

SUBSISTENCE STRATEGIES AND LANDSCAPE USE
IN THE CANYON EDGE ZONE: EAGLE NEST
CANYON, LANGTRY, TEXAS

by

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DEDICATION

I dedicate this thesis to my father, George V. Basham III.

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ABSTRACT

The remains of earth ovens are one of the most common types of archaeological features in the Lower Pecos Canyonlands of Southwest Texas. This study focuses on earth oven features, specifically the remains of individual earth ovens, in order to determine patterns of earth oven construction, use, and reuse over time. Seven earth oven features were excavated on the canyon edge of Eagle Nest Canyon, outside of Langtry, Texas. Results from these excavations indicate that a variety of wood charcoal was used in the features. In addition, all of the features excavated dated to the Late Prehistoric and Historic time periods. The location of the features, their components, and patterns of earth oven construction and use are discussed along with references to earth oven cooking in the greater Lower Pecos Region.

CHAPTER 1: INTRODUCTION

Earth ovens were used by the indigenous inhabitants of North America to cook food for at least 10,000 years (Black and Thoms 2014:204). In the Lower Pecos Canyonlands of Southwest Texas, burned rock middens (BRMs) are the most obvious type of evidence left from this behavior. BRMs are large concentrations of fire-cracked rock (FCR), ash, charcoal, and other debris produced by earth oven cooking (Dering 1999; Black and Thoms 2014; Koenig 2012). Other types of features common in the Lower Pecos region are smaller clusters of burned rock representing temporary earth oven facilities.

This thesis is a study focused on individual earth oven features. Burned rock middens, the most obvious and voluminous types of evidence associated with earth oven cooking, are incredibly valuable sources of data and have been essential in the development of models of landscape use related to subsistence intensification (Dering 1999; Koenig 2012). These large earth oven facilities represent a continuing behavior through time and a node of activity on the landscape. In contrast, smaller features are often the remnants of one or several earth oven heating elements. By studying these features we can determine specific patterns of earth oven construction and use.

The burned rock features investigated during this project were all on the canyon edge surrounding Eagle Nest Canyon in Langtry, Texas. The long and well-documented record of habitation by prehistoric people in Eagle Nest Canyon make it an excellent location to test any hypothesis concerning subsistence strategies and landscape use. The hypothesis proposed for this project is: Eagle Nest Canyon and its surrounding upland

areas were part of an integrated system of landscape use. Native people used the unique properties of the various canyon zones in order to maximize resource utility. The canyon edge zone in particular was used as a lookout point and a processing area for upland and canyon resources.

My thesis research investigated the canyon edge zone around Eagle Nest Canyon in order to document and sample burned rock features that reflect systemic patterns of landscape use and subsistence strategies. This involved the excavation of select features in order to identify what types of activities were done in the canyon edge zone, what materials were utilized during these activities, and when these activities occurred. Changes noted in botanical remains and feature location through time allows for an analysis of landscape use that considered changes in subsistence strategies associated with climate change and population pressure.

Climate heavily influenced indigenous behaviors in the Lower Pecos Canyonlands (Figure 1.1), and a discussion of past climate and associated culture change in the region will clarify and contextualize the above stated thesis.

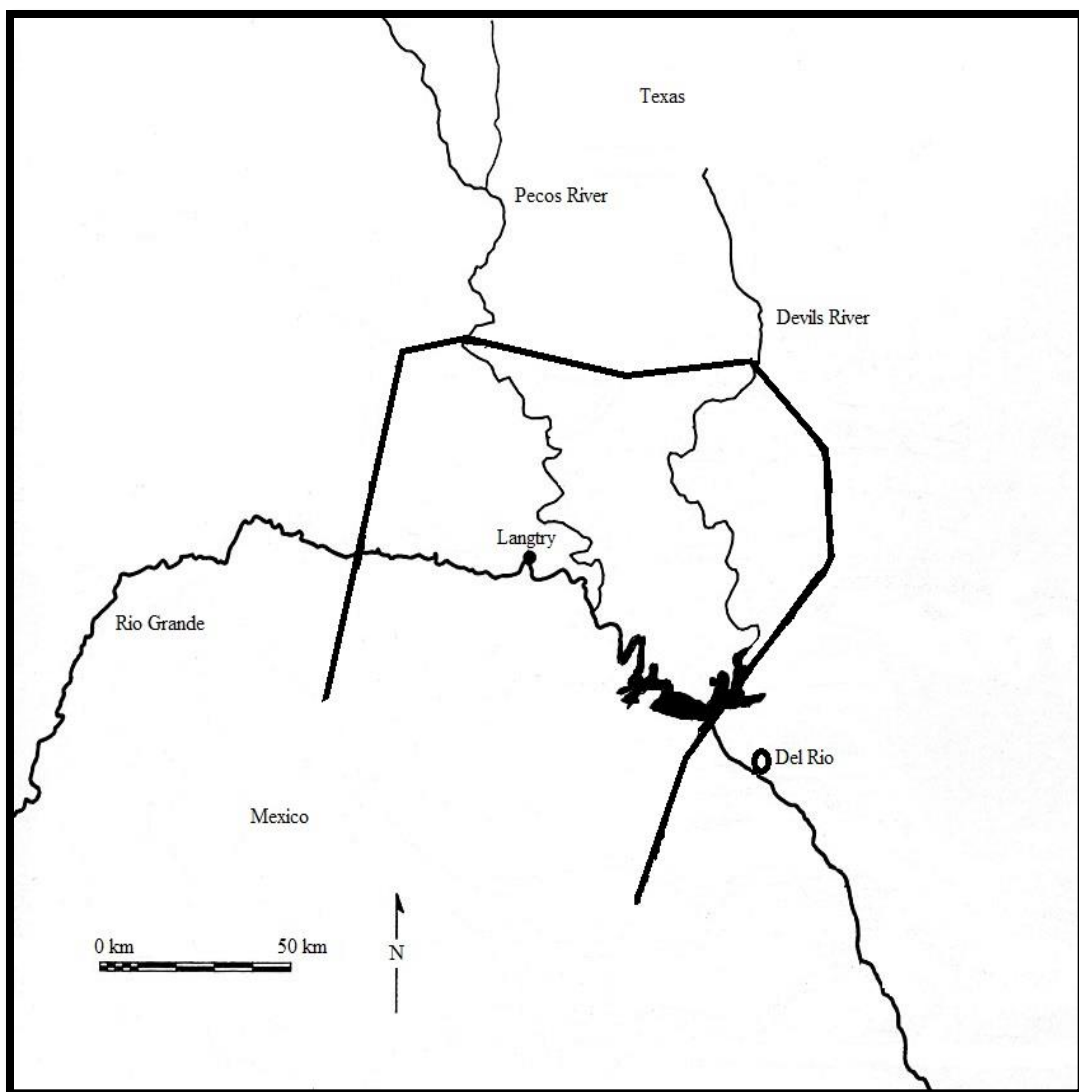


Figure 1.1. The Lower Pecos Culture Region (Redrawn from Turpin 2004).

Lower Pecos Climate

The Lower Pecos Canyonlands today appear to the casual traveler as a desert landscape of rolling hills punctuated by deep canyons, arroyos, and distant mountains. Annual rainfall is less than 50 cm (Dering 2002:2.4) but El Niño events and other continental patterns cause high variability in rainfall. A trend of increasing aridity is present from east to west. Vegetation types (Balconian to Chihuahuan Desert Scrub) generally reflect this. However, this trend is punctuated by unique microenvironments scattered throughout the region that offer glimpses into the past climatic conditions present in the Lower Pecos.

When humans first arrived in the Lower Pecos Canyonlands near the end of the Pleistocene it was a different place (Turpin 2004). Various types of now extinct fauna, such as mammoth and mastodon, roamed the landscape. Temperatures and evapotranspiration rates were lower, and vegetation was a mix of oak and juniper forests amidst scrub grasslands (Bryant and Holloway 1985:52; Dering 1979:53). During the transition from the Pleistocene to the Holocene (around 11,000 RCYBP), temperatures gradually increased and precipitation declined. In the four thousand years after this transition, regional vegetation continued its transformation from a mixed forest-savannah into grassland punctuated by microenvironments of juniper and oak hidden in canyons (Dering 2002:2.7). It was also during this period that evidence of plants such as sotol, lechuguilla, yucca, and cacti began to proliferate in the area (Dering 1979).

During the period between 7,000 and 4,000 RCYBP, the trend towards increasing aridity accelerated. This transition has been identified in geological, biological, and archaeological remains and has been referred to as the Altithermal (Bryant and Holloway

1985; Meltzer 1999). The only significant environmental shift postdating the Althithermal was a temporary increase in precipitation around 2,500 RCYBP (Dering 2002:2.9). It should also be noted that despite these larger trends specific climatic events did occur, including periods of drought and increased precipitation lasting from years to decades (Antevs 1955:317-335).

The paleoclimate of the Lower Pecos Canyonlands can therefore be seen in the vegetation types across the landscape. Ancient remnants of oak and juniper forests can be found in drainages and canyons that funnel the precious little but often violent precipitation that falls in the area, which is characteristic of the Stockton Plateau (McNab and Avers 1994). Uplands are dominated by desert plants that have crept in from the Chihuahuan desert to the south and west (Landers 1987:203-207).

Eagle Nest Canyon and the canyon edge surrounding it contain vegetation common to the Lower Pecos Region. Although the canyon edge has been heavily impacted over the past 130 years by the presence of sheep and goats, the remaining vegetation is indicative of what was present during the previous millennia and includes cacti, condalia bush, ocotillo, creosote, mesquite and grasses. In the drainages scattered along the canyon edge trees such as oak can be found. The canyon contains trees such as shin oak, willow, cottonwood, and walnut, but heavy precipitation events and shallow soils restrict upland vegetation to grasses and tough, scrubby brush. Food resources that might have been cooked in earth ovens include agave and sotol from rocky areas on the canyon walls and edge, and river onions from the canyon bottom.

Lower Pecos Culture

The indigenous inhabitants of the Lower Pecos Canyonlands were hunter-gatherers. As such their subsistence strategies and other behavioral variations were heavily influenced by climate and vegetation (Turpin 2004). As noted above, climate changed over the timespan of human habitation in the Lower Pecos Canyonlands. These changes caused corresponding adaptations in the behavior of the indigenous inhabitants. The most notable for this project was a decreasing reliance on big game resources at the beginning of the Holocene and a subsequent expansion of diet breadth over the course of that period to include a wider variety of plant resources such as sotol, yucca, lechuguilla, cactus, and wild onion (Dering 2002). This expanding diet breadth corresponded with increased aridity, which continued with few interruptions throughout the Holocene.

The most authoritative account of culture and culture change in the Lower Pecos Canyonlands was presented by Turpin (2004). Turpin divides the chronology into four periods and twelve subperiods: Paleoindian (Aurora, Bonfire, Oriente), Archaic (Viejo, Eagle Nest, San Felipe, Cibola, Flanders, Blue Hills), Late Prehistoric (Flecha, Infierno), and Historic (Table 1.1).

The Paleoindian period was primarily characterized by big game hunting. Little evidence has been found to indicate that Paleoindian peoples relied on earth oven technology to any appreciable degree, despite the recent discovery of a Late Paleoindian-age burned rock feature near Alpine, Texas by researchers with the Center for Big Bend Studies at Sul Ross State University (Walter and Cloud 2014).

Table 1.1: Periods in the Chronology of the Lower Pecos Region (Turpin 2004).

Period	Subperiod	Radiocarbon Years B.P.
Paleoindian		<12,000-9,800
	Aurora	14,500-11,900
	Bonfire	10,700-9,800
Late Paleoindian		9,400-9,000
	Oriente	9,400-8,800
Early Archaic		9,000-6,000
	Viejo	8,900-5,500
Middle Archaic		6,000-3,000
	Eagle Nest	5,500-4,100
	San Felipe	4,100-3,200
Late Archaic		3,000-1,000
	Cibola	3,150-2,300
	Flanders	2,300- ?
	Blue Hills	2,300-1,300
Late Prehistoric		1,000-350
	Flecha	1,320-450
	Infierno	450-250
Historic		350-1

During the Archaic, however, there is evidence of widespread earth oven cooking (Brown 1991; Turpin 2004). This time period coincided with increasing aridity across the region and cultural changes such as an increased reliance on plant resources and the appearance of the defining cultural element of the Lower Pecos Canyonlands: the Pecos River Rock Art style. A dramatic increase in the amount of earth oven cooking is evident during this period in burned rock midden deposits. Several archaeologists (Brown 1991; Dering 1999; Thoms 2008) have argued that this increasing use of earth ovens during the Archaic was characteristic of subsistence intensification as proposed by Binford (2001). In this case increasing populations combined with decreasing quality of food resources resulted in more labor intensive subsistence strategies. These strategies often focused on

plant resources, such as sotol and lechuguilla, and used cooking technologies, such as earth ovens, to process otherwise inedible foods.

The adoption of earth oven cooking during the Archaic formed an enduring component of Lower Pecos cultural identity throughout the remaining periods.

Relatively minor technological introductions, such as the bow and arrow at the end of the Archaic, did not dramatically influence this traditional subsistence behavior.

The Late Prehistoric period is of particular interest to this project because all of the excavated features date to this period. Turpin noted that ring middens at open sites, such as those on the canyon edge, “consistently date to the Late Prehistoric period” (Turpin 2004:274). Brown argued that this evidence indicated earth oven cooking during the Late Prehistoric period was done at sites strategically located near food and fuel resources (Brown 1991:127). This contrasted with earth oven cooking in rockshelters, which Brown cited as being widespread as early as 5,000 RCYBP, during the Middle Archaic.

Brown went on to hypothesize that during 1200-1500 A.D. “pit baking sites are moved out of rock shelters and relocated adjacent to stands of these plants and firewood because larger quantities of the plants are being processed” (Brown 1991:127). In this statement Brown emphasized the specific behavioral change involving a strategic placement of earth ovens adjacent to the resources needed to construct them. That is exactly what my research attempts to evaluate, specifically whether features on the canyon edge were strategically placed in relation to the resources needed for earth oven construction and use.

The Canyon Edge Project: Eagle Nest Canyon

This thesis is an attempt to make several contributions to archaeological research in the Lower Pecos Region. The first contribution is the study of a specific area, the canyon edge around Eagle Nest Canyon. Due to a low water crossing of the Rio Grande and numerous rockshelters, the area around Eagle Nest Canyon contains a large and well preserved record of prehistoric life. It is hoped that studying the archaeological remains on the canyon edge will contribute to landuse studies that focus on variations in behavior between uplands and canyons.

A second contribution is the evaluation of earth ovens as a subsistence strategy. Burned rock features are one of the most common features on the canyon edge around Eagle Nest Canyon. Although two of these features are burned rock middens, the majority are smaller burned rock features. By evaluating these individual features, it is hoped to provide a better understanding of what an earth oven really *was*, specifically what types of food, rocks, wood, and positions on the landscape were chosen. Five research questions were posed to guide research and make the above stated contributions:

1. What archaeological evidence is present in the canyon edge zone around Eagle Nest Canyon?
2. What is the spatial distribution of this evidence?
3. When was this evidence deposited?
4. Can inferences be made about the function of specific features and artifacts?
5. What can these inferences tell us about subsistence strategies and landscape utilization in the Lower Pecos region through time?

The study area for this project was the property of Jack Skiles, in Langtry, Texas (Figure 1.2). This property is 260.72 acres, abuts the Rio Grande, and contains the entirety of Eagle Nest Canyon (also known as Mile Canyon). Archaeological investigations in the area have been primarily focused on rockshelters within the canyon. However some work has been done on the canyon edge, including prior documentation of historic structures, prehistoric burned rock and lithic evidence, and a GIS evaluation of possible bison jump routes (Davis and Skiles 1999; Byerly et al. 2005). The former mentioned documentation of historic structures and prehistoric evidence was the starting point of this project. 41VV890, or the “Torres Ranch House”, is a multi-component site that runs along the downstream western edge of the canyon. It contains numerous burned rock features, large amounts of lithic debitage, and a sheen of historic trash and rubble. In addition to a resurvey of this site, the entirety of the canyon edge was investigated for archaeological evidence. Two additional sites were found, each of which contained burned rock features and lithic debitage. One of these sites, 41VV2167, was chosen for additional study.



Figure 1.2: Map of study area. Langtry is visible at left.

Excavations were carried out at two sites on the canyon edge, 41VV890 and 41VV2167. Of the twenty burned rock features identified during the survey of 41VV890, five were chosen for excavation. Of the three found at 41VV2167, two were excavated. These seven features comprise the sample from which this project's hypotheses will be evaluated.

Initial survey and excavation results indicate that the canyon edge around Eagle Nest Canyon was used as a processing area for plant resources. The charred fuel material recovered from burned rock features also indicates that canyon edge resources were commonly used in the construction of earth ovens along the canyon edge, including ocotillo, condalia bush, and mesquite. In addition, a pattern of selective placement of features was noted. Over half of the features excavated were placed above or in bedrock depressions.

Thesis Organization

The first chapter of this thesis has introduced the environment and culture of the Lower Pecos region and the archaeological focus of the thesis project. Chapter 2 presents a basic description of earth ovens and how they work and includes historical and ethnographic accounts of earth oven cooking. Chapter 3 presents various aspects of the archaeological study of earth oven features in the Lower Pecos Canyonlands. This includes a discussion of earth oven feature descriptions, photography, burned rock weights and measures, associated botanical remains, and landscape use associated with feature placement. Chapter 4 outlines the methods used to investigate burned rock features during my thesis project. Chapter 5 presents the field and laboratory

identification results. A discussion of the results is presented in Chapter 6, and a conclusion in Chapter 7.

CHAPTER 2: EARTH OVEN BASICS

Earth oven technology was originally developed in the Old World. People using the technology later came to occupy environments throughout North America (Black and Thoms 2014; Wandsnider 1997). In the Lower Pecos, earth ovens were used to process a variety of plants such as sotol, lechuguilla, onions, and yucca. Patterns of this behavior left distinct archaeological evidence across the landscape. The remains of individual earth oven features have been documented in many areas throughout the Lower Pecos, including upland settings (Campbell 2012; Koenig 2012).

Although individual thermally altered rocks can sometimes be difficult to identify, the remains of earth oven features are often distinct and easily identifiable on the landscape. Archaeologists such as Dering, Black, and Thoms have proposed models of individual earth oven construction to explain the formation of these burned rock features. Three components contributed to the development of these models: experimentation, perusal of historic and ethnographic records, and the excavation of features.

In order to elucidate the historical contexts of earth oven cooking this chapter discusses earth ovens and ethnographic accounts of their use. First earth oven cooking is explained as a food science technology. This will involve a discussion of the basic design behind earth ovens and why they were used to cook sotol and lechuguilla in particular. Earth ovens are also discussed in an ethnographic context including examples of earth oven cooking from historical and ethnographic records. In the next chapter, earth ovens are discussed as components of the archeological record. This includes how the

remains of earth ovens manifest in archaeological deposits and how they are studied by archaeologists.

Earth Oven Technology

The application of heat to food has various benefits depending on food type. These include increasing nutrient density and removal of pathogens. In other cases, it makes inedible plants digestible by breaking down complex molecules within them. Wandsnider wrote that “cooking entails manipulating the temperature, moisture, and pH regime of food as well as its surface area so that specific, desirable physical and chemical changes can take place” (1997:2).

Like open fires, earth ovens were used to apply heat to food. Earth ovens, however, were inherently more complex than simple fires, and use of them implies a greater knowledge of the thermodynamic properties of earth, air, and stone. The basic principles of earth oven cooking have been discussed by multiple archaeologists (Black and Thoms 2014; March et al. 2014; Wandsnider 1997). Earth ovens have also been the subject of numerous lines of experimentation (Dering 1999; Leach et al. 1998; March et al. 2014). These works have provided specific data about what earth ovens were and how they functioned.

The generalized pattern of earth oven construction, best outlined by Black and Thoms (2014:208), has several stages. The first stage of earth oven construction was digging a pit. The pit size, shape, and location on the landscape varied with climate, topography, soils, and culture group. However, ethnographic accounts and archaeological remains suggest that most individual earth ovens ranged from half a meter

to several meters in diameter. The average of most individual features appears to have been 1 to 2 meters. Supporting examples will be presented throughout the next two chapters.

Within the pit a fire was built. The amount of wood needed for this fire varied with wood type, topographic setting, depth of pit, humidity, air flow, and amount of food being prepared (Pennington 1963; March et al. 2014). Often the rocks used as heating elements in the oven were placed amongst the wood prior to firing (Black and Thoms 2014:209). The type of rocks chosen for use as heating elements in earth ovens depended on locally present sources. Most types of rock had sufficient thermal mass to allow them to function as heating elements. Some rocks were composed in such a way, however, as to make them unreliable as heating elements. In addition to type, specific sizes of rocks were used in earth oven construction. Small rocks were generally not chosen as their surface area to volume ratio made them inefficient thermal reservoirs. Larger rocks were more desirable from a thermodynamic standpoint. The need to manipulate the rocks once heated, however, meant that there was an upper limit to the weight of rocks used in earth ovens.

The rock, once selected and gathered for use in the earth oven, were either placed into the pit along with the fuel and then ignited, or placed amongst hot coals after ignition. Whether placed in the fire before or after ignition, the stones would be arranged in such a way as to provide a uniform surface upon which cooking could take place. The surface could be flat, bowl, or basin shaped. The arrangement of rocks was often done with sticks or wooden tongs.

A layer of packing material would be placed on top of this hot rock surface (Black and Thoms 2014:217). The material acted as an insulator to protect the food being burned from the direct heat of the stones. The material needed to be moist enough to prevent burning of the vegetative material itself and the food being cooked. This moisture was also essential for the process of hydrolysis, which will be explained below.

The food was the next element placed in the pit. Certain types of food were cooked in earth ovens, specifically plant foods high in complex carbohydrates (Thoms 2008). These foods necessitated long cooking times in order to break down the complex molecules through the process of hydrolysis. Wandsnider described this as the “process by which complex molecules are cleaved into smaller molecules through the uptake of a water molecule” (1997:4). Two types of plants common in the study area, agave and sotol, contain complex carbohydrates and were known to be processed in earth ovens (Black and Thoms 2014; Wandsnider 1997).

Once the food had been placed within the pit atop the layer of packing material, another layer of packing material was placed atop the food. The upper and lower packing material protected the food from excessive heat by creating a moist environment in which water content inhibited burning. The entire construction was then topped with sediment. Depending on the shape and depth of the pit, this topping or “capping” would take different forms. The most common, however, would involve the piling up of sediment removed during construction of the pit on top of the earth oven components in such a way as to cover them and prevent excessive heat loss. As noted in numerous cases of experimentation (Black and Thoms 2014; Dering 1999; March et al. 2014) more sediment is needed to properly insulate an earth oven than is produced by excavation of

the pit. Therefore sediment was often borrowed from “borrow pits” adjacent to the earth oven.

A simplified, theoretical model of the above described oven is presented in Figure 2.1. This is the basic earth oven, and functions as a theoretical type by which elements of the archaeological record are evaluated. Specifically, what elements of the earth oven are present in the archaeological record, and how can an evaluation of that evidence allow inferences to be made about human behavior.

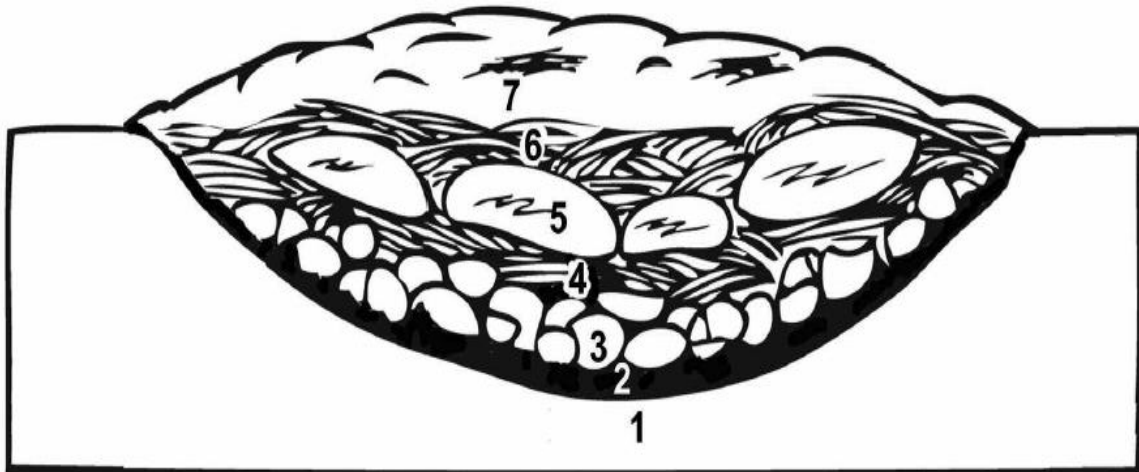


Figure 2.1. Model of earth oven construction. Layer (1) oven pit; (2) fire/charcoal; (3) hot rocks; (4) layer of packing material; (5) food; (6) layer of packing material; (7) sediment cap (Black and Thoms 2014:205).

Ethnographic Context

Human behavioral variation associated with earth ovens and hot rock cooking has been documented around the world (Wandsnider 1997). Of particular interest here are the types encountered throughout North America, specifically the cooking of sotol and agave in the desert Southwest and northern Mexico.

Wandsnider wrote that “ethnographic accounts of cooking indicate that traditional populations relied on pit-hearth cooking especially to alter the composition of foods high in either lipids or complex carbohydrates” (Wandsnider 1997:1). This is the main distinction that appears in the ethnographic record that has significant importance for the interpretation of archaeological evidence. Earth oven cooking was practiced in two ways to cook two different types of food. One type was high in lipids, and included large game meat. The other type contained complex carbohydrates.

There are several documented instances of the cooking of complex carbohydrates in earth ovens from North America. One is the account of Cabeza de Vaca. It highlighted one group’s food supply as being “principally roots of two or three kinds” that “take two days to roast” (Thoms 2008:127). Thoms also recounted ethnographies from the Pacific Northwest that documented the cooking of Indian potato in earth ovens containing cook-stones (Pokotylo and Froese 1983; Smith 1984; Turner 1978). In a statement by Alonso de Leon, a Spanish governor of Nuevo Leon, Mexico, speaking of his indigenous subjects during the mid sixteenth century: “the general food they eat in the winter time is the one they call mescale...it is made from the heart and fleshy leaves of the lechuguilla...their method is to barbecue it” (Duaine 1971:29). The governor also mentioned that this process would take “two days and three nights”. In these cases it has been inferred that earth ovens containing rocks were used to cook carbohydrate rich roots or bulbs (Thoms 2008). These inferences have been supported by the work of anthropologists (Bennett and Zingg 1935; Castetter et al. 1938; Lumholtz 1902; Pennington 1963; Zingg 1940) who have studied the cooking behaviors of indigenous groups throughout the deserts of the American Southwest and Northern Mexico.

One of these was an ethnographic account of agave cooking in Northern Mexico by the Tarahumara, a “semiagricultural” group from Chihuahua (Pennington 1963). It was noted that the Tarahumara made “far greater use of wild plants within their environment than was suspected” (i). The descriptions of their methods of agave cooking reflect the variation involved in the different aspects of this behavior:

“...[T]he hearts of certain species of Agave are eaten throughout the year, particularly when corn is scarce and during festival periods. To a lesser extent, baked or roasted leaves of these plants serve as food” (Pennington 1963:129).

“Mature hearts are baked in a covered or open earth oven... A circular pit, about three or four feet in diameter and of equal depth, is dug to bake the mature hearts. Such a pit is commonly located near a dwelling. Since the agaves are rarely found near Tarahumar habitations, great effort is required to transport to the pit the larger hearts, some of which are twelve to fifteen inches in diameter and very heavy. Transportation is not a problem upon canyon slopes, because the Indians usually roll plants down them from higher elevations. The coarse and heavy leaves are hacked from the heart with a machete or sharp rock, and the exposed heart is pried from the ground with a huge forked pole and rolled down the slope to the cooking pit... The baking pit is lined with stones upon which a fire is built of some slow burning wood, commonly oak, except where oak trees are scarce because many have already been cut for building or fuel purposes. When the stones are very hot and the fire has burned out, the pit is lined with either a layer of grass, small leaves of any species of Agave, pine needles, or the leaves of *seréke*. Which species is used for lining depends upon availability of the plants. In western canyons and upon middle portions of canyon slopes, stalks of *čawé* or *napisora* are laid crosswise upon the layer of material that covers the stones. Branches of these tall cacti are easily broken off when the central part of the plant dies, although there is some difficulty in transporting spiny branches up or down slopes of the canyons. The mescal hearts are arranged upon these branches and covered with a thick layer of pine needles or grass. When the large cacti branches are not available, as in the Eastern Tarahumar country, the hearts are placed directly upon the stones in the pit and then covered with pine needles or grass until the pit resembles an earth mound. The length of the baking period depends upon the size and age of the hearts. Small immature hearts bake within twenty four

hours; the more mature, larger hearts require several days of baking, sometimes four or five” (Pennington 1963:129-13).

“The baked and boiled hearts and the roasted leaves contain much fibrous material that cannot be digested. Therefore, slices of the heart or skinned roasted leaves are chewed until the digestible portion is separated from the fibrous matter which is spit out; or, baked hearts or leaves are pounded up a flat rock with a wooden mallet until the fibrous material is easily separated from the meat by hand. The edible portions may be eaten immediately, with ... atole gruels, or it may be shaped into small cakes that are dried and stored, and soaked before they are eaten. Occasionally, slices of baked hearts are dried for several hours and stored. When desired as food they are soaked and boiled for several hours and then mashed until the fibrous material is easily removed... There is no doubt about the great antiquity of agave food among the Tarahumar; chewed fibrous material found in caves anciently inhabited by the Indians has been identified as being from a species of Agave” (Pennington 1963:130-131).

A parsing of this account reveals much about the particulars of earth oven cooking as it was done throughout northern Mexico and the American Southwest and the types of evidence that might be found in the archaeological record: “a circular pit, about three or four feet in diameter and of equal depth”, “the baking pit is lined with stones”, “when the stones are very hot and the fire has burned out, the pit is lined with... a layer of grass”, “the hearts are placed... in the pit and then covered with pine needles or grass until the pit resembles an earth mound”. As discussed in Black and Thoms (2014) the pit and rocks form the primary elements of earth ovens found in the archaeological record. Secondary elements include packing material that might or might not be preserved within the pit, charcoal, and refuse deposited into features after use. The parameters of the earth ovens given by Pennington seem a bit small (3-4 feet diameter) but nevertheless fit into the lower size range estimated for earth oven features.

The work of Pennington was just one of those cited by Wandsnider in her 1997 work introduced above. Her evaluation of pit cooking presented much of the relevant ethnographic data that documented the pit baking of different types of food from all over the world. She noted that earth ovens were most commonly used to cook plant foods (77.3 %), thus supporting my assumption that burned rock features most likely represent the remains of earth ovens used to cook plants. Like Pennington, Wandsnider noted specific behavioral components associated with the earth oven cooking of agave and sotol:

“The window of maximum opportunity for harvesting camas or agave or other similar plants at any one locale, thus, was likely on the order of several weeks... groups that especially depended on camas and agave, for example, kept a close watch on those plants and the harvesting and processing of the plant parts was under the strict direction of a specialist... Isabel Kelly observed southern Great Basin families harvesting agave hearts at increasing elevations throughout the spring as agaves in turn sent up their flower stalks... very long cooking times are ethnographically documented for the treatment of camas, sotol, agave, and other plants...indeed, in 61 of 72 reports of pit-processing of known inulin- bearing foods, the presence of a rock element was mentioned...detailed accounts of agave, camas, and sotol processing speak of baking the product for several days, removing it from the pit, and kneading the hydrolyzed product into cakes or loaves. These were either sun-dried or further baked, to reduce water content (and its availability to microorganisms) and, therefore, the possibility of spoilage. The final product, whether camas or agave, had the consistency of plug tobacco, was easy to transport, and preserved well if kept dry” (Wandsnider 1997:23-24).

Perhaps the most relevant ethnographic compilation, however, was a study of agave cooking in the American Southwest by Castetter et al. (1938). The distributions of different types of agave and other plants that might have been cooked alongside agave

was presented with corresponding accounts of indigenous cooking behaviors. The Lower Pecos area was briefly discussed:

“...[L]echuguilla is very common on most of the limestone highlands of southwestern Texas... the distribution of the species began west of the Devil’s River (about meridian 101) and occupied most of the limestone highlands of southwestern Texas in very dense patches” (Castetter et al. 1938:23).

“...[I]n the sotol country of Texas *A. lechuguilla* rivals sotol in the actual extent of territory covered, and in the Langtry district it occupies the lower round-topped points and ridges where the stony debris is coarser and the conditions more arid than where sotol prevails” (Castetter et al. 1938:23).

“...[T]he use of *A. lechuguilla*, *Agave sp.*, and sotol as food by all the groups of west Texas is well established, but the occupation of this area in early times by large numbers of Apache suggest that the name of the most prominent tribe of the group be applied to this sotol pit culture-the Lipan... the distribution of the late food-gathering groups... indicate that the Lipan phase in Texas, centering in the Big Bend country and to the north, as well as the Pecos River, Big Bend cave dwellers, Jumano, and El Paso phases, extensively made use of sotol pits and of sotol. The Lipan also utilized *A. lechuguilla* and *Agave sp.* as food, and in culture these Lipan were like the other sotol users in the western part of the state. The occurrence of sotol pits among these groups does not mean that they were used only for sotol; they doubtless were used for agave as well. Sotol pits or mounds are commonly found throughout that part of the Trans-Pecos Texas where sotol is indigenous” (Castetter et al. 1938:36).

Descriptions of behaviors associated with agave cooking by Castetter et al. were similar to those later provided by Pennington but encompassed a wider variety of groups. The most relevant description was of Mescalero Apache cooking methods:

“The crowns of the mescal plants were dug out with three-foot sticks cut from oak branches and flattened at the end. This end, when pounded with a rock into the stem of the plant just below the crown, permitted the crown to be removed readily. A broad stone knife was used to chop off the leaves, two being left for tying the crowns together, thus

making transportation more convenient. The naked crowns were bulbous, white in color, and from one to two feet in circumference” (Castetter et al. 1938:28).

“Pits in which crowns were baked were about ten to twelve feet in diameter and three to four feet deep, lined with large flat rocks. On the largest rock, which was placed in the center, a cross was made with black ashes. Rocks were piled on the flat stones, but care was always taken that the top should be level. Upon this, oak and juniper wood was placed, and before the sun came up was set on fire. By noon the fire had died down, and on these hot stones was laid moist grass, such as bunchgrass (etc.) but bear grass was usually preferred since it did not burn readily. The largest mescal crown was selected and a cross made on it with the tule or cat-tail pollen, when this was available, the pollen always being placed on the crown from the east to west and from north to south. The Indians then prayed. Extending the large crown toward the opening of the pit four times, they tossed it in and threw the other crowns after it. Next the youngest child present stood as the east of the pit and threw four stones into it. It should be made clear that this little ceremony, held at the time of baking, varied among different family groups and the above description should be regarded as one of a type rather than a fixed performance. After the mescal had been covered with the long leaves of bear grass and the whole with earth to a depth sufficient to prevent steam from escaping, the crowns were allowed to bake the rest of the day and all night. Early in the morning the pit was opened and a crown examined and eaten. The pit was again closed and the Indians refrained from drinking until noon of this day so as to prevent rain. The following morning all the mescal was removed” (Castetter et al. 1938:28-29).

“The above was the rather standard method of pit-baking mescal among the Apache, particularly the Mescalero and Chiricahua, but there were many deviations” (Castetter et al. 1938:31).

By evaluating ethnographic and historical accounts and analyses of broader patterns of earth oven cooking, inferences can be made about past behaviors associated with agave and sotol cooking in the Lower Pecos Canyonlands. Earth ovens with rocks were most likely built to cook plants. Therefore the burned rock features encountered on the canyon edge around Eagle Nest Canyon most likely represent the remaining heating

elements of earth ovens used to cook agave or sotol. In addition, their position on the canyon edge represents a specific behavior that reflects the position of resources (agave, wood, etc.) and habitation sites, often assumed to be rockshelters within canyons, although habitation patterns in the Late Prehistoric have been noted as being more common on elevated areas near waterways (Turpin 2004).

CHAPTER 3: THE ARCHAEOLOGICAL STUDY OF BURNED ROCK FEATURES IN THE LOWER PECOS CANYONLANDS

The remains of earth ovens are common archaeological features and are widely recognized as valuable sources of archaeological data (Black et al. 1997; Black and Thoms 2014; Cambell 2012). The purpose of the archaeological study of burned rocks and burned rock features has been to provide a context and deeper meaning for this basic evidence of prehistoric activity.

Fire features associated with human behavior have been recognized at sites throughout the world (March et al. 2014). They generally manifest as sediment stains caused by exposure to high temperatures (Mentzer 2012). Some fire features contained rocks. However, the use of rocks as heating elements in earth oven first appeared in the Old World only 30,000 years ago, long after the initial use of fire by humans (Thoms 2012). The most common type of evidence associated with earth oven cooking, Concentrations of FCR, are diagnostic components of the archaeological record associated with the development of earth oven cooking.

In North America, evidence of earth ovens first appears around 10,000 years ago (Black and Thoms 2014:204). Use of these features increased dramatically throughout the Holocene. In the Lower Pecos region in particular, the Middle Archaic saw an increase in reliance on earth oven cooking by the indigenous inhabitants of the area (Dering 1999; Turpin 2004). This coincided with shifting settlement and demographic patterns, and has been argued by Brown (1991), Dering (1999), Thoms (2008) and others to indicate land-use intensification along lines discussed by Binford (2001). The general

argument behind this is that resource stress, either from growing population or environmental change, caused humans living in the area to develop behavioral subsistence strategies that allow them to access a greater variety of food resources. One such strategy was an increased use of earth ovens to process otherwise inedible plants, such as sotol and lechuguilla. This behavioral shift resulted in the massive accumulation of burned rocks found at midden and rockshelter sites throughout the area.

The few detailed studies of burned rock features in the Lower Pecos have attempted to provide the data for such inferences to be made about prehistoric lifeways. A brief history of the study of burned rock features in the Lower Pecos and neighboring regions will now be presented in order to outline the methods utilized in this project and presented in chapter 4.

Basic Descriptions

Much of the early documentation of burned rock features in the Lower Pecos was simple description. Few inferences were made about the function of fire features. For example, in his 1964 work at the Devil's Mouth site, LeRoy Johnson, Jr. described a number of features that fit the general description of burned rock concentrations produced by earth oven cooking. One was a "large pit...measured approximately 3.5 feet in diameter and 2.5 feet in depth, and it contained dark gray soil in which were many small pieces of fire-cracked limestone" (Johnson 1964:27). The others were "small, basin-shaped hearths" that "averaged four or five feet in diameter and were about six inches deep...composed of charcoal, burned rock, and other debris". However Johnson

refrained from making any serious guess as to the function of these features: “the use to which this feature was put remains a problem”.

In contrast to these remains which were clearly produced by earth oven cooking, as evidenced by the inclusion of rocks and feature size, were several smaller hearths documented at Baker Cave. These were “round or ovoid in outline, shallow, and bowl like in cross section...varied from 12.5 inches to 26.0 inches on the long axis and from 15.0 inches to 25.0 inches on the short axis...averaged 5.5 inches in depth...contained heavy concentrations of charcoal, and none was lined by rock” (Word and Douglas 1970:15).

From these two contrasting descriptions we can see that even though these archaeologists did not attempt to identify any purpose or strategy associated with these features, their descriptions are detailed enough to allow inferences to be made as to their use. Specifically in these two cases, there is a distinct difference in the size of the features (1 to 2 meters for earth oven features as opposed to less than one meter for simple fire features) and composition (those with rocks as compared to those without rocks).

A more recent description of an intact earth oven feature was that of Feature 3 from the Lost Midden Site. Roberts et al. described the feature as “a concentration of fire cracked limestone rocks that likely represents a rock-lined baking pit...oval in shape, it measures 1.4 m north-south by 1.04 m east-west...all boundaries were well defined and were delineated by semi-vertical alignments of burned tabular limestone measuring ≤ 24 cm, while the interior of the feature was composed of both tabular and nodular limestone

rocks measuring ≤ 24 cm...its cross section is approximately 16 cm thick along its edges and approximately 24 cm thicker near the center of the basin” (Roberts et al. 2011:92).

The simple descriptions of the remains of earth ovens as they appear as in the archaeological record include: “ovoid” or generally round concentrations of thermally altered rocks, one to two meters in diameter, with a vertical dimension depending on sediment depth but generally 40 cm or less, stained sediment in ovoid patterns radiating from the earth oven heating elements (burned rocks), large chunks of charcoal beneath rocks indicative of smothering, and other charred plant remains such as sotol and lechuguilla that might have been cooked or used as lining in the features (although these last are uncommon).

Photographic Documentation

The quickest way to gain familiarity with the archaeological remains of earth ovens is to look at photographs of burned rock concentrations that once formed the heating elements of these ovens. Figure 3.1 is a photograph of Feature 4 from Arenosa Shelter. It appears to be roughly 16 inches in diameter (around 40 cm) and consists of around 10 rocks arranged in a basin shape. This is a diagnostic configuration characteristic of an earth oven’s central pit. As earth ovens were generally round or ovoid and basin shaped, their configuration tended to be deeper at the center than around the periphery of the feature. Therefore rocks aligned in the center of the feature often formed this characteristic basin shape. Black identified these types of features as “primary structural elements” that marked “original functional contexts (i.e. cooking facilities)” (1997:83).

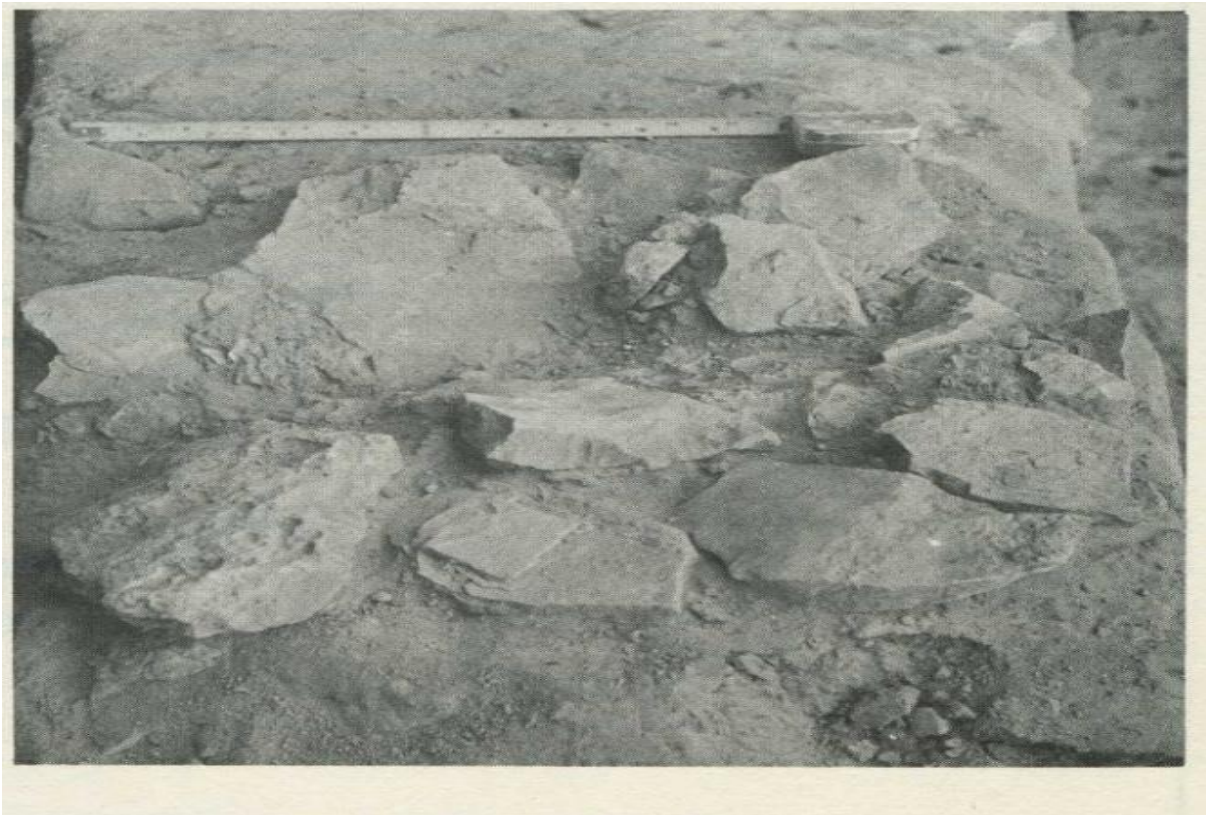


Figure 3.1. Feature 4 from Arenosa Shelter (Dibble 1967:25)

Another photograph that clearly shows the central depression and peripheral heating elements of an earth oven is presented in Figure 3.2. This is Feature 3, from the Lost Midden Site, whose description by Roberts et al. (2011) was given above. The feature as seen was roughly 140 cm in diameter, putting it within the range commonly associated with earth oven features used to cook sotol, lechuguilla, and other roots and bulbs. The central depression is visible at the northwest corner of the feature. The peripheral rock elements are slanted towards this central depression. The rock faces, though slanted, generally face upwards as if to form a reflective surface. The rocks themselves are closely wedged together. Judging from experiments and personal observations, this was most likely due to the combination of intentional rock placement during earth oven construction and the pattern of “settling” experienced by earth oven

components during and after use. The term “settling” is meant to describe the process whereby organic material in the oven burns out and the earth oven itself cools, is excavated and emptied of food, and finally shifted and compacted into a concentration of burned rock, ash, and charcoal representing a used earth oven feature. Much of this settling process is not immediate, and decades or even centuries go by before organic material buried in some features decomposes, resulting in additional “settling”. It should also be noted that this process is incredibly complicated and encompasses almost all aspects of site formation processes that might affect an earth oven feature. Nevertheless, earth oven features appear to “settle” in similar patterns.



Figure 3.2. Feature 3 from the Lost Midden Site 41VV1991 (Roberts et al. 2011:93).

The documentation of burned rock features in the Lower Pecos Canyonlands was taken in a different direction by John Campbell in his 2012 thesis. He used pole aerial photography (PAP) to document seven burned rock features and record “feature parameters, the spatial distribution of burned rock, and individual weights of burned rocks” (Campbell 2012:xiii). This was done in order to “interpret the role of feature weight and the degree of burned rock fragmentation in measuring frequency of use of earth ovens as well as the extent of intensification of the plants cooked in these features”. This approach emphasized the possible role of photography in the documentation *and* analysis of burned rock features.

Campbell’s method first involved a clearing of vegetation from the feature’s surface in order to delineate its extent. After this was done and the area of investigation defined, a grid made up of “control points” was positioned in a square pattern across the feature’s surface. The PAP used two digital cameras positioned on a crosspiece at the end of an extendible pole and elevated above the feature to take photographs of the feature simultaneously from multiple angles. Photos taken by these multiple cameras were then pieced together by a computer program specially designed for the project. Finally, by referencing the spatial data provided by the grid control points, Campbell was able to create a computer model of the feature that could be measured. By combining this method with his work calculating the average volume of Lower Pecos limestone, Campbell was able to estimate feature weight and density based on the computer models.

Photography remains one of the most important documentary techniques archaeologists have to record evidence of earth oven cooking. As noted in Campbell’s thesis, however, the goal of photography has expanded from simple documentation to

analysis, specifically the delineation of “feature parameters, the spatial distribution of burned rock, and individual weights of burned rocks” (2012:xiii). It is these types of data that form the core of most analyses concerning earth oven features, and a discussion of how these data types have been analyzed will now be presented in order to clarify the methods of analysis used for my project.

Burned Rock Measurements and Counts

The development of burned rock analysis that focused on quantifiable data from the features themselves, such as burned rock weight and volume was pioneered by several archaeologists. Notable were efforts by Black (1985, 1997), Dering (1999), and Leach et al. (1998).

In an attempt to analyze and understand burned rock evidence found at the Panther Springs Creek site, Black (1985) weighed samples of burned rock from several BRMs in order to calculate the overall volume and weight of burned rocks in the features. This involved a number of assumptions and estimations as to the extent of the feature in unexcavated areas. By calculating the entire weight and volume of rock in the feature Black was able to apply a quantitative value to the archaeological evidence at the site. The overall volume of a BRM could be compared to other BRMs in order to compare the scale of activity at different locations. And although Black did not link the Panther Springs Creek site’s BRMs to earth oven cooking, the quantification of burned rock features through the weighing of burned rock samples is the foundation of most subsequent analyses of burned rock accumulations.

Several archaeologists have proposed slightly different weight averages for an individual earth oven feature. Black, in his 1997 work at the Honey Creek site, proposed an average between 150 and 200 kg. In his 1999 work, Dering hypothesized 250 kg. And in their experiments with earth ovens, Leach et al. (1998) used 91 kg of rock. It should be noted that despite these discrepancies, a general range of burned rock weight per feature is thought to be 100 to 250 kg. And although this range is great enough to dramatically influence any conclusions made about burned rock accumulation rates, it is perhaps a more accurate reflection of variation found within individual burned rock features, as indicated by the ethnographic accounts cited in Chapter 2, than a simple average or midpoint.

A concern when investigating burned rock accumulations, however, is the presence of fragmented and discarded rocks. Clearly, as discussed in Chapter 2, large rocks were preferred for earth ovens but often cracked and were discarded during feature use and reuse. Several archaeologists have attempted to quantify fragmentation rates and identify the size range of rocks preferred for use in earth ovens (Black 1997; Black and Lucas 1998; Campbell 2012). The conclusions of these works collectively pointed to a tiered system of rock use that favored larger rocks. The more fragmented a rock, the less likely it was to be associated with a primary structural element preserved in the archaeological record. Smaller rocks are more characteristic of discard zones at the periphery of earth oven facilities.

The theoretical paradigm that looks at burned rocks as valuable sources of quantifiable data, developed by the archaeologists mentioned above, was stated succinctly by Campbell. He wrote that three questions developed by earlier researchers,

specifically Black and Lucas, now form the foundation by which burned rocks should be evaluated. First was “how does the patterning of rocks relate to either the cultural or environmental formation processes of the feature during and subsequent to its use?” (Campbell 2012:35-36). In other words, how does the morphology of burned rock features relate to specific behaviors associated with their construction and use as opposed to various other site formation processes that might have impacted their current manifestation? Second, Campbell asked “can the total weight of the burned rock within the feature be used to address the frequency of use of the feature?” (36) In other words, can archaeologists not only quantify burned rock features in their entirety, but also identify, through experimentation and field research, an average earth oven size and rock fragmentation rate that would allow for inferences to be made about burned rock midden accumulation through time? Finally, Campbell queried “how does the distribution of the burned rocks by weight reflect the degree of fragmentation with regard to the frequency of use of the feature.” In other words, is there a direct correlation between feature reuse and rock heating element fragmentation rates?

Botanical Remains

Botanical remains are among the most valuable types of data that can be recovered from earth ovens. When preserved and identified, they allow archaeologists to infer what types of wood were used as fuel, what types of plants were used as packing material, and what foods were cooked. When radiocarbon dated, charred botanical remains allow archaeologists to identify when features were built and possibly reused over time.

In the Lower Pecos Canyonlands, dry conditions have preserved one of the richest assemblages of ancient botanical remains in the world. Dering wrote that “analysis of biological remains preserved in midden deposits and rockshelters rich in desiccated organic material” has been an essential component in the development of “reconstructions of paleoenvironment and diet” in the Lower Pecos region (1999:661). Specifically “studies of midden deposits and coprolites have documented a broad-spectrum diet which most investigators argue was dominated by xerophytic plants lechuguilla, sotol, and prickly pear.” Therefore archaeologists have inferred that the indigenous inhabitants of the Lower Pecos were cooking and eating these plants due to specific evidence found in coprolites and cooking features.

The remains of cooking features are inherently composed of a variety of material, and contamination of the feature by various processes might result in the introduction of foreign substances such as unrelated refuse. Therefore evidence found in burned rock features has been compared not only with coprolite evidence, but also with experimental cooking features in order to further clarify what components were directly related to earth oven cooking and how earth oven cooking worked as a subsistence strategy (Dering 1999; March et al. 2014). The basic premise behind such experimentation is that archaeological features should contain assemblages of charcoal, burned rock, and other plant remains that are similar to experimental models. These experimental models are constructed in such a way as to accurately reflect what the archaeologist believes the feature to have been: a specific type and weight of rock, wood, and botanical components.

In his 1999 work, Dering compared the botanical remains from five experimental earth ovens with those found in two earth oven features excavated at Hinds Cave. The experimental earth ovens were constructed in order to establish “estimates for the food calories yielded by earth ovens, and for the rock and plant waste generated by earth ovens” (Dering 1999:661). This experimental population of plant waste was then compared with the botanical remains recovered from the earth oven features from Hinds Cave. Dering concluded that “the rich plant assemblage of the oven feature indicates mixing of adjacent deposits which is typical of earth-oven reuse.” In other words, the broad spectrum of plant remains found in earth oven features in Baker Cave was most likely due to post-depositional rather than cultural processes. Dering concluded this because the experimental features did not contain such a variety of botanical remains, and supported this conclusion by citing other archaeologists who have noted mixing in burned rock feature deposits due to feature reuse (Black 1997; Dering 1997).

Gasser offered a completely different interpretation of similar botanical evidence found in three burned rock features from the the Adobe Dam site in Arizona. One of these, Feature 43, “was about 90 cm in diameter and 25 cm deep...lined with about 50 fire-cracked and burned rocks” and “has all of the generally accepted physical attributes of a roasting pit” (Gasser 1982:172). Using the process of flotation Gasser was able to recover: 27 saguaro (*Carnegiea gigantea*) seeds, 19 mistletoe (*Phoradendron californicum*) fruits, 12 mistletoe stem fragments, a corn (*Zea mays*) cupule, a *Cheno-am* (cf. *Chenopodium*) seed, and a mustard (*Cruciferae*) seed. Corn and Cholla pollen were also found in the sample.

The variety of plant remains found in this feature led Gasser to conclude that “this evidence indicates that three outdoor features which could be interpreted as roasting pits for plant foods may have never actually functioned in that capacity” (174). Rather the evidence indicated that “saguaro, mistletoe, cholla, corn, Cheno-ams, and mustards were prepared over the fire...the rocks in the pits may have been used to retain heat and stabilize the vessel.” This statement implies that a ceramic vessel was placed over the feature and rocks within the feature might have been simply to hold the vessel in place. The fire feature might also have functioned as a refuse dump after its use.

Gasser was not arguing that all previous interpretations of burned rock features were wrong. Rather he was cautioning against “the fallacy of attributing a function to an archaeological pit feature prior to the analysis of the varied contents of that feature” (174). Perhaps the most important of these contents, as indicated by the two studies discussed above, are the botanical remains. That is why I focused on the recovery of botanical remains from burned rock features: in order to evaluate feature use in other ways than assumption based on feature size and morphology.

Locations on the Landscape

One of the assumptions of this study is that different parts of the landscape were used by prehistoric peoples in different ways. Behavior was a response to the different environmental conditions found in different geographic zones. In the Lower Pecos Canyonlands, several distinct zones are apparent (canyon, canyon edge, uplands). This is mostly due to topographic differences, but wind, sunlight, vegetation, and sediment also

dramatically influence which behaviors were most appropriate and applicable for different areas from the adaptive standpoint of a hunter-gatherer.

An earlier work that directly addressed the strategic placement of smaller earth oven features on the landscape in the Lower Pecos, and indeed can be considered a direct antecedent to this project, was a report by Kenneth Brown, Elton Prewitt, and David Dibble (1976) on survey and testing in Sanderson Canyon on the northeast periphery of the Lower Pecos Canyonlands. In it they documented a number of “hearth fields” or sites consisting of numerous small burned rock features. Site 41TE61, Area B, for example, consisted of “a cluster of 15 aboriginal hearths” which covered “an area about 120 x 140 m” (Brown et al. 1976:3). Some of the hearths were “located to the east along the margin of the arroyo.”

Brown et al. recommended the study of these features because they appeared “to be well enough preserved to provide some information about hearth construction and, possibly, function as well as age (if charcoal is present.)” They themselves prepared a “brief description and sketch of each hearth” and “sectioned” one to “determine whether it was intact.” More importantly, however, was their theoretical approach to the study of these features and their placement on the landscape.

They started by asserting that the “hearth features”, which judging by the descriptions appear to be the remains of earth ovens, were “not randomly distributed over the landscape” (Brown et al. 1976:16). Rather, the 47 burned rock features identified during the survey were found “along the edge of the floodplain at the break in slope with the present floodplain.” They hypothesized that this transitional zone could have been

chosen for two reasons: its relative position to water or its relative position to “some other critical resource of the arroyo margin habitat, such as firewood.” A third hypothesis they offered considered the unique formation processes present in such a transitional zone: that “hearth distribution is a function of recent erosion at the edge of the terrace.” In this case, features were constructed at other locations on the landscape, but were only exposed at the surface in eroded areas along the terrace edge.

Brown et al. concluded that the placement of burned rock features in the area around Sanderson Canyon “is probably an indicator of the location of natural resources that were critical to the prehistoric populations” such as water and “plant communities” (1976:17).

Models of landscape use were subsequently developed that emphasized these elements of site distribution: proximity to water, plant foods and fuel resources, and unique geographic localities at which features might be preserved and/or exposed at the surface. Koenig wrote that all LPC models of Archaic landscape use emphasized “earth ovens and exploitation of desert plants” because this was the time period in which “people shifted from big game hunting to a broad spectrum diet, including the processing (of) lechuguilla, sotol, prickly pear, and onion in earth ovens” (Koenig 2012:35). Deposits of burned rock dating to the Archaic, found in greatest volumes at rock shelter and midden sites along waterways, have been analyzed as quantitative representations of landscape use through time (Brown 1991; Dering 1999; Marmaduke 1978; Shafer 1976; Taylor 1964).

Koenig (2012) outlined two models of prehistoric mobility patterns in the Lower Pecos. The first model focused on water as the primary resource affecting mobility in the Lower Pecos Canyonlands. Indigenous inhabitants were “semi-nomadic” and “tethered” to water resources. This would explain the increase in evidence of earth oven cooking along waterways during the increasingly arid Middle Archaic time period. The second model emphasized nomadism and a cost-benefit analysis of subsistence strategies such as the earth oven cooking of desert succulents. In this case mobility was determined by resources other than water, specifically wood and stands of sotol and lechuguilla. These resources would be depleted rather quickly, given the slow growth of most vegetation across the region, and would have provided only minimal caloric return on any investment of time and energy to their processing (Dering 1999). Therefore mobility was a more complex behavioral question that considered plant resource concentration, growth patterns, and caloric yield in addition to the simple proximity of resources commonly found near water, such as wood (Brown 1991).

All of these models of landscape use emphasized the location of resources needed for earth oven cooking as important types of data. The location of stands of sotol, lechuguilla, prickly pear cactus, wood, rocks, sediment, water and even wind and sun direction were all factors that might have influenced behaviors related to earth oven cooking in the Lower Pecos Canyonlands. The general observations and assertions made in this thesis are based on data such as the types of wood, plants, rocks, and locations on the landscape that were chosen for earth oven construction. In such a way I hoped to contribute to models of landscape use and to continue the theoretical paradigm of study

applied in the Lower Pecos Canyonlands that emphasizes burned rock features and their components as valuable types of archaeological data.

Previous Studies of Burned Rock Features: 41VV890

All but one of the previously recorded burned rock features located on the canyon edge around Eagle Nest Canyon were located at 41VV890. This site, known as the Torres Ranch House after one of the earliest settlers in the area, is a multi-component site on the downstream western edge of the canyon. As occupation at the site has been almost continuous since the prehistoric period, evidence consists of modern, historic, and prehistoric material remains. Modern settlement, goat ranching and resulting erosion of the area due to vegetation loss has impacted most of the site's deposits. This relatively eroded and disturbed appearance of the area resulted in the earliest documentation of the site being limited to the most obvious historic structures (Turpin and Eling 1992).

These historic structures were investigated again in 1993 by the Iraan Archeological Society under the direction of James Collett. Excavations within the main, rectangular structure uncovered a possible Perdiz point beneath a stone structural component. In addition to this, a number of lithic flakes were recovered from the excavation units. These findings demonstrated "that the site manifested a prehistoric Native American component" (Davis and Skiles 1999:55). The site was argued to have a relatively high research potential due to "apparently intact subsurface archaeological deposits".

The burned rock features at the site were not documented until 1995, when a team from the Texas Historic Commission (THC) reinvestigated the site. They identified

“numerous prehistoric burned-rock features...scattered across the landscape along the canyon rim at 41VV890” (Davis and Skiles 1999:56). Twenty six rock features were documented and mapped using a total data station (TDS).

Two of the features identified during the THC survey were investigated during this study. The first of these was originally designated as Feature 1 (a and b) by Davis and Skiles (Figure 3.3). However, as noted by the THC crew, the feature had morphology indicative of “two overlapping hearths” (57). Davis went on to describe the feature as being 1.7 X 2.3 meters and “quasi-circular”. “The feature is predominantly intact” he argued, “with the majority of the rocks slightly to almost completely buried...in situ thermal fracturing of some rocks is evident...most rocks have been discolored by heat to a gray color, but some show a pinkish hue” (57). The feature (or features) was identified during the Canyon edge project as Feature 18. Portions of it were excavated (the results of which are presented in Chapter 5) thus expanding upon these initial conclusions about the feature.

A second feature identified by the THC and excavated during this study was designated Feature 24 (Figure 3.3). Davis described this feature as “a large, intact, burned limestone rock feature, with all rocks still more than 50 percent buried” measuring 1.35 by 1.20 meters (Davis and Skiles 1999:61). Of particular note was the inclusion of a “small-boulder-size, stream-rolled rhyolite stone in the center of the feature.” This feature was relabeled as feature 17 during the Canyon Edge Project, and excavated. Further comparisons between this project and earlier investigations at 41VV890 are presented in Chapter 6.

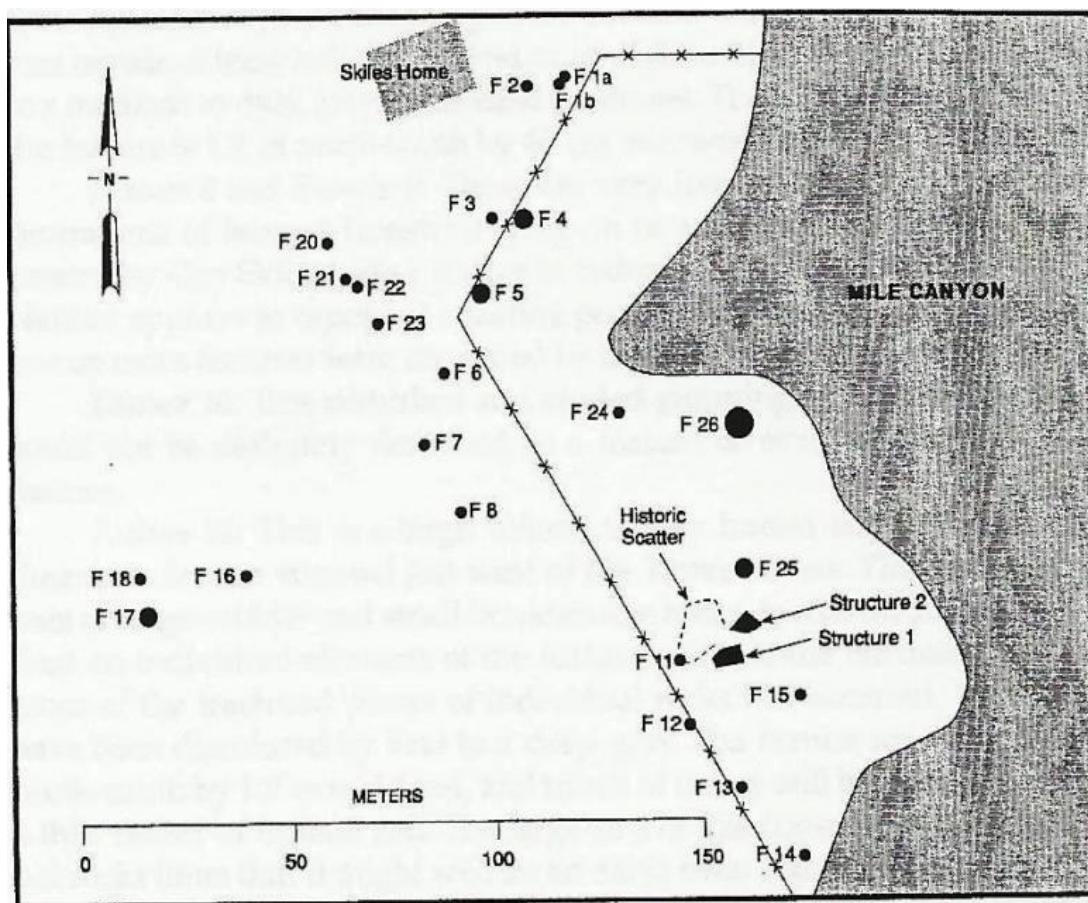


Figure 3.3. THC map of features at the Torres Ranch House site (41VV890) (Skiles and Davis 1999:55).

The archaeological methods outlined in this chapter (description, photography, analysis of burned rocks and botanical remains, and an evaluation of feature placement on the landscape), previously utilized to study the archaeological remains of earth oven features, are the same methods used during this project. The next chapter details these methods, how they were planned, how they were executed, and subsequent lab analysis of excavated materials.

CHAPTER 4: METHODS AND RESEARCH DESIGN

The goal of my research was to document and analyze evidence of prehistoric subsistence strategies, specifically earth oven cooking, and associated patterns of landscape use in the canyon edge zone surrounding Eagle Nest Canyon. Two primary methods were used to gather data: survey and excavation. The goal of the survey was to identify unrecorded sites and features and to further document previously identified sites in the canyon edge zone. Many of these loci represent activity areas associated with earth oven cooking. The goal of the excavations was to recover data that would allow inferences to be made concerning site or feature age, use, and preservation. Data gathered during the survey and excavation portions of the field work has contributed to a more comprehensive understanding of how the canyon edge was used by prehistoric people and to identify site formation processes that might impact our ability to make inferences from this data.

The methodology for the project was developed by referencing previous archaeological studies in the area, specifically surveys and excavations focusing on burned rock features. Also, as my thesis research was conducted under the auspices of the Ancient Southwest Texas Project (ASWT) of Texas State University, many of my methods were developed by previous and ongoing ASWT studies.

The methods used therefore involved background research on the project area, pedestrian survey, excavation of selected burned rock features, and laboratory analysis of excavated materials. In addition, three dimensional models of the features excavated

were produced in order to provide long term digital records of the excavations and their findings.

Background Research

Background research for this project was done during the fall of 2012 and spring of 2013. Primary consultations with the landowner, Jack Skiles, and Texas Archeological Research Laboratory (TARL) records provided data such as the boundaries of the project area, previously recorded sites, and information about unrecorded sites likely to contain burned rock features.

The boundary of the project area was defined by the extent of Jack Skiles property adjacent to Eagle Canyon in Langtry Texas (Figure 4.1). The entire area is 260.72 acres. A portion of the acreage is in the canyon itself and was not included in the survey. The upland area was therefore estimated to be roughly 200 acres, and was surveyed during the 2013 Texas State University field school.

Throughout the investigation Jack Skiles provided valuable first-hand knowledge concerning site 41VV890, or the Torres Ranch House site, which was the most significant previously recorded site in my study area. He also pointed out the location of an unrecorded site (41VV2167 or the Lone Star Bridge site) which was found to contain a number of burned rock features. The Lone Star Bridge site was recorded during the survey portion of the project and excavations were conducted at the site during the final stages of the project field work.

Previous surveys done on the canyon edge of Eagle Nest Canyon include those by Turpin and Eling (1992), the Iraan Archaeological Society (1993) and the Texas Historic

Commission (1995). An earlier field report by Taylor (1949) was also found that mentioned a brief excavation of a burned rock midden (41VV168) at the head of Eagle Nest Canyon.

Background research therefore involved consultations with the landowner, delineation of the project area, and an evaluation of previous studies done on the canyon edge in order to identify areas with high research potential and gaps in previous documentation.



Figure 4.1. Aerial image of Eagle Nest Canyon and canyon edge sites (clockwise from top left: the Lone Star Bridge site, the Langtry Midden site, 41VV2168, and the Torres Ranch House site).

Survey Methodology

In order to standardize survey methodology, the site definition and types used were those proposed by Dering in his inventory of regional surveys (Dering 2002:4.1).

He defined a site as “a discrete locality containing potentially interpretable cultural material” (Dering 2002:4.3). Interpretable cultural material includes artifacts, ecofacts, and features.

The survey involved a directed pedestrian inspection of the property. The entire area was divided into four sections of between 60 and 70 acres, and field school teams numbering from six to eight people walked transects across them (Figure 4.2). One day of survey was given to each section. Special attention was given to the previously recorded site of the Torres Ranch House (41VV890) and the newly identified Lone Star Bridge site (41VV2167).



Figure 4.2: Survey areas 1-4.

Sites and the artifacts and features found therein were recorded using a Magellan GPS (Mobile Mapper). A dropdown library of point types was developed for the project

using the Magellan Mapping software. GPS points were taken on individual artifacts, and site boundaries were recorded as lines around artifact concentrations. In addition, field notes were taken by this author, photos were taken of selected artifacts and site overviews, and sketch maps were drawn showing the general position of sites, artifacts, and major landforms. All of these records are on file at Texas State University.

The major goal of the survey, however, was to identify burned rock features with high research potential. In this regard specific attention was paid during the survey to identifying concentrations of burned rock that appeared to contain buried deposits. Specific components of burned rock features that might indicate this have been discussed in Chapter 3 and include partially buried rocks cracked in place, circular or semicircular configurations of burned rock, and darkened or stained sediment alongside burned rocks.

Excavation Methodology

Excavations for this project were done in two phases. The first involved a preliminary probing of several features to detect subsurface charcoal deposits. The second phase involved the excavation of seven features recorded during the survey in order to identify feature morphology, depth, and burned rock weight. In addition, charcoal and other burned plant remains were collected for identification and radiocarbon dating.

Probing

Several features were probed prior to selection for excavation in order to determine whether any charcoal was preserved beneath remaining heating elements. Three features were probed at site 41VV890: Features 7, 17, and 18 (Figure 4.2).

Features numbered one were probed at both 41VV2167 and 41VV2168. Charcoal was found in all of the features probed.

The first stage of probing was to thoroughly photograph the undisturbed feature as found. This was followed by a clearing of the vegetation from the surface of the feature with hand clippers and trowels in order to delineate the surface manifestation of the feature and to identify burned rocks that appeared to have not been moved since their initial burning. In situ thermal fracturing is characteristic of intact thermal features, and will be referred to as “cracked in place.”



Figure 4.3. Author probing Feature 7 at the Torres Ranch House site (41VV890).

At each of the probed features a relatively large thermally altered rock was chosen that appeared to be “cracked in place” and positioned near the center of a concentrations of burned rocks. These rocks or portions of these rocks were carefully removed and the

sediment beneath them investigated visually for charcoal. After this inspection, the rocks were carefully replaced to preserve the original surface manifestation of the features. The entire process of probing was documented photographically and will be presented in the Chapter 5.

Excavation

Excavations were done during the 2013 Texas State Archaeological Field School and during three subsequent field sessions in 2013 and 2014. Specific burned rock features were selected for additional excavation based on feature surface morphology, the presence of rocks cracked in place, and initial probing. The excavations generally followed traditional methods (detailed below), with the notable exception of the photo-documentation methodology used to develop three-dimensional models.

Seven thermal features were selected for excavation. These features were located at two sites, 41VV890 and 41VV2167. Excavation methodology was a synthesis of approaches previously utilized in ASWT field research. Specifically, each feature was photographed prior to, during, and after excavation in order to create three-dimensional records of the process. It was hoped that this methodology would create a more accurate and enduring type of data concerning thermal features. In addition, thermally altered rocks recovered from excavation units were sorted and weighed by size category (an ASWT documentation process known as Rock Sort). Rock Sort data allowed inferences to be made concerning the length and intensity of feature and site use on the canyon edge. Finally, traditional excavation methods involving trowels, brushes, and defined excavation units were used to expose and document feature morphology and to recover

material culture and soil matrix samples. Soil matrices were later processed using the flotation method.

The method of excavation was chosen in order to provide comparable samples of data from a number of what appeared to be individual earth oven features between 1.5 and 2 meters in diameter that were roughly circular in shape. The features chosen for excavation in this project generally fit this description. A 2 x 0.5 meter trench was placed across the approximate center of each feature. These were selectively placed in order to excavate what appeared to be the most intact portions of the features in order to recover preserved plant remains and document subsurface morphology. In addition, some excavation units extended beyond the central feature components in order document any carbon stain that might surround the feature. However, at the request of the landowner, great care was taken to preserve as much of each feature as possible for future study. The placement of excavation units varied with feature size, shape, and landowner requests. Each feature excavated was a unique circumstance, and context most often determined unit placement. Additional excavation units were placed around the features at the Lone Star Bridge site in order to further explore their components, as discussed in Chapter 5.

As with the probing, each feature was thoroughly documented by digital photography in its undisturbed state. This was followed by the clearing of vegetation from the surface of the feature. Various hand tools were used for this clearing, including shovels, hedge clippers, trowels, hand picks, hand clippers, and a weed whacker. Vegetation was generally thorny, especially the dogpear cactus that grows in dense patches on many areas of the canyon edge. Buffelgrass was present in some areas of the

Lone Star Bridge site. This invasive grass had very thick root structures and was often difficult to clear completely from the features prior to excavation.

The removal of surface vegetation was done in order to clear an area for excavation and to delineate the features' surface extent. Therefore once the vegetation was cleared, additional scraping away of topsoil covering the uppermost rock surfaces was often necessary in order to fully delineate the feature. In some cases this was not done prior to the laying out of excavation units, and therefore represented an intermediate phase of excavation between surface clearing and actual controlled excavation. This process was essential in order to be able to place the excavation units in such a way as to provide the maximum coverage of the feature given the excavation unit parameters.

A total data station (TDS) was used during the project to record spatial data within an arbitrary grid. The grid was initially defined in order to record spatial data from the canyon as well as on the canyon edge. The grid was later expanded to include areas of the canyon edge away from the rockshelters, specifically the Lone Star Bridge site.

Sets of photographs were taken throughout the excavation process in order to develop 3D models using Agisoft's Photoscan software. The program uses several algorithms to determine common points and angles from multiple digital photos and subsequently in the creation of 3D point clouds and skins (or textures) that are displayed in combination as 3D models. The program also requires TDS data to be included with the models in order to "geo-reference" and plot them in GIS programs. The spatial data was recorded by selecting ground control points (GCPs) at each feature. GCPs were

marked on major feature components, such as large rocks, and marked with “X” drawn with a marker. At least six GCPs were selected for each feature excavated. After the GCPs were marked and recorded in the field notes, they were recorded with the TDS. Once this was done, it was possible to then take measurements of various feature elements, including volumes excavated and the size of individual rocks. This process is known as Structure From Motion (SfM). For more information on the application of SfM methodology see Willis (2010) and De Reu et al. (2014).

Photos for the program had to be taken in sufficient numbers and from different angles in order for the program to make a complete image. The application of this technology to archaeological excavations was tested throughout this project by attempting multiple methods of use. The general method was to take one photo from each cardinal direction towards the feature, and then several in between each of those in order to create overlap in the photo’s margins. Photos were also taken from above. These photos were taken in a grid pattern, making sure that overlap existed between the photos. The photogrammetry process was repeated at various points throughout the excavation, especially after the feature’s upper components had been uncovered.

Each excavation trench was divided into two units, A and B (Figure 4.4). These were each 1 x 0.5 meter. Metal stakes were placed at the corners of each unit and string tied between them in order to outline the excavation units. The units were photographed before and after excavation.



Figure 4.4. Units A (bottom) and B (top) at Feature 17 at the Torres Ranch House site (41VV890).

The first goal of the excavation, once the units were laid out, was the removal of all topsoil from around the uppermost burned rocks composing the feature. Generally, the rocks were densely packed together within features and manifested as discrete layers of rock either exposed at the surface or partially buried. The rocks were left in place as long as possible during excavations. Burned rocks from the feature were removed and set

aside for the Rock Sort only after they had been thoroughly uncovered, photographed, and loosened from the surrounding sediment. The areas beneath the burned rocks were investigated for charcoal and other plant remains. Darkened or otherwise stained sediment beneath features were collected in matrix samples of up to five liters. At least one soil sample was taken from each feature. Uncollected sediments from the excavation units were sifted through bedded screens. The three screen sizes were ½ inch, ¼ inch, and 1/8 inch (Figure 4.5).



Figure 4.5. Sifting of sediment from Feature 3 at the Lone Star Bridge site (41VV2167).

After removal of the major feature components and sampling of carbon stained sediments, the units were excavated to bedrock. Special efforts were made to leave

components of the feature exposed in the sidewall, specifically burned rocks forming basin shapes. These profiles were documented in photographs and sketches when encountered.

The sediment around and between the rocks was therefore the first component of the feature to be excavated, followed by the feature's heating elements, and then the remaining subsoil beneath the feature. In some cases earlier features were found beneath upper components. These were designated as additional features and given their own feature numbers.

Except in cases where additional features were found buried beneath the surface features, all excavation units were excavated in one layer. This layer consisted of the surface sediment above bedrock and the intrusive feature within it. Sediments on the Canyon Edge are generally shallow (<50 cm) but some features were found to be above bedrock depressions over one meter deep.

The types of artifacts collected during excavations included lithic and ecofacts. Stone tool debris, mostly chert debitage, was collected if found within excavation units. Charcoal was the most sought after type of ecofact. Whenever charcoal was encountered, attempts were made to collect it. Large, identifiable chunks were placed in rigid containers such as plastic jars in order to protect their structure for identification.

All FCR from the excavation units was Rock Sorted using existing ASWT protocol. Some rocks were obviously thermally altered, due to their color, fracturing, or inclusion within a central heating element. Others exhibited clear signs of thermal alteration on some surfaces (e.g., reddening, carbon stain, cracking), while some had no

indication of alteration despite proximity to earth oven features. It should be noted that the identification of thermally altered rocks is sometimes difficult. Nevertheless, great efforts were made to identify all of the rocks from the excavation units, and to differentiate between altered and unaltered rocks.

FCR was sorted by size (Figure 4.6). As mentioned above, this Rock Sort procedure was previously developed by ASWT during the 2011-2012 field work along Dead Man's Creek. Three size categories were used: small (<7.5 cm); medium (7.5-15 cm); and large (>15 cm). These size categories were selected in order to evaluate patterns of feature reuse. Large rocks (>15 cm) are generally more common near the center of earth ovens, and are thought to indicate materials that might be reused rather than discarded. Medium rocks (7.5-15 cm) represent an intermediate stage of rock size indicative of a feature that has been used at least once and had some of its rock components fracture and separate. Small rocks (<7.5), especially in large quantities, are inferred to be refuse associated with multiple earth oven constructions at a single location. After the rocks were sorted by size, each of the three groups was weighed and photographed. Efforts were made during backfilling to replace the rocks in an approximate reconstruction of the feature's surface manifestation, as requested by Jack Skiles. Generally this involved the placement of the largest rocks removed from the feature during excavations near the surface during backfilling. Some of these larger rocks were left exposed in order to indicate the original feature location and morphology as much as possible.

The types of data recorded during excavations were sampled burned rock size and weights, charcoal and other plant remains recovered in situ, soil samples later processed

through flotation, and photo sets documenting the feature's morphology as exposed during various stages of the excavation.



Figure 4.6. Example of Rock Sort board. Large burned rocks (>15cm) from Feature 3 at the Lone Star Bridge site (41VV2167). The Rock Sort board is divided into 7.5 cm squares.

Flotation of soil samples was done using the method developed by Dr. Phil Dering. Dering also identified the plant remains recovered during flotation and the botanical material recovered in situ by comparisons with his laboratory collection. Samples were selected for radiocarbon dating from amongst those identified by Dering. These samples were prepared at UTSA by Ray Mauldin and processed by Direct AMS dating. In Chapter 5 the data sets produced by these methods will be detailed along with a narrative of the excavations.

CHAPTER 5: RESULTS

Results from the survey and excavation work on the canyon edge indicate a long and varied human occupation. At least four distinct prehistoric activity areas were identified, including two middens and numerous earth oven features and lithic scatters. (Figure 5.1) Isolated artifacts were also found dispersed in low density across much of the canyon edge. The spatial distribution of the evidence is presented in the survey portion of the chapter, while the excavation results detail the morphology, FCR weight, organic material, and radiocarbon dating results of individual earth oven features.

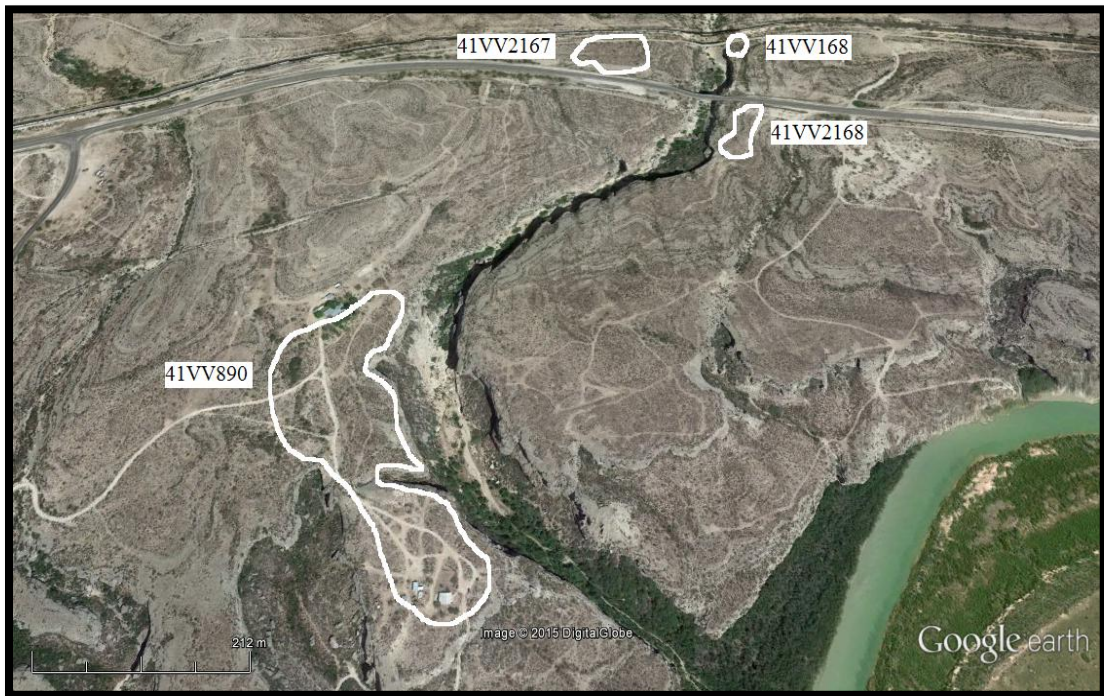


Figure 5.1. Sites of the canyon edge. Shown clockwise from top left: 41VV2167 (Lone Star Bridge site); 41VV168 (Langtry Rock Midden site); 41VV2168; and 41VV890 (Torres Ranch House site).

Survey

Two new sites were found during the survey of the canyon edge around Eagle Nest Canyon (Figure 5.2), sites 41VV2167 (Lone Star Bridge site) and 41VV2168. In addition, several isolated artifacts were collected. The two new sites, along with 41VV890 (Torres Ranch House site) and 41VV168 (Langtry Rock Midden site), comprise the currently documented site assemblage in the immediate canyon edge area.

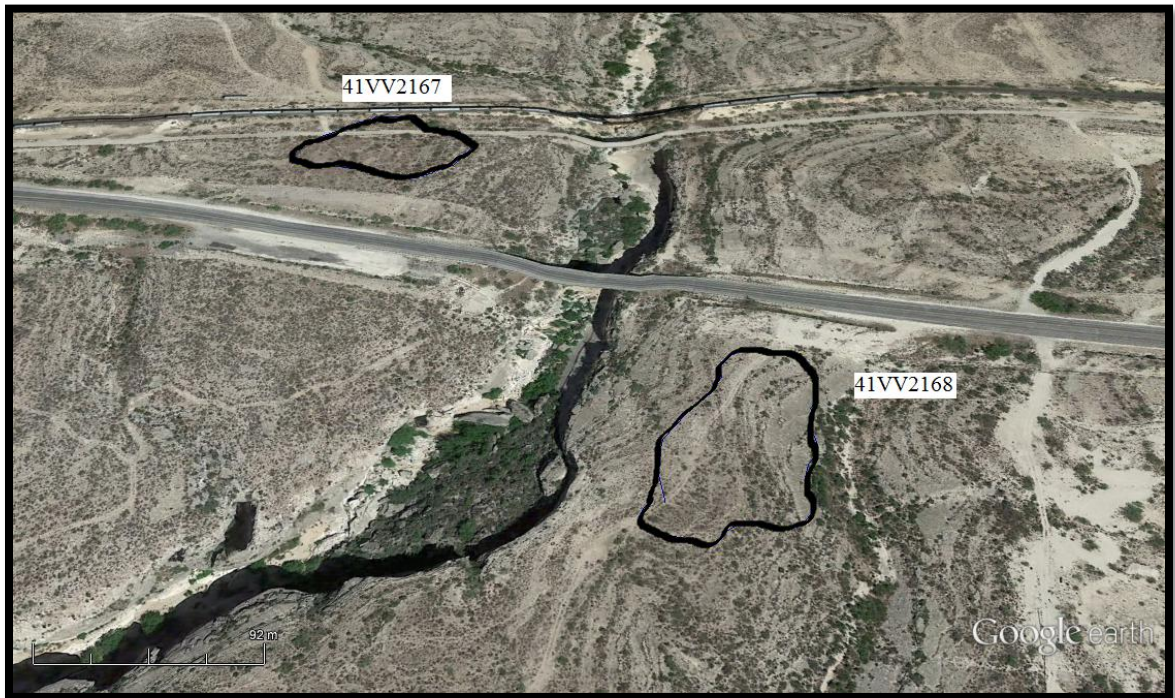


Figure 5.2. Newly identified canyon edge sites: 41VV2167 (The Lone Star Bridge site) and 41VV2168.

41VV2167: The Lone Star Bridge site

The Lone Star Bridge site (41VV2167) is located on a small knoll north of existing Highway 90. Old Highway 90, now defunct and on the property of Jack Skiles, runs through what was most likely the center of the site. Also impacting the area is an existing railroad line, and several power and fiber-optic right-of-ways adjacent to

Highway 90. The knoll upon which the site is located is also adjacent to the head of the canyon, where runoff has created a plunge pool, or tinaja, at the base of a pour-off. The tinaja contains water throughout the year and would have been a significant resource for people living in the area. The Lone Star Bridge site is directly across the canyon from the Langtry Rock Midden site, which was first recorded by Taylor (1949).

Three distinct concentrations of FCR are exposed on the surface of 41VV2167 (Figure 5.3). Numerous lithic artifacts, including several projectile points, were also found (Figure 5.4). Feature 1 is a partially buried 2 meter diameter earth oven feature. The largest feature, Feature 2, is a shallow ring midden almost twenty meters in diameter. The southern portion of the feature was impacted by mechanical clearing. Feature 3, which was found between Features 1 and 2, was only exposed at the surface as a single large rock thermally fractured in place. Subsequent excavations exposed a 2 meter diameter earth oven feature which was found to overlie a lower feature (Feature 5) within a bedrock depression. Feature 4 was a buried pile of unburned rocks adjacent to Feature 1 that most likely was a natural formation.

Several partial dart points were found on the surface of the site, as well as several unifacial scrapers. Lithic debitage was abundant throughout the area. However, site disturbance was clearly responsible for the position of some artifacts, especially the scrapers found in a push pile. Additional details about the features of the Lone Star Bridge site are presented in the excavation portion of this chapter.

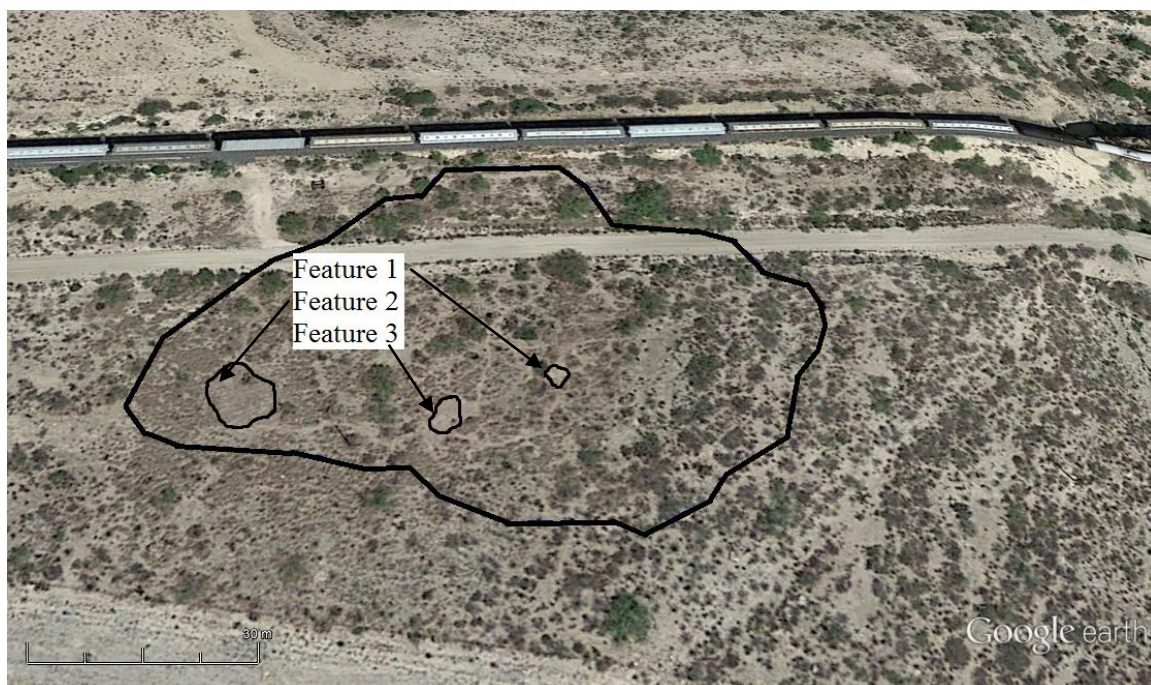


Figure 5.3. The Lone Star Bridge site (41VV2167) including the locations of Features 1-3.



Figure 5.4. Projectile point fragments from the Lone Star Bridge site (41VV2167). Shown include a possible Val Verde (middle), and Nolan (right).

41VV168: The Langtry Rock Midden site

41VV168 is a large ring midden at the head of the canyon (Figure 5.5). Located on the eastern side, it was previously trenched by Taylor (1949) and revisited by Graham and Davis (1958). The feature has been impacted by road construction, as noted by these earlier investigators. When it was revisited in 2013 the western portion of the feature was scattered and eroding into the canyon. However, its central portion's lateral dimension was similar to that recorded by Graham and Davis (20 meters vs 60 feet). The southern portion of the feature was a raised berm of FCR, which was most likely at least partially formed during construction of Old Highway 90.

Directly beneath the western edge of this midden feature was a small, collapsed rockshelter situated high on the eastern canyon wall above the tinaja. The rockshelter contained both FCR (possibly eroded over the canyon edge and into the shelter from the midden above) and a sparse amount of lithic debitage. The opening of the shelter is roughly twenty meters wide and can be entered by dropping down through a small cleft in the canyon edge. Although the rockshelter has not been recorded as a separate site, it might represent a significant additional component in the understanding of the midden above. Overall, within a 30 meter horizontal distance are the tinaja, the rockshelter, and the burned rock midden. Indigenous inhabitants would likely not have had much trouble scaling the canyon wall at this location.



Figure 5.5. The Langtry Rock Midden site (41VV168).

Situated directly across the head of the canyon from 41VV2167, which also contains a ring midden, 41VV168 has research potential not recognized by earlier archeologists. The combination of these sites along with the rockshelter on the canyon wall above the tinaja seems to represent a distinct activity area at the head of the canyon separate from that farther downstream. The area at the head of the canyon appears to have been used for large scale earth oven cooking, as middens appear nowhere else on the canyon edge.

41VV2168

41VV2168 is located on the east side of Eagle Nest Canyon downstream from the Langtry Rock Midden (Figure 5.6). It consists of lithic debitage scattered across a shallow slope leading into a drainage adjacent to Eagle Nest Canyon from the edge of

Highway 90 south almost to the cleft in the canyon above Bonfire Shelter. The area is heavily eroded. A thin ridge between the canyon and the drainage form the backbone of the site. One small concentration of FCR was found on the ridge, along with several unidentifiable projectile point fragments and a large groundstone. The FCR concentration identified at the site was probed to evaluate its research potential (Figure 5.7). However, no preserved botanical remains were found.



Figure 5.6. Site boundary of 41VV2168.



Figure 5.7. Feature 1 at 41VV2168 which was probed for charcoal. None was found.

41VV890: The Torres Ranch House site

The most significant site along the canyon edge is 41VV890, or the Torres Ranch House site. As outlined in the previous chapter, 41VV890 is a multicomponent site consisting of historic rubble and trash alongside prehistoric artifacts and features. The many individual burned rock features, the range of projectile points, and quantity of lithic debitage found at the site indicates that 41VV890 was a significant location of activity for thousands of years.

The historic components of the site are discussed by Davis and Skiles (1999). Other than a nickel from 1868 on the surface near Feature 13, no new historic artifacts were documented or collected during the 2013 investigation. The prehistoric components of the site, however, were reevaluated, and the site boundary expanded. A new feature inventory was developed and is presented below. It should be noted that features were renumbered because new features were identified and some other features from previous investigations were not found (Figure 5.8).

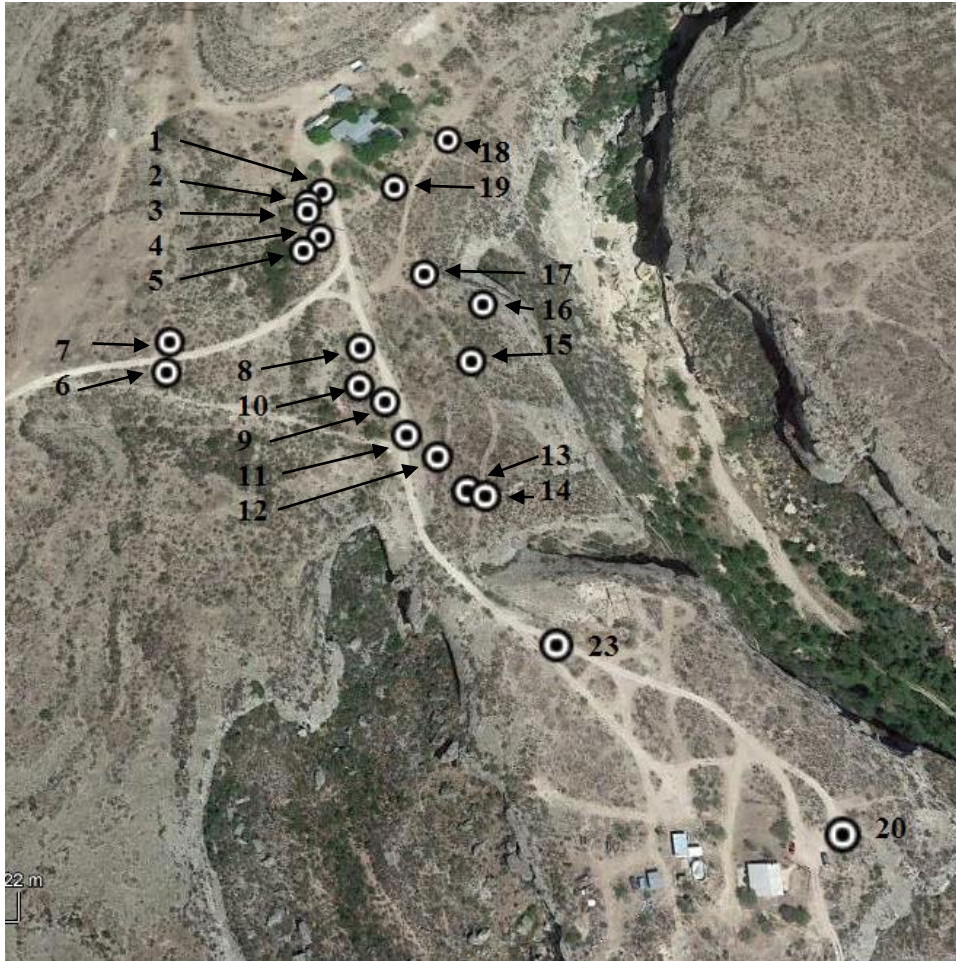


Figure 5.8. Features documented at the Torres Ranch House site (41VV890).

Feature 1. Feature 1 is a group of thermally altered rocks located in a driveway on the Skiles property. It is exposed in a small rut in the driveway and is roughly 25 centimeters in diameter.

Feature 2. Feature 2 is a small FCR circle near the Skiles home. It is adjacent to dog burial marked by a flat, orange, tabular rock. The feature is small, around 30 cm in diameter, and partially buried.

Feature 3. Feature 3 consists of < 10 thermally altered rocks and rock fragments near the yard fence surrounding the Skiles home. The feature is not well preserved at the surface and appears scattered.

Feature 4. Feature 4 consists of a semicircle of FCR around 60 cm in diameter (Figure 5.9). Some of the rocks are large, and a buried feature might be present at the location.



Figure 5.9. Feature 4 at the Torres Ranch House site (41VV890)

Feature 5. Feature 5 is a small assemblage (<10) of FCR and small FCR fragments. A buried feature might be present at the location.

Feature 6. Feature 6 is in a small clearing near the main drive entry road leading from Langtry to the Skiles home. It is around twenty meters southwest of a large, non-native agave on the north side of the drive. The feature consists of less than ten FCR and

FCR fragments. The rocks visible at the surface conform to a circular shape around 1.25 meters in diameter.

Feature 7. Feature 7 is located across the driveway from Feature 6. Feature 7 is a scatter of FCR several meters wide. The number and relatively large size of the rocks in the feature indicated that it might be well preserved. It was probed during the exploratory stages of the project and later excavated.

Feature 8. Feature 8 is located on the west side of the drive approaching the Guy Skiles home. It consists of FCR and FCR fragments. No distinct patterning is visible at the surface suggesting a possible disturbance (Figure 5.10)



Figure 5.10. Feature 8 at the Torres Ranch House site (41VV890).

Feature 9. Feature 9 is located on the west side of the drive leading to the Guy Skiles house, and is around 30 meters southeast of Feature 8. It consists of a 6 X 3 meter scatter of FCR. A large thermally altered rock is also partially buried in the road nearby.

Feature 10. Feature 10 is roughly between Features 8 and 9, but around 5 meters farther west of the driveway. The feature consists of several FCR fragments in a roughly circular configuration around half a meter in diameter. Some rocks in the configuration do not appear thermally altered. The relative paucity of large FCR suggests that this might not be an individual earth oven feature, but rather an accumulation of FCR fragments associated with features 8 and 9.

Feature 11. Feature 11 is located near the intersection of two fence lines and a dirt road (Figure 5.11). It is also near the historic structures associated with the Torres Ranch House. FCR is scattered across the surface on either side of the road and fence lines.



Figure 5.11. Feature 11 at the Torres Ranch House site (41VV890).

Feature 12. Feature 12 is a small accumulation of FCR around 2 meters in diameter. The area is slightly sloped, which may have caused movement of the rocks over time. The feature is located around 30 meters south of the Torres Ranch House.

Feature 13. Feature 13, around 60 meters southwest of the Torres Ranch House, was initially identified as a semicircular pile of rocks around the base of a bush (Figure 5.12). The rocks were fire cracked and appeared to part of an intact feature. The feature was excavated and is described further later in this chapter.



Figure 5.12. Feature 13 at the Torres Ranch House site prior to excavation.

Feature 14. Feature 14 is a gathering of FCR around 2 meters in diameter at the northern edge of the gorge leading into Eagle Nest canyon. Some of the FCR is separate from the main grouping.

Feature 15. Feature 15 (THC structure 3) is located near the Torres Ranch House structure and associated outbuilding ruins. Previous investigators associated the feature

with the Torres occupation. The feature is around 1.5 meters in diameter and made of large rocks.

Feature 16. Feature 16 is a ring of rocks around 5 meters across. The rocks are resting on bedrock. It was previously identified as a “large rock ring” by James Collett and the Iraan Archaeological Society. During consultations with Stephanie Mueller of the Witte Museum, however, it was learned that the ring was composed of rocks used to hold down the edges of a tent used by employees of the museum during their excavations of Eagle Nest Cave in the 1930s. This has been confirmed by archival photographic evidence (Mueller 2014).

Feature 17. Feature 17 is a tight cluster of burned rocks near the canyon edge around 20 meters downstream from Eagle Cave (Figure 5.13). It is over 1 meter in diameter. It was probed and excavated, as outlined later in this chapter.



Figure 5.13. Feature 17 at the Torres Ranch House site (41VV890).

Feature 18. Feature 18 is located near Jack Skiles home by the gate located on the fence at the southeast corner of the yard. The feature consists of a 2 meter diameter concentration of FCR. The feature appears to be two adjacent rock rings. A portion of the feature was excavated. The excavation results are presented later in this chapter.

Feature 19. Feature 19 is located next to the yard fence surrounding the Skiles house. It consists of a small concentration of FCR fragments and some disassociated larger rocks. The small grouping of rocks is most likely the original feature location.

Feature 20. Feature 20 is a large scattering of smaller FCR on a cliff overlooking the valley of the Rio Grande and the mouth of Eagle Nest Canyon (Figure 5.14). Bedrock is exposed at almost all points surrounding the feature. Some shallow sediment is present near the northern edge of the scatter, marked by some cactus and a large ocotillo plant. Vegetation was cleared from the surface of this area during the 2013 field session, revealing a tight cluster of FCR which was partially buried. Excavation units were placed near these rocks. The results of the excavation are presented later in this chapter.



Figure 5.14. Feature 20 (foreground).

Features 21 and 22. Features 21 and 22 were buried concentrations of limestone rocks found beneath Features 17 and 7, respectively. They were subsequently determined to be a natural formation. They are both discussed briefly during the excavation narratives of Features 7 and 17 presented later in this chapter.

Feature 23. Feature 23 is a large cluster of FCR near a Y in the dirt road leading to the former home of Guy Skiles. It is roughly 9 meters long by 1.5 meters wide. The feature is clearly scattered and disturbed probably by mechanical brush clearing (Figure 5.15).



Figure 5.15. Feature 23 at the Torres Ranch House site (41VV890).

In addition to the newly recorded features, several projectile points and projectile point fragments were found on the surface of 41VV890. Three of these were identified: a Pandale point and a Bell point were found near Feature 17, and a Shumla point was found near Feature 13 (Figure 5.16)



Figure 5.16. Projectile points found at 41VV890. From left to right: Pandale, Bell, and Shumla.

Isolated Finds

In addition to the sites recorded during this project, several isolated artifacts were found on the canyon edge. These items were determined to not be associated with any discrete concentration of artifacts, and were therefore labeled as isolated finds (Figures 5.17-5.19).



Figure 5.17. Bandy point (isolated).



Figure 5.18. Darl point (isolated).



Figure 5.19. Metal projectile point (isolated).

Excavations

Excavations were carried out at two sites, 41VV890 and 41VV2167 (Figure 5.20). Two surface features were excavated at 41VV2167, Features 1 and 3 (Figure 5.21). Feature 5, found beneath Feature 3, was also excavated. Five surface features were excavated at 41VV890: Features 7, 13, 17, 18, and 20 (Figure 5.29). Features 21 and 22, found beneath features 17 and 7 respectively, were assigned field numbers during excavation but subsequently determined to be natural rock formations. The excavation results presented here provide a breakdown of sampled FCR size and weights, identified botanical materials including weight and number, radiocarbon dates, and a written description of the feature and excavations.



Figure 5.20. Excavation loci on the canyon edge.

Excavation at 41VV2167: The Lone Star Bridge Site



Figure 5.21. Features excavated at the Lone Star Bridge site (Features 1, 3, and 5).

Feature 1 (and Feature 4)

Feature 1 is located near the eastern edge of the Lone Star Bridge site, where the ground begins to slope down towards the canyon edge. Brush and grass covered much of the feature, which was initially visible as a cluster of partially buried FCR (Figure 5.22). Several small burned rocks were also visible on the surface nearby.



Figure 5.22. Thermally fractured rock identified at the surface of Feature 1 at the Lone Star Bridge site (41VV2167).

Initial clearing of the feature was done during a brief August 2013 field session. A large rainstorm, however, caused a postponement of excavation until December. The preliminary clearing, along with the rain, thoroughly exposed the upper components of the feature.

Dimensions. Feature 1 at the Lone Star Bridge site was an almost completely round tight cluster of FCR measuring 215 by 220 centimeters.

Estimated Total FCR Weight. Total sampled FCR weight from the feature was 114.05 kg. This was estimated to be two-fifths of the entire feature, resulting in a total estimated FCR weight of 281.1 kg. A breakdown by size class is given in Table 5.1.

Table 5.1. FCR weight (kg) from Feature 1

Small (<7.5 cm)	Medium (7.5-15 cm)	Large (>15 cm)	total
16.25	45.67	52.13	114.05
14%	40%	46%	

Thickness. Feature 1 consisted of only one layer of FCR above bedrock.

Outline Morphology. As noted above, Feature 1 was round. In addition, it contained a small central depression (Figure 5.23).



Figure 5.23. Feature 1 (facing south) at the Lone Star Bridge site (41VV2167). Note the feature's small central depression and the cracked triangular bedrock protrusion at the top of the photo.

Cross Section. Sediment was shallow beneath Feature 1, and the entire area was deflated. Therefore the cross section showed an upper layer of FCR above a thin layer of

sediment and then bedrock. Bedrock was flat beneath most of the feature, although it did slope down to the south.

Matrix. Charcoal-stained matrix was only found directly beneath FCR within the feature. Very small amounts of tiny charcoal fragments were collected, and no botanical remains were identified within the matrix.

Rock Shape. Rocks used in the feature were sub-angular to sub-rounded. Some were tabular (sub-prismoidal) especially a triangular bedrock protrusion at the southern end of the feature.

Packing. Feature packing was tight, indicative of an intact earth oven heating element. Many of the rocks were touching or even slightly on top of adjacent rocks.

Intactness. Given the tight packing of the rocks and the round shape with a central depression, I believe that the feature is intact.

Botanical. No identifiable botanical remains were recovered from Feature 1. This was the only feature studied during the project in which this was the case. Thus, no radiocarbon assays were obtained.

Excavation Narrative. Excavation units A and B were placed so as to excavate the center of the feature (Figure 5.24). Unit A contained several large thermally altered rocks. Small samples of charcoal flecks were recovered from beneath the larger rocks in Unit A. Bedrock was present directly beneath the rocks in several locations.



Figure 5.24. Excavation Units A (top) and B (bottom).

Unit B also contained a number of large, thermally fractured rocks. However, the bedrock beneath this portion of the feature sloped down towards the south. The sediment at the southern end of Unit B was almost 40 centimeters deep, while it was only 5 to 10 centimeters deep at the opposite end of Unit A.

A noteworthy component of the feature was contained within Unit B: a large bedrock protrusion that was apparently used as part of a heating element. This was indicated by the clustering of other FCR around it and the large crack present near its tip (Figure 5.23).

Additional excavation units (C and D) were placed to the South of Unit B in order to explore a bedrock depression and a number of rocks that appeared to lie within it (Figure 5.25). These rocks (Feature 4) were found to be unburned, however.

Two explanations are possible for Feature 4 at 41VV2167. One is that the rocks were a source pile of rock built to be a reservoir for construction of Feature 1. Another explanation is that Feature 4 was a natural rock formation. I lean towards the second explanation, as the bedrock surface exposed in Units C and D was pitted and the rock in Feature 4 might have just been limestone chunks that had eroded and broken off.



Figure 5.25. Additional excavation units placed to explore Feature 4, the large tabular limestone visible in this photo.

Feature 3

Feature 3, like Feature 1, is located at the Lone Star Bridge site (41VV2167). It was initially identified as a single thermally altered rock which was partially buried. Several other large burned rocks were found partially buried in the surrounding area, leading me to believe that a buried feature was present. A weed whacker was used to clear much of the area surrounding the feature. Topsoil was removed from the cleared area to a depth of about five centimeters before excavation units were placed (Figure 5.26). The clearing revealed a large group of thermally altered rocks. The uppermost

rocks in the feature were inclined towards the southwest, while the buried portions were present to the northeast.



Figure 5.26. Clearing of surface soil from Feature 3 at the Lone Star Bridge site, view looking west.

Dimensions. Feature 3 was a round, partially buried feature. Due to the fact that the feature was never fully exposed by excavation, its dimensions were estimated to be 190 by 165 cm.

Est. Total FCR Weight. Total sampled FCR weight from Feature 3 was 68.5 kg. This was estimated to be a third of the feature, resulting in a total FCR estimate of 205.4 kg. A breakdown of size classes is given below (Table 5.2)

Table 5.2. FCR weight (kg) from Feature 3

Small (<7.5 cm)	Medium (7.5-15 cm)	Large (>15 cm)	total
12.13	19.33	37.01	68.47
18%	28%	54%	

Thickness. Feature 3 consisted of a single layer of FCR. In several places this FCR layer was above a thin layer of sediment and a lower layer of unburned rocks. In other locations FCR was directly above bedrock.

Outline Morphology. Feature 3, like Feature 1, was round with a central depression.

Cross Section. Feature 3 was clearly placed within a basin. The basin extended down into the bedrock depression containing Feature 5. The basin was later exposed in the sidewall of Unit D (Figure 5.27). Feature depth from the upper components at the edge of the feature to the lowest portions within the basin was roughly 30 cm.



Figure 5.27. Cross section of Feature 3. The central basin of Feature 3 (top) and Feature 5 within a bedrock depression (below).

Matrix. Charcoal-stained matrix associated was found beneath all feature components and away from the feature up to 15 cm. Numerous matrix samples were collected from the central basin portion of the feature.

Rock Shape. Like Feature 1, rock shape was generally sub-angular to sub-rounded. No tabular rocks were identified in the feature. Most were spherical.

Packing. Compared to other intact features, the packing of Feature 3 was relatively loose. Although some of the rocks were touching, most were separated by several centimeters.

Intactness. Feature 3 appeared to be intact, especially considering the central basin found within the bedrock depression.

Botanical. The only identifiable charcoal samples from Feature 3 were shin oak. Although a piece of sumac was originally identified from the feature, it subsequently radiocarbon dated to the same time as Feature 5, suggesting that some mixing between upper and lower features might have taken place (Table 5.3).

Table 5.3. Charcoal mass and types from Feature 3

<u>Taxon</u>	<u>Common</u>	<u>Part</u>	<u>Count</u>	<u>Mass (g)</u>
Quercus sp.	Shin Oak	Wood	8	3
Rhus sp.	Sumac	Wood	3	0.1

C14 Results. Feature 3 dated to roughly 200 RCYBP (181±87). This makes Feature 3 the second most recent feature excavated on the canyon edge. The second date presented below is most likely associated with Feature 5 (Table 5.4).

Table 5.4. Radiocarbon Dates for Feature 3

ASWT-ID	CAR-ID	SITE #	provenience	material	corrected RCYBP	$\delta^{13}\text{C}$ ‰	Oxcal (4.2) median	2 σ range cal BP
cs2b	326	41VV2167	Feature 3, Unit A	sumac	315±20	-20	388±41	458-306
cs1b	325	41VV2167	Feature 3, Unit D	oak	172±27	-25.3	181±87	290-...

Excavation Narrative

Excavation units were placed so as to excavate the exposed portion visible at the surface and what appeared to be a buried central depression. Unit A was placed above the central depression, and buried feature components were found almost directly beneath the surface. The rocks formed the single heating elements of a relatively intact earth oven feature.

Sediment was shallow, with the exception of a precipitous drop off at the northeast corner of Unit A. The depression appeared to be at the lip of a buried karstic solution cavity (Figure 5.28). FCR and charcoal was found in the depression, separated from the upper feature components by almost 15 centimeters of sterile fill. The depression and its components were labeled as a separate feature, Feature 5, which is discussed later in this chapter.

Unit B contained five large (>15cm) thermally altered rocks exposed at the surface. Beneath them was a layer of carbon-stained sediment and a number of unburned rocks resting on bedrock. Unburned rocks resting on bedrock were commonly encountered on the canyon edge beneath surface features (Figure 5.29). Although several of these were identified as possible features (Features 21, 22 at 41VV890 and Feature 4 at 41VV2167) none of their components appeared thermally altered. Unburned rocks formed an almost continuous layer above the bedrock throughout Units A and B. These rocks were separated from the upper feature components by a thin layer of sediment, varying in depth between five and ten centimeters.



Figure 5.28: Excavations Units A (top) and B (bottom).
Note the initial exposure of the karstic cavity in Unit A (top right).



Figure 5.29. Image showing the layer of unburned rocks above bedrock beneath Feature 3 heating elements.

In order to further explore Feature 5 (within the bedrock depression) additional excavation units were placed around Feature 3. The first, Unit C, was a one by one meter unit North of Unit A. Excavations revealed a layer of buried FCR above bedrock. The depression also continued into Unit C. As described earlier, the depression was manifested as a small cavity beneath an extended lip of bedrock. The cavity extended over thirty centimeters horizontally under the bedrock overhang, and was almost seventy centimeters deep.

Three additional units (D, E and F) were placed west of the first three (A, B, and C). The central basin of Feature 3 was uncovered in the sidewall at the intersection of Units A, C, and D. The components of this central heating element were removed and

weighed separately from other feature components in order to better understand what weights and volumes can be directly associated with a central heating element. Units C and D contained a dispersed layer of FCR resting on bedrock (Figure 5.30). The rocks were most likely refuse associated with Feature 3, or possibly another oven feature to the east that was not fully exposed.

Feature 5

Feature 5 was a dense concentration of FCR and charcoal found in a bedrock depression beneath Feature 3 at 41VV890. No distinct morphology was identified within the grouping, other than that it was contained within the depression. Bedrock was cracked and thermally altered in some areas adjacent to the feature components. Many of the rocks found in the depression were beneath a rock overhang. Charcoal was also found beneath this overhang. It appeared that the depression and overhang were used as thermal components, specifically as insulation, of an earth oven. All of the FCR within the depression was gathered and weighed.



Figure 5.30: Unit C placed to the east of Feature 3.

Dimensions. Feature 5 was confined to a bedrock depression measuring roughly 150 by 120 cm. Some of the feature components were beneath a bedrock overhang.

Est. Total FCR Weight. All of the FCR from the bedrock depression was weighed in the field, resulting in a sampled and total FCR of 198.2 kg. A breakdown of size classes is presented in Table 5.5.

Table 5.5. FCR weight (kg) from Feature 5

Small (<7.5 cm)	Medium (7.5-15 cm)	Large (>15 cm)	total
45.12	103.02	50.08	198.22
23%	52%	25%	

Thickness. Feature 5 was not a single earth oven heating element. It was a mixed cluster of FCR lacking distinct layers.

Outline Morphology. Outline morphology was defined by the bedrock depression in which the feature was found.

Cross Section. Feature cross section showed a mixed cluster of FCR embedded within a bedrock depression. The depth of the deposit was roughly 30 cm.

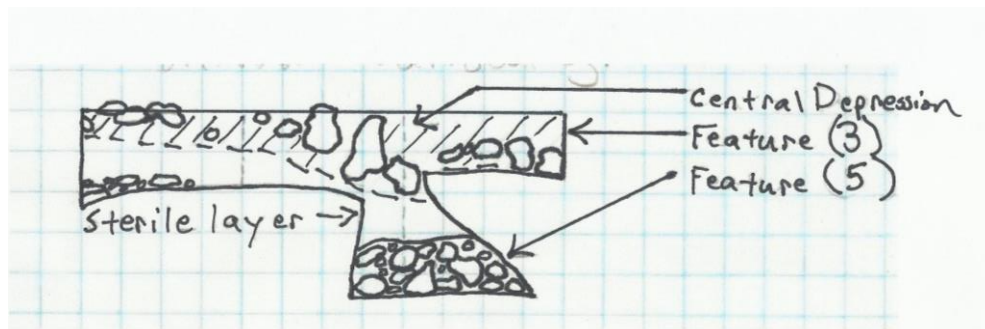


Figure 5.31. Field sketch showing relative position of Features 3 and 5. Width shown 2 meters.

Matrix. Charcoal stained matrix was found throughout Feature 5, including beneath the bedrock overhang. Several matrix samples were collected.

Rock Shape. The rocks within the feature were generally angular and prismoidal.

Packing. The packing of the rocks was very tight. Given the confined nature of the feature, it makes sense that scattering would be minimized.

Intactness. The feature appeared to be intact, although it was most likely reused several times.

Botanical. Oak, mesquite, and condalia charcoal were found in Feature 5 (Table 5.6).

Table 5.6. Charcoal mass and types from Feature 5

<u>Taxon</u>	<u>Common</u>	<u>Part</u>	<u>Count</u>	<u>Mass (g)</u>
Quercus sp.	Shin Oak	Wood	50+	2.4
Fabaceae	Mesquite	Wood	38	1.2
Condalia sp.		Wood	13	0.6

C14 Results. Two charcoal samples were radiocarbon dated for Feature 5 (Table 5.7). Both were very close, and imply that perhaps the feature was used repeatedly over a relatively short period of time (one decade). They are 395 ± 47 , 389 ± 43 .

Table 5.7. Radiocarbon dating results from Feature 5

ASWT-ID	CAR-ID	SITE #	provenience	material	corrected RCYBP	$\delta^{13}\text{C}$ %	Oxcal (4.2) median	2 σ range cal BP
cs3d	327	41VV2167	Feature 5	oak	290 \pm 18	-23.4	395 \pm 47	430-297
cs4c	328	41VV2167	Feature 5	condalia	308 \pm 23	-23.6	389 \pm 43	457-302

Excavations at 41VV890: The Torres Ranch House site



Figure 5.32. Features excavated at the Torres Ranch House site.

Feature 7 (and Feature 22)

Feature 7 is located north of the entrance drive to the Skiles property, adjacent to a very large non-native agave plant. A central component of the feature was probed prior to excavation to evaluate preservation conditions. Charcoal was found beneath the rock probed (Figure 5.33).



Figure 5.33: Probing of Feature 7 prior to excavation. Charcoal was found.

Dimensions. Feature 7 was roughly 200 by 390 cm. Some of its rocks were scattered, however, and were not included in this measurement.

Est. Total FCR Weight. Total sampled FCR from Feature 7 was 46.6 kg (Table 5.8). This was estimated to be one fifth of the feature, resulting in a total estimated FCR weight of 233 kg.

Table 5.8. FCR weight (kg) from Feature 7

Small (<7.5 cm)	Medium (7.5-15 cm)	Large (>15 cm)	total
3.4	24.4	18.79	46.59
7%	52%	40%	

Thickness. Feature 7 contained one layer of FCR above a sterile layer of sediment (Figure 5.34). Directly above bedrock a lower layer of unburned rocks was found (Feature 22).



Figure 5.34. Feature 7 exposed in profile (surface rocks) and Feature 22 below (in unit bottom).

Outline Morphology. Feature 7 had been impacted by construction of the nearby driveway, resulting in a triangular appearance of the feature. Nevertheless, a slight central depression does seem visible in photos taken of the feature prior to excavation. This depression was not noticed in the field.

Cross Section. Although a central depression appears in some photographs, it was not identified in the field. Therefore no cross section documentation of this feature

component was made. Otherwise the feature was one layer thick with no patterning to depth.

Matrix. Charcoal stained matrix was not common in Feature 7. Although large amounts of charcoal was recovered, stained sediment was difficult to identify and was not present in any identifiable pattern.

Rock Shape. Rocks used in Feature 7 were angular to sub-rounded. Many were tabular (prismoidal).

Packing. Some portions of Feature 7 were tightly packed. However, the over-all distribution was loose. This might have been caused by feature reuse or modern disturbance.

Intactness. Feature 7 was the most obviously disturbed feature studied on the canyon edge. I believe that a bladed tractor passed over the feature at some point. Driveway construction also impacted the feature.

Botanical. Feature 7 contained a wide variety of wood charcoal, including mesquite, condalia, desert olive, sumac, Mormon tea/ocotillo, desert hackberry, and shin oak (Table 5.9).

Table 5.9. Charcoal mass and types from Feature 7

<u>Taxon</u>	<u>Common</u>	<u>Part</u>	<u>Count</u>	<u>Mass (g)</u>
Fabaceae	Mesquite	Wood	100+	3.5
Condalia sp.		Wood	39	1.5
Forestiera sp.	Desert Olive	Wood	11	0.3
Rhus sp.	Sumac	Wood	3	0.1
Ephedra/Fouquieria	Mormon		3	0.1
	Tea/Ocotillo			
Celtis sp.	D. Hackberry	Wood	2	0.1
Quercus sp.	Shin Oak	Wood	1	<0.1

C14 Results. Radiocarbon dates for Feature 7 fall between 500 and 600 RCYBP.

591±35, 525±8 (Table 5.10).

Table 5.10. Radiocarbon dating results from Feature 7

ASWT-ID	CAR-ID	SITE #	provenience	material	corrected RCYBP	$\delta^{13}\text{C}$ %	Oxcal (4.2) median	2 σ range cal BP
cs2a	324	41VV890	Feature 7, Unit B	des olive	562±18	23.6	591±35	633-532
cs1a	321	41VV890	Feature 22, Unit B	Sumac	501±17	24.8	525±8	540-510

Excavation Narrative

Like the other investigated features, surface vegetation and topsoil was cleared prior to excavation. Clearing of the feature's surface revealed a 2 X 4 meter FCR concentration (Figure 5.35). The feature had clearly been impacted by construction of the driveway. And although a large amount of FCR was present, justifying its initial evaluation as a distinct feature, there was no obvious intact heating element. Nevertheless, the area was excavated, with excavation units placed stretching east from the western edge of a FCR concentration.



Figure 5.35 Feature 7 after clearing.

A tight cluster of fairly large rocks was found in the western half of Unit A (Figure 5.36). These rocks were placed in such a way that they might have formed a portion of an earth oven heating element. However, their position and angle implied that the oven would have extended beyond the excavation unit. A large, thermally fractured rock was also present in the unit about twenty centimeters east of this grouping (away from the edge). Beneath the upper layer of FCR was a thin (<5cm) layer of sediment above several unburned rocks resting on bedrock. Charcoal was found throughout the deposit.

Unit B contained what appeared to be the northern edge of one of the largest concentrations of FCR in Feature 7 (Figure 5.37). However the majority of this concentration lay outside of the excavation unit. The rocks within the unit consisted of one layer of thermally altered limestone. Sediment beneath this layer contained charcoal

and a number of unburned rocks to a depth of around forty centimeters. Feature 7 did not contain a distinct carbon stain. Only two matrix samples were collected from the feature. However, a variety of charcoal was found.



Figure 5.36. Unit A at Feature 7.



Figure 5.37. Unit B at Feature 7.

Given the extent and quantity of FCR at Feature 7 it seems likely that multiple earth ovens were constructed at or near this location. Morphology was not discernable because the feature was heavily disturbed by construction of the driveway (which ran directly over the southern portion of the feature) and by years of modern human activity and by limited excavation. The FCR size/weight distribution seems to indicate that an intact feature, composed of large rocks, was present at this location prior to its disturbance.

Feature 13

Feature 13 is located adjacent to a cleft in the canyon edge that offers easy access to the canyon. The feature itself had a large bush growing out of it. A distinct mound of closely spaced FCR was clustered around the base of the bush.

Dimensions. Feature 13 was an ovoid feature measuring 165 by 196 cm. The outer boundary was very distinct.

Est. Total FCR Weight. Total sampled FCR weight from Feature 13 was 99.52 kg (Table 5.11). This was estimated to be one third of the total feature weight, resulting in a total estimated FCR weight of 298.6.

Table 5.11. FCR weight (kg) from Feature 13

Small (<7.5 cm)	Medium (7.5-15 cm)	Large (>15 cm)	total
7.17	42.3	50.05	99.52
7%	43%	50%	

Thickness. Feature 13 was the only feature excavated during the project that had two distinct layers of rocks. The upper layer was composed of large rocks wedged closely together, while the lower layer of rocks was less tightly spaced. Both layers together were almost 30 cm thick.

Outline Morphology. Feature 13 was a distinct ovoid shape. Scattered FCR was noted around the feature but was not obviously associated with it. The feature did not have a central depression. Rather it was slightly dome shaped, most likely the result of there being two layers of rocks.

Cross Section. Feature 13's cross section was unique. A large triangular boulder bisected the feature components (Figure 5.38). In addition, bedrock was almost 20 cm deeper to the southeast of this rock than northwest of it.

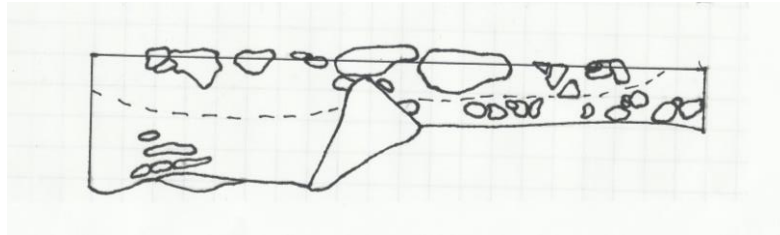


Figure 5.38. Cross section of Feature 13. Width shown 2 meters.

Matrix. A distinct carbon stain was noted around and beneath the feature. The stain extended in roughly 15 cm outward and beneath the heating element. A layer of unstained sediment was beneath the stained layer.

Rock Shape. Constituent rocks were sub-rounded to rounded. Sphericity was sub-prismoidal to sub-discoidal. The lack of angular rocks was noteworthy.

Packing. The packing of Feature 13 was very tight. It was often difficult to remove rocks from the excavation units due to the tight nature of the packing.

Intactness. Feature 13 was inferred to be intact. This was based on its appearance.

Botanical. Two types of wood charcoal were identified in Feature 13: mesquite and cedar. In addition, small amounts of agave were identified (Table 5.12).

Table 5.12. Charcoal mass and types from Feature 13

<u>Taxon</u>	<u>Common</u>	<u>Part</u>	<u>Count</u>	<u>Mass (g)</u>
Fabaceae	Mesquite	Wood	57+	7.9
Juniperus	Cedar	Wood	3	<0.1
Agavaceae	Agave	Leaf	3	0.1

C14 Results. Feature 13 contained charcoal dating very late in time: 146 ± 83 , 93 ± 77 (Table 5.13). It was probably one of the last earth oven features built on the canyon edge.

Table 5.13. Radiocarbon dating results from Feature 13

ASWT-ID	CAR-ID	SITE #	provenience	material	corrected RCYBP	$\delta^{13}\text{C}$ %	Oxcal (4.2) median	2 σ range cal BP
cs6b	298	41VV890	Feature 13, Unit A	exudate	144 ± 34	21.7	147 ± 83	283-2
cs5a	322	41VV890	Feature 13, Unit B	agavaceae	80 ± 18	9.3	93 ± 77	255-31

Excavation Narrative

Feature 13 was probably the most laboriously cleared feature of the project. The bush roots were well imbedded within the stones of the feature, which required careful removal so as to not disturb the feature components. In addition, knowledge gained during excavations of features 17 and 18 contributed to a more thorough approach to feature clearing. This was specifically done in order to document the features morphology make better photogrammetry models that included as much of the feature as possible (Figure 5.39).

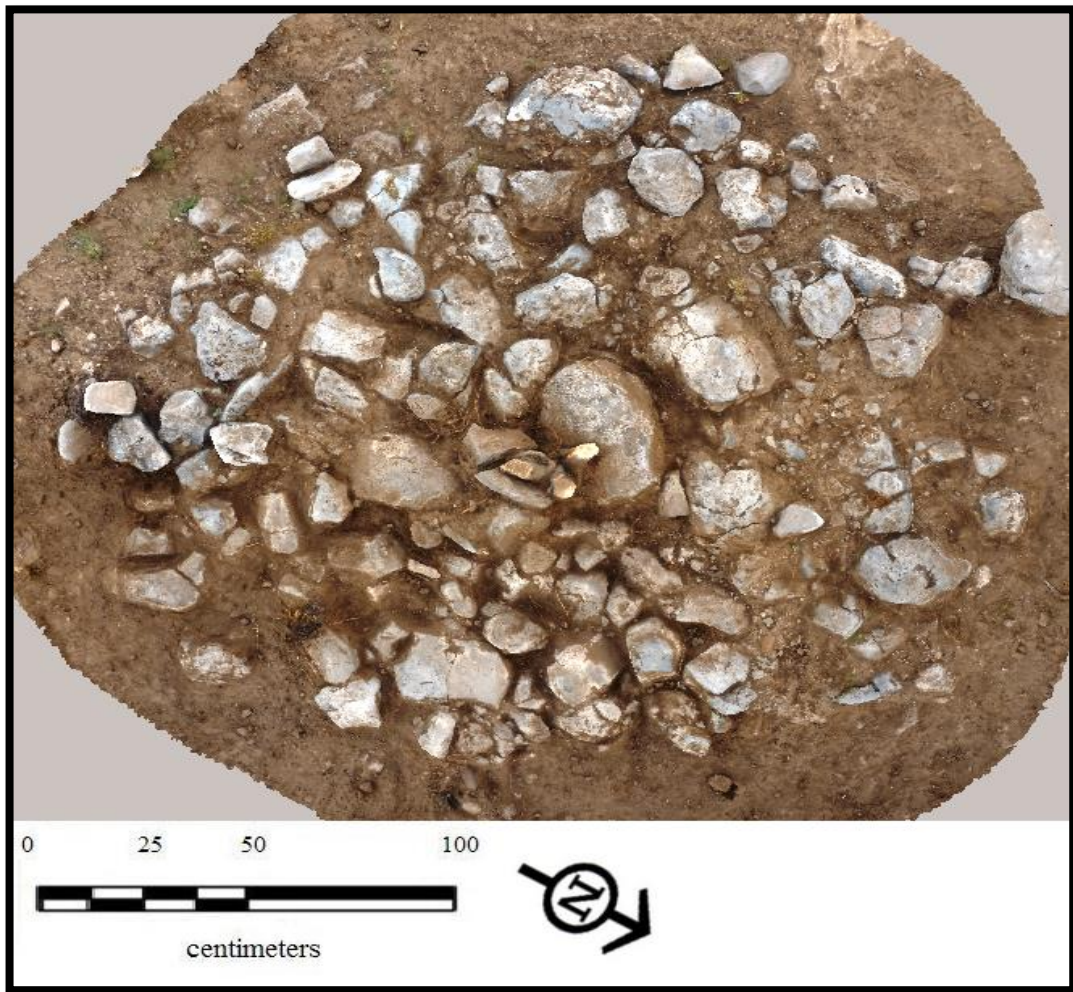


Figure 5.39: Composite Image of Feature 13.

A small trench was dug around the outside of the feature in order to delineate its extent and provide an area for topsoil to be brushed into away from the feature components. Once top soil and vegetation was removed, a small portable air compressor was used to blow dirt out of cracks and crevices between the feature components. These efforts resulted in perhaps the best photogrammetry model produced during the canyon edge project.



Figure 5.40: Excavation Units A (top) and B (bottom).

Excavation units were placed over the northern half of the feature (Figure 5.40). Both units were topped by a layer of large (>15cm) FCR wedged closely together. The rocks were loosened by slowly excavating soil and embedded stones from between them and subsequently removed. Charcoal was recovered from beneath the upper layer of FCR. A second layer of FCR was found directly beneath the upper layer, although a distinct outline was not clear. Beneath the lower layer of rocks was a layer of darkened

charcoal filled sediment 10-15 cm deep. Beneath this stained layer was a thin lens of light brown sediment above a 30 cm thick layer of unburned rock.

The feature itself did not conform to what had been expected. The raised appearance of the feature was originally thought to be a factor of plant disturbance, specifically the bush growing out of the center. However, upon removal of the upper feature components it was discovered that the entire feature was built around a large, triangular boulder measuring 40 cm tall by 50 cm wide (Figure 5.41). The upper portions of this rock had clear signs of burning and was surrounded by a tight cluster of burned rocks. The bedrock to the east of this boulder was encountered almost twenty centimeters deeper than west of it. This fits the pattern found elsewhere on the canyon edge: a bedrock depression of some sort being associated with the feature.



Figure 5.41: view of Feature 13 facing south. Note the domed appearance and central boulder.

A notable inclusion found in Feature 13 were small nodules of burned material identified in the field as “burned sugary substance” due to their resemblance to burned

candy or syrup. The material itself had the spongy structure of bone but sparkled under direct light. Testing is still underway to identify this substance, although I hypothesize it is charred agave nectar. Another noteworthy inclusion was a modified flake found beneath the feature at a depth of 36.5 cm below datum, at the eastern edge of Unit A.

Feature 17 (and Feature 21)

Feature 17 was the first feature excavated on the canyon edge. Previously identified by Skiles and Davis (1999) it was located near a cleft on the western canyon edge around twenty meters downstream from Eagle Cave. The feature was probed in April, 2013 to determine whether charcoal was present. Vegetation was cleared, photos taken, and a centrally place rock selected for removal (Figure 5.42). The rock was thermally cracked in place and therefore assumed to be in situ. Charcoal was found beneath the rock, which was replaced.



Figure 5. 42: Probing of Feature 17 prior to excavation. Charcoal was found.

Dimensions. Feature 17 contained a dense cluster of FCR adjacent to a small rock ring. All of these components were contained in a roughly 2 X 2 meter area.

Est. Total FCR Weight. Total sampled FCR for Feature 17 was 38.6 kg (Table 5.14). This was estimated to be one third of the feature total, resulting in a total estimated FCR weight of 115.8 kg.

Table 5.14. FCR weight (kg) from Feature 17

Small (<7.5 cm)	Medium (7.5-15 cm)	Large (>15 cm)	total
5.79	13.25	19.55	38.59
15%	34%	51%	

Thickness. Feature 17 was only one layer thick. All of the feature rocks were exposed at the surface or buried within the top 10 cm.

Outline Morphology. Feature 17, overall, was a round ring with a concentrated cluster of FCR at its western end. No central depression was visible.

Cross Section. A charcoal carbon stain was visible in the cross section of Feature 17 beneath the heating element (Figure 5.43).

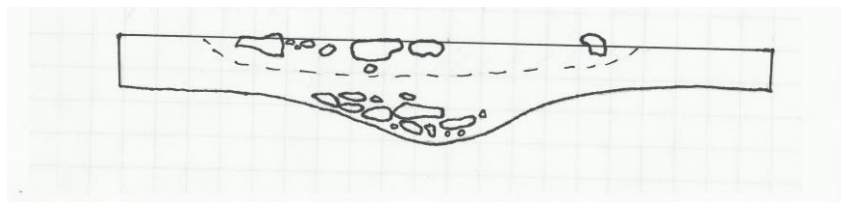


Figure 5.43. Cross section of Feature 17 (top) and Feature 21 (bottom). Width shown 2 meters.

Matrix. Feature 17 contained a large and easily identifiable carbon stain. The stain extended laterally from the feature almost 20 cm, while it extended almost the same distance beneath the feature. Several matrix samples were collected.

Rock Shape. Rocks used in the Feature 17 heating element were sub-angular to sub-rounded, and most were tabular (prismoidal).

Packing. Part of Feature 17 was tightly packed, while other portions of the feature were scattered downslope towards the canyon edge.

Intactness. Feature 17 was disturbed by erosion. Some of the feature components were found in the canyon bottom beneath a cleft near Feature 17.

Botanical. Several types of wood charcoal were identified from Feature 17, including mesquite, condalia, desert hackberry, and creosote. In addition, several agave fragments were identified, including a cluster of vascular bundles (Table 5.15).

Table 5.15. Charcoal mass and types from Feature 17.

<u>Taxon</u>	<u>Common</u>	<u>Part</u>	<u>Count</u>	<u>Mass (g)</u>
Fabaceae	Mesquite	Wood	100+	2.1
Condalia sp.		Wood	12	0.3
Celtis r.	D. Hackberry	Wood	21	0.2
Agavaceae	Agave	Vascular Bundles		0.1
Agavaceae	Agave	Epidermis	1	<0.1
Larrea t.	Creosote	Wood	4	<0.1

C14 Results. The radiocarbon dates for Feature 17 were 502 ± 25 and 443 ± 58 (Table 5.16). Feature 21 dated later than the upper the feature (313 ± 65).

Table 5.16. Radiocarbon dating results from Feature 17.

ASWT-ID	CAR-ID	SITE #	provenience	material	corrected RCYBP	$\delta^{13}\text{C}$ %	Oxcal (4.2) median	2 σ range cal BP
cs3c	295	41VV890	Feature 17, Unit B	hackberry	434 \pm 25	21.1	502 \pm 25	525-464
cs3a	294	41VV890	Feature 17, Unit B	agavaceae	370 \pm 23	19.5	443 \pm 58	501-319
cs13a	299	41VV890	Feature 21, Unit B	mesquite	271 \pm 25	25.1	313 \pm 65	430-154

Excavation Narrative

In June 2013 excavations units were placed across what appeared to be the densest concentration of rock within the feature (Figure 5.44). Unit A contained FCR in the southern portion of the unit and sediment in the northern portion. The bedrock beneath Unit A sloped down towards the south into a depression that extended into Unit B. Unit B contained the bulk of rock associated with the feature, including the rhyolite stone mentioned by the THC. A dark carbon stain was found beneath the surface rock components of Units A and B and collected as several matrix samples.

The dark carbon stain beneath the central portion of Feature 17 extended roughly 10 centimeters beneath the surface. Beneath this stain a yellowish brown silt covered a second layer of unburned rocks found with some charcoal inclusions, most likely from bioturbation. This buried group of rocks was labeled as Feature 21 (Figure 5.45).



Figure 5.44. Excavation Units A (bottom) and B (top). Note the rock ring to the left.



Figure 5.45. Feature 21 found beneath Feature 17.

Feature 21 was the first feature identified during excavations that was buried beneath an upper feature. I was concerned that the feature was an earth oven because of charcoal inclusions. Also, it would have been significant to find two features built at the same location separated by sterile sediment. In the case of Feature 21, however, none of the rocks appeared burned. Also, a later radiocarbon date for the feature came back as later than those for the upper feature. Therefore Feature 21 was determined to be a natural rock formation that was contaminated by charcoal, most likely through bioturbation. A bedrock depression was found beneath the feature at the intersection of both units. It appeared to extend east towards the cleft in the canyon edge, suggesting that it was a buried drainage.

Feature 17 appeared smaller than others excavated during this project. However it contained an equivalent amount of FCR in the excavation sample to several other features (38.59 kg). Also, a rhyolite stone was included in the feature heating element. (Figure 5.46) A large crack down the center of the rock and its placement within the feature seem to confirm this. Upon removal of this stone it was also found to be a grinding tool of some sort. It is most likely a Rio Grande gravel of some sort. Deposits made up of similar gravels can be found around Eagle Nest Canyon, including in the cleft in the canyon wall at the center of 41VV890.



Figure 5.46. Red rhyolite stone used as a heating element in Feature 17.

Feature 18

Feature 18 was previously identified as two features by Skiles and Davis (1999). The surface manifestation of the feature certainly suggested that perhaps two distinct “rings” were present (Figure 5.47). At the request of the landowner, only one of these rings was excavated. The area excavated did exhibit the characteristics of a simple fire feature rather than an earth oven. Specifically its surface manifestation as a hollow ring of rocks rather than a solid grouping. However, the feature was undoubtedly disturbed by modern activities, and the surface distribution of rocks in this case was probably not indicative of the original feature morphology.

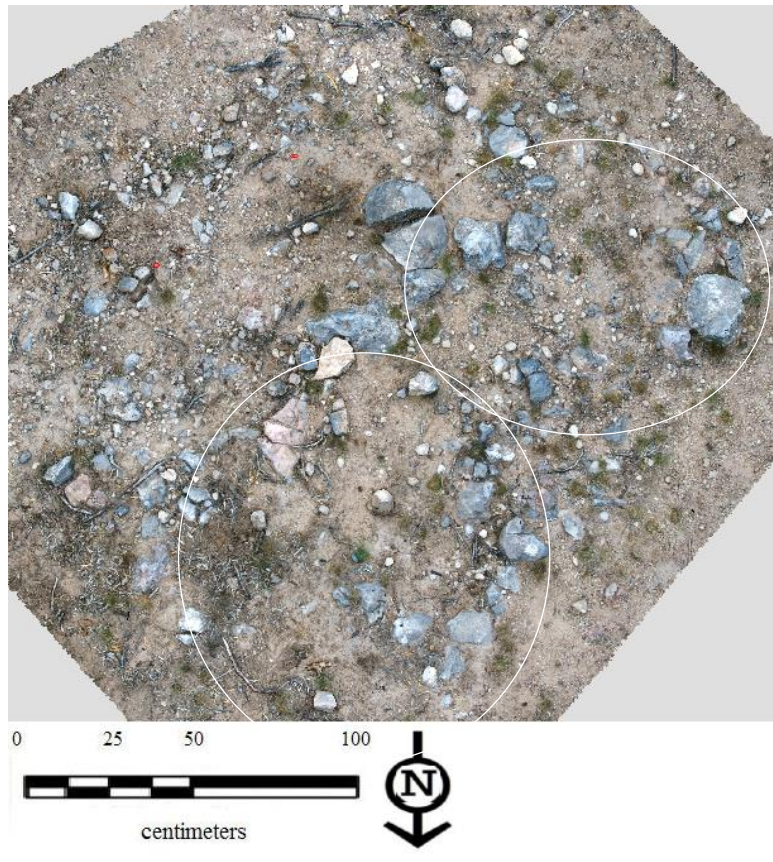


Figure 5.47: Composite image of Feature 18 showing adjacent rock rings.

Prior to excavation the feature was probed to determine whether charcoal was present. A large, thermally cracked rock near the center of the feature was selected and temporarily removed (Figure 5.48). The first half of the rock that was lifted did not have any charcoal beneath it, but the second half had a small speck of charcoal and an ashy stain beneath it. This was assumed to be sufficient evidence that the feature was moderately well preserved.



Figure 5.48. Probing of Feature 18. Charcoal was found.

Dimensions. Feature 18, although appearing to be two adjacent features, has total dimensions of roughly 225 by 200 cm.

Est. Total FCR Weight. Total sampled FCR for Feature 18 was 36.8 kg (Table 5.17). This was estimated to be one fourth of the entire feature, resulting in a total estimated FCR weight of 147.2 kg.

Table 5.17. FCR weight (kg) from Feature 18

Small (<7.5 cm)	Medium (7.5-15 cm)	Large (>15 cm)	total
3.2	14.5	19.1	36.8
9%	39%	52%	

Thickness. Feature 18 consisted of one layer of FCR above a relatively thick layer of sterile sediment.

Outline Morphology. As noted above, Feature 18 appeared to be two adjacent rock rings (Figure 5.46). One of these rings was excavated.

Cross Section. Cross sectioning of Feature 18 revealed a shallow carbon stain (<15cm) beneath the surface layer of FCR (Figure 5.49). No depression was noted.

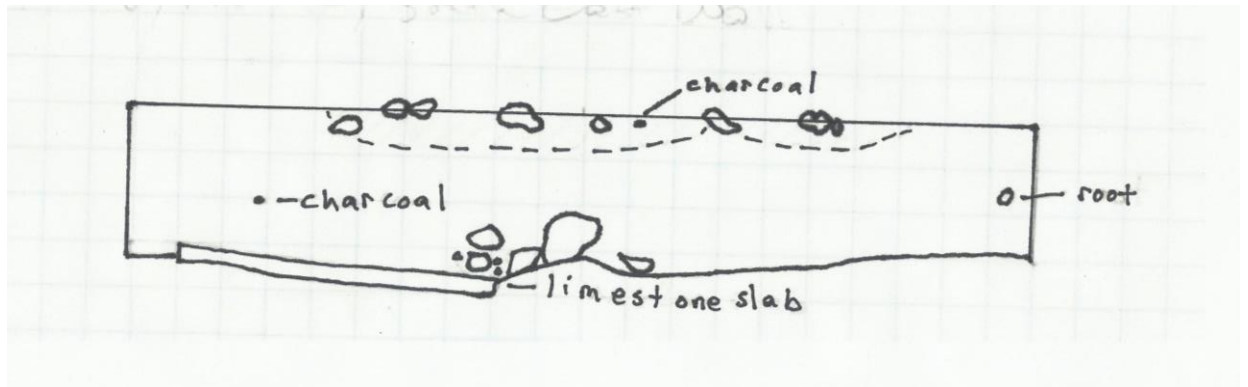


Figure 5.49. Cross section of Feature 18. Width shown 2 meters. Rocks at bottom not cultural.

Matrix. A very distinct charcoal stain was noted in the center of the rock ring excavated. In addition, carbon-stained sediment was found beneath the burned rocks. Several matrix samples were collected.

Rock Shape. Rock components of Feature 18 were angular to sub-angular. Some were spherical, while none were tabular.

Packing. The rock ring itself was tightly packed, while a loose scatter of FCR was present around the ring.

Intactness. Feature 18 appeared to have been disturbed. Some of the disturbance was due to erosion. It might also have been impacted by modern activity in the area. In addition (as discussed in the next chapter) Feature 18 might represent two features, one of which was scavenged for rocks used in the second feature.

Botanical. Four types of wood charcoal were found in the feature: oak, condalia, cedar, and mesquite (Table 5.18).

Table 5.18. Charcoal mass and types from Feature 18.

<u>Taxon</u>	<u>Common</u>	<u>Part</u>	<u>Count</u>	<u>Mass (g)</u>
Quercus sp.	Shin Oak	Wood	13	0.4
Condalia sp.		Wood	24	0.3
Juniperus	Cedar	Wood	21	0.2
Fabaceae	Mesquite	Wood	5	<0.1

C14 Results. The two radiocarbon dates returned for Feature 18 were very close to each other: 512±10 and 512±12 (Table 5.19).

Table 5.19. Radiocarbon dating results from Feature 18.

ASWT-ID	CAR-ID	SITE #	provenience	material	corrected RCYBP	$\delta^{13}\text{C}$ %	Oxcal (4.2) median	2 σ range cal BP
cs4b	296	41VV890	Feature 18, Unit A	oak	459 \pm 24	27.4	512 \pm 10	534-493
cs5b	297	41VV890	Feature 18, Unit B	condalia	460 \pm 26	21.1	512 \pm 12	536-491

Excavation Narrative

As noted above, the feature's surface manifestation appeared to be two adjacent hollow rock rings. The excavation units were placed so as to excavate the eastern ring, leaving the other intact (Figure 5.50). Unit A contained a solid semicircle of around 15 rocks surrounding darkened sediment (Figure 5.51). Charcoal was found throughout the unit, but the most significant quantities came from beneath the FCR and from the darkened sediment at the center of the feature.

Unit A was excavated to what was assumed to be boulders lying on bedrock, reaching a maximum depth of 38 cm. Unit B contained what appeared to be another portion of the hollow rock ring previously mentioned. There were two large rocks, one of which was cracked in several places, and several smaller FCR fragments. Darkened sediment was found beneath the FCR. Sediment beneath the stain was generally sterile,

although some charcoal was found in what were assumed to be insect burrows. Unit B reached 44 cm at its maximum depth, slightly deeper than Unit A.



Figure 5.50. Excavation Units A (bottom) and B (top). Note that the feature heating elements form a ring shape.



Figure 5.51. charcoal stained sediment found at the center of Feature 18 in Unit A.

One of the most striking aspects of Unit 18 was the darkened carbon stain associated with it (Figure 5.51). This continuous band of discolored sediment radiated from rocks and was present in areas where no rocks were present. Therefore this carbon stain, rather than the rock distribution, should be viewed as the best indicator of where the feature originally was and what its dimensions were. In this case Feature 18 was less than two meters in diameter, as the carbon stain did not extend across both excavation units. The carbon stain ranged in depth from 5 to 15 cm beneath the surface.

Feature 20

Feature 20 consisted of a broad scatter of FCR near the Guy Skiles house, on a bluff overlooking the Rio Grande. The feature scatter covered a roughly 20 meter wide area, while the thickest concentration was at the northern edge of this scatter. The feature was initially selected for study due to the large number of small rocks in the area. Subsequent clearing of dogpear cactus and a large ocotillo revealed several large, partially buried, thermally altered rocks cracked in place (Figure 5.52). Jack Skiles requested that these components be left intact, so excavation units were placed to the south of it.



Figure 5.52. Feature 20 FCR identified at the surface.

Dimensions. The concentrated cluster excavated was roughly 3 X 5 m. However, it should be noted that the entire FCR scatter associated with Feature 20 was almost 20 meters in diameter.

Est. Total FCR Weight. Total sample FCR for Feature 20 was 103.3 kg (Table 5.20). This was estimated to be one third of the feature total. The estimation was based on the large of rocks found in a bedrock depression within the excavation units. Most of the other feature components were resting on bedrock. Total FCR estimate is 309.8.

Table 5.20. FCR weight (kg) from Feature 20

Small (<7.5 cm)	Medium (7.5-15 cm)	Large (>15 cm)	total
21.45	59.75	22.08	103.28
21%	58%	21%	

Thickness. The thickness of Feature 20 was difficult to discern. Like Feature 5 at the Lone Star Bridge site, it was a mixed deposit contained within a bedrock depression.

Outline Morphology. The outline morphology of Feature 20 was very difficult to determine. Most of the feature rocks were scattered. The excavated portion contained not distinct morphology other than a sediment-filled central depression.

Cross Section. Cross sectioning of the feature revealed a mixed grouping of FCR adjacent to a sediment filled central depression. Almost no rocks were found in the central depression.

Matrix. Matrix from Feature 20 was charcoal stained throughout the feature. The central depression contained a particularly dark sediment. Most of the charcoal recovered from the feature was found in this matrix.

Rock Shape. Rocks in the feature were angular to sub-rounded. Some of the rocks were tabular and can be characterized as prismoidal to sub-prismoidal.

Packing. FCR within the excavation units was tightly packed, while the majority of rock associated with the feature was scattered or loosely spaced.

Intactness. Feature 20 was disturbed by erosion, goats, and other modern activity. In addition, the feature was clearly reused multiple times, resulting in scattering of much of the rocks away from the central bedrock depression through discard behavior.

Botanical. Of the very small amount of charcoal recovered, three types of wood were identified: desert hackberry, mesquite, and granjeno (Table 5.21).

Table 5.21. Charcoal mass and types from Feature 20

<u>Taxon</u>	<u>Common</u>	<u>Part</u>	<u>Count</u>	<u>Mass (g)</u>
Celtis r.	D. Hackberry	Wood	1	<0.1
Fabaceae	Mesquite	Wood	2	<0.1
Celtis p.	Granjeno	Wood	1	<0.1

C14 Results. Feature 20 was the oldest feature excavated during the project and two charcoal samples dated to 607 ± 30 and 594 ± 34 (Table 5.22).

Table 5.22. Radiocarbon dating results from Feature 20

ASWT-ID	CAR-ID	SITE #	provenience	material	corrected RCYBP	$\delta^{13}\text{C}$ %	Oxcal (4.2) median	2 σ range cal BP
cs4a	323	41VV890	Feature 20, Unit B	mesquite	588 ± 18	21.8	607 ± 30	644-541
cs3b	320	41VV890	Feature 20, Unit B	granjeno	635 ± 21	24.4	594 ± 34	663-556

Excavation Narrative

Excavation units A and B were placed to avoid bedrock in addition to the components selected by Jack Skiles (Figures 5.53 and 5.54). And although bedrock was present at the surface around the feature, a large bedrock depression was found beneath the excavation units. The depression was deepest in Unit B, where it reached a depth of over forty centimeters. The depression was unique in that it did not contain a large amount of FCR or charcoal. Rather it was filled with dark, charcoal stained sediment that significantly differed from the surrounding sediment. In Unit A, at the edge of this depression, FCR was found. The rock positioning was not indicative of an intact heating element. A large rodent burrow was also present within the feature.



Figure 5.53. Unit A at Feature 20.



Figure 5.54. Unit B at Feature 20.

Feature 20 did not manifest itself in any discrete fashion within the excavation units. Most of the FCR was of the medium size class (7.5-15 cm). Very little charcoal was recovered. However, most of the charcoal that was recovered came from darkened sediment found in the bedrock depression in Unit B (Figure 5.55).



Figure 5.55. Excavations of Feature 20. Note the lack of rock at the edge of Unit B (left).

Given the surface distribution of rock, the presence of the rodent burrow, and a nearby home and driveway, the feature was undoubtedly disturbed. It was also subjected to extreme forces of erosion, as constant wind from the Rio Grande valley has stripped the area of any topsoil not embedded in bedrock depressions. Rain events are also destructive, with sheet wash appearing to be responsible for much of the scattering of Feature 20.

As will be discussed in the next chapter the distribution of FCR in Feature 20 was similar to Feature 5 at The Lone Star Bridge site, which was also a feature embedded in a bedrock depression.

CHAPTER 6: EARTH OVENS OF THE CANYON EDGE

All of the features excavated during the project seem to be the remains of earth ovens. Data collected about the features is summarized below (Table 6.1). Several inferences about indigenous cooking behaviors can be made based upon the data gathered. These include patterns of earth oven use, reuse, and construction.

The first type of data discussed in this chapter is the Rock Sort data. A comparison of total FCR weight estimates for the features sampled at Eagle Nest Canyon and other Lower Pecos earth oven features is presented. Botanical remains are also discussed, specifically the charcoal wood types used on the canyon edge. Radiocarbon dates and shifting patterns of site use are discussed throughout. A final discussion compares the canyon edge sites around Eagle Nest Canyon to similar Lower Pecos sites.

The chart below is meant to function as a quick reference source for data on earth ovens studied during the project. It is also meant to function as a summary guideline for the future study and documentation of earth oven features. Although some of the chart components require the collection and analysis of charcoal, other components can be quickly gathered in the field. Future earth oven feature documentation would be more valuable if it was done in a systematic way that recorded specific types of data that could be compared to data gathered from other sites and features. Table 6.1 is an attempt to define such types and present an initial dataset for evaluation.

Table 6.1. Earth Oven Features of the Canyon Edge 41VV2167 and 41VV890

	Diameter	est. total FCR weight	Thickness- rock layers	Outline morphology	Cross Section	Carbon- Stained Matrix	Rock shape	Packing	Intact or Disturbed	Botanical	C 14 RCYBP
41VV2167											
Feature 1	215*220 cm	285.125 kg	1 layer of rocks	round, central depression	shallow <15 cm depth	stain beneath rocks only	sub- angular to sub- rounded; sub- prismoidal	tight	intact	n/a	n/a
Feature 3	188*165 cm	205.41 kg	1 layer of rocks	round, central depression	central basin <30 cm depth	stain extends 15 cm away from heating element	sub- angular to sub- rounded; spherical	loose	intact	oak	181±87
Feature 5	150*120 cm	198.22 kg	multiple/mixed	confined to depression	confined to depression (30 cm deep)	confined to depression	angular; prismoidal	very tight	intact	oak, mesquite, condalia, sumac	395±47; 389±43; 388±41

Table 6.1 continued

	Diameter	est. total FCR weight	Thickness	Outline morphology	Cross Section	Matrix	Rock Shape	Packing	Intact or Disturbed	Botanical	C 14 RCYBP
41VV890											
Feature 7	200*390 cm	233 kg	1 layer of rocks	triangular; central depression	shallow <15 cm depth	stain difficult to identify	angular to sub-rounded; prismoidal	loose	disturbed	mesquite, condalia, desert olive, sumac, mormon tea/ocotillo, desert hackberry, oak	591±35; 525±8
Feature 13	165*196 cm	299 kg	2 layers of rocks	round; domed	basin (SE of center) <30 cm depth	stain extends 15 cm away from heating element	sub-rounded to rounded; sub-prismoidal to sub-discoidal	very tight	intact	mesquite, cedar, agave	146±83; 93±77
Feature 17	200*200 cm	116 kg	1 layer of rocks	round; partial ring	shallow <15 cm depth	stain extends 20 cm away from heating element	sub-angular to sub-rounded; prismoidal to sub-prismoidal	tight; some scatter	disturbed	mesquite, condalia, desert hackberry, agave, cresote	502±25; 443±58
Feature 18	225*200 cm	147 kg	1 layer of rocks	2 rings	shallow <15 cm depth	stain confined to center of rock ring and beneath rocks	angular to sub-angular; sub-prismoidal to speherical	tight ring; no center	disturbed	oak, condalia, cedar, mesquite	512±10; 512±12

Table 6.1 continued

	Diameter	est. total FCR weight	Thickness	Outline morphology	Cross Section	Matrix	Rock Shape	Packing	Intact or Disturbed	Botanical	C 14 RCYBP
Feature 20	300*500 cm	309 kg	multiple/mixed	scatter; cluster at NE corner	central basin <40 cm depth	continuous stain; charcoal stained matrix in central depression (no rocks)	angular to sub- rounded; prismoidal to sub- prismoidal	loose; scattered	disturbed	desert hackberry, mesquite, granjeno	607±30; 594±34

Discussion of Rock Sort Data

The use of FCR to evaluate patterns of behavior in the past was discussed as a methodological approach in Chapters 3 and 4. The approach chosen for this project, known as Rock Sort, was used previously by the Ancient Southwest Texas Project at Texas State University during a 2011-2012 field session at Dead Man's Creek and subsequent research in Eagle Nest Canyon (2013-2015). The three size classes (<7.5 cm, 7.5-15 cm, and >15 cm) were used. These size classes were found to provide a sufficiently high resolution of feature composition to make inferences about past behaviors, specifically feature reuse. In addition each feature sample provided a data set comparable to previous studies of earth oven features, specifically those documented by John Campbell in his 2012 thesis and Roberts et al. (2011) during their study of the Lost Midden Site. Each of these projects sampled burned rock weights in landscape settings similar to the canyon edge zone I studied.

A summary of the sample weight of FCR for all features excavated during this project is presented in Table 6.2 along with estimates of total feature weight. In addition, comparable data from Campbell (2012) is presented. As noted in Chapter 3, Campbell studied a similar range of earth oven features elsewhere in the Lower Pecos region. His attempts to accurately define individual feature total weight through photogrammetry analysis and weighing of samples in the field are comparable to the work done here. Therefore his is the only data set that attempted to estimate the total rock weight in small to medium earth oven features.

The development of feature total weight estimates for this project was attempted based on reconstructed feature models produced in Agisoft Photoscan. It should be noted, however, that due to inconsistent application of methods in the field, suitable models were not produced for all of the features excavated. In addition, buried feature components were often not fully exposed outside of the excavation units to the extent necessary to allow for accurate estimates to be made of feature size, number, etc. Therefore each feature sampled weight was estimated based on a study of the models, photographs, and field notes. The resulting numbers fit within the range hypothesized earlier in this thesis for earth oven feature weight (100-250 kg).

Table 6.2. FCR Data from Lower Pecos Sites

<u>Feature</u>	<u>Site</u>	Measured Sample <u>Weight (kg)</u>	Estimated Total <u>Weight (kg)</u>
1	41VV2167	114.05	285.1
3	41VV2167	68.47	205.4
5	41VV2167	198.22	198.2
7	41VV890	46.59	233.0
13	41VV890	99.52	298.6
17	41VV890	38.59	115.8
18	41VV890	36.8	147.2
20	41VV890	103.28	309.8
<u>Other Lower Pecos Features</u> (Campbell 2012)			
A257	41VV2016	85.63	101.7
C001	41VV448	304.77	325.9
C003	41VV448	188.97	203.6
C004	41VV2096	68.31	83.7
C005	41VV2096	94.88	131.8
C006	41VV488	174.27	180.0
C007	41VV2097	97.34	108.8

A basic examination of the FCR weight data reveals several patterns. First, that the range of rock weight used in earth ovens proposed in Chapter 3 (100-250 kg) is supported by the data although the upper end is perhaps a bit low (300 kg would be better). The greatest weight directly measured during the project was from Feature 5 (41VV2167), which was excavated in its entirety (199.22 kg). The hypothesized greatest weights and volumes were from Feature 1 at the Lone Star Bridge site and Features 13 and 20 at the Torres Ranch House site. These features were comparable in total weight to Feature C001 from Painted Canyon Flats. Therefore a feature containing around three hundred kilograms of rock most likely represents the upper limit of individual feature weight. At the lower end of the spectrum, 100 kg seems to be an appropriate estimate for the minimum needed for an earth oven. Average feature FCR weight from all of the features listed above is 195.2 kg. Features 3 and 5 from the Lone Star Bridge site and C006 and C003 from Painted Canyon Flats fit into this average category.

If a range of earth oven rock weight is therefore to be proposed based upon this range of features, it should be 100-300 kg, with 200 kg being the average. This basic conclusion fits with the data, and provides nice round numbers for use in estimating such things as rates of midden accumulation.

In terms of the upper limit of this range, however, a comparison of the larger features (1, 13, 20, and C001) reveals another pattern. Feature 20 (41VV890) was clearly reused. This is reflected in the percentage of each size class of rock (21% small, 58% medium, 21% large) and in the feature's basic

morphology and appearance. In the case of Feature C001, Campbell inferred that the feature was reused based on the percentages of each type of rock (Campbell 2012:89). This would be the case if an earth oven feature was reused without necessarily adding any new rocks. Features 1 (41VV2167) and 13 (41VV890), however, appeared to have been used only once. This inference was based on the FCR distribution percentages (7% small, 43% medium, 50% large for Feature 13 and 4% small, 40% medium, and 46% large for Feature 1) and their morphology and appearance.

None of the smaller features appeared to have been reused. Features 3 (41VV2167), 17, and 18 (41VV890) had FCR distribution percentages similar to Features 1 and 13 in that large rocks were the most common. Feature 7 (41VV890) was a unique example does not seem to fit into this pattern, however. As discussed in Chapter 5 Feature 7 appeared to have been disturbed. In addition, FCR associated with the feature covered a large area, making it difficult to completely evaluate the feature's components. The most likely explanation was that the feature was run over by a tractor and the feature's original morphology destroyed. However a reinvestigation of photographs of the feature seem to show a central depression surrounded by a large scatter of FCR. These rocks were not all packed closely together, as those found in most of the other features were. However this manifestation could have been caused by other factors than modern disturbance, such as feature reuse. Given the size of rocks found Feature 7, I would argue that it was reused at least once. Features 3 (41VV2167), 17, and 18 (41VV890), in contrast, were relatively well preserved in terms of containing

central heating elements or rock alignments representative of the feature's original central components. FCR distribution seems to confirm the impression that they were not reused.

Feature 17 (41VV890), although exhibiting a distinct morphology and a possible central heating element, was heavily eroded. FCR most likely associated with the feature were found down the slope adjacent to the feature. The canyon edge is also nearby, and some FCR was found at the base of the canyon wall beneath the feature. It would be impossible to directly link those rocks with the feature itself. Nevertheless, it should be considered in any evaluation of feature preservation.

Feature 18 (41VV890) was not reused, but perhaps a second feature was built adjacent to it. As noted in the previous chapter, Feature 18 was originally recorded by Skiles and Davis (1999) as two features. The adjacent rock rings might represent two distinct features, or a single feature scattered into what appear to be two ring shapes. Given that charcoal was found during probing of feature components not associated with this ring, it seems that both feature components contained intact charcoal deposits, which would not be expected in a heavily scattered feature. In the comparison section later in this chapter I discuss how the pattern of adjacent features has been noted and explained before, and offer an explanation for Feature 18's morphology.

Feature 3 (41VV2167) was one of the best preserved features studied during the project. Not only did its FCR distribution percentages imply that the

feature was intact, a distinct central heating element was uncovered in a sidewall exposure. By comparison no other feature contained a comparable percentage of large rocks, not even Features 1 at the Lone Star Bridge site or 13 at the Torres Ranch House site (Figures 6.1 and 6.2).

In summary, basic perceptions of features as either single or multi-use earth oven heating elements in features can be confirmed by a simple breakdown of rock size/weight percentages. Features 5 and 20 both appeared to be midden type features that were clearly produced by the construction of multiple earth ovens and the subsequent breakdown of constituent rocks. This was confirmed by the FCR analysis. In addition, Features 1 and 3 (41VV2167) and 13 (41VV89) appeared to be large, relatively intact features that were most likely used only once. Again, this inference was supported by the data, with a majority of the FCR being classed as large in all three features. Features 17 and 18 (41VV890) contained similar distributions of FCR to Features 1 and 3 at the Lone Star Bridge site and 13 at the Torres Ranch House site. This was helpful in interpreting these features, as it was initially difficult to determine whether they were reused. An intermediate feature stage, i.e., a feature that has been used more than once but not many times, seems to be manifested in Feature 7 (41VV890).

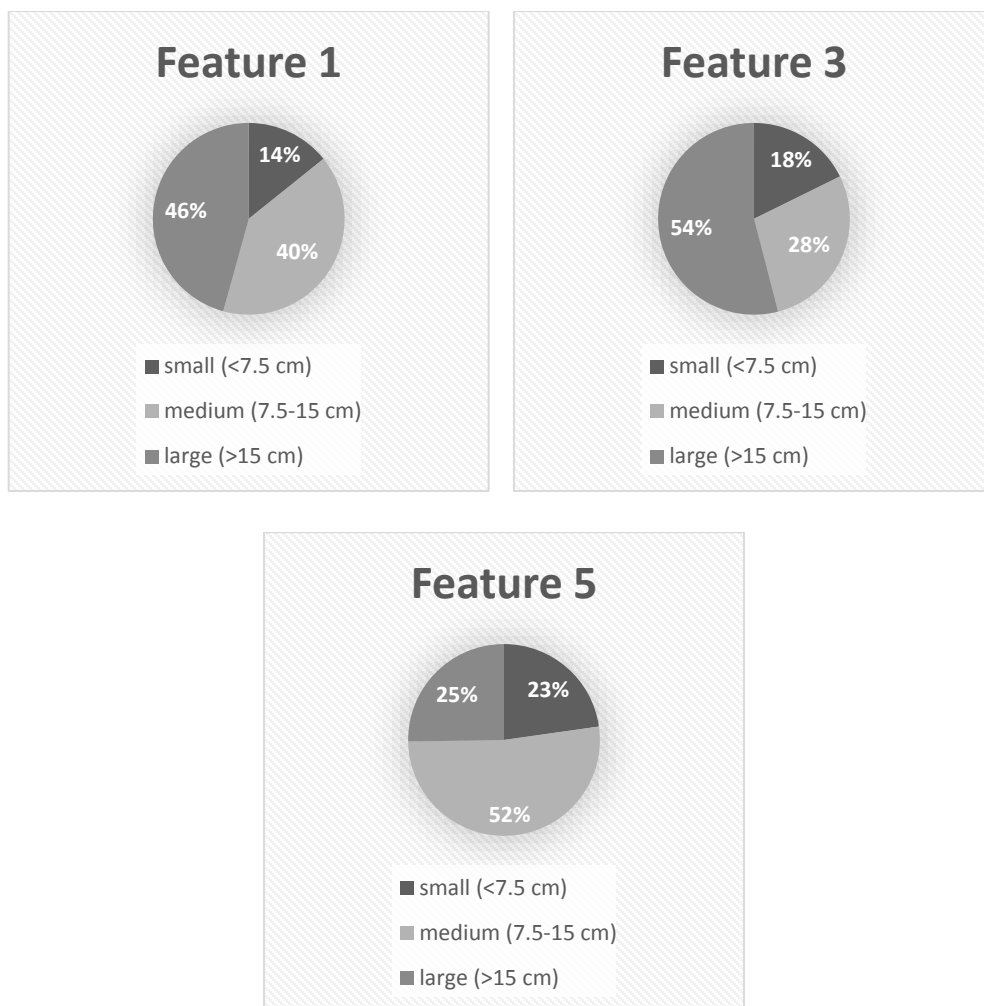


Figure 6.1. Size/Weight Distribution by Feature (41VV2167).

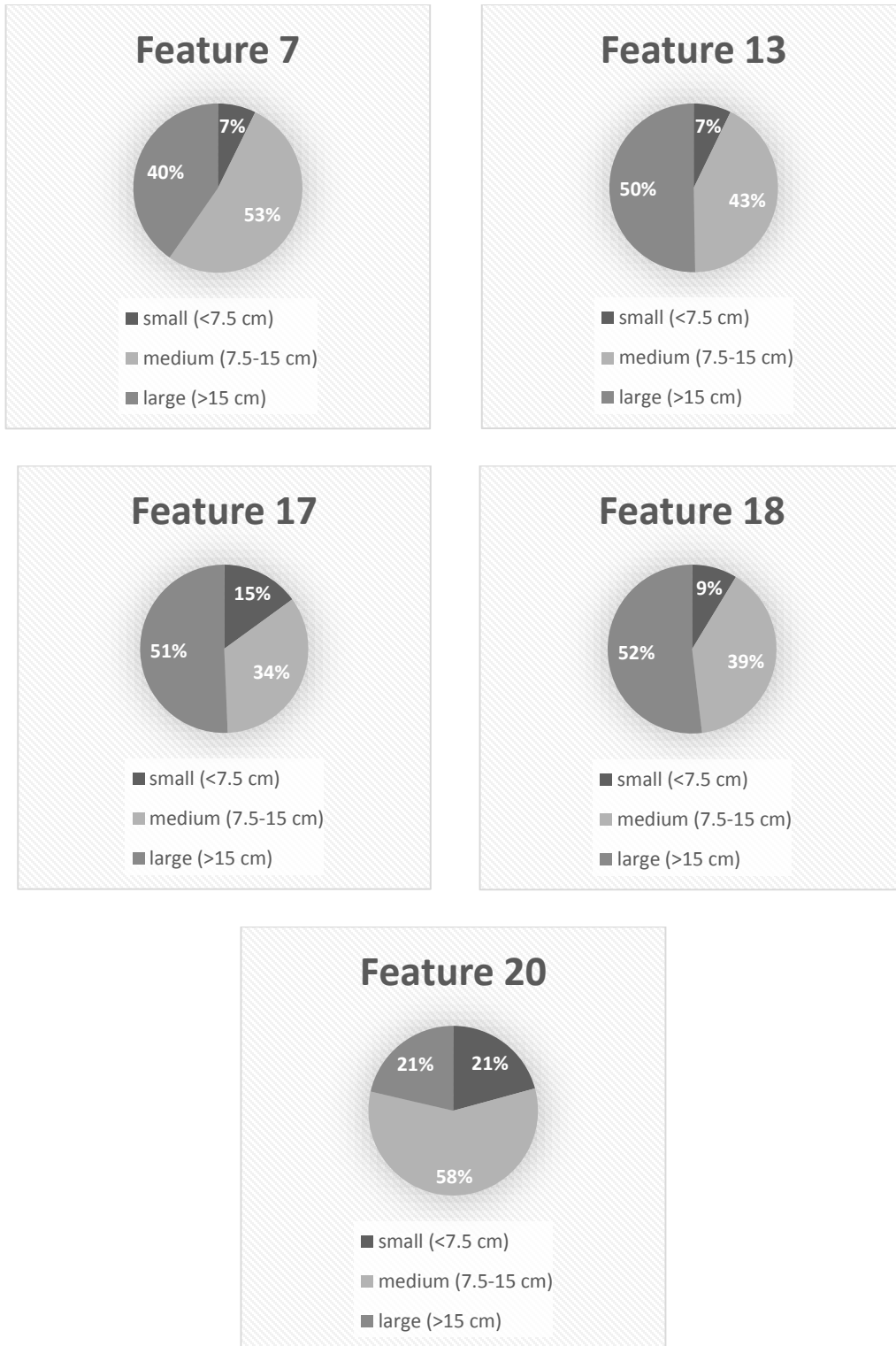


Figure 6.2. Size/Weight Distribution by Feature (41VV890).

Botanical Results

Charcoal was recovered from all features excavated during the project. Of these, only one did not contain any identifiable material. The remaining seven features contained nine different types of wood charcoal and several charred agave fragments. The most commonly used type of wood was mesquite, which was found in six features. This was followed by shin oak and condalia wood, which were found in four features. Desert hackberry was found in three features. Sumac, cedar, and agave were found in two. Creosote, ocotillo, and desert olive were found in one feature each.

It was notable that the vast majority of botanical remains recovered were of wood charcoal used to fire the earth ovens. Only small amounts of agave were found, and no prickly pear or other plant types that might have been used as packing material. This is clearly a factor of preservation bias favoring wood charcoal, all of which was found beneath and protected by FCR.

Although no documentation exists of existing botanical types on the canyon edge around Eagle Nest Canyon, Dering (2002) did discuss woody plants common in the uplands surrounding nearby Amistad Reservoir: “woody plants dominate the vegetation in most upland areas within the boundaries of the reservoir today. These include mesquite, several species of acacia, whitebrush, Texas persimmon, blue sage, lotebush, various buckthorns (*Condalia* sp.), spiny hackberry, Creosote and ceniza...Along the upper reaches of canyons, succulents and rosette-stemmed evergreens are also common, including prickly pear and

tasajillo, several yuccas, and Agave lechuguilla. Small trees are confined to narrow canyons or creek terraces. Littleleaf walnut, several species of oak, Mexican ash, and Texas persimmon are a few of the more prominent tree resources located in the canyons” (2002:2.4). The range of woody plants Dering discusses here is similar to that in and around Eagle Nest Canyon. However some species, such as lotebush, were not identified around the canyon or in any of the features excavated.

Given the botanical data presented in Table 6.1, several inferences can be made about fuel types available on the canyon edge. First, that all of the types of charcoal recovered were from trees and bushes that grow in the uplands surrounding the canyon. Mesquite, the most commonly used fuel type, is common in the rocky, shallow soils on the canyon edge. Condalia and creosote grow in the upland areas around the canyon rather than within it. Ocotillo, found in only one feature during the project, grows mainly in the uplands. The other plant types could conceivably be from the canyon or the canyon edge. So in terms of the hypothesis that earth ovens were built on the canyon edge due to the positions of resources needed for their construction, it seems that on the canyon edge any available wood was used. There does not appear to be any convincing evidence that fuel was brought up from the canyon bottom.

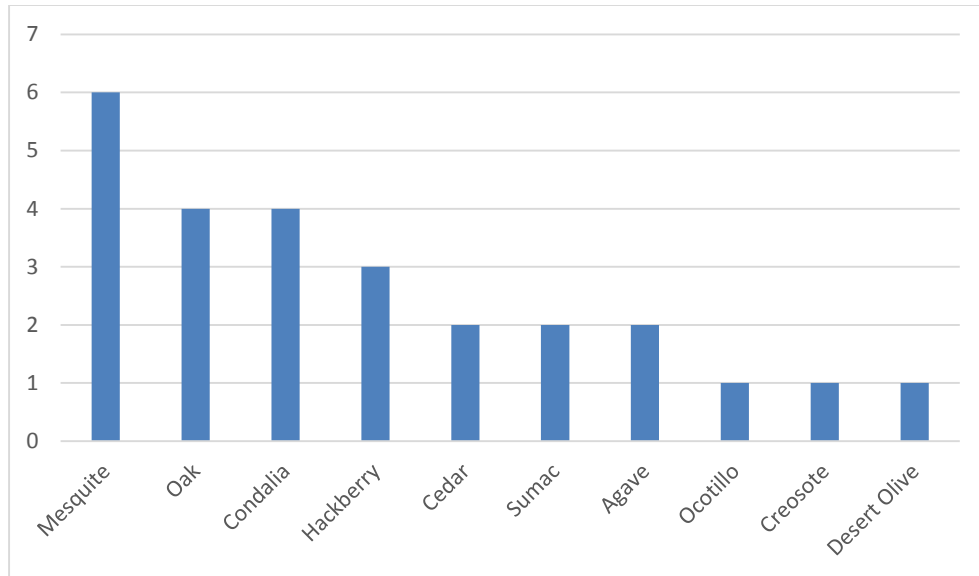


Figure 6. 3. Number of features in which each fuel type was used. Agave is included.

Agave (or sotol) fragments were found in two features, Features 13 and 17. In addition, an unknown substance was found in Feature 13 that appeared to be a burned, sugary substance. I hypothesize that this substance is burned agave exudate. This interpretation is based on the presence of other agave fragments from the feature.

Below several maps (Figures 6.4-6.9) are presented showing the locations of features in which the most common fuel types were used (in red). They most likely reflect the locations of these plant types on the canyon edge. Mesquite was clearly common and was used in features at both 41VV890 and 41VV2167.



Figure 6.4. Features containing mesquite



Figure 6.5. Features containing oak



Figure 6.6. Features containing condalia



Figure 6.7. Features containing hackberry



Figure 6.8. Features containing cedar

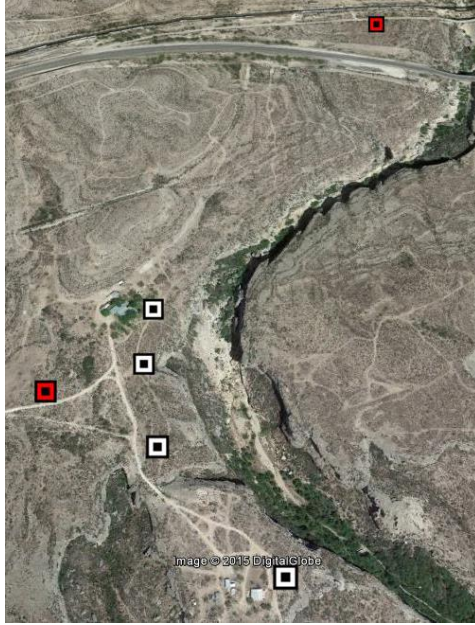


Figure 6.9. Features containing sumac

Oak on the other hand was confined to the features near drainages positioned away from the canyon edges, specifically the drainage between Features 7 and 18 at the Torres Ranch House site and drainages located north and south of the Lone Star Bridge Site. Sumac and condalia show a similar distribution to oak, and all three were probably growing in the same areas. No hackberry or cedar was found at the head of the canyon. However hackberry was most likely growing in the drainage at 41VV890 and even farther out on the point above the Rio Grande where Feature 20 was constructed.

Earth Ovens Through Time

The radiocarbon dates returned for charcoal samples collected during the project were all from the Late Prehistoric or Historic time periods. Two samples from each feature studied were sent for radiocarbon dating. This was done in order to provide a more definite radiocarbon age range for each feature. Dates for

many of the features overlap at the 1 sigma level, indicating that the probability that they accurately reflect each feature's age is very high. Additional analysis of the C14 results was done in Oxcal 4.2 using the R_Combine function, in order to provide a single estimated age for each feature excavated (Table 6.3). It should be noted that Feature 3 at the Lone Star Bridge Site (41VV2167) had only one radiocarbon date directly associated with it, and was therefore not analyzed. The R_Combine function assumes that the separate dates returned from each feature actually represent a single cooking event. Consistency between the dates is checked by a chi-squared test. It should be noted that Feature 7 was the only feature in which the chi-squared test failed. Therefore the combined dates for all of the remaining features is assumed to be fairly accurate. Discussion of the results reveals some interesting patterns concerning shifting landscape use and movement between the upstream and downstream ends of the canyon.

The earliest documented earth oven cooking on the canyon edge around Eagle Nest Canyon was taking place by at least the mid fourteenth century. Feature 20, located on a bluff overlooking the Rio Grande and Eagle Nest Canyon, was most likely built the earliest (based on the features sampled). Mesquite, desert hackberry, and ocotillo were used as fuel. Feature 7 was built about the same time on the edge of a drainage leading into Fox Canyon, several hundred meters north of Feature 20. Feature 7 contained seven types of charcoal, suggesting that this drainage contained these vegetation types at the time. On the other side of the drainage, on a ridge running along the west side of Eagle Nest Canyon, Features 17 and 18 were built decades later. These two features also

contained a wide variety of fuel types. Despite an anomalous radiocarbon date recovered from beneath Feature 17 (Feature 21), it seems that after these features were built earth oven cooking seemed to shift to the area around the head of the canyon.

Table 6.3. R_Combine Estimated Construction Dates for each Feature

Feature #	Site #	Oxcal 4.2 median (R_Combine)	2 σ range cal BP
feature 20	41VV890	602 \pm 29	651-550
Feature 7	41VV890	536 \pm 7	550-519
Feature 18	41VV890	511 \pm 39	526-499
Feature 17	41VV890	486 \pm 42	509-336
Feature 5	41VV2167	400 \pm 42	430-305
Feature 3*	41VV2167	181 \pm 87	290-...
Feature 13	41VV890	113 \pm 77	257-31

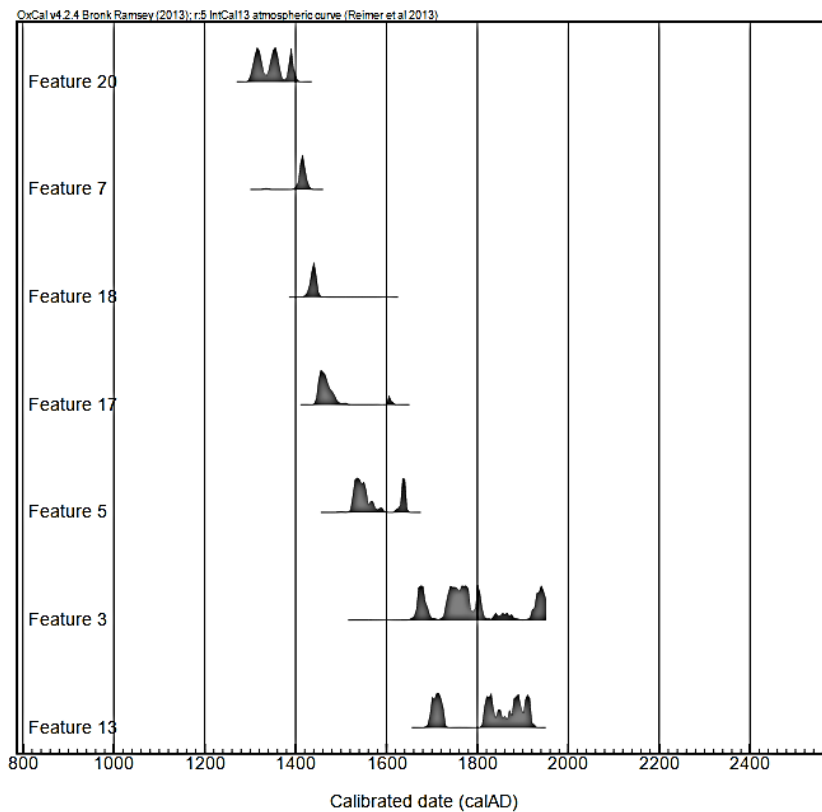


Figure 6.10. Graph showing 2 σ breakdown of the results of the R_Combine function (Oxcal 4.2)

The area around the head of Eagle Nest Canyon contains two ring middens, suggesting that earth oven cooking was concentrated in this area. Feature 5 was built near one of these middens in a large bedrock depression most likely between 300 to 400 RCYBP. Sometime later, the site was returned to and Feature 3 was constructed on top of the bedrock depression containing Feature 5.

The most commonly recovered charcoal type from Features 3 and 5 was shin oak, suggesting that perhaps a grove of these trees was present in the area at the head of the canyon. It could also be that oak was more abundant during this time period, and earth oven cooking relocated to take advantage of this resource.

The latest sampled feature built on the canyon edge was Feature 13. It was a large and well preserved feature and was located near the historic components associated with the Torres Ranch House occupation of the site. Given that Historic occupation of the area began around 1876, that Native American groups such as the Comanches, Apaches, and Kickapoo were documented using the crossing of the Rio Grande at the mouth of Eagle Nest Canyon about this time, and that a metal arrow point was found near the head of the canyon, it seems possible that indigenous groups in the area built earth ovens deep into the Historic era. More information about the radiocarbon dating results is presented in Table 6.4.

Table 6.4. C14 Dates from Canyon Edge Features

ASWT-ID	CAR-ID	SITE #	Provenience	Material	Corrected RCYBP	δ 13C %	Oxcal (4.2) median	2 σ range cal BP	95.4% probability breakdown
cs4a	323	41VV890	Feature 20, Unit B	mesquite	588 \pm 18	-21.8	607 \pm 30	644-541	1306AD (69.6%) 1364AD 1384AD (25.8%) 1410AD
cs3b	320	41VV890	Feature 20, Unit B	granjeno	635 \pm 21	-24.4	594 \pm 34	663-556	1288AD (38.5%) 1324AD 1344AD (56.9%) 1394AD
cs2a	324	41VV890	Feature 7, Unit B	des olive	562 \pm 18	-23.6	591 \pm 35	633-532	1317AD (47.7%) 1353AD 1390AD (47.7%) 1418AD
cs1a	321	41VV890	Feature 22, Unit B	Sumac	501 \pm 17	-24.8	525 \pm 8	540-510	1410AD (95.4%) 1440AD
cs4b	296	41VV890	Feature 18, Unit A	oak	459 \pm 24	-27.4	512 \pm 10	534-493	1416AD (95.4%) 1458AD
cs5b	297	41VV890	Feature 18, Unit B	condalia	460 \pm 26	-21.1	512 \pm 12	536-491	1668AD (16.1%) 1708AD 1717AD (29.6%) 1781AD 1796AD (33.3%) 1889AD 1910AD (16.5%) 1946AD
cs3c	295	41VV890	Feature 17, Unit B	hackberry	434 \pm 25	-21.1	502 \pm 25	525-464	1425AD (95.4%) 1486AD
cs3a	294	41VV890	Feature 17, Unit B	agavaceae	370 \pm 23	-19.5	443 \pm 58	501-319	1450AD (59.8%) 1524AD 1558AD (1.2%) 1564AD 1570AD (34.5%) 1631AD
cs13a	299	41VV890	Feature 21, Unit B	mesquite	271 \pm 25	-25.1	313 \pm 65	430-154	1520AD (37.6%) 1578AD 1582AD (1.6%) 1591AD 1623AD (52.4%) 1667AD 1783AD (3.8%) 1796AD

Table 6.4. continued

ASWT-ID	CAR-ID	SITE #	Provenience	Material	Corrected RCYBP	$\delta^{13}\text{C}$ %	Oxcal (4.2) median	2 σ range cal BP	95.4% probability breakdown
cs6b	298	41VV890	Feature 13, Unit A	exudate	144 \pm 34	-21.7	147 \pm 83	283-2	1668AD (44.8%) 1782AD 1796AD (34.6%) 1892AD 1908AD (16.0%) 1948AD
cs5a	322	41VV890	Feature 13, Unit B	agavaceae	80 \pm 18	-9.3	93 \pm 77	255-31	1695AD (24.9%) 1728AD 1812AD (22.6%) 1854AD 1867AD (47.9%) 1919AD
cs3d	327	41VV2167	Feature 5	oak	290 \pm 18	-23.4	395 \pm 47	430-297	1520AD (61.6%) 1592AD 1620AD (33.8%) 1653AD
cs4c	328	41VV2167	Feature 5	condalia	308 \pm 23	-23.6	389 \pm 43	457-302	1494AD (72.9%) 1602AD 1616AD (22.5%) 1648AD
cs2b	326	41VV2167	Feature 3, Unit A	sumac	315 \pm 20	-20	388 \pm 41	458-306	1492AD (74.9%) 1602AD 1615AD (20.5%) 1644AD
cs1b	325	41VV2167	Feature 3, Unit D	oak	172 \pm 27	-25.3	181 \pm 87	290-...	1660AD (17.4%) 1696AD 1725AD (52.5%) 1814AD 1835AD (5.3%) 1877AD 1916AD (20.2%) ...

Comparisons to other Late Prehistoric Earth Oven Features in the Lower Pecos

My thesis results show that a number of earth oven features dating to the Late Prehistoric are clustered at two locations on the canyon edge around Eagle Nest Canyon. And although there have been very few studies of upland sites in Lower Pecos region, at least two previous studies noted similar patterns of earth oven placement (Brown et al. 1976; Roberts et al. 2011). It should be noted that a number of “hearth fields” have been recorded in the Lower Pecos region.

One hearth field site, 41TE61, briefly discussed in Chapter 3, contained a “cluster of aboriginal hearths” along the margins of an arroyo in Terrel County (Brown et al 1976). They were originally documented during a CRM project in 1976 prior to construction of a dam. Additional work was done at the site in order to determine whether the site was eligible for the National Registry of Historic Places.

41TE61 was initially characterized as dating to the Middle Archaic due to the projectile point styles recovered from the surface. However all of the excavated hearths contained charcoal dating to the Late Prehistoric (Table 6.5). Examination of photos and plan maps of the features indicate that the “hearth” were the remains of earth ovens similar to those excavated at Eagle Nest Canyon.

Table 6.5. Radiocarbon Dates from other Lower Pecos Earth Oven Features

Site	Sample no.	Provenience	Conventional RC Age
41TE61	TX 2475	Hearth 4, Area B	360±80
	TX 2476	Hearth 3, Area B	390±60
	TX 2477	Hearth 6, Area B	300±60
	TX 2478	Hearth 7, Area B	490±60
	TX 2479	Hearth 8, Area B	450±90
	TX 2480	Hearth 9, Area B	640±90
	TX 2481	Hearth 2, Area C	740±90
41VV1991	5	Feature 3	860±40
	6	Feature 3	930±40
	7	Feature 3	890±40
	8	Feature 3	860±40

A unique pattern noted about the features at 41TE61 was “pairing” or adjacent placement of features. Brown et al. hypothesized two explanations for this pattern. One explanation was that paired features were constructed at the same time and were therefore simply two loci selected for their position relative to some resource (agave, sotol, wood, water, etc.) and the other feature. The other explanation was that one feature was “robbed” or scavenged for large rocks suitable for the construction of a new earth oven.

Given either explanation one pattern is evident: people were building earth oven features along the arroyo edge and might have initially placed features adjacent to stands of trees, agave, etc. However once earth oven facilities had been established they were returned to and scavenged for reusable material. This pattern fits well into hypothesized patterns of BRM accumulation, where middens were reservoirs of rock repeatedly scavenged and reused.

In terms of feature reuse, Brown et al. came to conclusions similar to those arrived at during this project. Specifically that some features appeared to not have been reused at all, while others, such as Hearth 4, contained rocks that “showed discolored areas in a variety orientations which might indicate reuse, scavenging, or most likely, post-abandonment disturbance” (Brown et al. 1976:42).

Therefore at 41TE61 multiple earth ovens were built along the arroyo margins. Some of them were used more than once, while others were not. A ring midden was present at the site, and represents an earth oven facility that was returned to multiple times. Smaller earth oven features at the site represented either one use or multiple use earth ovens, each of which was a distinct loci of activity that was qualitatively evaluated by people planning where to build earth ovens, either due to proximity to a specific resources or simply because an earth oven already existed at that location.

The explanations presented for the paired features found at 41TE61 are applicable to Feature 18 excavated at the Torres Ranch House site. As mentioned in Chapter 5, this feature appeared to be two adjacent rock rings. In the case of Feature 18, I hypothesize that it is actually two features. The original feature, consisting of the ring not excavated during the project, was possibly an earth oven. The ring excavated was most likely a simple fire feature constructed adjacent to the original earth oven feature with rocks scavenged from it.

Another site previously documented that was similar to those studied during this project was the Lost Midden site (41VV1991) in Seminole Canyon State Park (Roberts et al. 2011). Like Eagle Nest Canyon, Seminole Canyon

contains a number of rockshelters. The Lost Midden site is located on a bench above the canyon. It was initially discovered during construction of a parking lot for the park, and was subsequently excavated by TPWD archaeologists.

The site itself had three features: two ring middens and a smaller earth oven feature. The smaller feature, Feature 3, was mentioned in Chapter 3 in both the description and photography sections. It appeared to be an intact earth oven heating element.

Charcoal types from the feature were identified and display a similar range to those recovered from sites at Eagle Nest Canyon. These types included oak, mesquite, and condalia wood. In addition, agave fragments were recovered. Types of wood charcoal recovered from Feature 3 at the Lost Midden site not found in canyon edge features around Eagle Nest Canyon included colubrina, lotebush, and mimosa.

Charcoal from the ring middens and Feature 3 were radiocarbon dated (Table 6.4). All of the dates came back to the Late Prehistoric period, specifically the Fletcha sub-period (1320-450 RCYBP). These dates are somewhat earlier than those from 41TE61. However the pattern of building earth oven features along canyon and arroyo edges does seem to be confined to the Late Prehistoric. The discovery of a possible Paleoindian fire feature along an arroyo near Alpine, Texas is anomalous (Walter and Cloud 2014).

Both of the sites discussed here are similar to those studied during at Eagle Nest Canyon, and support arguments made by Brown (1991) and Turpin (2004)

that Late Prehistoric behavior differs from that of earlier time periods in that earth oven cooking was relocated to upland areas near resources needed for their construction.

A problem with this conclusion is that most evidence in the Lower Pecos comes from rockshelters is often disturbed in the upper layers where Late Prehistoric evidence would have been present. This makes any conclusion concerning use of rockshelters during the Late Prehistoric problematic. Another problem is variable preservation conditions between upland areas and rockshelters. It seems almost common sense, given the extreme forces of erosion occasionally present on the canyon edges and arroyos throughout the region, that any features built in these locations would be disturbed or even destroyed. Given this observation, it seems entirely plausible that earlier earth oven features were simply not preserved well enough to contain botanical remains. Prior to radiocarbon dating of any of the features on the Canyon Edge around Eagle Nest Canyon, I hypothesized that they would all date to the Late Prehistoric time period due to these conditions. This hypothesis is supported by the radiocarbon results.

However poor preservation is just one explanation of why all of the features on the canyon edge dated to the Late Prehistoric or Historic periods. Other explanations involve specific behaviors and contexts that might have been involved in behavioral changes associated with earth oven cooking on the canyon edge being confined to the Late Prehistoric and Historic periods.

One such explanation has already been briefly discussed earlier in this chapter: feature reuse. If features were commonly targeted for reuse or scavenged for heating element material they would break down over time due to human activity. Preservation of the feature would be primarily determined by patterns of reuse rather than erosion, deflation, bioturbation, etc. In this case older features would be destroyed by being reused, scavenged, or any combination of the two that would make identification of the original feature impossible. Evidence to support this argument is common on the canyon edge, especially at the Torres Ranch House site: disarticulated burned rock scatters. Many burned rock scatters could represent the remains of older earth oven facilities that are too disturbed to be properly identified. Although charcoal may be present beneath some of them, the research potential of such features is generally considered too low to invest much time in their study.

Another behavioral explanation is much more complex, and involves a discussion of the Lower Pecos Canyonlands climate and its relationship with surrounding regions. Some evidence has been found of climate change during the early Late Prehistoric period in the Lower Pecos. Specifically radiocarbon dates from whewellite in rockshelters, which is produced by a lichen and is indicative of dry, hot periods with increased evapotranspiration. Four distinct periods of increased whewellite formation have been identified (Russ et al. 1996), the last of which ranged from 680 to 1360 RCYBP. Around the end of this mesic period, evidence of violence and warfare increased in the Southern Great Plains region (Vehik 2002:42). Although these two lines of evidence are

not directly linked to earth oven cooking in the Late Prehistoric, they are indicative of a changing world. Climate change might have induced native groups to adjust behaviors, specifically an increased reliance on desert plant foods, such as sotol and agave. Even more importantly, changing climate might have forced people to become more mobile. As people moved farther and farther in search of fresh resources, they would have increasingly come into conflict with each other. The positioning of Late Prehistoric sites on elevated positions near waterways could have been a direct response to increased contact between groups, including instances of raiding and warfare. Eagle Nest Canyon in particular would have been a location in which safety would have been a major concern. Not only is the Rio Grande a major landmark and source of water, it was crossable at the mouth of Eagle Nest Canyon during the Late Prehistoric and Historic. Traffic in the area would have been much higher than in any of the surrounding highlands. In addition, the canyon's rockshelters would have been vulnerable to sudden attack, and the people in them trapped in the canyon itself if they fled upstream. By camping above the canyon, specifically at the Torres Ranch House site, which controls the most obvious entry point to the canyon, indigenous people would have increased their security without abandoning the canyon and its resources entirely.

CHAPTER 7: CONCLUSION

On a basic level my thesis is about thermally altered rocks, earth ovens, botanical remains and the canyon edge zone. On a deeper level, however, it is an attempt to capture a brief glimpse of the lives of the prehistoric inhabitants of the Lower Pecos region. These people did not just cook in earth ovens: they depended on it. Earth oven cooking of sotol and agave was a source of carbohydrates and calories during times of strain. But more importantly it was a tradition. Earth oven cooking among Native Americans was and is a precious component of their identity. Small details noted in the ethnographic section of this work, such as the inclusion of four small rocks in earth ovens among the Mescalero Apache, indicate the deeper meaning of earth oven cooking among indigenous groups.

The evidence presented in this thesis is only a brief glimpse into the spiritual, social, and economic importance of earth oven cooking in this part of North America. The presence of massive accumulations of burned rock throughout the Lower Pecos in rockshelters, across the canyon edges, and in the uplands is proof of the enduring importance of this behavioral tradition to prehistoric Native Americans. Only by further study of earth oven features throughout the region can archaeologists develop a better picture of when, where, and in what intensity earth oven cooking was taking place. Perhaps a broader understanding of these features will allow more comprehensive inferences to be made concerning earth oven cooking in the past, specifically what it meant to the people who used it to feed their friends, family, and themselves.

Earth Oven Cooking on the Canyon Edge

All of the features excavated during the project dated to the Late Prehistoric. Turpin wrote of this period that “although the Late Prehistoric people continued to take advantage of the natural shelter offered by caves and overhangs they apparently began processing desert succulents in a manner that left a distinctive feature on open sites...ring middens...consistently date to the Late Prehistoric period, although some caution is introduced by the mixture of projectile point styles on these open sites and the common sense recognition that charcoal is less likely to survive in older features” (2004:274).

The evidence I studied on the canyon edge around Eagle Nest Canyon confirms Turpin’s characterization of the time period. In addition to the features excavated, two ring middens are present near the Lone Star Bridge site and might date to the Late Prehistoric, although this is unknown. A variety of projectile points were found in the area. In addition, it is “common sense” that charcoal would not be preserved from older features. Turpin also wrote that during the Late Prehistoric “pit-baking ovens were relocated, being moved from rockshelters to open sites situated near stands of plants and firewood, where a temporary surplus of foods could be produced” (Turpin 2004:274-275). This also accurately characterizes the conclusions of this project. Sites 41VV890, 41VV168, and 41VV2167, the three areas of the canyon edge where large scale earth oven cooking was taking place, appeared to be located adjacent to drainages leading into the canyon. The drainage at 41VV890, west of the current Skiles residence, still contains trees and large bushes. The drainages adjacent to the head of the canyon were most likely destroyed by construction of the railroad at the end of the 19th century. However some evidence of them still exists on property to the north of the study area.

As agave and sotol grow at various places around the canyon, it seems that the location of earth oven cooking in this instance was determined by fuel location and another important resource identified by Charles Koenig: sediment. He wrote that “the association between earth oven cooking and availability of sediment may be an overlooked aspect of Lower Pecos burned rock midden site location” (Koenig 2012: 112). As noted in various places throughout this thesis, several of the features excavated during this project were located above, within, or adjacent to bedrock depressions. In addition, drainages are areas where sediment is most likely to be deposited in such depressions. Therefore the placement of earth ovens at 41VV890, 41VV168, and 41VV2167 were most likely determined by the availability of two resources: wood and sediment.

Future Research

Humans were undoubtedly active on the canyon edge prior to the 14th century. The range of projectile points found on the canyon edge and the long and well documented history of human activity in the canyon below support this assertion. It appears, however, that earth ovens were constructed on the canyon edge only during the Late Prehistoric period. This might be a factor of preservation. FCR scatters and smaller concentrations were found during the canyon edge survey. These could be the disarticulated remains of older earth ovens. They would not reflect their original morphology, nor would they be likely to contain preserved botanical remains. The concern here is the ability of the archaeologist to identify older features, as they might not be as visible or have as high a research potential as younger ones. So, is the lack of evidence for earth oven cooking on the canyon edge prior to the Late Prehistoric evidence

that it was not done? Given the findings of this project I would say yes. However, this seems unlikely, especially given the presence of Late, Middle, and Early Archaic projectile points found on the canyon edge.

The most obvious and feasible way to test this assertion would be to sample the burned rock middens on the canyon edge (Feature 2 at the Lone Star Bridge site and the Langtry Rock Midden across the canyon). Middens may form over hundreds if not thousands of years. The idea that either of these middens formed only during the last millennium is considered unlikely. It is more likely that they represent the only substantial remaining evidence of earth oven cooking on the Eagle Nest Canyon edge from time periods prior to the Late Prehistoric. Future research on the canyon edge should therefore focus on the middens, as they can contextualize the remaining earth oven features and confirm whether earth oven cooking on the canyon edge was confined to the Late Prehistoric.

I also believe that the study of individual burned rock features should be a major focus of future archaeological survey in the Lower Pecos region. Noting the location of often sparse and ephemeral FCR scatters during this project often led to the discovery of buried earth oven features. Several features were built within or above karstic depressions. Many of them contained charcoal that was identified and radiocarbon dated. The only way that such data can provide a convincing picture of earth oven cooking in the Late Prehistoric and earlier periods is to study more earth oven features. This project has contributed an admittedly small amount to what is needed to truly confirm the transition in landuse that would be reflected in earth oven cooking on the canyon edge and other upland sites being more common during the Late Prehistoric.

Critique

My project was far from perfect, and there are a few things that I would change if I could do it again. The first change I would make would be to spend more time documenting the feature through drawing and photogrammetry. Quality sketches or photogrammetry models were produced for only a few of the features studied during the project. Next, I would spend more time learning how to use computer programs, such as Excel, Word, Adobe Photoshop, and ArcGIS. Archaeology today is moving into a new era where technology is becoming indispensable to all stages of archaeological investigation. Finally I would try to completely excavate more features to minimize the estimations involved in developing hypothesized total FCR weight per features.

Conclusion

Evidence recovered during this project indicates that inhabitants of the Lower Pecos Canyonlands visited the area around Eagle Nest Canyon and cooked food in earth ovens during the Late Prehistoric to Historic time periods. They did so on the canyon edge and also in rockshelters in Eagle Nest Canyon itself. The results of this work and a contemporaneous project in the canyon by Dan Rodriguez (2015), who studied Skiles shelter and Kelley Cave, support this assertion. Indigenous inhabitants of the area were cooking in earth ovens. They were doing so on the canyon edge. They were also occupying the rockshelters within the canyon. Whether the combination of these behaviors was a continuing tradition from earlier times or a new development is difficult to determine due to variation in preservation conditions between the uplands and rockshelters.

The Lower Pecos region is famous because of its well preserved cave deposits. Unfortunately looting and other disturbances have negatively impacted the archaeological record of the Late Prehistoric and Historic periods from these locations. In the past this has obscured the importance of evidence left from these periods, when ancient patterns of human behavior were challenged and transformed by disease, migration, and conquest. Only further study of the Lower Pecos region with a specific focus on Late Prehistoric assemblages can reveal additional patterns of behavioral change during this transitional, and ultimately final, period of indigenous habitation in the Lower Pecos Canyonlands.

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