ANALYSIS OF SITE STRUCTURE AND POST-DEPOSITIONAL DISTURBANCE AT TWO EARLY HOLOCENE COMPONENTS, RICHARD BEENE SITE (41BX831), BEXAR COUNTY, TEXAS

A Thesis

by

JAMES BRYAN MASON

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

MASTER OF ARTS

August 2003

Major Subject: Anthropology

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Approved as to style and content by:

Alston V. Thoms (Chair of Committee)	David L. Carlson (Member)
Ben X. Wu (Member)	David L. Carlson (Head of Department)

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ABSTRACT

Analysis of Site Structure and Post-depositional Disturbance at Two Early Holocene
Components, Richard Beene Site (41BX831), Bexar County, Texas. (August 2003)
James Bryan Mason, B.S., Texas A&M University
Chair of Advisory Committee: Dr. Alston V. Thoms

Two deeply buried, well-stratified, and well-dated components dating to the Early Holocene period were excavated at the Richard Beene site (41BX831) in Bexar County, Texas. This thesis utilizes both qualitative (interpretation of maps) and quantitative (unconstrained clustering) spatial analysis techniques to identify site structure and assess post-depositional disturbance by analyzing patterns among artifact categories, selected artifacts, and features from these components. Results of spatial analysis are compared to expectations of the archaeological record based on previous research. Each component revealed a distinct pattern. The Lower Medina component (ca. 6900 B.P.) is well preserved and spatial analysis showed clear distinctions between domestic and peripheral zones. The Upper Perez component (8800 B.P.) is a fluvial lag deposit of displaced artifacts and fire-cracked rock features. Results of spatial analysis confirmed that most, if not all, of this component is disturbed, revealing no site structure.

DEDICATION

James Brent Mason

I remember a tree.

In its roots, I found stability
that stood firm against the wind.
The trunk was pliable
forgiving my pushes against it.
I used to play in its branches
and they sheltered me from the rain.
Its leaves followed me in my journeys
and always led me back home.

Now that tree is gone.

Look carefully, though, and see
in the ground on which it stood
small leaves pushing through the dirt.
Many are they.

And soon, a forest will grow.

Dad,

You inspire me. I can only hope to emulate your selfless devotion to your family.

You support me. You allowed me to choose my own path and gave me the opportunity to forge that path in any direction.

You challenge me. To impart your wisdom to your descendants so that they may follow in your footsteps.

I love you

ACKNOWLEDGMENTS

Through the years of research and writing, I have had to rely on the support and knowledge of many others. Some of those people are listed here, though I'm sure that others are missed. I extend my gratitude to everyone who had a hand in this project and believe that without each one, this thesis would not have been completed.

Committee Members

The members of my committee have had the most profound influence in the direction and content of this thesis. Without the guiding hand of Dr. Alston Thoms, a much lower quality of research would have been produced. Through his open discussions of the site and theory involved, his application of vast quantities of red ink to my drafts, and his tolerance of my objections, Alston truly has made this thesis better. Dr. David Carlson's help with the statistical analysis cannot be overlooked. I think he ran more statistical permutations of the data than I did trying to fine tune the application of the various techniques. Dr. Ben Wu is a biologist by training and persevered through the anthropological theories in this thesis. His unique viewpoint was critical in the end as a balancing force to the thesis. I'm sure that he has made a lasting impression on the other members of the committee and will be called on them in the future for advice.

Family

My family is very close and they have been instrumental in the completion of the thesis. The encouragement and love of my wife, Kerri made the entire process more bearable. She suffered with me through some of the hardest moments and kept me going when I thought I should stop. The addition of my son, Devon to my life during the writing of this thesis was truly a benefit. When I needed a break, he was always there with a smile and a laugh. Other family members were just as important and I appreciate their support. While it sometimes seemed as if I would never finish, I know that they each knew in their hearts that I would.

Applewhite Reservoir Archaeological Project Members

I did not know many of these people, but the excavation crews, lab crews, and researchers who devoted so much of their time to this project deserve special thanks. Patricia Clabaugh was most helpful as the laboratory supervisor. She was able to provide me with the data I needed to begin this thesis, but also provided background knowledge about the project and support as a fellow Master’s student.

Peers

My friends in the Department of Anthropology at A&M provided sounding blocks for my ideas, sometimes late into the night. They also provided that most important of all functions: drinking buddies. Thanks guys.

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CHAPTER I

INTRODUCTION

This thesis analyzes spatial patterning of artifact assemblages from portions of two components at the Richard Beene site near San Antonio, Texas. Its objectives are to identify site structure and assess the effects of post-depositional disturbance at the site. The Lower Medina and Upper Perez components, dated to 6900 and 8800 B.P. respectively, were occupied under very similar local environmental conditions and then deeply buried under alluvial sediments. The components were occupied at a pivotal time in Texas prehistory, the transition between the Late Paleoindian and Early Archaic periods, which is considered particularly important because "few components of this era have been excavated (or published) and detailed definition remains to be done" (Black 1989a:25).

The Lower Medina component at the Richard Beene site dates to 6900 B.P. and readily falls within the Early Archaic period of Texas prehistory (see Chapter III). This thesis analyzes a sample that represents the majority of both the artifacts and excavated area of the component. The Lower Medina sample encompasses an "occupation surface [that] has many well preserved features" (Thoms 1992:2). Cultural material within the Lower Medina sample is confined to a 10 cm lens which appears to be contained within a single depositional unit (Thoms 1992:22). Overall, the component is considered to be very well preserved (Thoms 1992).

The Upper Perez component at the Richard Beene site dates to 8800 B.P. Radiocarbon ages, along with the recovery of Angostura projectile points, place the component on both the temporal and technological boundary between the Late Paleoindian and Early Archaic periods (see Chapter III). This thesis analyzes a sample which, as in the case of the Lower Medina sample, represents most of the artifacts and excavation area within the

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This thesis follows the style and format of *American Antiquity.*

Upper Perez component (see Chapter IV). The Upper Perez sample encompasses an occupational zone which yielded part of “one of the largest Angostura assemblages in North America” (Thoms 1992:2). Unfortunately, the Upper Perez sample is not as well preserved as the other parts of the site and may not contain intact features. Thoms (1992:24) states that no in situ features were recorded, however Clabaugh (2002) analyzes the FCR concentrations recorded as cultural features. The sample is characterized by Thoms (1992:24) as being represented by “essentially random concentrations” of artifacts that are imbricated and appear to form a lag deposit resulting from a high energy flood event.

Research Objectives

This study is conducted in four phases: (1) qualitative spatial analysis: the visual interpretation of maps of artifact densities, selected artifacts, and features from each sample to determine the nature of each sample and to identify possible site structure; (2) quantitative spatial analysis: the use of unconstrained clustering, a spatial analysis method designed by Whallon (1984), to analyze each sample; (3) interpretation of phase 2 results to identify site structure and assess the effects of post-depositional disturbance; and (4) use of the results of phase 2 to refine the results from phase 1. Each phase of the study is designed to address two research questions: (1) do patterns identified with spatial analysis reveal elements of site structure; and (2) can spatial analysis be used to assess and potentially offset the effects of post-depositional disturbance within the components?

Identification of site structure focuses on defining domestic and peripheral zones. Domestic and peripheral zones can be defined based on locations of features and artifacts using qualitative spatial analysis. Quantitative spatial analysis can refine the identification of domestic and peripheral zones by revealing spatial relationships among artifact categories. Expectations formed from middle range theories are used to define and interpret these zones. Middle range theory is the use of “actualistic studies [in this case the ethnoarchaeological studies] designed to control for the relationship between dynamic properties of the past…and the static material properties common to the past and the present” to build theories about archaeological deposits (Binford 1981:30). Results from studies at archaeological sites at which middle range theories have been applied are also used to develop of expectations about site structure at the Richard Beene site.

Spatial analysis may also be used to assess and possibly offset effects of post-depositional disturbance by identifying statistically relevant patterning in an otherwise disturbed assemblage. The application of spatial analysis to these samples is an independent test of Thoms’ (1992) conclusions that the Lower Medina sample is very well preserved, while the Upper Perez sample is highly disturbed. An easily interpretable site structure is expected if post-depositional disturbance is slight. It is hoped that a moderately disturbed area will still retain site structure that can be identified by spatial analysis. If disturbance is extensive, spatial analysis may not be able to define site structure. In this case, analysis of patterning can be used to distinguish extremely disturbed areas from those with less disturbance.

Research Methods

The first phase of this research involves visual interpretation of a variety of maps of artifact density, features, and selected artifacts from each sample to gain a general understanding of the nature of each sample. The possible locations of domestic and peripheral zones based on locations of features and artifact patterning are also determined by interpreting these maps. Feature locations and descriptions are considered first and each feature is evaluated to determine possible function. Locations of features are then compared to artifact density and selected artifact maps to distinguish possible domestic zones from peripheral zones.

The second research phase is the analysis of each sample using unconstrained clustering. Unconstrained clustering uses statistical analysis to reveal spatial relationships among artifact categories at a site. Unconstrained clustering creates clusters that are internally homogeneous with respect to the relative densities of artifact categories.

The third phase is the assessment of patterns created by the resulting clusters to identify site structure and assess the extent of post-depositional disturbance within each sample. Clusters are assessed according to the probability of being located within domestic or peripheral zones based on expectations from middle range theory. Clusters are also assessed according to their degree of disturbance allowing research to focus on those areas with less disturbance or identifying areas for which research strategies should be modified to deal with the level of post-depositional disturbance.

The fourth phase compares the results of phases 1 and 2 to further distinguish the definition of domestic zones and peripheral zones. While the visual interpretation of maps in phase 1 can identify these zones based on artifact density, selected artifacts, and feature locations, the use of unconstrained clustering can identify patterns not evident in phase 1. These patterns can be used to refine the determination of domestic and peripheral zones made in phase 1.

Significance of the Research

This study is designed to identify statistically relevant patterns among artifact categories within Early Holocene components of the Richard Beene site. In doing so, new archaeological data will be created that can:

- describe site structure during the Early Holocene at the Richard Beene site,
- assess the effects of post-depositional disturbance during the Early Holocene at the Richard Beene site,
- be used in future research to compare to other components within the Richard

Beene site,

- illustrate the utility of unconstrained clustering in analyzing spatial patterning and post-depositional effects at archaeological sites, and
- serve as readily comparable "type descriptions" for Early Holocene site structure within South-Central Texas.

Organization of the Thesis

This chapter outlined objectives and methods used in this study. These objectives and methods are determined from the two research questions that can be addressed using environmental studies, the results from the excavations at the Richard Beene site itself, and previous research, all of which must be reviewed in detail. Chapter II describes the environmental setting of the Richard Beene site including information concerning the local and regional environments as well as the past and present environmental conditions. Chapter III presents an overview of the prehistory of South-Central Texas and a review of archaeological studies at other sites in the region that date to the Early Holocene. Chapter IV reviews the results of the excavations at the Richard Beene site, the excavation strategies, and the major components identified at the site. Chapter V reviews spatial analysis research and presents spatial analysis methods used in the project, the format of data used during analysis, how spatial analysis methods were applied to the data, and the problems encountered during the analysis. An example of the application of unconstrained clustering to an archaeological site similar to the Richard Beene site (Rose Island site in eastern Tennessee) is provided in Chapter V as well. Chapter VI details theoretical background information concerning activity area research and artifact patterning and then presents expectations of artifact patterning at the Richard Beene site based upon previous research. Chapters VII and VIII are devoted to presenting and interpreting data from each component and addressing research questions presented above. Figures and tables are used where necessary. Appendices are provided as references to the radiocarbon ages from the Richard Beene site and the data utilized during the analysis.

CHAPTER II

ENVIRONMENTAL SETTING

Interaction between physiography, climate, and biotic resources during both modern and prehistoric times is important in understanding the setting of the Richard Beene site both on a regional as well as a local scale. This chapter provides an overview of both modern and prehistoric environmental conditions within South-Central Texas including information specific to the local environment at the Richard Beene site. The implications of environmental conditions within and between ecological areas for the study of prehistory within South-Central Texas and at the Richard Beene site are then discussed.

Modern Environmental Setting

The Richard Beene site is situated in South-Central Texas (see Chapter III for a definition of South-Central Texas) along the Medina River in southern Bexar County (Figure 1). Ecologically, South-Central Texas is best described as a transition zone between eastern and western Texas (Blair 1950; Gehlbach 1991). South-Central Texas is truly a large, diverse ecotone at the confluence of four physiographic regions (Gould et al. 1960; Figure 2). Further increasing diversity in the region are variable edaphic factors and an east-west precipitation gradient. Diversity of the regional environment is enhanced by the local riverine setting of the Richard Beene site.

Regional Environment

Four major physiographic regions described by Gould et al. (1960) converge near Bexar County: (1) the South Texas Plains; (2) the Blackland Prairie; (3) the Post Oak Savannah; and (4) the Edwards Plateau (Figure 2). While the Richard Beene site is located within the South Texas Plains, it is immediately adjacent (within 5 km) to the Blackland Prairie and Post Oak Savannah and very near the Edwards Plateau.

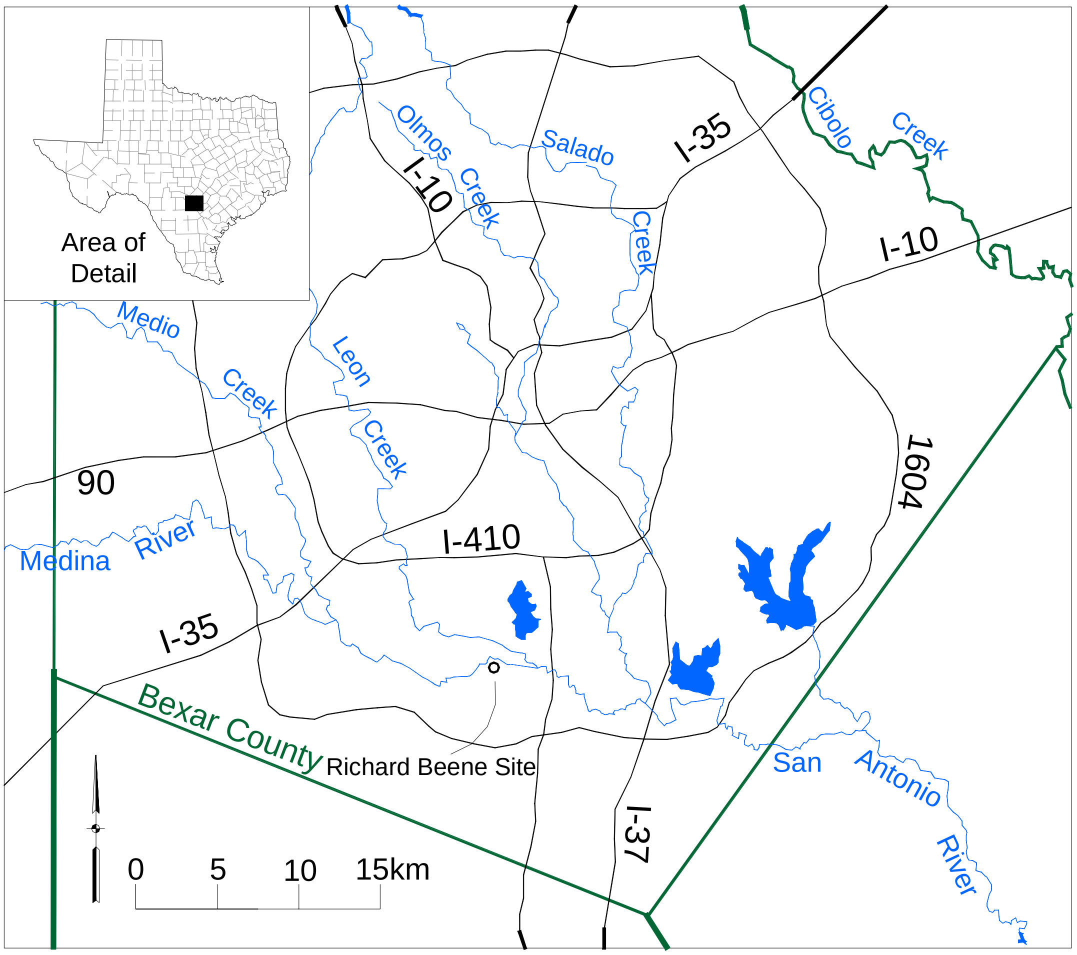


Figure 1. Site location within Bexar County.

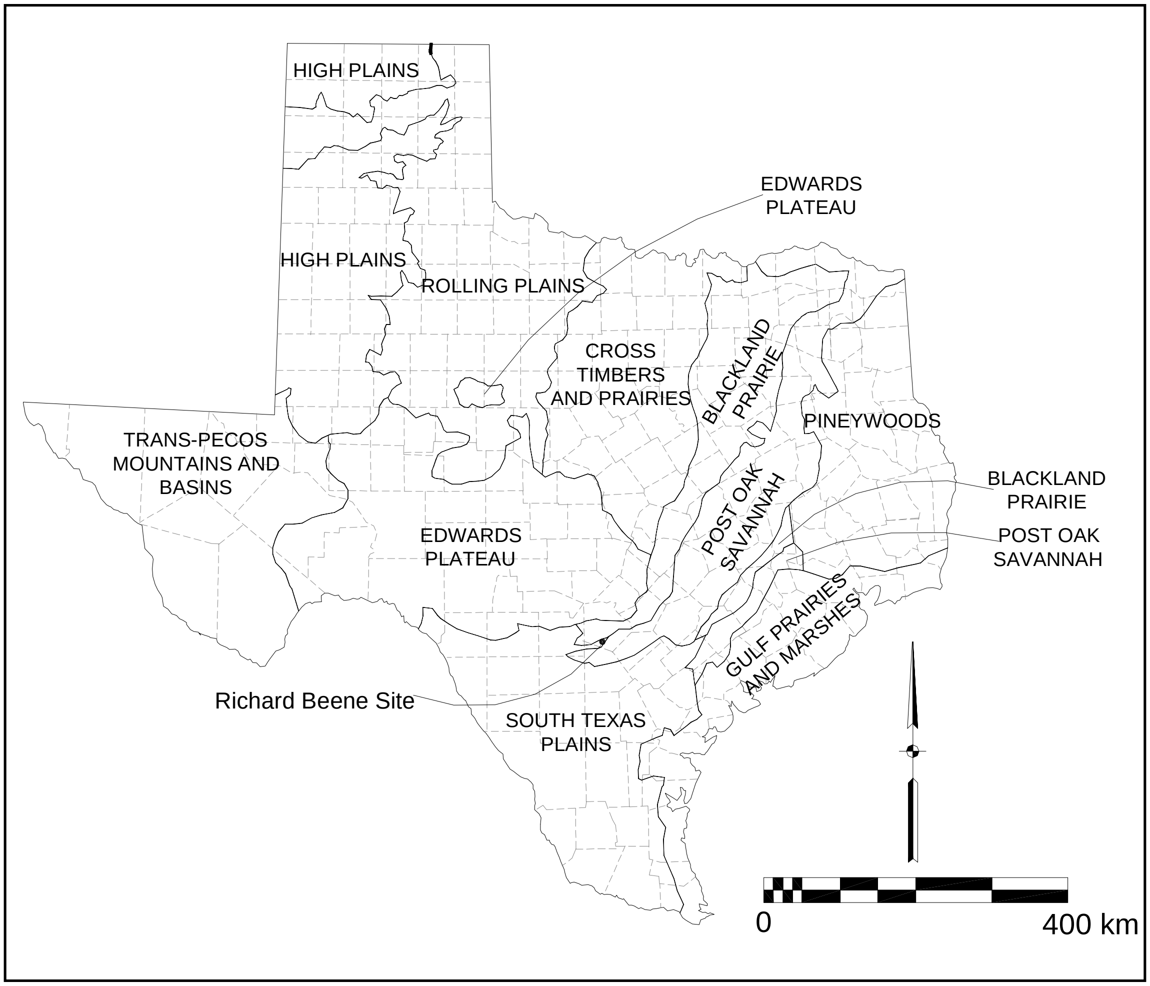


Figure 2. Physiographic regions of Texas based on Gould et al. (1960).

The South Texas Plains region is characterized by its transitional nature between the tropical climate of Mexico and the northern climate in the United States (Blair 1952). The region exhibits little topographic relief. Clays and clay loam soils and a semi-tropical climate support a wide variety of plants in a savannah setting (The Natural Heritage Research Policy Research Project [NHPRP] 1978:21). Brush such as mesquite, acacia, prickly pear, huisache, and mimosa clump together among live oaks. Wide expanses of grasslands separate the patches of brushy vegetation. Since the nineteenth century, brushy vegetation has taken up a larger portion of the landscape (NHPRP 1978:21). While not much archaeological data is available about the plant foods utilized by hunter-gatherers in this region, they most likely would have had access to nuts, roots, berries, and seeds that could have made up a good portion of their subsistence. The South Texas Plains support the widest variety of fauna in Texas (Blair 1952:247). Mammals (including extirpated species) characteristic of the South Texas Plains include bison, white-tailed deer, pronghorn, javelina, opossum, jackrabbit and cottontail rabbit, armadillo, squirrels, gray wolf, coyote, ringtail, jaguar, and cougar (Blair 1952).

Stretching from northeastern Texas and extending into the southern portion of Bexar County is the Post Oak Savannah physiographic region. The Post Oak Savannah consists of gently rolling hills with thick sandy soils in the uplands and alluvial sandy loams and clays in the bottomlands. The general vegetation pattern falls between an oak hickory forest and a true prairie (Gould 1975:11). Forests dominate much of the area with tree species including post oak, blackjack oak, live oak, and black hickory with an understory of yaupon, american beautyberry, hawthorn, and trumpet creeper (Gould 1975:11; McMahan et al. 1984:19). Evidence points to a modern increase in woody growth and suggests that the native vegetation contained more open grassland (Gould 1975:11). The prairie areas are located mainly along the edges of the region and include little bluestem, Indiangrass, switchgrass, silver bluestem, and Texas wintergrass. Fields (1995) suggests that hunter-gatherers in this region would have utilized hardwood nuts, seeds, and tubers for a portion of their subsistence. Mammals that may have been important in prehistoric economies in the Post Oak Savannah include bison, white-tailed deer, jackrabbit and cottontail rabbit, opossum, little short tailed shrew, raccoon, foxes, wolves, bobcat, fox squirrel, gopher, and various mice and rats (Blair 1952).

Extending into Bexar County from northeast Texas along the northern boundary of the Post Oak Savannah is the physiographic region known as the Blackland Prairie. Relief in this area consists of gently rolling hills and wide, shallow valleys. Sediments are typically very deep, dark colored clays and silts. Vegetation in the Blackland Prairie is dominated by little bluestem along with other grasses such as sideoats grama, Texas grama, buffalograss (Gould 1975:11; McMahan et al. 1984:5). Along the southeastern edge of the Blackland Prairie, the density of mesquite and oaks increases (Gould 1975:11). Plant foods utilized in the Blackland Prairie would have been similar to those used in the Post Oak Savannah (see Fields 1995). Mammals in the Blackland Prairie include white-tailed deer, jackrabbit and cottontail rabbit, opossum, little short tailed shrew, raccoon, foxes, wolves, bobcat, fox squirrel, gopher, and various mice and rats (Blair 1952).

The Edwards Plateau is an uplifted region containing limestone that has been severely eroded by river systems forming a scenic, high relief landscape commonly known as the hill country. The southeastern boundary of the Edwards Plateau is a ridge known as the Balcones Escarpment. Soil in this region is very thin and rocky except in alluvial deposits in valleys. Dominant vegetation in the Edwards Plateau region includes juniper, ash, live oak, as well as bluestem and grama grasses (Beaty 1974; Gould 1975:12-13; NHPRP 1978:22; McMahan et al. 1984:16-17). The amount of woody vegetation varies throughout the Edwards Plateau according to soil and moisture characteristics with scrub forests along the Balcones Escarpment and in alluvial canyonlands and savannah parks throughout the central portion (Gould 1975:12-13; NHPRP 1978:22; McMahan et al. 1984:16-17). Collins (1995:383) lists geophytes (e.g., onions, prairie turnip), nuts (e.g., acorn, pecan, walnut), berries (e.g., agarita, hawthorn), fruits (e.g., grapes, plums, persimmons), and grass seeds as potential plant foods included in hunter-gatherer subsistence in the region. Mammals that may have been important in prehistoric economies in the Edwards Plateau include white-tailed deer, bison, mule deer, pronghorn, javelina, jackrabbit and cottontail rabbit, ringtail, raccoon, foxes, wolves, coyote, bobcat, fox and rock squirrels, gopher, and various mice and rats (Blair 1952).

Local Environment

While the Richard Beene site is located within the South Texas Plains, the local environment is tempered by its riverine setting on the Applewhite terrace of the Medina River (Figure 3). The Applewhite terrace is one of four separate terraces within the Medina River valley (Mandel and Jacob 1995), each with its own vegetation patterns (Dering and Bryant 1992).

The Walsh terrace (T-4) is the highest terrace in the valley and it is dominated by blackbrush acacia, huisache, mesquite, various buckthorns, and cacti (Dering and Bryant 1992:1). Both the Leona (T-3) and Applewhite terraces (T-2) “consist of abandoned cotton fields characterized by a weedy mesquite/huisace scrub” (Dering and Bryant 1992:1). The Richard Beene site is located on and within the fill of the Applewhite terrace (T-2). The next terrace (T-1) is termed the Miller terrace by Mandel and Jacob (1995) and contains mesquite as well as acacias, retama, prickly pear, and live oak (Dering and Bryant 1992). The floodplain itself and is a quintessential Texas riparian habitat densely forested with pecan, cypress, soapberry, hackberry, sycamore, and elm.

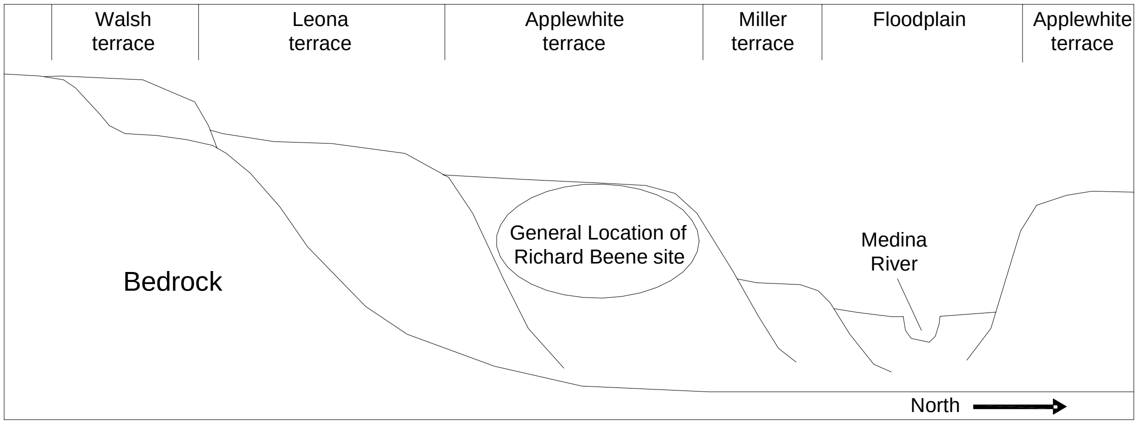


Figure 3. Modern formation of terraces within the Medina River valley (adapted from Mandel and Jacob [1992]).

Mesquite, oak, and other plants from the brushy terraces are also found here in less abundance. Aside from the mammalian species listed in the regional environmental discussion above, inhabitants of the Richard Beene site would also have had easy access to riverine animals such as fish, mussels, and turtle.

Climate

The climate in the South Texas Plains is humid and subtropical with mild winters and very warm summers. The climate is also unpredictable with erratic weather systems causing sudden, extreme changes. Average temperatures and rainfall are more the exception than the rule as cool northern air interacts with warm coastal breezes and hot tropical air masses (NHPRP 1978:21).

In the winter, average monthly temperatures reach 17ºC (62ºF), while the highest average monthly temperature in the summer is 34.6ºC (94.2ºF) (Taylor et al. 1991:Table 11). Average rainfall is 70.84 cm (27.89 in.) per year (Taylor et al. 1991:Table 11), however rainfall in the South Texas Plains is unpredictable and droughts are not uncommon (McGraw and Hindes 1987:37). There are generally higher rainfall averages to the east and lower averages to the west which vastly affect the vegetation across the region (Ellis et al. 1995:408).

Paleoenvironment

Paleoenvironmental conditions within South-Central Texas have been widely studied and debated for decades. Regional data presented here cover only the Early Holocene (ca. 10,000 to 6000 B.P.) time period and come from pollen analysis done at Boriack Bog near Bastrop, Texas. Local paleoenvironmental data is derived from studies done on sediments and materials recovered during the excavations of the Richard Beene site and focuses on information from the Lower Medina and Upper Perez components (6900 B.P. and 8800 B.P. respectively).

Regional Paleoenvironment

Paleoenvironmental data from South-Central Texas during the Early Holocene generally shows a trend from the cool, wet Pleistocene climate to a warmer, drier climate (Bryant and Shafer 1977:15-19). More recent research suggests wide fluctuations in the climate during the Early Holocene. Pollen data from Boriack Bog show an increase in woodland species at about 10,000 B.P. continuing to 9500 B.P. (Bousman 1994:80). Grasslands reappeared until about 8750 B.P. when woodland vegetation became dominant again, only to be replaced around 7500 B.P. by another succession of grasslands. The decline of the woodlands continued into the Middle Holocene (Bousman 1994:80).

Local Paleoenvironment

While the evidence for large-scale climate change exists for South-Central Texas, the local habitat, including vegetation patterns and animal populations, at the Richard Beene site seems to have been relatively stable. Pedostratigraphy information from the site illustrates varying periods of deposition, erosion, and soil formation, however analysis of stable isotopes, vertebrate faunal remains, mollusc remains, and plant remains from the excavations show that there was minimal environmental change in the immediate area of the site.

Pedostratigraphy

Applewhite terrace fill extends to a depth of 15 meters below the surface (mbs) or 140 meters above mean sea level (m amsl) (Figure 4). Varying periods of deposition, erosion, and floodplain stability led to the formation of multiple depositonal units, soils (paleosols and pedocomplexes), and sometimes the erosion thereof. Extended periods of floodplain stability allow the formation of soils as well as provide a stable living surface for hunter-gatherers. Subsequent depositional events cover both soil surfaces and artifacts remaining on the surface possibly creating an environment conducive to the preser-

Figure 4. Paleosols recorded within the Applewhite terrace fill (adapted from Nordt et al. [2002:Figure 2]).

vation of the prehistoric record. Erosion of the sediments can disturb or destroy archaeological evidence contained within them.

The uppermost depositional unit includes the present day surface (0 to 1 mbs or 159-160 m amsl) and was deposited between 3000 and 400 B.P. (Mandel and Jacob 1995). The soil forming in this unit is the Sunev clay loam with a weakly expressed A-Bk profile (Mandel and Jacob 1995). Thoms et al. (1996) locally refer to this soil as the Payaya. Between 4100 and 3200 B.P., sediments were laid down in which the Leon Creek paleosol formed (Mandel and Jacob 1995). This depositional unit is now between 3 and 1 mbs (157 and 159 m amsl) (Mandel and Jacob 1995). Sediments within this unit are fine-textured silty clays and clay loams with coarser loams near the base (Mandel and Jacob 1995). The Bk horizon of the modern soil extends into the Leon Creek paleosol at least through the A horizon (designated a Bk3 [Ab1] horzon) (Mandel and Jacob 1995).

The Medina pedocomplex formed within deposits laid down between 7000 and 4500 B.P. and is located between 7.5 and 3 mbs (153.5 and 157 m amsl) (Mandel and Jacob 1995). The lower portion of the Medina pedocomplex contains the Lower Medina component analyzed within the current study. The A horizon of the Medina pedocomplex has been stripped away by erosion, leaving a Btk-Bk profile. This depositional unit consists of fine-grained sediments with an increasing sand content towards the top (Mandel and Jacob 1995). An increase in sand is interpreted by Mandel and Jacob (1995) as indicating either the movement of the river towards the sample location or an increase in flood energy during deposition.

The Elm Creek paleosol formed within the deposits laid down between 8000 and 7600 B.P. and is now located between 9 and 7.5 mbs (151 and 153.5 m amsl) (Mandel and Jacob 1995). This paleosol has a weakly expressed Bk-CB-C profile with the A horizon removed by erosion (Mandel and Jacob 1995). The Elm Creek paleosol formed in fine-grained sediments of silty clay loam. The next depositional unit was deposited between 10,000 and 8800 B.P. and is between 13 and 9 mbs (147 and 151 m amsl) (Mandel and Jacob 1995). The Perez paleosol formed within these fine-grained sediments, however only the B and C horizons remain as the A horizon was eroded. The Upper Perez component is contained within the C horizon of the Elm Creek paleosol and the upper portion of the Perez paleosol. The Upper Perez sample used within this thesis is thought to have been contained within the A horizon of the Perez paleosol and subsequently eroded and deposited within the sediments in which the Elm Creek paleosol formed (Thoms 1992). Three weakly developed paleosols (Soils 6, 7, and 8) formed during separate short episodes of floodplain stability between 12,000 and 15,000 B.P. (Thoms and Mandel 1992). The sediments in which these soils formed are between 16 and 13 mbs (144 and 147 m amsl) (Mandel and Jacob 1995).

Stable Isotope Analysis

Nordt et al. (2002) studied the differences in quantum yield between C_3 and C_4 species by analyzing 51 bulk sediment samples taken from a vertical column extending from the surface to 20 mbs (140 m amsl) at the Richard Beene site. C_4 species are mainly warm season grasses of tropical and subtropical origin, while C_3 species are cool season grasses, herbaceous dicots, trees, and shrubs (Nordt et al. 2002:184-185). Therefore, C_4 plants indicate warmer temperatures and C_3 plants indicate cooler teperatures. Variations in relative C_3-C_4 productivity are linked to temperature and and can be compared to known changes in climate (Nordt et al. 2002). $\delta^{13}C$ from C_3 and C_4 plants is incorporated into the soil as the plants decompose. Known average $\delta^{13}C$ values for C_3 and C_4 plants can be compared to the values contained in the bulk sediment samples to reflect the relative amounts of each species group. Decreases in $\delta^{13}C$ values indicate increases in the number of C_3 plants and decreases in temperature. Increases in $\delta^{13}C$ values indicate increases in the number of C_4 plants and increases in temperature.

For samples collected from the Perez and Elm Creek paleosols dating to between 10,000 and 9000 B.P., $\delta^{13}C$ values slightly decrease and then stay relatively similar through samples collected in the lower portion of the Medina paleosol dating to 7000 B.P. This suggests continuity from the previous pattern (from 11,000 to 10,000 B.P.) of warm temperatures (Nordt et al. 2002:186). After 7000 B.P. $\delta^{13}C$ values decrease significantly indicating cooler temperatures (Nordt et al. 2002:186). Nordt et al. (2002:186) along with others (Barber et al. 1999; Hu et al. 1999) have noted that the interval between 8000 and 7000 B.P. is "the most prominent and globally widespread cold period to have occurred in the past 10,000 ^{14}C yr." This interval is of particular interest as it occurs between the two components studied within this thesis. Considering this cold period, shifts in $\delta^{13}C$ values recorded between 10,000 and 6000 B.P. are still relatively minimal. Nordt et al. (2002:187) record an overall warming and increase of C_4 plant productivity during this time interval.

Vertebrate Faunal Remains

Vertebrate faunal remains recovered from excavations provide different levels of information about subsistence depending on the preservation conditions within a given component. The Lower Medina component contained a great number of faunal elements, however they are described as being small, fragmented, and exhibiting cracking and abrasion (Baker and Steele 1992:2). Compared to the Lower Medina component, the assemblage from the Upper Perez component was "relatively small and poorly preserved" (Baker and Steele 1992:2).

The Lower Medina component contained the "largest culturally related faunal assemblage from the site (N=4,850)" (Baker and Steele 1992:10). Dominant identified taxa from this assemblage include medium/large mammals, rabbits, and small mammals.

Other vertebrates such as fish, amphibians, and reptiles were also prominent. The total assemblage included deer, pronghorn, fish, mud turtle, soft-shelled turtle, snake, rabbit, squirrel, gopher, cotton rat, woodrat, porcupine, canid, and small rodent. The Lower Medina assemblage is identified as having “the greatest potential for addressing questions of cultural activity and subsistence at the site” (Baker and Steele 1992:12)

The assemblage from the Upper Perez component was small (N=726), and only 25 specimens were identifiable to class (Baker and Steele 1992). Identified taxa included fish, snake, rabbit, gopher, woodrat, deer, small mammal, and small rodent.

The two components reflect a partially riverine exploitation pattern and suggests that the subsistence patterns were typical of those practiced by other hunter-gatherers in South-Central Texas. In general, the faunal record at the Richard Beene site shows a relatively stable local environment throughout the Holocene, with faunal remains representative of animals common in South-Central Texas today (Baker and Steele 1992).

Invertebrate Faunal Remains

Neck (1992) identified various species of nonmarine molluscs within sediment samples and determined fluctuations in species concentration. Since nonmarine molluscs are very sensitive to subtle changes in vegetation, fluctuations in species concentration can be used to determine specific vegetation regimes (Neck 1992).

Samples from the Upper Perez paleosol were attributed to a savannah with scattered woody growth and large, open grasslands. Evidence was found for periodic flooding interludes during the deposition of the sediments in which the Perez paleosol formed Neck 1992:5). During the deposition of the sediments in which the Lower Medina pedocomplex formed, vegetation was characteristic of a mid-grass prairie with few trees or shrubs (Neck 1992:6).

Neck (1992:7) mentions that the overall assemblage indicates homogeneity at the species level and notes that the inferred lack of a substantial vegetation change may be due to the fact that the basic sediment type ("fine-grained, tightly packed") at the site did not change throughout time.

Floral Remains

Plant remains recovered from archaeological sites can sometimes provide information about the consumption of plants. More often, however plant remains that make up the archaeological assemblage are not food items. Plant remains are either purposefully or inadvertently brought to the site by its inhabitants or are present at the site through natural processes. Depending on the preservation of the material, plant remains may provide evidence as to the environmental conditions present at the site.

Neither pollen nor carbonized plant remains were well preserved especially below the Leon Creek paleosol (Dering and Bryant 1992). Because of this, no meaningful interpretation of the pollen record prior to 2500 B.P. could be made by Dering and Bryant (1992).

Twenty-two carbonized wood samples collected from the sediment samples for radiocarbon dating were analyzed. Of these, only five wood fragments were identifiable (Dering and Bryant 1992:6). No identifiable carbonized plant remains were recovered from the Lower Medina paleosol, however oak, mesquite, and bois d' arc fragments were identified from Upper Perez paleosol. Oak and mesquite were not surprising finds and could have been used as firewood or building material. The bois d'arc fragment dates to 8800 B.P. and could indicate a colder, wetter climate, however the sample could have been part of a transported or traded item from an area further to the north (Dering and Bryant 1992). Dering and Bryant (1992) conclude by stating that they found no evidence to suggest a shift in environmental conditions during the Holocene compared to present day conditions.

Cultural Implications of Environmental Conditions

Environmental diversity in South-Central Texas both prehistorically (Bousman 1994) and throughout the area today is recognized as an important consideration for the study of prehistory (Ellis et al. 1995). Diversity surrounding the Richard Beene site is tempered by its riverine setting. While variation in alluvial patterns points to short term shifts in rainfall and river flow patterns, the consensus from other lines of environmental evidence is that little environmental change occurred at the site during the Early Holocene. Archaeological evidence points to a localized procurement area for the inhabitants of the site, suggesting that, while they lived at the site, they did not travel far to meet their daily needs (Thoms 1992).

The location of the Richard Beene site can be defined as an ecotone both at the regional as well as local scale. On the regional scale, the site is near the convergence of four physiographic regions (Figure 2). On the local scale, the site is located at the junction of the floodplain of the Medina River and the uplands. An ecotone is a dynamic zone of contact between two landscape patches which “functions by regulating the flow of materials between patches” (Lachavanne 1997:8). The dynamic nature of an ecotone creates heterogeneity in environmental conditions and habitats. This is important since “the more heterogeneous and complex the physical environment, the more complex the plant and animal communities and the higher the species diversity” (Lachavanne 1997:10). Ecotones were, most likely, prime hunting and gathering areas for prehistoric inhabitants of the region.

Ethnographic literature explains that hunter-gatherers like the inhabitants of the Richard Beene site are highly mobile, traveling to different locations throughout the course of a year (Binford 1978b; Yellen 1977). The inhabitants of the Richard Beene site chose the riverine location as one of their many campsites located within South-Central

Texas. Because of this, the Richard Beene site only provides information concerning one aspect of the lives of hunter-gatherers in South-Central Texas. It is important to understand that cultural patterns identified for the Richard Beene site may not apply to sites located in different environmental regimes. This idea is discussed in detail by Ellis et al. (1995) who believe that one generalized cultural model cannot encompass an environmentally diverse landscape and that the true representation of cultural patterns in such a landscape must be as diverse as the environment.

Of great interest to archaeologists is how prehistoric people adapted to variations in environmental conditions. Archaeological sites within South-Central Texas have provided massive amounts of data. Unfortunately, this information has not been synthesized in such a way as to be able to identify specific behavioral patters, subsistence practices, and settlement patterns of the prehistoric people who lived in the area. Only broad, generalized views of prehistory are known at this time. Chapter III deals with the prehistory of South-Central Texas from regional and local viewpoints and illustrates the importance of the current study in adding new information about behavioral patterns within a riverine setting.

CHAPTER III

PREHISTORIC BACKGROUND

This chapter reviews Early Archaic adaptations in South-Central Texas with a focus on aspects that pertain to the study of the Richard Beene site including subsistence, site structure, and the importance of the site within South-Central Texas prehistory. Prehistoric background based on radiocarbon ages and projectile points, perceived behavioral adaptations, and archaeological data from several recently investigated sites are reviewed.

The Richard Beene site is within an area of overlap between two cultural regions: South Texas (Hester 1995) and Central Texas (Prewitt 1981) (see Figure 5). The definition of South-Central Texas as used in this study relates South and Central Texas as cultural regions as they apply to Bexar and surrounding counties. The focus of the current study is on the Lower Medina and Upper Perez components at the Richard Beene site. As noted, these components span a pivotal time in the prehistory of Texas: the transition from the Paleoindian to the Early Archaic. This transition is recognized as an important shift in the prehistoric lifestyle in South-Central Texas. The additional fact that cultural manifestations during this transition are not well understood makes it an important focus for study.

Within South-Central Texas, projectile points have served as a basis for the development of cultural chronology. While projectile points have proven to be a sensitive indicator of chronology, Prewitt (1981:66) points out that the reliance on projectile points has led to disagreements about “how successive prehistoric manifestations should be characterized in terms of regional developmental periods and recognizable periodicity.” Most recent chronologies date the Paleoindian period from 11,500 B.P. to either 8800 B.P. for Central Texas or 7950 B.P. for South Texas (Table 1). The beginning and end of

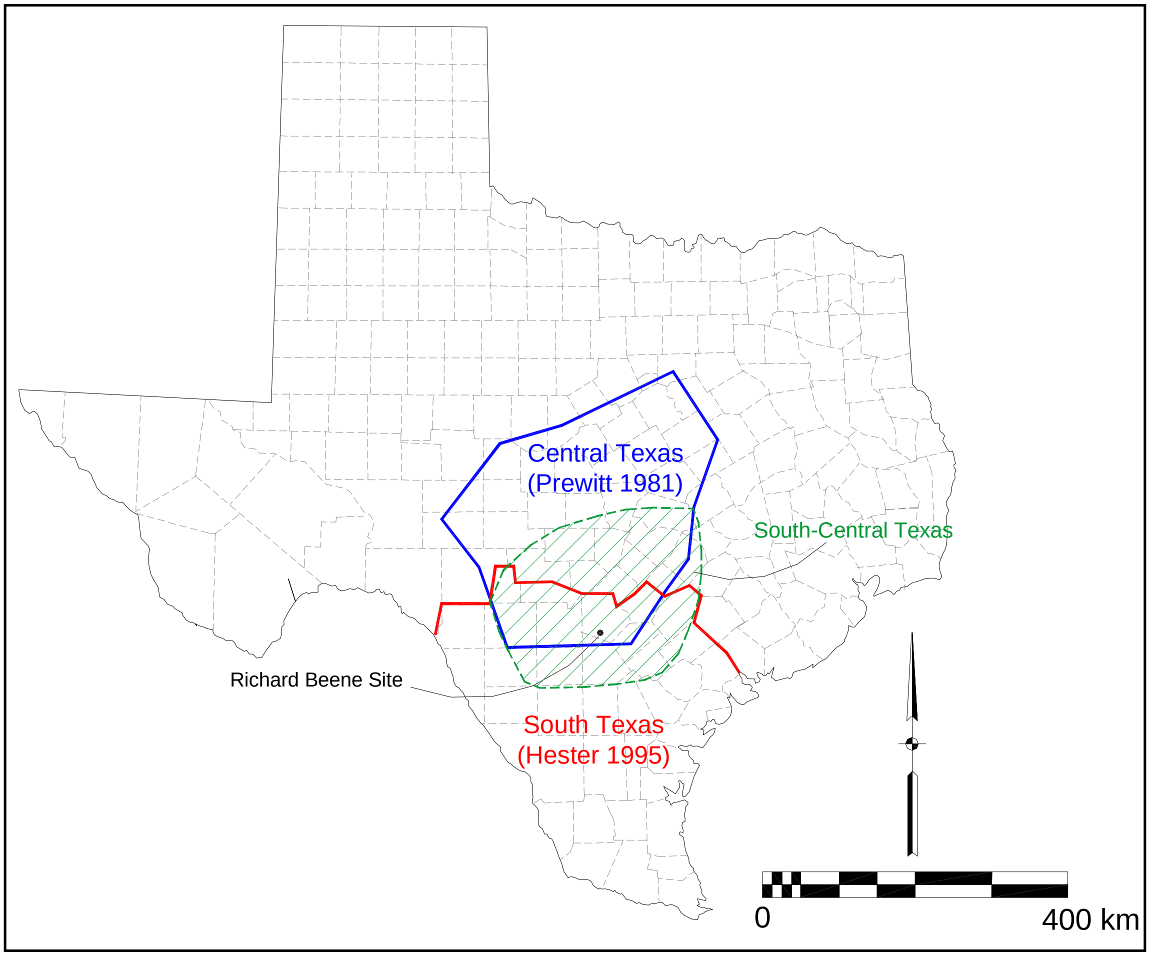


Figure 5. South-Central Texas as it relates to previously defined cultural areas.

Table 1. Cultural chronology of South and Central Texas.

Years B.P.	Geologic Epoch	Central Texas Stages (Suhm et al. 1954)	Central Texas (Collins 1995)		South Texas (Hester 1995)		Early Archaic Phases (Prewitt 1981)	
			Period	Points and Tools	Period	Points and Tools	Phase	Points and Tools
	Late Holocene	Historic	Historic		Historic			
		Neo-American	Late Prehistoric	Perdiz	Protohistoric		Toyah	Perdiz
1000				Scallorn, Edwards	Late Prehistoric	Perdiz, Edwards, Scallorn	Austin	Scallorn, Granbury
		Edwards Plateau	Late Archaic	Darl	Transitional	Frio, Ensor	Driftwood	Mahomet
				Ensor, Frio, Fairland	Late Archaic	Desmukes, Olmos bifaces, Montell, Shumla	Twin Sisters	Ensor
							Uvalde	Marcos, Marshall, Castroville
2000				Marcos, Montell, Castroville				
					Middle Archaic	Dimmit tools, Carrizo, Abasolo, Tortugas	San Marcos	Marshall, etc.
				Lange, Marshall, Williams			Round Rock	Pedernales
3000				Pedernales, Kinney				
				Bulverde			Marshall Ford	Bulverde
4000	Middle Holocene		Middle Archaic	Nolan, Travis			Clear Fork	Nolan, Travis
					Early Archaic	Early Basal Notched, Bell, Andice, Early Triangular, Clear Fork tools, Early Corner Notched, Martindale, Uvalde, Baker, Bandy, Guadalupe tools	Oakalla	
5000				Taylor				
				Bell-Andice-Calf Creek			Jarrell	Andice, Bell, Martindale, Uvalde
6000			Early Archaic	Martindale, Uvalde			San Jeronimo	Gower, Hoxie, Wells, Clear Fork and Guadalupe tools
	Late-Early Holocene						Circleville	Angostura, Scottsbluff, Meserve, Golondrina, Clear Fork tools
7000				Early Split Stem				
8000	Middle-Early Holocene			Angostura	Paleoindian	Lerma, Scottsbluff, Golondrina, Early Stemmed Laceolate, Angostura, Wilson, St. Mary's Hall, Plainview, Clovis		
		Paleo-American	Paleoindian	St. Mary's Hall				
9000	Early-Early Holocene			Golondrina-Barber				
				Wilson				
10,000	Pleistocene			(Dalton, San Patrice)				
				(Plainview?) Folsom				
11,000				Clovis				

the Early Archaic are variable and dependant on the region of Texas in which the site is located (Table 1). A summary of over 70 years of research is presented here and traces the evolution of the chronology of the Early Archaic period with particular interest to the transition from the Paleoindian to the Archaic.

Most information concerning chronology within South-Central Texas draws heavily on projectile point morphology. Projectile points are durable, easily identified, and their morphology changed often enough to provide archaeologists with a convenient measure of the passage of time. Unfortunately, focus on projectile points has led to a neglect of other areas of interest. Because of this, the prehistoric background presented here lacks the specificity necessary to identify all but the most basic differences between the Paleoindian and Early Archaic periods.

South-Central Texas Chronology

Early attempts to construct a chronology for South-Central Texas were based on the Midwestern Taxonomic System developed by McKern (1939) (Kelly 1947; Pearce 1932; Suhm et al. 1954). Suhm et al. (1954) modified the Midwestern Taxonomic System for use within Texas and included four stages (Table 1): (1) the Paleo-American stage; (2) an Archaic stage; (3) the Neo-American stage; and (4) the Historic stage (Ricklis and Collins 1994:11). The model proposed by Suhm et al. (1954) has been used in many important archaeological studies (Suhm and Jelks 1962; Turner and Hester 1993) and continues to play an important role in the chronology of South-Central Texas (Ricklis and Collins 1994:11).

Archaeological studies at the Canyon Reservoir in South-Central Texas (Johnson et al. 1962) revised the chronology devised by Suhm et al. (1954). Dating the stages resulted in the definition of periods. The Archaic was divided into four periods, Early, Middle, Late, and Transitional. The Early Archaic period was associated with lanceolate projectile point forms such as Nolan, Travis, Bulverde, and Pandale dart points (Johnson et al. 1962). Sollberger and Hester (1972) proposed a fifth developmental period termed the pre-Archaic. The pre-Archaic was described as a period of slow change between the Paleoindian and Archaic lifeways, spanning from 8000 B.P. to about 5500 B.P. (McKinney 1981:96). Projectile points from this period included expanding stem bifurcate base/concave base points like Early Barbed, Early Corner Notched, and other forms resembling Baker, Bandy, Martindale, and Uvalde (Hester 1971; Johnson 1964; Sorrow et al. 1967; Word and Douglas 1970). These points were all recovered below contexts containing Nolan, Travis, Pandale, and Bulverde points (Karbula 2000).

Further refinements to the chronology of the region were made by Weir (1976) and Prewitt (1981, 1985). Weir (1976) devised five phases within the Archaic period based on projectile points, other tools, radiocarbon dates, and features. Prewitt (1981, 1985) built on Weir's system, creating 13 phases from the Archaic to the Late Prehistoric period based mainly on projectile points (Table 1). Three phases included in the Early Archaic portion of Prewitt's system and pertinent to the Upper Perez and Lower Medina components at the Richard Beene site are Circleville (ca. 8500-7000 B.P.), San Geronimo (7000-6100 B.P.), and Jarrell (7000-6000 B.P.) (Prewitt 1981).

Each phase was associated with specific projectile points and other stone tools. The Circleville phase included Angostura, Scottsbluff, Meserve, and Golondrina points. Other tools included Clear Fork adzes, bifaces, drills, scrapers, and gravers (Prewitt 1981:77). The San Geronimo phase included Gower, Hoxie, and Wells points with Clear Fork and Guadalupe adzes, bifaces and scrapers (Prewitt 1981:78). The Jarrell phase included Andice, Bell, Martindale, and Uvalde points as well as Clear Fork gouges, bifaces, and scrapers (Prewitt 1981:78).

Based on more recent excavations at the Wilson-Leonard site Collins (1995:383) splits the early part of the Early Archaic (8800-6000 B.P.) into three so called “style intervals” based on the presence of specific projectile point forms (Table 1): (1) Angostura (8800-7900 B.P.); (2) Early Split-Stem (7900-7000 B.P.); and (3) Martindale/Uvalde (7000-6000). These intervals are of interest within the present study as projectile points associated with them are present within the Upper Perez and Lower Medina components at the Richard Beene site. Interestingly, Collins (1995) places Golondrina points in the Paleoindian period rather than the Early Archaic as Prewitt (1981) does.

Disagreement in the specific timing and period assignment of specific point forms still exists between the Paleoindian and Archaic periods. Much of this disagreement is due to regional differences that lead to slight changes in adaptational behavior (see Chapter II; Ellis et al. 1995) as these changes determine the types of chipped stone tools utilized by a population. Cultural chronology based on projectile point typology must be used in combination with the behavioral information gained from archaeological excavations.

Behavioral Transition

The division between the Paleoindian and the Archaic periods is not only based on differences in projectile point typology, but also by perceived differences in behavior and subsistence patterns (McKinney 1981:96). Some of the shifts in behavioral patterns set forth by Willey and Phillips (1958) still hold validity today. Willey and Phillips (1958:108-111) noted a number of indicators of a shift from the Paleoindian period to the Archaic period including: (1) a shift from hunting large animals to smaller and more varied prey; (2) an increase in the use of ground stone tools for plant processing, woodworking, and other activities; (3) the manufacture of a greater variety of projectile points that are stemmed, corner-notched, and side-notched; (4) an increase in number and variety of chipped stone tools used for wood working; (5) the intensive use of stone oven cooking; (6) the increase in the preservation of tools made from organic materials; and (7) the increase in evidence for the systematic burial of the dead. These differences are reflected in the archaeological record, however, as more sites are recorded, the timing and regional variability of the shift from Paleoindian to Archaic lifeways is being reassessed.

The Transition in South-Central Texas

The Paleoindian period begins at around 11,500 B.P. as sites older than this are rare and possibly misdated (Collins 1995). People during the Paleoindian period are considered to have been organized into small groups of nomadic, large game hunters who followed herds of mammoth, bison, camel, and horse across large territories. These hunters would have also been adept at foraging for plant food and smaller game during their travels (Black 1989a, 1989c). Sites from this period do not contain large amounts of fire-cracked rock (FCR) used in cooking plant foods, however. While most Paleoindian sites are surficial and recorded on upland terraces and ridges, buried sites in alluvial deposits have also been uncovered (Black 1989a).

The beginning of the Early Archaic is dated to 8800 B.P. by Collins (1995:383) based on excavations in Central Texas and 7950 B.P. in South Texas by Hester (1995:436-438). One of the major changes during this period is the extinction of large game animals hunted during the Paleoindian (Collins 1995). This led to the exploitation of a wider variety of both plants and animals. The occurrence of specialized points and tools, the emergence of large FCR features, and more ground stone tools within the archaeological record signal a shift in subsistence towards a greater emphasis on plant foods. People during the Early Archaic were highly mobile and organized into small groups (Collins 1995). Sites from this period are typically located along waterways (Collins 1995).

The major differences that can be identified between the Late Paleoindian and Early Archaic are based on lithic artifacts and the increased use of rocks in cooking. Lithic artifacts during the Early Archaic show more variability and become more specialized. This has been interpreted as indicating the occurrence of a wider variety of activities, especially related to subsistence practices. The increased use of rocks in cooking illustrates a shift in cooking technology and also indicates that more plant foods were being exploited. Cabeza de Vaca (Pupo-Walker 1993:61) discusses the practice of roasting roots for days in the Post Oak Savannah of Texas. Large amounts of hot rocks are necessary for this type of cooking. The increase of ground stone tools also indicates the consumption of plant foods.

The transition into the Archaic period has been identified as an important focus of study in Texas for many years. From the descriptions above, it is easy to see that more specific information is needed to identify the differences between the Paleoindian and Archaic periods. It is hoped that sites like the Richard Beene site can provide such information.

Archaeological Manifestations

Three phases (Circleville, San Geronimo, and Jarrell) identified by Prewitt (1981) apply to the study of the Lower Medina and Upper Perez components at the Richard Beene site. Prewitt's (1981) phases were widespread adaptations occurring after the Paleoindian period. Subsistence is similar throughout these three phases and is described generally as Archaic and based on hunting and gathering with limited plant food processing (Prewitt 1981:73). Others (Black 1989b; Story 1985; Weir 1976) have agreed that people during these phases were organized in small bands with high mobility, unspecialized tool kits, frequent changes in group composition, and a lack of well-defined territories.

The Circleville phase is dated from 8500 to 7000 B.P. (Prewitt 1981). While Paleoindian lithic technology (flaking techniques and projectile point morphology) continued within this phase, subsistence strategies had definitely changed. Prewitt (1981:77) described subsistence during this phase as "hunting and gathering with an emphasis on gathering." Specific foods utilized in this phase include plant foods, freshwater mussels, deer, and other small game. Features identified include large and medium basin shaped, stone lined hearths, charcoal pits, and mussel shell concentrations (Prewitt 1981:77).

The San Geronimo phase is dated from 7000 to 6000 B.P. (Prewitt 1981). Paleoindian lithic technology is still present in some forms (edge grinding and parallel flaking on projectile points), however projectile point morphology is very different during this phase (Prewitt 1981:78). This phase is poorly represented in the sample of sites that Prewitt (1981) studied. Subsistence practices are described as hunting and gathering which appear Archaic in style (Prewitt 1981:78). Features are similar to those during the Circleville phase.

The Jarrell phase dates from 6000 to 5000 B.P. (Prewitt 1981). Specific Paleoindian lithic technology such as edge grinding is still present during this phase, but subsistence patterns are definitely Archaic with mussel and plant food collecting dominant (Prewitt 1981:78). Bison were also present in South-Central Texas during this phase. Typical features of the phase are large flat hearths (Prewitt 1981:78).

More recent excavations indicate that ideas about behavior within the Paleoindian and Archaic periods within South-Central Texas may still need revision. The Wilson-Leonard site (Figure 6) contains evidence of the possibility of the early manifestation of Archaic lifeways (Bousman et al. 2002). The Wilson component at the site is dated to approximately 9500 B.P. and is stratigraphically located within sediments dating to the Paleoindian period (Bousman et al. 2002:986, 988). The component is defined by the

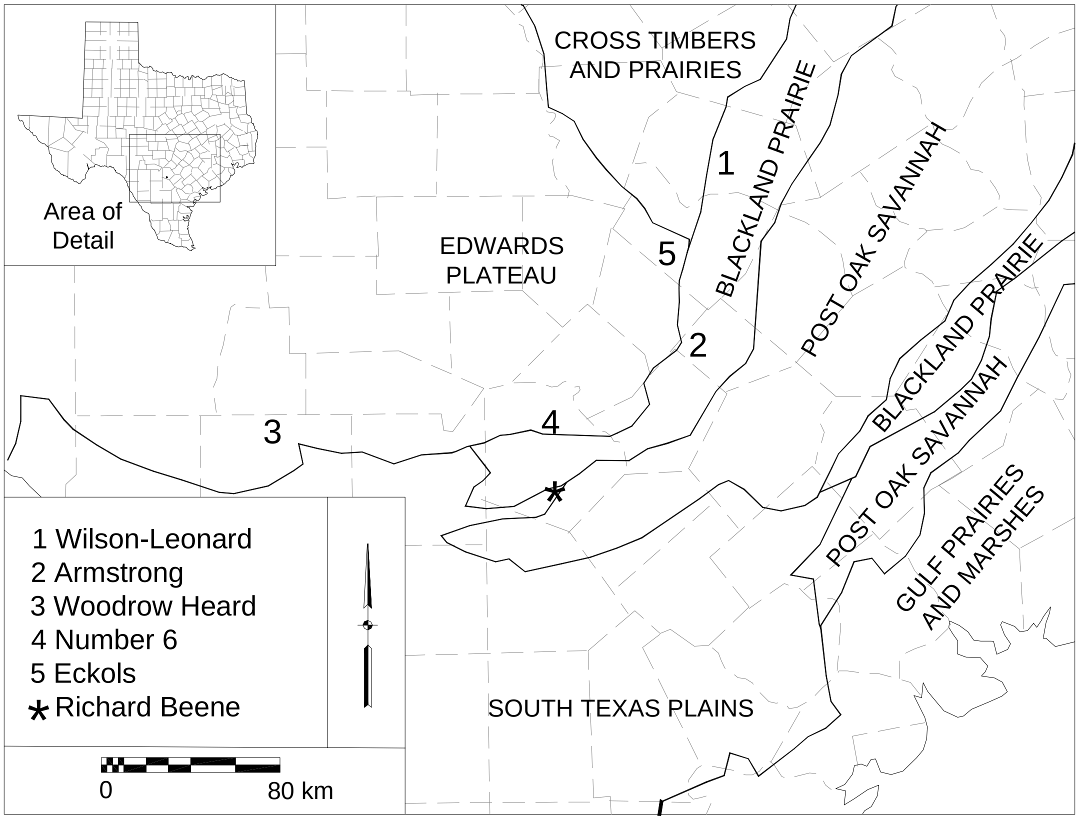


Figure 6. Locations of archaeological sites dicussed in the text.

occurrence of Wilson points, thick expanding stemmed points with ground edges that "reflect new hafting and possibly hunting strategies not present amongst Palaeoindian groups" (Bousman et al. 2002:983). Tools typical of the Archaic period are present within the Wilson component including gouges, burins, scrapers, and ground stone tools. The Wilson component also contains a burial associated with artifacts interpreted as offerings (Bousman et al. 2002:988).

Early Holocene Sites in South-Central Texas

Research topics pertaining to the transition between the Paleoindian and Early Archaic period that still do not have sufficient answers include the exact timing of the transition, projectile point typology, subsistence patterns, and adaptive strategies. These topics and others have remained unclear mainly due to a lack of well-preserved, stratified sites containing components relative to the transition throughout the state of Texas leading to a misunderstanding of the chronology of the periods by archaeologists (Decker et al. 2000:303; Hester 1995:437; Johnson 1991:111; Karbula 2000; Ricklis 1995:272; Ricklis and Collins 1994:94; Turpin 1995:544).

To intensively study the transitional nature between the Paleoindian and Early Archaic periods, a specific type of site is needed. While studies can be performed on multiple sites from different locations containing well preserved single components, these studies would assume that behavior is similar in different environmental conditions. While this is assumption does not prevent comparisons across environmental boundaries, controlling for environmental conditions allows more specific conclusions to be made. To control for local environmental variation sites must contain well-stratified, undisturbed components occupied under similar environmental conditions (Collins 1995:375; Decker et al. 2000:2-3; Ricklis and Collins 1994:96). These types of sites have been referred to as *gisements* (Collins 1995:375) and are extremely rare, especially in South-Central

Texas.

It has only been recently that a number of these types of sites (including the Richard Beene site) has been recorded and carefully studied. Sites which fall into this category and contain components that are comparable to the Upper Perez and Lower Medina components at the Richard Beene site are discussed below. Each site was excavated from terrace fill and contains well preserved components that date to the same time as either the Lower Medina or Upper Perez components. Artifacts from the sites are comparable to those from the Richard Beene site. These sites are all located in South-Central Texas within or near the Blackland Prairie or Edwards Plateau as is the Richard Beene site. The locations of these sites in relation to the Richard Beene site are shown in Figure 6.

Wilson-Leonard Site (41WM235)

The Wilson-Leonard site is located at the edge of the Blackland Prarie in Williamson County approximately 160 km northeast of the Richard Beene site (Figure 6). The site is encased in over 6 m of alluvial fill along Brushy Creek. Local vegetation is riverine and inhabitants of the site had easy access to the creek for resources (Bousman 1998).

Cultural components at the site date from the Early Paleoindian to Late Prehistoric periods. The important portions of the site for the purposes of this thesis can be broken into three main sections: (1) the Wilson component dating from 10,000 to 9500 B.P. (encased in the boundary between Units I and II); (2) sedimentary Unit II containing cultural material dating from 9500 to at least 8800 B.P.; and (3) the lower (Early Archaic) portion of sedimentary Unit III containing cultural material dating from 8800 to at least 8000 B.P. (Bousman 1998; Collins et al. 1998). These components are encased in fine-grained alluvium up to 3 m deep. While preservation is good, stratigraphic separation of the components is not clear especially at the boundaries between sedimentary units and within Units II and III.

A total of 68 m^2 was excavated in the two main blocks of the excavation. Despite its early date (10,000-9500 B.P.), the Wilson component is characterized as typical of Early Archaic, not Late Paleoindian behavioral patterns (Bousman et al. 2002). Nine projectile points within this component were classified as Wilson; the other two were Golondrina-Barber. Wilson points are more like Archaic style points in that they are stemmed. They are also more durable and possibly more flexible functionally than other Paleoindian points (Bousman et al. 2002:983, 986). Other tools within the Wilson component which also point to an Archaic lifestyle included gouges, scrapers, and burins (Bousman et al. 2002:986). Faunal preservation within the Wilson component was poor and most faunal fragments were only diagnostic by size. Most class identifiable fauna were either mammal or reptile. Of the mammals, deer, rabbits, rodents, and one bison bone fragment, were identifiable to genus (Bousman 1998:184-193). Features within the Wilson component included 10 small (50 to 100 cm diameter) FCR features, three small (40 to 60 cm diameter) pits, and one burial (Bousman 1998:191-194).

Sedimentary Unit II contained a Late Paleoindian artifact zone dating from 9500 to at least 8800 B.P. Projectile points within Unit II followed “a sequence starting with Golondrina-Barber (lower), St. Mary’s Hall (middle), and Angostura (upper) forms” (Bousman 1998:171). Other projectile points identified within Unit II include Wilson, San Patrice, Scottsbluff, Big Sandy, and some Early Archaic stemmed forms (Hoxie and expanding concave base) (Bousman 1998:171). Clear Fork and Brushy Creek (narrower and thinner than Clear Fork) bifaces occurred in Unit II. Bousman (1998:198-190) notes that Unit II contained more artiodactyls, rodents, and reptiles and less fish and rabbits than the Wilson component. Only small (50 to 100 cm diameter) FCR features were identified within Unit II. These features are slightly larger in size than those identified in the Wilson component (Bousman 1998:196).

The lower portion of sedimentary Unit III contained an artifact zone dating to the Early Archaic period. Dating as early as 8800 B.P., this unit contains evidence for a "significant change in subsistence technology" at this time (Collins et al. 1998:212). The lowest portion of this unit was intermixed with Unit II, containing intrusive projectile points such as Clovis, San Patrice, Scottsbluff, and a possible Wilson point as well as projectile points that may be intrusive such as Golondrina-Barber and St. Mary's Hall. Projectile points assumed to be from Unit III included lanceolate points such as Angostura and Thrall and stemmed points such as Hoxie, and Gower (Collins et al. 1998:220). The later Early Archaic components contained Uvalde, Baker, Bandy, and Martindale projectile points. Unifacial Clear Fork tools are also associated with the later Early Archaic components.

Features within Unit III included mostly (n=68) small to medium sized (45 to 140 cm diameter) FCR clusters. Fourteen basins (less than 1 m in diameter) containing FCR are also recorded and Collins et al. (1998:215) believe that the repetitive use and construction of these features led to what are known as *burned rock middens*, large accumulations of FCR mixed with other artifacts. A unique feature category described by Collins et al. (1998:235) is the proto midden; a large concentration of distinct FCR features. This term is used by Collins et al. (1998) to distinguish these features from burned rock middens and to suggest the developmental position of proto middens as precursory to burned rock middens. Within the Early Archaic portion of Unit III, two proto middens were identified. Proto midden A was made up of two large FCR basins, four small FCR basins, and one FCR accumulation. The entire proto midden measured 2 m by 4 m and was approximately 30 to 40 cm thick. A wild hyacinth bulb recovered from within the proto midden was dated to ca. 8250 B.P. (Collins et al. 1998:235-236). Proto midden B was also made up of a number of features including one FCR cluster, six large FCR basins, one small FCR basin, three FCR scatters, and two FCR accumulations. Proto midden B measured 6 m by 8 m and was approximately 30 cm thick. A wild hyacinth bulb was also recovered from this proto midden and dates to 8220 B.P. (Collins et al. 1998:236-239).

Spatial analysis similar to what is performed during the current study of the Richard Beene site was performed on the Wilson component at the Wilson-Leonard site (Bousman 1998:200-202). The spatial analysis was performed using bone and lithic artifacts separated into various categories. The artifacts were standardized using volume as a measurement of density. The analysis was performed using Whallon's (1984) unconstrained clustering method. The spatial analysis enabled Bousman (1998:202) to determine that the small FCR features identified within the component were most likely domestic hearths because they contained low densities of bone and lithic debitage. Clusters containing high densities of debitage and bone were interpreted as representing activities "located on the periphery of the residential concentration and perhaps played a role in an activity that was too messy, too dangerous, or too offensive to be in close proximity to the domestic hearths" (Bousman 1998:202).

Overall, excavations at the Wilson Leonard site have led to refinements in the projectile point chronology. Collins (1998:Figure 4.1) suggests that Golodria/Barber, St. Mary's Hall, and Wilson points can all be dated to the Paleoindian period, while Angostura points date to within the Early Archaic. The Wilson component illustrates that the existence of Archaic lifestyles ocurred within the Paleoindian period and suggests that the transition from the Paleoindian to the Archaic period was "neither short nor linear" (Bousman et al. 2002:980).

Armstrong Site (41CW54)

The Armstrong site is located in the Blackland Prairie in Caldwell County approximately 90 km northeast of the Richard Beene site. The site is encompassed within alluvial fill in the San Marcos River valley. Local vegetation is described as an oak, pecan, and elm riverine regime (Schroeder and Oksanen 2002:8).

Cultural components at the site date from the Late Paleoindian (ca. 9000 B.P.) to the Early Archaic periods (ca. 6500 B.P.). Most artifacts recovered from the site were from components occupied before 6500 B.P. which were described as four occupation zones (Schroeder and Oksanen 2002:36-37). These zones are located between 1 and 1.5 m below the surface within rapidly deposited fine-grained alluvial material that shows little sign of bioturbation (Schroeder and Oksanen 2002:79).

Occupation Zone 1 is dated from 9000 to 8560 B.P. and represents a short-term stable surface (Schroeder and Oksanen 2002:40). One Barber point and one St. Mary's Hall point were recovered from this zone (Schroeder and Oksanen 2002:48). Other tools recorded include a biface, a gouge, and a burin. Two FCR concentrations were recorded within this zone each approximately 25 to 50 cm in diameter and containing burned sediment. The faunal assemblage from this zone included bison, deer, small mammals, bird, turtle, and one mussel shell fragment (Schroeder and Oksanen 2002:51).

Occupation Zone 2 represents a brief occupation during a time of aggradation of the surface and dates sometime between 8560 and 8490 B.P. (Schroeder and Oksanen 2002:40). No projectile points were recovered from this zone, however one biface, one gouge, and one burinated flake were recorded (Schroeder and Oksanen 2002:58). Two small bone concentrations were recorded as features within this zone. The faunal assemblage included bison, deer, turtle, and mussel (Schroeder and Oksanen 2002:58-59).

Deposition halted briefly during the occupation of Occupation Zone 3 which is dated to 8490 B.P. (Schroeder and Oksanen 2002:40). Lithic artifacts included one Hoxie or Hoxie Gower point, a Hoxie type base, one Angostura point, a modified flake, and one “unusual notched and grooved limestone cobble” (Schroeder and Oksanen 2002:68). Features within this zone included two FCR concentrations (60-70 cm in diameter) and one large (90 cm in diameter) bone concentration. The faunal assemblage within this zone was small compared to other zones and included bison, deer, small mammal, and mussel remains.

The most intensively occupied zone, Occupation Zone 4, occurs at a pause in deposition which occurred from approximately 8000 to 6500 B.P. (Schroeder and Oksanen 2002:40, 68). Three projectile points were recorded including a Hoxie, Golondrina base, and Angostura. Other tools included gouges, adzes, and perforators (Schroeder and Oksanen 2002:73-75). The two features recorded within this zone are described as concentrations of debitage and lithic debris that were approximately 30 to 60 cm in diameter (Schroeder and Oksanen 2002:71-73). Faunal remains were mainly very small fragments only identifiable to the class level, however one fragment was positively identified as pronghorn antelope (Schroeder and Oksanen 2002:75). Mussel shell fragments were also recovered.

The extensive reworking of tools was common throughout the site. Most tools and tool fragments are resharpened and appeared to have been utilized until they were no longer useful (Schroeder 2002:45). Projectile points were also heavily resharpened. Schroeder (2002:45) characterized the discard of the tools as “likely…due to breakage or use-life exhaustion.” Analysis of residue on FCR recovered from the site indicated that activities such as bone grease processing, hide-smoking, broiling, and grilling animal products were common. Plant residues were also identified on some FCR fragments. In addition, charred plant remains (camas bulbs and acorns) were recovered that presumably represent food remains.

Woodrow Heard Site (41UV88)

The Woodrow Heard site is located on the Balcones Escarpment of the Edwards Plateau in Uvalde County approximately 125 km west of the Richard Beene site. The site lies on a gently sloping, broad terrace in a bend of the Dry Frio River. Local vegetation is riverine and prehistoric inhabitants of the site would have most likely had access to gravel beds in the river as a lithic source (Decker et al. 2000:11).

Cultural components at the site have been dated from the Early Archaic to the Late Prehistoric periods. An erosional unconformity exists from 8000 to 6500 B.P. and cultural material associated with that range of ages is not found at the site. The Angostura component (8300 to 8000 B.P.) lies approximately one meter below the surface within fine-grained alluvium and is described as the best preserved cultural component within the site. Disturbance by natural and cultural processes within the younger components at the site has created mixed assemblages (Decker et al. 2000:292, 296).

A total of 17 m^2 was excavated at the site within the Angostura component revealing 8 Angostura points, 22 bifaces, and 4 unifaces, along with other artifacts (Decker et al. 2000:Figure 223, 268). Bone preservation at the site was poor and no bone was recovered from the Angostura component, however bones from other components dating to the Early Archaic included mainly deer with some bison (Decker et al. 2000:172). The Angostura points recovered from the site are either broken or highly reused.

Three feature types were identified within the Angostura component: (1) burned rock clusters; (2) burned rock rings; and (3) ovens. Ovens were large (greater than 1 m) facilities and associated with charred sotol and yucca leaf bases dated to 8000 B.P. (Decker et al. 2000:303).

Overall, Decker et al. (2000:296) see a continuation of subsistence and tool manufacturing patterns between the Angostura component and the later Early Archaic components at the site. Although the Angostura point is stylistically more similar to points from the Paleoindian period, other lines of evidence point to a more Archaic behavior during the Angostura component. The use of local chert especially on the Angostura points indicates a limited territory, the use of ovens and presence of charred sotol indicate the varied subsistence of the Archaic period during the Angostura component (Decker et al. 2000:299-301).

Number 6 Site (41BX996)

The Number 6 site is located on the Balcones Escarpment of the Edwards Plateau in northern Bexar County 35 km north of the Richard Beene site. The site lies within the thin terrace fill of Panther Springs Creek. Local vegetation is described as an oak, hackberry, bluestem riverine regime (Potter 1995:10).

The main cultural component at the site (Component 3) dates from 8700 to 8500 B.P (Karbula 1998:30). This component is buried under 40 to 90 cm of silty clay deposited by Panther Springs Creek. Portions of Component 3 rest on a massive gravel bed that underlies the fine-grained sediment (Karbula and Black 1998:28). While all the archaeological components at the site contain gravel, *Rabdotus* shells, and artifacts that have been either deposited or displaced by flooding, Component 3 contains the best preserved of the components representing “intact, primary behavioral patterning with minimal evidence of erosional disturbance and overprinting” (Karbula 1998:31). It is assumed to represent a living surface occupied for a short period of time; “perhaps a few weeks or a few visits” (Black and Karbula 1998:78).

A block excavation of 100 m^2 along with a number of gradall trenches was excavated within Component 3. No projectile points were recovered from this excavation, however a perforator suggestive of Paleoindian flaking technologies was recorded within the component (Black and Karbula. 1998:82). Other tools from this component include unifacial and bifacial Clear Fork and Guadalupe tools, bifaces, unifaces, cores, hammerstones, and modified flakes.

Excavators recorded six, overlapping FCR features (earth ovens) within Component 3 (Black and Karbula. 1998:78), each of which showed signs being "smeared or scattered" by flooding (Karbula 1998:31). The largest earth oven measured 3 m by 2 m and contained nearly 700 fragments of FCR. Seven smaller FCR features (hearths) were also recorded.

While Component 3 is dated to the Angostura interval as defined by Collins (1995:383; see Table 1), no projectile points were recovered. The lack of points led Black and Karbula (1998:82) to conclude that this site may have been a short-term plant food processing site at which ovens were built. It seems possible, however that the excavated portion of Component 3 is only a portion of a larger site, other parts of which may well contain projectile points (Karbula 1998:82).

Eckols Site (41TV528)

The Ekcols site is located in southeastern Travis County along the eastern edge of the Balcones escarpment in the Edwards Plateau 120 km northeast of the Richard Beene site. The site lies within thick terrace fill along Barton Creek. A 5 to 6 m bluff rises to the north of the site and could have provided the occupants of the site with some protection from the elements (Karbula 2000). Vegetation at the site is described as riverine.

The best preserved occupation zones at the site were recovered from approximately 1.6 to 2.1 m below the surface and contain radiocarbon ages of 6500 B.P. (Karbula 2000). These zones were termed Analytical Units 3 and 4 (Analytical Units 1 and 2 are more recent and less well preserved).

Sediment deposited at the site during the occupation of Archaeological Units 3 and 4 consists of fine-grained alluvium and is assumed to have been deposited very quick as radiocarbon ages from within approximately 1.5 m of deposition vary by only 150 years (Karbula 2000). This has led to very good preservation of the units with minimal overprinting. These units contained a low density of artifacts and are characterized as being the result of one or two occupational events (Karbula 2000).

Approximately 12 m^2 was excavated within Archaeological Units 3 and 4. Most of the projectile points recovered from these units are described as Early Split Stem by Karbula (2000). One Gower point was also recovered from these units. Other stone artifacts included bifaces, cores, flakes, and a chert nodule used as a pounding tool. Bone fragments recovered from the units were mainly small and unidentifiable. Faunal specimens that were identified included deer and turtle species.

Features from Archaeological Units 3 and 4 were all small surface hearths less than 1 m in any horizontal dimension. Three of these features contained small FCR fragments and one was a charcoal stain with no rocks.

Compared to the units from later periods at the site, Archaeological Units 3 and 4 contain a relatively low density of artifacts. Karbula (2000) attributes this to the high rate of deposition and intermittent flooding apparent at the site. A surface on the terrace of Barton Creek at about 6500 B.P. would not have been exposed for long and occupants may have been forced to leave frequently by flooding. Karbula (2000) interprets Archaeological Units 3 and 4 as representing short term, seasonal hunting camps.

Importance of Gisements from the Paleoindian/Early Archaic Transition

Each of these sites has provided a rare glimpse of life during a pivotal time in South-Central Texas prehistory. All of these sites are located within alluvially deposited terrace fill and contain well preserved components that date comparatively to the Lower

Medina and Upper Perez components (6900 and 8800 B.P. respectively). Each of these sites also contains specific elements that may relate to site structure within the Richard Beene site. At all of these sites, small (less than 1 m diameter) features were defined that could function as family hearths. Large FCR concentrations that may have been used as large cooking facilities were also recorded.

Of particular interest is the determination that the Archaic lifestyle was expressed earlier than previously documented (Collins 1995; Hester 1995). A specific indicator of Archaic style behavior is a varied subsistence including the roasting of plant foods in large rock ovens. Almost all of the sites discussed within this chapter contain evidence for the use of plant foods during the Late Paleoindian and very Early Archaic periods. The Wilson-Leonard site contains proto middens dated to the beginning of the Archaic period which are interpreted as precursors to the large FCR middens common in South-Central Texas later in the Archaic period. Charred plant remains were also recovered from early components at the Wilson-Leonard site. The Armstrong site also contains charred plant remains dated to the Early Archaic, however the features from this site are small. At the Woodrow Heard site, charred plant remains and large ovens are recorded among Angostura points. Angostura points were once thought to represent the Paleoindian period because of their lanceolate form, but are now thought to represent a more Archaic lifestyle. While no projectile points were recovered from the Number 6 site, large rock ovens were recorded from a component dating from 8700 to 8500 B.P. These sites allow researchers to rethink our assessment of both the Paleoindian and Archaic periods and contain evidence that the transition between these two periods was more gradual and possibly dates to earlier than previously believed.

CHAPTER IV

THE RICHARD BEENE SITE: EXCAVATION PROCEDURES AND COMPONENTS

The Richard Beene site (41BX831) was recorded and investigated during the Applewhite Reservoir Archaeological Project (ARAP), a large-scale cultural resources management project (Carlson et al. 1990; McGraw and Hindes 1987; Thoms 1992; Thoms et al. 1996). It was one of twelve prehistoric sites scheduled for mitigation during the construction of the reservoir in compliance with state (Texas Antiquities Permit No. 801, Texas Historical Commission) and federal (Corps of Engineers 404 permit) permitting regulations. During the excavation of the large spillway trench for the dam, ARAP was cancelled by two City of San Antonio referenda. This led to the orderly conclusion of the excavations at the Richard Beene site (Thoms et al. 1996:10). Overall, however, the Richard Beene site provides a rare glimpse of Texas prehistory through a deeply buried, well-stratified context.

Initially recorded as a surface scatter about 350 m by 75 m in size, 41BX831 was eventually excavated to a depth of approximately 15 mbs and contains 20 distinct archaeological deposits ranging from historical times to the Early Holocene. The site also contains paleontological deposits dating to the Late Pleistocene (Thoms 1992:15). All of the deeply buried deposits were discovered during the construction of a massive spillway trench that measured 300 m by 100 m and as much as 12 m deep. Many of the components at the site can best be described as large, thin lenses of artifacts, characterized as occupational surfaces and zones, separated by alluvial fill (Thoms 1992:16). Most identified components are represented by features that could have functioned as hearths and earth ovens as well as scattered FCR, mussel shell, chipped stone, and vertebrate fauna (Thoms 1992:16).

Project Research Directions

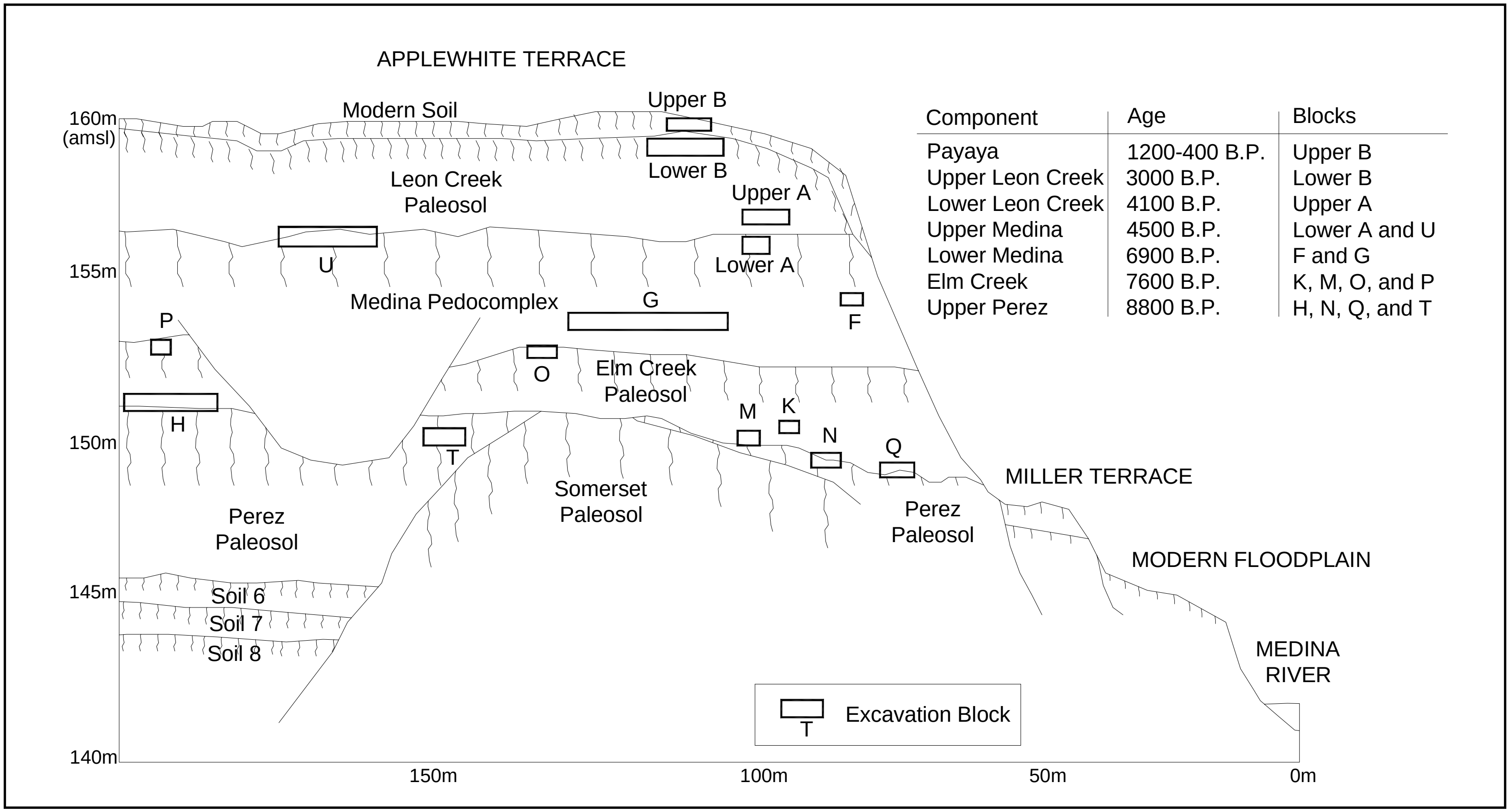
Research questions at the site are broad and address multiple issues, including paleoenvironment, site formation processes, human land use systems, subsistence, and behavior (Baker and Steele 1992; Caran 1992; Clabaugh 1996; Dering and Bryant 1992; Dockall 2003; Mandel and Caran 1992; Neck 1992; Thoms 1992, 1997, 1999; Thoms et al. 1996; Thoms and Mandel 1992). Each of these questions are geared toward the main research goal, which is to determine how the inhabitants of the site used the landscape and adapted to environmental conditions throughout the last 10,000 years (Thoms 1992). Analysis of cultural material recovered from the site has been oriented towards studies of comparative artifact density (Thoms 1992) or individual cultural material categories such as vertebrate fauna, FCR, plant remains, lithic material, or mussel shell (Baker and Steele 1992; Clabaugh 1996; Dering and Bryant 1992; Dockall 2003; Neck 1992). The current study of the site analyzes data from multiple artifact categories (lithic debitage, vertebrate fauna, FCR, and mussel shell), along with locations of selected artifacts and features to identify and compare spatial patterns in the Lower Medina and Upper Perez components.

Excavation Strategy

Excavations at the Richard Beene site revealed multiple components, living surfaces, and zones on and buried within the alluvial deposits of the Medina River. Several soils developed within the alluvial deposits and were subsequently buried by additional alluvium resulting in the creation of paleosols that are well dated (Mandel and Jacob 1995; see also Appendix A) and provide a convenient framework within which to place the archaeological components (see Thoms et al. 1996). Components are also referred to herein by the name of the paleosol in which they are encased. Table 2 presents information about each component and Figures 7 and 8 illustrate the relative positions of the excavations.

Table 2. Archaeological components at the Richard Beene site.

Archaeological Component	Excavated Blocks	Area Excavated (square meters)	Cultural Period (Hester 1995)	Geologic Period	Approximate Age (B.P.)	Elevation m amsl (Depth mbs)
Modern Soil	Upper B	25	Late Prehistoric	Late Holocene	1200-400	160-159 (0-1)
Upper Leon Creek	Lower B	150	Late Archaic		3000	159-158.5 (1-1.5)
Lower Leon Creek	Upper A	55	Middle Archaic	Middle Holocene	4100	157.5-157 (2.5-3)
Upper Medina	Lower A and U				4500	157-156.5 (3-3.5)
Lower Medina	F and G	180	Early Archaic	Early Holocene	6900	154-153.5 (6-6.5)
Elm Creek	K, M, O, and P	20	Late Paleoindian		7600	151 (9)
Upper Perez	H, N, Q, and T	210	Late Paleoindian		8800	151-149.5 (9-10.5)



Component	Age	Blocks
Payaya	1200-400 B.P.	Upper B
Upper Leon Creek	3000 B.P.	Lower B
Lower Leon Creek	4100 B.P.	Upper A
Upper Medina	4500 B.P.	Lower A and U
Lower Medina	6900 B.P.	F and G
Elm Creek	7600 B.P.	K, M, O, and P
Upper Perez	8800 B.P.	H, N, Q, and T

Figure 7. Schematic cross-section of the Applewhite terrace showing the locations of block excavation areas (adapted from Thoms [1992: Figure 3]).

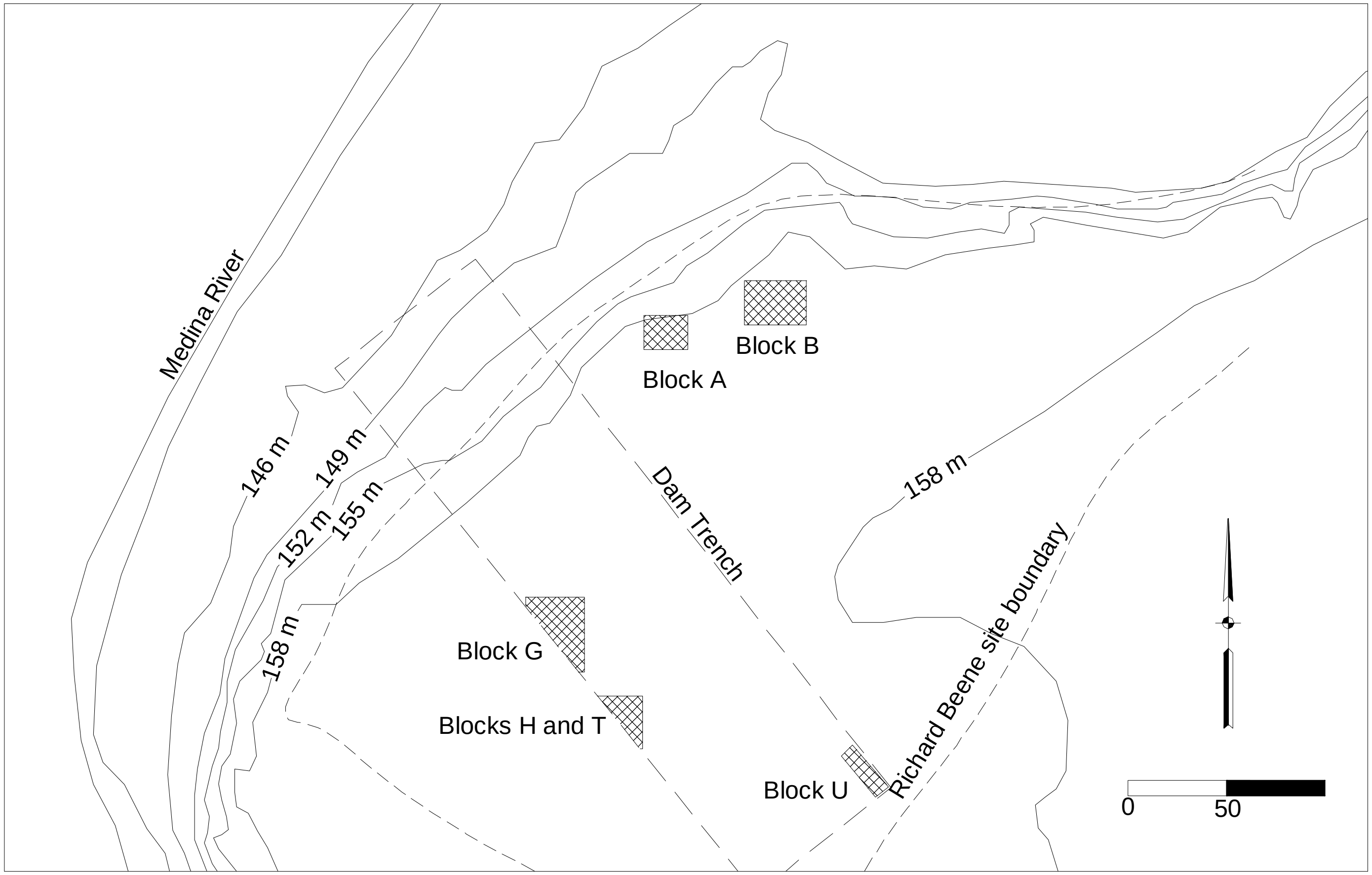


Figure 8. Richard Beene site map showing the locations of major block excavations (adapted from Thoms et al. [1996:Figure 3]).

Excavations began in 1989 and continued sporadically until 1995 (Thoms et al. 1996). The excavation goals at the site were to:

> (1) identify and isolate intact features and well-preserved occupation surfaces; (2) in the absence of intact features or occupation surfaces, identify and isolate artifact-rich zones; (3) recover as large a sample of artifacts and features as possible; and (4) where possible, sample each stratigraphically distinctive archaeological deposit exposed by heavy machinery during dam construction. [Thoms 1992:16]

To accomplish these goals, backhoe trenches were used to search for components buried within the upper 3 m of terrace fill. Cultural components buried more than 3 m deep were encountered as “emergency discoveries” during the actual construction of the spillway trench. When occupation surfaces or zones were identified, overlying sediments were mechanically removed to within 10 to 40 cm of the cultural deposit. Hand-dug cross trenches were used to more specifically identify the location and nature of these deposits. Block excavations were then undertaken to sample the best preserved cultural deposits that appeared to represent Early, Middle, and Late Holocene period occupations (Thoms 1992:16). Excavations within hand-dug cross trenches and features were screened using .3175 cm (1/8 in) mesh. All other excavations were screened using .635 cm (1/4 in) mesh.

This thesis is concerned with samples of the Lower Medina and Upper Perez components, dated to 6900 and 8800 B.P., respectively. The samples used within this thesis make up much of the excavated area as well as contain most of the artifacts from each component. The Lower Medina sample is contained within Block G and the Upper Perez sample is contained within Block H (see Table 2; Figures 7 and 8).

Natural Formation Processes at the Richard Beene Site

The alluvial setting of the site can be divided into two eras: "the comparatively high-energy environment of the Late Pleistocene, and the lower-energy system characteristic of the Early Holocene" (Thoms 1992:27). The amount of stream worn gravel contained in the sediments as well as the presence of sand lenses are an indicator of energy levels at the site (Thoms 1991). Only Block H within the Upper Perez component contains substantial amounts of gravel and sand mixed with the cultural deposits. Block T, also within the Upper Perez component, contains a moderate amount of gravel, and therefore seems more intact than Block H. The younger components, from the Elm Creek paleosol and above, contain much less gravel and are much better preserved than those within the Upper Perez. Thoms (1991) suggests that the source of the gravel and sand within and immediately overlying the Perez paleosol is from the older gravel and sand rich terrace on the valley wall as well as from the Pleistocene terrace remnants on the valley floor.

Thoms (1992:27) argues that a high-velocity flow of fine-grained sediment may have removed the light fraction (i.e., small fragments of bones, charcoal, and flakes) within the upper portion of the Perez paleosol and transported the heavy component (i.e., FCR and large chipped stone) only a short distance. In contrast, the younger components, from the Elm Creek paleosol and above, contain fine-grained sediments (silt, clay, and fine sand) that are the result of overbank deposition from the Medina River (Thoms 1991). These flooding episodes were apparently frequent, low-velocity events accompanied by high-viscosity flows that effectively covered the cultural materials with fine-grained sediments without disturbing them. Deposition during flooding was substantial enough to bury the archaeological deposits deeply, protecting them from significant bioturbation (Thoms 1991).

Archaeological Components

Figures 7 and 8 illustrate the relative positions of the archaeological components and the block excavation areas therein. Table 2 provides additional information about the components. The cultural time periods referred to within this section are taken from Hester (1995; see also Table 1). Radiocarbon ages provided are uncorrected and are also included in Appendix A.

Payaya

Bulk carbon radiocarbon ages from the modern soil range from 1200 to 400 B.P. (Mandel and Jacob 1995). The Payaya component located within the modern soil coincides with the Late Holocene geologic period and Late Prehistoric cultural period. The upper portion of Block B was excavated between 160 and 159 m amsl (0 to 1 mbs) (Thoms 1992). The archaeological component therein is termed Payaya in recognition of the Native American group which inhabited the area in the eighteenth century (Thoms et al. 1996). While almost 25 m^2 were excavated, no intact features were encountered. Temporally diagnostic artifacts from this component, including Perdiz arrow points and bone-tempered ceramics, are typical of Late Prehistoric period sites for the area (Thoms 1992:18).

Upper Leon Creek

The Upper Leon Creek component dates to approximately 3000 B.P. (Mandel and Jacob 1995) and falls within the Late Holocene geologic period and Late Archaic cultural period. The lower portion of Block B was excavated between 159 and 158.5 m amsl (1 to 1.5 mbs) (Thoms 1992). Excavations within this component totaled ca. 170 m^2. A radiocarbon age from a feature within this component was 3090 ± 70 B.P. (Beta-36702; wood charcoal). Features identified during the excavations included FCR features, basin-shaped pits, and mussel shell concentrations (Thoms 1992:18). Projectile points recovered from this paleosol include Ensor, Lange, Langtry, Marcos, Marshall, and Pedernales (Dockall 2003).

Lower Leon Creek/Upper Medina

The radiocarbon ages from both the Lower Leon Creek and Upper Medina components range from 4100 to 4500 B.P. (Mandel and Jacob 1995), coinciding with the Middle Holocene geologic period and Middle Archaic cultural period. A total of three blocks and 55 m^2 was excavated from the Lower Leon Creek and Upper Medina components. The upper portion of Block A was excavated between 157.5 and 157 m amsl (2.5 and 3 mbs) in the Lower Leon Creek component (Thoms 1992). Both the lower portion of Block A and Block U were located in the Upper Medina component between 157 and 156.5 m amsl (3 to 3.5 mbs) (Thoms 1992; Thoms et al. 1996). A charcoal radiocarbon sample from sediments within the upper portion of Block A returned an age of 4135 ± 70 (Beta-43330; wood charcoal; $\delta^{13}C$= -24.5‰). Wood charcoal from a tree burn in the lower portion of Block A yielded a radiocarbon age of 4570 ± 70 B.P. (Beta-38700; wood charcoal; $\delta^{13}C$= -26.3‰). Charcoal radiocarbon samples from sediments within Block U ranged in age from 4380 ± 100 (AA-20401; wood charcoal) to 4510 ± 110 (AA-20402; wood charcoal). Features within these components included FCR concentrations, basin-shaped pits (with and without FCR), lithic concentrations, and oxidized lenses (Clabaugh 2002). Projectile points recovered from the Upper Medina component include Desmuke, Uvalde, Travis, Bell, and Andice (Dockall 2003).

Lower Medina

The Lower Medina component dates to approximately 6900 B.P. (Mandel and Jacob 1995), placing it within the Early Holocene geologic period and the Early Archaic cultural period. Blocks F and G were excavated within this component between 154 and 153.5 m amsl (6 to 6.5 mbs). A sample from Block G is the younger of two samples analyzed in this thesis. More than 180 m^2 were excavated within this component (140 m^2 of which represent the Lower Medina sample). Ages from features within this component ranged from 6900 ± 70 B.P. (Beta-47542; wood charcoal) to 7000 ± 70 (Beta-47530; wood charcoal).

Archaeological deposits excavated within the Lower Medina component were well preserved, as indicated by the facts that almost all artifacts were found at horizontal angles of repose, features were intact, and there was very little evidence for bioturbation (Thoms 1992:22). Radiocarbon ages across the component are almost identical, the cultural deposits are only 10 cm deep, and the excavated occupation surface is located within the lower portion of the Medina pedocomplex, the parent material for which was quickly deposited (Mandel and Jacob 1995). Thoms (1992:23) suggested that the occupation surface in the Lower Medina component may not have been exposed for more than a generation before being buried by alluvium.

Feature Assemblage

A total of 20 features and 549 pieces of FCR was recorded within the Lower Medina sample. Four main feature types were recorded: (1) small (40 to 60 cm diameter) basin shaped features; (2) smaller (30 cm diameter) circular depressions filled with carbon-stained sediments; (3) oxidized surface stains; and (4) larger (1 m in diameter) FCR concentrations (Clabaugh 2002). Other feature types included large (greater than 1 m in diameter) mussel shell lenses and sheet middens containing various artifacts (Thoms 1992:22). Thoms (1992:23) identified evidence of overlapping features suggesting the possibility of multiple occupations.

Lithic Analysis

Lithic artifacts recovered from the Lower Medina sample included 9,598 pieces of debitage, 6 projectile points, 11 cores, 18 bifaces, and 38 edge modified flakes. Projectile points recovered included Bandy, Gower, Martindale, Uvalde, and one Angostura point (Dockall 2003).

Dockall's (2003) analysis of the lithic artifacts from all excavations within the Lower Medina component show a dominance of debitage (99 percent of lithic artifacts). The flake/tool ratio for this component is very high (128.5) compared to that of the Upper Perez (19.4) which would indicate that tool manufacture was not a common activity during the occupation of the Lower Medina component. A core/biface ratio of 0.82 is interpreted as indicating that core reduction and biface manufacture were prevalent activities during occupation (Dockall 2003). When compared to the core/biface ratio for the Upper Perez paleosol (2.71, see below), a technological difference can be identified and attributed to either stylistic differences in projectile point forms or changes in site function (Dockall 2003).

Faunal Assemblage

The vertebrate faunal analysis was performed by Baker and Steele (1992) on all faunal remains from excavations dating to within the Early Archaic period (N=4,850). The assemblage from within the Lower Medina sample composes most of this (N=3,835). Thoms (1992:22) notes that the faunal preservation within the Lower Medina component was better than in other components from the site and that the assemblage included more variety. Vertebrate analysis identified deer, pronghorn, canid, porcupine, rabbit, rat, gopher, squirrel, other rodents, fish, turtles, and snakes dominated by medium/large mammals, rabbits, and small mammals (Baker and Steele 1992) all of which were most likely part of the subsistence of the inhabitants of the site.

The invertebrate fauna within the Lower Medina sample included 1,488 mussel shell umbos which represent a major subsisistence category. *Rabdotus* sp. shells present within the component, while not part of the subsistence of the site's inhabitants, were used to identify the vegetation pattern during the formation of the lower portion of the Medina pedocomplex as a mid-grass prairie (Neck 1992).

Summary

Overall, the Lower Medina component at the Richard Beene site is a well preserved record of prehistory dating to approximately 6900 B.P. Table 3 presents a summary of the information provided above concerning the Lower Medina sample. With 180 m^2 excavated, the Lower Medina component also represents one of the most extensively recorded components from the Early Archaic period in South-Central Texas. Thoms (1992) argues that this component is the result of a very brief occupation, perhaps no longer than a generation. There is also evidence, in the form of overlapping features, that this component was intensively occupied. This site most likely represents a series of briefly, but intensively occupied campsites. Thoms (1992) also describes the Lower Medina component as being well preserved with a minimal amount of post-depositional

Table 3. Comparison of the Lower Medina and Upper Perez samples.

		Lower Medina Sample	Upper Perez Sample
Approximate Age (B.P.)		6900	8800
Excavated Area (square meters)		139	142
Feature Types		Basin shaped, carbon stained sediment, oxidized surface stain, FCR concentration, midden, mussel shell lens	FCR concentration, organic stain (all possibly lag deposits)
Point Types		Bandy, Gower, Martindale, Uvalde, and Angostura	Angostura
Lithic Debitage	(count)	549	6,269
Vertebrate Fauna		9,598	341
FCR		3,835	9,555
Mussel Shell		1,488	2,235

disturbance. He credits this to the rapid burial of the occupational surface with a low-velocity flow of fine-grained overbank sediments.

The lithic assemblage indicates that core reduction and biface manufacture were more common than tool manufacture (Dockall 2003). Core reduction and biface manufacture are more common at procurement sites. While procurement does not always occur within campsites, the location of river gravel near the site allowed procurement activities to take place within this campsite. Faunal remains at the site are typical of prehistoric sites from this stage within South-Central Texas. The riverine setting of the site resulted in the inclusion of riverine animals (fish, turtles, and molluscs) into the subsistence patterns.

Elm Creek

The Elm Creek component dates to approximately 7600 B.P. (Mandel and Jacob 1995) and falls within the Early Holocene geologic period and Late Paleoindian cultural period. This component is located between 152 and 151 m amsl (8 to 9 mbs). Approximately 20 m^2 was excavated within this component from a number of different block excavations. A charcoal radiocarbon age from sediments within this component was 8080 ± 130 (Beta-44386; wood charcoal; $\delta^{13}C = -26.0‰$). Features identified during the excavations included FCR platforms, basin-shaped pits, and mussel shell concentrations (Thoms 1992:21). No projectile points or other temporally diagnostic artifacts were recovered from excavations within this paleosol (Dockall 2003).

Upper Perez

The boundary between the Elm Creek and Perez paleosols contains the Upper Perez component. Blocks H and T make up the majority of the 210 m^2 excavated. A sample from Block H is the older of two samples analyzed in this thesis. The Upper Perez component dates to approximately 8800 B.P. (Mandel and Jacob 1995), placing it within the Early Holocene geologic period and the junction between the Late Paleoindian and Early Archaic cultural periods. Thoms (1992) argues that artifacts from this component point towards a more Archaic lifestyle. The Upper Perez component extends from 151 to 149.5 m amsl (9 to 10.5 mbs).

Radiocarbon ages of wood charcoal from features and sediments in Block T ranged from 8640 ± 60 (Beta-80687; wood charcoal; $\delta^{13}C$= -26.4‰) to 8805 ± 75 (Beta-47527; wood charcoal; $\delta^{13}C$= -25.0‰). Wood charcoal samples from Block H were not large enough to produce ages. Ages from bulk carbon samples from each of these blocks are comparable (i.e., 9870 ± 120 (Beta-47565; bulk organic sediments; $\delta^{13}C$= -20.6‰) from Block T and 9750 ± 130 (Beta-43878; bulk organic sediments; $\delta^{13}C$= -21.0‰) from Block H). Thoms (1992) argues that the ages from bulk carbon at the site consistently date 1,000 years older than those from wood charcoal in the same context. If the ages from the bulk carbon are reduced by 1,000, they are consistent with the charcoal ages from Block T.

Block H excavations are located within sediments eroded from the Perez paleosol and redeposited as the parent material for the Elm Creek paleosol (Thoms 1992:24). This resulted in the component being not as well preserved as the other excavated areas and described it as containing “essentially random concentrations of chipped stone artifacts, FCR, mussel shell, and stream worn pebbles up to 4 cm in diameter” in an occupation zone that reached up to 30 cm deep (Thoms 1992:24). Many artifacts were found in vertical angles of repose and were aligned in erosional rills or ridges or concentrated in small erosional depressions. Thoms (1992:24) indicated that the artifact lenses may represent lag deposits resulting from the erosion of the Perez paleosol. However, many pieces of large FCR and chipped stone artifacts in the component were substantially larger than the stream worn pebbles and small fragments of lithic debitage retained very sharp edges. These factors were interpreted as indicating that, although the cultural material was disturbed by flood waters, it was probably not moved very far (Thoms 1992:24).

Block T was excavated in the uppermost portion of the Perez paleosol where gravel was much less prevalent (Thoms et al. 1996). This area was better preserved than others in the Upper Perez component in that most of the artifacts lay in horizontal angles of repose and features were relatively intact (Thoms et al. 1996). Unfortunately, excavations were halted due to the cancellation of the dam construction before more work could be done within this block.

Feature Assemblage

A total of 24 features was excavated within the Upper Perez component (from Blocks H and T; 10 features from the Upper Perez sample) and a total of 9,555 fragments of FCR was collected specifically from the Upper Perez sample. As stated earlier, the features from Block H are disturbed and represent lag deposits. Thoms (1992) states that no in situ features were recorded from the block, however Clabaugh (2003) reviews the features from the block as if they were cultural. Features recorded within the block are not intact features and during the course of the excavations, excavators actually stopped recording features in Block H (Thoms 2003, personal communication). Most of the features are classified as FCR concentrations (n=19) or organic stains (n=2), however one platform oven, a basin-shaped containment feature, and a thin sheet midden were also identified (Clabaugh 2002:73). The disturbed nature of the deposits was evident in the features from the Upper Perez component which were graded as less pristine (3 on a scale of 4) overall (Clabaugh 2002:73). Features described within the sample analyzed within this thesis only include generalized FCR concentrations and one organic stain (Clabaugh 2002:Table 12).

Lithic Assemblage

Lithic artifacts from the Upper Perez sample included 6,269 fragments of debitage, 9 projectile points, 84 cores, 16 bifaces, and 202 edge modified flakes. All the projectile points recovered were Angostura.

Dockall (2003) performed analysis on the lithic assemblage from all excavations within the Upper Perez component. Tool manufacture was an important activity within the Upper Perez component as indicated by a flake/tool ratio of 19.4 (Dockall 2003). This pattern was interpreted as an indication of the availability of raw material which was also reflected in the core/biface ratio of 2.71 (Dockall 2003).

Faunal Analysis

The very few vertebrate faunal remains recovered from the Upper Perez sample (N=341) were small and rounded. While specific identification was not possible in most cases, deer- and rabbit-sized bone was dominant. Vertebrate faunal remains from Block T were more numerous, larger, and did not show signs of weathering compared to the faunal material from Block H. The entire assemblage from the Upper Perez component (N=726) included deer, small mammals and rodents (rabbit, gopher, and woodrat), fish, and snake (Baker and Steele 1992).

The invertebrate fauna within the Upper Perez sample included 2,235 mussel shell umbos which represent a major subsisistence category. *Rabdotus* sp. shells present within the Upper Perez component, while not part of the subsistence of the site’s inhabitants, indicated that the vegetation was a savannah with scattered woody growth and large, open grasslands (Neck 1992). Neck (1992) also identified periodic flooding interludes within the Perez paleosol by analyzing the subtle shifts in the *Rabdotus* sp. population.

Summary

The Upper Perez component at the Richard Beene site, which dates to approximately 8800 B.P., is heavily disturbed by erosion and high-velocity water flow. With approximately 210 m^2 excavated, the Upper Perez component also represents one of the most extensively excavated components from the transition of the Paleoindian into the Early Archaic stage in South-Central Texas. Table 3 presents a summary of the information provided above concerning the Upper Perez sample. Unfortunately, post-depositional disturbance appears to have distorted the spatial patterning within the component. Features recorded within the component do not appear to be intact and may represent lag deposits instead of cultural construction. Overall, the amount of FCR is quite high, especially compared to the Lower Medina component.

The lithic analysis indicates that tool manufacture was important within the component and that a lithic source was close by. Faunal remains within the component are not well preserved, but indicate that a wide variety of animals was exploited; behavior more typical of the Archaic period. The riverine setting of the site resulted in the inclusion of aquatic animals (fish, turtles, and molluscs) into the subsistence patterns.

Comparing the Lower Medina and Upper Perez Components

A number of important considerations must be made in discussing the Lower Medina and Upper Perez components at the Richard Beene site. Most striking is the almost pristine nature of the Lower Medina component and the very disturbed nature of the Upper Perez component. Thoms (1992) has described this distinction well and it has been reviewed above. Overall, comparisons made in this thesis between these components must account for this dramatic difference.

Another difference concerns the relative amounts of artifacts recovered from each component. While similar areas were excavated in each component, there were major discrepancies in the amounts of vertebrate fauna and FCR recorded. The Lower Medina sample contained 3,835 fragments of vertebrate fauna, while only 341 fragments were recorded in the Upper Perez sample. FCR counts were 549 fragments from the Lower Medina sample and 9,555 from the Upper Perez. An explanation for the discrepancy in vertebrate faunal remains could be a difference in preservation conditions. Thoms (1992:29) attributes the difference in FCR counts to a “variation in use intensity of particular places on the landscape.” Another explanation may be that the occupation zone of the Upper Perez represents more time and activity due to erosional forces creating a lag deposit. Thoms (1992:29) notes that more variety among tool types within the Upper Perez component may corroborate the lag deposit hypothesis.

Thoms (1992) compared average tool, FCR, and mussel shell densities between components. Tool types among the components indicate that “the basic approaches to tool manufacturing...appear to have changed little during the last 9,000 years” (Thoms 1992:28). Dockall (2003; see below), however makes observations based on lithic atifacts that indicate changes in lithic reduction techniques. Indicators of hunting, projectile points and thin bifaces, are common throughout time at the site and slight variations in their densities may indicate variation in the emphasis on hunting (Thoms 1992:29). The difference between the Lower Medina and Upper Perez components is negligible (Thoms 1992:Figure 12). Thoms (1992) notes that faunal samples analyzed by Baker and Steele (1992) indicate that deer made up a significant portion of the subsistence for the inhabitants of the site throughout both components.

Comparing tool types shows that the most common tool types throughout time at the site were expedient tools on thin (less than 1 cm thick) and thick (greater than 1 cm thick) flakes. These tools are presumed to have been used for light-duty and heavy-duty tasks respectively (Thoms 1992:29). Of specific interest are the relatively high densities of thick and thin flake tools as well as cores in the Upper Perez component as compared to the other components. Thoms (1992:29) gives three possible causes for this pattern: (1) the Upper Perez component may represent many eroded occupation surfaces; (2) the large sample size (of the Upper Perez component) may be more likely to contain more distinctive tools; (3) the sample is indicative of actual behavioral patterns during the occupation of the component, namely woodworking, or another similar activity.

Thoms' (1992) comments on the variability of FCR between the Lower Medina and Upper Perez components have been discussed above. He equates both FCR and mussel shell to food processing activities and notes that differences in their concentrations indicate that the use of FCR is not necessarily related to mussel cooking (Thoms 1992:29-30). Features at the site are also indicators of food processing. Thoms (1992:30) notes that small (30 to 50 cm diameter) basin-shaped features with varying amounts of FCR are common to most of the components at the site. Both the Lower Medina and Upper Perez components contain these types of features suggesting common food preparation and utilization throughout time at the site.

Dockall's (2003) analysis of the lithic assemblages from the Lower Medina and Upper Perez components identified differences in lithic production techniques. Tool manufacture was an important activity within the Upper Perez component as indicated by a flake/tool ratio of 19.4 (Dockall 2003) as opposed to the prevalence of core reduction and biface manufacture in the Lower Medina component as indicated by the core/biface ratio. As noted above, the core/biface ratio for the Upper Perez component (2.71) contrasts greatly with that of the Lower Medina component (0.82). A high value for this ratio, as in the Upper Perez component, is interpreted by Dockall (2003) as meaning raw materials were close at hand. Dockall (2003) assumes that the conservation of raw materials through actions such as core reduction and biface manufacture were less necessary during the occupation of the Upper Perez component than the Lower Medina component. While the ratios may indicate that the availability of raw materials was more prevalent at one time as opposed to another at the site, there may be other explanations for this pattern. Considering that the source of the raw materials (the Medina River) was close to each component during the times of their occupation, it is possible that the explanations given by Thoms (1992:29; see above) for discrepancies in tool concentrations may also apply to ratios described by Dockall (2003).

The Lower Medina and Upper Perez components at the Richard Beene site provide a rare opportunity to study a gisement site dating to the transition between the Late Paleoindian and Early Archaic periods. The Upper Perez component is interesting in that it contains a large amount of FCR, but dates to a time (8800 B.P.) when large FCR features are rare. All the projectile points from the Upper Perez are Angostura points. This relates the component directly to components at the Wilson-Leonard, Armstrong, and Woodrow Heard sites (see Chapter III). The components containing Angostura points at the Wilson Leonard and Armstrong sites only contained small features. The component containing Angostura points at the Woodrow Heard site, however contained large rock ovens and charred fragments of sotol and yucca. The Lower Medina component is noteworthy because of its pristine nature. Dating later than the Upper Perez component (6900 B.P.), it does not contain as much FCR. The features from the Lower Medina component are mostly small (less than 1 m diameter) and only contain a few FCR fragments. The study of each of these components should reveal much needed information about the transition from the Paleoindian to the Early Archaic period in Texas.

CHAPTER V

SPATIAL ANALYSIS METHODS

Identification of spatial patterning to determine specific activities and adaptational strategies practiced by prehistoric people is widely used in archaeology. For example, qualitative analysis of artifact distribution plots to identify spatial patterns has been in use for at least 50 years (Clark 1957:153). Today, however, computers allow many statistical calculations to be made very quickly, ushering in a new form of analysis: quantitative spatial analysis (Hodder and Orton 1976:3-4; Kintigh and Ammerman 1982:31-32; Reanier 1992:8-10).

Quantitative spatial analysis, basically, is the utilization of statistical methods to quantify spatial relationships among artifacts within an archaeological site. This type of archaeological analysis has been practiced for about 30 years and it has proven effective throughout the world (Blankholm 1991; Hietala 1984). The Richard Beene site lends itself nicely to this type of analysis because it is a well-stratified, multicomponent site located in a region with a fairly well known paleoenvironmental record covering the late Pleistocene and Holocene (Nordt et al. 2002; Thoms and Mandel 1992).

The popularity of quantitative spatial analysis has increased in the archaeological field for a variety of reasons. Hodder and Orton (1976) argue that more qualitative methods of analysis are limited in scope and interpretive value, produce erroneous results, and cannot deal with the large amounts of data now being studied. Qualitative visual interpretation of maps lends itself to error because "the ability of the map-user to discriminate and evaluate the information contained in the map is not free from subjective elements and…[because]…the more information contained in a map the more ambiguity and uncertainty there is likely to be…" (Harvey 1969:377). Hodder and Orton (1976:4-8) graphically illustrate the error inherent in qualitative analysis by showing that randomly distributed points within a grid may be interpreted as regularly spaced, structured, and even clustered by qualitative analysis.

The study of archaeological sites has become more complex and the amount of data collected by archaeologists is increasing. Analyzing and comparing large groups of data can be “time consuming, difficult to present in a published form, and extremely difficult to interpret” (Hodder and Orton 1976:7). The use of computer programs designed to analyze and illustrate archaeological data has allowed more intensive archaeological studies to be completed. While the value of qualitative studies is still highly regarded even among the technological crowd, quantitative spatial analysis is now seen as an invaluable tool in the identification of spatial patterning (Kintigh 1987). Researchers agree that qualitative spatial anlysis is an important tool in determining general patterns within the data which can help researchers clarify research questions and select additional research techniques (Hodder and Orton 1976; Kintigh 1987; Kintigh and Ammerman 1982).

Methods of quantitative spatial analysis range from methods designed for use in other fields of study (i.e., nearest neighbor, k-means clustering, dimensional analysis of variance) to techniques developed specifically for use on archaeological data (i.e., unconstrained clustering, local density analysis). As quantitative methods of spatial analysis were evaluated by the archaeological community, a number of reviews were published (Blankholm 1991; Carr 1985; Hietala 1984; Hodder and Orton 1976).

Quantitative spatial analysis has been used for a variety of purposes in archaeological projects such as identifying site structure (Bousman 1998; Daniel 1998; Ferring 1984; Kimball 1981; Kroll and Isaac 1984, Reanier 1992), site types (Kroll and Isaac 1984), length of occupation (Kroll and Isaac 1984), post-depositional effects (Hivernel and Hodder 1984), and identifying tool kits (Rigaud and Simek 1991; Reanier 1992).

The selection of a specific technique for use in a study is based on a combination of the types of questions under investigation and the nature of the data. Kintigh (1987) argues that there will never be a technique that can be applied in all situations. The technique selected must be well suited to meet the needs of the researcher. Kintigh (1987) also emphasizes the role of qualitative methods in spatial analysis (i.e., the visual interpretation of distribution and density maps) and concludes that a combination of quantitative and qualitative methods may be the optimal solution in many cases.

For the current study of the Lower Medina and Upper Perez samples, a combination of the visual interpretation of density maps and feature locations (qualitative) and the use of unconstrained clustering (quantitative) is used to address the two research questions: to identify site structure and to assess and possibly offset the effects of post-depositional disturbance.

Data Structure

Data used in this study are derived from the main site database and are presented in Appendix B. Information within this table includes provenience, the quantities of each of the four artifact categories, and a measure of total density, which is the combination of quantity data from each of the four main artifact categories. Total density is provided as a comparative value of the intensity of artifacts contained in each unit in relation to the other units. Data recorded within features is not included in Appendix B. The data in Appendix B is used for creating density maps interpreted during this study. Provenience data for selected artifacts are provided in Appendix C and are used to plot the locations of these artifacts for comparison to other maps used in the study.

Four artifact categories have been selected for the study: (1) lithic debitage; (2) vertebrate fauna; (3) FCR; and (4) mussel shell. Artifacts in these artifact categories comprise a vast majority of all artifacts collected during the excavations (99.5 percent within the Lower Medina sample and 98.2 percent within the Upper Perez sample). The remaining artifacts are lithic tools such as projectile points, bifaces, cores, hammerstones, and modified flakes. The low frequencies of these artifacts preclude their use in unconstrained clustering. The nature and distribution of these tools forms a key element of the visual interpretation of density maps as well as in the interpretation of the results of unconstrained clustering. Locations and types of features are similarly considered in these analyses.

In the abscence of post-depositional disturbance, the locations of the artifacts within the four main artifact categories can indicate the general activities that were being performed at the site. Lithic debitage indicates the locations of stone tool manufacture, use, or discard (Dockall 2003). Vertebrate fauna are located in areas where vertebrate animals were butchered, cooked, eaten, or disposed (Baker and Steele 1992). FCR was used in cooking facilities in which a variety of foods were cooked (Clabaugh 1996). The location of FCR can indicate the locations of these cooking facilities, however during the use of cooking facilities, the contents (including FCR) could have been removed in preparation for another cooking episode. In this case, the location of FCR would indicate a secondary deposit. Mussel shell is an indicator of the cooking and eating of mussels and the subsequent discard of the shells (Parmalee and Klippel 1974).

Many artifacts recovered from the site were point-plotted using an electronic distance measuring device, however the majority of the artifacts were provenienced according to their unit and level (i.e., grid-plotted). Point-plotting artifacts records their exact location within the site and results in one artifact per coordinate. Grid-plotting artifacts records the location of artifacts within a given excavation unit resulting in multiple artifacts being assigned to a single coordinate per unit. In the case of the Richard Beene site, the grid size is 1 m by 1 m. Within the database, artifacts were recorded at the southwestern corner of each unit. The location of the point was shifted to the center of the unit for the analysis performed in this study by adding .5 m to each coordinate.

For use in spatial analysis, it is best to have all the data either point- or grid-plotted. When data are recorded in both forms, converting from one form to another has consequences. Converting grid-plotted data to point-plotted data involves randomization of the data and adds another level of assumption to the process. The conversion of point-plotted data to grid-plotted data involves losing the more specific coordinates associated with the artifacts. As the conversion from point-plotted to grid-plotted data contains less interpolation, the point-plotted data in this study were converted to grid-plotted coordinates.

Inherent characteristics of each artifact category led to different approaches in their quantification within the database. Lithic debitage and vertebrate fauna were both counted and weighed. Most FCR was counted and weighed, however a very small percentage of FCR recovered from outside defined features was only weighed. Mussel shell was recorded in two ways: (1) all mussel shell was weighed; and (2) umbos (hinges of the shell which are very durable) were counted. For this thesis, counts per unit were used for all artifact categories.

The quantification of archaeological data is fraught with concern. Utilizing counts assumes that the number of items represented in the archaeological assemblage is indicative of cultural behavior. This is more likely the case if the items have been well preserved over time. Unfortunately, there are variable preservation factors associated with each artifact category.

Lithic debitage is very resistant to either breakage or deterioration over time. As such, lithic debitage counts are likely to be indicative the intensity of lithic tool manufacturing activities. Vertebrate faunal remains are quite susceptible to both deterioration and breakage over time. It is the case that much of the vertebrate faunal assemblage was poorly preserved. Utilizing counts of vertebrate fauna could either underestimate (in the case of extreme deterioration) or overestimate (in the case of excessive breakage) the intensity of vertebrate animal consumption at the site. Another concern with the vertebrate faunal assemblage is the unquantified presence of non-cultural species. While this is always a possibility at an archaeological site, Baker and Steele (1992) state that the faunal material seemed representative of cultural activities at the Richard Beene site.

Cook-stone is broken during its use as a heating element (resulting in FCR) as well as post-depositionally. While some post-depositional breakage is possible, it must be assumed that the counts of FCR within the site are reasonably representative of the intensity of cook-stone usage. Mussel shells are similar to vertebrate faunal material in their lack of resistance to post-depositional forces. Fortunately, each mussel has two umbos, or hinges, which are very identifiable and relatively more resistant to post-depositional forces. The identifiable umbos were counted and can provide a more accurate assessment of the number of mussels (albeit doubled as there are two umbos for every mussel) utilized at the site.

Qualitative Spatial Analysis

Visual interpretation of density maps is a traditional method used to interpret the distribution of artifacts and features in the archaeological record (Clark 1957; Fox 1943; Hodder and Orton 1976; Kintigh 1987). Density maps allow the viewer to quickly determine where concentrations of certain artifacts are located in relation to other parts of the site. Density maps used herein are created in Surfer® (made by Golden Software, Inc.) surface mapping software (Win 32) version 6.04 from the provenience and artifact frequency data presented in Appendix B.

A total of five maps are created for each sample: four density maps (lithic debitage, vertebrate fauna, FCR, and mussel shell) and one total density map. Locations of selected artifacts and features are also plotted on maps to aid in the visual interpretation. Provenience data for selected artifacts are provided in Appendix C. These maps are instrumental in determining general patterns within the data and in providing a background for the quantitative spatial analysis. Maps are also inspected for patterns that matched the expectations about artifact patterning as they relate to site structure and post-depositional disturbance set forth later in Chapter VI. Results of this analysis are presented in Chapters VII and VIII.

Quantitative Spatial Analysis Methods

Selection of a method of spatial analysis is based on data structure and the questions being asked by the researcher. Overall, unconstrained clustering was chosen as the best method for dealing with the study being performed herein because it is a well-designed method for producing maps of artifact clusters. Unconstrained clustering is well suited for the data available for this project and posesses the ability to identify site structure and assess and possibly offset the effects of post-depositional disturbance. The specific benefits of unconstrained clustering as they apply to the current study include: (1) it is theoretically sound (Blankholm 1991); (2) it has been shown to perform similarly with point-plotted data as well as grid-plotted data; (3) it can be used with irregularly shaped blocks, small blocks, and blocks separated by unexcavated areas without distortion of the results; and (4) the resulting data from separate calculations are easily plotted and compared (allowing intra- and inter-site comparison of results). During this study, Whallon’s (1984) technique is followed as closely as possible, however, some response to specific criticism is necessary and is discussed below.

Clustering within this thesis will be performed on four artifact categories (lithic debitage, vetebrate fauna, FCR, and mussel shell). Variations in these four artifact categories can signify differences in activities performed at the site. Unconstrained clustering creates clusters according to the similarity of the artifact assemblage at each data point. In doing so, clusters can then be assigned to expectations about artifact patterning as discussed later in Chapter VI.

Unconstrained clustering is a multistep process involving data smoothing, calculation of absolute and relative densities, and clustering of the resulting density vectors (Blankholm 1991:75-76). Whallon suggests using Ward's (1963) statistical method for the clustering portion of his method. Ward's (1963) method combines data points into clusters by their homogeneity and calculates the amount of variance (heterogeneity) within each cluster. The clustering continues in steps until all the data has been combined into one large cluster. Researchers can then identify the optimal number of clusters by reviewing the amount of variance at each step and selecting the best point at which clusters should be defined. The optimal number of clusters occurs at the point where the fewest number of clusters can be defined with the least amount of variance in their composition (Ward 1963). This point is typically signaled by a large deviance in variance between two adjacent steps (Figure 9), however the optimal point may not always be so clear. Individual clusters defined using this method are internally homogenous in the relative amounts of each artifact class represented. The composition of these clusters can then be analyzed and compared to the expected material signatures of activities present at an archaeological site.

Unconstrained clustering was devised by Whallon (1984) to provide a method of spatial analysis which reduced the number of constraining factors involved in many other methods of spatial analysis. Most of the other spatial analysis methods (i.e., dimensional analysis of variance, nearest-neighbor, LDA, factor analysis) available are constrained by one or more of the following factors relating to the clusters that they identify: size, shape,

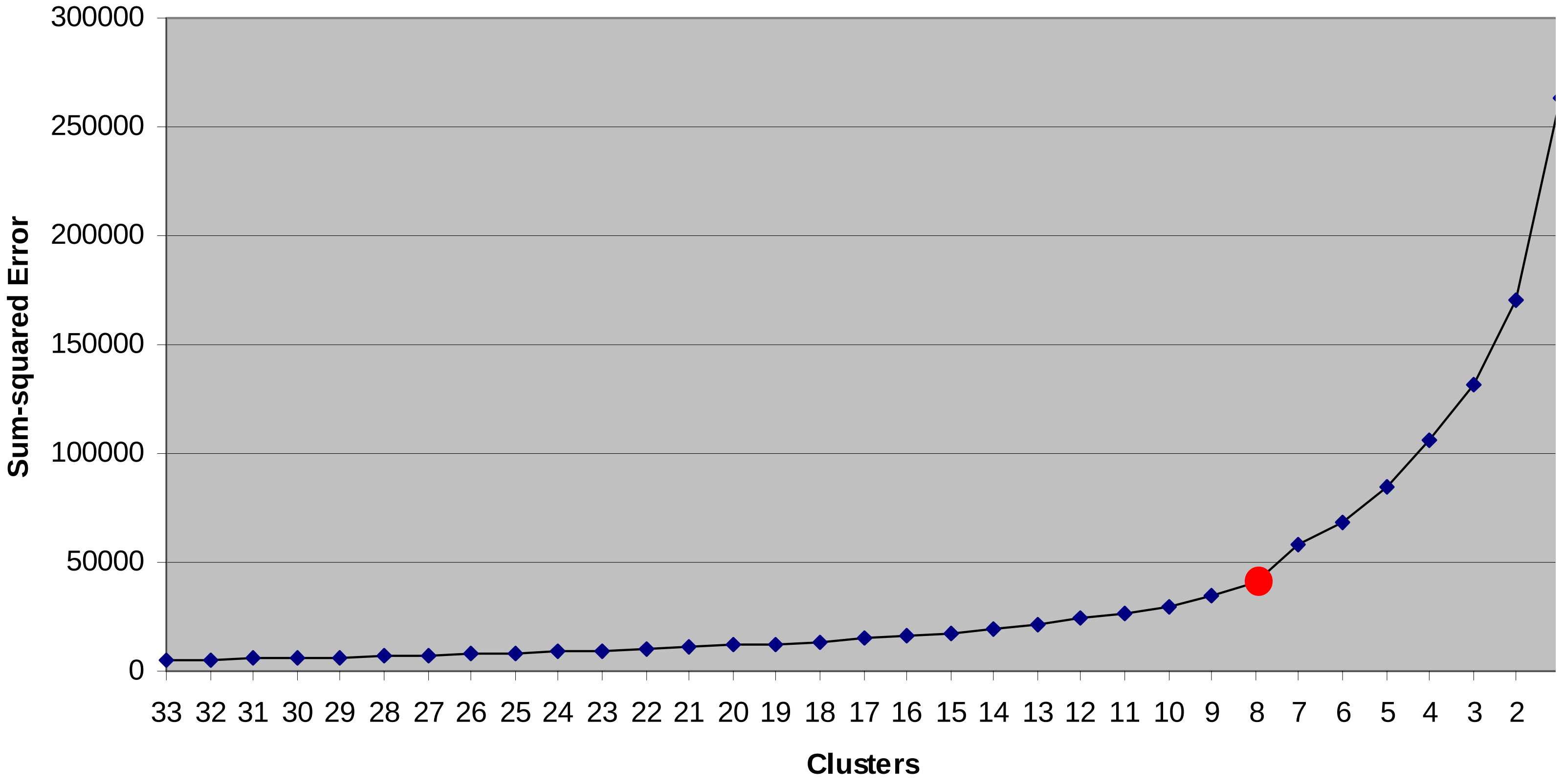


Figure 9. Sample variance graph showing a large deviance in error after eight clusters.

density, and internal patterns of covariation or association (Whallon 1984:243). The constraint stems from the fact that other methods of spatial analysis treat at least one factor relating to the clusters defined as a constant. Whallon (1984:243) argues that factors relating to clusters at archaeological sites should be considered variables. Unconstrained clustering accomplishes this and, therefore is “free from constraint in all these [factors]” (Whallon 1984:244). Both Whallon (1984) and Blankholm (1991) tested unconstrained clustering on data from the Mask site (Binford 1978a). Overall, Blankholm’s (1991) review of unconstrained clustering resulted in a ‘good’ rating (the highest in his hierarchy).

Application

Unconstrained clustering follows seven general steps outlined by Whallon (1984:244):

1. Smoothing the positional data for each artifact category using density contours.
2. For each grid point, interpolating the densities of each category using the smoothed data (generated in step 1) creating a vector of densities at each grid point.
3. Conversion of the vectors to ‘relative’ densities by summing the elements of the vector and dividing each element by the sum of the vector.
4. Using cluster analysis to combine grid points into clusters that tend to be homogeneous with respect to the vectors of relative densities.
5. Plotting the clusters and inspecting the results.
6. Describing each cluster according to its size, shape, density, composition, and internal patterns of covariation.
7. Interpretation of the data which constitute each cluster.

Each step involves decisions that need to be made by the researcher (Whallon 1984:245-

248).

Step 1 is unnecessary during the analysis of the Richard Beene site because the grid data is considered “smoothed” by virtue of containing information from a 1-x-1-m unit. Step 2 is equally unnecessary as the values for each artifact category at each grid point are considered the density vectors. These density vectors are represented in the tables in Appendix B. Step 3 is accomplished by summing the elements of the vector for each grid point and dividing each element by the sum of the vector, effectively creating a ratio between each artifact category for each grid point. This information is included in the tables in Appendix D.

To perform step 4 in Whallon’s (1984) method (cluster analysis), the statistical program suite SPSS® (made by SPSS, Inc.) version 11.0.1 was used. Ward’s (1963) clustering is available through SPSS and the relative densities for each grid point in Appendix D can be input directly into the program. SPSS allows the user to select the method of error calculation, but suggests the use of Euclidean squared distance. As this is also the method used in Whallon’s (1984) method, it is used in the analysis of the Richard Beene data. Results of the clustering are presented in Appendix D. The next steps in Whallon’s (1984) method are more analytical in nature and are presented in Chapters VII and VIII of this thesis.

Critical Assessment

Whallon (1984) identifies two potential drawbacks to unconstrained clustering. The first is the inability of Ward’s (1963) method to define overlapping distributions. A goal of unconstrained clustering is for data to be “grouped into discrete clusters according to the composition of the material assemblage at each location” (Whallon 1984:276). To accomplish this, data situated in an area of overlap or mixture “will be assigned to a [cluster] reflecting the mixed character of the assemblage at this spot” (Whallon

1984:276). This problem is magnified by the fact that it is up to the researcher to select the number of clusters defined, which can lead to arbitrary distinctions between clusters.

Whallon (1984) solved this problem by tracking trends in the nature of the composition of the clusters by looking at different sets of results. Blankholm (1991) suggests using an alternative clustering method designed for overlapping clusters (i.e. Jardine-Sibson method (Cole and Wishart 1970; Jardine and Sibson 1968)), but cautions that these would still involve the researcher selecting the number of clusters and may not be preferable to Ward's (1963) method.

The second drawback noted by Whallon (1984:276) is the fact that the clusters may not be spatially coherent, potentially creating a mosaic of small, intermingling clusters (Blankholm 1991:77). If this were the case, spatial patterns in the data would be difficult to interpret. While this is a danger, Blankholm (1991:77) suggests it is not of major concern, but mentions that the problem would be more likely when dealing with point-plotted data.

Carr portrays Whallon's use of unconstrained clustering as "largely inductive" (Carr 1985:316) and likens it to exploratory data analysis (EDA) (i.e. Hartwig and Dearing 1979; Tukey 1977) stating that unconstrained clustering does not provide for "identifying or postulating the formation processes responsible for a study area, deducing from those processes the relevant form of organization of artifacts within it, deducing from that organization the analytic technique(s) most appropriate for its analysis, and thus the *specification* of relevant artifact patterns" (Carr 1985:318; emphasis in original). Carr applied his own methods to the Pincevent no. 1 habitation site in France (Leroi-Gourhan and Brézillon 1966). In doing so, he developed a series of new coefficients and procedures of spatial analysis which combine inductive and deductive analytical frameworks and are sensitive to the "organization of depositional sets and activity sets" (Carr

1985:328).

Carr’s objections are based mainly on three limitations of EDA, limitations which he also sees in unconstrained clustering: (1) the use of alternative representations of a data set; (2) choosing an analysis technique without identifying the relevant structure of the data; and (3) Whallon’s (1984) application of unconstrained clustering is inductive. Each of these limitations is linked to the other and is based mainly on theoretical differences between Carr and Whallon.

The use of alternative representations of a data set neglects a priori hypotheses in guiding analysis (Carr 1985:319). By looking at multiple representations of the data set, “it may not be clear which...are the truest to the relevant aspects of its structure and its manner of generation” (Carr 1985:319). Carr argues that a priori hypotheses must be formed about the general nature of the data set to guide the researcher in identifying the relevant structure of the data. Without such knowledge, one cannot “use the *strongest criterion* to judge the appropriateness of alternative techniques in representing the data set” because the relative degree of concordance between the data set and the selected technique would not be known (Carr 1985:320; emphasis in original). By inductively selecting an analysis technique without considering the relevant structure of the data, “the possibility of *systematic* bias or distortion of the data and its patterns” resulting from any number of processes (i.e., a palimpsest, post-depositional disturbance) cannot be evaluated (Carr 1985:321; emphasis in original).

Whallon’s (1984) use of alternative representations of a data set includes first identifying seven distinct clusters within the site and then expanding his study to include thirteen clusters. Far from being a limitation, this allows him to describe the patterns at both general and specific scales. In doing so, he illustrates the flexibility inherent in unconstrained clustering. Whallon (1984) does not use a priori hypotheses in his study because the point of his study is not to analyze an archaeological site (his example site, the Mask Site (Binford 1978a), has probably been analyzed sufficiently over the years). Instead, he attempts to give "a first approximation to an effective approach to spatial analysis" (Whallon 1984:244). While Whallon (1984) may not identify data structure in the way Carr (1985) prescribes, he does use density maps and histograms in an attempt to determine relevant aspects of the data. In doing so, Whallon (1984) does consider the data structure in selecting an analysis technique.

During the current study of the Richard Beene site, each of these issues is considered. The issue of overlapping distributions is a problem in any attempt to categorize a data set. In the current study, clusters are analyzed carefully with the knowledge that they could indeed represent an area of overlap. The issue of mosaic clustering does not appear to be a problem with the data from the Richard Beene site. Results presented in Chapters VII and VIII show that clusters tend to be well defined with only a slight amount of mosaic clustering. I would argue that the current study avoids each of Carr's (1985) limitations. First, only one representation for each data set is used. Second, the current study uses the visual interpretation of density maps to determine the structure of the data. Third, these density maps were consulted during the selection of an analysis technique to ensure that the technique was appropriate for the data.

Rose Island: An Archaeological Example

An illustration of how quantitative and qualitative methods were used together successfully can be found in the Rose Island site. While the application of unconstrained clustering was also performed at the Wilson-Leonard site (Bousman 1998), work done at the Rose Island site (Kimball 1981, 1993) provides a more intensive example that can be compared to the current study. The Rose Island site is very similar to the Richard Beene site in its regional and local environmental setting, its stratigraphic setting within alluvial fill, and the occurrence of well preserved components representing short occupations from similar time periods as the Richard Beene site.

Rose Island lies in the Little Tennessee River in eastern Tennessee and is located in the broadly defined Oak-Hickory forest that stretches into Texas encompassing the Richard Beene site (Figure 10). The archaeological site which bears the island's name is encased in rapidly deposited alluvial sediments dating from the Early Archaic (ca. 10,000 to 8000 B.P.) to the Early Woodland (ca. 2500-2000 B.P.) periods as defined for the southeastern United States (Anderson et al. 1996). Two components from this site were analyzed using spatial analysis (Kimball 1981). These components represent the Early Archaic subperiods LeCroy (8100-8500 B.P.) and St. Albans (8600-9000 B.P.).

These dates compare favorably to those of the Upper Perez component (ca. 8800 B.P.) at the Richard Beene site, however, due to differences in cultural development between South-Central Texas and the southeastern United States, these components may be more technologically and behaviorally similar to the Lower Medina component (ca. 6900 B.P.). The Early Archaic period in the southeastern United States spans from 10,000 to 8000 B.P. (Anderson et al. 1996). This places the components at the Rose Island site in the middle to late portion of the Early Archaic as is the Lower Medina component at the Richard Beene site. Projectile points from the Rose Island components are more similar technologically to points within the Lower Medina component as compared to those from the Upper Perez component.

Each component at the Rose Island site represents a short period of time. Although there was evidence for multiple occupation episodes at the site, each component did not seem disturbed by post-depositional processes (Kimball 1981:9, 12). The excavation of each component was conducted in 5-x-5 ft square units for a total area of 1400 ft^2 (130 m^2) per component. While some artifacts were point-plotted, most were

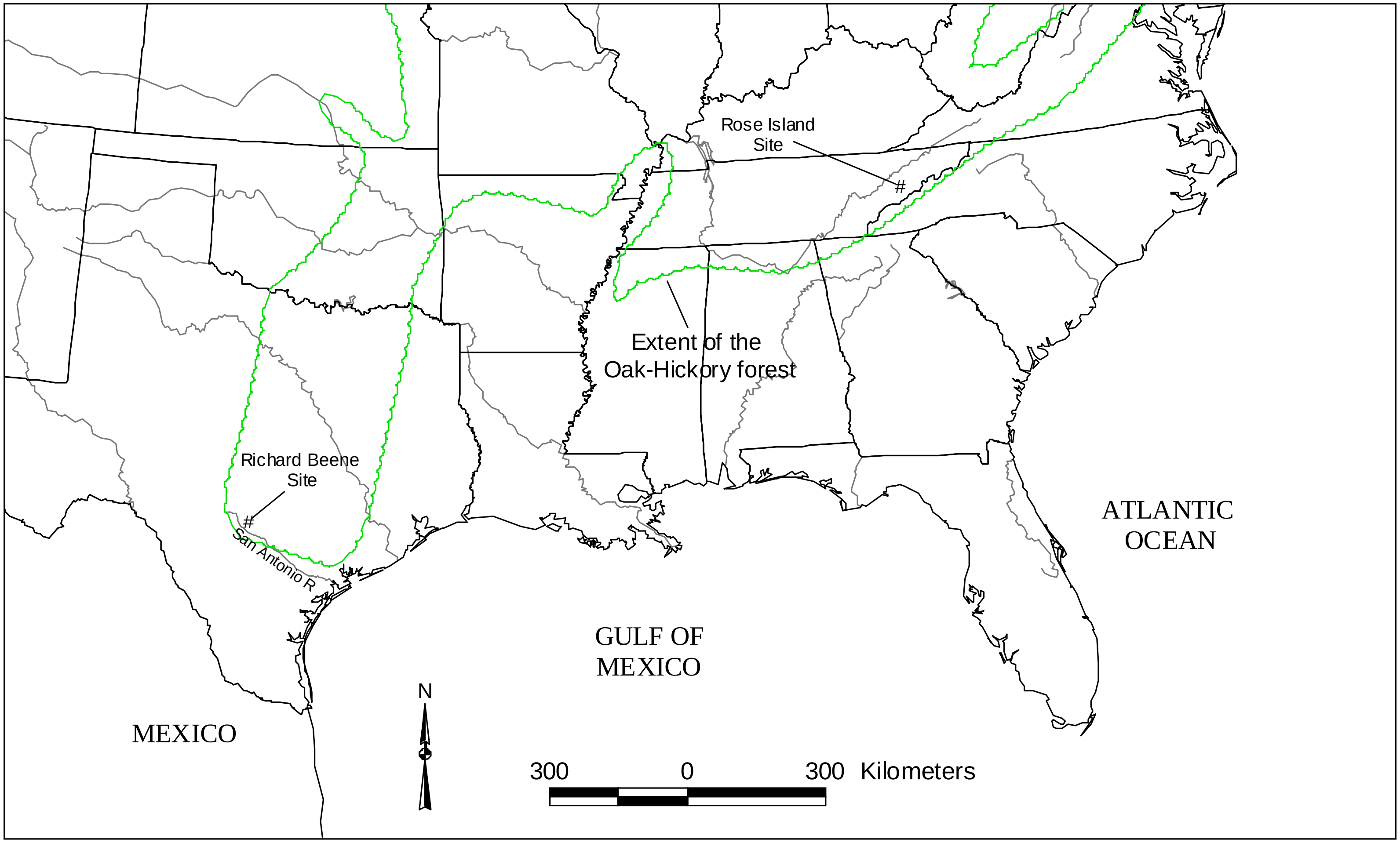


Figure 10. Location of the Rose Island site in relation to the Richard Beene site (environmental data from Hunt [1974:Figure 8.3]).

only grid-plotted. FCR was only recorded for a portion of the excavation area and, therefore, was not included in the spatial analysis conducted by Kimball (1981:10). Furthermore, no faunal remains were recovered due to poor preservation conditions (Kimball 1981:20).

Three feature types are recorded at the Rose Island site (Kimball 1981:17). Surface fired areas consisting of compact, oxidized clay resulting from a surface fire which are assumed to be family hearths. Rock basin hearths are shallow pits containing FCR and charcoal and were probably used as ovens. Rock free, charcoal-filled pits do not contain FCR and are thought to have been used as smudge pits for hide smoking. All of these features are less than 1 m in diameter.

Kimball (1981:21-38) generates a series of archaeological expectations about the nature and distribution of artifacts indicative of activities including "shelter construction and use; hearth use; preparation and consumption of plant and animal resources; hideworking; manufacture of bone, antler, wooden, and lithic implements; and the use and maintenance of tools." His expectations are based on ethnoarchaeological models of hunter-gatherer site structure.

Artifact density maps were used to detect distribution patterns expected to result from specific activities (Kimball 1981:41-43). Unconstrained clustering was then performed followed by an analysis of variance within and between the clusters. Kimball (1981:68) identified hearths located near shelters with activities such as nut processing, food consumption, some flintknapping, tool maintenance, and hideworking conducted around the hearth. Roasting pits and hide smoking pits were usually located on the opposite side of the shelter from the family hearth. Shelters in both components followed the pattern expected for warm weather shelters (small not containing hearths) as opposed to cold weather hearths (large containing hearths) (see Kimball 1981).

Kimball (1981:69) identified the location multiple, sometimes overlapping features of the same type together and interpreted this as indicating reuse of the site, wherein similar activities were conducted in the same general areas. While not recorded by the ethnoarchaeological research, this pattern certainly seems plausible (Kimball 1981:69). Kimball (1981:69) suspects that occupants of the site most likely had knowledge of past site layouts and used landmarks such as trees and topography to relocate previously occupied sites. By building features in the same locations, the site's occupants could take advantage of building materials left behind and avoid debris dumps generated by previous inhabitants. Overall, Kimball (1981:72-74) concludes that site structure at the Rose Island site follows expectations based on ethnoarchaeological research (Figure 11). His study paves the way for additional applications of middle range theory to archaeological assemblages.

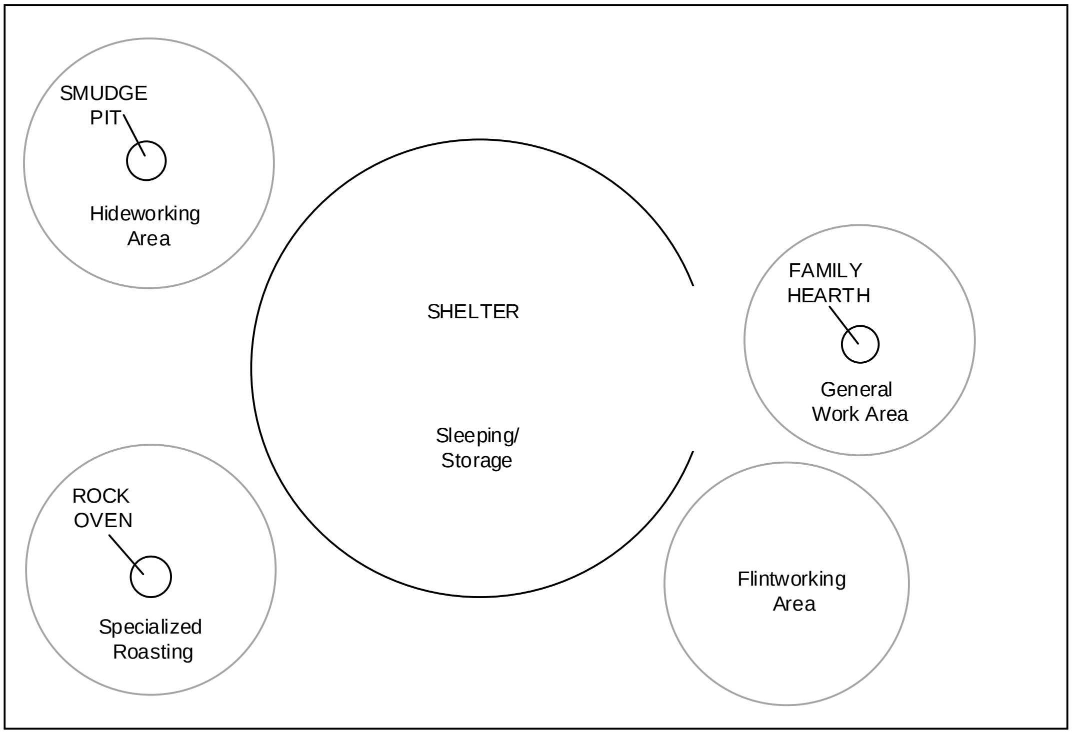


Figure 11. Depiction of Kimball's (1981:Figure 17) model of site structure at Rose Island.

Summary

Overall, the spatial analysis undertaken during the Richard Beene study investigates the spatial patterning of four variables (lithic debitage, vertebrate fauna, FCR, and mussel shell) from two large components dating to approximately 8800 and 6900 B.P. at the Richard Beene site. This analysis follows two procedures: qualitative visual interpretation of maps and quantitative spatial analysis. Qualitative visual interpretation of artifact density, features, and tool distribution is especially useful in identifying the intensity and nature of occupation throughout the components. Quantitative spatial analysis follows the procedure described by Whallon (1984) as unconstrained clustering, a spatial analysis technique designed to identify homogeneous clusters of artifacts within archaeological sites. The composition of these clusters can then be compared to expectations about the archaeological record (see Chapter VI) to determine site structure and to indentify and possibly offset the effects of post-depositional disturbance.

Background and methods of spatial analysis have been outlined within this chapter. Expectations based on ethnoarchaeological and prehistoric archaeological studies will be detailed in the following chapter. Each component is analyzed separately (Chapters VII and VIII) and then the results from each component are discussed in relation to the research questions, expectations, and previously recorded sites (Chapter IX).

CHAPTER VI

THEORETICAL BACKGROUND: ACTIVITY AREA RESEARCH

To adequately address the specific questions posed about site structure and post-depositional disturbance for this study entails that assumptions be made about the nature of the archaeological record. It is first assumed that the deposition of artifacts and items at a site by its inhabitants will be patterned according to the specific activities performed. It is further assumed that specific activities performed would have required the use of a specific set of tools known as a *tool kit*, and would have been carried out in specific locations within the site known as *activity areas*. Another assumption concerning this topic is the idea that tool kits and activity areas will be discernable in the archaeological record, assuming that significant post-depositional disturbance has not occurred. The following discussion illustrates examples of how ideas about activity areas and tool kits have been applied to archaeological studies and reveals some of the embedded controversy.

Activity Areas Defined

The concepts of activity areas and tool kits have become a standard part of archaeological literature due in large part to the work of Lewis and Sally Binford (Binford and Binford 1966). Activity areas can be identified due to the "fact that socio-cultural systems vary in the degree to which social segments perform specialized tasks, as well as in the cyclical pattern of task performance at any given location. These differences have spatial correlates with regard to the loci of task performance" (Binford 1964:432). Tool kits are formed when "a group of people occupy a location and are engaged in a specific activity…[and]…employ a number of different tools" (Binford and Binford 1966:242). While the number of tools may vary due to the number of individuals involved in the task, "the proportions of the tools used in the activity would remain essentially constant” (Binford and Binford 1966:242).

Over the years, archaeologists have critiqued and expanded upon these concepts (e.g., Schiffer 1972, 1976; Struever 1968) and entire books have been published on the topic of activity areas (e.g., Kent 1984, 1987). Ethnoarchaeological researchers have also described activity areas among living people, but point out that direct application of the concept to archaeological evidence entails flawed assumptions. Chief among these are the implied assumption that similar adaptational patterns can be expected in spite of differences in environmental regimes and that post-depositional forces are not especially imporant in the creation of archaeological records (Yellen 1977).

Activity Area Research Applied to Ethnoarchaeological Data

Identification of activities within an archaeological site is probably one of the most fundamental tasks for the archaeologist. In fact, one of Binford’s (1983:144; emphasis in original) “Big Questions” is “how early man organized his *life space*-the location and spatial relationship of activities.” Without understanding what a site’s inhabitants were doing, it is almost impossible to address more involved questions about their culture.

As the primary proponent of the term activity area, Binford (1978a, 1978b, 1983) has produced a number of descriptions of activities expected to be represented in the archaeological record. His ethnoarchaeological research centers around the excavation of sites created by living hunter-gatherers. By ethnographically observing the activities and then recording artifact distributions before post-depositional effects occur, Binford (1981) and other researchers (e.g. Gould 1980; Yellen 1977) have created a base of knowledge about activity areas that can be applied to prehistoric archaeological sites.

This knowledge base has led to the development of a group of middle range theories (Binford 1981; Gould 1980; Yellen 1977). Middle range theory is the use of “actualistic studies designed to control for the relationship between dynamic properties of the past…and the static material properties common to the past and the present" (Binford 1981:30) to build theories about archaeological deposits. In this case, the actualistic studies are all ethnoarchaeological.

Ethnoarchaeological Research

The ethnoarchaeological research summarized here is based on studies of three hunter-gatherer groups from three continents and provides the basis for the expectations generated later for the Richard Beene site. Yellen (1977) studied the !Kung; hunter-gatherers living in a warm, mainly dry portion of Africa. Binford (1978b) studied the Nunamiut, hunter-gatherers in the cold climate of Alaska. Both Binford (1987) and O'Connell (1987) developed models based on the Alyawara, hunter-gatherers in Australia whose environment is similar to that of the !Kung. While some behavioral differences can be expected among the various environments, the information about site structure is applicable to other hunter-gatherer groups (see Kent 1987; Kroll and Price 1991).

Yellen's (1977) ethnoarchaeological investigations of the !Kung in Africa led him to develop a model of how hunter-gatherer sites are arranged spatially (Figure 12). His model is based on an idealized camp layout that is centered around a communal area (Yellen 1977:126). Family groups each build their huts in a circular pattern surrounding this communal area. Each family group has its own space called the nuclear area. Each nuclear area contains at least one hearth and a hut (Yellen 1977:86). Within nuclear areas, most activities occur near hearths and artifacts tend to be clustered there. Huts in this hot climate are mainly used for shade during the day and only used for sleeping in during a rainstorm (Yellen 1977:86-87). Surrounding the entire camp is an outer ring used for various activities including those that are not appropriately conducted within the communal or nuclear areas such as large animal butchering, skin drying, and large roasting pits (Yellen 1977:129). These special activity areas usually contain lower density

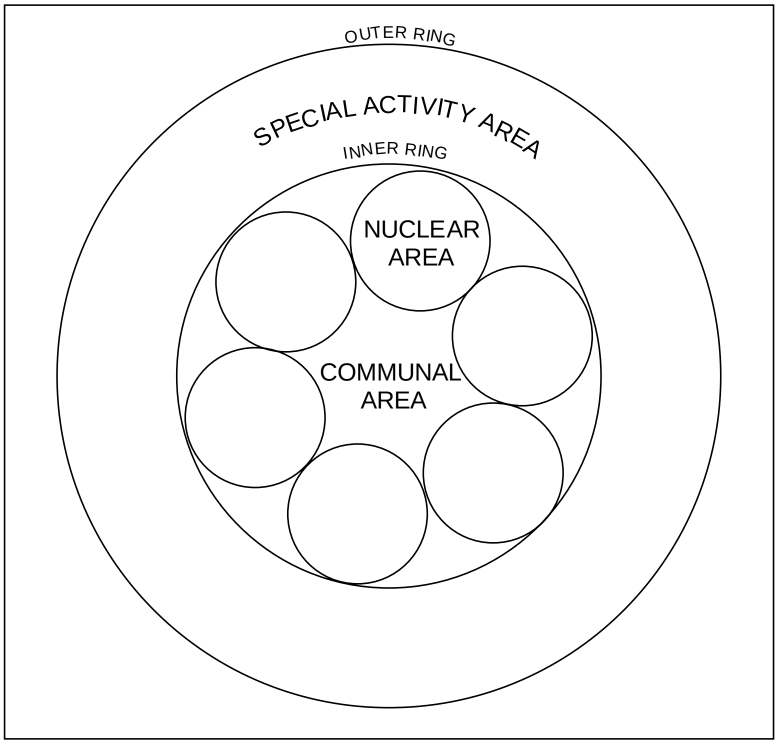


Figure 12. Depiction of Yellen's (1977:Figure 12) model of !Kung site structure.

clusters of artifacts compared to the nuclear areas. Note that activities conducted within the nuclear areas can also occur as a special activity in the outer ring.

Activities conducted in the communal area usually include all or most of the entire group occupying the camp. These activities include dancing and meat distribution and tend to have few material remains (Yellen 1977:90). Activities within the nuclear area are, as mentioned above, conducted primarily near the hearth and only involve members of the immediate family. These activities include cooking, plant food processing, tool manufacture, and clothing manufacture. The hearth is a small (less than 1 m diameter) depression containing a mixture of ash, charcoal, and sand. Artifact clusters surrounding the hearth are the remains of the various activities mentioned above and are usually not discrete. Huts rarely contain any artifacts (Yellen 1977 87-91).

Yellen draws important conclusions concerning the concepts of activity areas and tool kits as well as the spatial arrangement of activities. Since many different activities are conducted around the hearth, Yellen (1977:97) believes that the idea that a toolkit can be associated with a specific activity is erroneous and concludes by stating that only “generalized activity areas” can be defined. He also observes that “the location or locations for any particular kind of activity may then be predicted if such factors as the social context in which it takes place, its messiness, the amount of space it requires, and the time of day are known and considered” (Yellen 1977:85). Rather than allowing archaeologists to easily determine the locations of activities, this “complex set of interactions precludes the simplistic notion that a straightforward correlation exists between a specific activity and a unique location” (Yellen 1977:85-86).

Binford (1978b) developed a model of behavior for a specialized activity camp during his study of the Nunamiut in Alaska. While his model has similarities with Yellen’s description, an important difference is that Binford claims discrete activity areas and tool kits can be identified within a site. He attributes this difference to “differences…in what we [Binford and Yellen] consider to be appropriate uses of empirical materials and the role of our thoughts versus our observations” (Binford 1978a:359). Basically, Binford (1978a:359-360) believes that Yellen is only providing descriptions, not explanations, of what he sees. Binford (1978a:350-361) also notes, however, that the differences between the !Kung and Nunamiut contributed to the different archaeological signatures observed during the two studies and that these differences should be further examined.

Binford’s (1978b) model is based on his study of a specific site type in the Nunamiut system known as a hunting stand. He has since applied a portion of the model to residential sites (Binford 1983) specifically to address disposal patterns of individuals as they are seated around a hearth and whose activities create varying types of debris (Binford 1983:152-155). For example, tiny fragments are dropped as they are created near the individuals in a *drop zone*. Larger fragments are tossed either in front of or behind the individuals into a *toss zone* (Figure 13). As the site is occupied for longer amounts of time, other hearths are built and a similar pattern of activity is created around each one. Previous dumps are used if within reach for dumping of more materials.

During a different study of the Australian Alyawara, Binford (1987) and O'Connell (1987) both describe patterning similar to that observed by Yellen (1977). Binford's (1987) model is more general and is centered around what he calls the domestic space which typically includes cooking and sleeping areas that may or may not be sheltered (Figure 14). A peripheral zone surrounding the domestic space is made up of inner and outer zones of refuse and activity areas (Binford 1987). Dumps and specialized work areas are located outside the domestic area. Shelter from the elements (e.g., shade) can play a role in the location of the specialized work areas. The location of activities is also dependent on the scheduling of tasks. Multiple factors determine the size of activity areas such as the posture of the participants, scale of the work, and size of the work force (Binford 1987).

O'Connell (1987) makes more specific observations about the Alyawara, refining Binford's model. As in Binford's model, O'Connell describes that most activities take place within the household activity area, a cleared area about 10-20 m in diameter surrounding the hearth and sleeping shelter. Special activity areas and disposal areas are located outside the household area.

Activity placement can be dependent on a number of factors including group composition, the number and nature of simultaneous activities, weather, shade, and shelter (O'Connell 1987:74-75). O'Connell found that different activities could be

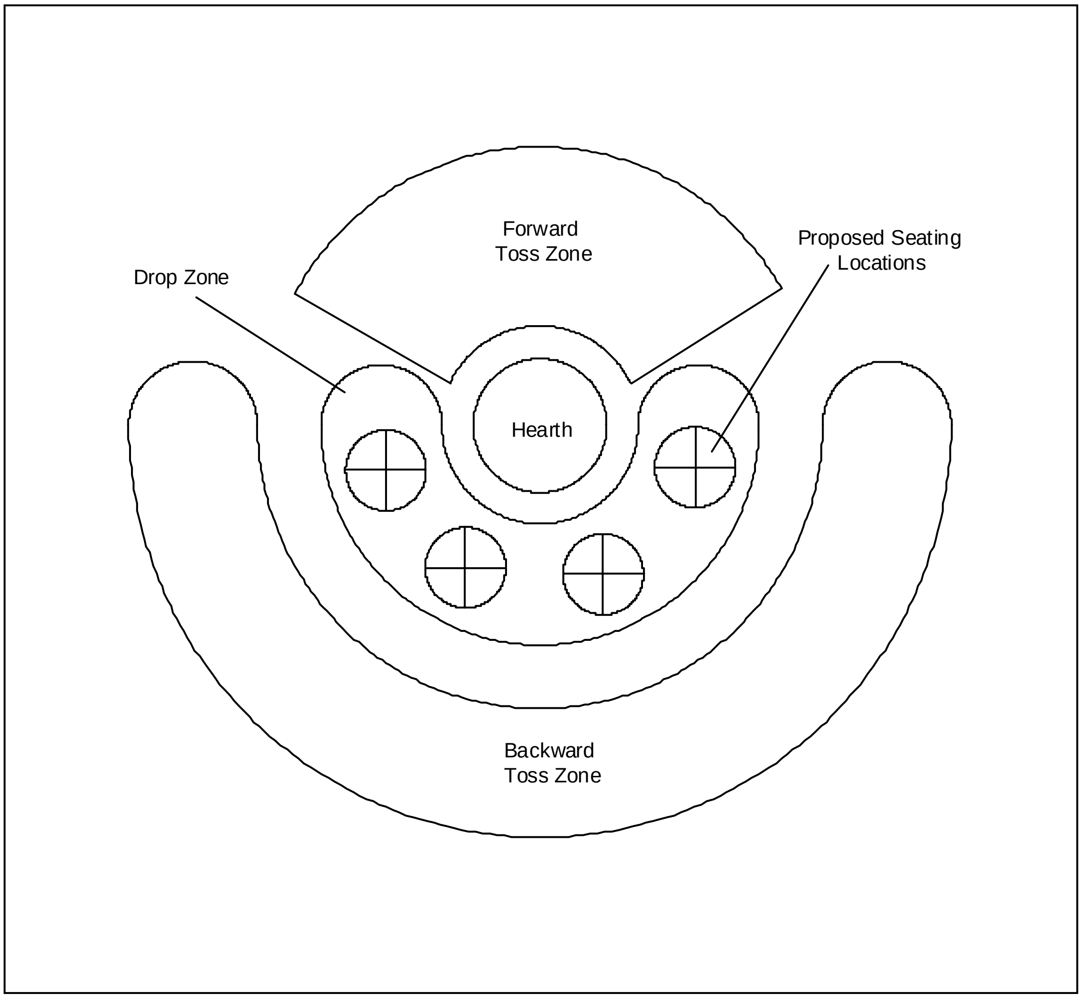


Figure 13. Depiction of Binford’s (1978b:Figure 89) model of Nunamiut disposal patterns.

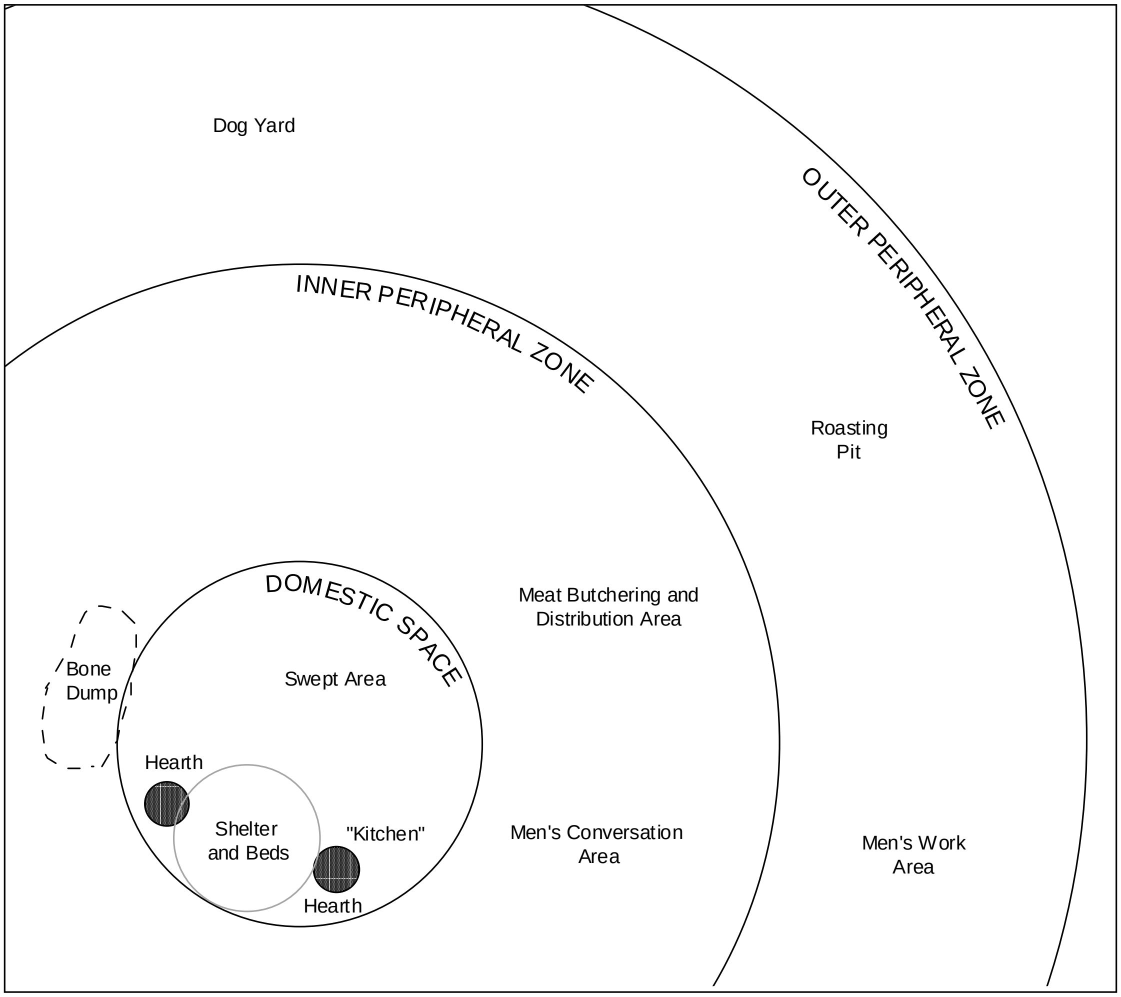


Figure 14. Stylized version of Binford’s (1987:Figure 10) model of Alyawara site structure.

performed in the same location, while the same activities might be performed at different locations. This leads him to propose that activities do not produce identifiable sets of artifacts. Further clouding the archaeological record is disposal which removes the debris from activities to different locations. O'Connell (1987:81) notes "the longer a camp is occupied, the broader the range of activities likely to take place there, the greater number of people likely to be involved, and the larger the space required to accommodate them. Household members react to this by gradually clearing and expanding the activity area as necessary." This statement is reminiscent of Yellen's (1977) observations concerning size and richness of a site as compared to length of duration (see above).

O'Connell (1987:82) describes a system of size sorting of debris in which items larger than 5 cm are tossed directly into the refuse area, while smaller items are dropped in place. Subsequent sweeping or raking may disturb and remove these smaller items from the household activity area. The size of refuse areas can vary according to the size of a household's population, the length of occupation, the size of items produced, and the rate of production. The density of the refuse area is highest near the household activity area.

Several important conclusions are made by O'Connell (1987) about patterned activities among the Alyawara. Concerning distinct activity clusters, "the longer a site is occupied, the more likely clusters of facilities and refuse will have begun to coalesce, gradually becoming indistinguishable as separate entities…[Distinctive activity clusters are] likely to be preserved only in less intensively occupied areas, generally along the margins of the site" (O'Connell 1987:90-91). He also suggests a similar organizational pattern between the ethnoarchaeological investigations of the Alyawara, !Kung, and Nunamiut. Residential areas in these instances all tend to contain refuse features of various sizes which are related to locations of household activity areas, special use areas, and secondary refuse areas.

> Variation in the size, content, and internal organization of these features appears to be the product of at least four factors: 1) the organization of subsistence, especially the relative importance of food storage, 2) the degree of seasonal variation in weather, especially the need for shelter, 3) the length of time each area is occupied or in use, and 4) the size of the group occupying or using each area [O'Connell 1987:103-104]

The generation of debris is an important factor in the formation of archaeological sites. Brooks and Yellen (1987) describe a model containing four debris generating categories as well as the modification of this debris at !Kung hunter-gatherer sites. Debris is generated through procurement, processing, consumption, and manufacture. The modification of this debris occurs through the creation of secondary refuse dumps. Note that inadvertent debris modification is discussed by Brooks and Yellen, but not assigned to a category. The placement and size of debris generating activities is constrained by environmental, technological, social, and spatial factors. For example, many activities depend on resource availability and unpleasant activities may be located away from the main camp. Brooks and Yellen (1987) identify the cooking hearth as a central element in many activities. While the main cooking hearth is located within a nuclear area, large ovens and ritual fires are usually located in periphery areas (Brooks and Yellen 1987:81). Activities may also be arranged spatially according to age, sex, status, and skill level of the participants.

Procurement involves "the gathering, hunting, harvesting, or collecting of natural materials for immediate or later consumption or manufacturing" (Brooks and Yellen 1987:70, 77-79). These activities tend to occur at specialized sites such as ambushes or quarries. Processing activities also occur at the procurement sites, but are common at residential camps and include the separation of edible from nonedible parts of both plants and animals through butchering, cracking, grinding, or roasting. Butchering and roasting are usually conducted in peripheral areas, while cracking and grinding are done near a cooking hearth (Brooks and Yellen 1987:71, 80).

Consumption of food items tends to occur near the cooking hearth although snacking and ritualistic consumption may occur at other locations (Brooks and Yellen 1987:81-82). The manufacturing of nonfood items into tools or other artifacts is also usually conducted near a cooking hearth, however artifacts are manufactured in outer areas and specialized and hunting tools are normally created away from the residential camps (Brooks and Yellen 1987: 82-83).

The creation of secondary refuse dumps, a form of debris modification, is an activity that has a tremendous effect on the overall archaeological appearance of a site. Debris is generated during each of the four previous categories through discard, loss, or deliberate caching. At short-term sites, items are normally discarded in close proximity to the area of last use, while more structured clean up and dumping activities occur at long-term sites. Secondary refuse dumps would typically be located outside the domestic area especially as the site was occupied for longer periods of time. Doershuk (1989:143) describes the content of refuse areas as containing material from all artifact categories. Trampling and other inadvertent modification of debris also occurs at sites and the extent to which items are disturbed by these factors can be linked to the length of time a camp is occupied (Brooks and Yellen 1987:90-91).

Activity Area Research Applied to Archaeological Data

One of the major problems with applying ethnoarchaeological data to archaeological sites is the effect of site formation processes. Schiffer (1987) called attention to general site formation processes, notably cultural transformations such as disposal and reuse during occupation and post-occupation, natural transformations such as alluviation and animal activity. The potential for these processes to completely change the nature of the artifact assemblage must be considered.

While site formation processes can be destructive, they do not necessarily alter the general nature of a site. To illustrate this point, Gregg et al. (1991) simulated the disturbances of post-depositional site formation processes on an ethnographically recorded site (Camp 14 from Yellen's [1977] study). The simulation involved deleting a good portion (ca. 60 percent) of the floral and faunal items from the database to simulate the deterioration of these items over time. The remaining artifacts were then randomly moved from their original locations using a computer program simulating the possible post-depositional movement of artifacts in an archaeological site. The simulation was run at three degrees of disturbance: minimum, moderate, and maximum, with the maximum category creating the effect of "relatively extreme" disturbance (Gregg et al. 1991:166).

The study compared results of analysis on these altered data with the conclusions drawn from ethnographic data. Integrity of the data and patterns of distribution were documented during the study. "The original spatial organization of a human site may be maintained in large part, though probably with some generalization or loss of resolution, through the relatively extensive attrition and physical disturbance that may occur during the process of its transformation into an archaeological location" (Gregg et al. 1991:195). While this analysis is encouraging, it may not be entirely accurate. It should be noted that post-depositional site formation processes do not actually disturb a site in a random pattern. In the case of flood disturbance (the most destructive force at the Richard Beene site), lighter artifacts would be expected to move further from their original locations than heavier ones. Deposition of the artifacts by moving water could be affected by large objects (e.g., trees, rocks) and ground slope, creating concentrations of artifacts in certain areas.

Expectations of the Archaeological Record at the Richard Beene Site

Spatial analysis (see Chapter V), along with the the ethnoarchaeological observations and their application to prehistoric archaeological sites can be used to derive expectations relating to the archaeological data sets from the Richard Beene site. These expectations, in conjunction with analytical results, are used to address the two questions posed in Chapter I: (1) Can interpreting patterns identified with unconstrained clustering reveal elements of site structure and (2) Can spatial analysis be used to identify and potentially offset the effects of post-depositional disturbance within the components?

Site Structure

Site structure can be defined as the patterns and associations between artifacts, features, and shelters within an archaeological site (South 1979:213). Evidence of activities performed at the site is contained within the density and spatial patterning of the artifacts recovered during excavation. The majority of these artifacts fall into four categories: (1) lithic debitage; (2) vertebrate fauna; (3) FCR; and (4) mussel shell. As discussed in Chapter IV, each of these artifact categories is associated with the use and discard of specific material during activities performed at the site.

This thesis relies on both qualitative and quantitative techniques together to address the research questions. Qualitative visual interpretation of maps allow the identification of low and high density areas compared to feature and selected artifact locations. Quantitative spatial analysis helps determine the spatial relationships among the artifact categories in question. By comparing the results of each technique, site structure and the effects of post-depositional disturbance may be identified.

A pattern of hunter-gatherer site structure emerges from the body of ethnoarchaeological research discussed in this chapter. Hunter-gatherer sites are typically organized into at least two main use areas: the domestic zone and the peripheral zone. Domestic zones can be related to Yellen’s (1977) nuclear areas or Binford’s (1987) domestic space and should contain at least one hearth, a shelter, and a sleeping area. Activities performed within the domestic zone are also expected to occur within the peripheral zone; however, activities performed within the peripheral zone are not expected to occur within the domestic zone.

Primary debris patterns within the domestic zone are expected to follow Binford’s (1978b) toss and drop model. Artifacts within the domestic zone are differentially subject to secondary disposal in refuse dumps. Clean up within the domestic zone is common to reduce the amount of debris located in heavily used areas, however smaller material may be overlooked. Clean up of activity areas within the peripheral zone is less likely, however activity areas in peripheral zones may be subject to becoming focal points for the dumping of material from domestic zones. Overall, clean up within the domestic zone would produce a low total density of artifacts while dumping in the peripheral zone would produce a high total density of artifacts. Some areas not used as dumps in the peripheral zone may have a low to moderate total density of artifacts.

Patterning of artifacts in each of the four artifact categories used in this study is affected by both primary and secondary disposal patterns. Lithic debitage is created during the manufacture and maintenance of stone tools. Most of this activity occurs within the domestic zone, however it can also occur in the peripheral zone. In either case, some lithic debitage is dropped as it is created, while other debitage and broken tools are tossed away from the activity area. Within domestic zones, the dropped debitage is less likely to be removed from the activity area. Because of this, lower density concentrations of debitage are expected within domestic zones, while higher concentrations of debitage are expected in peripheral zones.

The creation of vertebrate faunal remains is also common within domestic zones. Vertebrate faunal debris is created similarly to lithic debitage in that some fragments may be dropped, while others are tossed away. While dropped fragments may not be removed, high density concentrations of vertebrate fauna most likely indicate secondary disposal and are expected within peripheral zones. Dropped fragments not removed from the domestic zone may also be mixed with lithic debitage creating a low density scatter of both artifacts.

Primary deposition of FCR would be in the cooking facility in which it was used. The frequent cleaning out of hearths and ovens creates secondary deposition of FCR. Within a domestic zone, FCR should be primarily limited to within or near a cooking facility or within a secondary refuse dump along the edge of the domestic zone. Concentrations of FCR are mainly expected to occur within the peripheral zone. Mussel shell debris is created when mussels are eaten, which typically occurs in large numbers. This eating pattern would allow the clean up of mussel shell to occur easily, therefore, most mussel shell is expected to be located in a secondary refuse dump within a peripheral zone.

The identification of features is an important step in distinguishing domestic zones from peripheral zones. Hearths are described in each of the ethnoarchaeological and archaeological studies discussed above and seem to be fairly standard throughout hunter-gatherer sites. Hearths are located within the domestic zone and are typically a focal point for domestic activities. Exterior hearths would be used for daily cooking, be less than 1 m in diameter, and possibly contain some FCR. These hearths would be periodically cleaned out and the resulting scatter may increase the size of the feature somewhat. Interior hearths would similar in composition to exterior hearths, but would be smaller and more compact due to more careful cleaning and less scatter. Another common feature type in ethnoarchaeological and archaeological literature is the roasting oven. Roasting ovens typically would be located within the peripheral zone at a site. Roasting ovens may be larger than hearths and would contain large amounts of FCR. Larger features not containing FCR may have also served as roasting features for large animals or mussels. These features, too, would be located in the peripheral zone.

Features at the Richard Beene site are expected to fall into one of four definitions of function: (1) family hearths; (2) large cooking facilities; (3) mussel shell concentrations; and (4) middens. Within domestic zones, small (less than 1 m diameter) family hearths which may or may not contain FCR are expected. These hearths would have been used for various types of cooking (e.g., baking, boiling, roasting, grilling) and warmth and are described as being focal points for multiple daily activities such as tool manufacture, plant food processing, and socialization (Binford 1978b; Yellen 1977). It should be noted that family hearths can also be located within peripheral zones, but they are definitive of domestic zones. Outside domestic zones, large (greater than 1 m diameter) cooking facilities are expected that would have been used for roasting different food products. Depending on the food product being cooked, ovens may contain large amounts of FCR. Mussel shell concentrations represent secondary disposal related to mussel cooking and eating and are expected to be located in the peripheral zone. Repeated use of features near one another can lead to the formation of a midden, a very large (greater than 2 m diameter) concentration of FCR and associated debris.

The identification of domestic and peripheral zones also depends on the location of shelters. Shelters recorded in ethnoarchaeological studies vary according to the climate in which they were occupied (Binford 1978b, 1983; Yellen 1977). Shelters used within South-Central Texas by Indians are documented by Henri Joutel who traveled in the region in 1687 along with La Salle (Foster 1998). Joutel describes the shelters as domed huts covered with reed mats (Foster 1998:160). At times, many families lived together in large encampments of “at least 200 to 300 Indian huts...judging from the number of huts, there must have been 1,000 or 1,200 people” (Foster 1998:160). At other times Joutel encountered small hunting camps consisting of only about 15 people. “There were only three huts; they had women and children...situated in a small woods beside a stream” (Foster 1998:186-187). These descriptions suggest that about four or five people lived within one hut. Joutel does describe larger huts: “there were 24 or 25 huts and in each one there were five or six men and many women and children” (Foster 1998:167).

Even if the smaller huts are represented at the Richard Beene site, they would still be quite large, encompassing at least 10 m^2. Within the ethnographic literature, larger huts typically contain a hearth at which a variety of daily tasks are performed. Debris is cleaned out regularly creating an outer disposal area (Kimball 1993). An exterior hearth may also be present. Archaeological expectations of this type of shelter would include a large (6 to 15 m^2) area of low total artifact density containing a small hearth. An area of higher total artifact density may be located outside the shelter indicating a disposal area. Large shelters such as described by Joutel (Foster 1998) would encompass most of the domestic zone. Large shelters such as these are more typical of a cold weather campsite than one occupied during warm weather (Kimball 1981).

Site structure at the Richard Beene site is expected to follow these general patterns. Specifically, large shelters are expected at the Richard Beene site. The occurrence of large shelters at the site may indicate the site was occupied during cold weather. Occupation during cold weather could also be indicated by the presence of mussel shell and large amounts of FCR. Mussels are best collected and eaten during winter months.

FCR is an indicator that plant foods (specifically root foods) were being exploited. Root foods are best collected and eaten during the fall and winter months.

Shelters may initially be identified during the visual interpretation of maps by the co-location of low density areas and small hearths. Unconstrained clustering is useful in determining specific clusters of artifacts that are typical of either domestic or peripheral zones. Domestic zones should contain clusters made up of mainly lithic debitage and vertebrate fauna, but not contain high density concentrations of either. Slight amounts of mussel shell may also be present in domestic zones, but not common. Peripheral zones can contain clusters made up of a variety of materials indicating multiple activities or the location of a secondary refuse dump. Clusters mainly made up almost entirely of mussel shell and FCR should also be located in the peripheral zone.

Post-Depositional Disturbance

It is expected that unconstrained clustering can assess and possibly offset the effects of post-depositional disturbance. If post-depositional disturbance is extreme, spatial analysis may be unsuccessful in reconstructing site structure. Extreme post-depositional disturbance is expected to blur the archaeological assemblage. Clusters will be made up of a mixture of artifact categories and there will not be identifiable distinctions between domestic and peripheral zones. In the case of alluvial action (most likely at the Richard Beene site), floodwaters will create a mainly homogenized distribution of artifacts. In this case, composition of different clusters will be similar; artifacts may also be sorted by size and weight due to variable flow velocities.

Summary

Activity area research allows archaeologists to make inferences about the patterns identified in artifact assemblages. These inferences have been solidified into middle range theory allowing researchers to link ethnoarchaeological research to archaeological sites.

Key concepts from ethnoarchaeological research that can be applied directly to the Richard Beene site include the distinction between domestic and peripheral zones. This distinction can be made based on the locations of features and artifact concentrations as well as the composition of the artifact concentrations. The present study is designed to identify site structure at the Richard Beene site by comparing expectations outlined above to results of visual interpretation of density maps and unconstrained clustering.

The effects of post-depositional disturbance may also be identified by the use of unconstrained clustering. The present study is designed to mitigate the effects of low level post-depositional disturbance. Unfortunately, in the case of extreme post-depositional disturbance, site structure in the heavily disturbed areas will not be evident.

CHAPTER VII

SPATIAL ANALYSIS OF THE LOWER MEDINA SAMPLE

The Lower Medina sample is one portion of the Block G excavation area which is part of the Lower Medina component (Figure 15). Using the largest excavation area (139 m^2) allows for better interpretations about site structure. Future spatial analysis on the smaller excavation areas may be compared to the results of this study for interpretation. The Lower Medina component is thought to represent a briefly occupied, well preserved occupation surface (Thoms 1992).

The analysis of this sample is performed in three stages. First, an examination of the features is necessary to identify possible feature function. Second, the visual interpretation of density maps, selected artifacts, and features is used to identify possible domestic and peripheral zones. The identification of possible domestic and peripheral zones is then compared to the results of the unconstrained clustering in an effort to refine the qualitative analysis. Because of the undisturbed nature of the sample, clusters should represent definable aspects of site structure.

Description and Interpretation of Features

A total of 20 features was defined within the Lower Medina sample (Figure 16). These features are classified into types based on their morphology and contents (Clabaugh 2002; Table 4). Most of the features identified within the Lower Medina sample can be assigned to one of the four feature functions described in Chapter IV mainly by size and contents (Table 4). Clabaugh (2002) also assigns function to the features, but the definitions used in this thesis are slightly different.

The feature functions may be compared to the locations of artifact concentrations to identify possible domestic zones. Of the features within the Lower Medina sample, 13 are good candidates for possible family hearth features (Table 4, Figure 16). These

Figure 15. Excavations within Block G showing the location of the Lower Medina sample.

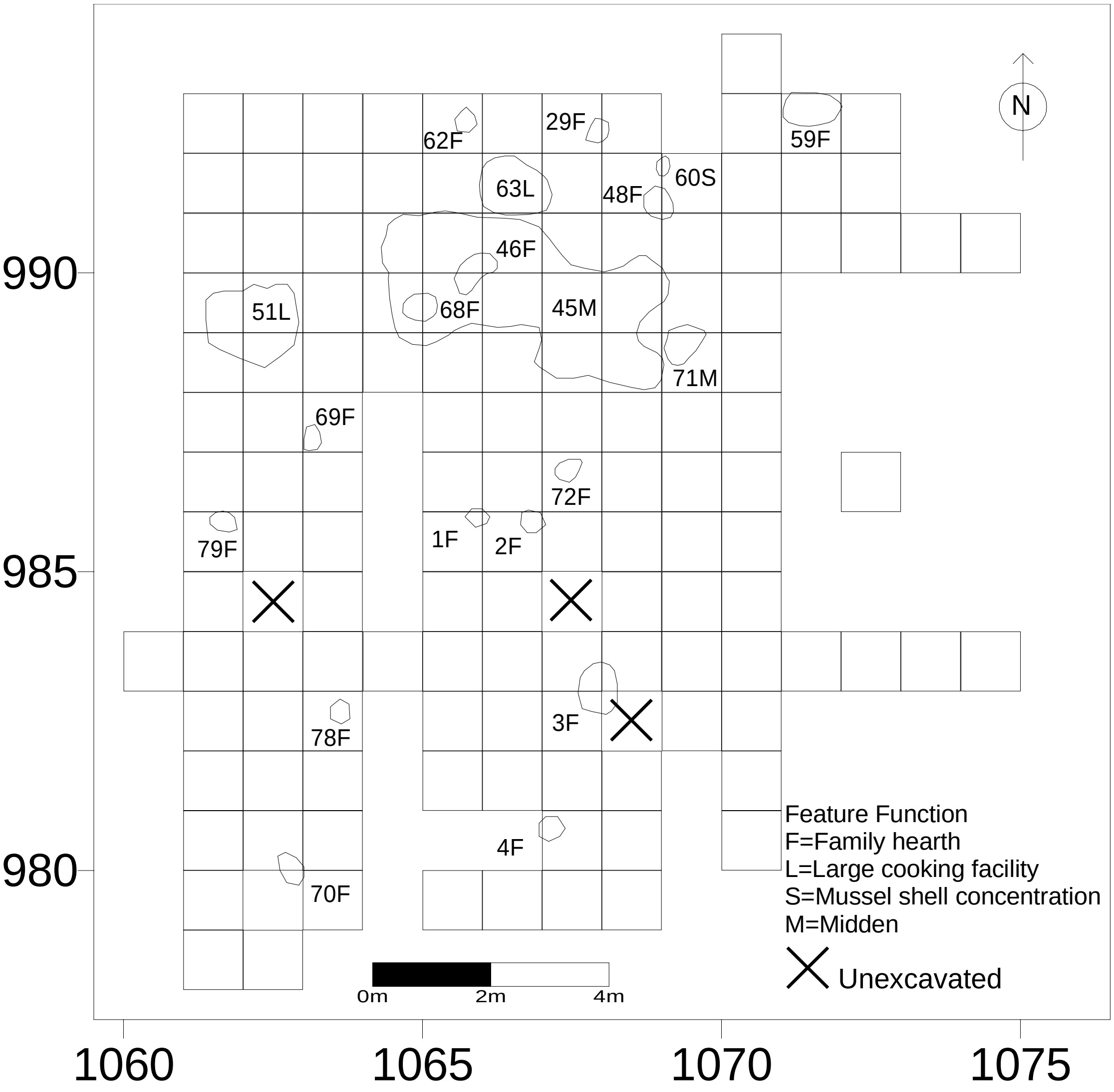


Figure 16. Outlines of features defined within the Lower Medina sample.

Table 4. Features defined within the Lower Medina sample.

Feature	Feature Type[a]	Possible Feature Function
1	FCR Concentration	Family Hearth
2	FCR Concentration	Family Hearth
3	FCR Concentration	Family Hearth
4	FCR Concentration	Family Hearth
29	Basin shaped, no FCR	Family Hearth
45	Midden	Midden
46	Oxidized area	Family Hearth
48	Basin shaped, burned sediment	Family Hearth
51	Basin shaped, no FCR, oxidized	Large cooking facility
59	Basin shaped with FCR	Family Hearth
60	Mussel shell lens with FCR	Mussel shell concentration
62	Basin shaped, no FCR	Family Hearth
63	Oxidized area	Large cooking facility
68	Basin shaped with FCR	Family Hearth
69	FCR Concentration	Family Hearth
70	Basin shaped, no FCR	Family Hearth
71	Mussel shell lens with charcoal	Mussel shell concentration
72	Basin shaped, lined with FCR	Family Hearth
78	FCR Concentration	Family Hearth
79	Oxidized area	Family Hearth

[a] Feature types defined by Clabaugh (2002).

features are all 1 m in diameter or less and are described as either FCR concentrations, basin-shaped, or oxidized lenses. Each of these descriptions allows the possibility of the features being hearths. Feature 72 is a prime example of the type of feature that may be considered a family hearth (Figure 17).

Visual Interpretation of Density Maps and Tool Distributions

Density maps of the Lower Medina sample were created in Surfer using data recovered during excavations. Five density maps are presented (Figures 18-22), including one for each of four artifact categories (lithic debitage, vertebrate fauna, FCR, and mussel shell) and one for the combined total of these values as a measure of total density.

Figure 17. Photograph of Feature 72, a typical basin shaped feature containing FCR (photograph by Rich Stocker).

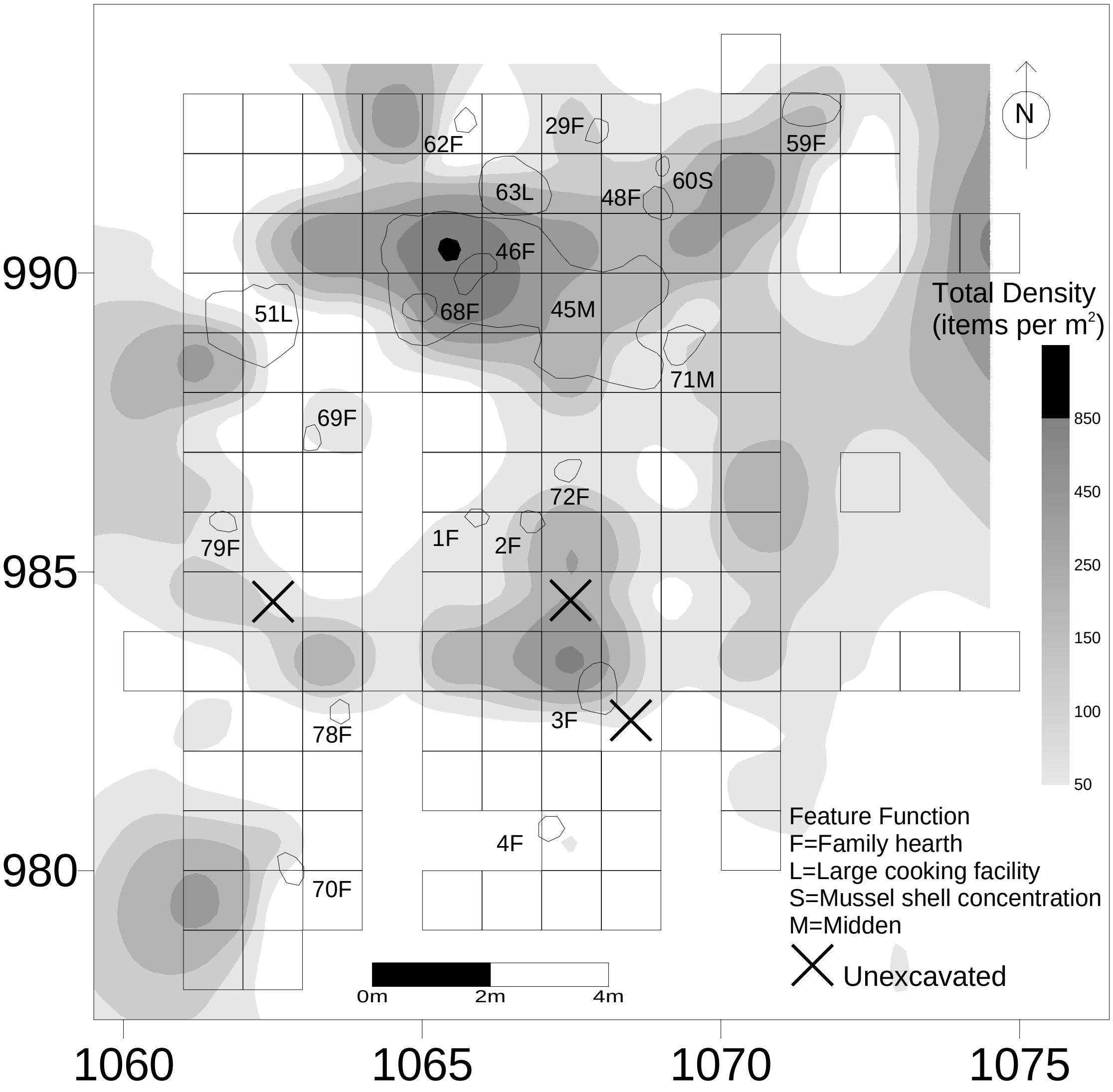


Figure 18. Total density of artifacts within the Lower Medina sample.

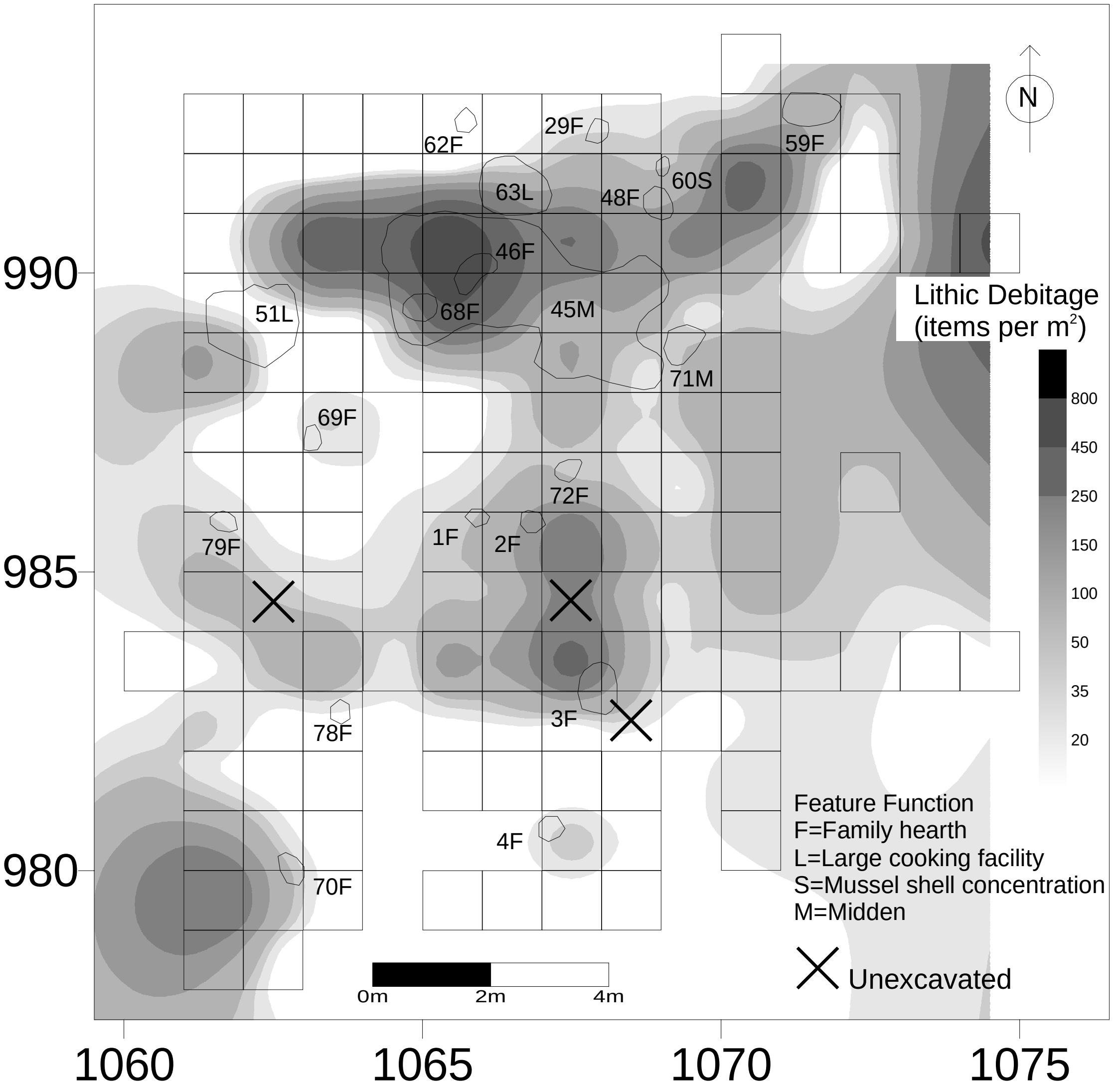


Figure 19. Density of lithic debitage within the Lower Medina sample.

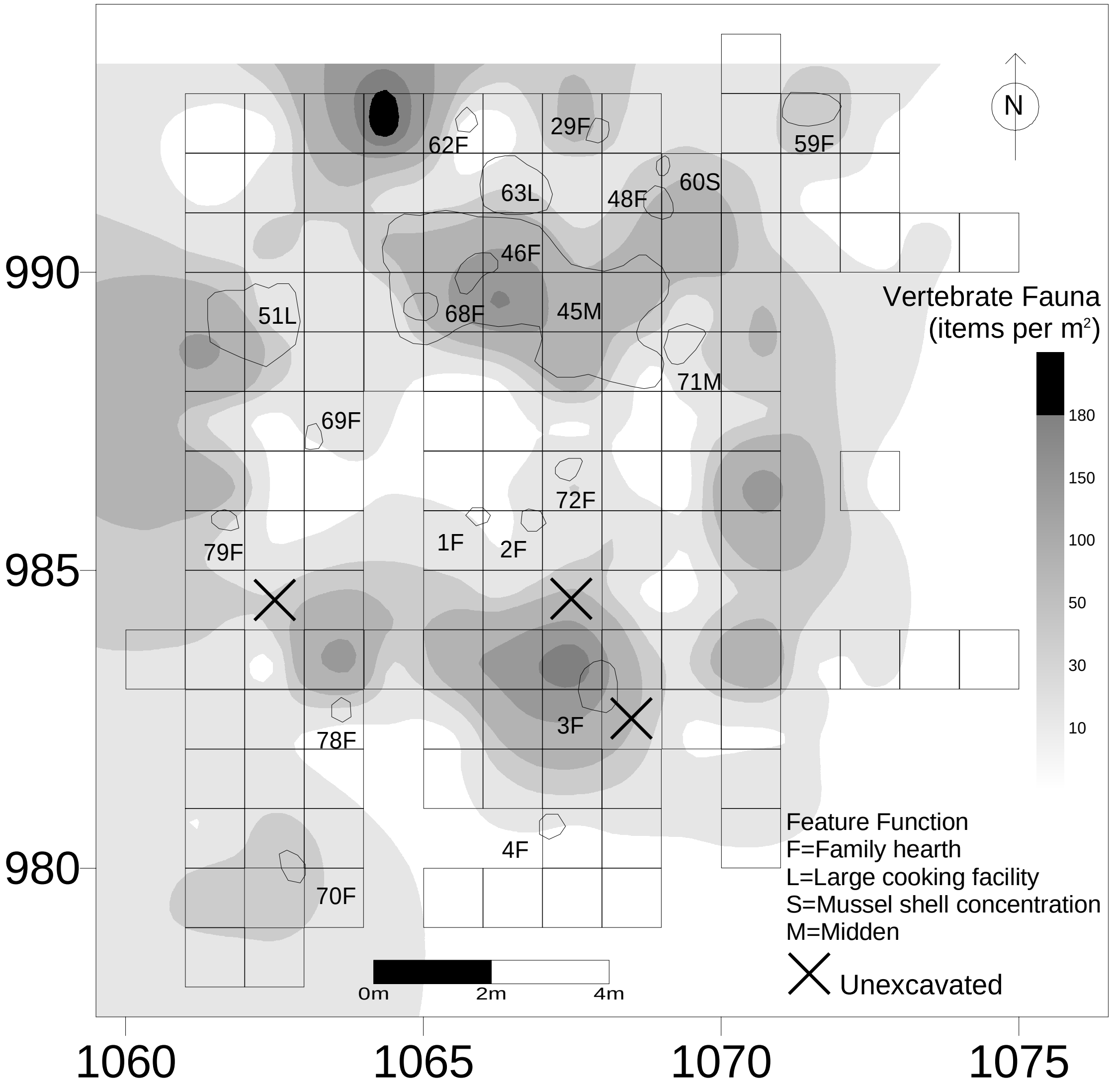


Figure 20. Density of vertebrate fauna within the Lower Medina sample.

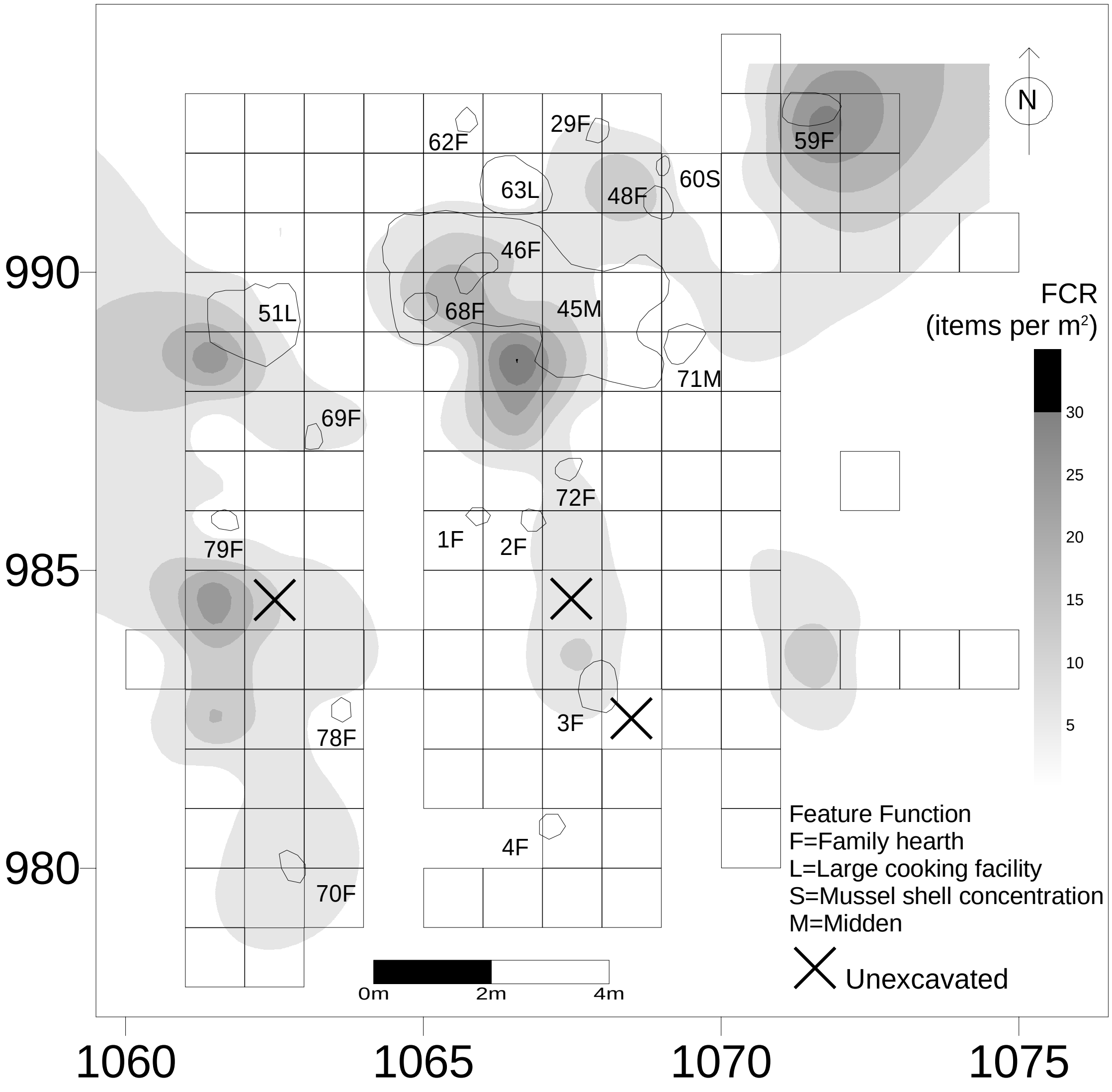


Figure 21. Density of FCR within the Lower Medina sample.

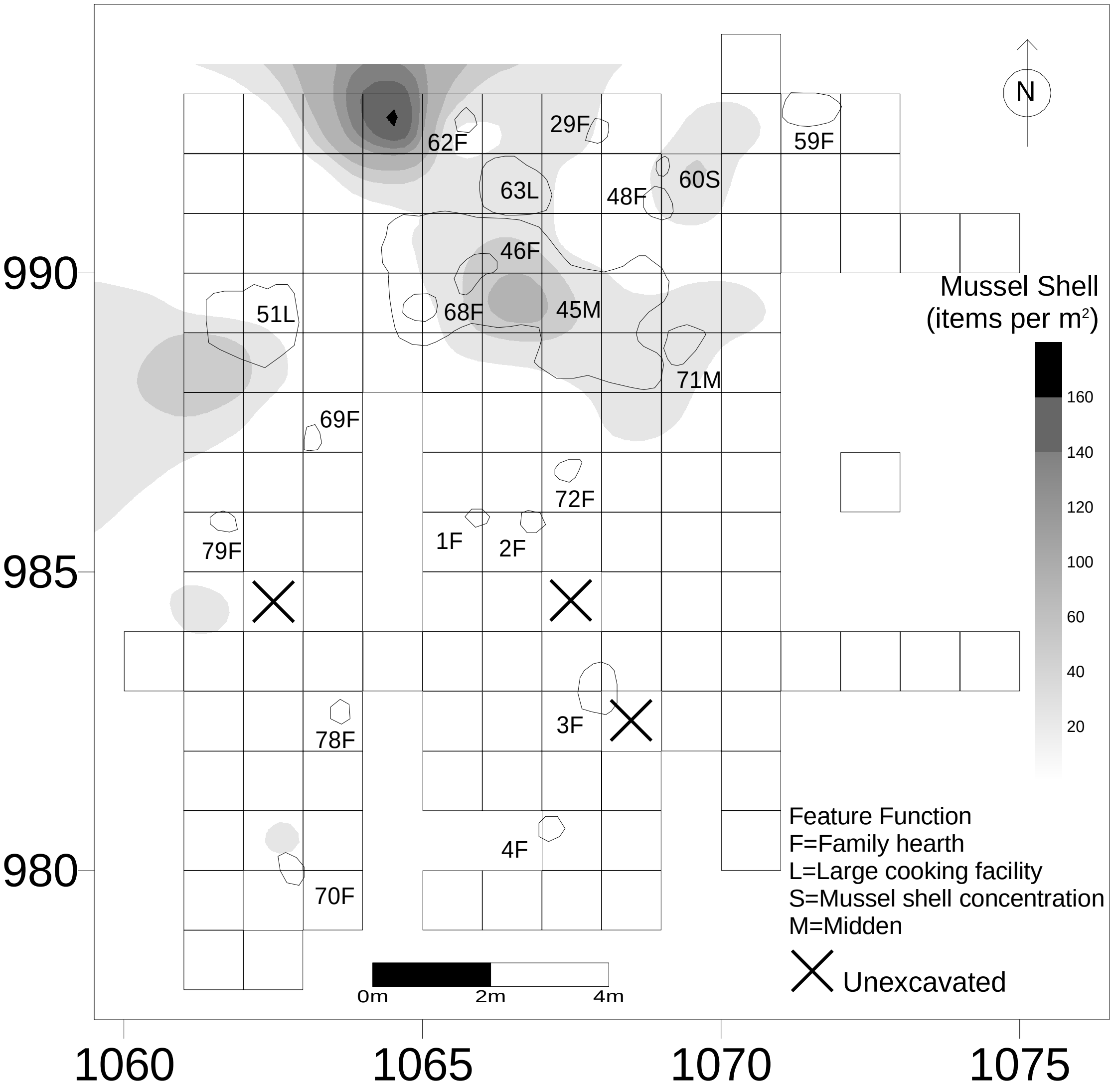


Figure 22. Density of mussel shell within the Lower Medina sample.

Interpretation of these patterns is compared to the results of unconstrained clustering that are presented later in this chapter.

Figure 18 depicts the total density within the sample and combines the data found in the other four figures (19-22). One of the most prominent features in this map is the major concentration of artifacts and features in the upper central portion of the map. Feature 45 encompasses much of this concentration and is best described as a midden deposit, consisting of debitage and fauna with some FCR and mussel shell and containing other defined features (Clabaugh 2002; Figure 18). Another prominent area of the map is the low total density area surrounding Feature 69. Feature 51 is defined as a basin with no FCR (Clabaugh 2002), however Figure 21 shows that the area near Feature 51 has one of the higher concentrations of FCR.

The density maps show that artifact concentrations tend to coincide with the definition of features. This pattern is distinct from ethnoarchaeological studies discussed in Chapter VI which indicate that artifact concentrations should surround features. The merging of features and artifact concentrations within the sample may indicate a distinct form of cleanup activity performed within this area. The large midden (Feature 45) in the center of the map may have been a major trash dump, while small hearths could have been used as immediate trash dumps. Observation of the hearth contents (Figure 23) seems to corroborate this interpretation by showing various artifact categories within many of the features. Note that not all features were excavated completely and that materials within these features were recorded, but not collected. This resulted in the representation of some of the features in the database being different from their representation in field documents, therefore, some features in Figure 23 do not appear to contain any material.

The locations of tools within the sample follow the basic pattern of total artifact

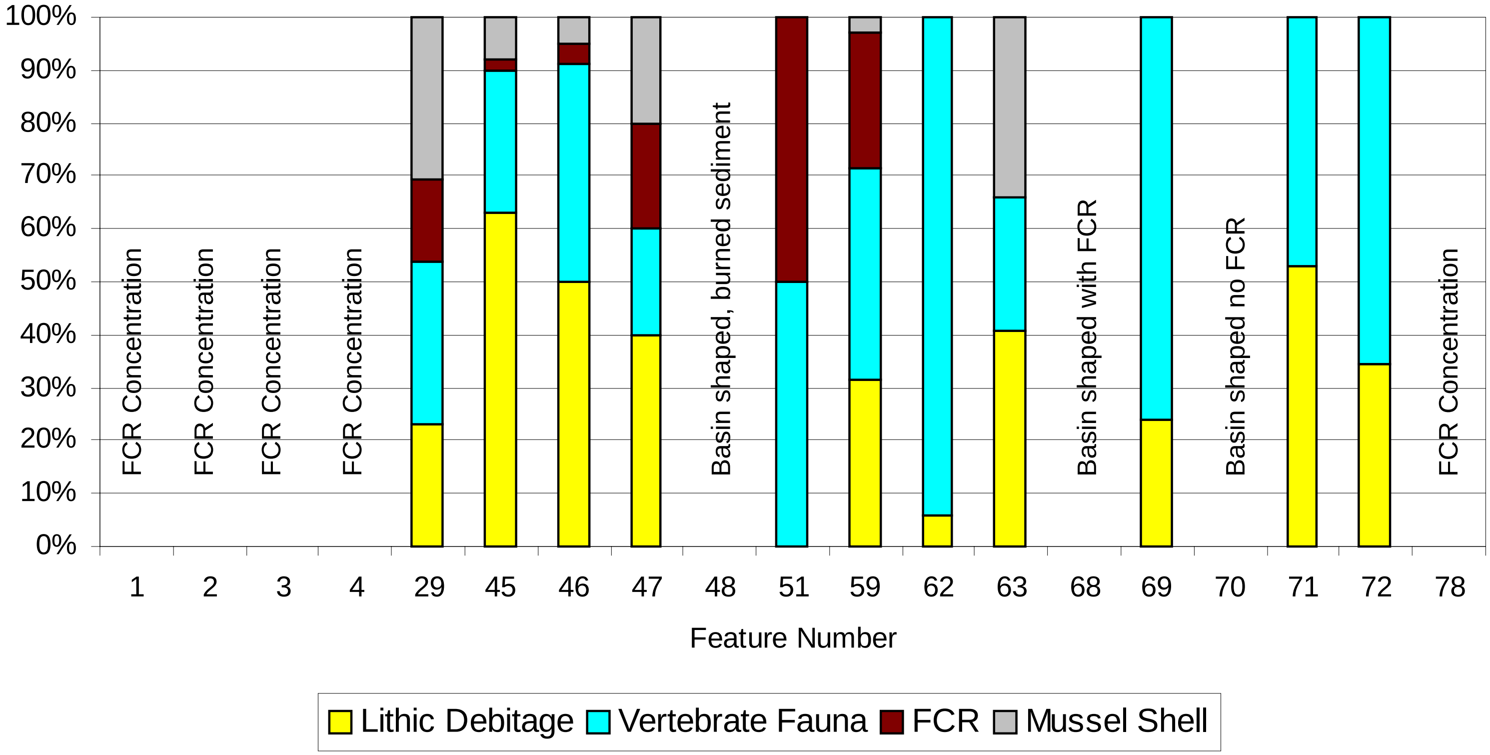


Figure 23. Graph of feature contents (contents of some features not collected).

density. Most tools are located in areas of high artifact density (Figure 24). This follows the expected pattern that tools would be disposed of outside of the domestic zone in high density areas.

Proposed Domestic Zones and Shelters

Proposed locations for domestic zones are based on comparisons of the locations of both possible family hearth features and low total density areas. The co-location of family hearths and low density areas is consistent with the descriptions of domestic zones by ethnoarchaeological and archaeological researchers (Binford 1978b, 1987; Bousman 1998; Kimball 1993; O'Connell 1987; Yellen 1977). Proposed locations of domestic zones and hearths are presented in Figure 25. Results from unconstrained clustering will later be compared to this information in an effort to refine the locations of domestic and peripheral zones.

The area of low total density surrounding Feature 69 is consistent with the expexctations of a domestic zone with a family hearth within a shelter (Figure 25). If this is the case, Feature 51 may represent an outer roasting pit possibly used for cooking various food items (as vertebrate fauna, FCR, and mussels are all present within or near Feature 51 [Figures 20-22]). Feature 79 may represent a secondary family hearth or a separate domestic zone with its own hearth and shelter. Concentrations of artifacts surrounding the low density area are interpreted as secondary refuse dumps.

Features 1, 2, and 72 are surrounded by an area of low total density (Figure 25). The location of these features together is interesting in that it may indicate the repeated use of this area as a domestic zone during different occupations. Kimball (1981) observed this pattern in his study at Rose Island (see Chapter V). The use of unconstrained clustering can help better define this area. Other low density areas near possible family hearths also indicate domestic zones. Low density areas are located near Features 3, 4,

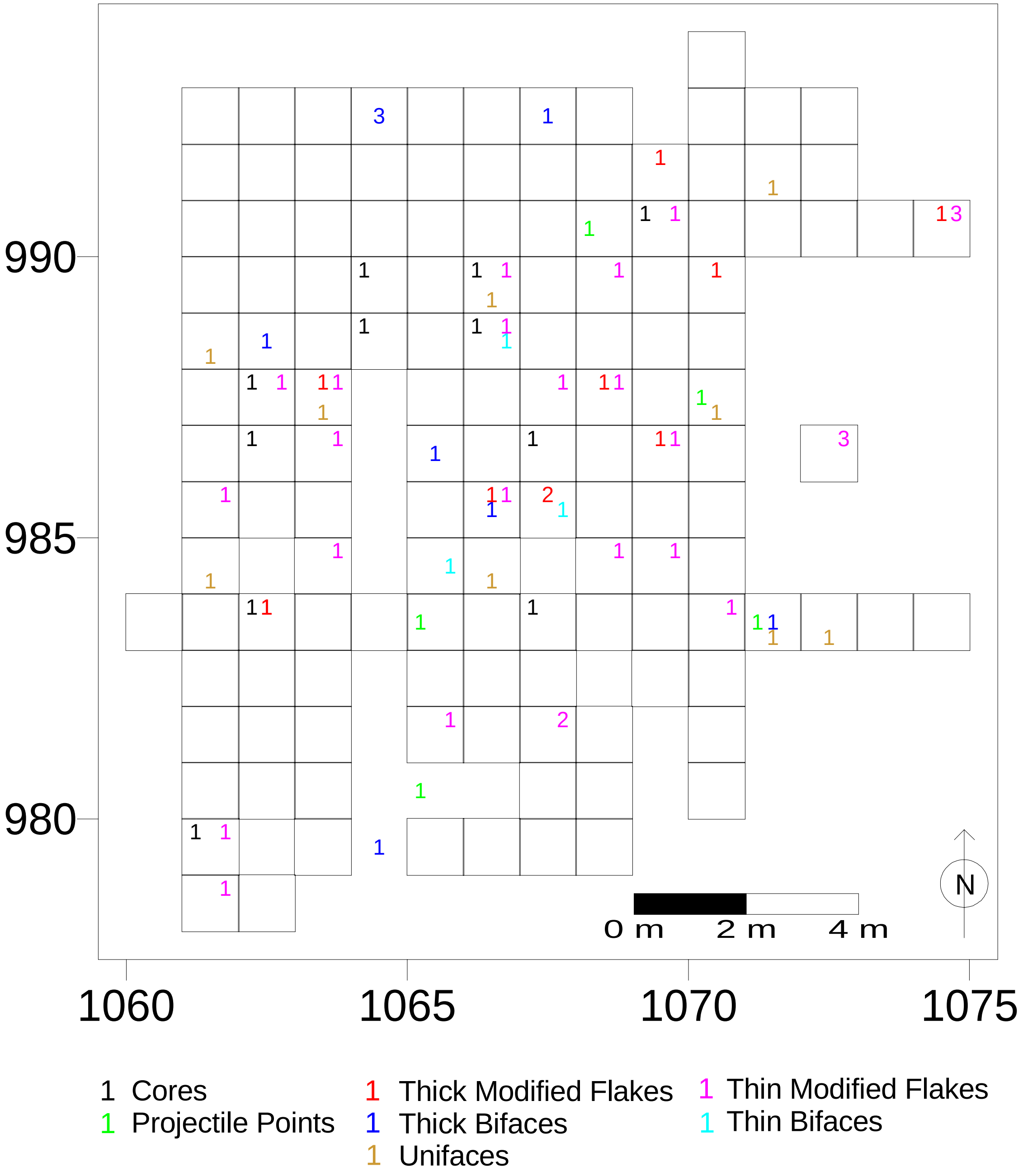


Figure 24. Distribution of tools within the Lower Medina sample.

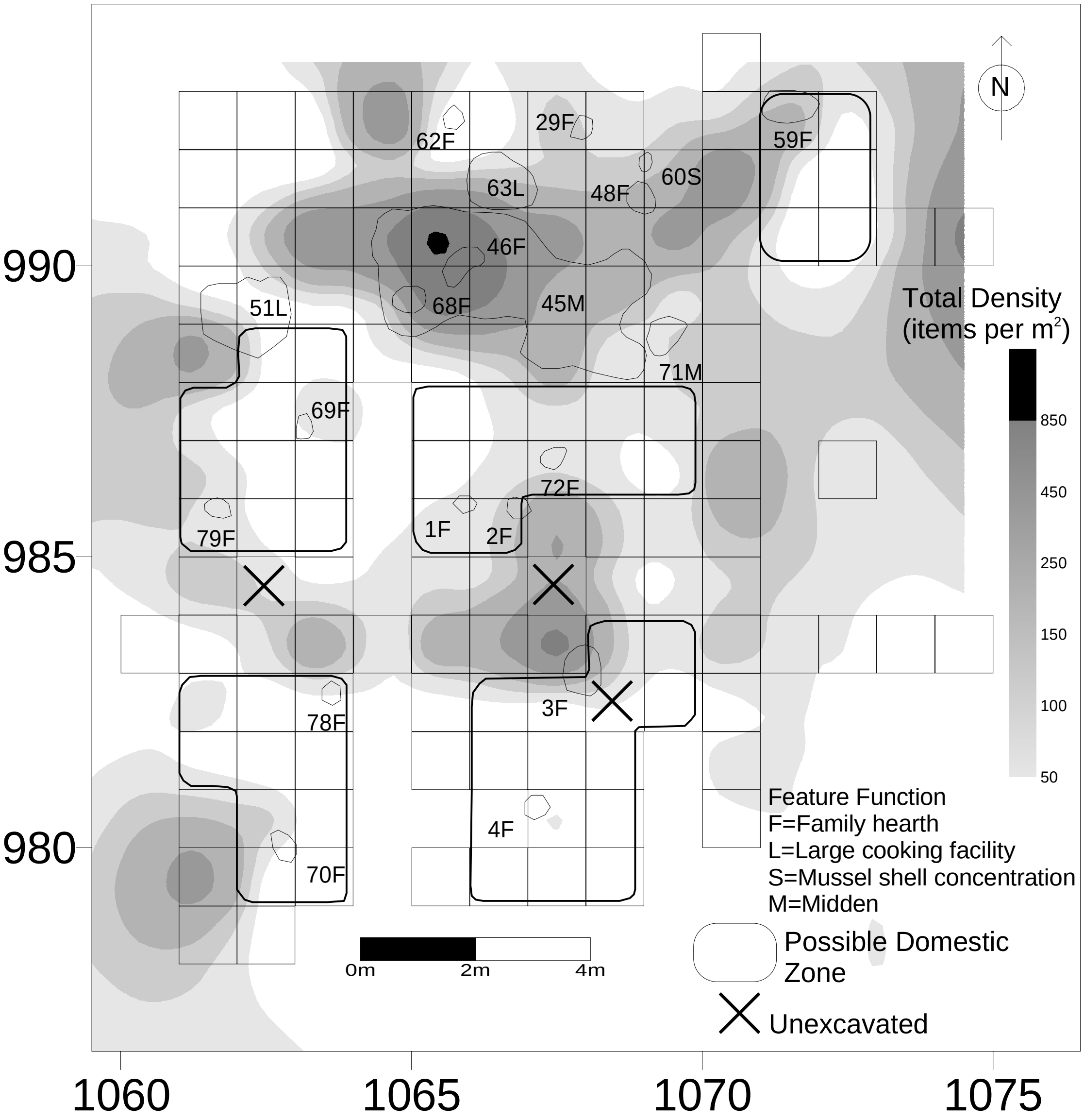


Figure 25. Proposed locations of domestic zones within the Lower Medina sample plotted against total density.

59, 70, and 78 (Figure 25). Each of these areas is surrounded by high density areas that could represent secondary refuse dumps in peripheral zones.

Features described as possible family hearths that are located in high density areas are Features 29, 48, 60, and 62. These features may represent one of two possibilities: the deliberate construction of small hearths for specific activities within the peripheral zone or multiple occupations in which the domestic zones associated with these hearths were mixed with peripheral zones. High concentrations of artifacts within Feature 45 are consistent with its definition as a midden and are interpreted as indicating a peripheral zone.

Unconstrained Clustering

The error graph produced during unconstrained clustering shows the first large deviance after six cluster types (Figure 26). The selection of six cluster types is corroborated by the dendrogram of this data (Appendix E). These cluster types are internally homogenous with respect to the relative densities of each artifact category. A complete list of the relative densities and cluster designation for each unit is presented in Appendix D. Table 5 presents the average relative densities of each artifact category according to cluster type. Cluster types are plotted in Figure 27 with squares representing cluster types expected to be found in domestic zones and circles representing cluster types expected to be found in peripheral zones. Interesting patterns obvious from Table 5 include the relative lack of FCR in almost every cluster type and the almost complete dominance of lithic debitage within the cluster types. The relative densities of each artifact category in each cluster type can be analyzed according to expectations proposed in Chapter VI pertaining to the occurrence of specific artifact categories within either a domestic or peripheral zone.

Cluster type 1 is made up mainly of lithic debitage (55 percent) and vertebrate

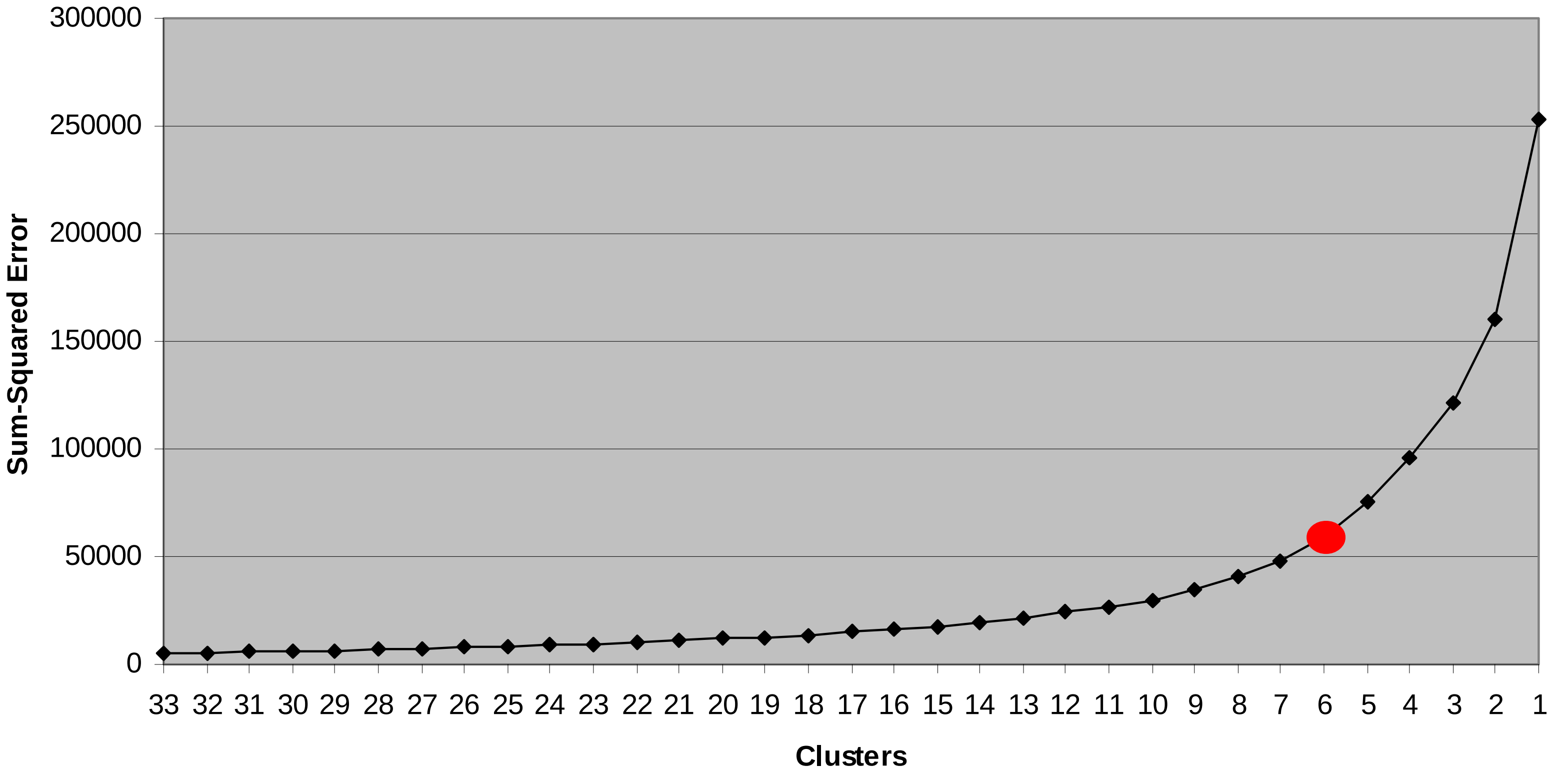


Figure 26. Variance graph of the cluster analysis for the Lower Medina sample.

Table 5. Description of cluster types within the Lower Medina sample.

Cluster Type	Relative Density				Number of Cells	% of Total Cells	Associated Zone
	Lithic Debitage	Vertebrate Fauna	FCR	Mussel Shell			
1	55	33	6	6	47	30	Domestic
2	92	5	1	2	47	30	Domestic
3	15	78	1	6	8	5	Peripheral
4	26	27	5	43	18	12	Peripheral
5	61	5	3	30	26	17	Peripheral
6	36	7	48	20	10	6	Peripheral

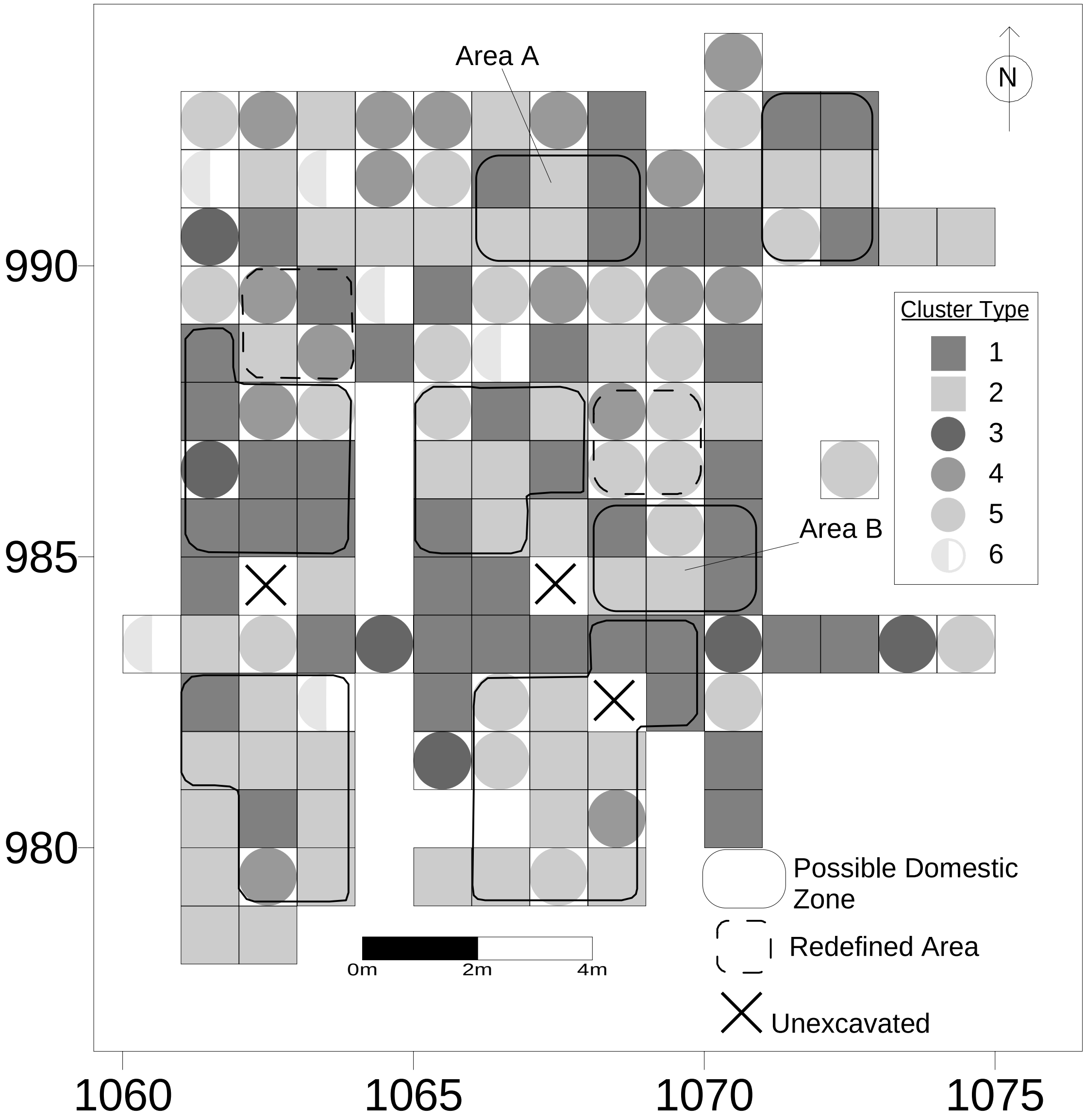


Figure 27. Cluster types plotted within the Lower Medina sample along with refined locations of domestic zones.

fauna (33 percent) along with very low (6 percent) average relative densities of FCR and mussel shell. This cluster type is represented mainly by moderate to large (5 to 15 m^2), linear clusters throughout the sample. These clusters span high, medium, and low total density areas. Clusters of type 1 are interpreted as representing a mixture of activities associated with the creation of lithic debitage and vertebrate faunal debris. Low total density areas of this cluster type are interpreted as representing debris missed during clean up in domestic zones. Occurrences of this cluster type in higher total density areas more likely represent secondary disposal of artifacts in peripheral zones.

Cluster type 2 represents an almost exclusive occurrence of lithic debitage (92 percent) (Table 5). Clusters of type 2 are small (1 to 3 m^2) or moderate sized (5 to 10 m^2) and are located throughout the sample (Figure 27). This cluster type tends to be located in low total density areas, but is also found in moderate to high total density areas. The creation of lithic debitage debris can occur in both domestic and peripheral zones. Low total density areas containing this cluster type are expected to be within domestic zones while higher total density areas containing this cluster type are more likely to be located in peripheral zones.

Cluster type 3 is dominated by vertebrate fauna (78 percent) and contains a moderate (15 percent) average relative density of lithic debitage. Clusters of type 3 are all one-unit clusters and are located in low total density areas. Concentrations of faunal material are expected only within peripheral zones.

Cluster type 4 contains moderate (26 to 43 percent) average relative density of all artifact categories except FCR (5 percent). Clusters of type 4 are small (1 to 3 m^2) and are located in both high and low total density areas. The mixed nature of this cluster type indicates that it represents secondary refuse dumps in peripheral zones.

Cluster type 5 contains a high (61 percent) average relative density of lithic debitage and a moderate (30 percent) average relative density of mussel shell. Clusters of type 5 are usually small (1 to 3 m^2), however one moderate sized (5 m^2) cluster is present (Figure 27). These clusters are mostly located in low total density areas, however some are in higher total density areas. Clusters of type 5 most likely indicate the secondary disposal of lithic debitage along with mussel shell and should be located within peripheral zones.

Cluster type 6 is notable as the only cluster type with a moderate (48 percent) amount of FCR. This cluster type also contains moderate amounts of lithic debitage and mussel shell. Clusters of type 6 are all one-unit clusters located in both low and high density areas. Clusters of type 6 represent a secondary disposal of FCR along with other material and are expected within peripheral zones.

Lower Medina Site Structure

Proposed domestic zones and shelters based on the visual interpretation of maps showing the co-location of possible family hearth features and low total density areas are mapped in Figure 25. A comparison of this analysis to the results from unconstrained clustering (discussed below) created refined domestic zones which are superimposed on the plotted cluster types (Figure 27). Cluster types 1 and 2 generally follow patterns expected to occur within domestic zones.

Cluster types 1 and 2 outside the proposed domestic zones could represent either activity areas outside the domestic area (following special activity areas defined by Yellen [1977]) or secondary refuse dumps that exhibit characteristics of the expected pattern of artifacts within the domestic zone. Occurrences of cluster types 1 and 2 in proposed peripheral zones may indicate domestic zones not identified by interpreting features and density maps. Area A in Figure 27 contains cluster types expected in domestic zones as well as a number of small hearths. This area was not categorized as a possible domestic zone because of the high density of artifacts (Figure 25). It is possible that this area was used as a domestic zone at one time. Area B in Figure 27 is an area of low total density, but does not contain a defined feature (Figure 25). Most of the units in this area are cluster types expected within a domestic zone. It is possible that his area was used as a domestic zone and the associated hearth is not preserved in the archaeological record.

Cluster types 3, 4, 5, and 6 and high density occurrences of cluster types 1 and 2 more closely follow patterns expected to occur within peripheral zones. Peripheral zone cluster types located within the proposed domestic zones are, for the most part, confined to the edges of the zones and are mainly composed of isolated units. Two proposed domestic zones contain three or four contiguous units assigned to cluster types expected in peripheral zones (dashed lines in Figure 27). These areas may be redefined as peripheral zones, not domestic zones. If these two areas are classified as part of the peripheral zones, then domestic zone cluster types represent 80 percent of the total excavated area within the proposed domestic zones and peripheral zone cluster types make up 59 percent of the total excavated area within the proposed peripheral zones.

The fact that domestic zone cluster types make up a large portion of the proposed peripheral zones follows expectations. It is expected that all activities conducted inside the domestic zone will also be performed within the peripheral zone, while some activities are exclusive only to the peripheral zone. It is also expected that secondary disposal of artifacts from within the domestic zone is represented in the peripheral zone.

Summary

Overall, the visual interpretation of features and density maps was, for the most part, able to suggest the locations of domestic zones within the sample. The application of unconstrained clustering allowed the proposed domestic zones to be refined by eliminating portions that seemed more typical of the peripheral zone. Unconstrained clustering also was able to identify two areas that may have contained domestic zones, but no longer exhibit all the characteristics of a domestic zone. Area A (Figure 27) may represent a domestic zone that is overprinted by secondary refuse disposal. Area B (Figure 27) does not contain a defined feature. Either the feature is not identifiable in the archaeological record, or the area was never used as a domestic zone. Future research targeted at the domestic zones identified herein may be able to determine specific activities that occurred at the site.

CHAPTER VIII

SPATIAL ANALYSIS OF THE UPPER PEREZ SAMPLE

The Upper Perez sample at the Richard Beene site for the purposes of this thesis is made up of a portion of the Block H excavation area which is part of the Upper Perez component (Figure 28). As with the Lower Medina sample, using a large excavation area (142 m^2) allows for better interpretations about site structure. The smaller excavation area within Block H may be compared to the results of this study for future interpretation. The analysis of this sample follows the three stages performed during the analysis of the Lower Medina sample. First, an examination of the features is necessary to identify possible feature function. Second, the visual interpretation of density maps, selected artifacts, and features is used to identify possible domestic and peripheral zones. The identification of possible domestic and peripheral zones is then compared to the results of the unconstrained clustering in an effort to refine the qualitative analysis.

It should be noted that for the Upper Perez sample, post-depositional disturbance by alluvial action is documented to have been extreme (Thoms 1992). While this may be the case, spatial analysis allows an opportunity to assess the disturbance at the site from a different point of view. Qualitative visual interpretations of the features and density maps are based on the (flawed) assumption that site structure will be evident in the sample. One goal of this chapter is to provide an independent assessment of the disturbance within the sample through a comparison of the analysis of features and density maps to the results from unconstrained clustering. It is possible that the application of unconstrained clustering can reveal site structure in spite of the disturbance that is evident.

Description and Interpretation of Features

A total of 10 features was defined within the Upper Perez sample (Figure 29). It should be mentioned that Thoms (1992) decided that these features were actually lag

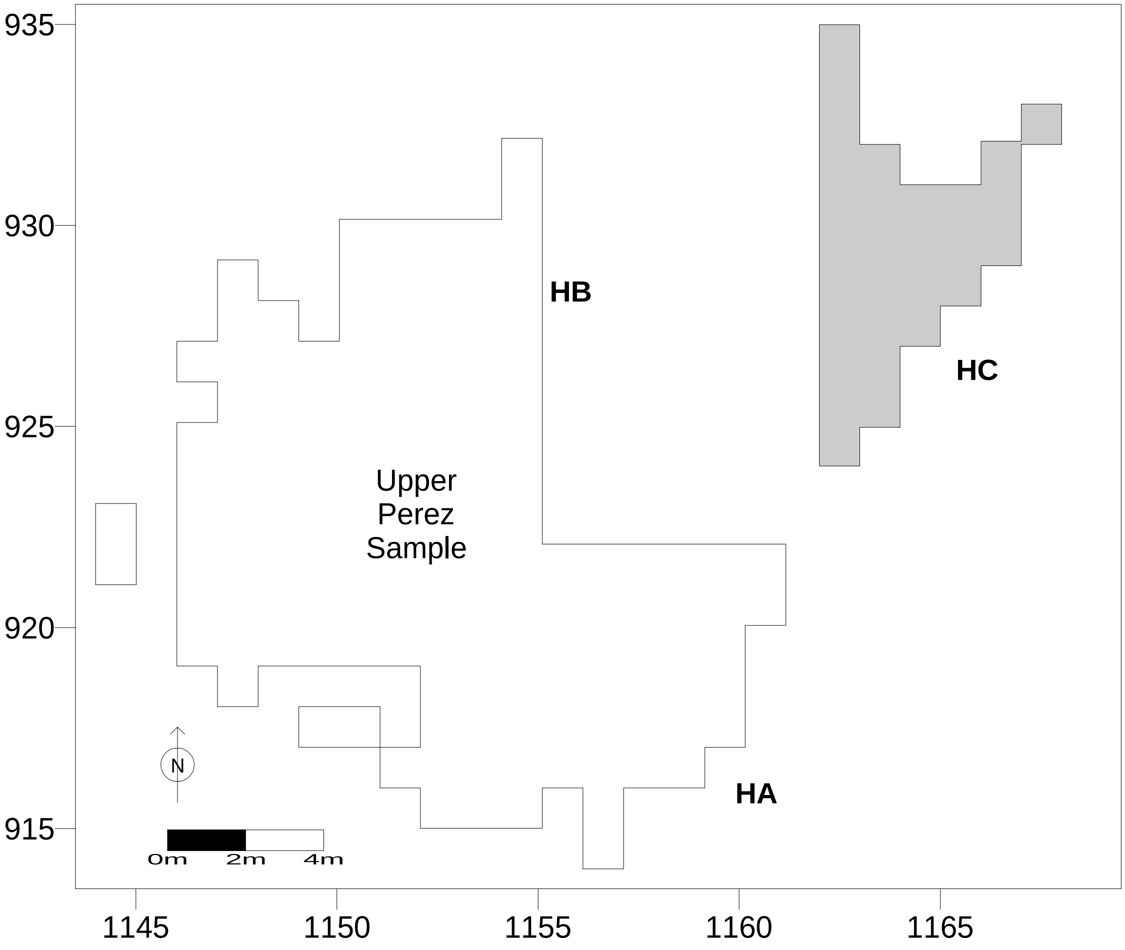


Figure 28. Entire Block H excavation area showing the location of the Upper Perez sample.

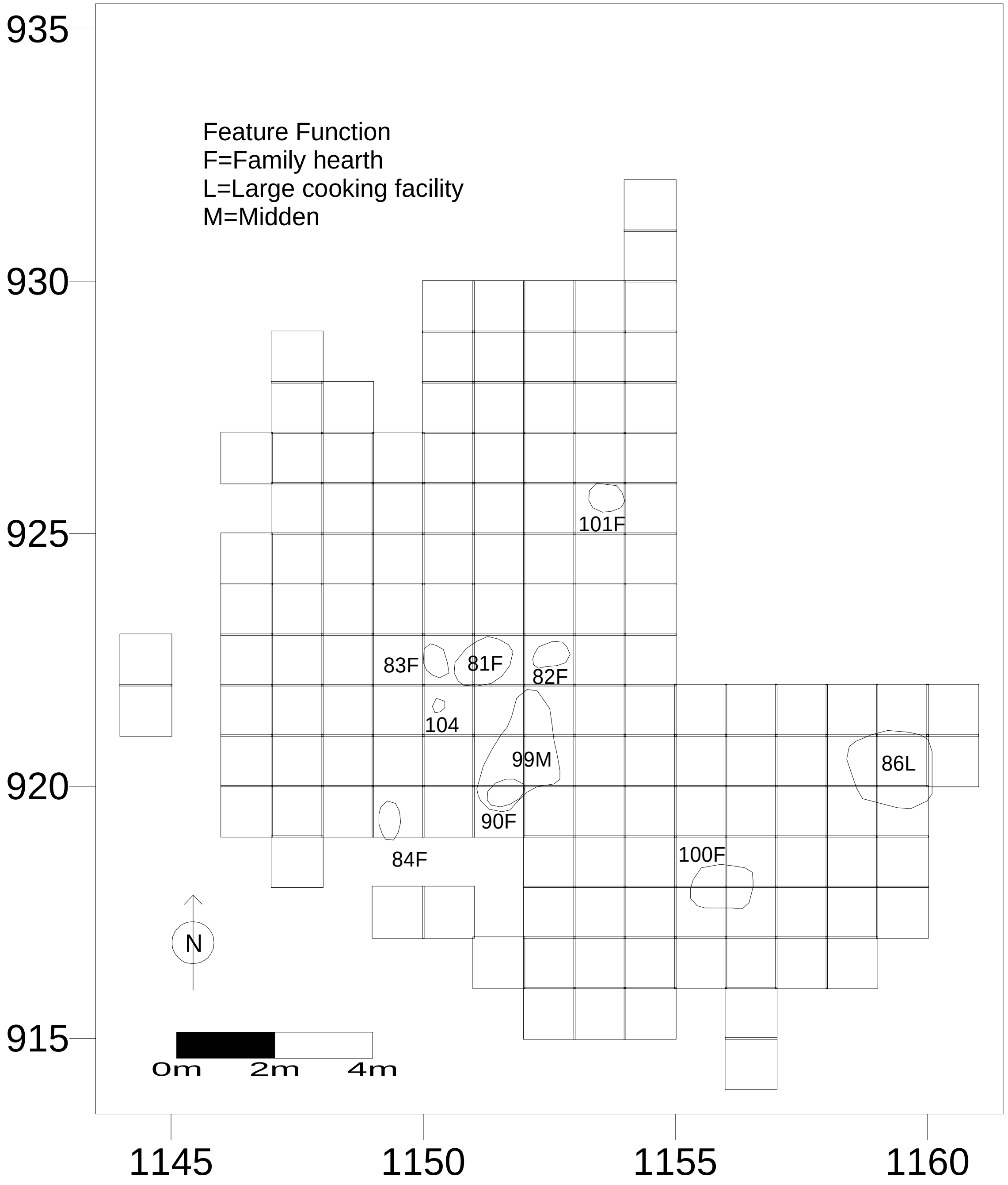


Figure 29. Outlines of features defined within the Upper Perez sample.

deposits and similar areas within the sample were not recorded as features. Clabaugh (2002:73) classifies the relative integrity of the features as less pristine and many features are seemingly random concentrations of imbricated artifacts (Thoms 1992; Figure 30).

In an attempt to independently assess the disturbance, these features will be assumed to be cultural. These features are classified into types (Clabaugh 2002) based on their morphology and contents (Table 6). Only one feature (Feature 104, organic stain) was not defined as an FCR concentration and was not assigned function. As discussed in Chapter VI, these features may also be assigned to possible function based on size and contents. The locations of these features can be compared to the locations of artifacts to determine possible domestic and peripheral zones.

Visual Interpretation of Density Maps

Density maps for the Upper Perez sample were created in Surfer using data recovered during the excavations. As with the Lower Medina sample, five density maps are presented, including a total density map and individual artifact category density maps (Figures 31-35). The interpretation of these maps is presented below and will later be compared to the quantitative spatial analysis of the data.

Figure 31 illustrates the combined totals from each artifact category into a total density map. An important consideration with the Upper Perez sample is the description of the sample as very disturbed by post-depositional processes. The total density map shows artifact concentrations in almost linear patterns within the sample. Thoms (1992), the lead investigator at the time of the excavations, indicated that the linear patterns followed small rills in the surface. Thoms (1992:24) believes that these artifacts have been moved from their original positions and re-deposited by alluvial action.

The other density maps show evidence of disturbance as well. A comparison of the lithic debitage (Figure 32), FCR (Figure 34), and mussel shell (Figure 35) maps all

Figure 30. Photograph of Feature 83 showing the disturbed nature typical of the features from the Upper Perez sample (photograph by Rich Stocker).

Table 6. Features defined within the Upper Perez sample.

Feature	Feature Type	Possible Feature Function
81	FCR Concentration	Family hearth
82	FCR Concentration	Family hearth
83	FCR Concentration	Family hearth
84	FCR Concentration	Family hearth
86	FCR Concentration	Large cooking facility
90	FCR Concentration	Family hearth
99	FCR Concentration	Midden
100	FCR Concentration	Family hearth
101	FCR Concentration	Family hearth
104	Organic Stain	

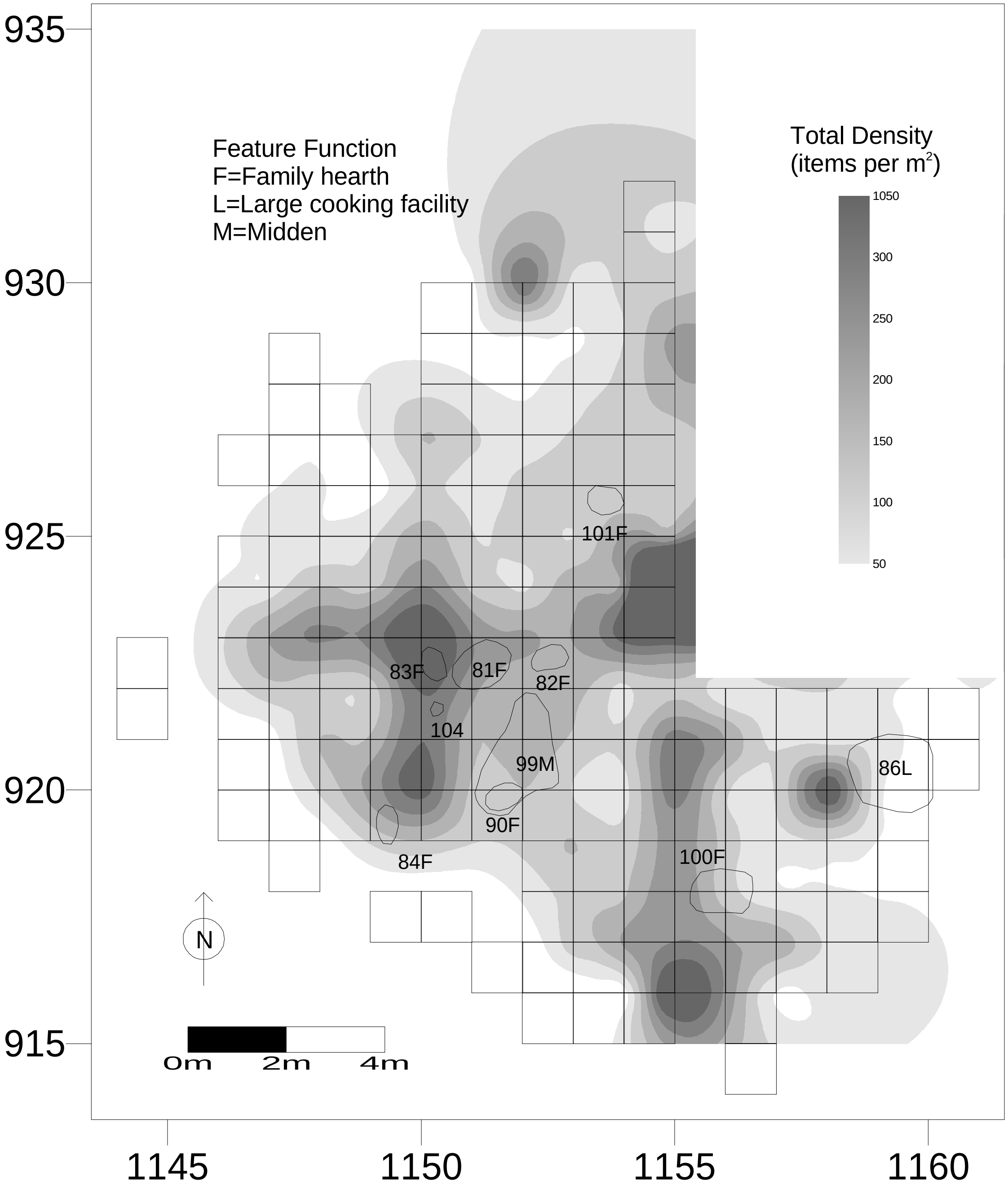


Figure 31. Total density of artifacts within the Upper Perez sample.

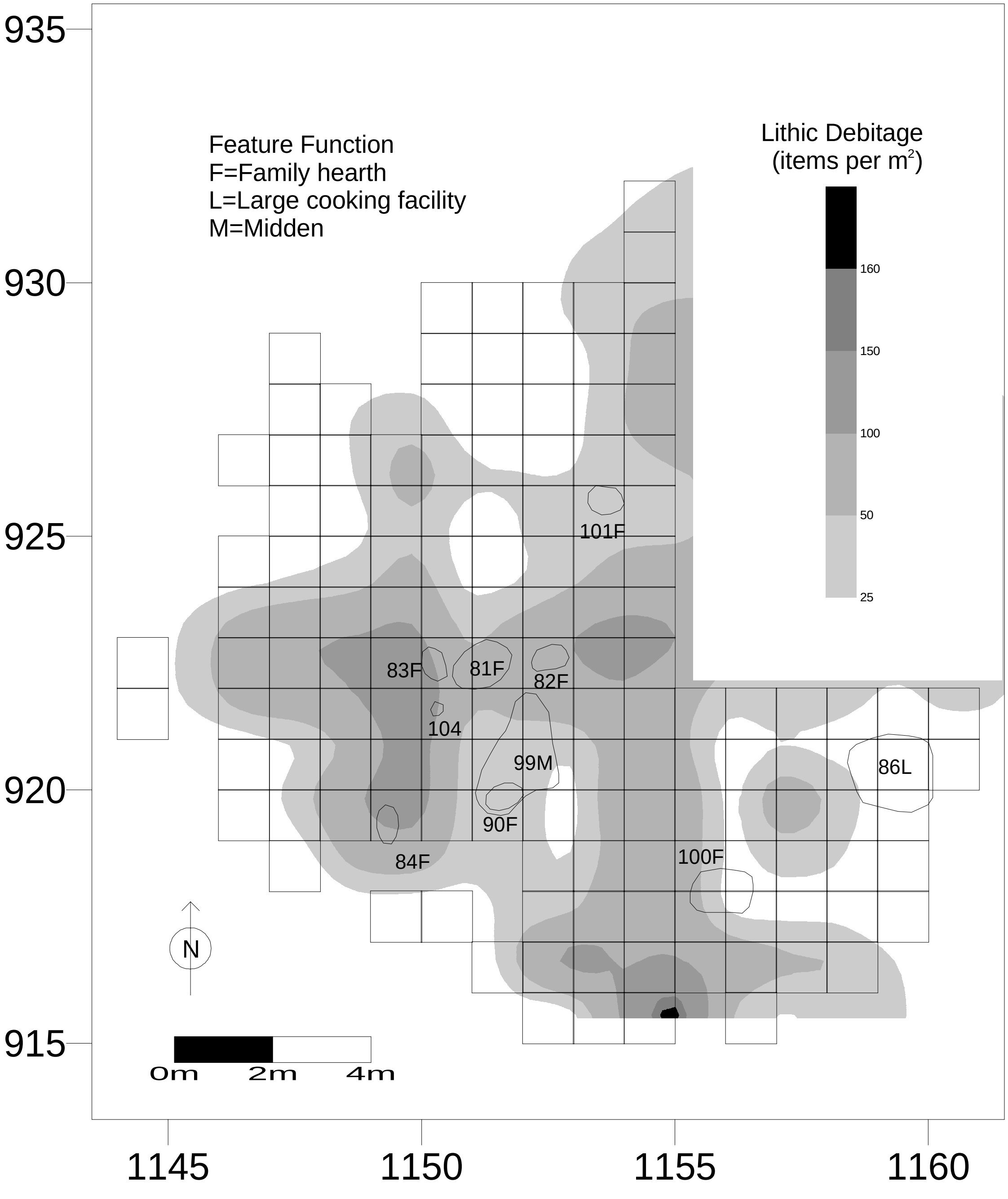


Figure 32. Density of lithic debitage within the Upper Perez sample.

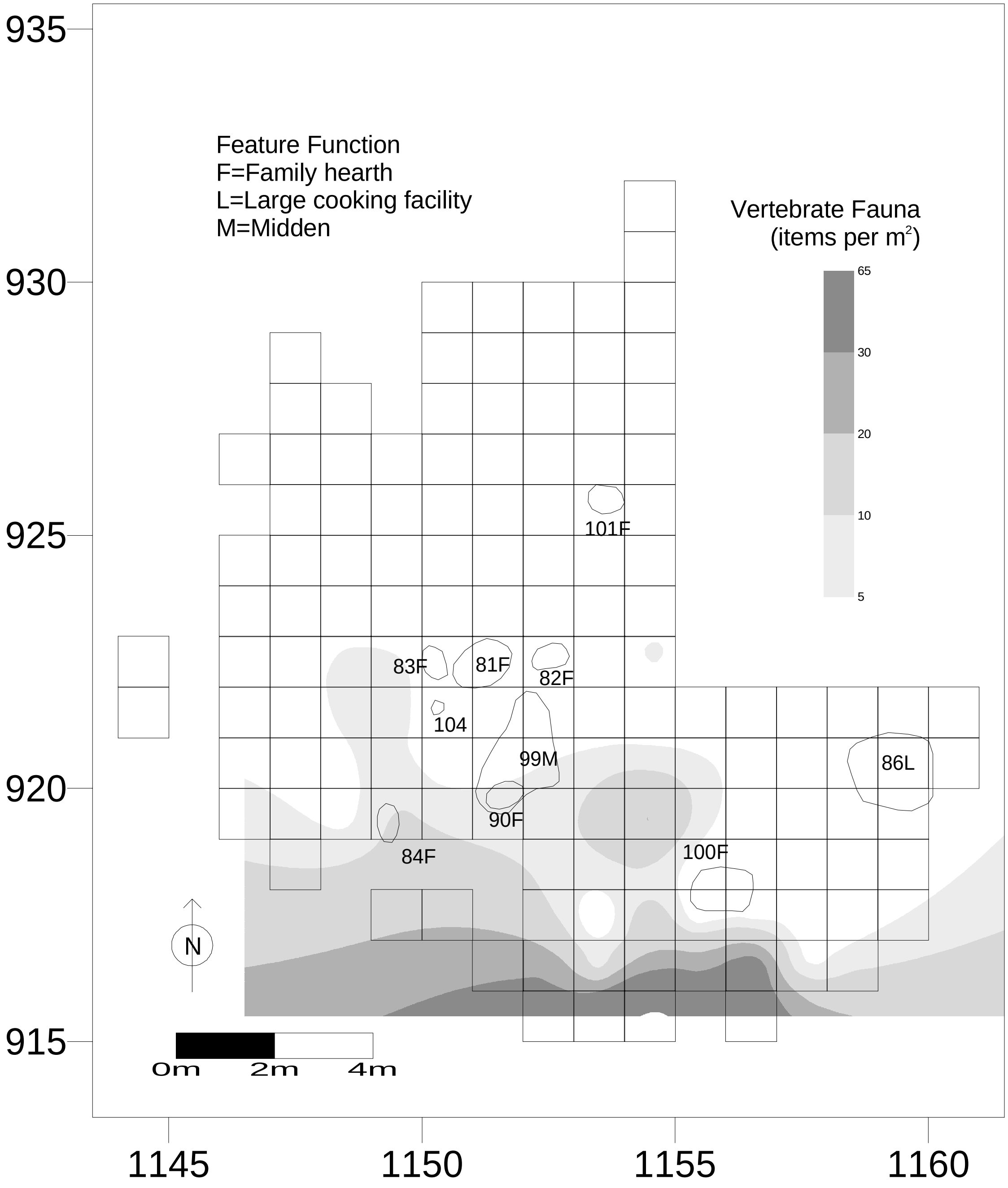


Figure 33. Density of vertebrate fauna within the Upper Perez sample.

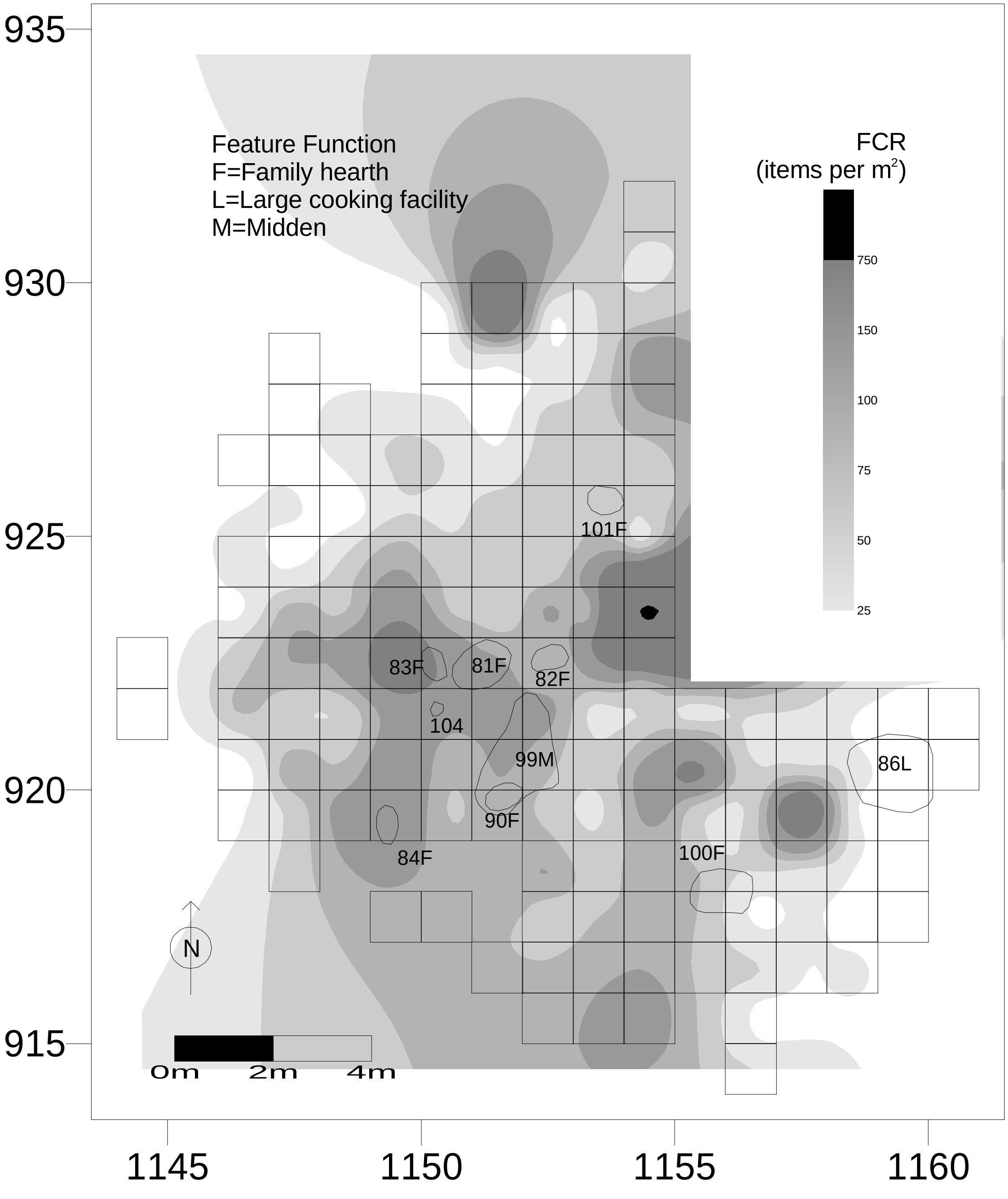


Figure 34. Density of FCR within the Upper Perez sample.

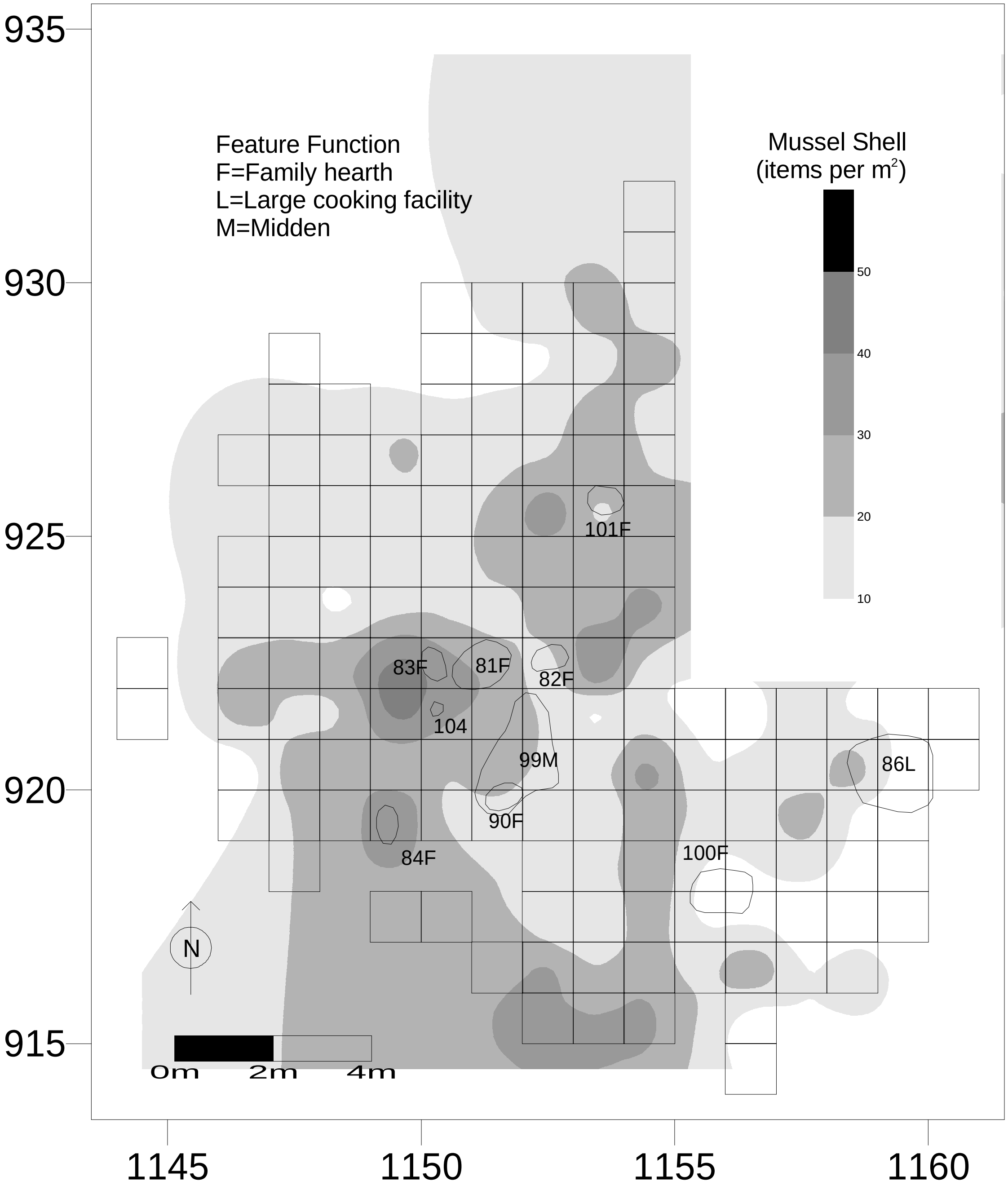


Figure 35. Density of mussel shell within the Upper Perez sample.

show concentrations in the same locations. This indicates that these artifacts may have been deposited by a process other than human behavior. It is assumed that disturbance by flooding would distribute artifacts (and other materials) according to weight. If this were the case, lithic debitage and mussel shell would be expected to be distributed differently than FCR. The reasons behind the similar distribution pattern are not evident. The vertebrate fauna density map (Figure 32) shows that this material was distributed differently than the other materials. This could be due, in part, to poor preservation of the vertebrate faunal remains. It could also be explained by an alluvial distribution of the faunal remains.

Preliminary interpretations about activities within this sample can be made using the individual artifact density maps. Debitage and FCR (Figures 32 and 34) seem to be fairly evenly distributed over the entire site. Interestingly, while most of the features are defined as FCR concentrations, the concentrations of FCR evident in Figure 34 do not always coincide with the locations of these features. The distribution of mussel shell shows small concentrations throughout the sample. These could indicate mussel cooking and eating areas. The amount of faunal material from this sample was very low and most of the fauna was concentrated along the southern boundary of the excavation. This area could represent the deliberate disposal of animal material in one location.

Considering the post-depositional disturbance, it is interesting that the patterns of artifacts at the site seem to follow distribution patterns predicted by ethnoarchaeological studies. The features (almost all of which are defined as FCR concentrations) are surrounded by artifact concentrations. This fits well with the model of individuals sitting around a small hearth and disposing of items as they are created. The merging of the large artifact concentrations in the sample (Figure 31) could be interpreted as evidence for a long term occupation (see O’Connell 1987).

Using just the artifact distribution, it is possible to define drop and toss zones such as those described by Binford (1978b) as well as domestic zones. Feature 100 is surrounded by a moderate amount of artifacts that could be interpreted as a drop zone for individuals sitting near the hearth (Figure 31). Three high total density zones are located slightly farther away from the feature and could be interpreted as forward and backward toss zones. A similar pattern appears near the group of features (81, 82, 83, 90, 99, and 104) in the center of the sample. Lower total density areas near features can be interpreted as domestic zones (Figure 36). Domestic zones and shelters could have been located to the east of Feature 100 and to the northwest of Feature 101 (Figure 36).

Interestingly, the features are located along the edges of the proposed domestic zones. This pattern is different from the pattern seen in the Lower Medina sample and expected for the large shelters described by Joutel (Foster 1998). Features located along the edges of the domestic zones would be more likely if the domestic zones contained smaller shelters than those expected. It is possible that the pattern of features in the Upper Perez sample is an indicator of the severe disturbance documented within the sample.

The contents of the features also seem to indicate disturbance. Feature contents are fairly similar among each feature (Figure 37). This is a contrast to the contents of the features defined in the Lower Medina sample which contained varying amounts of artifacts from each category (Figure 23).

The locations of the tools in the Upper Perez sample (Figure 38) do not follow expected patterns if the areas around Features 100 and 101 are to be considered domestic zones. Many tools, especially cores and modified flakes, are located within these proposed domestic zones when they should mainly be limited to peripheral zones.

Overall, the post-depositional disturbance did not prevent interpretation of the site

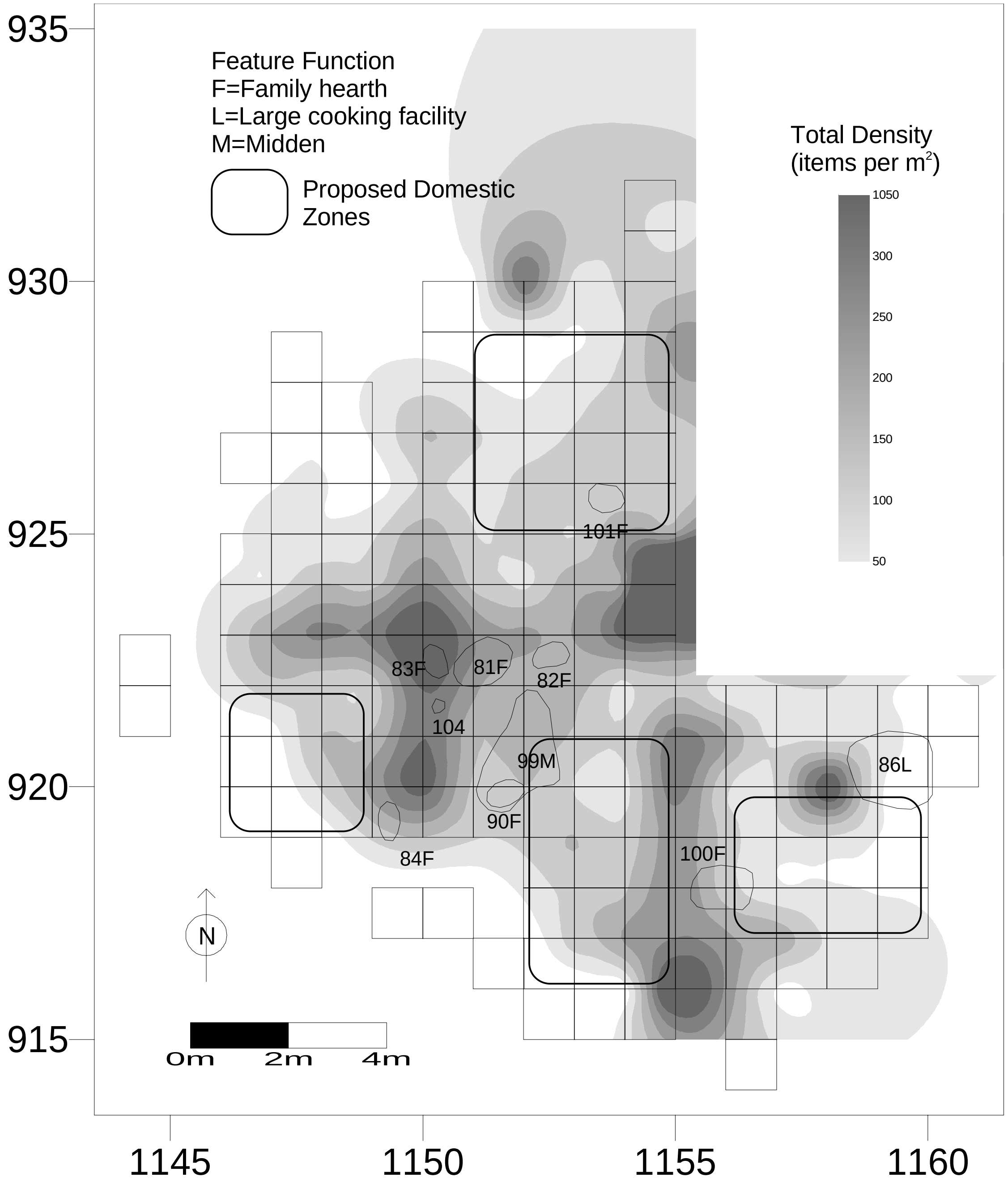


Figure 36. Proposed locations of domestic zones within the Upper Perez sample.

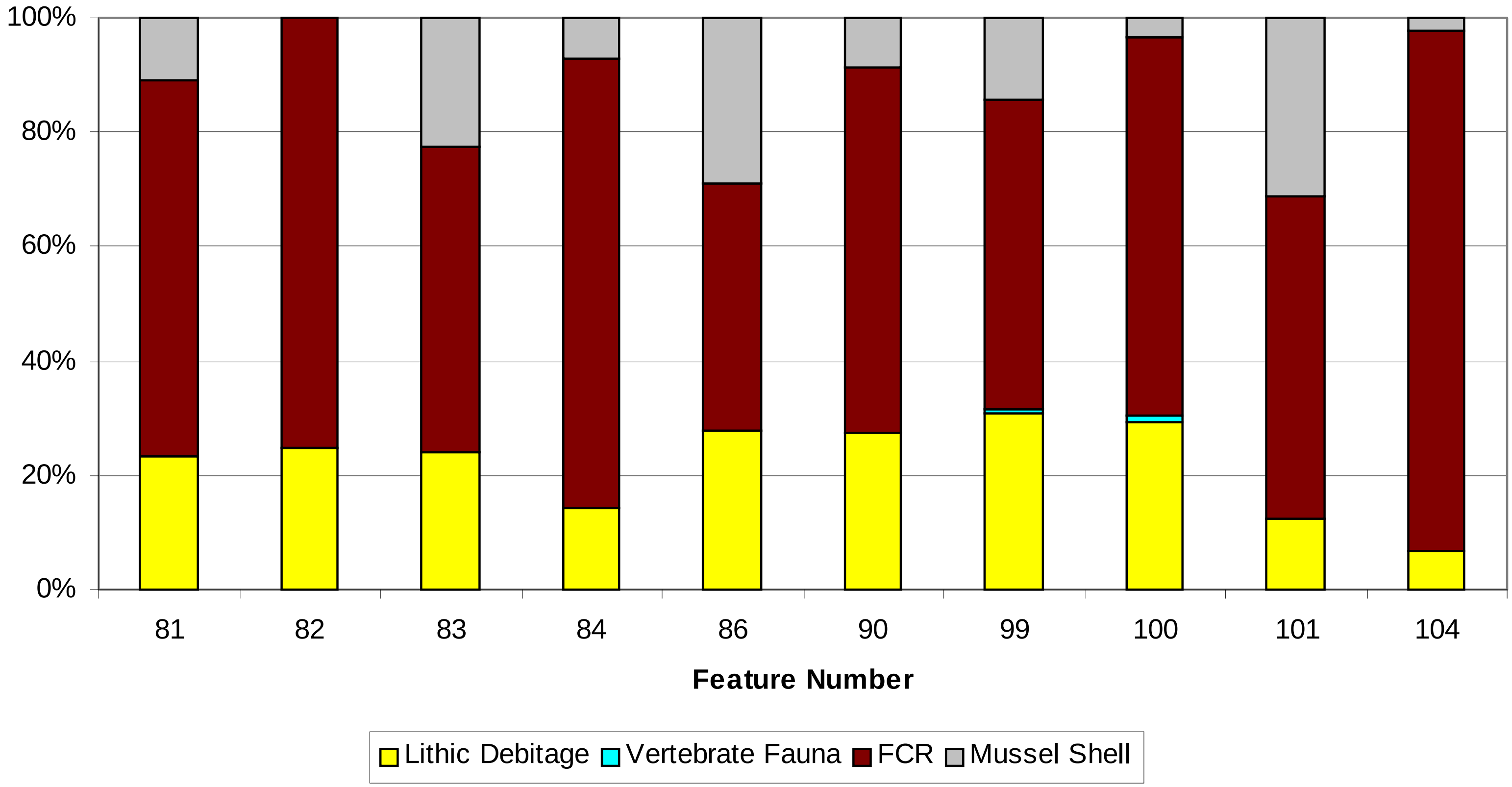


Figure 37. Graph of feature contents from the Upper Perez sample.

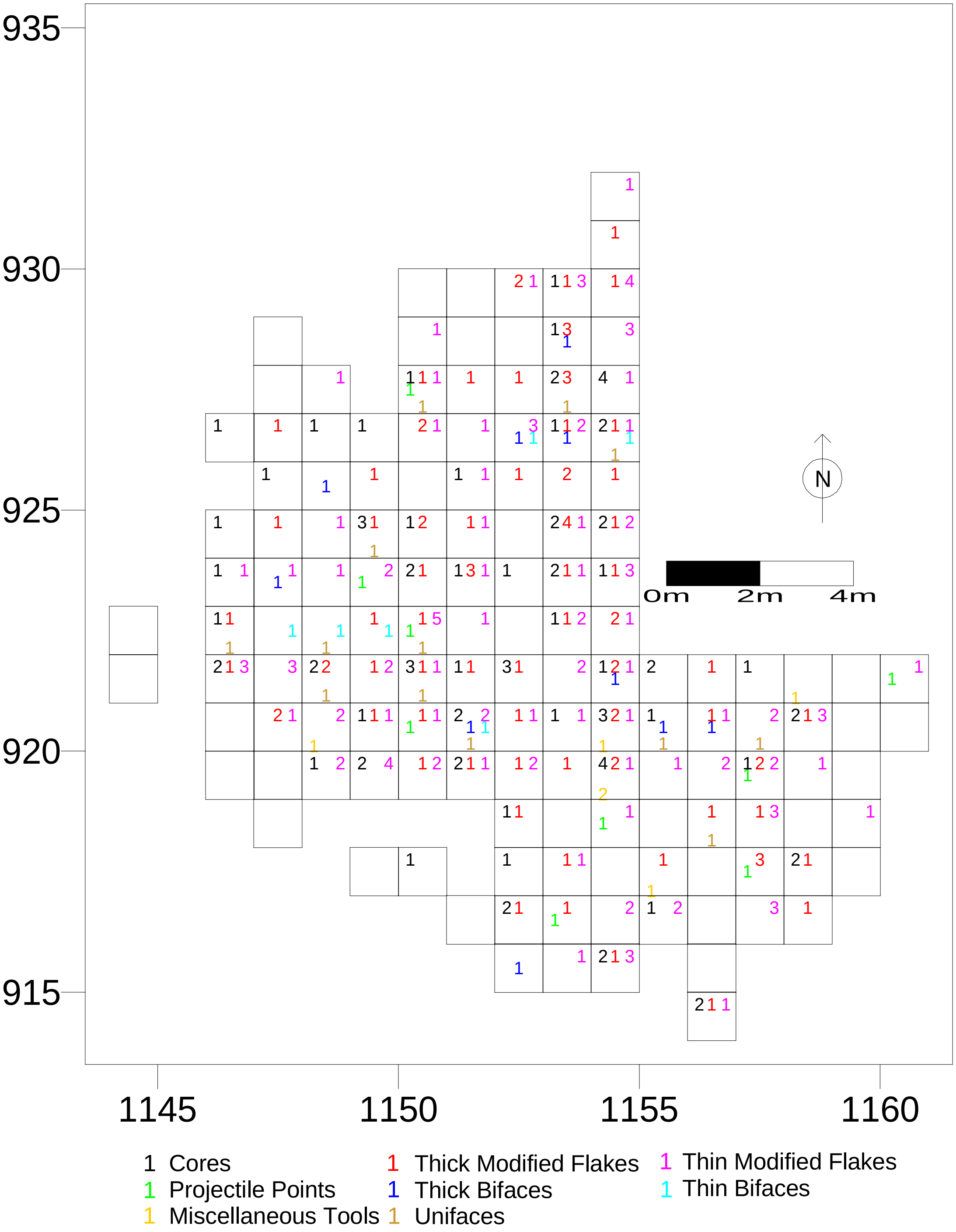


Figure 38. Distribution of tools within the Upper Perez sample.

using density maps. Unfortunately, the conclusions drawn using by the visual interpretation of these maps may not be correct. The effects of the post-depositional disturbance may have severely altered the distribution of the artifacts creating patterns that could be misleading. During the visual interpretation of the maps, many indicators of post-depositional disturbance were seen. These include the linear and sorted distribution of the artifacts, the locations of features along the edges of proposed domestic zones, the similar composition of each feature, and the scattered locations of the tools. While it was possible to identify possible domestic zones, these definitions are tentative. The use of unconstrained clustering may be used to show the extent of the disturbance and possibly counteract its effects in an effort to identify site structure.

Unconstrained Clustering

The error graph produced during unconstrained clustering shows the first large deviance after four cluster types (Figure 39). The selection of four cluster types is corroborated by the dendrogram of this data (Appendix E). These cluster types are internally homogenous with respect to the relative densities of each artifact category and are plotted in Figure 40. A complete list of the relative densities and cluster designation for each unit is presented in Appendix D. Table 7 presents the average relative densities of each artifact category according to cluster type. Trends that can be identified in Table 7 include the lack of vertebrate fauna throughout the sample and the dominance of cluster types 2 and 3 which cover 129 units (91 percent of the excavated area) and present similar compositions. Each cluster type will be discussed briefly; then an analysis of the sample based on the research questions in Chapter I will be presented.

Clusters of type 1 contain only debitage. Cluster type 1 is represented by four small (1 to 5 m^2) clusters along the edge of the excavation area. All of the units containing cluster type 2 are low total density units. This pattern is similar to the proposed

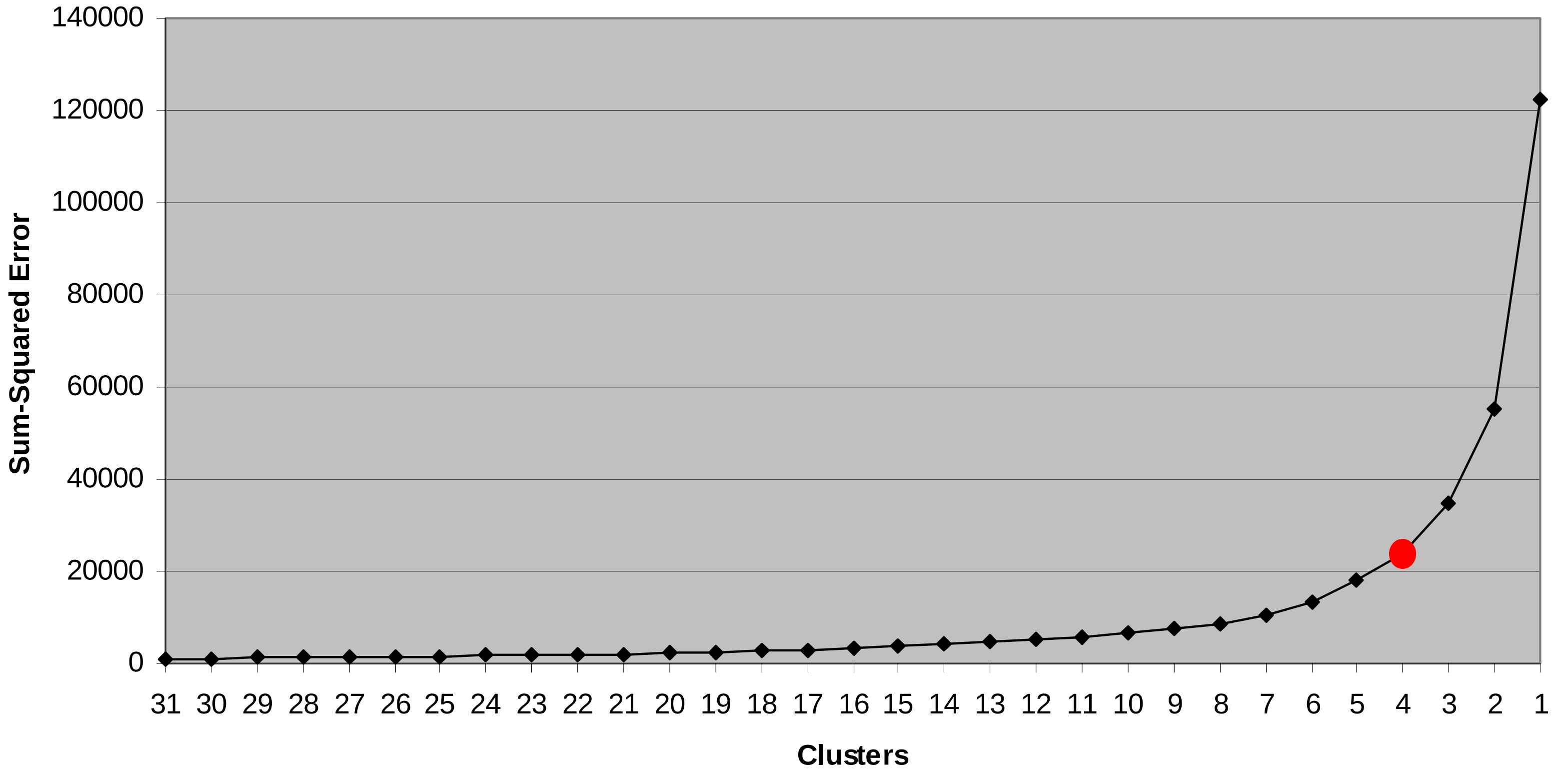


Figure 39. Variance graph of the cluster analysis for the Upper Perez sample.

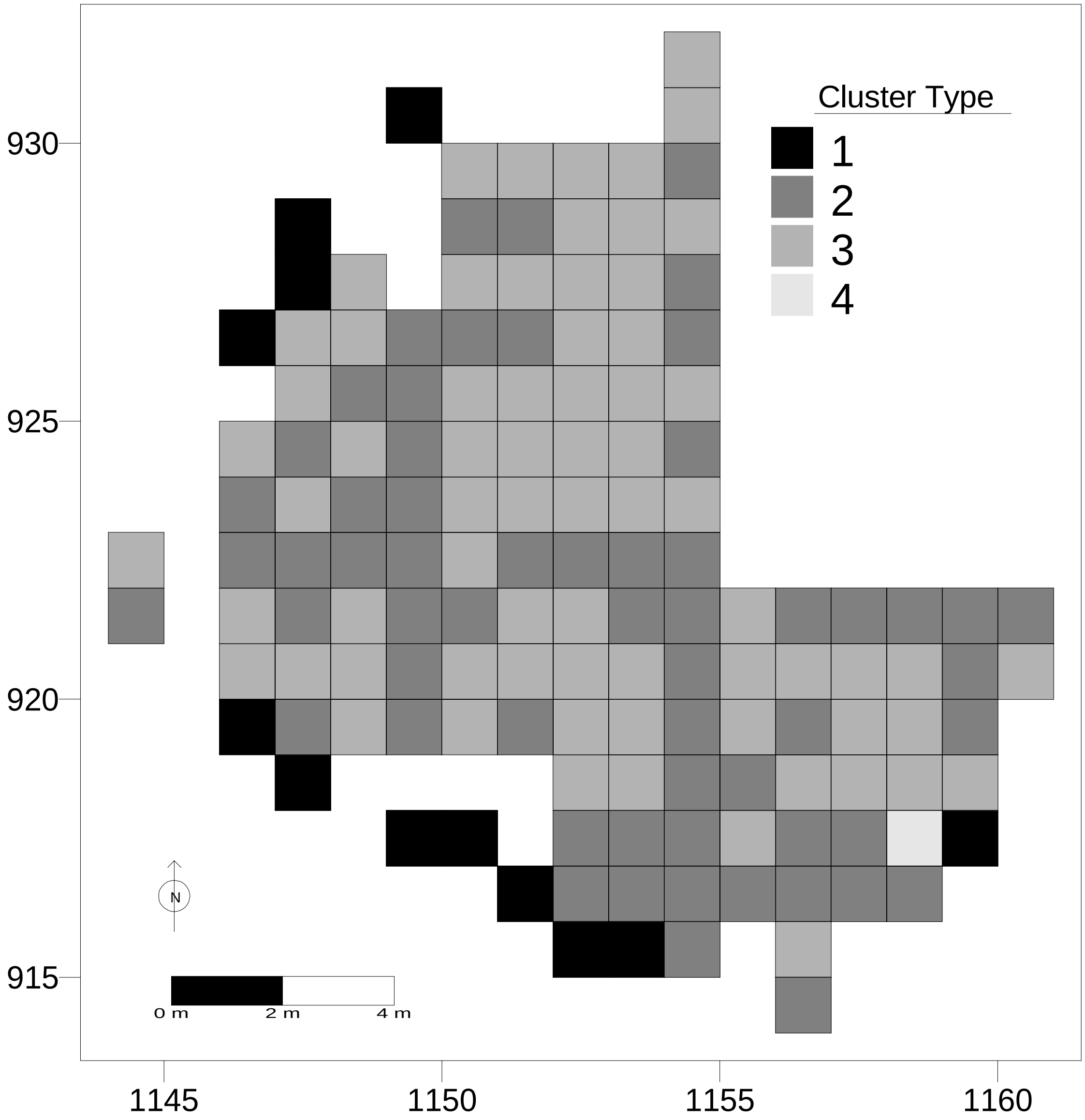


Figure 40. Cluster types plotted within the Upper Perez sample.

Table 7. Description of cluster types within the Upper Perez sample.

Cluster Type	Relative Density				Number of Cells	Percent of total cells
	Lithic Debitage	Vertebrate Fauna	FCR	Mussel Shell		
1	100	0	0	0	12	8
2	44	2	42	11	59	42
3	25	0	58	17	70	49
4	0	0	0	100	1	1

pattern for debitage that was missed during cleaning within domestic zones.

Cluster type 2 and 3 are similar in their composition and contain low (11 and 17 percent) concentrations of mussel shell, moderate to high (25 to 28 percent) concentrations of lithic debitage and FCR, and almost no vertebrate fauna. The clusters are large and span areas of high total density to areas of low total density. A mixture of artifact categories follows the expected pattern of a secondary refuse dump, however the relative similarity and dominance throughout the sample of these cluster types suggests that the secondary nature of the deposit was not the result of human action. Post-depositional disturbances are expected to create a homogenized distribution of artifacts with clusters of similar composition.

Cluster type 4 contains only mussel shell. Only two clusters of type 4 are located within the sample (each only 1 m^2) in low density areas. These clusters follow the pattern for being located in a peripheral zone because mussel shell is expected to be cleaned out of domestic zones.

Upper Perez Site Structure

Comparison of the results of unconstrained clustering to the interpretations of both features and artifact distributions was hoped to have mitigated the effects of post-depositional disturbance evident within the Upper Perez sample. Instead, the results of unconstrained clustering show that most (if not all) of this sample has been severely disturbed by post-depositional processes. Overall, site structure, identified through spatially distinct areas throughout the site, was not revealed. Cluster types 2 and 3, which make up 91 percent of the total excavated area, represent similar composition and are thought to represent post-depositional effects.

Cluster type 1 could be interpreted as the remains of a distinctive domestic zone. Unfortunately, clusters of type 1 are located along the edge of the excavation area and no family hearth features are identified near these clusters. Comparing the distribution of clusters of type 1 to the distribution of vertebrate fauna (Figure 33) reveals an interesting pattern. Both vertebrate fauna and clusters of type 1 are concentrated along the southern edge of the excavation area. This pattern suggests that lighter materials such as bone and lithic debitage were concentrated in this area as a result of alluvial action. The only occurrence of cluster type 4 is also located in this area and supports this interpretation.

Summary

While some elements of site structure seemed apparent through the interpretation of features and density maps, the results from unconstrained clustering show that most, if not all of the Upper Perez sample is heavily disturbed. This coincides with previous analysis of the sample based upon field observations that the sample was heavily disturbed, possibly representing a random distribution of artifacts that had been redeposited by alluvial action (Thoms 1992). Performing unconstrained clustering with the data from the Upper Perez sample revealed a distinctive pattern of disturbance that may be compared to other samples and sites where alluvial action is assumed to have disturbed the assemblage. Hopefully, during other research, unconstrained clustering can be used to identify less disturbed areas within the site that can then be studied further.

CHAPTER IX

CONCLUSION

This thesis is designed to identify site structure and the extent of post-depositional effects at two samples at the Richard Beene site. An effective model for site structure expectations is created using information from both ethnoarchaeological and archaeological studies. Spatial analysis (both qualitative and quantitative) allows the determination of identifiable archaeological signatures for the distinction between domestic and peripheral zones as well as between disturbed and less disturbed assemblages. By combining qualitative and quantitative methods for the definition of artifact and feature patterning, site structure and the effects of post-depositional disturbance at the site became evident.

Comparison of the Lower Medina and Upper Perez Results

The Lower Medina sample at the Richard Beene site (ca. 6900 B.P.) reveals artifact patterning consistent with expectations derived from ethnoarchaeological and archaeological research. Due to limited impacts of post-depositional disturbance from alluvial action, site structure is readily evident. Unconstrained clustering is used to refine the proposed domestic zones and peripheral zones determined by visual interpretation of features and density maps.

Considering the observed disturbance in the Upper Perez sample (ca. 8800 B.P.), visual interpretation of features and density maps appear to reveal a remnant site structure. Unconstrained clustering is used to identify at least 91 percent of the area of this sample as extensively disturbed by post-depositional factors. This confirms the assessment of the sample made by Thoms (1992). The remaining area is also suspect due to the expected effects of alluvial disturbance at the site. Unfortunately, with this much disturbance, the identification of site structure is not possible.

Comparisons between the two samples based on the results of the analysis must consider the distinct nature of the assemblages. Clear artifact patterning as seen in the Lower Medina sample is necessary for a determination of site structure. If artifacts are displaced by post-depositional effects, site structure may no longer be evident. While the trained eye of the professional archaeologist is the first line of defense in identifying post-depositional effects, unconstrained clustering has proven effective in defining the extent and severity of this disturbance.

Evaluation of the Results

In defining the data structure for this thesis, counts of artifacts per unit are used. This assumes that the number of artifacts present is representative of behavior at the site. Both samples are assumed to have been occupied for only brief periods of time (Thoms 1992:28) and most artifacts are limited to a thin lens approximately 10 to 30 cm deep.

By assuming artifact patterning is representative of human behavior, clearly some information is not considered. Preservation of artifacts is variable depending on many factors, mainly the material type of the artifact. Unfortunately, preservation issues are an inherent problem in archaeology. The current study is designed only in terms of remaining artifacts and, therefore, attempts to reduce the failings of this assumption.

The assemblages, stratigraphy, and radiocarbon dating of both samples lead researchers to conclude that they represent only brief occupations. While this is most likely the case, it is slightly possible that multiple occupations spanning a few decades are represented in these samples (especially in the Upper Perez sample [see Thoms 1992:28]). The analysis of the Lower Medina sample shows some evidence of multiple occupations, however it did not seem to mask the overall site structure. In some locations, multiple occupations may follow similar site structure as seen by Kimball (1981) at Rose Island.

The Upper Perez sample appears disturbed by post-depositional forces both archaeologically and spatially. Archaeologically, artifacts are described as being randomly distributed, at vertical angles of repose, and imbricated (Thoms 1992:24). Spatially, two similar clusters dominate the entire sample. No definable site structure is present throughout the sample.

The effects of sample size are another inherent problem in archaeological studies. No site can be completely recorded; therefore only a sample of the past is known. The samples selected for use within this thesis are rare within archaeological research in their size. Each sample consists of over 100 m^2 of excavated area and each is stratigraphically separated from other samples. The samples were selected partially because of their large sample size. It is hoped that results from these large samples can be used to help in the analysis of samples of a smaller size located within the site.

Comparison to Previous Research

This thesis draws heavily on previous research in order to produce expectations about the site structure and post-depositional effects present within the Lower Medina and Upper Perez samples at the Richard Beene site. A comparison of the analysis of the Richard Beene site to previous research indicates continuity in behavioral patterns among diverse hunter-gatherer groups.

While the delineation of domestic zones and peripheral zones is a direct goal in the current study, it was unclear whether the assemblages at the Richard Beene site would exhibit these patterns. In fact, the Upper Perez sample was so disturbed, the distinction between domestic and peripheral zones could not be made. The Lower Medina sample however did exhibit patterns that were interpreted as domestic and peripheral zones suggesting that prehistoric hunter-gatherers in South-Central Texas organized their space in similar ways, as did more recent hunter-gatherer groups in both Australia and Africa.

A mixture of artifact categories present within domestic zones defined in the

Lower Medina sample, suggests that a mixture of activities is represented. Multiple activites were observed taking place within domestic zones by Yellen (1977) and O'Connell (1987). Their research suggests that specific activity types may not be discernable in the archaeological record, a point contended by Binford (1978b).

Site structure within the Lower Medina sample also follows patterns identified by O'Connell (1987) and Kimball (1981) wherein large refuse dumps and messy activity areas are located very close to the domestic zones. The large midden in the Lower Medina sample served as either a refuse dump or location for messy activity areas within the peripheral zone. It is located very near domestic zones in the sample. The opposite pattern (messy, unpleasant activities or refuse areas located far from domestic zones) is recorded by Binford (1987) or Yellen (1977) in their studies. Locations of hearths within domestic zones in the Lower Medina sample are consistent with those located within large shelters. These shelters are more likely to have been occupied during cold weather (Kimball 1981).

Future Directions

Overall, the research conducted within this thesis effectively discerned site structure in the Lower Medina sample from the Richard Beene site. The identification of site structure allows for the comparison of this sample to others within the Richard Beene site. The Lower Medina sample can also be used as a benchmark for other studies of site structure within South-Central Texas. The hypothesis that shelters are more like those used during winter months can be tested in future research focusing on other indicators of seasonality.

An interesting outcome of this study was confirmation of most, if not all, of the Upper Perez sample as disturbed. The disturbed pattern observed within the clusters of this sample may prove useful for distinguishing disturbed areas from undisturbed areas in other areas at the Richard Beene site. Studies at other sites may also benefit from a comparison to the pattern seen in the Upper Perez sample.

The utility of unconstrained clustering was only partially illustrated by this thesis. The full utility of unconstrained clustering is in its ability to be used in a comparative fashion. Relative densities of artifact categories within defined clusters containing the same artifact categories can be directly compared within and between sites to observe similarities and differences in site structure. Small excavation areas within the site can be analyzed separately or along with larger excavation areas. This may allow the interpretation of specific behavioral patterns even in isolated excavation areas. Hopefully, future researchers at the Richard Beene site and throughout South-Central Texas can use the information presented here in just such a comparative way.

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APPENDIX A

RADIOCARBON AGES FOR THE RICHARD BEENE SITE

Table A.1. Radiocarbon ages from the Richard Beene site.

LAB ASSAY NO.	**^{14}C AGE B.P.**	**^{13}C/^{12}C**	**^{13}C ADJUSTED AGE B.P.**	**PROVIENIENCE**	**SOIL**	**MATERIAL TYPE**
UTA 7168	1300 ± 60	-19.7	1380 ± 60	ca. 1.04-1.14 mbs; Upper Block B	Modern Soil	Bulk Organic Sediments
UTA 7169	1360 ± 70	-21.7	1410 ± 70	ca. 1.35-1.49 mbs; Upper Block B	Modern Soil	Bulk Organic Sediments
BETA 36702			3090 ± 70	ca 1.3-4 mbs; Feature 1; Upper Block B	Upper Leon Creek	Charcoal
BETA 43330	4130 ± 70	-24.5	4135 ± 70	ca. 2.5 mbs; Upper Block A	Lower Leon Creek	Charcoal
BETA 38700	4590 ± 70	-26.3	4570 ± 70	ca. 2.6 mbs; Feature 2; Lower Block A	Upper Medina	Charcoal
AA 20401	AMS		4380 ± 100	Block U	Upper Medina	Charcoal
GX 21746	AMS		4430 ± 55	Block U	Upper Medina	Charcoal
AA 20402	AMS		4510 ± 110	Block U	Upper Medina	Charcoal
BETA 47523	AMS		6985 ± 65	ca. 6.4 mbs; Feature 76; Block	Lower Medina	Charcoal
BETA 47524	AMS		6900 ± 70	ca. 6.4 mbs; Feature 30; Block G	Lower Medina	Charcoal
BETA 47530	AMS		7000 ± 70	ca. 6.6 mbs; Feature 43; Block G	Lower Medina	Charcoal
BETA 47525	AMS		6930 ± 65	ca. 6.6 mbs; Feature 44; Block G	Toward Bottom Medina	Charcoal
BETA 44386	8100 ± 130	-26	8080 ± 130	ca. 10 mbs; Block K	Above top of Elm Creek	Charcoal
BETA 43877	9720 ± 120	-21	9780 ± 120	ca.2m below Block G; Block H	Bottom of Elm Creek	Bulk Organic Sediments
BETA 43878	9690 ± 130	-21	9750 ± 130	ca.2m below Block G; Block H	Bottom of Elm Creek	Bulk Organic Sediments
BETA 80687; CAMS 18801	8660 ± 60	-26.4	8640 ± 60	Block T; Feature 106	Upper Perez	Charcoal
BETA 47564	9590 ± 100	-21	9660 ± 100	ca. 10.3 mbs; Block T Area	Perez	Bulk Organic Sediments
BETA 47565	9800 ± 120	-20.6	9870 ± 120	ca. 10.6 mbs; Block T area	Perez	Bulk Organic Sediments
BETA 47566	9970 ± 120	-20.5	10,040 ± 120	ca. 10.8 mbs; Block T area	Perez	Bulk Organic Sediments
BETA 47567	10060 ± 120	-20.7	10,130 ± 120	ca. 10.6 mbs; Block T area	Perez	Bulk Organic Sediments
BETA 47527	AMS		8805 ± 75	ca. 10.6 mbs; Block T	Perez	Charcoal

Radiocarbon Laboratories: AA=University of Arizona; BETA=BETA Analytical, Inc., FL; GX=Geochron, MA; SMU=Southern Methodist University, TX; UTA=University of Texas at Austin

APPENDIX B

DENSITY VECTORS FOR THE LOWER MEDINA AND UPPER PEREZ SAMPLES

Table B.1. Density Vectors for the Lower Medina sample.

		Items per m^2			
North	East	Lithic Debitage	Vertebrate Fauna	FCR	Mussel Shell
992	1071	87	27	3	6
991	1070	413	30	6	4
991	1070	0	1	0	0
992	1066	11	0	0	0
992	1067	24	39	3	33
990	1070	102	37	1	4
992	1070	44	7	4	26
992	1072	7	11	0	0
992	1068	32	19	3	1
993	1070	8	9	5	7
983	1057	14	22	5	17
983	1053	2	0	0	1
989	1070	38	53	7	27
986	1070	108	134	1	4
984	1070	58	27	5	4
980	1070	23	11	1	6
988	1070	81	56	5	9
985	1070	75	79	5	14
992	1064	13	240	5	210
987	1070	88	18	0	3
982	1070	19	3	1	3
981	1070	40	24	1	10
992	1065	3	3	0	7
992	1061	1	0	0	2
983	1063	109	149	9	12
983	1066	106	133	3	8
983	1065	138	87	1	4
983	1068	67	53	3	5
983	1072	31	15	1	4
983	1074	12	3	2	6
983	1070	32	113	1	10
992	1062	5	4	2	5
983	1069	36	29	0	1
983	1062	64	8	5	13
983	1061	5	0	0	0
983	1067	322	188	13	16
990	1067	254	29	5	13
990	1064	218	28	4	13
983	1060	1	0	1	0
983	1071	35	5	17	4
983	1058	5	1	0	0
990	1069	194	99	7	10
982	1061	56	20	16	5
990	1066	126	15	4	15
990	1063	500	23	0	9
990	1065	570	22	3	19

Table B.1. Continued.

		Items per m^2			
North	East	Lithic Debitage	Vertebrate Fauna	FCR	Mussel Shell
981	1061	12	0	2	1
983	1073	2	6	0	1
980	1061	134	6	4	2
990	1062	114	38	6	5
991	1061	1	2	4	3
979	1061	283	55	5	5
978	1061	120	14	0	7
990	1061	4	18	1	4
984	1061	71	42	27	26
990	1068	129	53	7	11
989	1061	1	0	0	1
986	1063	11	5	1	1
991	1062	2	0	0	0
991	1063	2	0	3	2
991	1064	28	9	2	31
991	1065	42	7	3	19
991	1066	3	2		1
991	1067	89	3	9	10
991	1068	66	30	17	7
991	1069	53	56	1	54
991	1071	28	2	0	4
991	1072	1	0	0	0
989	1062	7	10	2	9
989	1063	43	17	1	8
989	1064	12	2	9	10
989	1065	88	36	4	3
989	1066	33	3	4	17
989	1067	18	5	5	23
989	1068	12	0	0	8
989	1069	18	9	5	27
990	1071	3	0	0	1
990	1072	2	3	0	0
988	1062	1	0	0	0
988	1063	10	22	1	11
988	1064	21	18	2	1
988	1065	46	9	1	17
988	1066	35	20	32	13
988	1067	73	82	13	21
988	1068	10	1	1	0
988	1069	29	1	1	23
987	1061	3	4	0	0
987	1062	4	3	0	5
987	1063	44	2	9	15
987	1065	7	2	0	2
987	1066	37	3	20	3
987	1067	70	6	3	9

Table B.1. Continued.

		Items per m^2			
North	East	Lithic Debitage	Vertebrate Fauna	FCR	Mussel Shell
987	1068	34	10	4	29
987	1069	57	7	0	17
986	1061	23	86	6	5
986	1062	9	5	4	3
986	1065	23	6	1	1
986	1066	48	11	2	1
986	1067	35	12	6	6
986	1068	28	5	2	10
986	1069	14	2	2	3
986	1072	33	4	0	9
985	1061	49	20	3	5
985	1062	17	4	3	3
985	1063	17	14	4	4
985	1065	52	18	0	0
985	1066	89	7	3	3
985	1067	257	22	10	1
985	1068	85	39	2	1
985	1069	41	8	1	14
984	1063	27	0	0	2
984	1065	49	43	0	2
984	1066	43	21	2	6
984	1068	37	5	0	4
984	1069	35	6	0	3
983	1055	0	1	0	0
990	1073	103	15	0	0
982	1057	1	0	1	0
982	1058	3	0	0	1
982	1062	1	0	0	0
982	1063	3	2	3	2
982	1065	8	6	1	0
982	1066	11	0	1	3
982	1067	1	0	0	0
982	1069	6	3	1	1
981	1056	1	1	0	1
981	1057	2	0	1	1
981	1058	5	0	2	1
981	1062	5	0	0	0
981	1063	3	0	0	0
981	1065	2	6	0	1
981	1066	5	0	0	1
988	1061	157	129	22	76
983	1064	5	20	0	0
992	1063	1	0	0	0
981	1067	3	0	0	0
981	1068	5	0	0	0
980	1056	1	0	0	0

Table B.1. Continued.

		Items per m^2			
North	East	Lithic Debitage	Vertebrate Fauna	FCR	Mussel Shell
980	1057	2	0	0	0
980	1058	0	0	2	1
980	1062	43	45	9	25
980	1063	3	0	0	0
980	1067	47	3	0	4
980	1068	0	0	0	1
979	1056	2	0	0	0
979	1057	2	0	4	0
979	1062	0	0	0	1
979	1063	4	0	0	0
979	1065	1	0	0	0
979	1066	4	0	0	0
979	1067	7	0	1	14
979	1068	2	0	0	0
978	1056	1	0	0	1
978	1057	1	0	0	1
978	1062	6	0	0	0
990	1074	520	2	1	3

Table B.2. Density Vectors for the Upper Perez sample.

		Items per m^2			
North	East	Lithic Debitage	Vertebrate Fauna	FCR	Mussel Shell
914	1156	30	0	53	7
915	1152	5	0	0	0
915	1153	1	0	0	0
915	1154	225	72	122	34
915	1156	5	0	9	3
916	1151	2	0	0	0
916	1152	142	27	78	31
916	1153	97	8	92	20
916	1154	93	26	99	24
916	1155	101	26	68	16
916	1156	78	39	63	33
916	1157	57	4	25	10
916	1158	52	9	29	14
917	1149	1	0	0	0
917	1150	3	0	0	0
917	1152	44	0	60	12
917	1153	47	1	74	8
917	1154	138	14	79	28
917	1155	9	0	42	5
917	1156	23	3	9	5
917	1157	18	0	31	2
917	1158	0	0	0	5
917	1158	18	0	19	0
917	1159	1	0	0	0
918	1152	39	0	107	21
918	1153	32	0	58	15
918	1154	101	10	97	30
918	1155	35	1	57	7
918	1156	10	0	50	10
918	1157	21	0	41	15
918	1158	12	0	26	7
918	1159	5	0	15	4
919	1148	76	3	120	25
919	1149	153	11	116	38
919	1150	35	0	66	17
919	1151	27	0	39	10
919	1152	18	0	63	9
919	1153	10	0	35	10
919	1154	143	23	115	26
919	1155	24	0	33	17
919	1156	31	0	38	13
919	1157	126	0	280	28
919	1158	13	0	22	8
919	1159	8	0	11	2
920	1146	3	0	4	2
920	1147	42	0	110	27

Table B.2. Continued.

		Items per m²			
North	East	Lithic Debitage	Vertebrate Fauna	FCR	Mussel Shell
920	1148	40	0	67	26
920	1149	144	6	151	22
920	1150	42	2	78	21
920	1151	21	0	70	13
920	1152	28	0	66	13
920	1153	34	0	57	16
920	1154	137	8	124	37
920	1155	18	0	203	10
920	1156	24	0	42	14
920	1157	9	0	31	9
920	1158	9	0	25	10
921	1144	6	0	4	1
921	1146	27	0	84	27
921	1147	37	0	38	15
921	1148	24	0	46	18
921	1149	164	6	106	45
921	1150	61	0	70	30
921	1151	21	1	89	20
921	1152	40	0	82	18
921	1153	24	1	32	7
921	1154	68	1	48	12
921	1155	8	1	12	6
921	1156	38	4	47	5
921	1157	45	0	46	21
921	1158	24	0	25	8
921	1159	16	0	10	7
921	1160	29	0	18	7
922	1144	5	0	7	4
922	1146	115	1	73	25
922	1147	144	3	112	26
922	1148	127	6	114	28
922	1149	165	6	223	46
922	1150	53	1	98	18
922	1151	71	0	86	25
922	1152	115	1	68	13
922	1153	144	0	145	47
922	1154	146	6	158	14
923	1146	24	0	19	10
923	1147	46	1	98	13
923	1148	38	0	63	8
923	1149	101	1	141	18
923	1150	31	0	75	18
923	1151	22	0	51	12
923	1152	59	0	106	27
923	1153	59	0	120	25
923	1154	90	0	923	34

Table B.2. Continued.

		Items per m^2			
North	East	Lithic Debitage	Vertebrate Fauna	FCR	Mussel Shell
924	1146	19	0	38	15
924	1147	33	0	6	12
924	1148	19	0	60	12
924	1149	73	2	107	16
924	1150	25	0	60	14
924	1151	27	0	75	26
924	1152	18	1	55	23
924	1153	69	1	116	26
924	1154	59	0	75	26
925	1147	16	0	32	12
925	1148	2	0	2	0
925	1149	46	1	46	11
925	1150	14	0	38	15
925	1151	25	0	67	23
925	1152	32	0	63	37
925	1153	32	0	71	18
925	1154	29	0	54	23
926	1146	1	0	0	0
926	1147	12	0	21	15
926	1148	13	0	29	8
926	1149	82	0	62	25
926	1150	39	0	55	17
926	1151	30	0	24	16
926	1152	18	0	68	19
926	1153	32	0	59	22
926	1154	46	0	58	19
927	1147	1	0	0	0
927	1148	20	0	31	11
927	1150	11	0	32	12
927	1151	9	0	13	14
927	1152	13	0	56	15
927	1153	24	0	63	26
927	1154	81	0	103	17
928	1147	1	0	0	0
928	1150	11	0	16	3
928	1151	15	0	20	6
928	1152	9	0	18	8
928	1153	25	1	52	16
928	1154	65	1	135	24
929	1150	2	0	7	4
929	1151	14	0	321	17
929	1152	22	0	23	17
929	1153	39	0	54	26
929	1154	53	0	54	16
930	1149	2	0	0	0
930	1154	28	0	42	15

Table B.2. Continued.

North	East	Items per m^2 Lithic Debitage	Vertebrate Fauna	FCR	Mussel Shell
931	1154	27	0	67	15

APPENDIX C

TOOL PROVENIENCE FOR THE LOWER MEDINA AND UPPER PEREZ SAMPLES

Table C.1. Tools within the Lower Medina sample.

North	East	Count	Type
989	1070	1	Modified Thick Flakes
983	1062	1	Modified Thick Flakes
983	1062	1	Modified Thick Flakes
991	1069	1	Modified Thick Flakes
987	1063	1	Modified Thick Flakes
987	1068	1	Modified Thick Flakes
986	1069	1	Modified Thick Flakes
985	1066	1	Modified Thick Flakes
985	1067	2	Modified Thick Flakes
990	1074	1	Modified Thick Flakes
978	1061	1	Modified Thin Flakes
986	1063	1	Modified Thin Flakes
989	1066	1	Modified Thin Flakes
989	1068	1	Modified Thin Flakes
988	1066	1	Modified Thin Flakes
987	1062	1	Modified Thin Flakes
987	1063	1	Modified Thin Flakes
987	1067	1	Modified Thin Flakes
987	1068	1	Modified Thin Flakes
986	1069	1	Modified Thin Flakes
986	1072	3	Modified Thin Flakes
985	1061	1	Modified Thin Flakes
985	1066	1	Modified Thin Flakes
984	1063	1	Modified Thin Flakes
984	1068	1	Modified Thin Flakes
984	1069	1	Modified Thin Flakes
981	1065	1	Modified Thin Flakes
981	1067	2	Modified Thin Flakes
990	1074	3	Modified Thin Flakes
992	1067	1	Thick Biface
992	1064	3	Thick Biface
983	1071	1	Thick Biface
988	1062	1	Thick Biface
986	1065	1	Thick Biface
985	1066	1	Thick Biface
979	1064	1	Thick Biface
987	1070	1	Thin Biface
983	1072	1	Thin Biface
983	1071	1	Thin Biface
984	1061	1	Thin Biface
991	1071	1	Thin Biface
989	1066	1	Thin Biface
987	1063	1	Thin Biface
984	1066	1	Thin Biface
988	1061	1	Thin Biface

Table C.1. Continued.

North	East	Count	Type
987	1070	1	Projectile Point
983	1065	1	Projectile Point
983	1071	1	Projectile Point
990	1068	1	Projectile Point
982	1058	1	Projectile Point
980	1065	1	Projectile Point
988	1066	1	Uniface
985	1067	1	Uniface
984	1065	1	Uniface
983	1062	1	Core
983	1067	1	Core
990	1069	1	Core
979	1061	1	Core
989	1064	1	Core
989	1066	1	Core
988	1064	1	Core
988	1066	1	Core
987	1062	1	Core
986	1062	1	Core
986	1067	1	Core

Table C.2. Tools within the Upper Perez sample.

North	East	Count	Type
917	1150	1	Core
916	1152	2	Core
926	1146	1	Core
917	1158	2	Core
910	1162	1	Core
924	1153	2	Core
924	1154	2	Core
923	1151	1	Core
923	1152	1	Core
923	1153	2	Core
923	1154	1	Core
922	1153	1	Core
921	1151	1	Core
921	1152	3	Core
921	1154	1	Core
921	1155	2	Core
921	1157	1	Core
920	1151	2	Core
920	1153	1	Core
920	1154	3	Core
920	1155	1	Core
920	1158	2	Core
919	1151	2	Core
919	1154	4	Core
919	1157	1	Core
918	1152	1	Core
917	1152	1	Core
916	1155	1	Core
915	1154	2	Core
914	1156	2	Core
927	1150	1	Core
927	1153	2	Core
926	1148	1	Core
926	1149	1	Core
926	1153	1	Core
926	1154	2	Core
925	1147	1	Core
925	1151	1	Core
924	1146	1	Core
924	1149	3	Core
924	1150	1	Core
923	1146	1	Core
923	1150	2	Core
922	1146	1	Core
921	1146	2	Core

Table C.2. Continued.

North	East	Count	Type
921	1148	2	Core
921	1150	3	Core
920	1149	1	Core
919	1148	1	Core
919	1149	2	Core
929	1153	1	Core
928	1153	1	Core
927	1154	4	Core
916	1152	1	Modified Thick Flakes
916	1153	1	Modified Thick Flakes
926	1147	1	Modified Thick Flakes
921	1144	1	Modified Thick Flakes
917	1158	1	Modified Thick Flakes
916	1158	1	Modified Thick Flakes
924	1151	1	Modified Thick Flakes
924	1153	4	Modified Thick Flakes
924	1154	1	Modified Thick Flakes
923	1151	3	Modified Thick Flakes
923	1153	1	Modified Thick Flakes
923	1154	1	Modified Thick Flakes
922	1153	1	Modified Thick Flakes
922	1154	2	Modified Thick Flakes
921	1151	1	Modified Thick Flakes
921	1152	1	Modified Thick Flakes
921	1154	2	Modified Thick Flakes
921	1156	1	Modified Thick Flakes
920	1152	1	Modified Thick Flakes
920	1154	2	Modified Thick Flakes
920	1156	1	Modified Thick Flakes
920	1158	1	Modified Thick Flakes
919	1151	1	Modified Thick Flakes
919	1152	1	Modified Thick Flakes
919	1153	1	Modified Thick Flakes
919	1154	2	Modified Thick Flakes
919	1157	2	Modified Thick Flakes
918	1152	1	Modified Thick Flakes
918	1156	1	Modified Thick Flakes
918	1157	1	Modified Thick Flakes
917	1153	1	Modified Thick Flakes
917	1155	1	Modified Thick Flakes
917	1157	3	Modified Thick Flakes
915	1154	1	Modified Thick Flakes
914	1156	1	Modified Thick Flakes
927	1150	1	Modified Thick Flakes
927	1151	1	Modified Thick Flakes

Table C.2. Continued.

North	East	Count	Type
927	1152	1	Modified Thick Flakes
927	1153	3	Modified Thick Flakes
926	1150	2	Modified Thick Flakes
926	1153	1	Modified Thick Flakes
926	1154	1	Modified Thick Flakes
925	1149	1	Modified Thick Flakes
925	1152	1	Modified Thick Flakes
925	1153	2	Modified Thick Flakes
925	1154	1	Modified Thick Flakes
924	1147	1	Modified Thick Flakes
924	1149	1	Modified Thick Flakes
924	1150	2	Modified Thick Flakes
923	1150	1	Modified Thick Flakes
922	1146	1	Modified Thick Flakes
922	1149	1	Modified Thick Flakes
922	1150	1	Modified Thick Flakes
921	1146	1	Modified Thick Flakes
921	1148	2	Modified Thick Flakes
921	1149	1	Modified Thick Flakes
921	1150	1	Modified Thick Flakes
920	1147	2	Modified Thick Flakes
920	1149	1	Modified Thick Flakes
920	1150	1	Modified Thick Flakes
919	1150	1	Modified Thick Flakes
930	1154	1	Modified Thick Flakes
929	1152	2	Modified Thick Flakes
929	1153	1	Modified Thick Flakes
929	1154	1	Modified Thick Flakes
928	1153	3	Modified Thick Flakes
914	1156	1	Modified Thin Flakes
915	1153	1	Modified Thin Flakes
915	1154	3	Modified Thin Flakes
916	1154	2	Modified Thin Flakes
916	1155	2	Modified Thin Flakes
916	1157	3	Modified Thin Flakes
917	1153	1	Modified Thin Flakes
918	1154	1	Modified Thin Flakes
918	1157	3	Modified Thin Flakes
918	1159	1	Modified Thin Flakes
919	1148	2	Modified Thin Flakes
919	1149	4	Modified Thin Flakes
919	1150	2	Modified Thin Flakes
919	1151	1	Modified Thin Flakes
919	1152	2	Modified Thin Flakes
919	1154	1	Modified Thin Flakes

Table C.2. Continued.

North	East	Count	Type
919	1155	1	Modified Thin Flakes
919	1156	2	Modified Thin Flakes
919	1157	2	Modified Thin Flakes
919	1158	1	Modified Thin Flakes
920	1147	1	Modified Thin Flakes
920	1148	2	Modified Thin Flakes
920	1149	1	Modified Thin Flakes
920	1150	1	Modified Thin Flakes
920	1151	2	Modified Thin Flakes
920	1152	1	Modified Thin Flakes
920	1153	1	Modified Thin Flakes
920	1154	1	Modified Thin Flakes
920	1156	1	Modified Thin Flakes
920	1157	2	Modified Thin Flakes
920	1158	3	Modified Thin Flakes
921	1146	3	Modified Thin Flakes
921	1147	3	Modified Thin Flakes
921	1149	2	Modified Thin Flakes
921	1150	1	Modified Thin Flakes
921	1153	2	Modified Thin Flakes
921	1154	1	Modified Thin Flakes
921	1160	1	Modified Thin Flakes
922	1150	5	Modified Thin Flakes
922	1151	1	Modified Thin Flakes
922	1153	2	Modified Thin Flakes
922	1154	1	Modified Thin Flakes
923	1146	1	Modified Thin Flakes
923	1147	1	Modified Thin Flakes
923	1148	1	Modified Thin Flakes
923	1149	2	Modified Thin Flakes
923	1151	1	Modified Thin Flakes
923	1153	1	Modified Thin Flakes
923	1154	3	Modified Thin Flakes
924	1148	1	Modified Thin Flakes
924	1151	1	Modified Thin Flakes
924	1153	1	Modified Thin Flakes
924	1154	2	Modified Thin Flakes
925	1151	1	Modified Thin Flakes
926	1150	1	Modified Thin Flakes
926	1151	1	Modified Thin Flakes
926	1152	3	Modified Thin Flakes
926	1153	2	Modified Thin Flakes
926	1154	1	Modified Thin Flakes
927	1148	1	Modified Thin Flakes
927	1150	1	Modified Thin Flakes

Table C.2. Continued.

North	East	Count	Type
927	1154	1	Modified Thin Flakes
928	1150	1	Modified Thin Flakes
928	1154	3	Modified Thin Flakes
929	1152	1	Modified Thin Flakes
929	1153	3	Modified Thin Flakes
929	1154	4	Modified Thin Flakes
931	1154	1	Modified Thin Flakes
915	1152	1	Thick Biface
921	1154	1	Thick Biface
920	1151	1	Thick Biface
920	1155	1	Thick Biface
920	1156	1	Thick Biface
926	1152	1	Thick Biface
926	1153	1	Thick Biface
925	1148	1	Thick Biface
923	1147	1	Thick Biface
928	1153	1	Thick Biface
920	1151	1	Thin Biface
926	1152	1	Thin Biface
926	1154	1	Thin Biface
922	1147	1	Thin Biface
922	1148	1	Thin Biface
922	1149	1	Thin Biface
916	1153	1	Projectile Point
921	1160	1	Projectile Point
919	1157	1	Projectile Point
918	1154	1	Projectile Point
917	1157	1	Projectile Point
927	1150	1	Projectile Point
923	1149	1	Projectile Point
922	1150	1	Projectile Point
920	1150	1	Projectile Point
920	1155	1	Thin Uniface
920	1151	1	Thick Uniface
920	1157	1	Thick Uniface
918	1156	1	Thick Uniface
927	1150	1	Thick Uniface
927	1153	1	Thick Uniface
926	1154	1	Thick Uniface
924	1149	1	Thick Uniface
922	1146	1	Thick Uniface
922	1148	1	Thick Uniface
922	1150	1	Thick Uniface
921	1148	1	Thick Uniface
921	1150	1	Thick Uniface

Table C.2. Continued.

North	East	Count	Type
921	1158	1	Hammerstone
920	1154	1	Grinding Slab
919	1154	2	Hammerstone
917	1155	1	Cobble Tool
920	1148	1	Cobble Tool

APPENDIX D

RELATIVE DENSITY VECTORS AND CLUSTER TYPES FOR THE LOWER MEDINA AND UPPER PEREZ SAMPLES

Table D.1. Relative density vectors and cluster types for the Lower Medina sample.

Coordinates		Relative Density				Cluster Designation
North	East	Lithic Debitage	Vertebrate Fauna	FCR	Mussel Shell	
992	1071	70.73	21.95	2.44	4.88	1
990	1070	70.83	25.69	.69	2.78	1
992	1072	38.89	61.11	.00	.00	1
992	1068	58.18	34.55	5.45	1.82	1
986	1070	43.72	54.25	.40	1.62	1
984	1070	61.70	28.72	5.32	4.26	1
980	1070	56.10	26.83	2.44	14.63	1
988	1070	53.64	37.09	3.31	5.96	1
985	1070	43.35	45.66	2.89	8.09	1
981	1070	53.33	32.00	1.33	13.33	1
983	1063	39.07	53.41	3.23	4.30	1
983	1066	42.40	53.20	1.20	3.20	1
983	1065	60.00	37.83	.43	1.74	1
983	1068	52.34	41.41	2.34	3.91	1
983	1072	60.78	29.41	1.96	7.84	1
983	1069	54.55	43.94	.00	1.52	1
983	1067	59.74	34.88	2.41	2.97	1
983	1071	57.38	8.20	27.87	6.56	1
990	1069	62.58	31.94	2.26	3.23	1
982	1061	57.73	20.62	16.49	5.15	1
990	1062	69.94	23.31	3.68	3.07	1
984	1061	42.77	25.30	16.27	15.66	1
990	1068	64.50	26.50	3.50	5.50	1
986	1063	61.11	27.78	5.56	5.56	1
991	1066	50.00	33.33	16.67	.00	1
991	1068	55.00	25.00	14.17	5.83	1
989	1063	62.32	24.64	1.45	11.59	1
989	1065	67.18	27.48	3.05	2.29	1
990	1072	40.00	60.00	.00	.00	1
988	1064	50.00	42.86	4.76	2.38	1
988	1067	38.62	43.39	6.88	11.11	1
987	1061	42.86	57.14	.00	.00	1
987	1066	58.73	4.76	31.75	4.76	1
986	1062	42.86	23.81	19.05	14.29	1
986	1067	59.32	20.34	10.17	10.17	1
985	1061	63.64	25.97	3.90	6.49	1
985	1062	62.96	14.81	11.11	11.11	1
985	1063	43.59	35.90	10.26	10.26	1
985	1065	74.29	25.71	.00	.00	1

Table D.1. Continued.

Coordinates		Relative Density				Cluster
North	East	Lithic Debitage	Vertebrate Fauna	FCR	Mussel Shell	
985	1068	66.93	30.71	1.57	.79	1
984	1065	52.13	45.74	.00	2.13	1
984	1066	59.72	29.17	2.78	8.33	1
982	1065	53.33	40.00	6.67	.00	1
982	1069	54.55	27.27	9.09	9.09	1
981	1058	62.50	.00	25.00	12.50	1
988	1061	40.89	33.59	5.73	19.79	1
980	1062	35.25	36.89	7.38	20.49	1
991	1070	91.17	6.62	1.32	.88	2
992	1066	100.00	.00	.00	.00	2
987	1070	80.73	16.51	.00	2.75	2
983	1061	100.00	.00	.00	.00	2
990	1067	84.39	9.63	1.66	4.32	2
990	1064	82.89	10.65	1.52	4.94	2
983	1058	83.33	16.67	.00	.00	2
990	1066	78.75	9.38	2.50	9.38	2
990	1063	93.98	4.32	.00	1.69	2
990	1065	92.83	3.58	.49	3.09	2
981	1061	80.00	.00	13.33	6.67	2
980	1061	91.78	4.11	2.74	1.37	2
979	1061	81.32	15.80	1.44	1.44	2
978	1061	85.11	9.93	.00	4.96	2
991	1062	100.00	.00	.00	.00	2
991	1067	80.18	2.70	8.11	9.01	2
991	1071	82.35	5.88	.00	11.76	2
991	1072	100.00	.00	.00	.00	2
988	1062	100.00	.00	.00	.00	2
988	1068	83.33	8.33	8.33	.00	2
987	1067	79.55	6.82	3.41	10.23	2
986	1065	74.19	19.35	3.23	3.23	2
986	1066	77.42	17.74	3.23	1.61	2
985	1066	87.25	6.86	2.94	2.94	2
985	1067	88.62	7.59	3.45	.34	2
984	1063	93.10	.00	.00	6.90	2
984	1068	80.43	10.87	.00	8.70	2
984	1069	79.55	13.64	.00	6.82	2
990	1073	87.29	12.71	.00	.00	2
982	1062	100.00	.00	.00	.00	2
982	1067	100.00	.00	.00	.00	2

Table D.1. Continued.

Coordinates		Relative Density				Cluster
North	East	Lithic Debitage	Vertebrate Fauna	FCR	Mussel Shell	
981	1062	100.00	.00	.00	.00	2
981	1063	100.00	.00	.00	.00	2
992	1063	100.00	.00	.00	.00	2
981	1067	100.00	.00	.00	.00	2
981	1068	100.00	.00	.00	.00	2
980	1056	100.00	.00	.00	.00	2
980	1057	100.00	.00	.00	.00	2
980	1063	100.00	.00	.00	.00	2
980	1067	87.04	5.56	.00	7.41	2
979	1056	100.00	.00	.00	.00	2
979	1063	100.00	.00	.00	.00	2
979	1065	100.00	.00	.00	.00	2
979	1066	100.00	.00	.00	.00	2
979	1068	100.00	.00	.00	.00	2
978	1062	100.00	.00	.00	.00	2
990	1074	98.86	.38	.19	.57	2
991	1070	.00	100.00	.00	.00	3
983	1070	20.51	72.44	.64	6.41	3
983	1073	22.22	66.67	.00	11.11	3
990	1061	14.81	66.67	3.70	14.81	3
986	1061	19.17	71.67	5.00	4.17	3
983	1055	.00	100.00	.00	.00	3
981	1065	22.22	66.67	.00	11.11	3
983	1064	20.00	80.00	.00	.00	3
992	1067	24.24	39.39	3.03	33.33	4
993	1070	27.59	31.03	17.24	24.14	4
983	1057	24.14	37.93	8.62	29.31	4
989	1070	30.40	42.40	5.60	21.60	4
992	1064	2.78	51.28	1.07	44.87	4
992	1065	23.08	23.08	.00	53.85	4
992	1062	31.25	25.00	12.50	31.25	4
991	1064	40.00	12.86	2.86	44.29	4
991	1069	32.32	34.15	.61	32.93	4
989	1062	25.00	35.71	7.14	32.14	4
989	1067	35.29	9.80	9.80	45.10	4
989	1069	30.51	15.25	8.47	45.76	4
988	1063	22.73	50.00	2.27	25.00	4
987	1062	33.33	25.00	.00	41.67	4
987	1068	44.16	12.99	5.19	37.66	4

Table D.1. Continued.

Coordinates		Relative Density				Cluster
North	East	Lithic Debitage	Vertebrate Fauna	FCR	Mussel Shell	
981	1056	33.33	33.33	.00	33.33	4
980	1068	.00	.00	.00	100.00	4
979	1062	.00	.00	.00	100.00	4
992	1070	54.32	8.64	4.94	32.10	5
983	1053	66.67	.00	.00	33.33	5
982	1070	73.08	11.54	3.85	11.54	5
992	1061	33.33	.00	.00	66.67	5
983	1074	52.17	13.04	8.70	26.09	5
983	1062	71.11	8.89	5.56	14.44	5
989	1061	50.00	.00	.00	50.00	5
991	1065	59.15	9.86	4.23	26.76	5
989	1066	57.89	5.26	7.02	29.82	5
989	1068	60.00	.00	.00	40.00	5
990	1071	75.00	.00	.00	25.00	5
988	1065	63.01	12.33	1.37	23.29	5
988	1069	53.70	1.85	1.85	42.59	5
987	1063	62.86	2.86	12.86	21.43	5
987	1065	63.64	18.18	.00	18.18	5
987	1069	70.37	8.64	.00	20.99	5
986	1068	62.22	11.11	4.44	22.22	5
986	1069	66.67	9.52	9.52	14.29	5
986	1072	71.74	8.70	.00	19.57	5
985	1069	64.06	12.50	1.56	21.88	5
982	1058	75.00	.00	.00	25.00	5
982	1066	73.33	.00	6.67	20.00	5
981	1066	83.33	.00	.00	16.67	5
979	1067	31.82	.00	4.55	63.64	5
978	1056	50.00	.00	.00	50.00	5
978	1057	50.00	.00	.00	50.00	5
983	1060	50.00	.00	50.00	.00	6
991	1061	10.00	20.00	40.00	30.00	6
991	1063	28.57	.00	42.86	28.57	6
989	1064	36.36	6.06	27.27	30.30	6
988	1066	35.00	20.00	32.00	13.00	6
982	1057	50.00	.00	50.00	.00	6
982	1063	30.00	20.00	30.00	20.00	6
981	1057	50.00	.00	25.00	25.00	6
980	1058	.00	.00	66.67	33.33	6
979	1057	33.33	.00	66.67	.00	6

Table D.2. Relative density vectors and cluster types for the Upper Perez sample.

Coordinates		Relative Density				Cluster
North	East	Lithic Debitage	Vertebrate Fauna	FCR	Mussel Shell	
915	1152	100.00	.00	.00	.00	1
915	1153	100.00	.00	.00	.00	1
916	1151	100.00	.00	.00	.00	1
917	1149	100.00	.00	.00	.00	1
917	1150	100.00	.00	.00	.00	1
917	1159	100.00	.00	.00	.00	1
918	1147	100.00	.00	.00	.00	1
919	1146	100.00	.00	.00	.00	1
926	1146	100.00	.00	.00	.00	1
927	1147	100.00	.00	.00	.00	1
928	1147	100.00	.00	.00	.00	1
930	1149	100.00	.00	.00	.00	1
915	1154	49.67	15.89	26.93	7.51	2
916	1152	51.08	9.71	28.06	11.15	2
916	1153	44.70	3.69	42.40	9.22	2
916	1154	38.43	10.74	40.91	9.92	2
916	1155	47.87	12.32	32.23	7.58	2
916	1156	36.62	18.31	29.58	15.49	2
916	1157	59.38	4.17	26.04	10.42	2
916	1158	50.00	8.65	27.88	13.46	2
917	1152	37.93	.00	51.72	10.34	2
917	1153	36.15	.77	56.92	6.15	2
917	1154	53.28	5.41	30.50	10.81	2
917	1156	57.50	7.50	22.50	12.50	2
917	1157	35.29	.00	60.78	3.92	2
917	1158	48.65	.00	51.35	.00	2
918	1154	42.44	4.20	40.76	12.61	2
918	1155	35.00	1.00	57.00	7.00	2
919	1149	48.11	3.46	36.48	11.95	2
919	1151	35.53	.00	51.32	13.16	2
919	1154	46.58	7.49	37.46	8.47	2
919	1156	37.80	.00	46.34	15.85	2
919	1159	38.10	.00	52.38	9.52	2
920	1149	44.58	1.86	46.75	6.81	2
920	1154	44.77	2.61	40.52	12.09	2
920	1159	40.54	0.00	43.24	16.22	2
921	1144	54.55	.00	36.36	9.09	2
921	1147	41.11	.00	42.22	16.67	2
921	1149	51.09	1.87	33.02	14.02	2

Table D.2. Continued.

Coordinates		Relative Density				Cluster
North	East	Lithic Debitage	Vertebrate Fauna	FCR	Mussel Shell	
921	1150	37.89	.00	43.48	18.63	2
921	1153	37.50	1.56	50.00	10.94	2
921	1154	52.71	.78	37.21	9.30	2
921	1156	40.43	4.26	50.00	5.32	2
921	1157	40.18	.00	41.07	18.75	2
921	1158	42.11	.00	43.86	14.04	2
921	1159	48.48	.00	30.30	21.21	2
921	1160	53.70	.00	33.33	12.96	2
922	1146	53.74	.47	34.11	11.68	2
922	1147	50.53	1.05	39.30	9.12	2
922	1148	46.18	2.18	41.45	10.18	2
922	1149	37.50	1.36	50.68	10.45	2
922	1151	39.01	.00	47.25	13.74	2
922	1152	58.38	.51	34.52	6.60	2
922	1153	42.86	.00	43.15	13.99	2
922	1154	45.06	1.85	48.77	4.32	2
923	1146	45.28	.00	35.85	18.87	2
923	1148	34.86	.00	57.80	7.34	2
923	1149	38.70	.38	54.02	6.90	2
924	1147	64.71	.00	11.76	23.53	2
924	1149	36.87	1.01	54.04	8.08	2
924	1154	36.88	.00	46.88	16.25	2
925	1148	50.00	.00	50.00	.00	2
925	1149	44.23	.96	44.23	10.58	2
926	1149	48.52	.00	36.69	14.79	2
926	1150	35.14	.00	49.55	15.32	2
926	1151	42.86	.00	34.29	22.86	2
926	1154	37.40	.00	47.15	15.45	2
927	1154	40.30	.00	51.24	8.46	2
928	1150	36.67	.00	53.33	10.00	2
928	1151	36.59	.00	48.78	14.63	2
929	1154	43.09	.00	43.90	13.01	2
915	1156	29.41	.00	52.94	17.65	3
917	1155	16.07	.00	75.00	8.93	3
918	1152	23.35	.00	64.07	12.57	3
918	1153	30.48	.00	55.24	14.29	3
918	1156	14.29	.00	71.43	14.29	3
918	1157	27.27	.00	53.25	19.48	3
918	1158	26.67	.00	57.78	15.56	3

Table D.2. Continued.

Coordinates		Relative Density				Cluster
North	East	Lithic Debitage	Vertebrate Fauna	FCR	Mussel Shell	
918	1159	20.83	.00	62.50	16.67	3
919	1148	33.93	1.34	53.57	11.16	3
919	1150	29.66	.00	55.93	14.41	3
919	1152	20.00	.00	70.00	10.00	3
919	1153	18.18	.00	63.64	18.18	3
919	1155	32.43	.00	44.59	22.97	3
919	1157	29.03	.00	64.52	6.45	3
919	1158	30.23	.00	51.16	18.60	3
920	1146	33.33	.00	44.44	22.22	3
920	1147	23.46	.00	61.45	15.08	3
920	1148	30.08	.00	50.38	19.55	3
920	1150	29.37	1.40	54.55	14.69	3
920	1151	20.19	.00	67.31	12.50	3
920	1152	26.17	.00	61.68	12.15	3
920	1153	31.78	.00	53.27	14.95	3
920	1155	7.79	.00	87.88	4.33	3
920	1156	30.00	.00	52.50	17.50	3
920	1157	18.37	.00	63.27	18.37	3
920	1158	20.45	.00	56.82	22.73	3
920	1160	0.00	0.00	80.00	20.00	3
921	1146	19.57	.00	60.87	19.57	3
921	1148	27.27	.00	52.27	20.45	3
921	1151	16.03	.76	67.94	15.27	3
921	1152	28.57	.00	58.57	12.86	3
921	1155	29.63	3.70	44.44	22.22	3
922	1144	31.25	.00	43.75	25.00	3
922	1150	31.18	.59	57.65	10.59	3
923	1147	29.11	.63	62.03	8.23	3
923	1150	25.00	.00	60.48	14.52	3
923	1151	25.88	.00	60.00	14.12	3
923	1152	30.73	.00	55.21	14.06	3
923	1153	28.92	.00	58.82	12.25	3
923	1154	8.60	.00	88.16	3.25	3
924	1146	26.39	.00	52.78	20.83	3
924	1148	20.88	.00	65.93	13.19	3
924	1150	25.25	.00	60.61	14.14	3
924	1151	21.09	.00	58.59	20.31	3
924	1152	18.56	1.03	56.70	23.71	3
924	1153	32.55	.47	54.72	12.26	3

Table D.2. Continued.

Coordinates		Relative Density				Cluster
North	East	Lithic Debitage	Vertebrate Fauna	FCR	Mussel Shell	
925	1147	26.67	.00	53.33	20.00	3
925	1150	20.90	.00	56.72	22.39	3
925	1151	21.74	.00	58.26	20.00	3
925	1152	24.24	.00	47.73	28.03	3
925	1153	26.45	.00	58.68	14.88	3
925	1154	27.36	.00	50.94	21.70	3
926	1147	25.00	.00	43.75	31.25	3
926	1148	26.00	.00	58.00	16.00	3
926	1152	17.14	.00	64.76	18.10	3
926	1153	28.32	.00	52.21	19.47	3
927	1148	32.26	.00	50.00	17.74	3
927	1150	20.00	.00	58.18	21.82	3
927	1151	25.00	.00	36.11	38.89	3
927	1152	15.48	.00	66.67	17.86	3
927	1153	21.24	.00	55.75	23.01	3
928	1152	25.71	.00	51.43	22.86	3
928	1153	26.60	1.06	55.32	17.02	3
928	1154	28.89	.44	60.00	10.67	3
929	1150	15.38	.00	53.85	30.77	3
929	1151	3.98	.00	91.19	4.83	3
929	1152	35.48	.00	37.10	27.42	3
929	1153	32.77	.00	45.38	21.85	3
930	1154	32.94	.00	49.41	17.65	3
931	1154	24.77	.00	61.47	13.76	3
917	1158	.00	.00	.00	100.00	4

APPENDIX E

DENDROGRAMS FOR THE LOWER MEDINA AND UPPER PEREZ SAMPLES

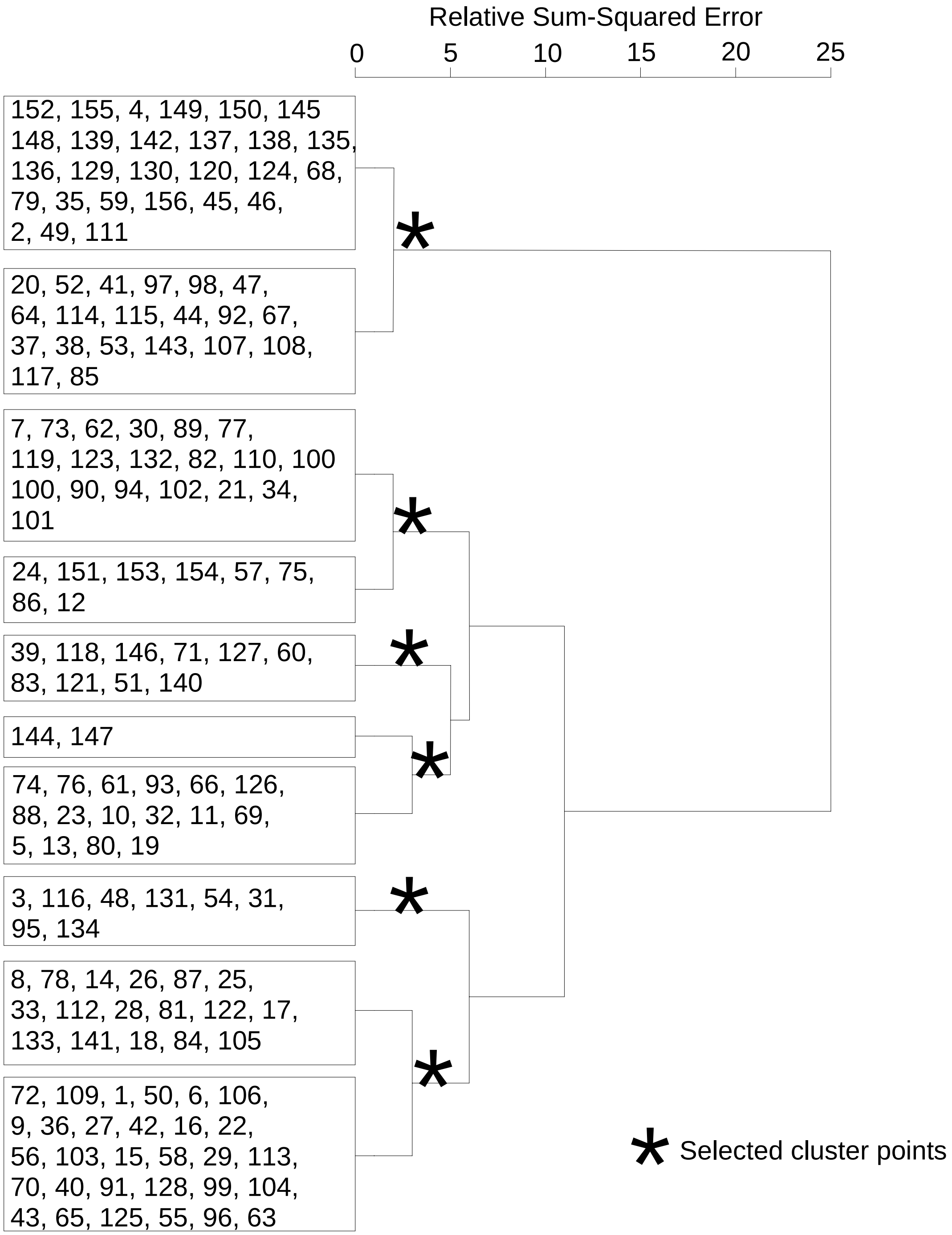

Figure D.1. Dendrogram for the Lower Medina sample.

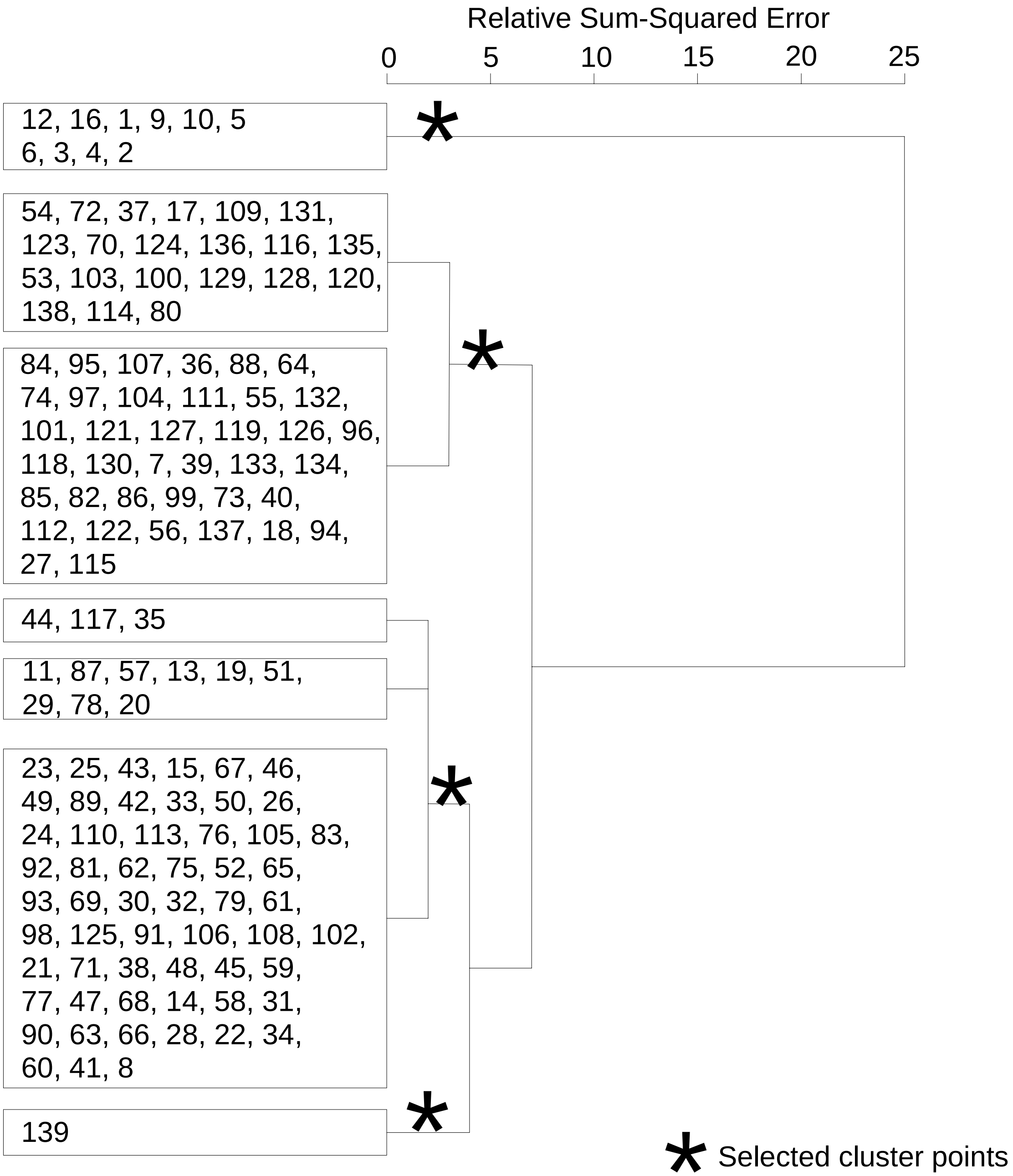

Figure D.2. Dendrogram for the Upper Perez sample.

VITA

James Bryan Mason
9911 Kings Walk Round
Houston, Texas 77070

James Bryan Mason was born in Houston, Texas on February 12, 1974. He attended high school in Bay City, Texas and graduated in May, 1992. The following September, he entered Texas A&M University and received a Bachelor of Arts degree in Anthropology in May 1996. In January 1997, he began study toward a master’s degree at Texas A&M University. This degree was awarded in August 2003. He has served as a graduate assistant at Texas A&M with the Conservation Research Laboratory (1997-1998) conserving artifacts from the *La Belle* shipwreck and with the Center for Ecological Archaeology (1998-2001) conducting cultural resources management projects throughout Texas. He has also worked as a project archaeologist for BHE Environmental, Inc. in Houston, Texas conducting archaeology in the southeastern United States. The author is currently a self-employed contract archaeologist living in Houston, Texas.

The author is a member of the Society for American Archaeology, the Texas Archeology Society, and the Council of Texas Archaeologists.

He is married to Kerri Lynn Mason of Houston, Texas and has a son, Devon Thomas Mason.

The typist for this thesis was Mr. James Bryan Mason