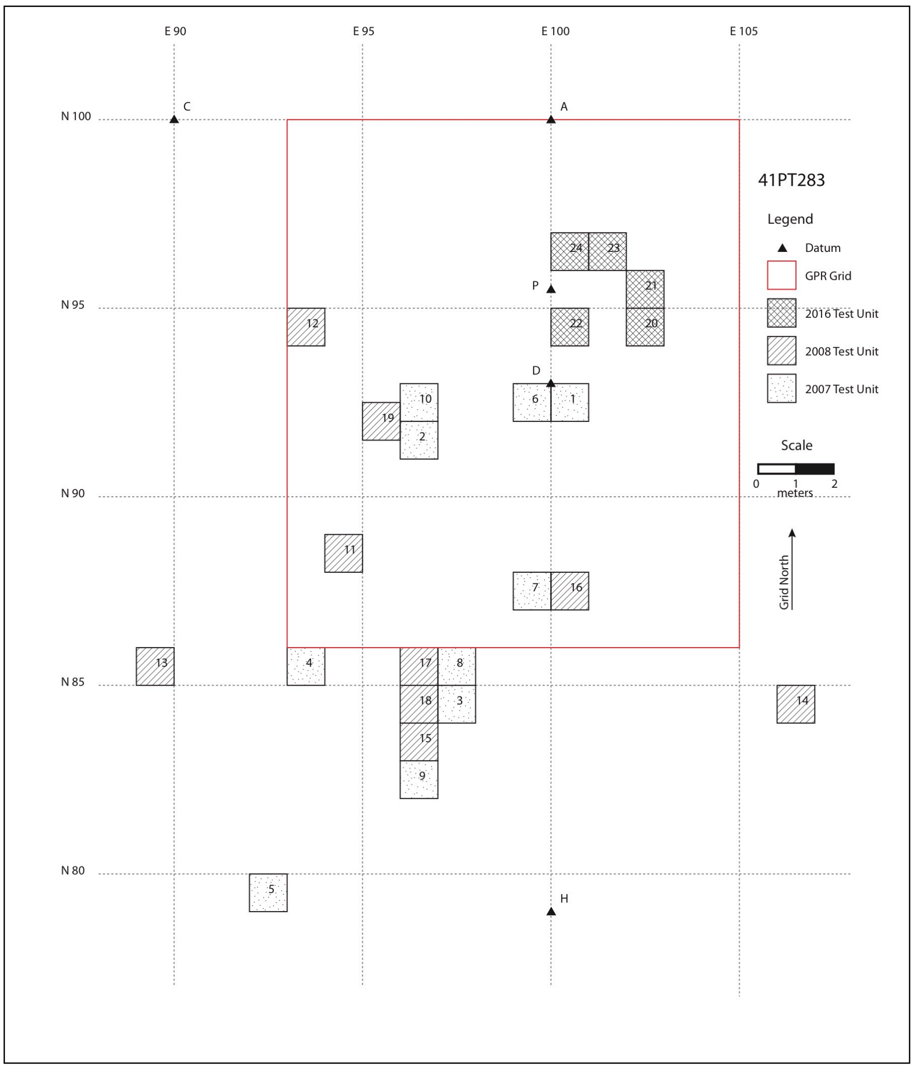

Figure 21. Plan map of GPR grid and 2016 test units.

Test unit corners were plotted with a TDS and mapped into the existing site grid using permanent Datums A and B. A new temporary point, Datum P, was mapped near the new units to record excavation level depths. This datum consists of an 8-inch metal stake with string affixed to the head. The stake was driven into the ground until the head of the stake became level with the elevation recorded for Datum D (99.84 m), which was used to record the depths of TU-1 and TU-6.

During the 2016 excavations, level forms were completed for each 10 cm unit level. All sediment was screened using ¼ inch steel mesh. The artifacts were bagged by type according to each unit level. Each unit level artifact bag was assigned a unique lot number, which continued in succession from the 2008 excavations. All recovered cultural materials were included in the total artifact inventory and prepared for curation at the Center for Archaeological Studies (CAS) located at Texas State University, San Marcos.

Four of the five new test units (20, 21, 22, and 24) were excavated during the 2016 investigations. TU-23 was not excavated because it was determined that sufficient data were collected from the four other test units. TU-20 and TU-21 were dug to a maximum depth of 70 cm, whereas TU-22 and TU-24 reached respective depths of 50 cm and 40 cm. The test units were terminated at these depths after marked decreases in artifacts and the observance of extensive rodent burrows in lower levels.

Upon completion of these excavations, the bases of the test units were capped with a single layer of cobble-sized rocks collected off-site. The units were then backfilled using the screened dirt. The cobbles marked where the excavations were terminated in the event the units are re-opened during future investigations at the site. This backfill method was chosen over the use of polyurethane sheets because this material becomes fragmented as it weathers and is displaced by animals, resulting in pollution of the site and surrounding environment. Another purpose of emplacing the stones at known depths was to facilitate a follow-up GPR study to test the utility of this method in locating buried stone-lined features in this depositional setting.

Laboratory Methods

All artifacts, sediment and macrobotanical samples collected during the 41PT283 excavations were taken to Texas State University to be analyzed. Chipped stone artifacts, bone fragments, ceramics, and botanical debris were cataloged and classified according to provenience and type. The lithic assemblage was separated into functional categories such as projectile points, bifacial preforms, unifaces, modified flakes, cores and debitage. Projectile point typology was based on the categories designated by Turner et al. (2011) and Prewitt (2014). Lithic cores were evaluated in terms of reduction stage, material composition and heat treatment. The lithic debitage was categorized based on the presence or absence of defining features such as striking platform, bulb of force, and termination type.

Other lithic artifacts such as modified flakes were assessed in terms of usewear and material composition. Also referred to as utilized flakes and flake tools, modified flakes show evidence of modification either from intentional retouch of edges or from usewear along the margins (Andrefsky 2005:160). Flake tools have very acute or sharp edge angles that are effective for cutting soft materials such as meat and plants. This attribute differentiates flake tools from other lithic tools such as unifaces, which have more obtuse edge angles for scraping materials.

Bifacial and unifacial tools were classified according to the manner and extent of retouch along distal and lateral edges. Unifacial tools or scrapers have wider edge angles than modified flakes and are hence better suited for working hides, wood, and bone than for cutting (Andrefsky 2005:161). Scrapers are commonly referenced based on bit location (e.g., side and end scraper), form and shape. Types commonly found at Antelope Creek sites are guitar-pick shaped end scrapers or "guitar-pick scrapers" as well as ovate side scrapers. With resharpening, the distinctive distal margin becomes less convex (i.e., straighter) and the edge angle becomes more obtuse, often exceeding 90 degrees at the time of discard (Brosowski 2009:11). Scrapers are usually produced on morphologically distinct flakes that are fairly thick and have a slight curvature.

Biface categorization is based mainly on overall form and flaking pattern. Given their sharp lateral edges and durability, bifacial knives can function as tools for cutting, scraping, or puncturing, among other things (Andrefsky 2005:182). In Plains villager assemblages, they typically begin their use lives as large ovate-shaped bifaces that often have width to thickness ratios equal or greater than 10:1 (Brosowski 2009:12). Using a distinctive method known as alternate beveling, resharpening flakes are removed sequentially by flaking along the upper half of a single lateral edge, and then flipped horizontally and flaked along the upper half of the opposite edge. Overall form of beveled knives can be diamond or ovate in shape, hence the term "diamond beveled knife", which is commonly used to describe reworked bifaces found at Antelope Creek sites.

I analyzed the ceramic collection with consultation provided by Chris Lintz. This assemblage was examined in terms of surface treatments and residues, general vessel attributes, sherd dimensions and type, and degree of fragmentation. The macrobotanical remains were identified by Phil Dering. Plant remains were sorted into categories based on their composition and identified using a binocular dissecting microscope or by comparing the samples to the archeobotanical herbarium. The faunal collection was analyzed using the comparative collection at the Center for Archaeological Studies. Despite the fragmentary nature of the faunal assemblage, a number of species and mammal size classes were identified. The results from the aforementioned analyses are discussed in detail in Chapter 7. The macrobotanical and faunal analyses are also referenced in Appendix A and Appendix B, respectively.

Lithic Debitage Analysis

I conducted detailed analyses of the stone tool and debitage assemblages. The debitage assemblage was analyzed to determine the frequencies of chert and quartzite materials. The material composition and frequency of heat-treatment was recorded for the lithic debitage and cores. The complete flakes underwent a more detailed analysis given the presence of defining attributes such as striking platform, bulb of percussion, and flake termination, which are good indicators of the method used in their detachment. The purpose of this study was to identify what reduction stage each flake represents and quantify these data to characterize what stone tool reduction strategies were executed at the site. Identifying discrete reduction stages inherent in the complete flake assemblage not only reflects how the lithic artifacts were manipulated during their use life at the site, but also how raw materials were handled prior to transport from source areas.

The study sample consisted of 214 waste flakes that were analyzed in terms of their individual chipped stone fracture mechanics (see Chapter 5). Qualitative characteristics were recorded for each complete flake, including bulb of force (prominent or diffuse), platform type (crushed or lipped), and termination type (feathered, stepped or overshot). Following tabulation of the fracture characteristics, the frequencies of early, secondary and late stage reduction were calculated. Since similar fracturing characteristics can occur in more than one reduction stage, the attributes recorded for each flake were evaluated collectively. For example, a flake with a crushed platform was not defined as an early or late stage flake until it met additional qualitative criteria such as feathered termination and/or diffuse bulb of force. Similarly, flakes with feathered terminations were assessed for other defining attributes such as platform and bulb of force type prior to determining reduction stage. Analyses of the individual flake attributes also took into consideration the overall thickness or density of the specimen, and the presence of cortex in determining reduction stage.

The stone tool assemblage was categorized according to specialized and expedient tools. Specialized or maintained tools consist of projectile points, knives and scrapers whereas expedient tools consist of flake tools. I calculated the ratios of these tool types as a crude measurement of economic diversity, mobility and stone resource availability. This was conducted with the premise that if the tool kit is comprised primarily of specialized tools, then the local economy was focused on specific resources that were predictable; if the assemblage is comprised of both maintained and expedient tools, then it can be postulated that a variety of economic strategies were performed to offset risk.

The ratio or index of expedient and specialized tools characterizes mobility and the availability of high-quality tool stone such as Alibates chert. The common presence of expedient tools made from chert materials reflects unimpeded access to stone resource areas, whereas a specialized tool kit represents limited access to high-quality tool stone, resulting in a highly specialized or more “expensive” tool kit. I calculated the expedient-specialized tool (EST) index by dividing the number of expedient by the number of specialized tools. In this application, an EST index value >1 reflects economic diversity, increased mobility, and frequent access to high-quality chert, whereas a value <1 indicates a specialized economy, a more sedentary lifestyle, and relatively limited access to chert resources. I developed the EST index not only to characterize the aforementioned attributes at the study site, but also to compare the economic variability between it and 41PT109.

Artifact Frequency Distributions

The main purpose of this study was to define discrete activity areas such as food-processing, stone tool reduction, and refuse areas at 41PT283. The frequencies of lithic artifacts, ceramics, grinding stones, burned rocks, fauna and mussel shells were tabulated in Excel and plotted in a histogram to generally characterize their spatial distributions across the site. An adjusted residuals statistical test was performed to identify which artifact categories significantly influence the degree of variance across the test units excavated at the site. Given the relatively low artifact counts and excavation depths in TU-12 and TU-13, these units were not included in this analysis.

Test units with adjusted residuals (i.e., frequency values) that fall between 1.96 and -1.96 are considered part of the mean and were thus eliminated as representing high-density areas. Frequency values that plotted above the 1.96 threshold are considered high-density localities indicative of discrete activity areas. For example, a test unit with a value >1.96 in the debitage category would be designated as an area utilized for stone tool reduction. Similarly, a test unit with a value >1.96 in the grinding stone category would be assigned as part of a plant-processing locality. Artifact categories with a frequency value <-1.96 are consider to be significantly below the mean variance, and were used to delineate the boundaries of activity areas where appropriate. In addition to calculating the artifact frequencies in terms of the entire material assemblage, the same statistical analysis was performed on the lithic assemblage to analyze the spatial relationships between cores and debitage, and stone tool sub-categories such as projectile points, bifaces, unifaces and modified flakes.

Subsurface artifact frequency distributions were analyzed to test for discrete cultural zones and gauge stratigraphy integrity. Similar to the horizontal distribution of artifacts, if discrete strata contain isolated clusters of artifacts then it can be postulated that the site served different occupational histories or functional purposes over different time intervals. Special emphasis was also placed on the vertical contexts of diagnostic materials such as projectile points and ceramics as well as the spacing between debitage, grinding stones and animal bones in looking for separation between cultural layers.

Artifact Density Analysis

In order to characterize subsistence and extent of occupation, the artifact frequencies and densities were compared to these data from site 41PT109. Boyd (1997:310-320) incorporates a simplified method of conducting inter-site comparisons using artifact density, adjusted artifact density and projectile point-grinding stone index calculations. The artifact density index is calculated as the total number of artifacts divided by the total number of m^2 excavated. The adjusted artifact density (AAD) is calculated similarly except debitage is eliminated from the total number of artifacts. These are considered to be crude measurement of the relative intensity and duration of occupation (Boyd 1997:310), but useful nonetheless in characterizing site function. Given that this index does not factor in m^3 excavated, it is biased towards single occupations.

The artifact categories used in the inter-site comparison include the stone tools, ceramics, animal bone, and shell, all of which occur at various frequencies at sites 41PT109 and 41PT283. A low or high AAD index value corresponds to the respective intensity/duration of occupation. The projectile point-grinding stone (PP/GS) index focuses on subsistence activities relative to the intensity/duration of occupation. It is calculated as the number of projectile points divided by the number of grinding stones, which is a simplified method of characterizing the relative importance of hunting versus plant processing activities. A relatively low PP/GS index reflects intensive plant processing activities whereas a high index value reflects the importance of hunting activities.

The indexes were calculated from the aforementioned artifact categories from sites 41PT283 and 41PT109 and plotted on a graph. The PP/GS forms the Y-axis and the AAD forms the X-axis. The PP/GS axis contains a value scale of 0-7 at increments of 1 and the AAD axis is 0-140 with increments of 20 (XY ratio = 20:1). Where these two index values intersect on the graph determines the relative scale of intensity/duration of occupation and the relative importance of hunting versus plant processing activities. For example, a high PP/GS index and low AAD suggests intensive hunting activities over the course of a short-term/low-intensity use period. This type of site can be characterized as a temporary/seasonal encampment focused on hunting game. A low PP/GS index and high AAD reflects intensive plant processing over an extended period of intense site use. This would be indicative of a permanent residence with an economy focused on horticulture and/or plant foraging. Index intersections falling in the middle-range would hence reflect subsistence diversity, and either intermittent occupation periods of intensive economic activity, or a year-round residence with labor-intensive activities occurring elsewhere such as temporary/seasonal encampments or field huts. Like the AAD and PP/GS indexes, the ETS index was calculated from the stone tool assemblages at both sites and cross-compared.

Cost Path Analysis

The distances between 41PT283 and other landmarks were calculated using an analysis known as Cost Path as opposed to measuring Euclidian distances (i.e., as a crow flies). Cost Path is a spatial analysis tool in GIS software called ArcMap 10.2. This application calculates the optimum travel route or "least-cost path" (LCP) between two points (e.g., start and destination) based on surface distance and slope. As such, Cost Path is a viable tool for analyzing prehistoric mobility across the landscape, calculating travel distances between multiple sites and regions, and inferring intra- and inter-group trade/exchange routes.

Cost Path was used to map the LCP from the study site to the North Quarry, providing necessary data to calculate realistic travel distance and time. Once the travel distance was calculated in ArcMap, the total increase in slope or elevation loss along the LCP was recorded to calculate travel time. Travel time was calculated using Naismuth's Rule, which factors 1 hour for every 5 km traveled (Magyari-Saska and Dombay 2012:125). Elevation loss comes into play when the total ascent is greater than 2000 feet. While Naismuth's Rule factors 1 hour for every 2,000 feet in elevation loss, Langmuir's (1984) Correction adds an extra 10 minutes for every 1,000-ft increase in elevation, and factors 1 hour of travel time for every 4 km traveled. However, neither of these models account for added time caused by deviations from the travel path. For simplicity and to account for potential extraneous activities along the LCP from the study site and the North Quarry, Naismuth's Rule was selected to estimate travel time.

The LCP was also mapped between the study site and the Antelope Creek homestead sites located in the study area. Although beyond the scope of the current study, these data are effective in analyzing Antelope Creek settlement patterns and the potential for interconnectivity between multiple sites.

Flotation Analysis

Given the placement of the study site along the West Amarillo Creek floodplain, and the implications for marginal horticultural practice during the Antelope Creek phase, I conducted flotation analysis to facilitate identification of domesticated plant remains. Another objective was to isolate botanical materials that characterize land use strategies and the vegetative setting at the time of occupation. This analytical method also aids in the identification of reliable samples for radiocarbon dating.

Flotation is a method of recovering organic remains from archaeological sediments by using water to separate inorganic particles from plant parts. Macrobotanical samples consist of carbonized plant debris that is hand-collected separate from archaeological deposits during unit excavation (Dering, Appendix A). The flotation samples and macrobotanical samples were collected from seventeen of the twenty-three test units excavated at the site, comprising a total of 10.5 g of debris and 43 lots. The soil samples collected during the 2007 and 2008 field schools were floated individually and assigned catalog numbers according to their respective lots.

Macrobotanical flotation was performed using the swirl and pour technique. The volume of each matrix sample was floated in a 5-gallon bucket. The light fraction was poured through a chiffon fabric and the heavy fraction through a metal strainer with 1/16" mesh. For each sample, the bucket was filled halfway with tap water into which the sediment was slowly poured. The water-sediment mixture was stirred for 15 seconds clockwise and 15 seconds counterclockwise. As the mixture settled, the water and light fraction were slowly poured through the chiffon cloth. Care was taken to avoid pouring out the sediment settling at the bottom of the bucket.

Once the water and light fraction were depleted, the remaining sediment was re-introduced to tap water until the bucket was half full, and the matrix was again swirled. The water and remaining light fraction was poured through the chiffon cloth. The chiffon cloth was then bundled and allowed to air dry. The remaining sediment was poured through the 1/16" mesh to collect any remaining materials, which were added to the sample. Once the bundles were completely dry, the sample was individually bagged and labeled according to lot provenance. These and the macrobotanical samples were shipped to Phil Dering for analysis.

Dating Methods

In order to refine the chronology at the study site, two radiocarbon samples were dated using Accelerator Mass Spectrometry (AMS) performed by DirectAMS, Inc. Of particular importance was the selection of the most applicable methods given the available organic materials and the most applicable samples given the unreliability of nondescript charcoal. This section provides an overview of these dating methods and the procedures used during sample selection and preparation.

Radiocarbon Samples

The first radiocarbon sample (Specimen 24.1) was selected following the analysis of the botanical assemblage, which revealed remains from a variety of plant species. Emphasis was placed on the selection of carbon samples that would yield the most accurate date. Nondescript charcoal may be from a tree of any age and may produce a date that is perhaps hundreds of years older than the fire event. In avoidance of the "old wood effect", plant materials appearing to be youngest at the time of deposition such as twigs, stems, seeds, leafs should be targeted during selection of radiocarbon samples. More reliable samples are annual domesticates such as maize. As such, 100 mg of charred maize fragments recovered from TU-24 at 30-40 cm was shipped to DirectAMS, Inc. for radiocarbon analysis.

The second radiocarbon sample (Specimen 18.1) was selected following preliminary analysis of the ceramic assemblage. This sample originated from a black residue observed on the exterior surface of a sherd recovered from TU-18 at 40-50 cm. A method called Energy Dispersive Spectroscopy was used to determine if the black residue was suitable for AMS analysis.

Energy Dispersive Spectroscopy

Given that the black residue observed on Specimen 18.1 likely accumulated during cooking use of the vessel, the sherd was tested for the chemical presence of carbon with a scanning electron microscope (SEM) by Dr. Juan Gomez of the Texas State University Physics Department. Using Energy Dispersive Spectroscopy (EDS), the surface of the sherd is bombarded with electrons, which bounce back as X-ray wavelengths. The SEM records these frequencies, converts them into mass percentages for each chemical element detected, and produces a detailed report of the trace elements for each sample area using EDS software.

In order to ensure sufficient coverage and sample controls, each surface of the sherd specimen was sampled at three different areas. The three samples on the exterior surface (i.e., black residue side) produced a mean carbon mass of 30.3% while the interior surface contains a mean carbon mass of 15.8%. The marked increase in carbon on the black residue surface is promising considering the other trace elements were consistent across all six samples. These findings indicate that the carbon residue likely accumulated during cooking use of the vessel. As such, 200 mg of the carbon residue was removed from the sherd using a metal blade tool, packaged in a plastic vile, and shipped to DirectAMS, Inc.

Summary

The available material data at 41PT283 provide baseline information to infer what purpose or purposes the site served during its use-life. The challenge lies in isolating discrete occupational periods or functions from the total occupational history. As such, analytical methods such as detailed evaluations of the projectile point typologies and vertical artifact distributions as well as applying the most applicable chronometric dating methods were emphasized.

Critical to an interpretation of site function are assessments of the human behaviors manifested in the material assemblage. The disposition of the artifact assemblage reflects economic activities at the micro-level (food processing, stone tool reduction, gardening, habitation and abandonment), meso-level (hunting, gardening, foraging, and settlement variability), and macro-level (the acquisition of Alibates tool stone). Also of importance is how these behavioral elements compare to other Antelope Creek phase sites found in the study area (i.e., meso-level).

VII. RESULTS AND INTERPRETATIONS

The following presents the results of the analyses described in the methodology sections and interpretations of these data in lieu of the research questions. This chapter is divided into five main sections. The first discusses the local preservation conditions and the observed site formation processes. The next section provides the results of the faunal and botanical analyses, interpretations of these data in terms of hunting, foraging, and horticulture, and a discussion of the ambiguous stone configurations initially thought to be ruins of a habitation structure. The third section describes the artifact assemblage and what these materials reflect in terms of technology, subsistence, and occupational history. The fourth section discusses the results of the artifact frequency distributions and what these data suggest in terms of human behavior and occupational history/extent at the study site. The final section presents the results of the comparative analyses performed on the material assemblages from sites 41PT283 and 41PT109 and what these data suggest in terms of differential site functions.

Formation Processes and Stratigraphic Integrity

I have used the term "poor preservation conditions" to describe the study site and this section explains why. Schiffer (1987:147-150) describes a tripartite set of natural processes that alter the context of archaeological deposits, which consist of chemical, physical, and biological agents. An example of the latter is bioturbation, which is quite common at sites on the Canadian River valley. Burrowing animals such as pocket gophers inhabit the valley region given the ample supply of vegetation and friable soil. They burrow into the loose substrate and tunnel laterally, wreaking havoc on the context of archaeological deposits. A review of the field school excavation records shows extensive rodent burrowing in nearly every test unit. These disturbances were assigned arbitrary level proveniences such as 3b, 4g, and 5bg when they encroached into cultural levels. Figure 22 shows the evidence and extent of gopher burrowing observed in one of the test units.

Figure 22. Pocket gopher burrows observed in TU-21 at 30-40 cm.

As discussed in Chapter 6, follow-up investigations were conducted at the site to ground-truth the anomalies identified during the GPR survey (Mudd and Selden 2015). The right-angle configuration of one of the anomalies was thought to potentially represent a buried structural feature. However, the hand excavations at TU-20, 21, 22, and 24 demonstrate that the GPR recorded various extents of gopher activity in this area. For example, the red (i.e., high signal) areas represent substantial voids beneath the surface, whereas the blue and green areas correspond with burrows filled in with loose soil (Figure 23). Some of the subsurface voids measured up to 30 cm in width and depth.

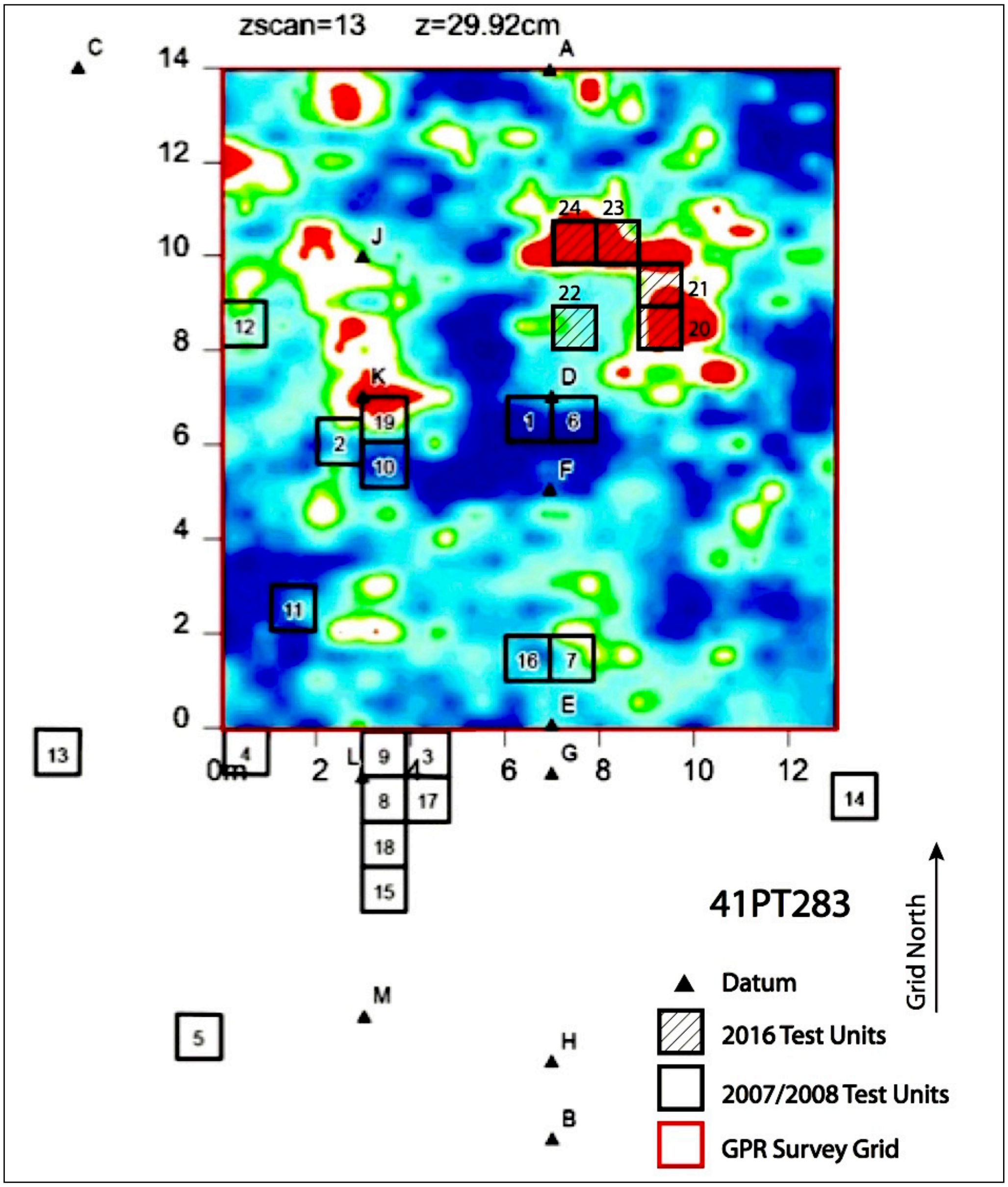

Figure 23. Plan map of the GPR data and test units placed atop a substantial anomaly.

Additional evidence of this kind of bioturbation include buried pockets of loose fill containing a vegetative matrix, small fragments of black polyurethane material, and other debris left behind by the rodents in abandoned burrows and/or dens. Although the

GPR survey did not identify any structural or archaeological features, it was successful in demonstrating the breadth of rodent burrowing at the site. The follow-up excavations also yielded important new archaeological data, including the only sample of maize found at the site.

Not only does the friable sandy loam of the West Amarillo Creek valley attract burrowing animals, the soils harbor chemical agents that are pervasive in both systemic and archaeological contexts. According to the NRCS Web Soil Survey (2016), Yomont soils have a high water holding capacity and are well drained, meaning they are oxygenated. Schiffer (1987:148) explains, the combination of water and oxygen are sufficient to initiate many chemical reactions, including oxidation of organic materials. Chemical reaction rates are compounded as surrounding temperatures rise, which work to break down materials such as bone and wood.

The local soils are also described as very slightly saline, which also contributes to poor preservation. However, Schiffer (1987:148) notes that soils with heavy salt content retard biological agents of decay. Yomont soils are also described as unsuitable for farmland, which suggests a high level of acidity, which acts as a deteriorating agent. Although modern soil descriptions are a viable means of gauging the preservation of archaeological materials, such descriptions should not be referenced in determining the agricultural suitability of soils for prehistoric societies (Boyd 2008:50-51).

Vertical Artifact Distributions

Given that the mean excavation depth of the test units equals 55 cm, the vertical artifact distribution study focused on test units dug to at least 50 cm. This resulted in a sample of 16 out of the 23 excavated test units. The purpose of the analysis was to test for stratigraphic separation between artifact concentrations, which would help identify multiple occupational zones. The test unit levels designated as gopher burrows were not included in the analysis given the disturbed context of their respective materials. Tables 2 and 3 display the results of the adjusted residuals statistical test performed on the subsurface artifact densities from northeast to southwest across the site sample. The red cells highlight values >1.96 while the blue cells designate values <1.96.

Table 2. Adjusted residuals for the vertical distribution of all artifacts.

Level	Test Unit															
	21	**20**	**22**	**1**	**6**	**10**	**19**	**2**	**11**	**7**	**16**	**8**	**4**	**14**	**9**	**5**
1	-2.33	-2.40	-1.25	2.53	5.63	0.83	-1.79	-2.64	-2.12	-0.82	-3.29	2.13	5.74	-5.57	5.46	2.26
2	-2.72	-2.49	-1.54	-0.79	-2.81	7.40	5.16	-2.17	2.95	-1.83	-1.90	1.86	1.32	-2.95	-1.29	3.45
3	-0.24	-2.18	0.85	1.77	-1.13	-0.70	5.30	4.24	-0.30	0.83	2.91	-1.57	-1.96	-4.46	-2.06	-1.16
4	2.74	3.04	0.62	-2.08	0.79	-4.05	-3.54	-0.31	-2.57	-2.46	3.66	-1.15	-1.44	7.52	-1.00	-3.14
5	1.65	3.17	0.89	-0.66	-1.12	-2.74	-5.38	0.05	1.83	4.28	-2.74	-0.51	-1.96	3.41	0.46	-0.42

Table 3. Adjusted residuals for the vertical distribution of lithic artifacts.

Level	Test Unit															
	21	**20**	**22**	**1**	**6**	**10**	**19**	**2**	**11**	**7**	**16**	**8**	**4**	**14**	**9**	**5**
1	-1.86	-2.01	-0.47	-1.17	3.06	1.58	-2.39	-1.57	-1.00	-1.27	-1.32	3.03	4.90	-2.01	3.95	-0.60
2	-2.33	-2.14	-2.45	-1.37	-1.85	2.40	5.38	-0.67	2.72	-0.72	1.76	0.26	-0.67	-0.33	-2.01	2.82
3	-0.46	-1.75	0.91	-0.23	-0.51	0.05	2.13	2.10	0.00	0.38	-1.59	0.17	-0.24	0.05	-0.72	-0.97
4	2.68	2.54	0.85	2.07	0.84	-2.06	-3.15	0.57	-2.51	-0.19	0.46	-0.06	-0.58	0.24	-0.61	-2.11
5	1.68	3.14	1.13	0.49	-0.85	-1.73	-2.80	-0.88	0.55	1.60	0.42	-2.85	-2.39	1.68	0.36	0.75

These data show that there is no significant stratigraphic separation between the cultural materials. This suggests that if multiple occupations are present, substantial mixing has occurred since initial deposition. Not only does this inhibit an identification of multiple components, the disposition of artifacts hinders an accurate measurement of a single occupation. This kind of stratigraphic mixing is common in regions containing loose sandy soils and may have been compounded by a variety of post-depositional processes.

Further confounding the spatial context of materials are recent human impacts. The two-track road observed during the initial recording of the site (Briscoe 2002) likely affected the distribution of artifacts along the northern portion of the site. Road activity may have also altered the context of stone slabs and other possible structural features, as none were found vertically positioned or in a patterned arrangement indicative of a house foundation. Instead, many were found overlapping, lying flat, or positioned at an angle (Figure 24). While bioturbation has undoubtedly altered the spatial context of cultural

Figure 24. View of TU-19 showing orientation of stone slabs and rodent burrowing.

materials such as lithic artifacts, ceramics, and organic materials, it is unlikely that this destructive agent caused substantial movement of the large slab stones. As such, there may be additional impacts associated with human activities whose extents were undocumented in previous investigations. The question remains as to what specific impacts occurred and whether they took place in systemic context such as during site abandonment, or much later in archaeological context through recent activities.

The location of 41PT283 between two abandoned two-track roads suggests recent vehicle traffic is a contributing factor to the displacement of the stone slabs (Figure 25). Vehicle access to this portion of the West Amarillo creek valley was closed in 2003. Prior to closing the road, the U.S. military conducted various training exercises in the area. Since then, this portion of the valley is accessible only by foot trails. The removal of

Figure 25. Aerial photograph showing the two-track roads located north and south of 41PT283 (2008 aerial photography provided by Google Earth).

surface vegetation from extended use of the roads located immediately to the north and south of the site could have promoted the erosion of upper soil strata. Physical agents such as flooding and erosion of the unstable soils would have caused sediments and artifacts to displace along the southward slope. Along with friable soil, the lack of underlying bedrock within the creek valley may also have a destabilizing effect.

At upland sites found at the Cross Bar, the deposition of wind-blown sediments help bury archaeological sites, having little adverse impact on the preservation of slab houses and artifact distributions. The greatest threat to upland homesteads is human activity such as vehicle traffic, vandalism and looting, although burrowing and other forms of bioturbation, plus erosion are also common. The destructive effects of erosion and inundation are well noted for upland sites located on the Lake Meredith Recreational Area (Etchieson and Couzzourt 1987). In general, upland sites located in areas away from recent human activity are stabilized by the gravelly soils and underlying geology.

Hunting, Foraging and Horticulture

A variety of animal and plant species were collected during the field investigations at the study site. Although poor preservation conditions inhibit one-to-one comparisons of these materials in terms of finite subsistence practices, these data reflect general behavioral patterns that aid in understanding local subsistence and land use strategies performed in a mixed subsistence economy of hunting, foraging and horticulture.

Faunal Data

A total of 453 fauna samples were analyzed by Rush and Jurgens (Appendix B), which comprise about 64% of the total faunal assemblage. The representative sample was selected from test units with high frequencies of animal bones (Figure 26) and evidence of roasting patterns. Analysis of the sample group indicates the hunting and processing of various size classes of mammals as well as a few bird and aquatic species. TU-14 contains the highest concentration of animal bones (n=181) indicative of a discard area. This locality is discussed in detail below in the Artifact Frequency Distributions section.

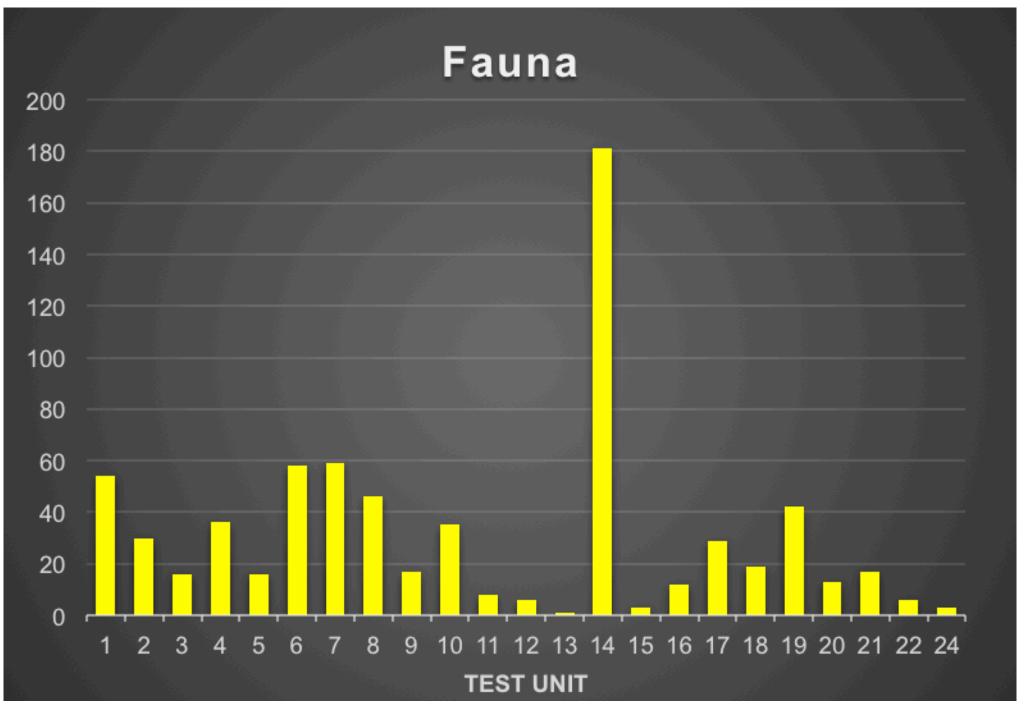

Figure 26. Frequency distributions of faunal remains.

The majority of the fauna samples have indeterminate taxonomies given the degree of fragmentation and weathering. In these instances, a generalized mammal size class was assigned for each sample when possible. Based on the known range for the Southern Plains, the large mammal category consists of bison- and deer-sized mammals;

the medium-sized mammal class comprises animals such as bobcat, fox, ringtail cat, cottontail, and jackrabbit; and the small mammal class includes prairie dog, ground squirrel, pocket gopher, and rat (Rush and Jurgens, Appendix B).

The site fauna sample reflects a marked reliance on large mammals as they make up 79.5% of the assemblage. The determinate taxon from this size class consists of bison- (n=39) and deer- (n=26) sized Artiodactyls. Medium sized mammals comprise the remainder of the faunal collection. Three of these were identified as fragments of a right calcaneous, right femur, and left side premaxilla from *Lepus californicus* (jackrabbit). Identifiable elements from the large mammal specimens include fragments of limb bones (n=266), rib bones (n=52) and skull parts (n=13). Rush and Jurgens note that the high frequency of limb bones and the absence of the axial skeletal elements indicate the animals were butchered where killed off-site, and high meat yields were transported to the site for further butchering. This behavior reflects an emphasis on transportation costs, and the abundance of high protein elements suggests that large mammals were unpredictable and/or infrequently killed.

Evidence of bone modification is present in about 20% (n=88) of the sample. This consists of roasting patterns observed on 63% of the deer- and bison-sized Artiodactyls, as well as a few indeterminate medium- and large-sized mammals, and turtle fragments. The unburned modified specimens exhibit cut marks indicative of defleshing (n=1), helical fractures indicative of marrow removal (n=6), and evidence of both defleshing and marrow extraction (n=4). All of the specimens modified by cut marks and/or helical fractures are from large mammals. No cultural modifications indicative of bone tools were observed in the sample.

The most consistent alteration observed on the faunal assemblage is the degree of weathering and fragmentation, which poses difficulty in determining whether this was the product of human behavior or natural agents. In general, the faunal evidence suggests that mostly large mammals were hunted and killed away from the site, and the limb bones and rib units were removed prior to transport to the site. This suggests that 41PT283 did not serve as a kill location, but rather a station for secondary processing of mostly bison- and deer-sized parts with high meat utilities. The roasting patterns (e.g., grey to dark grey coloration) observed on a small portion of large- and medium-sized mammals, and a turtle carapace suggests that animals were cooked and consumed at the site. The sparse presence of turtle, bird, and small-sized mammal bones suggests that these animals do not represent a significant portion of the diet, although these numbers could be biased by poor preservation conditions.

Macrobotanical Data

The macrobotanical materials consist of local plants such as mesquite, saltbush, cottonwood, and hackberry species. The presence of these wood types at archaeological sites has been attributed to a variety of functions such as dwelling construction and tool materials, as well as fuel and food resources. The preservation of the organic materials at 41PT283 can be accredited to their charred nature. Unburned debris such as fruits, seeds, arrow shafts, woven items, and thatched structural materials would not survive the archaeological record due to local environmental conditions.

The relative abundance of charred mesquite (66%) indicates that it provided the bulk supply of wood for fuel and/or structural purposes. However, saltbush (*Atriplex sp.*), a poor fuel wood, is the next most abundant wood type, suggesting its use for medicinal purposes (Bousman 1978). The limited presence of hackberry and oak also suggests other fuel supplements. Oak wood does not occur locally, indicating an expanded resource base adapted for either fuel depletion and/or bow and arrow production.

The only direct evidence of edible vegetation is represented in maize cupules recovered from TU-24. While considered by Dering (Appendix A) to be underrepresented due to poor preservation conditions, the presence of maize indicates that the site supported a farming community to some degree. The maize sample returned an uncalibrated radiocarbon age of 592 ± 42 B.P (D-AMS 017591). An OxCal two-sigma calibration provides a calendar date of A.D. 1295-1415 (Figure 27), which places the occupation on either side of the transition between the early and late sub-phase.

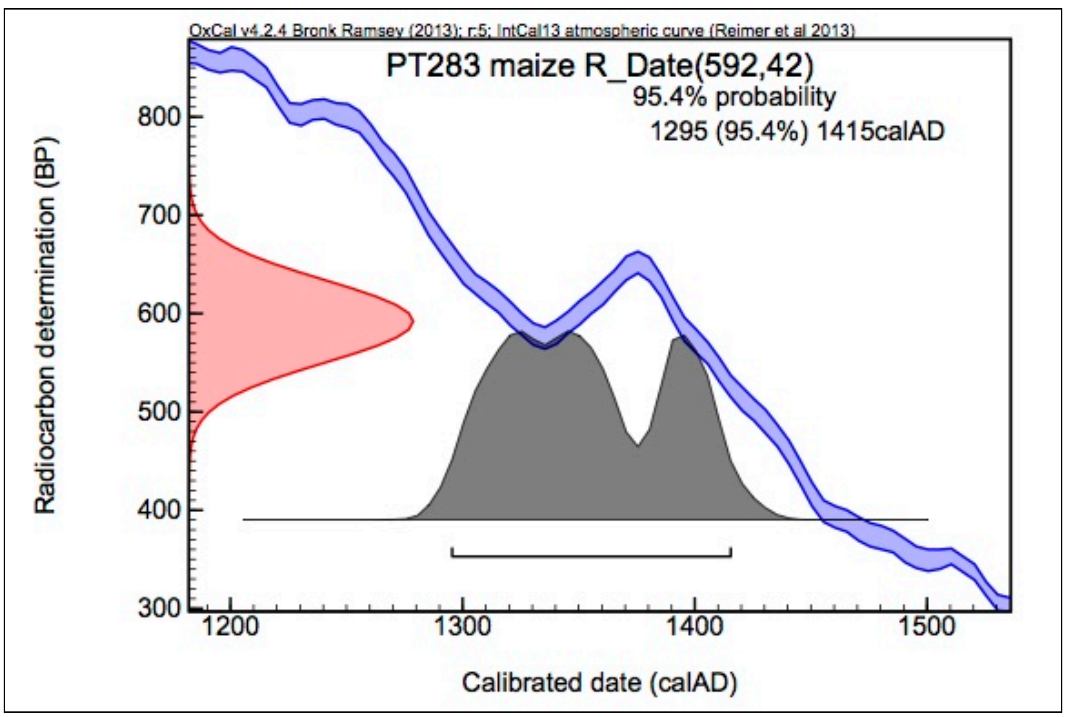

Figure 27. Two-sigma calibrated date of maize sample from 41PT283 (OxCal 2016).

The macrobotanical assemblage provides indirect evidence for the collection of wild edibles, which correlates with a high frequency of grinding stones (n=14). The common occurrence of mesquite wood could reflect the harvesting of mesquite beans, potentially to temporarily offset meat protein scarcities or crop failures during dry periods. Other wood types found at the site such as hackberry and rose family are fruit bearing. According to Dering (Appendix A:2), "although none [the fruits] are present in the samples, the edible fruits of sugarberry or desert hackberry were utilized anywhere they grew in sufficient abundance." Bousman's (1978) summary of Southern Plains ethnobotany further demonstrates this point. Two charred wood fragments belonging to the rose family (*Prunus sp.*), which produces a plum, are present in a single sample. The absence of edible parts of these native plants inhibits any substantial claim that these foods were intensively foraged. However, this is noteworthy given the frequency of plant-processing tools, and other wood types used primarily for structural and fuel purposes. Like the maize fragments, it is possible that these materials are underrepresented.

Indirect Evidence of Architecture

Although there is a lack of architectural features such as postholes and vertical stone slabs, the macrobotanical data provide indirect evidence of a structure. The common presence of charred cottonwood could represent a structural component since the slender stems may have been woven through roof supports, and the trunks used as structural posts. According to Lintz (2016:152), green cottonwood trunks and limbs were commonly used as structural materials whereas those taken from a dead tree were utilized for fuel.

If the structure consisted of a typical homestead unit type with a central hearth and wooden support columns, one would expect to find post molds with distinct wood types surrounding a concentration of burned rocks and/or stained soil indicative of central hearth. Similarly, if such a structure burned, charred posts and dense concentrations of charcoal and ash would have preserved in and around the scatters of stone slabs. However, no such architectural features were observed. This evidence and the lack of *in situ* stones and limited structural morphology prevent a determination of distinct unit type.

The absence of preserved architectural materials could reflect the temporary or seasonal nature of the structure. While it is plausible that structural elements such as support posts could have been salvaged during abandonment (Brooks 1993), the absence of post molds and the sparse and fragmented nature of the charred wood samples suggests use as fuel rather than support for a substantial habitation structure. The presence of cottonwood types could reflect the use of smaller limbs that were fashioned into a crude shelter. This is supported by a single sample containing small grass fragments, which could have been woven and used as roofing material. If these kinds of structural materials caught fire, the distribution of charcoal debris would be less concentrated, and more easily displaced by processes such as erosion and bioturbation. No dense concentrations of charred debris were encountered at the site. The highest amount of charcoal (2.65 g) was recovered from TU-8, which comprises 28% of the botanical assemblage. The limited botanical and architectural evidence can be viewed as the remains of a seasonally occupied field encampment or brush structure, but additional data are needed.

Stone Configurations

The surface scatter of dolomite stones presumed to be structural form a discontinuous linear distribution (Figure 28). The field school test units were placed in areas with surface depressions and stone distributions interpreted as individual rooms of a possible house structure. These areas were observed inside the stone configurations and are located in the north-central portion of the site (Figure 29).

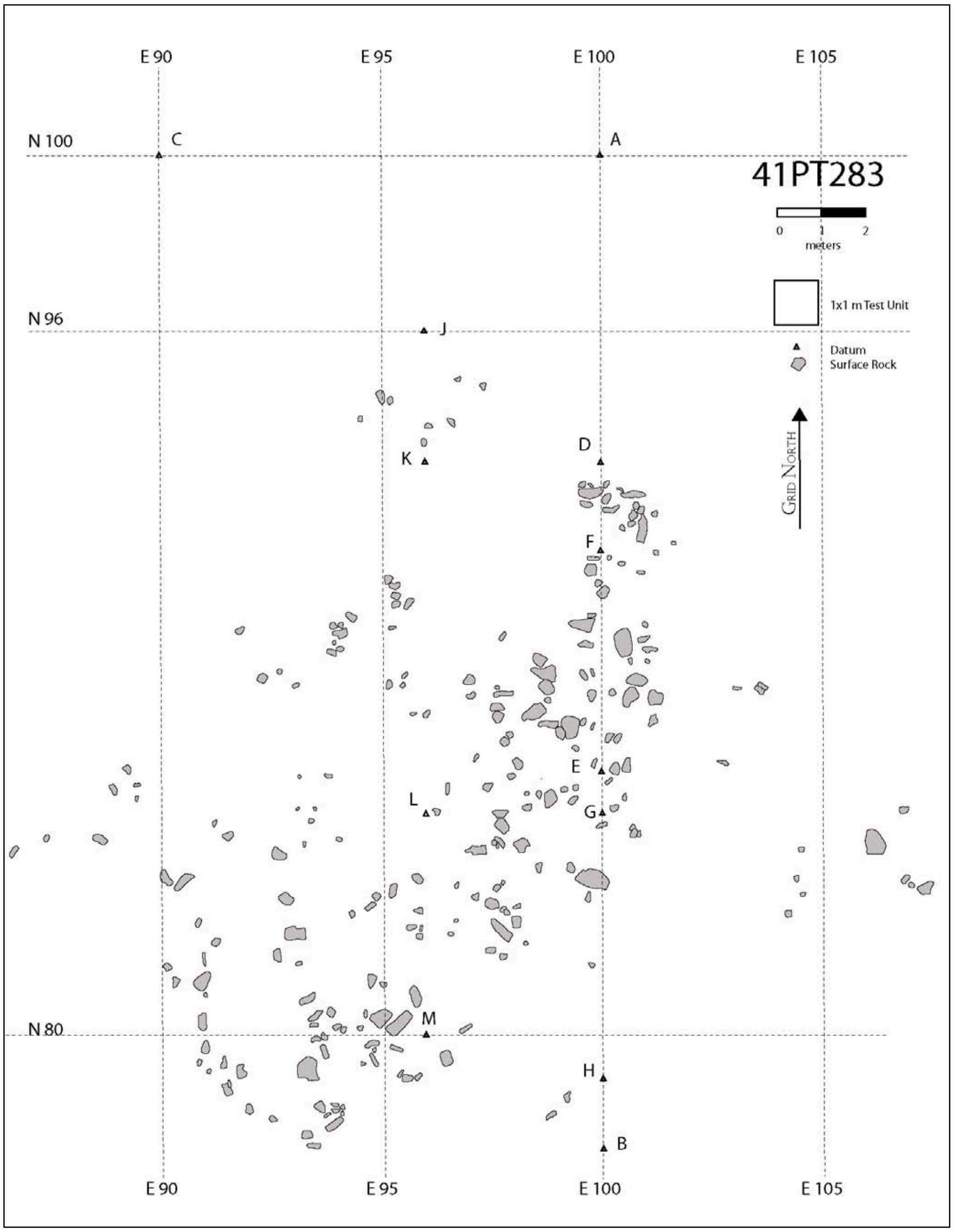

Figure 28. Plan map of the surface stone configuration.

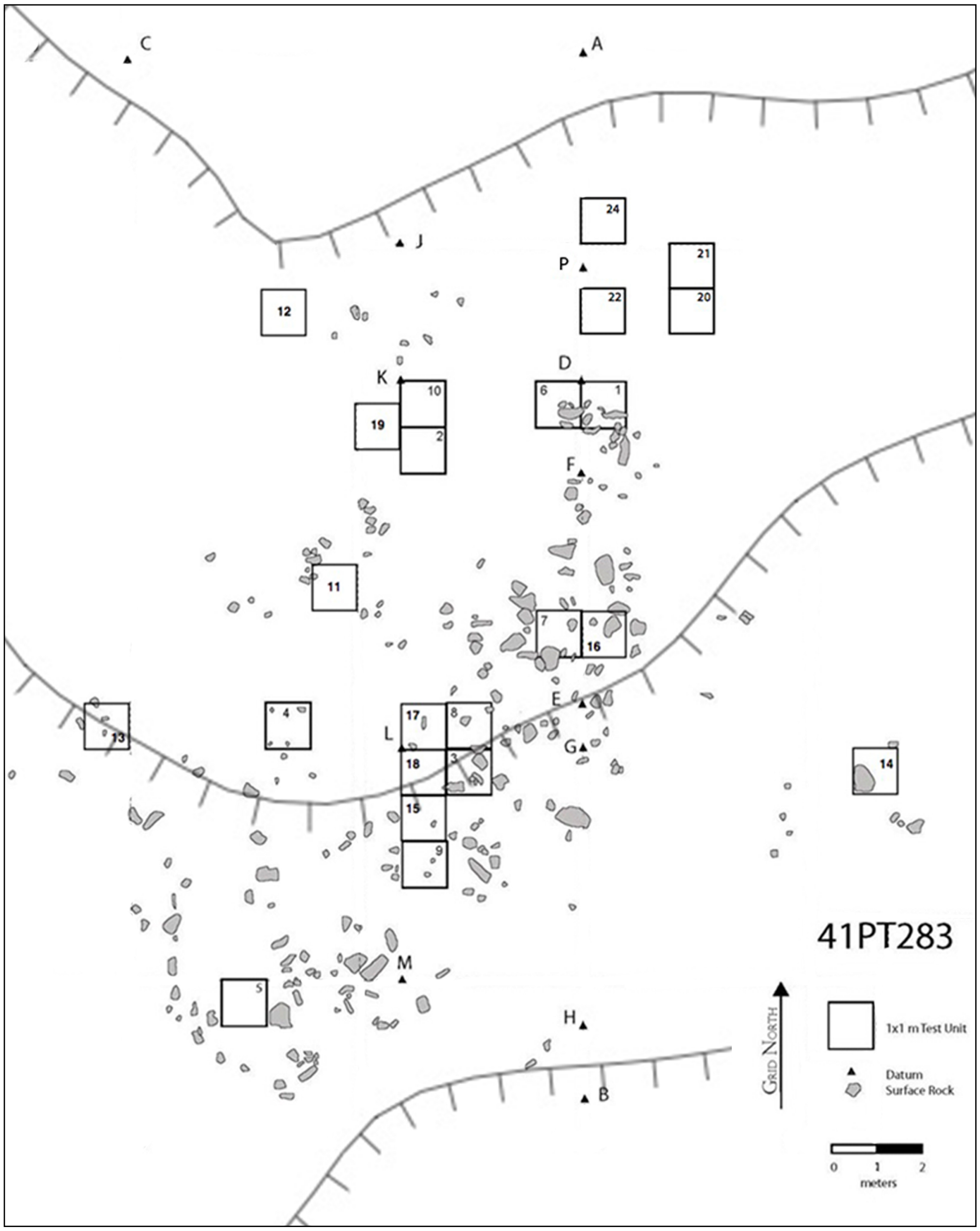

Figure 29. Plan view showing test units, stone configurations and topography (contour interval = 1m).

As seen in the Figures 28 and 29, the stone slabs appear to be oriented along a 12 m long north-south axis with random clusters extending approximately 6 m to the west; the topography along this axis slopes gently from north to south, tapering more abruptly to the southeast and southwest. During initial investigations at the site (Briscoe 2002), the arrangements of stones were interpreted as two individual rooms. John Northcutt later noted three rooms adjoining a common "long undivided rock wall on the east side of the structure," which is represented by the stone alignment along a north-south axis. The perception of the long common wall with adjacent rooms led Northcutt to postulate that the site could be a hamlet from the early sub-stage of the Antelope Creek phase. He also notes that the disturbed context of the stone slabs is not the product of recent human activity, but instead may have occurred "many years before by early ranchers or settlers." Similar to Briscoe, Northcutt's observations imply that site disturbance is associated with the abandoned two-track road. The differential surface to buried context along the north to south grade suggests that the stones may have been displaced during or soon after abandonment, and subsequently buried by physical processes.

Without any patterned arrangement of vertical stone slabs, or evidence of support columns, it is impossible to ascertain the extent of architecture and number of rooms. Nevertheless, the ambiguous alignment of stones along a north-south axis could represent a wall to which small and medium sized limbs were laid to form a temporary lean-to or brush structure. In this design, the stones located to the west of the axis were emplaced to stabilize the roof materials. The temporary nature of the possible architecture suggests that it would not have survived the archaeological record; it may have also been destroyed during abandonment or salvaging in systemic context.

The lack of structural features and the arrangement of stones could also be the remains of a bordered garden. In this scenario, the north-south stone axis or "long wall," and the shorter linear sections to the west could have been constructed to direct runoff and contain soil moisture for dry farming (Doolittle 2000:219-222). The dense concentrations of ceramic fragments found in the contiguous test units (3, 8, 15, 17, and

18) located along a portion of the long wall (see Figure 29) may reflect the use of ceramic vessels to bring water to gardens. Although the frequencies of other cultural materials around the stones suggests a variety of other site activities, which are discussed in detail below, the practice of dry farming at some point during the occupation cannot be ruled out as a possible functional element at the site. The potential for a stone-bordered garden at 41PT283 is important given that the extant evidence of gardening/farming by Antelope Creek peoples is limited to the recovery of charred cultigens, which offer little in terms of horticultural practices.

Material Assemblage

Stone Tools

A variety of diagnostic tool forms are present in the 41PT283 material assemblage. These include projectile points (n=18), bifaces (n=6), unifaces (n=26) utilized flakes (n=55) and grinding stones (n=14). Twelve of the projectile points were identified by Elton Prewitt as six Washita (Figure 30), four Fresno (Figure 31), and two

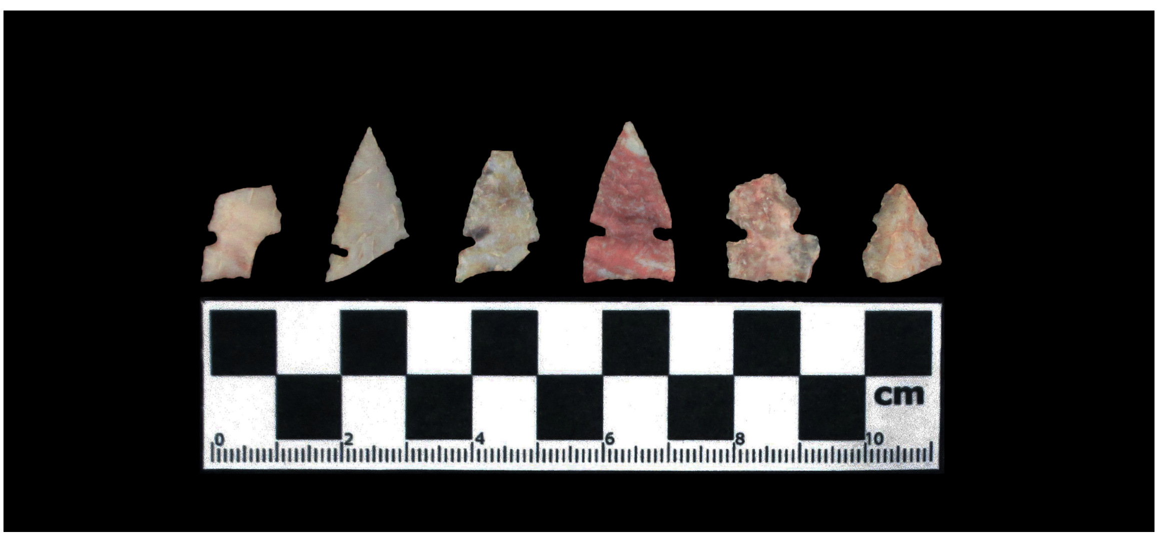

Figure 30. Washita points found at 41PT283.

Deadman (Figure 32) arrow points. The remaining untyped points consist of distal, medial and basal fragments with morphologies remnant of arrow points (Prewitt, personal communication 2016).

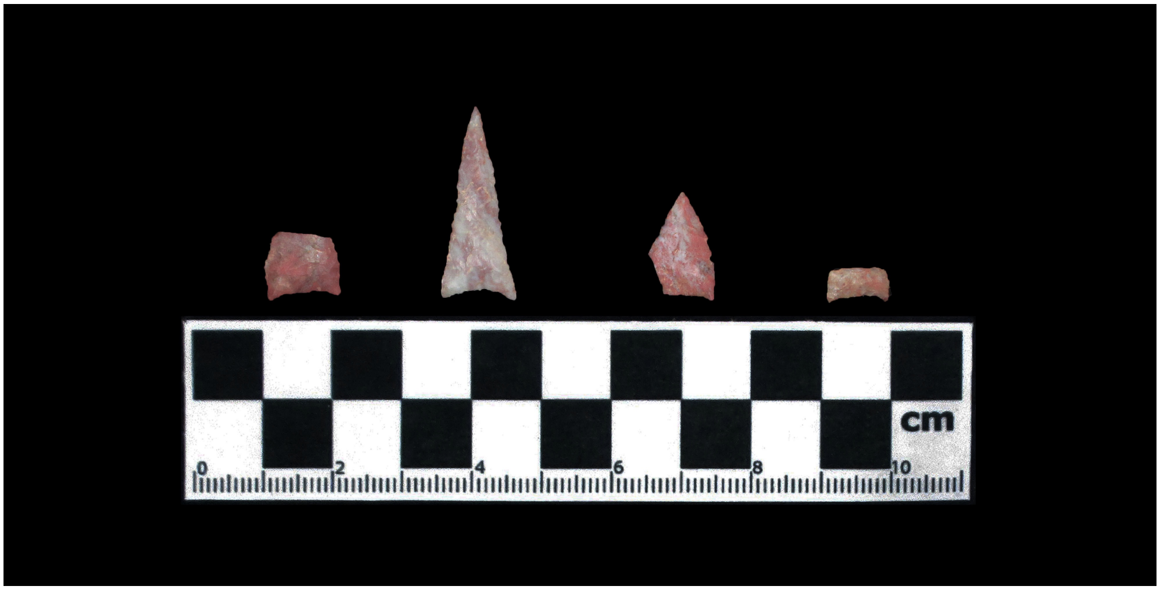

Figure 31. Fresno points found at 41PT283.

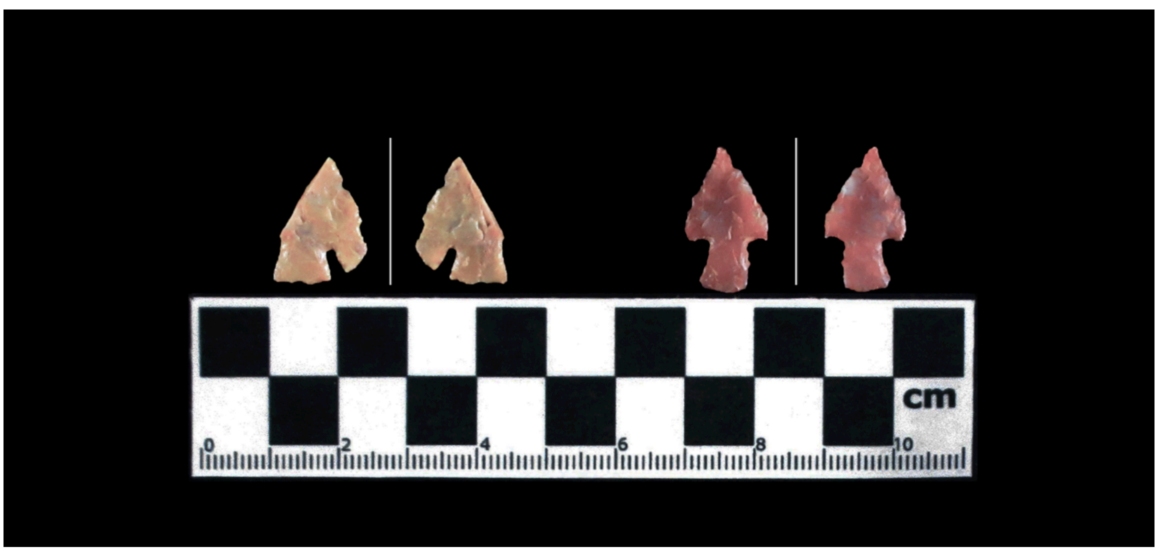

Figure 32. Deadman-like points found at 41PT283.

The projectile point typology is interesting when taken in the context of the Antelope Creek phase. The Deadman (or Deadman-like) arrow points suggest an earlier component such as the Palo Duro complex of the Plains Woodland period. While it is possible that Antelope Creek peoples acquired these points and put them to use at the site, these findings could represent a northern occurrence of the Palo Duro complex, or some other associated Woodland component, and thus an initial occupation that antedates Antelope Creek. A Palo Duro component is reasonable given the occurrence of campsites from this complex on the Canadian River valley (Boyd 1997:274-275).

However, the stratigraphic context of the Deadman-like points overlaps stratigraphically with that of the Washita types, making it difficult to differentiate the occupations (Figure 33). The mixing of these point types is likely the product of

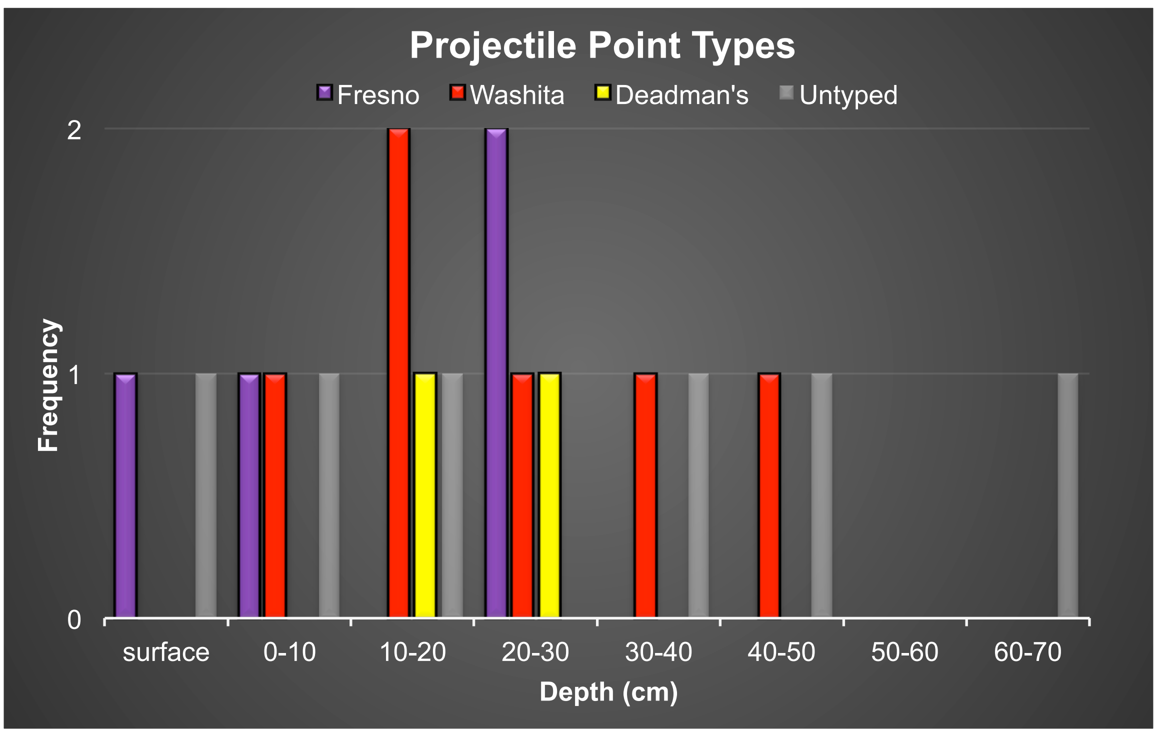

Figure 33. Vertical distributions of projectile points.

bioturbation and the friable sandy soil at the site. Regardless of temporal or cultural affiliation, the occurrence of Deadman-like arrow points is atypical during the Antelope Creek phase and represents one of the most interesting finds at the site. This finding encouraged further analyses focused on the potential for multiple occupations that could be separated stratigraphically. This topic is covered in detail in later sections of this chapter.

The high frequency of fracturing observed in the majority of arrow points (89%) suggests that they were discarded at the site at the terminus of their use-life. Only two complete projectiles were found, which consist of one Washita and one Fresno point (see Figures 30 and 31). The Fresno point was recovered on the surface, indicating it may have been deposited during a later occupation considering the majority of cultural materials are buried. The surficial context of this point could also be from post-depositional disturbance. The assemblage of complete arrow points may be underrepresented given the possibility that intact specialized tools were transported away from the site during abandonment. Nevertheless, the occurrence of 18 arrow points represents an importance of hunting activities by the site inhabitants.

The vast majority of other specialized tools are also fragmented, which is evidenced by breakages near tool-bit edges. No complete bifacial or unifacial tools were observed; however, the usewear and flaking patterns reflect bifacial knives and unifacial scraper tools common to the Antelope Creek and Wheeler artifact assemblages (Figures 34 and 35). The fragmented nature of the specialized tools and the lack of refits suggest that the tools were fractured beyond repair during use or maintenance and discarded at the site.

Figure 34. Biface fragments found at 41PT283.

Figure 35. Scraper fragments found at 41PT283.

A total of 14 grinding stones were found, reflecting plant processing activities at the site. Interestingly, some of the grinding stones show evidence of having been burned (n=6). Although Antelope Creek groups likely utilized portable manos and metates, the occurrence of burned grinding stones suggests that rather than be transported off-site during abandonment, they were re-purposed as hearth or boiling stones. The occurrence of quartzite and dolomite grinding stones is not surprising given the ample supply of these local materials, and the low topographic setting at the site, which has been associated with horticultural practice (Lintz 1986a:260). Figure 36 provides a representative sample of the grinding stones.

Figure 36. Representative sample of grinding stones from 41PT283 (Top row: manos and mano fragments; bottom row: metate fragments).

Utilized flakes are common in the stone tool assemblage (n=55), suggesting that stone resources were plentiful and mobility was frequent (Figure 37). A somewhat similar frequency of specialized tools (n=51) suggests that the local economy was diverse. This is evidenced by an expedient-specialized tool index of 1.08 (55/51). The PP/GS index is calculated at 1.29 (18/14), suggesting a mixture of hunting and plant processing activities. This evidence along with the relatively high frequency of animal bone fragments (n=705) suggests that the 41PT283 inhabitants exploited a variety of food resources and these goods were processed on-site. The above indexes are discussed further and presented graphically in the later sections focused on the comparisons of these data with site 41PT109.

Figure 37. Representative sample of flake tools found at 41PT283.

Material Composition

Macroscopic observations of the lithic assemblage indicate that Alibates silicified dolomite was the preferred tool stone. Less common material types such as quartzite and possibly Tecovas jasper are also present in the core and debitage assemblage, some containing discoloration indicative of heat-treatment. This form of specialized treatment is noticeably absent among the cores and flakes produced from Alibates chert (Table 4). The differential treatment of these materials may have been done to improve the malleability of the stone for more effective reduction and use. The evidence of heat-treated flakes and cores composed of quartzite may reflect other uses of these cobbles as boiling and/or hearthstones. However, their fracturing attributes (e.g., striking platforms and bulbs of percussion) differentiate them from the observed fire-cracked rocks.

Table 4. Variation in material composition and heat-treatment of debitage and cores.

Observation	**Debitage** (n=514)		**Cores** (n=12)	
	Alibates	**Other**	**Alibates**	**Other**
Portion of entire assemblage	90.1%	9.9%	58.3%	41.7%
Portion with signs of heat-treatment	1.9%	89.1%	0%	60%

The differential handling of the stone materials can be viewed as a technological response to a perceived decline in stone resource reliability. Given the other functional properties of locally abundant quartzite cobbles for uses such as grinding, boiling, hearth and hammerstones, it is not surprising that these materials were utilized to some extent for other utilitarian purposes. In addition to heating and grinding, quartzite cobbles were utilized as hammerstones (Figure 38). A unifacial quartzite tool is interpreted as a chopping and/or grinding implement (Figure 39).

Figure 38. Quartzite hammerstones found at 41PT283.

Figure 39. Quartzite tool found at 41PT283.

Macroscopic observations of the core assemblage indicate that most are composed of Alibates, but burned Tecovas jasper (n=1), and quartzite (n=4) are also present (Figure 40). The limited exploitation of the less durable and more local materials is juxtaposed against the usage of higher-quality Alibates materials that required greater effort to acquire. This suggests a mobile life style as well as an economy focused on more costly tasks such as the extraction of protein from high-yield elements of bison and deer sized mammals.

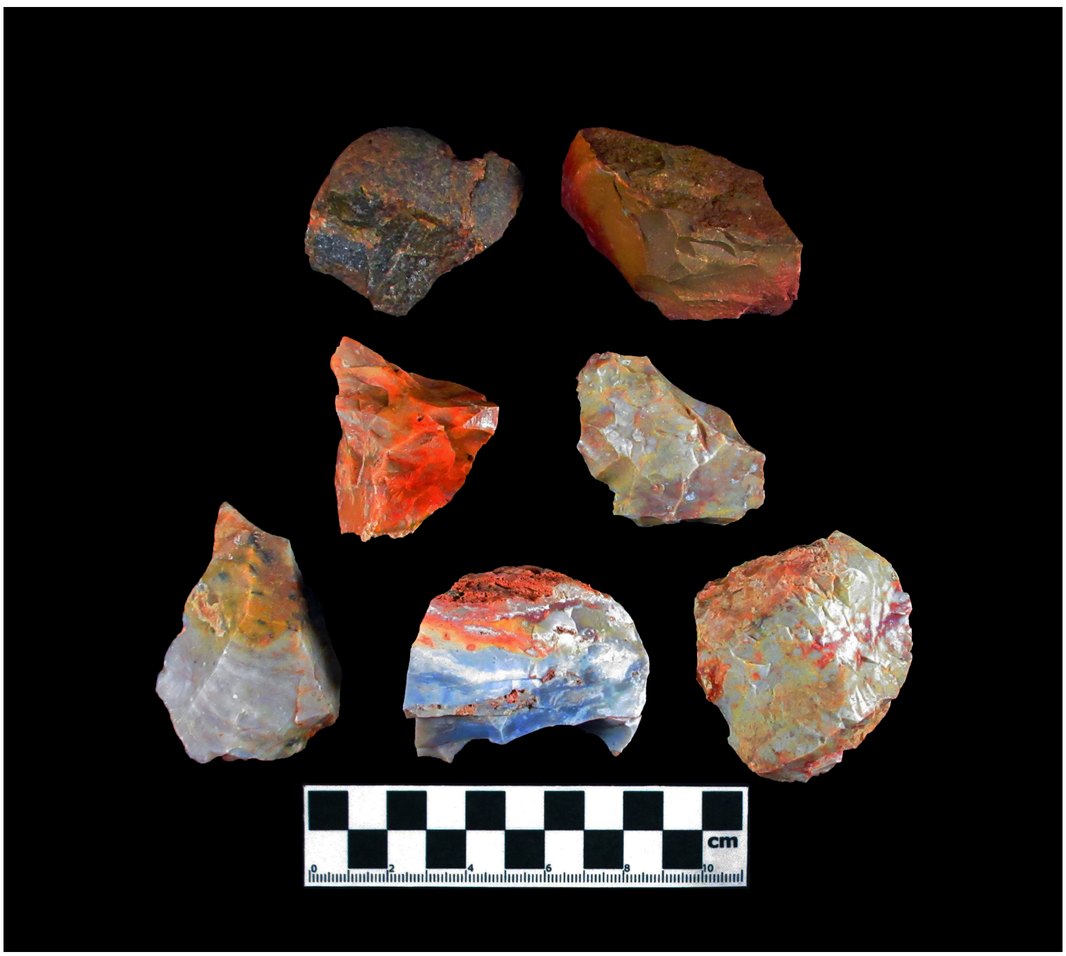

Figure 40. Lithic cores found at 41PT283 (Top left: burned quartzite; top right: burned Tecovas jasper; middle and bottom rows: unburned Alibates).

Acquiring Alibates Chert

A travel distance of at least 22.7 km (14.1 miles) was necessary to reach the nearest source of Alibates tool stone (Bousman et al. 2015). The least cost path (LCP) from 41PT283 to the North Quarry first traverses northward across rolling uplands west of the creek valley towards the Canadian River. This path comes in close proximity to sites 41PT257, 41PT112, before reaching 41PT109 at the Canadian River (Figure 41). From there the proposed travel route crosses the river and meanders northeastward along mostly uplands and draw passages until reaching the source area.

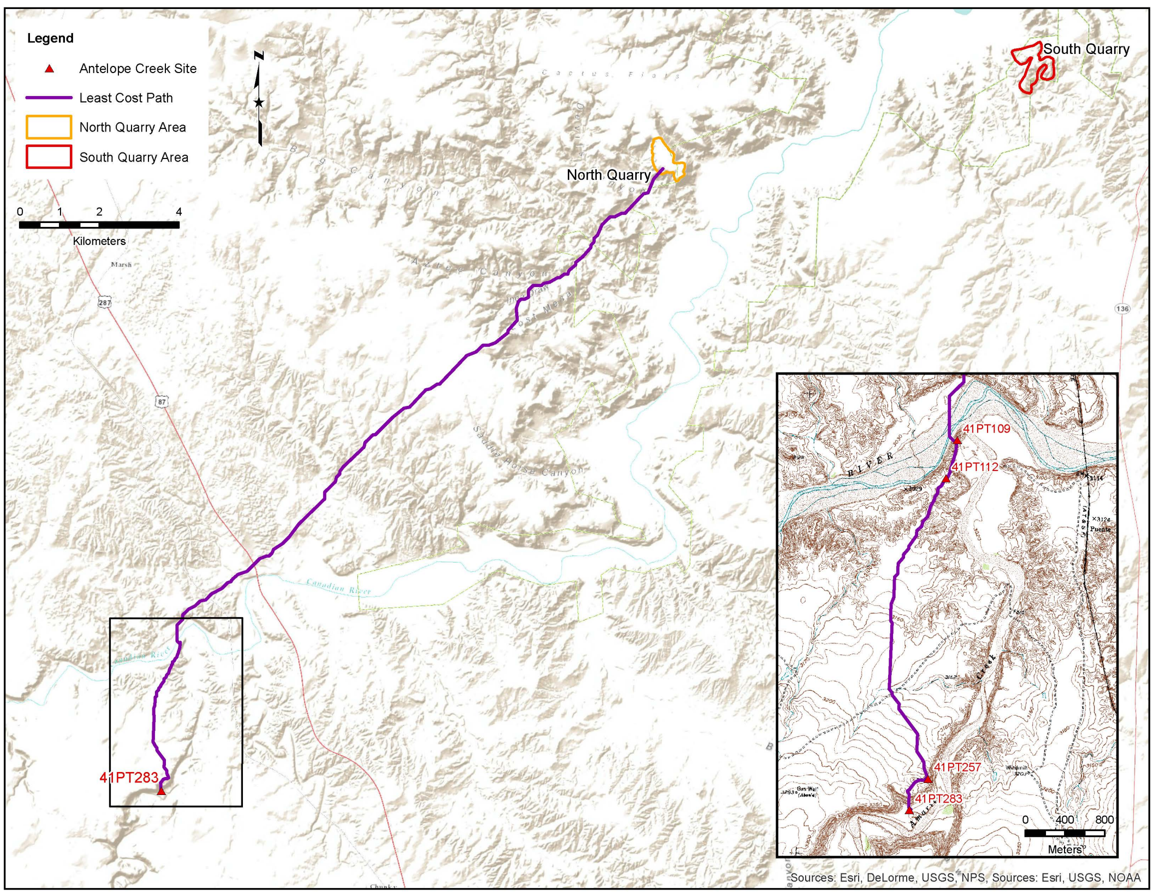

Figure 41. Map showing the proposed travel path from 41PT283 to the North Quarry.

The undulating terrain along the path results in a combined ascent of roughly 700 feet in elevation. Based on the criteria for significant elevation loss in Naismuth's Rule

(2000 feet) and Langmuir's Correction (1000 feet), the combined elevation loss of 700 feet is too minimal to influence the estimated travel time. Given the topography and the 22.7 km LCP distance from the study site to the North Quarry, this one-way journey likely took five to six hours, suggesting that the 41PT283 inhabitants could have performed their lithic procurement activities in a single day, barring limited setbacks.

Lithic Reduction Strategies

The debitage collection consists of 214 complete flakes, 295 incomplete flakes, and 80 pieces of shatter (Figure 42). A detailed analysis was performed on the complete flake assemblage to characterize the lithic reduction strategies executed at the site. The fracturing attributes recorded for each complete flake are presented in Table 5 and discussed below.

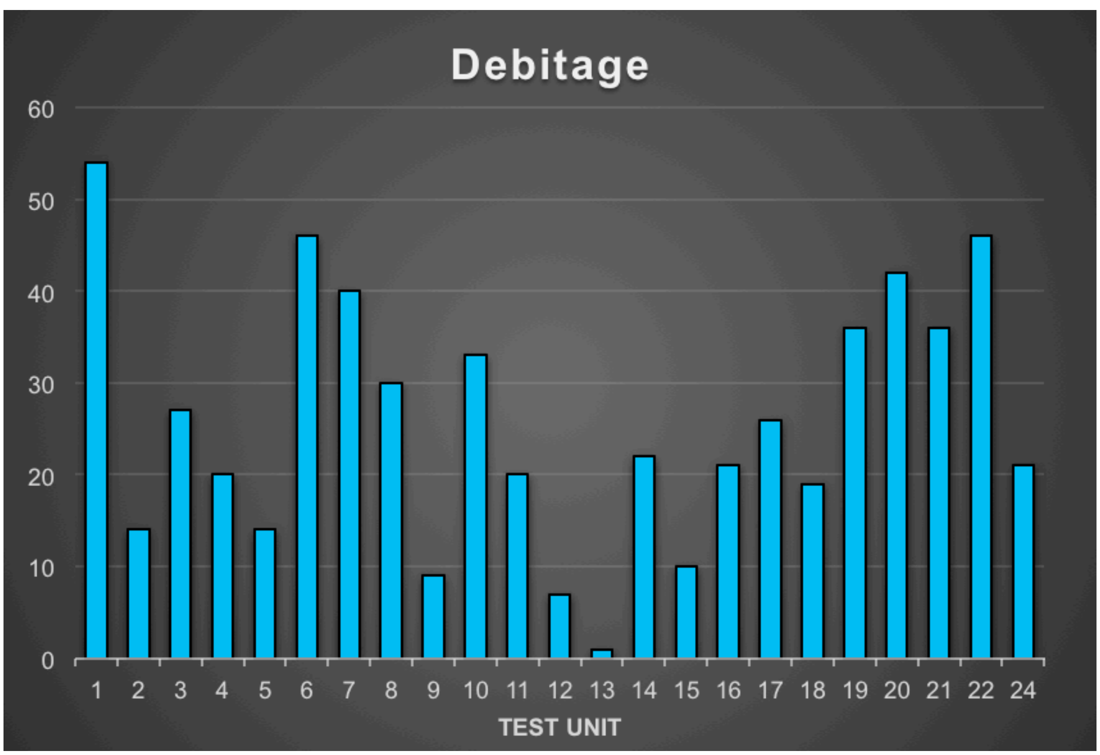

Figure 42. Frequency distributions of lithic debitage at 41PT283.

Table 5. Stone fracture attributes of the complete flake assemblage.

Unit-Level	n=	Bulb of Percussion		Platform		Termination		
		Prominent	Diffuse	Crushed	Lipped	Overshot	Stepped	Feathered
1-1	2		2		2			2
1-3	6		6	1	5	1	1	4
1-4	4		4		4		1	3
1-5	3		3	3				3
1-7	4		4		4		1	3
2-2	1		1		1			1
2-3	4	1	3	1	3		1	3
2-4	1		1		1			1
3-2	6		6		6		2	4
3-3	1		1		1		1	
4-1	1		1		1			1
4-3	1		1		1			1
5-2	3	1	2	1	2			3
5-3	1		1	1				1
5-5	2		2	2			1	1
6-1	7		7		7		1	6
6-3	4		4		4			4
6-4	5	1	4	1	4		1	4
6-5	4		4		4	1		3
6-6	1		1		1			1
7-2	1		1		1			1
7-3	5	1	4	1	4		2	3
7-4	3		3		3		1	2
7-5	5	4	1		5		2	3
7-6	5		5	1	4		2	3
8-1	3		3	1	2			3
8-2	3		3	1	2			3
8-3	1	1			1	1		
8-4	2		2	1	1		1	1
8-4b	1	1			1			1
8-6	2	1	1	1	1		1	1
9-1	1		1	1				1
9-3	1		1	1				1
9-4	1		1	1				1
10-1	3	1	2	1	2		1	2
10-2	4		4		4	1		3
10-3	1		1		1		1	
10-4a	1		1	1				1
10-4b	2	1	1		2		1	1
10-4bg	1		1	1			1	
10-5g	2		2		2		1	1
n/a	1	1		1				1
11-1	1	1			1			1
11-2	5	2	3	2	3		1	4
11-3	3		3	3				3
11-5	3		3	1	2		1	2
12-1	1	1			1			1

Table 5. Continued

Unit-Level	n=	Bulb of Percussion		Platform		Termination		
		Prominent	Diffuse	Crushed	Lipped	Overshot	Stepped	Feathered
12-2	1		1	1				1
14-2	4		4	1	3		2	2
14-3	2		2		2		1	1
14-4	2	1	1	1	1		2	
14-5b	1		1	1				1
15-2	1		1		1		1	
16-2	2		2		2			2
16-3	2	1	1		2			2
16-4	1		1		1		1	
16-5	1		1		1			1
17-2	2		2		2		2	
17-3	2		2	1	1			2
17-4b	1	1			1			1
18-4	3		3	3				3
19-2	6		6	2	4		1	5
19-3	3	1	2	1	2			3
19-3b	2		2	1	1			2
19-5f	1	1		1			1	
20-3	2		2		2			2
20-5	5		5	5				5
20-6	4		4	3	1	1		3
20-7	4		4	2	2		2	2
21-2	1	1			1		1	
21-3	2	1	1		2		1	1
21-4	2		2	1	1			2
21-5	3	1	2	2	1		1	2
21-6	2		2	2				2
21-7	4	1	3	3	1			4
22-1	3		3	1	2			3
22-2	3		3		3			3
22-3	5	1	4	3	2		1	4
22-4	3		3	1	2			3
22-5	5		5	3	2			5
24-1	1		1	1				1
24-3	2	1	1		2		1	1
24-4	3		3	1	2		1	2
Total	**214**	**29**	**185**	**70**	**144**	**5**	**46**	**163**

The complete flake assemblage consists primarily of diffuse bulbs of percussion (86.4%), lipped platforms (67.3%), and feathered terminations (76.2%). These data indicate that the lithic reduction strategies executed at the site consist primarily of secondary and late stage reduction. This is further supported by a disproportionate relationship between prominent bulbs of percussion and crushed platforms as well as scant amounts of overshot and stepped terminations.

The modest amount of crushed platforms (32.7%) and relative abundance of diffuse bulbs of percussion (86.4%) and feathered terminations (76.2%) reflects a degree of late-stage tool production and maintenance. However, the predominance of lipped platforms relative to the bulb of percussion and termination numbers supports the notion that secondary reduction was the main technological strategy executed by the 41PT283 flintknappers. Quantification of the fracture attributes for each flake specimen shows a total of 115 secondary flakes, 89 tertiary flakes, and 10 early-stage flakes. The prevalence of secondary and late-stage reduction at the site is supported by high frequencies of decortical flake tools, the common occurrence of maintained tools, and the marked absence of cortex on waste debris produced from Alibates.

Lithic Procurement Behavior

The results of the lithic analysis support the notion that Alibates chert cores underwent initial stage reduction at primary source areas. This suggests that pre-fabricated blanks like the one pictured below (Figure 43) were manufactured at Alibates source areas and transported to the site as intermediate forms to be reduced according to specific functional needs, or used as items of trade. The common occurrence of large early stage flakes, tested cobbles and lithic cores at the Alibates Flint National Monument (personal observation, June 2016) is testament to this procurement behavior. This stone procurement strategy can be characterized as a technological response to stone procurement and transportation costs.

Figure 43. Large bifacial preform found at 41PT283.

Several millennia of lithic procurement activities at the Alibates Monument severely limits a firm understanding of the technological behaviors of Antelope Creek people based solely on the abundant evidence of early stage reduction. However, the prevalence of early-stage reduction at the quarry, and later stage at the study site implies a technological system reliant on a highly versatile tool kit adapted to offset not only transportation costs, but also the unpredictability of resources that the chert materials were used to extract.

Beyond the notion of pre-fabricated Alibates tool forms manufactured for multiple utilitarian purposes, another interpretation stresses the importance of manufacturing “trade blanks” at quarry areas (Katz, personal communication 2016). In this scenario, Antelope Creek artisans exploit their proximity to the abundant supply of

Alibates tool stone and produce preforms or blanks to exchange with distant groups such as those from the Southwest.

Whether this procurement strategy represents a socially circumscribed territory controlled by Antelope Creek peoples is impossible to ascertain, but it likely required a hierarchical social organization. One interpretation proposes that Antelope Creek groups hailing from the isolated peripheries of the Antelope Creek cultural area participated in a system of labor exchange at Alibates source areas (Bousman, personal communication 2016). This scenario implies a socio-economic system where personal-use raw materials were mined in exchange for the production of Alibates trade blanks that were distributed by “satellite villages” functioning as trade/exchange depots. Regardless of the potential social implications, this dynamic system of multi-purpose tool blank production at Alibates quarry areas represents an economic strategy adapted to offset perceived resource unpredictability- a system that is reflected in the lithic assemblage at 41PT283.

Ceramic Assemblage

A total of 165 ceramic sherds were recovered at various frequencies across the site (Figure 44). A portion of the assemblage is highly fragmented as 20% consists of sherd crumbs that measure ≤ 1x1 cm. These offer no clues as to surface finish and vessel portion. The second most common sherd size category is ≤ 2x2 cm (n=69), followed by those that measure > 2x2 cm (n=32).

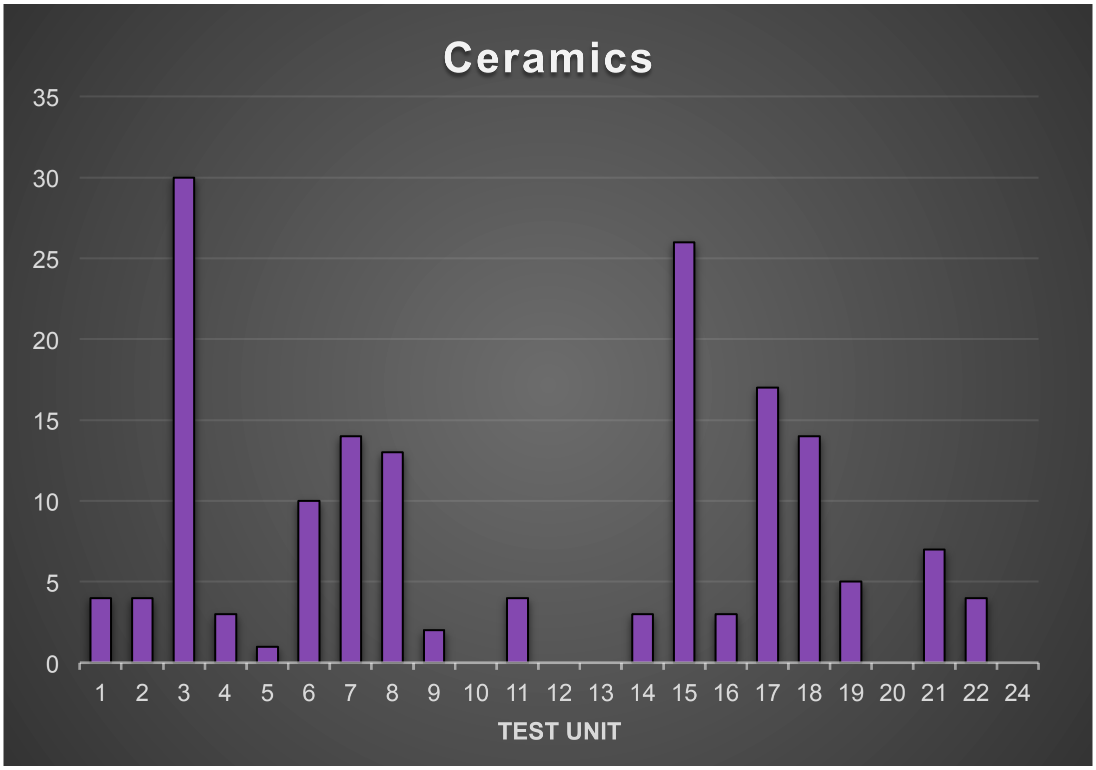

Figure 44. Frequency distribution of ceramics at 41PT283.

The largest two sherds are > 10x10 cm, which come from a dense cluster of relatively large sherds (i.e., > 3x3 cm) found in TU-3 that refit into the neck and body portion of a large globular vessel (Figure 45). The restored vessel section measures

Figure 45. Partially restored cordmarked vessel from TU-3.

upwards of 16x23 cm. All but two of the large sherds were recovered from contiguous Test Units 3, 7, 8, 15, and 17, which is thought to represent a pot-drop or discard area. The other two pieces are from TU-7 and TU-11, located less than 2 m northeast and northwest of the concentration of large sherds. The highest sherd counts come from TU-3, which also contains the largest pieces found at the site.

The various degrees of fragmentation appear to generally correspond with their spatial distribution across the site. For example, the test units placed along the outer periphery of the concentration of large sherds yielded fragments no larger than 3x3 cm. The majority (76%) of these small sherds were found in TU’s 1, 2, 6, 19, 21, and 22, which are located in the northern portion of the site. The remaining concentrations of small sherds come from TU’s 4, 5, 9, 14, and 16. This marked difference between sherd sizes in these different areas suggests different intervals of deposition. The presence of only small sherds and crumbs in the northern portion of the site could indicate an earlier occupation. The high level of fragmentation may also be the product of site disturbance associated with the two-track road. The predominance of larger sherds (> 3x3 cm to < 12x12 cm) in the proposed pot drop area suggests that they were deposited late in the occupation, perhaps near the time of abandonment. Occupation history and extent are discussed below.

Macroscopic observations show that the ceramic assemblage consists of 124 body sherds, 6 rim/lip sherds, and 2 rim/neck sherds, the majority which generally conforms to the descriptions of Borger Cordmarked pottery by Suhm and Jelks (1962). However, surface treatments are somewhat varied, consisting of cordmarked (n=90), boldly cordmarked (n=6), and smoothed (n=9) surfaces. Sherds that lack intact exterior surfaces total 60, the majority of which are sherd crumbs that provide no information regarding surface characteristics. The absence of cordmarking on nine large sherds probably reflects the rare smoothing along the lip-rim juncture, or extensive surface smoothing or "wiping" that obliterated evidence of cordmarking on exterior vessel surfaces (Lintz, personal communication 2016). This suggests that the surface smoothing occurred after the use of the cord-wrapped paddle. Figure 46 shows the variation in surface treatments observed amongst the large sherds.

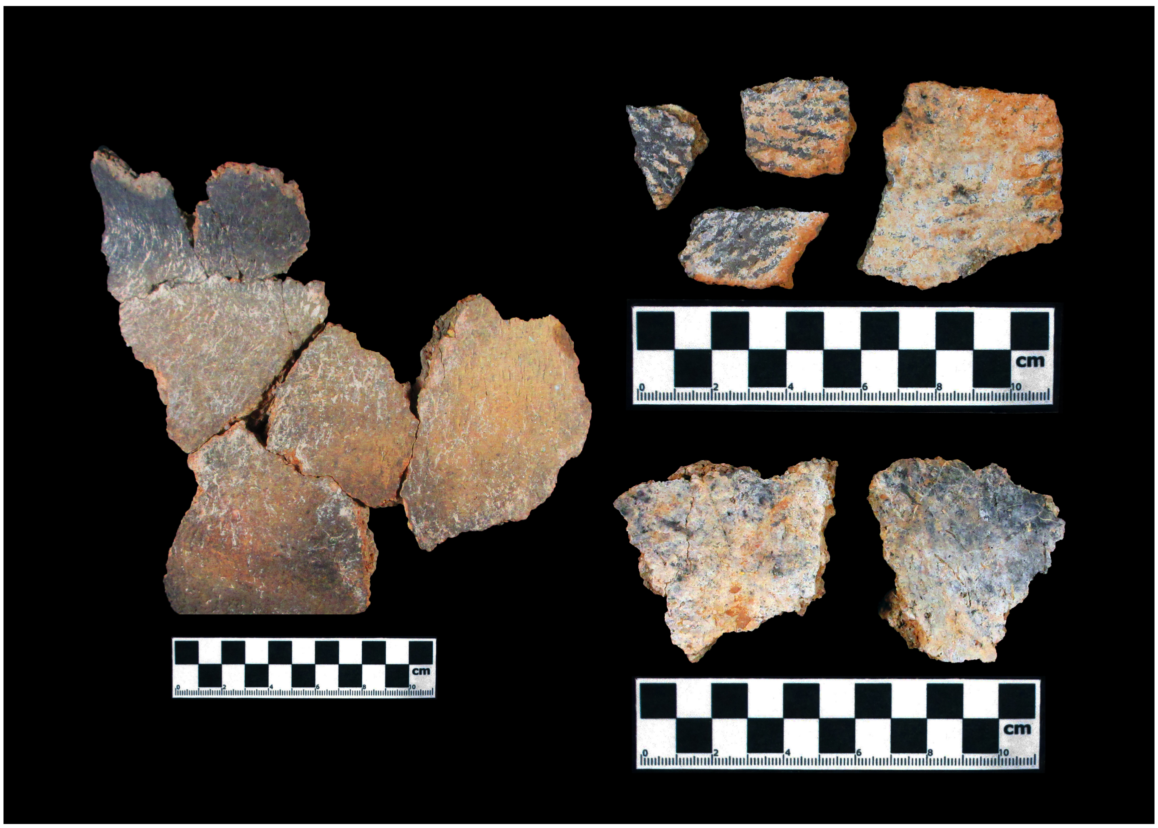

Figure 46. Examples of surface treatment variability observed in the 41PT283 ceramics (Left: cordmarked from TU-3; top right: boldly cordmarked from TU-11; bottom right: smoothed from TU-17).

In addition to sherd sizes and surface treatments, a degree of variability occurs in the thicknesses of the ceramic assemblage. Common thickness ranges include 3-5 mm (n=27), 5-7 mm (n=25), 7-9 mm (n=23), and 9-11 mm (n=22). Thicker sherds are less common and found in the 11-13 mm (n=6), 13-15 mm (n=4), 15-17 mm (n=5), and 17-19 mm (n=4) ranges. The thickest ceramics were observed in a cluster of sherds from TU-17 with smooth surfaces (Figure 47).

Figure 47. Sherds from TU=17 with thicknesses > 17 mm.

The divergent sherd surface treatments and thicknesses not only suggest different vessel forms, they also suggest influence by potentially different cultural traditions. Jack Hughes (1991:25) notes that Plains Woodland pottery usually consists of a few "big thick fragments of large conoidal vessels, tempered with liberal quantities of coarse particles... and boldly impressed with long parallel cordmarks." The sherd surfaces pictured on the right in Figure 46 and the thicknesses shown in Figure 47 appear to conform more to this definition than that of Borger Cordmarked pots. The thick sherds in TU-17 could reflect a "large conoidal vessel" found at Lake Creek and Palo Duro complex sites. However, these wares lack the "boldly impressed long cordmarks", which are only observed on the TU-11 sherds that measure ~5 mm thick.

The relatively scant presence of thick and smoothed sherds and thinner boldly cordmarked sherds highlight the well-known influence of Plains Woodland ceramic traditions on those of the Antelope Creek peoples (Pertulla and Lintz 1995). However, evidence suggesting a Woodland occupation at the site is a radiocarbon date of A.D. 1051 ± 46 obtained from the carbon residue on Specimen 18.1. This sherd has a smoothed surface, measures 10.43 mm thick and was found in TU-18. The origin of the carbon residue is unknown and it was recovered from the external surface of the specimen. Nevertheless, the variability of the ceramic assemblage, the radiocarbon date, and the two Deadman-like points provide supporting lines of evidence for a Plains Woodland component at 41PT283. Although the mixed context of the site's cultural materials complicates an identification of discrete occupations, further analyses of the ceramic assemblage could foster an improved understanding of these components.

Artifact Distributions

The purpose of the artifact distributions study was to identify site activity areas, evaluate the importance of hunting versus plant processing activities and gauge the intensity/duration of occupation. To identify activity areas, an adjusted residual statistical test was performed on the material assemblage from the study site. Artifact frequencies and densities were calculated and analyzed to identify general economic behavior and occupation extent. These data were compared alongside the artifact frequency/density at site 41PT109 to characterize different levels of functional variability between homestead and subhomestead site types.

Site Activity Areas

The 41PT283 artifact frequencies exhibit a multi-modal distribution across the site (Figure 48). As discussed in Chapter 6, the adjusted residuals test shows patterns of significantly high and low artifact frequencies across the test units. Tables 6 and 7 present these frequency distributions from northeast to southwest across the site. The high-density artifact concentrations indicate discrete activity areas reflected in the artifact/feature types from each test unit (Figure 49). Four subareas, called localities, were identified for the distribution analysis. These are Locality A, B, C and D and discussed in detail below.

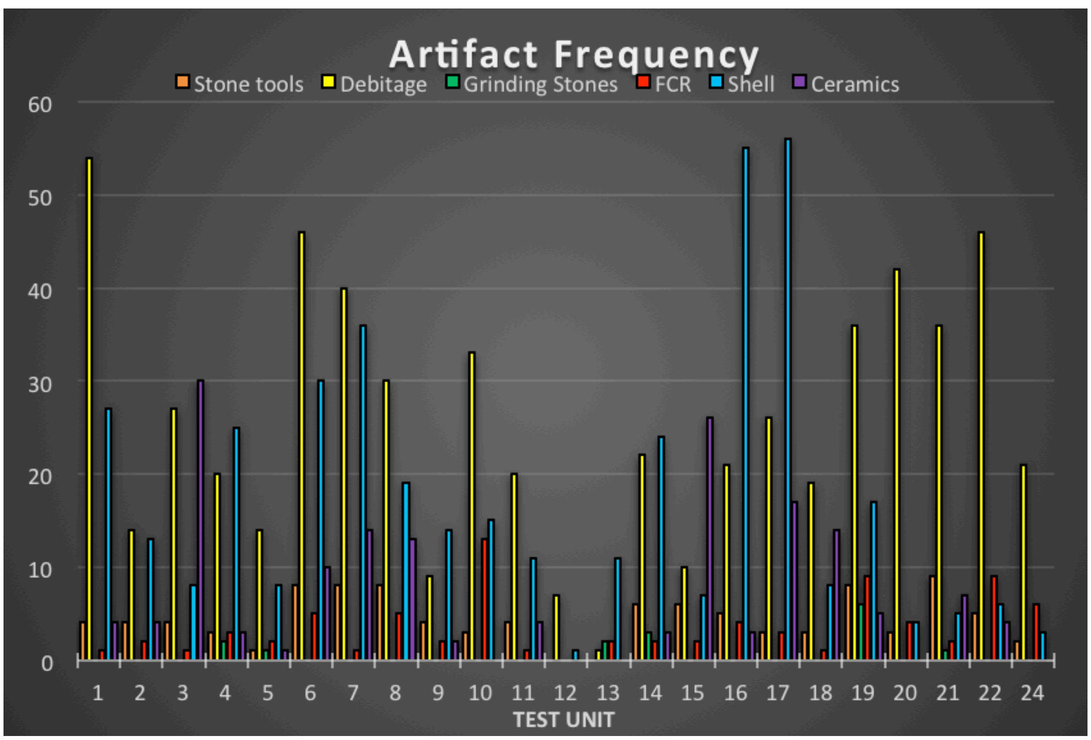

Figure 48. Artifact frequency distributions from 41PT283 test units.

Table 6. Adjusted Residuals for artifacts by test unit.

Test Unit	Stone Tools	Lithic Debitage	Ceramics	Fauna	Shell Fragments	Grinding Stones	Burned Rock
24	0.18	4.18	-1.77	-3.26	-1.62	-0.48	4.04
21	2.76	3.48	0.35	-2.27	-2.87	0.75	-0.60
20	0.39	6.17	-2.45	-2.58	-2.77	-0.66	0.89
22	0.66	6.18	-0.90	-4.93	-2.53	-0.71	3.65
1	-1.27	2.57	-2.41	0.66	-0.14	-1.00	-2.07
6	0.03	0.26	-0.83	0.66	-0.07	-1.05	-0.51
10	-0.94	1.11	-3.03	0.18	-1.08	-0.82	4.81
19	0.67	0.39	-1.78	-0.36	-1.75	5.95	2.81
2	0.35	-1.39	-0.65	1.79	-0.02	-0.67	-0.41
11	1.15	1.63	0.15	-2.47	0.80	-0.55	-0.63
7	-0.01	-0.90	0.36	0.77	1.15	-1.05	-2.23
16	0.03	-2.03	-1.87	-4.76	9.46	-0.82	0.07
8	0.82	-0.91	1.10	0.83	-1.04	-0.91	0.10
17	-1.53	-2.39	2.01	-3.25	6.82	-0.96	-1.05
4	-0.71	-2.18	-1.65	1.29	2.21	1.96	-0.27
18	-0.10	0.03	4.17	-0.74	-1.35	-0.65	-0.98
3	-0.17	0.63	9.30	-3.18	-2.40	0.76	-1.36
15	2.07	-1.63	10.93	-4.54	-1.20	0.60	-0.10
9	1.06	-1.50	-1.01	0.13	1.75	-0.56	0.08
14	-1.92	-7.19	-4.14	14.19	-3.89	1.26	-2.64
5	-0.82	0.61	-1.40	0.37	-0.12	1.40	0.24

Table 7. Adjusted residuals for debitage and cores, and stone tools.

Test Unit	Debitage	Cores
24	-2.19	2.19
21	-0.23	0.23
20	1.00	-1.00
22	0.02	-0.02
1	0.19	-0.19
6	0.02	-0.02
10	-0.32	0.32
19	0.92	-0.92
2	0.56	-0.56
11	0.68	-0.68
7	0.98	-0.98
16	-0.78	0.78
8	-0.41	0.41
17	0.78	-0.78
4	0.68	-0.68
18	-0.88	0.88
3	0.79	-0.79
15	0.47	-0.47
9	-1.71	1.71
14	-2.11	2.11
5	0.56	-0.56

Test Unit	Points	Bifaces	Unifaces	Modified Flakes
24	-0.63	-0.33	-0.81	1.30
21	-1.30	1.00	0.91	-0.27
20	-0.77	-0.41	1.74	-0.75
22	0.49	-0.47	2.42	-2.24
1	1.88	-0.47	-1.15	-0.19
6	1.71	-0.68	-1.67	0.47
10	-0.77	-0.41	1.74	-0.75
19	-1.30	1.00	-0.81	1.21
2	1.88	-0.47	-1.15	-0.19
11	0.49	-0.47	0.04	-0.19
7	-1.30	1.00	-0.81	1.21
16	0.24	-0.53	0.84	-0.67
8	0.71	-0.68	-0.81	0.47
17	-0.77	2.27	1.74	-1.93
4	0.82	-0.41	-0.99	0.43
18	0.82	-0.41	-0.99	0.43
3	-0.90	-0.47	0.04	0.84
15	0.03	1.34	-0.45	-0.23
9	-0.90	-0.47	0.04	0.84
14	0.03	-0.58	1.52	-1.08
5	-0.44	-0.23	-0.57	0.92

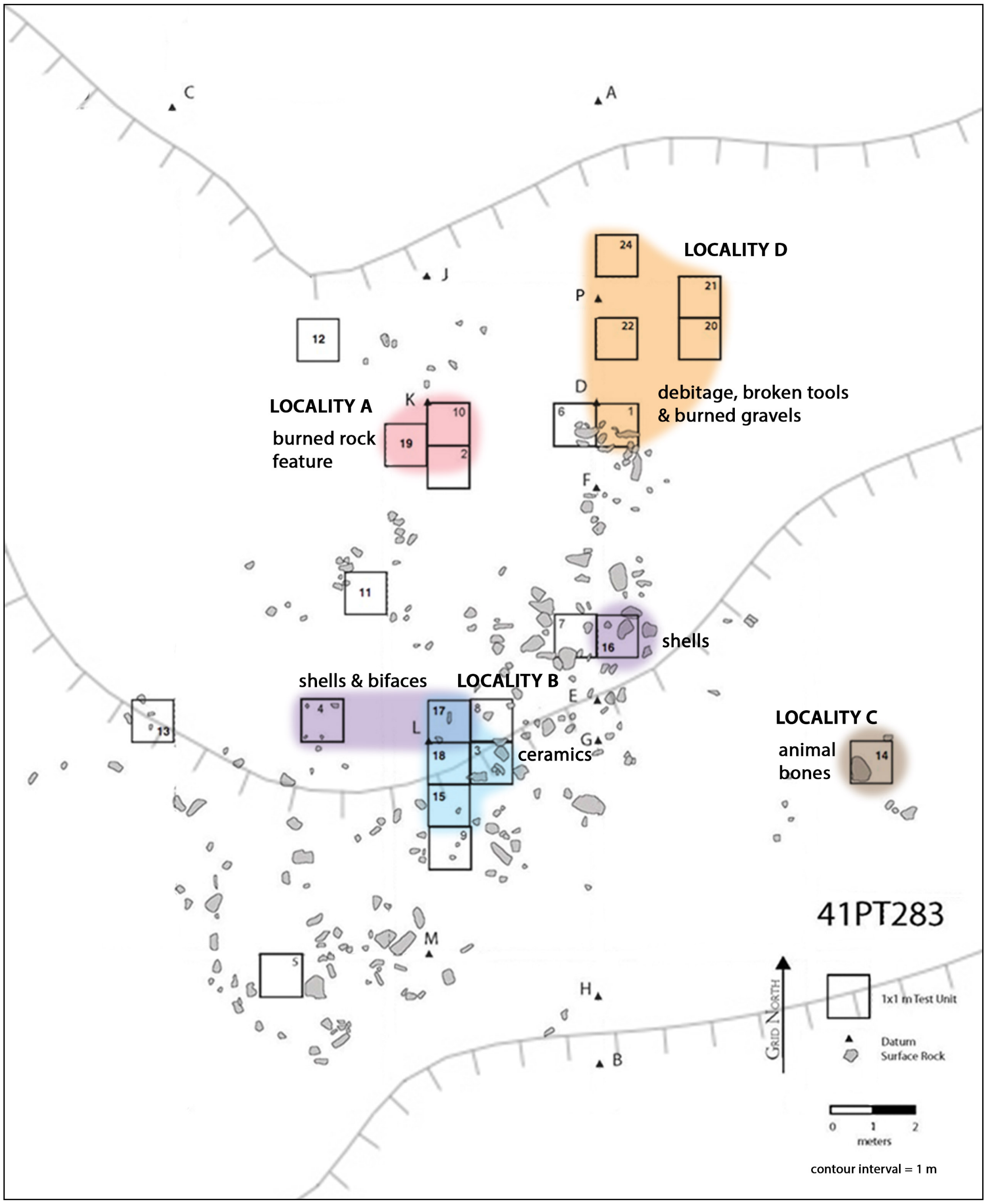

Figure 49. Plan map of artifact concentrations and Localities A-D.

Locality A: Burned Rock Feature

During the 2007 field school, a burned rock feature (Feature 2007-1) was recorded in TU-10 at a depth of 20-35 cmbd. This feature was described as a small cluster of quartzite, dolomite and sandstone cobbles located atop a "gray soil" containing a small accumulation of dispersed charcoal. A total of twelve burned rocks were observed in Levels 2 and 3. Rodent burrows were noted in the levels within and below the feature. At depths similar to the feature, nine burned quartzite cobbles and sparse charcoal were found in adjacent TU-19 along with moderate charcoal and carbon-stained soil in TU-2. The presence of such materials in these units indicates that they also contain part of the feature. The dispersed nature of the burned rocks suggests that they are not *in situ*. Some of the burned cobbles from TU-19 show wear patterns indicative of grinding use. The condition of these burned stones suggests that at some point they were utilized for plant processing and perhaps repurposed as hearth and/or boiling stones. Their association with Feature 2007-1 inhibits an identification of areas utilized for plant processing.

The charcoal samples collected from Feature 2007-1 consists of mesquite and saltbush wood types. A few fragments of burned bone were also recovered from the feature levels in Test Units 2 and 19. Bioturbation, erosion and possibly vehicle traffic may have compromised the spatial context of the burned rocks, hindering a determination of the size and morphology of what is thought to be a cooking/heating feature. The vertical extent of burned rocks from TU-10 and TU-19 is confined to a 15 cm thick stratum. The associated charcoal and soil staining from these units and TU-2 comprise the lower 5 cm of the feature. The small accumulation of these materials and limited number of burned rocks suggests an ephemeral hearth or roasting pit. This feature may have also been used to heat boiling stones, which is reflected in the common presence of burned quartzite cobbles in TU-19 and burned gravels in Locality D (discussed below).

Locality B: Clamshells and Ceramics

The high frequency of mussel shell fragments in TU's 4, 16, and 17 suggest this area was utilized for clam processing and/or discard. Although shellfish are considered insufficient supplements for protein dependent diets (Parmalee and Klippel 1974), they could have served as a supplemental food resource at least on a seasonal basis (Erlandson 1988). The ubiquity of freshwater clamshell fragments (n=403) suggests that clams were exploited to some degree. The fact that the site lies above the West Amarillo Creek floodplain signifies that the shells were not deposited naturally, but likely harvested from the nearby creek channel and transported to the site for processing.

The concentrations of ceramics in TU's 3, 7, 8, 15, 17, and 18 could reflect their association with shellfish processing. The mixed context of these artifacts could also be the product of multiple occupations. The presence of black soot on the surfaces of some of the sherds suggests ceramic pots were placed directly atop a heat source and used as cooking vessels. The pots may have also been used to extract bone marrow through stone boiling. Preliminary analysis of the paste and surface treatment characteristics of the Locality B sherds indicates a total of 7 vessels (Lintz, personal communication 2016).

In addition to a high frequency of sherds in Locality B, this concentration contains the largest fragments found at the site. The seventy-six sherds collected from TU-3, 15, 17, and 18 accounts for 62.3 % of the ceramic assemblage and have a collective weight of 1.25 kg, which is 90.4 % of the total ceramics. The large size of the Locality B sherds suggests that they were deposited near the time of abandonment. All but two of the largest 15 sherds were recovered from Locality B. The other two largest sherds come from TU-7 and TU-11 located less than 2 m northeast and northwest of this high-density area. The abundance of relatively large sherds in Locality B suggests that their associated activities occurred near the time of abandonment.

Locality C: Animal Bone Concentration

The most distinctive material concentration occurs in the southeast portion of the site in Locality C (see Figure 49), which consists of a single test unit (TU-14) containing 181 animal bone fragments. An adjusted residual of 14.19 at this unit is the only significantly high value in the fauna category and the highest overall at the site (see Table 6). Although the excavation at TU-14 terminated at 60 cm, the bone deposit may continue beyond this depth as the highest concentrations (n=139) occur in the lowest two levels.

This concentration of bone represents part of a midden utilized for the discard of primarily animal remains, but other artifacts are present at significantly low frequencies. These consist of debitage (n=22), stone tool fragments (n=6), shell fragments (n=24), grinding stones (n=3), burned rock (n=2), ceramics (n=3), and 0.6 grams of mesquite charcoal fragments (n=10). The association of moderate debitage and stone tools with the bones suggests lithic reduction/maintenance may have occurred during butchering activities in this area.

The majority of the fauna from TU-14 have indeterminate taxonomies given the degree of fragmentation. Out of the 181 fragments, the determinate samples consist of bone from large mammals (n=26) medium-sized mammals (n=8) and aquatic species (n=2) (Table 8). All of the samples of medium-sized mammals are indeterminate and no small mammal parts were observed in this test unit. Amidst the determinate samples are 7 bison-sized parts, 6 are deer-sized, and 2 consist of turtle fragments. Less than 10 percent of the bones from Locality C show discoloration indicative of possible roasting.

Levels 1-3 contain clusters of dolomite stones consisting of small (< 10x10 cm), medium (< 30x30 cm), and large (< 60x60 cm) sized slabs. There is no patterned arrangement of these stones and no available stratigraphic evidence to determine whether this feature is a stone-lined trash pit. The concentration of discarded animal remains beneath the stones suggests they may be associated with later use of the midden.

Table 8. Determinate taxon and mammal size classes from TU-14.

Level	General Description	Taxon	Element	Part	Section	Burning Pattern	Count
2	Large mammal	*Artiodactyla*	Femur	Distal	Diaphysis	NA	1
2	Large mammal	Indeterminate	Long bone	NA	Epiphysis	Roasting	1
3	Medium mammal	Indeterminate	Long bone	NA	Epiphysis	NA	2
3	Large mammal	Indeterminate	Vertebrae	NA	NA	NA	3
3	Medium mammal	Indeterminate	Long bone	NA	Epiphysis	Roasting	3
3	Large mammal	Indeterminate	Long bone	NA	Diaphysis	NA	4
4	Bison size	*Artiodactyla*	Metapodial	Mesial	Diaphysis	NA	1
4	Bison size	*Artiodactyla*	Axial bone	NA	NA	NA	1
4	Deer size	*Artiodactyla*	Metatarsal	Proximal	NA	NA	1
4	Deer size	*Artiodactyla*	Humerus, right	Distal	Epiphysis	NA	1
4	Deer size	*Artiodactyla*	Radius, left	Proximal	Epiphysis	NA	1
4	Deer size	*Artiodactyla*	Long bone	Mesial	Diaphysis	Roasting	1
4	Deer size	*Artiodactyla*	Long bone	Mesial	Diaphysis	NA	1
4	Bison	*Bison bison*	Molar tooth	Distal	NA	NA	1
4	Turtle	*Testudinidae*	Carapace	Neural	NA	Roasting	1
4	Medium mammal	Indeterminate	Skull, parietal	NA	NA	NA	1
4	Bison	*Bison bison*	Femur, right	Proximal	Epiphysis	NA	1
4	Deer size	*Artiodactyla*	Femur, left	Distal	Epiphysis	NA	1
4	Bison	*Bison bison*	Metacarpal	Distal	Epiphysis	NA	1
4	Large mammal	Indeterminate	Lone bone	NA	NA	NA	3
4	Medium mammal	Indeterminate	Lone bone	Mesial	NA	NA	7
4	Large mammal	Indeterminate	Lone bone	NA	Epiphysis	NA	69
4g	Medium mammal	Indeterminate	Long bone	NA	Epiphysis	NA	6

Table 8. Continued

Level	General Description	Taxon	Element	Part	Section	Burning Pattern	Count
5	Bison size	*Artiodactyla*	Sacrum	NA	Fragment	NA	1
5	Bison size	*Artiodactyla*	Axial bone	NA	NA	Discard	1
5	Large mammal	*Artiodactyla*	Humerus	Mesial	Diaphysis	Roasting	1
5	Large mammal	lndeterminate	Lone bone	NA	Epiphysis	Roasting	1
5	Turtle	*Testudinida*e	Carapace	Neural	NA	NA	1
5	Large mammal	Indeterminate	Lone bone	NA	Epiphysis	NA	5
5	Medium mammal	Indeterminate	Skull	NA	NA	NA	1
5	Large mammal	Indeterminate	Lone bone	NA	Diaphysis	NA	4
5	Large mammal	Indeterminate	Lone bone	NA	Diaphysis	Discard	1
5	Large mammal	Indeterminate	Long bone	NA	Diaphysis	NA	32
5b	Medium mammal	Indeterminate	Long bone	NA	Epiphysis	NA	3
5b	Medium mammal	Indeterminate	Lone bone	NA	NA	NA	1
5b	Large mammal	*Artiodactyla*	Long bone	NA	Epiphysis	NA	1

Locality D: Debitage, Broken Tools, and Burned Rock

High concentrations of waste flakes, broken scrapers, and burned gravels comprise Locality D, which is interpreted as an ephemeral midden deposit. The concentration of small burned gravels from TU-22 and TU-24 occur approximately 3 m east of Locality A, which contains larger burned cobbles. This suggests that exhausted (i.e., fractured beyond effective future use) burned rocks and/or boiling gravels were discarded away from the cooking/heating area.

The common presence of debitage in this locality suggests it was utilized for lithic reduction. The high frequency of broken unifaces may represent the discard of stone tools and the secondary and late stage debitage suggests tool maintenance. Locality D also has a high relative frequency of lithic cores, which supports its function as a stone tool production/maintenance area.

The burned gravels, waste flakes and broken unifaces in Locality D are positioned along the northern margins of the stone slab concentrations. This pattern is also observed at homestead sites such as 41PT109 where living areas contain significantly low artifact frequencies. Given the location of Locality D along the northern periphery of the site, the spatial context of these artifacts may have been altered by disturbances associated with the abandoned two-track road that encroaches this portion of the site. However, the highest artifact densities in this area are between 30-50 cm, which is consistent with the vertical context of cultural materials in other high-density areas. The common observance of gopher burrows in Locality D suggests that substantial mixing has likely occurred.

When compared to the midden in Locality C, the Locality D artifacts are less concentrated. The sparse nature of the refuse in Locality D suggests use of the midden during an ephemeral occupation. The Locality D midden could be associated with a Plains Woodland occupation given the presence of a Deadman-like point in TU-22. No other projectile point types such as Washita and Fresno were found in this area. The absence of bison bone in this midden could correspond with the bison absence period of A.D. 500-1200 proposed by Dillehay (1974), suggesting an earlier occupation. The richness of bison in the Locality C midden would then reflect the Antelope Creek phase occupation, which corresponds with the time when bison are thought to have returned to the Southern Plains, becoming the primary subsistence focus during the 13th century (Collins 1968:156).

Discussion

The cultural material assemblage has a generally uniform spatial distribution across the site with a few significant concentrations. The disposition of discrete artifact concentrations displays patterns in terms of the layout of different economic activities. For example, cooking/heating, stone tool production/maintenance/discard, and trash disposal areas are positioned away from the concentration of slab stones that might be indicative of a temporary structure or gardening area. The significant artifact concentrations observed amidst the slab stones consist of ceramics and shell fragments, which suggests that activities such as freshwater clam processing and perhaps stone boiling were the primary tasks conducted in this area. These materials are adjacent to TU-8, which contains the highest density of charcoal found at the site, containing 2.0 g of mesquite, 0.6 g of cottonwood, and scant amounts of saltbush, rose, and indeterminate plant species (Appendix A:Table 2). The absence of burned rock in this test unit suggests that this material is not associated with a cooking/heating feature, but rather a small brush structure or tent superstructure that may have burned.

The concentration of materials around the stone slabs and organic debris implies that certain food processing activities could have occurred within a temporary structure, whereas refuse was placed away from this area. However, the lack of *in situ* architectural features severely limits a more detailed assessment of the type and morphology of the structure. Nevertheless, the absence of such components does not indicate the absence of a structure, but perhaps that it was built according to a temporary/seasonal function and was thus unable to survive the archaeological record.

In addition to delineating the general layout of activities at the site, the distribution of activity areas also helps characterize the local subsistence economy. The artifact types and their respective distributions reflect a range of subsistence strategies, including the processing of animals, plants, and freshwater clams and the possible use of boiling stones in ceramic pots to extract proteins from bone and/or shellfish.

The provenience of the maize fragments in TU-24 (Locality D) is not enough to identify where and to what extent horticultural activities took place at or near the site. However, the low topographic setting and the stone configurations suggest that garden plots were established in close proximity. In this scenario, lowland soils could have been collected from the floodplain to furnish garden plots constructed at or near the site. The concentrations of ceramics in Locality B could reflect their use in bringing water and/or fertile soil to bordered gardens. However, additional data are needed to test this hypothesis.

The available material and settlement pattern evidence at 41PT283 suggests that large mammal limbs were acquired from distant areas and transported to the site for secondary butchering, cooking and consumption. Other resources such as wild and/or cultivated plants and shellfish were harvested locally and brought to the site for processing. Along with game animals, these supplemental resources were either cooked and consumed on-site or transported to a nearby homestead residence. Unfortunately, the degree of plant processing, be it harvested crops or wild edibles, is likely underrepresented due to poor preservation, and the possible reuse of grinding stones for cooking/heating complicates a gauging of plant processing activities. All in all, the diversity of the stone tool assemblage, faunal data, and the direct and indirect evidence for plant processing suggests that a variety of resources were exploited. Given the range of economic activity areas discussed above, and the temporary nature of the architecture, it is possible that 41PT283 may have been interconnected with a nearby homestead, such as 41PT257. In this scenario, the former site functioned as a field camp for the collection of various resources that were processed and brought to the upland residence. However, more detailed investigations are warranted at site 41PT257 to test this interdependence model.

Inter-Site Comparisons

The extant archaeological data from the Antelope Creek sites found in the study area indicates that they are likely homestead residences, which contain divergent attributes when compared to 41PT283. These include differences in settlement pattern and architecture, which likely correlate with variability in site function, occupation extent, and abandonment patterns. The observed discrepancies in topographic setting and architecture prompted detailed comparisons of the material assemblages from 41PT283 and 41PT109 to characterize these different levels of variability.

Settlement Variability

One of the most recognizable differences between 41PT283 and the study area sites is its lowland setting. The Antelope Creek homesteads are all located atop canyon rims overlooking the West Amarillo Creek valley. Many of these sites resemble the typical Antelope Creek homestead unit, containing square- and rectangle-shaped stone enclosures with dominant room forms oriented on a cardinal axis with eastern-facing entryways.

The settlement level of variability has been correlated with occupation extent and subsistence practice. Lintz (1986a:260) describes subhomesteads as containing subordinate room forms (Unit Types 5, 6, or 8) with or without pit/cist features (Unit Types 7, 10, or 11) that lack evidence of associated dominant household rooms (Unit Types 1 or 2). Subhomesteads typically occur on low topographic settings within the inner valley and are placed close to rich bottomland soils (Lintz 1986a:260). These sites contain a relatively low tool density, limited tool variety, and a scarcity of trade wares when compared to homestead sites.

Homestead sites occur in both upland and lowland settings, but have a single dominant room with pit and cist features and occasional subordinate room forms (Lintz 1986a:260). These sites typically have a greater density and variety of tools than subhomesteads. Based on Lintz's definitions of homesteads and subhomesteads, isolated Antelope Creek site types are delimited by their relative artifact densities, artifact type frequencies, and style of architecture- not topographic setting. However, the comparative analysis at sites 41PT283 and 41PT109 suggests that topography does influence occupation extent, architecture, and subsistence. Detailed analyses of the sites' material assemblages are necessary to support this hypothesis. Such an analysis also helps characterize their divergence in terms of site function. Tables 9-11 demonstrate the variability in material assemblages between these two sites.

Table 9. Artifact densities and type frequencies.

Artifact Category	**41PT283**	**41PT109**
Debitage	594	2831
Projectile Points	18	21
Bifaces	6	10
Unifaces	26	6
Modified Flakes	53	5
Grinding Stones	14	4
Ceramics	164	61
Animal Bone	705	3094
Shell	403	1076
Site Total	**1983**	**7108**
$\chi2=713.296$, $df=8$, $CV\alpha0.05=15.507$	*Artifact variation is significant*	

Table 10. Adjusted residuals for artifact frequencies.

Artifact Category	**41PT283**	**41PT109**
Debitage	-8.02	8.02
Projectile Points	3.69	-3.69
Bifaces	1.52	-1.52
Unifaces	8.16	-8.16
Modified Flakes	12.87	-12.87
Grinding Stones	5.76	-5.76
Ceramics	18.79	-18.79
Animal Bone	-4.92	4.92
Shell	6.63	-6.63

Table 11. Additional comparisons of the artifact assemblages.

Totals/Indexes	**41PT283**	**41PT109**
Total Artifacts	1,983	7,108
Artifacts (excluding debitage)	1,389	4,277
Area Excavated (m^2)	23	31
Artifact Density ($\#/m^2$)	86.2 (1,983/23)	229.3 (7,108/31)
Adjusted Artifact Density ($\#/m^2$)	60.4 (1,389/23)	138.0 (4,277/31)
Projectile Point/Grinding Stone Index	1.3	5.25
Expedient/Specialized Tool Index	1.1	0.14

As discussed in Chapter 6, these data comparisons demonstrate the variability of a number of attributes such as artifact densities and type frequencies, which reflect the relative duration/intensity of occupation and the importance of hunting and planting activities at each site. Figure 50 graphs the latter two differences based on the data presented in Table 11. These data provide the analytical basis for characterizing the different subsistence economies and occupation extents at upland homesteads and valley field encampments.

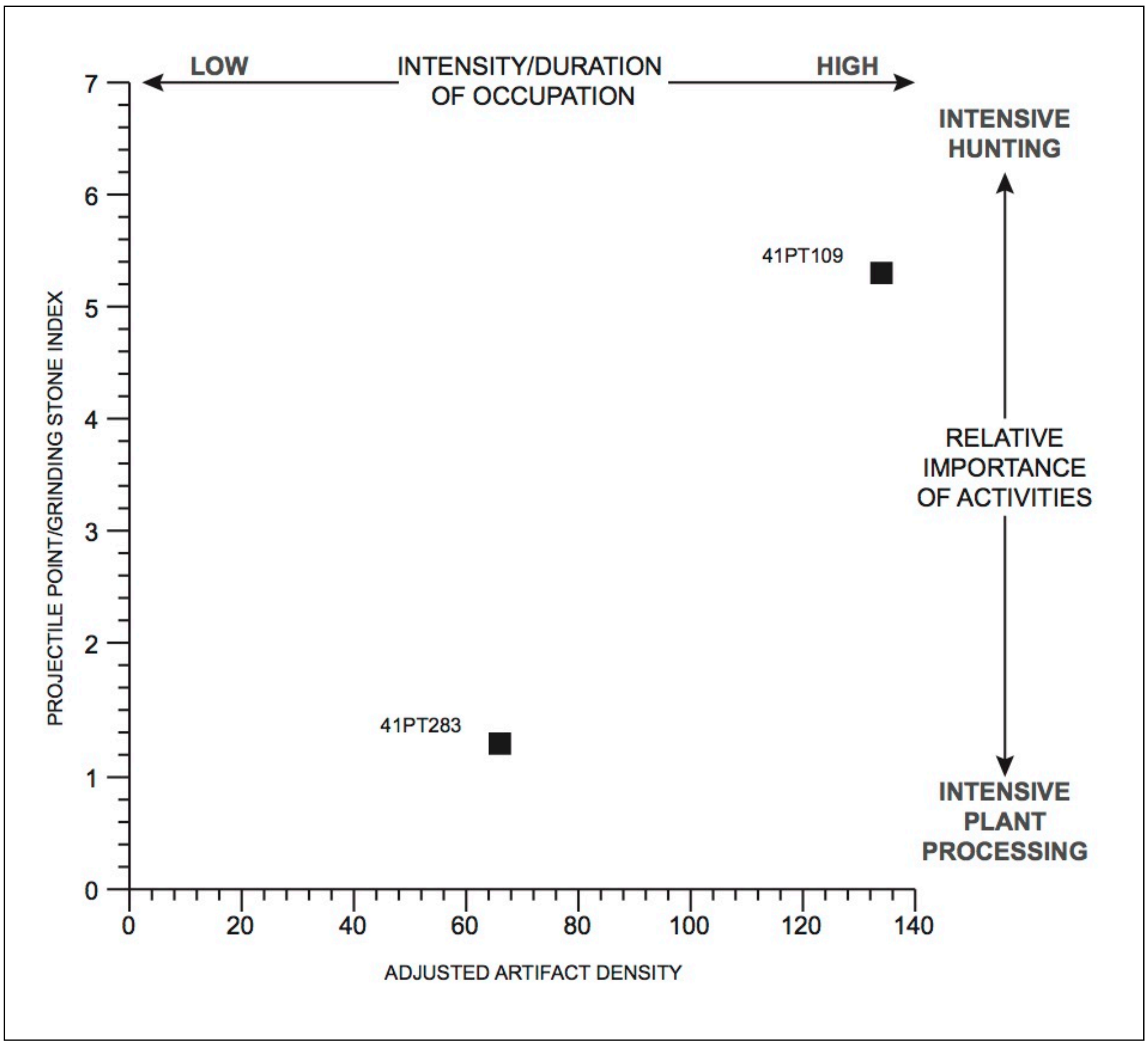

Figure 50. Plots for adjusted artifact densities and projectile point/grinding stone indexes.

Economic and Subsistence Variability

Sites 41PT283 and 41PT109 contain a variety of stone tools, but at various frequencies. Tables 9 and 10 illustrate the significant variability between artifact frequencies and densities at the two sites. The artifact densities in Table 9 reflect a greater intensity/duration of occupation at 41PT109; however, the adjusted residual values in Table 10 reflect greater tool diversity at 41PT283. These data demonstrate economic specialization and long-term occupation at 41PT109, and economic diversity and short-term occupation at 41PT283, which generally correlate with the functional dichotomy between homesteads and field camps.

The EST and PP/GS indexes presented in Table 11 also characterize the variability between local subsistence strategies, although these data are not as clear. For example, a PP/GS index of 5.25 at 41PT109 suggests that the local economy was heavily dependent on hunting activities (see Figure 50); however, the ubiquity of maize recovered at the site (Dering 2005: Table 2) indicates that horticulture was an important element of subsistence. A PP/GS index of 1.30 at 41PT283 places a greater emphasis on plant processing activities although the ubiquity of maize is much lower than 41PT109. These data suggest that this index is biased towards the presence/absence of grinding stone frequency and is not a sufficient measure of intensive plant processing at sites containing cultigens. Although plant processing could have been conducted away from the residence, perhaps at an encampment similar to 41PT283.

The potential for salvaging grinding stones during abandonment, as proposed by Weinstein (2005:98), could also contribute to an underrepresentation of the importance of plant processing. Tomka (1993) demonstrates that among Andean agropastoralists, the material culture on abandoned sites is scavenged by later ephemeral short-term users, and the removal of artifacts by later, but not necessarily the same, occupants alters the numerical make-up of the assemblages. It is also possible that upon abandonment, specific tool types are removed as the people leave, especially if the abandonment is planned as proposed at 41PT109. As such, the abundance of grinding stones at 41PT283 could be the product of differential abandonment patterns.

This has important implications for the possible underrepresentation of cultural materials at the two Antelope Creek sites under question. This is especially true at the study site given the potential for multiple occupations. For example, a later Antelope Creek occupation or series of intermittent occupations would undoubtedly alter the spatial context of an earlier Woodland component. Along similar lines, disarrangement of the Antelope Creek phase occupation(s) would be subject to similar destructive processes such as scavenging by later groups, which may explain the marked absence of complete tool forms and the re-use of grinding stones for heating elements at the site. In other words, the array of potential formation processes, both cultural and natural, severely limit a firm understanding of human behavior over the course of the site's use life.

In addition to the evidence of plant processing at the sites, the faunal analysis at 41PT109 indicates that bison supplied the main source of protein, whereas smaller Artiodactyls, rabbits and rats provided very little to the diet (Meissner 2005). The divergent fauna frequencies suggest that hunting activities are influenced by topographic settings. For example, the 41PT109 fauna suggests the use of plateaus to hunt upland grazers such as bison, and that logistic mobility was required to acquire this resource. The frequencies at 41PT283 suggest that deer-sized mammals were as important as bison, which along with the presence of medium- and small-sized mammals, reflects a more opportunistic subsistence strategy. The frequency of bison at 41PT283 could also be the product of food sharing with an upland homestead such as 41PT109 or 41PT257.

The relatively high frequency of expedient tools made from Alibates at 41PT283 also suggests that access to workable tool stone was dependable and quantities were not limited, which also corresponds with a degree of mobility and economic diversity. This dependability of Alibates is also supported by the presence of intact lithic cores composed primarily of this material (n=8).

The relative ubiquity of Alibates at 41PT283 could also reflect the caching of cores and preforms at the site to ensure adequate supplies for planned return occupations. In this scenario, occupations at 41PT283 involved bringing an adequate supply of tool stone to exploit a variety of resources. As such, task groups could have timed the occupations at the field encampment with procurement expeditions to Alibates source areas. This is juxtaposed against a specialized tool kit at 41PT109, which suggests that these homesteaders conducted logistic resource acquisition strategies conducive to a more limited subsistence economy.

Occupational History and Abandonment

The density and distribution of cultural materials at 41PT283 and 41PT109 demonstrates their variability in occupation extent. The majority of artifacts at 41PT109 were placed into refuse areas located away from the house or high traffic areas. Cultural materials at 41PT283 were discarded somewhat similarly, but artifacts are also common among presumed living/high traffic areas. The significant absence of artifacts inside the structure at 41PT109 compared to the common occurrence of materials around the stone slab concentrations at 41PT283 suggests a higher degree of site maintenance and greater occupation extent at the former site. The artifact frequencies and densities presented in Tables 9-11 and Figure 50 also demonstrate the lower duration/intensity of occupation at 41PT283. Table 12 shows the artifact counts from the test units with the highest densities at both sites. The test units with the highest densities were excavated in areas identified as discard areas, which highlights their behavioral similarities.

Table 12. Artifact densities from test units with the highest concentrations.

Artifact Densities	**41PT283**	**41PT109**
Highest	235 (TU-14)	2,766 (TU-7)
Second highest	157 (TU-7)	893 (TU-2)
Third highest	152 (TU-6)	610 (TU-10)

The dichotomy between occupation histories at the two sites is also apparent in the architecture. At 41PT109, a builder's trench was dug into the rocky ground surface along the outside perimeter of the structure, helping to stabilize the vertically inset stone slabs for long-term use (Figure 51). Antelope Creek builders at this homestead likely understood the utility of the natural upland surface to support the structure's wall load pressures. The loose and friable sands at 41PT283 would cause obvious limitations, which likely influence the construction of a more temporary unit. This design may have consisted of medium-sized limbs woven into a crude shelter to provide partial cover during the economic activities discussed above. Given the temporary nature of the site layout, artifact frequencies/densities, and activity areas versus those at 41PT109, it is likely that the architecture was suited towards a field hut and not a habitation structure.

Thus, the study site likely functioned as a temporary encampment to process resources acquired from the creek valley and/or monitor inner valley garden plots.

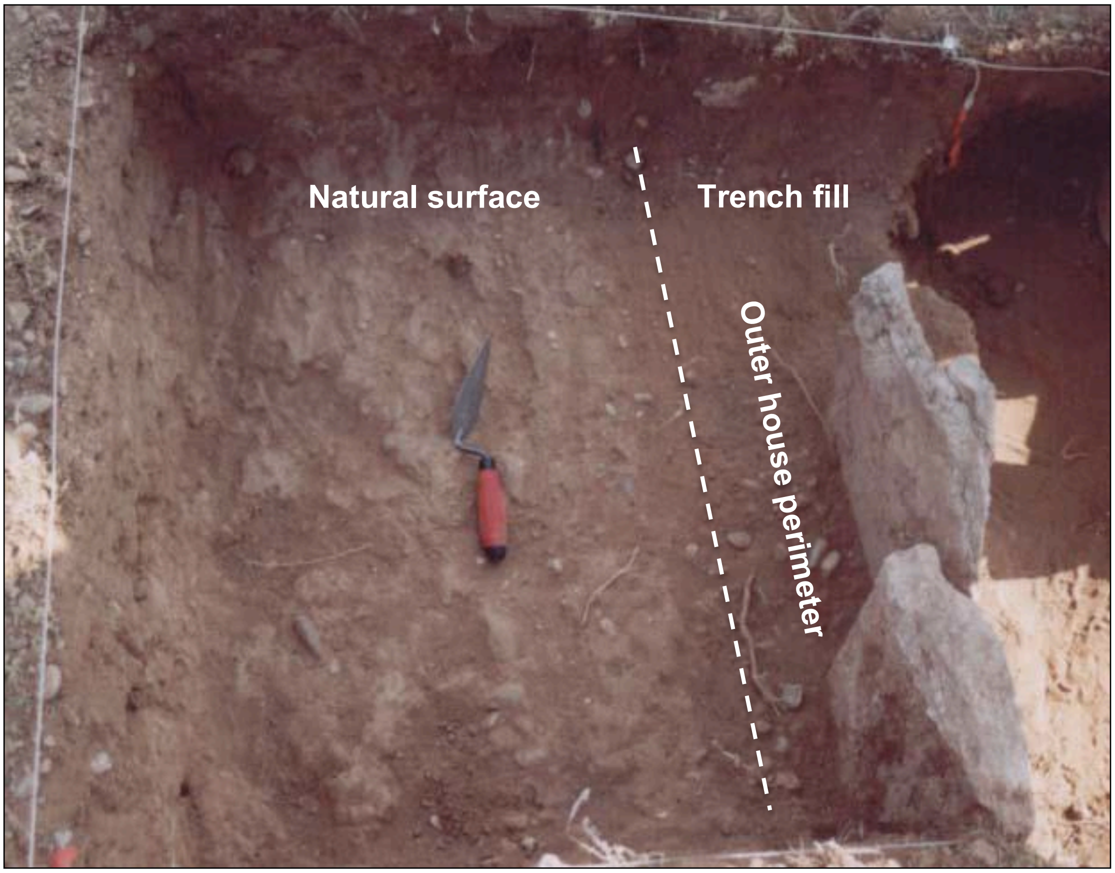

Figure 51. Upright dolomite stone slabs forming the outer west wall of 41PT109 house (Note the soil change from compact [left] to loose and gravelly [right]; photo modified from Weinstein 2005:57).

The divergent artifact frequency distributions at the two sites demonstrate variability in site maintenance and abandonment. The most salient evidence of this are the concentrations of artifacts relative to stone slab clusters. At 41PT109, the test units placed outside of the structural stones contain the highest densities of artifacts while those excavated within and around living areas are significantly low (Figure 52). This behavior suggests that a degree of attention was paid to keeping habitation and high-traffic areas free from waste debris. The lack of artifacts in the structure at 41PT109 could have also been from a final cleaning at the time of abandonment and not a continuous process. The opposite occurs at 41PT283 where artifact densities decrease in

Figure 52. Artifact percentage by test unit at 41PT109.

areas away from the cluster of slab stones and increase in and around presumed living areas (Figure 53). The exceptions to this pattern are the high artifact densities observed in the Locality C and D refuse areas.

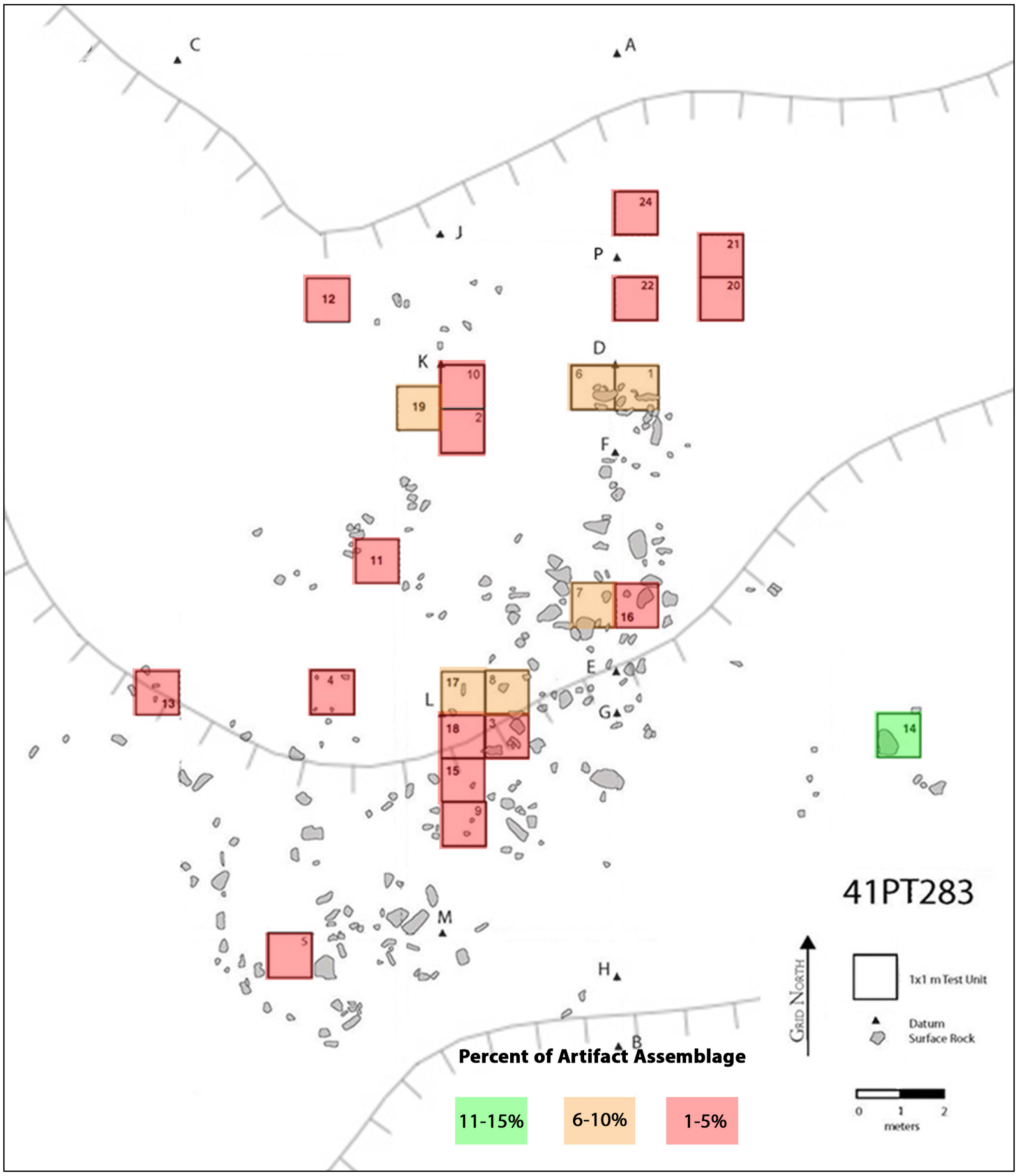

Figure 53. Artifact percentages by test unit at 41PT283.

In terms of abandonment type, the absence of artifacts within the habitation or living quarters at 41PT109 indicates an organized abandonment. This implies that various items of value were salvaged and carried away from the residence. According to Bousman (personal communication, 2015), the artifact distributions at 41PT109 suggest, "someone's grandma swept the place clean prior to leaving." Conversely, the general uniform distribution of artifacts at 41PT283 indicates an abrupt final abandonment. However, there is insufficient evidence to discern whether this was the result of natural or cultural forces.

Summary

The distributions of cultural materials, the temporary nature of architecture, and lack of evidence of a habitation structure suggests that 41PT283 functioned as a temporary field encampment for the processing of food resources. The low frequency of expedient tools, logistic mobility, high frequency of maintainable tools, and degree of site maintenance at 41PT109 indicates that this site functioned as a family residence. It is postulated that 41PT283 was occupied intermittently by tasks groups comprised of a few adults that were skilled hunters, foragers, and/or farmers, whereas 41PT109 housed a family comprised of both adults and children that participated mainly in mundane domestic activities at the residence.

Not surprisingly, both of these sites have direct evidence of horticulture and hunting large game, traits that are not uncommon during the Antelope Creek phase regardless of site type. However, a closer look into the variability in their material assemblages and the stone configurations highlights the discrete economic behaviors at two sites with divergent functions and settlement patterns. The behaviors also demonstrate a generalized social structure where specialized and orderly domestic activities occurred at the permanent residence versus an assortment of economic strategies occurred at the field camp. Of particular importance is the notion that these seemingly conflicting ways of life were not part of a linear transition during the phase, but instead may reflect complimentary site types that acted as buffering mechanisms to offset risk. This research topic, among others, is presented in the proceeding chapter using the settlement pattern and chronological data from sites 41PT283 and 41PT257.

VIII. CONCLUSIONS AND FUTURE RESEARCH

This chapter provides a summary of my research and concluding remarks regarding my interpretation of function at site 41PT283. Archaeological investigations often lead to more questions than answers, and my work at the Cross Bar Ranch study area is no exception. As such, this chapter discusses the future research perspectives developed over the course of my research. These topics are presented in hopes they will be tested and further developed during future studies of Antelope Creek settlement and functional variability.

Functionality at the Study Site

The material culture and topographic setting of the study site suggest that economic activities were focused on the processing of a variety of food resources, and that these occurred over the course of intermittent or seasonal occupations. One of the more notable behaviors is the processing of large game that I believe were transported to the site from distant kill zones. The inferred emphasis on low transport costs and high meat utility elements suggests an expanded hunting range was required to obtain bison and deer meat and/or that these animals were hunted infrequently. The risks associated with a primary reliance on high protein yields from large mammals were likely offset by other subsistence activities involving smaller mammals, cultivation, wild edible plants, and aquatic species present in the nearby riverine environment. Macrobotanical remains and plant-working tools provide indirect evidence for the use of local vegetation for food, fuel, tools and perhaps construction of a brush structure. These materials may have been locally abundant given the potential for marsh-like conditions during the late Holocene observed at further reaches of West Amarillo Creek (Frederick 2008; Palacios-Fest 2010).

Although direct evidence of horticulture is limited to the presence of charred maize, the lowland setting and paleoenvironmental data suggest that dry farming was practiced at or near the site. The significant frequencies of high protein elements from large mammals can be interpreted as a contributing element to the focus on horticulture at the site. If Artiodactyls were hunted less frequently, then this could be a reflection of the higher ranking of horticultural subsistence by Antelope Creek peoples in this region. Presumably driven by the ecology of the inner valley, this economic strategy may have been influenced by a variety of adaptive behaviors such as marginal valuation, opportunity cost, discounting, and risk sensitivity, each of which represent alternative courses of action under a range of socioenvironmental conditions (Winterhalder and Kennett 2006:11-13). Theoretical models such as behavioral ecology look at these different mechanisms as collective contributors to a gradual transition towards agriculture, and are thus critical to studies focused on the practice of horticulture during the Antelope Creek phase, and its dynamic yet poorly understood role in hunting and foraging economies of Plains Village societies.

Poor stratigraphic integrity and preservation conditions at the study site inhibit a firm understanding of multiple occupational sequences, or functions over time. A Woodland component is evidenced by the two Deadman-like points, ceramic variation, and radiocarbon date of A.D. 1051 ±46. The provenience of one Deadman-like point in the Locality D trash midden, which lacks bison bones, can be viewed as indirect evidence of an earlier occupation when taken in the theoretical context of the Bison Absence

Period II (Dillehay 1974). The Plains Woodland occupation could have been horticulture driven, but the extant data hinder an understanding of site function during this component. It is possible that structural materials from an earlier pithouse were salvaged by Antelope Creek people and used for other purposes such as dry farming, which would have destroyed any telltale architectural features. While the chronometric data support the Woodland hypothesis, the origin of the carbon residue is unknown and could be temporally biased. Nevertheless, the limited dataset implies a Woodland component. Given the lack of stratigraphic separation between these two possible occupations, the current understanding of functionality at 41PT283 is limited to the Antelope Creek phase.

Several significant concentrations of artifacts revealed four discrete activity areas (Localities A-D) that reflect human economic behaviors. Some of the activities are interpreted as secondary butchering and discard of mainly bison and deer limbs, and the processing of wild and/or cultivated plant materials. The frequencies of materials also reflect activities such as shellfish consumption, lithic manufacture and maintenance, and cooking/heating. In the absence of a habitation structure and storage features, it is postulated that the majority of these goods were processed and transported away from the site; however, the scant observance of roasting patterns in the fauna sample and a poorly preserved burned rock feature suggests that food was consumed on site. Cooking and/or heating activities likely occurred in the open air and not beneath the cover of a substantial habitation structure. If a simple structure such as a hut or arbor were built at the site, it would likely leave behind little archaeological evidence given the various post-depositional processes discussed above.

The spatially overlapping concentrations of sherds and clamshells suggest that ceramic vessels may have been used to cook clams harvested from the nearby creek. Black residue observed on sherds from this area indicates that the vessels could have been used for boiling clams or bone for marrow extraction. The presence of burned gravels suggests stone boiling may have occurred. It is postulated that these discrete activities occurred individually or in different combinations during intensive but episodic use of the site. This is supported by the mixed context and distribution of cultural materials.

The inferred economic activities reflect behaviors at site types defined as field encampments and food processing stations. In his study of Southern Plains villager architecture in southeastern Colorado, Owens (2007:12) subdivides field camps into two functional types- lithic procurement and food procurement areas. The latter is described as containing attributes such as: evidence of subsistence related activities, moderate tool diversity, debitage produced from tool manufacture/maintenance, thermal/roasting features, temporary architecture, and smaller site size and lower artifact counts compared to residential sites. Lithic procurement camps share similar attributes except they contain evidence of early stage lithic reduction, which has been ruled out at the study site. Stations have very low artifact density and diversity, debitage produced by tool maintenance, thermal features, temporary architecture, and multiple temporal components (Owens 2007:12).

The material evidence at the study site display similarities with the functional elements listed for both food procurement camps and stations. As such, 41PT283 is defined as a field camp/food processing station, which falls under the generalized type category of subhomestead defined by Lintz (1986a). The implications for a dependent relationship between sites of this type and permanent residences are discussed below.

What is Antelope Creek without Architecture?

As discussed in Chapter 4, subtle variation in architecture typically receives a degree of attention by archaeologists interested in the Plains villager traditions of the Southern Plains. In regards to the Antelope Creek phase, this is understandable given the conspicuousness of the house ruins, which for the most part retain their general morphologies in the archaeological record. However, my study at 41PT283 has shown the need to consider the frequency distributions of various non-architectural cultural materials when site preservation conditions inhibit detailed assessment of structural layout, number of rooms, or construction methods.

The analytical methods used in my study also take into consideration what the seemingly non-structural materials reflect in terms of Antelope Creek settlement patterns and site function (while still trying to identify structural elements). The available material data suggests that some form of field hut may have been built from locally acquired perishable materials. The variety of activity areas identified suggests that this possible temporary structure was used on a seasonal basis as a field camp/station. This inference is based primarily on the lack of direct evidence of a permanent habitation structure and the apparent short-term occupation reflected in the relatively low overall artifact density. However, the possibility that 41PT283 represents a temporary camp associated with dry farming of bordered gardens or in the nearby floodplain cannot be ruled out.

Since the permanent homesteads found in the study area all appear to retain at least some of their defining morphology (i.e., square- to rectangular-shaped outlines of vertically placed stone slabs), the lack of structural preservation at the study site can be viewed as a reflection of its temporary/seasonal nature, the product of formation processes, or very likely, a mixture of both. The lack of telltale architectural features such as postholes, daub fragments, floor surfaces, and internal hearth(s) suggest the former, whereas the discontinuous surface and buried arrangements of stone slabs suggest the latter. Nevertheless, the ambiguous layout of stone slabs provided an opportunity to focus on the distributions of cultural materials that were more active in systemic context and thus represent discrete human behavioral patterns.

This mandatory shift in focus revealed a variety of possible site attributes that are uncommonly discussed in the extant Antelope Creek literature. These include the possible Plains Woodland occupation manifested in the stone tool and ceramic assemblages, the social/economic variability observed between different site types (e.g., homestead [41PT109] and subhomestead [41PT283]), the potential for dry farming, and the possibility for interdependence between divergent site types.

How and Where Did Antelope Creek People Farm?

This is one of the most frequently asked yet poorly understood questions when it comes to Plains Village horticulture on the Southern Plains (Boyd 2008). The direct evidence for farming at the study site (i.e., maize) is surpassed by the indirect evidence. The latter is manifested in the lowland setting (and its potentially suitable ecology), the frequency of grinding stones, the proposed utilization of dolomite slabs for garden plots, and ceramic vessels to bring soil and/or water to dry gardens. The extant data are not enough to support any substantial claim that Antelope Creek villagers participated in anything more than the commonly held notion of “marginal horticulture” at 41PT283.

However, the material culture and topographic setting at the site are sufficient justification to continue seeking evidence bearing on where and how Antelope Creek people farmed in the West Amarillo Creek valley.

Recent investigations focused on Antelope Creek settlement patterns in relation to horticulture practice incorporate geoarchaeological and paleoenvironmental analytical methods. Ongoing work by Doug Boyd and Charles Frederick at Plains Village pithouses located on the M-Cross Ranch West Pasture in Roberts County, Texas (Boyd 2008) have focused on landform analysis, and different depositional settings in identifying high probability areas for cultivated fields and/or garden plots. Frederick developed a landform model that maps out the distribution and relationships of the colluvial fans and alluvial terraces in lower canyon elevations (Boyd 2008:49), which are similar to physical setting at West Amarillo Creek. This model looks at the possible placements of cultivated areas that took advantage of colluvial fans that provided water from rainfall runoff and seep springs, as well as low-lying “wet spots” that collect more rainfall and have high moisture retention (Boyd 2008:51).

Other studies (Bement and Brosowske 2001; Brosowske 2005) have analyzed the suitability of different soil types identified by modern soil surveys for the Texas and Oklahoma Panhandles, suggesting a correlation between the locations of Plains Village sites and the region’s best agricultural soils. However, Lintz (1986a:201-213) demonstrates that Antelope Creek sites occur in a variety of different topographic settings with soil varieties that are not always highly ranked for cultivation by modern standards. A study of irragric anthrosols in the Middle Gila River Valley of Arizona (Woodson et al. 2013) compares the composition of soil samples from Hohokam irrigation canals to the soil properties listed by the U.S. Department of Agriculture. The differential soil characteristics helped confirm the locations of known canals and allowed for the mapping of new branches. Frederick (2008) and Palacios-Fest (2010) have demonstrated the viability in integrating geoarchaeological and paleoenvironmental studies in the identification of buried soils suitable for horticulture during Plains Village times. These case study examples are provided to encourage the development of survey/sampling strategies for horticulture features in the West Amarillo Creek study area.

Isolated Homesteads or Interdependent Settlements?

It is commonly believed that Antelope Creek peoples employed a wide range of economic strategies to account for local environmental changes, population increase, and the migration patterns of bison during the Plains Village period. The ambiguous transition from the aggregation of people in contiguous multi-room hamlets to a dispersed pattern of isolated settlements thought to occur in the latter half of the phase insinuates a shift from community-oriented social patterning to more independent life ways of single-family households. My analysis of Antelope Creek settlement patterns at the study area suggests that isolated residences such as 41PT109 and 41PT257 may have had interdependent relationships with field camps/stations such as 41PT283.

Although this notion of ancillary relationships between homesteads and subhomesteads is not a new one (Lintz 1986a), it is for the most part absent from the existing literature of the Antelope Creek phase. This is not surprising given the site-specific nature of Cultural Resource Management excavation projects, and the difficulty in establishing contemporaneity between sites with questionable radiocarbon dates and/or century-wide temporal assays. Nevertheless, the settlement patterns, least cost path, and chronological data for the Antelope Creek sites found in the study area provide an opportunity to explore potential interdependent relationships.

The proximities and divergent topographic settings at the study site and 41PT257 make them candidates for interconnectivity. Site 41PT257 is located approximately 450 m (LCP distance) to the northeast and situated along a bluff edge overlooking the West Amarillo Creek floodplain. The available chronology at 41PT109 suggests a late sub-phase occupation, but the radiocarbon dates from 41PT283 and 41PT257 overlap significantly on both ends of the early- and late-subphase (Table 13). However, until the radiocarbon dating of annual plants such as maize is available for 41PT257, this occupation period should be approached with caution.

Table 13. Radiocarbon assays from Antelope Creek sites in the study area.

Antelope Creek Site	Calibrated Radiocarbon Date
41PT283	A.D. 1295-1415 (maize)
41PT257	A.D. 1290-1420 (mesquite)
41PT109	A.D. 1400-1420 (maize)

As discussed in Chapter 5, it is thought that subhomesteads functioned as subsidiary sites to other more permanent site types. According to Lintz (1986a:260), "the dependent relationship of [homesteads and subhomesteads] is reflected in the faunal remains, as indicated by food sharing or, more likely, food brought from the residential sites." If 41PT257 and 41PT283 are interdependent, then this could explain the common presence of bison at the study site. In addition to the notion of food being brought from residence to field camp/station, it is possible that lowland resources were brought to the upland residence as well.

This interdependence model fits nicely within the framework of behavioral ecology in that each topographic setting provided an alternative course of action, and perhaps even different social environments. In this scenario, residents at the homestead intermittently utilized the field camp/station to conduct intensive economic activities (e.g., gardening/harvesting, clam collection/consumption, secondary butchering, lithic reduction, etc.), and select food resources were brought to the upland residence as part of collector system. As such, the primary residence (i.e., residential base) would have functioned in more of a domestic environment, with mundane activities, logistic mobility, and perhaps a focus on social interaction.

To test the interdependence hypothesis, detailed comparisons of the similarities and differences of the 41PT257 and 41PT283 material assemblages are warranted. These inter-site analyses would be similar to those conducted on the material cultures at the study site and 41PT109 (e.g., the divergent settlement patterns, artifact frequencies/densities, floral/faunal assemblages, architecture, site activities, occupational history/extent, etc.). In terms of similarities, the notion of food sharing could be tested through comparisons of the faunal assemblages. If food sharing occurred between 41PT257 and the study site, then their faunal assemblages should contain similar taxons; however, the element types should differ. Comparative analysis of the bone chemistries (i.e., stable isotopes) from each assemblage could also be a useful method of analyzing different similarity categories. The two sites could also be cross-examined through analyses of ceramic attributes such as surface treatments and paste composition. A chemical analysis known as Instrumental Neutron Activation Analysis (INAA) has proven effective in determining ceramic production zones between multiple Antelope Creek sites (Meier 2007).

These kinds of site comparisons are not limited to the study site and its nearest neighbors, or dichotomous site types such as homesteads and field encampments. Comparative analyses can and should be conducted whenever possible, especially when two sites are found in proximity to one another. For example, a view of Antelope Creek settlement patterns at the macro-level shows interesting spatial relationships between hamlet and homestead site types. When a 400 m radius is assigned to a sample of Antelope Creek sites located along a portion of the Canadian River valley, the individual radius boundaries overlap, forming distinct site clusters (Figure 54).

Interestingly, many of these catchments contain sites identified as hamlets or villages are found grouped together with one or more homestead. These settlement pattern data lend credence to the notion of "satellite villages", which may have been an important element of the Antelope Creek social structure as these residence types became more dispersed on the landscape. All in all, these preliminary data suggests that the physical dispersion of Antelope Creek settlements does not necessarily equate to social isolation.

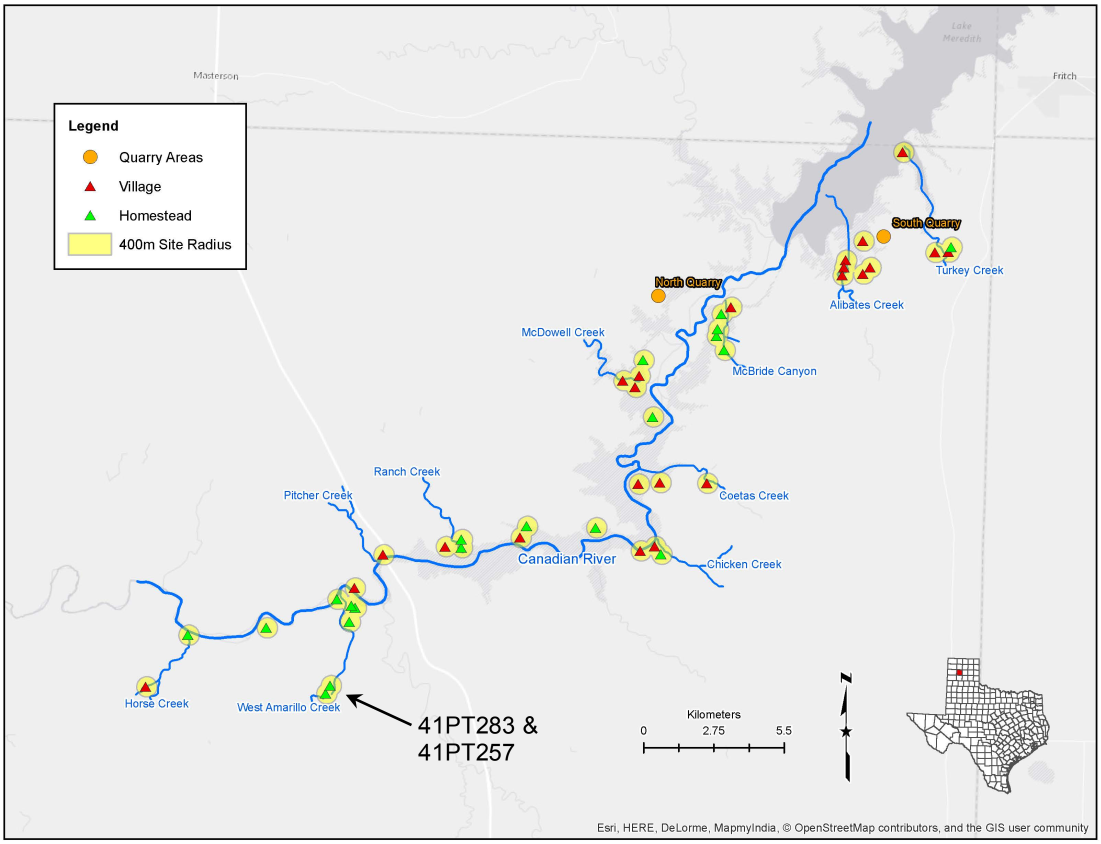

Figure 54. Distribution of catchments containing Antelope Creek villages and homesteads.

Summary

As additional Antelope Creek sites found in the study area undergo systematic mapping and excavation like those conducted at 41PT109 and 41PT283, the new archaeological data should be integrated into the analytical models presented above. In other words, interpretations of the material data at the micro-level must be taken in the context of the extant data from other sites in the study area (i.e., meso-level). This approach is necessary in order to better understand site settlement pattern and functional variability in this portion of the Canadian River valley during the Antelope Creek phase. Such analytical models can lead to new knowledge in many of the poorly understood elements of Antelope Creek culture, including earlier cultural components, horticulture methods, social organization, intra-cultural dependent relationships, and inter-cultural trade/exchange relationships.

Any attempt at identifying site function during the Antelope Creek phase must consider the material data in the context of the surrounding physical and cultural environment. This analytical model also proposes that functionality at the individual site level is related with the functionalities of neighboring sites regardless of contemporaneity. The variability in localized site settings and their respective land use, subsistence and technological strategies observed through time and space help characterize adaptive strategies performed in response to the dynamic economic and social environments of the Antelope Creek tradition.

My study at 41PT283 has shown the utility in studying the distributions of cultural materials in interpreting human behavior and site function. The absence of diagnostic architecture required a degree of thinking outside the norm, in terms atypical of the paradigmatic views on Antelope Creek material culture. In doing so, new and testable hypotheses have been developed toward an improved understanding of the complex relationship between Antelope Creek settlement patterns and site function, which are manifested in the material cultures of permanent residences and temporary field encampments/stations. Critical to an evaluation of the aforementioned levels of variability are extensive excavations at sites from the Antelope Creek phase, and propagation of the resulting archaeological data.

APPENDIX SECTION

APPENDIX A: PLANT REMAINS FROM 41PT283, POTTER COUNTY, TEXAS

Phil Dering
Shumla Archeobotanical Services

The purpose of this analysis is to provide botanical data that will contribute to an understanding of Late Prehistoric Period land use along the Canadian River. A total of seven flotation samples and macrobotanical samples from 48 different lots, were recovered and analyzed from 41PT283. The botanical data will contribute to a description of plant utilization and local environmental conditions.

METHODS

There are two types of samples in the current study – flotation samples and macrobotanical samples. Flotation is a method of recovering organic remains from archeological sediments by using water to separate heavy or soluble inorganic particles from plant parts and small animal bone. The material floating to the surface is called the light fraction, and this is caught on a fine mesh screen or strainer. The material that sinks to the bottom is the heavy fraction and it is also caught on a fine mesh screen. Most of the soil including clay and silt is suspended in water and passes through the screens and is either recycled or discarded. In most cases, only the light fraction is submitted for analysis after the heavy fraction has been examined for plant materials. Macrobotanical samples are carbonized plant remains that are separated from the rest of the archeological material by hand. Macrobotanical samples are collected either from an excavator's screen or are point-collected and plotted individually in the field. They are often labeled ^{14}C or radiocarbon samples.

The analysis follows standard archeobotanical laboratory procedures. The light fraction of each flotation sample is passed through a nested set of screens of 4mm, 2mm, 1mm, and 0.450mm mesh and examined for charred material, which is separated for identification. Plant remains are sorted into two categories –wood fragments and seed/fruit fragments. Identification of carbonized wood is accomplished by using the snap technique, examining the transverse section of the fragments at 8 to 75 magnifications with a hand lens or a binocular stereo-microscope, and comparing the material to samples in the archeobotanical herbarium.

All seed identifications are made using seed manuals and reference collections at Shumla Archeobotanical Services. Only charred plant material is included in the analysis, because uncarbonized material is consumed by insects, fungi and bacteria, and does not survive more than a few years in the deposits of open sites.

Results

Results of the analysis are presented in Tables 1 and 2. Table 1 lists the identifications and counts of plant material recovered from flotation samples, and Table 2 the results from the macrobotanical samples. The recovery of charred plant material from the seven flotation samples was poor. The mass of all charcoal types recovered from the flotation samples totaled less than 0.5 grams. Mesquite, saltbush, and cottonwood-willow types were noted in these samples, but there was so little material that any comparison of frequency or abundance is probably meaningless.

Recovery was better in the **35** macrobotanical samples examined; all charcoal types had a total mass of a little over **9.7** grams. Six wood types were identified in the macrobot samples – woody legume (mesquite or acacia), oak, cottonwood-willow, rose family (probably sand cherry or chokecherry), saltbush, and hackberry. In addition, a few indeterminate monocot stems were recovered from Unit 12, level 12. No seeds or maize fragments were noted.

Wood types. Most of the wood charcoal was mesquite, 6.5 grams. Woody legume (mesquite-acacia) is one of the most common wood types identified in archeological sites in the western half of Texas. It is particularly dominant in plant assemblages that have been severely affected by poor conditions of preservation, because it is both durable and a preferred structural and fuel wood. Most likely this material is mesquite, but it is difficult to distinguish between these two wood types. Saltbush, a poor fuel wood, is the next most abundant wood type. It is often recovered from hearths or ovens, possibly a reflection of the overutilization of fuel near settlements. Hackberry is present in two samples and was likely utilized as a fuel. Although no present in the samples, the edible fruits of sugarberry and desert hackberry fruits were utilized anywhere they grew in sufficient abundance.

A single sample contains oak wood. Oak is an excellent fuel, and one would expect more oak in samples if oak had been abundant near this settlement. The cottonwood/willow wood type is present in several samples; it was often used as a structural component in roofs and walls. The slender green stems of cottonwood, a common riparian tree, are often woven through roof supports to provide a framework for weaving thatch. Cottonwood trunks and larger stems are also used as posts (Bohrer 1962). Rose family wood (probably a type of cherry) is present in a single sample.

The single sample bearing the monocot fragments deserves mention because it may reflect use of some type of structural material, most likely a grass. Given the tiny amount and fragmented condition of the material, it is difficult to determine a more precise identification.

Maize. Maize cupules were recovered from a single sample, Lot 139, Unit 24, Level 4. The location and time period of the site's occupation suggest that this was a farming community. However, given the generally poor nature of preservation at the site recovery of even a few cob fragments is a pleasant surprise.

Table 1. Plant remains identified in flotation samples, ordered by unit and level, 41PT283.

Lot	Unit	Level	Taxon	Common	Part	Count	Wt (g)
11	3	3	No carbonized plant material	NA	--	--	--
22	6	3	No carbonized plant material	NA	--	--	--
41	10	3	Fabaceae	Mesquite-acacia	Wood	8	0.1
41	10	3	Indeterminate	NA	Wood	5	<.1
41	10	3	Atriplex sp.	Saltbush-type	Wood	1	<.1
109	17	4	Atriplex sp.	Saltbush-type	Wood	2	0.1
109	17	4	Fabaceae	Mesquite-acacia	Wood	5	<.1
116	19	2	Indeterminate	NA	Wood	4	<.1
117	19	3	Salicaceae	Cottonwood-willow	Wood	9	0.2

Table 2. Screen and point-collected macrobotanical and C-14 samples, ordered by unit and level.

Lot	Unit	Level	Taxon	Common	Part	Count	Wt (g)
3	1	3	No Carbonized Plant Remains	--	--	--	--
7	2	3	Atriplex sp.	Saltbush-type	Wood	3	0.1
7	2	3	Fabaceae	Mesquite-acacia	Wood	5	0.2
7	2	3	Indeterminate	NA	Wood	4	0.2
8	2	4	Indeterminate	NA	Wood	3	0.1
12	3	4	Atriplex sp.	Saltbush-type	Wood	2	0.2
12a	3	4	No Carbonized Plant Remains	--	--	--	--
14	4	2	Salicaceae	Cottonwood-willow	Wood	6	0.2
15	4	3	Fabaceae	Mesquite-acacia	Root	1	0.6
15a	4	3	Fabaceae	Mesquite-acacia	Wood	2	0.2
30	8	3	Atriplex sp.	Saltbush-type	Wood	6	0.1
31	8	4	Fabaceae	Mesquite-acacia	Wood	22	1.1
31a	8	4	Fabaceae	Mesquite-acacia	Wood	3	0.3
31	8	4	Indeterminate	NA	Wood	0	0.1
31	8	4	Rosaceae	Rose family-cf. Prunus	Wood	2	0.1
31	8	4	Salicaceae	Cottonwood-willow	Wood	6	<.1
32	8	4b	Fabaceae	Mesquite-acacia	Wood	4	0.1
40	10	2	Burned bone	NA	Bone	--	--
40	10	2	Indeterminate	NA	Flecks	3	<.1
40	10	2	Fabaceae	Mesquite-acacia	Wood	3	0.2
41	10	3	Atriplex sp.	Saltbush-type	Wood	4	0.2
41	10	3	Indeterminate	NA	Wood	6	0.2
46	1	6	Celtis sp.	Hackberry	Wood	2	0.3
47	1	7	Fabaceae	Mesquite-acacia	Wood	9	0.5
48	2	5	Atriplex sp.	Saltbush-type	Wood	8	<.1
48	2	5	Fabaceae	Mesquite-acacia	Wood	2	0.1
50	4	5	Atriplex sp.	Saltbush-type	Wood	5	0.1

Lot	Unit	Level	Taxon	Common	Part	Count	Wt (g)
51	4	6	Fabaceae	Mesquite-acacia	Wood	3	0.2
52	4	7	Fabaceae	Mesquite-acacia	Wood	6	0.1
58	6	7	Quercus sp.	Oak	Wood	8	0.2
59	6	9	Indeterminate	NA	Wood	2	0.1
62	7	6	Salicaceae	Cottonwood-willow	Wood	2	0.1
63	7	7	Fabaceae	Mesquite-acacia	Wood	4	0.3
65	8	6g	Fabaceae	Mesquite-acacia	Wood	2	0.1
65	8	6g	Salicaceae	Cottonwood-willow	Wood	5	0.3
66	8	7	Fabaceae	Mesquite-acacia	Wood	4	0.3
66	8	7	Salicaceae	Cottonwood-willow	Wood	3	0.2
67	8	7g	Fabaceae	Mesquite-acacia	Wood	2	0.1
68	8	8	Indeterminate	NA	Wood	3	<.1
69	8	8g	Salicaceae	Cottonwood-willow	Wood	1	<.1
71	8	9g	Salicaceae	Cottonwood-willow	Wood	2	<.1
77	10	4b	Atriplex sp.	Saltbush-type	Wood	1	0.1
82	11	3	Non-botanical	NA	--	--	--
85	11	5	Fabaceae	Mesquite-acacia	Wood	14	0.8
86	11	6	Celtis sp.	Hackberry	Wood	1	0.1
87	11	7	Atriplex sp.	Saltbush-type	Wood	5	<.1
87	11	7	Fabaceae	Mesquite-acacia	Wood	5	0.2
91	12	3b	Monocot – Indeterminate	NA	Wood	4	<.1
96	14	4	Fabaceae	Mesquite-acacia	Wood	6	0.2
98	14	5	Fabaceae	Mesquite-acacia	Wood	4	0.4
101	15	3	Burned bone	NA	--	--	--
104	16	3	Fabaceae	Mesquite-acacia	Wood	2	<.1
105	16	4	Salicaceae	Cottonwood-willow	Wood	6	<.1
109	17	4	Fabaceae	Mesquite-acacia	Wood	3	0.2
116	19	2	Burned bone	--	--	1	--

Lot	Unit	Level	Taxon	Common	Part	Count	Wt (g)
125	20	2	No Carbonized Plant Remains	NA	--	--	--
126	20	3	No Carbonized Plant Remains	NA	--	--	--
128	20	5	Fabaceae	Mesquite-acacia	Wood	5	0.2
134	22	4	No Carbonized Plant Remains	NA	--	--	--
135	22	5	Fabaceae	Mesquite-acacia	Wood	2	0.1
139	24	4	Salicaceae	Cottonwood-willow	Wood	3	0.1
139	24	4	Zea mays	Maize	Cob fragment	4	0.1

Discussion and Conclusion

The samples processed in the current study have yielded a poor to modest recovery of plant materials. Wood is present in most of the samples, but the only edible plant remains in the assemblage are represented by a few maize cob fragments. Recovery from the flotation samples was very poor. The macrobotanical/C-14 samples yielded some information about landscape use around the settlement. Woody legumes (mesquite and/or acacia) were common in the area. Mesquite-acacia is the most abundant wood type in the assemblage and was probably used in structures and as a fuel wood. Saltbush, present in eight lots, was likely utilized due to depletion of better fuel wood types in the region. Cottonwood/willow, most commonly utilized in structures and for tools, was fairly common, occurring in five different lots. Maize, likely underrepresented due to poor conditions of preservation, is present in Lot 139 from Unit 24, Level 4.

References

Bohrer, Vorsila L.

1962 Nature and Interpretation of Ethnobotanical Materials from Tonto National Monument. In *Archeological Studies at Tonto National Monument, Arizona*, edited by Louis R. Caywood, pp. 79-114. Southwestern Monuments Association, Technical Series, Vol. 2.

APPENDIX B: FAUNAL REMAINS FROM 41PT283

Haley Rush and Christopher Jurgens

METHODS

The faunal remains from site 41PT283 were identified by using modern animal type-collection from Texas State University as well as Gilbert (1980), Gilbert et al. (1996), and Barone et al. (1973). To the extent possible all remains were identified taxonomically to the genus-species level. However, the faunal remains from 41PT238 were very fragmented and were in poor condition, therefore, taxonomic identifications to the genus-species level were not always possible. Genus-species identifications made include *Bison bison* (American bison)*, Lepus californicus* (black-tailed jackrabbit) and identifications to higher taxonomic levels include Artiodactyla (even-toed ungulates), Emydidae (pond turtles), and Squamata (lizards and snakes). Despite the difficulty in taxonomic identification, in most cases, specimens could be assigned to animal size class. Size classes used include large and medium sized bird and large, medium, and small mammal. Based on the known range for animals now inhabiting the Southern Plains, the large mammal category consists of bison, deer, and antelope; medium sized mammal classes could include animals such as bobcat, fox, ringtail cat, cottontail, and jackrabbit; and the small mammal class includes prairie dog, ground squirrel, pocket gopher, and rat.

If a taxonomic identification was possible, remains were identified to the skeletal element, and, if possible, the element's symmetry (side) was assigned, and the remains were also examined for evidence of cultural modifications. Modifications noted in the 41PT283 faunal materials include cutmarks, helical fractures (indicative of bone fracturing from a freshly-killed animal), and burning. Bones with dry-state, post-deposition breaks were also noted. A dry state break was determined based on the color and morphology of the fractured edge when compared to the rest of the specimen. These dry-state breaks were likely caused after field collection. Those with dry-state breaks were considered "re-fits" and counted as one specimen.

RESULTS

In general, the faunal remains were highly fragmented and in poor condition. As there are numerous factors in fragmentation and quality of bone found in the archeological record, it can be difficult to pinpoint why materials became fragmented (cf. Lyman 1994; Shipman et al. 1981). If bone is buried rapidly, the preservation will generally be better than if the materials are on the surface for a length of time (e.g., Mandel and Hofman 2006). However, experimental studies have shown that bone in hot, dry climates degrades very quickly (Karr and Outram 2012). This suggests that even if the materials from 41PT238 were buried relatively rapidly they could be heavily degraded, even if only exposed for a short time.

Approximately 64 percent sample of the 705 faunal specimens collected at 41PT283 were analyzed (n=453). That count was adjusted to 442 to reflect dry breaks and "re-fits". The adjusted count of **442** considered the total and is used below for counts and percentage calculations. Of the analyzed specimens, the majority (93.89 percent or 415 specimens) were mammal. The next highest count was of unidentifiable fragments (3.85 percent or 17 specimens). The remaining, bird (n=3), turtle (n=6), and lizard (n=1) each represent less than one percent of the total.

Mammal

Of the 415 mammal fragments, 66 (15.9 percent) were identified as Artiodactyla of those, 26 were deer sized, 39 were bison sized, and the remaining one was not identifiable to bison or deer sized Artiodactyla. Four of the bison sized Artiodactyla specimens were identified as *Bison bison*. The four identified specimens include a lower right M3 from a 4 to 5-year-old adult (based on tooth wear), a fragment of a molar, a portion of the epiphyseal portion of the right femur, and a metacarpal.

Artiodactyl	
Deer sized	26
Bison sized	39
Deer or Bison sized	1
Total=	**66**

The 349 mammal fragments that remain include small (n=1), medium (n=83), and large mammal (n=265). Three of the medium mammal fragments are from *Lepus californicus* and include a right calcaneus, right femur, and premaxilla (left side). Specimens identified as large mammal included deer and bison-sized animals. If the 265 large mammal fragments are included with the deer and bison sized Artiodactyla specimens (n=330), then large mammals make up **79.5** percent of the specimens at 41PT283.

Mammal	
Small Mammal	1
Medium Mammal	83
Large Mammal	265
Total=	**349**

Identifiable elements from the mammal specimens include skull (e.g., skull fragments and teeth), axial (e.g., vertebra and rib fragments), and limb fragments (e.g., femur, humerus, phalanges, radius, tibia). Comparison of the number of specimens from different animal size classes and if those elements are from the skull, axial skeleton, or from limb bones can shed light on butchery practices and if the faunal remains are from a primary or secondary butchery episode. Desired animal resources may be located away from the camp or home-site and the entire animal cannot always be transported back to the camp for processing (Emerson 1993).

For example, if high numbers of axial bones, particularly the vertebra, are found, the entire skeleton could be inferred to have been present and therefore killed nearby and the entire carcass present during butchery. If, however, transport costs are high (i.e., large animal size), an animal may be partially butchered and body parts with high meat yields would be transported and those body parts with low meat yield would not be transported. High yield resources could include “rib-units” and limb bones. Therefore, if faunal remains are dominated by limb bones, which could indicate limb bones were removed after the animal was killed and those (limb) elements were transported to the site. It is worth noting, however, that bones present at a site cannot not always be equated with patterns of consumption (Bartram 1993) as there are numerous factors in whether or not faunal materials are preserved and recovered from archeological contexts (Reitz and Wing 2008).

For the comparison of skull, axial, and limb elements, the small and medium mammal specimens were excluded leaving 331 large mammal and Artiodactyla specimens. Large mammal remains were focused as they dominate they faunal materials and are more likely to be transported or sought after as higher return resources. Eighty percent (n=266) of the large mammal and Artiodactyla specimens were from limb bones, 16 percent (n=52) from the axial skeleton, and 4 percent (n=13) from the skull. Nearly all of the axial skeletal elements (n=45 or 14 percent) are from ribs.

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Skeletal Part for Artiodactyla and Large Mammal		
Limb		266
Axial (Vertebra)		7
Axial (Rib)		45
Skull		13
	Total=	**331**

Non-Mammal

Twenty-seven of the specimens from 41PT238 were not identifiable as mammal. Seventeen of those were not identified to any taxonomic class. Three specimens were identified as bird, two large and one medium. Six were identified as turtle; all were carapace fragments. One reptile vertebra, likely from a snake, was also identified.

Bone Modification

Eighty-eight of the 442 specimens were modified. Seventy-eight of the modified bones exhibited some degree of burning. The color and degree of burning was noted; bones that were completely black or calcined were interpreted to be bones discarded and included in fill that was incorporated into a cooking feature, while those specimens that were partially burned were interpreted to be from intentional roasting of meat (Shipman et al. 1984). Twenty-nine of the 78 burned bone specimens (or 37 percent) were determined to have been discarded. The remaining 49 specimens (or 63 percent) were burned while roasting. Those specimens that exhibited roasting pattern include Artiodactyla (deer and bison sized), medium and large mammal, and turtle.

The size of the animal can affect how bones fracture and what conclusions can be made about the causation (Lyman 1994) and whether it was purposeful human activity or environmental causes. Fat is a key nutrient and performs essential functions for the human body (Mead et al. 1986 and Wing and Brown 1979). Animal resources provide protein and fat, with marrow being a fairly easily accessible source of fat as a limb bone simply needs to be cracked open.

The ten modified specimens that are not burned exhibit fracturing and/or cutmarks suggesting defleshing and/or marrow removal. One specimen has cutmarks indicative of defleshing, six have helical fractures indicative of marrow removal, and the remaining three have evidence of both defleshing and marrow extraction. All ten of the specimens modified by cutmarks and/or helical fractures are from large mammals.

SUMMARY

The causes of the degraded characteristic of the faunal materials at 41PT238 are not clear. It is also difficult to point to an exact cause for the high degree of fragmentation and whether that is due to intentional human behavior or due to environmental factors. However, the high percentage of large mammal remains suggest that the focus at 41PT238 was on the hunting of large mammals. Large mammals would likely have been killed away from site 41PT238 and then the limb bones and rib units removed and transported to 41PT238 for further butchery and/or consumption. This is supported by the high percentage of limb and ribs bones compared to other skeletal elements (i.e., skull) as well as the bone fragments that exhibit burning consistent with roasting. The presence of turtle, bird, and medium mammal bones suggest that other animal resources were utilized as well, but do not appear to represent a significant portion of the diet at site 41PT238.

REFERENCES

Barone, R., C. Pavaux, P.C. Blin, and P. Cuq
1973 *Atlas D'Anatomie du Lapin*. Masson and Co. Paris.

Bartram, L.
1993 Perspectives on Skeletal Part Profiles and Utility-Curves from Eastern Kalahari Ethnoarchaeology. *From Bones to Behavior*, edited by Jen Hudsen, pp. 115-137. 1st edition. Center for Archaeological Investigations at Southern Illinois University, Carbondale.

Emerson, A.M.
1993 The Role of Body Part Utility in Small-scale Hunting Under Two Strategies of Carcass Recovery. In *From Bones to Behavior*, edited by Jen Hudsen, pp. 138-157. 1st edition. Center for Archaeological Investigations at Southern Illinois University, Carbondale.

Gilbert, B.M. (editor)
1980 *Mammalian Osteology*. Special Publication, No. 3. Columbia University of Missouri, Missouri Archaeological Society.

Gilbert, B.M., L.D. Martin, and H.G. Savage
1996 *Avian Osteology*. Special Publication, No. 4. Columbia University of Missouri, Missouri Archaeological Society.

Karr, L.P., and A.K. Outram
2012 Tracking Changes in Bone Fracture Morphology Over Time: Environment, Taphonomy, and the Archaeological Updates. *Journal of Archaeological Science*. 39:555-559.

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

Mandel, R.D. and J.J. Hofman.
2006 Late Quaternary Alluvial Stratigraphy and Geoarcheology in the Central Great Plains. American Quaternary Association. Available at http://www.kgs.ku.edu/Publications/Bulletins/TS21/field_trip4.html.

Mead, J.F., R.B. Alfin-Slater, D.R. Howton, and G. Popjak.
1986 *Lipids: Chemistry, Biochemistry, and Nutrition*. Plenum Press, New York.

Reitz, E.J. and E.S. Wing.
2008 *Zooarcheology*. Cambridge University Press, Cambridge.

Shipman, P., W. Bosler, and K.L. Davis

1981 Butchering of a Giant Geladas at an Acheulian Site. *Current Anthropology*. 22:257-268.

Shipman, P., G. Foster, and M. Schoeninger.
1984 Burnt Bones and Teeth: An Experimental Study of Color, Morphology, Crystal Structure, and Shrinkage. *Journal of Archaeological Science*. 11:307-325.

Wing, E.S. and A.B. Brown
1979 *Paleonutrition: Method and Theory in Prehistoric Foodways*. Academic Press, New York.

REFERENCES CITED

Ahler, Stanley A.
1989 Mass Analysis of Flaking Debris: Studying the Forest Rather Than the Tree. In *Alternative Approaches to Studying Lithics*, D. O. Henry and G. H. Odell, eds., pp. 85-118. Archaeological Papers of the American Anthropological Association Number 1.

Andrefsky, William
2005 *Lithics: Macroscopic Approaches to Analysis,* Second Edition. Cambridge University Press.

Baerreis, D. A. and R. A. Bryson
1965 Historical Climatology of the Southern Plains: A Preliminary Statement. *Bulletin of the Oklahoma Anthropological Society* 13:69-75.

Baker, E.M., and J.A. Baker
1941 Final Report WPA: West Texas State Archaeological Project 9249. Panhandle-Plains Historical Museum, Canyon, Texas.

Banks, Larry D.
1990 *From Mountain Peaks to Alligator Stomachs: A review of Lithic Sources in the Trans-Mississippi South, the Southern Plains, and Adjacent Southwest*. Oklahoma Anthropological Society Memoir 4, Norman.

Barnes, Virgil
1969 Geologic Atlas of Texas, Amarillo Sheet. Bureau of Economic Geology, University of Texas, Austin.

Baugh, Timothy G.
1982 *Edwards I (34BK2): Southern Plains Adaptations in the Protohistoric Period.* Oklahoma Archeological Survey, Studies in Oklahoma's Past 8. University of Oklahoma, Norman.

1986 Culture History and Protohistoric Societies in the Southern Plains. *Plains Anthropologist* 31(114):167-187.

1994 Holocene Adaptations in the Southern High Plains. In *Plains Indians: A.D. 500-1400*, Karl H. Schlesier, ed., pp. 265-289, The University of Oklahoma Press, Norman.

Bell, Robert E., and David A. Baerreis
1951 A Survey of Oklahoma Archaeology. *Bulletin of the Texas Archaeological and Paleontological Society* 22:7-100, Lubbock.

Bell, Robert E., and Tyler Bastian
1967a Survey of Potential Wichita Archeological Remains in Oklahoma. In *A Pilot Study of Wichita Indian Archaeology and Ethnohistory,* Robert E. Bell, Edward B. Jelks, and W. W. Newcomb, eds., pp. 119-127. National Science Foundation, Final Report, On file at the University of Oklahoma Archeological Survey, University of Oklahoma, Norman.

1967b Preliminary Report upon Excavations at the Longest Site, Oklahoma. In *A Pilot Study of Wichita Indian Archaeology and Ethnohistory,* Robert E. Bell, Edward B. Jelks, and W. W. Newcomb, eds., pp. 54-118. National Science Foundation, Final Report on file at the University of Oklahoma Archeological Survey, University of Oklahoma, Norman.

Bell, Robert E., E.B. Jelks and W.W. Newcomb
1967 *A Pilot Study of the Wichita Indian Archaeology and Ethnohistory.* Report submitted to National Science Foundation, Washington D.C.

Bement, Leland C, and Scott D. Brosowske
2001 *Streams in No Man s Land: A Cultural Resources Survey in Beaver and Texas Counties, Oklahoma*. Archeological Resource Survey Report.43. Oklahoma Archeological Survey, University of Oklahoma, Norman.

Binford, Lewis R.
1980 Willow Smoke and Dog's Tails: Hunter-Gatherer Settlement Systems and Site Formation. *American Antiquity 45(1):4-20.*

Bleed, Peter
1986 The Optimal Design of Hunting Weapons: Maintainability or Reliability. *American Antiquity* 51:737-747.

Bomar, George
1995 *Texas Weather*. University of Texas Press, Austin.

Bousman, C. Britt
1978 Biotic Resources of the Fort Sill Area: An Ethnographic View. In *An Archaeological Reconnaissance of Fort Sill, Oklahoma*, C. R. Ferring, ed., pp. 25-56. Contributions of the Museum of the Great Plains, No. 6, Lawton, Museum of the Great Plains.

1993 Hunter-gatherer Adaptations, Economic Risk and Tool Design. *Lithic Technology* 18:59-86, University of Texas Austin.

2008 *Preliminary Results of the 2007 Texas State University Field School at the Cross Bar Ranch, Potter County, Texas*. Center for Archaeological Studies, San Marcos, Texas.

Bousman, C. Britt, Virgina Moore and Bob Wishoff
2015 *A GIS Analysis of Alibates Quarries and Antelope Creek Sites - an update*. Paper presented at the 86th Annual Texas Archeological Society Meeting, October 2015, Houston, Texas.

Bowers, Roger Lee.
1975 *Petrography and Petrogenesis of the Alibates Dolomite and Chert (Permian), Northern Panhandle of Texas*, Unpublished Master's Thesis, University of Texas, Arlington.

Boyd, Douglas K.
1997 *Caprock Canyonlands Archeology: A Synthesis of the Late Prehistory and History of Lake Alan Henry and the Texas Panhandle-Plains, Vol. II*, Reports of Investigations, Number 110, Prewitt and Associates, Texas Antiquities Committee Archeology Permit No. 954.

2001 Querechos and Teyas: Protohistoric Hunters and Gatherers. In *Texas Archeological Society Bulletin* 72:5-22.

2004 The Palo Duro Complex: Redefining the Early Ceramic Period in the Caprock Canyonlands. In *The Prehistory of Texas,* Timothy K. Perttula ed., pp. 296-330. Texas A&M University Press, College Station.

2008 Prehistoric Agriculture on the Canadian River of the Texas Panhandle: New Insights from West Pasture Sites on the M-Cross Ranch. *Plains Anthropologist* 53(205):33-57.

Boyd, Douglas K., and Steve A. Tomka
1990 A Model of Late Holocene Human Adaptation for Justiceberg Reservoir. In *Phase II Investigations at Prehistoric and Rock Art Sites, Justiceburg Reservoir, Garza And Kent Counties, Texas*. Douglas K. Boyd, James T. Abbott, William A. Bryan, Colin M. Garvey, Steve A. Tomka, and Ross C. Fields eds., pp. 261-273. Reports of Investigations No. 71, Vol. 1 and 2, Prewitt and Associates, Inc., Austin, Texas.

Boyd, Douglas K., C. Britt Bousman, and Martha Doty Freeman
1991 Archeological Survey of Wildlife Mitigation Lands, Justiceburg Reservoir, Garza County, Texas. Reports of Investigations No. 79. Prewitt and Associates, Inc., Austin.

Boyd, Douglas K., James T. Abbott, William A. Bryan, Colin M. Garvey, Steve A. Tomka, and Ross C. Fields,
1990 *Phase II Investigations at Prehistoric and Rock Art Sites, Justiceburg Reservoir, Garza And Kent Counties,* Reports of Investigations No. 71, Vol. 1 and 2, Prewitt and Associates, Inc., Austin, Texas.

Boyd, Douglas K., Jay Peck, Steve A. Tomka, Karl W. Kibler, and Martha Doty Freeman
1994 Data Recovery at Lake Alan Henry (Justiceberg Reservoir), Garza and Kent Counties, Texas: Phase III, Season 3. Reports of Investigations No. 93, Prewitt and Associates, Inc., Austin.

Briscoe, James
1993 *An Archaeological Survey along Segments of the Geo-Seismic Services*. Broken Leg Prospect Seismic Line No. 2. Report submitted to the U.S. Forest Service, Cibola National Forest, Albuquerque, New Mexico.

2002 *Archeological Survey of the Bureau of Land Management Cross Bar Ranch Fire Lanes Project Potter County, Texas.* Report Submitted to the Bureau of Land Management, Amarillo, Texas.

Brooks, Robert L.
1989 Village Farming Societies. In *From Clovis to Comanchero: Archeological Overview of the Southern Great Plain,* pp. 70-90. Arkansas Archeological Survey, Fayetteville.

1993 Household Abandonment among Sedentary Plains Societies: Behavioral Sequences and Consequences in the Interpretation of the Archaeological Record. In *Abandonment and Settlement of Regions: Ethnoarchaeological and Archaeological Approaches*, Catherine M. Cameron and Steve A. Tomka, eds., pp. 178-190, Cambridge University Press.

1994 Warfare on the Southern Plains. In *Skeletal Biology in the Great Plains: Migration, Warfare, Health and Subsistence,* D. W. Owsley and R. L. Jantz, eds., pp. 317-323. Smithsonian Institute Press, Washington D.C.

2004 From Stone Slab Architecture to Abandonment. In *The Prehistory of Texas,* Timothy K. Perttula ed., pp. 331-346. Texas A&M University Press, College Station.

Brooks, Robert L. and Richard R. Drass
1996 *A Reclassification of Plains Village Cultural Complexes in Oklahoma*. Paper presented at the 54th Annual Meeting of the Plains Anthropological Conference, Iowa City.

Brooks, Robert L., Michael C. Moore and Douglas Owsley
1992 New Smith, 34RM400: A Plains Village Mortuary Site in Western Oklahoma. *Plains Anthropologist 37*(138):59-78.

Brosowske, Scott D.
1999 OU Archeological Field School at the Odessa Yates Site. *Oklahoma Archeological Survey Newsletter* 19:2-3.

2002 What Exactly is the Zimms Complex? A Review and Synthesis of Architectural and Assemblage Traits. *Oklahoma Archaeology* 50(4):20-39.

2004 Obsidian Procurement and Distribution during the Middle Ceramic Period of the Southern High Plains: Evidence for the Emergence of Regional Trade Centers. *Council of Texas Archeologists Newsletter* 28(2):16-28.

2005 The Evolution of Exchange in Small-Scale Societies of the Southern High Plains. Dissertation from University of Oklahoma, Norman.

2009 Guide to the Identification of Prehistoric Artifact Classes on the Southern High Plains. Courson Archaeological Research Project.

Brosowske, Scott D. and C. Tod Bevitt
2006 Looking South: The Middle Ceramic Period in Southern Kansas and Beyond. In *Kansas Archaeology*, Robert J. Hoard and William E. Banks, eds., pp. 180-205. University Press of Kansas, Lawrence.

Brosowske, Scott D., and David Maki
2002 *Ground Truthing of Geophysical Anomalies at Area 1, Buried City Complex, Ochiltree County, Texas*. Archaeo-Physics Report of Investigations No. 40, Minneapolis.

Bryson, Reid A., David Baerreis, and Wayne Wendland
1970 The Character of Late-Glacial and Post-Glacial Climatic Changes. In *Pleistocene and Recent Environments of the Central Great Plains,* Wakefield Dort and J. Knox Jones, eds., pp. 53-76. Special Publication 3, Department of Geology, University of Kansas, Lawrence.

Campbell, R.G.
1969 *Prehistoric Panhandle Culture on the Chaquaqua Plateau, Southeast Colorado.* Ph.D. Dissertation, University of Colorado, Boulder.

Charnov, E. L.
1976 Optimal Foraging and the Marginal Value Theorem. *Theoretical Population Biology* 9:129-136.

Chase, H.
1951 *Field Report of the Excavation of Snake Blakeslee I by the Columbia University Summer Field Expedition.* Dept. of Anthropology, University of Denver.

Collins, Michael B.
1968 *The Andrews Lake Locality: New Archeological Data from the Southern Llano Estacado, Texas*. M.A. Thesis, Department of Anthropology, University of Texas, Austin.

1971 A Review of the Llano Estacado, Archeology and Ethnohistory. *Plains Anthropologist* 16(52):85-104.

Corley, John A.
1965 Proposed Eastern Extension of the Jornada Branch of the Mogollon. In *Transactions of the First Regional Symposium for Southeastern New Mexico and Western Texas*, pp. 31-36.

Crabtree, Don E.
1982 An Introduction to the Technology of Stone Tools. Occasional Papers of the Idaho Museum of Natural History, Second Edition, Lucille B. Harten ed., pp. 1-12. Pocatello, Idaho.

Cruse, Jimmy Brett
1992 *Archeological Investigations at the Kent Creek Site (41HL66): Evidence of Mogollon Influence on the Southern Plains*. Publication No. 6, Panhandle Archeological Society, Amarillo.

Dering, Phil
2005 Plant Remains from 41PT109, Potter County, Texas. In *Investigations at an Antelope Creek Phase Isolate Homestead (41PT109),* Appendix D, Unpublished Master's Thesis by Abby Weinstein, Texas State University, San Marcos.

Diamond, David D.
2016 Grasslands. *The Handbook of Texas*, Electronic document, www.tshaonline.org/handbook/online/articles/gqg01, Accessed March 5 2016.

Dillehay, Tom D.
1974 Late Quaternary Bison Population Changes on the Southern Plains. *Plains Anthropologist* 19(65):180-196.

Doolittle, William E.
2000 *Cultivated Landscapes of Native North America*. Oxford University Press, New York.

Drass, Richard R.
1989 Reexamination of the Hedding Site, 34WD2. *Oklahoma Anthropological Society Newsletter* 37(8):2-6.

1995 Lost Pottery from the Hedding Site, 34WD2. *Oklahoma Anthropological Society Newsletter* 43(6):7-11.

1996 Excavations at the Little Deer Site, 34CU10. *Oklahoma Archeological Survey Newsletter* 15(3):1-7.

1997 *Culture Change on the Eastern Margins of the Southern Plains*. University of Oklahoma, Oklahoma Archeological Survey, Studies in Oklahoma's Past 19 and Oklahoma Anthropological Society Memoir 7.

1999 Redefining Plains Village Complexes in Oklahoma: The Paoli Phase and the Redbed Plains Variant. *Plains Anthropologist* 44(168):121-140.

Drass, Richard R. and Timothy G. Baugh
1997 The Wheeler Phase and Cultural Continuity in the Southern Plains. *Plains Anthropologist* 42(160):183-204.

Drass, Richard R, and C.L. Turner
1989 *An Archaeological Reconnaissance of the Wolf Creek Drainage, Ellis County,* Oklahoma. University of Oklahoma Archeological Resource Survey Report 35, Oklahoma Archeological Survey, Norman.

Duffield, Lathel F.
1964 Three Panhandle Aspect Sites at Sanford Reservoir, Hutchinson County, Texas. *Bulletin of the Texas Archeological Society* 35:19-81.

1970 *Some Panhandle Aspects Sites in Texas: Their Vertebrates and Paleoecology*. Unpublished Ph.D. dissertation, Department of Anthropology, University of Wisconsin, Madison.

Erlandson, Jon M.
1988 The Role of Shellfish in Prehistoric Economies: A Protein Perspective. *American Antiquity* 53(1):102-109.

Etchieson, Gerald Meeks
1981 *Archeological Survey at Lake Meredith Recreation Area, Moore and Potter Counties, Texas*. United States Dept. of Interior, Water and Power Resources Services, Southwest Region, Amarillo, TX.

Etchieson, Gerald Meeks and James E. Couzzourt
1987 *Shoreline Survey at Lake Meredith Recreation Area in the Texas Panhandle.* U.S. Dept. of the Interior, Bureau of Reclamation Southwest Region, Amarillo, Texas.

Evans, Glen L. and Grayson E. Meade
1945 *Quaternary of the Texas High Plains*. The University of Texas Publication 4401:485-507.

Eyerly, T.L.
1912 The Buried City of the Panhandle. *The Archaeological Bulletin* 3(1):1-5.

Flynn, Peggy
1984 An Analysis of the 1973 Test Excavations at the Zimms Site (34RM72). In *Archeology of the Mixed Grass Prairie Phase I: Quartermaster Creek*, edited by T. G. Baugh, pp. 215-290. Oklahoma Archeological Resource Survey Report 20, Oklahoma Archeological Survey, Norman.

1986 Analysis of Test Excavations at the Zimms Site (34RM72), Western Oklahoma. In Current Trends in Southern Plains Archaeology, edited by T. G. Baugh, *Plains Anthropologist* 31(114):129-140.

Frederick, Charles D.
2008 Stratigraphic Overview of Upper West Amarillo Creek Valley. In *Landis Property: Data Recovery at Three Prehistoric Sites (41PT185, 41PT186, and 41PT245), Potter County, Texas,* pp. 151-163, TRC Technical Report No. 150832, Bureau of Land Management.

Gould, Charles N.
1907 *The Geology and Water Resources of the Western Portion of the Panhandle of Texas.* Dept. of the Interior, United States Geological Survey.

Green, F.E.
1967 *Archaeological Salvage in the Sanford Reservoir Area*. National Park Service Report 14-10-0333-1126. Texas Tech University, Lubbock.

Gunnerson, James H.
1987 *Archaeology of the High Plains.* Cultural Resource Series, No. 19. Bureau of Land Management, Denver, Colorado.

1989 *Apishapa Canyon Archaeology: Excavations at the Cramer, Snake Blakeslee and Nearby Sites.* Reprints in Anthropology, Volume 41. J&L Reprint, Lincoln.

Gustavson, Thomas C.
1986 Geomorphic development of the Canadian River Valley, Texas Panhandle: An example of regional salt dissolution and subsidence. *Geologic Society of America Bulletin* 97:459-472.

Gustavson, Thomas C., Vance T. Holliday and S.D. Hovorka
1995 *Origin and development of Playa Basins, sources of recharge to the Ogallala Aquifer, Southern High Plains, Texas and New Mexico*. The University of Texas at Austin Bureau of Economic Geology Report of Investigation 229.

Habicht-Mauche, Judith A.
1987 Southwestern-Style Culinary Ceramics on the Southern Plains: A Case Study of Technological Innovation and Cross-Cultural Interaction. *Plains Anthropologist* 32(116):175-191.

1988 *An Analysis of Southwestern Style Utility Ceramics from the Southern Plains in the Context of Protohistoric Plains-Pueblo Interaction.* Ph. D. Dissertation, Department of Anthropology, Harvard University, Cambridge.

1991 Habicht-Mauche, Judith A. "Evidence for the manufacture of Southwestern-style culinary ceramics on the Southern Plains." In *Farmers, hunters, and colonists: Interaction between the Southwest and the Southern Plains*, pp. 51-70.

1992 Coronado's Querechos and Teyas in the Archaeological Record of the Texas Panhandle. In *Plains Anthropologist* 37(140):247:259.

Hayden, Brian.
1986 Resource Models of Inter-Assemblage Variability. *Lithic Technology* 15(3):82-89.

Hobbs, Hulda R.
1941 Texas Panhandle Ruins. *El Palacio* 48(6):121–128).

Hofman, Jack L.
1975 A Study of the Custer-Washita River Foci Relationships. *Plains Anthropologist* 20(67):41-51.

1978a The Development and Northern Relationships of Two Archeological Phases in the Southern Plains Subarea. In *The Central Plains Tradition: Internal and External Relationships*, Donald J. Blakeslee, ed., pp. 6-35. Office of the State Archeologist, University of Iowa, Iowa City.

1978b An Analysis of Surface material from the Little Deer Site, 34CU10, of Western Oklahoma: A Further Investigation of the Wheeler Complex. *Oklahoma Anthropological Society Bulletin* 27:1-109.

1984 The Western Protohistoric: A Summary of the Edwards and Wheeler Complexes. In Prehistory of Oklahoma, R.E. Bell ed., pp. 347-362, Academic Press, New York.

1989 Protohistoric Culture History on the Southern Great Plains. In *From Clovis to Comanchero: Archeological Overview of the Southern Great Plain,* pp. 91-100. Arkansas Archeological Survey, Fayetteville.

Holden, William C.
1931 Texas Tech Archeological Expedition Summer 1930. In *Bulletin of the Texas Archeological and Paleontological Society* 3:43-52.

Holliday, Vance T.
1989 The Blackwater Draw Formation (Quaternary): A 1.4-plus-m.y. Record of Eolian Sedimentation and Soil Formation on the Southern High Plains. *Geological Society of America Bulletin* 101(12):1598-1607.

1997 *Paleoindian Georchaeology of the Southern High Plains*. University of Texas Press, Austin.

Holliday, Vance T., James H. Mayer, and Gren G. Fredlund
2008 Late Quaternary Sedimentology and Geochronology of Small Playas on the Southern High Plains, Texas and New Mexico, U.S.A. *Quaternary Research* 70:11-25.

Hughes, Jack T.
1942 *An Archeological Report on the Harrell Site of North-Central Texas.* Unpublished Master's thesis, The University of Texas, Austin.

1962 Lake Creek: A Woodland Site in the Texas Panhandle. Bulletin of the Texas Archeological Society 32:65-84.

1991 Prehistoric Cultural Developments on the High Texas Plains. *Bulletin of the Texas Archeological Society* 60:1-55.

Hughes, David. T.
2001 *Buried City Architecture and Settlement*. Paper presented at the 67th Annual Meeting of the Society of American Archaeology, Denver.

2002 *Buried City Ceramics, Ochiltree County, Texas*. A paper presented at the Plains Anthropological Conference, Oklahoma City, October 2002.

2004 *Buried City*. Texas Beyond History, University of Texas at Austin, Electronic document, http://www.texasbeyondhistory.net/villagers/buriedcity/index.html, Accessed April 16th 2015.

Hughes, D. T. and Alicia Hughes-Jones
1987 The Courson Archeological Projects, 1985 and 1986. In *A Final Report of the 1985 Investigations and a Preliminary Report of the 1986 work.* Innovative Publishing, Perrytown, Texas.

Huhnke, Marie H.
2000 *Form and Function: The Bone Tools from Alibates Ruin #28*. Unpublished Master's thesis, Department of Anthropology, Wichita State University, Wichita.

Ireland, S.K.
1968 *Five Apashapa Focus Sites in the Arkansas Valley, Colorado.* M.A. Thesis, University of Denver.

Johnson, Eileen and Vance T. Holliday
2004 Archeology and Late Quaternary Environments of the Southern High Plains. In *The Prehistory of Texas,* Timothy K. Perttula ed., pp. 283-295. Texas A&M University Press, College Station.

Johnson, Eileen, Vance T. Holliday, M. J. Kaczor and R. Stuckenrath
1977 The Garza Occupation at the Lubbock Lake Site. *Bulletin of the Texas Archaeological Society* 48:83-109.

Johnston, C. Stuart
1939 A Report on the Antelope Creek Ruin. *Bulletin of the Texas Archeological and Paleontological Society* 11:190–202.

Kansas Geological Survey
2005 Kansas Ground Water. Electronic document, www.kgs.ku.edu/Publications/Bulletins/ED10/04_occur.html, Accessed December 15, 2015.

Keller, John Esten
1975 *The Black Dog Village Site: A Panhandle Aspect Manifestation in Hutchinson County, Texas*. Texas Highway Department, Publication in Archeology, Highway Design Division, Report No. 5, Austin.

Krieger, Alex
1946 *Culture Complexes and Chronology in northern Texas with Extension of Puebloan Datings to the Mississippi Valley*. Publication No. 4640. University of Texas, Austin.

LaBelle, Jason M., Vance T. Holliday and David J. Meltzer
2003 Early Holocene Paleoindian Deposits at Nall Playa, Oklahoma Panhandle, U.S.A. *Geoarchaeology* 18(1):5-34.

Langmuir, Eric
1984 Mountaincraft and Leadership. In *Official Handbook of the Mountain Leader Training Boards of Great Britain and Northern Ireland*, Britain & Scottish Sports Council, Edinburgh, Scotland.

Leslie, Robert H.
1979 The Eastern Jornada Mogollon, Extreme Southeastern New Mexico (A Summary). In *Jornada Mogollon Archaeology: Proceedings of the First Jornada Conference*, Patrick H. Beckett and Regge N. Wiseman, eds., pp. 179-199. Cultural Resource Management Division, New Mexico State University, Las Cruces.

Lintz, Christopher
1976 The McGrath Site of the Panhandle Aspect. *Bulletin of the Oklahoma Anthropological Society* 25:1–110.

1979 Radiocarbon and Archeomagnetic Dates from the Two Sisters Site, 34TX32, Texas County, Oklahoma. *Oklahoma Anthropological Society Newsletter* 27(6):1-9.

1984 The Plains Villagers: Antelope Creek. In *The Prehistory of Oklahoma*, Robert E. Bell, ed., 325–346. Academic Press, Orlando.

1986a *Architecture and Community Variability within the Antelope Creek Phase of the Texas Panhandle*. Studies in Oklahoma's Past Number 14. Oklahoma Archeological Survey, Norman.

1986b The Historical Development of a Culture Complex. *Plains Anthropologist* 31(114):111-128.

1991 Texas Panhandle-Pueblo Interactions from the Thirteenth through the Sixteenth Century. In *Farmers, Hunters, and Colonists: Interaction between the Southwest and the Southern Plains*, Katherine Spielmann ed., Pp. 89–106. University of Arizona Press, Tucson.

2010 Antelope Creek Phase. Texas State Historical Association. Electronic document, https://tshaonline.org/handbook/online/articles/bba07, Accessed September 3, 2016.

2016 Antelope Creek Phase, Architecture, Chronology and Lessons from the Jack Allen Daub Studies: A Person Journey. *Papers of the Archaeological Society of New Mexico.* 42:147-160.

Lintz, Christopher, Jason Smart, Audrey Scott and Shane Pritchard
2002 Cultural Resource Class II Survey of a 1,500 Acre Sample of the Cross Bar Ranch Complex, Potter County, Texas. Report submitted to the Bureau of Land Management, TRC Environmental, Austin, Texas.

Lohse, Jon C., David B. Madsen, Brendan J. Culleton, Douglas J. Kennett
2014 Isotope paleoecology of episodic mid-to-late Holocene bison population expansions in the Southern Plains, U.S.A. *Quaternary Science Reviews* 102:14-26.

Lorrain, Dessamae
1969 *Archeological Investigations in the Fish Creek Reservoir.* Contributions in Archeology No. 4. Department of Anthropology, Southern Methodist University, Dallas.

Lowery, Earl J.
1932 T*he Archaeology of the Antelope Creek Ruin.* Unpublished Master's thesis, Texas Technological College, Lubbock.

Luedtke, Barbara E.
1992 *An Archaeologist's Guide to Chert and Flint.* Archaeological Research Tools 7, Institute of Archaeology, University of California, Los Angeles.

Magyari-Saska, Zsolt and Stefan Dombay
2012 Determining Minimum Hiking Time using DEM. *Geographia Napocensis* 6(2):124-129.

Martin, Ernest R.
1994 The Dillard Site: A Late Prehistoric Plains Village Site in Cooke County, Texas. In *Bulletin of the Texas Archeological Society* 62:105-200.

Mason, J. Alden
1929 The Texas Expedition. *University of Pennsylvania Museum Journal* 22:318–338.

Meier, Holly.
2007 *An Evaluation of Antelope Creek Interaction using INAA*. Unpublished Master's Thesis, Texas State University, San Marcos.

Meissner, Barbara
2005 Vertebrate Faunal Remains from Crossbar Ranch (41PT109). In *Investigations at an Antelope Creek Phase Isolate Homestead (41PT109),* Appendix C, Unpublished Master's Thesis by Abby Weinstein, Texas State University, San Marcos.

Moore, M. C.
1984 *The New Smith Site, 34RM400: A Late Prehistoric Mortuary Site in Western Oklahoma*. Paper presented at the 42nd Annual Plains Conference, Lincoln.

1988 Additional Evidence for the Zimms Complex? A Re-evaluation of the Lamb-Miller Site, 34RM-25, Roger Mills County, Oklahoma. *Bulletin of the Oklahoma Anthropological Society* 37:151-190.

Moorehead, Warren K.
1921 Recent Excavations in Northwestern Texas. *American Anthropologist* 23(1):1-111.

1931 *Archaeology of the Arkansas River Valley*. Phillips Academy, Andover.

Mudd, Michael L., and Robert Z. Selden Jr.
2015 *Ground-Penetrating Radar Data from an Antelope Creek Site (41PT283) in Potter County, Texas*. Paper presented at the 86th Annual Texas Archeological Meeting, October 2015, Houston, Texas.

NRCS
2016 Web Soil Survey. Natural Resource Conservation Service. Electronic document, http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx, Accessed September 3, 2016.

Owens, Mark
2007 *A Model for Predicting Late Prehistoric Architectural Sites at the Pinon Canyon Maneauver Site in Southeastern Colorado*. Report prepared for the Directorate of Environmental Compliance and Management, Department of the Army, Fort Carson, Colorado.

Palacios-Fest, Manual R.
2010 Late Holocene Paleoenvironmental History of the Upper West Amarillo Creek Valley of Archaeological Site 41PT185/C, Texas, USA. *Boletín de la Sociedad Geológica Mexicana* 62(3):399-436.

Parker, Wayne
1982 *Archaeology at the Bridwell Site.* Crosby County Pioneer Memorial Museum, Crosbyton, Texas.

Parmalee, Paul W. and Walter Klippel
1974 Freshwater Mussels as a Prehistoric Resource. *American Antiquity* 39(3):421-434.

Parry, W. J. and J. D. Speth
1984 *The Garney Springs Campsite: Late Prehistoric Occupation in Southeastern New Mexico.* Museum of Anthropology, University of Michigan, Technical Reports 15, Ann Arbor.

Parsons, Mark L.
1967 *Archeological Investigations in Crosby and Dickens Counties, Texas during the Winter, 1966 – 1967.* State Building Commission Archeological Program, Report 7.

Pertulla, Timothy K., and Christopher Lintz
1995 Prehistoric and Protohistoric Ceramics from the Lower Plains, Caprock Canyonlands, and Texas Panhandle. In Prehistoric and Historic Aboriginal Ceramics in Texas, Timothy K. Pertulla, Myles R. Miller, Robert A. Ricklis, Daniel Prikryl, and Christopher Lintz, eds., *Bulletin of the Texas Archeological Society* 66:203-210.

Prewitt, Elton R.
2014 *Notes on Describing Projectile Points*. Unpublished Manuscript.

Quigg, J. Michael
2013 They're Here: Pithouses in the Texas and Oklahoma Panhandles During the Middle Ceramic Period. *Plains Anthropologist* 58(226):31-66.

Quigg J. Michael, Charles D. Frederick, Paul M. Matchen, and Kendra G. DuBois
2008 *Landis Property: Data Recovery at Three Prehistoric Sites (41PT185, 41PT186 and 41PT245) in Potter County Texas, Vol. I.* TRC Report No. 150832. Prepared for the Bureau of Land Management Amarillo Field Office, Amarillo, Texas.

Quigg, J. Michael, Paul M. Matchen, Charles D. Frederick and Robert A. Ricklis
2013 Long View (41RB112): Data Recovery of Two Plains Village Period Components in Roberts County, Texas, Volume 2, *Index of Texas Archaeology: Open Access Gray Literature from the Lone Star State*: Vol. 2013, Article 7.

Rathjen, Fredrick W.
1998 *The Texas Panhandle Frontier.* Texas Tech University Press, Lubbock.

Reeves, C. C., Jr.
1976 Quaternary Stratigraphy and Geologic History of Southern High Plains, Texas and New Mexico. In *Quaternary Stratigraphy of North America,* W. C. Mahoney, ed., pp. 213-233. Dowden, Hutchinson and Ross, Stroudsburg, Pennsylvania.

Runkles, Frank A.
1964 The Garza Site: A Neo-American Campsite Near Post, Texas. *Bulletin of the Texas Archeological Society* 35:101-126.

Runkles, Frank A. and E. D. Dorchester
1986 The Lott Site (41GR56): A Late Prehistoric Site in Garza County, Texas. *Bulletin of the Texas Archeological Society* 57:83-115.

Sayles, E.B.
1935 *An Archeological Survey of Texas*. Medallion Papers, Vol. 17, Gila Pueblo, Globe, Arizona.

Schiffer, Michael B.
1987 *Formation Processes of the Archaeological Record*. University of Utah Press, Salt Lake City.

Schmidly, David J.
1994 *The Mammals of Texas*. University of Texas Press.

Schneider, Frederick
1969 The Roy Smith Site, Bv-14, Beaver County, Oklahoma. *Bulletin of the Oklahoma Anthropological Society* 18:119–179.

Shaeffer, J.B.
1965 The Hedding Site, 34WD2. In Salvage Archaeology in Oklahoma, Papers of the Oklahoma Archaeological Salvage Project, Numbers 9-15 by J.B. Shaeffer. *Oklahoma Anthropological Society Bulletin* 13:131-145.

Sharrock, Floyd W.
1961 The Grant Site of the Washita River Focus. *Bulletin of the Oklahoma Anthropological Society* 9:1-66, Oklahoma City.

Smith, E.A. and B. Winterhalder
1992 *Evolutionary Ecology.* Aldine de Gruyter, New York.

Spielmann, K. A.
1983 *Inter-Societal Food Acquisition Among Egalitarian Societies: An Ecological Analysis of Plains/Pueblo Interaction in the American Southwest*. Unpublished Ph.D. dissertation, Department of Anthropology, University of Michigan, Ann Arbor.

Stephens, D.W. and J.R. Krebs
1986 *Foraging Theory.* Princeton University Press, New Jersey.

Studer, Floyd V.
1931 Archeological Survey of the North Panhandle of Texas. *Bulletin of the Texas Archeological and Paleontological Society* 3:73–75.

1934 Texas Panhandle Culture Ruin No. 55. *Bulletin of the Texas Archeological and Paleontological Society* 6:80–96.

Suhm, D. A. and E. B. Jelks
1962 *Handbook of Texas Archeology: Type Descriptions*. Texas Archeological Society, Special Publication No. 1, Austin.

Swanton, J.R.
1942 *Source Material on the History and Ethnology of the Caddo Indians.* Bureau of American Ethnology Bulletin 132. Smithsonian Institute, Washington D.C.

Texas Beyond History
2001 Alibates Flint Quarries and Ruins. Texas Beyond History, Electronic document, www.texasbeyondhistory.net/alibates/index.html, Accessed September 3, 2016.

Texas Historical Commission
2016 Texas Historic Sites Atlas. Electronic document, https://atlas.thc.state.tx.us, Accessed March 15 2016.

Thurmond, Peter J.
1991 Archeology of the Dempsey Divide: A Late Archaic/Woodland Hotspot on the Southern Plains. *Bulletin of the Oklahoma Anthropological Society Newsletter* 37(8):3-4.

Tomka, Steve A.
1993 Site Abandonment Behavior among Transhumant Agro-pastoralists: The Effects of Delayed Curation on Assemblage Composition." In *Abandonment and Settlement of Regions: Ethnoarchaeological and Archaeological Approaches*, Catherine M. Cameron and Steve A. Tomka, eds., pp. 11-24. Cambridge University Press.

Torrence, Robin
1989 Retooling: Towards a Behavioral Theory of Stone Tools. In *Time, Energy and Stone Tools,* pp. 57-66, Cambridge University Press.

Turner, Ellen Sue, Thomas R. Hester and Richard L. McReynolds
2011 *Stone Artifacts of Texas Indians.* 3rd Edition, Taylor Trade Publishing.

Vehik, Susan C.
1984 The Woodland Occupations. In *Prehistory of Oklahoma*, Robert E. Bell, ed., pp175-199. Academic Press, Orlando.

2002 Conflict, Trade and Political Development on the Southern Plains. *American Antiquity* 67(1):37-64.

Wallis, C.S. Jr.
1984 Summary of Notes and Earlier Analyses of the Wickham #3 Site, 34RM29, Roger Mills County, Oklahoma. *Oklahoma Anthropological Society Bulletin* 33:1-29.

Wanner, Heinz, Jurg Beer, Jonathan Butikofer, Thomas J. Crowley, Ulrich Cubasch, Jacqueline Fluckiger, Hugues Goosse, Martin Grosjean, Fortunat Joos, Jed O. Kaplan, Marcel Kuttel, Simon A. Muller, I. Colin Prentice, Olga Solomina, Thomas F. Stocker, Pavel Tarasov, Mayke Wagner, and Martin Widmannm
2008 Mid- to Late Holocene Climate Change: An Overview. *Quaternary Science Reviews* 27:1791-1828.

Watson, Virginia
1950 The Optima Focus of the Panhandle Aspect: Description and Analysis. *Texas Archeological and Paleontological Society Bulletin* 21:7–68.

Weinstein, Abby
2005 *Investigations at an Antelope Creek Phase Isolated Homestead (41PT109)*. Unpublished MA Thesis, Texas State University, San Marcos.

Weymouth, John W.
1981 Magnetic Surveys of the Edwards I (34BK2) and Taylor (34GR8) Sites in Western Oklahoma. Ms. on file with the Oklahoma Archeological Survey, University of Oklahoma, Norman.

Whittaker, John C.
1994 *Flintknapping: Making and Understanding Stone Tools*. University of Texas Press, Austin.

Willey, Gordon R.
1953 Prehistoric Settlement Patterns in the Vuru Valley, Peru. *Bureau of American Ethnology Bulletin*, Vol. 155.

Willey, Patrick S. and Jack T. Hughes
1978 The Deadman's Shelter Site. In *Archeology at Mackenzie Reservoir*, Jack T. Hughes and Patrick S. Willey, eds., pp. 149-1990. Office of the State Archeologist Survey Report No. 24, Texas Historical Commission, Austin.

Winterhalder, Bruce and Douglas J. Kennett
2006 Behavioral Ecology and the Transition from Hunting and Gathering to Agriculture. In *Behavioral Ecology and the Transition to Agriculture*, Douglas K. Kennett and Bruce Winterhader, eds., pp. 1-12. University of California Press.

Woodson, M. Kyle, Jonathan A. Sandor, Colleen Strawhacker, and Wesley D. Miles
2015 Hohokam Canal Irrigation and the Formation of Irragric Anthrosols in the Middle Gila River Valley, Arizona, USA. *Geoarchaeology* 30:271-290.

Word, James H.
1963 Floydada Country Club Site, 41FL1. *South Plains Archaeological Bulletin* 1:37-63.

1965 The Montgomery Site in Floyd County, Texas. *South Plains Archaeological Society Bulletin* 2:55-102.

Wyckoff, Don G.
1973 The Lowrance Site of Murray County: 1969 Excavations by the Oklahoma Anthropological Society. *Oklahoma Anthropological Society Bulletin* 21:1-155.

1982 Prehistoric People and Western Oklahoma. In *Edwards I (34BK2): Southern Plains Adaptations in the Protohistoric Period,* Timothy B. Baugh, ed., pp. 33-44. Oklahoma Archeological Survey, Studies in Oklahoma's Past 8. University of Oklahoma, Norman.