THESIS

PREHISTORIC ARCHAEOLOGICAL INVESTIGATIONS AT PERDIZ CREEK: AN INTER-LANDSCAPE COMPARATIVE ANALYSIS IN THE SOUTHERN TRANS-PECOS REGION OF SOUTHWESTERN TEXAS

Submitted by

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WE HEREBY RECOMMEND THAT THE THESIS PREPARED UNDER OUR SUPERVISION BY SAMUEL CASON ENTITLED PREHISTORIC ARCHAEOLOGICAL INVESTIGATIONS AT PERDIZ CREEK: AN INTER-LANDSCAPE COMPARATIVE ANALYSIS IN THE SOUTHERN TRANS-PECOS REGION OF SOUTHWESTERN TEXAS BE ACCEPTED AS FULFILLING IN PART REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS.

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ABSTRACT OF THESIS

PREHISTORIC ARCHAEOLOGICAL INVESTIGATIONS AT PERDIZ CREEK: AN INTER-LANDSCAPE COMPARATIVE ANALYSIS IN THE SOUTHERN TRANS-PECOS REGION OF SOUTHWESTERN TEXAS

A 2000 Texas Archeological Society field school collected information from the Marfa Plains in the Southern Trans-Pecos region of southwestern Texas, using pedestrian survey and subsurface test excavations. This investigation presents archaeological data from Perdiz Creek, a portion of the field school project, using a landscape scale analysis in addition to site-specific information. The Perdiz Creek landscape is compared to an additional landscape unit, noting differences in feature distributions and environmental contexts. Course-grained observations are used to construct hypotheses concerning mobility patterns in different landscape settings. Finally, recommendations are made in regard to how landscape level analyses might proceed in future investigations and how this may contribute to an understanding of prehistoric behavioral diversity in the Southern Trans-Pecos and hunter-gatherer studies in general.

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Table of Contents

List of Figures

List of Tables

CHAPTER 1: INTRODUCTION

The Southern Trans-Pecos of Texas is a physiographically and ecologically distinctive portion of North American geography. Its prehistoric inhabitants led lives strongly conditioned by their surroundings and environmental conditions that have changed significantly over time. The character of archaeological remains in the region indicates prehistoric lifestyles that are markedly different from those in other North American geographical settings. The Southern Trans-Pecos exhibits a great deal of environmental diversity that has undoubtedly contributed to a variety of behavioral responses in prehistoric peoples. A primary goal of this research project is the recognition of behavioral diversity in the archaeological record of the region, with emphasis on a portion of Perdiz Creek, located along a tributary of the Rio Grande.

Data are compiled from small scale test excavations and survey along Perdiz Creek. Test excavations focus on high visibility features related to prehistoric subsistence at four sites. These data are compared to that collected at another Southern Trans-Pecos study area, Gilliland Canyon, one with a distinctively different environmental setting. Although subsurface excavations were undertaken only at Perdiz Creek, the primary focus of the investigation is on the distribution of surface features, particularly on hearths and middens. The archaeological material observed at each site is the result of palimpsest deposits, overlapping occupations and events, and a range of taphonomic processes (Folley 1981). Therefore, the analysis of data for this project is based on the overall assemblage of features rather than on aspects of specific sites, components or representations of specific cultural phases, or other cultural historical taxonomic units.

My conclusions rely on the explicit assumption that environment is a substantial conditioning factor of human behavior. This paper compares the environmental context of the two study areas, with particular emphasis on gross attributes, e.g. topographic setting and vegetative community. In addition, I consider the impacts of archaeological and environmental diversity in the further understanding of prehistoric subsistence behavior at Perdiz Creek specifically and on populations in general. My conclusions suggest future research aims and objectives, including the observations of modern hunter-gatherer groups, new sources of information, and methods of data collection.

The information relied upon for this project was collected by members of the Texas Archaeological Society (TAS) at the organization's annual field school in August 2000. The event was hosted by the Center for Big Bend Studies (CBBS), headquartered at Sul Ross State University in Alpine, Texas, and was carried out on the McGuire Ranch in the Southern Trans-Pecos region of Texas. The CBBS provided logistical support and framed the project's research goals and objectives. TAS also provided logistical support as well as funding. Ranch owners Betty McGuire and John McGuire were gracious hosts and provided the use of their ranch houses as staging area for the event. Robert J. Mallouf, CBBS Director, and Williams A. Cloud, CBBS CRM Coordinator, directed the project.

The 350+ TAS members of diverse backgrounds, ages, experience and education, brought to the project an invaluable wealth of knowledge, many returning and others participating for the first time in an archaeological field school. Many returning members and CBBS staff who have considerable experience and knowledge of prehistoric lifeways contributed immeasurably in formulating research questions for this project. In addition, longtime residents of the Southern Trans-Pecos region played a pivotal role in this investigation. David Williams, McGuire Ranch manager, contributed a keen eye for cultural resources. Monroe Elms grew up in the region, and he also evidenced an intimate knowledge of the area and its archaeological materials. Both men brought to the project invaluable knowledge of area resources.

There exists a dearth of information about prehistoric lifeways in the Southern Trans-Pecos region, particularly of the Marfa Plain where the McGuire Ranch is situated. Although the field school research objectives were straightforward and elementary, they are invaluable in that this investigation provides a sample of the area's prehistoric and historic cultural resources. As the Marfa Plain is a veritable blank spot on the map of archaeological knowledge of the region, any information constitutes a significant contribution. Known resources were assessed in preliminary investigations preceding the field school event, and several sites were selected for follow-up subsurface test excavations to determine the nature of archaeological deposits and to assess their archaeological integrity for future investigations.

Landscape and Scale

This investigation of Perdiz Creek, Gilliland Canyon, and the Southern Trans-Pecos utilizes the concept of *landscape*, borrowed from the discipline of landscape ecology. The methods used in the current project are not a drastic departure from "site" based investigations, but the application of the landscape concept is intended to be a tool to define the scale of investigation not typically addressed elsewhere in archaeological investigations. The concept of landscape usefully integrates ecological ideas and places emphasis on the relationship between resource distributions and human behavior.

Definition of scale has been brought to the forefront in landscape ecology and the search for understanding between pattern and process (Butzer 1980). Levin (1989) notes that the selection of a proper scale of analysis is contingent on the pattern that is under investigation. In this sense, one can expect that the processes needed to explain inter-site patterning would be different from those needed to explain intra-site patterns. Similarly, the information needed to understand the mobility strategies employed in a single drainage basin (Steward 1938) would be different from that needed to explain mobility strategies employed in different parts of the world (Binford 1980; Kelley 1995).

A landscape can be somewhat difficult to define, as it has been referred to in many ways in various disciplines. Farina (1996:2) describes a landscape as "...a particular configuration of topography, vegetation cover, land use and settlement pattern which delimits some coherence of natural and cultural processes and activities." Forman (1995:13) provides a more practical definition, describing the spatial extent of the landscape scale:

> A landscape is...a mosaic where the mix of local ecosystems or land use is repeated in similar form over a kilometers wide area where several attributes tend to be similar and repeated across the whole area, including geological landforms, soil types, vegetation types, local faunas, natural disturbance regimes, land uses, and human aggregation patterns. Thus a repeated cluster of spatial elements characterizes a landscape.

Forman (1995:14) further notes some important attributes of a landscape: "The above-described concept, now widely used, integrates a focus on (a) spatial pattern, (b) the area viewed in an aerial photograph or from a high point on the land, and (c) unity provided by repeated pattern." The definitions provided by Forman and Farina suggest that, regardless of the inherent ambiguity of the term, some consensus can be reached as to what defines a landscape.

The landscape defined by Forman, and used here, lies within a hierarchical system of scale, including in descending magnitude: biosphere (planet), continent, region, landscape, local ecosystem, and site. In this scheme, the degree and shape of forest canopy might be used to understand animal behavior at the site level, while large scale weather patterns might be needed to understand species distributions at a regional or continental level.

The Perdiz Creek and Gilliland Canyon study areas do not in themselves define or fully encompass landscapes, as their boundaries are defined by property boundaries and logistical constraints. They do, though, represent significant samples of landscape units from which it is possible to project patterns and processes. While this concept is fraught with practical difficulties and ambiguity, it serves as a useful interpretive framework upon which we might build future investigations and research designs.

CHAPTER 2: ENVIRONMENT

Perdiz Creek Within the Southern Trans-Pecos: The Chihuahuan Desert Biotic Province

The Perdiz Creek study area is located in the Southern Trans-Pecos, a geographical region dominated by the Chihuahuan Desert biotic province (Brown 1982a). The Chihuahuan Desert is classified as warm-temperate, similar to the Mojave Desert. It is the largest desert region of North America, covering significant portions of Mexico's northern states, southwestern Texas, southern New Mexico, and southeastern Arizona. It is characterized as a high desert with elevations between 400 m along the lower Rio Grande and 2000 m in its southwestern extent.

Temperatures range from exceedingly hot summers (>40 C) to cold winters (<30 C); typically there are 200-250 frost-free days during the year between March and the beginning of autumn. Precipitation ranges between 200-300 mm/year and varies greatly over its geographic expanses (annual, monthly, and seasonal averages available in Brown 1982a:170). The majority of precipitation occurs as intense thunderstorms between May and September; the most intense storms occur the late summer. Rainfall usually falls during warm seasonal periods when evapotanspiration is high and effective precipitation is much lower. Thunderstorm runoff is quickly channeled by flashfloods, resulting in little effective moisture. Overviews of regional vegetation and ecological relationships are found in Blaire 1950; Brown 1982a, 1982b, 1980; Kelley et al. 1940; Powell 1988; Warnock 1946, 1977; Wauer and Riskind 1977 .

The Chihuahuan Desert shares a characteristic with two other North American deserts, a floral dominance of *Larrea tridentada* (creosotebush). This specie is typically commingled and shares dominance with *Flourensia splendens* (tarbush) and *Acacia neovericosa* (whitethorn acacia). Other characteristic floral species are *Fouquieria splendens* (ocotillo), *Koeberlinia spinosa* (allthorn), and a wide variety of others. Modern boundaries of the Chihuahuan Desert are a reflection of a relatively recent encroachment of very xeric conditions into regions of semidesert grasslands. There are more than 1000 plant species endemic to this region that form a distinctive overall biotic community. The Chihuahuan Desert is essentially a shrub-dominated biome with leaf and stem succulents (cacti) assuming a secondary and localized role in plant communities.

The Chihuahuan Desert in the Southern Trans-Pecos interdigitizes with the South Plains to the northeast, Rocky Mountain biotic province to the north, the Mogollon and Sonoran deserts to the west, and the Southeastern biotic province to the east (Brown 1982a). The Southern Trans-Pecos sits at the northern periphery of the Chihuahuan Desert, two thirds of which lie to the south in northern Mexico. In this region, xeric Chihuahuan Desert vegetation is making slow but progressive intrusions into mountain and plains like environments. Powell (1998:2) notes, "In overall profile the Trans-Pecos can be pictured as extensive lower elevation flats, slopes, dunes, basins, hills, ridges surrounding higher, island like mountains, plateaus, and basins" (Fig. 1). The range of mean annual temperatures, amounts of monthly rainfall, and vegetation communities further demonstrate the diversity of these topographic settings. Some of this environmental diversity is characterized by biotic subdivisions.

Ecological conditions in the Southern Trans-Pecos stand in marked contrast to adjoining eco-regions such as the South Plains and Rocky Mountain biomes. The availability of resources in these different settings have undoubtedly conditioned prehistoric behavior in important ways.

Brown (1982a) recognizes several biomes (biotic communities) within the Chihuahuan Desert. *Biomes* are natural formations within a biotic province characterized by distinctive vegetation physiognomy. Biomes are "…plant and animal community responses to integrated climactic factors, more or less regional in scope" (Brown 1982a:9). The divisions pertinent to the present investigation include *desert scrub, semidesert grasslands*, *interior chaparral*, and the *madrean montane forest*. Not all of these biotic communities are fully encompassed by the Chihuahuan Desert, but all are present and adjacent within the Southern Trans-Pecos, forming the mosaic character noted above.

In the Southern Trans-Pecos, there is an overall correlation between lower elevations and Chihuahuan Desert (desert scrub) flora. Mountain "islands" are the principle features of macro topographic relief, and desert flora is present on their lower slopes to the extent that soils, moisture, and elevation factors permit. The desert scrub biome (Brown 1982b), which accounts for much of the homogeneous appearance of the Chihuahuan Desert plant assemblage, is subdivided further into three different communities, based upon: 1) soil properties, 2) topographic relief, 3) bedrock substrata, and 4) local climate.

Figure 1. Overview of Southern Trans-Pecos region showing major physiographic features.

This further division reflects considerable variability that more aptly characterizes the desert scrub biome. Only specific and pertinent communities are addressed in this discussion.

The first desert scrub subdivision is the "plains community", which is dominated by three shrub species: *Larrea tridentata* (creosotebush), *Flourencia splendens* (tarbush), and *Acacia neovernicosa* (whitethorn Acacia). This triad is commonly mixed or broken by stands of *Prospis glandulosa* var. *torreyana* (mesquite). The plains community subdivision is characterized by expansive outwash plains, low hills, and valleys. The distribution and nature of this community type is significant in respect to the presence of mesquite, which has been documented historically and ethnohistorically as an important subsistence staple for human populations (Simpson 1977).

The "succulent scrub community" is found on slightly higher elevations that display more topographic relief. Plant community associations include *Euphorbia antisyphilitica* (candelilla), *Agave lechugilla* (lechugilla), and Ocotillo.

The change to "succulent scrub upland" in the desert scrub biome occurs at still higher elevations, accompanied by an increase in leaf succulents. Stemmed succulents are found in higher frequencies as well and include *Agave, Hechitsa, Yucca, and Dasylirion* (sotols). Lechugilla is often found in dense and nearly impenetrable stands interspersed with a modest number of woody shrubs and cacti. Common cacti are typically clumped and low growing: turk's heads, hedgehogs, claret cups, rainbows, strawberries, cholla, and prickly pears.

Succulent scrub communities frequently grade into semidesert grasslands at their upper limit, often co-mingling with summer grasses (*Bouteloua*), sparse Pinon, and chaparral. Desert scrub also comes into contact with madrean evergreen woodland or interior chaparral (see below). The presence of sotol, agave, and yucca in these communities suggest their distribution was an important factor in prehistoric subsistence. Powell (1998:7) notes that there is a strong correlation between bedrock substrate in these areas and the preponderance of yucca and agave. A sotol-lechugilla association is common on limestone hills, whereas a sotol grassland association is more common on igneous formations.

Brown (1982a) classifies the semidesert grassland biome as warm-temperate grassland in a semiarid environment characterized by drying wind and frequent droughts. As noted above, more xeric plant communities have substantially encroached upon this biome, and the landscapes hosting these grasslands may have been significantly different in the recent past. This possibility is a compounding, if not confounding, factor in ecological-archaeological correlations and is discussed further below.

Semidesert grasslands are typically situated at elevations between desert scrub and mountain evergreens and chaparral. The lower elevation extent is ~1000 m and the higher extent ~1700 m. The grasslands generally receive between 250 and 450 mm of precipitation per year. Predictable summer rainfalls support perennial bunch grasses, dominated at lower elevations by *Bouteloua gracilis* (blue gramma). Areas of lower summer rainfall host relatively more annual grasses. Invasions of more xeric species introduce relatively high numbers of woody shrubs, cacti, and forbs at the expense of grasses.

Semidesert grasslands are situated between plains grasslands and desert scrub, sharing attributes of both. This environment has been described as the "...geographical and evolutionary center for a distinguishable and diverse flora and fauna" (Brown 1982a:127). Summer-active perennial grasses include tobosa grass and *Bouteloua eriopoda* (black grama), each a dominant specie depending on the local soil regime. Higher elevations sometimes host plains species such as *Buchloe dactyloides* (buffalo grass) and *Bouteloua gracilis* (blue grama).

Dasylirion wheeleri (sotol), *Nolina microcarpa* (beargrass) and agaves are present in varying frequencies as are varieties of yucca, mesquite, and a host of other forbs, succulents, and shrubs. These species of dry-tropic stem, leaf succulents and scrub serve to break up expanses of grassland landscape, often in a well-spaced manner. *Flourensia cernua* (tarbush), *Acacia neovernicosa* (whitethorn), Mesquite, and *Larrea tridentata* (Creosotebush) are typical Chihuahuan desert scrub species that are found to invade grasslands in increasing rates. Cacti play a similar role in these communities.

The "interior chaparral" corresponds to Powell's (1998) classification of oak-pinyon juniper woodland. Brown (1982a) describes this biome as a climax community dominated by a pinyon-juniper association with a preponderance of oak species, predominantly *Quercus* (live oak). These oak species host prolific acorns seed crops that provided a significant subsistence resource to historic and prehistoric populations.

The "madrean evergreen woodland" biome corresponds to Powell's classification, conifer forest and is classified as a mild winter- wet summer woodland. Trees include evergreen oaks between 6-15 m high and alligator and one-seed juniper. *Quercus grisea* (emory oak and gray oak) are common, alongside *Arbutus arizonica* and *A. Texana* (madrones). At higher elevations, these species grade into conifers, including ponderosa pine and sparse stands of aspen. This biome occurs at a similar elevation gradient, as grasslands and its formation may be soil and moisture dependant. The madrean evergreen woodland appears savanna-like, and is often found within or above drier interior chaparral, with a mean annual precipitation range of 200-400 mm. These conditions provide optimal habitat for white tail and mule deer. Examples of this biome in the vicinity of the project area occur at the upper elevations of the Chinati, Davis, and Chisos Mountains.

Perdiz Creek Study Area Environment

The Perdiz Creek study area lies within the McGuire Ranch, located adjacent to, south, and west of the town of Marfa, Texas, and is approximately 35 mi (56km) southwest of Alpine, Texas. The Del Norte Mountains lie 25 mi (40km) to the east; the Chinnati Mountains lie 35 mi (56km) to the southwest, and the Davis Mountains are 30 mi (48km) to the north. The ranch occupies approximately 60,000 acres that encompass a variety of topographic and ecological settings (Fig. 2).

Alamito Creek is a primary tributary to the Rio Grande, which lies approximately 40 mi to the south of the project area and runs north-south through the McGuire Ranch. The east and northeast portions of the McGuire Ranch are comprised of gently undulating semidesert grasslands. The surrounding topography displays subtle relief broken by the headwaters of incipient drainages that trend generally northeast to southwest, joining Alamito Creek. These grasslands, particularly in the southeast portion of the ranch, contain several playa depressions that are remnants of very old and shallow pond deposits.

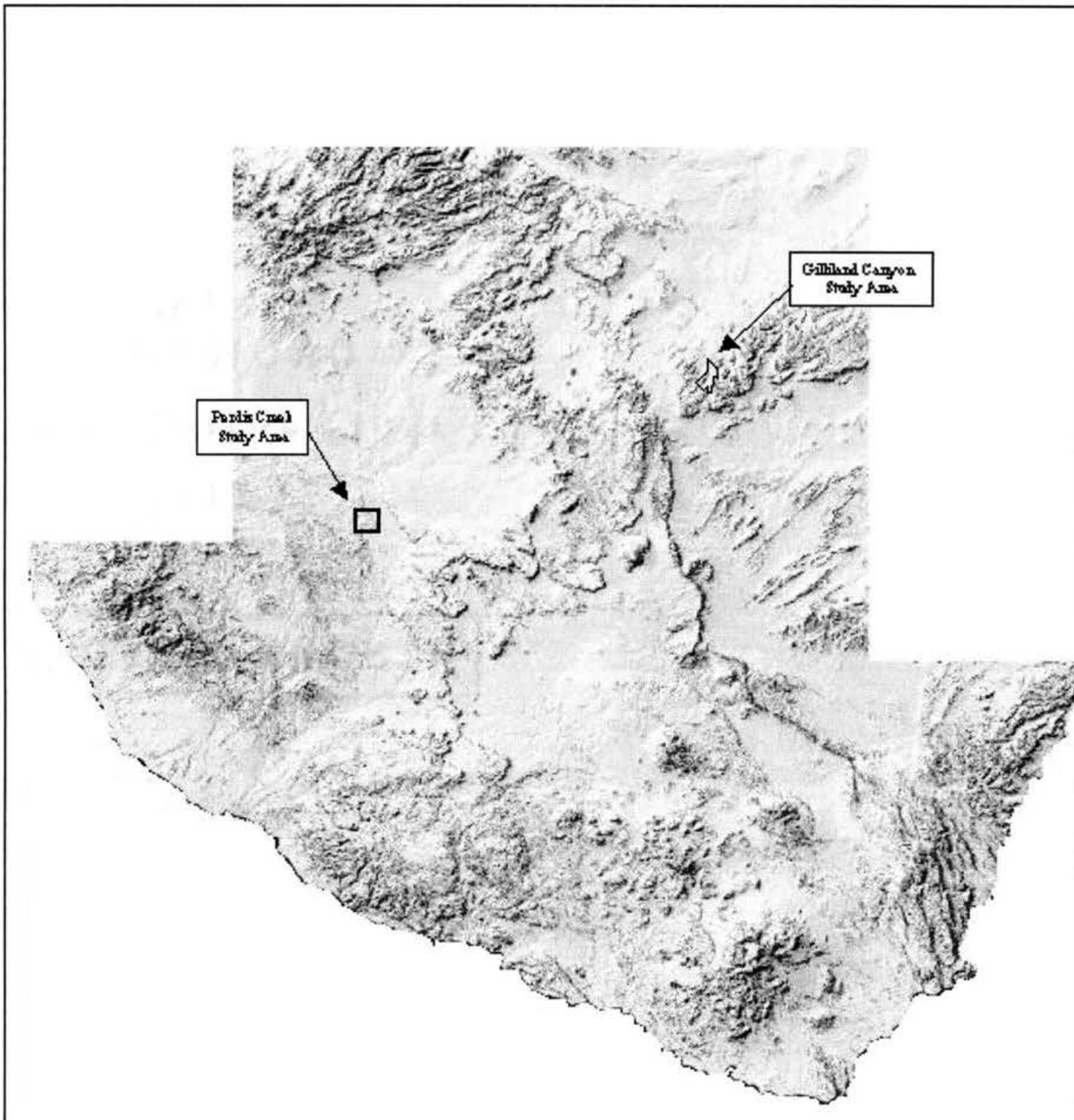

Figure 2. Southern Trans-Pecos region with study areas depicted.

that overlooks the Alamito Creek floodplain and terraces to the west. The tributaries that drain into Alamito Creek become deeply incised along the escarpment, forming small canyons up to 20 m deep. This escarpment forms a prominent landform that represents a line of demarcation between the grasslands to the east and northeast, and the more topographically diverse badland-like landscape to the west and southwest.

In the southwestern portion of the ranch, Alamito Creek runs approximately north to south below the aforementioned escarpment. A substantial floodplain terrace has formed a riparian corridor measuring approximately 10 km north to south and 3 km west to east. This part of the landscape was extensively modified in historic times as a result of irrigation, agriculture, and improvement of cattle forage along the floodplain and terraces.

The landscape in the extreme southwestern corner of the ranch, southwest of the Alamito Creek floodplain, is of a distinct character with increased topographic relief. It is designated as the Frenchman Hills on USGS quad maps. This area is drained by Perdiz Creek, which runs roughly west to the southeast, joining Alamito Creek to the south of the study area (Fig. 3). The Frenchman Hills are made up of highly eroded rim rock of igneous rhyolite and basalt, basically the western counterpart of the linear escarpment east of Alamito Creek. Small tributaries of Perdiz Creek produce a complicated erosion pattern, forming what Kelley et al. (1940:82) refer to as a "...veritable bad-land." The landscape is highly irregular compared to the eastern portions of the McGuire Ranch. To the east of Alamito Creek is an escarpment of basalt that parallels the main drainage. This escarpment forms a north-northwest to south-southeast trending cliff line.

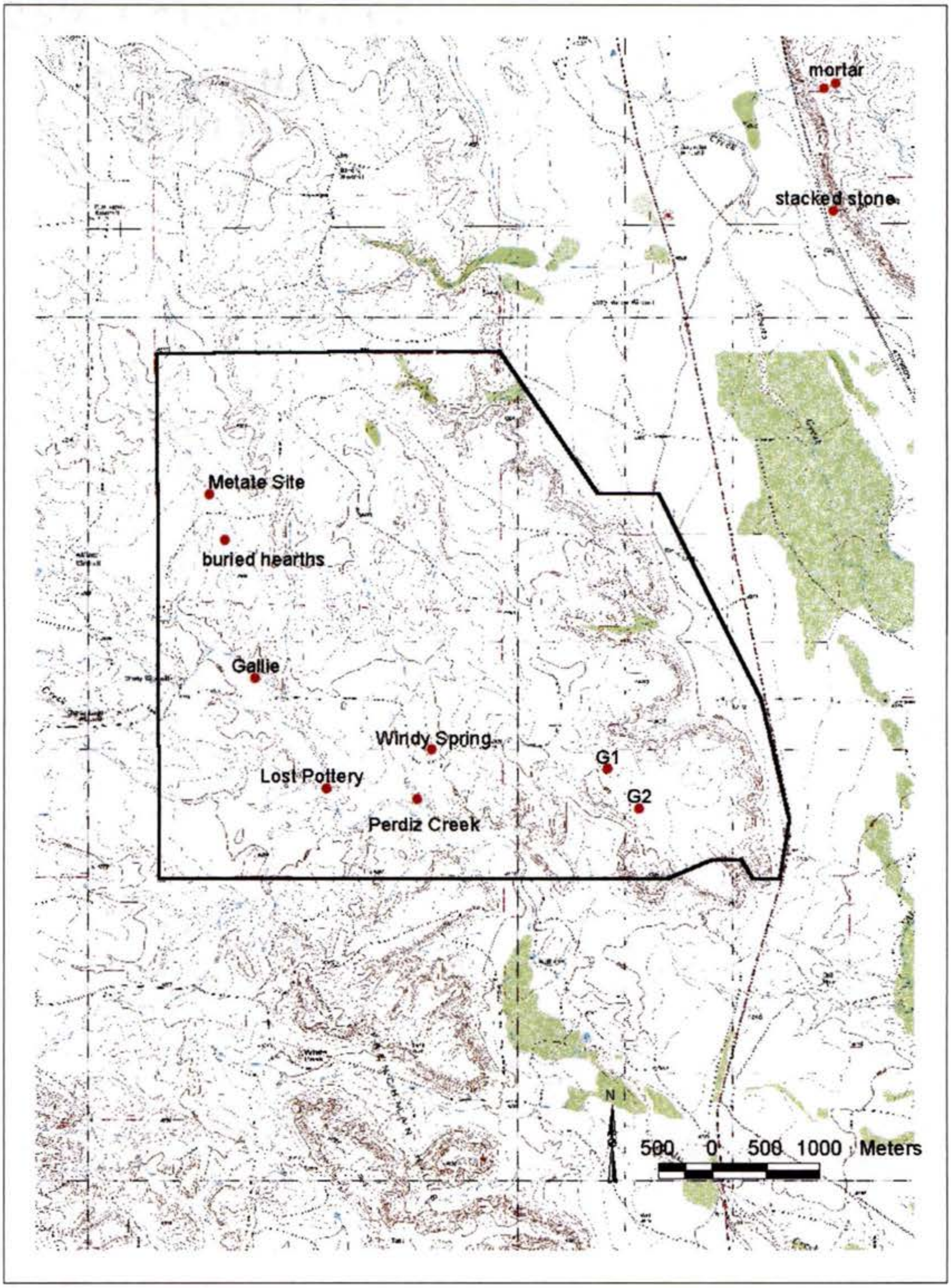

Figure 3. Perdiz Creek study area with site names.

More xeric desert scrub communities have progressively impinged on grassland biomes, supplanting some admixture of desert scrub plant species. Still, the landscape adjoining Perdiz Creek to the east hosts a very different semidesert grassland plant assemblage. The predominant biotic community within the Perdiz Creek landscape unit is a *plains community desert scrub* dominated by tarbush, creosote, and acacias. It is possible that during prehistoric times in the Perdiz Creek landscape, the amount of topographic relief and the prevailing soil conditions would have hosted a similar desert scrub environment. These factors place the landscape within a fairly diverse ecological setting, situated at the junction of desert scrub vegetation, a significant riparian corridor (Alamito Creek), and an isolated grassland. The study area was within reach of several key resources: game populations (pronghorn antelope, white tail and mule deer, and, possibly, bison) in the grasslands; important water sources, water fowl, and firewood along the riparian corridor; and diverse plant resources within the desert scrub environment with mesquite possibly playing a major role in foraging subsistence in this area. Perdiz Creek is a relatively small drainage system compared to the adjacent Alamito Creek drainage. The Alamito Creek drainage corridor hosts more substantial alluvial terraces and likely contained water more predictably than Perdiz Creek. This last point is important to bear in mind during subsequent discussions of land use of the Perdiz Creek area, as cultural activities may have been more intense along Alamito Creek to the east.

CHAPTER 3: CULTURAL HISTORY CONTEXT

Traditionally, Southern Trans-Pecos archaeology has been investigated and understood in a cultural historical framework, where artifact assemblages and feature types are affixed to time frames and cultural taxonomic units. Since excavations of stratified cultural deposits have been relatively sparse, the region's phases and socio-cultural units are best understood and borrowed from neighboring regions. Excavations in the Southern Plains, Central Texas, and the Lower Pecos River areas have provided relatively detailed culture-chronological sequences. This is particularly true in the earlier cultural periods, including Paleoindian, and the Early, Middle, and Late Archaic. The Late Prehistoric period is best represented by stratified archaeological sites in the Southern Trans-Pecos, primarily those sites in rock shelters that exhibit exceptional preservation, and in village sites along the Rio Grande corridor. Excellent overviews of the regional prehistoric cultural history are found in Suhm et al. (1954) and Mallouf (1985, 1999).

Paleoindian Period (ca. 10,000- 6500 B.C.)

Evidence of Paleoindian lifeways in the Southern Trans-Pecos is limited to sporadic surface finds of Clovis, Folsom, Plainview, and Golodrina projectile point types. Nowhere in the region is there evidence of long term campsites, large game procurement/processing, or rock shelter habitation. Synthesizing paleoenvironmental data from pollen studies, fossil packrat middens, and geomorphology, Mallouf (1981) postulates that Late-Pleistocene environments in the Southern Trans-Pecos were generally more moist and cooler than at present. Conifer forests dominated high elevation settings, and lower elevations were composed of mixed woodland and scrub environments interspersed with grasslands. His hypothetical model of Late-Pleistocene / Early-Holocene cultural interactions suggests changing climatic and ecological conditions may have contributed to a shift to more diversified Early Archaic subsistence economies by 8500 B.C. This early change would have been coeval with Folsom big game hunting lifestyles elsewhere in North America.

<u>Archaic Period (ca. 6500 B.C. - A.D. 900)</u>

The Early Archaic (ca. 6500-3000 B.C.) is poorly understood in the Southern Trans-Pecos due to limited excavated components dated to this period. Manifestations of this period are restricted to surficial finds of diagnostic artifacts. These include corner notched and expanding stemmed dart points such as Baker, Uvalde, Martindale, Early Barbed, Pandale, Zorra, Bulverde as well as Clear Fork tools (Sanchez 1999). A comparison to cultural chronologies in adjoining regions provides the most useful information about the Early Archaic. Prehistoric cultural units from the Lower Pecos River region are provided by Weir (1976) and Prewitt (1981) and include the San Geronimo through Marshall Ford phases (Mallouf 1985). Diagnostic artifacts in the Southern Trans-Pecos region suggest some attributes are shared with these cultural units. Many of these phases are only loosely defined and their viability as sociocultural units is debatable (Johnson 1986). These include Circleville phase (*ca.* 6550-5050 B.C.), San Geronimo phase (ca. 5050 - 4050 B.C.), and Jarrell phase (*ca.* 4050- 3050 B.C.).

Generally, it is suggested that Early Archaic lifeways reflect a shift from specialized hunting to a more diversified subsistence strategies. Technological innovations are evidenced by grass lined pits, sandals, and matting. People of the Early Archaic made use of large earthen ovens with attendant burned rock middens, indicating a growing reliance on desert succulents such as lechugilla, sotol, and prickly pear (Mallouf 1985; Sanchez 1999). The lack of data from this period presents a significant gap in our understanding of regional prehistory and is considered as a high priority for future research (Mallouf 1985).

The Middle Archaic (*ca.* 3000-1000 B.C.) is better understood through dry cave excavations in the region during the 1920's, 30's and 40's (Campbell 1970; Kelley et al. 1940). Diagnostic projectile points include Langtry, Val Verde, Perdenales, Shumla (both early and late varieties), Almagre, Marshall, and Arenosa. Other artifacts reflecting technological change include increased numbers of groundstone and perishables (cordage, sandals, netting, and others). Increased frequencies of burned rock features such as hearth fields and middens indicate a greater reliance on desert succulents (Mallouf 1985; Sanchez 1999).

The earlier portion of the Middle Archaic is loosely associated with the Langtry-Val Verde complex (Mallouf 1985) and is believed to reflect influence from the Lower Pecos River cultural sphere. Projectile point styles from the Southern Trans-Pecos are diagnostic of several Lower Pecos River and Central Texas phases (Prewitt 1981): Clear

Fork phase (*ca.* 2650-2050 B.C.); Marshall Ford phase (*ca.* 2050-1450 B.C.); Round Rock phase (*ca.* 1450-650 B.C.). While there are some typological similarities between projectile points of the Southern Trans-Pecos, Central Texas, and the Lower Pecos River areas, "...the typology and chronology of one region cannot be transferred blindly to another region" (Hughes 1991:17). Instead, it is likely that cultural developments between the three areas differed in significant ways. The number and density of Middle Archaic sites, suggest a substantial increase in local populations and an expansion of land use strategies and adaptations to more diversified environments (Mallouf 1985).

The Late Archaic period has received slightly more scrutiny than the earlier Archaic periods. Kelly, Campbell, and Lehmer defined a Chisos Focus in the 1940's. The focus is defined by substantial ring middens, distinctive corner notched dart points, basketry, and a number of other perishable items found in dry desert caves. Roughly coeval phases in the Lower Pecos River region include the Uvalde phase (ca. 300 B.C. to A.D. 200) and the Twin Sisters phase (*ca.* A.D. 200-500) (Prewitt 1981).

Data indicate a continued increase in site density and more varied landform use. Campsites became considerably larger and contained increased numbers of burned rock features. There are sparse indicators of cultigens in dry caves, but this minimal evidence does not support an idea that horticulture or agricultural was well developed. The material culture is more diverse, and perishable items are more numerous in dry rock shelters. Increased site density suggests continued population growth and adaptation to a changing environment (Mallouf 1985).

The Late Prehistoric Period (*ca.* A.D. 700 -1540)

Compared to earlier periods, the Late Prehistoric has received substantially more scrutiny since the 1930's. Elsewhere in North America, this period is marked by technological innovations including the bow and arrow, the advent of ceramics, and the introduction of agriculture.

Archaeological investigations have been most substantive in the southern sector of the region, mostly along the Rio Grande and its confluence with the Rio Conchos on the Mexico side of the river, the "La Junta de Los Rios". This locality was described by early Spanish soldiers, explorers, and missionaries near the time of European contact (Kelley 1986). Kelley investigations (Kelly et al. 1940) established some of the Late Prehistoric Period's earliest cultural constructs. These include the Livermore foci (now termed phase) and the later Bravo Valley aspect, which subsumes the La Junta and Conception foci. Local researchers refer to these foci as "phases", a change from earlier taxonomic classification schemes.

The Livermore phase, dating between A.D. 900 to A.D. 1200 (Kelley 1957) and characterized by a number of triangular and notched arrow points (including the Livermore style) may extend to southeastern New Mexico and as far south as northern Cohuila (Mallouf 1999). Origins for the Livermore phase may have been intrusive movements of Plains groups (Kelley et al. 1940), or alternately, the phase may be indigenous in origin (Mallouf 1999). Archaeological investigations have produced little in the way of behavioral information regarding these Late Prehistoric peoples. Clearly, much remains to be learned of the Livermore phase.

The Bravo Valley aspect is much better understood as a result of a series of excavations and surface recordings in the La Junta district (Kelley 1957; Kelley et al. 1940; Mallouf 1985, 1999). The earlier La Junta phase, A.D. 1200-1400, is characterized by distinctive technological innovations: floodplain agriculture, pit house architecture, and adobe-jacal architecture. Representative sites are located in an area along the confluence of the Rio Grande and its tributary drainages. Structural remains include oval and rectangular pit houses that sometimes incorporated low adobe walls or curbs in room blocks of several houses. Artifacts believed to be associated with the Bravo Valley aspect include arrow points (Fresno, Perdiz, Toyah) and tradeware ceramic types similar to those found to the west (El Paso and Casas Grandes). Ceramic styles include El Paso Polychrome, Chupadero Black on White, and a variety of Chihuahuan Polychromes (Kelley et al. 1940:34).

Architectural and ceramic styles indicate an important relationship with Jornada Mogollon cultural spheres during this period, though speculation varies about La Junta origins. Kelley suggests intrusive movements into the La Junta District, while Mallouf points out the distinct possibility that indigenous peoples adopted these technologies (Mallouf 1999).

Mallouf (1999), formulated another cultural unit called the Cielo complex, that is roughly contemporaneous (A.D. 1300-1700) with the La Junta and Concepcion phases. The Cielo complex is characterized by circular stacked stone structures believed to be wickiup type dwellings. These features are often conjoined to form village-like complexes found in a circumscribed area near the La Junta District and to the northeast (See Mallouf [1999: Fig. 14]). Hearth remnants and refuse deposits, as well as Perdiz arrow points, chipped stone tools, and bone tools, have been found in association with these stone features. While the distribution of these sites closely overlaps La Junta phase architectural complexes, ceramics are conspicuously absent from Cielo complex features. The close proximity and overlapping dates of the La Junta phase and Cielo complex suggest a unique relationship between what appear to be relatively mobile hunter-gatherer subsistence strategies and more sedentary agricultural practices. Mallouf (1999:73-85) discusses some exciting research questions regarding the possibility of symbiotic relationships between groups practicing different but complimentary subsistence strategies. His hypotheses include: the Cielo complex and La Junta phases represent ethnically and socially distinct groups in a symbiotic relationship; or that Cielo complex sites represent seasonal foraging camps of peoples based in the La Junta district who practiced agricultural during portions of the year or when conditions were conducive.

The Concepcion phase incorporates developments in the La Junta district near the time of European contact. This phase is marked by changes in architectural styles, changes in ceramic types, and further changes in artifact assemblages (Kelley et al. 1940). Habitation structures became larger and no longer incorporated adobe in their construction. While tradeware ceramics continued in use, Kelley notes the use of locally produced wares, including Chinati Plainware and Capote Red-on-Brown.

The Concepcion phase overlaps with the first appearance Europeans: Nunez Cabeza de Vaca (*ca.* 1535), Espejo (*ca.* 1582), and several subsequent *entradas.* Kelley (1952, 1986) addresses these early historic encounters in fascinating detail. These accounts document the presence of indigenous groups, "Paturabeyes" and

"Jumanos", establishing a cultural territory in the general Southern Trans-Pecos and La Junta district. Mallouf (1999:76) suggests that, given symbiotic relations between early Cielo complex occupants and La Junta phase agriculturalists "...there exists a potential ancestral linkage of the Cielo complex to the Jumano, Cibolo, or Chisos Indians of the 16th and 17th century Spanish accounts (Mallouf 1999:76).

This paper addresses only prehistoric archaeological questions, but the fascinating cultural developments and interactions in the historic period abound with research potential. At the time of European contact, coeval with the Concepcion phase, northern Plains aboriginal groups were making incursions into the Southern Trans-Pecos, the Apache arriving on the scene in the 17th century. Spanish missions and presidios were established in the La Junta area as early as 1684. The assimilation of Jumano peoples into Apache bands is believed to have occurred by the mid 18th century, followed by the arrival of Comanche groups. "Indian wars" between Apache and the Spanish (and later the Mexicans) were fixtures in the Southern Trans-Pecos region. Texas statehood was accompanied by large scale ranching and agricultural economies that characterize the region today.

CHAPTER 4: PREVIOUS INVESTIGATIONS

Very few archaeological investigations have taken place in the vicinity of the Perdiz Creek project area, fewer still on the immediate Perdiz Creek landscape. The only work documented was undertaken by J. Charles Kelley, T. N. Campbell, and D. J. Lehmer (Kelley et al. 1940), as well as C. Albritton Jr. and Kirk Bryan (Albritton and Bryan 1939). These collaborative efforts were part of a joint expedition sponsored by the Peabody Museum of Archaeology and Ethnology, which was organized to investigate the occurrence of archaeological sites and associated geologic deposits in the Big Bend. The group visited a number of sites in the region and conducted small scale excavations and made geomorphic observations of surrounding soil deposits. Soil observations contributed to a geomorphic history of the area, defining the Neville, early Calamity, and later Kokernot soil formations (Kelley et al. 1940:48). These associations between archaeological remains and geologic formations came along at an early time, signaling the inception of geoarchaeology in the Big Bend. Ultimately, these observations are somewhat difficult to quantify, but they provided an excellent starting point for future refinements.

Two of the sites investigated by these early endeavors are located approximately 22 miles south of the confluence of Perdiz and Alamito Creeks. The Shiner 6:1 Site is located along Alamito Creek, where investigators recorded buried hearths, pit house floors, and artifacts within Calamity and Kokernot formation deposits. These stratified occupations were assigned to the Pecos River focus in the Calamity deposits and La Junta and Alamito foci in the Kokernot deposits.

The Shafter 6:2 Site is located on an irrigation ditch adjacent to Alamito Creek. Here, in the Kokernot formation, investigators recorded exposed hearth features, charcoal lenses, and artifacts, including El Paso Polychrome ceramic sherds. Several possible house floors were noted among the exposed cultural debris. Lastly, the group excavated a flexed burial that they suspected was inhumed beneath a house floor. The cultural material at Site 6:2 was attributed to the La Junta focus of the Bravo Valley aspect.

The Jordan Gap 1:1 Site is located on a small west bank tributary of Alamito Creek approximately one mile south of its confluence with Perdiz Creek. In a cutbank investigators noted four stratified occupations consisting of groundstone in the lower Calamity formation assigned to the Big Bend Cave aspect, and a hearth, projectile points, and chipped stone were recorded in the upper Kokernot formation assigned to the Bravo Valley aspect.

The Alpine 7:2 Site is located on Perdiz Creek, approximately one mile upstream from its confluence with Alamito Creek. This site is situated adjacent to the current project area, below the basalt escarpment. Kelley et al. (1940) recorded several locations within this site, each location situated on a unique landform. The team reported that, along the creek, "At various points in the badlands area, archaeological sites erode from alluvium at various levels, or appear in situ in vertical arroyo banks. So vast is the eroded area, so complex the archaeological picture, that it is impossible to clearly reconstruct events at the site. No excavation was attempted" (Kelley et al. 1940:82). Immediately south of Perdiz Creek the landforms are more stable. At various locations south of the creek, investigators noted hearths exposed in ancillary arroyo cuts, thick layers of fire cracked stone, ceramic fragments attributed to the Alamito focus, and corrugated brown ware fragments; all were associated with Kokernot formation soils and attributed to the Bravo Valley aspect. The group also observed a burned and tanged projectile point, a chipped stone blade, and crude bifacial tools within the Calamity formation. These artifact types were unfamiliar to the investigators and were assigned to an unknown cultural affiliation.

CHAPTER 5: ARCHAEOLOGICAL INVESTIGATIONS

Fieldwork and Methodology

This study uses information from two locations within the Southern Trans-Pecos region. Data derive primarily from TAS field school operations near the Marfa Plain (Perdiz Creek) on the McGuire family ranch. Further information comes from a location in the Glass Mountains on the Mills family ranch in Gilliland Canyon. The Perdiz Creek data will be addressed first and foremost, while the Glass Mountain data will be presented in a comparative analysis.

TAS field investigations on the McGuire ranch are best characterized as reconnaissance rather than systematic coverage. This is true of both survey and subsurface testing activities. While the information recovered is invaluable, the nature of the sampling methods does limit the conclusions that can be drawn at the close of the Perdiz Creek investigations. This point will be addressed at the close of this section.

To organize data recovery, the ranch was portioned into seven survey areas (areas A-G) that roughly approximate an environmental stratification. Areas A through D are located in the east and northeast portion of the ranch and correspond to the semidesert grassland biome. Areas E and F encompass the east and upper rim of the basalt escarpment and the floodplain corridor of Alamito Creek, respectively. Area G is comprised almost entirely of the Frenchman Hills landscape and the Perdiz Creek drainage system. Either property lines or geographic features bound these areas. It must be stressed that the survey areas were demarcated for general logistical purposes only and do not represent a systematic sample technique. None of the survey areas were covered in their entirety but instead were spot-checked in a reconnaissance fashion.

Crew members conducted a pedestrian survey, spaced at intervals approximately 20 m apart. They documented resources in personal field notes and recorded sites on state archaeological survey forms. Most sites were recorded with sketch maps using a compass and pace technique, and global positioning devises (GPS) were used to record site localities. 9000 acres were surveyed during of 10 days of investigation. Due to time constraints, the portions of the landscapes that were covered vary greatly in shape and area. Accessibility and/or topographic setting determined survey locations.

The portion of Perdiz Creek that runs through the southwest portion of the McGuire Ranch is the focus of this investigation (area G). The creek lies north of the landform labeled "Frenchman Hills" on USGS quadrangles. This area encompasses a segment of Perdiz Creek and a number of smaller tributary drainages running northwest to southeast approximately 8 km northwest of its confluence with Alamito Creek. These small drainage patterns are highly irregular and form a badland-like topography. Area G encompasses approximately 6000 acres bounded by the McGuire Ranch property lines. The steep escarpment of rhyolite and basalt dominates the eastern portion of Area G. It runs roughly northwest to southeast and overlooks Alamito Creek and its flood plain and terraces 1 km to the east.

Prior to field school investigations, local informants with intimate knowledge of the landscape accompanied CBBS investigators on a preliminary reconnaissance. Archaeologists were shown the location of high visibility archaeological resources in the study area. These locations were surveyed in a cursory fashion to determine their potential for further investigation, particularly for subsurface testing. Informants also shared with CBBS investigators specimens in their own extensive artifact collections gathered from sites. In addition, informants related their observations of land use, as well as the changing character of the landscape. Based on these visits, five sites were selected for further investigation and subsurface testing.

These preliminary field investigations noted a very high frequency of humanly modified and naturally occurring specimens of chalcedony, found mostly on the crests of landforms near the basalt escarpment. Abundant debitage made of this material was found at many of the sites and the intervening landscape. Earlier visits to this area suggested that the rim escarpment, formed of vesicular basalt, was the source of this raw material. This resulted in a further survey objective for field investigations: to identify and document any possible chalcedony quarries.

Pedestrian Survey Results

Pedestrian survey was organized to investigate specific portions of the landscape in area G, in particular, the upper portion of the rim rock escarpment that overlooks Alamito Creek to the east. The locations selected for subsurface testing are generally representative of high visibility archaeological manifestations in the western portion of area G and characteristic of the badland like topography. Survey on the eastern rim rock landscapes represents a sample of another variety of topographic setting.

Survey crews inspected approximately 440 acres of the escarpment landform and examined the high flats west of the rim, nearly vertical exposures, and the colluvial talus immediately below the escarpment. They recorded five sites within this small sample area.

Site 832/G1 is a high density scatter of debitage found among the generally widespread scatter of debitage covering much of the landform. The site occupies and area roughly 100 m across . Data recorded for this location are very sparse and will not be mentioned further.

Site 833/G2 is an extension of a broad lithic scatter that covers a large peninsular rim rock projection in the southeastern portion of area G. This portion of the rim rock escarpment is dominated by a moderate density scatter of debitage formed of locally available chalcedony. The site area measures approximately 100 meters across and is bounded by natural breaks in the rim rock that drop away steeply towards the Alamito Creek floodplain to the east and the erosional cut made by Perdiz Creek to the south. A light density scatter of burned rock was found among the debitage, but no distinct features were noted. There is an exposure of banded chalcedony several meters to the south of G2 datum, along the steep escarpment of the basaltic rim rock formation. There is undoubtedly a link between the high density lithic scatter observed on the upper landform and the close proximity of this raw material source.

Site 834/G3 is likewise an extension of this ubiquitous scatter of debitage and burned rock that covers much of the higher landforms. This location was noted for the higher density of debitage situated on the upper edge of an arroyo cut that incises the landform. A single unifacial scraper and projectile point were mapped and collected from the surface. The extent of the high density scatter covers an area of 23 x 30 m.

Site 839/G8 is located at the bottom of a small arroyo cut that incises the eastern boundary of the rim rock escarpment. Two hearths were noted along the small drainage within an incipient terrace. Each of these hearths are semi-intact and located in a light to moderate density scatter of burned rock. An unspecified quantity of groundstone fragments were noted along with debitage and bifacially modified flakes. A finger-like projection of the rim rock escarpment overlooks the site from the southwest. Atop this landform is a relatively a high density scatter of chalcedony debitage.

Site 841/G10 is located at the head of a small arroyo cut that incises the rim rock escarpment, overlooking Alamito Creek floodplain to the east. At the head of the drainage cut, on the upper escarpment, is an exposure of basaltic bedrock. Ground into this surface is a set of five mortar holes that vary in dimension from 11-18 cm deep and 20-34 cm in diameter. Situated among these mortar holes is a small *tinaja* depression that would hold water from surface runoff. Near these features, below the rim and inside the drainage cut, is a small overhang eroded from the basaltic parent material. In the vicinity of these mortar features investigators found one ground stone mano, three unifacially modified scrapers, two small dart points (collected) and two late-stage biface fragments. An unspecified amount of debitage was noted as well. A second tinaja is located approximately 15 m north of the bedrock mortars. These natural features hold water, which would have aided in the processing of resources. Approximately 100 m downstream from the head of the drainage, below the upper escarpment, is an *in situ* exposure of chalcedony within the basaltic parent material that shows signs of quarrying. Overall, this site location is extremely advantageous due to its proximity to numerous resources, including standing water, sources of bedrock for groundstone implements, and chipped stone procurement.

Subsurface Testing

As noted above, five locations were selected for further recording and subsurface testing. While the information gained from these investigations is invaluable, the methodologies employed and the limitations imposed by time and resources placed considerable constraints on the types and extent of data interpretation.

Each testing location was selected based on subjective assessment of artifact density, diversity, visibility, the presence of significant features, and access. Time constraints and logistical concerns dictated that testing localities be determined in advance of the ten-day field school. These sites were not selected in the course of field school survey or systematic sampling techniques, but were selected based on observations by CBBS investigators in company with local informants. While admittedly a subjective selection of resources to investigate, this method proves practically useful for reconnaissance purposes. This project comfortably relies upon informants who are knowledgeable of their surroundings and on their observations of archaeological resources in Perdiz Creek. These observations amount to a representative sample of high visibility features in the study area. This fact does mean, however, that lower visibility archaeological materials are not fully represented in the project findings. These materials, and the blank areas between known sites, cannot be discounted, as they undoubtedly were important in the subsistence activities of prehistoric peoples.

Focusing on high-visibility locations obviates significant archaeological data reflecting the subsistence systems of the regions inhabitants. Moreover, archaeological resources or features that have been considerably displaced and disturbed, or completely buried, are similarly under-represented in the data. These constraints are due mostly to the scope of investigations and scarcity of resources such as time and funding. This important consideration demonstrates a significant limitation on how the data can be used and the conclusions derived.

Any data set imposes limitations in some degree or fashion, that challenges the researchers resourcefulness. In a practical sense, a researcher must whittle down the number of variables addressed, so some limitations are a necessity.

Each site locality was surface mapped and subjected to test excavations to assess the nature and extent of subsurface deposits. Excavations consisted of 1x1 m test units or smaller subdivisions. Units were laid out in reference to a site datum on a magnetic north and east-west grid system, established independently at each location and situated to investigate features at each site. Therefore, subsurface sampling was not organized according to randomized or environmentally stratified techniques. Units were excavated according to 10 cm arbitrary levels, and screened through 1/8 inch machine cloth. Artifacts recovered in the screening processed were collected according to 10 cm levels and assigned a single lot number. Artifacts discovered *in situ* were assigned a separate lot number and plotted on unit plan view maps. In several instances, soil and feature matrix samples were collected for future analysis, then were provenienced by level designation with assigned lot numbers.

Surface artifacts, outside of established excavation units, were treated in a variety of ways. Unmodified debitage was simply estimated without quantification or provenience, while formal tools were mapped in place using a theolodite or a total data station (TDS). Diagnostic projectile points were given horizontal provenience and assigned individual lot numbers. Beyond this general description of testing methods, each location is discussed independently below.

Subsurface testing serves a number of functions. First, such testing provides a preliminary assessment of the nature and integrity of cultural deposits at specific locations. Researchers are provided a limited amount of information about the depth, integrity, and extent of cultural deposits in a finite area. Furthermore, it allows one to begin to address whether the deposits have been considerably disturbed, if they contain stratified cultural or depositional sequences, and if the deposits are likely to extend beyond what is observed on the surface or in test excavations.

Second, test excavations provide inventories of artifacts that provide information about the nature of prehistoric lifeways and specific activities of prehistoric inhabitants. This type of data carries with it a particular risk and a potentially dangerous set of assumptions, this being that artifact associations may be misleading due to sample biases and the possibility of palimpsests depositional sequences. In the absence of highly discrete, well-defined stratigraphy and a systematic sampling technique, it would be a dubious assumption to say that artifacts from a single, arbitrary 10 cm level, let alone nearby excavation units, are actually components of a shared technology or part of a single cultural event. Therefore, in this study, artifact frequencies and their distributions are addressed in a course-grained fashion, data and observations addressing larger scale phenomenon, such as the repeated use of a particular landscape or geographical area over time. At this level of investigation, it is not prudent to speculate about what the kind of technology is associated with a particular feature at a particular site because few deposits were discrete enough or displayed sufficient stratigraphy.

Subsurface testing provides additional information about the nature, morphology, integrity, and content of the large-scale subsistence related features that are the focus of this investigation. This information is used here to make qualitative judgments concerning landscape use intensity and the energy expended in the activities that collectively contributed to the formation of middens, hearths, and burned rock scatters.

The Gallie Site

The Gallie Site is located along the Perdiz Creek drainage, 4 km west of the basaltic rim rock escarpment. The site is situated on the west bank terrace immediately adjoining the drainage and measures 150 m north-south by 75 m east-west. The site is a broad but relatively light density scatter of chipped and ground stone artifacts among burned rock features and incipient midden deposits. The site lies at a sharp bend in Perdiz Creek where cutbanks are relatively high and form a slightly sheltered landform. There are several exposures of basaltic bedrock along the creek bed where tinaja depressions have formed; one of these holds water during extreme dry seasons. The uppermost terrace of the creek is expansive and mostly level and incised by tributary arroyo cuts joining Perdiz Creek. Local informants said that much of the upper terrace, mainly to the west and south of the site boundaries, had been root tilled and chain-dragged in the past to clear vegetation and improve livestock forage. The western site boundaries are influenced by this relatively recent disturbance.

Cultural material is concentrated on the eastern part of the terrace, particularly where the primary terrace slopes toward the bend in Perdiz Creek. This part of the landform receives over-bank flooding deposits during periodic wet seasons, and the edges of the landform are subject to small arroyo cuts and erosion. Several of the burned rock features that are exposed in this area are probably the result of erosional forces that partially uncovered these buried deposits.

Investigators recorded 18 cultural features. Twelve of these were discernable hearths, 70 cm to 3.0 m in diameter, and ranging from mostly dispersed to very intact. These features were scattered over the site area with no readily discernable clustering or intra-site patterning. Four additional features were recorded as burned rock clusters or concentrations, but were not readily apparent as hearths. Two clusters are very suggestive of dump piles from of hide lined boiling basins. A single incipient midden feature was recorded on the eastern portion of the landform. This feature occupies an aerial extent of approximately 20 m square, consisting of a high density scatter of burned rock in the midst of dark, charcoal stained soil. Burned rock is uniformly distributed within the feature, but is not so dense as to dominate the soil matrix. In this sense, like others in the area, this midden feature is not characteristic of the "burned rock middens" of central Texas or localities in the Southern Trans-Pecos (Weir 1976).

Chipped stone artifacts observed on the landform surface include a variety of small, stemmed dart point fragments as well as arrow points and fragments. Unmodified debitage is very numerous and dominated by locally available chalcedonies. Groundstone artifacts include mano and metate fragments.

Eleven 1x1 m units (four 1x2 m and three 1x1 m) were excavated to investigate the nature and integrity of subsurface deposits and to determine the morphology of burned rock features.

Test unit 1 (TU 1) was excavated within a relatively high density surface scatter of burned and fire cracked rock (FCR). Excavations indicated that FCR and frequent charcoal flecking is present to 30 centimeters below surface (cmbs). Moderate amounts of debitage accompanied this light, midden-like deposit. A single utilized flake and a Perdiz arrow point were recorded in the first 10 cm level of the unit.

Test unit 2 (TU 2) was excavated to a depth of 20 cmbs. Chipped stone debitage decreased in frequency with depth, and charcoal flecks were found sparsely scattered in the soil and matrix. One biface fragment was recovered from level 2.

Test unit 3 (TU 3), a 1x2 m unit excavated to a 20 cmbs, yielded nine pieces of debitage in the first level and two pieces in the second level. Test unit 4 (TU 4), a 1x1 m unit excavated to 10 cmbs, yielded ten pieces of debitage and one Livermore arrow point in the single level excavated. Test unit 5 (TU 5) was excavated on the perimeter of the incipient midden feature. Profile exposures indicate an anthropogenic soil moderately stained with charcoal. This soil rests on an irregular surface 10 to 20 cmbs. Debitage was frequent in all three levels excavated. Very little burned rock was noted. Test unit 6 (TU 6), a 1x1 m unit, was excavated within Feature 6 (Fig. 4), to determine whether this feature in fact represented a hearth. Excavated to 40 cmbs, the profile revealed a basin shaped hearth with a moderately charcoal stained matrix and sparse FCR.

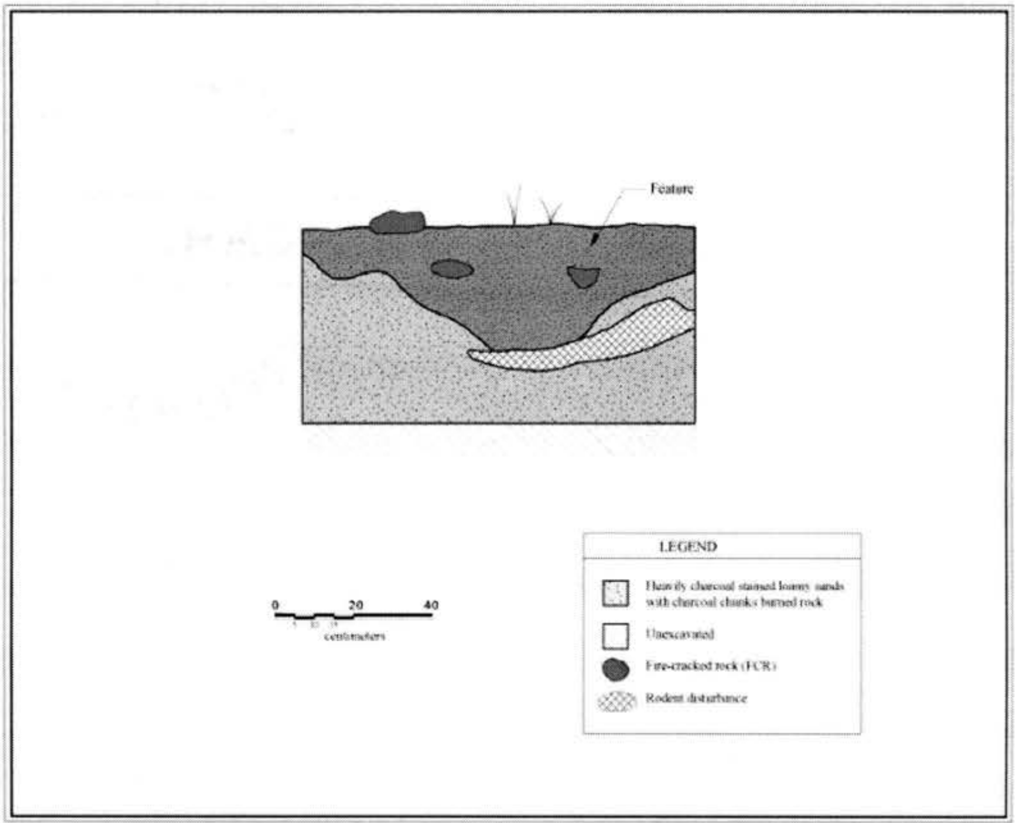

Figure 4. Gallie Site, Test Unit 6, hearth Feature 6 profile.

Test Unit 7 (TU 7), a 1x2 m unit, was excavated over Feature 8 (F8), a remarkably well-preserved hearth (Fig. 5). This feature was bisected by the unit excavated to determine feature morphology. The hearth proved to be a slightly basin-shaped depression filled with numerous basaltic cobbles, tightly packed in a circle 1.7 m in diameter. The profile of the feature indicates it is 15 cm deep with abundant charcoal chunks. A large fragment of mostly burned but intact wood was recovered. The matrix surrounding the FCR was collected, as were large quantities of bulk carbon for radiocarbon dating. The single submitted radiocarbon sample (Beta-161391) (see Table 1) was returned with a calibrated date range of A.D. 1660-1950. The intercept points are equally as disparate. These ranges are a by-product of the high variability in atmospheric

C14 during this general timeframe, resulting in a highly irregular calibration curve. The hearth basin excavation revealed linear impressions, probably the signs of the excavation of the depression during hearth construction. These impressions on the base of the feature were noted as "digging stick marks" and attest to the general integrity and preservation of the feature, despite its surficial context.

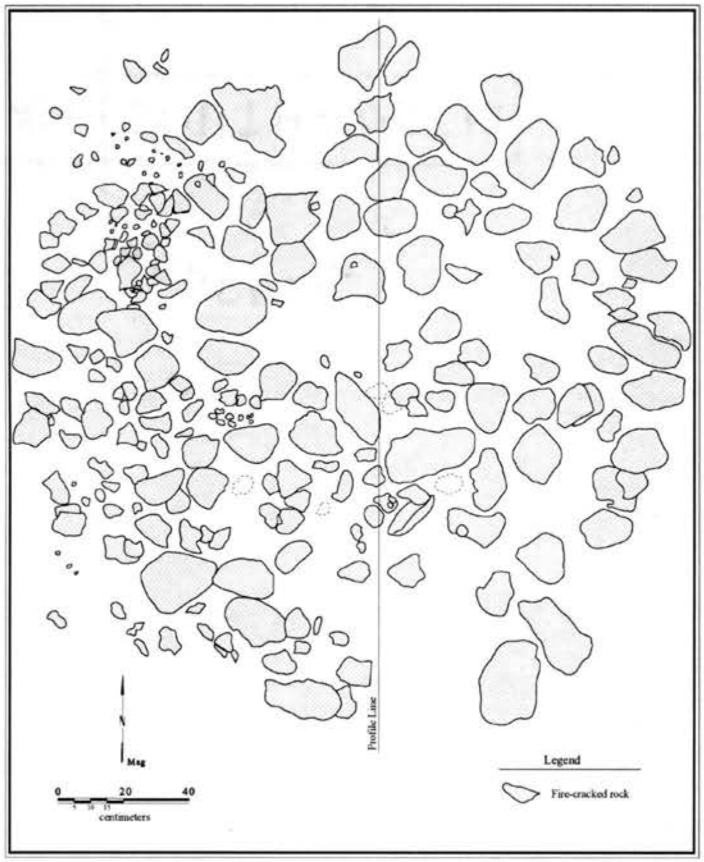

Figure 5. Planview of hearth feature F8.

Table 1. Radiometric dates recovered from features in the Perdiz Creek Landscape unit.

site name	lot	Beta	Cal AD	Cal BP	Intercept of radiocarbon age with calibration curve (Cal AD)	conventional age BP	unit	level	contexts
Windy Spring	151	161386	1040-1280	910-670	1210	840 +/-50	N100/E120	1	Charcoal stained soil recovered from general midden deposit matrix
Windy Spring	152	161387	1220-1400	730-550	1290	710+/-60	N102/W114	2	Charcoal stained soil recovered from general midden deposit matrix
Perdiz Creek	273	161388	1530-1550 1630-1950	420-400 320-0	1670, 1780, 1800	190+/-60	TU-A	NA	hearth matrix
Metate	171	161389	900-1030	1050-920	1000	1050+/-40	N87/E98	4	hearth matrix recovered from small subfeature within a larger midden deposit
Gallie	129	161390	1020-1270	930-680	1180	880+/-60	TU-1	3	general midden soils
Gallie	260	161391	1660-1950	290-0	1690, 1730, 1810, 1920, 1950	130+/-50	TU-7		hearth feature F8

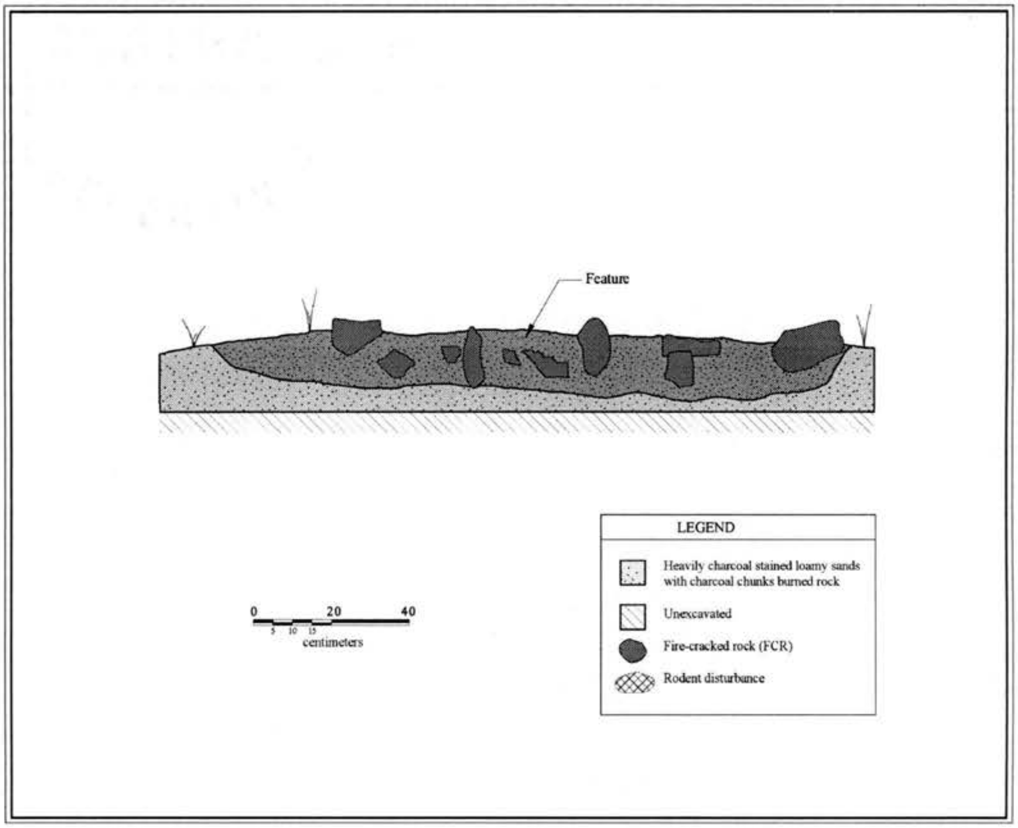

Figure 6. Profile of hearth feature F8.

Perdiz Creek Site

The Perdiz Creek Site is located along a sharp bend of Perdiz Creek, 2 km west of the rim rock escarpment. The site is situated on an eroding, primary stream bank terrace (Fig. 7). The Windy Spring site, described below, lies approximately 500 m upslope and north-northeast of this site. Cultural material immediately adjoins the main drainage system, across from a short, vertical exposure of basalt that forms a steep embankment. The location is ideally sheltered and has ready access to water pooling in bedrock tinajas in the stream course bottom.

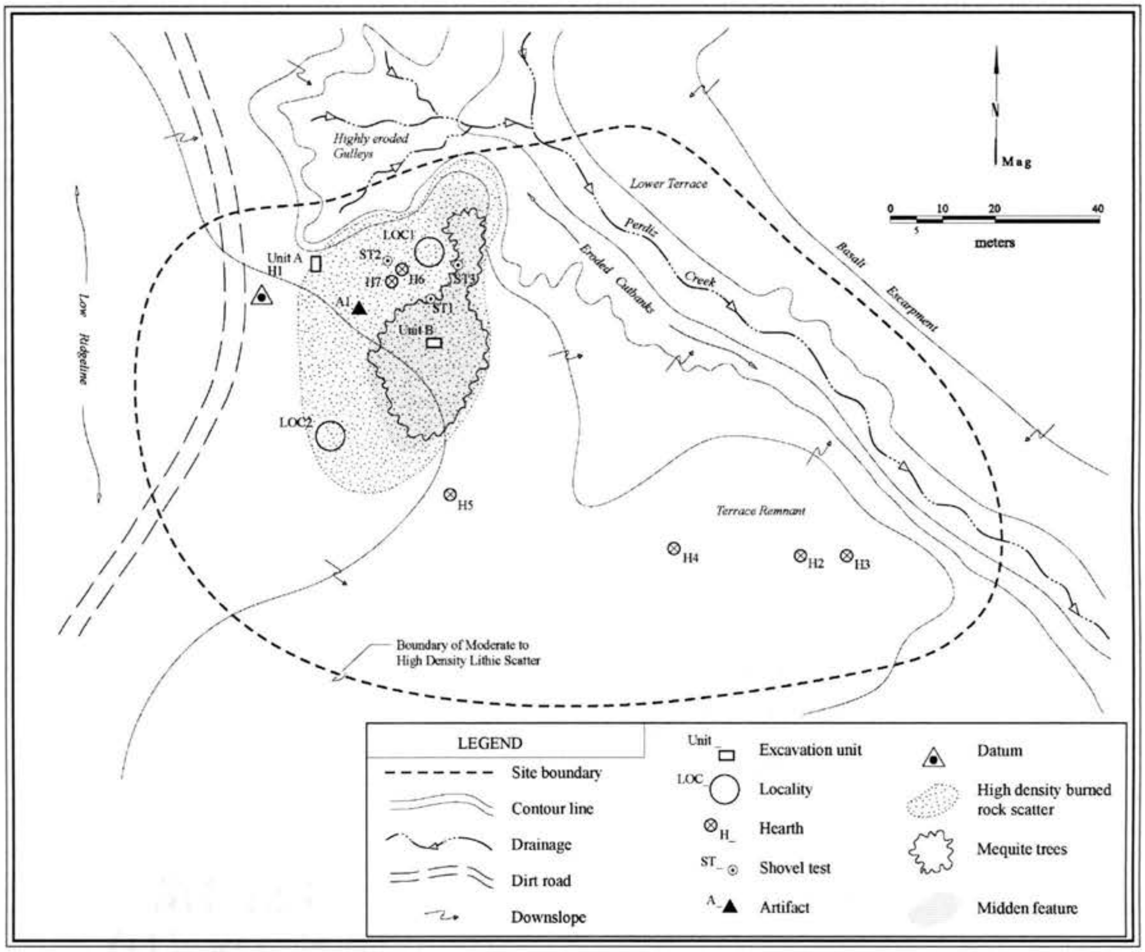

Figure 7. Sketch map of Perdiz Creek Site.

A high density artifact scatter (including both formal tools and debitage), hearth features, and a midden deposit occupy the site area, all situated amidst a light density lithic debris scatter that is ubiquitous on the surrounding landscape. The midden deposit is exposed on the surface in an area that measures 40 m north-south and 20 m east-west. Portions of this feature have been truncated to an unknown degree by small arroyo cuts along the stream terrace above Perdiz Creek. The surface expression of the midden deposit is a moderate to high-density scatter of burned and fractured basaltic cobbles within a matrix of soil that is moderately to heavily stained with charcoal. The feature has an ambiguous boundary, and it is possible that there are multiple concentration areas of FCR obscured by loamy sand overburden.

A high-density scatter of artifacts, fifteen features, and a large midden deposit were recorded within a 140 x 120 m area. All of the features consist of discrete burned rock concentrations that represent hearths with various amounts of disturbance, ranging from mostly displaced to remarkably well intact. Two 1x2 m units and three shovel probes were excavated in the vicinity of the primary midden deposit to investigate the nature and integrity of subsurface deposits.

Test Unit A (TU A) was excavated over a single hearth feature visible on the ground surface. This feature (Hearth #1) was remarkably well intact (Fig. 8). FCR was tightly packed within a 4 m area with a central, high-density concentration measuring 1 m across. All FCR was carefully mapped before removal and a narrow trench was excavated across the feature to obtain a sketch of the feature profile. Artifacts within the feature consist of 19 pieces of unmodified debitage. Samples in the form of feature fill and matrix were collected, as well as bulk-carbon used to determine radiocarbon dates. Several large fragments of charcoal were noted in the samples that would likely be adequate for wood specie identification.

A single charcoal sample (Beta-161388) was submitted for radiocarbon dating, and returned with a date range (calibrated) between A.D. 1530-1550 and A.D. 1630-1950. These disparate ranges are a result of the high variability in atmospheric C14 during this general time frame. The intercept points may be more instructive, at A.D. 1670, A.D. 1780, and A.D. 1800. However these date ranges are to be interpreted, it

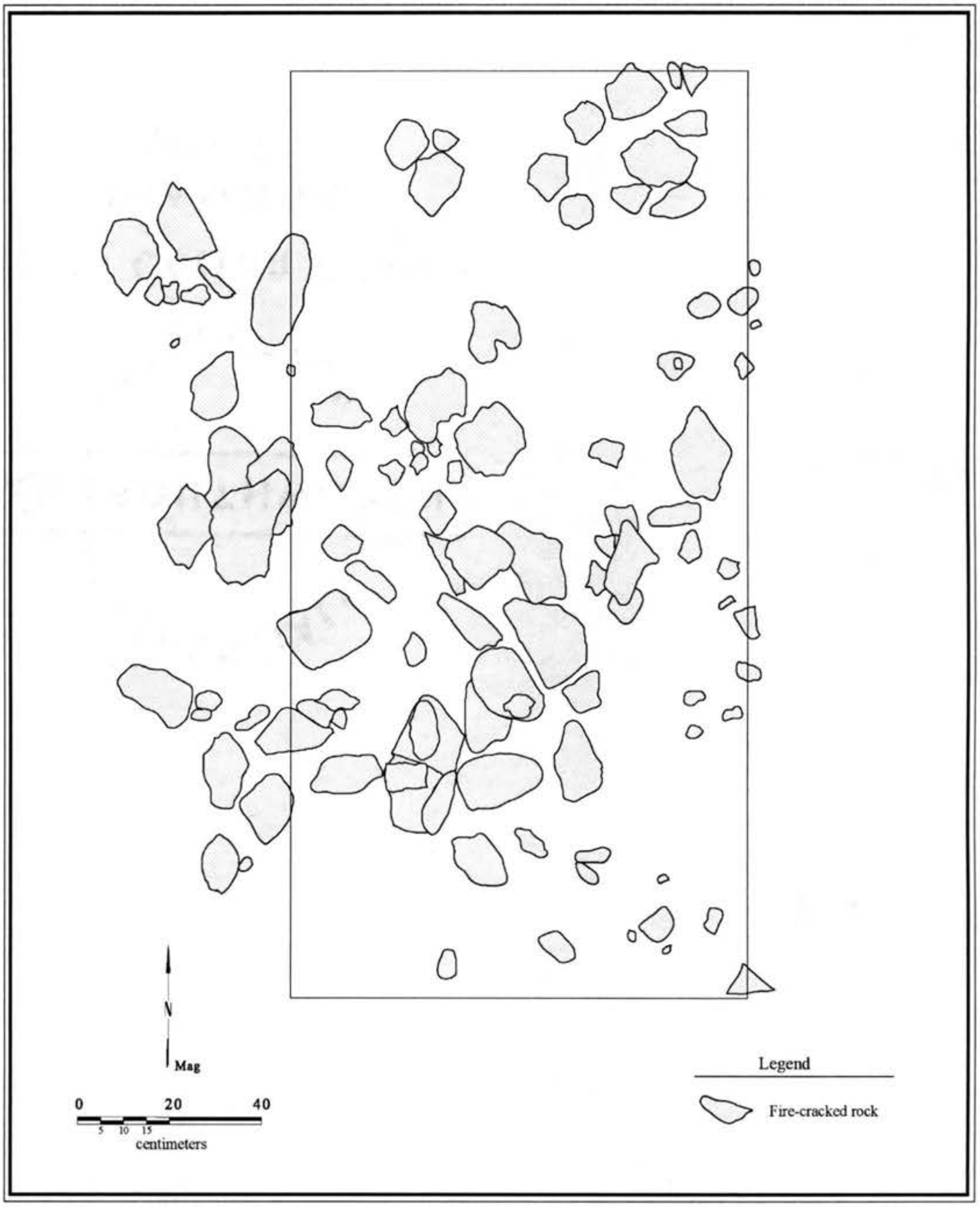

Figure 8. Unit 1 planview, Perdiz Creek Site, overview of hearth stones.

seems safe to assume that this discrete, mostly intact hearth feature is historic in age and constructed by indigenous peoples, as indicated by the association of debitage.

Test Unit B was excavated within the surface expression of the midden deposit, and indicated that anthropogenic soil is as deep as 50 cmbs. This feature has vague and difficult to distinguish horizontal boundaries (Fig. 9). It appears only slightly mounded above the surrounding landscape and FCR density is variable, most heavy on the southern end of the feature. The surface expression measures approximately 60 x 25 m. Excavations indicated a general depth of 40-50 cm. Soils within the deposit are darkly stained with carbon and charcoal flecks are numerous in portions of the feature. Three shovel probes were excavated within the northern portion of the midden deposit and indicate that anthropogenic soils vary considerably with depth and that deposits between the north and south surface exposure are not uniform. Shovel probes showed relatively shallow deposits of midden soils.

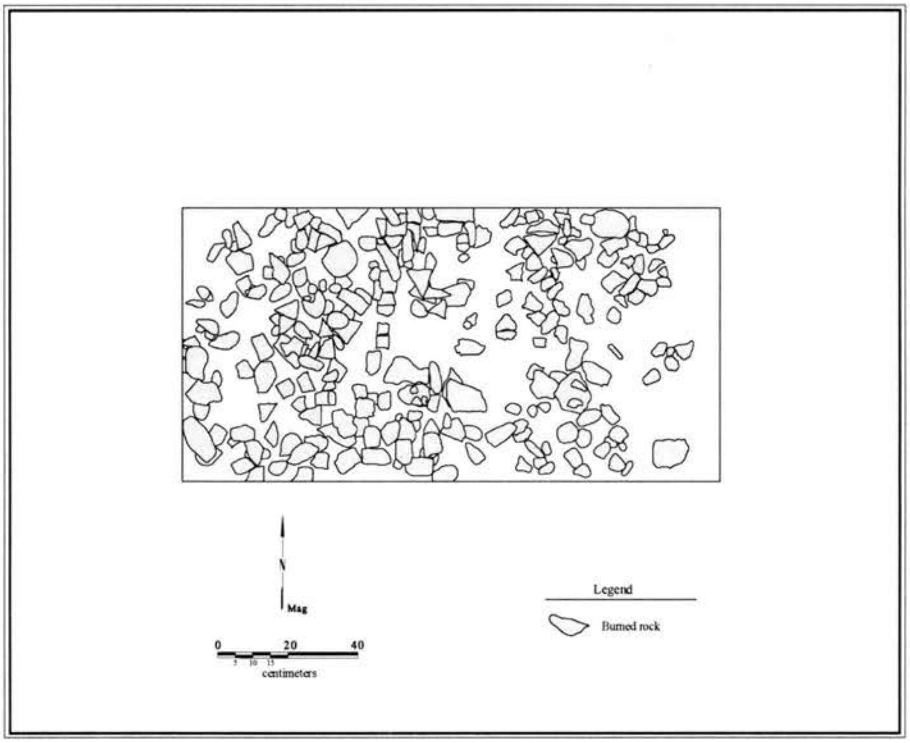

Figure 9. Test unit B, excavated in midden deposits, Perdiz Creek Site.

Windy Spring Site

The Windy Spring Site is located on a gradual southwest-facing slope approximately 500 m north of Perdiz Creek. It is situated mid-slope between the upper crest of the rim rock escarpment to the east and the main Perdiz Creek drainage to the south. Cultural material consists primarily of a moderate density scatter of burned rock surrounding a core area of incipient midden deposits. The scatter of burned rock occupies an amorphous area about 45 m across. Debitage formed of local chalcedony is found in high densities within the site area. The central incipient midden deposit measures approximately 20 m across and is identified by the occurrence of abundant burned rock and charcoal stained soils. Three projectile points, two bifacial tools, two ceramic fragments, and a groundstone metate fragment were recorded on the surface within the site boundaries.

Ten 1x1 m units were excavated in the course of subsurface testing (one 1x1, three 1x2s, and one 1x3 m). All of these, with the exception of the single 1x1, were excavated within the midden deposit.

From the nine 1x1 m units it is apparent that the midden deposit is relatively shallow, at approximately 15-20 cm in depth, and it rests on a bedrock surface (Fig. 11). Soils within the midden are moderately stained with charcoal and a minimal amount of ash. FCR is not tightly packed, so that the charcoal stained soil matrix dominates the deposit. Chipped stone frequency is generally light (Table 3)

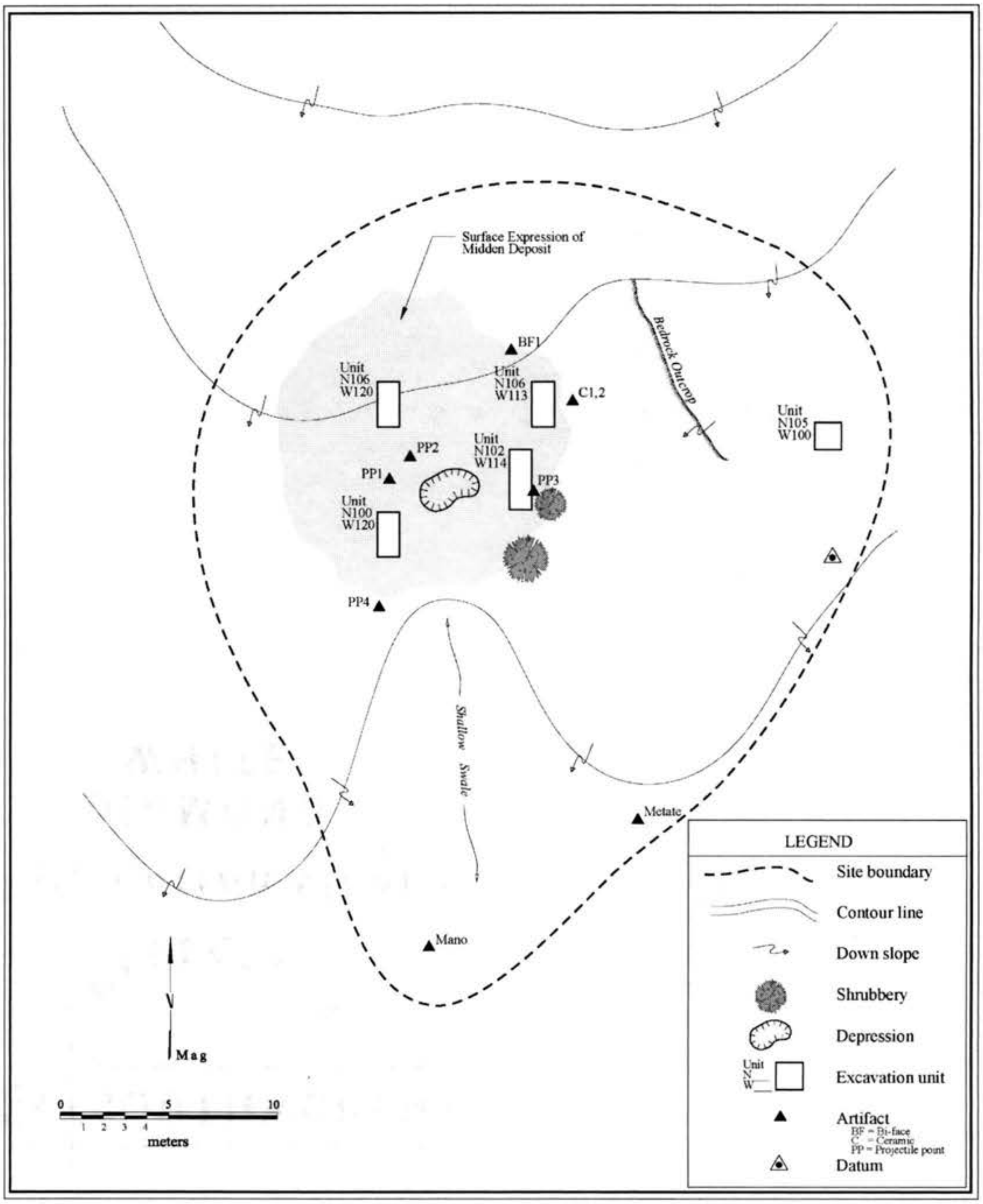

Figure10. Sketch map of Windy Spring Site.

and formalized tools were not common. Eight projectile points were recovered from within the test excavations, seven in the first arbitrary level and one in level 2. Three projectile points were noted on the surface of the landform. No discrete features were encountered in the course of excavations within the midden.

Soil samples were taken in anticipation of future investigations and small bulk carbon samples were collected from arbitrary 10 cm levels in 1x1 m units. These samples were collected for radiocarbon dating and did not come from discrete features.

One 1 x 1 m unit was excavated 12 m outside of the surface expression of burned rock and midden deposits to investigate the nature of surrounding soils and deposition. This unit revealed that surrounding soils are weakly developed, consisting of approximately 15 cm of decomposing bedrock and soil overlying basaltic bedrock. No cultural material was recovered from this excavation.

The shallow profile of anthropogenic soils and the lack of identifiable stratigraphy suggest that this feature may represent a short-term event or possibly a single occupation. Two soil samples recovered from the general midden deposit have dates that conflict with a single event hypothesis. Radiocarbon dates from sample numbers Beta-161386 and 161387 have intercept dates of A.D. 1210 and A.D. 1290, respectively. Their calibrated date ranges overlap, while their conventional radiocarbon ages B.P. do not. This observation is significant because, in the case of other midden deposits in the Perdiz Creek study area, it was difficult or impossible to determine how many components or formation events were represented in the formation of burned rock accumulations. This large feature at the Windy Spring Site is a possible exception to this situation.

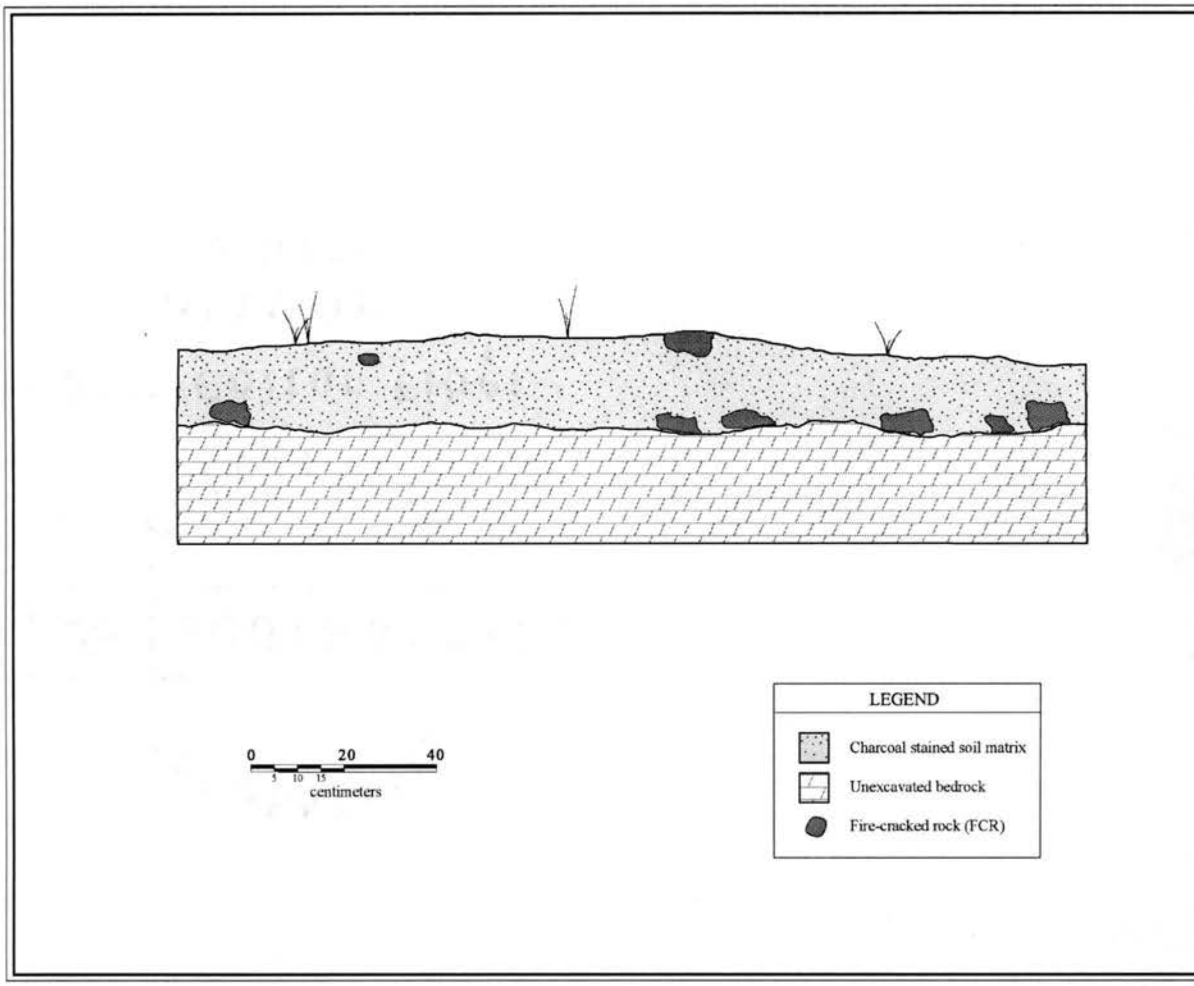

Figure 11. Unit N106/W120, profile , cross section of shallow midden deposit.

Metate Site

The Metate Site is located in the northwestern sector of area G, situated on a tributary to Perdiz Creek. The site is, essentially, an ephemeral midden deposit amidst a high density scatter of debitage, chipped stone tools, and groundstone debris. The midden itself does not fit the classification or description of the "typical" burned rock midden commonly found across central and western Texas (Prewitt 1979; Weir 1976).

On the surface of the landform, this feature does not display the mounded appearance that typifies the burned rock middens of central Texas. Burned rock is of moderate density and is not tightly packed, as is typical in the central Texas case. Burned rock is scattered in a concentrated area that measures approximately 10 m across and elliptical in shape. The boundaries of the feature are not well defined, as lighter densities of burned rock are strewn around the perimeter of the central portion of the moderate density scatter. Soil within the surface expression of the feature is moderately to heavily stained with charcoal and diffuse carbon material. The central portion of the midden deposit is overgrown with mesquite brush, which likely indicates ground disturbance. This feature is located approximately 100 m west of the tributary drainage and is at the toe of a gradual slope that leads up and east to the higher rim rock deposits of igneous and basaltic material.

Artifacts observed on the surface include two large metate fragments and abundant chipped stone debris. Three projectile point fragments were point plotted before collection. Surface artifacts surrounding the feature were recorded within a 40 m diameter area. Site boundaries were determined by subjective judgment, based on a decrease in artifact frequencies away from the focal point of the midden deposit.

Subsurface testing at this location consisted of five 1 x 1 m units (two 1 x 2 m units and one 1 x 1 m unit) and five shovel probes. The purposes of these excavations were to investigate the subsurface integrity and extent of the midden deposit and to investigate whether significant intra-site variability could be identified in buried deposits. A single "pothole" on the site provided a glimpse into the nature and depth of midden deposits.

One 1x2 m (Unit N87/E98) unit was excavated within the central portion of the midden feature. It was placed adjacent to the pothole, as there was a clear indication that placing a unit in this fashion would sample a considerable depth of dense midden stained soil. This test unit was excavated to a depth of 70 cmbs, though the size of the units decreased with depth to accommodate time constraints. FCR was counted according to arbitrary 10 cm levels and was assigned to rough size classes, in a effort to document gross changes in FCR density with depth.

In the southern 1x1 m portion of this unit, shallowly buried within the first arbitrary level, a concentration of tightly packed FCR (Fig. 12) within a matrix of darkly stained midden soil was encountered. It was determined that this concentration represented a semi-intact hearth feature, which was subsequently cross sectioned and profiled (Fig. 13). Morphological measurements indicate that the hearth was a roughly basin shaped arrangement of FCR, 85 cm in diameter and 20 cm deep in cross section.

Soil samples were collected from the interior of this feature and charcoal was extracted from the interior matrix for radiocarbon dating. This sample (Beta 161389) was dated to between A.D. 900-1030 (1050 -920 B.P.) with an intercept at A.D. 1000. This feature very likely post-dates the surrounding midden deposit since it appears to have been constructed within that deposit and overlying deeper midden soils.

A soil profile of the entire west wall of this test unit was drawn to a depth of 70 cm. Charcoal stained soil was recorded 60 cmbs, resting upon lighter carbonate rich loamy sands. Bioturbation complicated the profile considerably, as there was no

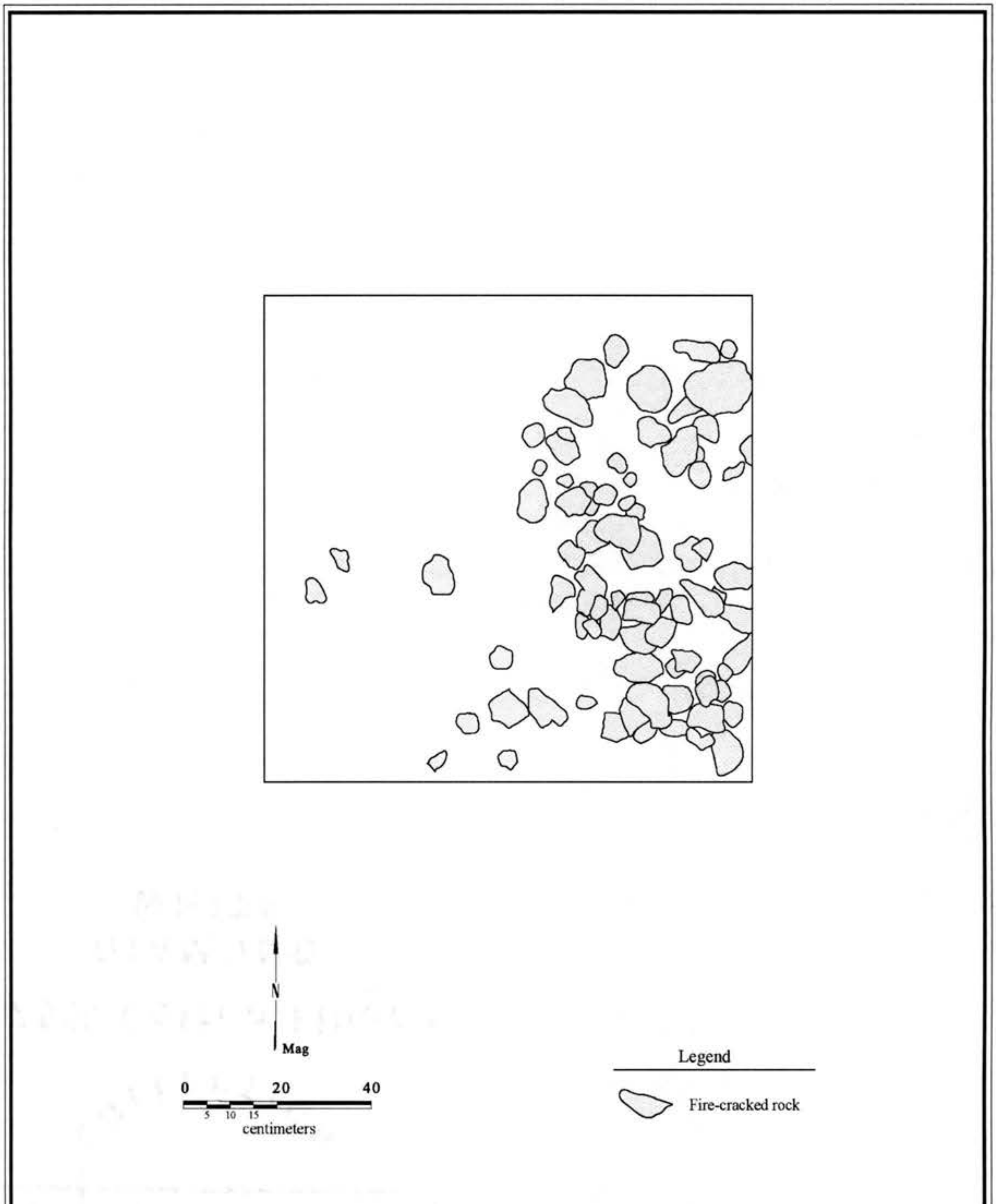

Figure 12. Southern portion of unit N87/E98, planview of hearth feature F1, constructed within midden deposit.

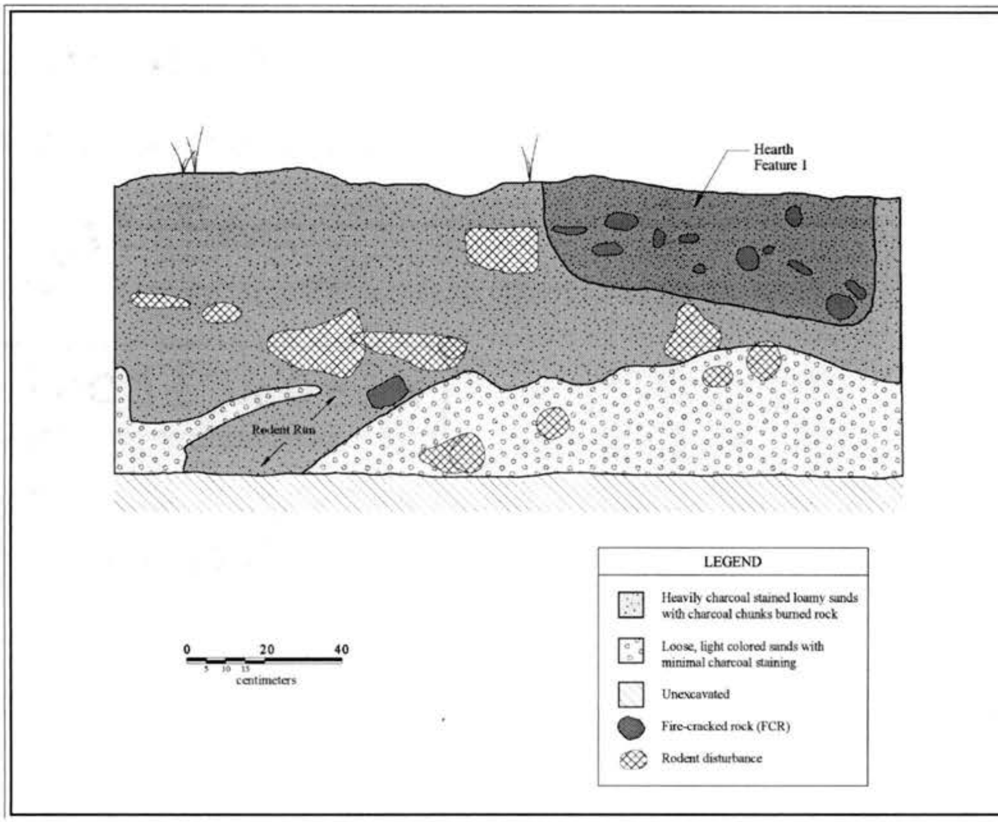

Figure 13. Profile drawing of unit N87/E98.

discernable stratigraphy noted within the profile, with the exception of the relatively darker and FCR rich cross-section of the hearth feature.

A second 1x1 m unit (N87/E102) was excavated in a stand of mesquite within the dark, charcoal stained soil and a slightly elevated portion of the midden deposit. This unit was excavated to a depth of 60 cmbs, and profiles displayed exceptionally dark (gray to black) stained soil. A tightly packed concentration of large-sized FCR (Fig. 14) was encountered in the second arbitrary level (7 cmbs). This concentration dominates the entire north wall of the unit, extending into the central portion of the excavation unit. The boundary of this feature was clearly demarcated by the relative frequency, density, and sizes of FCR. Impressions on this feature suggest that it is a boundary portion of a larger feature buried outside of the test unit. Since this feature extended past the base of the excavation unit, it apparently represents a portion of a large accumulation of FCR. It is speculated that the concentration is a portion of the central focus of the midden deposit, possibly an excavated roasting pit. Due to time constraints, this feature was left intact for future investigations.

Artifact recovery from this unit included numerous specimens of debitage, a grooved tooth, a medium sized ungulate mandible, and a single ceramic fragment. The ceramic specimen is a single body fragment of a type known as Chupadero Black on White.

The south wall profile of this unit displays very slight zonation, but the two different strata show too few differences to determine whether they were a part of different events and processes, or are part of a similar event. The depth of midden soil here is 55 cmbs.

A final 1x2 m (N97/E101) unit was excavated to the north of the initial 1x2 m unit in lighter surface soils. This unit was placed to investigate the potential of buried midden deposits in the northern portion of the site, and to determine whether there might be significant intra-site differences in artifact frequencies and densities. This unit was excavated to a depth of 80 cmbs, and soils exhibited in the profile proved to be minimally charcoal stained, thus outside of the focal midden deposit. FCR was infrequent in this area, and debitage proved to be much more abundant. Given the homogeneity of natural deposits observed in the course of excavations, it is speculated that debitage were

Figure 14. Metate Site, unit N87E102, Feature 2.

deposited contemporaneously with the major portion of the midden deposit, though not necessarily with the hearth feature observed in unit N87/E98.

Lost Pottery Site: Two 1x1 m excavation units were opened at this location to investigate a surface scatter of pottery fragments. Recovery from this location was minimal and will not be discussed in detail.

Artifact Recovery from Subsurface Testing

Since the research questions addressed in this investigation refer to landscape scale phenomenon, the following overview of subsurface testing will take a macroscopic approach, treating each site excavation as a sample of the larger study area. Excavations at these locations were limited in scope; the sample from each individual location is not of an adequate size to make substantive observations concerning inter and intra site variability. These issues will be addressed to an appropriate degree, but the overall goal is to give a larger scale impression of the nature of archaeological deposits within the Perdiz Creek study area. In this way, Perdiz Creek can be qualitatively compared to a different study area where data were collected at a similar scale. The overview and analysis is comprised of descriptions of artifacts and features and their localized frequency and density.

At four of the site locations, Windy Springs, Perdiz Creek, Metate, and Gallie, 20 1x1 m excavation units were excavated. All of these units were excavated by arbitrary 10 cm levels, accounting for a total of 70 1x1 m x 10 cm deep excavation levels.
All of these units were placed within or in the vicinity of substantial subsistence related features, ranging from incipient midden deposits to hearth fields to individual hearths. Recovery included large quantities of burned rock, debitage, modified debitage, formalized tools including bifaces and projectile points, groundstone, macro floral and faunal remains, charcoal samples, feature matrix samples, and some few ceramic sherds.

Most of the artifacts on the surface of the tested sites were merely noted in a rough inventory. Diagnostic artifacts were assigned surface provenience and collected. All of the artifacts recovered from the test excavation units were collected, curated, and analyzed in the laboratory. Findings from the laboratory analyses are discussed below.

Debitage

All chipped stone from excavation units were closely inspected and categorized according to specific attributes and unit provenience (Andrefsky 1998). All specimens were initially sorted according to whether they exhibited modification in the form of retouch, as informal tools. The unmodified specimens were further sorted according to the amount and portion of the flake represented. These categories consist of:

Complete flake: a specimen with complete platform, distal termination and lateral edges.

Flake fragment: a specimen with the distal terminal portion of the flake absent, but with an intact platform.

Chip: a specimen with the proximal portion and platform absent; distal and terminal portion remaining.

Chunk: a specimen with neither terminal nor proximal portion, where the approximate portion represented is extremely difficult to discern, and where specimens are very angular.

Chipped stone from each level was next classified as to whether there was any cortex left on any portion of the specimen (*cortex present* or *cortex absent*). Lastly, each complete flake and flake fragment, i.e. specimens with an intact platform, were examined with a 20 x hand lens to determine the nature of the platform. These specimens were then classified according to platform type:

Single facet: a simple platform with a single plane where the flake was struck from the core.

Multiple facet: where the platform is composed of more than one distinct plane, often where smaller flakes were removed from the edge of the core or tool to prepare the platform for a specific end result.

Ground: where the platform shows signs of abrading and grinding, often to strengthen the platform edge for a desired end result; another prepared platform.

Cortex: where the platform is a cortical surface, indicating early-stage lithic reduction.

Crushed: where the platform has been smashed, often with a highly irregular, stepped surface.

Modified debitage was also inspected with a hand lens, each piece being recorded with a set of attributes including: portion of flake represented (fragment, complete, etc.); number of modified edges; length of modified edge; shape of modified edges (concave or convex); whether it shows signs of only modification and/or utilization.

All of these characteristics were recorded in table form and are presented here in comparative fashion. The objective of this analysis is to give accounts of the frequencies of artifacts and type classes within the small excavation samples. It is also the aim of chipped stone analysis to give an impression of the nature and intensity of activities preformed at the site area and within the landscape unit, with an emphasis on intensity of use. It is hypothesized that frequencies suggest some measure of energy expended at the site location, intensity of energy expended in stone tool manufacture, and maintenance, as well as activities carried out with the aid of these tools. The preparation of platforms would intuitively seem to be a more intensive manufacture technique than early-stage reduction. It could also be the case that more specialized subsistence activities are carried out with more formalized and refined tools.

Unmodified debitage frequencies vary significantly between the four sites excavated (Fig. 15), and average numbers of specimens per excavated level (Table 2) varies most significantly. The site with the fewest excavated levels yielded the highest number of unmodified chipped stone specimens, while the site with the highest number of excavated levels had the smallest average of specimens per level. Few conclusions can be drawn from this information, as the overall sample is too small to be very instructive.

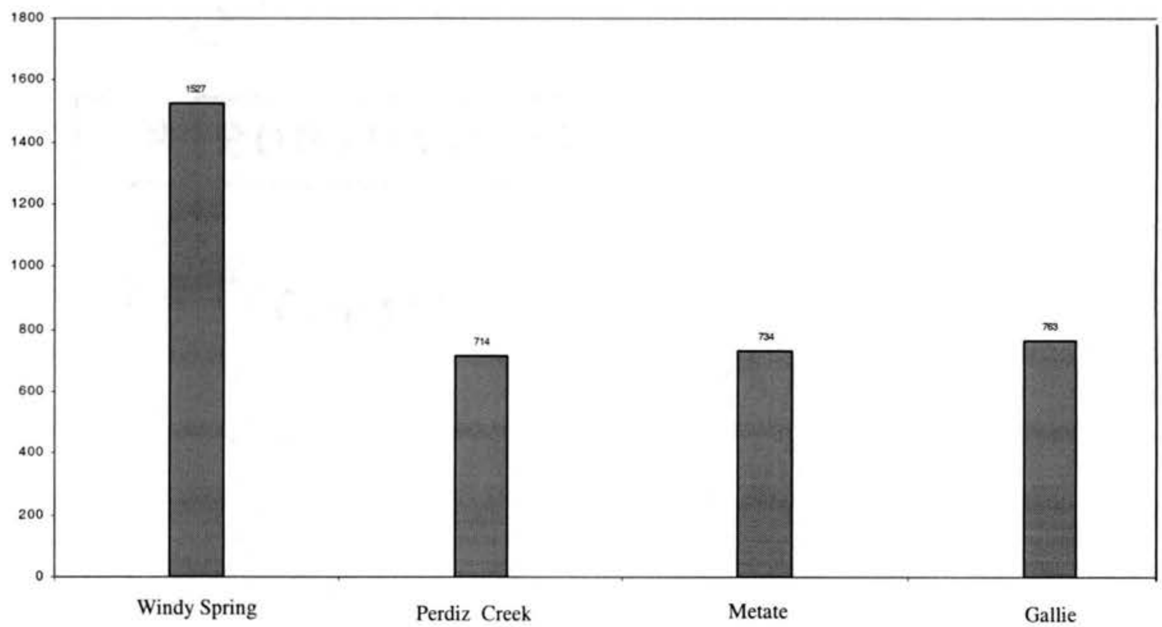

Figure 15. Unmodified debitage at each site location, Perdiz Creek study area.

A more instructive observation is the percentage of prepared platforms at all four sites (Table 3). These numbers are remarkably similar, given the sample population. It can be postulated that if different activities, or activities of different intensity, were

Site name	Unmodified debitage	Number of unit levels	Average unmodified debitage per level
Windy Springs	1527	14	109
Perdiz Creek	714	14	51
Metate	734	28	26
Gallie	763	15	50

Table 2: Frequencies and averages of unmodified chipped stone at four sites.

Site name	Total platforms	Total prepared platforms	% prepared platforms
Windy Springs	702	103	14
Perdiz Creek	341	69	20
Metate	336	52	15
Gallie	387	61	15

Table 3. Percentages of prepared platforms at four sites.

practiced at different locations in the Perdiz Creek landscape, different percentages of prepared platforms would be apparent in the archaeological record. As these numbers are not drastically different, it is postulated that there is some uniformity or homogeneity in the activities performed at these locations.

Figures 16-19 depict the frequencies of unmodified debitage recovered from each level of individual subsurface test units. In most cases, the units with the highest numbers of artifacts are 1x2 m units, while the lower numbers are associated with 1x1 m units. This fact, along with the small sample unit, makes the figures not very instructional concerning intrasite variability. However, they do serve to show that in most cases artifact frequencies are highest in the upper deposits of the excavation units, indicating that these features and cultural deposits are not deeply buried, and that the upper ten centimeters are representative of the highest density of cultural material. This is a useful observation for future investigations, since it points out that shallow excavations and testing can yield useful information.

An exception to this point is the Metate Site, where the highest average frequencies of artifacts are found in level 2, 10-20 cmbs. Since this is true concerning several units across the site area, it could be indicative of a buried cultural deposit.

Modified Debitage

Modified flakes occur in relatively small numbers (n-40) compared to the amount of unmodified debitage recovered from all of the test excavations. Very few of these specimens displayed a high degree of modification, such as extensive retouching where the edge of the flake has been substantially reduced. The majority of specimens are fragmentary chips or flake fragments. Most specimens have multiple modified edges, both concave and convex. Material types are dominated by a locally available red or brown rhyolite, followed by locally available chalcedony. Only seven of these 40 specimens are formed on cherts that are not immediately available within the study area. This fact suggests that these more ‘exotic’ materials were conserved for different types of tools, rather than mere expediency tools like modified flakes. The majority of these specimens also show evidence of both modification and utilization.

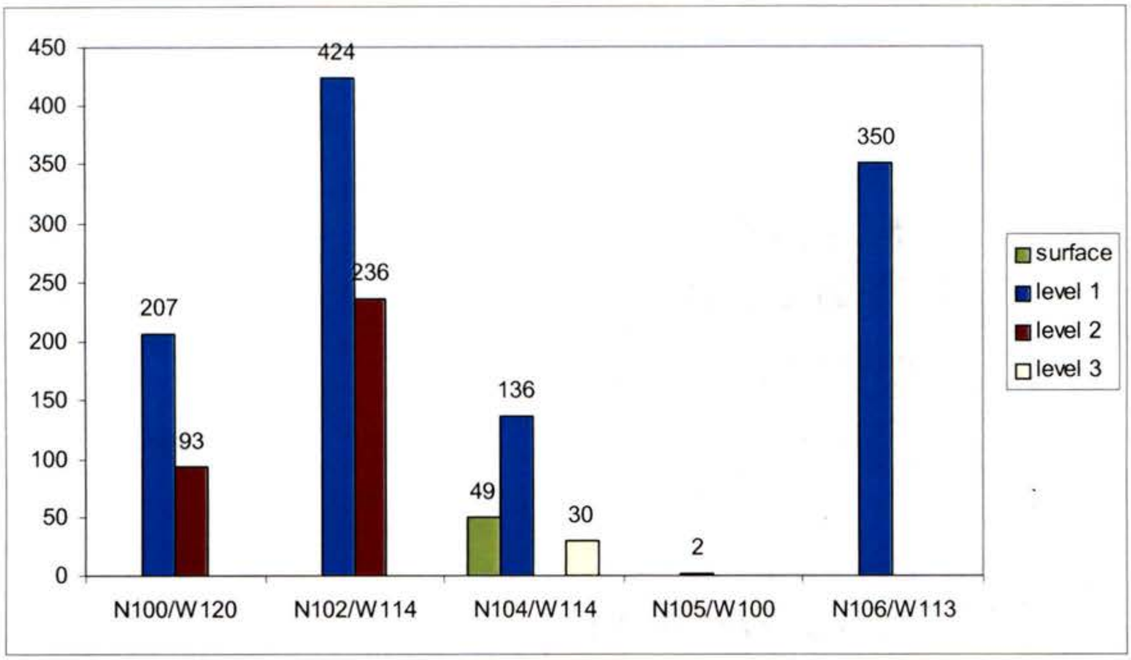

Figure 16. Windy Spring Site, unmodified debitage at each excavation unit, per level.

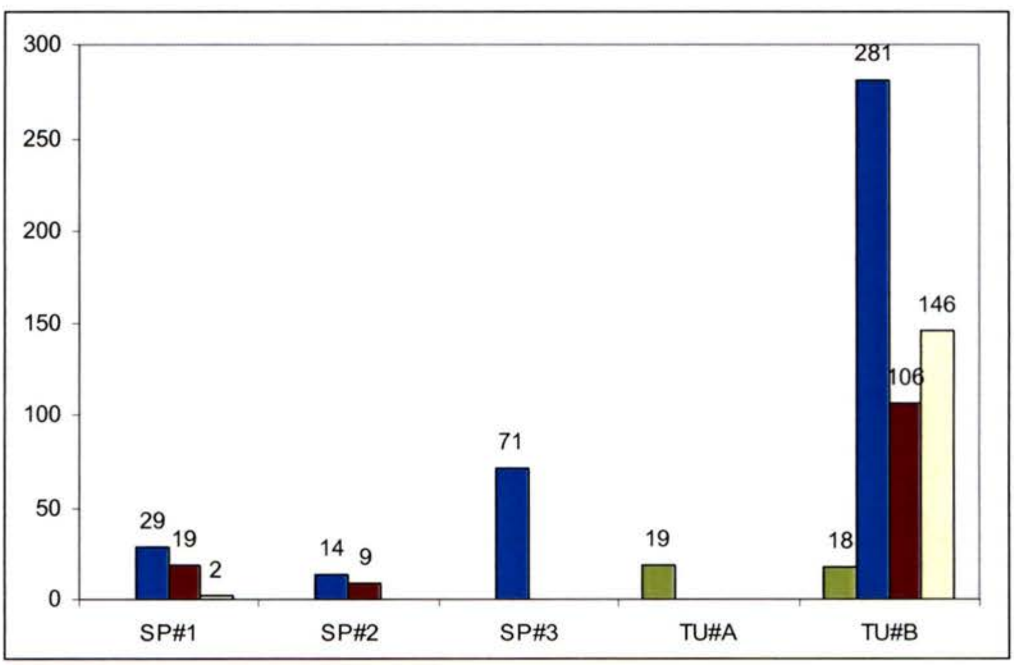

Figure 17. Perdiz Creek Site, unmodified debitage at each excavation unit, per level.

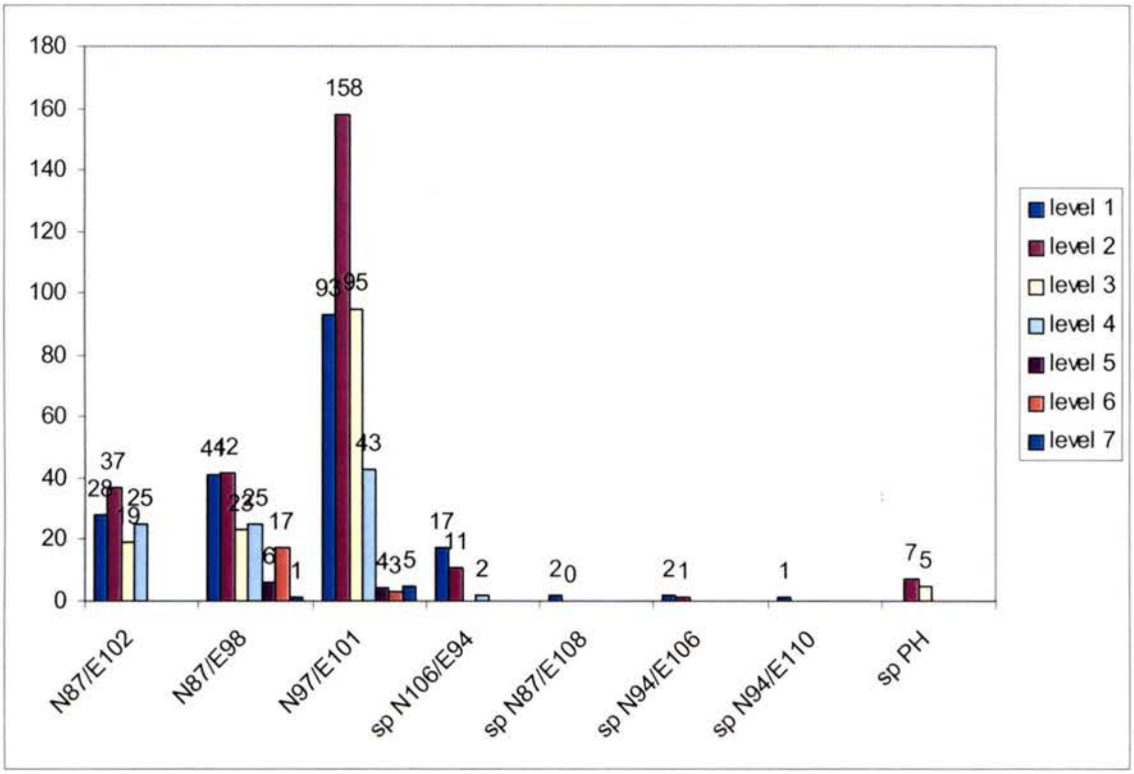

Figure 18. Metate Site, unmodified debitage at each excavation unit, per level.

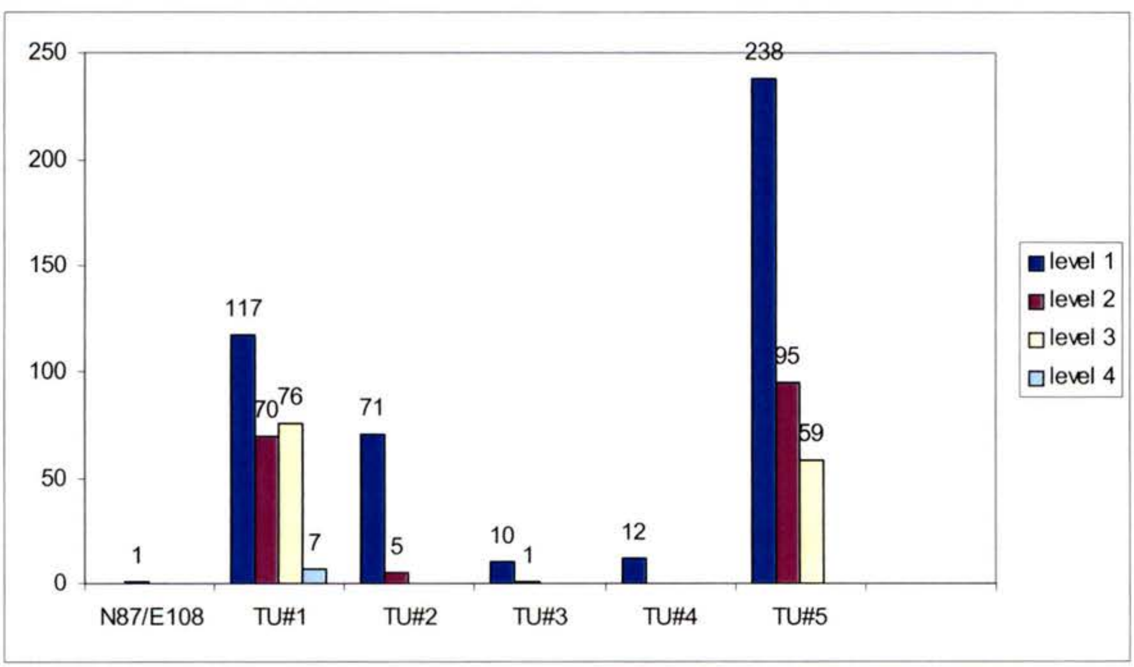

Figure 19. Gallie Site, unmodified debitage at each excavation unit, per level.

Number of Modified Debitage Specimens	
Site Name	**Total**
Windy Springs	18
Perdiz Creek	9
Metate	3
Gallie	10
total	40

Table 4. Frequencies of modified debitage at each site.

Projectile Points

A total of 32 projectile points were recovered from the ground surface and in subsurface excavations at sites in the Perdiz Creek project area. These artifacts were analyzed in the laboratory, where they were recorded with a number of attributes (see appendix). These consist of the shape of stem and blade edges, neck width, base width, length of blade, width of blade, and metric weight. Formal typologies were assigned using descriptions from Suhm and Jelks (1962). Nine of these projectile points were recovered from the upper 10 cm of excavation units, while two were recovered from 10-20 cmbs.

The projectile point collection consists of 19 dart points, six arrow points, three performs, and three specimens that are too fragmentary to make a finer classification. Seven of the dart points have expanding stems, three have parallel sided stems, three have bulbous stems, three have contracting stems, and three are too fragmentary to classify the stem side shape. Two dart points can be classified as Palmillas type (Fig. 22, lot#104 and 200), one as Pandale (Fig. 21, lot#29), and one as Paisano (Fig. 20, lot#200).

Arrow points (n-6) consist of two notched specimens, one bulbous stem, two expanding stemmed, and one contracting stem (Fig. 25). Specimens assigned to a formal typology include: two Toyah (Fig. 25, lot#s 111 and 110), three Livermore (Fig. 25, lot#s 59b, 59c, 259), and one Perdiz (Fig. 25, lot# 262).

In the Perdiz Creek study area, ten projectile points were recovered from excavation units in a subsurface or near surface context. Eight of these projectile points were found at the Windy Spring site. At the latter site, four projectile points were recovered from a single 1 x 2 m excavation unit (N102/W114). One Toyah arrow point fragment (Fig. 25, lot# 111.a) was recovered from level 1 of this unit, 7 cm below the ground surface. A second projectile point fragment (Fig. 25, lot# 111.b) was recovered from level one and is likely a shoulder fragment of a dart point too fragmentary to be diagnostic. A third dart point fragment (Fig. 20, lot# 111.c) was recovered from level 1 of this unit, an un-typed, expanding stem specimen. The fourth projectile point fragment (Fig. 22, lot# 104) was recovered from screened soil in level 2. This fragment is the basal portion of a Palmillas dart point. These specimens were found within the boundaries of the midden feature in the center of the site.

Three projectile points were recovered from unit N100/W120 at the Windy Spring site. Two Livermore arrowpoints (Fig. 25, lot# 's 59.b and 59.c) were found in level one, each 3 cm below the ground surface. A single Shumla type dart point fragment (Fig. 20, lot# 59.a) was recovered from level 1 of this same unit, 10cm below the ground surface.

In unit N106/W113, a single Toyha arrow point (Fig. 25, lot# 110) was recovered from screened soil in level 1.

Figure 21. Parallel sided dart points.

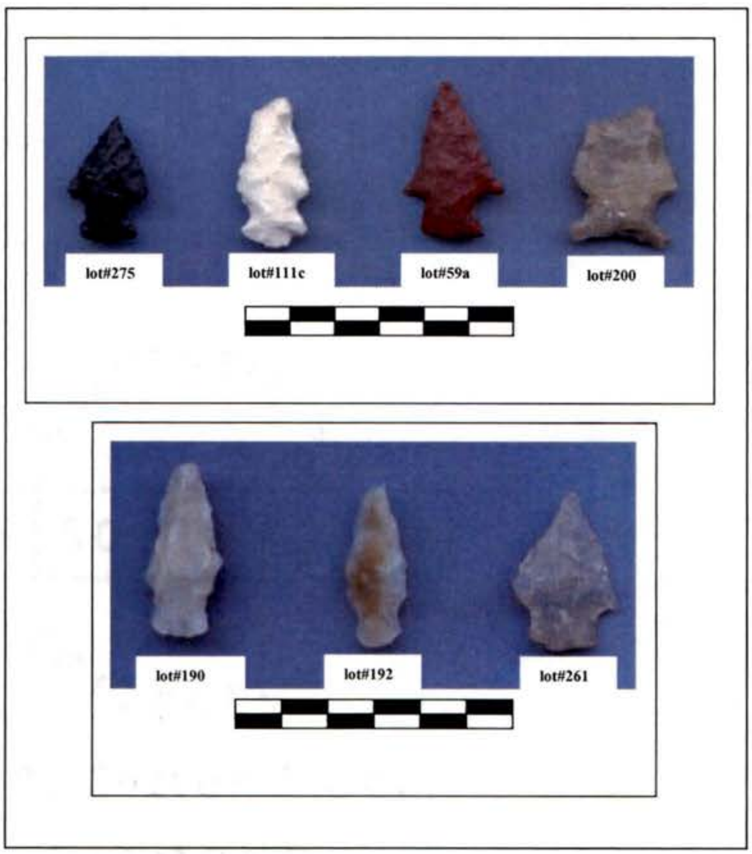

Figure 20. Expanding stem dart points

Figure 22. Bulbous stemmed dart points.

Figure 23. Contracting stem dart points.

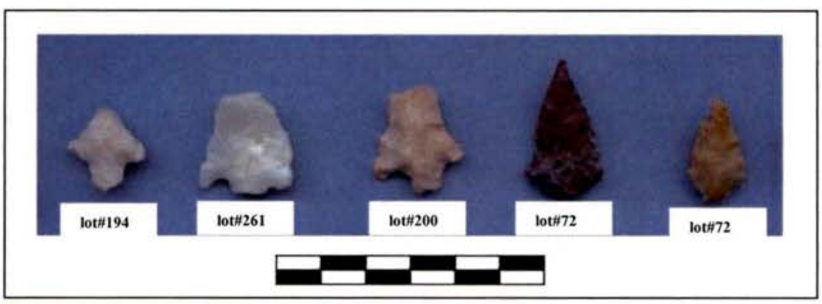

Figure 24. Fragmentary projectile points.

Figure 25. Arrow points.

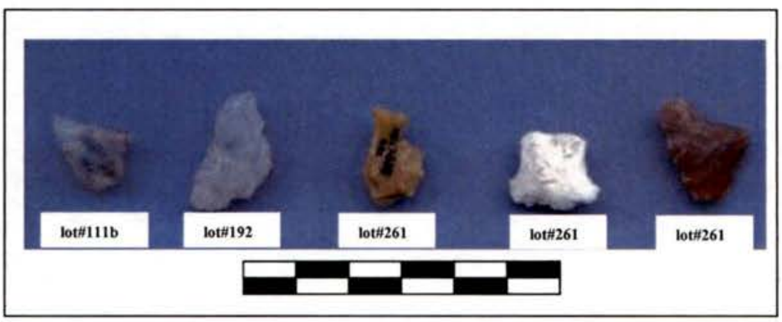

Figure 26. Projectile point and biface fragments.

Two arrow point fragments were found in excavation units on the Gallie site. In Test Unit 1, a single Livermore arrow point (Fig. 25, lot# 259) was recovered in level 1, 1 cmbs. This unit was situated within a surface expression of light charcoal staining and scattered burned rock, in what might be best described as an incipient midden deposit. In test Unit 4, a single Perdiz arrow point (Fig. 25, lot# 262) was recovered in the screened soil of the upper 5 cm of level one. This unit was excavated to investigate the extent of midden deposits, but found the underlying soils were found to be free of charcoal and burned rock.

Ceramic Sherds

Thirty-three ceramic sherds were recovered in subsurface testing and surface collections at five site localities. The ceramic assemblage is divided into four types based on color, texture, and surface treatment.

Type 1 (n -3) has a smooth and slightly burnished surface texture, dark brownish red in color. The interior is a similar color absent the burnishing. In cross section, the paste is very dark gray (charcoal colored) with very course, white temper that is white in color. A tempering agent is visible in the interior and exterior surfaces as well, and there are exterior markings or patterned finishings. All fragments representative of this type class were found on the surface of the Windy Spring Site, within or directly adjacent to the surface expression of the primary midden deposit.

Type 2 (n~1) has a grayish, red-brown, smooth exterior surface. In cross section it has a similar color to the exterior surface, with minor white colored tempering agent. The burnished interior surface is very dark gray. This specimen is unique in that it has distinctly different exterior and interior surface coloration and treatment. Both interior and exterior surfaces evince possible smoothing with fingers or grasses as attested by intersecting parallel smudges. The single fragment representative of this category was collected from the surface of the Lost Pottery Site.

Type 3 (n-1) has a course light gray exterior surface and in cross section has the same color, relatively fine-grained in texture. The interior surface is decorated with black lines, depicting the corner of a possible rectangle, with closely spaced parallel lines intersecting the corner at ~45-degree angles. This fragment is suggestive of Chupadero Black on White pottery noted elsewhere along the Rio Grande corridor (Kelley 1940:34) and was included as an artifact diagnostic of Kelley's La Junta focus. The single sherd was found within test unit N87/E102 at the Metate Site. This unit was situated within a dark midden deposit, and the fragment was recovered in level 2, approximately 10-20 cmbs.

Type 4 (n-28) is the most common ceramic type noted in the study area and has a mostly grayish red-brown exterior, cross section and interior color. The paste is mostly course with a few white colored temper particles. No surface decoration is present, but surface treatment can be seen in the form of intersecting smudges possibly from grasses or fingers. This last type has some minor variation in color, but are all remarkably similar. This type has distinct similarities to the crude Chinati Ware noted at localities along the Rio Grande corridor (Kelley et al. 1940:34) and was included in Kelley's Concepcion Focus. All sherds of this category were found on the surface of the Lost Pottery site within an approximately 3 m diameter area and all likely come from the same vessel.

Cultural Features

A total of 19 hearth features were recorded within the Perdiz Creek project area, all noted within the boundaries of five sites. Only four of these features retain any significant integrity. From a review of the individual feature descriptions in the preceding site discussions, it becomes apparent that hearths do not appear to be particularly large or contain substantial quantities of burned rock (with the exception of Feature 8 at the Gallie Site). Hearth feature frequency and density is minimal at the Metate and Windy Springs localities, while most of the hearths recorded are found at the Perdiz Creek and Gallie sites. The Gallie Site contained 12 hearth features, and the majority, with the exception of features F6 and F8 , is mostly disturbed and do not contain a great number or volume of stones. Most of these features consist of loose but discrete clusters of 5-20 pieces of burned rock, with few indications that there are substantial portions of the features buried in surrounding deposits. The majority of features at the Perdiz Creek location, with the exception of Hearth Feature 1, are similarly not very substantial.

Many of these features have been significantly disturbed over time by taphonomic processes such as erosion and modern landscape modification. It is plausible to assume that if these features had at one time contained large quantities and volume of burned rock, there would have been some evidence of this in the area immediately surrounding the hearth remnants. The overall impression is that hearth features are relatively few and unsubstantial in the Perdiz Creek landscape in contrast to comparative study units. Several factors can account for this impression, such as: the unsystematic sampling method, visibility, or different food processing activities. These issues will be visited further in subsequent discussion.

Five midden features were recorded in the Perdiz Creek survey area. The feature recorded at the Metate Site is a somewhat diffuse surface expression with minimal mounding, visible within an area measuring 10 m across. Its principle characteristics are very dark soil staining and moderate to high densities of burned rock in the intervening matrix. The boundaries of this feature are vague and amorphous. This same description applies to the midden recorded and tested at the Perdiz Creek Site. While neither of these features is significantly mounded, each has a substantial subsurface content in the form of burned rock and heavily charcoal stained soil to a depth of between 20 to 60 cmbs. Chipped stone densities in these features are somewhat variable. Two sub-features (Hearth F1 and possible roasting pit F2) were identified within the midden deposit at the Metate Site. Two midden features were identified at the Gallie Site locality, but neither of these is very substantial in comparison to the midden features at other site localities. Each of these consist of medium to high density burned rock scatters with minimal charcoal stained soil. Subsurface deposits within the Gallie Site middens were minor compared to other Perdiz Creek midden features.

The Windy Spring Site contains the most discrete midden feature, as its subsurface extent is clearly limited by the shallow depth of deposits to bedrock (~10-20 cmbs). This feature has a somewhat amorphous perimeter and is roughly 15 m across. While the soil in the intervening soil matrix is distinctly stained with charcoal, burned rock is not exceptionally dense and does not dominate the cultural deposit. No sub-features were identified within the general midden deposit.

Summary of Artifact Associations with Features in Subsurface Contexts

As noted earlier, the majority of excavation units opened in the Perdiz Creek study area were situated within the surface expressions of subsistence related features, including isolated hearths, burned rock accumulations, and charcoal stained soil deposits. Excavated hearths were, for the most part, discrete and isolated features, with minimal amounts of associated chipped stone debris. The larger burned rock accumulations and midden features exhibited very vague soil stratigraphy, where separate occupations or events were difficult, if not impossible to identify with the extent of subsurface testing employed during field school investigations. Beyond debitage, artifacts associated with the larger features (excluding hearths) include modified and utilized flakes, bifacial chipped stone tools, projectile points, ceramic sherds, groundstone, and bone fragments.

Excavation units within the midden feature at the Windy Springs Site recovered 23 modified flake specimens as deep as 30cmbs and one mano fragment was recovered from 20 cmbs. Nine bifaces were recovered from the upper two 10 cm levels, both an early and late-stage reduction specimens. Nine cores or core fragments were recovered from subsurface deposits within the midden feature. While several ceramic fragments were noted on the surface of the midden expression, none were found in a subsurface context. A total of six projectile points and point fragments were recovered from subsurface contexts. Toyah and Livermore points were recovered from 0 to 10 cmbs, which support the Late Prehistoric radiocarbon assay from midden soils. Three dart point fragments (one Palmillas, one Shumla, and one unidentified fragment) were recovered between 3 to 10 cmbs. These late archaic specimens are vertically interspersed with the

Late Prehistoric specimens and could represent an earlier occupation below the Late Prehistoric midden, displaced by activities associated with the feature. It is, therefore, difficult to determine whether the other recovered artifacts, ie. bifaces, debitage, modified flakes, are actually associated with the Late Prehistoric midden activities.

Two test units were excavated in the large midden feature at the Metate site. Two sub-features were identified within the larger midden deposit, consisting of a near surface hearth and a large burned rock concentration that is postulated to be a central roasting pit feature. No bifaces or modified flakes were recovered from excavations centered over the possible roasting pit. Three modified flakes were recorded in excavations outside of the midden feature. Four bifaces were recovered from the general midden matrix in unit N87/E98, and six bifaces were recorded in unit N97/E101. These units are situated at, respectively, farther distances from the central roasting pit feature (Unit N87/E102). Unmodified debitage occurs in increasing frequency in excavation units that are farther from the possible roasting pit feature. These observations are at least suggestive of some significant intra site variability, where tool manufacture, maintenance, and processing activities are arranged around the central pit feature. While the excavation sample size is too small to draw meaningful conclusions, it clearly suggests productive avenues for future investigations.

No projectile points were found in association with the Metate site features. Of note is the single Chupadero Black on White ceramic sherd recovered from 10-20 cmbs in the test unit centered over the possible roasting pit (N87/E102). This specimen is a tradeware from the El Paso cultural area. This single artifact may indicate cultural interactions between groups who used the Perdiz Creek landscape in their subsistence rounds and the La Junta district to the south, where Chupadero ceramic types are associated with the La Junta phase agriculturalists (Kelly et al. 1940).

At the Perdiz Creek site, there were no projectile points recovered from subsurface excavations. Test Unit B was excavated inside the large midden deposit composed of burned rock and charcoal stained soil. In this unit two early-stage biface fragments were recovered in a subsurface context, along with six modified flakes.

At the Gallie Site, several test units (1,2, and 5) yielded artifacts other than unmodified chipped stone. Recovery in Test Unit 1, excavated in an ephemeral midden deposit, included seven pieces of unmodified debitage, three cores, one biface, one Livermore projectile point, and a single mano. Test Unit 5 was likewise excavated in an ephemeral scatter of charcoal and burned rock. This test unit recovered three pieces of modified debitage, three core fragments, two early-stage bifaces, and a single mano fragment. Test Unit 2 was excavated in charcoal stained soil. This unit recovered one core, and one biface fragment. As these test units were not excavated within a discrete feature, it is not possible to determine associations.

Perdiz Creek in Overview

When the archaeological manifestations within the Perdiz Creek study area are considered in overview, it is possible to sketch a general impression of the nature of surface deposits and a small sample of subsurface deposits. Generally, within the 6000-acre sample unit, we see four locations that host clusters of subsistence related burned rock features. These take the form of mostly small unsubstantial hearths and midden deposits. Most hearths consist of relatively loose clusters of burned rock. The midden features (n-5) are likewise unsubstantial in comparison, formed of moderate to heavily charcoal stained soils with moderate amounts of burned rock in the intervening soil matrix. These midden features are considered to be incipient, i.e. "just coming into being, and not fully formed". Radio carbon dates (n-6) for the incipient midden features and hearths all fall within a Late Prehistoric to Proto-Historic time period (Table 1).

Chipped stone technologies evident at site locations are not exceptionally diverse, consisting overwhelmingly of unmodified debitage (n-3762, recovered in excavation units), simple modified flakes, few formalized tools, and a small number of projectile points. Formalized scrapers, spoke shaves, perforators, drills, pecking stones, hammer stones, metates, figurines, shell, and other decorative items indicative of more diverse activities are absent from Perdiz Creek artifact assemblages in subsurface contexts. Recovered diagnostic artifacts are indicative of Late Archaic and Late Prehistoric technologies. Groundstone specimens, though present, are sparse (n-4 recovered in excavation units, 10 recorded in field notes). The specimens are formed mostly of locally available materials. Bedrock mortars, while present in the project area (n-8), are not as numerous as in other comparable landscapes. Ceramic sherds (n-33) are dominated by a single type (Chinati Plainware), with the exception of a single decorated Chupadero Black on White specimen, likely traded and imported from neighboring peoples along the Rio Grande corridor. The ceramic sherd assemblage likely came from a small number of vessels, indicating that ceramic technologies were not used heavily within the area or in association with features recorded in the sample area.

No evidence of structures or habitation was noted within the Perdiz Creek landscape unit. A single Cielo complex structure was found adjacent to the southern boundary of the Perdiz Creek study area, but no sites with these characteristic structures were noted in the survey areas. In general, habitation structures such as stacked stone wicki-up rings, pit houses, or jacal structures are not known in the actual project area, and are not known to occur in any abundance in nearby areas.

CHAPTER 6:

COMPARATIVE STUDY AREAS AND LANDSCAPE UNITS

Archaeological data, information concerning the material remains of past human behavior, are best considered within a large context. In the same sense that a projectile point can offer little information without provenience, the archaeological data of Perdiz Creek can be better understood when viewed in relation to comparative observation units. The goal of this section is to introduce a comparative study area with a description of the nature of archaeological material present there, and to compare this location to the evidence previously presented for Perdiz Creek. Observations at each of these locations is course-grained, in that reconnaissance level recording was focused on high visibility archaeological material, mostly surface expressions of large burned rock features. There is obviously a huge array of archaeological attributes to compare between landscape units, including: chipped stone densities, frequencies and densities of different tool types, percentages of different material types, archaeological faunal assemblages, and a host of others.

In the comparative case, archaeological data were collected according to somewhat different methods, varying in systematic survey coverage and descriptions. While this is certainly not an optimal situation for comparisons, the available data are probably representative and serve as an excellent departure point for understanding Perdiz Creek better. Differences in recording methodologies will be briefly discussed, but a fuller discussion of these differences will be addressed later with recommendations for future investigations.

Comparative Unit Environment: Gilliland Canyon

The comparative study area is within the Glass Mountains, approximately 69 km east-northeast of the Perdiz Creek study area. This area, privately owned by Mr. Homer Mills, is called Gilliland Canyon named after the prominent geographical feature in the unit. The study area is situated in a rugged mountain range formed mostly of fault blocked limestone deposits. Elevations range between 5791' and 4300', and the research unit is superimposed upon a central drainage, Gilliland Creek, and the linear ridges that flank its western and east sides. The canyon sides are steep and the drainage assumes a position in the mountain range making it a somewhat ideal causeway between the Marathon Basin to the south and the Toyah Creek drainage basin and grasslands to the north. A smaller portion of this study area occupies an ancillary drainage basin, Jail Canyon, immediately adjoining Gilliland Canyon from the west.

The Gilliland Canyon study area lies within a setting distinctly different than Perdiz Creek, an area that can be described as the northeastern boundary of the Trans-Pecos. Beyond the Glass Mountains, to the east, are the distinct physiological characteristics of the Stockton Plateau. The Glass Mountains are also adjacent to the Monahan Sand Dunes to the north, and the Toyah Creek basin and grasslands to the east and north. The surrounding plant community contrasts with Perdiz Creek, being dominated by a madrean woodland and sotol scrub community. While Gilliland Canyon does not have as immediate access to major biomes and ecological settings as does Perdiz Creek, a greater small-scale diversity of resources are present within the unit. The steep slopes of the canyon walls host dense stands of sotol, a resource that has been documented ethnographically as an important food and fiber source. The margins of the canyon floor contain stands of emory and live oaks intermixed with stands of juniper (Warnock 1946, 1977). All of these tree species have reproductive biomass, acorns and berries, recognized in archaeological and ethnographic documentation as important resources (Niethammer 1974). Mesquite likewise is a common food source, but its abundance may be a product of modern conditions, including range land modification and livestock grazing. Vegetation density is generally higher in the Glass Mountains, with more above-ground structural biomass, as compared to the dominance of grasses and subsurface plant components found in the Perdiz Creek setting.

Initial investigations in Gilliland Canyon began with a 1998 archaeological field school, hosted by Sul Ross State University and directed by Robert J. Mallouf. Activities focused on the test excavation of a large, partially buried burned rock midden eroding from a terrace fronting on Jail Canyon, a tributary to Gilliland Canyon (Mallouf n.d.). In 2000, the Center for Big Bend Studies conducted a reconnaissance over approximately 9000 acres of the study area. Twenty-three sites were recorded by this author, who visited midden features and recorded site localities using pedestrian survey techniques. Each of these sites is centered on high visibility features that typically consist of large, mounded burned rock middens.

<u>Gilliland Canyon Feature Distributions</u>

A total of 106 hearth features and 29 burned rock middens were recorded at 23 sites. These features are located mostly on the main stem terraces of Gilliland Creek and

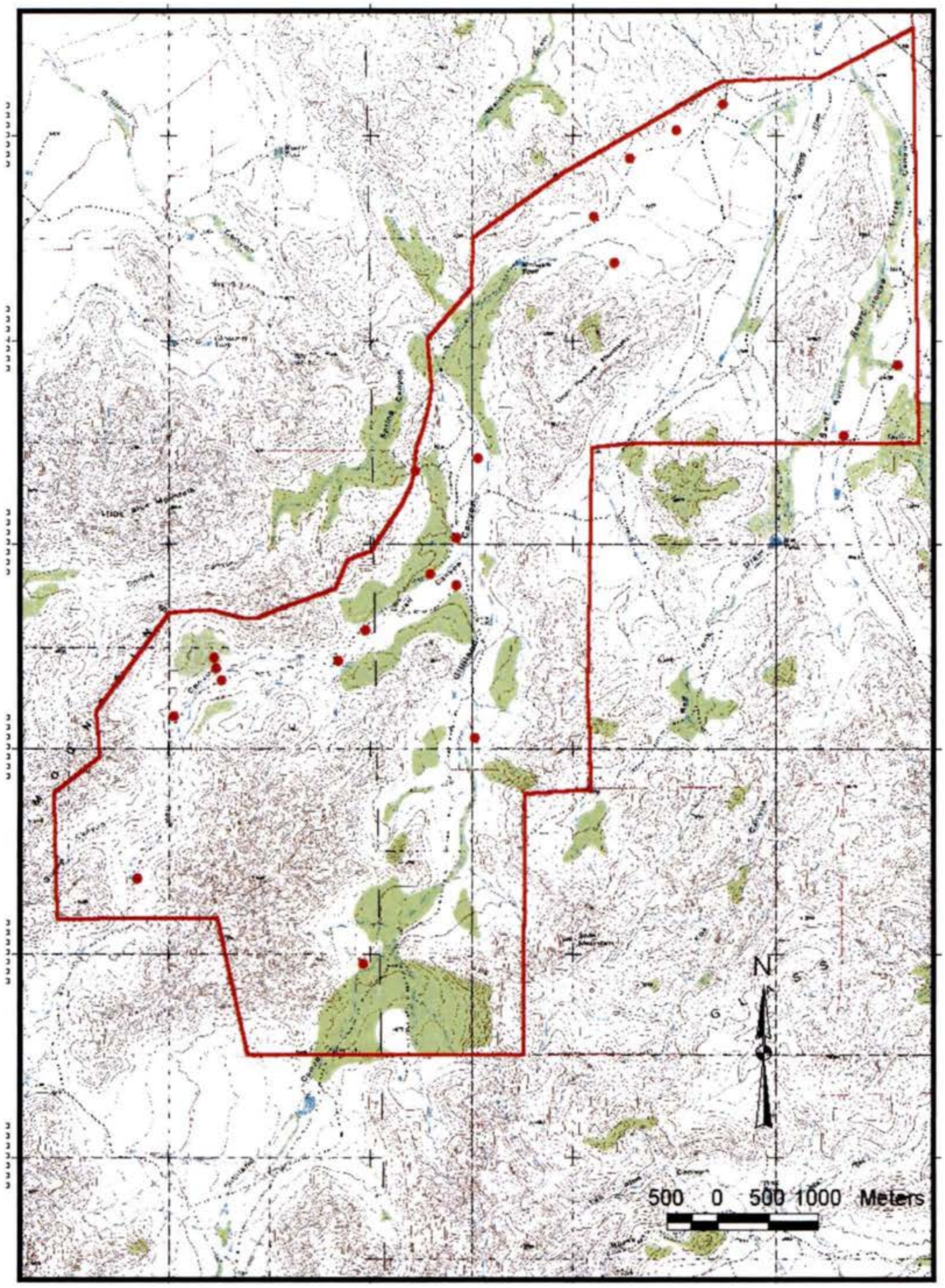

Figure27. Gilliland Canyon study Area, depicting site locations.

its tributary drainages. Two localities were recorded high above the drainage floor, one on an elevated bench, and another in a saddle above the main drainage. Hearth features range from small, loose clusters of a few stones, to large pavement or mounded style hearths up to 3 m in diameter. A simple classification of these hearths consists of: small clustered variety (small hearths) and large substantial (large hearths). These two varieties subsume a significant amount of diversity, but the classification is useful here for course-grained comparisons. The small hearth varieties range from tight clusters of 5 to 40 stones, often significantly displaced and having vague or amorphous boundaries. The large hearth varieties are mostly over 1.0 m in diameter, formed of 50 to 400+ stones, tightly packed, often displaying a pavement or mounded shape, and sometimes numerous courses deep. These features are often substantial and well defined, and they occasionally have intact stained soil and charcoal chunks under the stones and in the intervening soil. Of the total number of hearths (n-106), 68 are small, while 38 are large. Hearths are frequently in close proximity to burned rock midden features.

The 29 midden features display significant morphological diversity. Three general classifications are defined here to facilitate course-grained comparisons. **Mounded middens** (Fig. 28) are very high density clusters of burned rock, where stones mostly dominate the feature's matrix deposit. These middens are by definition numerous courses thick and mounded above the surrounding landform surface. Within this class of midden feature are further morphological differences. These features are sometimes domed, round or oval, displaying a significant degree of symmetry, while at other times they are irregularly shaped with stepped levels of mounding, some with a shallow central depression on the crest of the dome. This last characteristic is fairly common, where the

site numb	small hearths	large hearths	burned rock scatters	mounded middens	crescent middens	incipient middens	ring middens
HM1				1			
HM2	2	1	1	1			
HM3	2	1		1			
HM4	1	8		2			1
HM5	4	3	3	1		1	
HM6	2					1	
HM7	9	3	4				
HM8	4		1			1	
HM9	9	1	2			2	
HM10	3					1	
HM11				1		1	
HM12						1	
HM13				1			
HM14	3	1	3	2			
HM15				1			
HM16	3	1	3	1			
CD17				1			
CD18				1			
CD19				1			
CD20		1	2	1			
CD21						1	
CD22	11	18		1			
CD23	15			1	1		
totals	68	38	19	18	1	9	1

total hearths=106
total middens=29

Table 5. Gilliland Canyon study area, list of feature types associated with individual sites.

central depression is filled with dark, charcoal stained soil and where burned rock is relatively lighter in density. This type is not to be confused with the characteristic ring midden or "douh-nut midden" found in other western Texas locations, as the overall morphology is mounded rather than ring-like. These mounded middens range in size from 3-17 m in diameter, and are mounded between 30-100 cm above the surrounding surfaces. Eighteen of these features were recorded in the study area.

The second class of midden feature is termed a **ring midden** (Fig. 28), denoted for its characteristic ring shape, mostly a circular low mound of burned rock where the central portion is mostly free of stones. These features are found quite frequently in portions of west-central and western Texas, as well as within the Southern Trans-Pecos region. The single ring type midden located in the Gilliland Canyon study area is a small mound, ~3 m in diameter, mounded ~30 cm above the surrounding surface. Elsewhere, these features show significant morphological diversity.

The third class of midden feature is a **crescent midden** (Fig. 28), similar to the ring midden but displaying only a portion of the perimeter mound of burned rock. One of these features was recorded in the Gilliland Canyon study area.

The fourth midden type is termed an **incipient midden** (Fig. 28), which in most cases has very weak or ambiguous morphology. These features are differentiated from the other midden types by their relatively smaller number and density of stones. These burned rock features are rarely mounded and are often represented by a high density cluster of FCR on the ground surface, where soil rather than stone dominates the surrounding matrix. Often there is some degree of charcoal staining in the surrounding soils. Nine of these features were recorded in the study area.

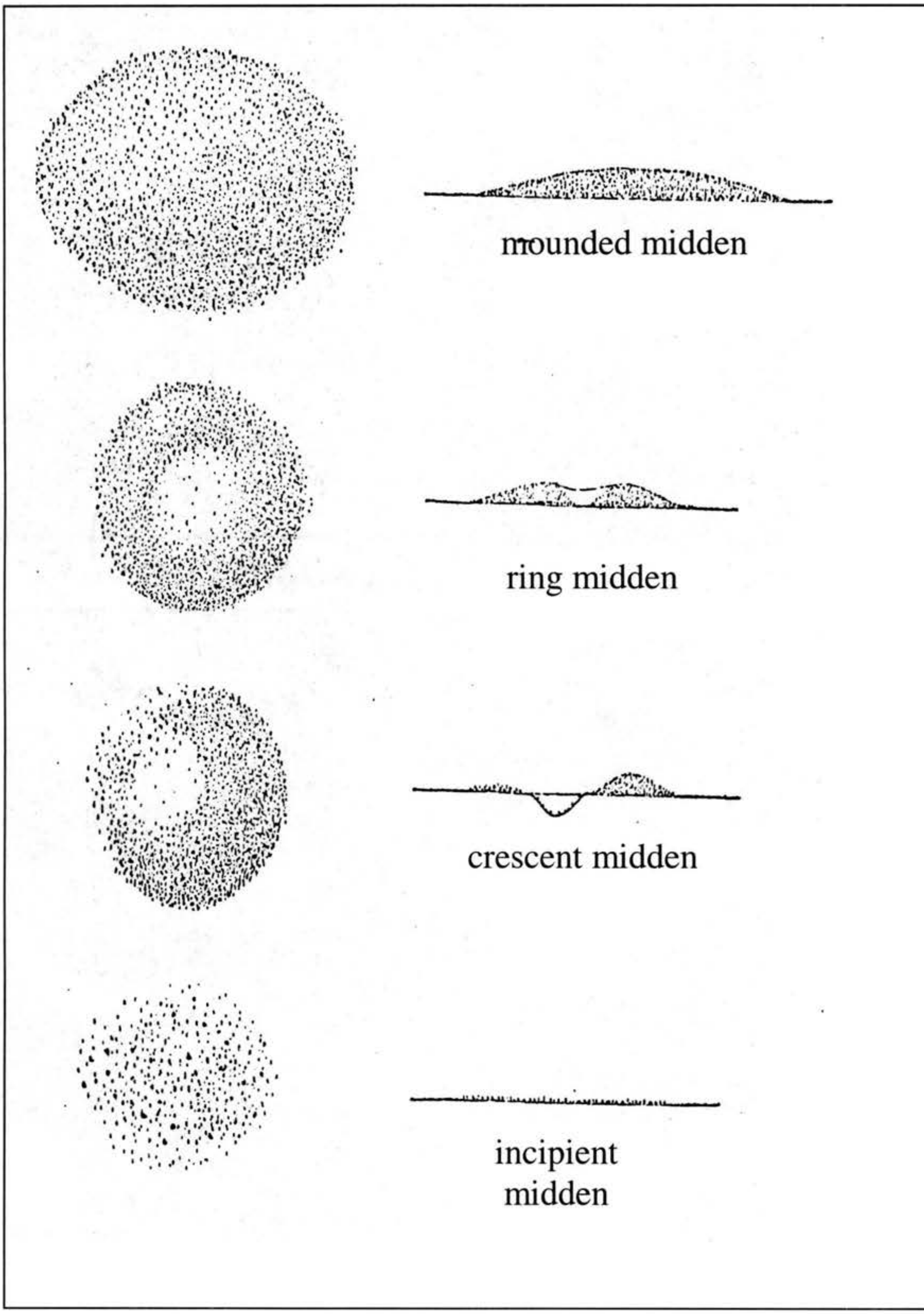

Figure 28. Midden types, adapted from Weir (1976: Fig. 7).

The overall picture that emerges from archaeological reconnaissance in the Gilliland Canyon study area is considerably different from that of Perdiz Creek. There is a relatively high number of more robust subsistence related features in the Gilliland Canyon unit. These are generally more intact and contain higher amounts of burned rock and charcoal stained soil matrix. While midden features are quite numerous in this area, hearth features, too, occur in higher frequency and a higher number of these hearth features are of the large size class.

The formational process of middens in Gilliland Canyon is still unclear. It has not yet been determined if these large features are the product of repeated use over several seasons, several generations, or several thousands of years. The degree of morphological diversity between these middens may indicate different functions and likely different methods of processing a variety of resources. Future investigations, with the aid of radiocarbon assays, might determine that morphological variability is a product of changes in food processing methods developed over time, i.e. temporal variability. While it can be safely assumed that we know very little concerning how these features relate to changing subsistence strategies, the unique archaeological signature left by the distributions of these features is an excellent starting place, especially when compared between different areas.

CHAPTER 7:

COMPARATIVE ANALYSIS BETWEEN STUDY AREAS

Subsistence Features and Hunter Gatherer Behavior

Before comparing study areas, it is necessary to discuss briefly the role that middens played in the subsistence activities of prehistoric peoples. The goal is to provide a basic overview concerning the variability in these features and how they have been interpreted in past investigations. Morphological variability and relationships to subsistence activities are critical analytical components that are related to human behavior and the use of specific landscapes.

The term "burned rock midden" used here encompasses a substantial variety of features. Generally, a burned rock midden is a relatively discrete concentration of stone that has been thermally altered, often to the extent that the stones have been heat fractured. Archaeologically, they are viewed as high density concentrations of thermally altered stone. This feature is typically made up of a course fraction matrix, composed of cobbles or small boulders, as well as a fine fraction matrix, made up of the soil filling the voids between course fraction clastics. The fine fraction matrix commonly includes varying amounts of carbon, chunks of charcoal, and ash (Collins 1994). The content of midden deposits includes human artifacts, (chipped and groundstone, ceramics), micro and macro floral debris, and micro and macro faunal material.

A burned rock midden is here differentiated from other cultural features in a qualitative and subjective fashion. It is different from a burned rock scatter in that a midden has more discrete boundaries, has a much higher frequency and density of thermally altered stone, and has a distinctive carbon stained fine fraction matrix. Middens are discerned from stone hearths in their aerial extent, density of matrix material, and the assumption that a midden feature represents a higher intensity and more industrious activity.

Collins (1994) provides a useful overview of burned rock midden features. A distinction is drawn between the general class of burned rock middens (BRM), which include the sub-classes of mounded BRM and annular BRM. The mounded form is a distinct morphological feature found mostly in Central Texas, but also in portions of the southern Trans-Pecos region. Annular middens have their own characteristic distribution, being much wider over portions of western Texas, Northern Mexico, and portions of the lower Southwest. Prewitt (1981) notes a correlation between archaeological time frames specific to each midden type. The mounded forms have been dated to as early as the Middle Archaic of Texas from 5000 - 2500 B.P. The annular forms have a later time distribution, between 2500 B.P. up to the historic period. While these date ranges provide a rough framework for the development of midden features, later observations suggest that these dates are somewhat in question (Mallouf, personal communication), where it seems that the annular forms of burned rock middens may date between ca. 800-1200 A.D..

The function and acreational history of the mounded variety of burned rock midden has been subject to a high degree of speculation. Explanations include: 1) they are the refuse pile and secondary dump locations for the byproducts created by other burned rock features, such as the cleaning out of hearth basins; 2) they are the result of multiple and overlapping hearth construction in a confined space, so that burned rock naturally accumulates over time as consecutive hearths are constructed in the same location; 3) they are the product of a specific subsistence activity, such as the bulk processing of a vegetable resource in earth ovens; 4) they are the product of a specific activity performed repeatedly in a single location, such as the repeated use of a mounded BRM for the construction of successive earth ovens. Morphological studies made through excavations suggest that several of these explanations may be needed to explain the mounded BRM phenomenon. In some cases, hearths are discernable within the midden matrix, while in others slab lined features are found to be the central sub-feature within the midden. Creel (1994) notes the correspondence of the mounded BRM variety with contemporary distributions of oak (sp) in central Texas. He attributes this correspondence to the processing of acorns as a major food source. There is a further correspondence of these features with geologic exposure of limestone on the Edward's Plateau, and it is hypothesized that limestone aids the leaching of tannin from acorns, making them palatable and digestible for humans. The western distribution of the mounded middens overlaps with eastern distribution of annular middens (their relationship to sotol and agave sp. is discussed below). Prehistoric distribution of oak, sotol, and agave in this area is subject to some debate (Creel 1994), making a direct functional relationship between mounded middens and oak tenuous.

Greer (1964) deals with variations on the annular midden or midden circle, and mescal pits. He observes that, generally, different forms are found associated with differing geographic and geological contexts. He distinguishes between midden circles, which are entirely above ground, and mescal pits, which have an above-ground burned rock deposit associated with an excavated, subsurface pit or depression. Type I includes both large, steep walled middens with pronounced central depressions, and smaller, slightly mounded variety where the central depression is filled with an ashy, charcoal stained soil matrix.

Mescal pits, referred to as earth ovens, are excavated depressions associated with burned rock debris, the latter often forming the ring or crescent midden described by Greer and others. Ethnographic accounts describe the use of mescal pits in the greater Southwest, western Texas, northern Mexico, and southwestern Arizona. This technology is applied today in northern Mexico to prepare sotol bulbs for production of alcoholic beverages (Niethammer 1974). Greer notes a variety of mescal pits ranging from shallow depressions to steep walled depressions that are lined with stone slabs. Occasionally, these pits are found in association with a heavy accumulation of stone debris, and sometimes none at all.

Greer (1964) provides a useful overview of ethnographic and ethnohistoric accounts of the use of earth ovens and mescal pits. It is important to note that many of these observations are from western Texas, adjoining northern Mexico and Arizona. Many groups using this technology, including the Jumano, Mescalero Apache, and Lipan Apache Indians, are known from ethnohistoric accounts to have inhabited the Trans-Pecos region. These features and food preparation activities are mentioned in a plethora of ethnographic accounts, a summary of which is provided below.

The principal resource processed in these accounts is sotol (sp) and maguey (agave). The hearts of sotol and the tubers of the maguey plant are gathered en mass by foraging parties that range far afield, depending on the local abundance of the resource.

Hearts and tubers are brought to a central location where the earth oven pit is excavated. The pits, as noted earlier, range in size from a shallow depression to a pit up to a meter deep and two meters across. These larger pits undoubtedly involve a great deal of labor. A fire is kindled inside the pit, then overlain by stones that are heated. It has been noted that this process alone may take the greater part of a day. Once the fire has burned down, the tubers and sotol hearts are arranged in the pit, over the rocks, and covered completely with soil. The oven is left to sit and bake for up to two days. The roots and hearts are then removed and are further processed in the same location. To make drink, the sotol hearts are pounded and pulverized in mortars while water is added, and the liquid is subsequently drained from the vegetable debris. For foodstuffs, hearts and roots are ground and pulverized into a flour like substance from which cakes are made.

The overall picture of this process suggests a very labor-intensive activity, which can take more than three days to carry out. Furthermore, these activities resemble a central place model involving: logistical forays of variable length, performing simple gathering activities, then congregating at a central place where resources are processed. The activities that produced midden features undoubtedly varied significantly in the expenditure of time and energy.

When we consider midden features at Perdiz Creek, it is apparent that they do not resemble any of the formal "burned rock" midden types described by Greer (1964), as they lack the distinct morphological characteristics, such as mounding, central depressions, crescent, or ring shaped perimeter. As mentioned in the overview of the Perdiz Creek findings, these features are incipient and not robust. Comparatively, they have a small volume of burned rock and their morphology is generally weak. Several possibilities exist concerning their formational history: 1) these features are the palimpsest accretion of several hearths that have been deflated and their matrices commingled; 2) midden deposits represent a mass processing event, necessitating energy and activities beyond the scope of typical hearth construction, possibly the parching of a large number of mesquite beans, succulent parts, tubers, or a combination of several of these. The second hypothesis will be used for comparative processes, supported by the generally homogeneous matrix deposits and the lack of discrete hearth features found within these midden deposits.

Features recorded in Gilliland Canyon, though variable, have the overall characteristics of the mounded burned rock middens described by Greer. They have a considerably higher volume of burned rock in comparison to the Perdiz Creek features. The formational history behind these middens is likewise not well understood. It is possible that these features represent a single, very intensive processing event, or perhaps closely spaced seasonal events. It is also possible that the extensive midden deposits are the product of multi-generational use, massive accretions of burned rock over an extended time period. While further investigations are needed to answer these questions, the single event or closely spaced event possibility will be assumed, minimally supported by the strong morphology and structural integrity of many of these features.

Prior Knowledge and Mobility Patterns

While certainly a qualitative account, it is clear that there are distinct differences in the feature assemblages between the Perdiz Creek and Gilliland Canyon study areas. To bring this information to bear on prehistoric behavior in the Southern Trans-Pecos region, it is useful to introduce prior knowledge concerning hunter-gatherer behavioral variability. This information is in the form of ethnographical data collected from modern peoples. Behavioral variability has been addressed in a variety of ways and there are a large number of potential questions. As the archaeological evidence of this study is concerned with subsistence related features, some of the more appropriate questions that will be addressed pertain to mobility patterns.

Binford (1980) makes useful distinctions between logistical and residential mobility and the factors that condition these variations. In this model, logistical movements, such as hunting trips and gathering forays, are used to acquire resources. Residential moves are those that entail the movement of camps, where living units move their central habitation and residences. The distributions of resources play a critical role in conditioning a spectrum of mobility variants. According to this familiar model, we could expect Southern Trans-Pecos mobility behaviors to trend towards the *forager* end of the mobility continuum. Relative to Great Plains groups, Trans-Pecos inhabitants would have relatively more frequent residential moves, while logistical moves may have been shorter and more frequent. This is primarily a matter of the vegetative and trophic environment. The plains environment supports large mammal food resources; these resources are highly mobile making for very patchy and unpredictable resources, suggesting that a logistical strategy of bringing resources to a central camp through extended logistical forays would be most profitable. While the Southern Trans-Pecos resources are not homogeneously distributed on the landscape, resources are more predictable with respect to their location and seasonality. Moving between "patches" of resources would seem a more viable strategy.

In further contrast, the arid adapted behaviors of Southern-Trans Pecos inhabitants can be expected to differ significantly from arboreal or equatorial groups. In this sense, Southern Trans-Pecos groups have a lower rate of residential moves, as they are somewhat tethered by water sources (see Taylor [1964, 1966] for a description of *tethered nomadism*). Trans-Pecos environments are more 'patchy' than forest or tropical environments, as these high primary productivity areas are characterized by more homogeneous distributions of resources (Kelly 1995). In this respect, it would not be prudent simply to classify groups in the Southern Trans-Pecos as "nomadic". While attempting to account for all of the variables in the forager-collector model is beyond the scope of this investigation, one important lesson is that mobility strategies can vary significantly along that spectrum, even within a single cultural group and their respective range.

Lee (1984) and Yellen's (1976, 1977) accounts of the Dobe !Kung are instructive in this regard. The !Kung are similar (though not simply analogous) to inhabitants of the Southern Trans-Pecos in that they rely on adaptations to an arid environment. In the Kalahari, mobility is strongly conditioned by variable distributions of resources and seasonal availability of water. Their dry season camps host high visibility material evidence for both shelter and food processing. During this portion of the year residential mobility is extremely low and logistical foraging mobility is high, as they are extremely tethered by very localized and limited water sources. Alternately, during the wet season in the Kalahari, residential groups fragment into smaller group parties, picking up camp and making more frequent residential moves, traveling between different resource patches. These wet season camps, occupied for only a few days, would show little evidence of habitation.

Binford (1980) notes characteristic archaeological signatures for these different mobility strategies, noting that with decreases in residential mobility and increases in length of logistical movements, we can expect higher visibility material remains in residential localities. In a forager context, this can be a result of *redundancy*, where localities are used repeatedly from season to season. To simplify this observation, we can speculate then where residential mobility is lower, logistical forays are more lengthy; where use of the landscape is more redundant, we can expect higher visibility archaeological remains. This generalization is somewhat intuitive, in effect saying, the longer a group stays in one place, the more debris they will leave behind.

From this somewhat oversimplified observation it is postulated that between the two contrasting study areas, we can discern potential differences in mobility patterns and land use. In Perdiz Creek we see relatively few high visibility features that are incipient in nature. The number of hearth and midden features (n-19 and n-5 respectively) is significantly smaller than the number of like features in Gilliland Canyon (n-106 and n-29 respectively). Similarly, the features in Gilliland Canyon are more substantial and have considerably higher visibility on the landscape. The middens and the large hearths in Gilliland Canyon are extremely suggestive of redundant land use and repeated, centrally focused activities. One plausible explanation is that mobility patterns in Perdiz Creek, in contrast to Gilliland Canyon, were of a nature that residential moves were more frequent and logistical forays were shorter. It follows that in Gilliland Canyon, residential occupations were longer in duration and seasonally reoccurring, and logistical forays were longer. Alternatively, it is possible that the incipient features in the Perdiz Creek study area represent specialized logistical localities, where resources were processed, then transported to a central, more long-term residential camp.

Along this line of reasoning it may be useful to speculate that group sizes differed between landscape units as well, where foraging parties and residential units in the Perdiz Creek landscape were smaller to facilitate more frequent movements, and more dispersed in order to make more efficient use of the more thinly distributed resources.

Given the proximity of these different landscape units in the Southern Trans-Pecos, it is quite possible that groups engaging in different subsistence and mobility strategies in different areas could at some point have been part of larger socio-cultural units. Undoubtedly, different landscapes played different roles in the subsistence strategies of prehistoric peoples in the region. Smaller groups making use of the Perdiz Creek landscape could have seasonally merged with one another, or groups from other areas, to form larger units utilizing the Gilliland Canyon area at some point in their movements within the region.

If we can accept these simplified expectations as a working hypothesis, we can search for forms of supporting evidence, ideally independent of the distribution of high visibility features used thus far. In archaeological contexts, one tool we have to use is other components of the material assemblage. Elaborating on the mobility hypothesis forwarded above, how might other aspects of archaeological assemblages, on a landscape level, be expected to vary according to different mobility patterns? We could hypothesize that localities used for extended periods should have evidence of a greater diversity of activities, including tool maintenance, processing of different resources, methods of storage, and construction of habitation structures. It is assumed that persistent environmental properties would have conditioned human behavior in similar ways over time. This case may be true of the Late Prehistoric period encompassed by radiocarbon dates recovered from the features in the Perdiz Creek study area. Given these suppositions, we should expect to see some degree of consistency in human land use in the archaeological record of the Perdiz Creek landscape. Finally, working with the proposed mobility hypothesis, we should expect that Perdiz Creek material should reflect a smaller diversity of cumulative activities in comparison to landscapes with higher redundancy use.

Small scale and fine-grained information is likely the most useful in this regard. Unfortunately, at a landscape scale sample, this information is available only for Perdiz Creek. Reviewing the inventory analysis, it is apparent that there is a seemingly low diversity of artifact classifications, a low percentage of prepared platforms, and a small number and variety of groundstone implements. Feature types outside of midden deposits are likewise low in number and display little variability (though this last observation is based on a purely subjective overall impression). While this appears to weakly support the mobility hypothesis posited above, comparative samples of subsurface artifact inventories would be needed to make more meaningful observations.

A definitive explanation of this postulated behavioral diversity cannot be achieved at this stage, but it is useful to speculate in order to formulate future hypotheses. The Dobe !Kung example cited above is a good modern example of intra-group behavioral diversity, especially with regards to mobility strategy (Lee 1984, Yellen 1977). There we see the importance of several key-conditioning properties, namely the seasonal availability of resources. We could expect that during times and at places where resources are abundant, plentiful, and predictable, we could expect to find more redundant land use and centrally focused activities. This is certainly true of dry season !Kung camps, where activities are tethered to large water holes. A similar scenario could be expected at wet season camps in the northern !Kung district. While not as severely tethered to water resources as during the dry season, mongongo nut groves present a somewhat predictable and abundant resource, which likely restricts movements (lower mobility) when compared to dry season foraging trips or hunting expeditions, when resources are not nearly as abundant or predictable.

This scenario presents one with expectations for the archaeological record in the Southern Trans-Pecos. Very generally, we might expect repeated and redundant land use in landscapes where resources are more predictable and more abundant. Such a pattern would be a product of longer duration occupation. We could further expect these areas to have a higher diversity of activities and that the cumulative deposition from these activities will result in higher visibility archaeological remains.

The feature assemblage in the Gilliland Canyon study area has been observed to be more diverse and of greater visibility than the Perdiz Creek area. Likewise, there is a greater floral diversity in the Glass Mountain landscape, along with a greater number of vegetable resources. Succulents, namely agave and sotol, are more abundant in the Glass Mountains and are not seasonally dependant in their harvesting for subsistence uses. In comparison, the Perdiz Creek study area has a smaller variety of major vegetable staples. If modern conditions are analogous to prehistoric conditions, the principle resources would likely have been mesquite beans (which are seasonally dependant on their harvest and yield) and game in the neighboring semidesert grassland (which comprise highly mobile and less predictable resources).

Another contributing factor to the dispersal and concentration of subsistence related activities, particularly processing of resources, could be the "lay of the land" or the physiographical setting of the different study areas. Put simply, Gilliland Canyon, because of its high topographical relief, offers a smaller space for use in the processing of subsistence staples. Activities would need to be focused in a smaller area, namely on the narrow and limited alluvial benches at the base of the steep canyon walls. In contrast, the Perdiz Creek topography is marked by less topographic relief, facilitating more diffuse activities.

CHAPTER 8:

CONCLUSIONS AND FURTHER RESEARCH

Survey and test excavations in the Perdiz Creek study area provided preliminary archaeological data for a landscape in the Southern Trans-Pecos that has not previously been addressed. To date, most archaeological investigations have taken place in the southern sector, mainly along the Rio Grande corridor, in the La Junta district, in the mountains and bajadas surrounding Big Bend National Park, in Green Valley within the central volcanic mountain ranges of the region, within the Glass Mountains adjacent to the Stockton Plateau, as well as a smattering of small scale investigations at select localities across the region. Investigations at Perdiz Creek add to our understanding of archaeological variability between different geographical settings in the Southern Trans-Pecos. The nature of field school investigations imposed limitations on how data were collected. Logistical concerns dictated that, in order to achieve some basic understanding of archaeology on a landscape scale, attention was focused on high visibility archaeological features. Subsurface testing was limited to small scale excavations intended to determine the integrity and general composition of cultural features. This research design can be considered preliminary, setting the stage for more detailed and fine-grained future investigations.

From the sample of features there emerges an image of the landscape use of the Perdiz Creek drainage, specifically within a Late Prehistoric timeframe. Three radiocarbon dates recovered from three separate incipient middens range between A.D.

1000 and A.D. 1290 (calibrated y-intercept). Excavations at these locations were limited in scope, but suggest that these features are not the product of long term, repeated use, but rather, the result of single or relatively short-term activities.

Clearly, further excavations are needed to make more substantive observations concerning the nature of these features. Small block excavations could yield morphological data useful in understanding the formational history of burned rock and charcoal stained soil accumulations. Further studies may be able to discern morphological diversity between roughly contemporaneous features within the study area.

Artifact recovery from midden features is dominated by unmodified debitage. Formalized tools, such as scrapers, bifaces, and groundstone tools are few in number. While this observation may be a product of sampling methods, further investigations could yield useful comparative information concerning artifact/tool diversity as a measure of the diversity of activities associated with the use of midden features. Excavations outside of midden features may be more instructive concerning types of activities associated with the features themselves. While the sample size is small, excavations at the Metate site indicate that, between the midden feature deposits and surrounding deposits (outside of these features), there are drastic differences in the frequency of artifacts and tools types.

It is important to note that both the Perdiz Creek and Gilliland Canyon study areas have been surface collected extensively in recent times. Collections from both these areas contain a wide variety of artifacts, including projectile point styles indicating a deep history of land use and occupation. While small dart points and Late Prehistoric arrow points dominate the assemblages collected in systematic excavation and site recording, surface collections contain projectile point styles indicative of late Paleoindian and Early Archaic occupations as well. Furthermore, surface collections contain a wide variety of chipped stone tools, including drills, perforators, formalized scrapers, spoke shaves, bifaces, a variety of groundstone, and ceramics. While these artifacts are indicative of diverse activities, it is not possible to associate them directly with any of the feature assemblages examined in this investigation.

A comparison of the Perdiz Creek and Gilliland Canyon study areas has demonstrated significant environmental and archaeological variability, with some important implications concerning behavioral diversity within the Southern Trans-Pecos region. Considering the minimal amount of chronometric control, this regional approach appears somewhat a-temporal in nature. Overall, radiometric dates and feature morphology address a very broad time period, namely the Late Prehistoric period. The next question should address in more detail the relationship between the two study areas.

While the Southern Trans-Pecos region is expansive, it is likely that a single group could have practiced a variety of mobility strategies in different environmental contexts. Still, the notion of a "group" is ambiguous at best. Some similarities in technological attributes (diagnostic artifacts and feature types) suggest some continuity of landscape use at the level of the "phase". This is suggested by the ubiquitous presence of Late Prehistoric Perdiz and Toyah arrow points found across the region, as well as a plethora of Late Archaic dart point types. Common feature types found across the region suggest shared technologies. Certainly, a cultural taxonomic unit such as a phase covers a broad time period and subsumes smaller "group" units. It is tempting to envision that a single group included the Perdiz Creek area in their subsistence rounds, then perhaps combined with other groups in the Glass Mountains, changing their mobility strategy to more efficiently exploit resources in a different ecological setting.

This is a perplexing proposition. The !Kung example demonstrates the fluidity of group constituency, from large dry season communities to smaller family household units in wet season camps. Even family units can be fluid as relationships change and are redefined. Furthermore, these relationships seem nearly impossible to identify in the archaeological record.

For these reasons, it is proposed that future investigations include a larger scale approach, a landscape level approach, in investigating the relationships between different environmental settings. Certainly what is needed most is some degree of chronological control in order to identify roughly contemporaneous mobility strategies. This entails the acquisition of numerous radiocarbon dates of different types of features in contrasting landscape settings. In this way questions would address not how a specific group utilized different mobility strategies, but rather, what roles different landscapes played in the overall subsistence system of populations in the Trans-Pecos region. Thus, investigations should include macro geographical issues, rather than relying heavily on cultural taxonomic questions.

Examining the archaeological evidence firsthand, then attempting to explain the behavior that produced that evidence can be considered *induction*, a kind of bottom up approach to the explanation of prehistoric behavior. A number of factors make this a complicated and potentially dubious approach. The first is that taphonomic processes make archaeological remains very difficult to explain and ascribe behavioral causal agents to observed patterns. In the case of this comparative analysis, it is not clear specifically what kind of behavior and post depositional processes produced the features in question. Second, there is a dangerous risk of circular reasoning where evidence is interpreted in order to support a premature conclusion. A top down approach, one of *deduction*, would ideally involve the construction of a model based on prior knowledge, where one generates expectations of human behavior given certain conditions, then testing how the archaeological data supports or refutes those expectations. As this project is based principally on the presentation of archaeological material evidence, collected a priori, induction has served as the principle tool of data interpretation.

It is tempting to envision the apparent mobility patterns at Perdiz Creek and Gilliland Canyon superimposed onto a larger scale scheme of the Southern Trans-Pecos region. When it becomes possible to determine the ages of different features, it will be particularly instructive to compare different landscape patterns, specifically to the area along the Rio Grande corridor in the vicinity of the La Junta District. In this region we see different types of features not addressed in the previous units due to their complete absence. These features include semi-subterranean pit houses, jacal and adobe structural remnants, and in the Cielo complex, stacked stone structural remnants. Many of these features have radiocarbon dates and a wealth of data concerning associated tool assemblages, many of which may elucidate changes in mobility strategies in different landscape settings.

Furthermore, it would be advantageous to add more refined attributes to the recording of landscapes, specifically adding surface assemblages of features and artifacts, to compare to existing data. Binford's (1980) mobility model suggests that where redundant land use increases and residential camps are used more intensely there should be characteristic archaeological signatures- evidence of more diverse activities. The structure of feature and artifact distributions on the surface of entire landscape units would likely be telling in this regard. Future research may benefit from standardized surface recording with "site-less" survey methodologies, where specific attributes of landscape use can be compared. Frequencies and proximity clustering of different artifact and feature types could be useful in regards to overall land use patterns.

Alongside cultural/archaeological information, ecological attributes would be useful in classifying landscapes according to specific environmental properties. Sample measurements of above ground biomass, plant diversity, soil characteristics, could all be used to characterize landscape ecological conditions, which may correlate with different feature assemblages. Lessons from landscape ecology (Forman 1995) suggest that *patches* and *corridors* are important, measurable attributes of landscapes that condition ecological communities and behavior. This idea of resource patches integrates well with behavioral ecological concepts of human behavior, including optimal foraging and patch choice models. These kinds of data could be collected using geographic information system tools and remote sensing. If representative portions of numerous landscape units could be sampled with archaeological surface inventories, it may be possible to construct spatial models that reflect relative mobility patterns in region. Ideally, these tools could be used to test hypotheses regarding diversity in mobility patterns, and other aspects of prehistoric behavior through further survey and excavation.

Perhaps most of all, the greatest contribution to the present study, and broader investigations of prehistoric behavior in the Southern Trans-Pecos, is a top down approach and model construction. Great strides have been made using such an approach with modern hunter-gatherer groups. This is evident in studies of optimal foraging (Bettinger 1991; Joachim1976) and in behavioral ecology (Kelly 1995; Winterhalder and Smith 1992). Through an application of systemics (Binford 1964; Blaike 1993), projection (Binford 2001), and a search for conditioning agents of behavior, observations of modern hunter gatherer peoples can offer useful insights into past human behavior.

The relationship between environment and behavior is used to address issues as sophisticated as the sexual division of labor and egalitarianism (Kelly 1995: Ch 7 and Ch 8), to the differential development of complex society, and prehistoric and historic social development on a global scale (Diamond 1999). More appropriate to the present scale of investigation are issues of mobility. Effective temperature (ET), primary biomass (PP) and trophic structure have been noted as important environmental properties that strongly condition mobility, helping to explain the variability between different groups in differing environments.

A top down approach in the Southern Trans-Pecos, particularly at a landscape scale, would seek to investigate what environmental properties may condition mobility strategies of populations in different environmental contexts. While variables such as ET and primary biomass appear to be useful properties in understanding large scale, inter-group variability, it is likely that different properties are needed to explain smaller scale, intra-group behavioral diversity at the scale of the landscape.

Profitable research could entail an in-depth survey of ethnographic literature in an effort to understand how modern within-group mobility changes in relation to different environmental properties. This could be achieved by documenting environmental variables within areas known ethnographically to host specific kinds of mobility patterns.

Useful properties might include topographic relief, plant community, the structure of adjoining ecological communities, trophic structures, and proximity to different resources including information and social resources. Conditioning relationships at this scale are poorly understood, and any advances in this area would not only advance understanding of the Southern Trans-Pecos, but human behavior in general.

Conclusion

Comparing the archaeological evidence between Perdiz Creek and Gilliland Canyon study areas shows differences in the nature and distribution of high visibility subsistence related features. This is most evident in the frequency and distribution of hearth and midden features. The Perdiz Creek study area is characterized by few and relatively unsubstantial hearth and midden features. Gilliland Canyon displays a greater frequency and morphological diversity of features, which are notably more robust and substantial than the Perdiz Creek feature assemblage. Prior knowledge based on observations of modern hunter-gatherer groups makes it possible to hypothesize differences in mobility patterns practiced at these different locations. It is postulated that the more robust features present in Gilliland Canyon are the result of relatively longer residential events and a higher redundancy of land use and resource extraction. Subsistence activities at Perdiz Creek appear to have been more dispersed, where movements consisted of farther ranging logistical forays, pursuing less predictable resources. Tentative explanations for the apparent behavioral diversity are based on the nature and distributions of resources in each of the different study areas, principally the abundance, diversity, and predictability of key subsistence staples.

In order to better understand how the Perdiz Creek and Gilliland canyon feature assemblages relate to behavioral diversity across the Southern Trans-Pecos region, greater chronometric control and further data sets are needed. These include standardized data collection of feature assemblages at a larger, landscape scale, as well as the documentation of environmental attributes. Furthermore, much can be learned concerning properties that condition behavioral diversity from modern hunter-gatherer groups. While the present study begins to address some issues of behavioral diversity in the Southern Trans-Pecos, different scales of observation are needed to improve our understanding of the region, and human behavior in general.

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