

BURNED ROCK MIDDENS, SETTLEMENT PATTERNS, AND BIAS IN THE
LOWER PECOS CANYONLANDS OF TEXAS

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BURNED ROCK MIDDENS, SETTLEMENT PATTERNS, AND BIAS IN THE
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ABSTRACT

BURNED ROCK MIDDENS, SETTLEMENT PATTERNS, AND BIAS IN THE LOWER PECOS CANYONLANDS OF TEXAS

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Burned rock middens (BRMs) are one of the most common archaeological features encountered in the Lower Pecos Canyonlands of southwest Texas and Coahuila, Mexico. BRMs form from the repeated use of a single location for constructing earth ovens. Based in part upon interpretations of BRM accumulations, two models of Archaic settlement patterns have been hypothesized for the Lower Pecos: the semi-sedentary rockshelter and canyon collectors model and the nomadic foragers model. However, these two settlement pattern models have never been tested using site survey data.

In order to test these two competing settlement pattern models, a new area within the Lower Pecos was surveyed: Dead Man's Creek (a tributary to the Devils River).

Observations regarding BRM site location data along Dead Man's Creek (DMC) indicate that there could be a connection between BRM site location and the availability of naturally occurring sediment. Through the use of GIS, site frequency and density was analyzed using Buffer analysis to determine site patterns in relation to the Devils River. The patterns observed within the DMC data were then compared to three additional datasets: the Lower Pecos regional site data, site data from Seminole Canyon State Park and Historic Site, and site data from Devils River State Natural Area – North Unit (DRSNA-NU). The DMC data could only be compared to the Seminole Canyon and DRSNA-NU data because the regional data are too biased towards the main river canyons. Patterns within the frequency and density data for DMC, Seminole, and DRSNA-NU indicate that more earth oven cooking was occurring as distance away from the major rivers increased. This pattern of increased earth oven cooking away from the major river canyons conflicts with the canyon collector settlement pattern model, but there is too little site data to fully evaluate either the canyon collector or the nomadic forager models of Lower Pecos settlement pattern models. Further, the site data for the Lower Pecos is heavily biased in two ways, both of which impact settlement pattern modeling.

First, nearly all of the surveys have occurred along the major river canyons. Second, there is a recording bias towards recent sites found on the surface. Based on the analysis of the limited geoarchaeological investigations, there is the potential for buried archaeology in the three main topographic settings in the region (uplands, rockshelters, and canyon bottoms). Further, due to geomorphic processes the most common sites present on the surface date to the last 3,000 RCYBP. These two biases have severely

impacted previous settlement pattern hypotheses, and until we collect additional site data from areas greater than 7 kilometers from the major rivers and conduct extensive geoarchaeological investigations, settlement pattern models will remain biased. Only through multi-disciplinary, systematic studies can data be objectively collected to test previous hypotheses and build new, better-grounded settlement pattern models for the Lower Pecos Canyonlands.

CHAPTER 1: BURNED ROCK MIDDENS IN THE LOWER PECOS: AN INTRODUCTION

Burned rock middens (BRMs) are one of the most common archaeological features encountered in the Lower Pecos Canyonlands of southwest Texas and Coahuila, Mexico (Dibble and Prewitt 1967:117-118; site records on file at the Texas Archeological Research Lab [TARL]). As defined by Dering (2002:Table 4.1) a burned rock midden is, “a feature consisting of fire-cracked rock, charcoal, darkened midden soils, artifacts, ecofacts, and often other associated or imbedded features.” For decades, archaeologists have recognized burned rock middens as being related to food preparation (e.g., Greer 1968; Pearce and Jackson 1933), but only recently have BRMs been interpreted—and widely accepted—as being related to earth oven cookery (e.g., Black et al. 1997; Brown 1991; Dering 1999). Yet, even with the recognition that burned rock middens represent earth oven facilities, these common features remain one of the most underappreciated and misunderstood aspects of Lower Pecos archaeology. In this thesis, I analyze how earth oven facilities are distributed across the Lower Pecos landscape and describe patterns in burned rock midden frequency, distribution, and density. The identified patterns are then compared to previous models of Lower Pecos settlement patterns to determine if the data matches the models. Further, biases within site data are identified and discussed in terms of how the biases affect settlement pattern models.

Earth Ovens and Burned Rock Middens in the Lower Pecos Canyonlands

To begin to understand what burned rock middens represent, there needs to be a discussion concerning how BRMs form in relation to earth oven construction. Earth oven cooking technology has been used by peoples across the world to bake plants and animals that would be otherwise indigestible, and often toxic, to humans (Thoms 2008a:443; Wandsnider 1997). As described by Dering (1999:664),

An earth oven consists of a pit filled with fuel wood on which rocks are placed. The mass is fired and allowed to burn down so that the heat is transferred from the burning fuel to the rocks. Plant packing material is placed on the rocks to provide insulation and steam. The food is then placed on and within the packing material and the whole mass is covered with earth and left for 24 to 48 hours.

Food placed in an earth oven is cooked through a chemical process called hydrolysis through which, “complex molecules are cleaved into smaller molecules through the uptake of a water molecule” (Wandsnider 1997:16). It is imperative that earth ovens maintain a sufficient amount of moisture in the cooking environment for the entire length of baking time because otherwise the entire mass of food and insulation will char and become inedible.

Across the Lower Pecos landscape, there are nearly infinite locations that could be utilized for the purpose of constructing a single earth oven. At the most basic level, any earth oven location would only need to provide four resources¹: (1) food to cook; (2) fuel wood to build a fire; (3) rock (or other heat retaining material) to serve as the heating element; and (4) sediment/soil matrix to dig an oven pit (Dering 1999; Ellis 1997; Thoms

¹ In some ethnographic examples of earth oven cooking, water is a required resource; however, ethnographic summaries of earth ovens do not list agaves, sotol, and prickly pear as requiring additional water to be added (Ellis 1997; Wandsnider 1997).

2008a, 2008b, 2009; Wandsnider 1997). All of these resources are widely distributed—albeit unevenly—within the Lower Pecos landscape (Dering 1999). Therefore, although prehistoric inhabitants of the region could have constructed earth ovens nearly anywhere, we know they returned over and over to specific locations due to one feature type: burned rock middens (Black et al. 1997) (Figures 1.1 and 1.2).



Figure 1.1. An experimental earth oven after it has been opened. Notice the amount of plant debris surrounding the oven pit.



Figure 1.2. Dr. J. Phil Dering constructing the first earth oven at the SHUMLA School, Inc. campus in 2002 (left). The same SHUMLA School earth oven location, now a burned rock midden, in March 2012 (right).

Each time an earth oven is constructed refuse is produced—fire-cracked rocks (FCR), food waste, ash, charcoal—and over time, the refuse accumulates into a concentration of burned rock and other earth oven detritus (Black et al. 1997; Leach et al. 2005). This accumulation of FCR, organics, ash, and charcoal comprises the bulk of archaeological material at any BRM site, suggesting that the dominant activity was earth oven cooking. However, even though BRMs are formed mainly by the repeated construction and use of earth ovens, other activities took place at some BRM locations (Black 1997:86). Artifacts typically found in association with BRMs include large uniface and flake tools as well as projectile points, a variety of bifacial stone tools, ground stone artifacts, animal bone, plant remains unrelated to earth oven construction (e.g., charred grass seeds and mesquite beans), and grinding features (Black et al. 1997; Miller et al. 2011; Shafer 1981:135; Shafer and Bryant 1977).

Based on the artifact assemblages at BRMs, a variety of human activities often occurred including food preparation (unrelated to earth oven cooking), tool production, and—in the case of dry rockshelters within the Lower Pecos—habitation in the form of coprolites and grass lined beds (Shafer and Bryant 1977). Yet, the artifacts found in association with BRMs are not homogenous across all BRM sites, indicating a range of other activities—besides earth oven cooking—likely occurred at different locations (e.g., Black et al. 1997; Miller et al. 2011; Nunley et al. 1965). Unfortunately, the majority of these activities are lost to archaeologists due to preservation biases (Leach et al. 2005; Schiffer 1983). If BRM sites (or sites containing BRMs) are not equal in terms of the artifact assemblages (hence human behavior), how can archaeologists study burned rock middens on a landscape perspective?

The simple answer is that in order to analyze burned rock midden distribution on a landscape scale we must first focus on a subset of what they mean in regard to past human activities. No matter what other activities took place at a BRM, or where that site might be located (within a rockshelter, for instance), every site containing a BRM represents a place on the landscape where people repeatedly returned to build earth ovens. In other words, a BRM site represents a hot spot, or hub of human activity on the landscape (Black 1997:86). Therefore, by analyzing the distribution of the most common behavioral loci within a region, it is possible to discern patterns in site location, distribution, and frequency and test previous models of prehistoric settlement and landuse.

Burned Rock Middens and Landuse in the Lower Pecos

Within the Lower Pecos, burned rock middens are found in three main topographic settings: along stream terraces (e.g., Dibble and Prewitt 1967; Johnson 1961), within rockshelters and caves (e.g., Dibble and Prewitt 1967; Ross 1965), and on upland ridges or flats (e.g., McClurkan 1968; Roberts and Alvarado 2011, 2012). Sites containing BRMs have been excavated in each setting. Based on the identification of botanical remains from earth oven and BRM sites, as well as plant fibers identified in human coprolites, it is reasoned that lechuguilla (*Agave lechuguilla*), sotol (*Dasylirion* spp.), yucca (*Yucca* spp.), prickly pear (*Opuntia* spp.), and onion (*Allium* spp.) were the dominant plant foods processed in earth ovens within the Lower Pecos (Brown 1991; Dean 2006; Dering 1979, 1999, 2005; Stock 1983; Williams-Dean 1978). During certain times of the year, portions of these plants are edible without the necessity of constructing earth ovens (yucca flowers; prickly pear *nopals* and tunas); however, in order to be

rendered edible throughout the remainder of the year all of these plants require cooking and earth ovens would provide that facility (Dering 1999:667).

Despite the range of topographic settings in which BRMs exist, the most intensively studied sites in the region are rockshelters and caves containing BRMs (e.g., Dering 1979; Epstein 1963; Martin 1933; Ross 1965; Turpin and Bement 1992; Word and Douglas 1970). Based on data recovered from rockshelter excavations, archaeologists argue that beginning around 7,000 RCYBP, plants baked in earth ovens became one of the staple food sources for the indigenous inhabitants of the region (Brown 1991:118; Johnson 1967:74; Marmaduke 1978:10; Shafer 1976:6, 1981:134, 1986:116-117; Taylor 1964:198; Turpin 2004:274). The distribution of BRMs and the economic impact of plants baked in earth ovens have contributed to hypotheses regarding group mobility, regional settlement patterns, intensity of regional landuse, territoriality, and the development of rock art styles (e.g., Brown 1991; Dering 1999; Shafer 1981, 1986; Taylor 1964; Turpin 1990, 1994, 2004).

At the core of many of the settlement pattern hypotheses is the long standing argument that the indigenous population used rockshelters and caves differently than open-air sites. This dichotomous aspect of settlement patterns is based largely on the view of rockshelters and caves as natural houses or “home bases” (Kirkland 1937:110; Martin 1933:11; Mason 1936:193; Shafer 1986:94, 99; Taylor 1948:74; Turpin 1982:237, 1984a:17, 1990:265; 1994:3, 2004:267), and open-air sites as temporary camps or logistical processing stations (Kirkland 1937:110; Martin 1933:11; Mason 1936:193; Pearce and Jackson 1933:139; Sayles 1935:63; Saunders 1986:42, 1992; Shafer 1981, 1986:94, 96; Shafer and Bryant 1977; Taylor 1948:74, 1949:76; Taylor 1964:198; Turpin

1982:10, 67, 237, 1984a:17, 1990:265, 1994:71, 2004:267, 269, 274). Based on artifacts and features recorded from rockshelters containing BRMs—basketry, wooden artifacts, burials, coprolites, grass lined beds (Epstein 1963; Martin 1933; Ross 1965; Shafer and Bryant 1977)—the artifacts seems to support this hypothesis of *habitation* occurring within rockshelters as opposed to open-air BRM sites where the dominant artifacts recovered are lithics of various types (Roberts and Alvarado 2011, 2012).

Yet, the argument about open-air sites being temporary and sheltered sites being “habitations” is based on data that is heavily biased from the dozens of rockshelter excavations that have occurred (e.g., Alexander 1970; Brown 1991; Chadderdon 1983; Collins 1967; Davenport 1938; Dering 1979; Dibble 1967; Dibble and Lorrain 1968; Dibble and Prewitt 1967; Epstein 1963; Holden 1937; Martin 1933; Nunley et al. 1965; Parsons 1965; Pearce and Jackson 1933; Prewitt 1966; Ross 1965; Shafer and Bryant 1977; Turpin and Bement 1992; Word and Douglas 1970) compared to only a few open-air sites (e.g., Dibble and Prewitt 1967; Johnson 1964; McClurkan 1968; Nunley et al. 1965; Roberts and Alvarado 2011; Sorrow 1968; Turpin and Bement 1988). Thus, in order to study the settlement patterns in the Lower Pecos, it seems that archaeologists must stop using the terms “habitation site” and “temporary camp” because we do not have enough data from sites besides rockshelters to assign sites to a behavioral category. It is also clear that the differences in artifact assemblages between open-air and sheltered locations are due to the inherently different levels of preservation present at both sites and not solely on the activities that occurred there in prehistory. No open-air BRM excavations within the Lower Pecos report perishable remains being recovered except in the form of charred plant remains and bone. Thus, until extensive testing of numerous

open-air sites occurs, it seems premature to classify a rockshelter with perishable remains and a burned rock midden as a “habitation” site and an open-air burned rock midden site as a “temporary camp” (Shafer 1986:94-95; Turpin 2004:269, 272) when the differences could be largely, or even entirely, due to preservation.

Therefore, rather than use the terms “habitation,” “residential,” or “temporary camp” to describe sites based on their topographic setting, this analysis will only describe sites based on their explicit characteristics. For instance, a rockshelter with a burned rock midden is described as just that: a rockshelter with a burned rock midden. In this way, this study can focus on just the presence or absence of burned rock middens, no matter the topographic setting, to identify patterns of frequency, distribution, and location across the region.

Analysis of Lower Pecos Settlement Patterns and Landuse Using Burned Rock Midden Distribution

Previous models of settlement and landuse for the Lower Pecos have been dependent upon interpreting the distribution of burned rock middens. However, the location of the sites (sheltered verses open-air) and the presumed associated behavior (habitation verses temporary camp) have biased the interpretations of site distribution and settlement to fit data collected from rockshelter excavations (e.g., Shafer 1986). For this study, no sites are designated “habitation” or “residential” sites, and sites that have been previously recognized as habitation sites (e.g., Hinds Cave [Shafer and Bryant 1977]) are not classified as such. Nor does this analysis provide detailed discussions of artifacts present at burned rock midden sites.

This thesis analyzes the landscape distribution of earth oven cooking facilities through the use of Geographic Information Systems (GIS) to identify patterns in site distribution, test previous models of settlement patterns, and discuss biases within the site data. We know that these earth oven cooking facilities are wide spread across the Lower Pecos Canyonlands, and that people returned to these locations dozens and hundreds of times throughout prehistory to construct earth ovens. It will be assumed that in the process of earth oven cooking people would have occupied a site for various, unknown lengths of time, but not necessarily that people “inhabited” or “resided” at a specific site. This thesis presents the first landscape analysis of burned rock midden site distribution in the Lower Pecos.

Archaeological Survey Along Dead Man’s Creek

Within the Lower Pecos, the survey emphasis has never been on the identification of burned rock middens and earth oven features, but rather recording threatened sites, namely rockshelters and caves with rock art and perishables (Graham and Davis 1958; Turpin 1982, 1990; Turpin and Davis 1993). In order to obtain an unbiased survey data set to be used for comparison to the extant site data for the entire Lower Pecos region, I completed a pedestrian survey of approximately 4,500 acres along Dead Man’s Creek (DMC), a tributary to the Devils River (Figure 1.3).

Survey along Dead Man’s Creek (DMC) was conducted between March 2011 and January 2012, and a total of 68 sites were recorded, 60 of which were previously unrecorded. Site locations were mapped using GPS units, and the DMC survey data has been analyzed using GIS to identify patterns in site distribution, frequency, and location.

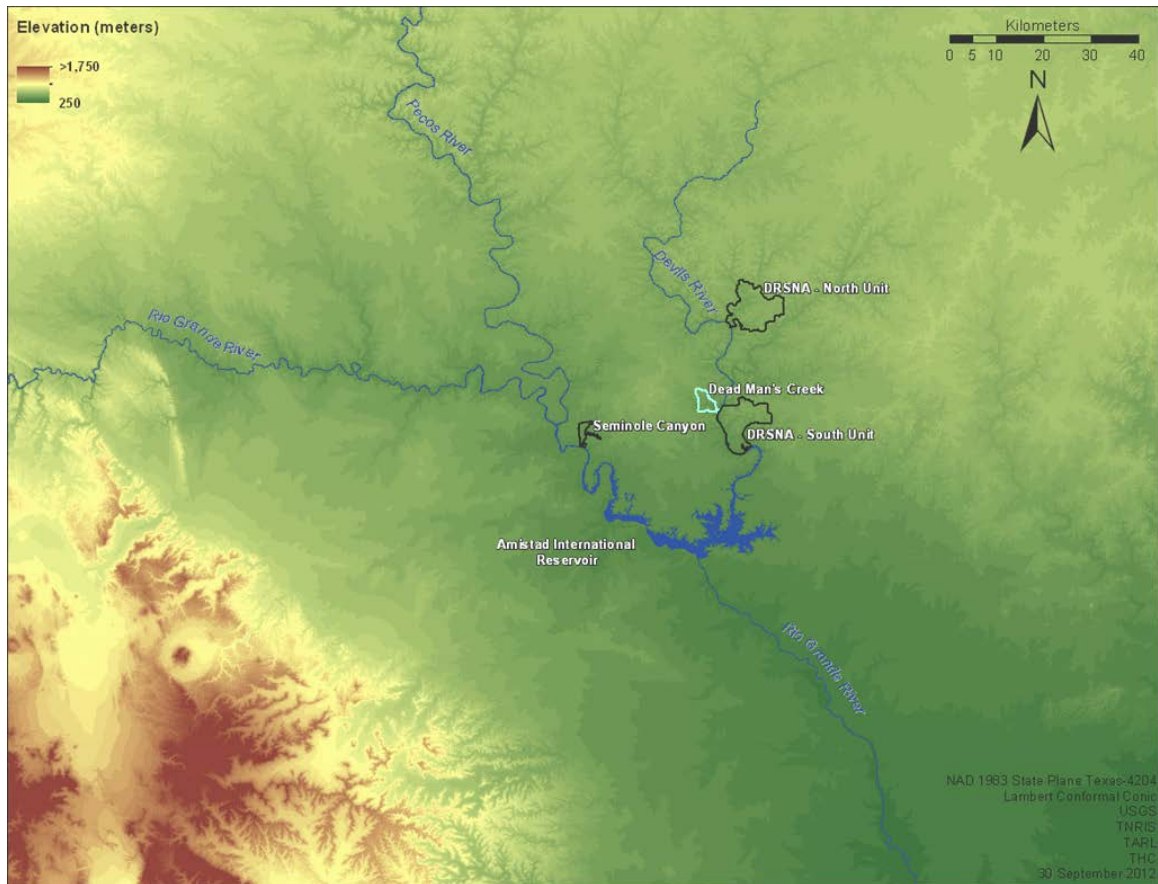


Figure 1.3. Location of Dead Man's Creek in relation to other Texas Parks and Wildlife Department properties and Amistad International Reservoir within the Lower Pecos Canyonlands.

In order to determine if the patterns observed within DMC were representative of other areas within the region, three additional areas were analyzed using the same GIS techniques: Seminole Canyon State Park and the Devils River State Natural Area – North Unit (Figure 1.3). Once the data from the three survey areas were amassed, I could compare the data and evaluate regional site distribution patterns. Finally, using the identified patterns I could test previous hypotheses concerning settlement patterns and landuse within the Lower Pecos Canyonlands, identify how the site data are biased towards certain areas of the landscape, and put forth hypotheses for future research.

Thesis Organization

The layout of this thesis is as follows. Chapter 2 provides an introduction to the region and its archaeology. Chapter 3 summarizes the archaeological survey work and previous models of settlement patterns and subsistence. In Chapter 4, the research design and survey methodology I used along Dead Man's Creek are discussed. The sites recorded on survey are described in Chapter 5. The site data from Dead Man's Creek are analyzed using GIS in Chapter 6, and patterns of site distribution, density, location, and frequency are discussed. Chapter 7 focuses on the regional survey data and the analysis of that data using the same methods employed with the DMC data, as well as comparing the site from Dead Man's Creek to the regional survey data. Chapter 8 discusses the patterns of BRM site distribution, location, and frequency and what those patterns indicate regarding previous models of Lower Pecos settlement patterns. In addition, Chapter 8 describes how biases within the site data have affected the previous settlement pattern models for the region. Chapter 9 provides concluding statements regarding the distribution, frequency, and location of burned rock middens in the Lower Pecos Canyonlands and suggests avenues for future research.

CHAPTER 2: THE LOWER PECOS CANYONLANDS ENVIRONMENT

Situated around the confluence between the Pecos and Rio Grande Rivers, the Lower Pecos Canyonlands of southwest Texas and Northern Mexico (Figure 2.1) is one of the most unique archaeological regions in North America (Turpin 2004:266). The area is famous for the amazing organic preservation afforded by the arid environment, especially within rockshelters and caves (Turpin 2004). Due to the preservation, the archaeological record of the Lower Pecos has one of the longest—and best preserved—

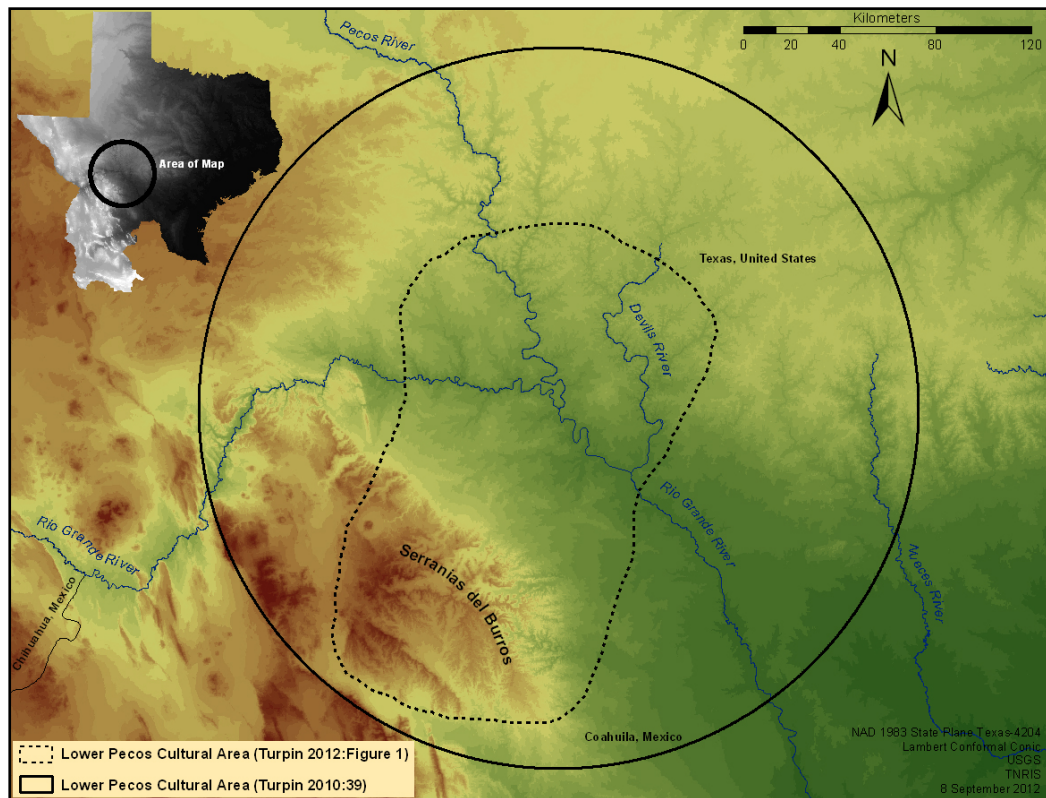


Figure 2.1. Location of the Lower Pecos Canyonlands and the boundaries for the Lower Pecos Cultural Area. Adapted from Turpin (2010:39, 2012:Figure 1).

records of hunter-gatherer lifeways in North America (Dering 2002:3.1).

The Lower Pecos archaeological region is defined by Turpin (2004:266) as being the known extent of the large, polychromatic Pecos River style pictographs and similarity in artifacts recovered from dry rockshelters (Figure 2.1). “The Lower Pecos region...encompasses an elliptical area that centers on the mouth of the Pecos River and extends perhaps 150 km north and south of the Rio Grande...The east-west axis roughly follows the Rio Grande from Del Rio-Ciudad Acuna to...the Stockton Plateau” (Turpin 2004:266). In 2010, Turpin (2010:39) suggests that the region can be said to extend in a circular, 150 kilometer radius around the mouth of the Pecos River. Essentially, the two regional boundaries shown in Figure 2.1 represent the hypothesized maximum (150 km) and known minimum extent of the region.

Physical Environment

The Lower Pecos is located at the southwestern edge of the Edwards Plateau where numerous canyons are incised into Cretaceous age limestone formations of Del Rio Clay, Boquillas Formation, Eagle Ford Formation, Salmon Peak Limestone, Buda Limestone, Devils River Limestone, and Edwards Limestone (USGS 2005). South of the Rio Grande, a large plain separates the Serranias de los Burros in Coahuila from the Edwards Plateau (Dering 2002:2.1). Scattered across the region are numerous springs, including San Felipe Springs, the fourth largest spring in Texas.

Besides the different limestone formations, two other geologic mapping units are located within the Lower Pecos. Miocene-Pliocene age alluvial gravels, called Uvalde Gravels, are found on the uplands in the southern and central portion of Val Verde

County (USGS 2005). The Uvalde Gravels provided an important lithic resource to prehistoric inhabitants of the region (Dering 2002:2.3). There are also scattered Quaternary alluvial deposits and terraces mapped along the Rio Grande and the upstream tributaries of the Pecos and Devils Rivers (USGS 2005).

The dominant soils found within the Lower Pecos can be categorized on the basis of their parent materials: soils derived from the Edwards Plateau (limestone bedrocks) and soils derived from the Pliocene-Pleistocene Rio Grande Plain alluvium (Golden et al. 1982). Of the total acreage within Val Verde County, 88 percent contains soils that form in sediments derived from limestone parent material (Edwards Plateau soils) and are mapped as the Ector-Rock Outcrop group, Langtry-Rock Outcrop-Zorra group, Lozier-Mariscal-Shumla group, and Tarrant-Ector-Rock Outcrop group (Golden et al. 1982:4-8). The soils that form on the old Rio Grande Plain alluvium comprise eight percent of the acreage for Val Verde County (Golden et al. 1982:9). These soil units are the Olmos-Acuna-Coahuila group and the Jimenez-Quemado group (Golden et al. 1982:9-12).

Recent alluvial deposits are mapped as Dev-Rio Diablo group and the Rio Grande-Reynosa-Lagloria group (Golden et al. 1982:12-14). These two soil units only comprise 2 percent of the acreage within Val Verde County, and the Dev-Rio Diablo group forms on alluvium from the Edwards Plateau, while Rio Grande-Reynosa-Lagloria group forms on alluvium from the Rio Grande Plain. Both soil groups are located in bottom-lands and stream terraces.

Regional Climate

The Lower Pecos is located at the juncture between large climactic regions of North America: the humid east and arid west as well as the seasonal climate of the northern latitudes and the more tropical, winterless climate to the south (Norwine 1995:140). Average rainfall in Del Rio, Texas, is 18.38 inches (Golden et al. 1982:2), with two peaks, one between April and May and the other from September through October (Dering 2002:2.4). During the winter, the average daily temperature is 53 degrees Fahrenheit, and during the summer the average is 98 degrees Fahrenheit. This equates to a frost-free growing season of 300 days. Based on modern data collected in Val Verde County, Texas, the Lower Pecos has a semiarid climate, with hot summers and dry winters. However, the inter-annual variation in rainfall for the Lower Pecos is greater than all other semiarid regions in the world except for northeastern Brazil (Norwine 1995:140), meaning that droughts can occur often and unpredictably (Dering 2002:2.4).

Biological Environment

Within the Lower Pecos, three biotic provinces intersect: the Tamaulipan, the Balconian, and the Chihuahuan (Blair 1950:98) (Figure 2.3). The region is a savannah, ranging from juniper-oak savannah along the eastern and northern portions, to mesquite-acacia savannah in the southern and southeast, and sotol-lechuguilla-creosote savannah in the northwest, west, and southwest (Blair 1950; Dering 2002:Figure 2.2). Each one of these three biotic zones have distinctive biological communities, and due to the convergence the flora and fauna within the Lower Pecos is a mix of all three (Dering 2002:2.4). Flora include multiple species of acacia (*Acacia* spp.), mesquite (*Prosopis glandulosa*), Texas persimmon (*Diospyros texana*), little leaf walnut (*Juglans*

microcarpa), oaks (*Quercus* spp.), ceniza (*Leucophyllum frutescens*), prickly pear (*Opuntia* spp.), yuccas (*Yucca* spp.), lechuguilla (*Agave lechuguilla*), and sotol (*Dasylirion texanum*) (Dering 1999, 2002:2.6; Turner 2009). Fauna include whitetail deer (*Odocoileus virginianus*), javelina (*Tayassu tajacu*), black-tailed jackrabbits (*Lepus californicus*), and porcupines (*Erethizon dorsatum*) (Davis and Schmidly 1994) as well as many small reptiles, rodents, birds, and fish. Dering (2002:2.10) also points out that the biomass within the region increases from west to east.

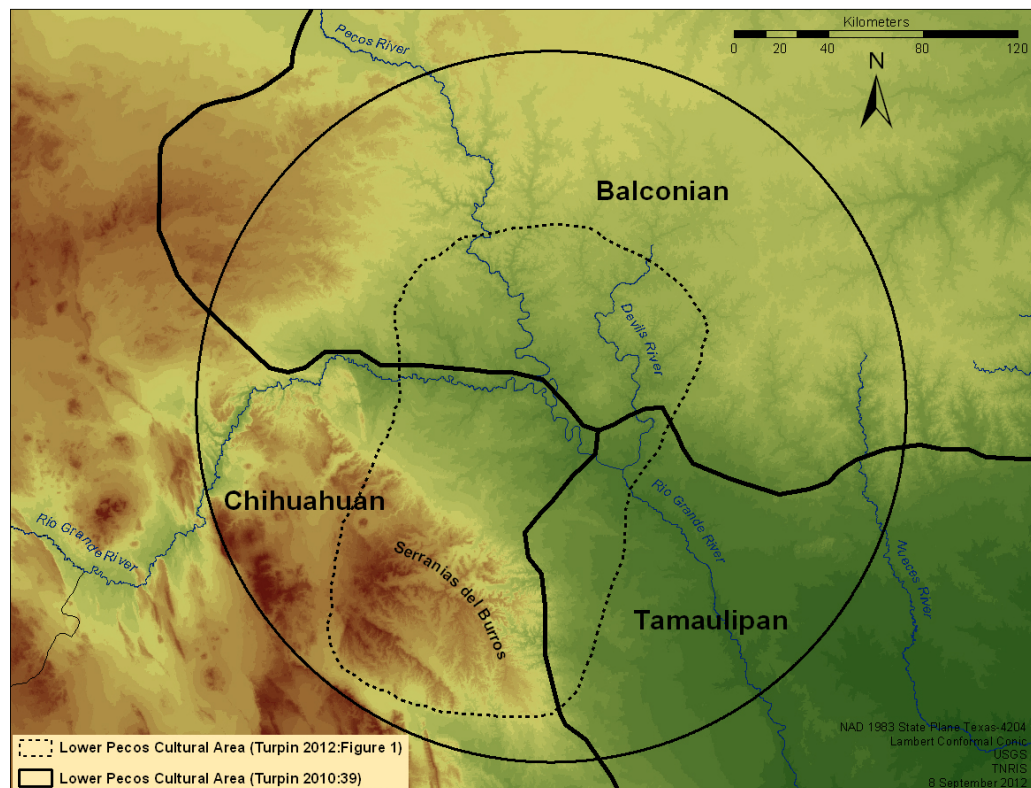


Figure 2.2. Location of the Balconian, Chihuahuan, and Tamaulipan biotic provinces in relation to the boundaries of the Lower Pecos. Adapted from Dering (2002:Figure 2.5).

Paleoenvironmental Reconstructions

Paleoenvironmental reconstructions for the region are based mainly on analysis of plant and pollen remains from a few excavated sites (e.g. Dering 1979; Johnson 1963),

analysis of terrace formation along the Pecos River (e.g. Kochel 1988; Patton and Dibble 1982), and the presence of bison jumps at Bonfire Shelter (Dibble and Lorrain 1968).

Pollen, macrobotanical remains, and the presence of now extinct fauna indicates the region was much cooler and wetter at the end of the Pleistocene, and then began to warm during the early and middle Holocene (Bryant and Holloway 1985; Turpin 2004).

Around 2,500 RCYBP, a brief period of cooler and wetter conditions returned to the region, which corresponds to the use of Bonfire Shelter as a bison jump after a 6,000 year hiatus (Bryant and Holloway 1985; Dibble and Lorrain 1968). After 2,500 RCYBP, the Lower Pecos once again became more xeric, and that general trend continues today (Bryant and Holloway 1985; Turpin 2004).

Cultural Chronology

This section is a brief summary of the accepted cultural chronology for the region, and readers are directed to Dering (2002) and Turpin (2004) for additional detail.

Paleoindian Period. Based on the data from survey and excavations, archaeologists can demonstrate that humans have inhabited the region since the Early Paleoindian period (12,000 – 9,800 RCYBP) when people were scattered across the landscape and were dominantly big game hunters as evidenced by the presence of a bison jump site at Bonfire Shelter dating to 10,250 RCYBP (Dibble 1968). During the Late Paleoindian period (9,800 – 8,800 RCYBP), there is an increase in the frequency of Paleoindian diagnostic artifacts found at deeply stratified deposits (Dibble 1967; Johnson 1964; Sorrow 1968), as well as evidence for a widening diet breadth based on floral and faunal remains from Baker Cave (Hester 1983), which may indicate a growing regional

population. Also, it is assumed based on a lack of bison bone recovered within archaeological sites that bison were not present in the region in substantial numbers after the Early Paleoindian period (Turpin 2004). Pollen data from this time period also indicates the region was becoming warmer and drier at the beginning of the Holocene (Bryant and Holloway 1985; Dering 1979; Patton and Dibble 1982).

Early Archaic Period. 8,800 RCYBP marks the beginning of the Archaic period within the Lower Pecos, and the Early Archaic, spanning between 8,800 and 5,500 RCYBP (Turpin 2004), sees the first evidence of earth oven construction and plant baking in the region (Dering 2007) and an inferred increase in rockshelter occupations (Turpin 2004:269).

Middle Archaic Period. The Middle Archaic Period spans from 5,500 – 3,200 RCYBP (Turpin 2004), and is marked by an increase in the amount of earth oven debris found within rockshelters and along rivers (Bryant 1986; Turpin 1990:265, 1994:3, 2004:272). This time period is also believed to have been a period of greater aridity in the region, which is hypothesized to have forced people to concentrate along the rivers and canyons due to a lack of upland water, and to intensify the processing of plants in earth ovens (Shafer 1986:94; Turpin 2004:272). Turpin (2004:272) and Shafer (1986:96) argue there is an increase in the number of upland sites related to logistical processing of desert succulents in earth ovens during this time period. Marmaduke (1978:Figure 23), in his analysis of projectile point distribution¹, found that there was an increase in the amount of Middle Archaic dart points from Early Archaic dart points, arguing this is evidence for increased population during the Middle Archaic. It is also during the

¹ Marmaduke (1978) focused almost exclusively on projectile points recovered from excavations.

Middle Archaic that the Pecos River style pictographs are produced (Boyd 2003; Turpin 2004). The Pecos River style pictographs are hypothesized to be mythic or historic narratives related to the religious belief systems of the indigenous peoples (Boyd 2003, 2012). Turpin (2004:272) argues that the Pecos River style pictographs developed as a result of increased population pressures placed on the people during the period of poor climactic conditions.

Late Archaic Period. The beginning of the Late Archaic (3,200 – 1,300 RCYBP) was marked by a cooler and wetter climactic interval, and a return of bison into the region, demonstrated by renewed bison jumps at Bonfire Shelter (Dibble 1968). Turpin implies (2004:272) that during the beginning of the Late Archaic there is a decrease in earth oven construction. Yet, burned rock middens and earth ovens dating to the early part of the Late Archaic are recorded at several sites within the region (e.g. Dibble 1967; Johnson 1964). Turpin (1984b; Turpin and Eling 2002) has argued during this early part of the Late Archaic a new pictograph style was introduced to the region by bison hunter: the Red Linear style. Recently, Boyd et al. (2012) have documented the presence of Red Linear style pictographs stratigraphically beneath Pecos River style pictographs, indicating the pictographic chronology for the region needs to be reassessed.

During the latter half of the Late Archaic period, the climate returned to more arid conditions, and bison cease to be found archaeologically, and the regional archaeological patterns shift back towards one dominated by plant processing (Turpin 2004). The Late Archaic is argued to be the time of greatest population density in the region based on the number of projectile points found as well as the apparent increase in number of rockshelter and upland sites containing burned rock middens (Marmaduke 1978; Turpin

2004). Marmaduke (1978:Figure 23) recorded a drastic increase of the numbers of Late Archaic projectile points over the previous time periods, and he argues that there seems to be a greater number of Late Archaic projectile points found within upland sites than at any previous time periods.

Late Prehistoric Period. The Late Prehistoric period (1,300 – 250 RCYBP) is marked by a shift in settlement patterns from one dominated by rockshelter use to one seemingly focused on upland exploitation (Turpin 2004:274). Late Prehistoric sites are much more common in upland environments (as opposed to sheltered canyons), and include a specific “type” of burned rock midden – circular ring middens (Turpin 2004:274). Other Late Prehistoric sites include upland stone alignment sites (Turpin and Bement 1988) and hearth fields (Johnson and Johnson 2008). It is during the Late Prehistoric period when the bow and arrow first appears in the region (Turpin 2004).

CHAPTER 3: HISTORY OF ARCHAEOLOGICAL SURVEY AND SETTLEMENT PATTERNS IN THE LOWER PECOS CANYONLANDS

History of Archaeological Research in the Lower Pecos¹

Archaeological investigations in the Lower Pecos began during the 1930s, with museum sponsored research projects aimed at accumulating artifacts for collections (e.g., Davenport 1938; Gutzeit 1931; Jackson 1938; Martin 1932; Pearce and Jackson 1933). Several rockshelters were excavated during this time period, including Eagle Cave, the Shumla caves, and Fate Bell Shelter, and dozens of perishable artifacts were sent to museums across the country. In addition to the early archaeological excavations, several researchers ventured into the region in order to record the pictographs; and, due to the construction of Amistad Reservoir, their works are occasionally the only remaining records of some pictograph sites (e.g., Gutzeit 1931; Jackson 1938; Kirkland 1937; Kirkland and Newcomb 1967).

During the 1930s, archaeological “survey” was limited to talking with local ranchers and informants in order to obtain information regarding promising rockshelter

¹ Although there is a rich and detailed history of archaeological excavations in the region, this section will provide only a brief summary, instead focusing more in archaeological surveys and the methodology employed. The reader is directed to Black (2004), Dering (2002), and Turpin (2004) for additional information. Previous summaries of the history of archaeological research in the region have focused predominantly on the archaeology conducted within Val Verde County, Texas, and not archaeological work conducted within the entire 150 km regional boundary. This summary will also focus mainly on archaeological studies conducted within Val Verde County.

sites (Gutzeit 1931). However, even though no surveys were officially conducted, archaeologists did begin to catalogue the locations of sites, specifically those sites containing pictographs. A.T. Jackson (1938:162) recorded the approximate locations of all then-known sites containing pictographs, and his map may be the earliest published record of site locations for the region.

The first formal archaeological survey carried out in the region was conducted by Herbert C. Taylor in 1948. Taylor's (1948) survey was focused on the Coahuila side of the Rio Grande near the mouth of the Pecos River. Depending on the terrain, survey was conducted on foot, truck, or horseback (Taylor 1948:76). Because Taylor's focus was on locating pictograph sites, virtually all of the sites he recorded were rockshelters (1948:Plate 7). Taylor's search for pictographs aided in estimating the boundaries for what he called, "the Pecos River Focus" (Taylor 1948:74).

Amistad Salvage Project

The late 1950s and 1960s bore witness to the largest archaeological project ever conducted in the Lower Pecos region. In preparation for the construction of Amistad International Reservoir (then Diablo Dam) below the confluence of the Rio Grande and Devils Rivers (Figure 3.1), archaeological survey and excavation was conducted on both sides of the Rio Grande (e.g., Dibble and Prewitt 1967; Graham and Davis 1958; Ross 1965; Taylor and González Rul 1961). Because the flood pool from Amistad Reservoir would extend dozens of kilometers up the canyons of the Devils, Pecos, and Rio Grande Rivers, excavations were mainly focused along these major canyons and on the numerous rockshelters contained within them (e.g., Dibble and Lorrain 1968; Epstein 1963; Nunley

et al. 1965; Prewitt 1966). Although rockshelter excavations received the majority of the archaeological focus, several excavations did occur at river terrace sites (e.g., Dibble 1967; Johnson 1964; Sorrow 1968) as well as upland burned rock middens (e.g., Dibble and Prewitt 1967; McClurkan 1968; Nunley et al. 1965). The main goal of the research, however, was on establishing a cultural chronology for the region, and not on site-specific research questions. In addition to excavations, rock art researchers once again returned to the region to document the numerous pictograph panels (e.g., Gebhard 1965; Grieder 1966). Archaeological surveys were conducted on both sides of the Rio Grande

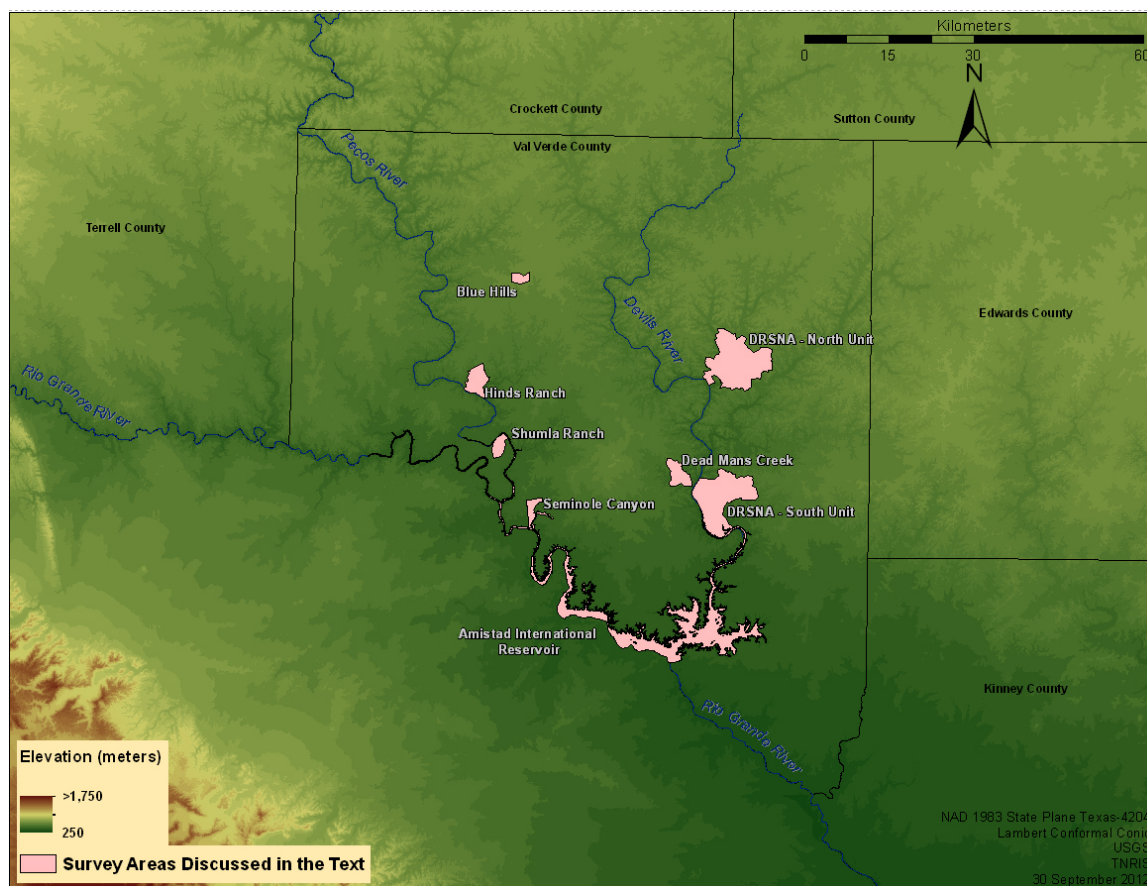


Figure 3.1 Survey areas within the Lower Pecos region discussed in Chapter 3. All of the survey areas are within Val Verde County, Texas.

(Graham and Davis 1958; González Rul 1990; Taylor and González Rul 1961).

Unfortunately, due to lack of time, resources, and landowner access, many areas within

the flood pool of Lake Amistad were not sufficiently surveyed, and the emphasis was placed largely on finding and documenting large sites along the three main river canyons (Dering 2002:3.15; Graham and Davis 1958:9). Often local informants told archaeologists where to find sites (Dering 2002:3.15; Taylor and González Rul 1961:157). Brief aerial surveys were also conducted on both sides of the border in search of sites (Graham and Davis 1958; Taylor and González Rul 1961:154) as well as survey by motor boat up the Rio Grande by Graham and Davis. Table 3.1 shows the number and types of sites recorded by Graham and Davis and Taylor and González Rul during the initial reconnaissance of Lake Amistad.

After the initial survey by Graham and Davis, Dave Dibble and Elton Prewitt (1967) conducted additional surveys around the mouths of the Pecos and Devils Rivers. Although the survey methodology is not detailed in the report, Dibble and Prewitt (1967:5) used a combination of foot and jeep transportation to conduct survey. Compared to the earlier work that focused largely on the main river canyons, Dibble and Prewitt began to explore areas further from the canyons.

In the process of surveying for sites in the entrenched canyons of the two rivers, it was soon noticed that many relatively small open sites were situated in the bottoms of, or bordering, the myriad of dry tributary canyons as well as on the tops of bluffs enclosing the mainstem canyons. Though few of these sites appear as though they would be informative on excavation (most occur on severely deflated surfaces), their gross surface characteristics and location seem significant enough to record. Considerable attention was thus directed at walking out drainages away from the main canyons. Virtually all of the sites located will fall within the maximum (flood pool) anticipated elevation of the reservoir. [Dibble and Prewitt 1967:5]

The sites recorded by Dibble and Prewitt are categorized in Table 3.1. Other sporadic survey was conducted by Mark Parsons around Bonfire Shelter in 1963 and 1964 (Dering 2002:3.15).

Even though the Amistad Salvage Project era provided archaeologists with a huge data set in terms of both material culture and plotted archaeological sites, there are inherent biases in the data that must be addressed. First, although Dibble and Prewitt (1967:5) occasionally conducted survey away from the major river canyons, the bulk of the site data from this period is heavily biased towards large sites located within the major canyons and tributaries, and rockshelters were by far the most commonly recorded site (Table 3.1) (Dering 2002:3.17; Dymond 1976, cited in Dering 2002:3.17; Saunders 1986:24). In addition, the majority of excavated archaeological sites were rockshelters, and consequently we have very little data from river terrace and upland sites. These biases must be taken into consideration when discussing settlement pattern models.

Table 3.1: Prehistoric Sites Recorded During Survey of Amistad (Diablo) Reservoir								
	Graham and Davis (1958)		Taylor and González Rul (1961)		Dibble and Prewitt (1967)		Totals for Amistad Reservoir	
Site Types	n	% of Sites	n	% of Sites	n	% of Sites	N	% of Total
Rockshelters	126	74.1%	51	75.0%	12	17.6%	189	61.8%
Open Sites	34	20.0%	16	23.5%	48	70.6%	98	32.0%
Buried Sites	10	5.9%	--	--	7	10.3%	17	5.6%
Pictograph Site	--	--	1	1.5%	1	1.5%	2	0.7%
Total	170	100.0%	68	100.0%	68	100.0%	306	100.0%

The 1970s-1990

In the decades following the Amistad project, archaeological focus shifted to smaller scale projects involving specific research questions. University sponsored research projects took place at two different rockshelter sites in the region: Hinds Cave

and Baker Cave. Hinds Cave was excavated by Texas A&M University, and Baker Cave was excavated by the University of Texas at San Antonio and avocational archaeologists (Chadderdon 1983; Dering 1979; Shafer and Bryant 1977; Word and Douglas 1966). These two sites have contributed a great deal of knowledge about prehistoric subsistence and diet because the recovery of macrobotanical, faunal, and coprolite remains was an integral part of the research plans during excavations (e.g., Dering 1979; Sobolik 1991; Williams-Dean 1978).

Although Hinds Cave and Baker Cave represent the largest excavations that occurred during this time period, Solveig Turpin of the University of Texas at Austin led an excavation into the Pleistocene deposits at Bonfire Shelter (Bement 1986). Bonfire Shelter had originally been excavated in the 1960s (Dibble and Lorrain 1968), but Turpin addressed specific research questions concerning the evidence for human activity in the earliest deposits at the site. In addition, several upland stone alignment sites were excavated by Turpin during this time period (e.g., Turpin 1982, Turpin and Bement 1988).

During the 1970s and 1980s, several large areas within the Lower Pecos region were subject to archaeological survey: Seminole Canyon State Park and Historic Site (Turpin 1982), Devils River State Natural Area-North Unit (Marmaduke and Whitsett 1975; Turpin and Davis 1993), the area surrounding Hinds Cave, and a distant upland area called the Blue Hills (Saunders 1986, 1992). Because all of these areas are smaller than the large area impacted by Lake Amistad—and that state and federal regulations required survey of the state parks—it allowed researchers to conduct more systematic surveys.

Seminole Canyon State Park. In 1973, Texas Parks and Wildlife Department began acquiring property around Seminole Canyon in order to form what is now Seminole Canyon State Park and Historic Site (Turpin 1982:2). Seminole Canyon is a tributary to the Rio Grande located east of the confluence of the Rio Grande and Pecos Rivers (Figure 3.1). Turpin conducted the archaeological survey of Seminole Canyon, which was the first large scale pedestrian survey completed in the Lower Pecos (Dering 2002:3.18). The main goal of the survey was to gain an understanding of the overall settlement patterns within the park, with a focus on upland stone alignment sites as well as rock art sites (Turpin 1982:3). Because of the nature of the physical environment, survey crews walked transects dictated by the topography of the canyons (Turpin 1982:58). No subsurface testing was conducted during the survey.

Dering (2002:3.17-3.18) points out that Turpin's Seminole Canyon survey was also the first project in the region to use an explicit site definition: "sites were defined on the basis of the presence of features or of temporally or functionally diagnostic artifacts accompanied by other cultural material, sufficient to indicate a more than passing use of the location" (Turpin 1982:60). However, this definition is sufficient only in documenting intensively utilized sites (e.g., burned rock middens and rockshelters), but not at recording more ephemeral sites such as those documented by Saunders (1986) (Dering 2002:3.18). After Turpin's survey, a total of 70 archaeological sites had been recorded within the boundaries of Seminole Canyon State Park (Table 3.2).

Table 3.2: Archaeological Sites Recorded Within Seminole Canyon State Park as of 1982				
Site Types	Sites Previously Recorded	Sites Recorded by Turpin (1982)	Totals	% of Total Sites
Rockshelters	22	4	26	37.7%
Burned Rock Middens	5	9	14	20.3%
Stone Alignment Sites	--	12	12	17.4%
Historic Sites	2	6	8	11.6%
Quarry	1	4	5	7.2%
Artifact Scatter	1	3	4	5.8%
Totals	31	38	69	100.0%

Devils River State Natural Area-North Unit. Much like Seminole Canyon State Park, Texas Parks and Wildlife acquired what is now designated the Devils River State Natural Area-North Unit (DRSNA-NU) in the early 1970s. DRSNA-NU is located at the confluence of Dolan Creek with the Devils River, approximately 12 kilometers upstream from the impoundment of Amistad Reservoir (Figure 3.1). Marmaduke and Whitsett (1975:82-89) conducted the initial archaeological reconnaissance and documented a total of 72 sites in only ten days allowed for survey (1975:76). Later, Turpin recorded several additional sites on the property as part of her generalized rock art surveys conducted during this period (Turpin and Davis 1993:8).

Another directed survey of DRSNA-NU was conducted in 1989, during the Texas Archeological Society summer field school (Turpin and Davis 1993). The area to be surveyed was divided up into 12 blocks, and several hundred volunteers spent one week surveying the entire DRSNA-NU (Turpin and Davis 1993:8). The survey techniques and site definitions were the same as from Turpin's earlier work in Seminole Canyon (Turpin and Davis 1993:8). Because of the shared site definitions, this survey provided data that could be compared to the Seminole Canyon data in order to test hypotheses concerning regional settlement pattern models. Upon completion of the field school, there were a

total of 239 archaeological sites recorded within the boundaries of DRSNA-NU (Table 3.3) (Turpin and Davis 1993:8). This represents the largest area to be systematically surveyed within the Lower Pecos (Dering 2002:3.18).

Table 3.3: Archaeological Sites Recorded Within Devils River State Natural Area-North Unit as of 1989 TAS Field School (includes sites recorded by Marmaduke and Whitsett [1975] and Turpin)		
Site Types	Totals	% of Total Sites
Burned Rock Middens	71	29.7%
Rockshelters/Caves	59	24.7%
Lithic Procurement Sites	32	13.4%
Burned Rock Scatters	28	11.7%
Hearth	13	5.4%
Lithic Scatters	13	5.4%
Lithic Reduction Sites	12	5.0%
Historic Sites	6	2.5%
Stone Alignments	5	2.1%
Totals	239	100.0%

Hinds Ranch and Blue Hills. Joe Saunders (1986, 1992) conducted intensive survey around the area of Hinds Cave and the more distant Blue Hills area (Figure 3.1). Saunders targeted the distribution of specific artifact types related to two specific activities: hunting and gathering. By analyzing the spatial distribution of specific stone tools and cooking features related to hunting and gathering, Saunders was able to develop a model of land use that showed more intensive plant processing closer to the Pecos River and more hunting in the distant uplands of the Blue Hills. However, Saunders' definition of a site was much different than that used by Turpin (1982). Instead of requiring sufficient features and artifacts to indicate more than a passing presence, Saunders' (1992:340) defined a site as an area five meters in diameter containing at least two artifacts, and an isolate as a location with only one artifact within a five meter

diameter. When conducting the survey, Saunders used transects spaced one to two meters apart and followed the natural topographic contours.

Although his survey documented the presence of 695 sites on the Hinds Ranch as well as 73 sites in the Blue Hills (Table 3.4), Saunders never officially recorded (received archaeological trinomial numbers) for any of his sites (Saunders 1986; site records on file at TARL). Because of this, comparisons cannot be made directly between Saunders' data and other survey areas within the Lower Pecos. Yet, it must be noted that Saunders' study provides the most detailed record of prehistoric landscape use in the region due to the small scale at which he conducted his survey and subsequent lithic analysis.

Table 3.4: Archaeological Sites Documented by Saunders (1986:Table 7.2, Table 8.1)				
	Hinds Ranch		Blue Hills	
Site Types	Totals	% of Total Sites	Totals	% of Total Sites
Projectile Points	120	17.3%	61	83.6%
Bifaces	140	20.1%	1	1.4%
Unifaces	258	37.1%	10	13.7%
Core Clusters	57	8.2%	1	1.4%
Lithic Scatters	65	9.4%	--	--
Quarries	46	6.6%	--	--
Rockshelters	8	1.2%	--	--
Rockart	1	0.1%	--	--
Totals	695	100.0%	73	100.0%

Additional Survey between 1970 and 1990. In addition to the larger areas surveyed during this time period, Turpin conducted targeted, opportunistic rock art surveys on accessible private properties along the major river canyons and tributaries (Turpin 1990:268). Turpin's rock art surveys documented a number of additional sites that were previously unknown and helped to compile a more detailed inventory of pictographs in the region. Although she focused on rock art sites, she also recorded

various other occupied rockshelters and open-air sites from time to time. During the 1980s, dozens of rock art publications came from analyses of Lower Pecos pictographs and painted pebbles (e.g., Mock 1987; Turpin 1984b, 1986a, 1986b; Parsons 1986). Another small survey was conducted by Geo-Marine in two areas along the Devils River prior to possible nuclear testing (Peter et al. 1990). One of the areas surveyed by Geo-Marine is now within the boundaries of the Devils River State Natural Areas – South Unit.

1990-Present

During the 1990s, Lake Amistad was drawn down to the lowest levels since filling in the early 1970s. Archaeological survey and testing was carried out by National Park Service personnel and volunteers, which focused on areas within the flood pool that were exposed by dropping water levels and areas impacted by public access (Dering 2002). In addition, the 1999 TAS field school carried out survey and testing in several areas of Amistad National Recreation Area (Johnson and Johnson 2008). Also, archaeological and geoarchaeological investigations were conducted along San Felipe Springs in preparation for new water systems (Mehalchick et al. 1999) and Laughlin Air Force base saw extensive survey and geoarchaeological investigations (Tennis et al. 1996). Based on site forms at TARL, Turpin continued conducting targeted, opportunistic rock art surveys along the major river canyons and tributaries during this time period. However, no large scale systematic archaeological surveys were conducted within the Lower Pecos region.

Most recently, Texas Parks and Wildlife personnel discovered a buried, upland burned rock midden site within Seminole Canyon State Park in 2007 (Roberts and Alvarado 2011). The regional archaeological focus, however, has remained largely on the pictographs, with ongoing research being conducted by SHUMLA Archaeological Research and Education Center (Boyd 2003; Boyd et al. 2012; Johnson et al. 2011), and continued research by Turpin (2010, 2012). A new wave of university research has also begun, with field research by Texas State University (Black 2011, 2012; Campbell 2012; Knapp 2011; Koenig 2011, 2012a, 2012b). John Campbell directed survey on the Shumla Ranch upstream from the confluence of the Pecos River as part of the 2010 Texas State University archaeological field school (Figure 3.1). The Shumla Ranch work was the first large scale survey conducted in the region since the late 1980s. The University of Texas at San Antonio is also currently conducting laboratory research involving isotopic analysis of human hair (Verostick et al. 2012). In 2011, Texas Parks and Wildlife acquired the Devils River State Natural Area-South Unit, and systematic survey began to be conducted at the same time as the present study. In fact, surveying the new state property was the focus of the 2012 Texas Archeological Society field school (Howard and Alvarado 2012).

Summary of Archaeological Survey

As of September 2012, there have been over 2,000 archaeological sites recorded in Val Verde County (site records on file at TARL). These sites are the result of nearly a century worth of archaeological survey and site recording. The regional site data are discussed in greater detail in Chapter 7. As explained, survey has focused mainly along the major river canyons and on rockshelters, with areas away from the major canyons

receiving the least amount of attention. This survey bias is discussed again in Chapter 8, but it must be taken into consideration when discussing the hypotheses regarding Lower Pecos settlement and subsistence patterns.

History of Settlement Pattern/Subsistence Hypotheses in the Lower Pecos

Over the course of the past century, archaeologically driven hypotheses related to prehistoric settlement patterns have been largely a *byproduct* of archaeological investigations rather than the goal. This is not to fault the archaeologists who have worked in the region, but rather to draw attention to the limited number of directed settlement pattern studies that have been conducted. As was stated in Chapter 1, settlement pattern models for the Lower Pecos are primarily based on interpretations of two archaeological site/feature types: burned rock middens and rockshelters. This can be attributed to three main factors: 1) archaeological survey has focused on the main river canyons where rockshelters are a common occurrence; 2) the regional archaeological emphasis has been on rockshelter excavations and recording rock art; and 3) rockshelters and burned rock middens are the largest, most conspicuous archaeological features in the region.

The bulk of archaeological material recovered from the region dates to the long Archaic era; thus, settlement pattern models have focused on interpreting Archaic period settlement. However, before discussing the Archaic settlement, changing settlement patterns through time must be addressed. Ignoring for now small-scale or minor changes throughout the culture history of the Lower Pecos (Turpin 2004:272), settlement pattern models for the region are focused on four temporal periods: 1) Late Pleistocene

occupation of the region (>12,000 to 9,000 RCYBP.); 2) the Archaic occupation between 9,000 and 3,000 RCYBP; 3) brief Early-Late Archaic interval between 3,000 and 2,300 RCYBP; and 4) the Late-Late Archaic through Late Prehistoric occupations (2,300 to 450 RCYBP) (Turpin 2004:Table 8.1). Based on the data recovered from the numerous rockshelter excavations, it has been hypothesized that during these four time periods there were marked changes in the regional settlement and mobility patterns (Turpin 2004).

Paleoindian Settlement and Mobility Patterns

During the Paleoindian period, it is believed that people living in the region were nomadic big game hunters (Dibble and Lorrain 1968; Turpin 2004). Their mobility was dictated by the presence of large game animals; and the largest known Paleoindian site in the region is Bonfire Shelter where Late Pleistocene hunters drove several dozen now-extinct bison off a cliff (Bement 1986; Dibble and Lorrain 1968). Aside from Bonfire and a few additional sites containing Late Pleistocene fauna (Dibble 1967; Turpin and Bement 1992), very little is known about settlement patterns and mobility during the early Paleoindian period. However, based on a preliminary report from the adjacent Big Bend region by the Center for Big Bend Studies, it is possible that people may have begun were baking desert succulents as early as 10,000 RCYBP in regions around the Lower Pecos (Cloud and Mallouf 2011). At Baker Cave, a hearth dating to around 8,500 RCYBP contained the remains of dozens of small plants and animals, indicating that Late Paleoindian peoples were beginning to shift from a big game hunting strategy to a wider diet breadth (Chadderdon 1983; Hester 1983).

Early Archaic through Middle-Late Archaic Period Settlement and Subsistence Patterns

The majority of settlement pattern hypotheses that have been put forth for the Lower Pecos region were developed to address Archaic settlement and mobility. This is due in large part to the fact that most excavated sites in the region have contained substantial Archaic age deposits (e.g. Collins 1967; Dibble 1967; Epstein 1963; Johnson 1964; McClurkan 1968; Nunley et al. 1965). Based on the data from excavations, Johnson (1967:74) as well as Shafer (1976, 1981; 1986) have argued for a stable Archaic lifeway that persisted from the end of the Pleistocene up to Late Prehistoric times. Johnson (1967:74) reasoned that due to the desert environment, people would have been forced to adapt early on in prehistory to the types of plants and animals available, and the adaptive technologies that emerged would have not needed changing for the span of Lower Pecos occupation. Turpin (2004:268), on the other hand, argues the Archaic was instead marked by, “abrupt and gradual changes within the parameters imposed by small scale social organization.” Evaluating “stable” verses “abrupt and gradual” changes in regional trends requires analyzing excavation data from numerous sites across the region, which is outside of the scope of this study.

Nevertheless, one aspect of Archaic lifestyle where there is a general agreement is that early on during the Archaic people shifted from big game hunting to a broad spectrum diet, including the processing lechuguilla, sotol, prickly pear, and onion in earth ovens (Brown 1991; Dering 1979; Marmaduke 1978; Shafer 1976, 1981; Shafer and Bryant 1977; Stock 1983; Turpin 1984a, 1990, 1994, 2004; Williams Dean 1978). The use of earth ovens and exploitation of desert plants is at the core of all the settlement pattern models, and interpretations of what exactly the large Archaic-age burned rock

middens represent *in terms of mobility* is where conflicting hypotheses regarding prehistoric mobility and settlement patterns arise (e.g. Dering 1999 vs. Shafer 1986). Based on large burned rock accumulations, archaeologists began to describe prehistoric mobility using anthropological terms such as nomadic, semi-nomadic, semi-sedentary, and sedentary (e.g., Martin 1933; Shafer 1981, 1986; Turpin 1982, 1984a, 1990, 1994, 2004). Paraphrasing Robert L. Kelly (2007:116-117) when describing foraging societies, nomadic groups are characteristic of colonizing populations with no territorial boundaries, semi-nomadic groups are constrained by territorial boundaries and live in greater population densities, semi-sedentary groups return to specific locations year after year, and sedentary populations occupy a single location year-round but move every few years.

Interpretations of burned rock accumulation and mobility led to the development of two settlement hypotheses: one where people lived the majority of time along major river canyons and rockshelters subsisting off the desert bounty offered by the Lower Pecos environment verses a model of high residential mobility forced by the depletion of local food and fuel resources that required the people to constantly move across the landscape exploiting new areas and new resources.

The Semi-Sedentary Rockshelter and Canyon Collectors of the Lower Pecos. The concept of a semi-sedentary culture living in rockshelters along the major canyons is the earliest, and most repeated, hypothesis regarding Archaic settlement patterns. Archaeologists working during the 1930s and 1940s, and without any excavation data from sites outside of the major river canyons, argued that the prehistoric inhabitants of the region were semi-sedentary and lived in rockshelters and caves (Kirkland 1937:110;

Martin 1932, 1933:11; Mason 1936:19; Pearce and Jackson 1933:139; Sayles 1935:63; Taylor 1948:74). W.W. Taylor can be credited with the first directed hypothesis relating to Lower Pecos settlement and subsistence patterns with his tethered nomadism hypothesis. Taylor (1964:198-199), using data collected south of the Rio Grande, argued that the only available permanent water was either in the major rivers or within the mountains to the south, and the expansive plain between the two would be essentially water-less. Therefore, he reasoned people would be “tethered” to these water resources, which would explain why there are so many large occupation sites—mainly rockshelters—along the Rio Grande and Pecos rivers (Taylor 1964).

Taylor (1964:198) also argued that people depended heavily on the exploitation of plant foods (yucca, sotol, lechuguilla, prickly pear, and mesquite) located on the broad plain between the Rio Grande and the mountains in Mexico based on the presence of burned rock middens and sotol pits. Because, as Taylor (1964:198) explained, not all of these plants would have been available at all times of year, people would have been forced to constantly move across the landscape in search of food, but could not stray too far from the permanent water resources. Maintaining access to water resources while also insuring sufficient plant resources were available to a group would have led to the establishment of territories by resident groups within the Lower Pecos region (Taylor 1964). Taylor’s tethered nomadism hypothesis provided the foundation for additional river/rockshelter-centric ideas regarding settlement patterns because he, conceptually, created two mutually exclusive zones of prehistoric exploitation: the canyons and the uplands.

Nearly 20 years later, Harry Shafer (1986) again discussed the exploitative dichotomy originally proposed by Taylor (1964). However, Shafer had new data to use in explaining prehistoric settlement patterns: macrobotanical, coprolite, lithic, and faunal remains from sites such as Hinds Cave and Baker Cave (e.g. Chadderdon 1983; Dering 1979; Lord 1984; Shafer and Bryant 1977; Stock 1983; Williams-Dean 1978). Using excavation data mainly derived from Hinds Cave, Shafer (1986:94-95) argued for an intensive exploitation of the main river canyons, with habitation occurring predominantly in large rockshelters and along stream terraces. In addition, Shafer (1986:94) introduced a new idea—borrowed from behavioral ecology and ethnoarchaeology (e.g. Binford 1980; Winterhalder 2001)—to describe the large rockshelters and terraces along the major river canyons as being “home bases” for hunting and foraging activities. It was from these home bases that prehistoric collectors were depicted as venturing out from the major canyons into the uplands to harvest desert succulents and bring the food back to home (Shafer 1986:94).

This home base argument is based largely on the archaeological remains from Hinds Cave, a rockshelter in a tributary canyon approximately one kilometer from the Pecos River, where coprolite, macrobotanical, and faunal remains indicated heavy exploitation of the riverine environments coupled with baking desert succulents found in the uplands (Dering 1979; Lord 1984; Shafer and Bryant 1977; Stock 1983; Williams-Dean 1978). Turpin (1990:265, 1994:3; 2004:267) and Bement (1989:75) have also supported this rockshelter-centric view of Archaic life. Turpin (2004:272) goes further by characterizing the prehistoric inhabitants as living in a, “densely populated linear enclave along the major rivers.”

Thus, based on data mainly from Hinds Cave, Shafer (1976, 1981; 1986:94-95) proposed a residential core for the Lower Pecos people centered within 30 miles of the Pecos, Devils, and Rio Grande canyons, and a peripheral zone extending another 40 miles beyond the residential core. The residential core would have formed out of the heavy exploitation of resources along the major rivers (Shafer 1986:94-95) with only periodic use of the peripheral uplands for logistical plant baking trips (Shafer 1981:132). He explained that as the distance from the major river canyons increase, “Outdoor sites, too, tend to be more temporary in nature, the result of short stays or locations for specific short term tasks” (Shafer 1986:95). Further, he described how the inhabitants of the Lower Pecos used the peripheral zone:

The crescent and ring middens constitute the most common archaeological site in the periphery zone of the core area...The high frequency of crescent middens on the periphery of the lower canyons suggests that groups would leave the main canyons for short periods to hunt and to cook desert succulents in the peripheral zone, venturing as much as seventy miles from the Pecos and Rio Grande. As what time during the annual cycle this occurred is unknown, but winter is a good guess, since the aquatic fauna and fishing activities would be at a minimum during this time. [Shafer 1986:95]

The idea of an annual round throughout the region was originally postulated by Shafer (1981) and expanded by Sobolik (1996:Figure 1), who used coprolite data from several different rockshelter sites to show how people may have migrated on a yearly basis. However, this seasonal round hypothesis is based solely on data derived from rockshelter excavations. As Turpin (1982:237) notes: “the most logical assumption that can be drawn from the known data is that the Archaic peoples centered the major part of their lives in the rock shelters, occupying upland camps such as hearth fields...during specific seasons.”

Theories regarding how and when the Archaic inhabitants of the region utilized the uplands is based largely on the studies conducted by William Marmaduke (1978) and Joe Saunders (1986, 1992). Marmaduke analyzed the frequency of projectile points recovered from excavated sites across the Trans-Pecos region, with Amistad being a study area. All of his data for Amistad is derived from excavations conducted during the Amistad Salvage Project, meaning that Marmaduke used no data from sites outside of the main river canyons. Nonetheless, Marmaduke (1978:272-273) suggested that exploitation of the upland environments began to occur in the Middle Archaic (approximately 5,000 RCYBP), and peaked during the Late Archaic (approximately 2,000 RCYBP). Further, Marmaduke (1978:211) cited the appearance of ring and crescent middens as indicators of increased upland utilization, attributing these features to earth oven baking. Burned rock middens, on the other hand, were considered as evidence of generalized camping activities. Although Marmaduke's interpretations are based on a limited sample of sites directly adjacent to the major river canyons, his work has been cited by numerous researchers as establishing evidence of increasing upland utilization for the entire region (e.g., Saunders 1986; Shafer 1976, 1981, 1986; Turpin 1982, 1984a, 1990, 1994, 2004).

In a related study, Saunders (1986) analyzed upland utilization based on different types of artifacts. Based on changes in the artifact assemblages, he argued that upland use changed as the distance from major canyons increased. He surveyed the area around Hinds Cave and found that closer to the Pecos River there was a mix of plant processing and hunting tools (Saunders 1986). However, in the distant upland area of Blue Hills, Saunders found a marked increase in the number of artifacts associated with hunting.

Saunders, like Marmaduke, recorded more Late Archaic projectile points than those of any other time period, suggesting that upland utilization increased in the Late Archaic. Saunders (1986), hypothesized a relative decrease in gathering activities as the distance from major canyons and rockshelters increases, but an increase in the amount of hunting relative to gathering as distance away from canyons and shelters increased coupled with an increase in upland utilization throughout prehistory.

Another aspect of Lower Pecos archaeology related to the semi-sedentary hypothesis is the development of the Pecos River style pictographs (Turpin 1984a, 1990, 1994, 2004)². The Pecos River style pictographs are presumed to have been produced between 4,200 and 2,750 RCYPB (Rowe 2009). Turpin (1984a:39) offers an explanation for why some of the pictographic panels were painted:

The massive amounts of overpainting at some sites, such as Panther Cave and Rattlesnake Canyon, suggests recurring ceremonial events perhaps carried out during times when the scattered populace came together for harvest celebrations. Ethnohistorically, such aggregations took place when desert fruits, such as prickly pear, ripened. Congregating for social events such as this gave small groups the opportunity to exchange information and goods, make political alliances, and marry outside of their immediate family.

Turpin (1990, 1994, 2004) also argues people were forced to concentrate along the major rivers due to the loss of upland water during the Middle Archaic. This “population packing” led to the intensification of earth oven plant processing to cope with resource shortages as well as the development of the Pecos River style pictographs as a release for scalar stress caused by increasing population pressure.

² This discussion only focuses on the larger scale social aspects of the pictographs and does not summarize any of the interpretations that were also being put forth during this time period. For details on a history of rock art research in the region, see Boyd (2003).

Finally, at the heart of the argument regarding the inferred semi-sedentary nature of the Archaic inhabitants of the region is the idea that plants such as lechuguilla, prickly pear, and sotol were dietary staples (Marmaduke 1978:10; Shafer 1976:6, 1981:134, 136, 1986: 100-101, 116-117; Taylor 1964, 1966). These plant resources could be harvested easily and frequently in what has been described by Dering (1999:667) as a “source of desert bounty.” Marmaduke (1978:10) even suggested that plants like lechuguilla and sotol represent resources that could have been intensified in terms of the amount of food produced. Yet, Marmaduke makes no mention regarding the cost (food, fuel, energy) of building earth ovens. Shafer (1986:117-118) was the first person to mention resource cost when he stated:

In the lower canyons, strategies of seasonal movement were also determined by the availability of material resources such as firewood. Prolonged stays at one location diminished the chances of catching game and denuded the locality of firewood and critical plants, making a shift in settlement necessary.

While this statement is the first acknowledgement of any cost in terms of the exploitation of natural resources by the prehistoric inhabitants, it is unclear whether Shafer (1986) understood the relationship of his statement to the *costs of baking* “critical” plants (sotol, lechuguilla, and prickly pear) and harvesting firewood to build earth ovens (Dering 1999).

To summarize the main points of the semi-sedentary rockshelter and canyon dwellers of the Lower Pecos hypothesis: 1) the Archaic inhabitants of the Lower Pecos focused on exploitation of the riverine zones, with only occasional utilization of the uplands for logistical plant baking or collecting forays; 2) settlement in the region was focused on rockshelters and large terraces along to the main river canyons; 3) the

combination of desert succulents baked in earth ovens with the riverine resources in the canyons provided a desert bounty for the prehistoric inhabitants; 4) large rockshelter and terrace sites functioned as home bases for collecting activities; 5) upland burned rock midden sites were only used as temporary cooking/camping locations; and 6) people living in the Lower Pecos were more semi-sedentary than nomadic because of the number of resources available to them along the major canyons and in the nearby uplands. It is noteworthy that none of the studies supporting the semi-sedentary view of Lower Pecos settlement patterns offer any explicit site distribution or frequency data to support their claims.

The Nomadic Foragers of the Lower Pecos. The alternative settlement pattern to the one discussed above is a hypothesis focused on a more mobile settlement pattern not necessarily concentrated or tethered to any one specific area. The main reason given for this inferred higher level of mobility is that processing the “staple” foods of lechuguilla, sotol, and prickly pear is energetically expensive, and yields very little caloric value in return (Brown 1991; Dering 1999). The first person to discuss this aspect of Lower Pecos subsistence was Kenneth Brown (1991), who considered the processing of desert succulents to be indicators of the development of an economy of scale. Essentially, Brown argued that as the region became more arid and population began to increase, the availability of higher ranked resources decreased, forcing the region’s inhabitants to begin to exploit lower ranked, more dependable resources. And, because of the poor nutritional value of lechuguilla, sotol, and prickly pear, Brown (1991:123) argued the plants were likely processed during times of food shortages or as a winter famine food rather than a true “staple.”

The first person to provide *data* in support of the energetic and caloric costs of baking lechuguilla and sotol in earth ovens was Phil Dering. Dering (1999) analyzed the energetic costs of constructing earth ovens as well as the amount of caloric energy yielded from each earth oven. Based on experimental data, Dering (1999:665) estimates that a fully loaded earth oven only produces 7,650 kcal—enough for 5.1 people days (1,500 kcal/day), while using 224 kilograms of fuel wood and 250 kilograms of rock. These figures have important implications for prehistoric mobility patterns because as Dering (1999:669) explains:

...desert xerophytes are not resources that could be utilized during long residential occupations in a logistical subsistence strategy. Earth ovens provide a relatively low return at a high cost to both the oven builders and the local plant resources. Sotol and lechuguilla are slow growing...[and] the best specimens in a patch were depleted rapidly, increasing pursuit time and reducing the productivity of each oven firing. Standing dead wood near a camp was exhausted rapidly...Depletion of both plant resources and fuel would force residential movement during any time they were relied upon as a primary carbohydrate source.

Dering (1999) also argues that due to the variability of the regional climate and resources, the hunter-gatherers were constantly forced to map onto a changing map of food and resource availability. This would force people to be constantly moving across the landscape.

In an interesting parallel with Dering's (1999) findings, Taylor (1964:198) in discussing aspects of tethered nomadism stated, "another factor which encouraged, even demanded, mobility was that many of these plants, especially the succulents, provide very little food-value per unit of consumption and thus require large harvests and bulk consumption." Additional support for Dering's (1999) hypothesis regarding processing

of desert succulents in earth ovens is provided by Sobolik (1991, 1996), who also argues that prickly pear, lechuguilla, and sotol were famine foods.

In summary, the nomadic forager model of Lower Pecos Archaic inhabitants is based on the energetic costs and low caloric yield from baking sotol, lechuguilla, and prickly pear in earth ovens. In comparison with the semi-sedentary model, the difference lies in that Dering (1999) and others (Brown 1991, Sobolik 1996) argue that baking plants in earth ovens is seen as a response to dietary stress and decreasing resource availability, not as “bountiful” food source. The people could not have resided at sites where earth oven processing was occurring one location for long because the local availability of plants and fuel wood would be quickly exhausted, forcing relocation. However, just like the semi-sedentary model, no researchers have supplied explicit site frequency or distribution data to support their hypothesis regarding a more mobile settlement pattern.

Middle-Late Archaic Bison Hunters

It has been hypothesized that during the Middle Late Archaic (approximately 2,500 RCYBP), there was a temporary shift in settlement and subsistence patterns from the previous Archaic lifeways to bison hunting (Dibble and Lorrain 1968; Turpin 2004). This is largely based on the occurrence of a bison jump at Bonfire Shelter during this time period. Because bison had not been present in the archaeological record in the region for 6,000 years, archaeologists have argued that intrusive bison hunters followed the bison herds into the Lower Pecos from the Great Plains and/or central Texas (Dibble and Lorrain 1968; Turpin 2004; Turpin and Eling 2002). Based on this hypothesis, the influx of new people and animals caused a temporary shift in subsistence strategy, and

the people who were living in the region switched from baking plants to hunting bison. Turpin (2004:272) argues that due to an increase in the relative amount of diagnostic projectile points dating to this time period from Devil's Mouth site, coupled with a decrease of points within rockshelters, that the people during this period were occupying open-air sites more frequently because they were more mobile. In this model once the bison left the region due to climate change the people were forced to switch back to subsisting mainly on desert plants (Dibble and Lorrain 1968; Turpin 2004).

Late-Late Archaic through Late Prehistoric Settlement Patterns

The last interval of the prehistoric chronology of the region has hypothesized settlement patterns much like the earlier Archaic era; however, there is one distinct addition: a perceived increase in the amount of upland land use related to plant baking. Marmaduke (1978) asserted that frequency of Late Archaic projectile points in upland sites was greater than any other time period. Furthering the argument for an increase in upland utilization during the Late Archaic, Turpin (1984a:28, 31, 2004) and Marmaduke (1978) assign distinctive ring or crescent-shaped burned rock middens to the Late Archaic and Late Prehistoric. It is far from clear, however, that allegedly "earlier" domed and annular burned rock middens have a demonstratively different morphology. In the adjacent Edwards Plateau, Black and Creel (1997:285) have argued that all BRMs form as "center-focused" accumulations.

A final shift that occurred in the Late Prehistoric was the use of upland stone alignment sites (Turpin 1982:3). These are circular arrangements of rocks that are believed to be the anchors for wikiups or small tipis (Turpin 1982, 2004). These stone

alignments are suggested to indicate a regional shift in settlement patterns from more rockshelter-based occupation during the Archaic to upland habitation during the Late Prehistoric (Turpin 1982:206). Due to the differences between rockshelter occupation and the upland stone alignment sites, Turpin (1982:206) argues that these two different settlement types are likely the result of different cultural traditions.

Application of Settlement Pattern Hypotheses to this Thesis

The focus of this thesis is on analyzing the distribution of burned rock middens across the Lower Pecos and using these data to test the two competing models of Archaic and Late Prehistoric settlement patterns: the canyon-centric exploitation and the nomadic forager pattern. Based on projectile point associations and radiocarbon dates, most burned rock middens throughout the region date from 4,000 RCYBP through the Late Prehistoric (e.g., Dibble and Prewitt 1967; Marmaduke 1978; McClurkan 1968; Saunders 1986). Because burned rock middens are persistent places on the landscape, for this study I assume that all the burned rock middens within the Lower Pecos were used between the Late Middle Archaic and the Late Prehistoric. I will not discuss the hypothesized change in settlement pattern during the Middle Late Archaic bison times, only what information can be learned from the distribution, frequency, and location of burned rock middens that are assumed to have been used between 4,000 and 450 years ago.

CHAPTER 4: ARCHAEOLOGICAL SURVEY ALONG DEAD MAN'S CREEK: METHODOLOGY

Dead Man's Creek (DMC) is a western tributary to the Devils River, located across the river from the new Devils River State Natural Area South Unit (Figure 4.1). The headwaters of DMC are located along State Highway 163, roughly five miles north of Comstock, Texas. The confluence of DMC and the Devils River is located

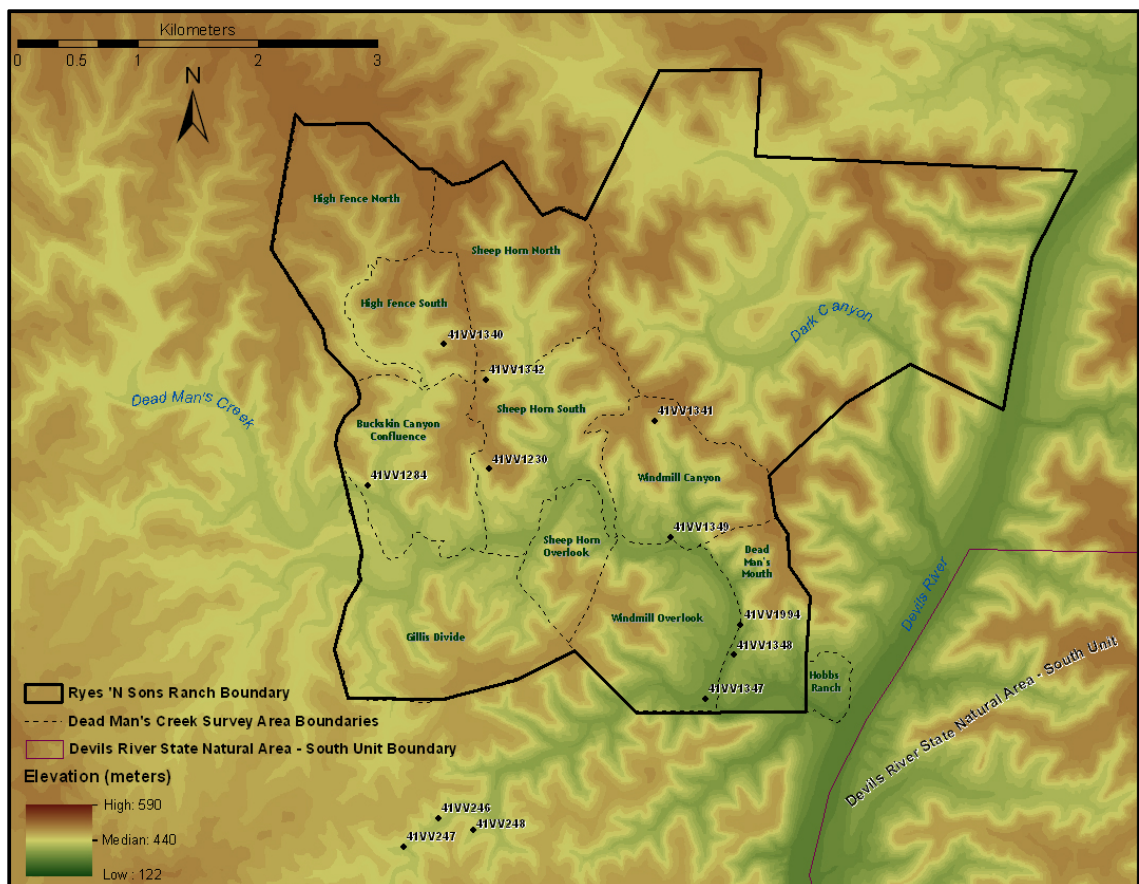


Figure 4.1. Dead Man's Creek survey area in relationship to the Ryes 'N Sons Ranch and Devils River State Natural Area – South Unit. The locations of archaeological sites recorded previously along Dead Man's Creek are plotted in addition to the survey areas used during this study.

approximately two miles upstream from the upper limit of Amistad Reservoir. Prior to this research, only minor archaeological survey had been conducted within DMC, and the recorded sites are plotted in Figure 4.1. During the initial surveys conducted in association with the construction of Amistad Reservoir, Mark Parsons recorded 41VV246, 41VV247, and 41VV248¹ on the south side of DMC in 1966 (site records on file at TARL). Turpin recorded eight additional sites along DMC: VV1230, VV1284, VV1340, VV1341, VV1342, VV1347, VV1348, and VV1349 (site records on file at TARL). Another site, VV1994, was recorded by Evans Turpin and the Iraan Archaeological Society at the request of Rick and Mary Rylander (Evans Turpin 2010). However, based on the site forms for VV1348 and VV1994, both of these sites are one and the same. In 1993 when Solveig Turpin recorded VV1348, it appears that the site was mis-plotted by approximately 150 meters to a location in the canyon where there is another small shelter. That small shelter, however, does not have any evidence of human occupation. Because VV1348 was mis-plotted, when VV1994 was recorded it was assumed to be a new site. As a result of my research, this mistake has been corrected in the site records at TARL, but the original plotted locations of VV1994 and VV1348 are shown in Figure 4.1. In all subsequent figures only the corrected plot of VV1348 is shown (the duplicate designation is now considered void).

Of the eleven sites recorded prior to this research, all except VV246, VV247, and VV248 are located on what is now the Ryes N' Son's Ranch, owned by Rick and Mary Rylander. As is the pattern for much of the survey work done in and around Amistad Reservoir, the majority of previously sites recorded within Dead Man's Creek are

¹ The "41" will not be used throughout the remainder of this thesis because all the sites discussed are recorded within the state of Texas.

rockshelters (VV246-248, VV1230, VV1284, VV1340-1342, and VV1348). In addition, all of these rockshelter sites contain pictographs in varying degrees of preservation. Of the two sites that are not rockshelters, one can be classified as an open-air burned rock midden (VV1347) and the other as a burned rock feature (VV1349). VV1347 and VV1349 are both located directly adjacent to a ranch road and within borrow pits. It is quite likely that landowners acted as informants, telling the archaeologists where rockshelters were located along DMC, a common occurrence during work around Amistad Reservoir (Dering 2002:3.15), and one which Rick Rylander demonstrated by showing the author several sites within Dead Man's Creek in 2009.

Dead Man's Creek was chosen as the location for the present survey for several reasons. First, through my involvement with the SHUMLA School, I have a very good relationship with the landowners. In addition, the Rylanders graciously allowed the 2011 Texas State Lower Pecos Canyonlands Archaeological Field School to be held on their ranch, and have been constant supporters of archaeological research on their property. The portion of Dead Man's Creek surveyed is located almost entirely on the Ryes N' Son's Ranch (Figure 4.1), with the confluence of Dead Man's Creek and the Devils being owned by the Hobbs family. The Dead Man's Creek survey area covers approximately 4,500 acres.

DMC Survey Research Design

The goal of the survey was to record the locations of as many prehistoric sites as possible, with an emphasis on documenting burned rock middens and smaller burned rock features. Burned rock is notoriously difficult to detect on smaller sites within the

region (Saunders 1986:139), so emphasis was given to training volunteers and field school students to distinguish burned rock from naturally gray/black limestone. This was done by taking crew members to known BRM sites, or sites containing obvious burned rock features, before beginning pedestrian survey in order to introduce them to spotting burned rock. This strategy seemed to help crew members in the field, but only after repeated encounters with burned rock features did most crew members finally learn the nuances of identifying burned rock.

Rather than create a new definition of a site, this survey utilized Dering's (2002:4.3, emphasis in original) definition:

A site is any discrete locality containing potentially interpretable cultural material. Discrete refers to the fact that the material is spatially limited. By interpretable, it is meant that there are artifacts of sufficient quality or quantity to be able to make inferences about behavior at the locus. Cultural materials refer to artifacts, ecofacts, and features. *Minimally, a site is defined as a locus containing at least 10 artifacts and/or one feature within an area measuring 10 m².*

In addition, the site types outlined by Dering (2002:Table 4.1) were also used during survey (Table 4.1). The locations of sites, features, and artifacts were all recorded using two Magellan GPS units running Magellan Mobile Mapper™ software. This program allows for the user to enter additional data along with the GPS coordinate. Tables 4.2, 4.3, and 4.4 show the fields that were used to collect data for point, line, and polygon features. The unique ID for each GPS point was assigned based using two variables: the survey area where the point is recorded and the order in which the point was recorded within that survey area. The survey area was divided into 11 different parcels (Figure 4.1), each given a unique name, and coded using a three letter identifier (e.g., DMM: Dead Man's Mouth, WMC: Windmill Canyon) (Table 4.5). Every GPS point recorded

was enumerated according to which survey area it is in, plus a numeric number in ascending order of which point within that survey area. For instance, if a burned rock feature is the fifth site recorded within the Dead Man's Mouth survey area, that GPS point gets the name "DMM005", the next GPS point recorded within Dead Man's Mouth would be "DMM006", and so on. All GPS points were recorded on the GPS Recording form (Figure App A.1) by describing what was being recorded and which GPS was used.

In addition to recording locations for features, sites, and artifacts, the GPS units were used to continuously track the routes being walked on survey. Since I only had the use of two GPS units, whoever was walking on the ends of the survey line would carry a GPS unit. Although it would have been more accurate to have each person on survey crew carry a GPS unit and track their own route for the day, using the two GPS units on the ends allows for the assumption that the area between the GPS routes was covered by the rest of the survey crew.

As per landowner request, any diagnostic artifacts and/or "collectable" items (projectile points, bifaces, unifaces, manuports, grinding stones, large flakes) found within archaeological sites were collected. This was done more to discourage unauthorized collection than to collect artifacts for curation and future study. Any diagnostic isolates were also collected. All collected materials will be returned to the landowners once analysis is finished at Texas State University. All other artifacts were left in place on the ranch.

Table 4.1. List of Prehistoric Site Types (from Dering 2002:Table 4.1)	
Site Type	Definition
Alignment	Linear or circular arrangement of stones that usually does not exhibit the effects of heating; may occur in oblong stacks, paired stones in a continuous circle, or a circle of stones with a slab in the center, have been described as tipi rings, wikiup rings, or signal fires.
Burned Rock Midden	A feature consisting of fire-cracked rock, charcoal, darkened midden soils, artifacts, ecofacts, and often other associated or imbedded features
Burial	Human or animal inhumation or cremation; may be primary or secondary.
Cairn	Ovoid or conical heap of stones built as a landmark or a monument; may be prehistoric or historic; prehistoric cairns may contain a burial.
Cave	A site located within a natural solution cavity in bedrock canyon or bluff walls; its depth is greater than its width.
Fire-cracked rock concentration	Amorphous concentration of fire-cracked rock in a discrete (sharply defined) area; often represents a disarticulated hearth.
Fire-cracked rock scatter	Low-density surface scatter of heat-altered or burned rock, with or without lithic artifacts, that contains more burned rock than lithic artifacts.
Hearth	A clast-defined feature, usually of fire-cracked rock, that is circular to oval in plan view and approximately .5 to 1.5 m in diameter
Hearths - multiple	Groups of two or more intact hearths (clast defined and .5 to 1.5 m in diameter); usually accompanied by artifact and fire-cracked rock scatters.
Lithic scatter	Surface scatter of chipped stone or ground stone debris, including flakes, cores, early stage bifaces, etc., with no other features.
Midden	Consists of darker, organic-stained soil and increased concentrations of cultural remains, including artifacts, ecofacts, and features; often contains concentrations of mussel shell and remains of vertebrate fauna; associated features may include surface scatters of lithics and/or fire-cracked rocks, pits, and hearths; note that fire-cracked rock is not a dominant component of middens.
Overhang	A cavity in a canyon/bluff wall that has a back wall and an upper horizontal element that serves as a roof; overhangs lack well-defined side walls.
Pictograph/petroglyph	Painted or pecked images on a boulder or bedrock.
Quarry	A locale with a concentration of abundant raw lithic materials, and sufficient chipped stone debris to indicate quarrying activities and stone tool production. Debris may include some or all of the following: tested cobbles, exhausted cores, primary, secondary, and tertiary interior flakes, biface blanks or preforms and failures, bifacial and unifacial tools, sequent flakes, and burins.
Rockshelter	A site located within a natural solution cavity in bedrock canyon or bluff walls. It has well defined side walls and its width is greater than its depth.
Sinkhole	A concentration of cultural debris located in a depression in the land surface that opens into an underground passage or cavern that was formed by solution; burials are often identified in sinkhole sites.

Table 4.2. Attribute Data Collected for Individual Points		
Point ID	To be assigned by the recorder based on what survey area the point is in and the sequential number of GPS point (DMM001, DMM002, etc...). Everything recorded (be it an artifact, polygon feature, or linear feature, receives a Point ID.	
Geographic Setting (Select From Dropdown)	Upland	Mid Holocene Terrace
	Canyon Rim	Late Holocene Terrace
	Canyon Slope	Canyon Bottom
	Pleistocene Terrace	Other
Difficultly of Access (Select From Dropdown)	Scale of 1 to 10	
Direction of Access (Select From Dropdown)	Traverse	
	Ascend	
	Descend	
	Other	
	Not Applicable	
Type of GPS point being recorded (Select From Dropdown)	Artifact	
	Feature	
Artifact Class (Select From Dropdown)	Chert	Chert Tool
	Core	Groundstone
	Flake	Ceramic
	Uniface	Historic Artifact
	Biface	Other
	Projectile Point	
Feature Class (Select From Dropdown)	Quarry	Bedrock Mortar
	Artifact Cluster	Rockshelter
	FCR	Rock Overhang
	Geometric Stone Alignment	Cave
	Stone Carin	Historic Feature
	Infilled Crevase	Other
Notes (Manually enter notes)	Any additional notes (here is where recorder would say BRM, FCR scatter, etc...	

Table 4.3. Attributes Collected for Polygon GPS Features		
Polygon ID	Assigned in the same way as Point IDs; however, all polygon features should share an ID number with a Point feature; if not, polygon is recorded sequentially within that survey area.	
Feature Type (Select From Dropdown)	Quarry	Bedrock Mortar
	Artifact Cluster	Rockshelter
	FCR	Rock Overhang
	Geometric Stone Alignment	Cave
	Stone Cairn	Historic Feature
	Infilled Crevace	Other
Notes (Manually Entered)	Any Additional Notes	

Table 4.4. Attributes Collected for Polyline GPS Features		
Line ID	Assigned in the same way as Point and Polygon IDs; all polyline features should share a number with at least a Point feature, and typically also a polygon feature. If they are not associated with Point or Polygon GPS IDs, line is recorded sequentially within that survey area.	
Feature Type (Select From Dropdown)	Survey Route	
	Rockshelter Face	
	Rock Overhang Face	
	Cave Face	
	Road	
	Fence	
	Other	
Notes (Manually Entered)	Any additional notes.	

Table 4.5. The Three Letter Codes Assigned to the 11 Survey Areas within Dead Man's Creek.	
BCC	Buckskin Canyon Confluence
DMM	Dead Man's Mouth
GDE	Gillis Divide
HFN	High Fence North
HFS	High Fence South
HOB	Hobbs Ranch
SHN	Sheep Horn North
SHS	Sheep Horn South
SHO	Sheep Horn Overlook
WMO	Windmill Overlook
WMC	Windmill Canyon

Field Methodology

Survey was conducted in high probability areas located on uplands, canyon rims, and canyon bottoms. Based on previous surveys, burned rock midden sites are most frequently found in these three topographic settings. Canyon slopes were considered low probability areas because, aside from talus cones emanating from rockshelters, very few burned rock features have been recorded on slopes. Concentrating on high probability areas allowed me to use the time as effectively as possible. Rather than using tight transects like Saunders (1986) or transects on compass headings, survey crew members were spaced between ten and twenty meters apart and used a similar technique as Turpin (1982) by letting the natural contours of the canyon topography dictate the walking direction. By walking transects in this fashion I was able to cover the high probability areas more thoroughly than using just compass transects; however, the distance between surveyors (10-20 meters) placed an emphasis on identifying features and not on individual artifacts. The number of people surveying on a daily basis, in addition to myself, ranged from one to six, and the area targeted for survey dictated by the crew size that day. For instance, with more people I could cover larger upland ridges, but with only a couple people smaller areas, like canyon rims, were better options. No subsurface testing (shovel tests) occurred during survey, a practice that is common with other large scale surveys in the region. This lack of subsurface testing is due to the generally shallow soils, relatively sparse vegetation (good surface visibility), and comparatively few areas with a likelihood of buried sites (buried site potential is discussed further in Chapter 8).

Hand-drawn site maps were created for all rockshelter sites, but GIS was used to create site maps for any open-air sites where GPS signal was available. In addition to GPS points being collected for each feature or artifact recorded, several photographs were taken. For artifacts, only diagnostic tools (unifaces, bifaces, projectile points, etc.) were photographed, and each artifact received at least four in-the-field photographs: (1) Overall Context (people standing by the artifact in its original place and pointing at it; north arrow placed next to the artifact and a view of the surrounding landscape); (2) Midrange (a picture of a person's hand pointing at the artifact in its original place with north arrow); and (3 and 4) two Closeup photos. The Closeup photographs were taken on a photo board that several pieces of information written on it: 1) the assigned GPS point of the artifact that was being photographed; 2) the type of artifact; and 4) date and recorder. Minimally both sides of the artifact are photographed. In addition to the Overall Context, Midrange, and Closeup shots, additional photos of the artifacts were sometimes taken at the discretion of the field crew.

For each recorded feature the feature name (per GPS point designation) was written on the photo chalk board in addition to the date and feature type (rockshelter, BRM, hearth, etc.), and the board placed near the feature along with the north arrow. If the feature was a rockshelter, cave, or overhang, two 270 degree panoramas are taken, one of the viewshed looking out from the shelter, and another of the shelter interior. These panoramas were taken from the middle of the shelter. In addition to the two panoramas, each rock shelter was photographed from both ends to give an interior context. Most rockshelter site received additional photographs taken at the discretion the field crew. Finally, for every rockshelter between 50 and 150 photogrammetry

photographs were taken to create 3D models of the shelters in the future. If the feature was an open-air site, two panoramas were also taken, but the photographer did not have to be centered on the feature; rather, the photographer could stand off to one side so that the panoramas recorded the overall landscape context of the feature. Several closer scale photographs were also taken of each feature from the four cardinal directions (when possible).

Lab Methodology

Each day, the original GPS data and photographs were downloaded from the units and saved onto an external hard drive. However, data was left on the cameras and GPS units for an additional 48 hours prior to deletion to insure no problems occurred during the downloading process. Copies of the unmodified, original photographs were placed into an “Original Photographs” folder under subfolders named by date and by camera. The bulk of the collected data were placed in another folder, called “Survey Areas.” This directory was divided into 11 different subfolders, one for each of the survey areas. Within each survey area, a folder was created for the GPS data. These data were divided into subfolders by date and by GPS unit (either A or B). Corresponding folders were also created for features and artifacts based on their GPS IDs, and these folders were placed into the appropriate survey area directories. Copies of the original photographs were placed in these GPS ID folders. Photographs were renamed describing what feature/artifact the photographs were taken of and the type of photograph (Overall, Closeup, etc.). Any artifacts that were recorded within the boundaries for a larger site were placed in a subfolder within the GPS ID folders.

Implementing and maintaining an extensive file structure required forethought, organization, and extra work; but, because I managed the data this way I could identify mistakes in data collection (bad photographs, bad or missing GPS data) immediately and fix the problems the next day if needed. Also, by dividing GPS and photographic data on a daily basis, any mistakes that were made on previous days recording forms were not automatically carried over. Thus, the photos of any site recorded that day on survey could be easily located without searching through hundreds of photographs. My use of this type of file structure was based on my experiences creating a similar file structure for the SHUMLA rock art site files.

Once the original photographs and GPS data were downloaded, the GPS data needed to be exported as an ArcGIS readable shapefile. This was easily accomplished using the Magellan Mobile Mapper software on the computer, and the new shapefile versions of the points, lines, and polygons were saved in that day's GPS data directory. In this way, if any problems were identified in the GIS maps related to a specific data set, I could easily go back and find the exact day those points were recorded and either re-export the shapefiles from the raw GPS data or simply re-upload the shapefiles into GIS.

Any artifacts that were collected in the field were placed into plastic bags upon collection and were accompanied by a small paper tag (Appendix A). Once these artifacts were brought back to the lab, they were cleaned and placed back into the bags. Artifact labels were only applied after site trinomials were received for the different sites. After the artifacts were labeled, they were photographed again and given a new paper tag with the site trinomial.

During the time spent surveying along Dead Man's Creek, no internet access was available in order to submit TexSite forms to obtain trinomial numbers. However, using TexSite 3.0, information was entered into the Microsoft Access TexSite database, and the information was uploaded when access to the internet was obtained.

CHAPTER 5: DEAD MAN’S CREEK SURVEY RESULTS

Survey was conducted between March 2011 and January 2012 with the assistance of the 2011 field school students as well as dozens of volunteers. As stated in Chapter 4, survey focused on the high probability areas along Dead Man’s Creek (uplands, canyon rims, and canyon bottoms), meaning that the canyon slopes received only minimal coverage. Some canyon slopes within the survey area, especially around VV2036 and VV2037, received more attention due to their proximity to ongoing excavations. The survey routes and all the GPS points taken during survey are plotted in Figure 5.1a. As of September 2012, 68 archaeological sites have been recorded within the survey area (Figure 5.1b), with 60 of those sites being recorded since 2011. The only two sites not recorded (or revisited) by the author were VV2036 and VV2037, as these were recorded by Ashleigh Knapp prior to the 2011 field school. Complete site forms are available for all 68 sites at TARL.

Chapter 5 summarizes the recorded sites in seven categories: (1) rockshelters, caves and overhangs; (2) upland burned rock middens; (3) terrace burned rock middens; (4) open-air sites containing non-midden burned rock “hearths,” concentrations, or scatters; (5) stone alignment and cairn sites; (6) lithic procurement sites; and (7) lithic scatters. Additional information about each site, including site photos, site maps, and artifact photos are provided in Appendix B.

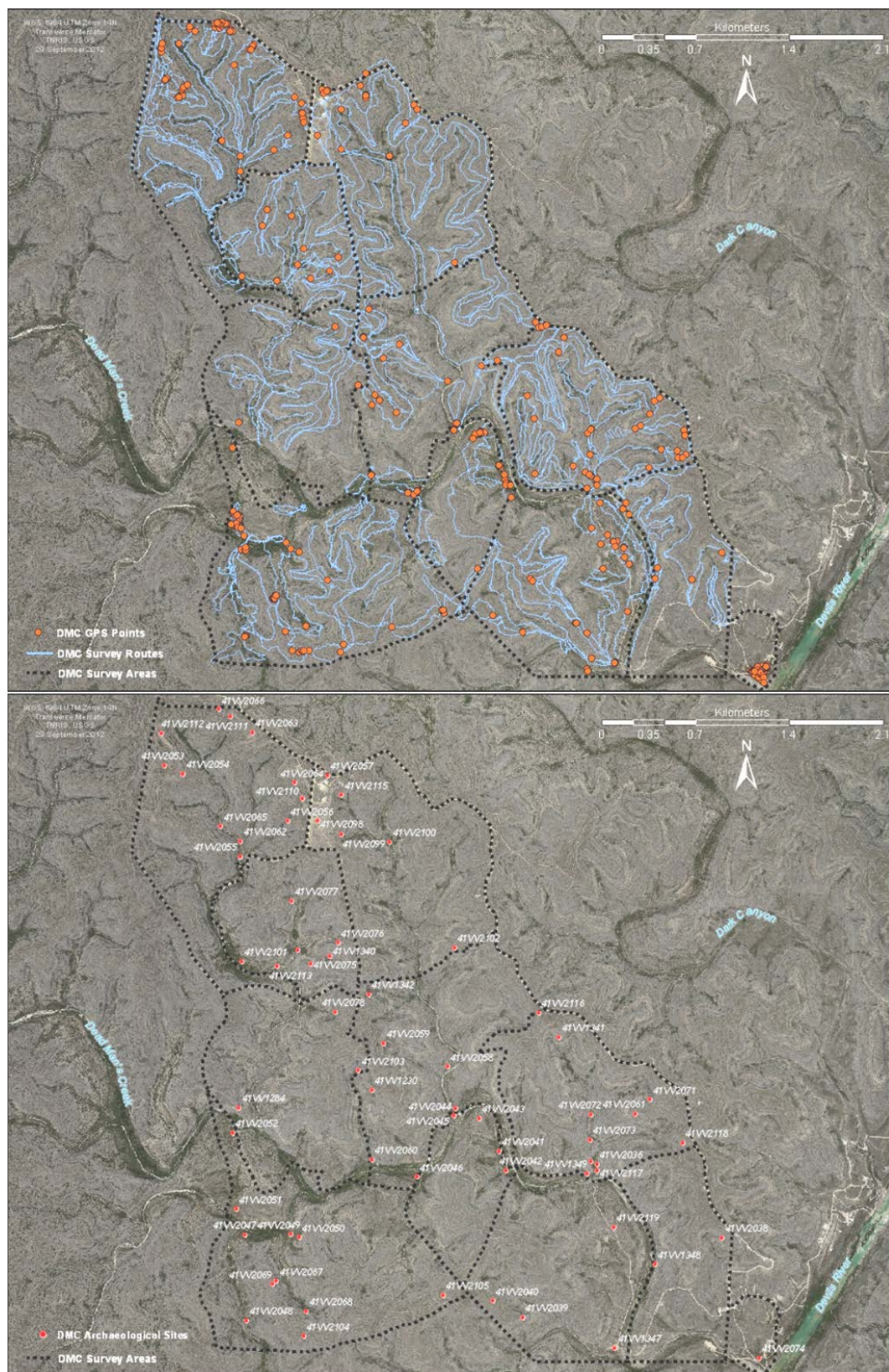


Figure 5.1. (a, top) Survey routes and GPS points collected within the Dead Man's Creek survey area; (b, bottom) archaeological sites recorded as of September 2012.

Rockshelters, Caves, and Overhangs

Of the 68 sites recorded within the study area, 23 are classified as rockshelters, caves, or overhangs (Figure 5.2). Features within rockshelters included lithic scatters,

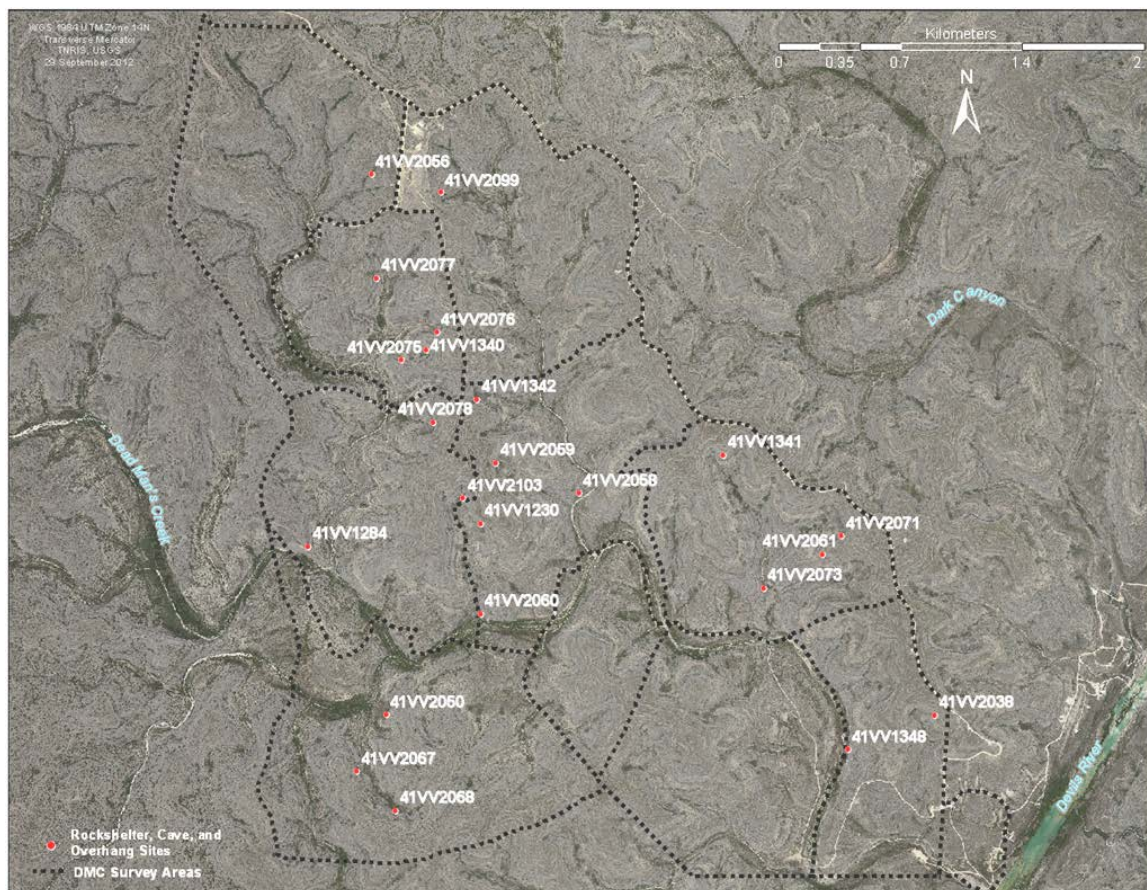


Figure 5.2. Locations of rockshelters, caves, and overhangs recorded within the survey area.

burned rock middens, stone alignments and pictographs. A summary of each site noting its recorded features and artifacts follows.

VV1230 – Halo Shelter. Halo shelter is perhaps the most famous site within the survey area due to the presence of excellently preserved Pecos River and Red Linear style pictographs. The shelter faces west and is located along a minor tributary canyon to Dead Man's Creek. The shelter measures 40 meters in length and six meters at the

deepest point. A substantial burned rock midden talus extends 20 meters down the slope. The shelter floor is covered in burned rock, scattered lithics, and ashy soil. Several boulders within the shelter contain small bedrock grinding features as well as one circular petroglyph. Two hammerstones and one biface were collected during survey, and the Rylanders had collected three biface fragments, one untyped projectile point fragment, one uniface, and a unifacial flake tool (Figures App B.2 and App B.3).

VV1284 – Running Deer Shelter. Running Deer shelter also contains Pecos River style pictographs. This site is located on a high, south facing canyon rim overlooking Dead Man's Creek. The shelter measures 20 meters in length and six meters deep. The burned rock midden talus at this site is impressive, extending out of the shelter down into the canyon some 40 meters. 21 bedrock grinding features (e.g., facets and shallow mortars) are located within the shelter in addition to numerous incised grooves. The shelter has hundreds of chert flakes visible on the surface. During site recording several biface fragments, an Ensor dart point, an untyped arrow point (possible Perdiz), one oval biface, fragment of an igneous nutting/grinding stone, and a limestone nutting/grinding stone were collected. The Rylanders have collected Pandale, Val Verde, Ensor, Montell, and Shumla dart points as well as several untyped points (Figures App B.5, App B.6, and App B.7).

VV1340 – Hibiscus Shelter. Hibiscus Shelter is another rockshelter containing well preserved Pecos River and Red Linear style pictographs in addition to pictographs of unidentified styles. Hibiscus is located along a small side canyon that flows into a larger tributary canyon of Dead Man's Creek. The shelter faces west, and is 30 meters long by five meters at the deepest point. The site has a substantial burned rock midden within the

shelter as well as extending down the talus approximately 15 meters. No obvious bedrock features were observed within the site. Prior to the survey, Rick Rylander had removed several old shovels and buckets from the site that had been left behind by looters. Between the survey and the Rylander collection, three unifacial flake tools, three biface fragments, two Ensor projectile points, and one Pedernales projectile point were recovered (Figure App B.9).

In the summer of 2012, Texas State University returned to Hibiscus Shelter and conducted excavations to understand the morphology of the burned rock midden in order to estimate the total number of earth oven firing events. Although these excavations were not part of the survey research, several salient aspects bear discussion. After the site was cleared of vegetation, we took over 1,000 photographs to create a 3D model of the site using Microsoft Photosynth™ (Figure App B.10). This point cloud was later imported into GIS and combined with the Total Data Station (TDS) data for the site (Figure App B.11). During excavations, several projectile points were recovered, including Perdiz arrow points, Ensor, Pedernales, Val Verde, Langtry, Marcos or Castroville, and Pandale dart points as well as several untyped projectile points (Figure App B.12). In addition to projectile points, other interesting artifacts included several pieces of red ocher (Figure App B.13) along with numerous river mussel shell fragments (Figure App B.14).

Prior to excavations, we designed a simple system to protect the rock art from further damage due to dust during excavation. To accomplish this, we suspended a tarp against the wall, but away from the rock art (Figure 5.3). We used five, eight-foot long sections of one-inch base board to staple two 20-foot-long section of painter's tarp. Each base board had pipe insulation placed on the opposite side from where the painter's tarp

was stapled. The side with the pipe insulation was then pressed against the shelter ceiling/wall with expandable curtain rods that had been set into one-half inch PVC pipe. Once the “curtain” was put in place, the bottom of the painter’s tarp was held down by rocks to prevent it from billowing into the rock art. This simple, yet effective, system withstood three and a half weeks of constant set up and take down while excavations occurred.



Figure 5.3. Curtain system in place to protect the pictographs at 41VV1340. Notice Pecos River style figure in foreground. Photo taken minutes before a wind gust caused the curtain to collapse, necessitating improved anchoring.

VV1341 – Windmill Shelter. Located high on a canyon rim at the head of Windmill Canyon, this shelter faces south toward the main branch of Dead Man’s Creek. The shelter is 23 meters wide at the drip line, and 11 meters at the deepest point. The site has been heavily impacted by historic ranching, as evidenced by the scattered trash and graffiti throughout the site. Two panels of poorly preserved Pecos River style pictographs are present in the downstream end (Figure App B.16). No diagnostic

artifacts were recorded during survey, but the Rylanders collected two dart points, a Val Verde and an Ensor (Figure App B.17). The largest feature at the site is the substantial burned rock midden talus that extends from inside the shelter some 40 meters down the steep canyon slope.

VV1342 – Ryes ‘N Sons Retreat. 41VV1342 is the largest rockshelter within the study area. The shelter faces north-northeast, and is 54 meters wide at the drip line and 11 meters at the deepest point. Thick vegetation shields the inside of the shelter from excessive sunlight, but the shelter is visible from the main ranch road across the canyon to the east. The entire rear section of the shelter appears to have been shoveled out by looters, and we found several shovels, buckets, and screens that had been left behind (Figure 5.4). Hundreds of chert flakes and other artifacts are visible on the surface as well as numerous grinding features on small boulders within the shelter. This site has the



Figure 5.4. A large screen that was removed from 41VV1342 in addition to several other tools left behind by looters.

potential to preserve remnant perishable remains, but testing would be required to determine if any intact deposits remain. The largest boulder within the shelter has dozens of grinding features (Figures App B.18 and App B.19). Although the back wall of the shelter has no identifiable pictographs, wherever water seeps have suppressed lichen growth remnant paint is visible, suggesting the shelter walls may have been covered with extensive pictographs (Figure App B.20).

Numerous artifacts were collected from the shelter because of the high visibility of the shelter and potential for future looting. These included a large fragment of ocher with visible scratching, a volcanic rock, two drills, numerous biface fragments, and Pedernales, Marshall, Arenosa, Langtry, Val Verde, Figueroa, and Ensor dart points (Figures App B.21, App B.22, App B.23, and App B.24).

VV1348 – Dead Man’s Canyon Overhang. VV1348 is located just over a kilometer from the Devils River within the main Dead Man’s Creek canyon. The shelter faces west, and is 46 meters long at the drip line and 4 meters at its deepest point. VV1348 contains Pecos River style and unidentified pictographs, but due its location low in the canyon bottom, the pictographs are in poor condition (Figure App B.25). There is some burned rock and lithic material visible on the ground surface, but much of the interior of the shelter is choked with thick acacia, grass, and flood deposits, making any evaluation of the deposits difficult. As explained in Chapter 4, VV1348 was recorded twice; the second time it received the duplicate trinomial VV1994 (now abandoned).

VV2038 – Serenity Overlook. Serenity Overlook was the first site recorded during this project. It is a long rockshelter, or alcove, high on the canyon rim overlooking the

confluence with Dead Man's Creek and the Devils River. The shelter faces south, and is 73 meters in length and 6 meters deep. The most impressive aspect of this site is the relatively well preserved Pecos River style, Red Linear, and unidentified pictograph panels within the shelter (Figure App B.27). The Pecos River style and Red Linear pictographs are the dominant styles represented with several other examples of unidentified pictographs, some of which are reminiscent of Bold Line Geometric. Based upon a preliminary survey of pictographs at the site, there are at least 27 anthropomorphic figures, 10 zoomorphic figures, and seven enigmatic figures (see Boyd et al. [2012] and Johnson et al. [2011] for more detailed definitions of pictograph forms). In addition to the pictographs, three possible stone alignments are located inside the shelter; two of which are directly in front of the main pictograph panel (Figure App B.28). Several burned and unburned chert flakes along with small pieces of fire-cracked rock are visible on the talus, although there is little potential for extensive cultural material.

VV2050 – Hackberry Den. VV2050 is a relatively small, west facing rockshelter (six meters wide by four meters deep) that has a very large burned rock midden talus extending nearly 50 meters downslope. Rick Rylander showed the author this site in 2009. In front of the shelter a flat area creates a large (eight meters by three meters) work area. It is likely this flat area is where the prehistoric occupants constructed earth ovens. A large boulder with a shallow grinding feature is also present in the flat area (Figure App B.30). On the downstream wall of the shelter is a small panel of pictographs in an unidentifiable style (Figure App B.31). Hundreds of chert flakes were observed on the

talus of VV2050, but no diagnostic projectile points were found. A large river mussel shell and a crude biface were collected (Figure App B.32).

VV2056 – Big Cactus Shelter. Big Cactus Shelter is the farthest rockshelter away from the Devils River in terms of the distance within the drainage (canyon) system. This small rockshelter faces west-northwest and measures only six meters along the drip line and two meters deep. Numerous large boulders cover the talus. Between the boulders and washed into the drainage bottom are hundreds of burned rocks originating from VV2056. Compared to other burned rock middens located within rockshelters in the study area this is relatively small, but indigenous peoples constructed numerous earth ovens in this location.

In addition to the burned rock midden, there is a poorly preserved pictograph in the upstream end of the shelter (Figure App B.34). This pictograph resembles a Pecos River style serpentine line motif, but it is difficult to determine due to the preservation. No bedrock features were observed within the site. One projectile point, identified as being in the Big Sandy series (Elton Prewitt, personal communication, 2012), was collected (Figure App B.35).

VV2058 – Nopal Sanctuary. VV2058 is an east facing cave located low in a canyon bottom along what the Rylanders call Sheep Horn Canyon, a tributary to Dead Man's Creek. Rick Rylander had shown this cave to the author in 2009. The cave measures four meters wide at the drip line, and extends six meters back. There is a small chamber within the cave that extends to the south another two meters. Several modern animal bones were visible within this small antechamber. The largest feature at the site is

the substantial burned rock midden talus that extends downslope from the mouth of the cave approximately 15 meters onto the small stream terrace below. The site has been looted, as evidenced by a screen found on the talus. The only artifact collected appears to be a projectile point preform (Figure App B.37). Charcoal was noted on the surface of the cave floor.

VV2059 – Audad Escape. Audad Escape is a large east facing rockshelter located high on a canyon rim overlooking the confluence of Sheep Horn Canyon and Dead Man's Creek. The shelter measures 30 meters at the drip line and seven meters deep. Given the size of the shelter, there was surprisingly little evidence of occupation, especially in terms of fire-cracked rock. The floor is covered in small roof spalls from the shelter wall. Several dozen chert flakes and fragments of FCR were observed, but relatively few artifacts were visible. One Langtry projectile point was collected (Figure App B.39).

VV2060 – Gnarly Bone Shelter. VV2060 sits low in a canyon bottom at the confluence between a small tributary and Dead Man's Creek. Rick Rylander told the author about this shelter in March 2011. The shelter faces west, and is five meters wide and only four meters deep. The talus extending outward from the shelter has a light scattering of FCR and chert flakes. Based on the artifacts present on the surface this site does not show signs of heavily utilization; however, there are several very large boulders on the talus and it is possible that more cultural debris lies buried. One large hammerstone, a battered stream-rolled cobble, was collected from the site (Figure App B.41). The material appears to be either metamorphic or igneous suggesting it possibly originated from the Rio Grande or Pecos River.

VV2061 – *Rylander Refuge*. VV2061 is located high on the canyon rim looking south over the confluence of Windmill Canyon and Dead Man's Creek. This shelter is extremely difficult to access. The shelter is fairly small (eight meters wide at the drip line and five meters deep), and shows only minor evidence of human occupation. There are several dozen chert flakes and pieces of FCR. No other features were visible within the shelter, and the lack of archaeology is likely related to the degree of difficulty involved in gaining access to the site.

VV2067 – *Hinds Deep*. Hinds Deep is a horizontal shaft cave located at the southwest corner of the study area. The cave faces east, but is completely obscured from view by dense vegetation in the front of the cave. The cave measures 10 meters across at the drip line, and extends 40 meters into the cliff face (Figures App B.44 and App B.45). The inside of the shelter is littered with burned rock and other midden debris (lithics, plant fibers). Most of the material is concentrated within the cave, with only a small midden talus spilling downslope. Outside of the cave overhang there is an area covered in burned rock.

The interior of the cave is dry enough to preserve some perishable remains (plant fibers were visible in the interior), but based on the lichen on the cave walls the cave receives enough moisture to prohibit the preservation of any pictographs. Due to the dampness in the cave everything is obscured by a layer of fine dust that sticks to the artifacts. Only a few artifacts were collected from the cave: two bifaces and one stream rolled pebble (Figure 11.46). Just inside the entrance to the cave is a vertical chamber that extends approximately five meters above the roof of the cave. At the top of this chamber burned rock fragments and a possible grinding stone were observed (Figure App

B.47). At approximately 35 meters from the entrance, the cave narrows down into a passageway to the rear chamber. To pass through this passageway requires crawling on your stomach over what appears to be sediment deposited into the cave from water running into the rear chamber (allochthonous deposits [Goldberg and Macphail 2006:177]). It is quite likely that below this layer of sediment is a travertine deposit. In the rear chamber were several modern javelina skulls and long bones, but no evidence of human occupation was visible on the surface.

The potential for perishable remains (including human burials) to be preserved at this site is high. The shelter has been looted to an unknown extent, most obviously along the walls leading up to the narrow passageway; a looters screen was removed from the cave entrance.

VV2068 – Awe-dad Shelter. VV2068 is located upstream from VV2067 in the same canyon. The shelter is hidden behind a large roof fall, and it is only visible from the opposite canyon rim once you get upstream on the opposite bank. The shelter faces north, and measures 27 meters wide along the drip line and is five meters at the deepest point. There is a large deposit of éboulis cemented to the back wall in the center of the shelter (Figure App B.48), evidence the shelter's deposits were much deeper at some point in time. The floor of the shelter is strewn with burned rock and ashy soil. More burned rock is concentrated toward the back wall of the shelter, likely due to deposits being washed out of the shelter by pour over from the canyon rim above. The burned rock midden at this site is not as substantial as those at many rockshelters in the study area, but this location was still intensively used to construct earth ovens. Numerous chert

flakes are visible on the floor of the shelter, along with two large grinding stones. Two Val Verde projectile points were collected along with two bifaces (Figure App B.49).

VV2071 – Echo Overlook. Echo Overlook is a long and narrow rockshelter, or overhang, located high on a canyon rim facing west toward VV1341 and Windmill Canyon. The shelter is 58 meters long and four meters at the deepest point. The floor of the shelter is covered in small roof and wall spalls; however, intermixed with the spalls are scattered pieces of FCR and chert flakes. A small concentration of FCR is present on the talus directly below the central portion of the shelter, but there is not enough FCR to classify the accumulation as a burned rock midden talus. Based on the number of artifacts, this site was not used intensively. The only feature visible in the shelter is a panel of very poorly preserved pictographs that cannot be assigned to a particular style (Figure App B.51).

VV2073 – Oven-Smashed-In. As the name implies, Oven-Smashed-In is a collapsed rockshelter with burned rocks and lithics eroding out from underneath the roof collapse. Some remnants of a talus are identifiable on the small stream terrace at the base of the shelter. The site is just upstream from 41VV2037 within Windmill Canyon. The shelter is low in the canyon bottom on the west bank, but still high enough to be unaffected by most flood events down Windmill Canyon. The depth and nature of the deposits cannot be inferred based on the limited visibility. In its present condition, the shelter appears to have once been approximately 14 meters wide and nine meters deep. This site provides the potential for preserved deposits underneath the roof fall.

VV2075 – *Hibiscus View*. VV2075 is located directly across the canyon from VV1340, Hibiscus Shelter. VV2075 is more appropriately termed an overhang, and is 30 meters wide at the drip line and four meters at the deepest point facing northeast. Only a few pieces of FCR and several chert flakes are visible within the shelter. There are also a few fragments of a bottle glass.

VV2076. VV2076, much like VV2075, is an overhang containing only a few pieces of FCR and several chert flakes. It is located on the other side of the ridge from 41VV1340 and measures 17 meters along the drip line and four meters deep. The site faces northeast, and there are two pour offs from the canyon rim—one in the center of the overhang and one on the downstream end—that have likely washed away artifacts from within the shelter. There are also two clusters of rocks beneath each pour off (Figure App B.54), but it is unclear if the clusters are cultural or natural, and if they are cultural, prehistoric or historic in nature.

VV2077. VV2077 is located in the larger canyon which the smaller tributaries containing 41VV1340, 41VV2075, and 41VV2076 drain into. This rock overhang site contains several dozen pieces of FCR and a few lithics scattered between large roof falls (Figure 11.55) and on the talus below the site. The overhang faces northeast, and is 11 meters wide and five meters at the deepest point.

VV2078. VV2078 is located along the main tributary canyon that drains the northwest portion of the study area. The site is an overhang containing few pieces of FCR, several chert flakes, and one core. The wall of the shelter at this location is heavily

spalled, and many spalls are located on the shelter floor. The overhang faces west, and measures 40 meters wide at the drip line, and four meters at the deepest point.

VV2099. VV2099 is a rockshelter site located just east of the Rylander bunkhouse complex. Rick Rylander informed the author about the whereabouts of this shelter early during the survey. This small rockshelter faces southeast, and measures four meters wide and four meters deep. Just inside the drip line, the floor of the shelter is very dark and ashy (Figure App B.57), with several large pieces of FCR and a few flakes within the matrix; however, due to the large pour off directly above the shelter entrance much of the material that was once present is now washed downstream. All that remains is an FCR and lithic scatter.

VV2103 – *Rick's Chimney*. VV2103 is located just upstream from VV1230—Halo Shelter, one of the most visited sites on the property. Rick Rylander took the author into this shelter in 2009. The shelter faces southwest, and is 66 meters in length and eight meters at the deepest point. It is named for the vertical solution cavity in the upstream end of the shelter that goes through the shelter ceiling up to the uplands above (Figure App B.59). There are large roof falls along the drip line of the shelter, and water that comes in through the “chimney” runs through the interior of the shelter, as evidenced by grass wrapped around the bases of small trees within the shelter. The floor of the shelter is covered in rocks coated in CaCO_3 from water pooling within the shelter. Many of the coated rocks are burned. We found this out by breaking open rocks that looked suspiciously like burned rocks but were white on the outside. It is possible that there was (or even are) burned rock features intact at this site, but it would require subsurface testing to evaluate this possibility. The visible scattered FCR and lithics within the site

do not constitute a midden. Several artifacts were collected from VV2103: one crude biface and a fragment of a uniface (Figure App B.60).

Upland Burned Rock Middens

Of the 68 recorded sites within the study area, six are classified as upland burned rock midden sites (Figure 5.5). These sites are often covered with dense vegetation, and this characteristic can be used to identify burned rock middens amid the surrounding sparse vegetation. This could be due to BRMs being located over depressions in the bedrock that contain deeper, wetter soils that promote vegetation growth. All of the upland burned rock midden sites are associated with a dispersed FCR and/or lithic scatter surrounding the site. A discussion of each upland site containing a BRM follows.

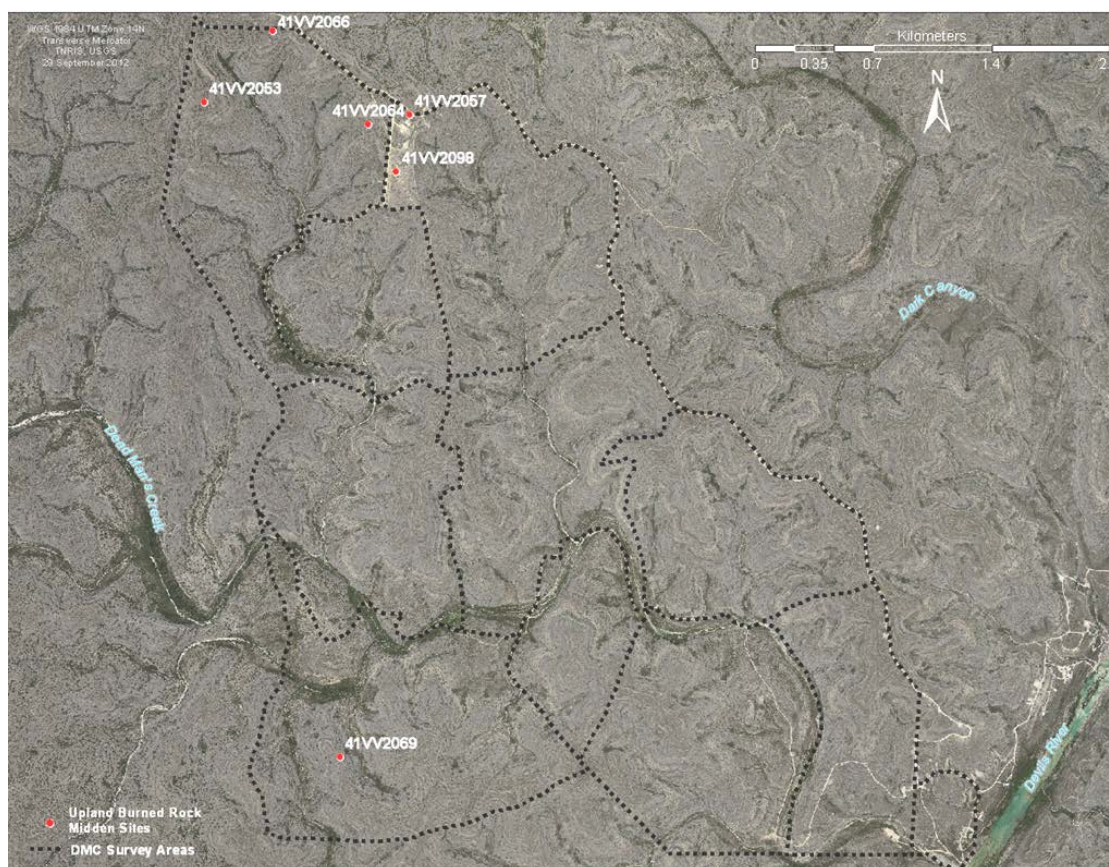


Figure 5.5. Distribution of upland burned rock midden sites within the study area.

VV2053 – *Rancid Cactus*. VV2053 is located in the northwest corner of the study area, and when it was discovered it was covered in thick, thorny vegetation – including prickly pear. The low BRM was very inconspicuous, and if a trained survey member had not walked through the center of the feature it likely would have been missed. The burned rock midden measures roughly 10 meters in diameter, and an associated FCR and light lithic scatter extends outward an additional 20 meters. Rancid Cactus is not a large burned rock midden, especially when compared to other upland BRMs in the study area. It can be described as a subtle crescent midden with the opening of the crescent to the southeast. The site was cleared soon after being recorded to perform Pole Aerial Photography (PAP) (Campbell 2012) at the site. The center of the midden was nearly void of burned rock when it was recorded, and there was also an old animal burrow in this central area (Figure App B.61). No artifacts were collected from the site during the 2011 survey.

In 2012, Texas State University conducted excavations at Rancid Cactus to determine the amount of earth oven cooking that had occurred at the site and obtain charred plant remains for identification and dating. Nearly 2,000 PAP and low-angle oblique photographs were taken of the site prior to excavations to create a point cloud in Photosynth™ that was then used in GIS to create a high resolution contour map of the site (Figure App B.62). In addition, Mark Willis carried out Kite Aerial Photogrammetry at the site while under excavation (Figure App B.63). Excavations yielded several Transitional Archaic and Late Prehistoric projectile points (Figure App B.64), as well as numerous bifaces and unifaces. In addition, a conch shell bead was found (Figure App B.65). Aside from the artifacts, the most interesting aspect of the site is that more burned

rock was found *buried beneath the surface* than on it (Figure App B.66). This is remarkable because the surrounding area evidences very shallow soil depth and several bedrock outcrops. The amount of buried cultural debris at this site is very reminiscent of VV1994, the buried, upland BRM excavated in Seminole Canyon State Park (Roberts and Alvarado 2011, 2012). Rancid Cactus and VV1994 were both located over depressions in the bedrock. Also, it is likely VV2053 and VV1994 were both buried as a result of bioturbation, a topic which will be discussed in Chapters 6 and 8. The analysis and reporting of this site is beyond the scope of the present study.

VV2057 – Bunkhouse Midden. As the name implies, VV2057 is located adjacent to the Rye ‘N Sons bunkhouse complex. This BRM site has been impacted by ranch road construction, fence construction, and power line construction. The extent of FCR and lithic scatter covers an area approximately 55 meters north-south by 50 meters east west, with the burned rock midden on the eastern portion of the site (Figure 11.68). Within the BRM there appear to be two obvious central depressions, one on the north-east corner and one in the east-central portion. Thick vegetation covers the burned rock midden, making searching for artifacts difficult, but three dart points (Frio, Ensor, and Pedernales) and one biface fragment were collected (Figure App B.69).

VV2064 – Ridge Top Midden. VV2064 is located just south and west of the Rylander bunkhouse complex inside the high fence that encloses the northwest portion of the study area. This BRM is covered in thick brush, almost to the point where you have to crawl on hands and knees to get through the site. The burned rock midden at VV2064 is approximately 40 meters in diameter, with an accompanying light FCR and lithic scatter extending another 20 meters. Although it is difficult to determine for certain

without clearing the brush and conducting minor excavations, this burned rock midden seems to be the largest (intact) upland burned rock midden within the study area. On the downstream side, the vertical relief visible from the base of the midden to the crest is over one meter (Figure App B.71), indicating that a substantial amount of earth oven cooking took place at this location.

The brush was too thick to confidently identify any central depressions within the site; however, the northern half of the site appears to contain significantly less rock and more obvious ashy soils, indicating this could be where the oven pits are (Figure App B.72). The midden also appears to be located within/on/in-between exposed bedrock outcrops, which could affect the topographic prominence of the midden. No artifacts were collected, although dozens of chert flakes were observed on the surface.

VV2066 – High Fence Midden. High Fence Midden is located directly on the northern boundary for the study area. VV2066 had been bulldozed through during construction of the Rylander high fence. Additional burned rock was visible on the northern side of the fence; however, I did not have permission to survey the adjacent property which is why the site boundary is depicted as running down the fence line (Figure App B.74). The BRM at this site measures 30 meters north south and 70 meters east west; however, bulldozing in an east-west direction has undoubtedly moved a substantial amount of rock, and it is unclear how this 70 meter dimension reflects the site prior to fence construction. Regardless, this burned rock midden is very large, and is nearly as big, if not larger, than the burned rock midden at VV2064. The center of the BRM appeared to be less damaged than the northern portion, and it was in this area there appeared to be a central depression. The site boundary extends another 15-20 meters

south of the burned rock midden. Numerous flakes and other chert artifacts were observed on the surface of the site, including five bifaces, four Frio dart points, and one Ensor dart point that were collected (Figure App B.75).

VV2069 – Ridge Side Midden. VV2069 is directly above Hinds Deep, VV2067, on the side of an upland ridge. The central feature of VV2069 is located in a depression in the bedrock geology that has served to capture sediment as well as support the growth of several large trees. However, due to the site being located on a gentle to moderate slope, FCR and artifacts are being washed downslope, ultimately ending up on the talus slope of VV2067 (Figure App B.77). This BRM is small compared to the other very large features on the northern end of the survey area, but the apparent size of this feature is very likely diminished due to water erosion. The site boundary for VV2069 measures 37 meters north-south by 45 meters east-west, but core area of the midden is 10 meters in diameter. Due to sheet wash, numerous chert artifacts were found on the slope below the feature, including Almagre, Val Verde, Nolan, and Shumla dart points (Figure App B.78).

41VV2098 – Shotgun Shell Midden. The site is located just south of the Rylander bunkhouse complex, and southwest of a series of old livestock pens. This BRM site has been heavily impacted by road construction on the east side in addition to borrowing of material out of the southern end of the site. Undoubtedly this site has seen heavy pedestrian traffic for decades—shotgun shells being one indication, which could explain why no diagnostic artifacts were observed at this site. The midden, in its much impacted form, measures 40 meters north south by 20 meters east west, with the site boundary

measuring 65 meters east-west by 70 meters north south (Figure 11.80). No obvious central depressions were observed and no artifacts were collected.

Terrace Burned Rock Middens

Eleven of the 68 total sites recorded along Dead Man's Creek are burned rock midden sites located on stream terraces. Most of the stream terraces along Dead Man's Creek are choked by thick vegetation and/or have been altered with heavy machinery during road construction. These two factors, in combination with natural water erosion in the canyon system, have likely had a negative impact on the total number of BRM sites that have been recorded on stream terraces. Discussion of recorded terrace BRM sites follows.



Figure 5.6. Locations of terrace burned rock middens within the survey area.

VV1347 – *Borrowed Midden*. VV1347 was one of the sites originally recorded by Turpin along Dead Man's Creek. This site is located at the first crossing of Dead Man's Creek on the canyon road. The site has been heavily impacted by blading, dirt borrowing, and construction of an earthen stock tank. Burned rocks and lithics are scattered in roughly a 50 meter diameter circle around the site, with what remains of a BRM concentrated in a 15 meter diameter area on the eastern edge of the site (Figure App B.82). However, borrowing activities at the site have exposed two burned rock features in profile within the borrow pit. The furthest south feature was profiled as practice for field school students (Figure App B.83), but no charcoal was collected. The feature that is exposed to the north has charcoal eroding out from among the burned rocks. There is a good chance that additional features are still buried within the terrace. Two biface fragments were collected from the site (Figure App B.84).

VV2036 – *Dead Man's Kitchen* and VV2037 – *Little Sotol*. VV2036 and VV2037 were recorded prior to the 2011 Texas State University field school. These sites are located on the left and right banks, respectively, of Windmill Canyon just above its confluence with Dead Man's Creek (Figure App B.85). VV2036 was shown to the author by the landowner in 2009, but VV2037 was not found until January 2011 during a reconnaissance trip. VV2036 measures 60 meters north-south by 20 meters east-west at its widest point. The entire site is a large burned rock midden, but there are two probable areas where oven pits were constructed, one in the south end and one on the north end. This site was not surveyed as part of this research project, but numerous chert flakes and several grinding stones are visible on the ground surface of the site.

Little Sotol, VV2037, is another BRM, measuring approximately 24 meters north-south by 17 meters east-west and up to two meters deep. This site has two small caves that front onto the terrace. This site was excavated by Texas State University-San Marcos in 2011-2012, and is the focus of graduate student Ashleigh Knapp's thesis research.

VV2042 – Dam Midden. This site has been heavily impacted by road construction and borrowing of material from the BRM to construct a large earthen check dam. Burned rocks and lithics along with dark, ashy soil can be found at the top of the check dam. Only a small portion of what was once a substantial burned rock midden survives in the profile of the borrow pit (Figure App B.88). Burned rock and lithics are scattered for an area 113 meters north-south by 40 meters east west (Figure App B.89). The remains of two smaller features are visible to the north of the remnant midden. One large biface/chopper was collected from the road (Figure App B.90).

VV2045 – Sheep Horn Terrace. VV2045 is located at the confluence between Sheep Horn Canyon and Dead Man's Creek. The site boundary is 25 meters northwest-southeast and 25 meters southwest-northeast. Thick vegetation covers most of the site. The burned rock midden is located in the center of the site, and is approximately 12 meters in diameter. There is an obvious central depression in the middle of the midden (Figure App B.91). Numerous flakes were observed on the site, and two artifacts were collected, one Val Verde dart point and one small biface fragment (Figure App B.92).

VV2048 – Eureka Terrace. VV2048 is located at the southwestern corner of the study area. This terrace has been impacted by water erosion down the main canyon as

well as sheet wash from the canyon slope. The BRM is located in the northern portion of the terrace, and another smaller FCR feature is being eroded out on the southern portion of the terrace. The BRM measures 20 meters southwest-northeast and 10 meters northwest-southeast. The area that appears to contain the central depression for the midden is located near its northwest edge. FCR and lithics are scattered across the entire terrace, and this scatter of debris marks the site boundary at measures 33 meters southwest-northeast and 13 meters northwest-southeast (Figure App B.94). One Nolan dart point fragment was collected (Figure App B.95).

VV2052 – Goat Pen Midden. VV2052 is located directly across the canyon from VV1284 on a Late Pliocene or Early Pleistocene stream terrace. The site has been severely impacted by goat and sheep pens that surround the feature. FCR is scattered in a 20 meter radius around the BRM. The midden itself is severely deflated; however, animal burrows within the central portion of the site demonstrate that dark, ashy soil is still buried beneath the layer of exposed surface rocks, but no central depressions were obvious. The main burned rock midden measures 20 meters northwest-southeast and eight meters southwest-northeast (Figure App B.97). Numerous chert flakes were observed, but no artifacts were collected.

VV2055 – Tractor Terrace Midden. Tractor Terrace midden is a fairly large BRM located on a terrace in the northwest portion of the study area. The site was covered in thick vegetation and had obviously been impacted by the tractor (which the site is named after) or other machines. The site boundary is formed by the extent of the FCR scatter present on the terrace, measuring 70 meters north-south by 20 meters east-west. There is also a large borrow pit on the southern end of the site. The main BRM is located at the

southern end of the site, and on the surface covers an area 20 meters north-south by 15 meters east west (Figure App B.99). Two Frio dart points were collected during pedestrian survey of the site (Figure App B.100).

In 2012 Texas State returned to Tractor Terrace to conduct excavations to determine the amount of earth oven cooking that had occurred at this site and obtain charcoal for radiocarbon dating. The landowner assisted excavations by using a Bobcat to dig a trench on the north side of the burned rock midden, expose the eastern portion of the midden, as well as clean the borrow pit profile for geoarchaeological analysis (Figure App B.101). The site was extensively mapped with a Total Data Station (TDS) (Figure App B.102), and after excavations were completed, 1,200 photographs were taken to create a point cloud in Photosynth™ (Figure App B.103) to be used in the future to create a 3D model of the site. Several additional dart points (Pandale and Val Verde) were uncovered during excavation (Figure App B.104) as well as fragments of river mussel shell. Excavations demonstrated two surprising aspects of the site: 1) that the upper deposits within the central section of the midden had been bulldozed into the drainage bottom to the east, and 2) the site was much more extensive than initially thought. The results of excavations at Tractor Terrace are not within the scope of the present study.

VV2065 – Woodcutter Terrace. VV2065 is located about one kilometer upstream from VV2055. This BRM site is much smaller than VV2055, and could be classified as a ring midden with a well defined central depression. The site has been impacted by water erosion down the main canyon and from sheet wash down the canyon slope as well as animal burrowing. FCR and a few lithics are scattered downstream from the burned rock midden several meters, creating the site boundary. The site measures 27 meters

northwest-southeast by 10 meters east-west, with the burned rock midden measuring 14 meters north-south by 10 meters east-west (Figure App B.106). No diagnostic artifacts were observed at the site, but a fragment of river mussel shell was collected (Figure App B.107).

VV2074 – Dead Man’s Mouth. By far the largest site recorded within the survey area, VV2074 is located at the confluence of Dead Man’s Creek and the Devils River. The site covers a huge area, with an extensive BRM zone located at the confluence and a large lithic scatter located along the Early Pleistocene stream terrace north of the burned rock midden area. The site boundary measures 250 meters east-west and 480 meters north-south in the maximum dimension. The burned rock midden area covers 220 meters east-west and 144 meters north-south. This area has been heavily impacted by road construction and borrowing activities, but four locations within the midden were identified as having a high likelihood of containing oven pits based on concentrations of dark, ashy soil with fewer burned rocks (Figure App B.109).

This site undoubtedly has a long occupation history, and the diagnostic projectile points recorded from this site give some indications as to the time span over which this site was used. Val Verde, Langtry, Gower, Marshall, Almagre, Bell, Marcos, Paisano, Castroville, Martindale, and Pedernales dart points were recovered (Figures App B.110 and App B.111), indicating Early Archaic through Transitional Archaic use of the site. Numerous other artifacts were recovered from the site, including numerous biface fragments (a sample of which are provided in Figure App B.112), river mussel shell, and two pieces of worked quartz (Figure App B.113). All artifacts collected from Dead Man’s Mouth were returned to the landowner (Mike Hobbs) in June 2012.

VV2117 – *Little Lechuguilla*. VV2117 is located adjacent to VV2036 and VV2037, and because it is a terrace neighbor of Little Sotol (VV2037), received the name Little Lechuguilla. This BRM site is located at the confluence between Windmill Canyon and Dead Man's Creek, and the downstream portion of the site has been eroded away, leaving a deflated burned rock and lithic scatter on bedrock. However, the upslope portion appears to be more intact. The size of this site is small compared to VV2036 and VV2037, but there is the possibility that more of the site is buried in the terrace due to both alluvial and colluvial deposition onto the site. The site boundary measures 54 meters northwest-southeast and 32 meters north-south. The burned rock midden covers an area 15 meters in diameter (Figure App B.115). No central depressions were identified. One biface was collected (Figure App B.116).

Open-air, Non-Burned Rock Midden Sites Containing FCR Features or Scatters

This site category is comprised of sites ranging from isolated hearths to large FCR and lithic scatters covering entire stream terraces. Seventeen sites of the total 68 recorded within the survey area fall into this site type category (Figure 5.7). All sites have site forms on file at TARL that contain additional information.



Figure 5.7. Locations of all open-air, non-burned rock midden sites containing FCR features or scatters within the study area.

VV1349 – *Bobcat Dug*. VV1349 is located in a borrow pit just of the road that travels through Dead Man’s Creek. This site has two aspects: the first has a small rockshelter with poorly preserved red and black pigment on the upstream end, and the second is the stream terrace directly in front of the rockshelter where a borrow pit exposed a burned rock feature. This feature was sectioned by Texas State in 2011 in an attempt to understand the morphology of the feature and to obtain charcoal; but, the preservation within the terrace/borrow pit was poor and little was learned from the feature. The site boundaries measure 28 meters east-west by 18 meters north-south (Figure App B.117). The possibility exists that additional features are buried within the

terrace, and the area of the borrow pit may well have been a small BRM. No artifacts were collected.

VV2041 – Mesquite Terrace. VV2041 is directly upstream from VV2042 on the same terrace of Dead Man's Creek. This site is comprised of one central, deflated burned rock feature (Figure App B.118) and a surrounding FCR scatter that measures 65 meters north-south by 45 meters east-west. There is also another concentration of burned rock east of the main feature at the site (Figure App B.119). This area has been heavily impacted by road construction and brush clearing along this portion of the terrace. Two dart points were collected from within the main feature: a Pandale base fragment and a Baker point (Figure App B.120).

VV2044 – Lone Flower Terrace. VV2044 is an FCR scatter exposed in the profile of a borrow pit. This scatter was profiled as part of the 2011 LPC Archaeological Field School and several charcoal samples were collected. No identifiable features are visible within the profile, and no FCR or other artifacts are visible on the surface above the borrow pit. The site has likely been either completely destroyed by borrowing activities or portions of the site may still be intact within the terrace. Only additional subsurface testing can determine the extent of this site. The site boundary is the extent of the borrow pit, 30 meters north-south by 15 meters east-west (Figure App B.121).

VV2046 – Mouflon Terrace. VV2046 is an FCR and lithic scatter that spans an entire terrace along Dead Man's Creek. This site has been heavily impacted by road construction, sediment borrowing, and clearing of the terrace for deer feeders. Based on the sheer amount of FCR scattered across the terrace and within the road, it is quite likely

that a burned rock midden existed at this location at one time. The burned rock scatter covers a distance of 120 meters east-west by 30 meters north-south (Figure App B.122). There is a good chance that additional FCR features are still intact beneath the surface of the terrace. Several biface fragments were observed, but none were collected.

VV2047 – Lion Bait Terrace. VV2047 is located at the confluence of two large tributary canyons to Dead Man’s Creek. This terrace has been impacted by road construction on the west side, but the rest of the terrace appears intact. FCR and lithics are scattered across the entire terrace, and there is one identifiable burned rock feature in the center of the terrace (Figure App B.123). FCR and lithics cover an area shaped like an upside-down “L,” measuring 150 meters in length, and ranging between 5 and 20 meters wide. The identified feature is located in the center of the northern portion of the terrace (Figure App B.124). No artifacts were collected.

VV2049 – Hackberry Hollow. VV2049 is located on a low stream terrace downslope of VV2050. The site consists of one deflated burned rock feature measuring five meters in diameter. FCR scatter extends an additional five meters south and three meters north (Figure App B.125). Several flakes were observed, but no artifacts were collected.

VV2051 – South Canyon Flat. One of the most surprising sites found during survey was VV2051, a large “hearth” (earth oven) field located in the southwest corner of the survey area. The location of this site was unexpected because the hearth fields I have visited in other areas of the Lower Pecos are located on upland flats and ridges while this site is located in a canyon bottom. The site boundary measures 120 meters east-west by

135 meters north-south, and the western boundary follows the Rylander property line (Figure App B.127). It is quite likely that additional features are located on the adjacent property. Fourteen individual burned rock features were documented within the site boundaries and there are likely others that are completely obscured by thick vegetation (Figure App B.128). Lithics are scattered over the entire site, but are most concentrated in the southeast portion.

We found an apparent cache of cores at the site (Shipman 2011) (Figure App B.129). The cores were found together in a tight cluster on the surface, and all were eroding out from beneath a bush. The area surrounding containing core cache was excavated in an attempt to gain additional information about the feature. The cache itself was cross-sectioned, but no pit features were identified, and all the cores themselves appeared to be resting on the same surface. A total of 13 cores were recovered (Figure App B.130). During excavations of the core cache, a biface and a flake were also recovered (Figure App B.131). In addition to the cores, several other artifacts were collected from the site, including a possible Perdiz, arrow point, several bifaces, one uniface, and a possible Catan projectile point (Figure App B.132).

VV2054 – Bunkhouse Vista. VV2054 is located in the northwestern portion of the study area. The site has a light scatter of FCR and lithics over a very large area (130 meters north-south by 30 meters east-west) with two small burned rock features in the central and southern portions of the site (Figure App B.133). There is an old ranch road that enters the site at the northern boundary, and the large expanse of FCR and lithic scatter could be due to historic blading of this area. One Pedernales dart point was collected (Figure App B.134), and an additional biface was noted but not collected.

VV2062 – Old Fence Terrace. VV2062 is located just upstream from VV2055 on the opposite side of the canyon. This site is located on a low terrace, and there is a light scatter of burned rocks and lithics measuring 21 meters northwest-southeast and seven meters east-west (Figure App B.135). There is a small concentration of burned rock partially exposed in the southeastern portion of the terrace, but there is not enough burned rock visible to justify calling the concentration a feature. No artifacts were collected.

VV2063 – High Fence Flat. VV2063 is located in the uplands in the northwest corner of the study area. The site has been heavily modified by bulldozing and blading, as evidence by the large piles of rock and sediment along the southern boundary of the site. This historic disturbance has likely contributed to the large area over which FCR and lithics are scattered (55 meters northeast-southwest by 15 meters northwest-southeast) (Figure App B.136). There is one identifiable burned rock feature within the site boundaries, and it is possible that all of the FCR scattered across the site could have come from this single feature. No artifacts were collected.

VV2072 – Windmill Canyon Terrace. VV2072 is located on the canyon right side of Windmill Canyon upstream from VV2037. This low terrace has three different burned rock features, two in the north and one in the southern edge of the terrace. FCR and a few lithics are also scattered across the terrace, forming the site boundary. The site measures 60 meters north-south by 15 meters east-west. It is possible that additional features may still be buried within the terrace, but this location has been heavily impacted by flood events (Figure App B.137). No artifacts were collected.

VV2100. VV2100 is located at the confluence of two side canyons of Sheep Horn Canyon, just east of the Rylander bunkhouse. FCR and a few lithics are scattered across most of the confluence, with a burned rock feature partially exposed in the center of the scatter. The site boundary covers approximately a 20 meter diameter circle at the confluence of the two canyons (Figure App B.138). No artifacts were collected, although a large biface fragment was found within the site boundary. There could be additional features buried within the terrace.

VV2101. VV2101 is an isolated “hearth” located in the large, western-most tributary to Dead Man’s Creek within the study area. The burned rock feature is located in the canyon bottom between flood channels. It measures approximately one meter in diameter, and it appears likely that a portion of the feature may still be within the terrace. No additional features were located nearby and no artifacts were observed.

VV2104 – *Gillis Divide*. VV2104 is an FCR and lithic scatter located at the southwestern corner of the study area. The site boundary measures 70 meters east-west by 30 meters north-south, and is centered on a dense cluster of large brush and thorny vegetation (Figure App B.139). There is a concentration of burned rock around this vegetation, but no features were observed. A substantial amount of burned rock is also being brought to the surface by burrowing animals, which indicates that features are likely buried at the site. No artifacts were collected, although two biface fragments were observed within the boundaries of the site.

VV2113. VV2113 is another isolated burned rock feature located in the large, western-most tributary to Dead Man’s Creek within the study area. This feature

measures approximately 2 meters in diameter, and is within the road that leads to the parking area for VV1340. It is possible that additional features are buried upstream within the terrace. No artifacts were collected.

VV2114 – Hibiscus Hollow. VV2114 is located at the confluence between two drainages, and the trail leading to VV1340 passes directly through the site. The site consists of an FCR scatter covering an area 20 meters east-west by 15 meters north-south. The site has been heavily impacted by tree throw and animal burrowing, one concentration of FCR that it may be a partially exposed feature (Figure App B.140). Three flakes were observed within the site boundaries, and based on the amount of FCR being brought to the surface by animals there is the potential for buried features. No artifacts were collected.

VV2115. VV2115 is an FCR scatter located just east of the Rylander bunkhouse at the edge of an upland ridge. The site is located in an area of thick vegetation, but burrowing animals have brought dozens of pieces of FCR to the surface. No features were visible, but the FCR scatter measures 25 meters east-west by 20 meters north-south (Figure App B.141). No chert artifacts were observed within the site boundaries.

Stone Alignment and Cairn Sites

While participating in the survey on the Shumla Ranch in 2010 (Campbell 2012), I helped document several stone alignment and cairn sites. Recording these features gave me an introduction on how to identify these features on the landscape. In preparation for the DMC survey, I was expecting to find numerous stone alignment sites; however, only two were found during the course of the survey. Numerous locations contained

collections of stones that vaguely resembled partial stone alignments, but no associated artifacts were found and many times these potential rock alignments were located on canyon slopes where natural erosion and weathering can create such features. In addition, most crew members had little to no experience recording stone alignment sites, and it is quite probable that several features were walked over without being noticed. Nonetheless, below are brief descriptions of the two definitive stone alignment/cairn sites found during the survey (Figure 5.8).



Figure 5.8. Stone alignment and cairn sites recorded during the Dead Man's Creek survey.

VV2039 – Sunrise Point. VV2039 is located in the southeastern portion of the study area, and sites at the point of a high ridge looking east towards the Devils River.

This stone alignment site is very subtle, semi-circular in outline and measuring just over a meter in diameter with a single large flake in the center of the feature (Figure App B.142). The western side of the alignment is abutted against a bedrock outcrop, and approximately 12 medium-sized stones (15-25 cm largest dimension) create the arc of rock extending to the east. No additional artifacts or features were found in the area around the feature.

VV2102 – Sheep Horn Cairn. VV2102 is located on a high ridge that overlooks a large tributary to Dead Man’s Creek. The cairn measures approximately four meters in length (east-west) by two meters in width at the widest point (Figure App B.143). The cairn is located on a bedrock exposure that gently slopes to the west. The overall length of the cairn is likely due to either it being recently (historically) disassembled or the rocks sliding downslope with gravity. The rocks are stacked in piles from two to six rocks deep. No artifacts were found near the site, making assignment of the feature to any time period difficult. Based on the size, it is likely prehistoric, but it could well be historic in age.

Lithic Procurement Site

VV2040 – Sunrise Quarry. Only one lithic procurement site was identified during survey – VV2040 (Figure 5.9). This site is located on a high ridge looking east towards the Devils River. The chert at this location is eroding out of the limestone bedrock and is exposed on the northeast slope of the ridge (Figure App B.144). The chert appears to be originating from seams in the bedrock with small nodules ranging in size from 5 – 15 cm in maximum dimension. The chert appears to be of fairly good quality, as numerous



Figure 5.10. Location of lithic scatters recorded within the survey area.

VV2043 – Sheep Horn Overlook. VV2043 is located on the Early Pleistocene terrace directly across from the confluence of Sheep Horn Canyon and Dead Man’s Creek. Scattered debitage covers an area roughly 30 meters north-south by 18 meters east-west (Figure App B.145). No artifacts were collected.

VV2105 – Sunrise Flat. VV2105 is located on a ridge in the southern portion of the study area. Scattered lithics cover an area 62 meters north-south by 45 meters east-west (Figure App B.146). There are also two pieces of historic glass on the site. No artifacts were collected.

VV2110. VV2110 is an upland lithic scatter located near the Rylander bunkhouse complex. The scatter is located south of VV2064, and covers an area of 100 meters north-south by 40 meters east west (Figure App B.147). There are also a few small pieces of FCR scattered across the site. This site has been heavily impacted by historic

ranching activities, evidenced by the trash dump on the west side of the site. No artifacts were collected.

VV2111. VV2111 is an upland lithic scatter located east of VV2066, a large BRM site. Lithics are scattered over an area measuring 43 meters north-south by 57 meters east west (Figure App B.148). This site is at the head of a small drainage, and lithics are scattered from the small benches on the north end of the site downslope into the drainage. Two artifacts were collected: a broken biface and an untyped projectile point fragment (Figure App B.149).

VV2112. VV2112 is another upland lithic scatter located in the northwest corner of the study area. Lithics are scattered in an area measuring 65 meters north-south by 45 meters east-west (Figure App B.150). This area has a road that goes through the western portion, and there is a stock water trough on the west side of the site. No artifacts were collected from this location.

VV2116 – Windmill Divide. VV2116 is located on an upland ridge directly above VV1341. Lithics and small pieces of FCR are scattered for a very wide area along this portion of the ridge (290 meters east-west by 100 meters north-south) (Figure App B.151). Much of the site has been disturbed by the historic construction of goat and sheep pens, a windmill, and use as a trash dump. Lithics were most concentrated in the west end of the site within goat pens, but artifacts were found in the far eastern portion as well. No artifacts were collected.

VV2118 – Windmill Canyon Overlook. VV2118 is located on a high ridge overlooking the confluence of Windmill Canyon and Dead Man's Creek. Lithics are

scattered for an area measuring 66 meters north-south by 84 meters east-west (Figure App B.152). A Paisano projectile point was collected (Figure App B.153).

VV2119 – Dead Man’s Creek Flat. VV2119 is located on an Early Pleistocene terrace across (west) from 41VV1348. The light lithic scatter covers a huge area measuring 400 meters by 144 meters (Figure App B.154). The main concentration of lithics (10 artifacts in a 10m² area) was recorded in the center of the site, just east of the road. No artifacts were collected.

Summary of Dead Man’s Creek Survey

The 68 prehistoric archaeological sites recorded along Dead Man’s Creek range from large rockshelters containing burned rock middens to diffuse upland lithic scatters. A tabular summary of the different site types is presented in Table 5.1. The largest single

Table 5.1. Summary of Sites Recorded Along Dead Man's Creek		
Site Type	# of Sites	% of Total
Rockshelters, Caves, and Overhangs	23	33.8%
Upland Burned Rock Middens	6	8.8%
Terrace Burned Rock Middens	11	16.2%
Open-Air Sites Containing non-BRM FCR Features and/or Scatters	17	25.0%
Stone Alignment/Cairn Sites	2	2.9%
Lithic Procurement Sites	1	1.5%
Lithic Scatters	8	11.8%
Total	68	100.0%

category of sites recorded during survey were rockshelters, caves, and overhangs (n=23); however, the vast majority of sites along Dead Man’s Creek are located in open-air locations (n=45). Table 5.2 provides a tabular summary of the projectile points collected during survey¹.

¹ Data from VV2037 – Little Sotol – is not included in this analysis.

Table 5.2. Summary of projectile points collected along Dead Man's Creek by time period (from Turpin 2004)																										
Time Periods (from Turpin 2004)	Projectile Point Types		Archaeological Sites																							
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Early Archaic (9,000 - 6,000 RCYBP)	Untyped		1	2																						
	Untyped Early Archaic			1																						
	Gower																									
	Big Sandy																									
	Martindale																									
	Nolan																									
Middle Archaic (6,000 - 3,000 RCYBP)	Baker																									
	Bell																									
	Pandale		2		1	1																				
	Reworked Pandale or Nolan																									
	Val Verde		1	2	1	4																				
	Langry			1		1																				
Late Archaic (3,000 - 1,000 RCYBP)	Arenosa					2																				
	Val Verde/Langry/Arenosa			1																						
	Almagra																									
	Pedernales			4		3																				
	Montell		1																							
	Castroville/Marcos fragment			1																						
Late Prehistoric (1,000 - 350 RCYBP)	Marcos																									
	Castroville																									
	Marshall			1		1																				
	Flanders (2,300 - ? RCYBP)		1																							
	Shumla																									
	Ensor		2	6	1	4																				
Late Prehistoric (1,000 - 350 RCYBP)	Frio																									
	Figueroa					1																				
	Paisano																									
	Catan																									
	Untyped Late Archaic			4																						
	Untyped Arrow Point		2																							
Late Prehistoric (1,000 - 350 RCYBP)	Perdiz Arrow Point		1	4																						
	Sabal Arrow Point																									
	Chadbourne Arrow Point																									
	Totals		1	11	27	2	17	2	1	1	2	9	1	1	3	1	5	2	6	22	1	1	1	1	1	125

Based on the frequency of projectile points, more Late Archaic points were collected than diagnostic points that dated to any other time period (Figure 5.11). This pattern resembles the studies by Marmaduke (1978) and Saunders (1986, 1992) in their analysis of projectile points from other areas of the region.

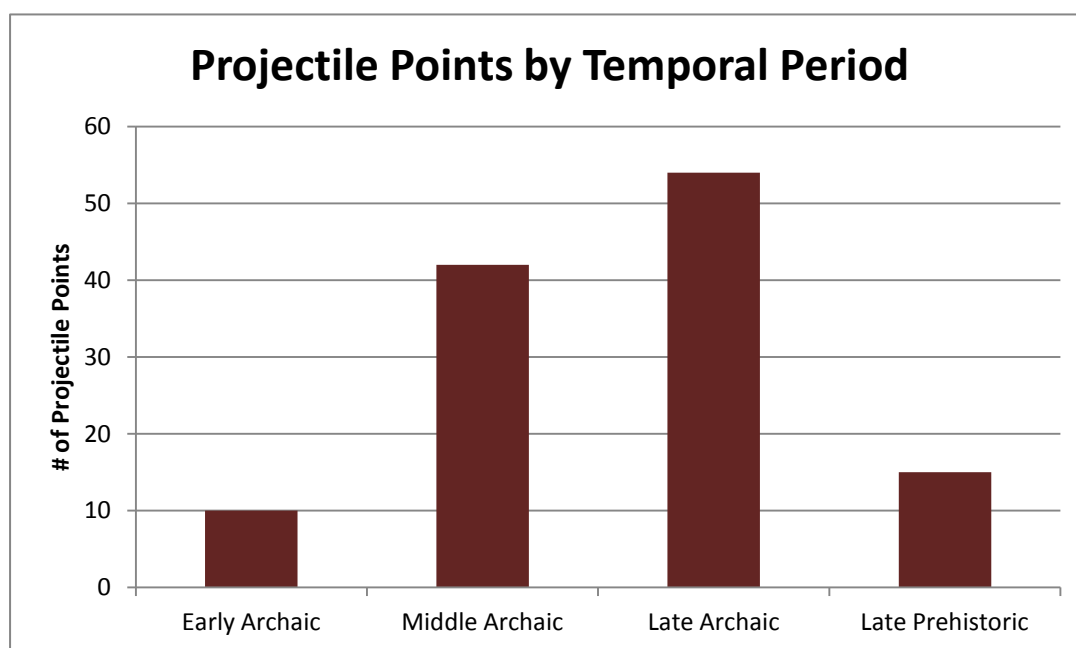


Figure 5.11. Summary of projectile points collected along Dead Man's Creek. Data from VV2037 is not used.

CHAPTER 6: GIS ANALYSIS OF THE LOCATION, FREQUENCY, AND DISTRIBUTION OF BURNED ROCK MIDDEN SITES WITHIN THE DEAD MAN'S CREEK SURVEY AREA

As was expected based on previous surveys conducted in the region, burned rock middens were recorded in all three topographic settings: on stream terraces, within rockshelters/caves, and on upland ridges. The locations of sites containing BRMs are shown in Figure 6.1, with a tabular summary of BRMs by geographic setting in Table 6.1. This discussion focuses on identifying patterns within the site data for DMC

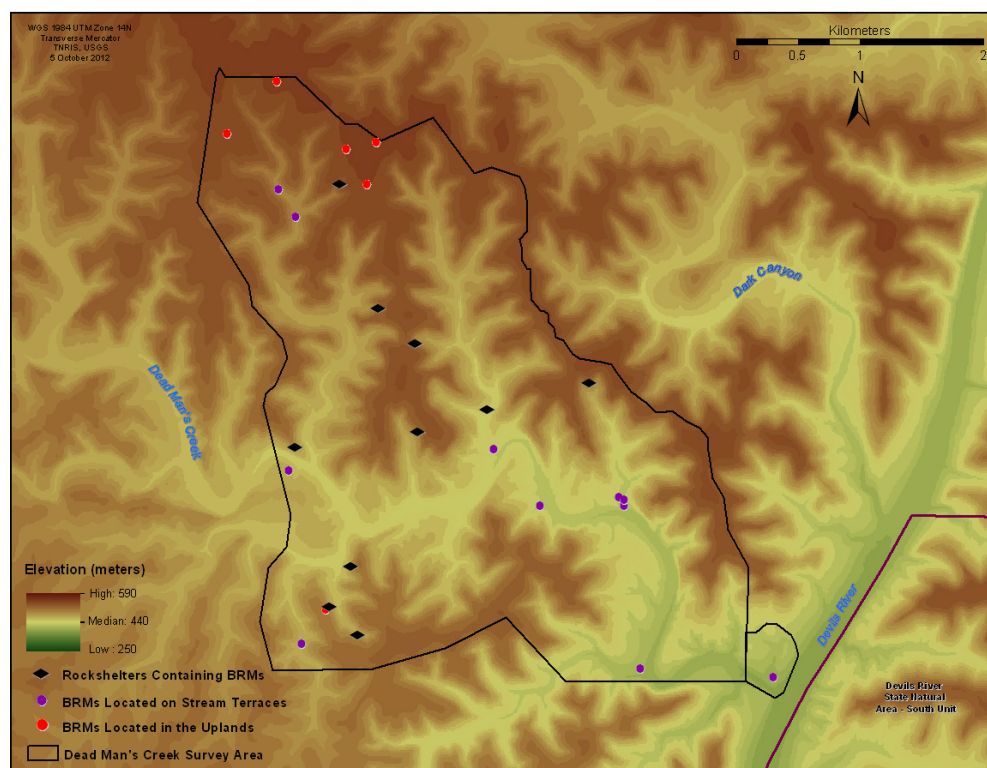


Figure 6.1. Location of burned rock middens within the study area.

Table 6.1. Number of Burned Rock Middens by Topographic Setting		
Topographic Setting	# of BRMs	% of Total
Uplands	6	22.2%
Rockshelters/Caves	10	37.0%
Terrace	11	40.7%
Totals	27	100%

to test previous hypotheses regarding burned rock midden site location, frequency, and distribution. As discussed in Chapter 3, previous archaeological studies have demonstrated that most burned rock middens typically have Middle and Late Archaic components based on projectile point types (Marmaduke 1978; Turpin 1982:210). This pattern holds true for the projectile point types most commonly found during the course of survey (Val Verde, Langtry, Ensor, and Frio). In addition, based on arrow points recovered during excavations of VV1340 and VV2053 as well as arrow points surface collected from VV1284, the projectile point evidence suggests a Late Prehistoric utilization of some of the BRMs along Dead Man's Creek. Thus, this analysis will focus on describing the patterns in how earth oven facilities were distributed across the landscape of DMC between 4,000 and 500 RCYBP, and what we can learn from the patterns to test the models of Lower Pecos Archaic settlement patterns.

Burned Rock Middens in Rockshelters and Caves

Because of the shelter-centric hypotheses regarding Lower Pecos prehistory, burned rock middens in sheltered locations will be discussed first. Rockshelters, overhangs, and caves showing signs of human occupation are the largest single category of site types in the study area (Table 5.1). However, there are dozens, perhaps hundreds, of rockshelter, cave, and overhang sites throughout DMC containing no visible evidence of human utilization (the locations of unoccupied shelters were not recorded). This

apparent disproportion between the total number of sheltered locations available verses sheltered sites showing evidence of occupation was surprising. Of the total number of sheltered sites recorded (n=23), less than half (43%) contain burned rock midden features. I expected many more rockshelter locations to contain at least a scattering of lithics and FCR, if not BRMs.

In order to determine if there was a pattern between the rockshelter sites that contained burned rock middens verses those that did not, I analyzed two attributes of rockshelters that have been cited as possibly having an impact on rockshelter selection: shelter size and aspect (e.g., Shafer 1986; Turpin 2004). Turpin and Davis (1993:51, 53), in discussing the relatively low number of inhabited rockshelters compared to “open camps,” attributed it to an overall lack of “large” rockshelters within Devils River State Natural Area – North Unit. To analyze shelter size, I calculated the usable surface area (generally flat areas of the shelter floor, not including talus slope) (cf. Galanidou 2000; Walthall 1998:224) within the rockshelters based on pace and compass maps drawn in the field for all sheltered sites. Table 6.2 shows the comparison of surface area between shelters with and without BRMs. The averages between the two samples are different (137.3 vs. 171.9 m²), but the standard deviations are very large (89.2 and 189.6 m²). Using a two-tailed t-Test (assuming unequal variances), there is no statistical difference between the two samples (t=-.562, df=16, p=2.12). This comparison has as much to do with the available sizes of shelters within the canyon system as it does which shelters were most intensively occupied. Nonetheless, it is surprising that shelters with BRMs are not significantly larger than shelters without burned rock middens because large rockshelters have been hypothesized to be used as home base locations and extended

residential stays. These data indicate that shelter size has very little impact on the occupation of sheltered sites.

Table 6.2. Usable Surface Area within Rockshelters, Caves, and Overhangs Along Dead Man's Creek					
All Rockshelter Sites		Rockshelters With BRMs		Rockshelters Without BRMs ^z	
Site	Usable Area (m ²)*	Site	Usable Area (m ²)*	Site	Usable Area (m ²)*
41VV1230	130	41VV1230	130	41VV2038	532
41VV1284	110	41VV1284	110	41VV2058	38
41VV1340	149	41VV1340	149	41VV2059	325
41VV1341	204	41VV1341	204	41VV2060	23
41VV1342	263	41VV1342	263	41VV2061	37
41VV1348	60	41VV1348	60	41VV2071	464
41VV2038	532	41VV2050	61	41VV2075	95
41VV2050	61	41VV2056	16	41VV2076	41
41VV2056	16	41VV2067	286	41VV2077 ^y	18
41VV2058	38	41VV2068	94	41VV2078	137
41VV2059	325			41VV2099	17
41VV2060	23			41VV2103	336
41VV2061	37				
41VV2067	286				
41VV2068	94				
41VV2071	464				
41VV2073 ^x	--				
41VV2075	95				
41VV2076	41				
41VV2077 ^y	18				
41VV2078	137				
41VV2099	17				
41VV2103	336				
Average ^z (μ)	156.2	μ	137.3	μ	171.9
Standard Deviation ^z (σ)	150.2	σ	89.2	σ	189.6

* Calculated from pace and compass maps drawn on site; consider these approximate values

^x Collapsed Shelter, no surface area data available

^y Does not include area beneath roof fall

^z Does not include 41VV2073

Another common hypothesis is that rockshelters were occupied at different times of year based on the posited desire for shade in the summer and sun in the winter (e.g., Shafer 1986:96; Turpin and Bement 1992:54). Table 6.3 compares the aspect of each

rockshelter to determine if any patterns existed between shelters with and without burned rock middens (Table 6.3). Based on the plotted comparison of shelter aspects (Figure 6.2), there is a bi-modal distribution pattern of shelters facing northeast and southwest. In order to determine the significance of this pattern, a Chi-Square Goodness-of-Fit test was used to analyze the distribution (Table 6.4). Based on the Chi-Square results, the bi-modal pattern is significant for all rockshelters, but the sample sizes of shelters with and without are too small to test. The orientation of rockshelter sites is largely dependent upon the bedrock geology, and the two large tributaries to DMC in the northern portion of the study area drain northwest-southeast, which causes shelters to face northeast and southwest (Figure 6.1).

Table 6.3. Directional Aspect of Rockshelters, Caves, and Overhangs Along Dead Man's Creek					
All Rockshelter Sites		Rockshelters With BRMs		Rockshelters Without BRMs	
Site	Aspect (degrees)*	Site	Aspect (degrees)*	Site	Aspect (degrees)*
41VV1230	220	41VV1230	220	41VV2038	206
41VV1284	178	41VV1284	178	41VV2058	143
41VV1340	253	41VV1340	253	41VV2059	75
41VV1341	160	41VV1341	160	41VV2060	225
41VV1342	33	41VV1342	33	41VV2061	198
41VV1348	280	41VV1348	280	41VV2071	313
41VV2038	206	41VV2050	282	41VV2073	52
41VV2050	282	41VV2056	240	41VV2075	4
41VV2056	240	41VV2067	58	41VV2076	328
41VV2058	143	41VV2068	16	41VV2077	71
41VV2059	75			41VV2078	252
41VV2060	225			41VV2099	116
41VV2061	198			41VV2103	228
41VV2067	58				
41VV2068	16				
41VV2071	313				
41VV2073	52				
41VV2075	4				
41VV2076	328				
41VV2077	71				
41VV2078	252				
41VV2099	116				
41VV2103	228				

* Calculated using the GIS function "Extract Values to Points" with the "Interpolate Values at point locations" button checked. Aspect Raster file was generated from a 10 meter TIFF downloaded from USGS.

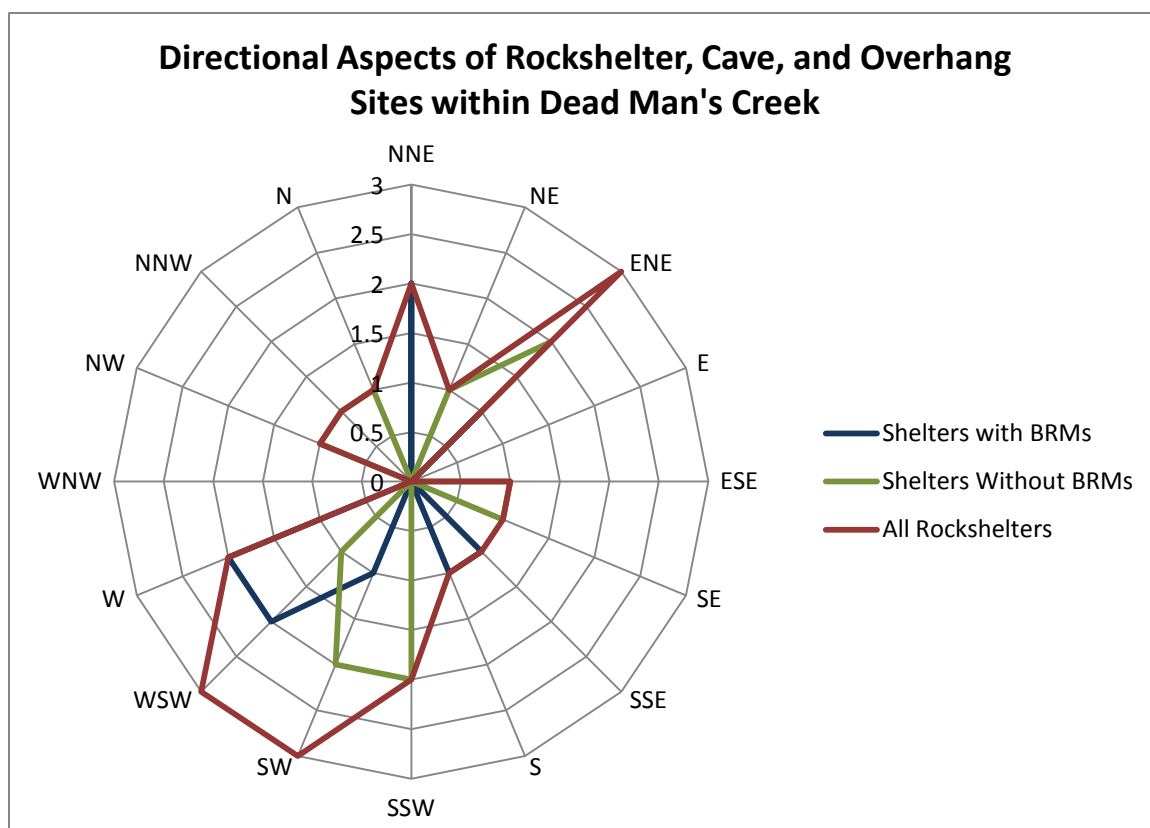


Figure 6.2. WindRose diagram showing the aspects of the rockshelters, caves, and overhangs along DMC.

Table 6.4. Chi-Square Goodness-of-Fit Test Results for Rockshelter Aspect			
Shelter Orientation	Number of Sites	Expected Number of Sites	χ^2
NNE-ENE	6	4.313	0.660
E-S	4	7.318	1.414
SSW-W	10	4.313	7.501
WNW-N	3	5.750	1.315
$\chi^2 = 10.890$, DF = 3.00, p = 0.012			

Locations of Open-Air Burned Rock Middens

Terrace Burned Rock Middens. Burned rock middens on stream terraces were found from the confluence of DMC and the Devils River all the way up the drainage system to the farthest northwest corner of the study area (Figure 6.1). The largest archaeological site within the study area is the terrace burned rock midden site (VV2074)

located at the confluence between Dead Man's Creek and the Devils River, which follows the pattern of large archaeological sites located adjacent to the Devils River by Turpin (2004:267). In terms of stream terrace locations, an important point must be made in that the sites which are visible today do not constitute the complete record of prehistoric terrace utilization (Turpin 1982:218).

Due to intensive flood events, stream terraces in the region are known to have been completely destroyed (Kochel 1988; Kochel and Baker 1982) along with any archaeology located on and within the terrace deposits. Based on radiocarbon dating of terraces along the Pecos River, Kochel and Baker (1982) and Kochel (1988) found that terraces at the confluences of side canyons and the Pecos River had been completely washed away by localized flooding events around 2,000 RCYBP. Turpin (1982:93) recorded the loss of a large portion of the Early Archaic and older deposits from within 41VV76 in Seminole Canyon State Park due to flood erosion. Undoubtedly, the extant terrace record within DMC is not a complete sample of sites present throughout prehistory.

All of the terrace BRM sites (and also burned rock scatters) recorded along the main branch of DMC are located either at confluences between Dead Man's Creek and tributary canyons or on the inside of a bend in the canyon (Figure 6.1). This categorization of the sites along DMC does not include old stream terraces ($\pm 30,000$ cal. years) that are located well above the modern channel. The pattern of recorded site distribution is likely due to flushing of terrace deposits along the main channel of DMC more than indigenous site selection. Also, based on preliminary geoarchaeological reconnaissance by Charles Frederick (personal communication, 2011), there are only a

few places within the canyon containing remnant Late Pleistocene/Early Holocene (12,000 – 8,000 RCYBP) terraces or Late Holocene deposits (1,500 RCYBP to present). The vast majority of stream terraces date to 8,000 - 1,500 RCYBP. Terrace sites located along the tributaries of DMC are also located at canyon confluences or on the inside of bends of canyons (Figure 6.1).

Another important consideration is that the majority of the terrace sites along DMC have been impacted by historic ranching and road construction. Terraces offer smooth areas to build roads on, sources of sediment to be borrowed for road improvements, flat areas to build corrals and pens, and areas that can be bladed/plowed to promote grass growth. All of these historic activities have impacted the terraces within the study area.

Upland Burned Rock Middens. The most surprising aspect of the upland burned rock middens within the survey area was not where they were located, but the unexpectedly large size of the features. Turpin and Davis (1993:18, 20) report a similar reaction to survey within DRSNA – NU:

An unanticipated finding of the DRSNA survey was the number of large, complex midden sites found on the high, flat upland divides, remote from the more obvious sources of permanent water...The larger and more complex midden sites may have been so situated as to take advantage of water in natural potholes...that trap water and air-borne sediments that silted them in and obscured their obvious role in settlement patterns.

Previous researchers have noted that upland BRMs occur at the heads of canyons and on broad upland flats (Shafer 1981:132; Turpin 1982:207; Turpin and Davis 1993:51). The locations of upland BRMs within Dead Man's Creek seem to fit this

categorization. That said, it must be noted that the survey area contains a relatively small sample of upland environments distant from any canyons (Figure 6.1). Upland BRM sites also contain the thickest vegetation, and surveyors can use vegetation indicators (i.e., concentrations of thick brush) when searching for upland burned rock middens. However, because naturally weathered limestone can look strikingly similar to thermally altered rock, upland features were the most difficult to identify during survey.

Patterns in Burned Rock Midden Location: Where's the Dirt?

Burned rock and burned rock middens, like much of the archaeological record, can be found in sediment. Although finding archaeology in sediment seems like an obvious statement, the association between earth oven cooking and availability of sediment may be an overlooked aspect of Lower Pecos burned rock midden site location. Within DMC, all of the recorded BRMs and FCR features are deflated to some extent. Said differently, due to erosion and soil loss the features recorded during survey are different in size and shape today than they likely were during their use lives. Even though some pieces of burned rock or lithics may be deflated onto bedrock, the majority of all burned rock features are still located on or within a sediment matrix. Finding archaeology in sediment does not seem like a surprising point; yet, the Lower Pecos landscape is often noted for *a lack of sediment* and soil compared to the amount of exposed bedrock and/or rocky outcrops across the region (Golden et al. 1982).

As discussed in Chapter 1, earth ovens require four basic resources: food to cook, fuel to burn, heating element (rock), and a sediment/soil matrix to dig an oven pit and form the cap. Limestone rocks to serve as heating elements are omnipresent across the

canyonland landscape. It has also been argued that food to bake in earth ovens is available virtually everywhere and can be (relatively) easily transported (Dering 1999:665). Further, one of the benefits of earth oven technology is that it does not require quality hard woods to heat up the rock heating elements. As Alston Thoms (1998:93) put it, “Rock heating elements also appear to be characteristic of fuel-poor environments where it is often necessary to capture heat from flames generated by small, fast-burning fuel (e.g., brush in desert environments).” Based on my experience gathering wood during experimental earth oven construction, sufficient quantities of fuel wood can be found virtually anywhere in the Lower Pecos environment, including uplands, canyon slopes, and canyon bottoms. The botanical remains identified from VV1994 in Seminole Canyon indicate fuel was gathered from all of these localities for earth oven construction (Roberts and Alvarado 2011:Table 1). There is the distinct possibility that fuel wood was available in different quantities during prehistory than today, which would have impacted earth oven location. Leach et al. (2005) stress the importance of having sufficient sediment available for capping earth ovens in central Texas, but no mention is made by Dering (1999) or any other researcher in the Lower Pecos regarding how sediment availability may have impacted the locations of earth oven construction.

Dering (1999) cites fuel and food as being the limiting resources in terms of earth oven construction because both local food and fuel supplies would be quickly exhausted. In regards to reusing the same earth oven location, Brown (1991:123) stated, “even in the loose fill of Baker Cave, digging a large cooking pit with a digging stick and basket represented a substantial investment of labor...the initial cost of digging a large pit could

be amortized over many use episodes.” Brown’s statement is substantiated by ethnographic accounts of people reusing oven pits, as described for the Apache by William Corbusier (1886:327): “they then carry them [agave plants] in their baskets to a suitable spot in a ravine or canon [sic] where they dig a pit, or if an old one be in the neighborhood, as is frequently the case, they resort to it.”

Taking Brown’s argument and the Apache account into consideration, one reason why earth oven locations would be reused is because it was energetically less costly to take advantage of a pre-dug oven pit rather than dig a new one. Dering (1999) argues that earth ovens affect the availability of local fuel and food around an earth oven site, forcing the people to move to a new location. He implies that earth oven locations would be optimally located in areas that allow easy access to both food and fuel resources. As an addition, I suggest that the initial selection of locations for earth oven construction was governed by the availability of a sediment matrix that would readily allow earth oven pits to be dug and the actual ovens to be adequately capped.

The Relationship between Burned Rock Middens and Sediment Availability within Dead Man’s Creek: A Hypothesis

Hypotheses regarding earth ovens/burned rock midden locations in relation to resource availability are not new. For instance, Black and Ellis (1997:4-5) summarize the documented occurrences where burned rock middens and earth oven features are located adjacent to outcrops of stone for heating elements in stone poor environments. Creel (1986, 1991, 1997) analyzed the distribution of burned rock middens in relationship to that of sotol and oak-savannah, arguing that sotol and acorns were the resources being

exploited, and that the middens were distributed to target these specific resources. Given that rocks, fuel, and food are readily available in the Lower Pecos landscape, indicating that the availability of these three resources may not have been the driving force behind why people selected locations to construct earth ovens. So, where's the dirt?

During survey along DMC, especially in the uplands and within rockshelters, it was observed that sites containing BRMs had substantially more sediment than sites lacking BRMs. The most obvious differentiation is between rockshelters with and without middens; more specifically, the availability of naturally deposited sediment/material *within* the rockshelter. Every rockshelter or cave has two potential sources of fill, those that originate from within the shelter (autochthonous or endogenous sediments) and those that originate from outside the shelter (allochthonous or exogenous sediments) (Goldberg and Macphail 2008:175). Deposits that originate outside of the shelter include anthropogenic and biologic material as well as water and wind borne sediments. Of the DMC shelters that did not contain BRMs, in many cases the shelter floor is mostly exposed bedrock with only minor accumulations of roof spalls and/or alluvial deposited sediments on the floor (e.g., VV2075, VV2076, VV2077, and VV2078; see Figure 6.3a). In other shelters without BRMs, the shelter floor is covered in small to large (3 cm plus) roof spalls with little to no fine grain sediment visible on the surface (e.g., VV2038, VV2059, VV2061, and VV2071; see Figure 6.3b). In both examples, water erosion could have washed deposits out of the shelters. Water erosion impacting shelter deposits was identified at VV1348, VV2099, and VV2103.

In contrast, several rockshelters with BRMs (e.g., VV1230, VV1340, VV1342, VV2050, VV2056, VV2067, and VV2068; see Figure 6.3c) showed evidence of fluvial

deposition via slope wash into the shelters. Other shelters containing burned rock middens that did not show evidence of water-borne sediment deposition into the shelter contained a different sediment source: fine grain limestone spalls (VV1284, VV1341, the cave at VV2037, and VV2058) (Figure 6.3d). No matter the sediment source, if enough fine



Figure 6.3: Examples of different deposits within rockshelters: (a) 41VV2076 containing mostly exposed bedrock with some minor roof spall and alluvial deposition (exogenous and endogenous); (b) 41VV2071 containing mostly small to large roof spalls (mainly endogenous); (c) 41VV1340 showing where water runs into the shelter during runoff from the uplands (exogenous deposition) (photograph taken after the shelter was cleared prior to excavations in 2012); and (d) 41VV2058 showing some larger roof spalls mixed in with very fine roof spalls.

grain material was deposited into the shelter it would allow for oven pits to be dug.

There are dozens of rockshelters along DMC that contain both sediment sources but lack any indication of human use. Obviously some other attribute(s) of rockshelters (aside

from size, aspect, and sediment source) made them more attractive to utilization than others.

Identifying sediment sources within the uplands and along stream terraces is less complicated. Stream terraces are formed via deposition of sediments onto flood plains of streams. Terraces provide ample sources of sediment, and it is likely the selective force in terms of where terrace BRM sites are located has more to do with where terraces were present during prehistory than providing sufficient sediment. Sediment sources in upland environment are the natural weathering of bedrock parent material, the decay of organic material, and wind deposition (Schaetzl and Anderson 2005:169). Sediment availability in the uplands is largely dictated by where there are gentle slopes (steeper slopes have less sediment) and places between exposed sections of bedrock that trap sediment during sheet wash (Goldberg and Macphail 2008:73).

Based on excavations at VV1994 (Roberts and Alvarado 2011, 2012) and VV2053 along DMC, there is an emerging pattern where upland BRMs are located where deep upland soils are present in depressions in the underlying bedrock. Both VV1994 and VV2053 were mostly buried and bedrock was not encountered until one meter below surface (Roberts and Alvarado 2011, 2012). Assuming the selection of these two site locations is not coincidental, how could the prehistoric inhabitants recognize these locations without substantial testing? And, if VV1994 and VV2053 are buried, why are other large upland sites mounded accumulations on the ground surface? The answer to these questions, I argue, is bioturbation.

I think it is possible the prehistoric inhabitants used biologic indicators (animal burrows, ant colonies, and thick vegetation for example) to select places to construct earth ovens along both stream terraces and in the uplands. Not only would large animal burrows provide an indication of sufficient soil depth, but also provide a starting hole that could be easily expanded. Burrowing animals and insects, like humans digging earth oven pits, tend to select loosely compacted, less rocky soils over densely compacted, rocky soils (Balek 2002; Johnson et al. 1987; Wood and Johnson 1978). Along DMC one can walk along an upland ridge for hours without spotting a single large animal burrow or ant colony, but then encounter an area pock-marked by animal burrows. In the case of 41VV2053, the location demonstrates ongoing bioturbation in the form of large mammal burrows, reptile burrows, and burrowing insects (Figure 6.4).



Figure 6.4. Bioturbation observed at 41VV2053: large animal burrow (top left), small animal burrowing (top right), and burrowing ants (above).

Bioturbation and its effects on the archaeological record are discussed at some length in Chapter 8. Briefly, the result of burrowing is that the deposits become mixed, with large artifacts “sinking” in the soil profile and small artifacts (including fine grain sediment) rising in the profile (Balek 2002; Johnson et al. 1987; Wood and Johnson 1978).

Bioturbation is not just a post-depositional process that may locally impact an already buried site, but rather it is one of the mechanisms by which artifacts become buried on nonaccreting upland surfaces. In fact, burial of artifacts on stable uplands is a predictable and natural consequence of biologic processes. [Balek 2002:42]

Bioturbated areas of the landscape may have been selected for earth oven construction, but these settings remove features from surface archaeological record via burial (Balek 2002; Johnson et al. 1987; Wood and Johnson 1978).

In order for a large feature, like a BRM, to be buried via bioturbation there would need to be sufficient fine grain sediment remaining for animals to dig into and deposit onto the surface. As the sediment to rock ratio in one location decreased (i.e., more rock than sediment), humans may have been forced to abandon the location in search of additional sediment. This “depletion” of fine grain sediment within one location would limit any ongoing bioturbation to small insects and worms, and because these insects only move fine particles, the burned rocks would settle downward. The sinking of the burned rock would eventually create a soil profile consisting of burned rocks from bedrock to surface with only small pockets of fine grain material between the rocks. After decades of settling, the burned rock accumulation would begin to resemble domed burned rock middens.

Crescent and ring midden formation can be explained in a similar way. The central depression, or pit, is centered in an area with deeper soils. Exhausted burned rock is tossed out of the central depression onto the surrounding surface. Underlying the toss-out zone is the edge of the bedrock depression, with shallower soils. Eventually, the burned rocks on the edges of the midden settle via bioturbation until they rest on bedrock. The central oven pit, however, has significantly more sediment available for both human and animal use. Once humans abandon the site, burrowing animals (large and small) bury the features located in the central depression, but because the ring around the site is on thin underlying sediment, the ring does not become buried.¹

I hypothesize that earth oven locations within the Lower Pecos are dictated to a significant extent by the availability of sediment within all three topographic settings: rockshelters, uplands, and stream terraces. Biologic indicators such as burrowing animals and insects may have played a role in prehistoric inhabitants' abilities to identify suitable locations in the uplands and along stream terraces. However, the difficulty with a hypothesis postulating a relationship between sediment availability and earth oven construction is objectively demonstrating that sites with burned rock middens contain more sediment than other areas of the landscape. There are some avenues that could be explored using erosion and soil loss modeling in GIS (e.g., Cochrane and Flanagan 1999; Jain et al. 2000; Lim et al. 2005; Mitsova et al. 1996) to begin modeling locations on the landscape where deeper sediments may accumulate. But, additional testing and

¹ Bioturbation is one of many natural formation processes that impact BRM site formation and preservation. This discussion of BRM formation is focused on bioturbation because it is an underappreciated formation process in the Lower Pecos; this is not saying that other factors (cultural and natural) have not impacted BRM sites. Chapter 8 will detail additional formation processes that affect archaeological sites.

excavation is necessary – especially in upland BRM settings – to fully evaluate this hypothesis.

Analysis of Site Distribution within Dead Man’s Creek

This section focuses on analyzing the distribution of sites within Dead Man’s Creek using GIS. As summarized in Chapter 3, access to riverine resources is frequently cited as an important variable in Lower Pecos settlement patterns. Because the Devils River is adjacent to the survey area, I wanted to determine how the distribution of all sites, rockshelters, and BRMs within DMC were related to proximity to the river.

Buffer Analysis

A basic way to test how sites along DMC are related to the Devils River was to conduct a Buffer analysis in ArcGIS. A buffer is simply a calculated boundary around an object using linear distances (i.e., as the crow flies). The use of buffers to analyze the distance between objects is a common technique within archaeology (Chapman 2006:100-101; Conolly and Lake 2006:209-211; Wheatley and Gillings 2002:148-149). Figure 6.5 provides the flow model for this analysis using GIS. I started by creating buffers in one kilometer increments extending outward 10 km from the Devils River using the “Buffer” function in ArcGIS 10. I then used the “Clip” function to clip each river buffer by the next lowest increment so instead of having a river buffer that goes from 0 – 6 km, I have a river buffer from 5-6 km. Once the buffers were created, I used the “Clip” function again, this time on the entire DMC site data. Within each clipped group of sites I could then pick different site types to conduct analysis. Table 6.5 provides a tabular summary of the site distribution data.

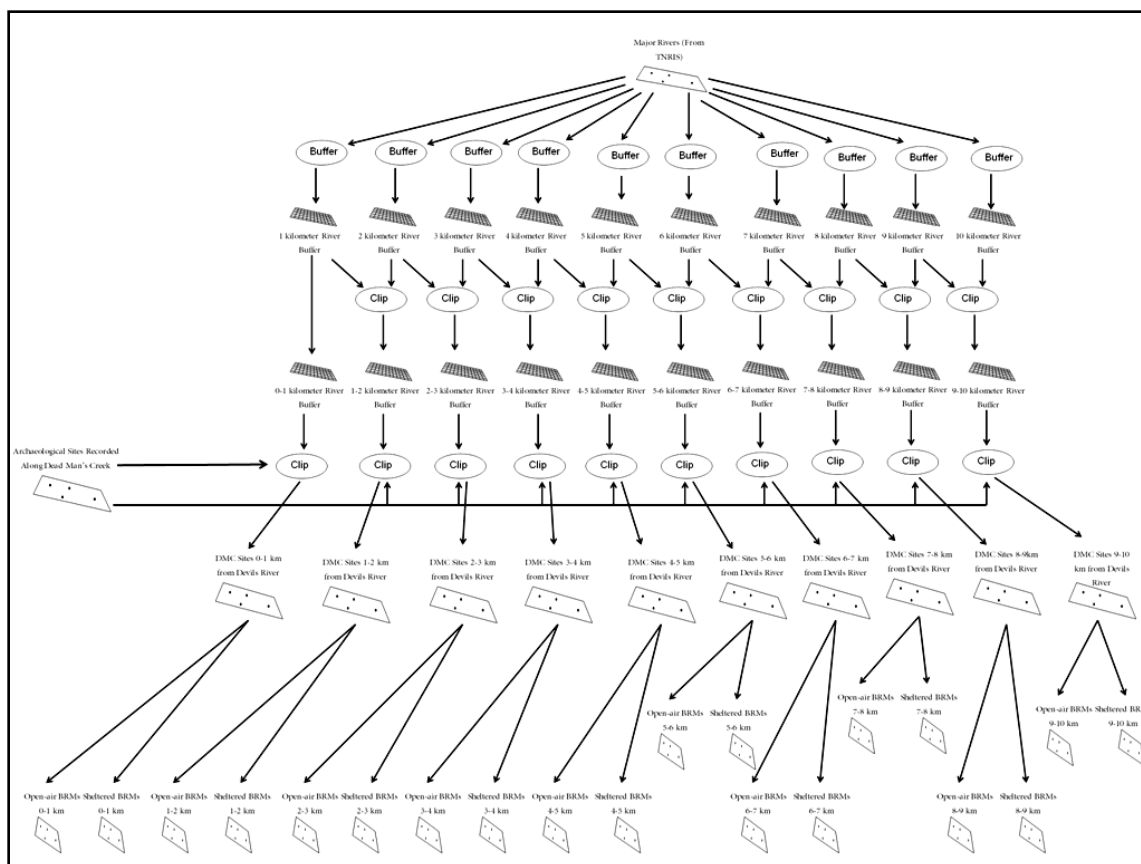


Figure 6.5. Schematic flow model of the GIS processes used to generate the river buffers and the site distribution data within Dead Man's Creek.

Table 6.5. Distribution of Archaeological Sites Along Dead Man's Creek								
Distance from Devils River (km)	Site Types Used in this Analysis							
	All Sites	All Rockshelters	All Open-Air Sites	All BRMs	Shelter BRMs	Shelters w/o BRMs	Open-air BRMs	Open-Air Sites w/o BRMs
0-1	2	1	1	1	0	1	1	0
1-2	4	1	3	1	0	1	1	2
2-3	13	3	10	4	0	3	4	6
3-4	10	4	6	4	3	1	1	5
4-5	17	10	7	9	6	4	3	4
5-6	13	4	9	4	1	3	3	6
6-7	9	0	9	4	0	0	4	5
Totals	68	23	45	27	10	13	17	28

I calculated site frequency (number of sites per river buffer/total number of sites) for all the archaeological sites within the survey area (Figure 6.6). Site frequency was then calculated for rockshelters and open-air sites (Figure 6.7). The frequency of sites containing burned rock middens is plotted in Figure 6.8. Figure 6.9 compares the frequency of open-air versus rockshelter BRM sites. Figure 6.10 compares the frequency of sheltered sites with and without BRMs, and Figure 6.11 compares open-air site frequency with and without BRMs. In two final frequency comparisons, the frequency of sheltered BRM sites is compared to open-air non-BRM sites in Figure 6.12, and the frequency of open-air BRM sites is compared to sheltered sites not containing BRMs in Figure 6.13. Table 6.6 provides a tabular summary of the frequency data.

[illegible]

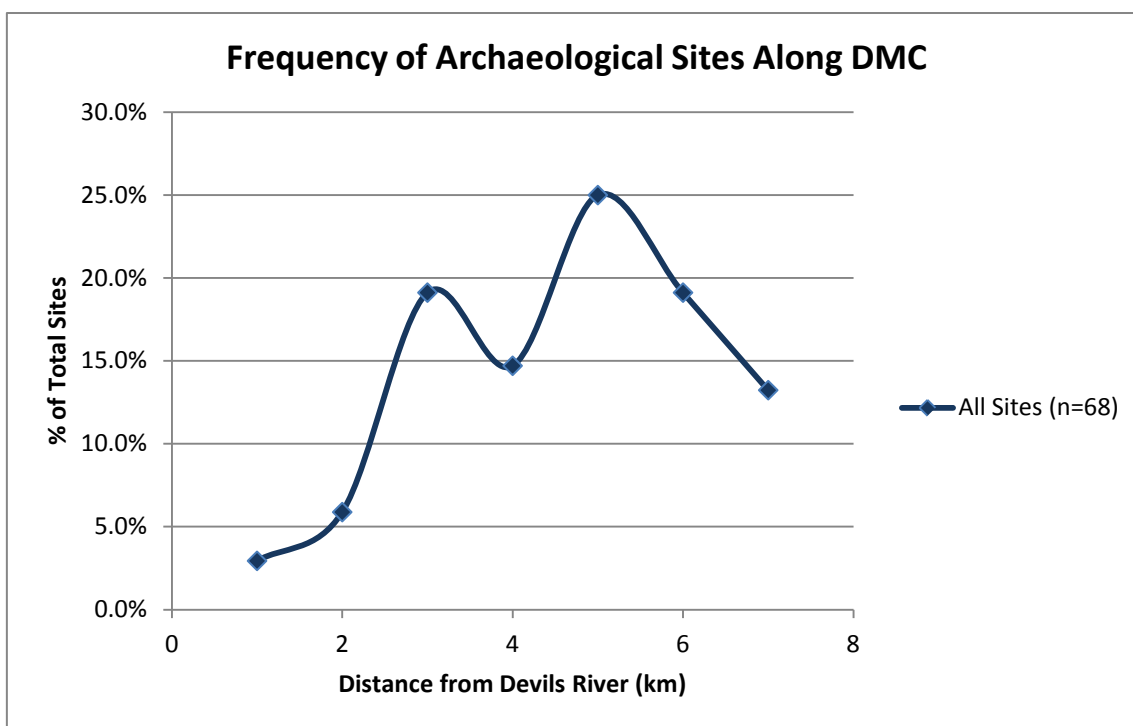
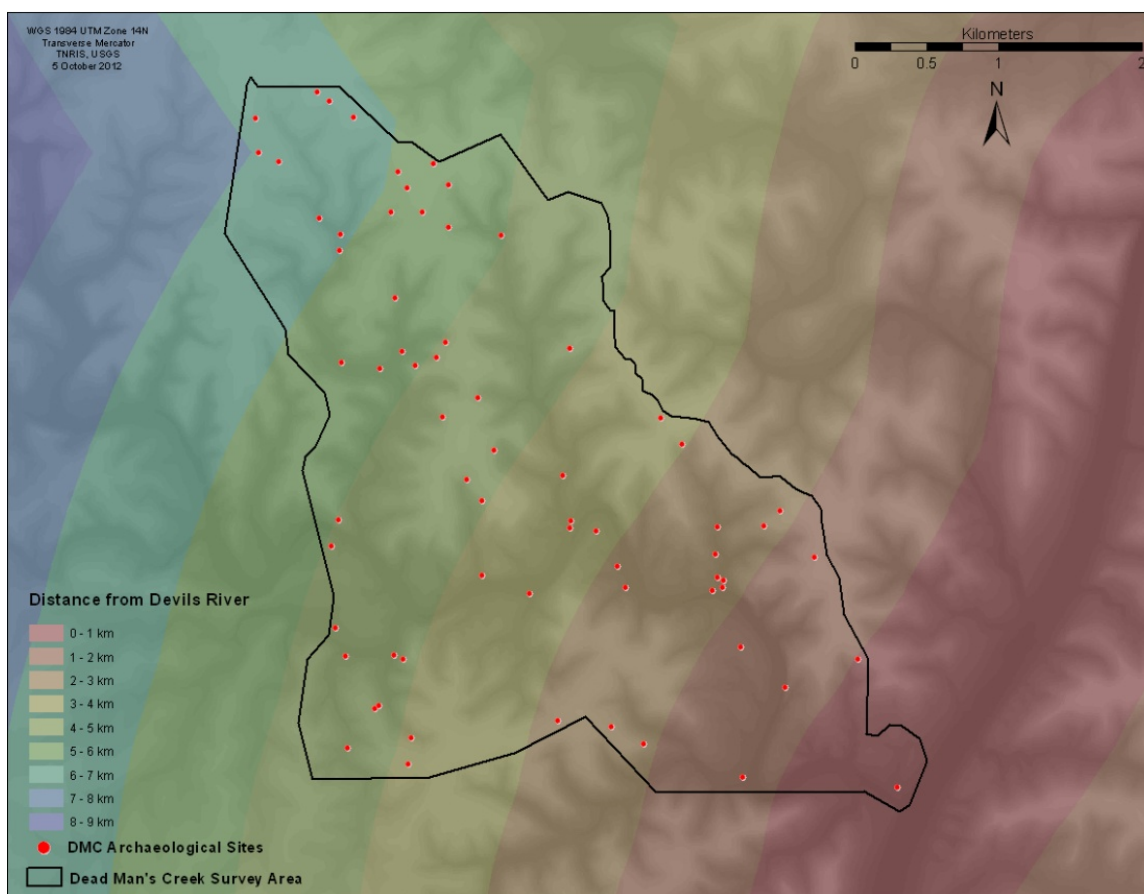


Figure 6.6. Frequency of all archaeological sites within DMC relative to the Devils River: map showing plotted sites and river buffers (top) and line graph showing site frequency (bottom).

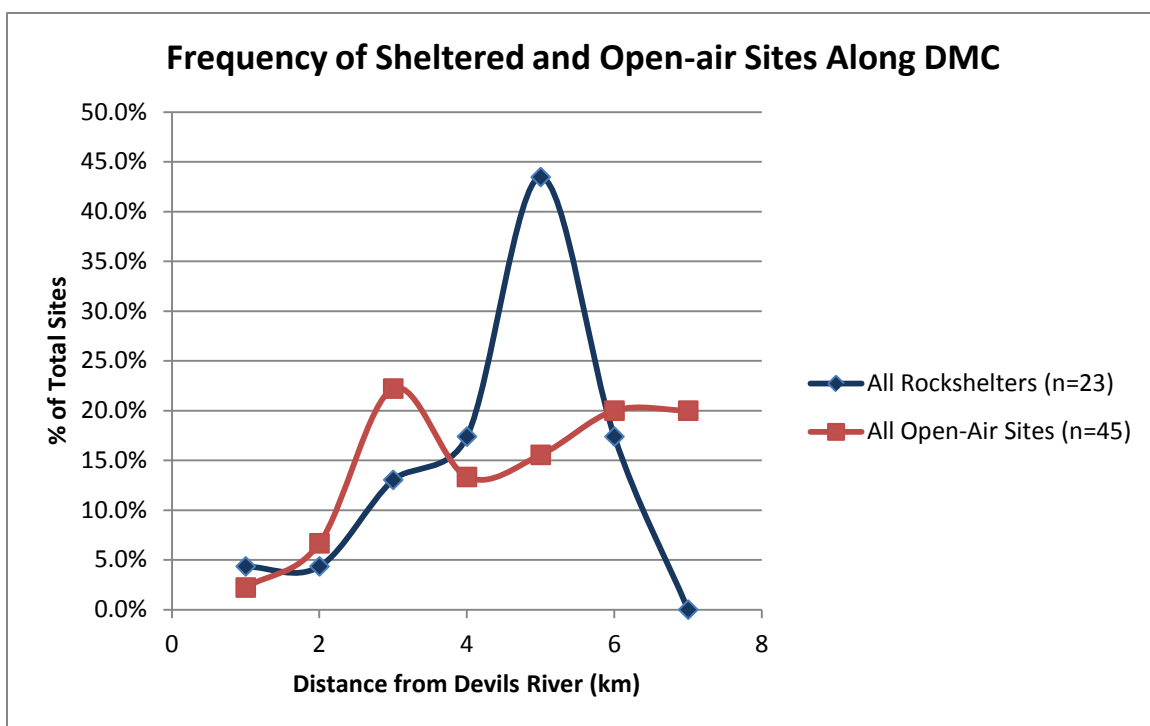
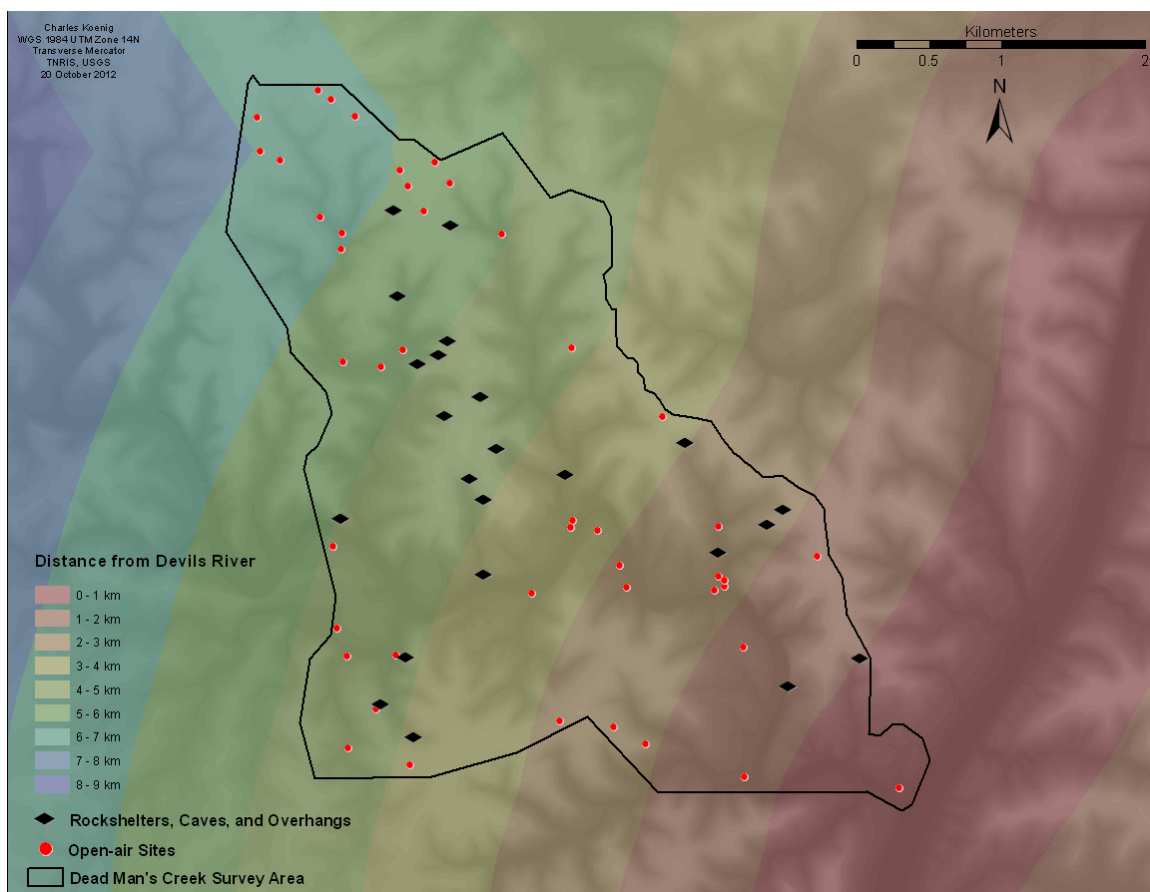


Figure 6.7. Frequency of sheltered versus open-air sites within DMC relative to the Devils River: map showing plotted sites and river buffers (top) and line graph showing site distribution (bottom).

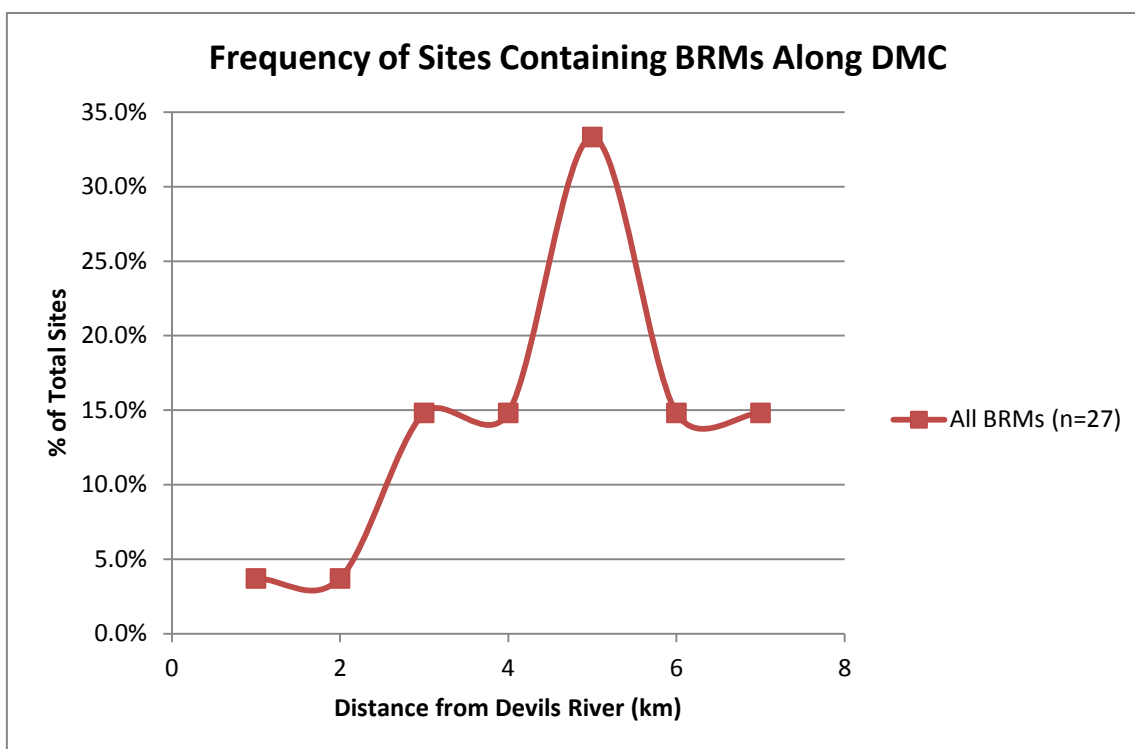
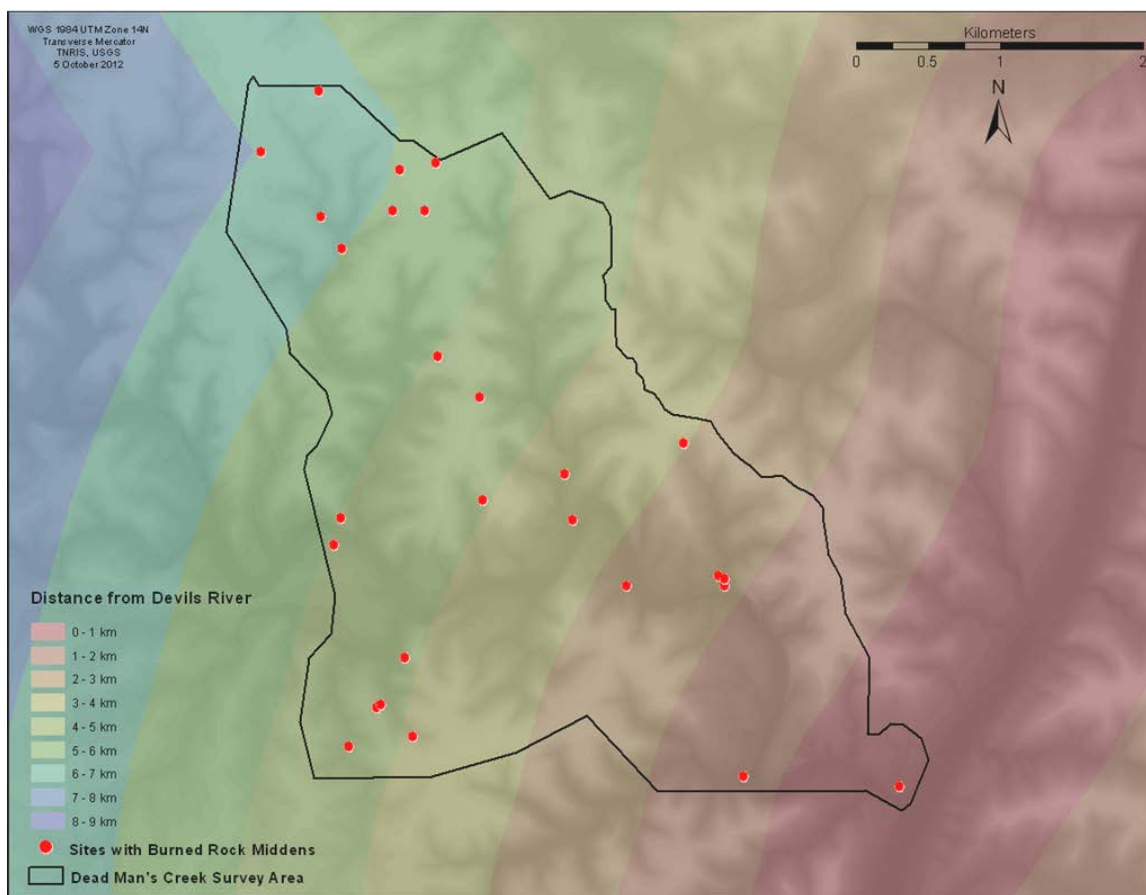


Figure 6.8. Frequency of sites containing burned rock middens within DMC relative to the Devils River: map showing plotted sites and river buffers (top) and line graph showing site distribution (bottom).

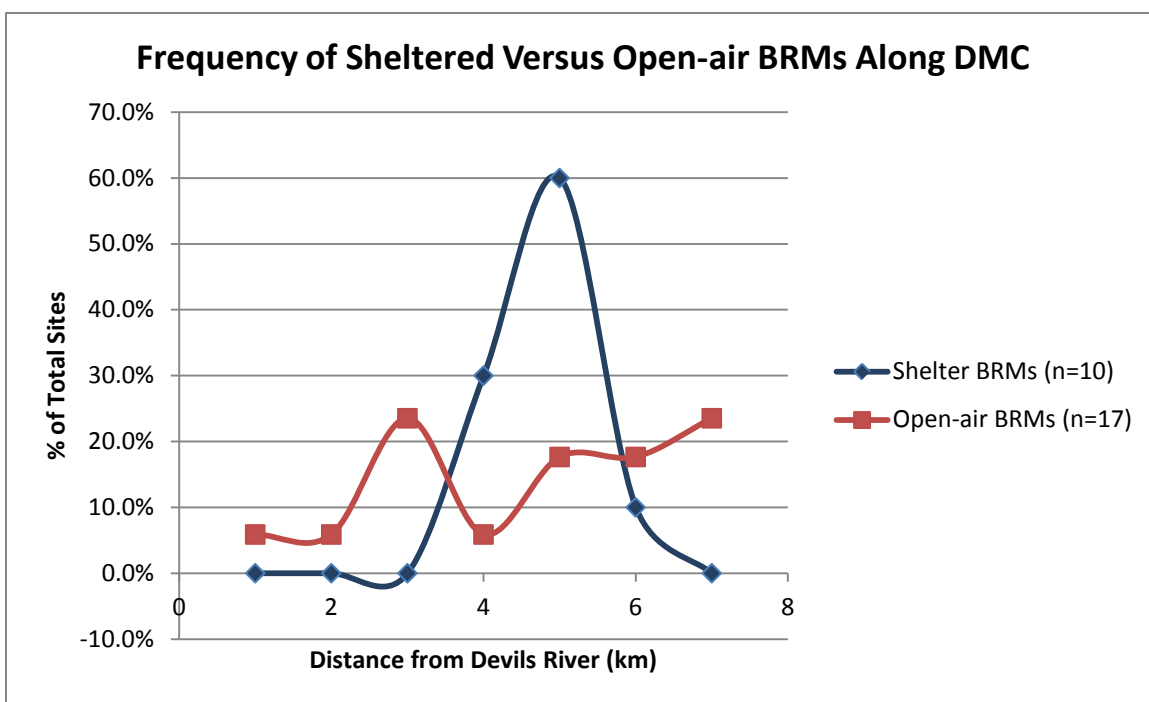
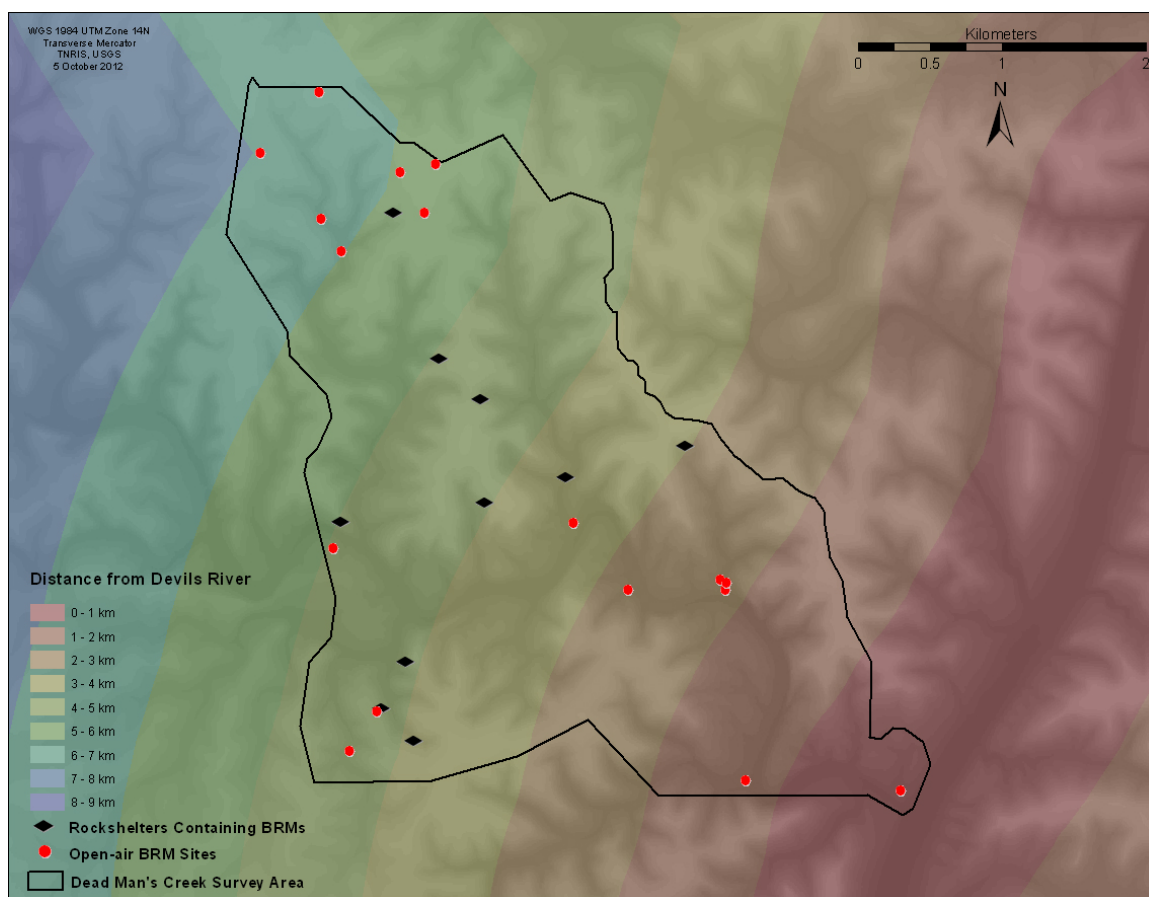


Figure 6.9. Frequency of open-air and rockshelter burned rock midden sites within Dead Man's Creek relative to the Devils River: map showing plotted sites and river buffers (top) and line graph showing site distribution (bottom).

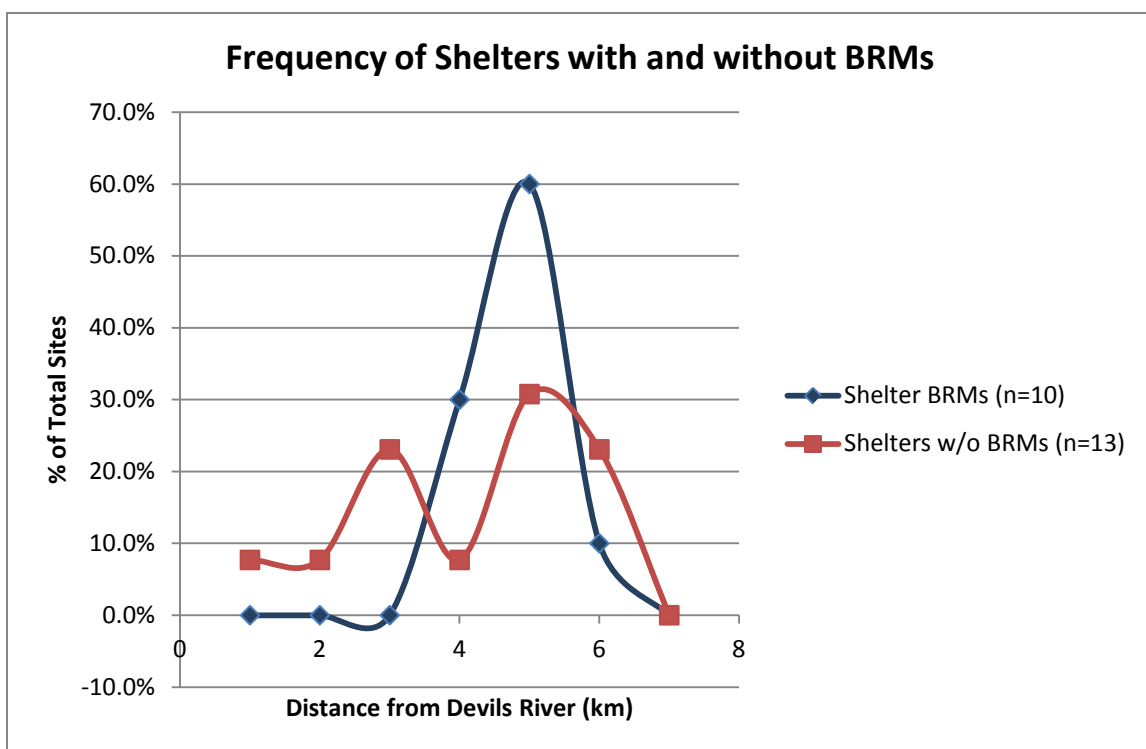
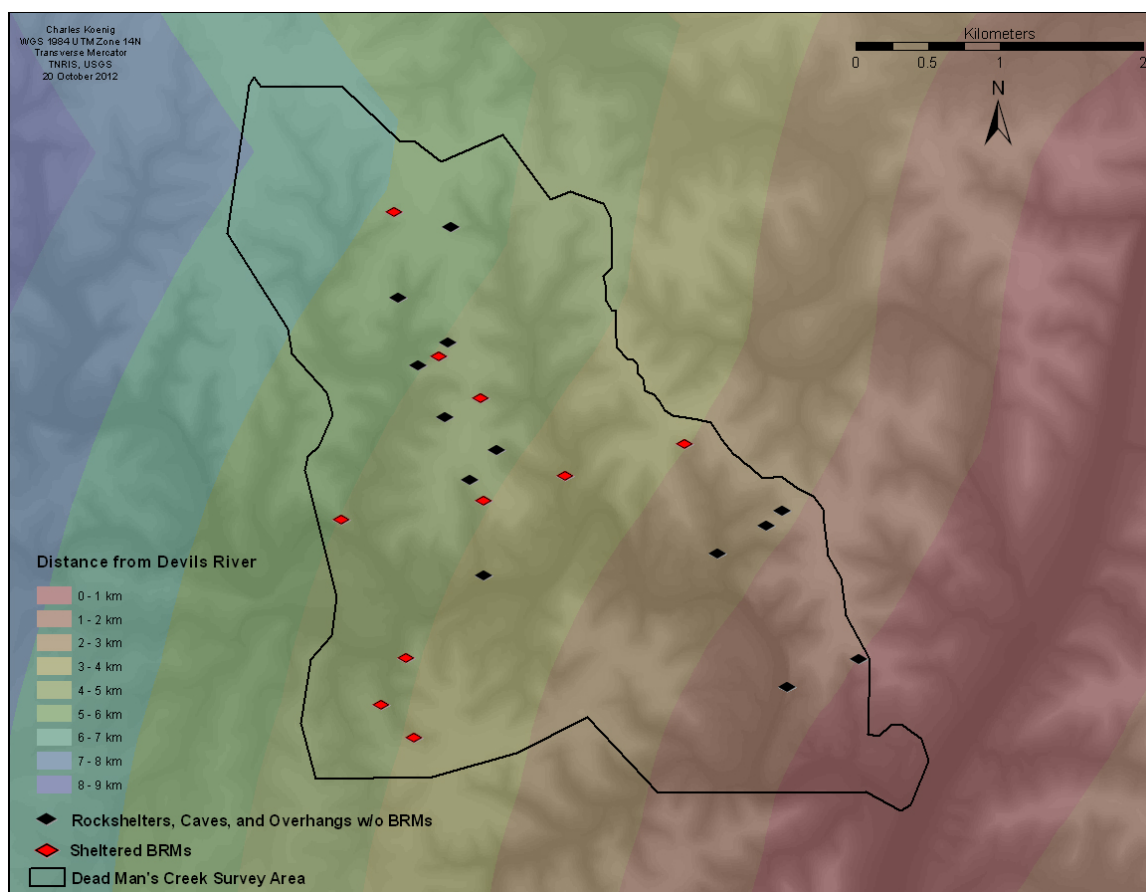


Figure 6.10. Frequency of shelters with and without BRMs within DMC relative to the Devils River: map showing plotted sites and river buffers (top) and line graph showing site distribution (bottom).

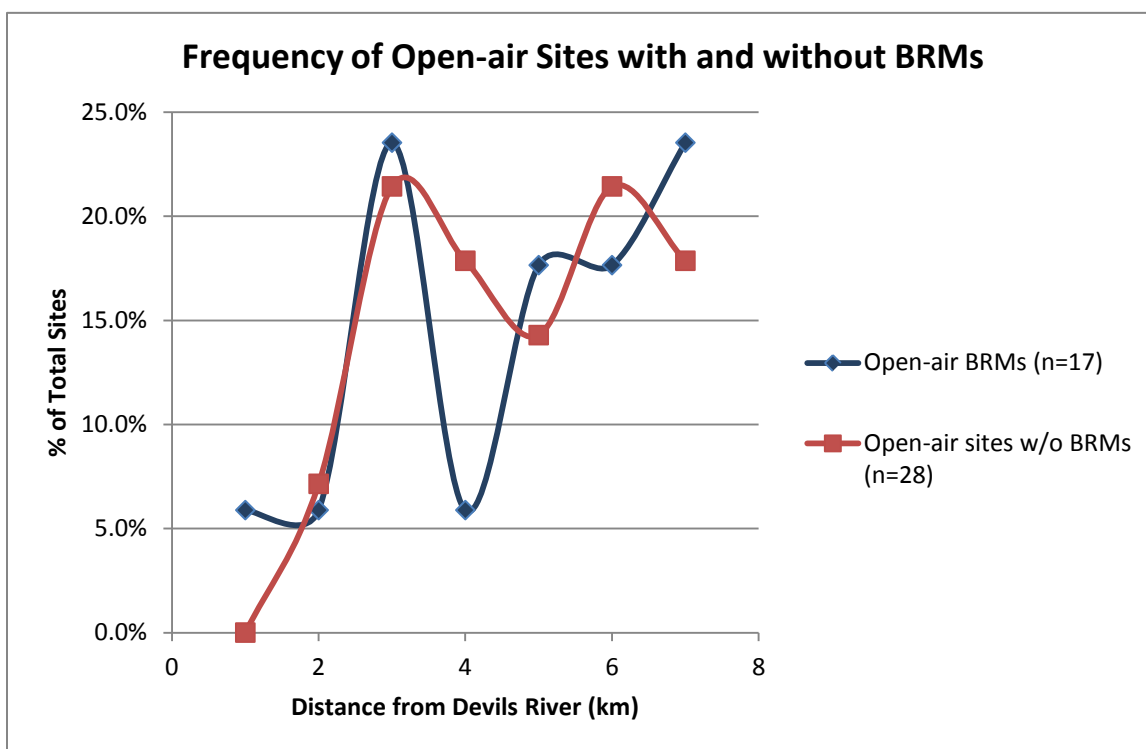
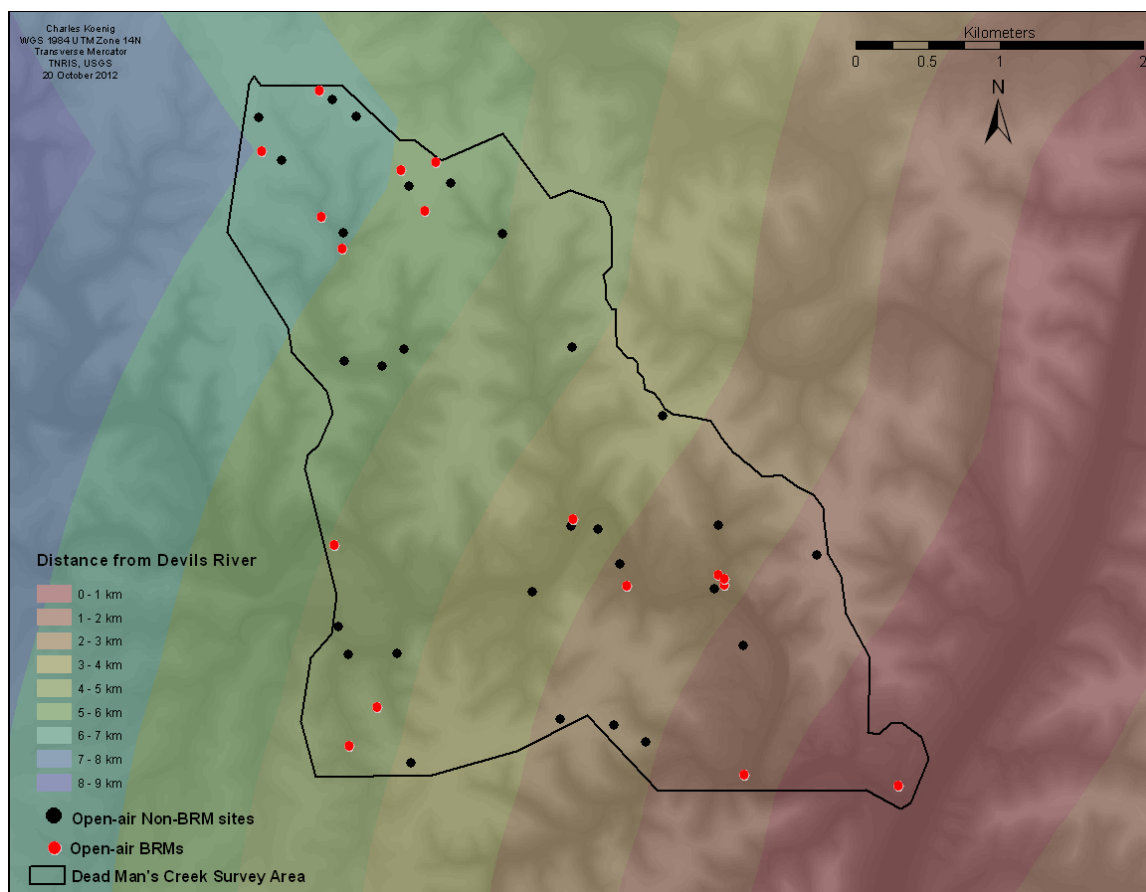


Figure 6.11. Frequency of open-air sites with and without BRMs within DMC relative to the Devils River: map showing plotted sites and river buffers (top) and line graph showing site distribution (bottom).

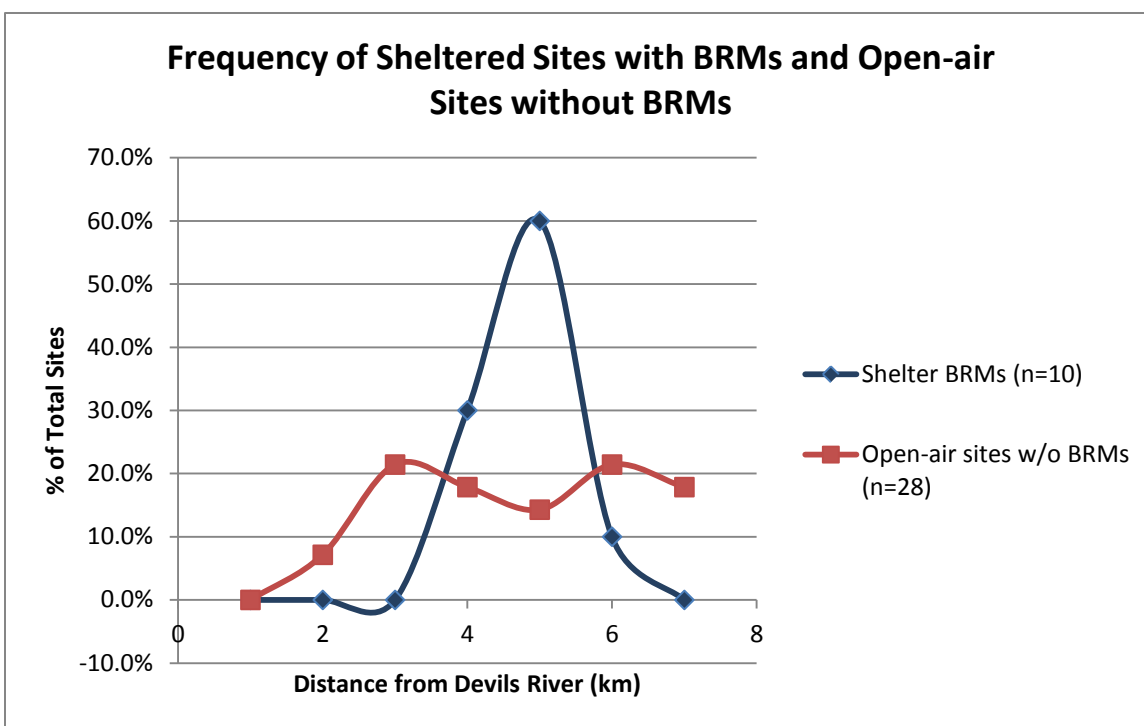
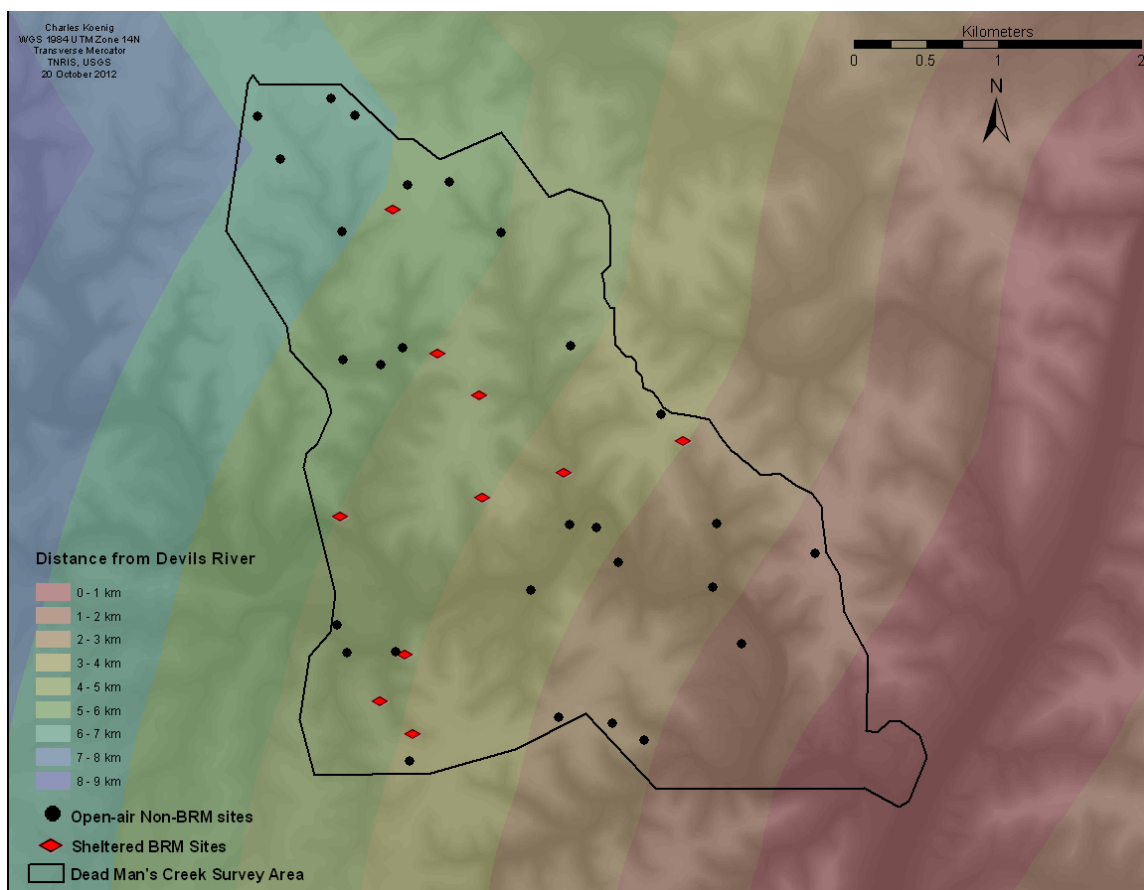


Figure 6.12. Frequency of sheltered sites with BRMs versus open-air sites without BRMs within DMC relative to the Devils River: map showing plotted sites and river buffers (top) and line graph showing site distribution (bottom).

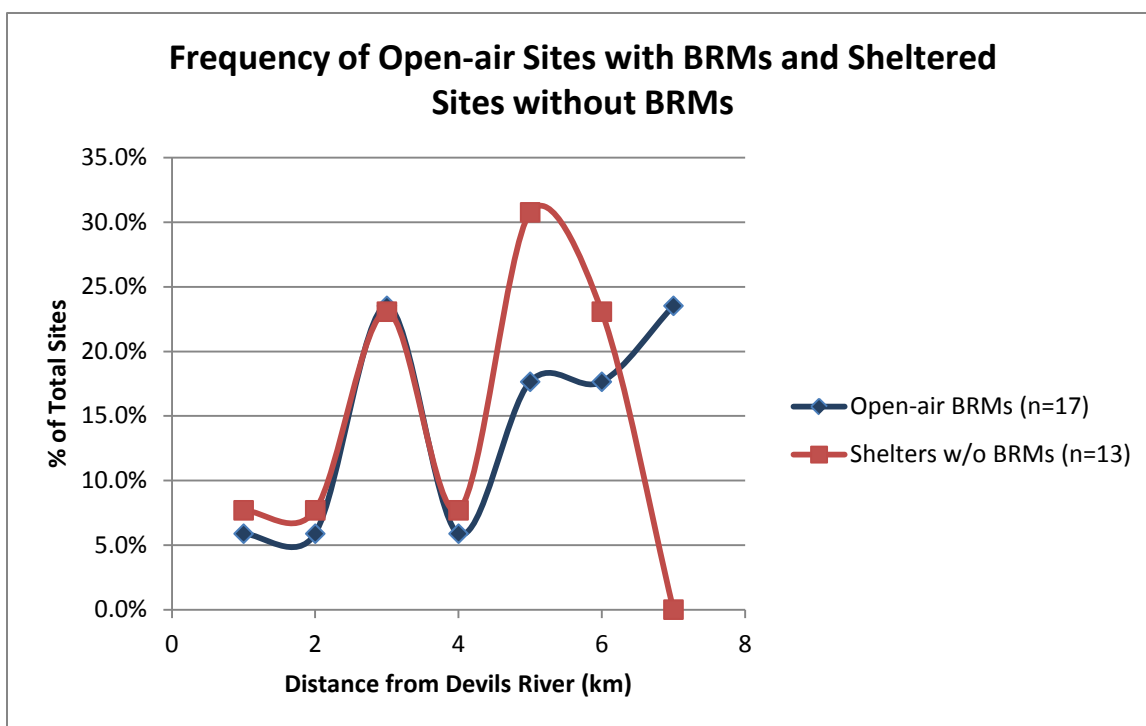
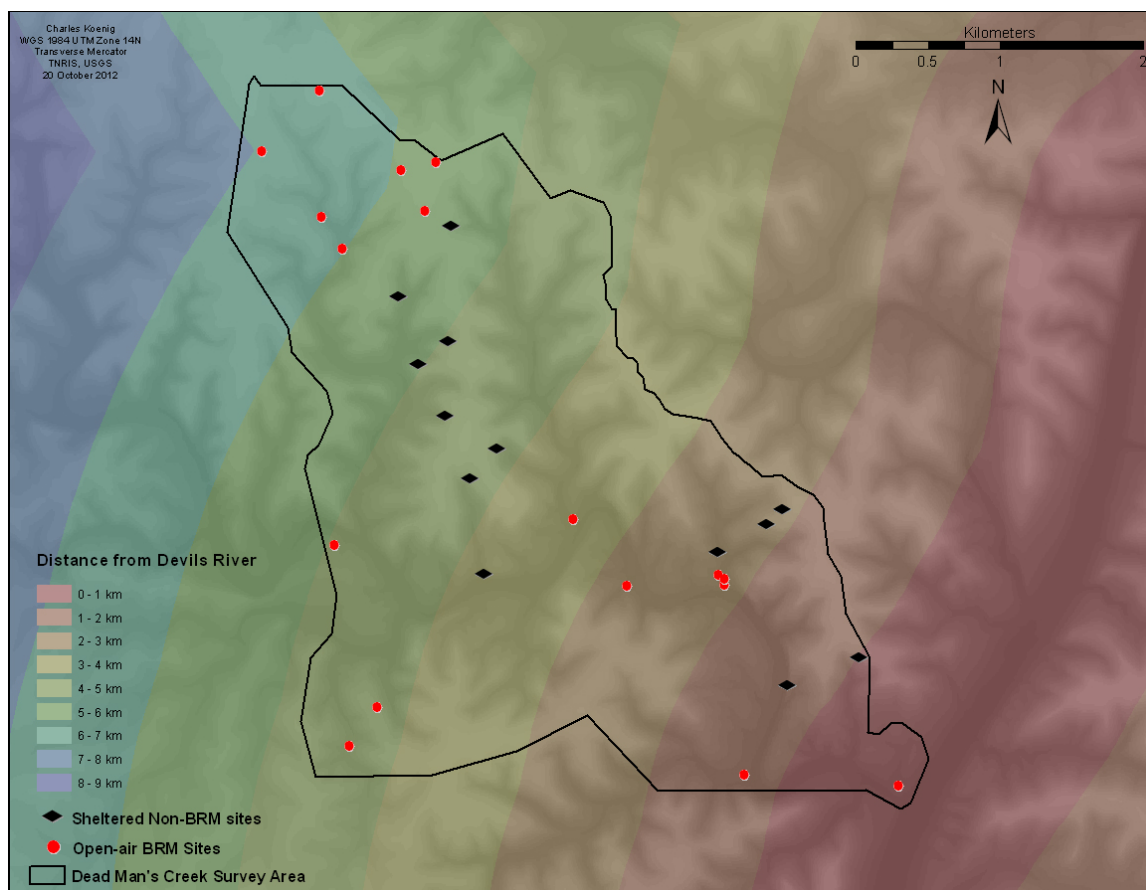


Figure 6.13. Frequency of open-air sites with BRMs versus sheltered sites without BRMs within DMC relative to the Devils River: map showing plotted sites and river buffers (top) and line graph showing site distribution (bottom).

In order to determine if the trends observed in site frequency were significant, I used the Chi-Square Test-of-Independence on six different data sets: sheltered versus open air sites, sheltered BRMs versus open-air BRMs, shelters with and without BRMs, open-air sites with and without BRMs, sheltered sites with BRMs versus open-air sites without BRMs, and open-air sites with BRMs versus sheltered sites without BRMs. Due to small sample sizes, I consolidated the river buffer increments into four smaller units (Table 6.7). The results of the different Chi-Square tests are provided in Tables 6.8, 6.9, 6.10, 6.11, 6.12, and 6.13.

Table 6.7. Distribution of Archaeological Sites Along DMC Used in Chi-Square Test-of-Independence Tests

Distance from Devils River (km)	Site Types Used in this Analysis							
	All Sites	All Rockshelters	All Open-Air Sites	All BRMs	Shelter BRMs	Shelters w/o BRMs	Open-air BRMs	Open-Air Sites w/o BRMs
0-2	6	2	4	2	0	2	2	2
2-4	23	7	16	8	3	4	5	11
4-5	17	10	7	9	6	4	3	4
5-7	22	4	18	8	1	3	7	11
Totals	68	23	45	27	10	13	17	28

Table 6.8. Chi-Square Test-of-Independence Results for All Sheltered Versus Open-air Sites Along DMC

Distance from Devils River (km)	Observed Values			Expected Values		χ^2	
	Sheltered Sites	Open-Air Sites	Totals	Sheltered Sites	Open-Air Sites	Sheltered	Open-Air Sites
0-2	2	4	6	2.029	3.971	0.0004	0.0002
2-4	7	16	23	7.779	15.221	0.078	0.040
4-5	10	7	17	5.750	11.250	3.141	1.606
5-7	4	18	22	7.441	14.559	1.591	0.813
Totals	23	45	68				

$\chi^2 = 7.2702$, DF = 3.00, p = 0.0637

Table 6.12. Chi-Square Test-of-Independence Results for Sheltered sites with BRMs Versus Open-air Sites without BRMs Along DMC							
Distance from Devils River (km)	Observed Values			Expected Values		χ^2	
	Shelters w/ BRMs	Open-air w/o BRMs	Totals	Shelters w/ BRMs	Open-air w/o BRMs	Shelters w/ BRMs	Open-air w/o BRMs
0-2	0	2	2	0.526	1.474	0.526	0.188
2-4	3	11	14	3.684	10.316	0.1271	0.0454
4-5	6	4	10	2.632	7.368	4.312	1.540
5-7	1	11	12	3.158	8.842	1.475	0.527
Totals	10	28	38				
$\chi^2 = 8.7394$, DF = 3.00, p = 0.0329							

Table 6.13. Chi-Square Test-of-Independence Results for Open-air BRMs Versus Sheltered Sites without BRMs Along DMC							
Distance from Devils River (km)	Observed Values			Expected Values		χ^2	
	Open-air w/ BRMs	Shelters w/o BRMs	Totals	Open-air w/ BRMs	Shelters w/o BRMs	Open-air w/ BRMs	Shelters w/o BRMs
0-2	2	2	4	2.267	3.067	0.031	0.371
2-4	5	4	9	5.100	6.900	0.0020	1.2188
4-5	3	4	7	3.967	5.367	0.236	0.348
5-7	7	3	10	5.667	7.667	0.314	2.841
Totals	17	13	30				
$\chi^2 = 5.3611$, DF = 3.00, p = 0.1472							

Based on the Chi-Square tests (to a 90% level of confidence) the differences between sheltered versus open-air site frequency, sheltered versus open-air BRMs frequency, and sheltered sites containing BRMs versus open-air non-BRM site frequency are statistically significant. Aside from these three datasets, all the other site frequency data from DMC are statistically similar.

Site Density

In addition to the frequency of sites, site density within each buffer zone was calculated. Table 6.6 provides the areas for each buffer zone and a tabular summary of

the density data. Density was calculated using GIS after the stream buffers were trimmed using the “Clip” function to only include areas within the survey boundary. Line graphs of site density are provided for all archaeological sites (Figure 6.14), rockshelters versus open-air sites (Figure 6.15), all burned rock middens (Figure 6.16), open-air versus rockshelter BRMs (Figure 6.17), rockshelters with and without BRMs (Figure 6.18), open-air sites with and without BRMs (Figure 6.19), shelter BRMs versus open-air non BRM sites (Figure 6.20), and open-air BRMs versus shelters without BRMs (Figure 6.21).

Table 6.14. Density of Archaeological Sites Along Dead Man's Creek																	
Distance from Devils River (km)		Site Types Used in this Analysis															
		All Sites (n=68)		All Rockshelters (n=23)		All Open-Air Sites (n=45)		All BRMs (n=27)		Shelter BRMs (n=10)		Shelters w/o BRMs (n=13)		Open-air BRMs (n=17)		Open-air w/o BRMs (n=28)	
Distance from Devils River (km)	River Buffer Area (km ²)	# of Sites	Sites/km ²	# of Sites	Sites/km ²	# of Sites	Sites/km ²	# of Sites	Sites/km ²	# of Sites	Sites/km ²	# of Sites	Sites/km ²	# of Sites	Sites/km ²	# of Sites	Sites/km ²
0-1	0.54	2	3.69	1	1.85	1	1.85	1	1.85	0	0.00	1	1.85	1	1.85	0	0.00
1-2	1.60	4	2.51	1	0.63	3	1.88	1	0.63	0	0.00	1	0.63	1	0.63	2	1.25
2-3	2.04	13	6.38	3	1.47	10	4.90	4	1.96	0	0.00	3	1.47	4	1.96	6	2.94
3-4	2.72	10	3.68	4	1.47	6	2.21	4	1.47	3	1.10	1	0.37	1	0.37	5	1.84
4-5	3.60	17	4.73	10	2.78	7	1.95	9	2.50	6	1.67	4	1.11	3	0.83	4	1.11
5-6	2.02	13	6.44	4	1.98	9	4.46	4	1.98	1	0.50	3	1.49	3	1.49	6	2.97
6-7	1.29	9	7.00	0	0.00	9	7.00	4	3.11	0	0.00	0	0.00	4	3.11	5	3.89
Totals	13.79	68	4.93	23	1.67	45	3.26	27	1.96	10	0.73	13	0.94	17	1.23	28	2.03

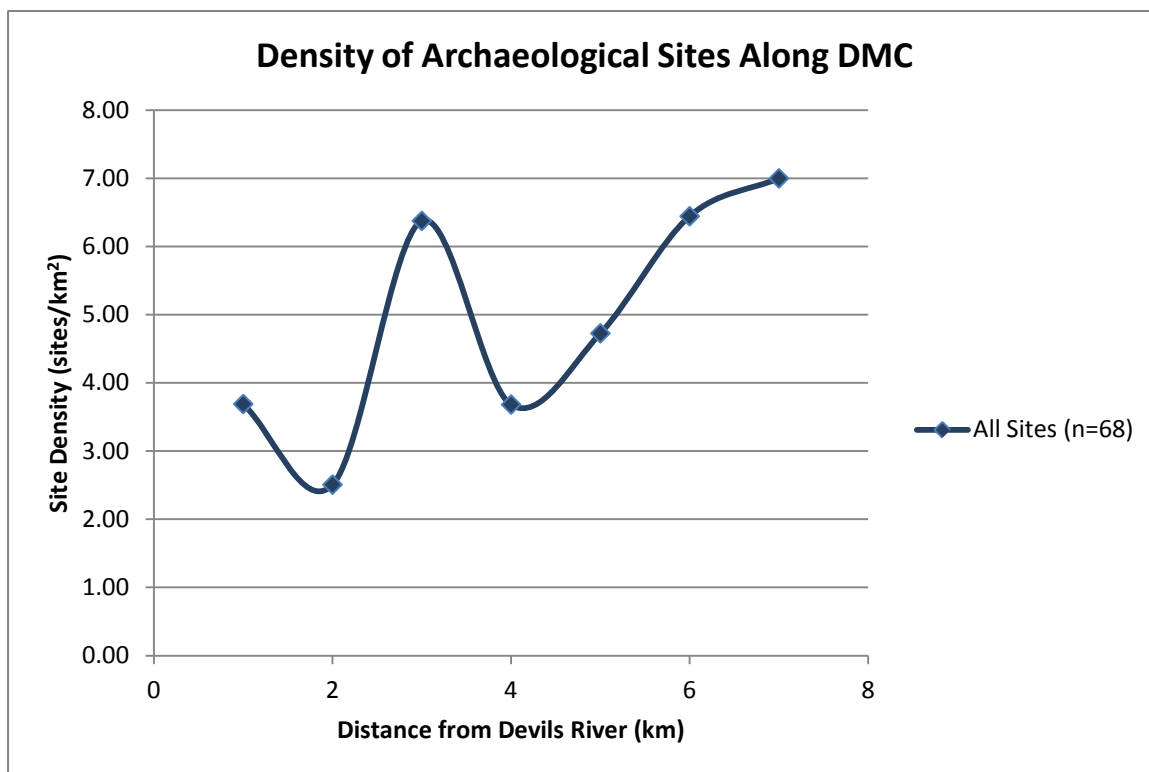


Figure 6.14. Archaeological site density in relation to distance away from the Devils River.

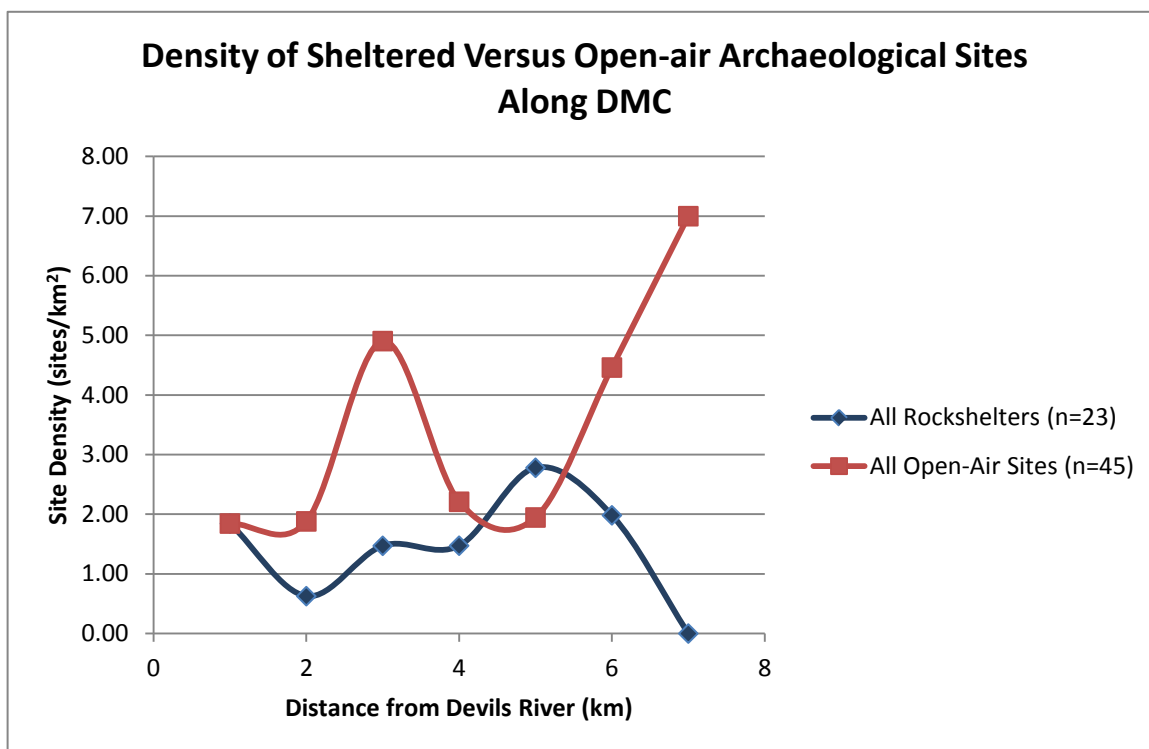


Figure 6.15. Density of sheltered versus open-air sites in relation to distance away from the Devils River.

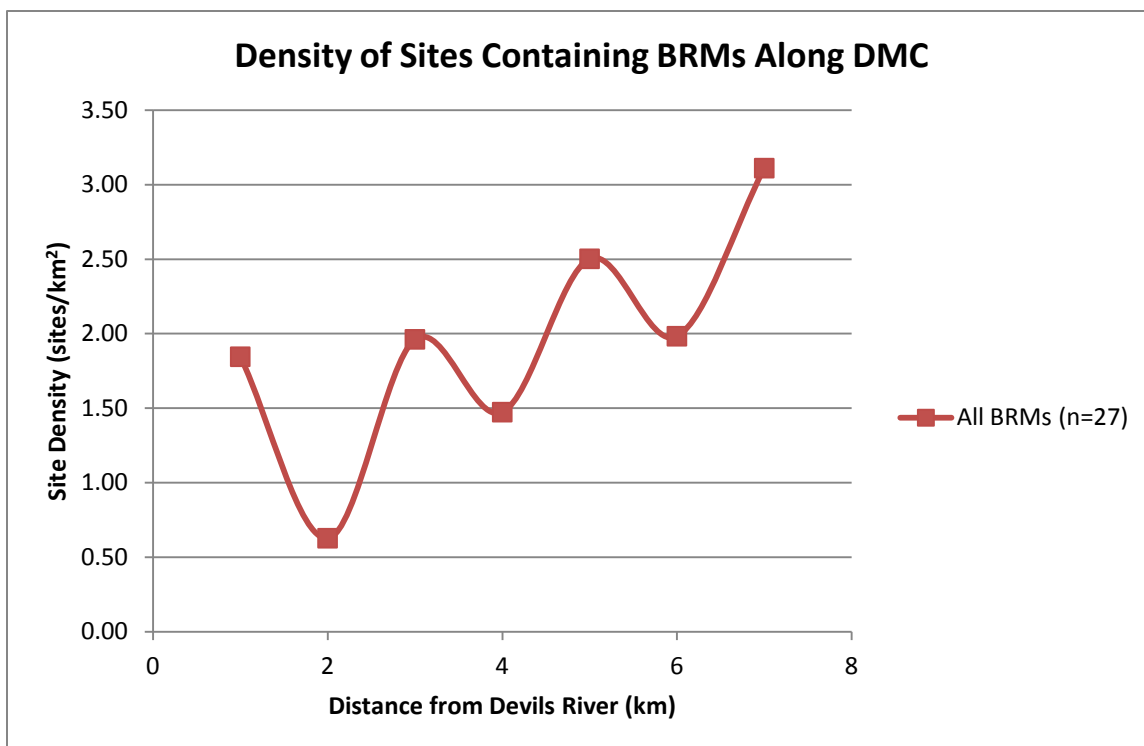


Figure 6.16. Density of burned rock middens in relation to distance away from the Devils River.

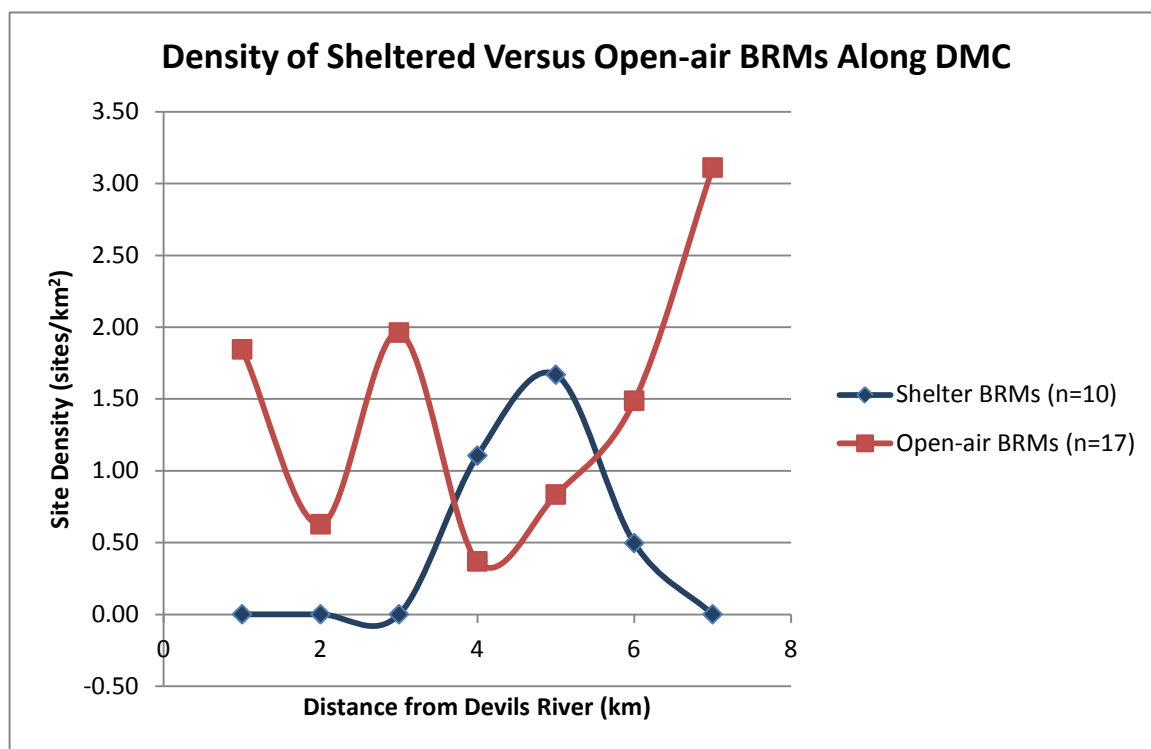


Figure 6.17. Density of open-air versus rockshelter burned rock middens in relation to distance away from the Devils River.

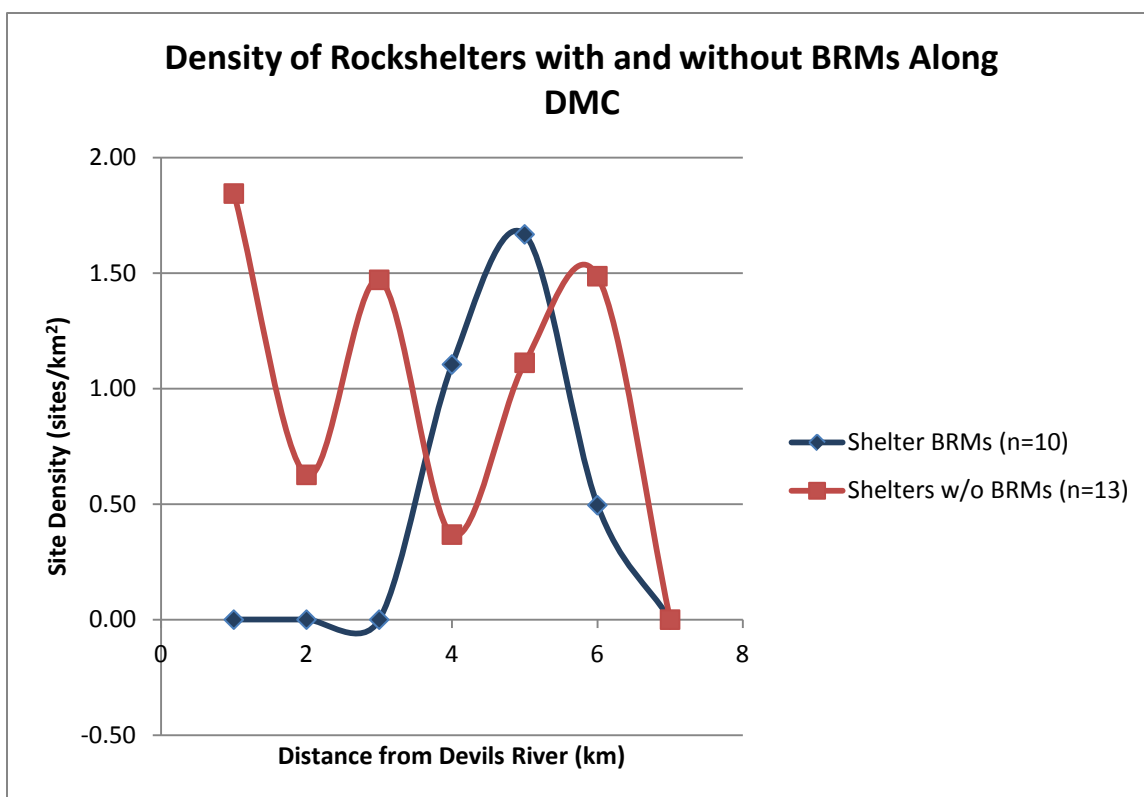


Figure 6.18. Density of rockshelters with and without BRMs in relation to distance away from the Devils River.

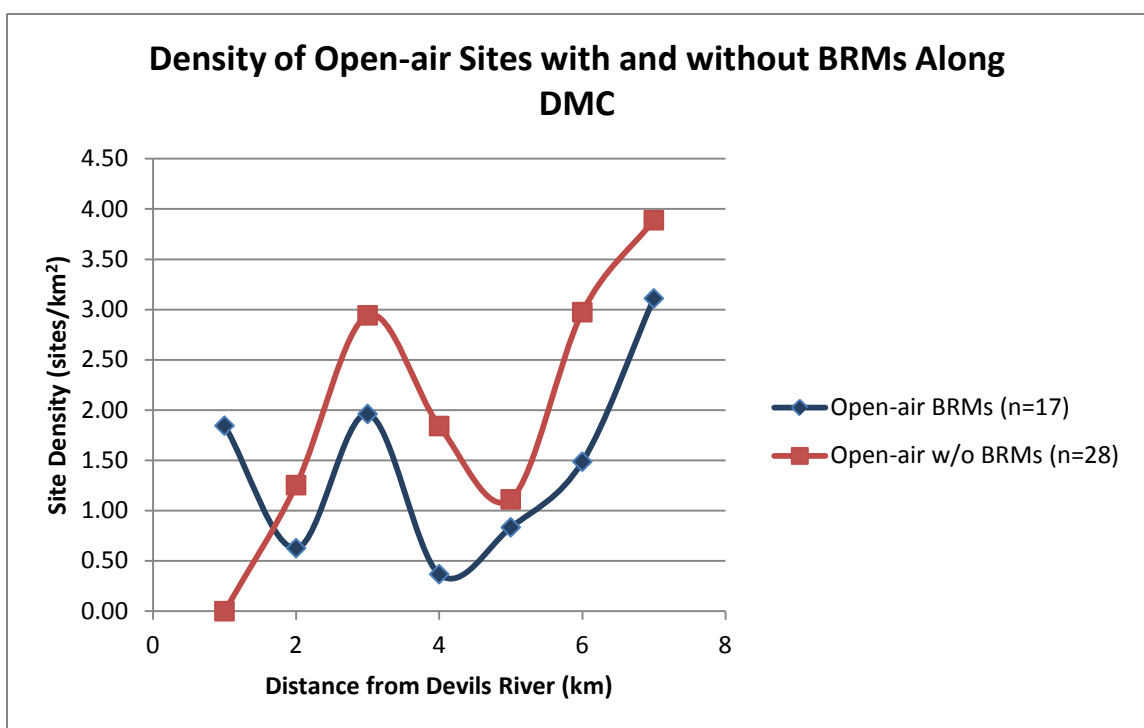


Figure 6.19. Density of open-air sites with and without BRMs in relation to distance away from the Devils River.

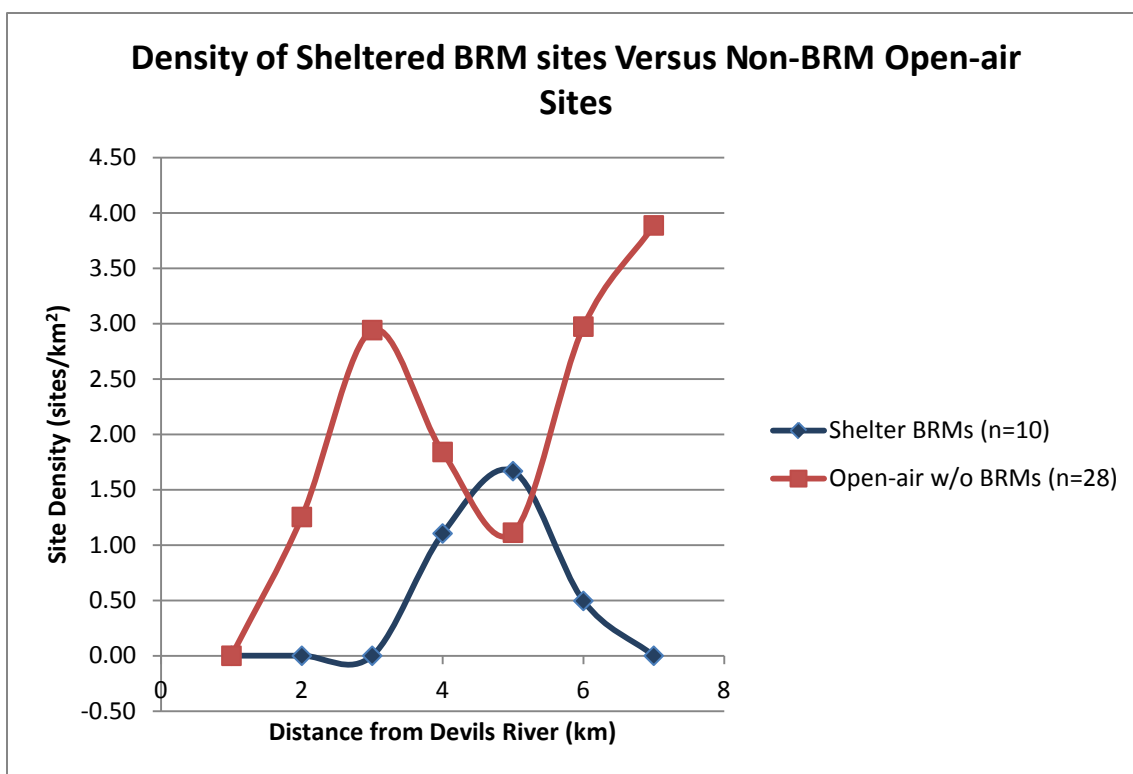


Figure 6.20. Density of sheltered BRM sites versus non-BRM open-air sites in relation to distance away from the Devils River.

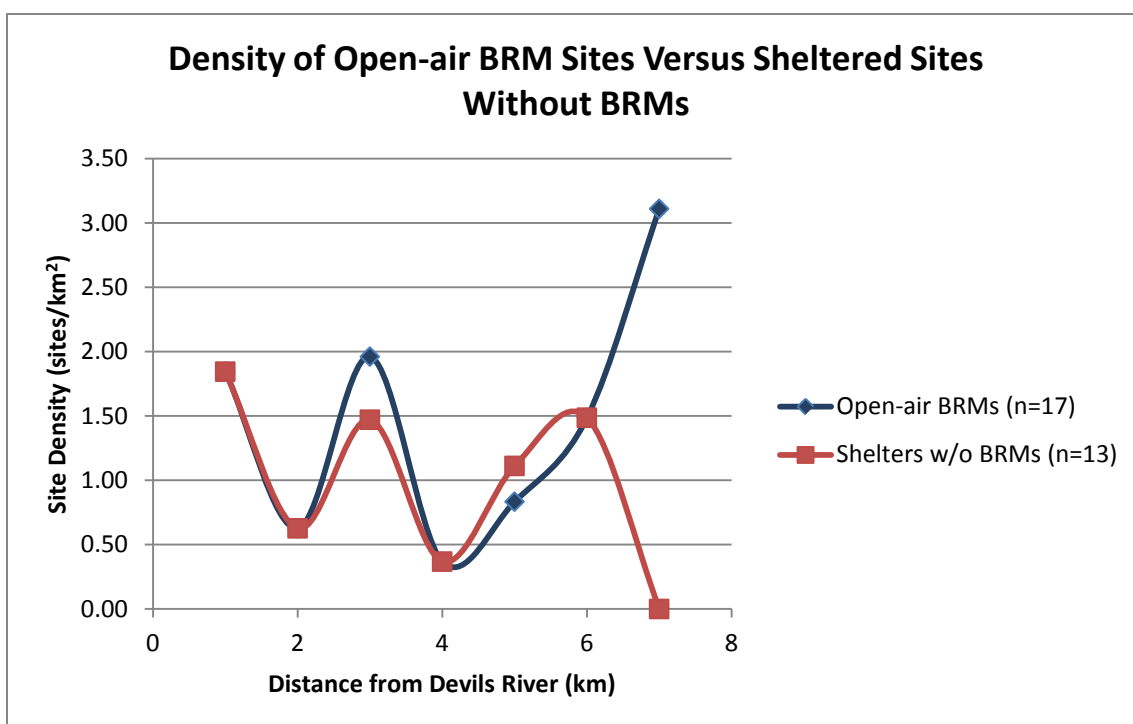


Figure 6.21. Density of open-air BRM sites versus sheltered sites without BRMs in relation to distance away from the Devils River.

In order to determine if the trends observed in site density were significant, I used regression on six different data sets: sheltered versus open air sites, sheltered BRMs versus open-air BRMs, shelters with and without BRMs, open-air sites with and without BRMs, sheltered sites with BRMs versus open-air sites without BRMs, and open-air sites with BRMs versus sheltered sites without BRMs. The regression analysis results are provided in Figures 6.22, 6.23, 6.24, 6.25, 6.26, and 6.27.

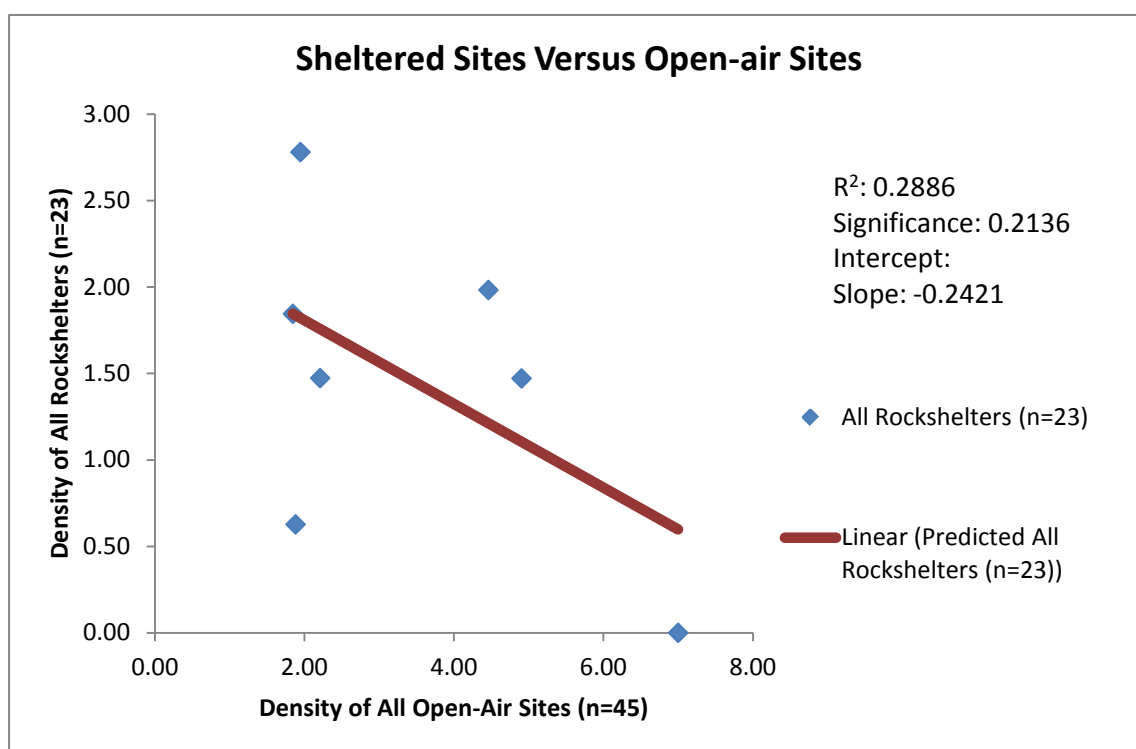


Figure 6.22. Linear regression of rockshelters and open-air sites.

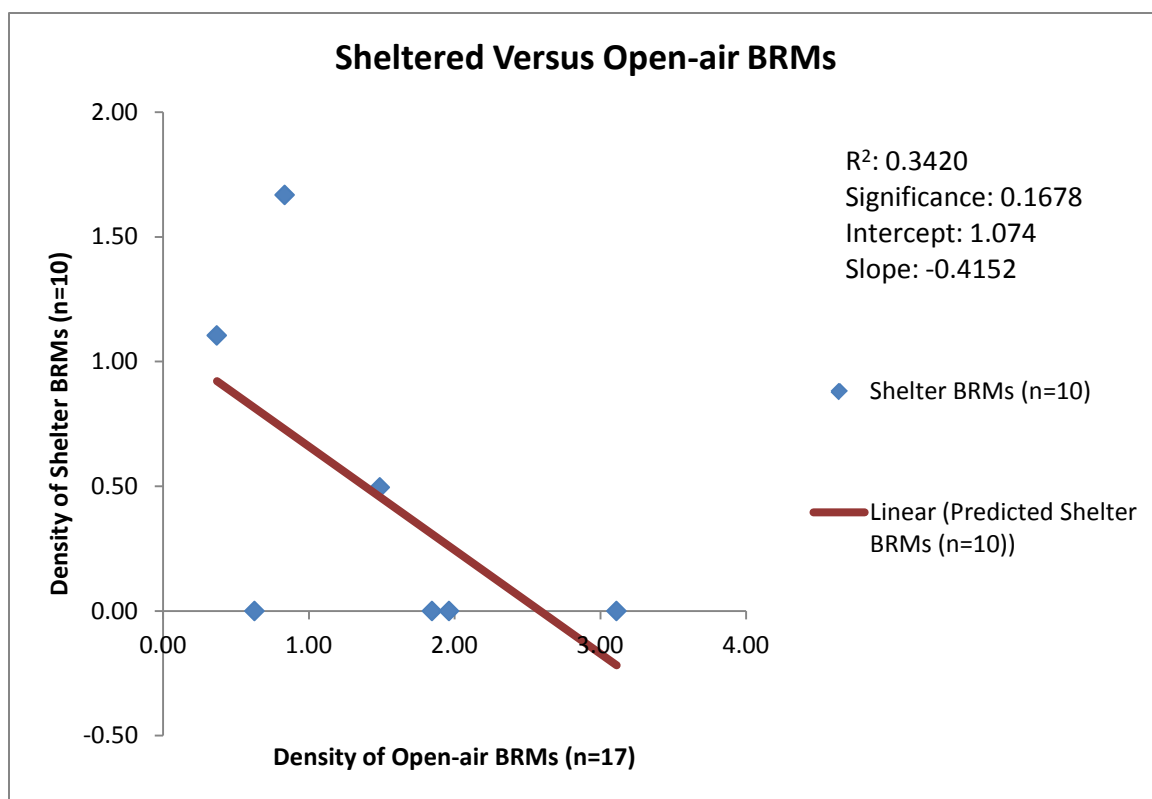


Figure 6.23. Linear regression of sheltered versus open-air BRM sites.

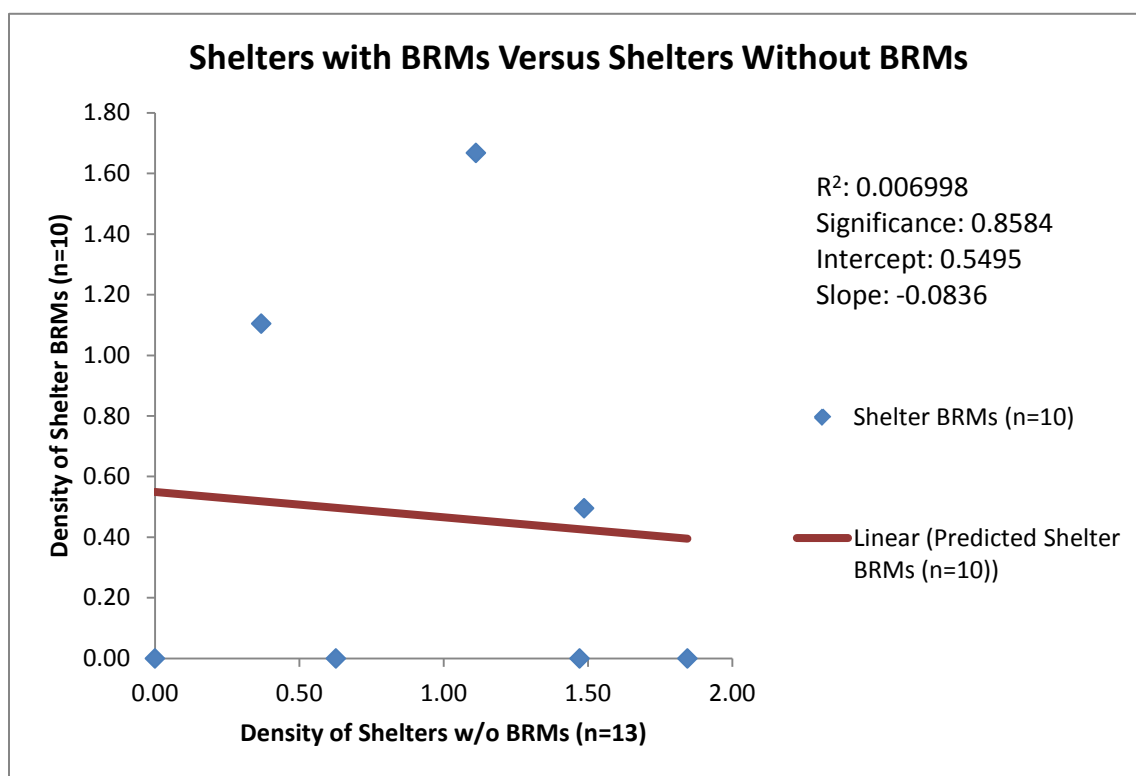


Figure 6.24. Linear regression of shelters with and without BRMs.

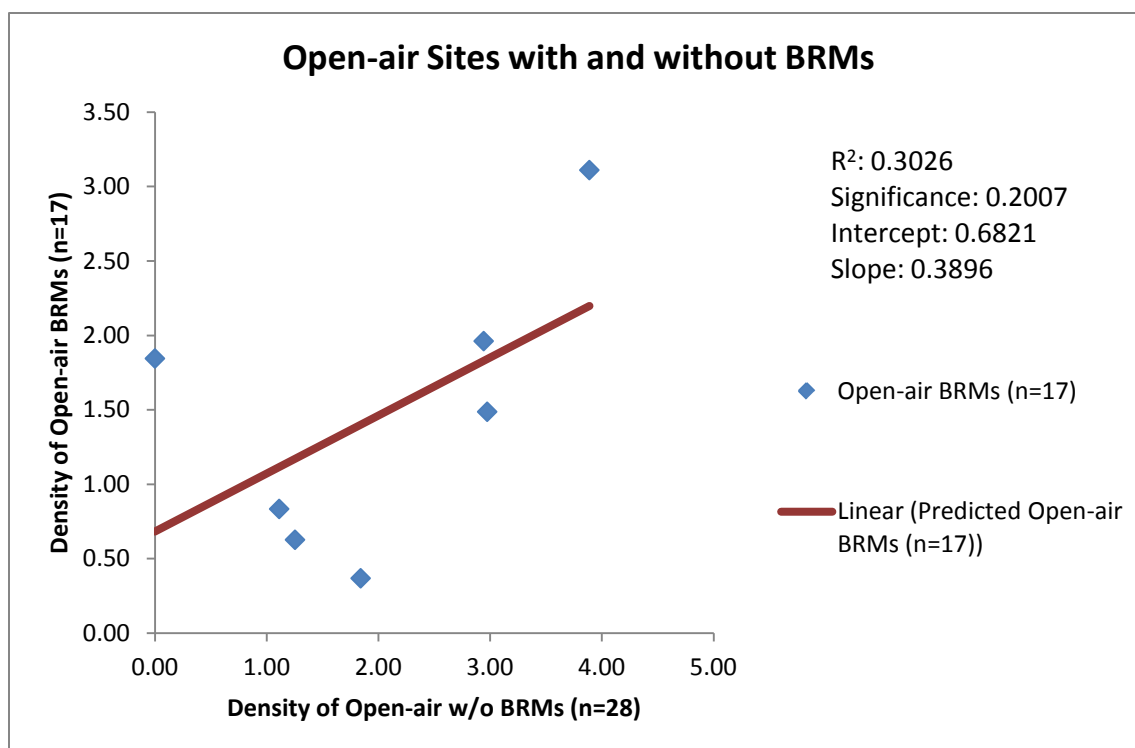


Figure 6.25. Linear regression of open-air sites with and without BRMs.

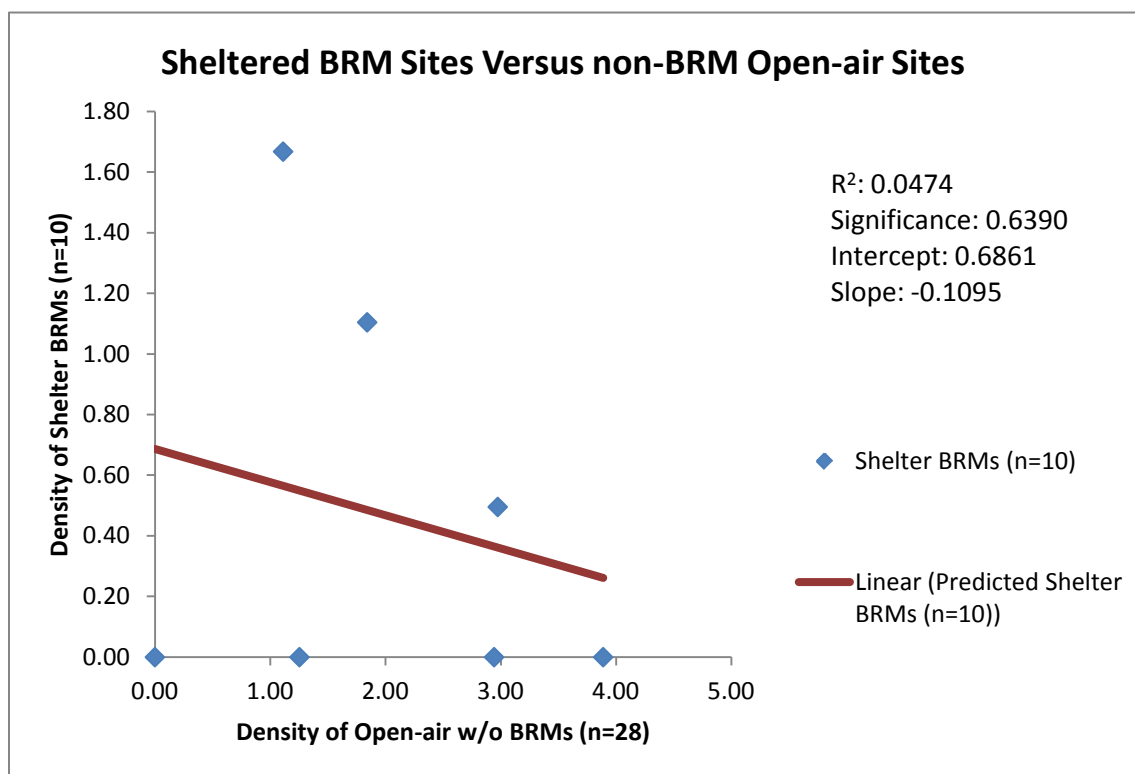


Figure 6.26. Linear regression of sheltered BRM sites versus non-BRM open-air sites.

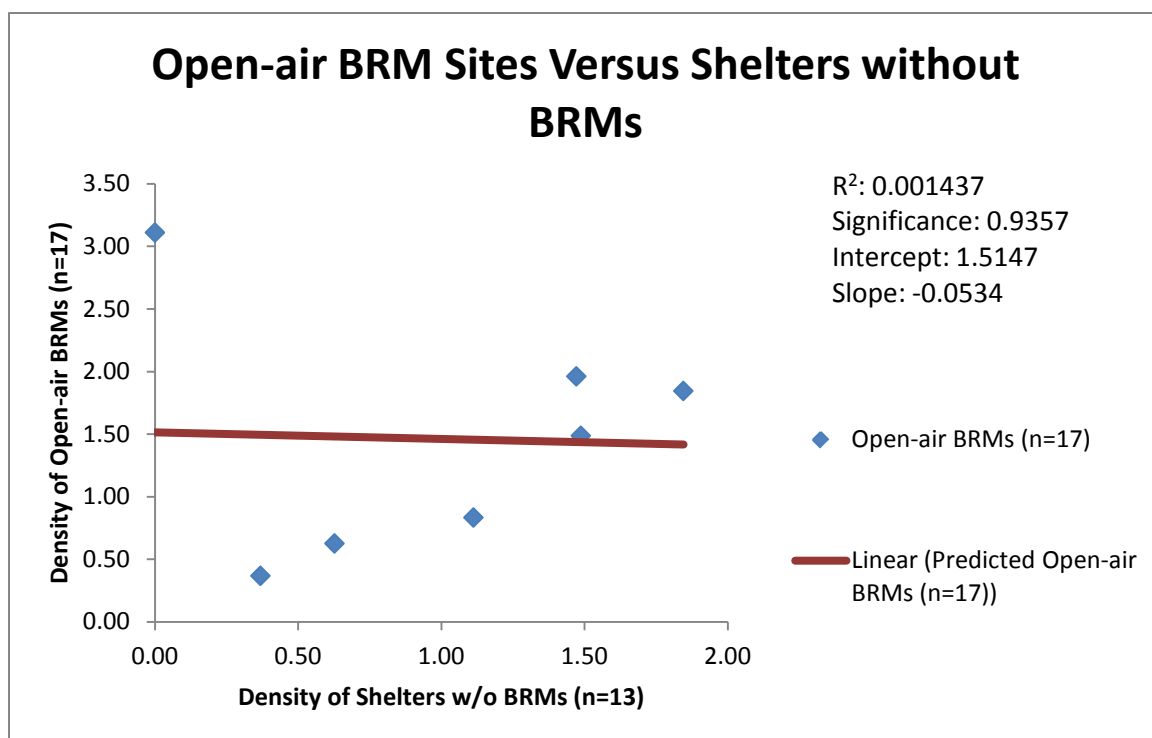


Figure 6.27. Linear regression of open-air BRM sites versus shelters without BRMs.

Based on the regression analysis, the different data sets that were compared are not similar enough to predict one another. Several trends that appear to be very similar within the density data (Figure 6.21, for example) fail in regression because of the small sample size provided by the DMC data. Essentially, although many of the trends are interesting and indicate patterns within the data, they cannot statistically be demonstrated as patterns.

Discussion of Site Distribution and Frequency Trends Observed Along Dead Man's Creek.

Based on the analysis discussed above, there are some intriguing trends within the Dead Man's Creek survey data. First, there is an increase in overall site frequency and

density as the distance away from the Devils River increases. In terms of rockshelter utilization, rockshelters are more intensively used (contain BRMs) further away from the river, and the overall density of utilized rockshelter sites is much lower than open-air sites (Figure 6.15). Following the distribution and density patterns for all sites, there is an increase in BRM frequency and density as distance away from the Devils River increases (Figures 6.8 and 6.16). Interestingly, there is a possible relationship between rockshelters and open-air sites containing BRMs where the peak in rockshelter BRMs frequency is matched with a decrease in open-air BRMs (Figures 6.9 and 6.17). It is also an noteworthy pattern that the frequency and density trends for open-air BRMs and shelters without BRMs are very similar (Figures 6.13 and 6.21). In general, the trends within the frequency and density data for sites along DMC indicate more earth oven cooking was occurring as the distance away from the Devils River increases, and that the overall archaeological footprint increases in relation to distance from the Devils.

A pattern of more earth oven processing away from the Devils River was an unexpected pattern. Based on the view of prehistoric inhabitants being tethered to the major rivers for food, water, and shelter (e.g., Shafer 1986; Taylor 1964; Turpin 2004), I was expecting more sites located closer to the river than further away; especially BRM sites. More sites closer to the rivers would have followed Saunders' (1986, 1992) study of the lithics around Hinds Cave and Blue Hills where he inferred that as distance away from the Pecos River increased plant processing decreased.

However, the DMC study area is a rather small survey sample given the size of the entire Lower Pecos region, and it is possible that the patterns observed along Dead Man's Creek were outliers compared to the regional data set. Therefore, two questions

arise: how does the DMC site data compare to that of the rest of the Lower Pecos, and how does the site distribution and frequency data fit into prehistoric models of settlement patterns? Chapter 7 compares the DMC data to other areas within the Lower Pecos, and Chapter 8 provides the comparison to previous models of Lower Pecos settlement patterns.

**CHAPTER 7: COMPARISON OF THE DEAD MAN'S CREEK SITE
DISTRIBUTION DATA TO REGIONAL DATA FOR THE LOWER PECOS
CANYONLANDS**

To compare the Dead Man's Creek data and the regional site data to be made, the first challenge is to format both data sets so they are comparable. To accomplish this, site data needed to be combined from two complimentary sources: site spatial data acquired from TARL and the TexSite archaeological site forms from the Texas Archeological Site Atlas, hosted by the Texas Historical Commission (THC). These two data sets come in different forms, the spatial data from TARL is an ArcGIS shapefile, and the THC data are text delimited spreadsheets. The reason these two data sources must be combined is that the TARL spatial data is just that, spatial data; whereas the THC data has all other information regarding each specific site, but it has no spatial reference. Before any landscape analysis of site-type distribution can be carried out, these two data sets must be merged together. In order to analyze the regional site distribution data, I downloaded all of the THC data and received the TARL spatial data for Val Verde, Crockett, Edwards, Kinney, Sutton, and Terrell Counties.¹ All of these counties are within the 150 km radius defined for the region by Turpin (2004, 2010). The THC data, although it can be

¹ Data for this analysis was acquired in April 2012, and the TARL spatial data reflects all the sites that had been recorded as of that date, but the THC data reflects all the sites that had been recorded as of January 2012.

easily downloaded into a delimited text file, comes in a variety of different configurations based on the different versions of site forms used to record the sites. For instance, the THC data for Val Verde County was downloaded as 22 different text delimited spreadsheets.

Each different version of the TexSite form (or other survey forms) corresponds to a different delimited file. Each form contains substantial amounts of important information regarding site setting, description of location, artifacts collected/observed, etc. For this analysis, however, I only focused on two data fields that were similar across all site form versions: site type and site description (e.g., “rockshelter with midden deposit” or “burned rock midden” as examples of site types and “large rockshelter containing substantial midden deposit, dozens of chert flakes, and Pecos River style pictographs on the shelter wall” as an example of a site description). Thus, each delimited text file was converted into a Microsoft Excel 2010™ spreadsheet, and then all fields except for the Atlas Number, Trinomial, Site Type, and Site Description were deleted. Once all the different Excel spreadsheets contained identical data fields, all the Excel files for each county were combined together into six county spreadsheets.

After the county data was merged together, the next step in the process was deleting duplicate site forms from the list (any site that was recorded using different forms – including revisit forms – has duplicate data in the site atlas). This was done first by sorting the data by Atlas Number (not by Trinomial), and then going through site by site selecting the site record that contained the most information. For instance, if two records existed for site 41VV3064 and one said “midden” and the other said “burned rock midden located on an upland ridge,” the less detailed record would be deleted in favor of

the more detailed one. Once this was completed, the archaeological sites recorded in each county only had one entry for site type and one for site description. Next, the site type and site description fields were combined together into a third field using the Excel equation: =Cell#&" "&Cell#. Once the cells were merged together, I deleted the original site type and site description fields, leaving a single "Site Description" field for every site.

This new site description field provided the source data to begin assigning site types to all the recorded archaeological sites. Because the focus of this analysis is on comparing the distribution of burned rock middens observed within Dead Man's Creek to the larger regional data set, I wanted to identify these site types:

rockshelters/caves/overhangs, all sites containing burned rock middens, open-air burned rock middens, and rockshelters/caves/overhangs containing burned rock middens. Using the "Find" function in Excel, I searched for these key words within the new site description field: midden, talus, occupation, deposit, residential, habitation, shelter, cave, overhang, and alcove. If one of these words was present, Excel would return the character number within the cell that started each word. For instance, if the cell text read, "site is a midden located on a low stream terrace," and the Find function was searching for "midden," then Excel would return 11 because midden starts on the 11th character within the cell. Each Find operation required creating a new column in Excel.

Once the Find function was finished for all key words, I converted the numbers generated from the find into a simple binary system (1 present, 0 absent). I then combined the separate key word fields into two site categories (still using the binary identification system): midden (midden, talus, occupation, deposit, residential, and

habitation) and rockshelters (shelter, cave, overhang, and alcove). Finally, in order to determine whether a burned rock midden was located in a rockshelter or in an open air location, the two fields (midden and rockshelter) were added together: if the sum was 2, the site was a rockshelter containing a BRM, if the fields added to 1, then the site was an open-air BRM. Once this process was completed for all the sites within the six counties, all the site data was combined together into one large Excel spreadsheet containing the records for 3,758 archaeological sites. The next step was to link the newly created THC site type data with the TARL spatial data. To do this, the THC site data was loaded into ArcGIS, and the “Join” function was used to link the THC data with the TARL data. However, there are missing data within both datasets, resulting in a total of 4,043 sites recorded (3,625 having associated THC site-type data and the remaining 418 having no data other than site location) being plotted within the six county area (Figure 7.1).

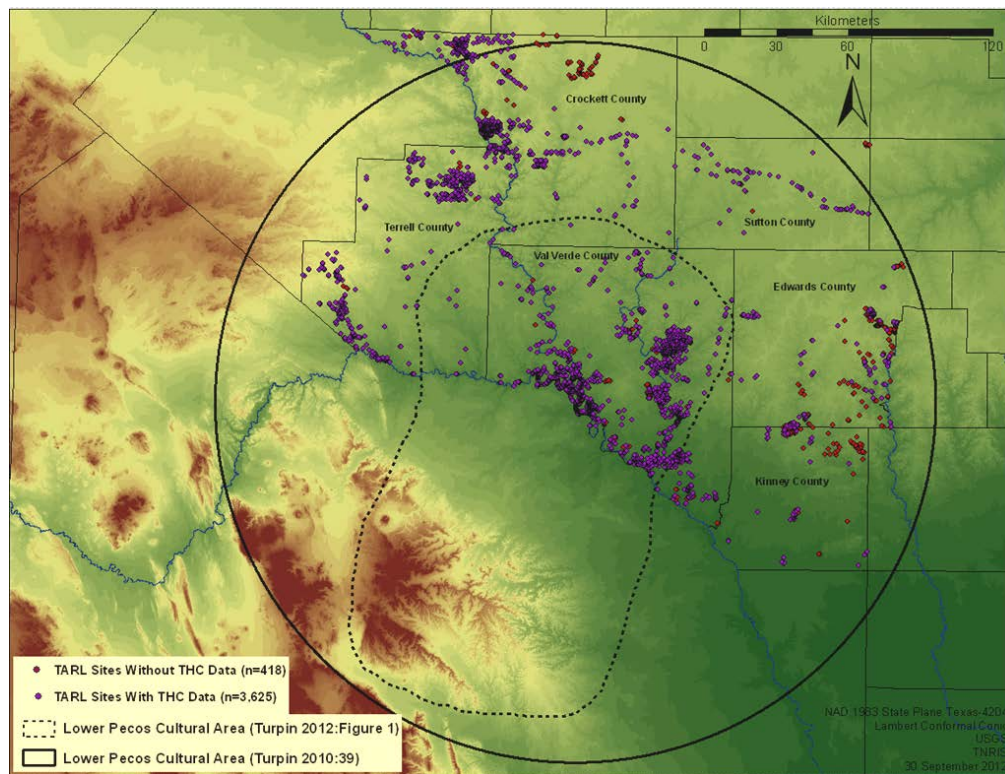


Figure 7.1. Distribution of archaeological sites recorded within Val Verde, Terrell, Crockett, Sutton, Edwards, and Kinney Counties. Site data from TARL and THC.

Sites that do not have both TARL data and THC data were not used in this analysis. An important note regarding extracting data using this methodology is that it will return false data. For instance, if Excel is searching for “midden,” and the site form says, “there is no midden at the site,” Excel will return a positive for midden at this site. Because of this inherent potential for errors using this method it is not a long term solution, but it is a faster and easier method than reading through each individual site form and recording information. Currently Elton Prewitt (personal communication, 2012) is working on compiling a more detailed site list for Val Verde County. Nonetheless, the site data available from TARL and the THC Site Atlas represent datasets that can be mined for additional information for use in landscape analyses.

Analysis of Burned Rock Midden Distribution within the Lower Pecos Region.

Defining the Region

The boundary for the Lower Pecos region is defined by the known extent of Pecos River style pictographs (Turpin 2004, 2010, 2012). However, the boundary for the pictograph style is constantly changing as additional survey data is added to the regional database. Turpin (2010:39) defines the region as encompassing an area within a 150 kilometer radius around the mouth of the Pecos River (Figure 7.1). More recently, Turpin (2012:Figure 1) draws the boundary for the region in roughly a 75 km radius around the mouth of the Pecos River on the Texas side, extending south into Coahuila approximately 150 kilometers from the Rio Grande (Figure 7.1).

The purpose of this study is not to define the Lower Pecos region, but instead to analyze how sites are distributed within the region. However, the 150 kilometer

boundary extends well into the Edwards Plateau to the northeast and east, the Gulf Coastal Plain to the southeast, the southern Plains to the north, and the Trans-Pecos to the west. Likewise, the smaller regional boundary barely includes any area outside of Val Verde County, and even excludes the eastern portion of Lake Amistad. For this analysis the two boundaries are either too inclusive or too exclusive. Thus, I decided to include all the sites within 100 kilometers of the mouth of the Pecos River (Figure 7.2). This 100-kilometer radius study area effectively splits the difference between the boundaries proposed by Turpin (2010, 2012).

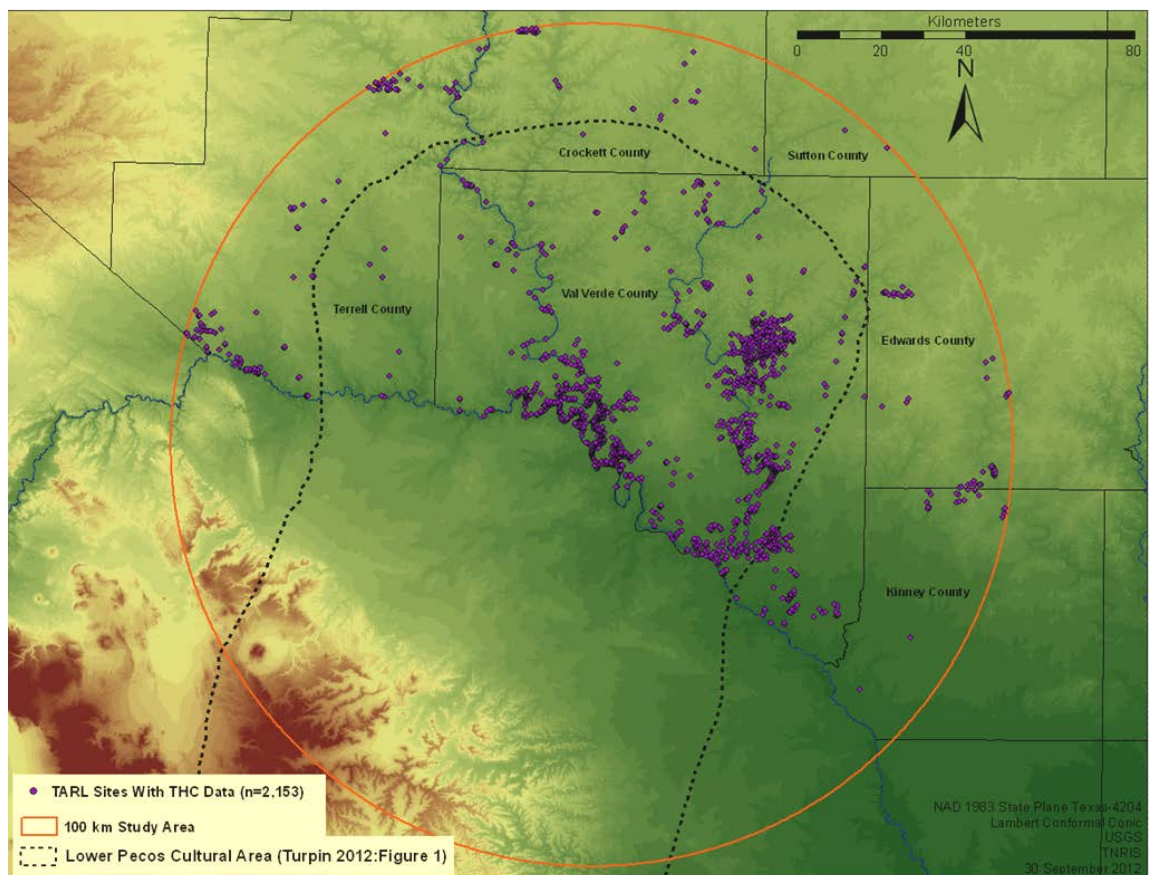


Figure 7.2. Distribution of archaeological sites within 100 kilometers of the confluence of the Pecos and Rio Grande Rivers. Site data from TARKL and THC.

Analyzing Regional Site Distribution: Buffer Analysis

As with the Dead Man's Creek survey data, the first step in analyzing the site distribution is to create the stream buffers. These were created in the same way that the Devils River buffers were made, and the flow diagram is provided in Figure 7.3. In addition to the 1 – 10 kilometer increments, an additional >10 category was created. Table 7.1 provides a tabular summary of the regional site data. The Lower Pecos regional data was analyzed in the same way as the DMC data: frequency of all sites is provided in Figure 7.4, frequency of rockshelters versus open-air sites (Figure 7.5), frequency of all burned rock middens (Figure 7.6), frequency of sheltered versus open-air BRMs (Figure 7.7), frequency of rockshelters with and without BRMs (Figure 7.8), frequency of open-air sites with and without BRMs (Figure 7.9), the frequency of shelter BRMs versus non-BRM open-air sites, and the frequency of open-air BRM sites versus shelters without BRMs. Table 7.2 provides a tabular summary of the site frequency data.

Table 7.1. Archaeological Sites Recorded Within 100 kilometers of the Confluence Between the Pecos and Rio Grande Rivers								
Distance From Major River	Site Types Used in this Analysis							
	All Archaeological Sites	All Rockshelters	All Open-Air Sites	All BRMs	Shelter BRMs	Shelters w/o BRMs	Open-air BRMs	Open-air w/o BRMs
0-1	940	527	413	549	369	158	180	233
1-2	189	81	108	100	51	30	49	59
2-3	147	53	94	71	31	22	40	54
3-4	119	43	76	67	24	19	43	33
4-5	107	40	67	56	26	14	30	37
5-6	75	19	56	30	10	9	20	36
6-7	73	10	63	31	3	7	28	35
7-8	75	10	65	32	4	6	28	37
8-9	79	27	52	41	11	16	30	22
9-10	59	10	49	22	4	6	18	31
>10	290	58	232	144	38	20	106	126
Totals	2153	878	1275	1143	571	307	572	703

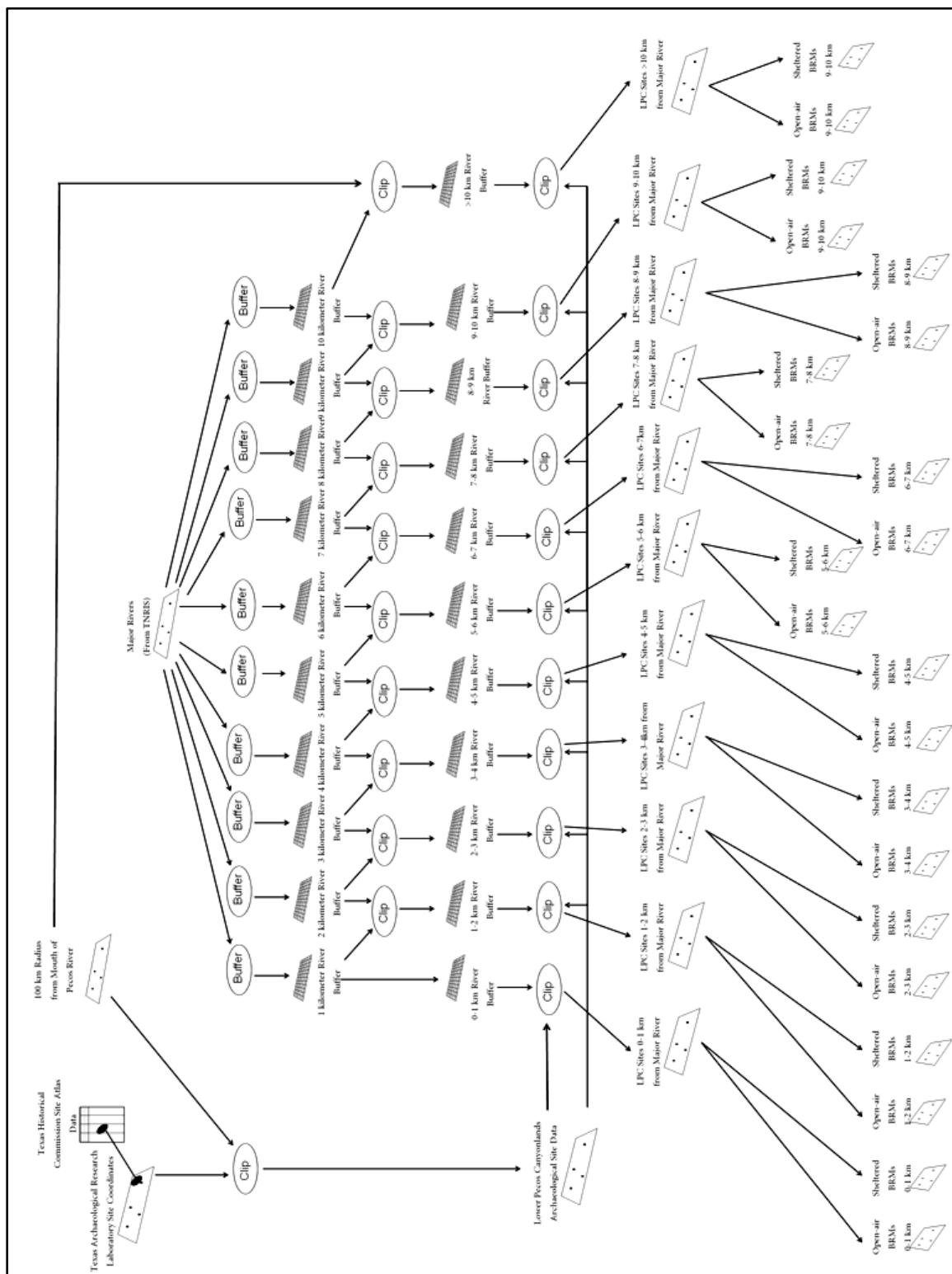


Figure 7.3. Flow diagram of the process of generating stream buffers and site distribution data for archaeological sites recorded within 100 km of the confluence of the Pecos and Rio Grande Rivers.

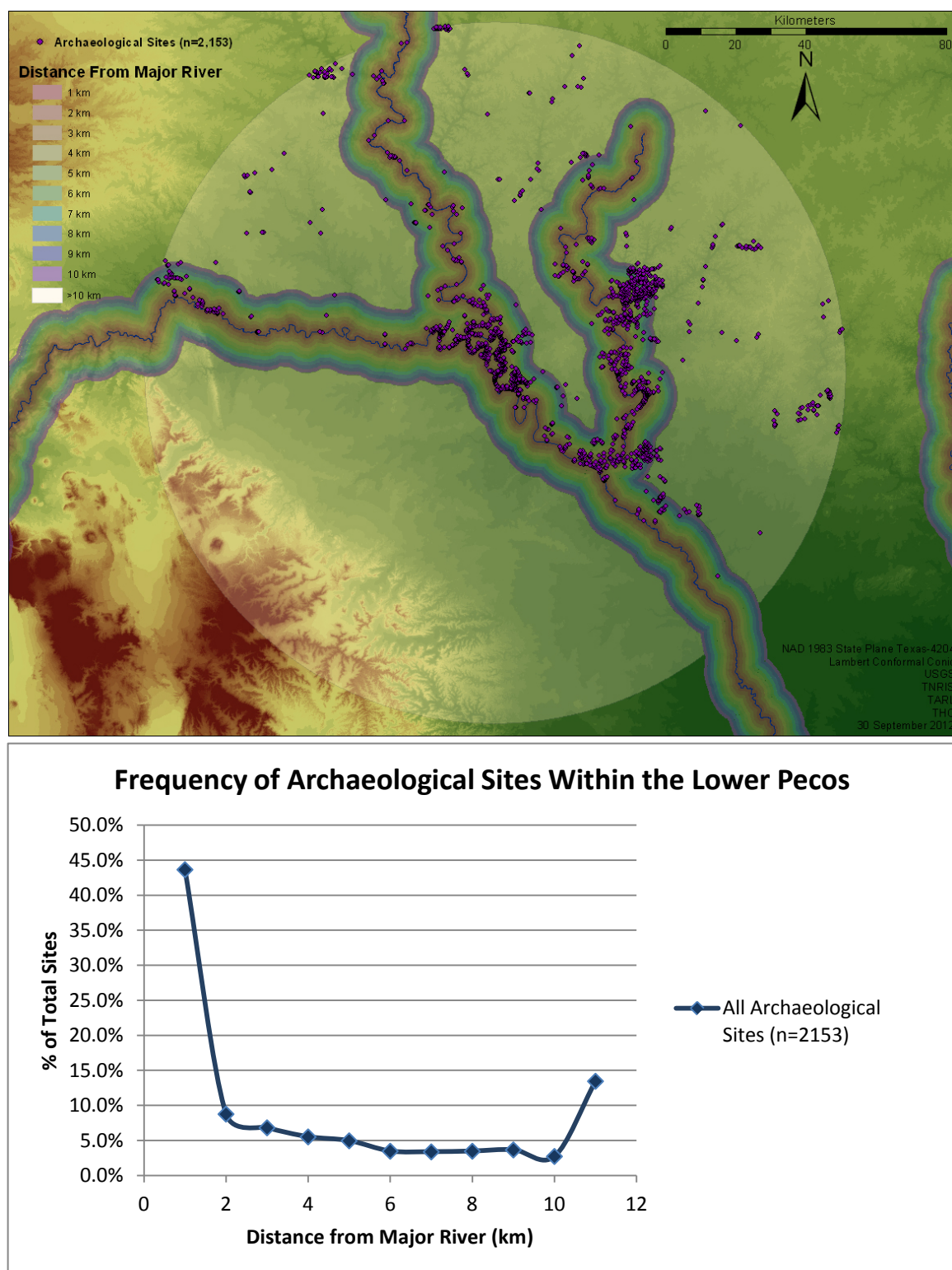


Figure 7.4. Frequency of archaeological sites within the 100-km radius study area: (top) map showing the distribution of all sites and the buffers around the major rivers and (bottom) a line graph illustrating the number of sites in relation to proximity to major rivers.

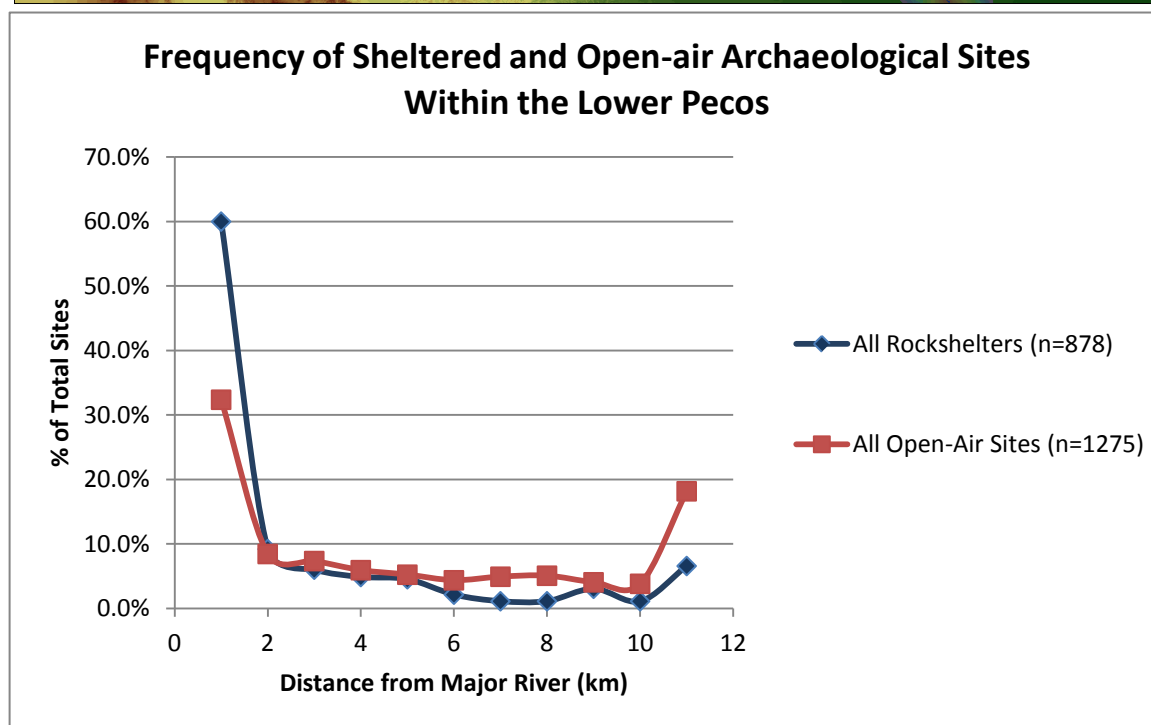
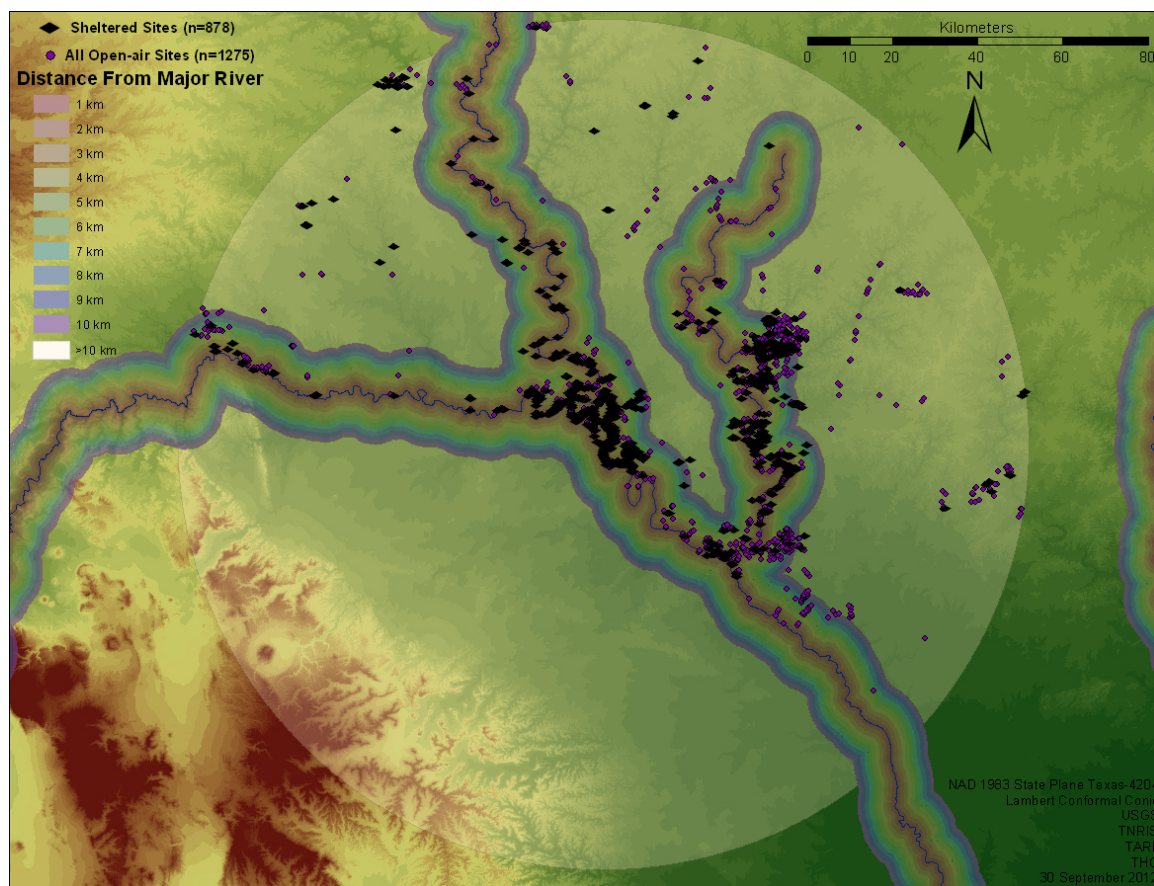


Figure 7.5. Frequency of sheltered and open-air archaeological sites within the 100-km radius study area: (top) map showing the distribution of all sites and the buffers around the major rivers and (bottom) a line graph illustrating the number of sites in relation to proximity to major rivers.

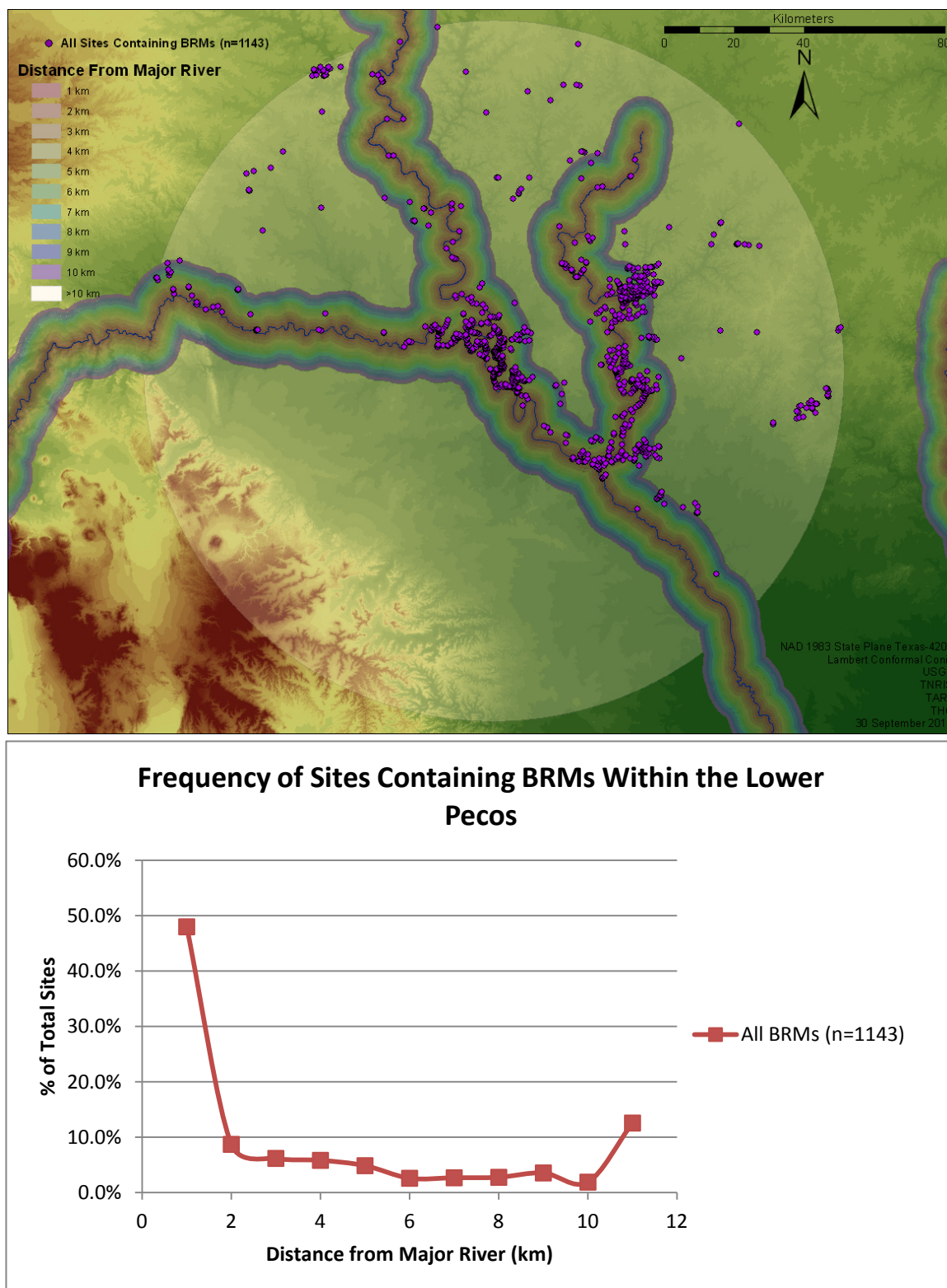


Figure 7.6. Frequency of all sites containing burned rock middens within the 100-km radius study area: (top) map showing the distribution of all burned rock midden sites and the buffers around the major rivers and (bottom) a line graph illustrating the number of burned rock midden sites in relation to proximity to major rivers.

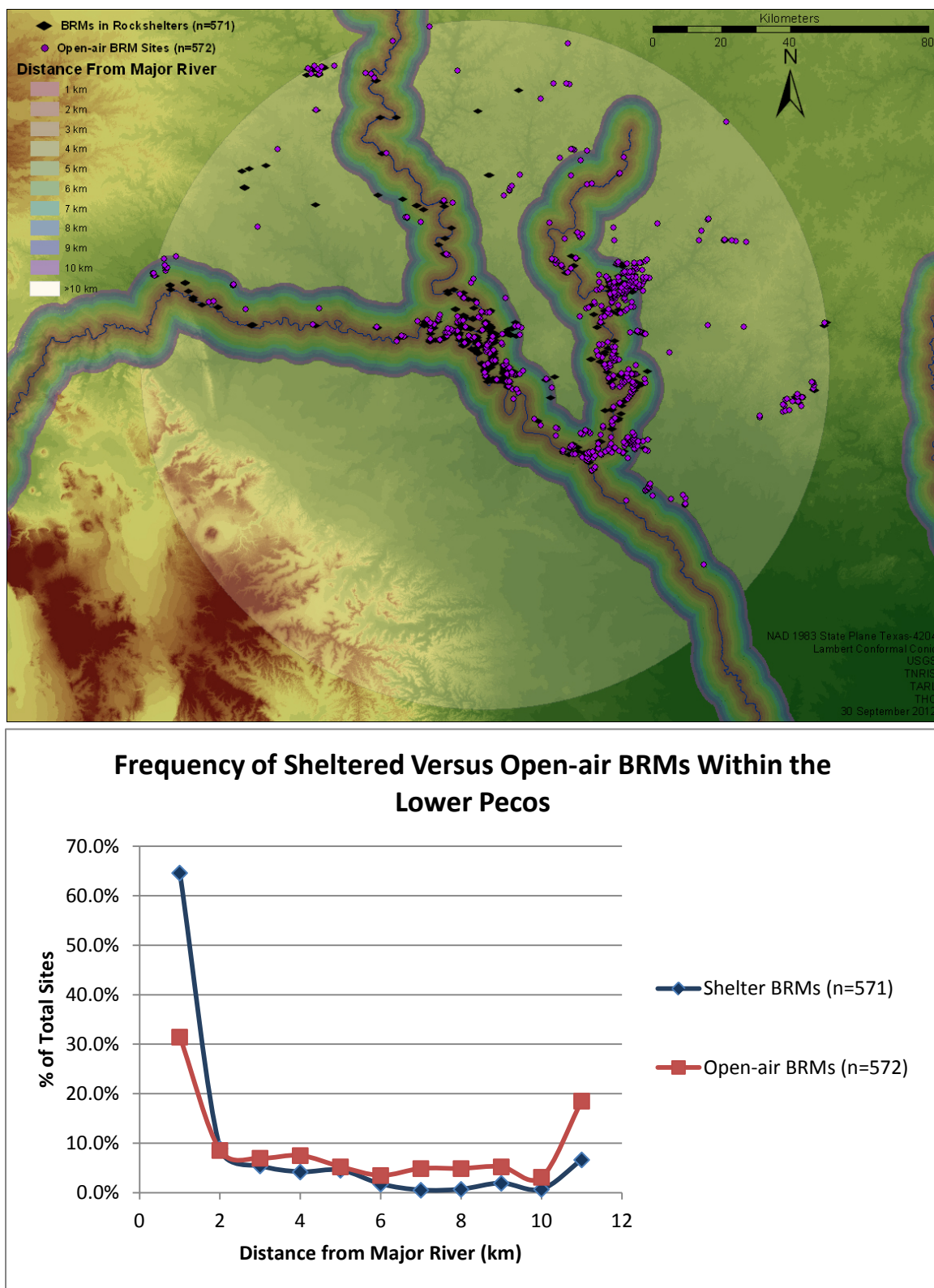


Figure 7.7. Frequency of all rockshelter BRMs and open-air BRMs within the 100-km radius study area: (top) map showing the distribution of rockshelter and open-air BRM sites and the buffers around the major rivers and (bottom) a line graph illustrating the number of sheltered and open-air burned rock midden sites in relation to proximity to major rivers.

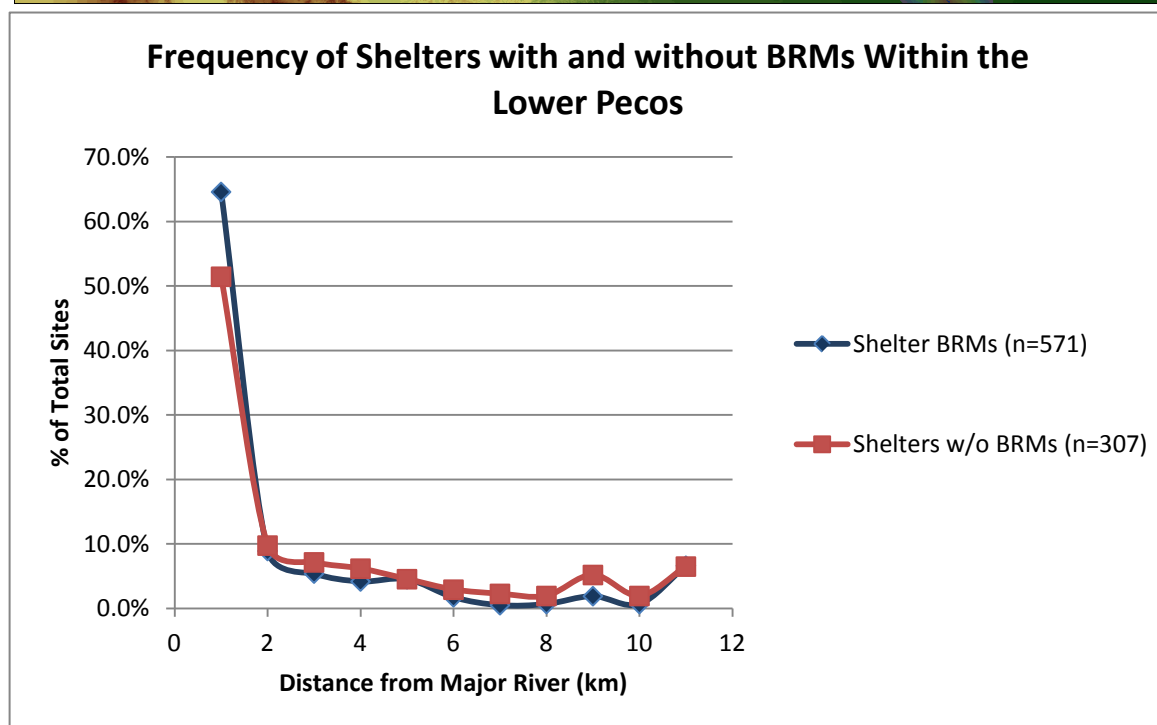
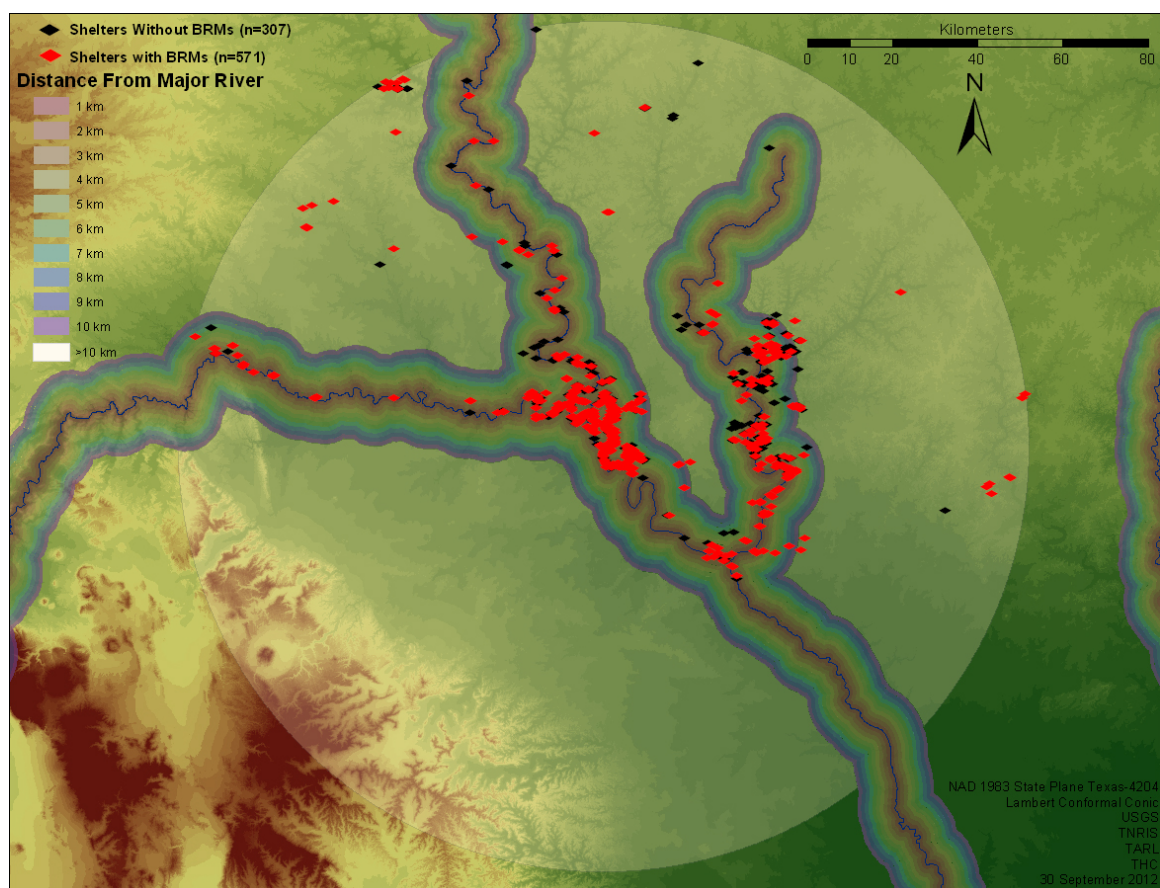


Figure 7.8. Frequency of all rockshelters with and without BRMs within the 100-km radius study area: (top) map showing the distribution of rockshelters and the buffers around the major rivers and (bottom) a line graph illustrating the number of shelters with and without BRMs in relation to proximity to major rivers.

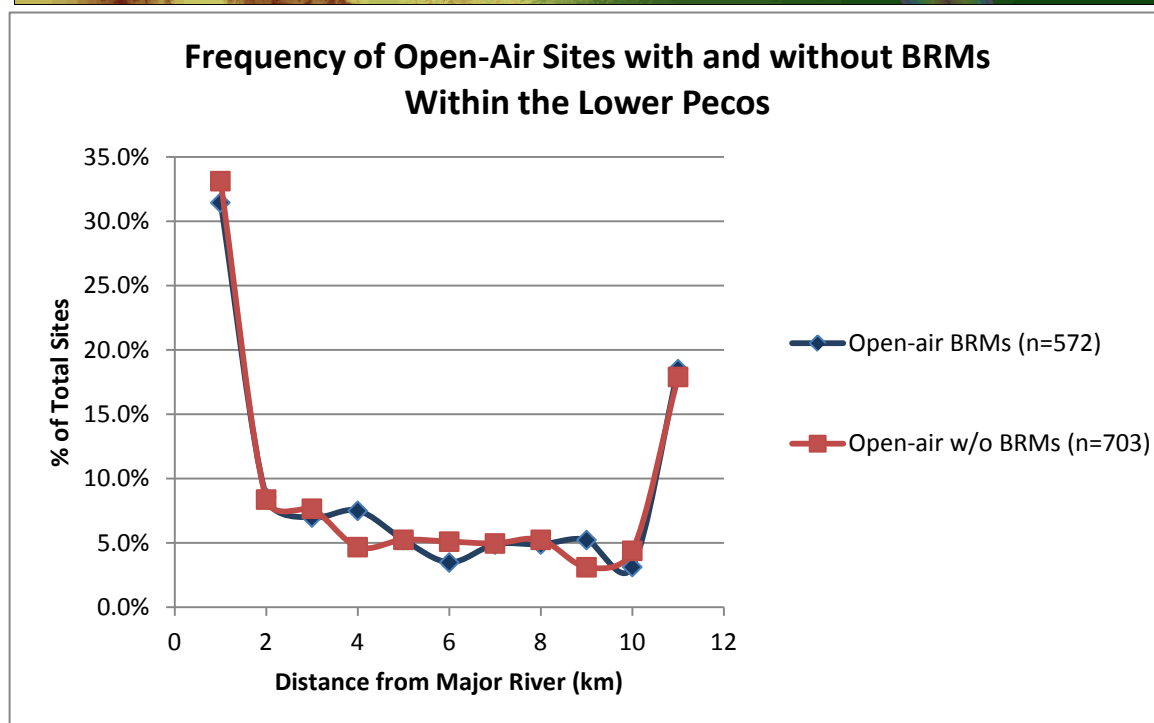
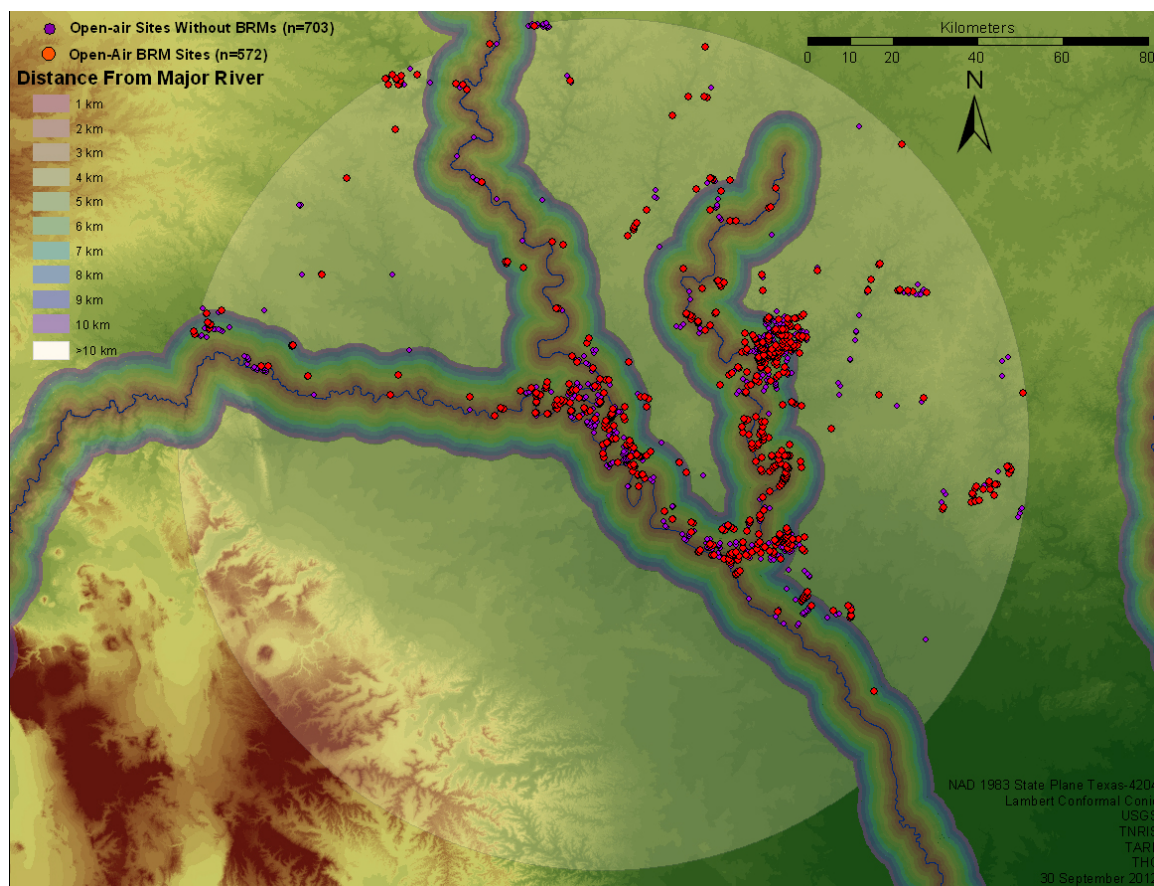


Figure 7.9. Frequency of all open-air sites with and without BRMs within the 100-km radius study area: (top) map showing the distribution of open-air sites and the buffers around the major rivers and (bottom) a line graph illustrating the number of open-air sites with and without BRMs in relation to major rivers.

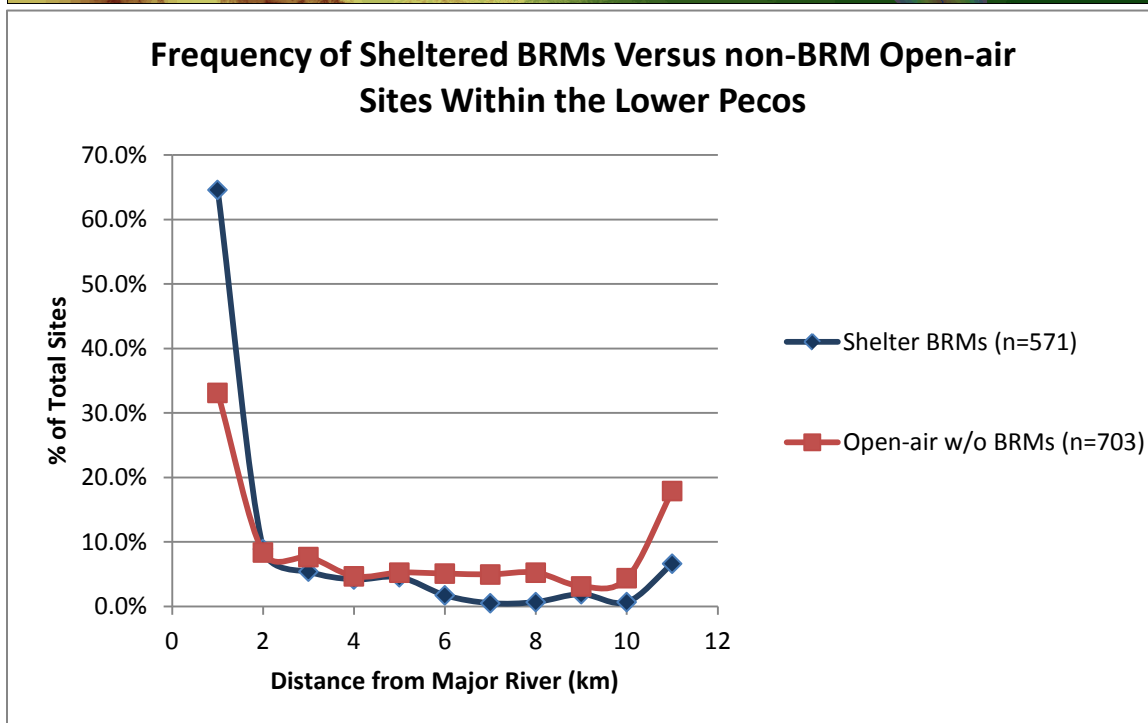
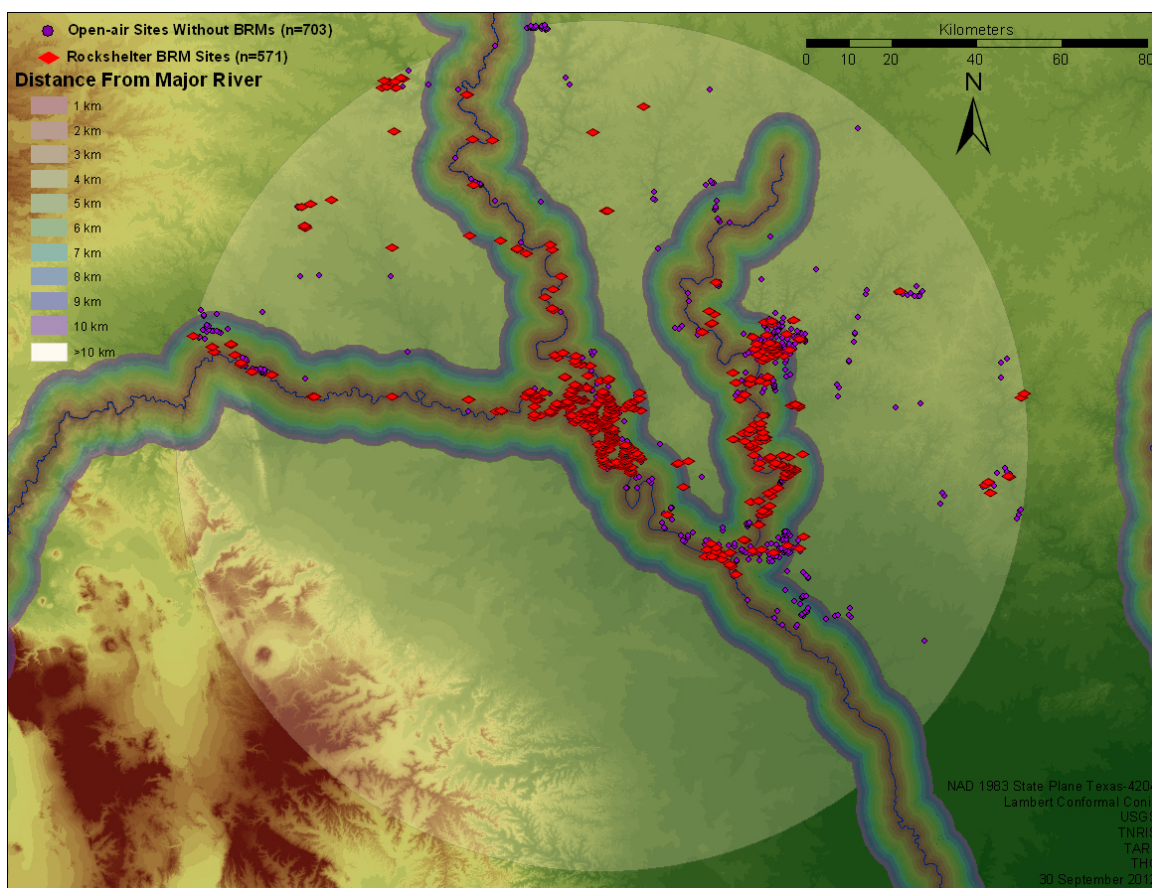


Figure 7.10. Frequency of all sheltered BRMs and non-BRM open-air sites within the 100-km radius study area: (top) map showing the distribution of sites and the buffers around the major rivers and (bottom) a line graph illustrating the frequency of sites in relation to major rivers.

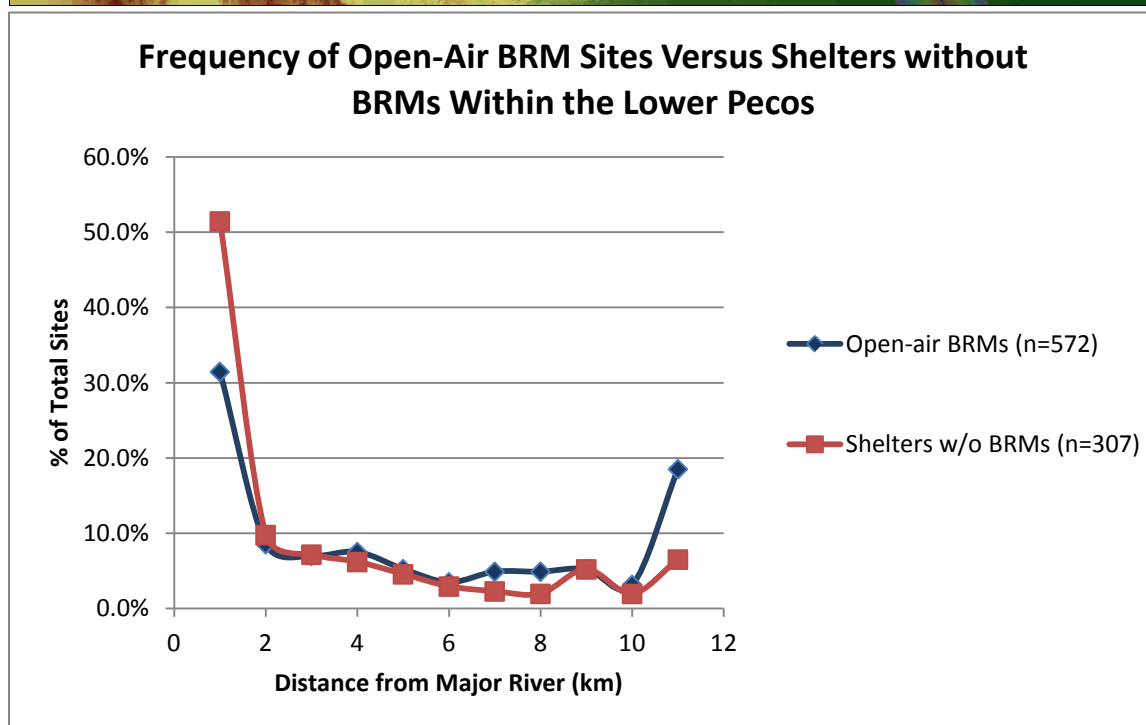
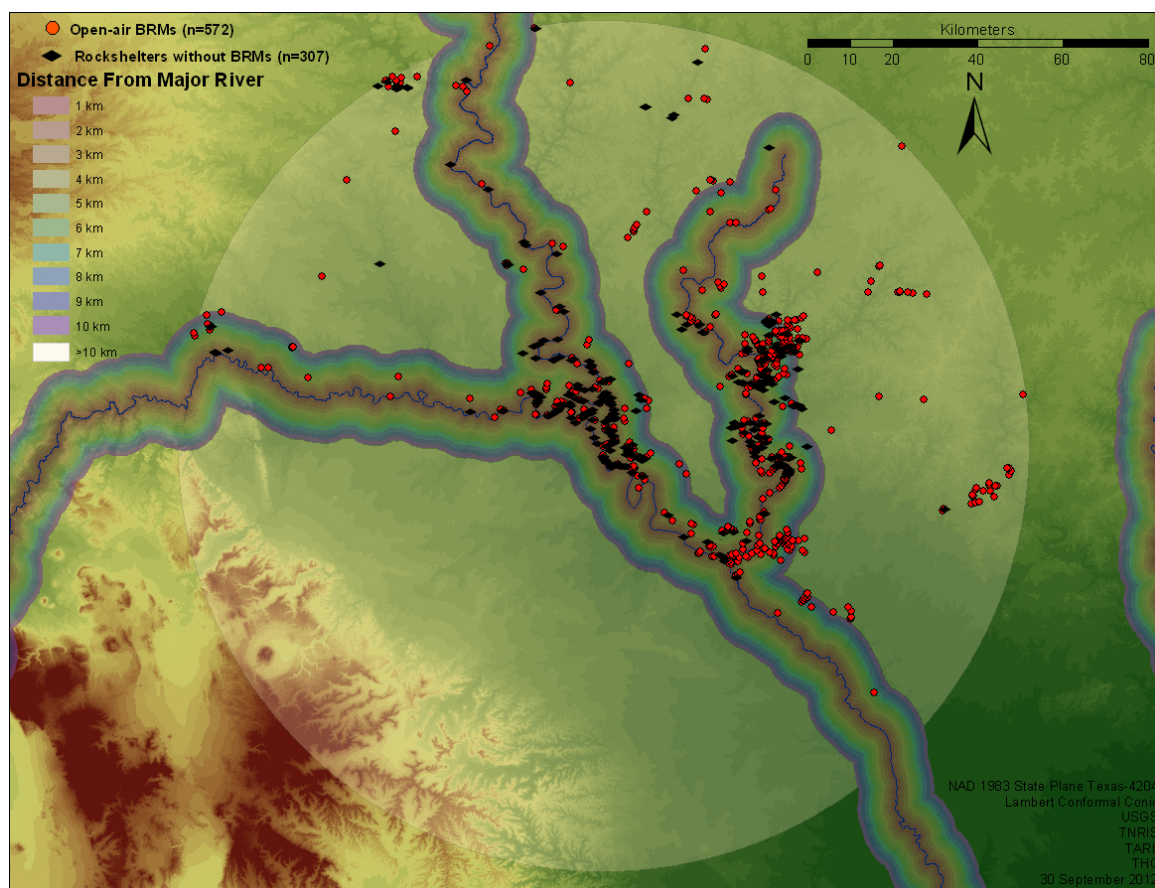


Figure 7.11. Frequency of all open-air BRMs and shelters without BRMs within the 100-km radius study area: (top) map showing the distribution of sites and the buffers around the major rivers and (bottom) a line graph illustrating the frequency sites in relation to major rivers.

Table 7.2. Frequency of Archaeological Sites Recorded Within 100 kilometers of the Confluence Between the Pecos and Rio Grande Rivers								
Distance From Major River	Site Types Used in this Analysis							
	All Archaeological Sites	All Rockshelters	All Open-Air Sites	All BRMs	Shelter BRMs	Shelters w/o BRMs	Open-air BRMs	Open-air w/o BRMs
0-1	43.7%	60.0%	32.4%	48.0%	64.6%	51.5%	31.5%	33.1%
1-2	8.8%	9.2%	8.5%	8.7%	8.9%	9.8%	8.6%	8.4%
2-3	6.8%	6.0%	7.4%	6.2%	5.4%	7.2%	7.0%	7.7%
3-4	5.5%	4.9%	6.0%	5.9%	4.2%	6.2%	7.5%	4.7%
4-5	5.0%	4.6%	5.3%	4.9%	4.6%	4.6%	5.2%	5.3%
5-6	3.5%	2.2%	4.4%	2.6%	1.8%	2.9%	3.5%	5.1%
6-7	3.4%	1.1%	4.9%	2.7%	0.5%	2.3%	4.9%	5.0%
7-8	3.5%	1.1%	5.1%	2.8%	0.7%	2.0%	4.9%	5.3%
8-9	3.7%	3.1%	4.1%	3.6%	1.9%	5.2%	5.2%	3.1%
9-10	2.7%	1.1%	3.8%	1.9%	0.7%	2.0%	3.1%	4.4%
>10	13.5%	6.6%	18.2%	12.6%	6.7%	6.5%	18.5%	17.9%
Totals	2153	878	1275	1143	571	307	572	703

Based on the distribution of sites within the Lower Pecos in respect to the major rivers, there is a heavy concentration of sites adjacent to the major river canyons. Of the 2,153 total archaeological sites, 940 (43.7%) are located within 1 kilometer of a major river; 1,129 sites (52.4%) are located within 2 kilometers of a major river; 1,276 (59.2%) are located within 3 kilometers of a major river; and 1,502 (69.7%) are located within 5 kilometers of a major river (Table 7.2). This distribution pattern concentrated around the major river canyons is strikingly different than the patterns observed in Dead Man's Creek data (Chapter 6), indicating either the DMC data is an outlier, or that the combined regional data set is heavily biased towards the areas directly adjacent to the main river canyons.

Figure 7.12 plots the locations of large survey areas within the Lower Pecos against the same river buffers. Biases within the regional data reflect where surveys have been conducted. Based on the 10 kilometer river buffers, the only survey area that lies entirely beyond the 10 kilometers from a river is Saunders' (1986) Blue Hills study area.

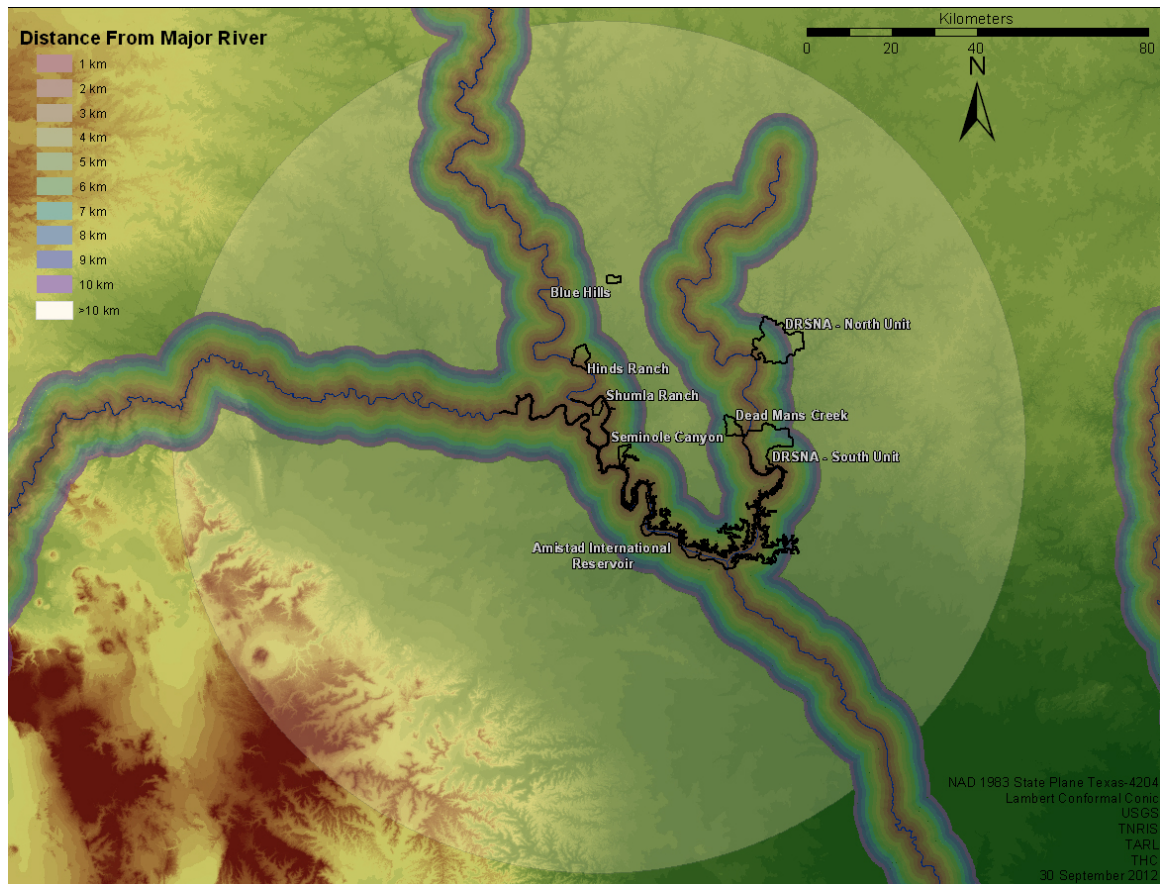


Figure 7.12. Location of major survey areas within the Lower Pecos in relation to the 10-kilometer river buffers.

Unfortunately, because Saunders did not formally record any of the sites he found, we have no comparable site data from this distant source. Because all of the other surveys conducted in the region have focused on areas adjacent to the major river canyons, the data set for the Lower Pecos is heavily biased toward the major river canyons. Because of the regional survey bias, it is not possible to meaningfully compare the DMC data to the entire regional dataset; however, it is possible to compare the distribution patterns within Dead Man's Creek to other smaller survey areas within the region.

Analysis of Site Distribution Patterns Within Two Texas Parks and Wildlife Department Properties in the Lower Pecos Canyonlands.

As noted in Chapter 3, two state managed properties within the Lower Pecos region have received substantial amounts of archaeological survey. Seminole Canyon was intensively surveyed by Turpin (1982). Devils River State Natural Area – North Unit (DRSNA-NU) was surveyed by Marmaduke and Whitsett (1975) and Turpin (Turpin and Davis 1993). In addition to the sites within the boundaries of the TPWD properties, some sites directly adjacent to the parks are also included in the distribution analysis, as explained below. This section first presents the site frequency and density data for Seminole Canyon and DRSNA-NU. The two TPWD properties are then compared to DMC to determine if the trends observed along DMC exist in other areas of the region.

Seminole Canyon State Park and Historic Site

Buffer Analysis. Seminole Canyon is a tributary to the Rio Grande, and is located just downstream of the confluence between the Rio Grande and Pecos (Figure 7.8). The Seminole Canyon survey data represents the most unbiased dataset available from an area not adjacent to the Devils River. The same river buffers used for the regional analysis were used to generate the distribution patterns within Seminole Canyon. Sites recorded within the drainage basin of Seminole Canyon were used in this analysis (Figure 7.9). Table 7.2 provides a tabular summary of the sites recorded within Seminole Canyon. The frequency of all sites relative to the major rivers (in this case both the Pecos and Rio

Grande) is provided in Figures 7.14, 7.15, 7.16, 7.17, 7.18, 7.19, 7.20, and 7.21. A tabular summary of the frequency data is provided in Table 7.4.

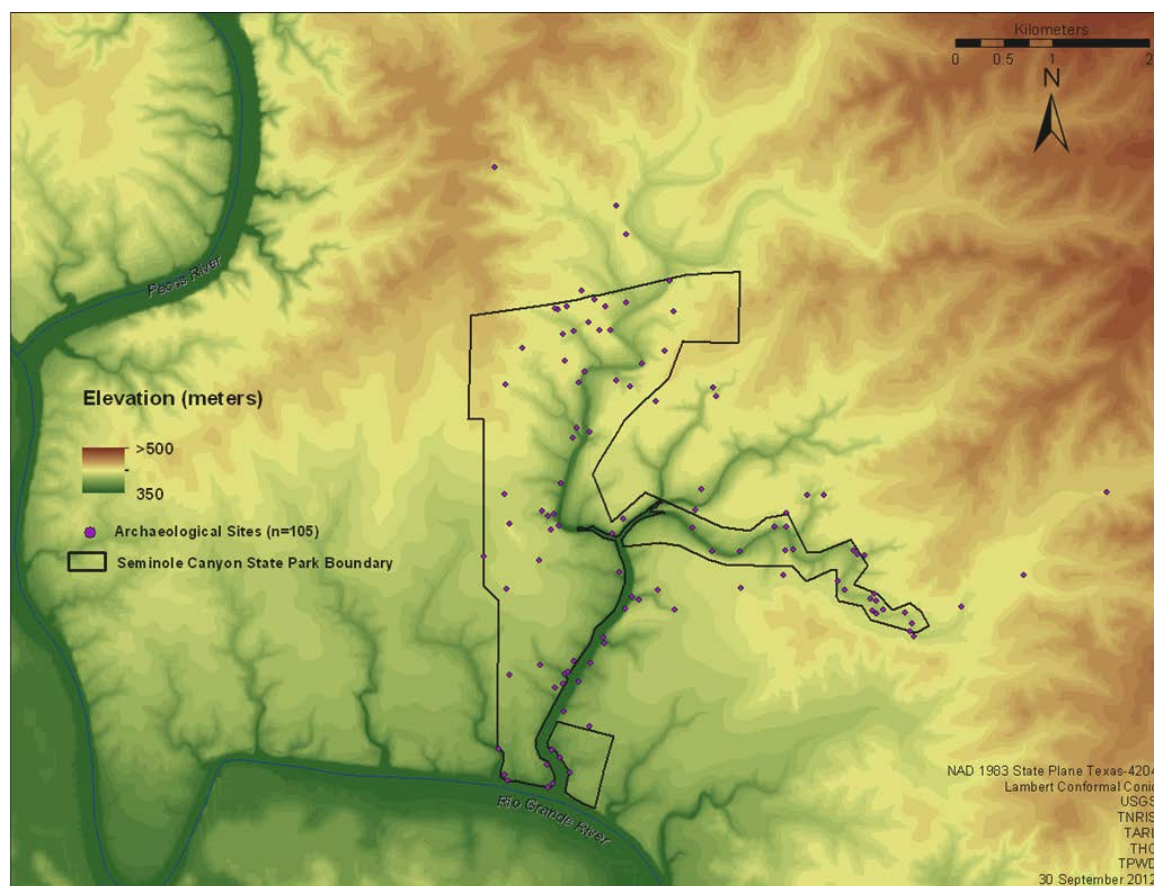


Figure 7.13. Archaeological sites distributed within Seminole Canyon State Park and Historic Site.

Table 7.3. Archaeological Sites Recorded Along Seminole Canyon								
Distance From Major Rivers (km)	Site Types Used in this Analysis							
	All Sites	All Rockshelters	All Open- air Sites	All BRMs	Shelter BRMs	Shelters w/o BRMs	Open-air BRMs	Open-air w/o BRMs
0-1	11	8	3	5	5	3	0	3
1-2	11	4	7	4	4	0	0	7
2-3	17	6	11	7	5	1	2	9
3-4	31	14	17	14	8	6	6	11
4-5	31	17	14	18	12	5	6	8
5-6	3	1	2	1	0	1	1	1
6-7	1	0	1	1	0	0	1	0
Totals	105	50	55	50	34	16	16	39

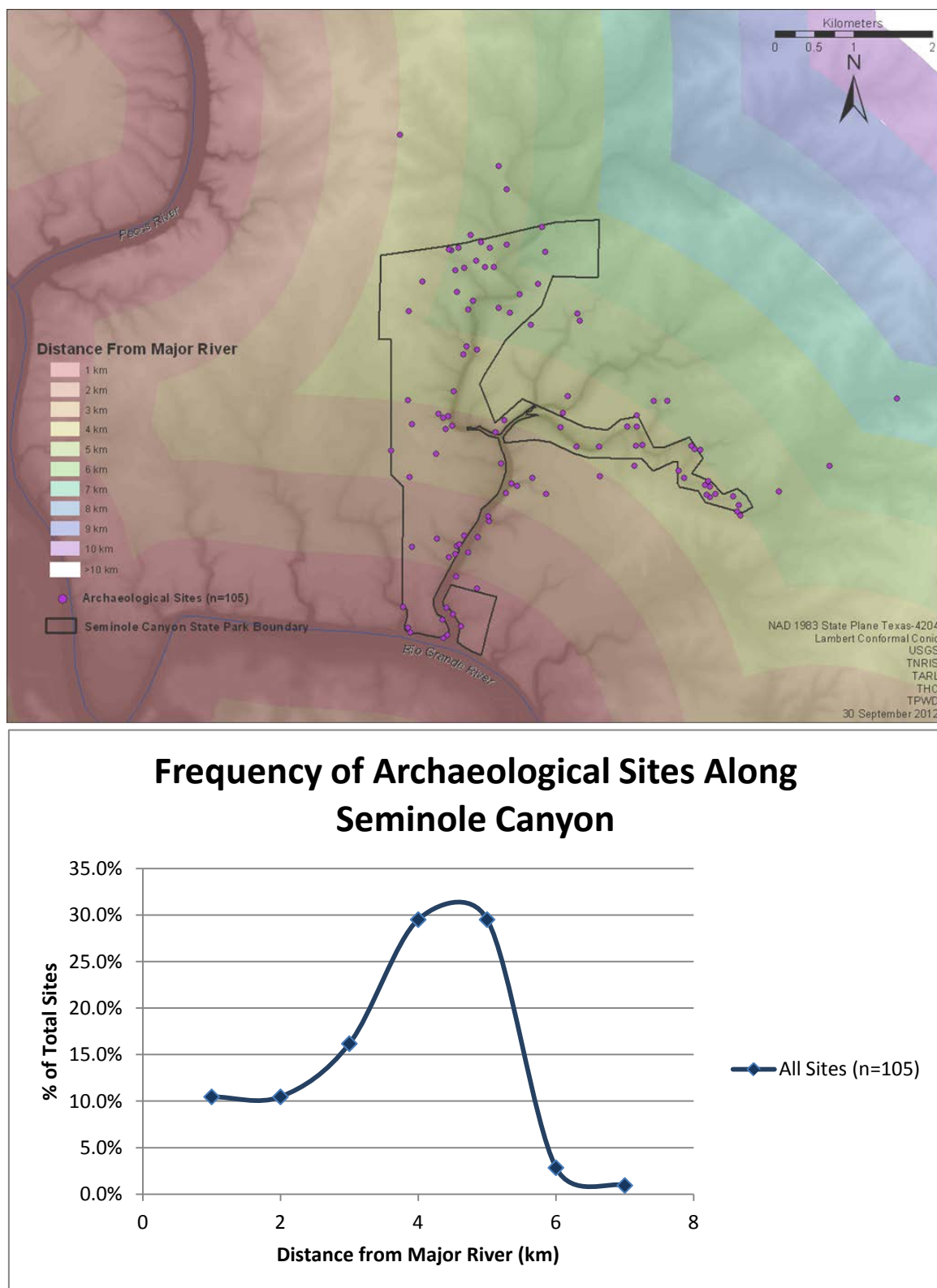


Figure 7.14. Frequency of all archaeological sites along Seminole Canyon: (top) map showing locations of sites and the river buffers extending from the Rio Grande and Pecos, and (bottom) a line graph showing site frequency in relation to distance from major rivers.

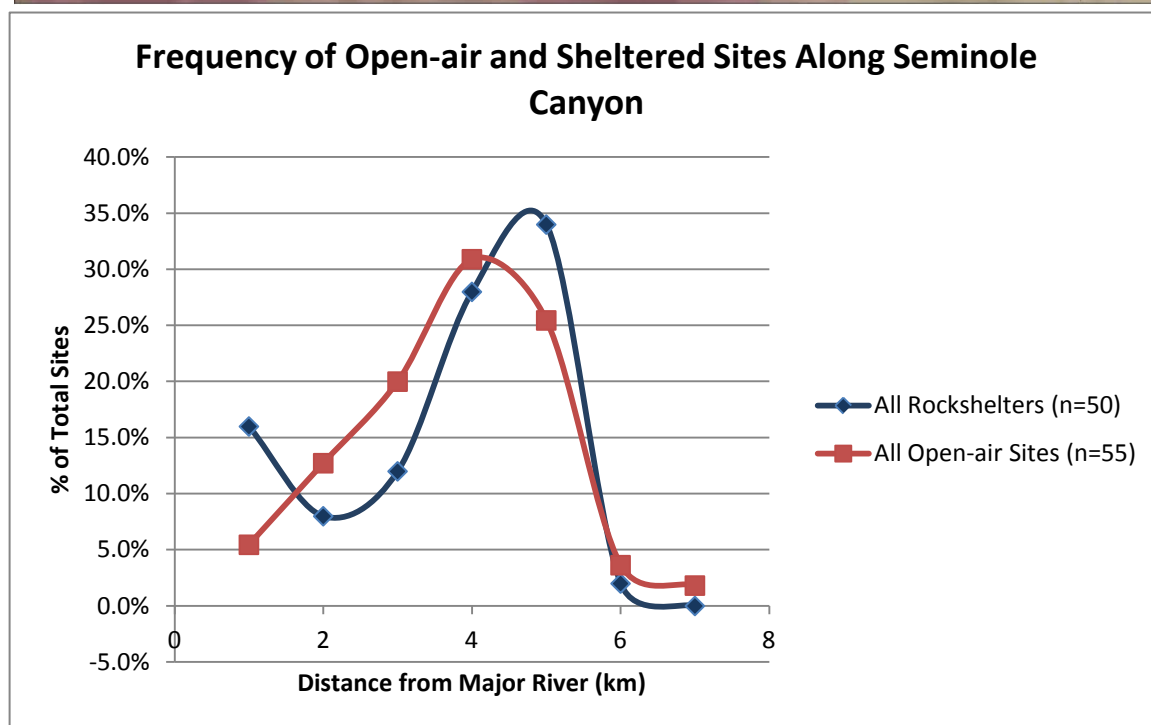
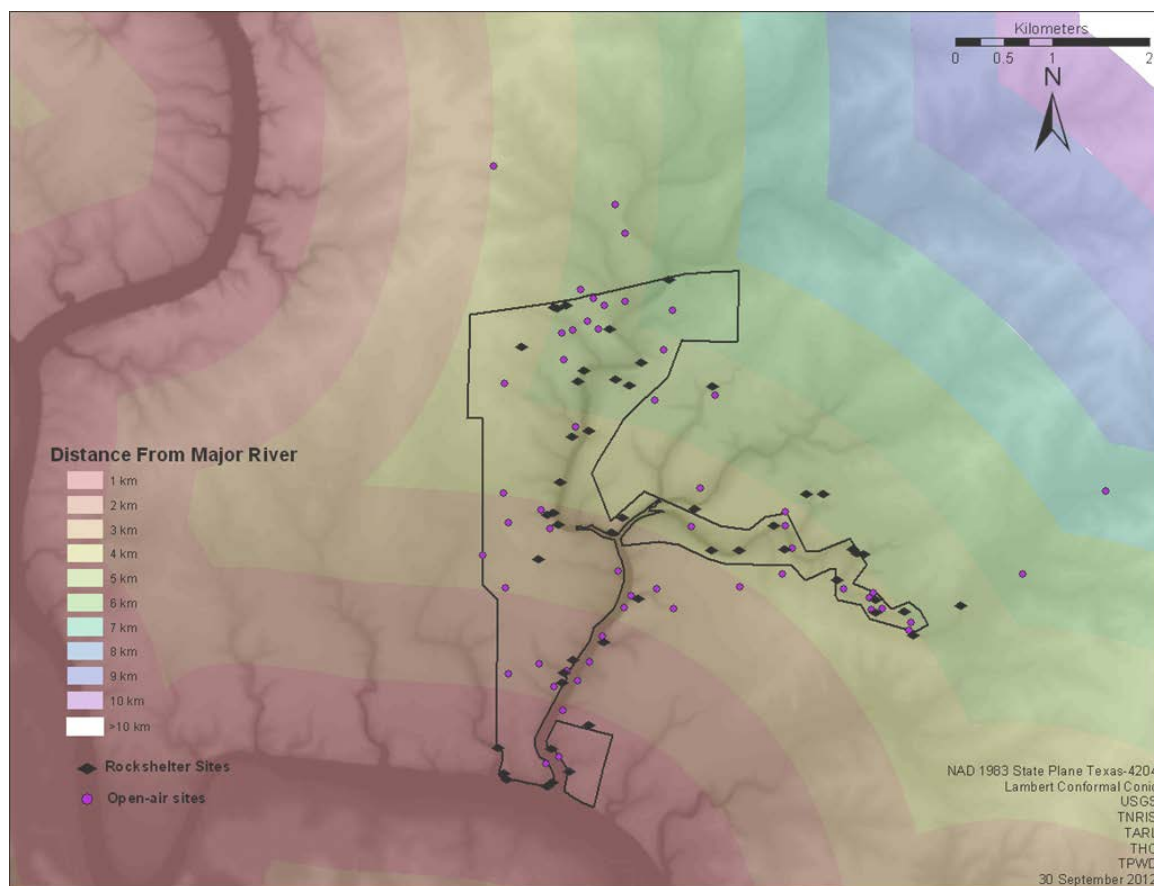


Figure 7.15. Frequency of all open-air and sheltered sites along Seminole Canyon: (top) map showing locations of sites and the river buffers extending from the Rio Grande and Pecos, and (bottom) a line graph showing site frequency in relation to distance from major rivers.

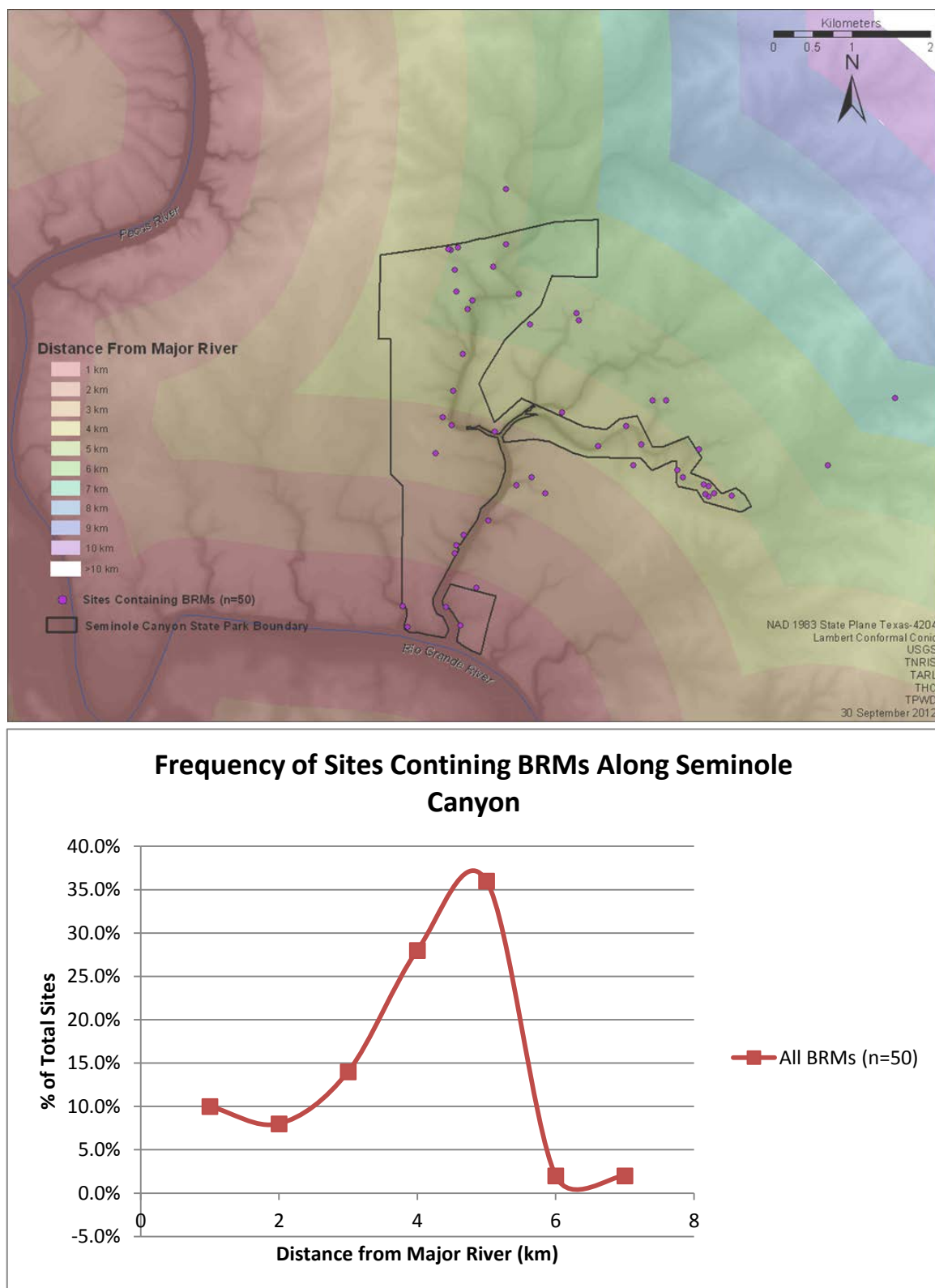


Figure 7.16. Frequency of all sites containing burned rock middens along Seminole Canyon: (top) map showing locations of burned rock midden sites and the river buffers extending from the Rio Grande and Pecos, and (bottom) a line graph showing BRM site frequency in relation to distance from major rivers.

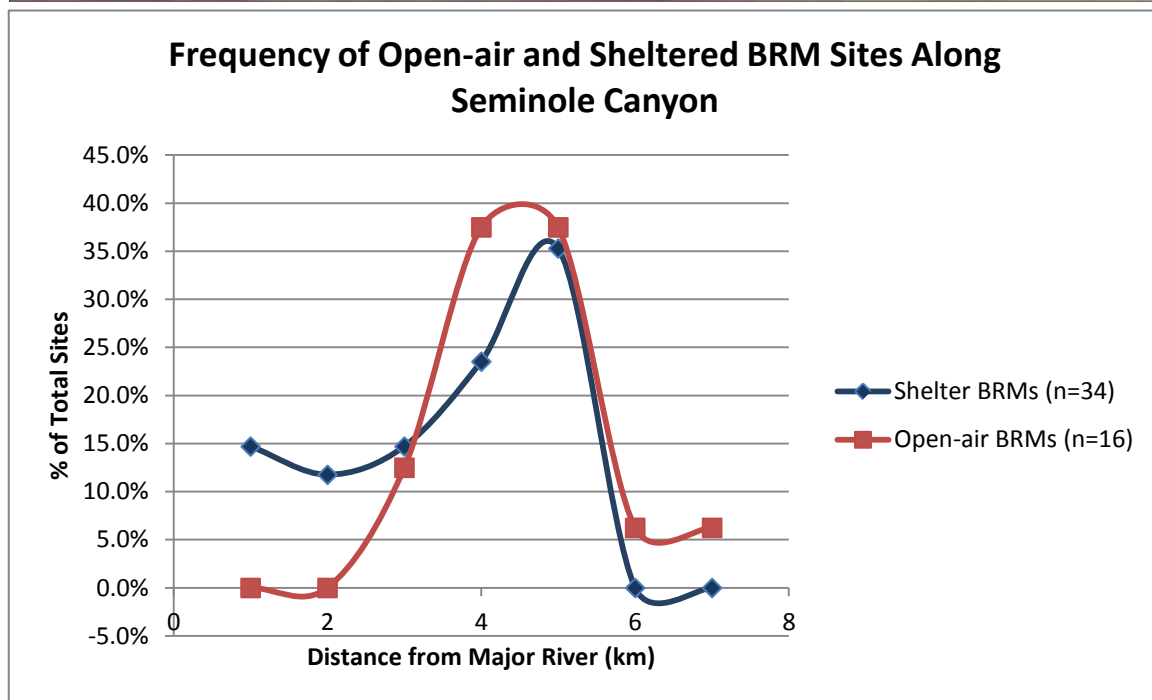
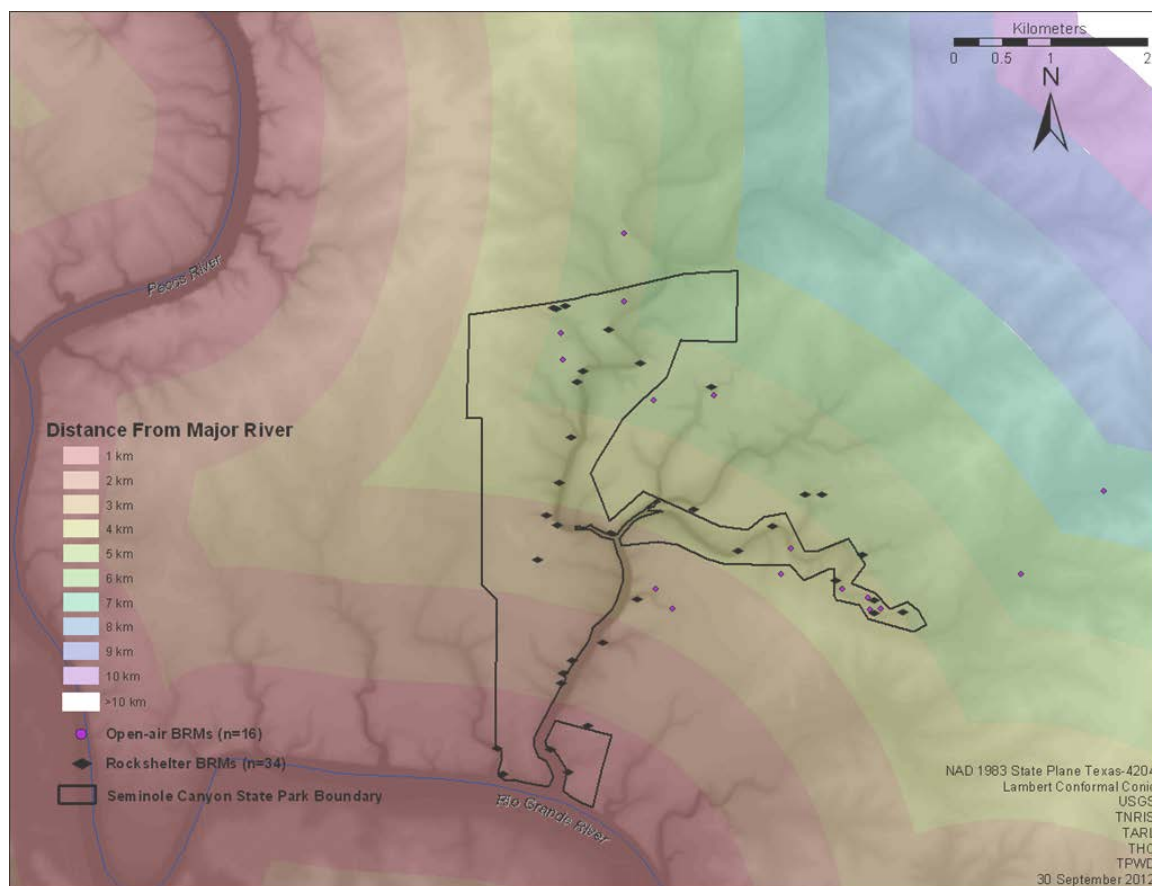


Figure 7.17. Frequency of open-air and sheltered BRM sites along Seminole Canyon: (top) map showing locations of sheltered and open-air BRM sites and the river buffers extending from the Rio Grande and Pecos, and (bottom) a line graph showing sheltered and open-air BRM site frequency in relation to distance from major rivers.

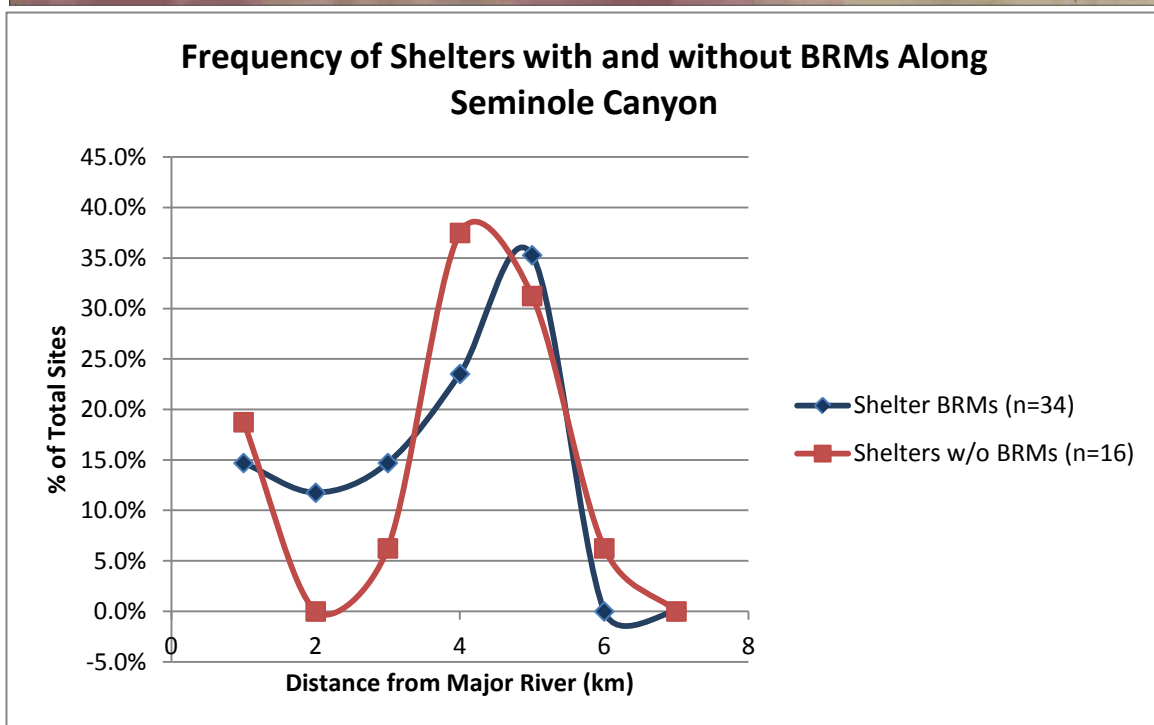
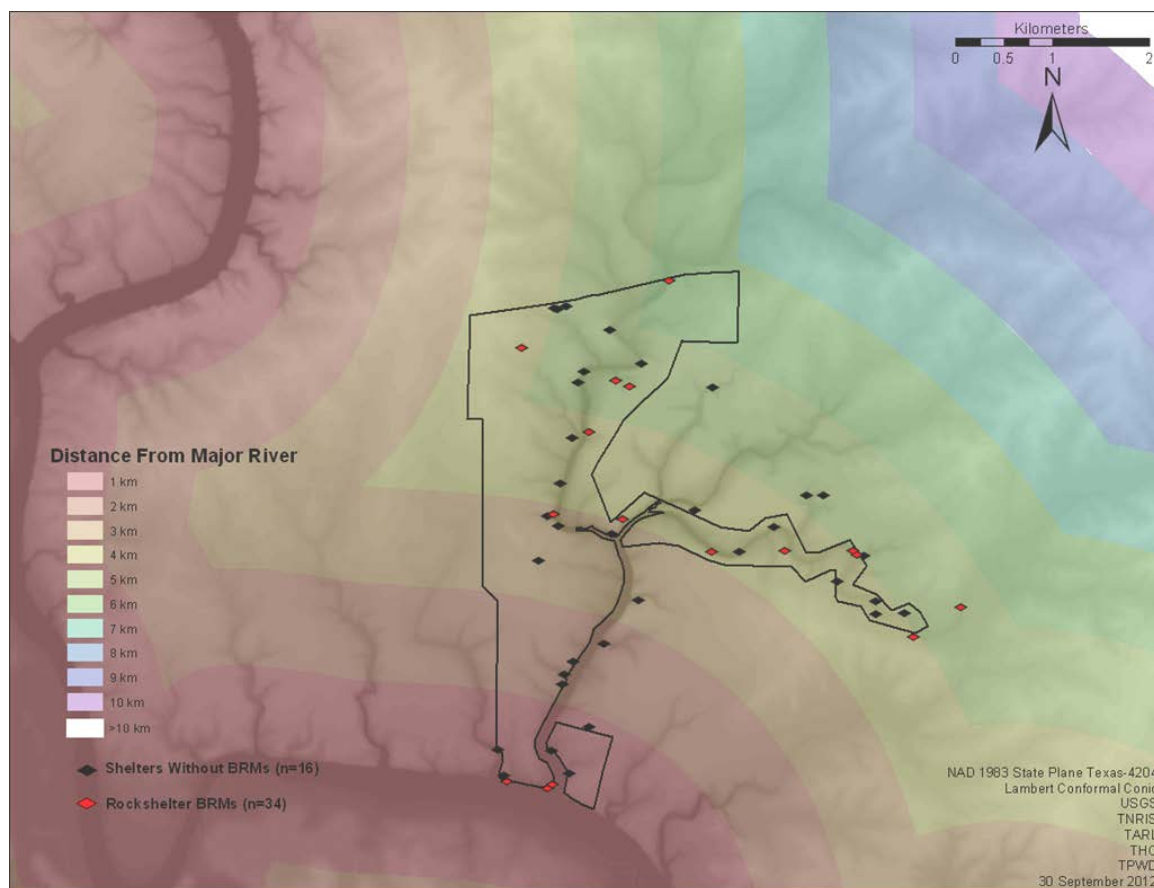


Figure 7.18. Frequency of shelters with and without BRMs along Seminole Canyon: (top) map showing locations of sites and the river buffers extending from the Rio Grande and Pecos, and (bottom) a line graph showing site frequency in relation to distance from major rivers.

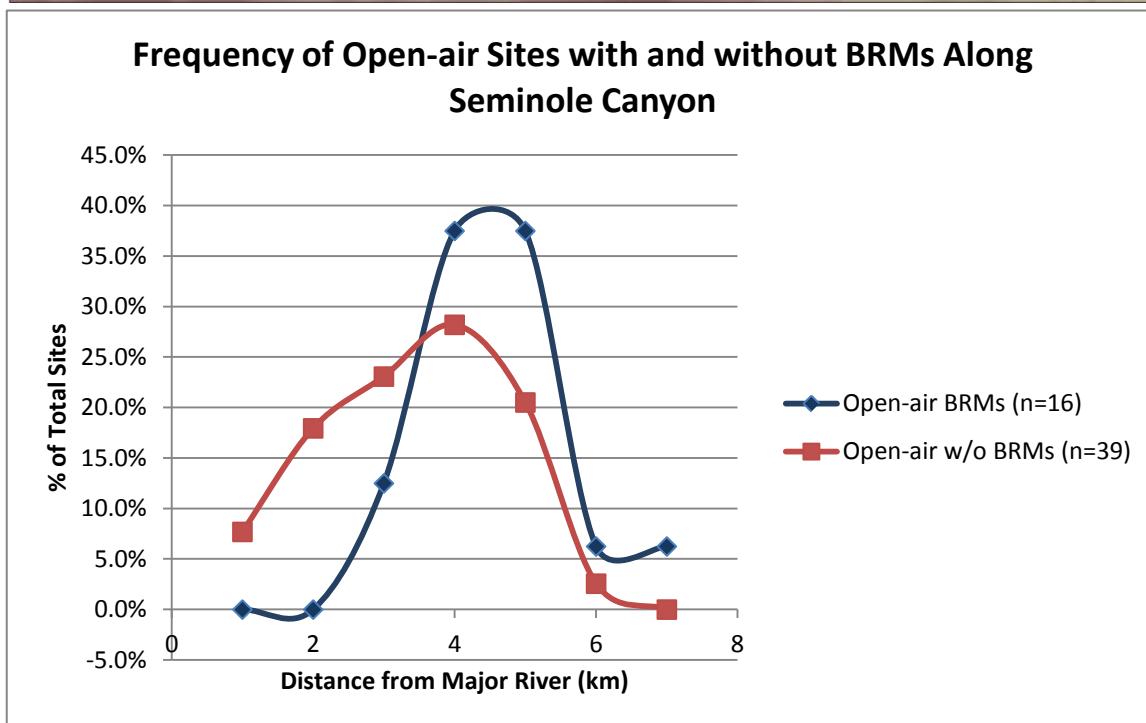
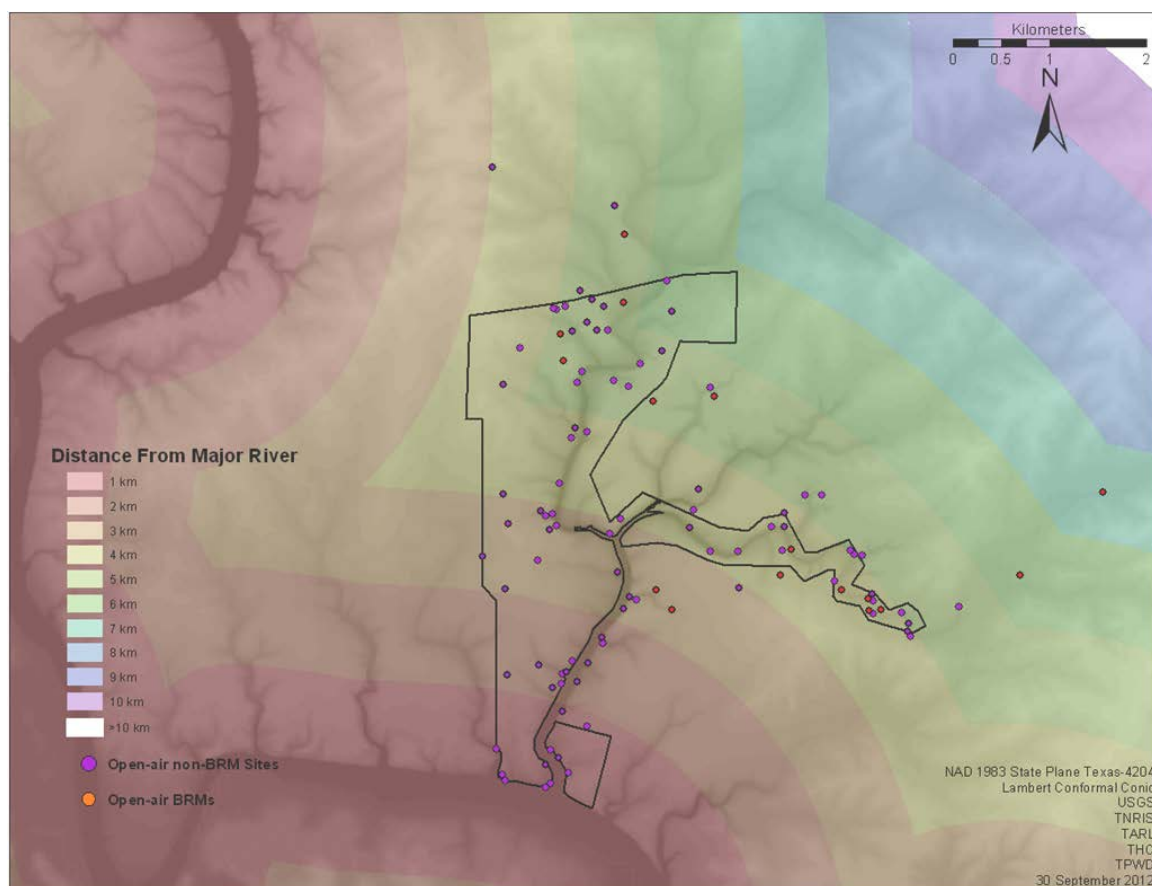


Figure 7.19. Frequency of open-air sites with and without BRMs along Seminole Canyon: (top) map showing locations of sites and the river buffers extending from the Rio Grande and Pecos, and (bottom) a line graph showing site frequency in relation to distance from major rivers.

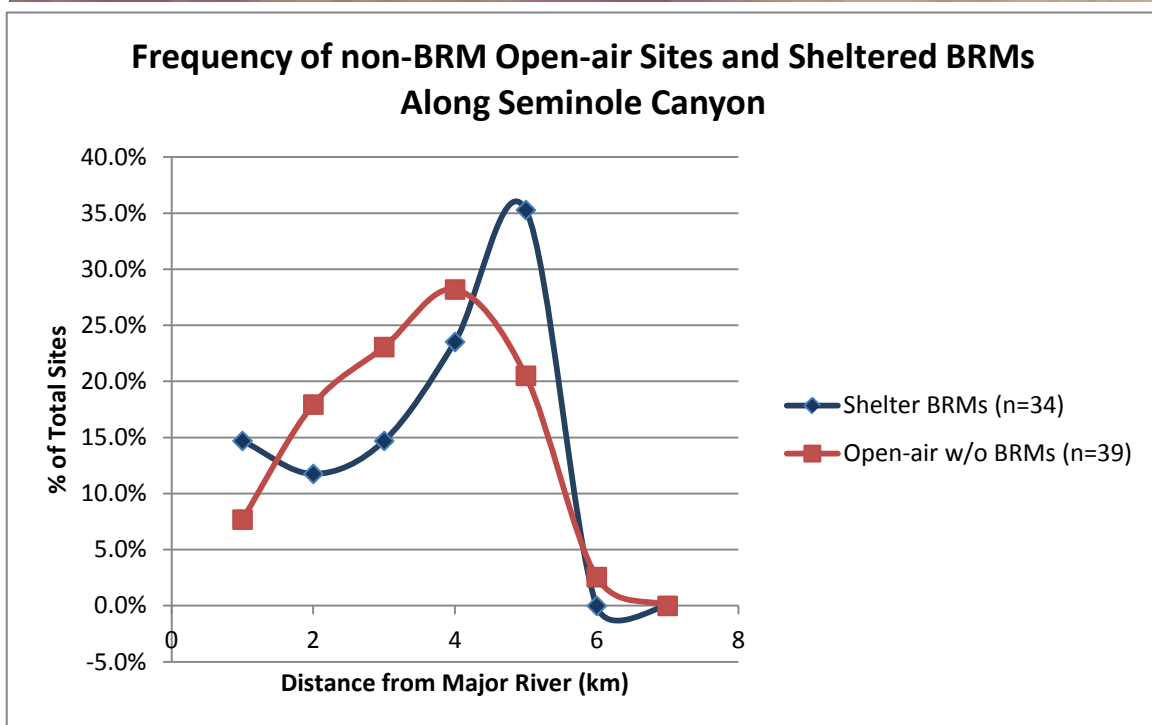
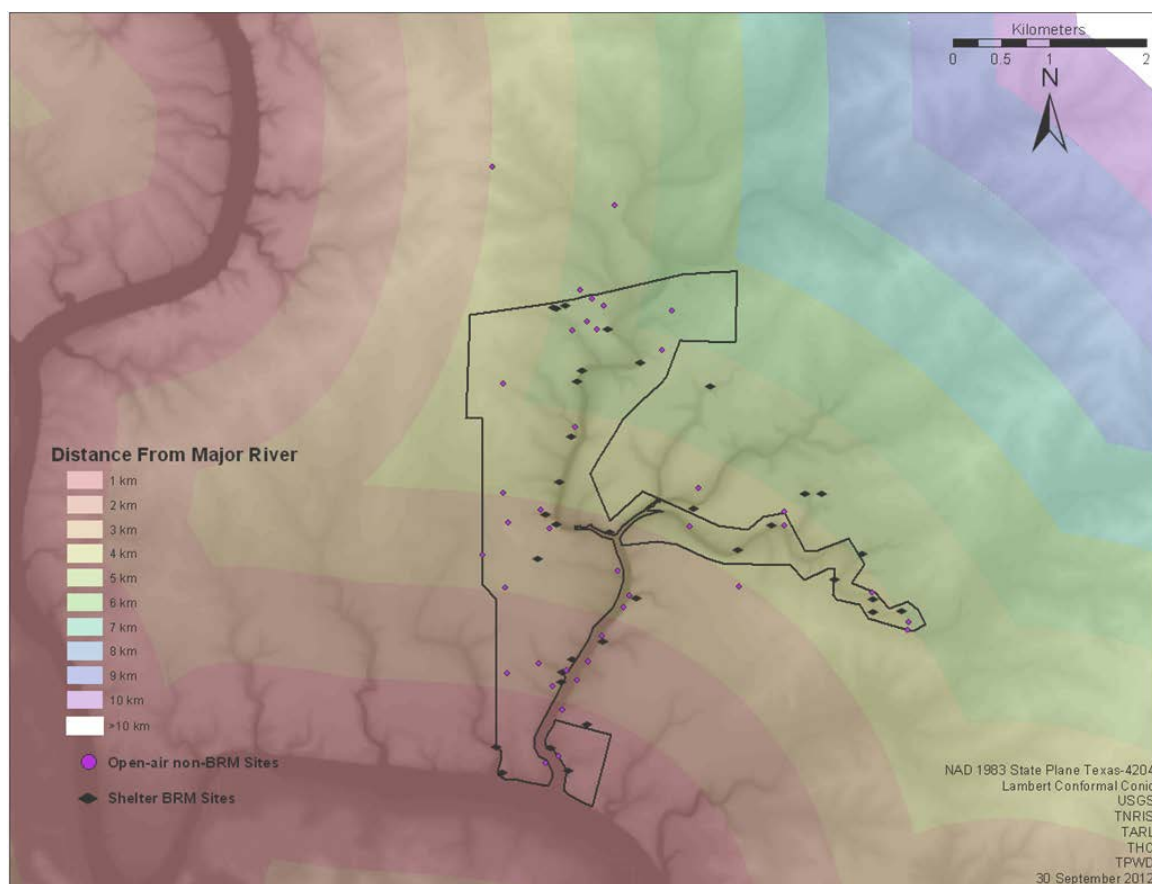


Figure 7.20. Frequency of non-BRM open-air sites and sheltered BRMs along Seminole Canyon: (top) map showing locations of sites and the river buffers extending from the Rio Grande and Pecos, and (bottom) a line graph showing site frequency in relation to distance from major rivers.

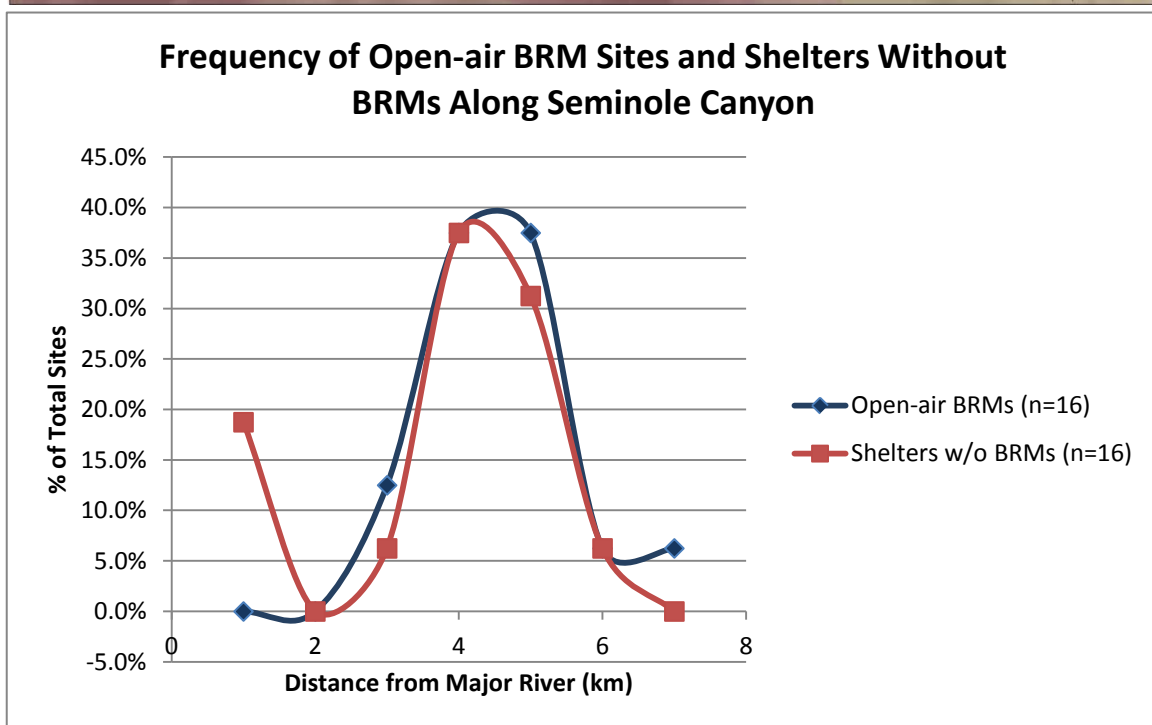
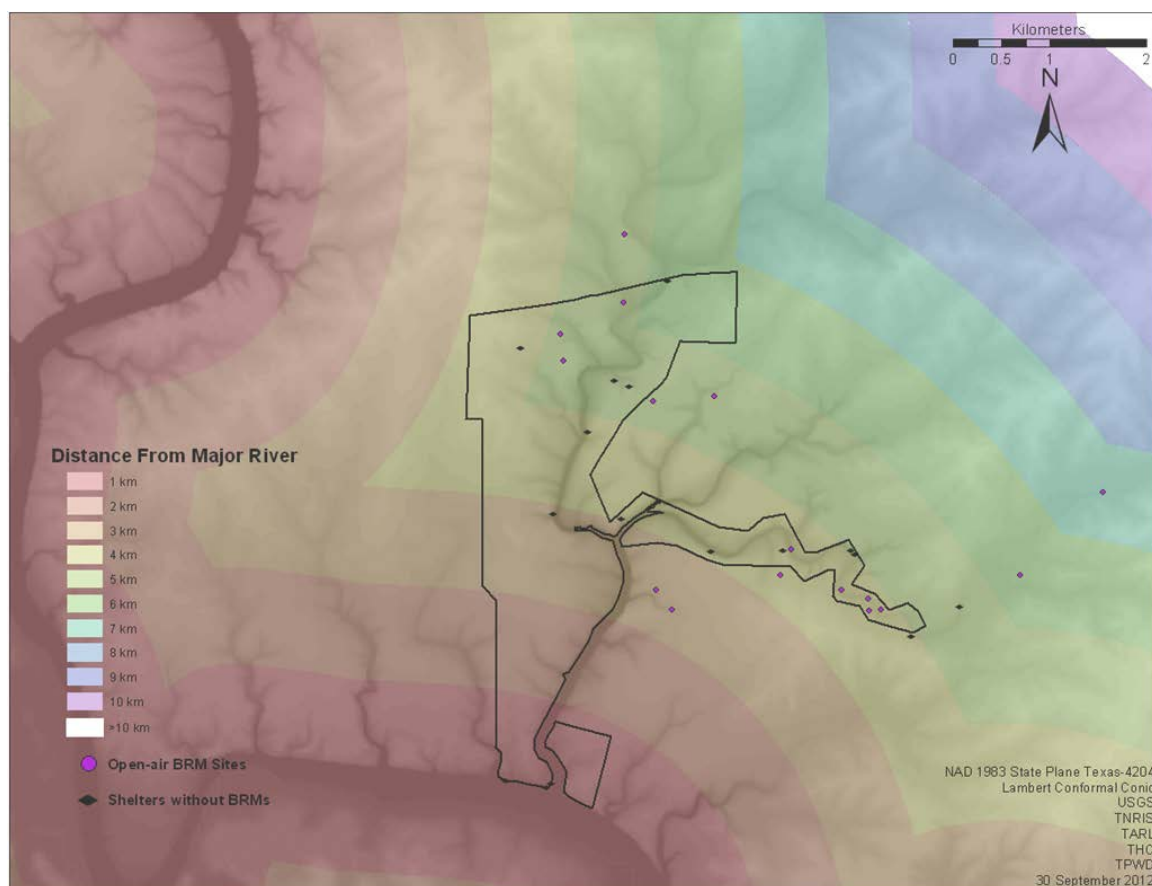


Figure 7.21. Frequency of open-air BRM sites and shelters without BRMs along Seminole Canyon: (top) map showing locations of sites and the river buffers extending from the Rio Grande and Pecos, and (bottom) a line graph showing site frequency in relation to distance from major rivers.

Table 7.4. Frequency of Archaeological Sites Recorded Along Seminole Canyon								
Distance From Major Rivers	Site Types Used in this Analysis							
	All Sites (n=105)	All Rockshelters (n=50)	All Open-air Sites (n=55)	All BRMs (n=50)	Shelter BRMs (n=34)	Shelters w/o BRMs (n=16)	Open-air BRMs (n=16)	Open-air w/o BRMs (n=39)
0-1	10.5%	16.0%	5.5%	10.0%	14.7%	18.8%	0.0%	7.7%
1-2	10.5%	8.0%	12.7%	8.0%	11.8%	0.0%	0.0%	17.9%
2-3	16.2%	12.0%	20.0%	14.0%	14.7%	6.3%	12.5%	23.1%
3-4	29.5%	28.0%	30.9%	28.0%	23.5%	37.5%	37.5%	28.2%
4-5	29.5%	34.0%	25.5%	36.0%	35.3%	31.3%	37.5%	20.5%
5-6	2.9%	2.0%	3.6%	2.0%	0.0%	6.3%	6.3%	2.6%
6-7	1.0%	0.0%	1.8%	2.0%	0.0%	0.0%	6.3%	0.0%
Totals	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

In order to determine if the trends observed in site frequency were significant, I used the Chi-Square Test-of-Independence on six different data sets: sheltered versus open air sites, sheltered BRMs versus open-air BRMs, shelters with and without BRMs, open-air sites with and without BRMs, sheltered sites with BRMs versus open-air sites without BRMs, and open-air sites with BRMs versus sheltered sites without BRMs. Due to small sample sizes, I consolidated the river buffer increments into four smaller units (Table 7.5). The results of the different Chi-Square tests are provided in Tables 7.6, 7.7, 7.8, 7.9, 7.10, and 7.11.

Table 7.5. Archaeological Site Distribution used in Chi-Square Test-of-Independence for Seminole								
Distance From Major Rivers	Site Types Used in this Analysis							
	All Sites	All Rockshelters	All Open-air Sites	All BRMs	Shelter BRMs	Shelters w/o BRMs	Open-air BRMs	Open-air w/o BRMs
0-2	22	12	10	9	9	3	0	10
2-4	48	20	28	21	13	7	8	20
4-5	31	17	14	18	12	5	6	8
5-7	4	1	3	2	0	1	2	1
Totals	105	50	55	50	34	16	16	39

Based on the Chi-Square tests (to a 90% level of confidence), most of the site trends analyzed within Seminole Canyon are very similar. The only tests that showed that the data were statistically different were the open-air versus sheltered BRM sites and the open-air sites with and without BRMs.

Seminole Canyon Site Density Analysis. In order to analyze the site density within Seminole Canyon, the boundary for the park needed to be slightly modified to include the areas of high site concentrations immediately adjacent to the park boundary (Figure 7.22). This was done assuming that sites directly adjacent to the park boundaries were recorded during survey efforts (e.g., Turpin 1982), while sites further from the park boundaries were likely recorded randomly, which would skew the density analysis. Of the total 105 sites within Seminole Canyon, 93 were used in the density analysis. The same methodology used to calculate the site density within Seminole Canyon as the Dead Man's Creek study area. The density of all archaeological sites is reported in Figure 7.23, the density of rockshelters versus open-air sites in Figure 7.24, the density of all sites containing BRMs in 7.25, density of shelter versus open-air BRMs in Figure 7.26, density of rockshelters with and without BRMs in Figure 7.27, density of open-air sites with and without BRMs in Figure 7.28, density of sheltered BRMs versus non-BRM open air sites in Figure 7.29, and the density of open-air BRMs versus shelters without BRMs in Figure 7.30. A tabular summary of the data is provided in Table 7.12.

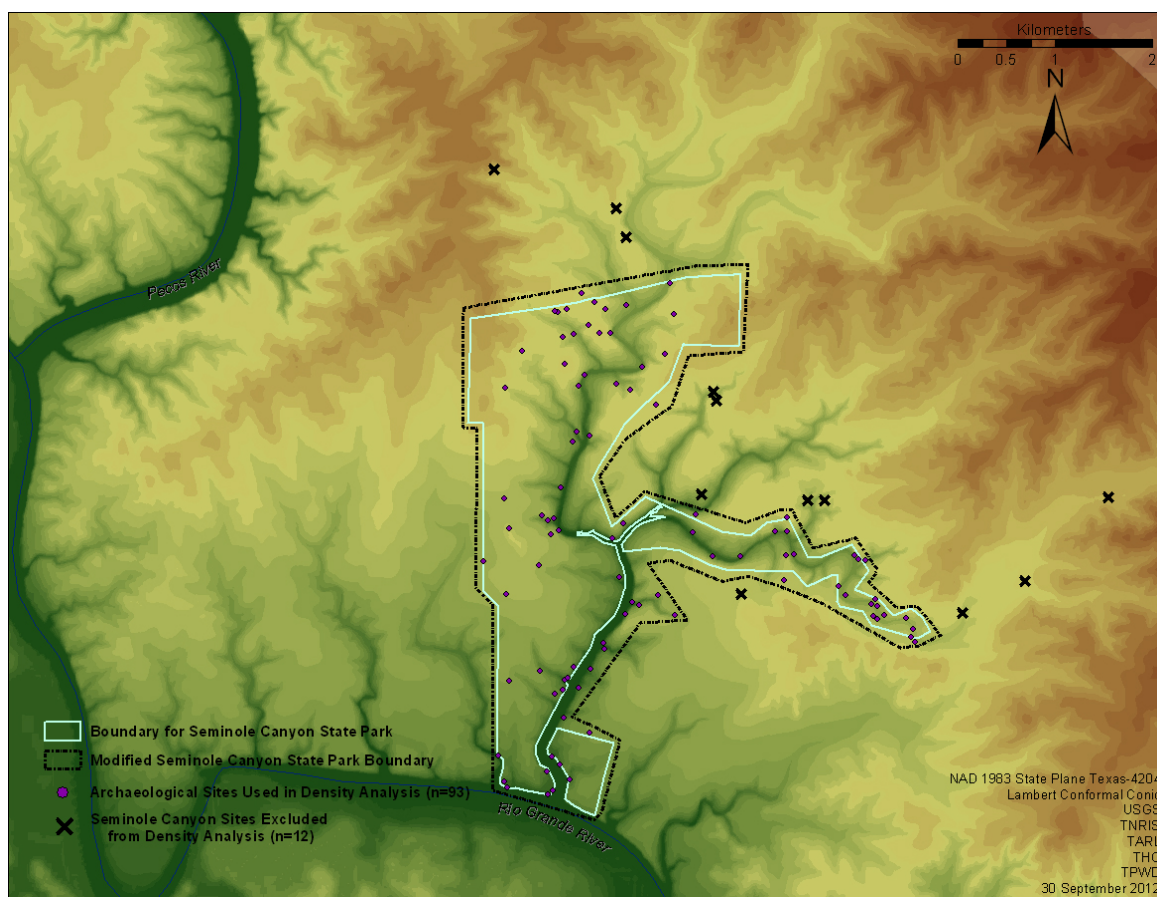


Figure 7.22. Map showing the boundary used for the Seminole Canyon site density analysis as well as the sites not used in the analysis.

Table 7.12. Density of Archaeological Sites Within Seminole Canyon																	
Distance from Major River (km)		Site Types Used in this Analysis															
		All Sites (n=93)		All Rockshelters (n=46)		All Open-Air Sites (n=47)		All BRMs (n=43)		Shelter BRMs (n=31)		Shelters w/o BRMs (n=15)		Open-air BRMs (n=12)		Open-air w/o BRMs (n=35)	
Distance from Major River (km)	River Buffer Area (km ²)	# of Sites	Sites/ km ²	# of Sites	Sites/k m ²	# of Sites	Sites/ km ²	# of Sites	Sites/ km ²	# of Sites	Sites/ km ²	# of Sites	Sites/ km ²	# of Sites	Sites/ km ²	# of Sites	Sites/ km ²
0-1	1.19	11	9.24	8	6.72	3	2.52	5	4.20	5	4.20	3	2.52	0	0.00	3	2.52
1-2	1.18	11	9.32	4	3.39	7	5.93	4	3.39	4	3.39	0	0.00	0	0.00	7	5.93
2-3	2.05	16	7.80	6	2.93	10	4.88	7	3.41	5	2.44	1	0.49	2	0.98	8	3.90
3-4	3.95	29	7.34	14	3.54	15	3.80	14	3.54	8	2.03	6	1.52	6	1.52	9	2.28
4-5	1.89	24	12.70	13	6.88	11	5.82	13	6.88	9	4.76	4	2.12	4	2.12	7	3.70
5-6	0.83	2	2.41	1	1.20	1	1.20	0	0.00	0	0.00	1	1.20	0	0.00	1	1.20
Totals	11.09	93	8.39	46	4.15	47	4.24	43	3.88	31	2.80	15	1.35	12	1.08	35	3.16

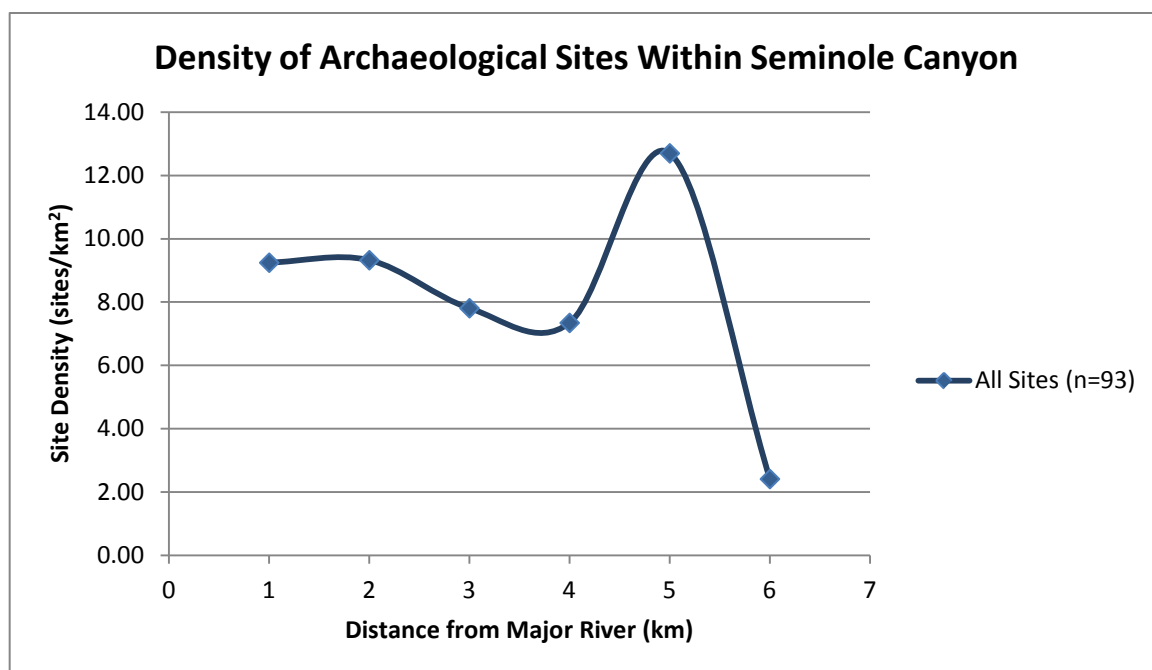


Figure 7.23. Density of archaeological sites within Seminole Canyon State Park in relation to distance from major rivers.

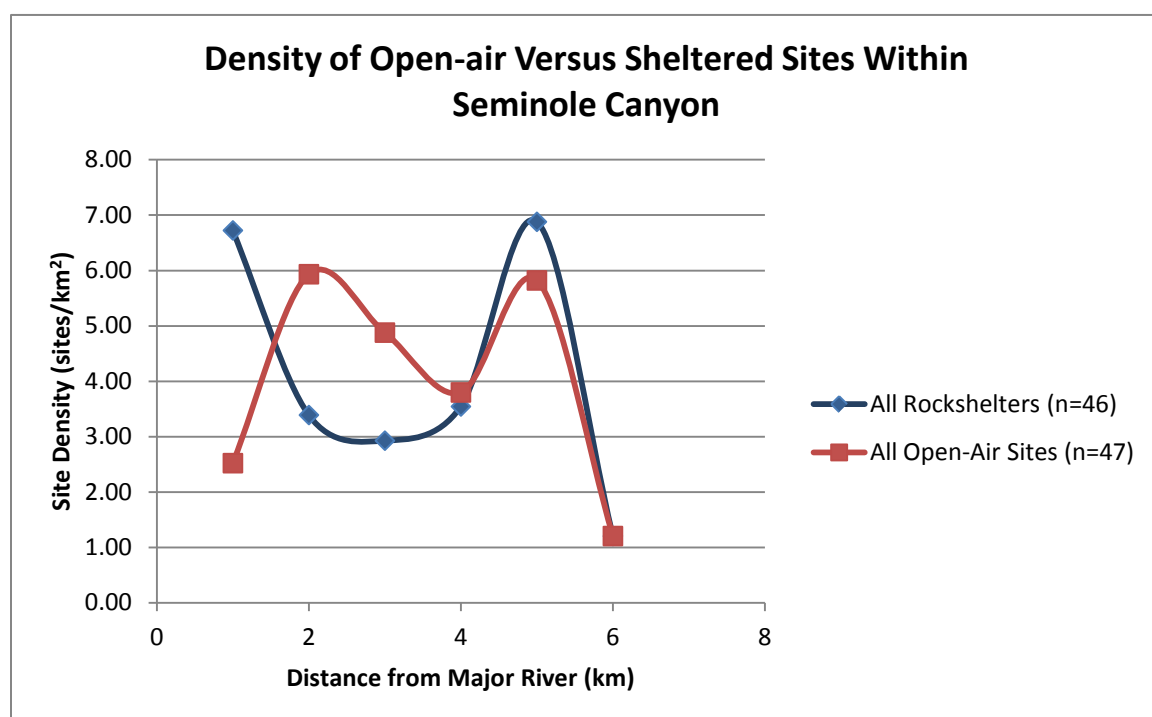


Figure 7.24. Density of open-air and sheltered sites within Seminole Canyon State Park in relation to distance from major rivers.

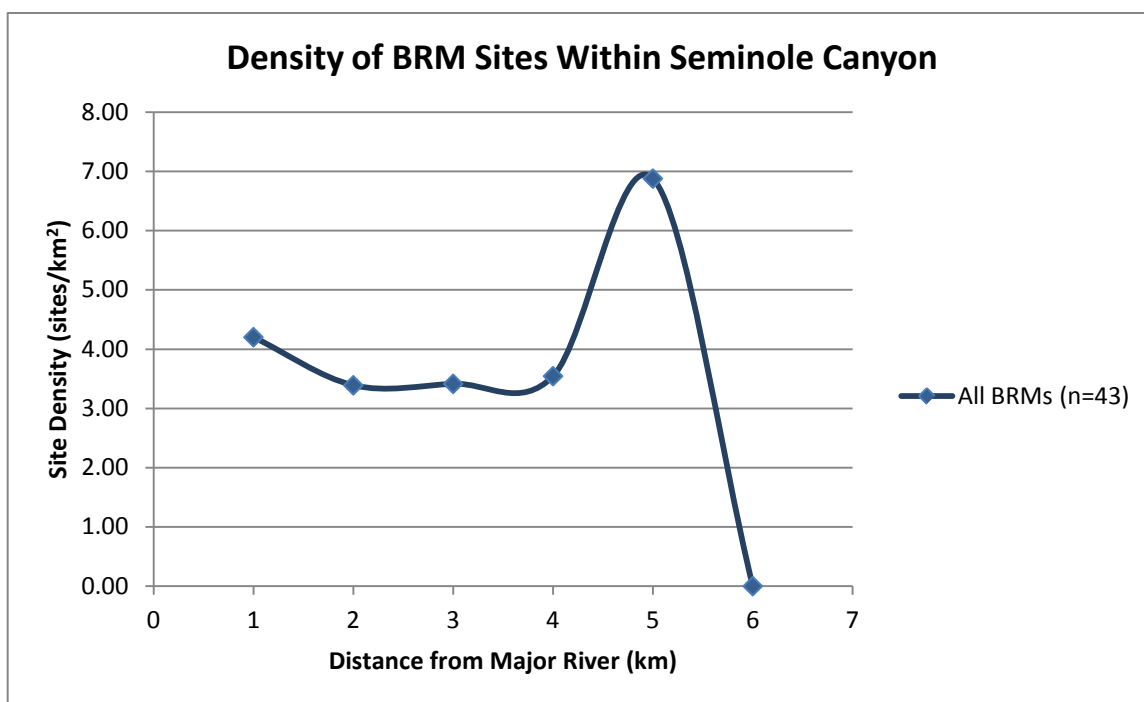


Figure 7.25. Density of all sites containing burned rock middens within Seminole Canyon State Park in relation to distance from major rivers.

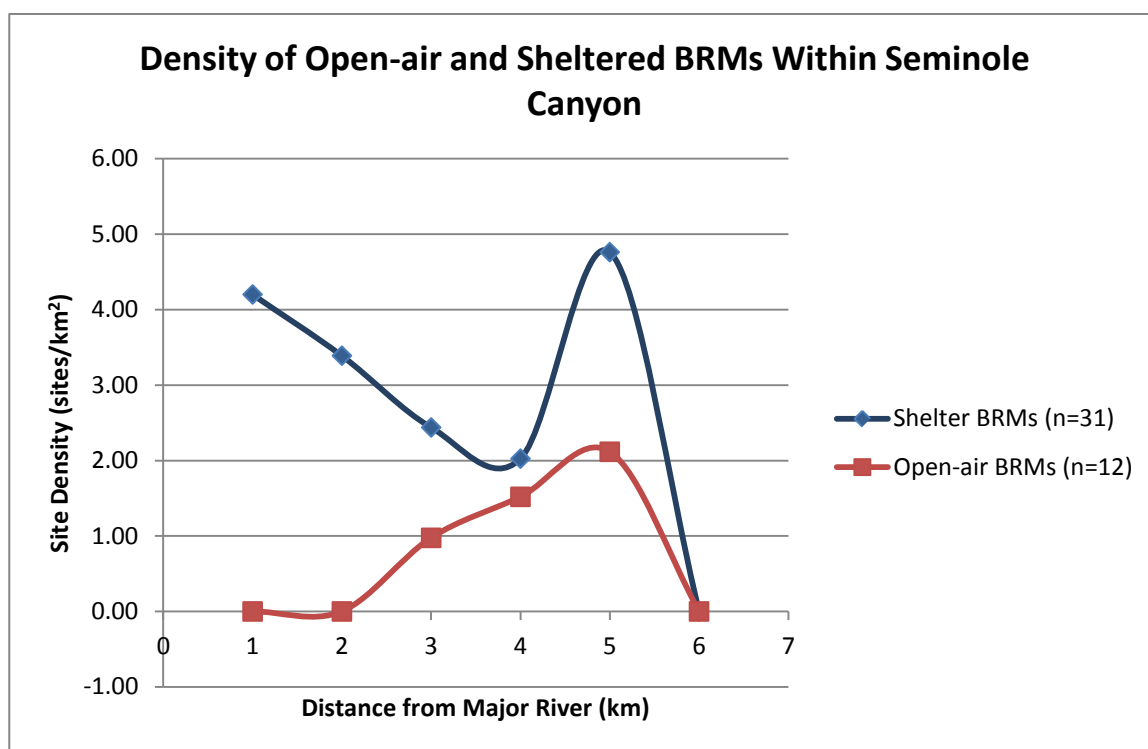


Figure 7.26. Density of rockshelter BRM sites versus open-air BRM sites within Seminole Canyon State Park in relation to distance from major rivers.

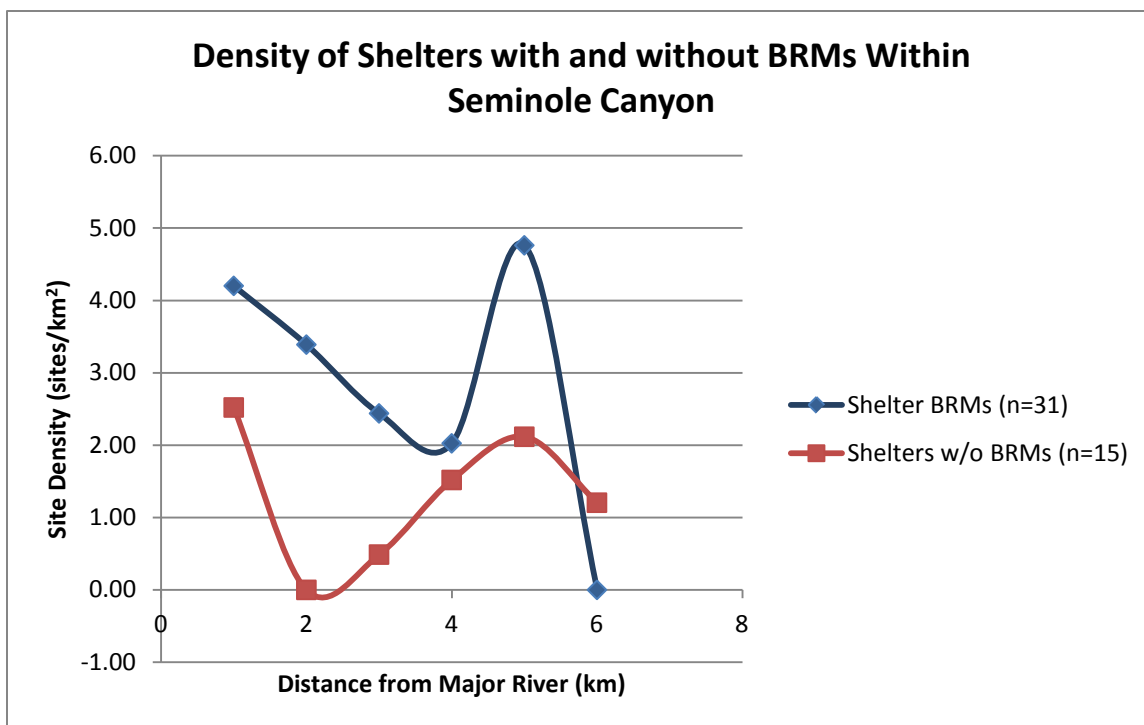


Figure 7.27. Density of shelters with and without BRMs within Seminole Canyon State Park in relation to distance from major rivers.

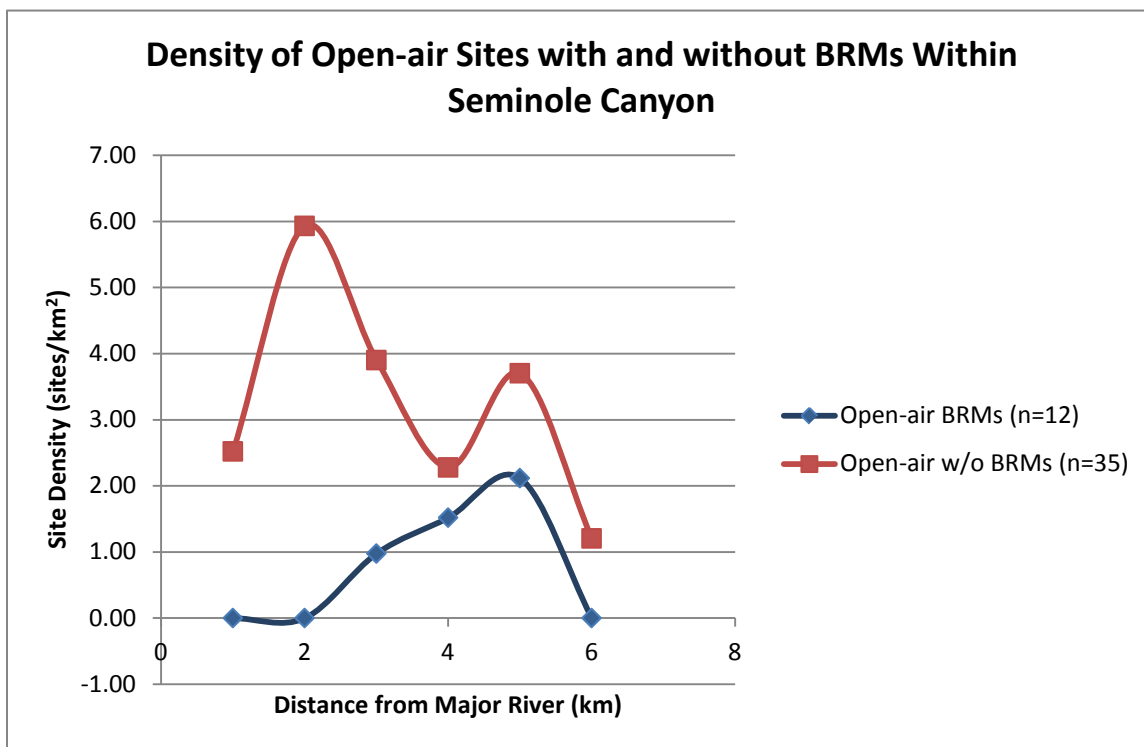


Figure 7.28. Density of open-air sites with and without BRMs within Seminole Canyon State Park in relation to distance from major rivers.

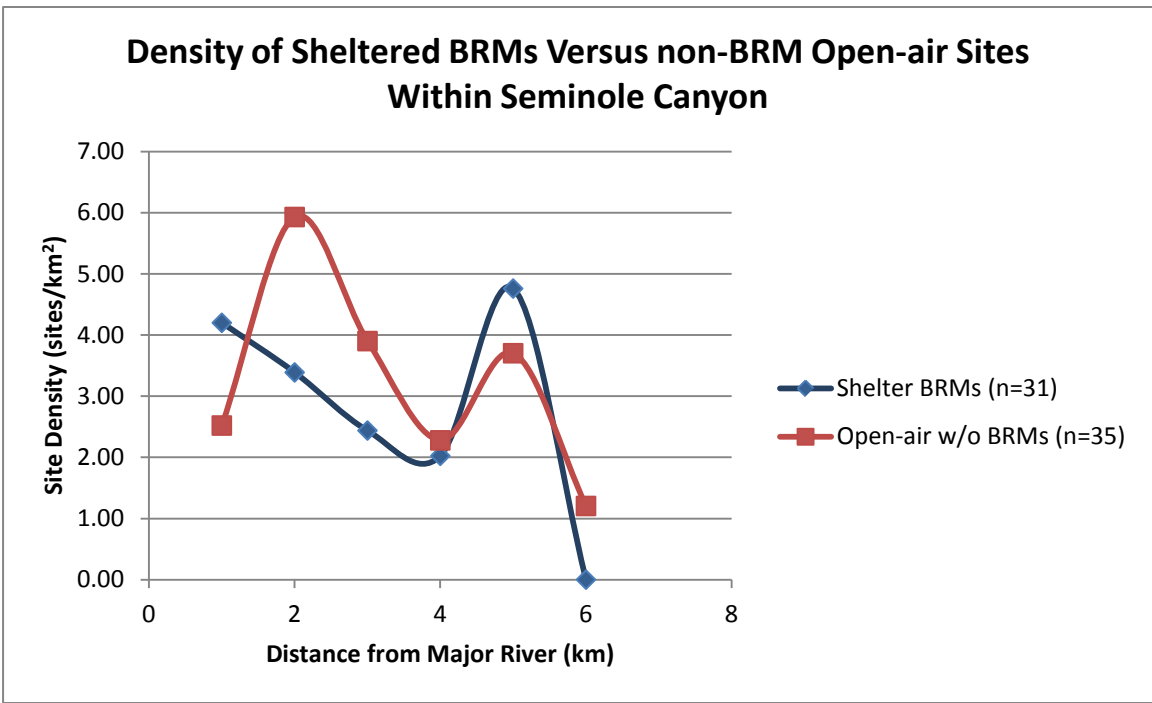


Figure 7.29. Density of sheltered BRM sites versus non-BRM open-air sites within Seminole Canyon State Park in relation to distance from major rivers.

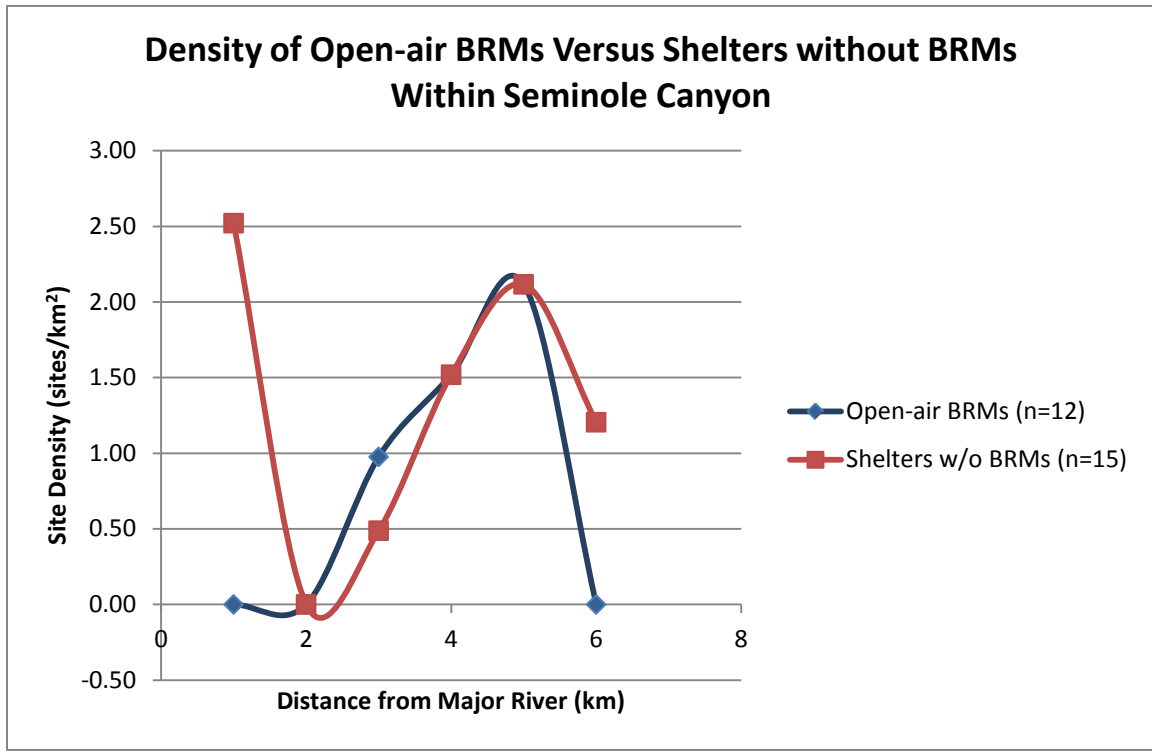


Figure 7.30. Density of open-air BRM sites versus shelters without BRMs within Seminole Canyon State Park in relation to distance from major rivers.

In order to determine if the trends observed in site density were significant, I used regression on six different data sets: sheltered versus open air sites, sheltered BRMs versus open-air BRMs, shelters with and without BRMs, open-air sites with and without BRMs, sheltered sites with BRMs versus open-air sites without BRMs, and open-air sites with BRMs versus sheltered sites without BRMs. The regression analysis results are provided in Figures 7.31, 7.32, 7.33, 7.34, 7.35, and 7.36.

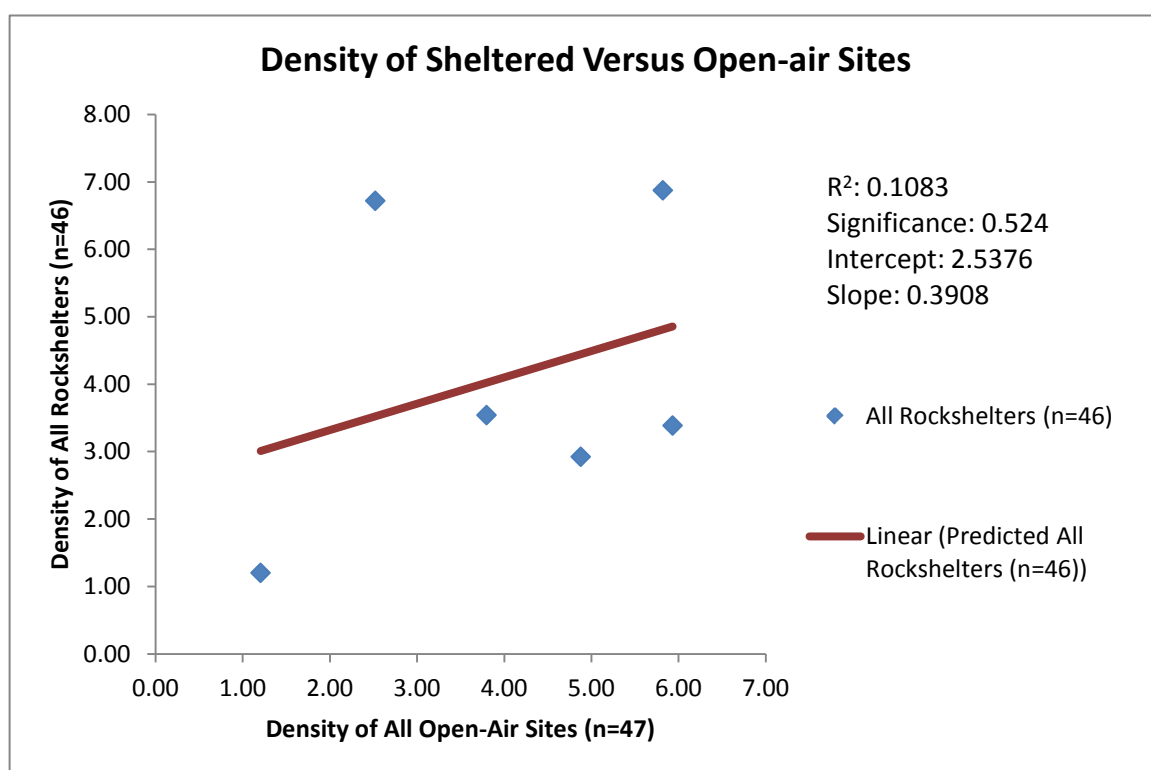


Figure 7.31. Linear regression of rockshelters and open-air sites.

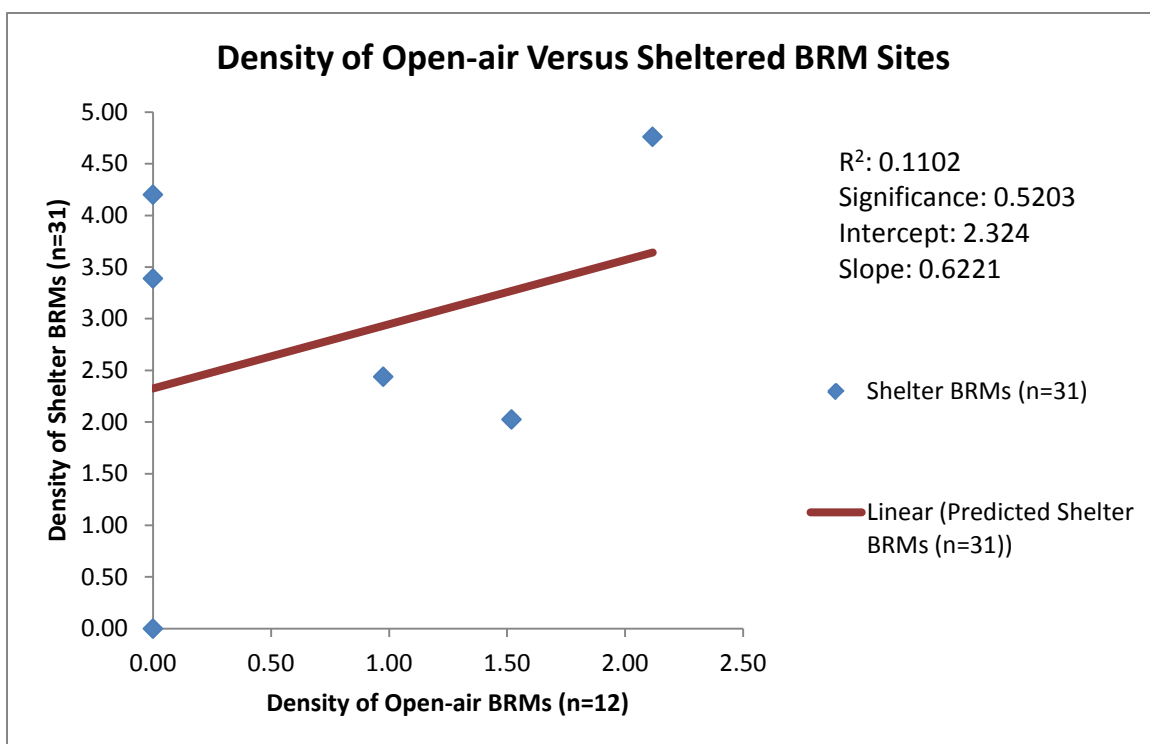


Figure 7.32. Linear regression of rockshelter and open-air BRM sites.

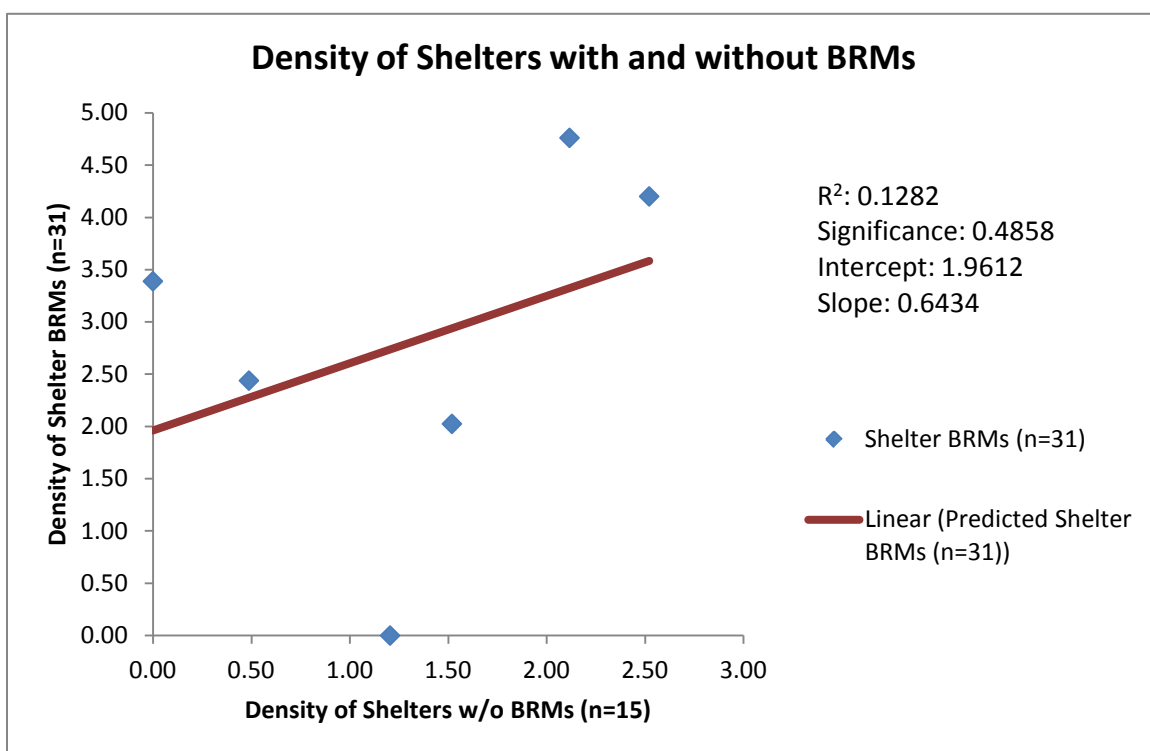


Figure 7.33. Linear regression of shelters with and without BRMs.

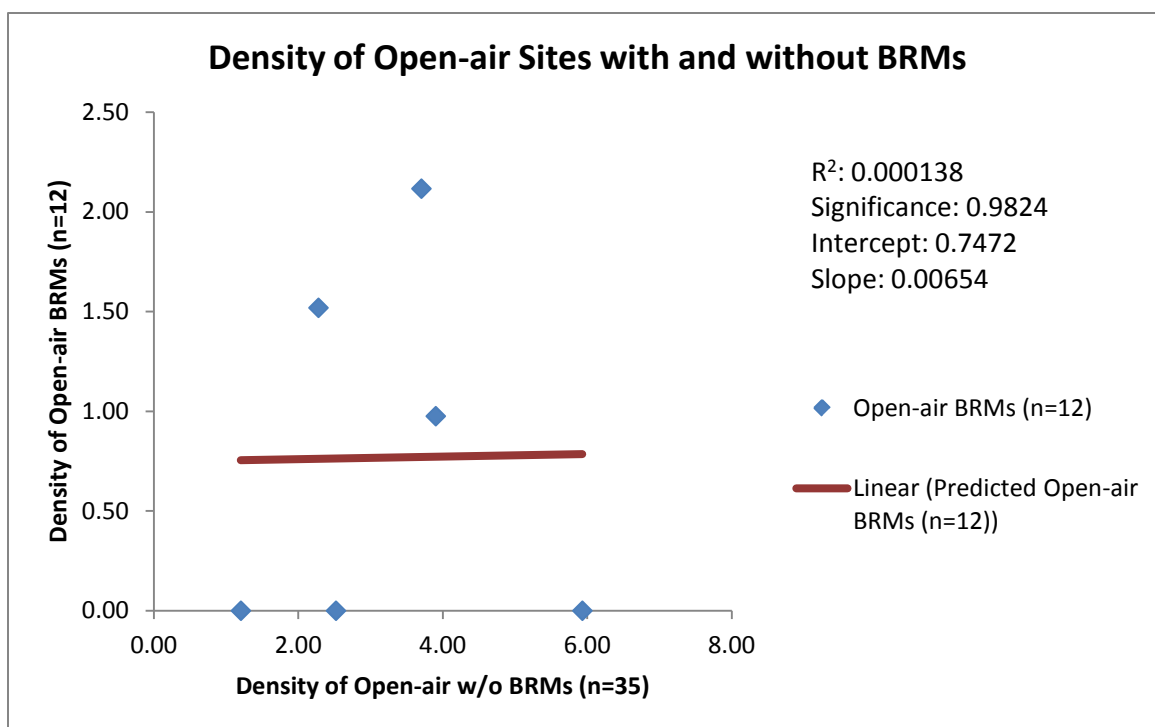


Figure 7.34. Linear regression of open-air sites with and without BRMs.

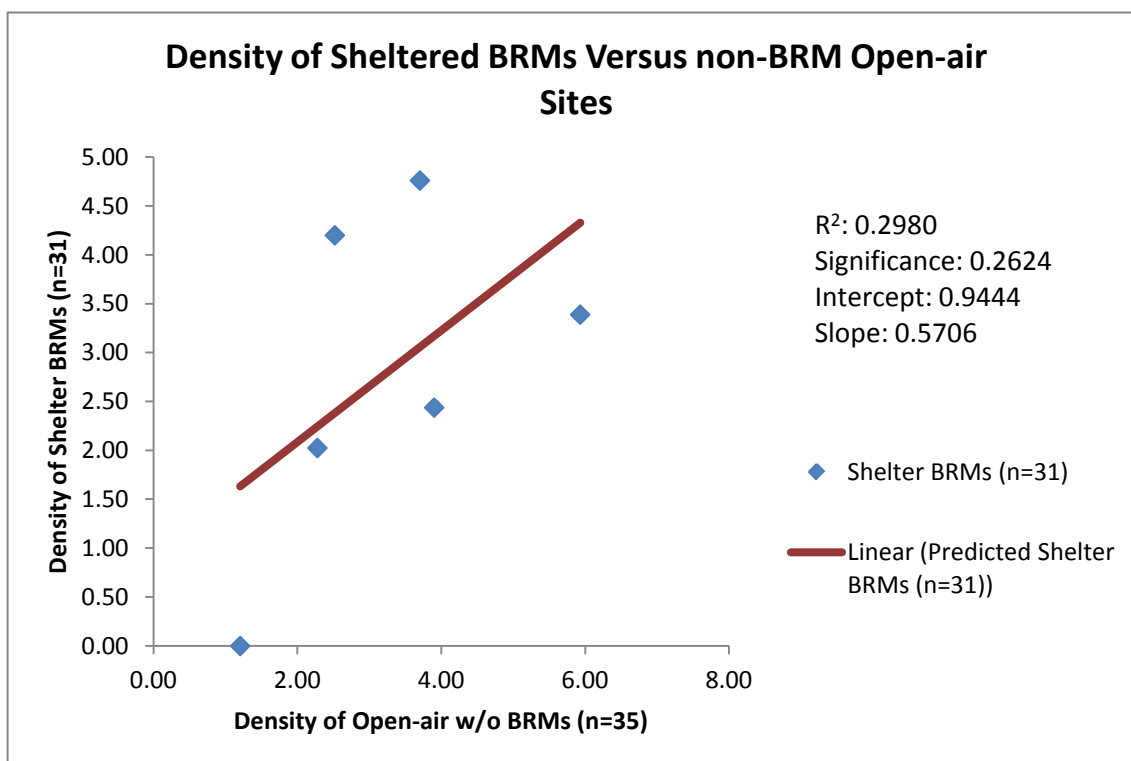


Figure 7.35. Linear regression of sheltered BRMs versus non-BRM open-air sites.

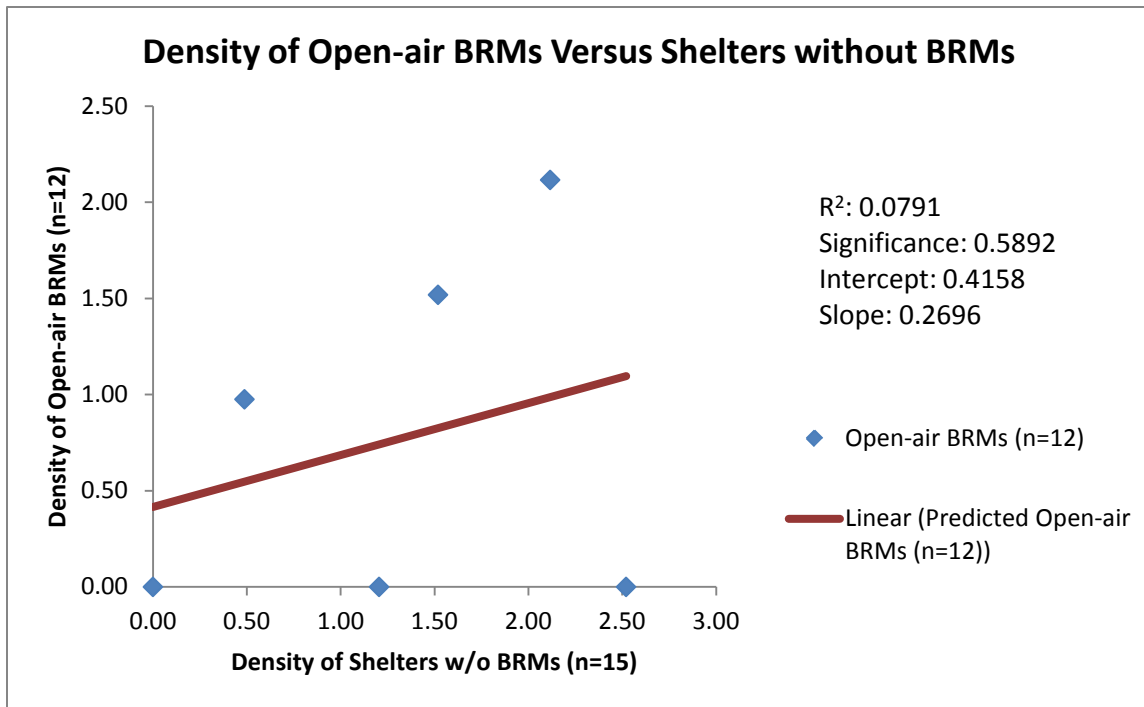


Figure 7.36. Linear regression of open-air BRM sites versus shelters without BRMs.

The Seminole Canyon density data appears to have some similar trends within the different data sets, but the regression analysis shows that the samples are statistically different. Much like the DMC density data, this is largely due to small sample size. Seminole Canyon does provide a quality dataset to be compared to the Devils River State Natural Area – North Unit and DMC data later in this chapter.

Devils River State Natural Area – North Unit

The Devils River State Natural Area – North Unit is located approximately 10 kilometers upstream from DMC, and is the largest survey area used in this analysis. The sites used in this study are plotted in Figure 7.37, and a tabular summary of site data is provided in Table 7.13. Similar to Seminole Canyon, all sites within the drainage basin of DRSNA are used in the distribution analysis, but a smaller sample of sites within and

adjacent to the park boundaries are used to be sure the area being analyzed for site density received sufficient archaeological survey.

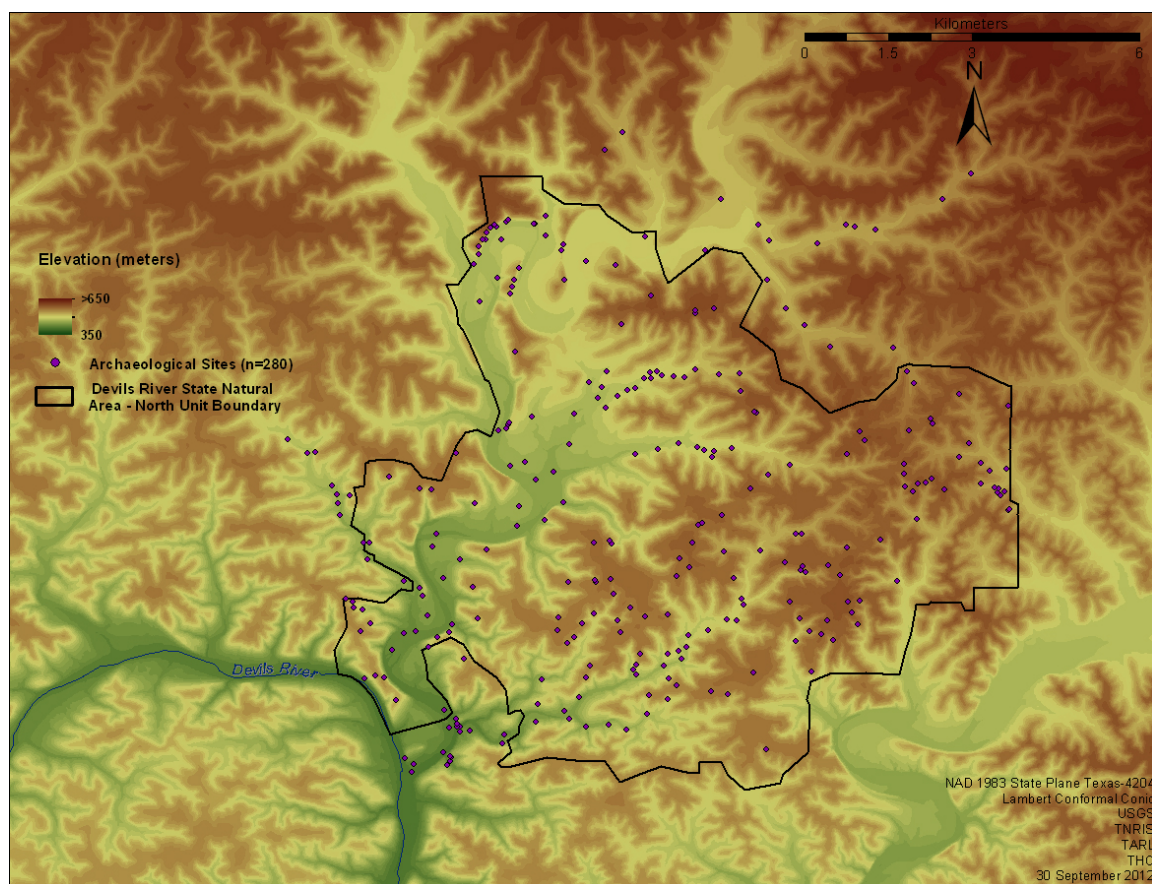


Figure 7.37. Devils River State Natural Area – North Unit and the archaeological sites used in the frequency analysis.

Table 7.13. Archaeological Sites Recorded Along Devils River State Natural Area - North Unit								
Distance From Devils River (km)	Site Types Used in this Analysis							
	All Sites	All Rockshelters	All Open- air Sites	All BRMs	Shelter BRMs	Shelters w/o BRMs	Open-air BRMs	Open-air w/o BRMs
0-1	11	5	6	5	3	2	2	4
1-2	25	8	17	14	6	2	8	9
2-3	15	3	12	8	2	1	6	6
3-4	18	3	15	14	3	0	11	4
4-5	18	7	11	12	6	1	6	5
5-6	29	9	20	12	5	4	7	13
6-7	15	3	12	2	1	2	1	11
7-8	29	3	26	10	0	3	10	16
8-9	43	18	25	20	4	14	16	9
9-10	26	5	21	10	1	4	9	12
10<	51	6	45	21	3	3	18	27
Totals	280	70	210	128	34	36	94	116

Buffer Analysis. The same methodology used for conducting the buffer analysis with the Seminole Canyon and DMC data was used for DRSNA-NU. Figure 7.38 shows the frequency of all sites, Figure 7.39 shows the frequency of sheltered versus open-air sites, Figure 7.40 shows the frequency of all BRM sites, Figure 7.41 shows the frequency of open-air versus rockshelter BRM sites, Figure 7.42 compares the frequencies of shelters with and without BRMs, Figure 7.43 compares the frequencies of open-air sites with and without BRMs, Figure 7.44 compares the frequencies of shelters with BRMs versus non-BRM open-air sites, and Figure 7.45 shows the frequencies of open-air BRMs versus shelters without BRMs. Table 7.14 provides a tabular summary of the frequency data.

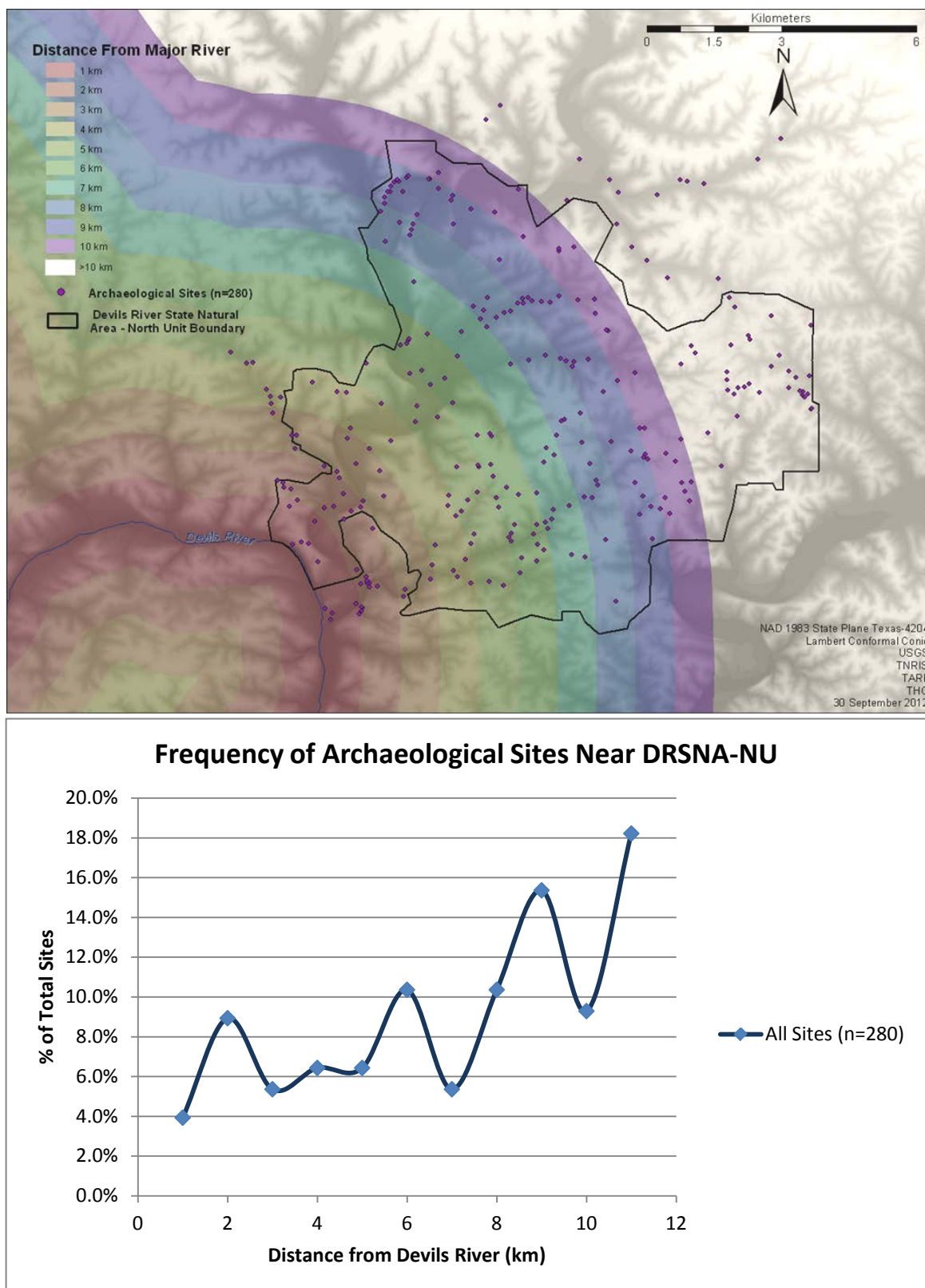


Figure 7.38. Frequency of all archaeological sites within DRSNA-NU: (top) map showing site distribution and river buffers and (bottom) line graph showing site distribution in relation to the Devils River.

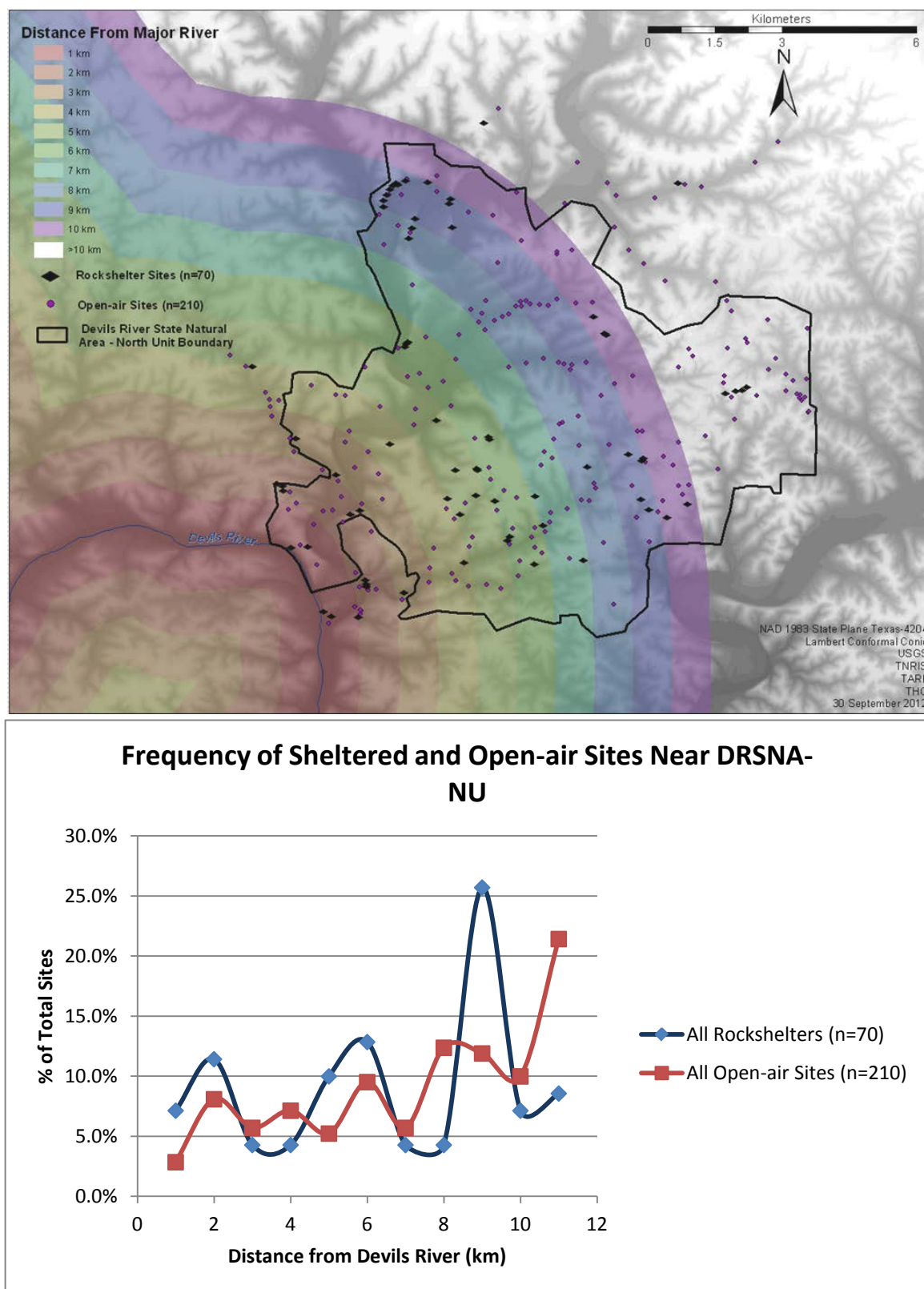


Figure 7.39. Frequency of open-air and sheltered sites within DRSNA-NU: (top) map showing site distribution and river buffers and (bottom) line graph showing site distribution in relation to the Devils River.

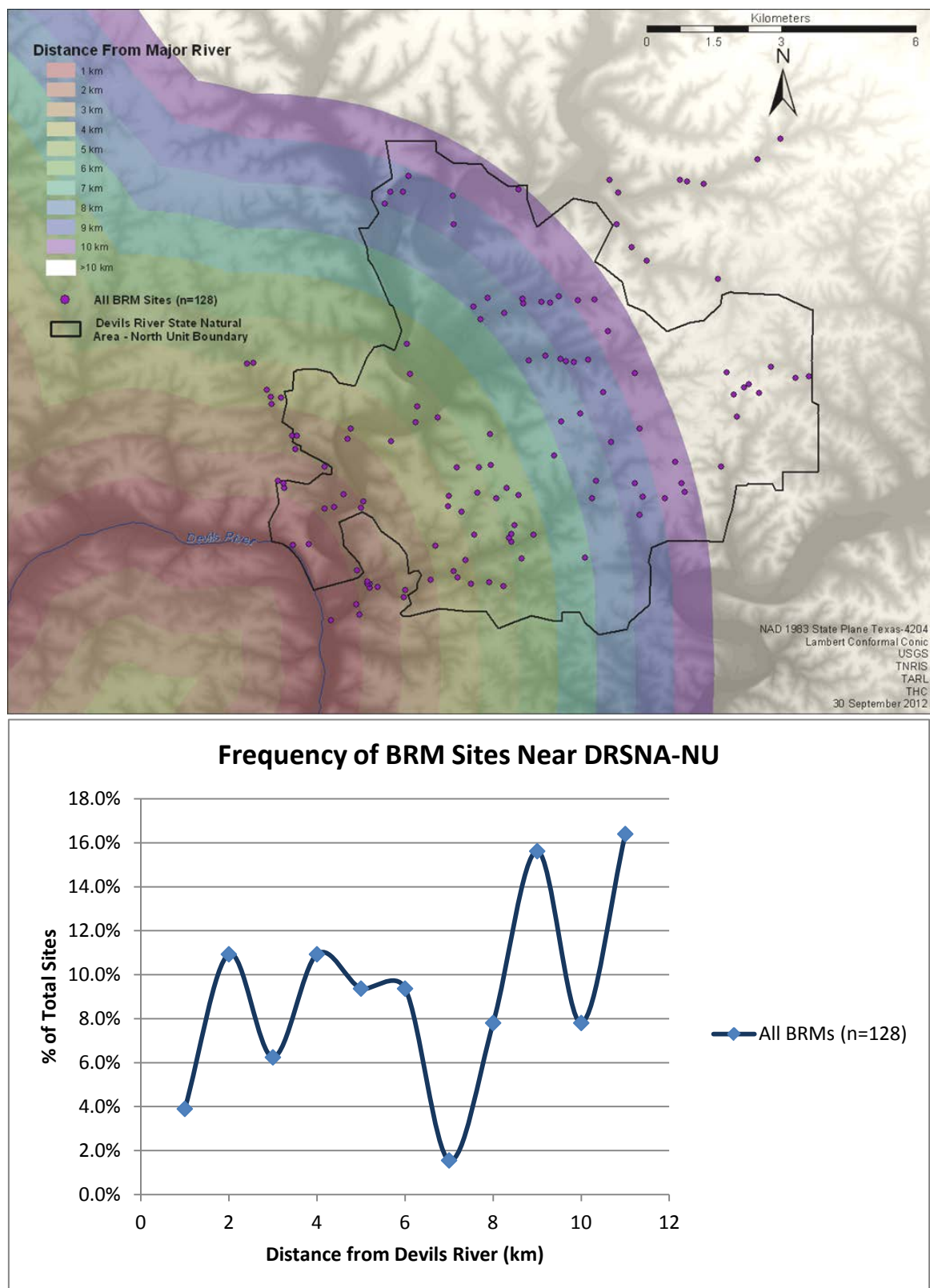


Figure 7.40. Frequency of sites containing BRMs within DRSNA-NU: (top) map showing recorded BRM sites in relation to the river buffers and (bottom) line graph showing site distribution in relation to distance from the Devils River.

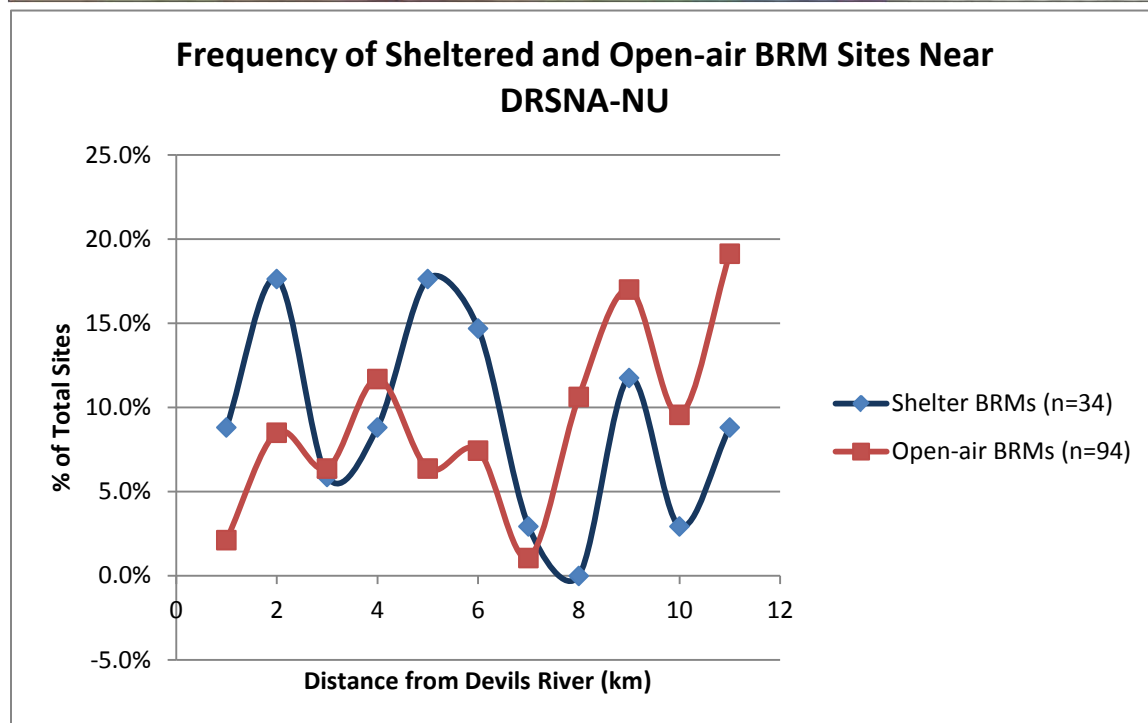
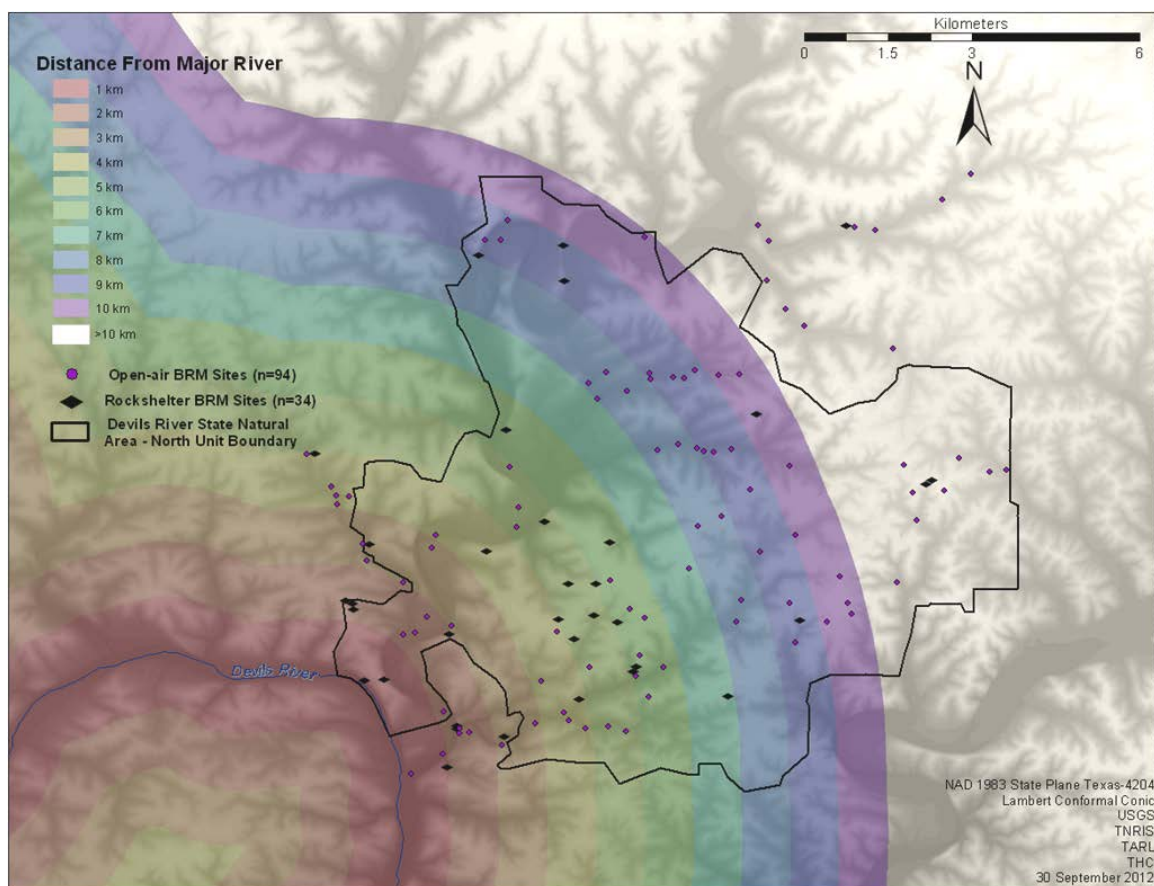


Figure 7.41. Frequency of open-air versus sheltered BRM sites within DRSNA-NU: (top) map showing recorded open-air and sheltered BRM sites in relation to the river buffers and (bottom) line graph showing site distribution in relation to distance from the Devils River.

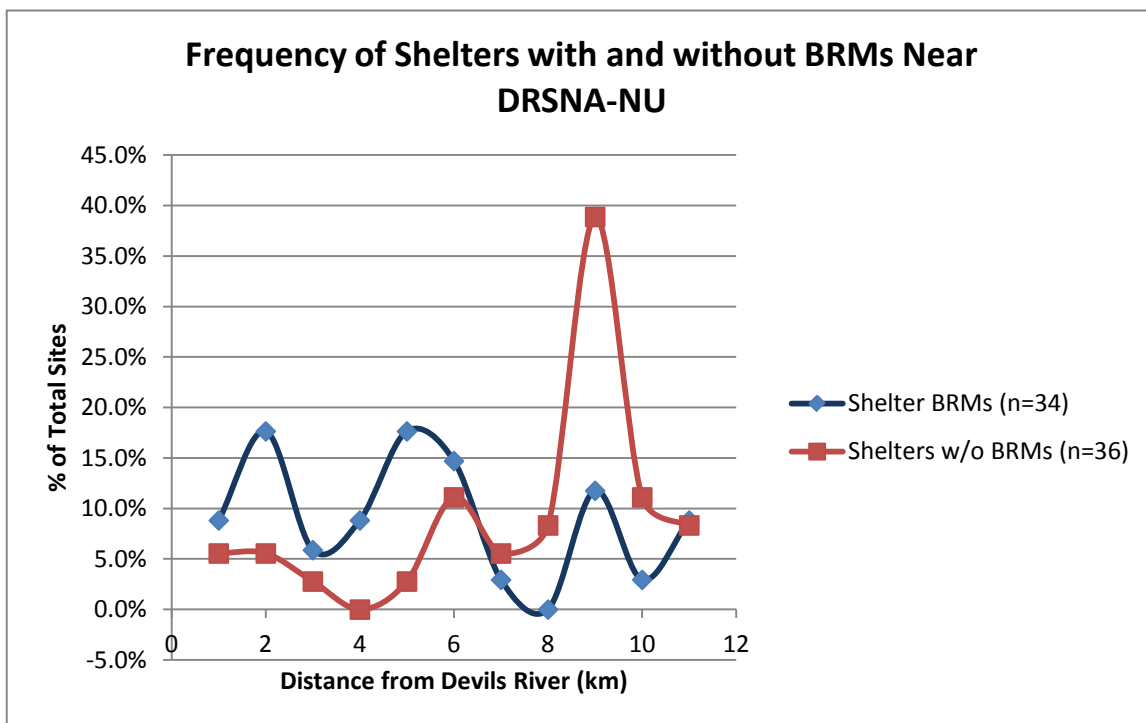
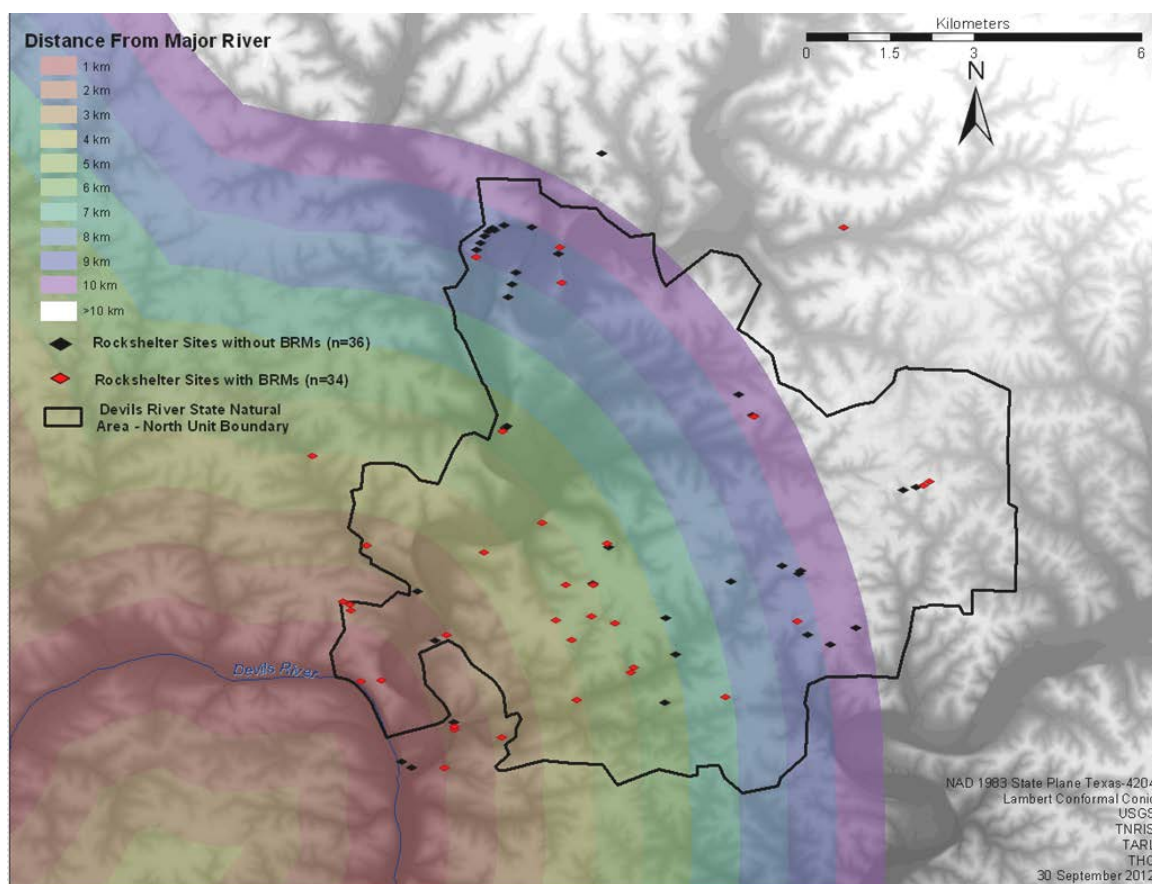


Figure 7.42. Frequency of shelters with and without BRMs within DRSNA-NU: (top) map showing sheltered sites in relation to the river buffers and (bottom) line graph showing site distribution in relation to distance from the Devils River.

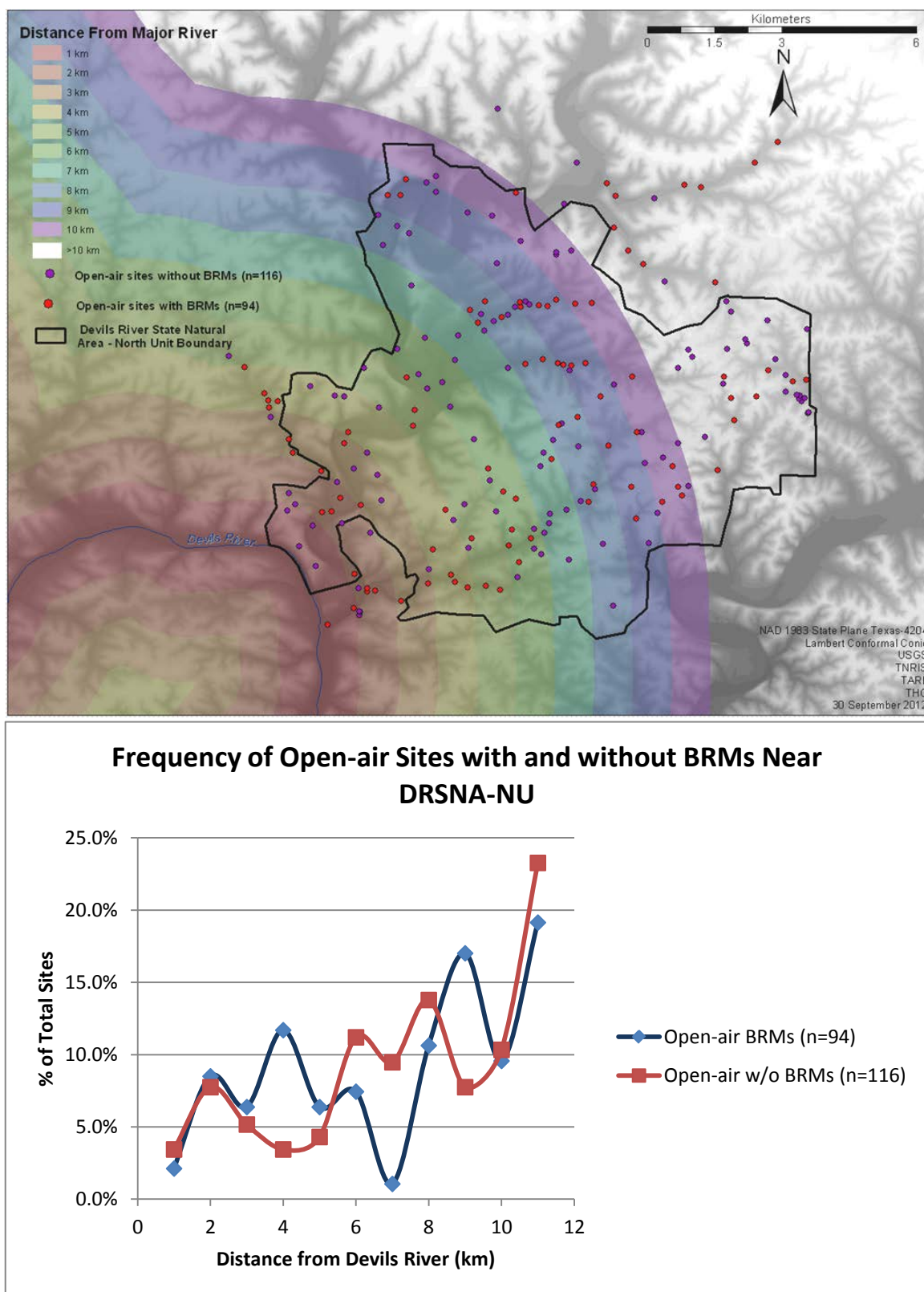


Figure 7.43. Frequency of open-air sites with and without BRMs within DRSNA-NU: (top) map showing open-air sites in relation to the river buffers and (bottom) line graph showing site distribution in relation to distance from the Devils River.

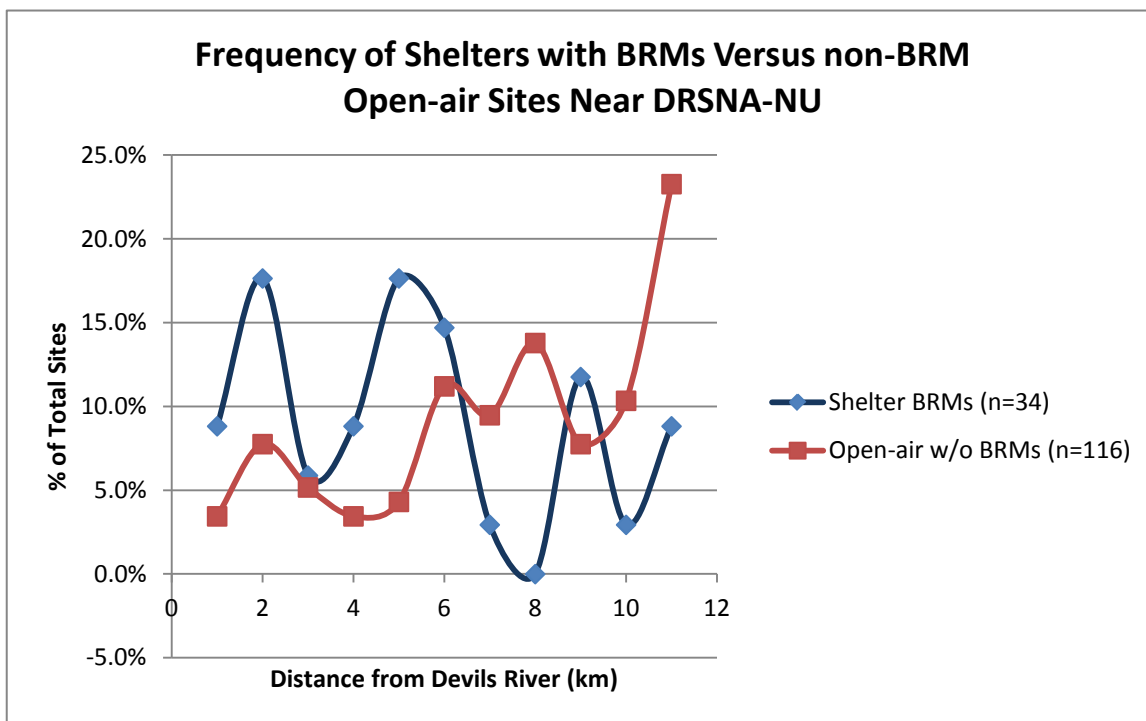
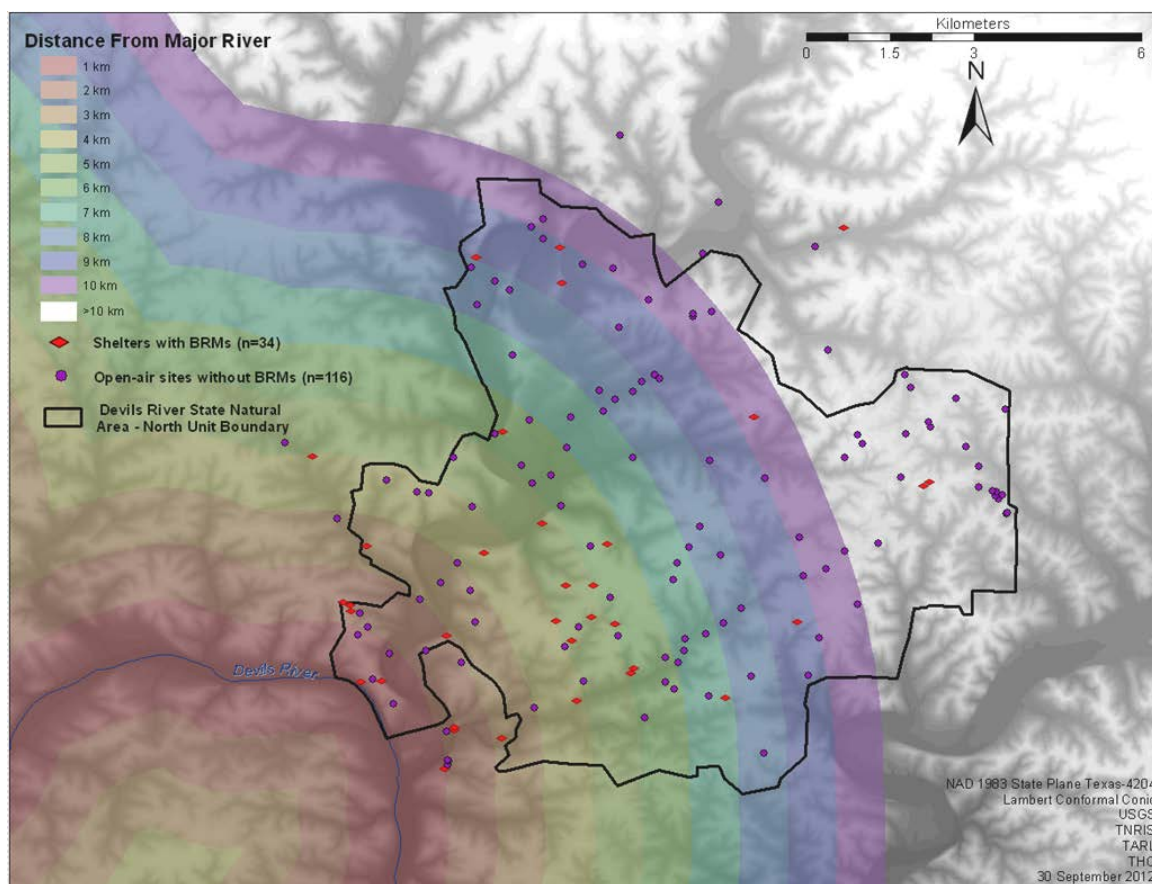


Figure 7.44. Frequency of shelters with BRMs versus non-BRM open-air sites within DRSNA-NU: (top) map showing sites in relation to the river buffers and (bottom) line graph showing site distribution in relation to distance from the Devils River.

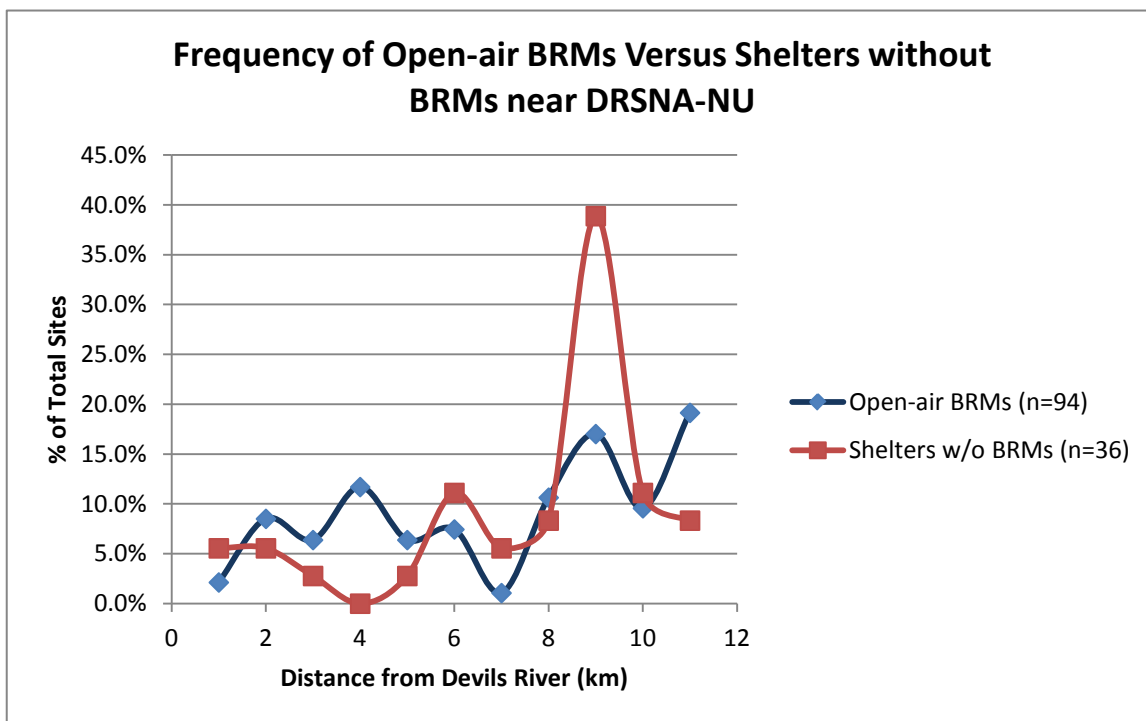
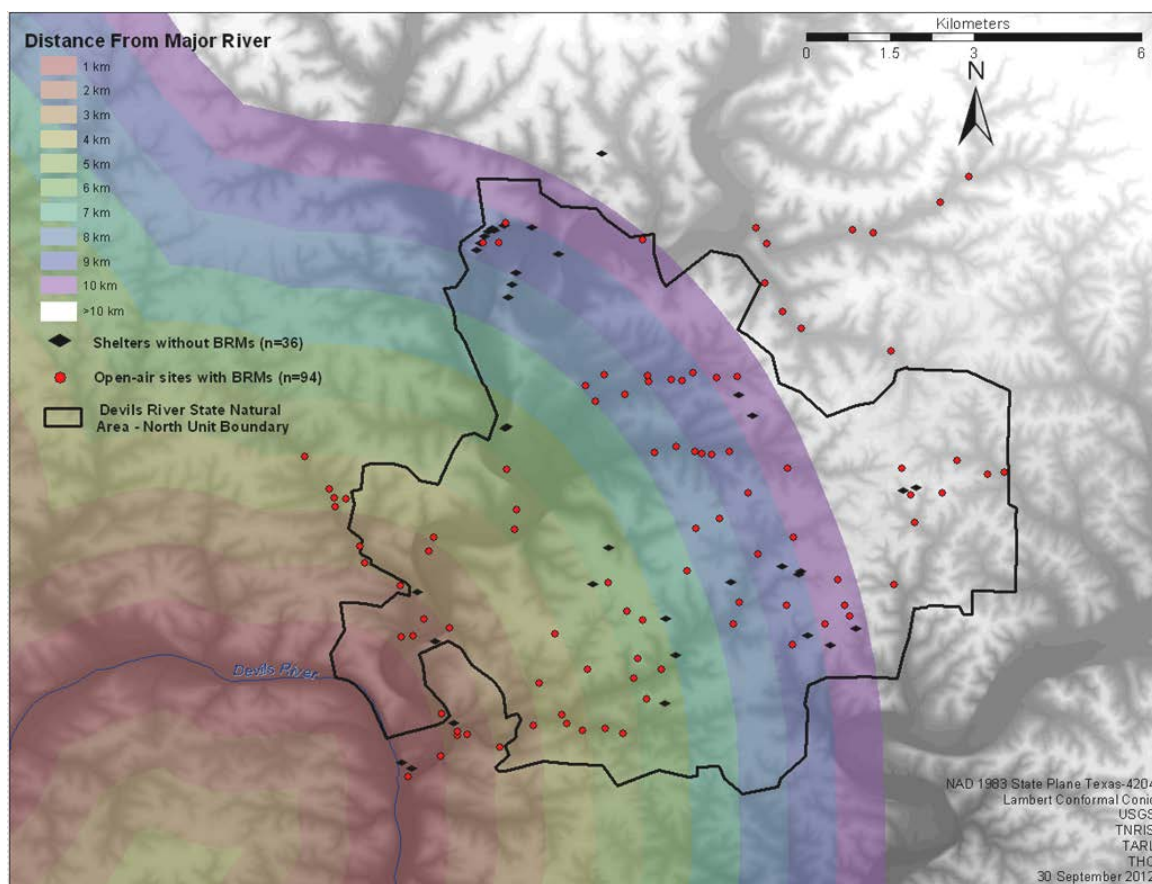


Figure 7.45. Frequency of open-air BRMs versus shelters without BRMs within DRSNA-NU: (top) map showing sites in relation to the river buffers and (bottom) line graph showing site distribution in relation to distance from the Devils River.

Table 7.14. Frequency of Archaeological Sites Recorded Along Devils River State Natural Area - North Unit

Distance From Devils River (km)	Site Types Used in this Analysis							
	All Sites (n=280)	All Rockshelters (n=70)	All Open-air Sites (n=210)	All BRMs (n=128)	Shelter BRMs (n=34)	Shelters w/o BRMs (n=36)	Open-air BRMs (n=94)	Open-air w/o BRMs (n=116)
0-1	3.9%	7.1%	2.9%	3.9%	8.8%	5.6%	2.1%	3.4%
1-2	8.9%	11.4%	8.1%	10.9%	17.6%	5.6%	8.5%	7.8%
2-3	5.4%	4.3%	5.7%	6.3%	5.9%	2.8%	6.4%	5.2%
3-4	6.4%	4.3%	7.1%	10.9%	8.8%	0.0%	11.7%	3.4%
4-5	6.4%	10.0%	5.2%	9.4%	17.6%	2.8%	6.4%	4.3%
5-6	10.4%	12.9%	9.5%	9.4%	14.7%	11.1%	7.4%	11.2%
6-7	5.4%	4.3%	5.7%	1.6%	2.9%	5.6%	1.1%	9.5%
7-8	10.4%	4.3%	12.4%	7.8%	0.0%	8.3%	10.6%	13.8%
8-9	15.4%	25.7%	11.9%	15.6%	11.8%	38.9%	17.0%	7.8%
9-10	9.3%	7.1%	10.0%	7.8%	2.9%	11.1%	9.6%	10.3%
10<	18.2%	8.6%	21.4%	16.4%	8.8%	8.3%	19.1%	23.3%
Totals	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Once again, in order to determine if the trends observed in site frequency were significant, I used the Chi-Square Test-of-Independence on six different data sets: sheltered versus open air sites, sheltered BRMs versus open-air BRMs, shelters with and without BRMs, open-air sites with and without BRMs, sheltered sites with BRMs versus open-air sites without BRMs, and open-air sites with BRMs versus sheltered sites without BRMs. Due to small sample sizes, I consolidated the river buffer increments into seven smaller units (Table 7.15). The results of the different Chi-Square tests are provided in Tables 7.16, 7.17, 7.18, 7.19, 7.20, and 7.21.

Table 7.21. Chi-Square Test-of-Independence Results for Open-air BRMs Versus Shelters without BRMs in DRSNA-NU							
Distance from Devils	Observed Values			Expected Values		χ^2	
	Open-air BRMs	Shelters w/o BRMs	Totals	Open-air BRMs	Shelters w/o BRMs	Open-air BRMs	Shelters w/o BRMs
0-2	10	4	14	10.123	3.877	0.0015	0.0039
2-4	17	1	18	13.015	4.985	1.220	3.185
4-6	13	5	18	13.015	4.985	0.000	0.000
6-8	11	5	16	11.569	4.431	0.028	0.073
8-9	16	14	30	21.692	8.308	1.494	3.900
9-10	9	4	13	9.400	3.600	0.017	0.044
10<	18	3	21	15.185	5.815	0.522	1.363
Totals	94	36	130				
$\chi^2 = 11.8522$, DF = 6.00, p = 0.06534							

Based on the results of the Chi-Square tests, the frequencies of sites along DRSNA-NU are all statistically different to a 90% level of confidence. This is surprising given the similarities in the frequency trend graphs. The dissimilarity between the samples is most likely due to small sample size, a common pattern within the different survey areas. The DRSNA-NU data also indicate a break in site frequency patterns between six and eight kilometers from the Devils River. This is an interesting pattern, but unfortunately no other survey area has data that extends into this six to eight kilometer zone to provide a comparative dataset.

Site Density Analysis. Site density analysis, like the Seminole Canyon study area, was only conducted on the sites within the boundary of the state land. Once again, the boundary of the DRSNA-NU was modified to include areas near the Devils River with dense clusters of sites in the analysis (Figure 7.46). Of the 280 sites, 263 are used in the density analysis. The other boundaries of the study area remained unchanged. The

results from the density analysis are provided in Figures 7.47, 7.48, 7.49, 7.50, 7.51, 7.52, 7.53, and 7.54. A tabular summary of the density data is provided in Table 7.22.

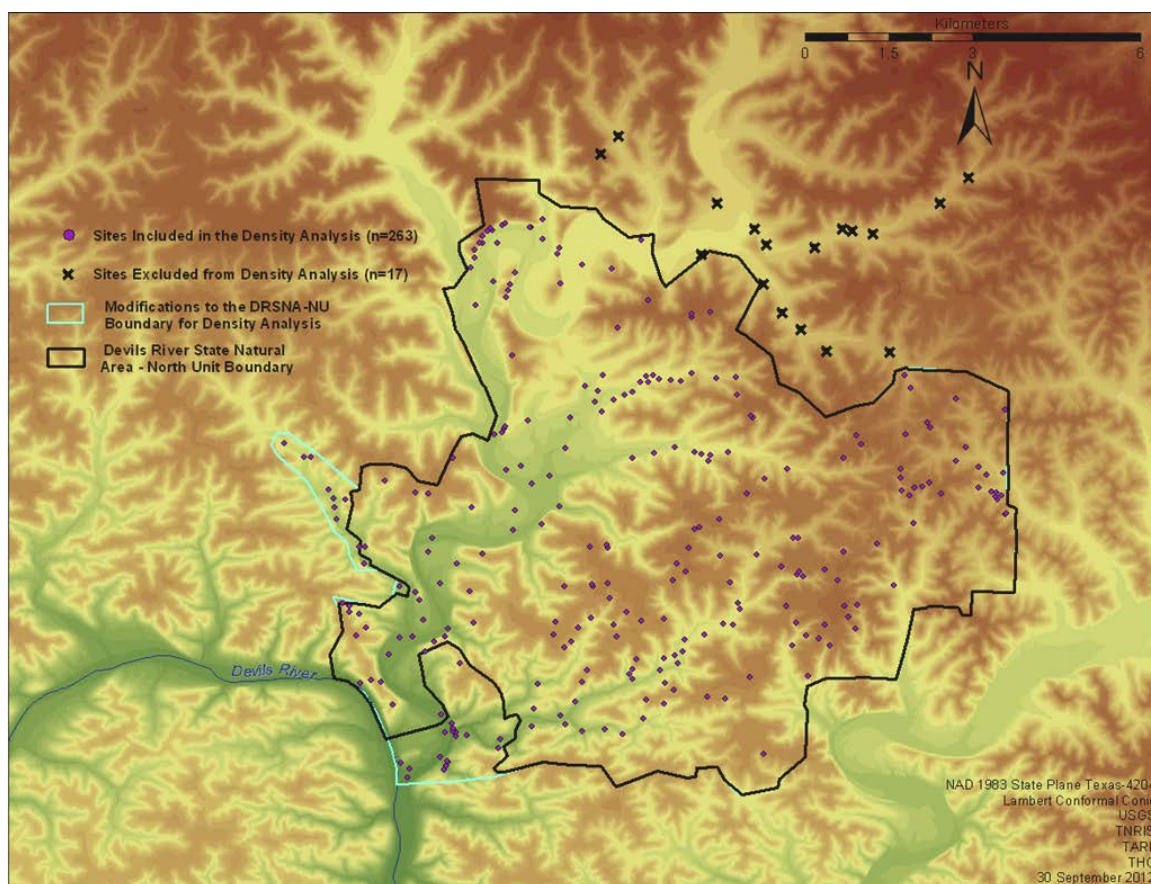


Figure 7.46. Distribution of sites within DRSNA-NU used in the density analysis as well as the additions to the study area boundaries.

Table 7.22. Density of Archaeological Sites Within Devils River State Natural Area - North Unit																	
Distance from Major River (km)		Site Types Used in this Analysis															
		All Sites (n=263)		All Rockshelters (n=68)		All Open-Air Sites (n=195)		All BRMs (n=117)		Shelter BRMs (n=33)		Shelters w/o BRMs (n=35)		Open-air BRMs (n=84)		Open-air w/o BRMs (n=111)	
Distance from Major River (km)	River Buffer Area (km ²)	# of Sites	Sites/ km ²	# of Sites	Sites/ km ²	# of Sites	Sites/ km ²	# of Sites	Sites/ km ²	# of Sites	Sites/ km ²	# of Sites	Sites/ km ²	# of Sites	Sites/ km ²	# of Sites	Sites/ km ²
0-1	2.84	11	3.87	5	1.76	6	2.11	5	1.76	3	1.06	2	0.70	2	0.70	4	1.41
1-2	3.55	25	7.04	8	2.25	17	4.79	14	3.94	6	1.69	2	0.56	8	2.25	9	2.54
2-3	5.18	15	2.90	3	0.58	12	2.32	8	1.54	2	0.39	1	0.19	6	1.16	6	1.16
3-4	6.86	18	2.62	3	0.44	15	2.19	14	2.04	3	0.44	0	0.00	11	1.60	4	0.58
4-5	6.28	18	2.87	7	1.11	11	1.75	12	1.91	6	0.96	1	0.16	6	0.96	5	0.80
5-6	6.65	29	4.36	9	1.35	20	3.01	12	1.80	5	0.75	4	0.60	7	1.05	13	1.95
6-7	8.51	15	1.76	3	0.35	12	1.41	2	0.24	1	0.12	2	0.24	1	0.12	11	1.29
7-8	10.26	29	2.83	3	0.29	26	2.53	10	0.97	0	0.00	3	0.29	10	0.97	16	1.56
8-9	10.26	43	4.19	18	1.75	25	2.44	20	1.95	4	0.39	14	1.36	16	1.56	9	0.88
9-10	9.63	26	2.70	5	0.52	21	2.18	10	1.04	1	0.10	4	0.42	9	0.93	12	1.25
10<	15.06	34	2.26	4	0.27	30	1.99	10	0.66	2	0.13	2	0.13	8	0.53	22	1.46
Totals	85.08	263	3.09	68	0.80	195	2.29	117	1.38	33	0.39	35	0.41	84	0.99	111	1.30

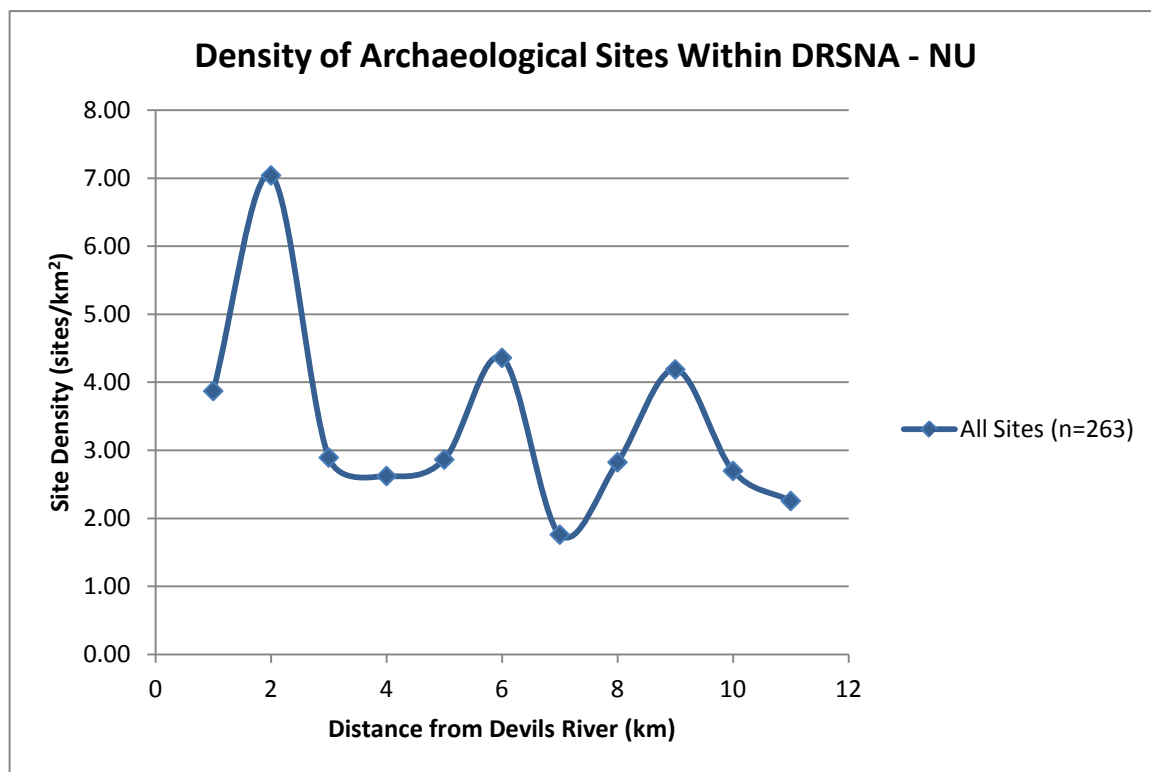


Figure 7.47. Density of all archaeological sites within DRSNA-NU in relation to the Devils River.

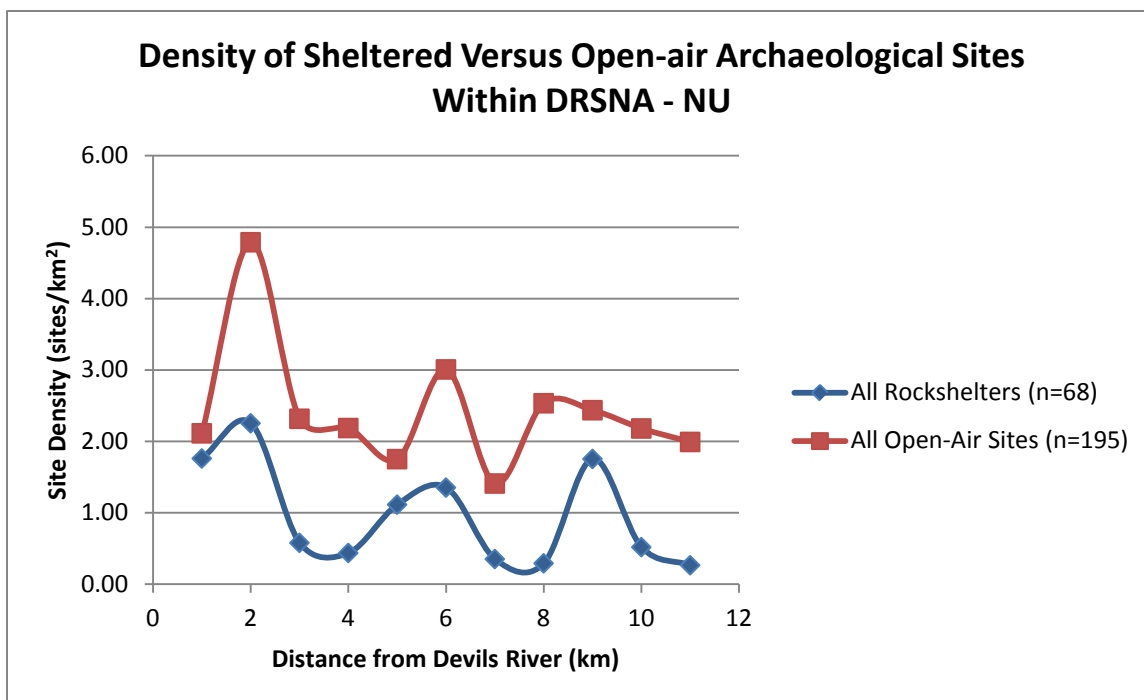


Figure 7.48. Density of all sheltered and open-air sites within DRSNA-NU in relation to the Devils River.

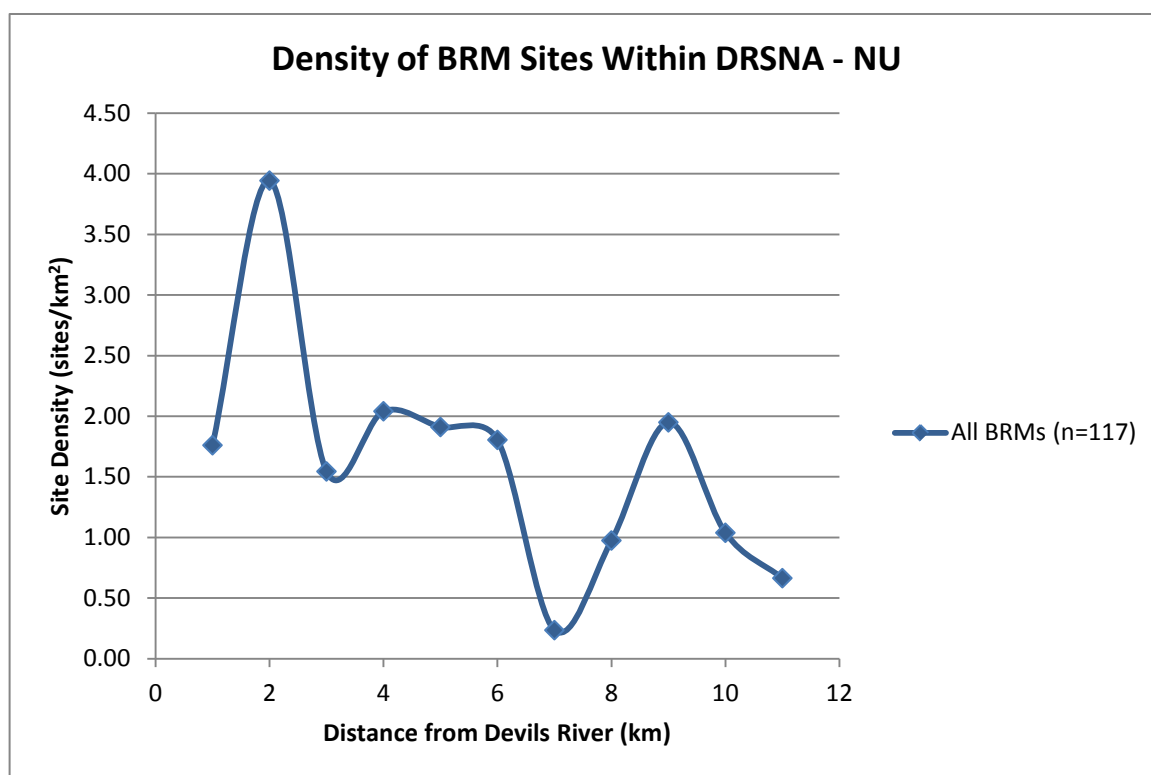


Figure 7.49. Density of all sites containing burned rock middens within DRSNA-NU in relation to the Devils River.

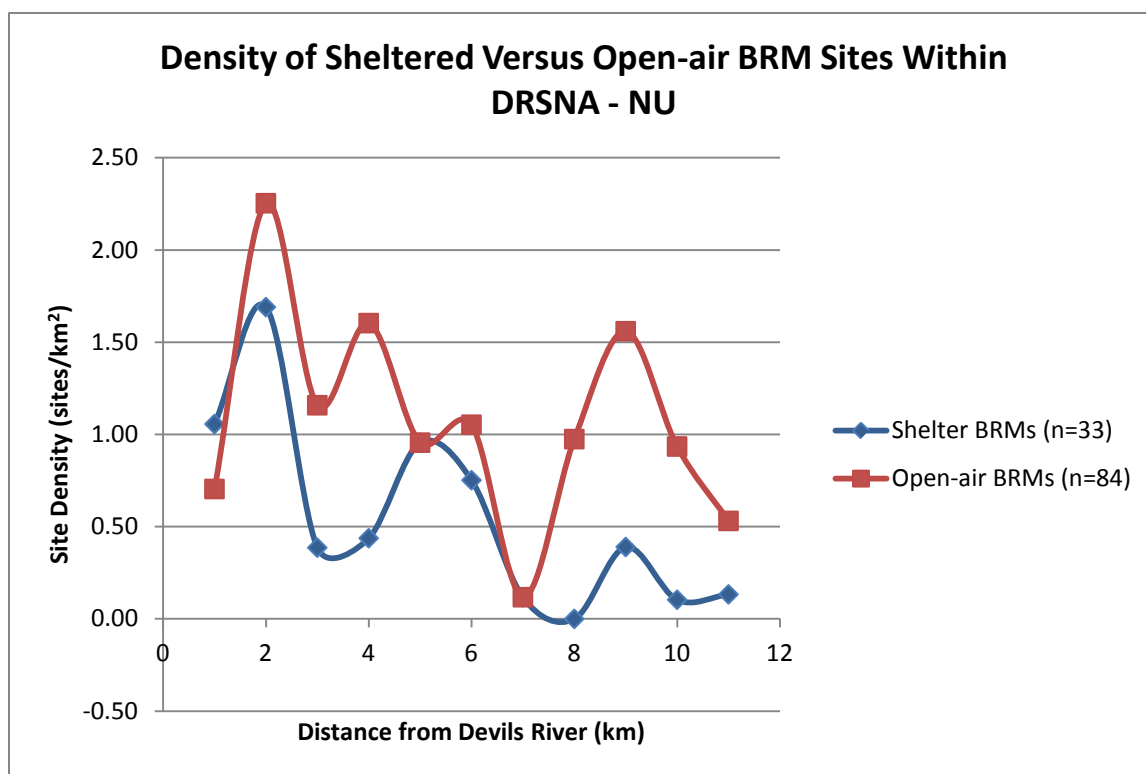


Figure 7.50. Density of all open-air and sheltered burned rock middens within DRSNA-NU in relation to the Devils River.

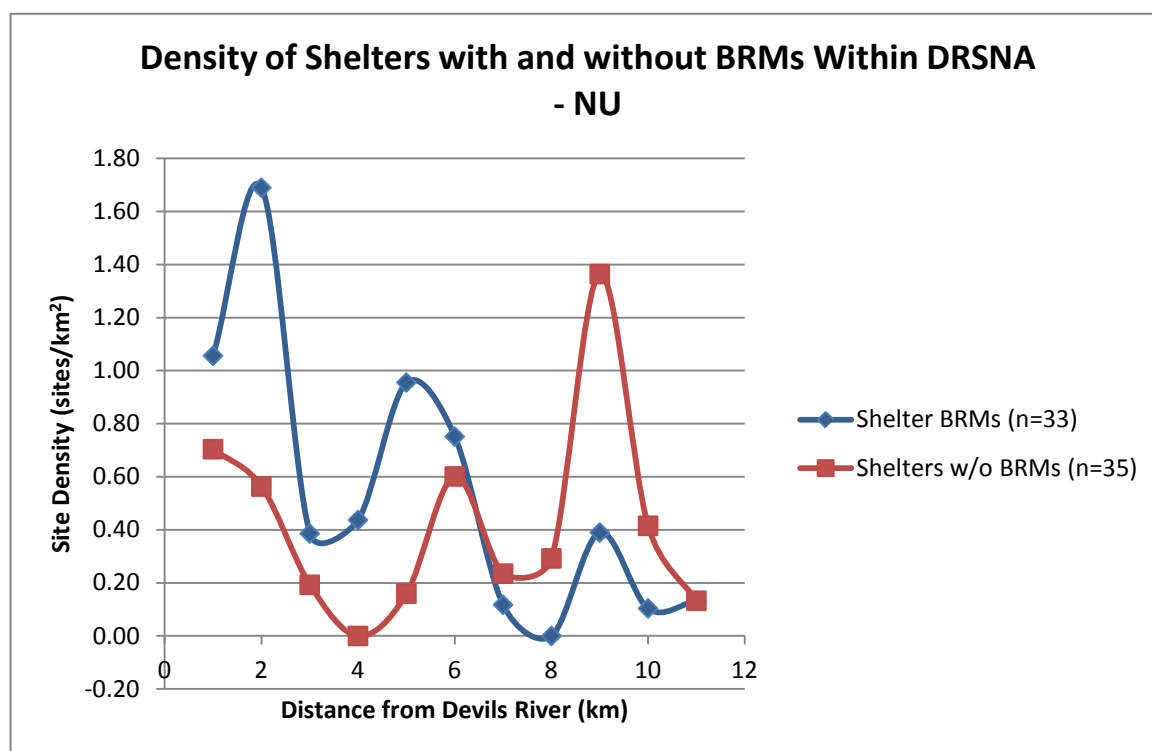


Figure 7.51. Density of shelters with and without BRMs within DRSNA-NU in relation to the Devils River.

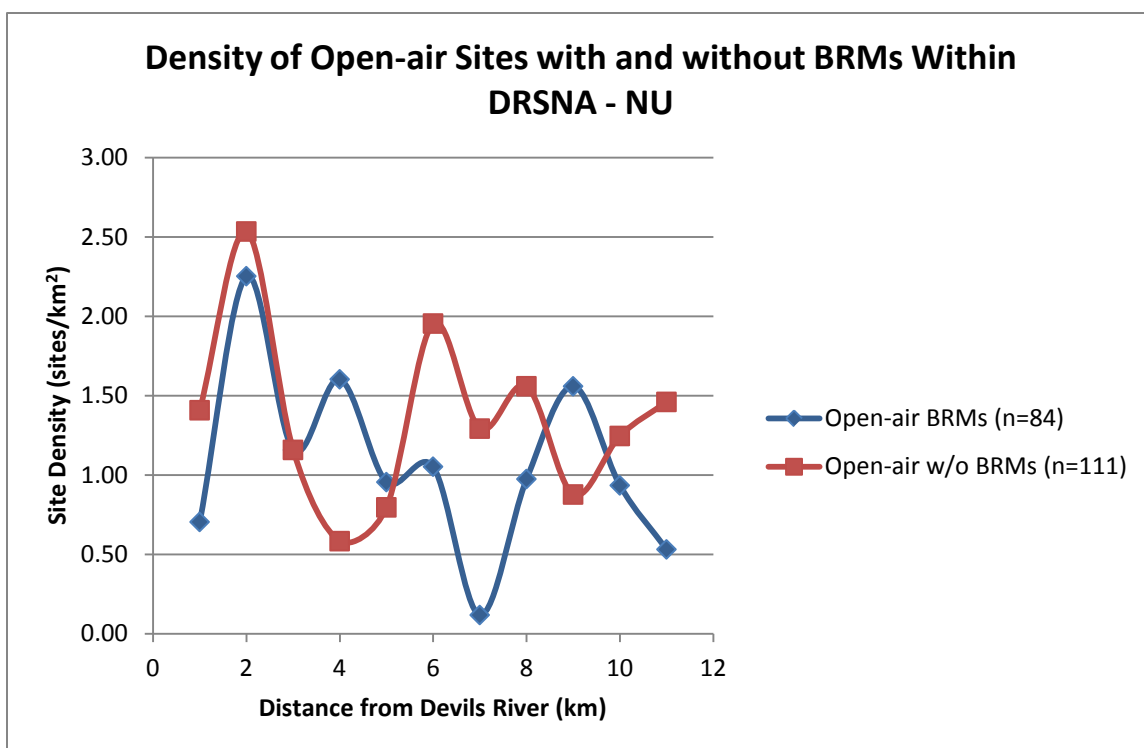


Figure 7.52. Density of open-air sites with and without BRMs within DRSNA-NU in relation to the Devils River.

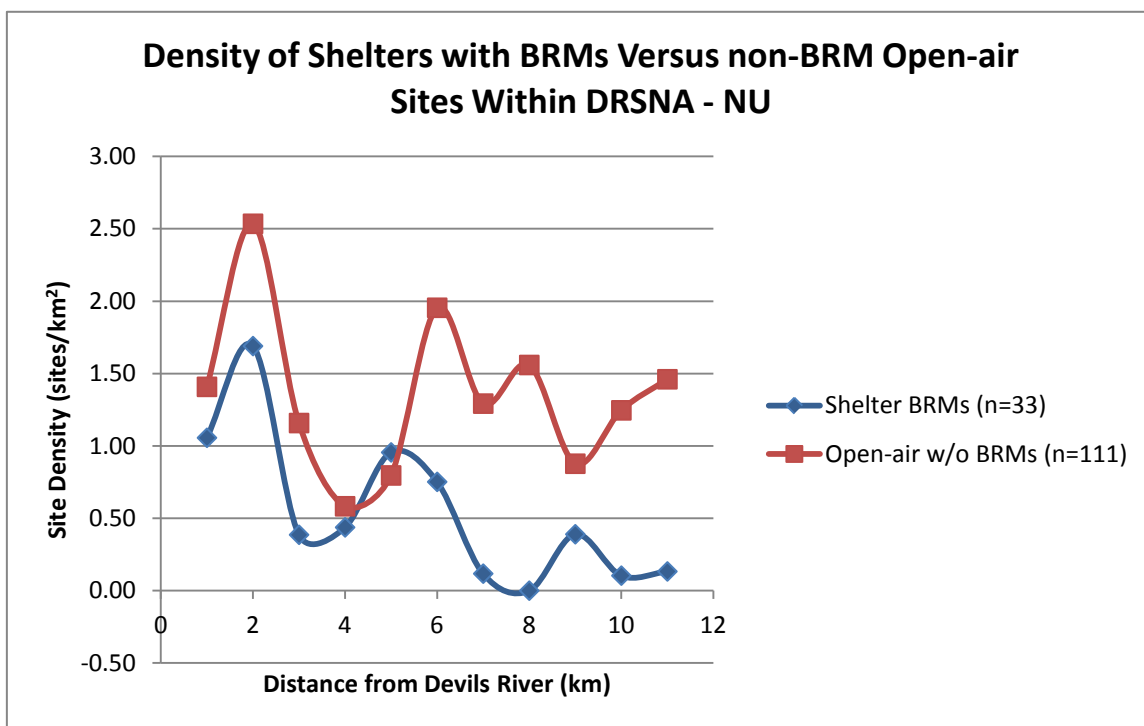


Figure 7.53. Density of shelters with BRMs versus non-BRM open-air sites within DRSNA-NU in relation to the Devils River.

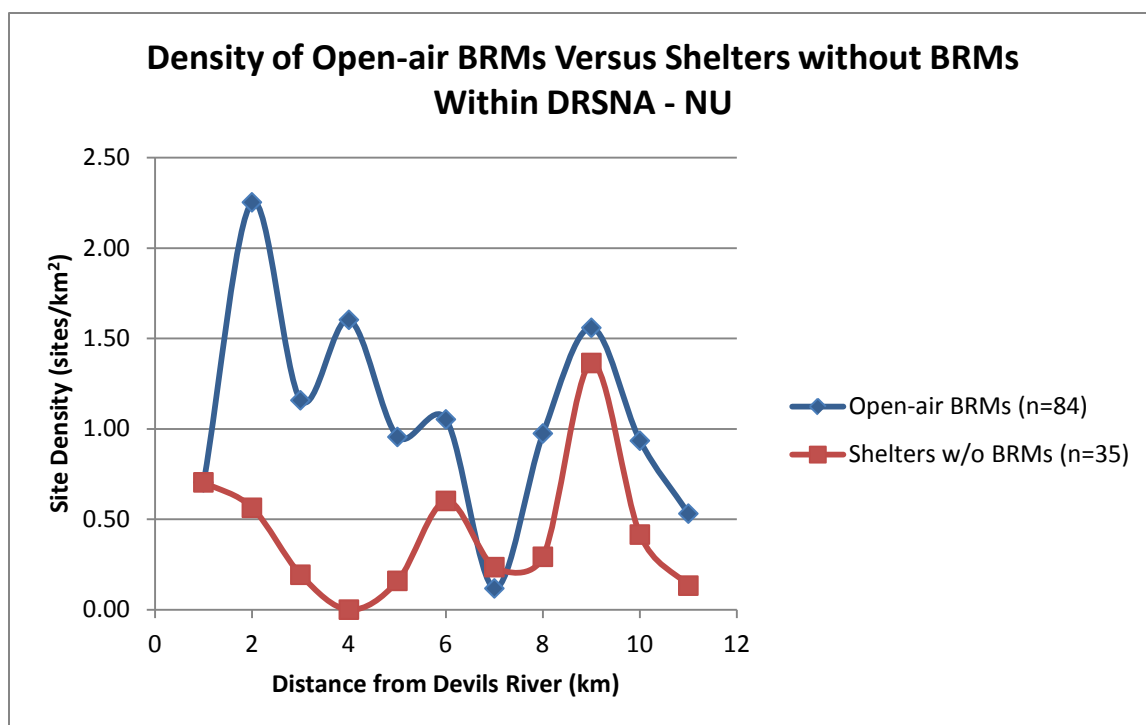


Figure 7.54. Density of open-air BRMs versus shelters without BRMs within DRSNA-NU in relation to the Devils River.

In order to determine if the trends observed in site density were significant, I once again used regression on six different data sets: sheltered versus open air sites, sheltered BRMs versus open-air BRMs, shelters with and without BRMs, open-air sites with and without BRMs, sheltered sites with BRMs versus open-air sites without BRMs, and open-air sites with BRMs versus sheltered sites without BRMs. The regression analysis results are provided in Figures 7.55, 7.56, 7.57, 7.58, 7.59, and 7.60.

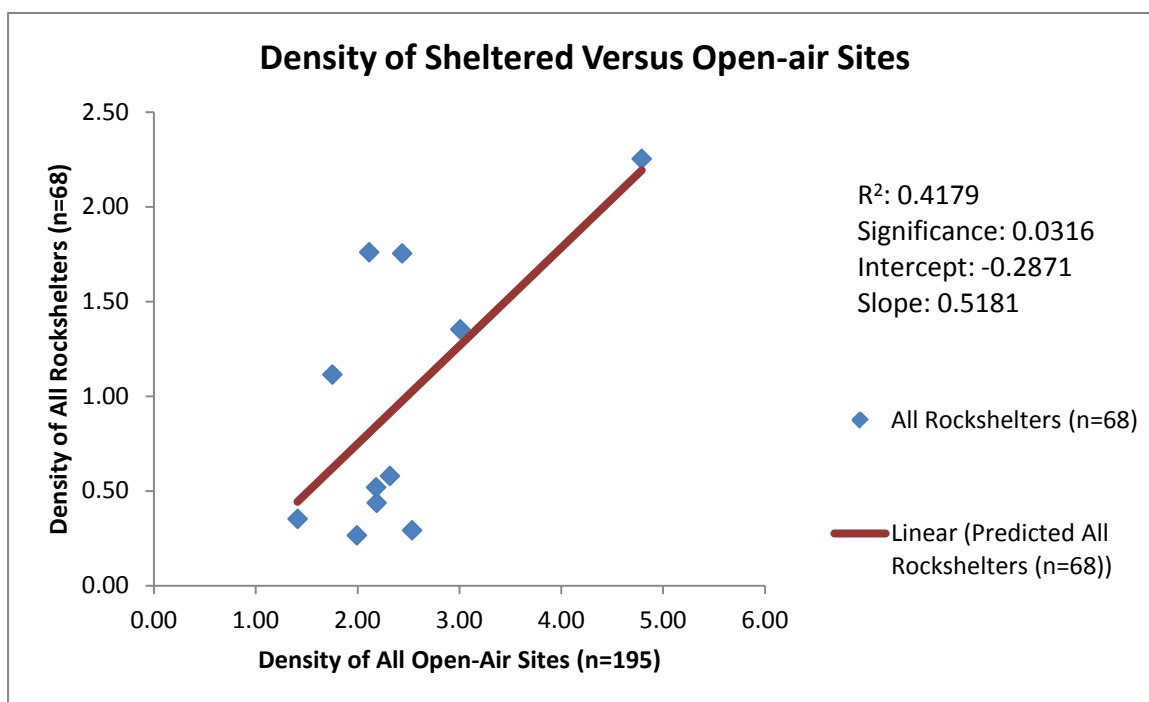


Figure 7.55. Linear regression of sheltered and open-air sites within DRSNA-NU.

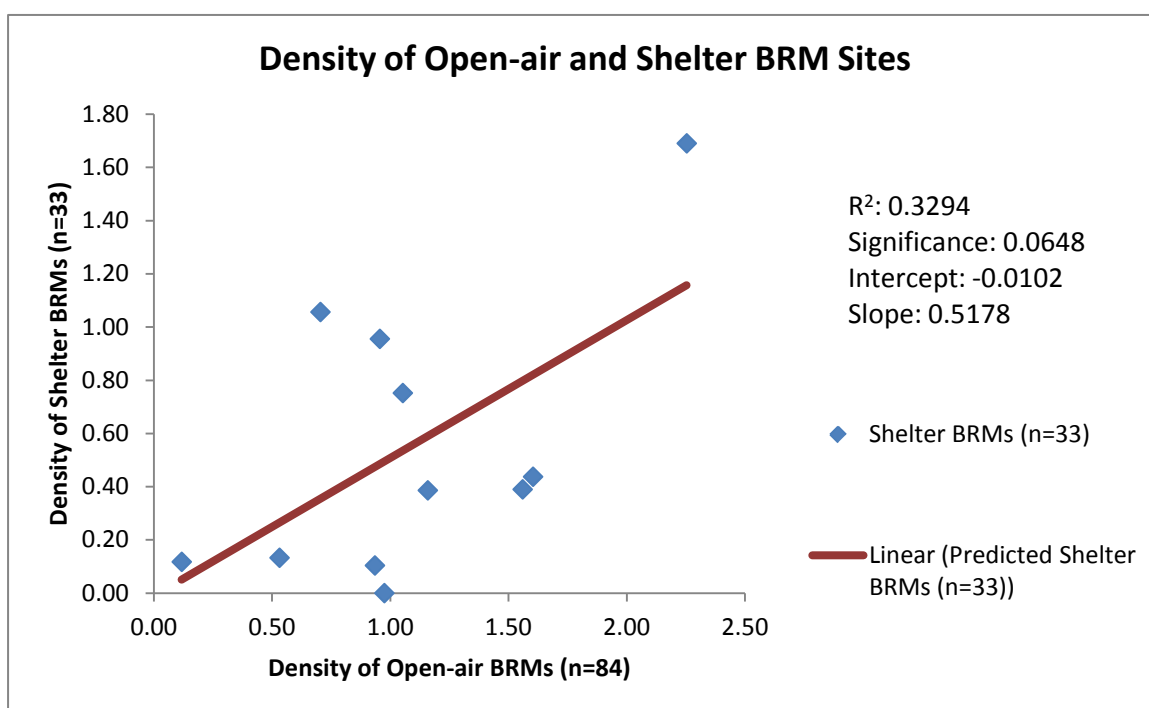


Figure 7.56. Linear regression of sheltered and open-air BRM sites within DRSNA-NU.

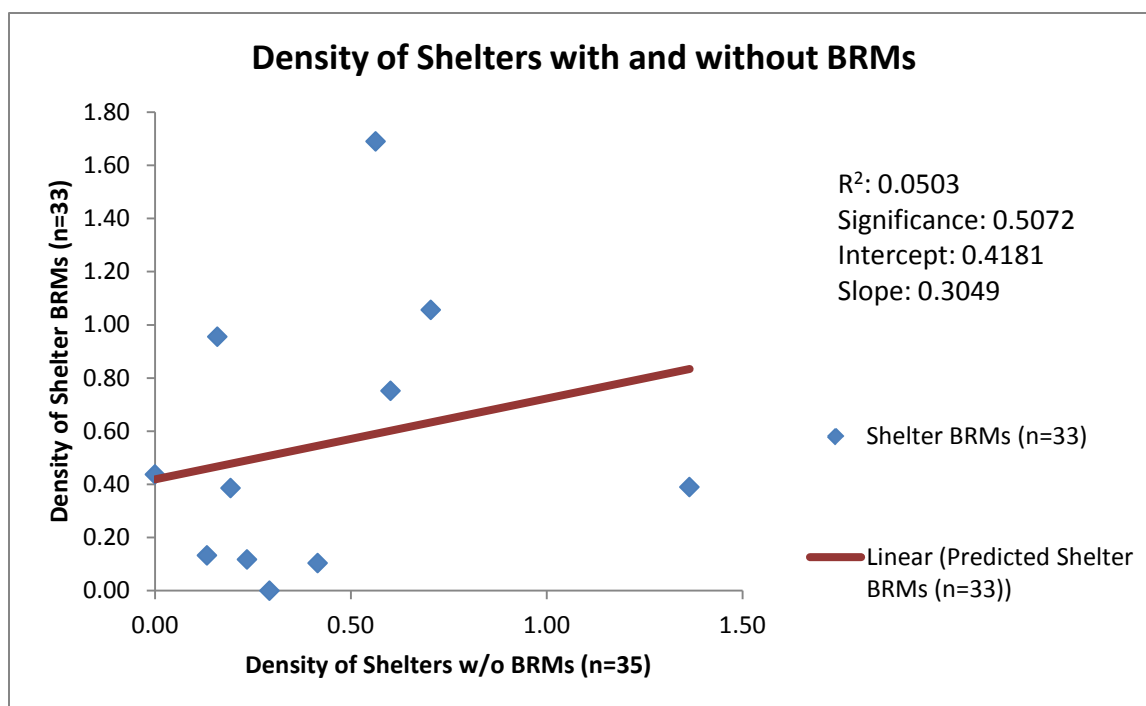


Figure 7.57. Linear regression of shelters with and without BRMs within DRSNA-NU.

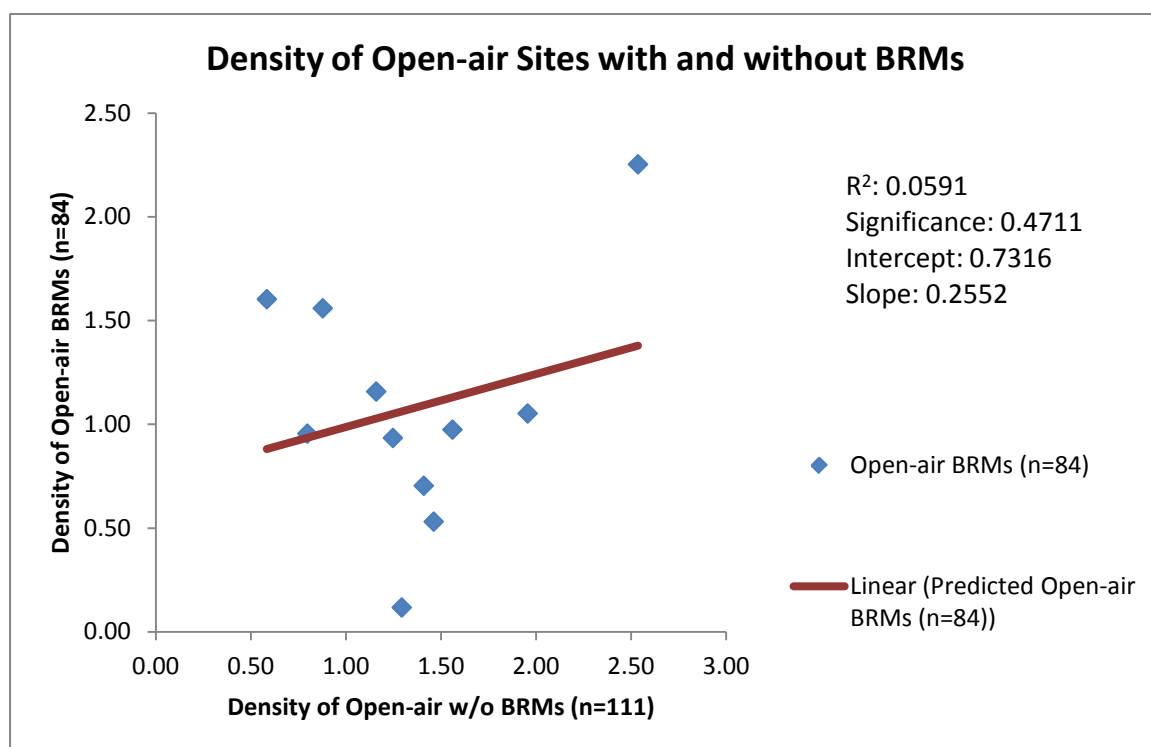


Figure 7.58. Linear regression of open-air sites with and without BRMs within DRSNA-NU.

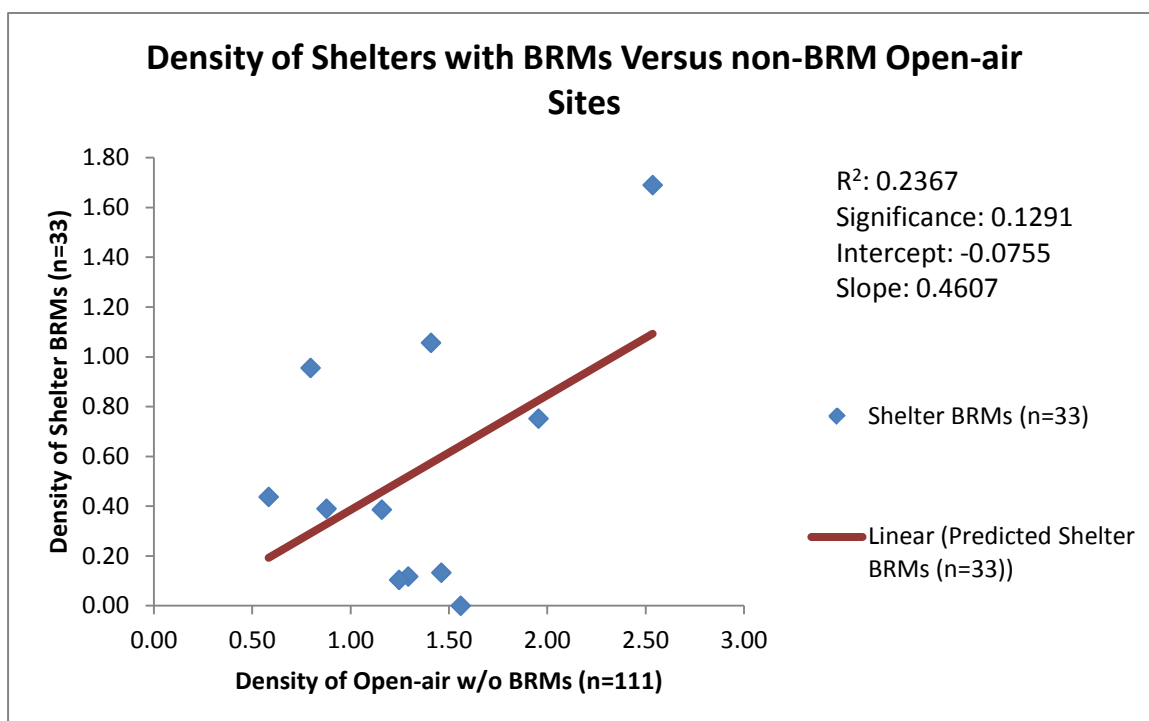


Figure 7.59. Linear regression of shelters with BRMs versus non-BRM open-air sites within DRSNA-NU.

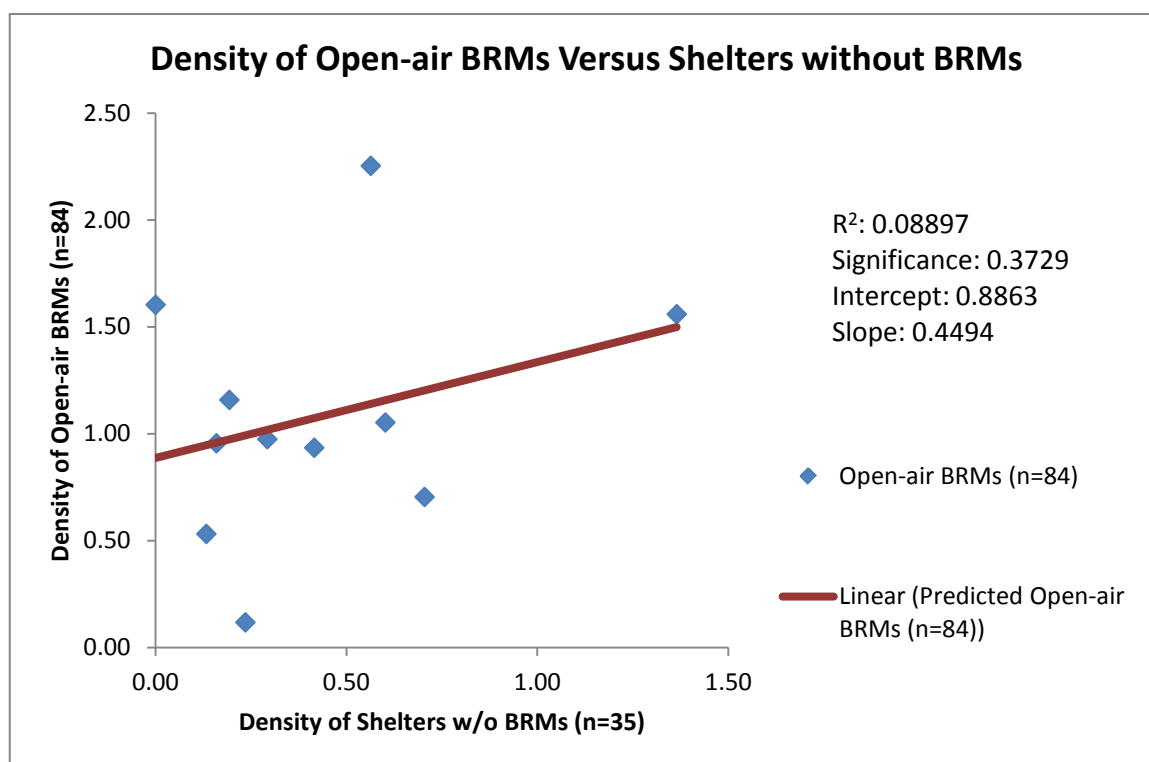


Figure 7.60. Linear regression of open-air BRMs versus shelters without BRMs within DRSNA-NU.

Based on the regression analysis, the majority of trends within the density data are statistically different than one another to a 90% level of confidence. However, the trends for sheltered sites versus open-air sites and sheltered BRMs versus open-air BRMs are statistically the same (Figures 7.55 and 7.56). Both these trends show a decrease in site density up to 7 kilometers from the Devils, and an increase in site density after 7 kilometers. This break in density data is also present in the DRSNA-NU frequency data.

Patterns in Site Density Between Dead Man's Creek, Seminole Canyon, and Devils River State Natural Area – North Unit

This section combines the different types of data from each of the three regional survey areas to determine what patterns exist within smaller subsets of the regional data set. This section only focuses on comparing the site density data. Site frequency cannot be compared across survey areas at this point because there is no way to standardize the frequency numbers to allow for meaningful comparisons. However, I think the frequency data from each survey are interesting and shows that patterns in site distribution exist within each area (the Chi-Square tests demonstrates that many of the frequency patterns are statistically similar). Many of the frequency graphs show peaks in site frequency that are not present in the density analysis. The density measurements I calculated assume sites are evenly distributed within each buffer zones (which, based on the maps, sites are not evenly distributed). Frequency data was similarly calculated: sites were counted within each buffer area not accounting for proximity or density. Essentially, the frequency and density data I calculated are at either ends of a frequency-density spectrum. By providing both frequency and density data for each survey area, I have supplied future researchers with the basic data to perform more advanced spatial analysis

that combines both frequency and density data (cluster analysis in GIS, for instance). I would expect the true landuse pattern to fall somewhere between the graphs shown for frequency and density.

Nonetheless, in order to compare the site density data, all site data for the three areas are trimmed to the same buffer distance (6 kilometers). Regression is used to compare trends across three survey areas. Common trends and patterns for each dataset (all sites, rockshelters, open-air sites, BRMs, shelter BRMs, shelters without BRMs, open-air BRMs, and open-air without BRMs) are briefly discussed, but the interpretations of patterns are left to Chapter 8.

Overall Archaeological Site Density

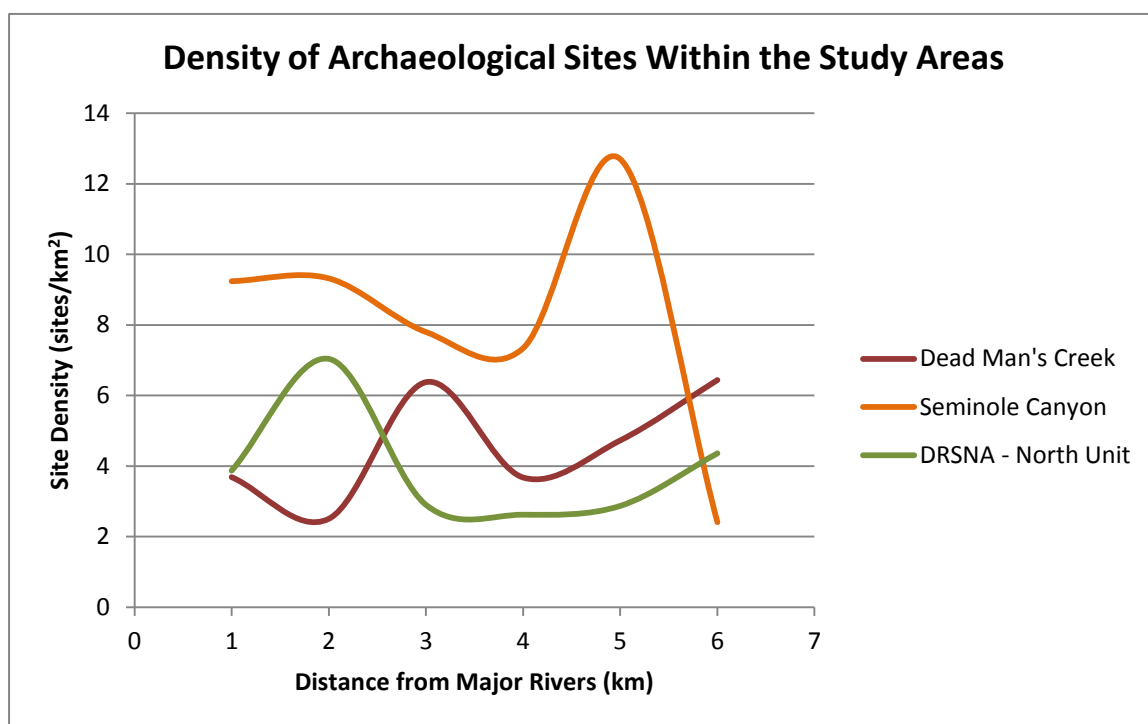


Figure 7.61. Density of archaeological sites within the three study areas.

Table 7.23. Density of All Archaeological Sites within Dead Man's Creek, Seminole Canyon, and Devils River State Natural Area - North Unit (sites/km ²)						
Study Area	Distance from Major River (km)					
	0-1	1-2	2-3	3-4	4-5	5-6
Dead Man's Creek	3.69	2.51	6.38	3.68	4.73	6.44
Seminole Canyon	9.24	9.32	7.8	7.34	12.7	2.41
DRSNA - North Unit	3.87	7.04	2.9	2.62	2.87	4.36

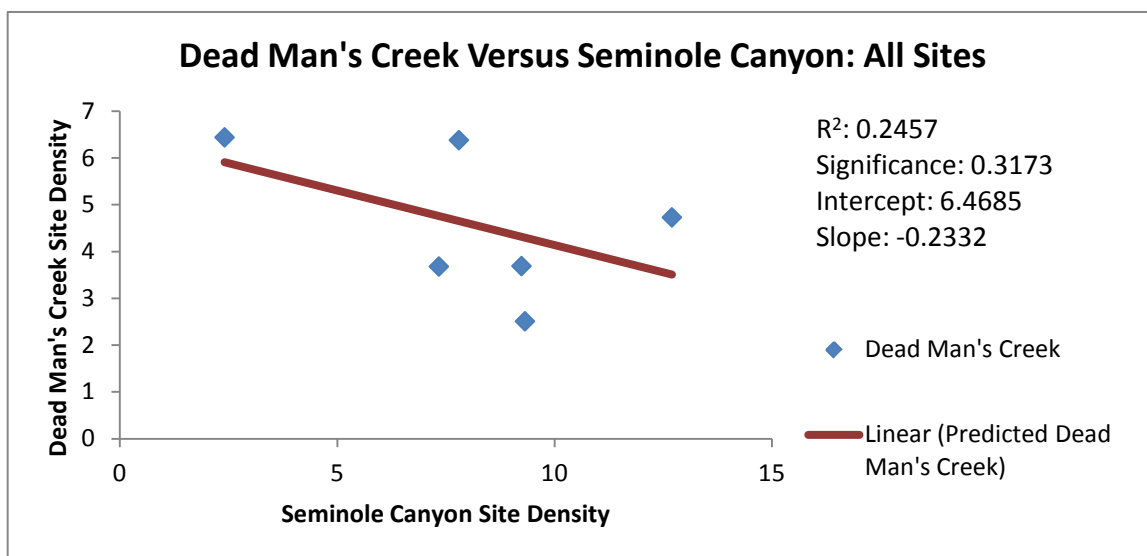


Figure 7.62. Linear regression of archaeological site density for DMC and Seminole Canyon.

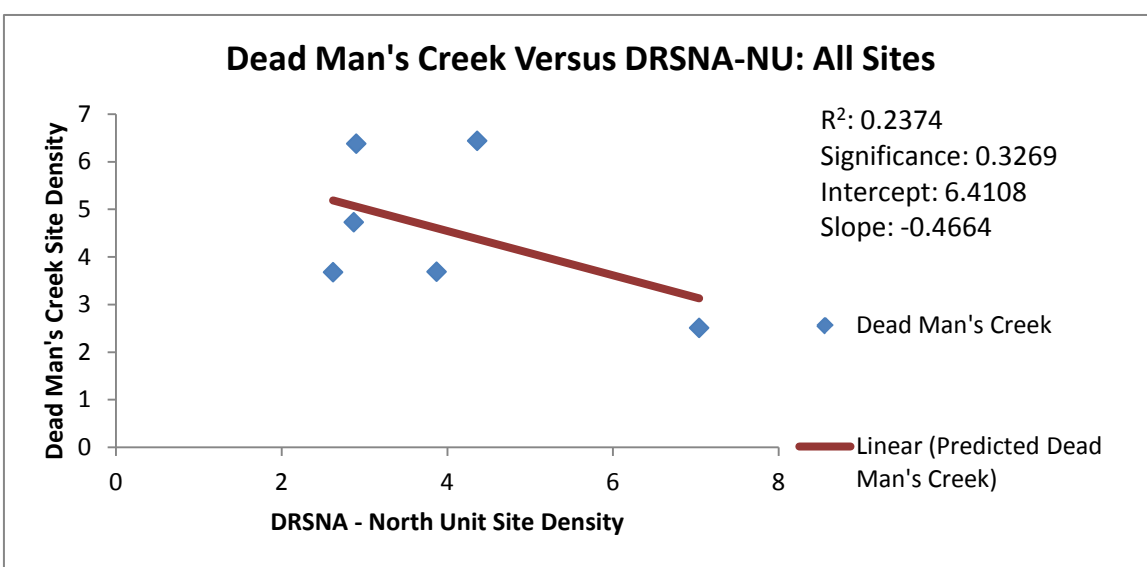


Figure 7.63. Linear regression of archaeological site density for DMC and DRSNA-NU.

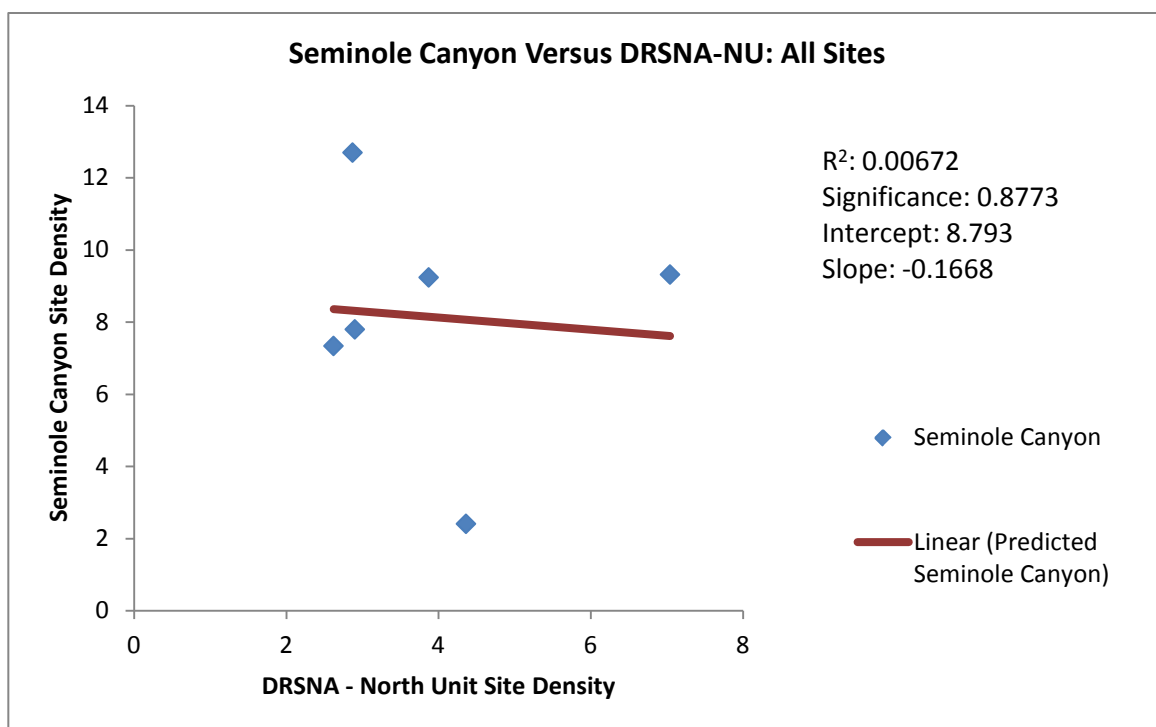


Figure 7.64. Linear regression of archaeological site density for Seminole Canyon and DRSNA-NU.

The regression analysis shows that all of the trends in site density are statistically different within each of the three survey areas. The DMC data is more similar to both Seminole Canyon and DRSNA-NU than Seminole and DRSNA-NU are to each other. Undoubtedly the small sample sizes for all three areas affects the results from the regression analysis; nonetheless, the general trends within the density data indicate an increase in archaeological site density as distance away from the major rivers increases.

Density of all Sheltered Sites

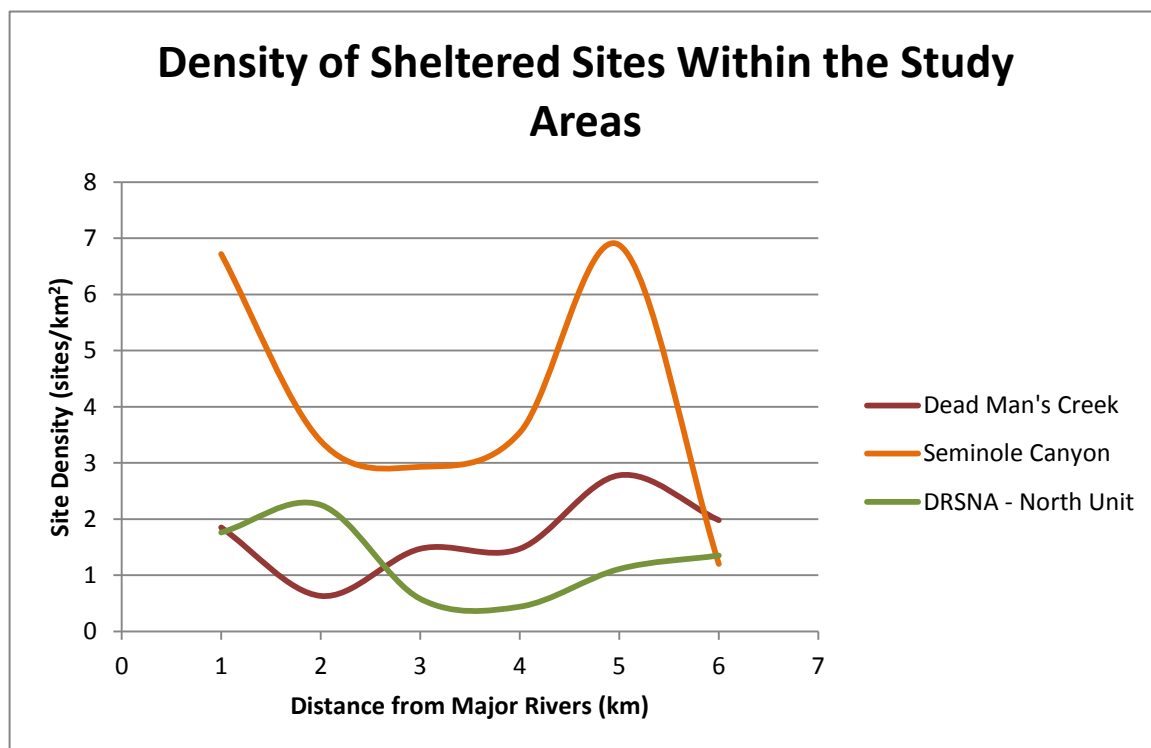


Figure 7.65. Density of sheltered sites within the three study areas.

Table 7.24. Density of Sheltered Sites within Dead Man's Creek, Seminole Canyon, and Devils River State Natural Area - North Unit (sites/km ²)						
Study Area	Distance from Major River (km)					
	0-1	1-2	2-3	3-4	4-5	5-6
Dead Man's Creek	1.85	0.63	1.47	1.47	2.78	1.98
Seminole Canyon	6.72	3.39	2.93	3.54	6.88	1.2
DRSNA - North Unit	1.76	2.25	0.58	0.44	1.11	1.35

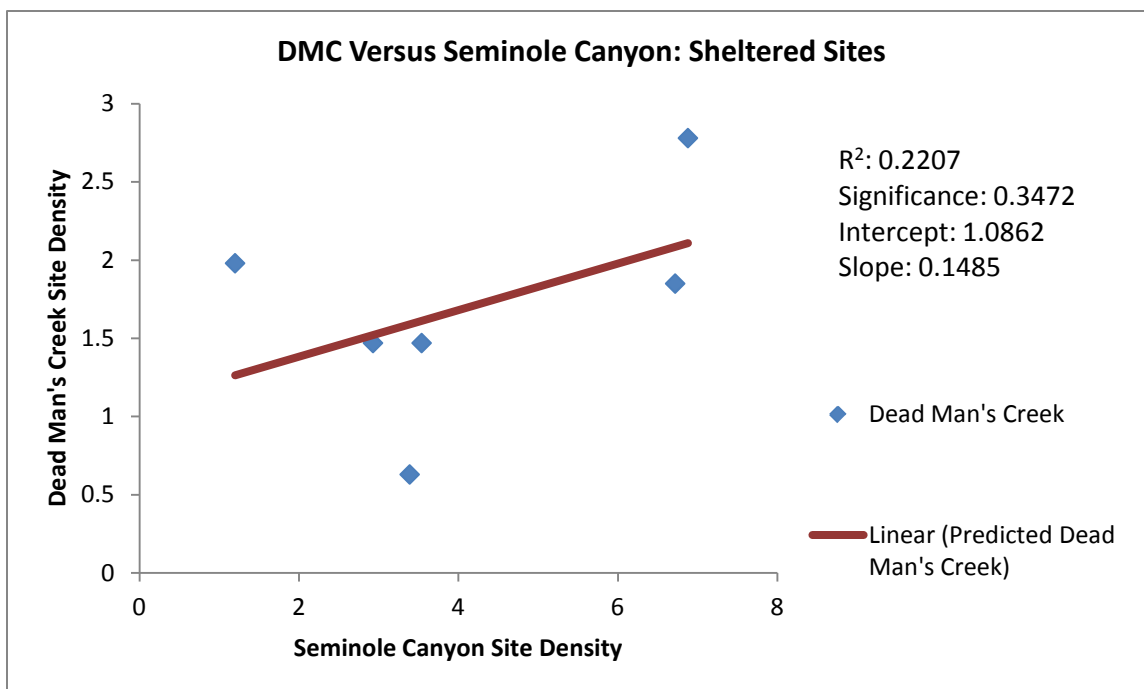


Figure 7.66. Linear regression of sheltered site density within DMC and Seminole Canyon.

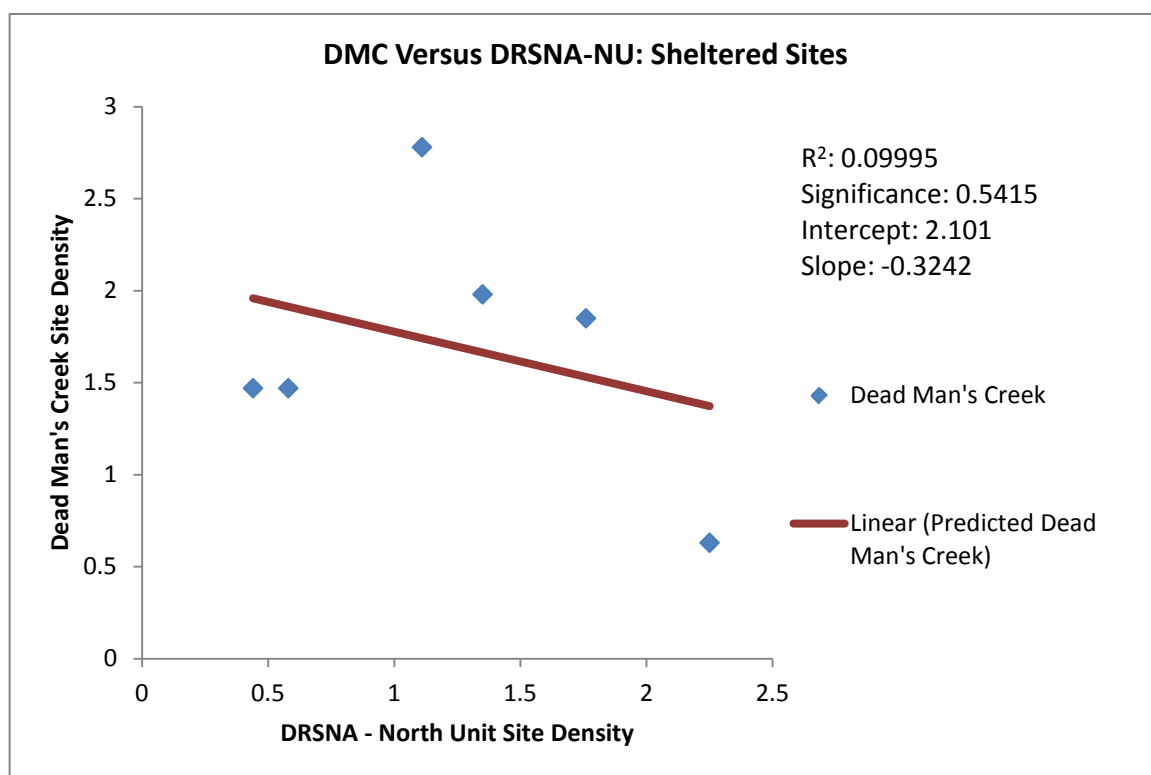


Figure 7.67. Linear regression of sheltered site density within DMC and DRSNA-NU.

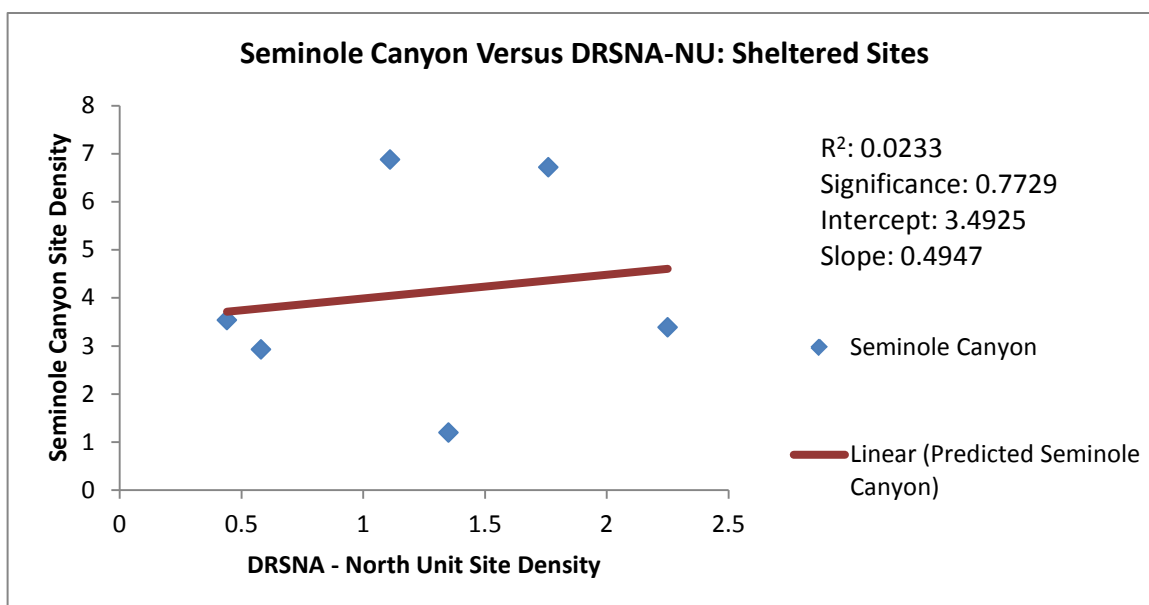


Figure 7.68. Linear regression of sheltered site density within Seminole Canyon and DRSNA-NU.

The regression analysis indicates the survey areas are statistically different from one another in terms of the density of sheltered sites. The density between Seminole and DMC is more similar than the other combinations, which is surprising because DMC and DRSNA are located along the Devils River while Seminole is along the Rio Grande.

Open-air Site Density

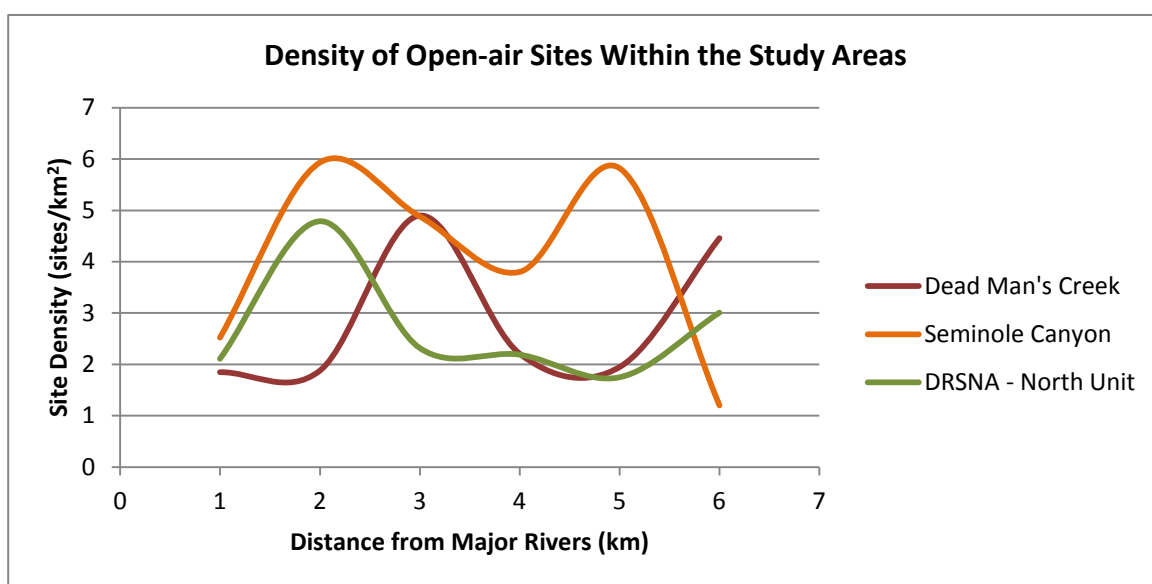


Figure 7.69. Density of open-air sites within the three study areas.

Table 7.25. Density of Open-air Sites within Dead Man's Creek, Seminole Canyon, and Devils River State Natural Area - North Unit (sites/km ²)						
Study Area	Distance from Major River (km)					
	0-1	1-2	2-3	3-4	4-5	5-6
Dead Man's Creek	1.85	1.88	4.9	2.21	1.95	4.46
Seminole Canyon	2.52	5.93	4.88	3.8	5.82	1.2
DRSNA - North Unit	2.11	4.79	2.32	2.19	1.75	3.01

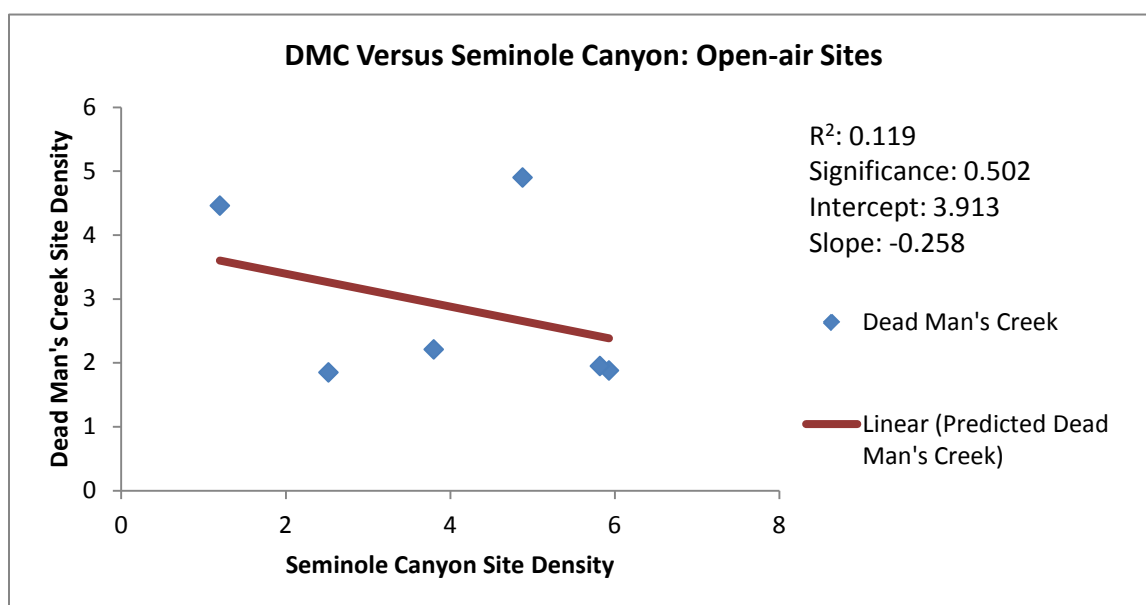


Figure 7.70. Linear regression of open-air site density within DMC and Seminole Canyon.

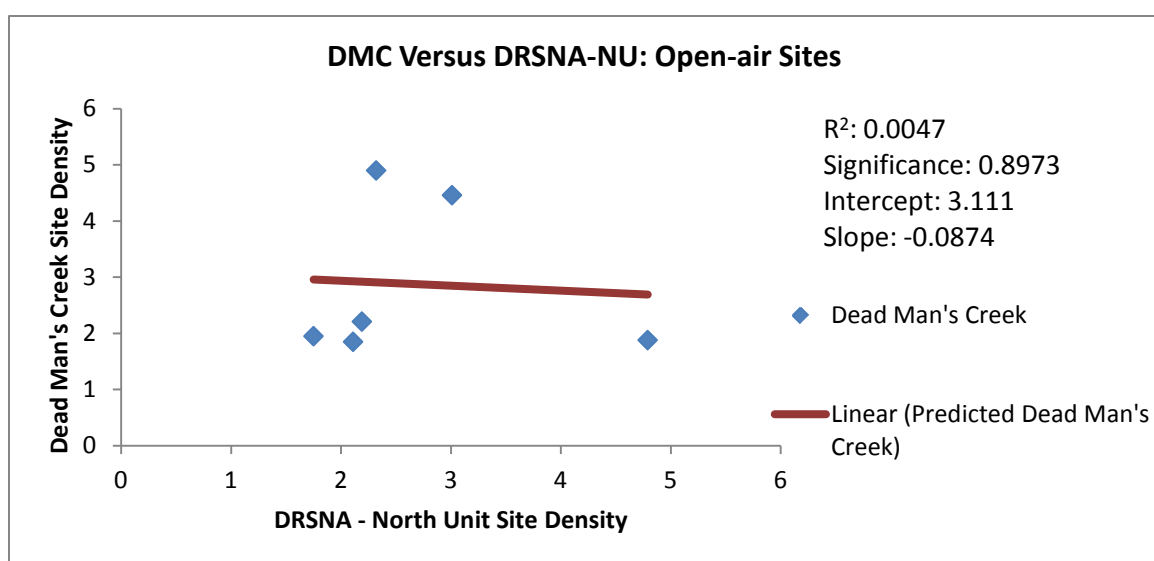


Figure 7.71. Linear regression of open-air site density within DMC and DRSNA-NU.

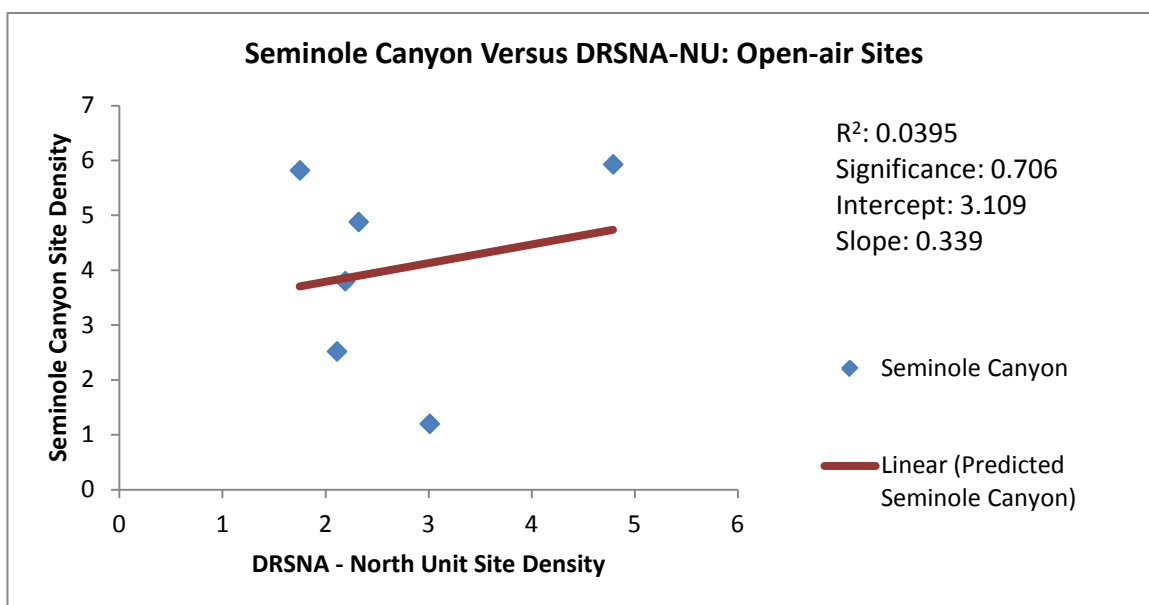


Figure 7.72. Linear regression of open-air site density within Seminole Canyon and DRSNA-NU.

Once again, regression demonstrates that all three survey areas have statistically different densities of open-air sites. The two Devils River areas show peaks in site density closer to the river, while the Seminole data has two-peaks: one closer to the river and one further away.

Burned Rock Midden Density

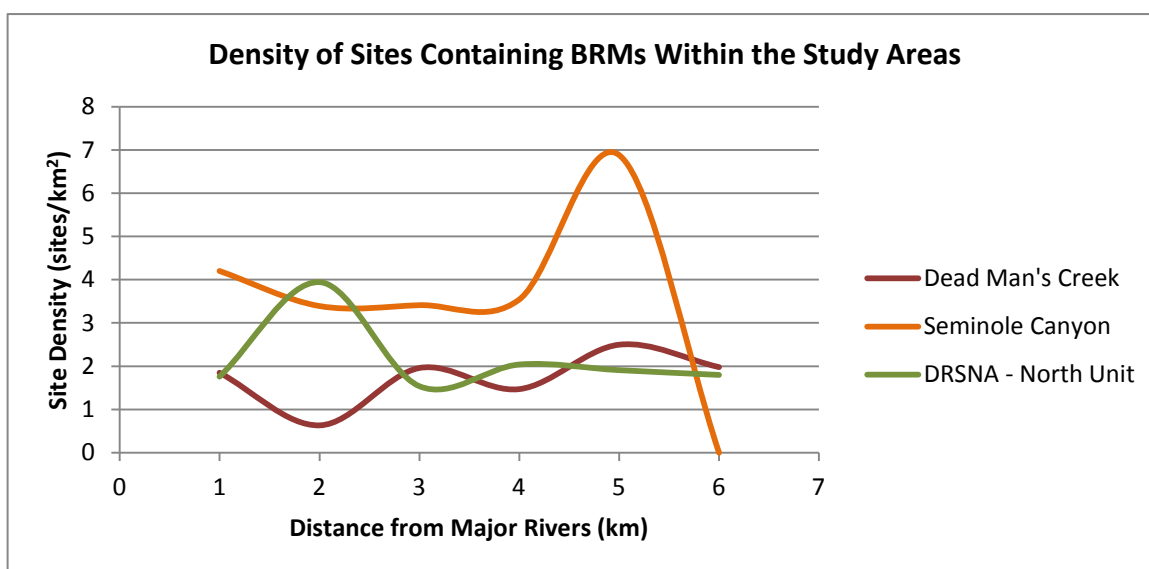


Figure 7.73. Density of BRM sites within the three study areas.

Table 7.26. Density of Sites Containing BRMs within Dead Man's Creek, Seminole Canyon, and Devils River State Natural Area - North Unit (sites/km ²)						
Study Area	Distance from Major River (km)					
	0-1	1-2	2-3	3-4	4-5	5-6
Dead Man's Creek	1.85	0.63	1.96	1.47	2.5	1.98
Seminole Canyon	4.2	3.39	3.41	3.54	6.88	0.00
DRSNA - North Unit	1.76	3.94	1.54	2.04	1.91	1.8

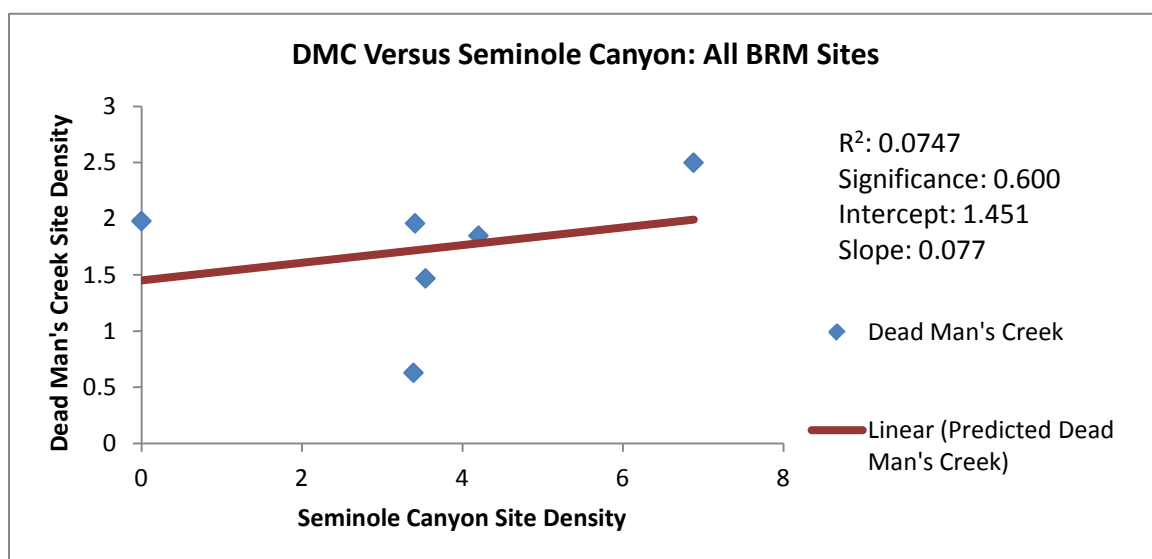


Figure 7.74. Linear regression of BRM site density within DMC and Seminole Canyon.

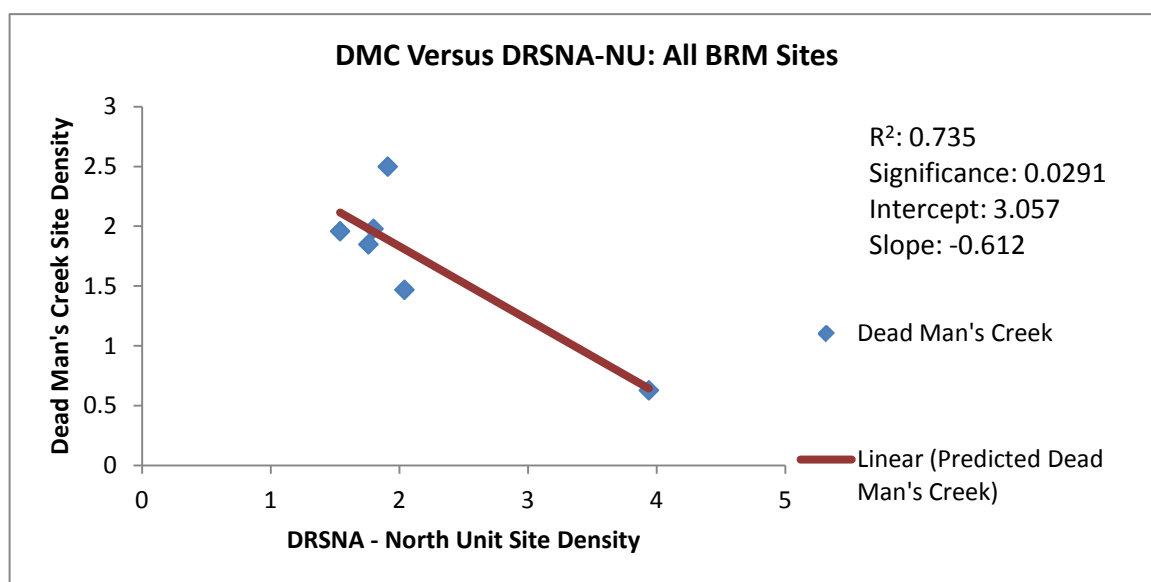


Figure 7.75. Linear regression of BRM site density within DMC and DRSNA-NU.

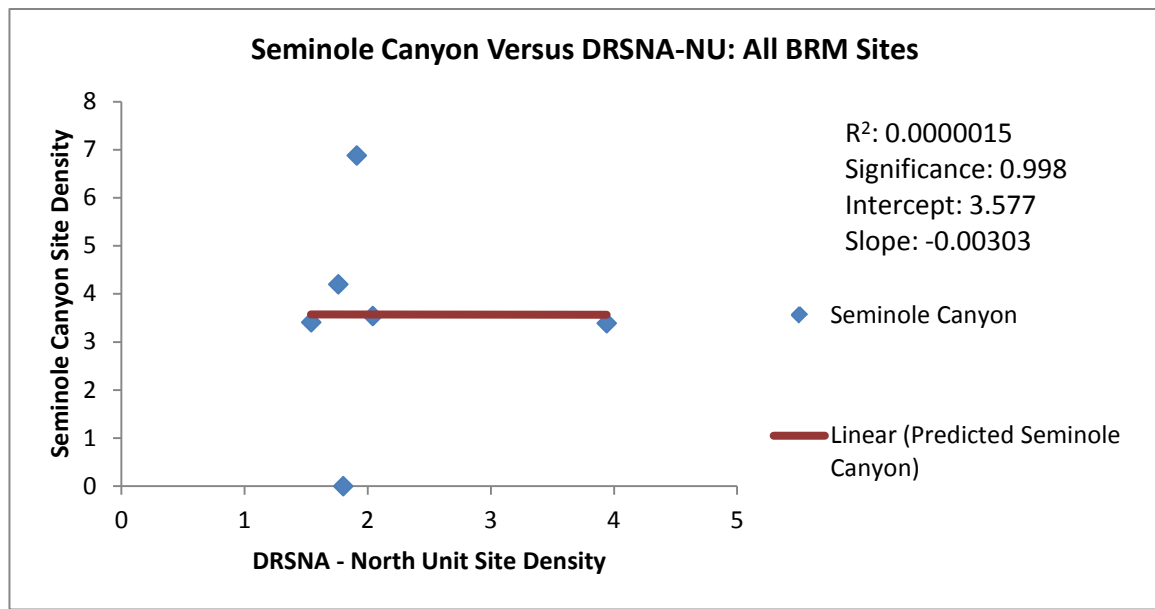


Figure 7.76. Linear regression of BRM site density within Seminole Canyon and DRSNA-NU.

Linear regression demonstrates some interesting relationships within the BRM data for the three survey areas. The DMC and DRSNA-NU have a statistically significant negative pattern (DMC increases in density as DRSNA-NU decreases) whereas the other two regressions show that the areas are statistically different. The negative relationship between DMC and DRSNA-NU is surprising because they are both along the Devils River and theoretically should have similar trends in site density. However, the DMC data is a much smaller dataset which could be causing the inverse relationship. Also interesting is the very dissimilar relationship between Seminole Canyon and DRSNA-NU BRM densities.

Sheltered Burned Rock Midden Density

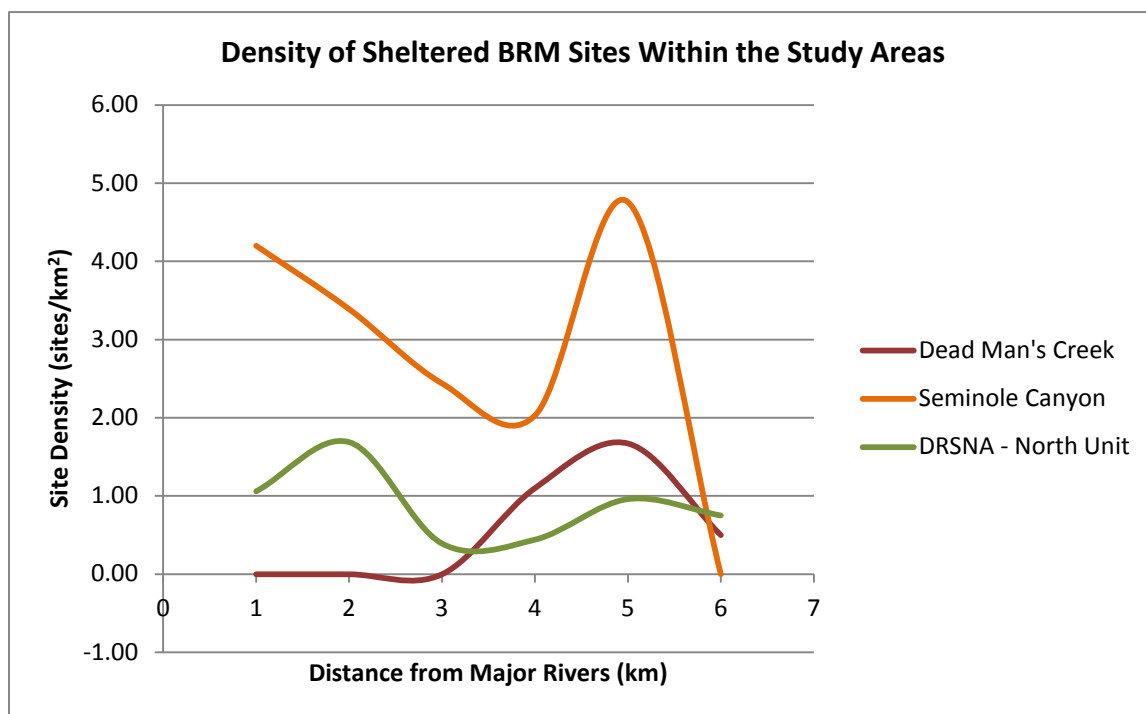


Figure 7.77. Density of sheltered BRM sites within the three study areas.

Table 7.27. Density of Rockshelter BRMs within Dead Man's Creek, Seminole Canyon, and Devils River State Natural Area - North Unit (sites/km ²)						
Study Area	Distance from Major River (km)					
	0-1	1-2	2-3	3-4	4-5	5-6
Dead Man's Creek	0.00	0.00	0.00	1.10	1.67	0.50
Seminole Canyon	4.20	3.39	2.44	2.03	4.76	0.00
DRSNA - North Unit	1.06	1.69	0.39	0.44	0.96	0.75

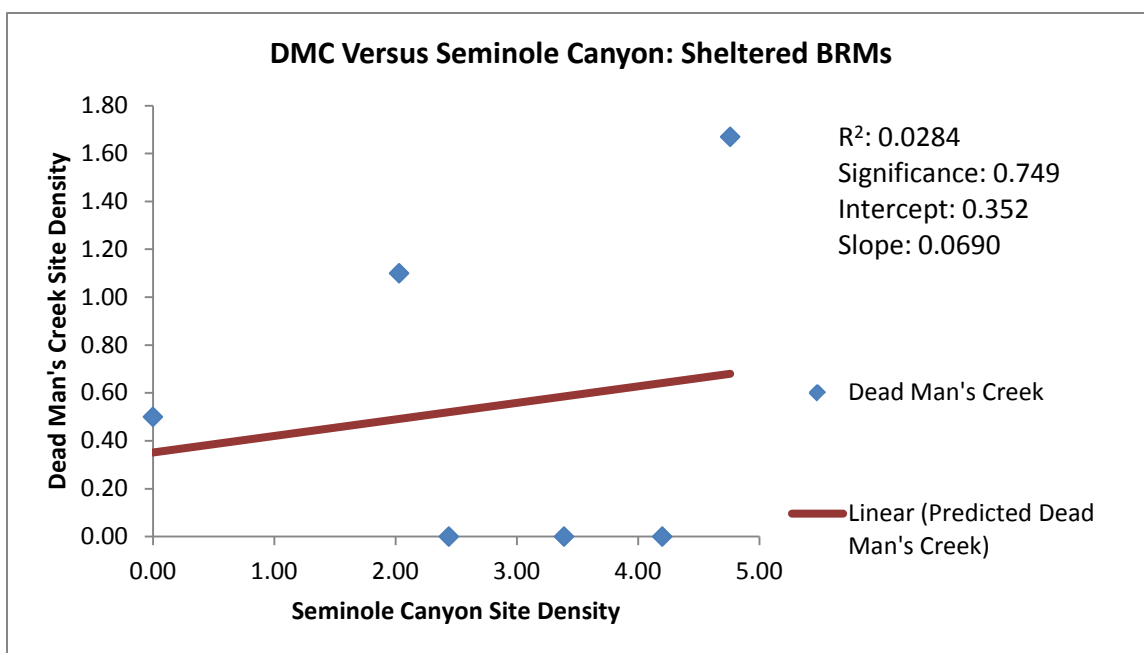


Figure 7.78. Linear regression of sheltered BRM sites within DMC and Seminole Canyon.

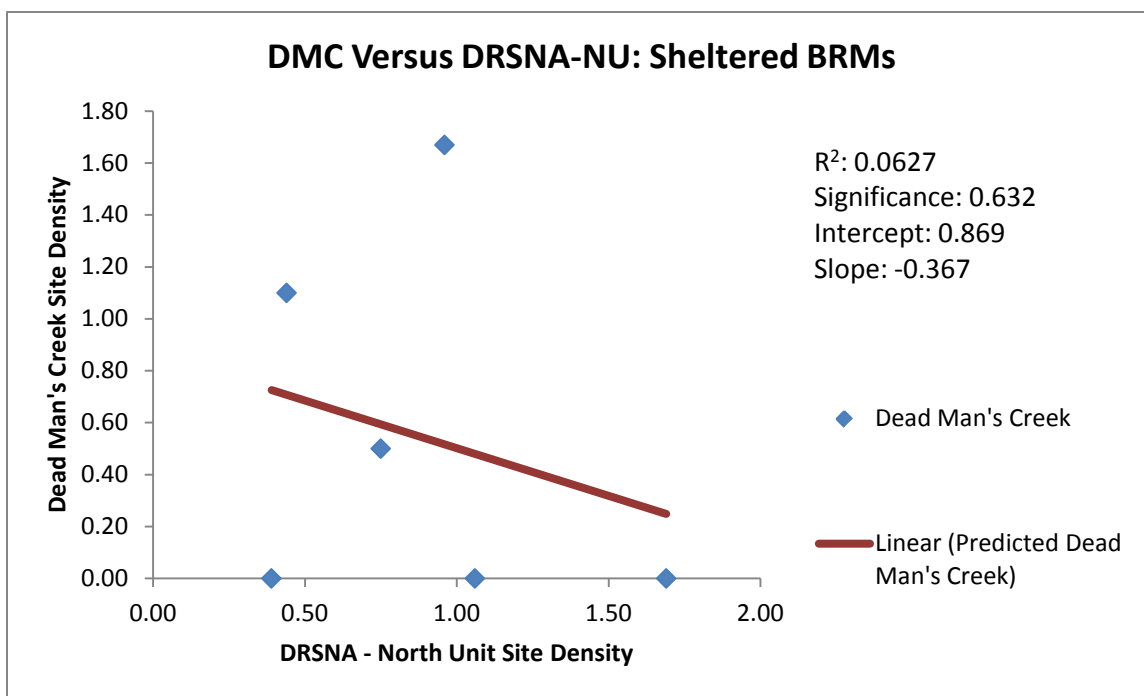


Figure 7.79. Linear regression of sheltered BRM sites within DMC and DRSNA-NU.

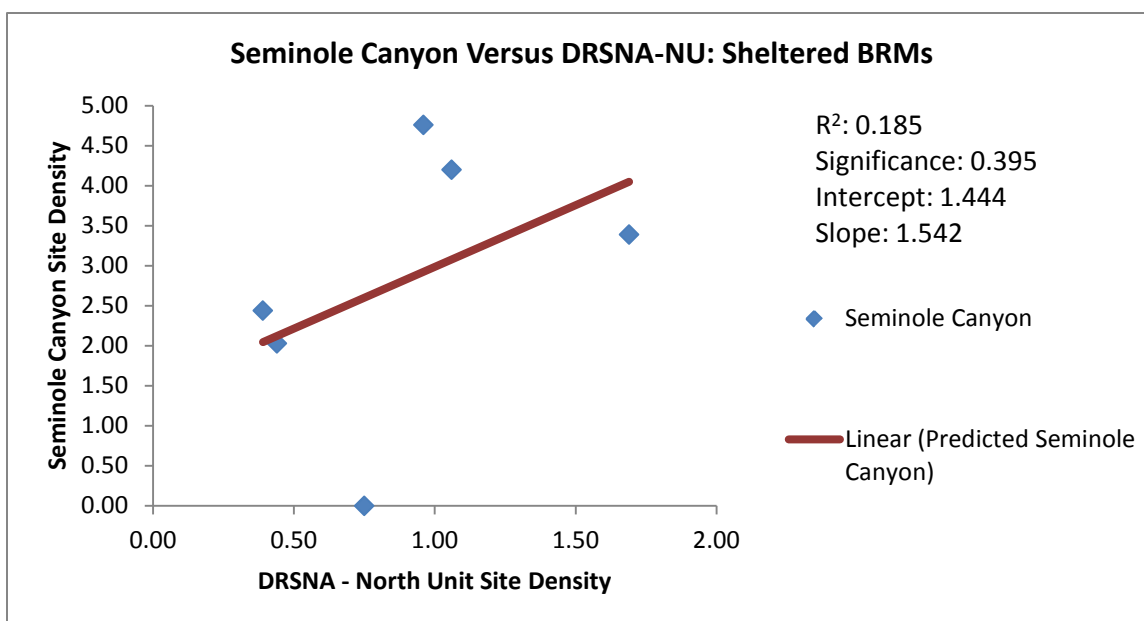


Figure 7.80. Linear regression of sheltered BRM sites within Seminole Canyon and DRSNA-NU

Once again the regression statistics indicate that the density of sheltered BRMs within the three study areas is different. Seminole Canyon and DRSNA-NU are the most similar, but they do not share a strong relationship.

Density of Open-air Burned Rock Middens

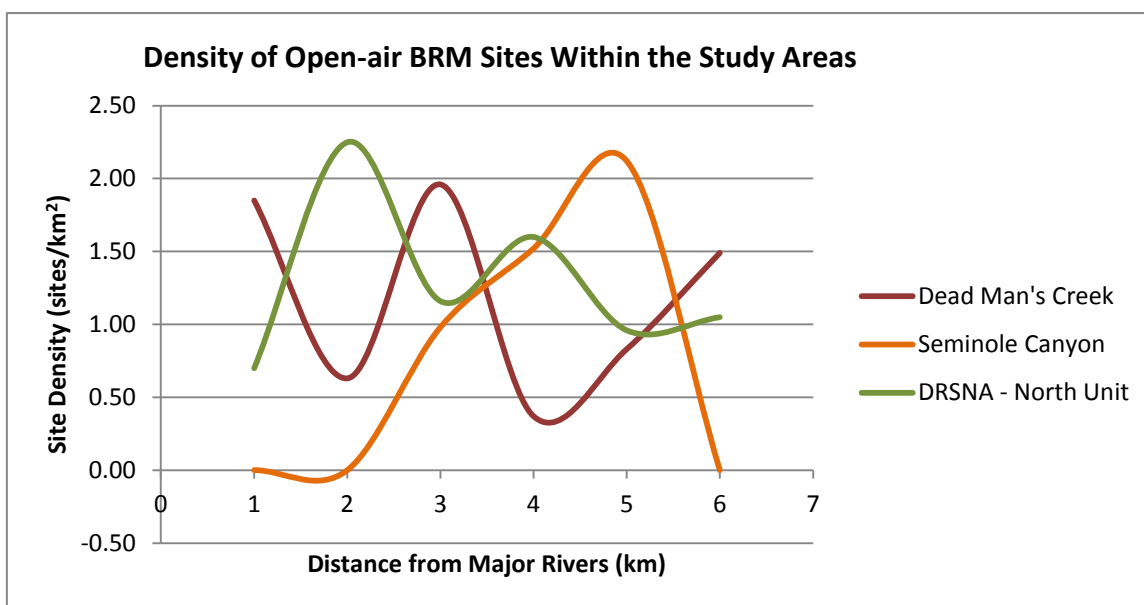


Figure 7.81. Density of open-air BRM sites within the three study areas.

Table 7.28. Density of Open-air BRM sites within Dead Man's Creek, Seminole Canyon, and Devils River State Natural Area - North Unit (sites/km ²)						
Study Area	Distance from Major River (km)					
	0-1	1-2	2-3	3-4	4-5	5-6
Dead Man's Creek	1.85	0.63	1.96	0.37	0.83	1.49
Seminole Canyon	0.00	0.00	0.98	1.52	2.12	0.00
DRSNA - North Unit	0.70	2.25	1.16	1.60	0.96	1.05

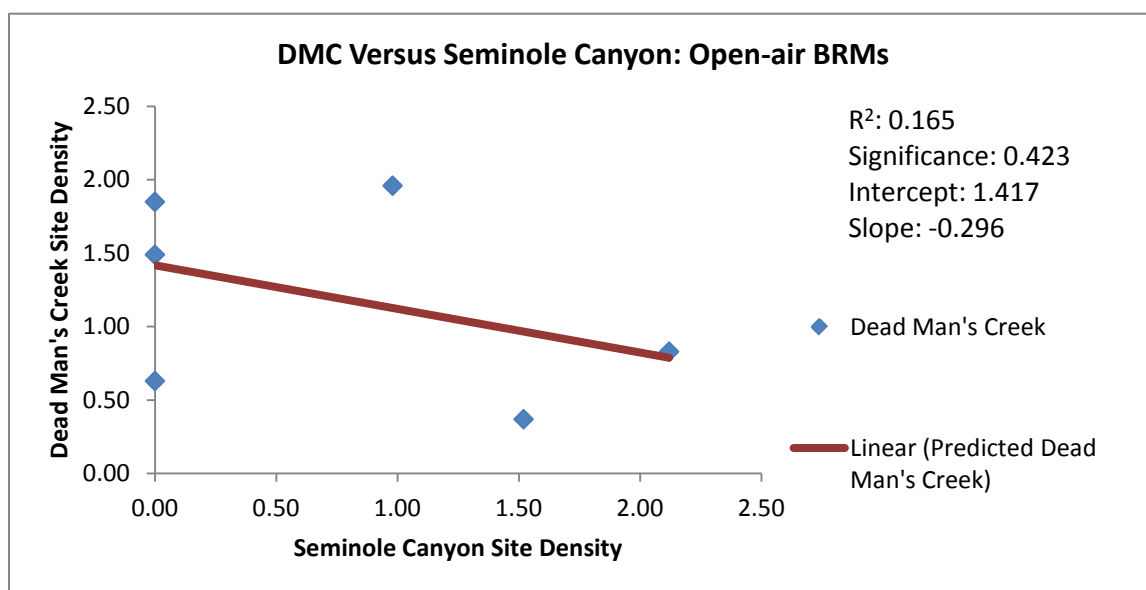


Figure 7.82. Linear regression of open-air BRM sites within DMC and Seminole Canyon.

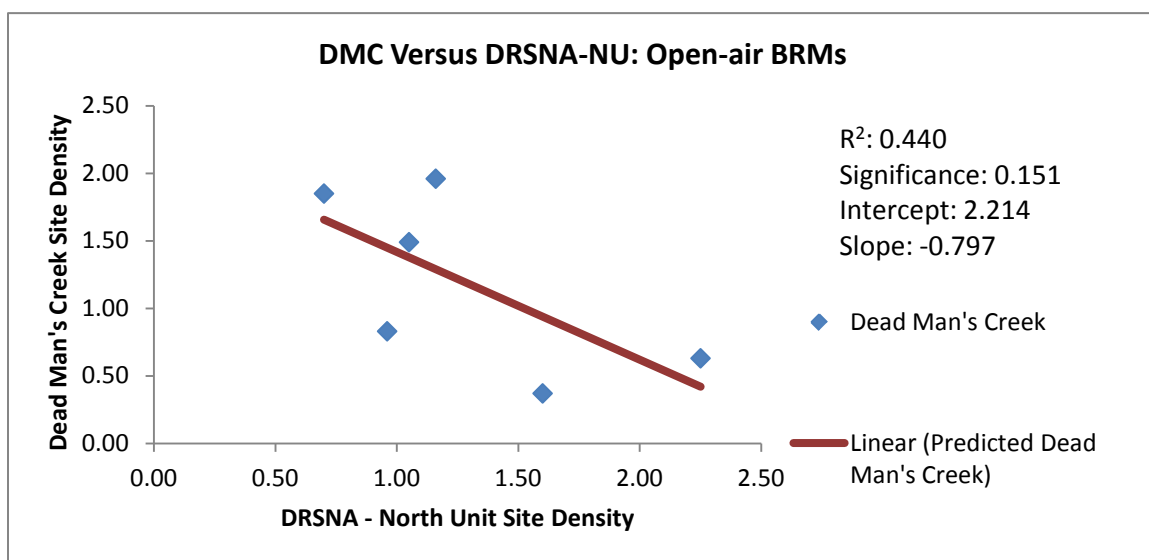


Figure 7.83. Linear regression of open-air BRM sites within DMC and DRSNA-NU.

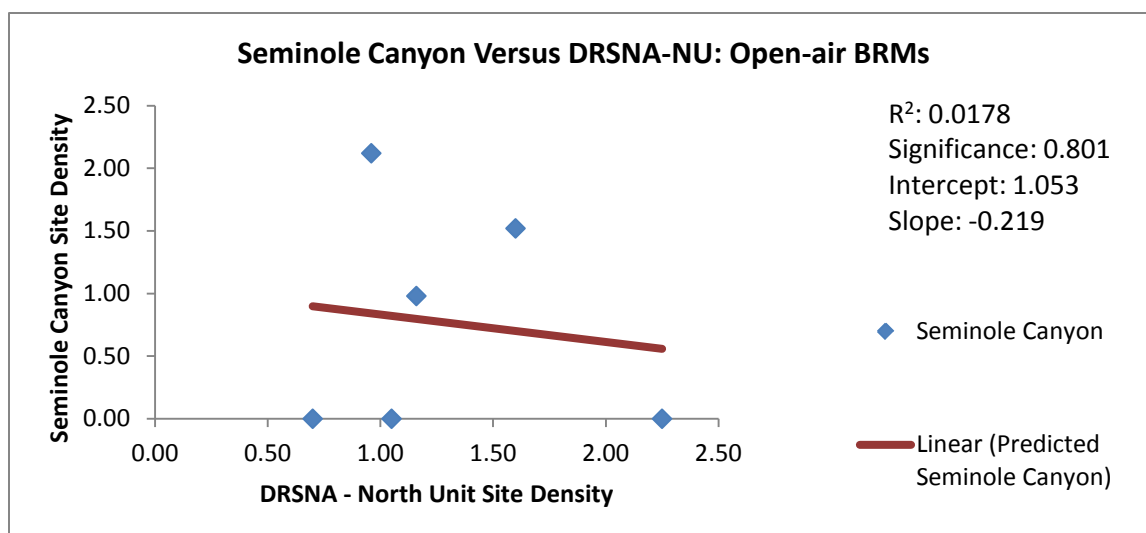


Figure 7.84. Linear regression of open-air BRM sites within Seminole Canyon and DRSNA-NU.

Based on the different regressions, the three study areas are dissimilar in terms of open-air BRM density. The regression between DMC and DRSNA-NU is nearly significant (0.15), and indicates once again a negative relationship between the two areas.

Density of Shelters Without Burned Rock Middens

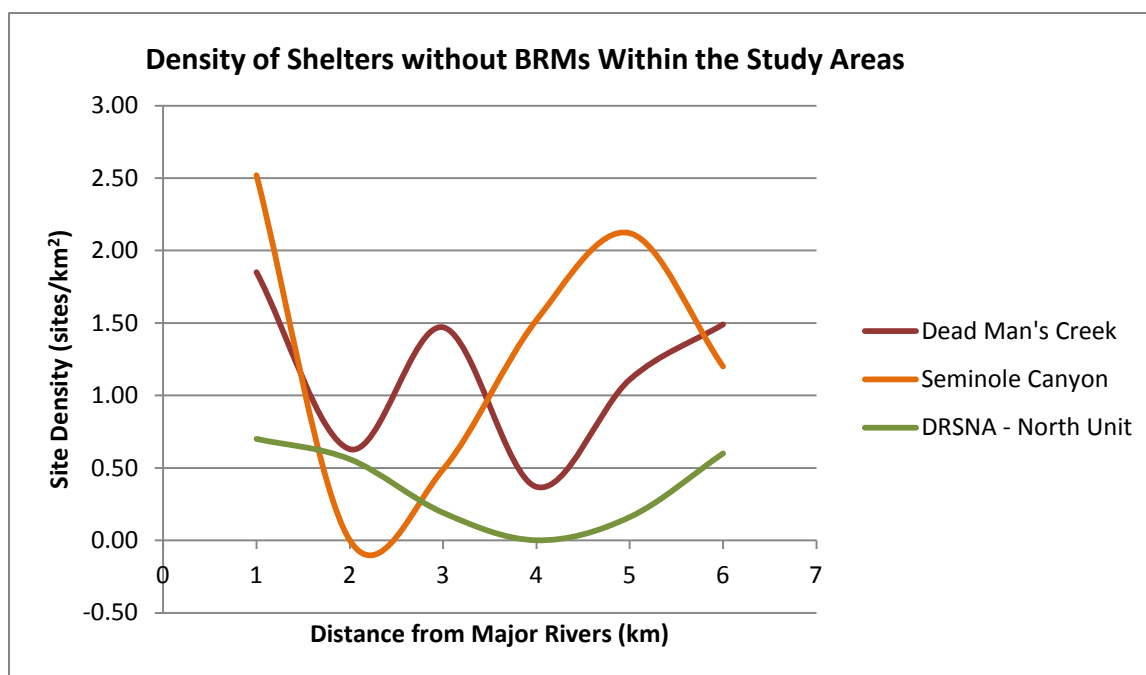


Figure 7.85. Density of sheltered sites without BRMs within the three study areas.

Table 7.29. Density of Shelters without BRMs within Dead Man's Creek, Seminole Canyon, and Devils River State Natural Area - North Unit (sites/km ²)						
Study Area	Distance from Major River (km)					
	0-1	1-2	2-3	3-4	4-5	5-6
Dead Man's Creek	1.85	0.63	1.47	0.37	1.11	1.49
Seminole Canyon	2.52	0.00	0.49	1.52	2.12	1.20
DRSNA - North Unit	0.70	0.56	0.19	0.00	0.16	0.60

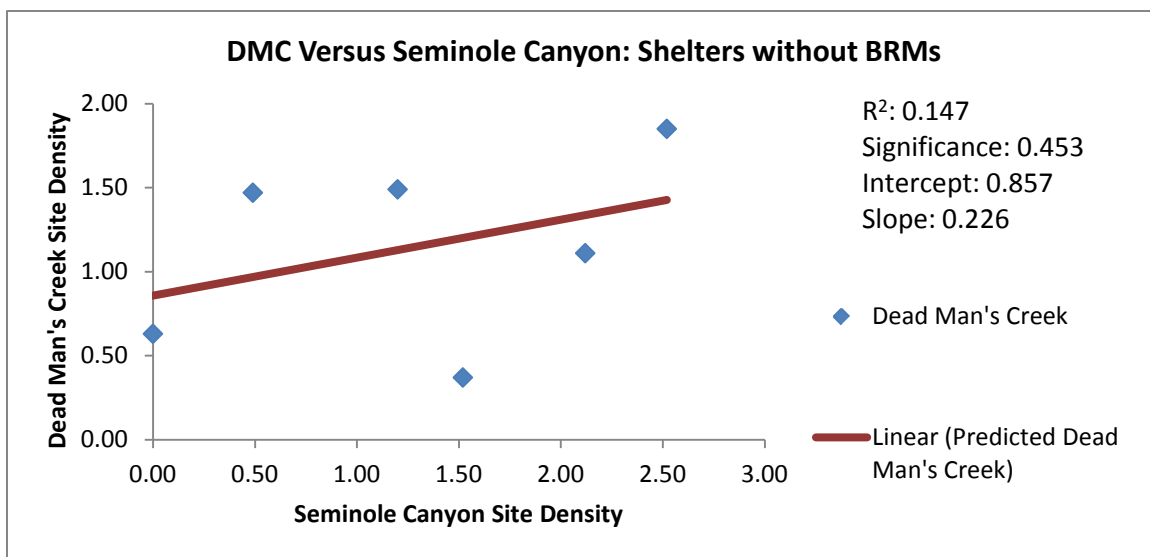


Figure 7.86. Linear regression of shelters without BRMs within DMC and Seminole Canyon.

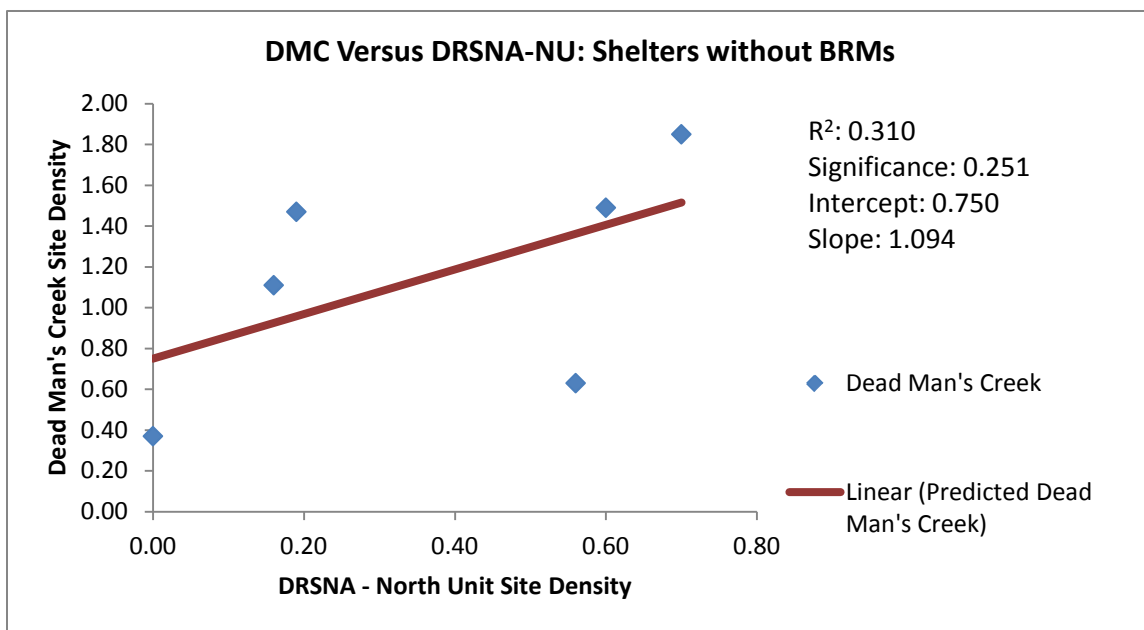


Figure 7.87. Linear regression of shelters without BRMs within DMC and DRSNA-NU.

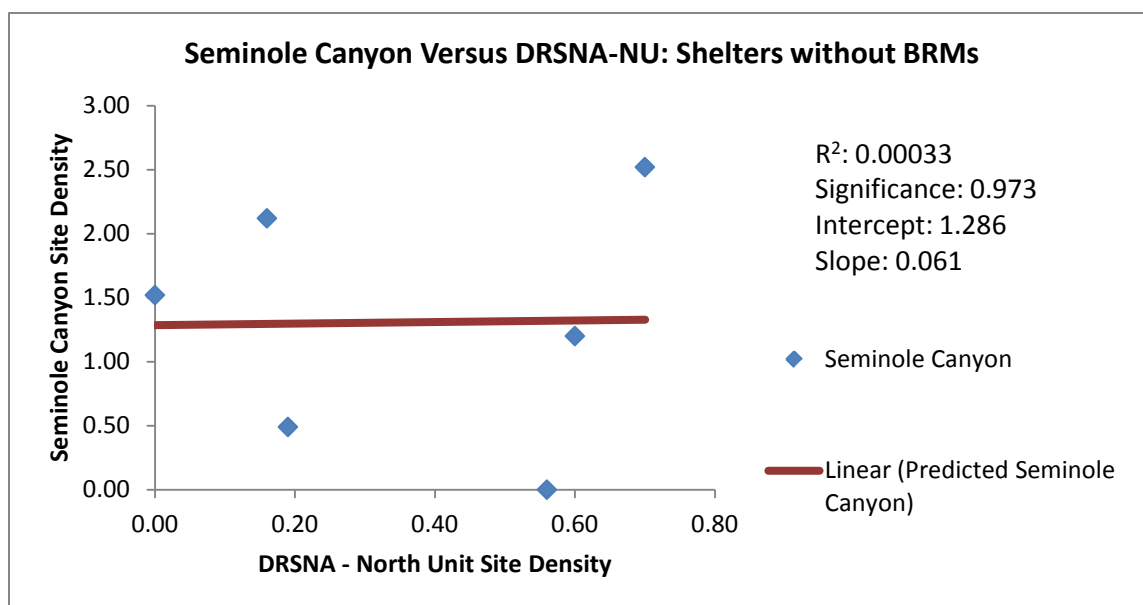


Figure 7.88. Linear regression of shelters without BRMs within Seminole Canyon and DRSNA-NU.

The pattern of statistically different density datasets is again shown by the regression analysis of shelters without BRMs. Once again DMC and DRSNA-NU had nearly a significant relationship (0.25), but this time the similarity was trending towards a positive relationship. DRSNA-NU and Seminole Canyon were the least similar.

Density of non-BRM Open-air Sites

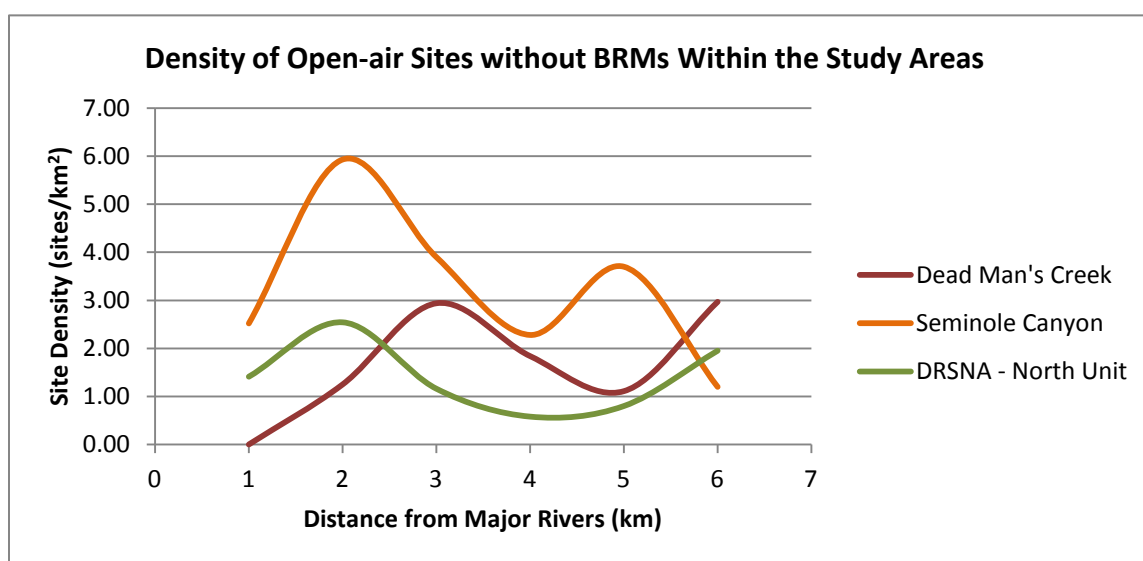


Figure 7.89. Density of non-BRM open-air sites within the three study areas.

Table 7.30. Density of Open-air sites without BRMs within Dead Man's Creek, Seminole Canyon, and Devils River State Natural Area						
Study Area	North Unit (sites/km ²)					
	Distance from Major River (km)					
	0-1	1-2	2-3	3-4	4-5	5-6
Dead Man's Creek	0.00	1.25	2.94	1.84	1.11	2.97
Seminole Canyon	2.52	5.93	3.90	2.28	3.70	1.20
DRSNA - North Unit	1.41	2.54	1.16	0.58	0.80	1.95

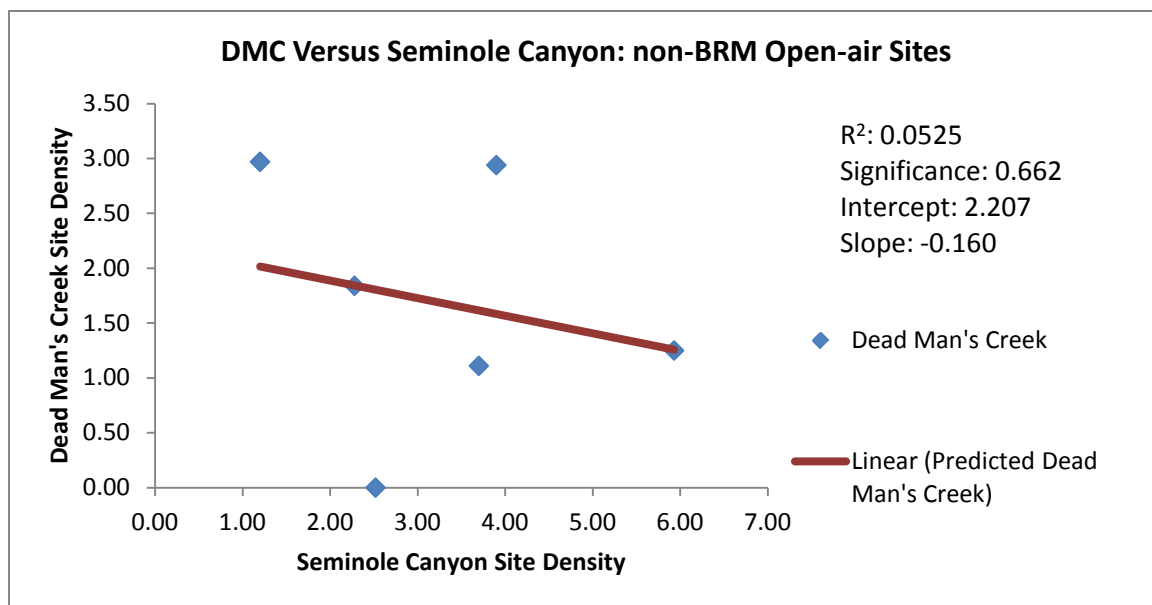


Figure 7.90. Linear regression of non-BRM open-air sites within DMC and Seminole Canyon.

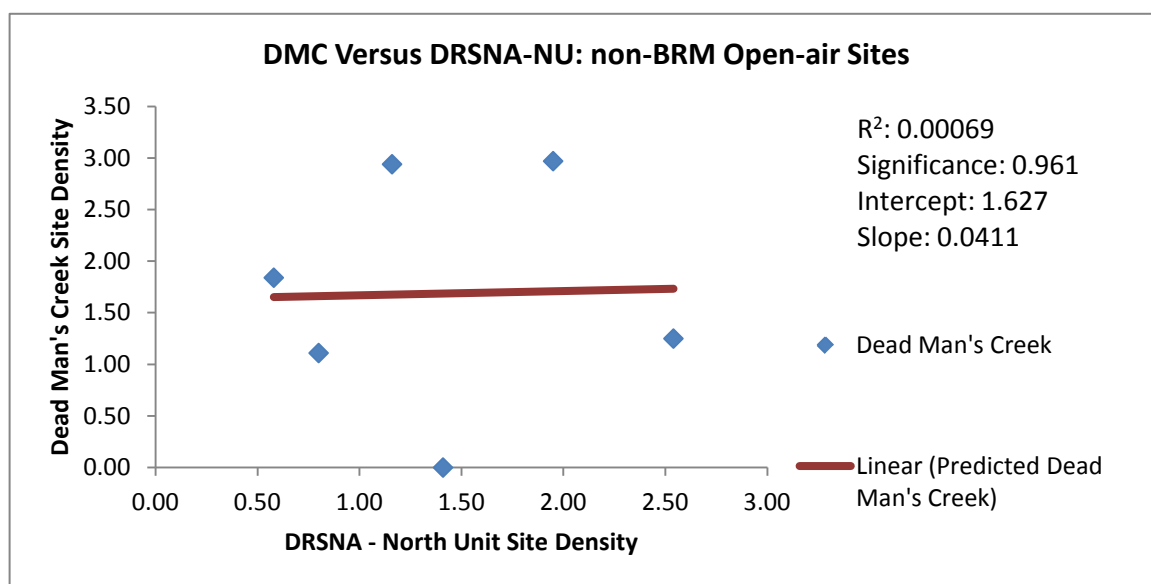


Figure 7.91. Linear regression of non-BRM open-air sites within DMC and DRSNA-NU.

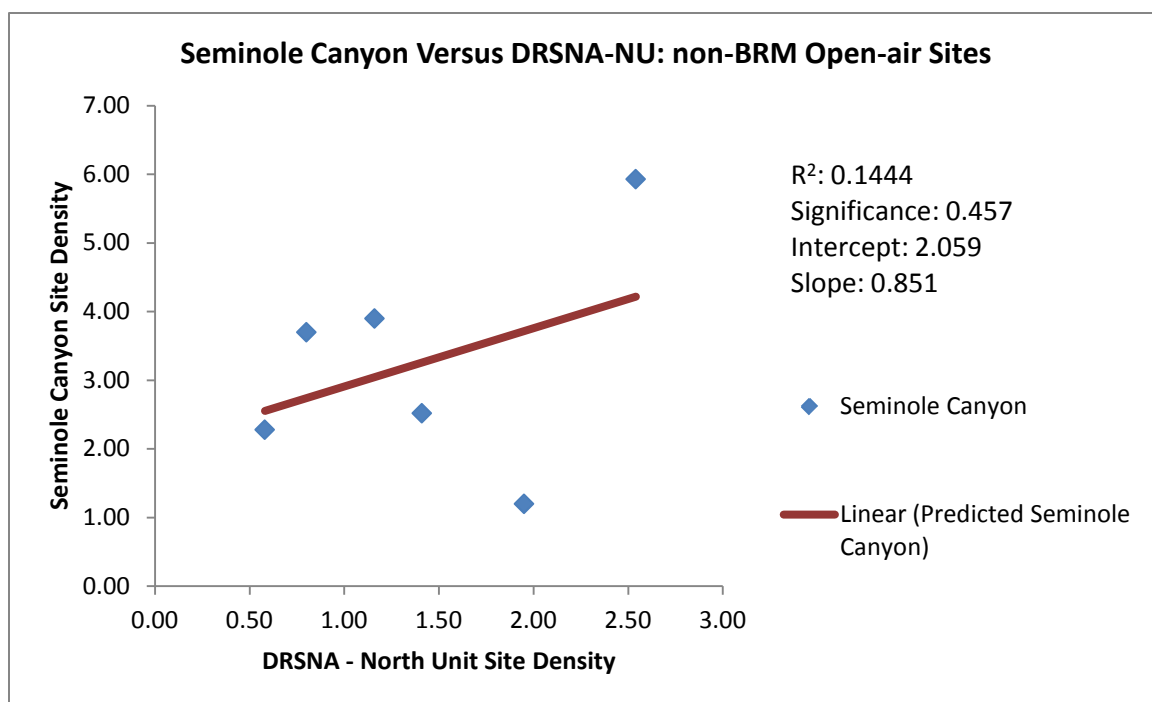


Figure 7.92. Linear regression of non-BRM open-air sites within Seminole Canyon and DRSNA-NU.

Summary of Regional Density Comparisons

The regression analysis indicates that each of the different survey areas has a different pattern of site density. These statistical differences can be partially attributed to small sample sizes, but differences in survey methodologies are also likely to have contributed to differences in site densities. The statistical data does not support interpretations of large-scale patterns; however, based on visual examination of the density curves there do appear to be a few patterns within the data. There is a general increase in site density within Seminole Canyon and DMC, but a decrease in site density in DRSNA-NU. Rockshelter density is much higher within the Seminole Canyon area than along the Devils, which supports an observation made by Turpin and Davis (1993:51).

CHAPTER 8: INTERPRETING BURNED ROCK MIDDENS: LANDUSE, SETTLEMENT PATTERNS, AND BIASES

The previous chapter provides the data for interpreting site frequency and density patterns in relation to published models of Lower Pecos settlement patterns for the Middle and Late Archaic. As discussed in Chapters 1 and 3, settlement pattern models for the Lower Pecos are linked to interpretations of burned rock middens and earth oven cooking (Dering 1999; Shafer 1986; Turpin 2004). For instance, did the people eat lechuguilla, sotol, prickly pear, and onions as dietary staples throughout most of the year (Shafer 1986; Taylor 1964; Turpin 2004)? Or, were these plants used mainly in lean times when other, higher ranked, food resources were unavailable (Dering 1999)? Further, do burned rock midden sites represent home bases/residences, logistical processing stations (Shafer 1986; Turpin 2004), or as hubs of human behavior (Black 1997)? To evaluate Lower Pecos settlement pattern models, we must address two questions: 1) what do the observed patterns in burned rock midden frequency and density indicate regarding where earth oven cooking was taking place on the landscape? And 2), what biases are present within the data that would affect interpretations?

Burned Rock Middens on the Landscape: Patterns and Postulations

Burned rock middens represent persistent places on the landscape where people returned over hundreds or even thousands of years to bake plants in earth ovens (Black et al. 1997). As discussed in Chapter 1, without extensive excavations we cannot determine what additional activities may have occurred at a burned rock midden site. Nonetheless, the distribution of burned rock middens *first and foremost* tells us where people were baking plants for consumption. Based on site density and frequency data, more earth oven plant baking occurred between 3 and 6 kilometers from the major rivers than from 0 to 3 kilometers (Chapter 7)¹. There is also a larger archaeological footprint away from the major rivers than directly adjacent to them. Said differently, the combined site data demonstrates that the people who lived in the Lower Pecos spent a great deal of time away from the major river canyons.

Site distribution data alone cannot measure landuse intensity. Thoms (1998:87) defines landuse as, “the patterned exploitation of resources by human groups, the manner in which they used places on the landscape, the technologies they employed in the process, and the effect of that exploitation on the ecosystem,” and landuse intensity as the, “expenditure of more energy per unit area to recover more food from the same landscape to feed more people.” Burned rock middens are landscape markers of intensive earth oven processing, and represent locations where people used an energetically costly technology to procure calories from low ranked plant resources

¹ This pattern of more burned rock middens located away from the major river canyons was asserted by Shafer (1986:95) without supporting data.

(Black 1997; Dering 1999, 2005). Even though all BRMs can be considered markers of intensive landuse, not all BRMs equal the same quantity of intensive earth oven processing.

Because earth oven cooking produces refuse, the more earth ovens constructed at a single location the greater the debris generated. Sites that were used more intensively will contain greater amounts of earth oven refuse (FCR, ash, charcoal, organic remains) than sites used less frequently. Calculating BRM size data would be indispensable to a thorough landscape analysis of earth oven cooking; however, BRM size cannot be objectively measured by surface pedestrian survey. All that can be recorded is the apparent extent of surface burned rock and lithic scatter and observations made regarding the estimated depth of deposit, and observations are highly subjective and dependent upon the experiences and consistency of the recorders. For the regional data set, based solely on differential recording methods/techniques, it seemed unwise to include site/feature size in the analysis because there is no standard for recording BRM sites. However, since I personally observed and recorded all the BRMs along DMC, some comments can be made about relative burned rock midden size and landscape distribution.

Without question, the site with the largest accumulation of earth oven debris is VV2074, located at the confluence of Dead Man's Creek and the Devils River. Taken purely on a site by site basis, a reasonable deduction would be that the most intensive earth oven processing within Dead Man's Creek occurred at VV2074. Yet, if instead of comparing individual sites you take the combined amount of earth oven cooking per buffer zone, VV2074 (the only BRM site within the 0 to 1 kilometer buffer) probably

equates to similar, or possibly even less, amount of total earth oven cooking than other buffer zones along DMC . Essentially, if VV2074 was used 4,000 times for earth oven construction, and the four BRM sites between 5 and 6 kilometers were used 1,000 times each, then the total amount of earth oven cooking per zone would be equal for both 0 to 1 and 5 to 6 kilometers. This type of comparison/calculation is not possible given just site data (even the DMC data) because an accurate estimate of the total earth oven cooking that occurred at each BRM site requires excavation data. But, in lieu of this data, it still seems reasonable to hypothesize that increases in BRM density and frequency within buffer zones indicates an *increase in the intensity of earth oven processing as distance away from the major rivers increases*.

This hypothesized increase in the amount of earth oven cooking away from the major rivers is somewhat conflicting with Saunders' (1986, 1992) analysis of lithics in the areas around Hinds Cave and Blue Hills. Saunders recorded both plant and animal procurement activities in areas around the Pecos River, but mostly evidence of hunting at distances further from the river (Saunders 1986, 1992). Therefore, there should be a decrease in the amount of plant processing stations (earth ovens) as distance away from the major rivers increases as well. This pattern is not present within the Dead Man's Creek data (Chapter 6) nor the other two survey areas (Chapter 7). However, it is possible that if survey were to be extended away from the river another 10 kilometers to the "distant" uplands, the distribution trend observed by Saunders (1986) may become more apparent. Moreover, there is only one survey area (DRSNA – NU) that has been extensively surveyed beyond 6 kilometers, and this limited data set hints at continued increases relative to burned rock midden frequency and distribution beyond 6 kilometers.

Biases Affecting Site Distribution Patterns: Proximity to Major Rivers

As discussed throughout, the entire regional data set is heavily biased towards the major river canyons. This is evident in the three smaller survey areas as well. Site data from DMC and Seminole Canyon does not extend beyond 7 kilometers, and only DRSNA-NU contains sites greater than 7 kilometers. The heavy bias towards the major river canyons has clearly affected the posited settlement pattern models for the region. Without additional survey beyond 7 kilometers we cannot evaluate regional trends in settlement patterns because there is not enough data. What the available site frequency and density data does demonstrate are patterns present within the first 7 kilometers from the major rivers.

Biases Affecting Site Distribution Patterns: Lack of Geoarchaeological Studies

One of the data gaps for the Lower Pecos is the lack of geomorphological or geoarchaeological studies that have been conducted (Dering 2002:3.14). Without such studies, archaeologists have little understanding of how the natural landscape has affected site formation as well as site preservation. For instance, throughout the half-century of archaeological survey in the region, one of the constants has been a dearth of subsurface testing. Of the published surveys reviewed in Chapter 3, the only discussion of subsurface shovel testing is from Peters et al. (1990), where only occasional shovel testing was used. The same is true for this study; although I did take advantage of features exposed in borrow pits, no subsurface testing was conducted during survey. This lack of subsurface testing is not due to archaeological ignorance that buried sites exist, but rather that methodologies utilized in the region have focused on recording the most

endangered sites (i.e., rockshelters) and most attractive (i.e., shelters with pictographs) and the identification of buried sites has not been a major goal. However, without using methodologies designed to identify buried sites, our regional site data is biased towards archaeology visible on the surface. This section addresses three questions: 1) what (if any) potential exists for buried sites within the three main topographic settings in the Lower Pecos; 2) are there preservation biases towards sites of a certain age; and 3) has the potential for buried archaeology and/or preservation biases affected the interpretations of regional settlement pattern models?

Geomorphology of the Uplands. Of the three broad topographic zones in the Lower Pecos, uplands are the most extensive, yet remain the least studied segment of the landscape. The dominant forms of erosion on upland surfaces are caused by wind and water (Goldberg and Macphail 2008; Waters 1992). Of these two forces, water erosion in the form of rainsplash and sheet wash (Goldberg and Macphail 2008) have visibly impacted the uplands of the Lower Pecos by eroding sediment off slopes and depositing it at the bases of the slopes. Rainsplash occurs when the impact of the rain drop ejects sediment particles, causing the sediment particles to be “splashed” down slope in greater proportion than up slope (Goldberg and Macphail 2008). Sheet wash occurs during heavy rain fall. As water moves downhill it carries sediments with it, and depending on the velocity of the water, the slope angle, the vegetation cover on the slope, the sediment supply, friction between the water and the ground surface, and the saturation of the underlying sediment, the volume of sediment moved by water can fluctuate (Goldberg and Macphail 2008).

In addition to movement of sediment by wind and water, sediment can move downslope under gravitational soil creep (Goldberg and Macphail 2008; Waters 1992). Together, sediments that are transported down a slope are classified as colluvium. For archaeologists, down slope movement of sediments accumulate at the bases of slopes (also known as toe slopes), and colluvial deposition can cover archaeological deposits, preserving them from becoming eroded. However, in the same setting archaeological materials discarded upslope can become mixed with material deposited at the base of the slope (Goldberg and Macphail 2008; Waters 1992).

Another important aspect of upland geomorphology is the constant pedoturbation (mixing of soils) that occurs (Wood and Johnson 1978). Pedoturbation takes many different forms including faunalturbation (animal mixing), floralturbation (plant mixing; including tree-throw), graviturbation (gravity pulling particles downward), and argilliturbation (shrink/swell clays) (Wood and Johnson 1978). The mixing of the soil in the uplands causes archaeological material to be moved both vertically and horizontally within the soil profile. Thus, archaeologists must understand these pedoturbative processes before beginning to interpret any deposit found within an upland environment (see discussion in Chapter 6).

Summary of Upland Geoarchaeological Investigations. Geoarchaeological investigations within upland environments of the Lower Pecos are rare, but based on three studies, there is potential for pockets of buried archaeology within the uplands across the entire region. Abbott (1991) and Nordt (1996) both conclude that there is the potential for buried archaeology within colluvial slope wash zones, common geologic features in the Lower Pecos (e.g., Turpin 1982:207). Nordt (1996) states that the

colluvial zone within Laughlin Air Force Base has been accumulating since the late Pleistocene (last 10,000 RCYBP), whereas Abbott (1991) estimates the slope wash deposits near the Del Rio landfill have been aggrading over the past 5,000 RCYBP. Both of these locations are in the southeastern portion of Val Verde County, but there are no radiocarbon dates to get an absolute measure of how long the colluvial surfaces have been aggrading. The Lost Midden Site (VV1994) did yield a series of radiocarbon dates. Based on multiple assays, the bedrock depression containing VV1991 began accumulating sediment via wind and water deposition before 1150 RCYBP, and continued to be a sediment trap until after the feature was abandoned (between 860 RCYBP and present) (Roberts and Alvarado 2011, 2012).

One point not discussed by Roberts and Alavarado is the role of bioturbation on upland surfaces. Larger mammals such as skunks, raccoons, badgers, and foxes all are known to dig holes/burrows in the ground. These animals can move any object within the soil profile smaller than them (Johnson et al. 1987; Wood and Johnson 1978). The same rule of thumb applies to smaller burrowing animals (lizards, mice, voles, ground squirrels, gophers) and burrowing insects (ants, beetles, earth worms, etc.) (Balek 2002; Johnson et al. 1987; Wood and Johnson 1978). Essentially, animals move a lot of sediment within soil profiles, and the movement of sediment and material causes large artifacts (like large pieces of burned rock) to sink in a profile and smaller artifacts (small fragments of FCR, flakes, projectile points) to rise in the profile (Balek 2002). Although the geomorphic study at VV1994 demonstrated the ongoing deposition of sediment via wind and water transport, it is likely bioturbation also played a major role in burying VV1994 based on observations at VV2053 (Chapter 6).

Another aspect of upland geomorphology that must be addressed is the impact ranching and livestock have had on the sediments in the uplands. It has been discussed by others (e.g., Williams Dean 1978:232, 240) that the region has undergone extensive soil loss since large-scale ranching operations began in the 1800s. Overgrazing exposes the sediment to increased wind and water erosion, which causes the archaeology in many places to be deflated onto bedrock. Thus, even though there is the potential for buried archaeology in the uplands, archaeology is continuously being exposed on the surface due to soil loss from livestock.

Geomorphology of Lower Pecos Rockshelters and Caves. Even though caves and rockshelters are the most frequently excavated sites in the Lower Pecos, our understanding of the geomorphic and formation processes at such localities is relatively poor. For instance, we have very little knowledge of the relationship between the sediments derived from inside the shelter compared to sediments derived from outside of the shelter or the connections between naturally occurring deposition and material deposited from humans and animals. And, as Farrand (2001:537, emphasis in original) states regarding rockshelters and caves, “*it is important to recognize that the sediment constitutes the site!*” The relationship between different sediments in Lower Pecos rockshelters is made even more difficult because in many dry rock shelters, virtually everything that was deposited within the shelter over the past 9,000 years is still there (e.g., Chadderdon 1983; Dering 1979).

All of the caves and rockshelters within the Lower Pecos formed through differential weathering of the limestone bedrock. This weathering can be in the form of wind erosion, water dissolution, or chemical weathering (including salt weathering)

(Goldberg and Macphail 2008; Waters 1992). Once the features form, they are exposed to additional atmospheric weathering processes (i.e., freeze-thaw action). As discussed in Chapter 6, deposits within rockshelters can be classified into two main categories, endogenous (sediments derived from inside the shelter) and exogenous (sediments derived from outside the shelter; including anthropogenic sediments) (Goldberg and Macphail 2008:Table 8.2).

Within many of the excavated rockshelters, archaeologists have noted an increase in the number of large wall spalls (also called *éboulis*) the deeper they excavated into the deposits (e.g., Epstein 1963; Dibble 1968). They attributed the larger spalls to the cooler climate during the last glacial maximum. *Éboulis* is attributed to freeze-thaw action at the contact between the rock face and the atmosphere (Goldberg and Macphail 2008:175). In addition to *éboulis* at depth within rockshelters, archaeologists have noted a decrease in organic preservation as excavation depth increased, related not just to the age of deposit but also to water seepage into the base of the rockshelter (e.g. Collins 1969:2; Epstein 1963:12; Kochel 1982:268). Within the region, it is not uncommon to observe springs and travertine deposits within rockshelters (e.g., Alexander 1970), and these springs would deposit reworked sediment into the sites (Goldberg and Macphail 2008:Figure 8.2). Archaeologists working in the region must be able to identify the different sources of sediments within shelters in order to reconstruct the geomorphic history of sites.

Summary of Rockshelter Geoarchaeological Investigations. One of the challenges in summarizing the geoarchaeological investigations of rockshelters in the Lower Pecos is the unfortunate situation that Bonfire Shelter represents the only

rockshelter to receive substantial geoarchaeological-type investigations (e.g., Dibble 1968; Robinson 1997)². Other rockshelter sites that have been excavated in the region describe the cultural stratigraphy and material record (e.g. Chadderdon 1983; Collins 1969; Dering 1979; Epstein 1963), but descriptions and analysis of where the different sediments originated from are lacking. Within Bonfire, Robinson (1997:Figure 3) noted a decrease in sedimentation rate between 12,430 and 6,340 RCYBP, and a subsequent increase between 6,340 RCYBP and the present. In addition to the change in rate of sedimentation, Robinson (1997:Figure 4) recorded a decrease in the frequency of larger particles (cobbles, pebbles, and granules) as the deposits got younger, as well as two peaks of smaller particles (sand, silt, and clay): one peak during the Mid Holocene (5,000 RCYBP) and one in the Late Holocene (2,000 RCYBP). Robinson argues (1997:40) there is evidence of eolian deposition of fine grain material into the shelter. This increase in deposition within Bonfire appears to correspond to the increase in slope wash deposits from the Del Rio landfill (Abbott 1991). Therefore, Bonfire serves as an example of a sheltered location in which substantial exogenous and endogenous sediment deposition contributed to both preserve a long cultural history but also to hide archaeology beneath the surface.

Geomorphology of Alluvial Terraces. Of the three main geographic settings within the Lower Pecos, the one with the best geoarchaeological record is alluvial terraces. Alluvial terraces are formed by water-born sediments being deposited during channelized flow and overbank deposition (Goldberg and Macphail 2008; Waters 1992).

² I do not include Arenosa Shelter in this summary of rockshelter investigations because the deposits at the site are derived largely from alluvial deposition and that the site has been treated as a river terrace site in the literature (e.g., Kochel 1988).

Most sediments are deposited as the result of over-bank flooding, and depending on the intensity of the flood, different sized alluvium is deposited onto the flood plain.

Generally speaking, the larger the particles being transported, the closer those particles are to the main current. Particle sizes can be classified into three types: bedload (larger particles, usually gravel and rock) being rolled along the bottom of the stream; suspended load (sand and silt particles held in suspension); and the dissolved load (dissolved clay and chemical concentrations within the water) (Goldberg and Macphail 2008; Waters 1992).

Many of the canyons in the Lower Pecos are very narrow, which limits the number of alluvial terrace because of canyon flushing events. As discussed in Chapter 6, the stream terraces present today *do not* represent where all or even most of the terraces have been throughout the Quaternary. Further, terrace sediments are subject to more pedoturbation than other areas of the landscape because the soils have a higher clay content (Golden et al. 1992), making them subject to more argilliturbation (shrink/swell forces) and because terraces have deep soils bioturbation is more common (faunalturbation and floralturbation).

Alluvial Sequence Along the Pecos, Devils, and Rio Grande Rivers. During the 1950's, archaeological attention was drawn to the deep alluvial terraces along the Pecos, Devils, and Rio Grande rivers as potential locations to find deeply stratified cultural deposits (Graham and Davis 1958). Before the completion of Amistad Dam, alluvial terraces along the Pecos were excavated at Arenosa Shelter (Dibble 1967) and VV347 (Dibble and Prewitt 1967); along the Devils River at the Devil's Mouth Site (Johnson 1961, 1964; Sorrow 1968), VV263 (Dibble and Prewitt 1967:63), VV279 (Dibble and

Prewitt 1967:70), and VV316 (Dibble and Prewitt 1967:79); and also along the Rio Grande at Nopal Terrace (Sorrow 1968), Devils Rockshelter (Dibble and Prewitt 1967:67; Prewitt 1966), and VV350 (Dibble and Prewitt 1967:80). Relatively few radiocarbon dates were obtained for the terrace sites. For instance, at Devil's Mouth we only have three radiocarbon dates; at Nopal Terrace, Devils Rockshelter, and at VV263 we have one radiocarbon at each site (Turpin 1991). Fortunately, we do have a well-dated sequence from Arenosa shelter (a total of 32 radiocarbon dates) (Dibble 1967, 1974; Turpin 1991). In addition to the lack of radiocarbon dates from all the sites, only four sites (Devil's Mouth, Devils Rockshelter, Arenosa, and Nopal Terrace) have had substantial publications detailing the excavations conducted at the sites (e.g., Dibble 1967, 1974; Johnson 1961, 1964; Prewitt 1966; Sorrow 1968).

Unfortunately, the goal of the excavations at the sites was not to understand the relationship between the cultural sequence and the geologic sequence, but rather to use the well-stratified deposits to establish a cultural chronology for the region. This resulted in more attention being paid to describing the different types of projectile points excavated than describing the different alluvial deposits themselves (e.g., Dibble and Prewitt 1967; Johnson 1961, 1964; Prewitt 1966; Sorrow 1968). When the different sediments are described in the reports, most descriptions are limited to basic characteristics (sand, silt, clay, cobbles, spalls, yellow, brown, red, black, etc.) and not on understanding the geomorphic relations between the cultural and natural deposits. No mention is made of the presence or absence of paleosols at any of the terrace sites (Dering 2002:2.10). The most unfortunate aspect of the terrace sites excavated during the

Amistad period is that the sites are now inundated by Lake Amistad, which makes returning to collect geoarchaeological data impossible.

Nonetheless, some broad geoarchaeological trends have been documented. Patton and Dibble (1982) used the radiocarbon chronology and the magnitude and frequency of flood events at Arenosa to argue that the Pecos River has gone through four broad climatic trends: around 9,500 RCYBP, the area was cooler and wetter, with more frequent (but lower magnitude) flooding events. Between 9,500 and 3,000 RCYBP, the deposits at Arenosa show less frequent, but higher magnitude flooding events during a hotter and drier climactic interval. From 3,000 to 2,000 RCYBP, the region went into another period of wetter and cooler climate, again showing lower magnitude and higher frequency flooding events. The last climactic interval is from 2,000 RCYBP till the present, and it is again marked by lower frequency, higher magnitude flooding events during this more arid interval (Patton and Dibble 1982). As discussed by Kochel (1988), for a flood to deposit sediment on top of a terrace that flood must have a greater discharge than the last flood that deposited material onto the terrace. Otherwise, if a flood does not have a greater discharge the water cannot reach the top of the terrace, and sediment cannot be deposited (Kochel 1988:387). This has implications when discussing flood frequency throughout the stratigraphic sequence. Also, in their analysis of the stratigraphic record of Arenosa Shelter, Patton and Dibble (1982) do not differentiate between slack water flood deposits from the Rio Grande, upstream flooding down the Pecos, or localized flooding along the Pecos.

In another more recent geoarchaeological analysis of Rio Grande alluvium, Gustavson and Collins (1998:37) report as many as five different buried soils within a

terrace of the Rio Grande below Lake Amistad. These buried soils were not mentioned in the analysis of the Devils Mouth site (Johnson 1964; Sorrow 1968), and based on Gustavson and Collin's (1998) work, it is likely there were buried soils within at Devils Mouth. Within the terrace analyzed by Gustavson and Collins (1998:37), cultural remains were present on the surface of the buried soils. Gustavson and Collins (1998:38) conclude:

The stratigraphy of this site suggests a history of episodic flooding and sedimentation interrupted by periods of landscape stability during which soils began to develop. Recognition and dating of cultural materials (Ensor point, 2000 to 1400 B.P.) and features (1300 to 660 B.P.) as well as the presence of an additional hearth approximately 1.5 m below the oldest dated hearth further suggests that Archaic and Prehistoric Native Americans occupied the area repeatedly throughout much of the same time period.

Kochel and Baker (1982), Baker et al. (1979), and Kochel (1988) undertook a broader study to understand the flooding sequence along the Pecos River over the last 2,000 years. They sampled terrace deposits at the mouths of smaller tributary canyons along the Pecos between Lake Amistad and Pandale, Texas (Kochel 1988). In total, 19 different tributary mouths were profiled and (where possible) radiocarbon dated. They were looking for stratigraphic indicators of slack-water deposits from the Pecos River that backed up into the smaller tributaries. Their data provided evidence of a 2,000 year flood history of the Pecos River as well as a record of local tributary flooding events based on grain analysis and bedding patterns. They were not able to date any alluvial deposits older than 2,000 RCYBP because none of the tributary mouths they sampled contained deposits older than 2,000 RCYBP, indicating the Pecos River and *its*

tributaries went through a period of intense erosion that washed away the older terrace deposits (Kochel 1988; Kochel and Baker 1982; Baker et al 1979).

Kochel (1988) and Kochel and Baker (1982) conducted a smaller study along the Devils River. They did not have as large of sample size along the Devils River, but were able to correlate flooding events within the last 2,000 years between the Pecos and Devils. It was much more difficult to distinguish between tributary flood and Devils River flood events because the parent materials are the same limestone-based gravels and sediments (Kochel 1988; Kochel and Baker 1982). It appears that because the Devils River has a much smaller drainage basin than the Pecos, flood events on the Devils are caused by more localized flooding. In a related study along San Felipe Creek, a tributary to the Rio Grande located east of the Devils River, Boyd and Kibler (1999) also found that prior to 3,300 RCYBP, any alluvium (and archaeology) that had been present within the study area had been eroded away by flash flooding

Summary of Alluvial Terrace Geoarchaeological Investigations. Based on the combined geoarchaeological records for the major rivers and one smaller stream sample, some general patterns of alluvial erosion/deposition emerge for the region. Evidence from Arenosa and Devils Mouth indicate that during the end of the Late Pleistocene (ca. 10,000 RCYBP) the area was experiencing frequent, low energy flood events (Patton and Dibble 1982). Between 10,000 and 5,000 RCYBP, the frequency of flooding events decreased, but the energy of the flood events increased. Around 5,000 RCYBP a large erosional event occurred not only along the major rivers (which could mean it may have been by upstream flooding events) (Patton and Dibble 1982), but also within Seminole Canyon (Turpin 1982). This erosional event occurred around the end of the Early

Archaic and the beginning of the Middle Archaic, very likely indicating that many sites dating to this time period and earlier that were on alluvial terraces were washed away.

The stratigraphic record at Arenosa indicates that around the beginning of the Late Archaic (3,200 B.P.), there was another series of high frequency, low energy flooding events along the Pecos River (Patton and Dibble 1982) that were soon followed by another region wide erosional event (Boyd and Kibler 1999; Kochel 1988) that removed deposits dating between 5,000 and 2,000 B.P. This sequence of flooding and erosional events throughout the Holocene creates a strong preservation bias towards stream terrace sites that are less than 3,000 years old. Only deeply stratified (Devils Mouth) or protected (Arenosa Shelter) terrace locations along the major rivers are likely to preserve the full sequence of Holocene human occupations of the region.

Geoarchaeology and Site Biases in the Lower Pecos: Conclusions. Based on several case studies concerning the geomorphology of the Lower Pecos region, it has been demonstrated buried archaeology is present within the three main topographic areas of the region. Therefore, archaeologists must begin to redesign our survey strategies to not only target surface features, but also systematically search for buried sites. Without some sampling for buried features our regional survey data will continue to be biased towards palimpsest sites like rockshelters and surface burned rock middens.

Perhaps more important than the identification of buried sites is understanding that the preservation of archaeology in the region is directly linked to geomorphic processes that have been ongoing for the last 13,000 years. Within all three topographic areas, there are similar sequences of erosion and deposition throughout the Holocene

(erosional events beginning in the Late Pleistocene and Early Holocene; a large erosional episode sometime in the Mid Holocene; and a final erosional event in the Late Holocene). Based on this geomorphic evidence, the potential number of preserved archaeological sites dating to the period between 0 and 3,000 RCYBP is greater than the period between 3,000 and 5,000 RCYBP, which is again greater than the period between 5,000 and 10,000 RCYBP.

Thus, any hypothesized models of prehistoric settlement patterns must explicitly take into account the presence of buried archaeology and the preservation bias against sites older than 3,000 years. The posited ideas regarding an increase in rockshelter occupation in the Early Archaic, the increase in population during the Middle and Late Archaic, the shift to occupation of open-air sites during the Middle and Late Archaic, and the intensification of upland utilization in the Late Archaic are almost certainly related as much to preservation bias as actual patterns within the archaeology.

Lower Pecos Settlement Patterns and Site Data: Hypothesis Testing

As discussed in Chapter 3, the two competing models of Archaic settlement patterns for the Lower Pecos are the “semi-sedentary canyon collector” versus the “nomadic canyonland forager.” The core difference between these two models lies with what the foods processed in earth ovens represented: staple plants that comprised the bulk of the diet (Shafer 1976, 1981, 1986; Taylor 1964; Turpin 1984a, 1990, 1994, 2004) or low ranked resources that were expensive to process, yielded few calories, and were processed to provide necessary calories during lean times (Brown 1991; Dering 1999, 2005; Sobolik 1996). Thus, BRMs are either viewed as locations of long-term habitation

supported by an economy of large scale earth oven processing or as extractive locations where desert succulents were processed when virtually nothing else was available.

Within the “canyon collector” model it is hypothesized that the major river canyons were home bases from where foraging (and hunting) expeditions would set forth and return with the gathered food resources. Home bases were located along the major river canyons in order to insure access to water and riverine resources (Shafer 1976, 1981, 1986; Taylor 1964; Turpin 1990, 1994, 2004). In this model, open-air and “small” rockshelter sites located away from the major river canyons were used as temporary processing stations for desert succulents. Once the food was processed, logistical foraging groups would return to the home base within a rockshelter or stream terrace along the major canyons.

The expected site distribution pattern within this model should have two peaks in site frequency: one along the major rivers and another in the logistical processing zone. Based on the analysis of site frequency and density data, there is a peak in earth oven cooking between 3 and 6 kilometers from the major rivers. Given this pattern of BRM sites on the landscape, if people were tethered to the river canyons this 3 to 6 kilometer peak could represent the “logistical” foraging/processing radius (Bettinger 1991; Binford 1980; Butzer 1982; Kelly 2007) in terms of sotol, lechuguilla, prickly pear, and onions.

However, this model does not take into account any of the experimentally driven data for earth oven processing in terms of caloric yield and cost in terms of food and fuel (Dering 1999). Using central place foraging, as foragers traveled away from the major river canyons in search of food, the net return in foraging expeditions would decrease in

relation to distance traveled (Bettinger 1991; Binford 1980; Dering 1999; Kelly 2007; Winterhalder 2001). The main resources that would have been targeted on these foraging expeditions would have been sotol, lechuguilla, prickly pear, and onions (Brown 1991; Dering 1999; Sobolik 1996; Williams Dean 1978). Kelly (2007:127) argues that water-tethered foragers will travel up to 10 kilometers from the base camp to collect food, whereas non-water tethered foragers would travel no more than 5 kilometers as long as the net return rate remain greater than 0. However, for the resources in question for the Lower Pecos, additional processing is required for all the resources in order to render them edible (Brown 1991; Dering 1999); therefore, causing the 10 kilometer radius to be truncated due to the additional processing costs of desert succulents.

The narrowing of the logistical radius around a home base would cause the food and fuel resources to be exhausted more rapidly because foraging would be concentrated into a smaller geographic area. This depletion of the local resources would force people to move frequently if plants processed in earth ovens contributed the bulk of calories (Dering 1999). In addition, if people were semi-sedentary around the major river canyons and subsisting mainly from baking desert succulents, it would be expected that storage features of some type would be found (Brown 1991; Dering 1999), however no such features have been identified.

Moreover, in order to accept the home base/logistical camp model for burned rock middens, there needs to be some way of assigning one site as a “home base” and others as logistical processing stations. This has been done by classifying rockshelters and terrace sites along the major rivers as home bases, and smaller open-air and rockshelter sites away from the rivers as logistical camps (Shafer 1986; Turpin 2004). Yet, without

extensive excavations, it seems premature to assign burned rock middens into categories of home bases and logistical camps based solely on their proximity to major rivers and whether they are in sheltered or open-air locations. Therefore, even though the site frequency and density data does show a peak in BRM sites between 3 and 6 kilometers, without extensive excavations we have little empirical data upon which to assign functional categories such as home bases and logistical camps. As I see it, the “semi-sedentary canyon collector” hypothesis does not have enough supporting data to warrant it being accepted as the dominant model for Lower Pecos settlement patterns.

The alternative model, the nomadic canyonland forager hypothesis, uses experimentally derived data from earth oven experiments to make informed hypotheses regarding settlement patterns. The generally low site density within DMC and DRSNA-NU could provide some supporting evidence for a more mobile model, but additional survey data from areas greater than 7 kilometers is necessary. However, the mobile forager model does not necessarily explain why the apparent peak in BRM frequency is between 3 and 6 kilometers from the major rivers.

Summary of Settlement Pattern Hypothesis Testing and Regional Biases in Site Data

Based on my analysis of site frequency and density data, the semi-sedentary canyon collector model is not supported and there is not enough site data from areas greater than 7 kilometers from the major rivers to adequately test the mobile foragers model. The regional site data is heavily biased towards the major river canyons, and the analysis of site distribution can only discuss trends within the first 7 kilometers away

from the major rivers. The pattern of increasing earth oven processing as distance away from major rivers is interesting, but it requires more survey greater than 7 kilometers from the river before it can be considered to indicate a regional mobility pattern.

The published settlement patterns models—specifically the increase population over the last 5,000 years and the increase in upland utilization during the last 3,000 years—reflect a serious lack of understanding regarding the regional geomorphologic record. There is potential for buried archaeology as well as a preservation bias towards recent sites. The geomorphologic biases alone warrant a large scale radiocarbon dating project of sites across the landscape to begin gaining a better understanding of site use through time.

CHAPTER 9: CONCLUSIONS AND FUTURE RESEARCH

In his summary of the archaeological work conducted around Lake Amistad, Dering (2002:3.14) states that a lack of archaeological survey has created one of the most “glaring data gaps” in the region. Even with the addition of the DMC data, the regional archaeological site data lacks an unbiased record of sites located away from the major rivers. Until we collect more survey data from areas away from the rivers, biases in where survey has been conducted will continue to affect our interpretations of site distribution. The peak in burned rock midden frequency and density between 3 and 6 kilometers from the major rivers is interesting; however, we know virtually nothing about sites at distances greater than 7 kilometers. Once areas well beyond the major river canyons are surveyed, the trends in site frequency and density observed along DMC, Seminole Canyon, and DRSNA-NU can be placed into a better landscape context.

More survey must be done using subsurface testing in conjunction with extensive geoarchaeological research in the region (Dering 2002:3.14). Our lack of understanding of how geomorphology affects site preservation has dramatically impacted how we view regional trends in settlement patterns (i.e., increased upland utilization in the Late Archaic), and must be taken into consideration before developing new hypotheses regarding regional settlement patterns. A combination of river-canyon focused archaeological investigation and a lack of geomorphic understanding has created

a picture of Lower Pecos life that is heavily biased to recent surface sites located within 7 kilometers of the major rivers.

An additional observation based on BRM site location data from Dead Man's Creek indicates that there could be a connection between burned rock midden site location and the availability of naturally occurring sediment. Availability of sediment may have played a significant role in determining prehistoric earth oven site selection, and this hypothesis must be tested using sediment modeling in GIS as well as continued excavation and subsurface testing the uplands.

The findings of this thesis, although providing some intriguing data, point to the simple fact that we know less than previously thought. We need to continue to re-address regional chronologies through extensive radiocarbon dating, excavations of sites in a variety of settings, targeted geoarchaeological investigations, re-analysis of existing data, and survey away from the major river canyons. Only through multi-disciplinary, systematic studies can data be objectively collected to test previous hypotheses and build new, better-grounded settlement pattern models for the Lower Pecos Canyonlands.

APPENDIX A: SURVEY RECORDING FORMS

Survey Site Element Log		1 of 6
GPS #		GPS #
_____ GDE001 _____		_____ GDE031 _____
_____ GDE002 _____		_____ GDE032 _____
_____ GDE003 _____		_____ GDE033 _____
_____ GDE004 _____		_____ GDE034 _____
_____ GDE005 _____		_____ GDE035 _____
_____ GDE006 _____		_____ GDE036 _____
_____ GDE007 _____		_____ GDE037 _____
_____ GDE008 _____		_____ GDE038 _____
_____ GDE009 _____		_____ GDE039 _____
_____ GDE010 _____		_____ GDE040 _____
_____ GDE011 _____		_____ GDE041 _____
_____ GDE012 _____		_____ GDE042 _____
_____ GDE013 _____		_____ GDE043 _____
_____ GDE014 _____		_____ GDE044 _____
_____ GDE015 _____		_____ GDE045 _____
_____ GDE016 _____		_____ GDE046 _____
_____ GDE017 _____		_____ GDE047 _____
_____ GDE018 _____		_____ GDE048 _____
_____ GDE019 _____		_____ GDE049 _____
_____ GDE020 _____		_____ GDE050 _____
_____ GDE021 _____		_____ GDE051 _____
_____ GDE022 _____		_____ GDE052 _____
_____ GDE023 _____		_____ GDE053 _____
_____ GDE024 _____		_____ GDE054 _____
_____ GDE025 _____		_____ GDE055 _____
_____ GDE026 _____		_____ GDE056 _____
_____ GDE027 _____		_____ GDE057 _____
_____ GDE028 _____		_____ GDE058 _____
_____ GDE029 _____		_____ GDE059 _____
_____ GDE030 _____		_____ GDE060 _____

Texas State University Lower Pecos Canyonlands Fieldschool 2010

Figure App A.1. Sample of a GPS log.

Dead Man's Creek Survey Collection

GPS#: _____

Survey Area: _____

Artifact Type: _____

Isolate ☐ Associated ☐

Date: _____ Recorder: _____

*Lower Pecos Canyonlands Field School 2011
Texas State University*

Figure App A.3. Sample of an artifact tag.

APPENDIX B: ADDITIONAL SITE INFORMATION

Rockshelters, Caves, and Overhangs

VV1230 – Halo Shelter



Figure App B.1. View looking downstream inside VV1230. Notice polychromatic Pecos River style pictographs on the shelter wall.



Figure App B.2. VV1230 artifacts from the Rylander Collection. Clockwise from top: biface fragment (a), untyped projectile point fragment (b), biface fragment (c and d), uniface (e), and an unifacial flake tool (f).



Figure App B.3. VV1230 artifacts collected during recording: (a) hammerstone showing possible remnant pigments; (b) hammerstone; and (c) incomplete biface. Both hammerstones show indications of snap fracturing.

VV1284 – Running Deer Shelter



Figure App B.4. View of VV1284 looking north from across Dead Man's Creek.



Figure App B.5. Projectile points collected from VV1284: Pandale (a & b), Val Verde (c), Ensor (d), Montell (e), untyped Early Archaic (f), untyped arrow point (g), Perdiz arrow point (h), untyped arrow point (i), Ensor (j), and Shumla (k).



Figure App B.6. Tools collected from VV1284: uniface fragment (a), biface fragment (b-e), biface (f), and a biface fragment (g).



Figure App B.7. Nutting/grinding stones collected from VV1284: fragment of igneous nutting stone (a) and (b) a complete limestone nutting stone.

VV1340 – Hibiscus Shelter



Figure App B.8. View of the interior of Hibiscus Shelter – VV1340 – during the 2011 survey. Notice pictographs on shelter wall. Photograph is looking downstream.



Figure App B.9. Artifact collected from VV1340 during pedestrian survey and from the Rylander's collection: (a-c) unifacial flake tools, (d, e, and i) biface fragments, (f & g) Ensor dart points; and (h) Pedernales dart point.



Figure App B.10. Screenshot of point cloud generated from over 1,000 photographs of VV1340 using Microsoft Photosynth™. View is looking northeast into shelter from opposite canyon rim.

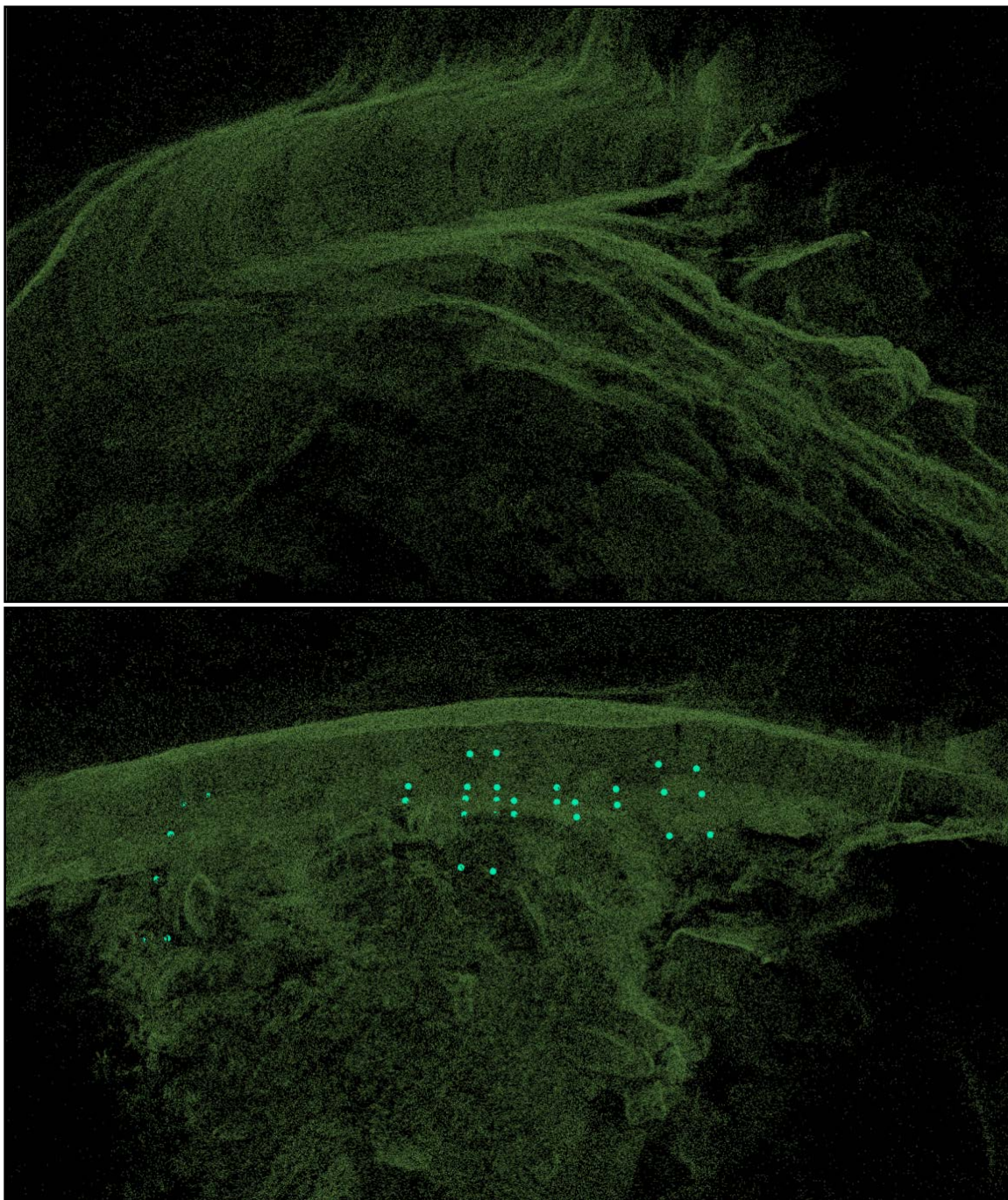


Figure App B.11. Point cloud from VV1340 in GIS after exporting from Microsoft Photoynth™: view of VV1340 looking upstream into the shelter (top) and corners of excavation units as part of the 3D point cloud (bottom).



Figure App B.12. Projectile points recovered during excavations at VV1340: (a) untyped dart point, possibly Early Archaic; (b and c) Val Verde; (d) untyped Langtry/Val Verde/Arenosa fragment; (e) Langtry; (f-h) Pedernales; (i) untyped base fragment; (j) Castroville/Marcos base fragment; (k) untyped dart point fragment; (l) Marshall base fragment; (m-p) Ensor; (q-t) untyped Late Archaic dart points; (u-x) Perdiz arrow points.



Figure App B.13. Large piece of red ocher recovered from VV1340.



Figure App B.14. Several pieces of river mussel shell recovered from VV1340.

VV1341 – Windmill Shelter



Figure App B.15. View inside VV1341 looking downstream (east) toward the two rock art panels.

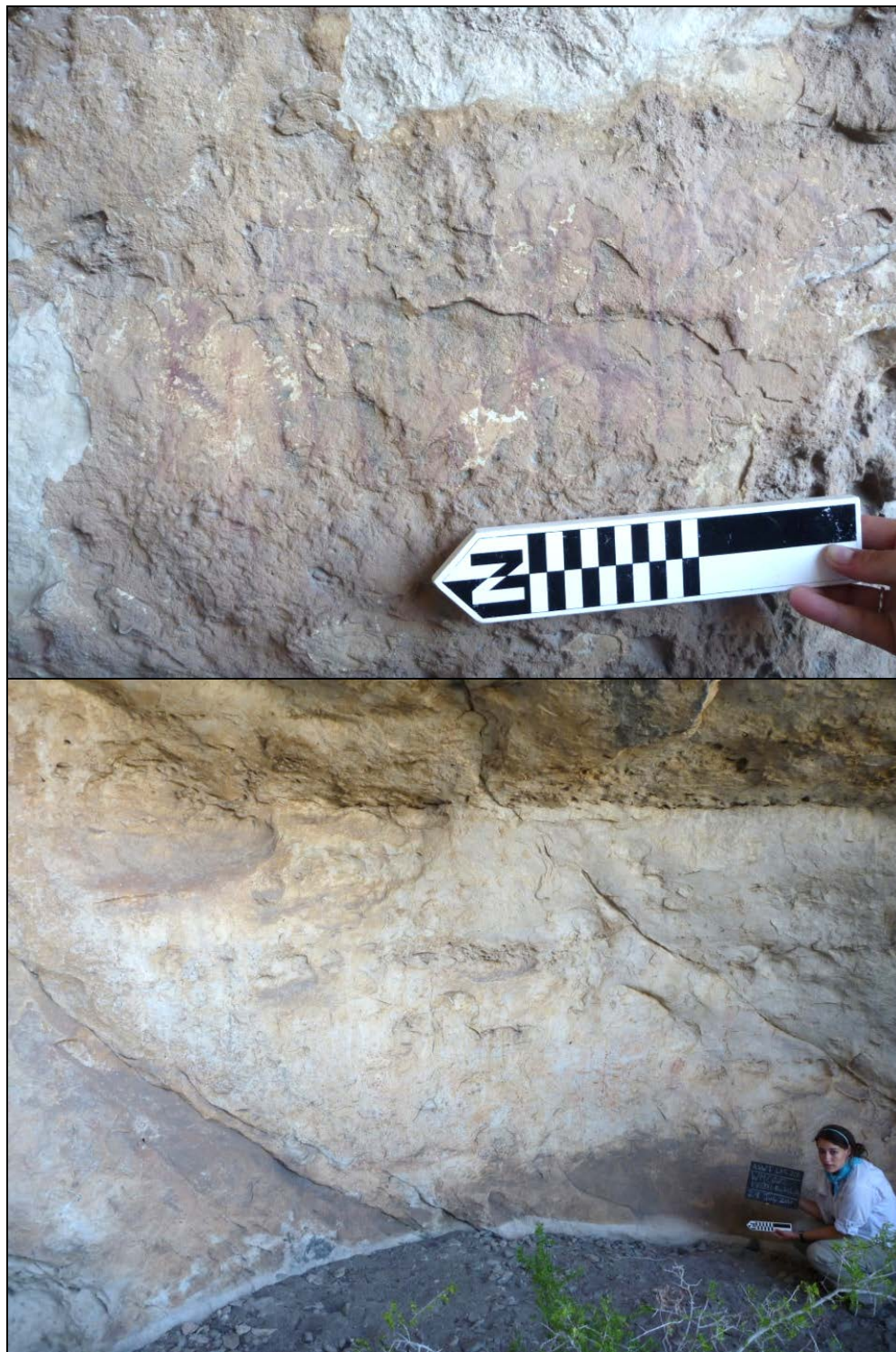


Figure App B.16. Pictograph panels one (top) and two (bottom) within VV1341. The Pecos River style pictographs at this site are in very poor condition.



Figure App B.17. Projectile points collected from VV1341: Val Verde (left) and Ensor (right).

VV1342 – Ryes ‘N Sons Retreat



Figure App B.18. View of VV1342 looking northwest (upstream). Boulder in foreground is covered in bedrock grinding features.



Figure App B.19. Close up photograph of bedrock grinding features in large boulder within VV1342.



Figure App B.20. Close up of red, remnant pigment around a water seep in the back wall of VV1342.



Figure App B.21. A large piece of ocher showing evidence of grinding (left) and a piece of volcanic rock (right).



Figure App B.22. Two drills recovered from VV1342. The artifact on the right is a reworked Gower dart point.



Figure App B.23. Bifaces and biface fragments collected from VV1342 (n=23).



Figure App B.24. Projectile points recovered from VV1342: (a-c) Pedernales; (d) Pandale; (e) Marshall; (f and g) Arenosa; (h-k) Val Verde; (l) Langtry; (m) Figueroa; and (n-q) Ensor.

VV1348 (VV1994) – Dead Man’s Canyon Overhang



Figure App B.25. View looking downstream (south) in VV1348.

VV2038 – Serenity Overlook



Figure App B.26: View of VV2038 looking downstream. People pictured are directly in front of the main pictograph panel.

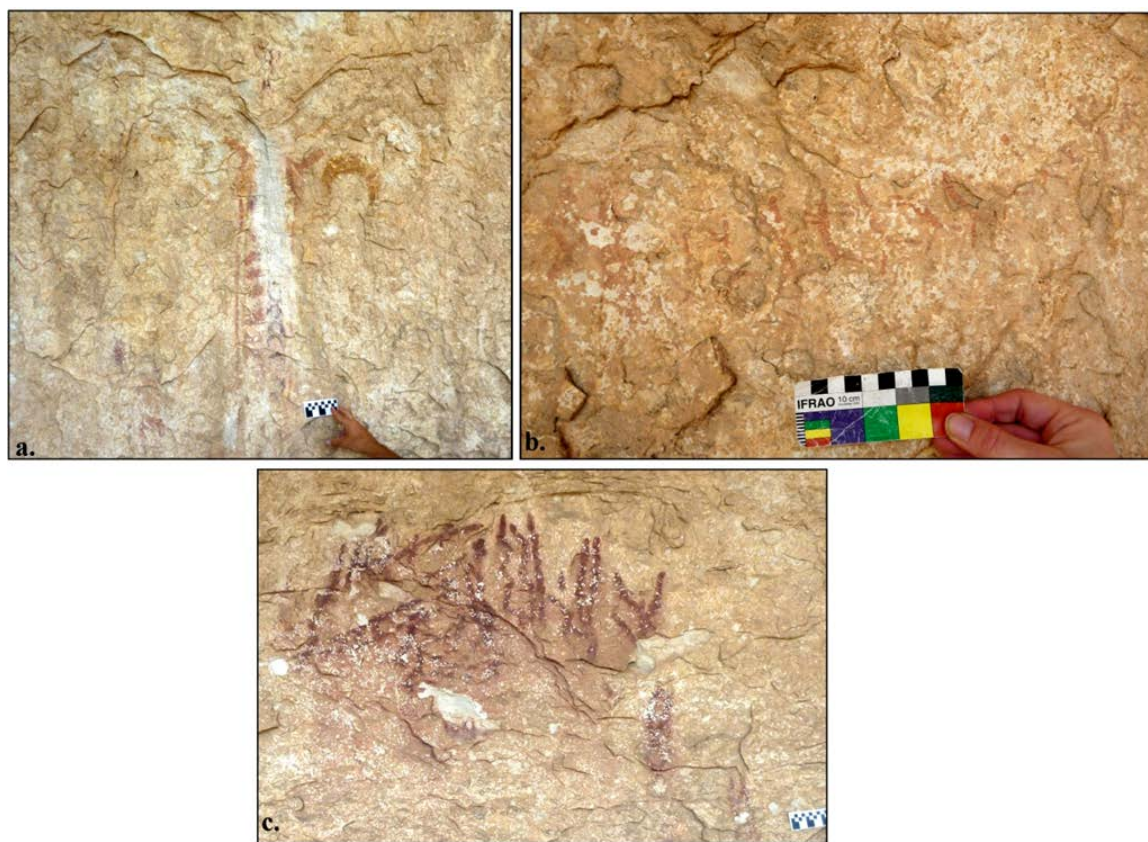


Figure App B.27: Different pictographic styles present at VV2038: Pecos River style (a), Red Linear (b), and Bold Line Geometric (c).



Figure App B.28: Overall (a) and close up (b) views of possible stone alignment directly in front of pictograph panel.

VV2050 – Hackberry Den



Figure App B.29. View looking out of VV2050 onto the flat area in front of the shelter. Notice smoke blackening on ceiling. Grinding feature is located on boulder to the right of the large boulder in the photograph.



Figure App B.30. Shallow grinding feature located in VV2050.



Figure App B.31. Pictographs of an unidentifiable style within VV2050.



Figure App B.32. Artifacts collected from VV2050: crude biface (left) and a large river mussel shell (right).

VV2056 – Big Cactus Shelter



Figure App B.33. View looking out of VV2056; pictographs (not visible in photograph) are on right (upstream) side of the shelter.



Figure App B.34. Remnants of a red pictograph visible in the upstream end of VV2056.



Figure App B.35. Big Sandy series projectile point recovered from VV2056.

VV2058 – Nopal Sanctuary



Figure App B.36. View of VV2058 looking west.



Figure App B.37. Possible dart point perform recovered from VV2058.

VV2059 – Audad Escape



Figure App B.38. View inside VV2059 looking south (downstream).



Figure App B.39. Langtry dart point recovered from VV2059

VV2060 – *Gnarly Bone Shelter*



Figure App B.40. View of VV2060 looking north into the shelter.



Figure App B.41. Large igneous or metamorphic hammerstone collected from VV2060.

VV2061 – *Rylander Refuge*



Figure App B.42. View of VV2061 looking south from the back wall of the shelter.

VV2067 – *Hinds Deep*



Figure App B.43. Entrance to VV2067. The opening to the vertical chamber is visible just left of the center of the cave ceiling.

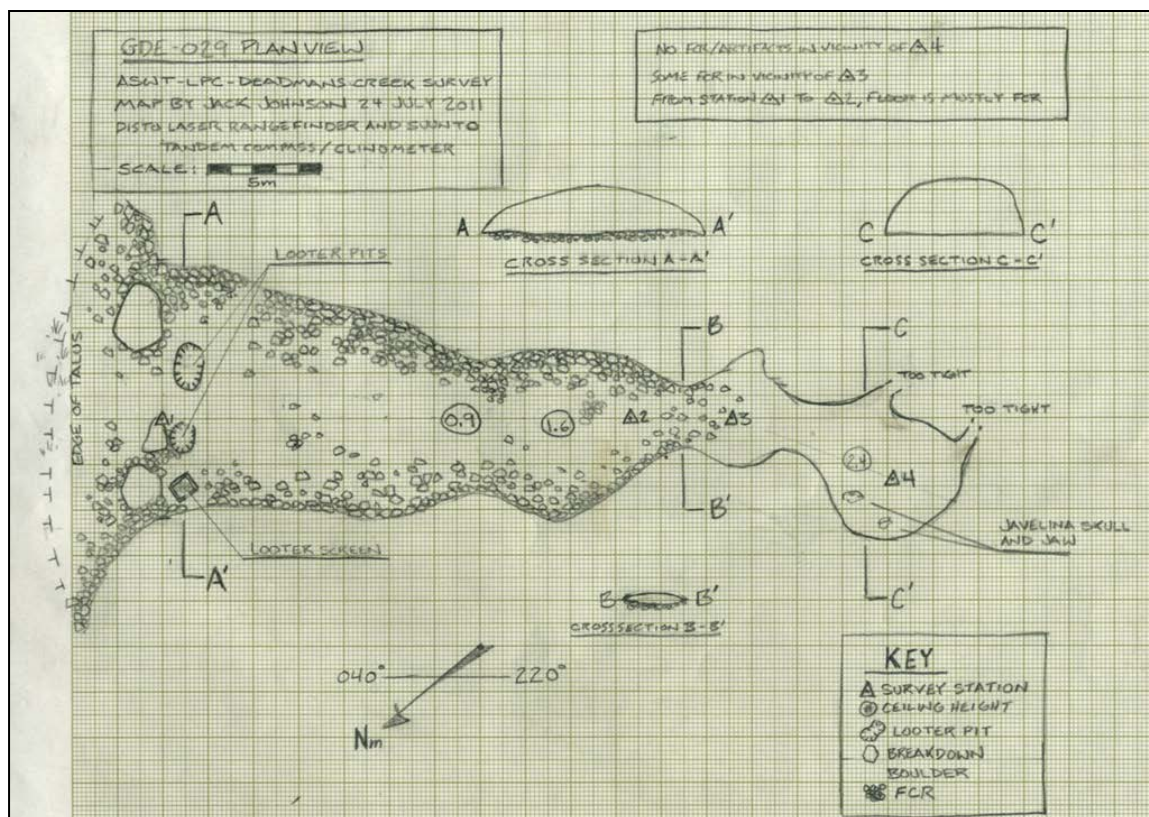


Figure App B.44. Plan view of VV2067. Map by Jack Johnson.

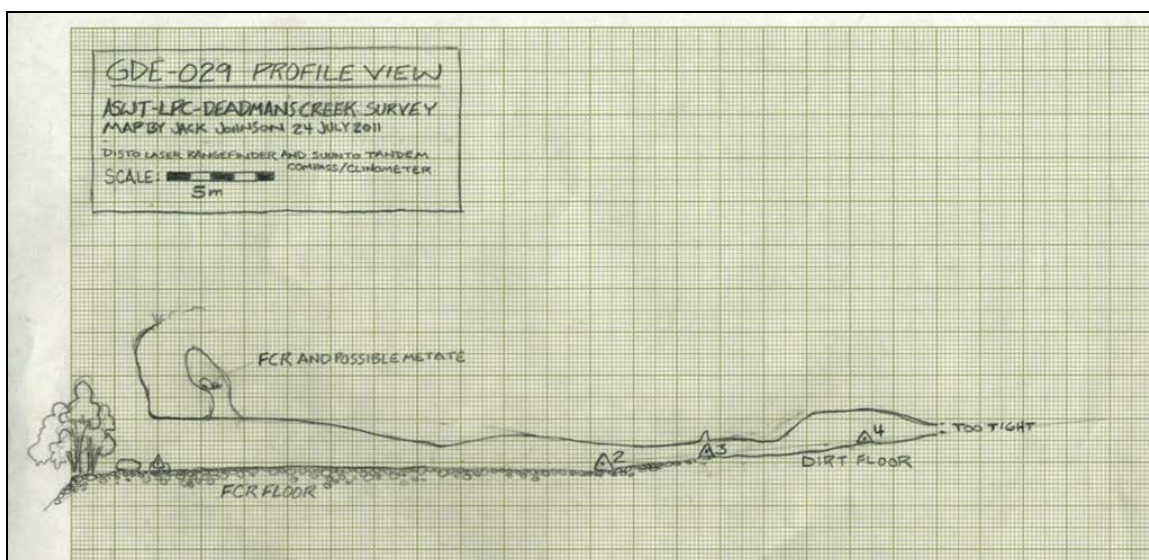


Figure App B.45. Profile view of VV2067. Map by Jack Johnson.



Figure App B.46. Artifacts collected from VV2067: (a and b) bifaces and (c) a stream rolled pebble.



Figure App B.47. Burned rock (top) and possible grinding stone (bottom) found at the top of the vertical chamber within VV2067.

VV2068 – Awe-dad Shelter



Figure App B.48. View looking upstream (east) within VV2068. Notice cemented éboulis along rear wall, and the pour off from the canyon rim.



Figure App B.49. Artifacts collected from VV2068: (a and b) Val Verde dart points, (c) broken biface, and (d) tear drop shaped biface.

VV2071 – *Echo Overlook*



Figure App B.50. View of VV2071 looking south (downstream). Person is standing in front of rock art panel.

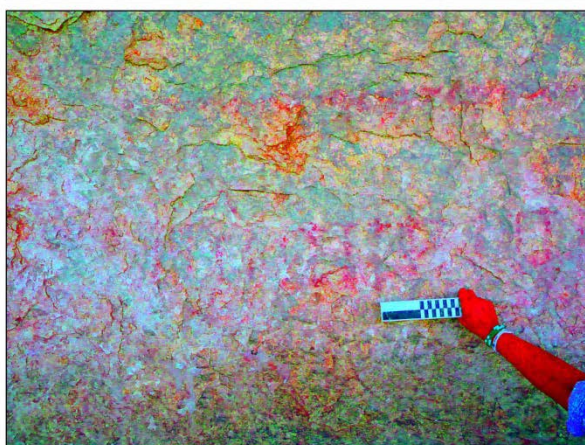


Figure App B.51. Pictographs within VV2071. Original photograph (top) and D-Stretch enhanced photograph (bottom).

VV2073 – Oven-Smashed-In



Figure App B.52. View of VV2073 looking northwest. The large boulders between the person and the photographer are the collapsed roof.

VV2075 – Hibiscus View



Figure App B.53. View of VV2075 looking from across the canyon near VV1340.

VV2076



Figure App B.54. View inside VV2076 looking upstream (east); notice two concentrations of rock. It is unclear what these rock clusters are, and if they are cultural, when they date to.

VV2077



Figure App B.55. View of VV2077 looking northwest. Notice large roof falls within the overhang.

VV2078



Figure App B.56. View of VV2078 looking upstream within the overhang. Artifacts were found on the opposite side of the ocatillo plant from the photographer.

VV2099



Figure App B.57. View looking out from VV2099. Notice dark, grey, ashy sediment at the entrance to the site.

VV2103 – Rick’s Chimney



Figure App B.58. View of VV2103 looking outward from the backwall. Notice the large roof falls at the dripline. The “chimney” is in the far upstream (right) end of the shelter.

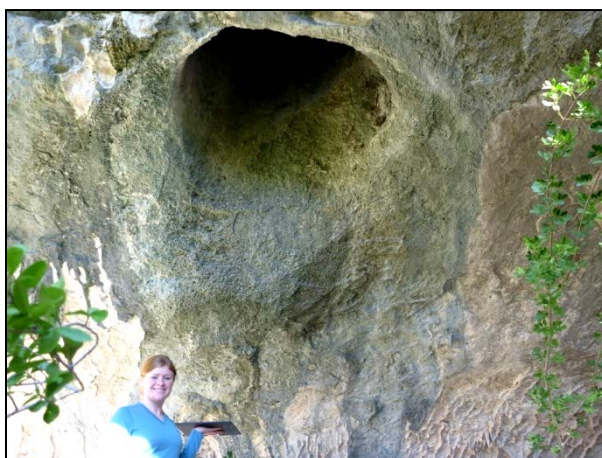


Figure App B.59. Vertical solution cavity – “chimney” – in upstream end of shelter.



Figure App B.60. Artifacts collected from VV2103: Biface (left) and uniface fragment (right).

Upland Burned Rock Midden Sites

VV2053 – *Rancid Cactus*



Figure App B.61. View looking southeast across “crescent” of burned rock at VV2053 (top) and view looking northwest toward the “crescent” (bottom). Notice absence of burned rock and an animal burrow in the center of the bottom photograph.

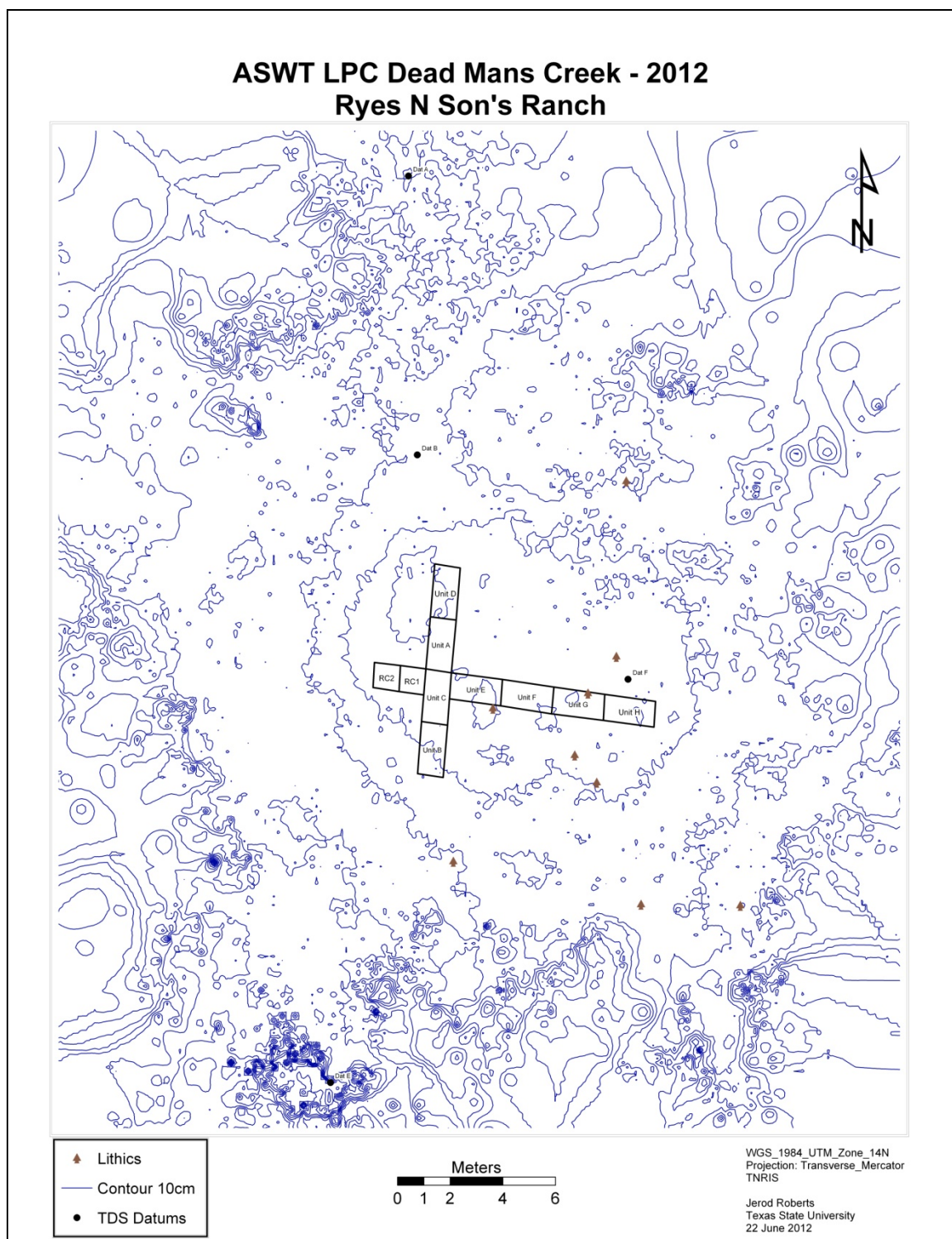


Figure App B.62. Contour map created by exporting a point cloud from Microsoft Photosynth™ into GIS. Map by Jerod Roberts.

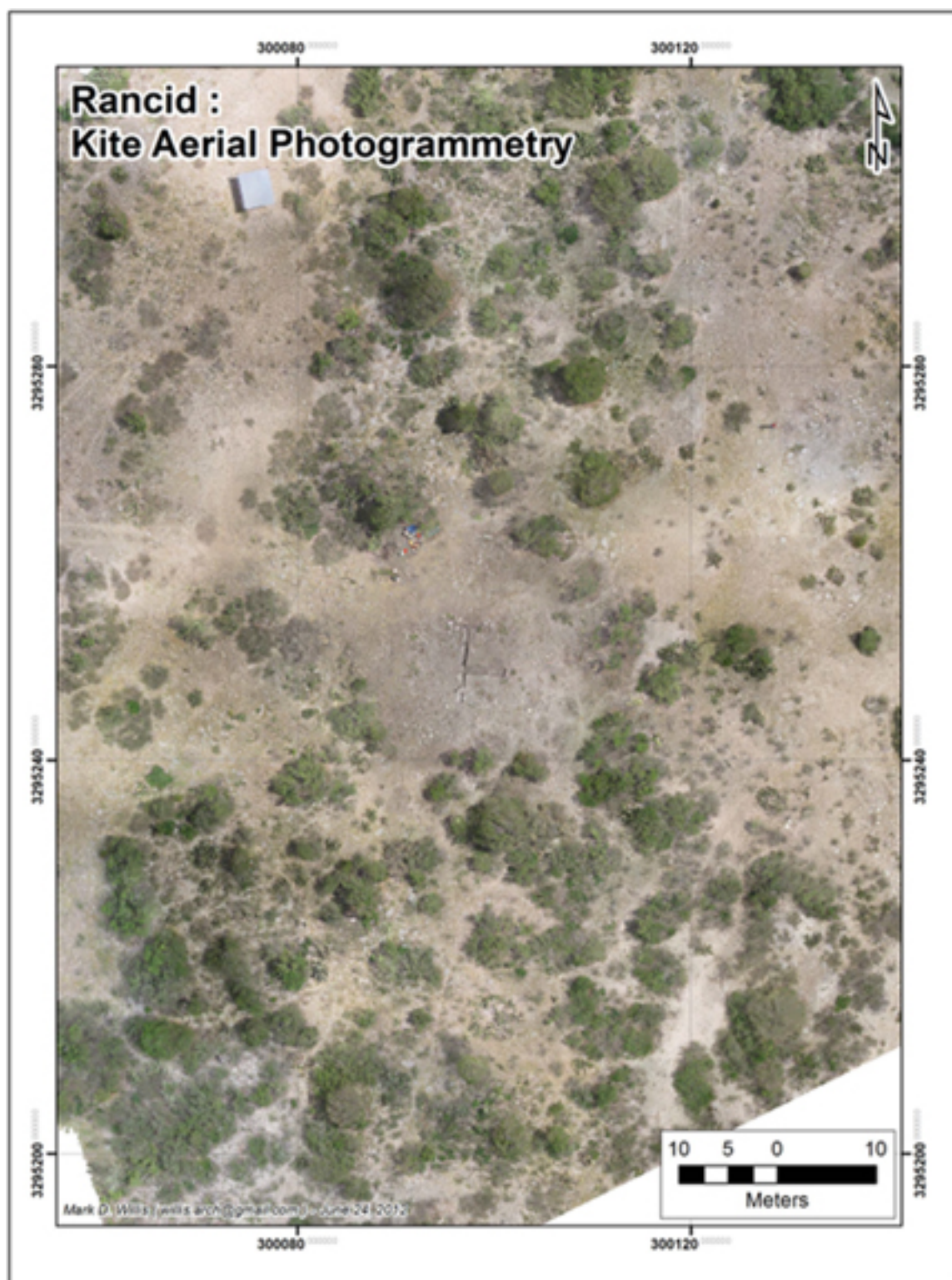


Figure App B.63. Aerial photogrammetry of 41VV2053. Map by Mark Willis.



Figure App B.64. Projectile points recovered from VV2053 during excavations: (a and b) Figueroa, (c-e) expanding stem arrow points, possibly Sabinal; (f and g) Perdiz arrow points; (h) untypable arrow point; and (i) Chadbourne arrow point.

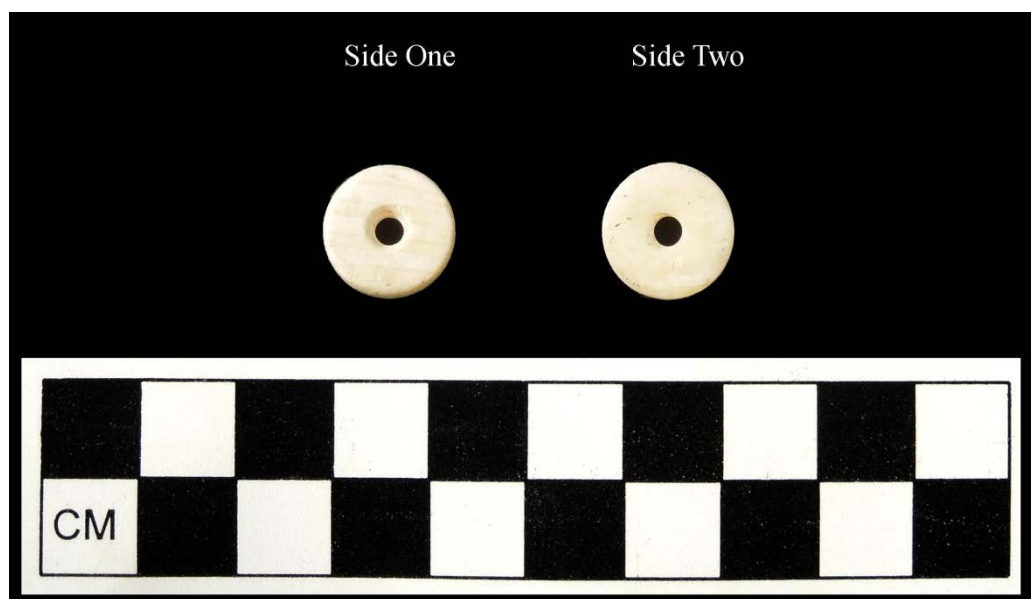


Figure App B.65. Conch Shell Bead recovered from VV2053.



Figure App B.66. View of burned rock zone 30 cm below surface. Absence of burned rock at the surface of trench was not due to excavation activities. Notice the size of rock within the trench. The majority of burned rock at VV2053 was likely buried due to burrowing insects and other animals.

VV2057 – Bunkhouse Midden



Figure App B.67. View of 41VV2057 looking west from within the Ryes ‘N Sons bunkhouse parking lot. The burned rock midden is covered by the thick vegetation in the photograph.



Figure App B.68. Site and feature boundaries for VV2057. Notice the proximity to the Ryes 'N Sons bunkhouse.



Figure App B.69. Artifacts collected from VV2057: (a) Pedernales base fragment; (b) Frio dart point; (c) Ensor dart point fragment; and (d) a biface fragment.

VV2064 – Ridge Top Midden



Figure App B.70. View of VV2064 looking northwest; the dense vegetation is covering the burned rock midden.



Figure App B.71. The base of the burned rock midden at VV2064 is in the foreground, and the figure is standing near the top of the mounded burned rock.



Figure App B.72. Site map of VV2064 showing site boundary, extent of burned rock midden, and location of possible oven pits.

VV2066 – High Fence Midden



Figure App B.73. View of VV2066 looking north. Thick vegetation is covering the burned rock midden.



Figure App B.74. Site map of VV2066 showing site boundary, burned rock midden boundary, and area of possible oven pits.



Figure App B.75. Artifacts collected from VV2066: (a-d) Frio dart points; (e) Ensor dart point; and (f-j) biface fragments.

VV2069 – Ridge Side Midden



Figure App B.76. View of VV2069 looking west. Figure is standing just downslope of the burned rock midden; notice the burned rocks on the slope in the foreground.



Figure App B.77. Site map of VV2069 showing site boundary and extent of burned rock midden. Notice VV2067 directly downslope.



Figure App B.78. Projectile points collected from VV2069: (a) Nolan, (b) Shumla, (c) reworked Pandale or Nolan, (d) Almagre, and (e and f) Val Verde.

VV2098 – Shotgun Shell Midden



Figure App B.79. View of VV2098 looking east. The thick vegetation in the photo is obscuring the burned rock midden.



Figure App B.80. Map of VV2098 showing site boundary and extent of burned rock midden.

Terrace Burned Rock Middens

VV1347 – Borrowed Midden



Figure App B.81. View of VV1347 looking southeast. Borrow pit is on the left side of the photograph.



Figure App B.82. Location of VV1347 showing site boundary, extent of burned rock midden, and the two features exposed in the borrow pit.



Figure App B.83. Profile of southern feature exposed in the borrow pit.



Figure App B.84. Two biface fragments collected from VV1347.

VV2036 – Dead Man’s Kitchen and VV2037 – Little Sotol



Figure App B.85. View of VV2036 (near terrace) and VV2037 (cleared area with two small caves) looking west. Photograph taken prior to 2011 Texas State field school.

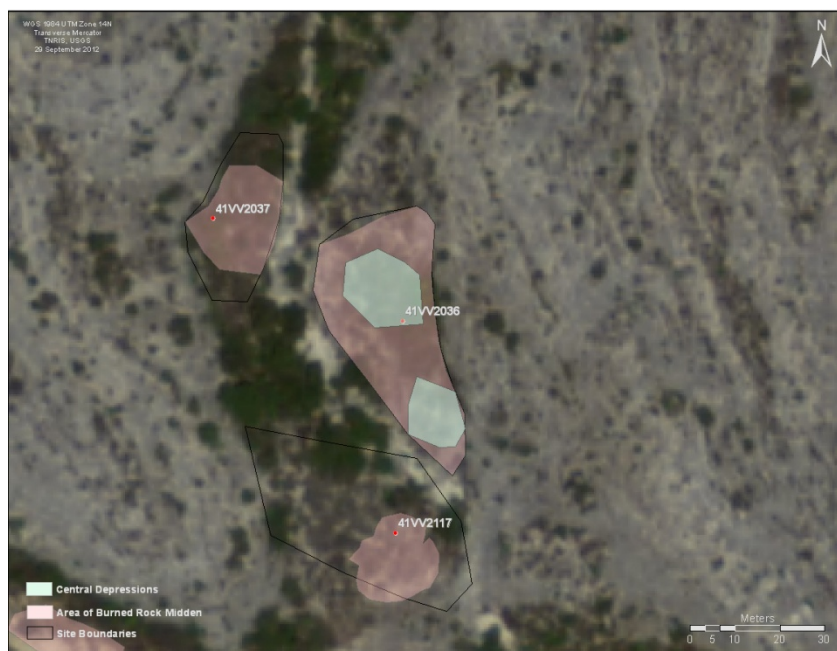


Figure App B.86. The site boundaries and burned rock midden extents for VV2036 and VV2037. Possible central depressions for VV2036 are also included.

VV2042 – Dam Midden



Figure App B.87. View of VV2042 looking east. Borrow pit and dam are to the right (south) of the truck.



Figure App B.88. Only remaining section of burned rock midden exposed in the profile of the borrow pit.



Figure App B.89. Map of VV2042 showing site boundary, burned rock midden, and other features.



Figure App B.90. Biface/chopper collected from VV2042.

VV2045 – *Sheep Horn Terrace*



Figure App B.91. Map of VV2045 showing site boundary, extent of burned rock midden, and central depression.



Figure App B.92. Artifacts collected from VV2045: (left) biface and (right) Val Verde dart point.

VV2048 – Eureka Terrace



Figure App B.93. View of VV2048 looking west. Burned rock midden is located north (right) of the figure standing in the photograph. The figure is standing in the center of the additional FCR feature at the site.



Figure App B.94. Map of 41VV2048 showing site boundary, extent of burned rock midden, and smaller FCR feature.



Figure App B.95. Nolan projectile point collected from site.

VV2052 – Goat Pen Midden



Figure App B.96. View looking south of the central area of the burned rock midden at VV2052.



Figure App B.97. Map of VV2052 showing site boundary and extent of burned rock midden.

VV2055 – Tractor Terrace Midden



Figure App B.98. View of VV2055 looking west prior to clearing.



Figure App B.99. Site map of VV2055 from the 2011 survey showing site boundary and extent of burned rock midden.



Figure App B.100. Frio dart points collected from VV2055 during pedestrian survey.



Figure App B.101. Using the Bobcat to expose profiles of the midden at VV2055 prior to excavations.

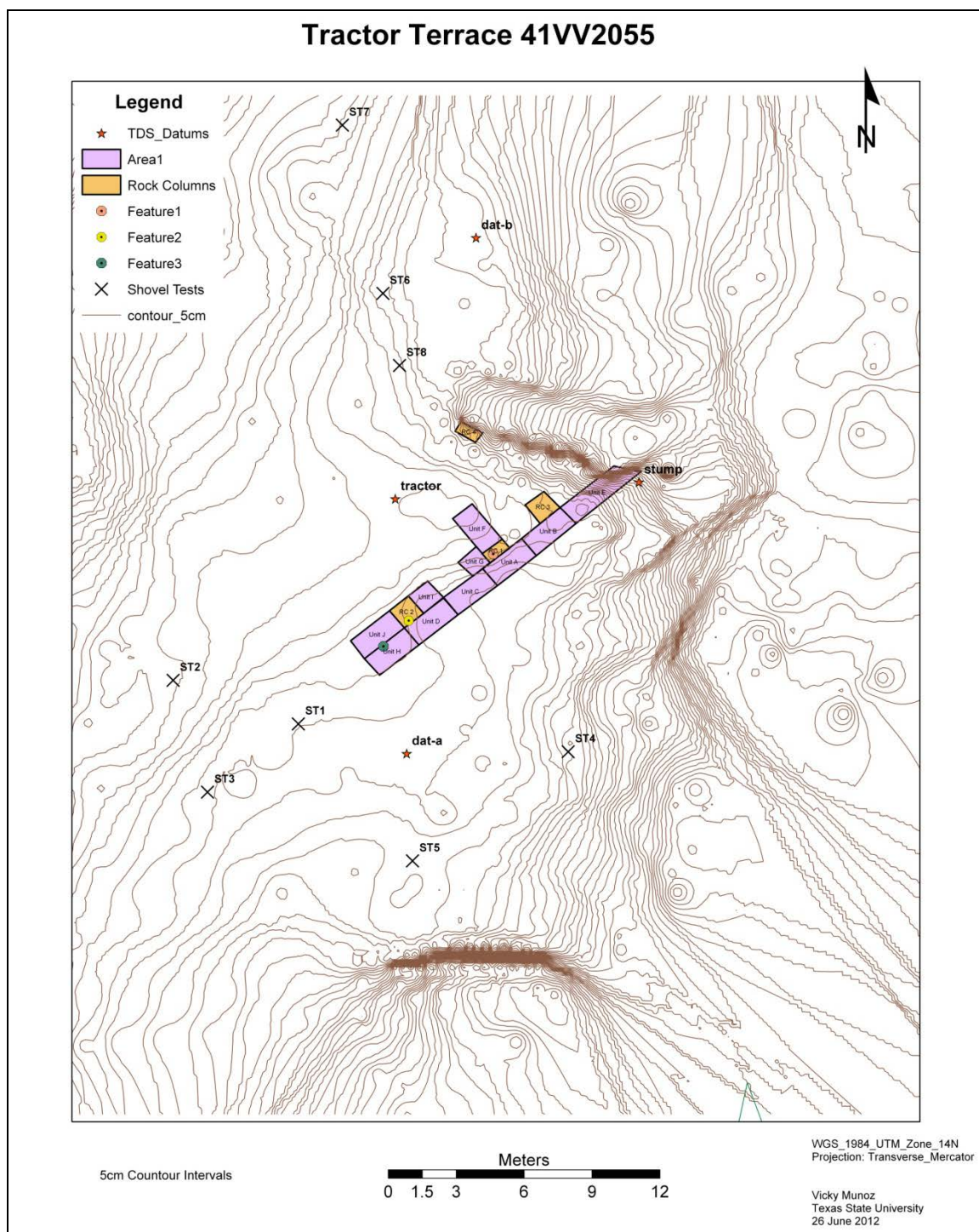


Figure App B.102. TDS contour map of 41VV2055 showing excavation units, shovel tests, and excavation datums. The steep contours are the trenches dug by the bobcat. Map by Vicky Munoz.



Figure App B.103. Screenshot from Microsoft Photosynth™ of VV2055 after the excavation. View is directly overhead, with the excavation units in the center of the photograph, the tractor at the top, and the northern Bobcat trench in the right portion of the image.



Figure App B.104. Projectile points recovered from VV2055: (a, b, c, f, and g) Val Verde and (d and e) Pandale.

VV2065 – Woodcutter Terrace



Figure App B.105. View of VV2065 looking west. Midden is located in the center of the photograph.

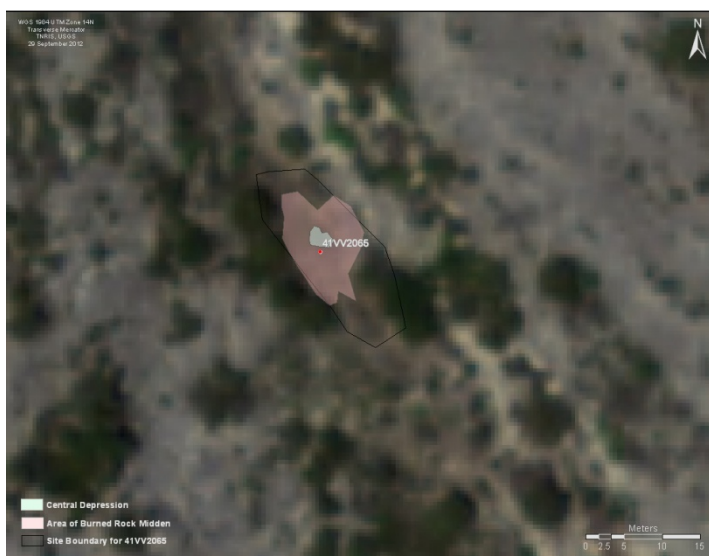


Figure App B.106. Site map of VV2065 showing the site boundary, extent of burned rock midden, and the area of the central depression.



Figure App B.107. River mussel shell fragment recovered from VV2065.

VV2074 – *Dead Man's Mouth*



Figure App B.108. View of VV2074 looking north from across Dead Man's Creek. The Devils River is visible in the right side of the photograph.



Figure App B.109. Map of VV2074 showing site boundary, extent of large burned rock midden, and central depressions within the burned rock midden area. The finger that extends to the north is littered with lithics.



Figure App B.110. Projectile points collected during pedestrian survey of VV2074: (a) Almagre, (b) Marcos, (c) Almagre, (d) Gower, (e) Val Verde, (f) Bell, (g) Marshall, (h) Val Verde, (i) Paisano, (j) Val Verde medial fragment, and (k) untyped Late Archaic base fragment.



Figure App B.111. Projectile Points in the Hobbs Collection: (a) Gower, (b) Martindale, (c) Castroville, (d) Val Verde/Langtry/Arenosa fragment, (e) Marcos/Castroville fragment, (f) Late Archaic side notched, (g) Langtry, (h) Pedernales, (i) Langtry, and (j and k) Val Verde.



Figure App B.112. A sample of the bifaces recovered from VV2074.



Figure App B.113. Quartz artifacts recovered from VV2074: biface (left) and a broken fragment (right).

VV2117 – *Little Lechuguilla*



Figure App B.114. View of VV2117 looking southwest. The area of the terrace covered in cenizo is the location of the midden. People are standing in the deflated FCR and lithic scatter eroding out of the main burned rock midden.



Figure App B.115. Site map of VV2117 and surrounding sites showing site boundaries, extent of burned rock midden, and central depressions.



Figure App B.116. Biface collected from VV2117.

Open-air Non-Burned Rock Midden Sites Containing FCR Features or Scatters

VV1349 – Bobcat Dug



Figure App B.117. Map of VV1349 showing site boundary and extend of borrow pit with exposed feature. The small rockshelter is located in the bluff to the north of the borrow pit.

VV2041 – Mesquite Terrace



Figure App B.118. Main burned rock feature at VV2041.



Figure App B.119. Map of VV2041 showing site boundary and burned rock features.

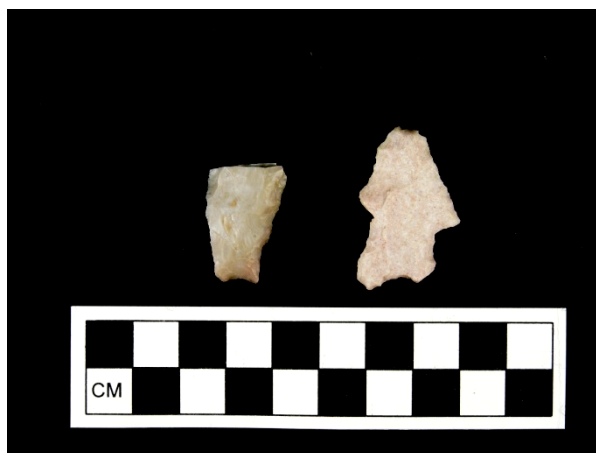


Figure App B.120. Pandale (left) and Baker (right) projectile points collected from VV2041.

VV2044 – Lone Flower Terrace



Figure App B.121. Map of 41VV2044 showing site boundary and the extent of the borrow pit.

VV2046 – *Mouflon Terrace*



Figure App B.122. Map of VV2046 showing the site boundary.

VV2047 – *Lion Bait Terrace*



Figure App B.123. Close up of the burned rock feature at VV2047.



Figure App B.124. Map of VV2047 showing site boundary and the one identified burned rock feature.

VV2049 – Hackberry Hollow



Figure App B.125. Map of VV2049 showing the extent of the burned rock feature and the site boundary. Notice VV2050 to the east.

VV2051 – South Canyon Flat



Figure App B.126. View of VV2051 looking southwest.



Figure App B.127. Map of VV2051 showing site boundary, the 14 plotted burned rock features, and the location of the core cache. The western boundary of the site follows the Rylander property line.



Figure App B.128. Three of the 14 burned rock features recorded at VV2051.



Figure App B.129. Core cache from VV2051: condition of the core cache upon discovery (left) and after clearing of brush and leaf litter prior to test excavations (right).



Figure App B.130. The 13 cores collected from the core cache at VV2051.



Figure App B.131. Biface (left) and flake (right) recovered during test excavations of the core cache.



Figure App B.132. Additional artifacts collected from VV2051: (a) uniface, (b-d) bifaces, (e) possible Perdiz arrow point, (f) biface fragment, and (g) possible Catan projectile point.

VV2054 – Bunkhouse Vista

Figure App B.133. Map of VV2054 showing site boundary and two burned rock features. Notice the faint trace of an old road coming into the site from the north.



Figure App B.134. Pedernales dart point fragment recovered from VV2054.

VV2062 – Old Fence Terrace



Figure App B.135. Map of VV2062 showing site boundary as defined by the FCR and lithic scatter.

VV2063 – High Fence Flat



Figure App B.136. Map of VV2063 showing site boundary and the burned rock feature in the center of the site.

VV2072 – Windmill Canyon Terrace



Figure App B.137. Map of VV2072 showing site boundary and the three burned rock features.

VV2100



Figure App B.138. Map of 41VV2100 showing site boundary and location of burned rock feature.

VV2104 – Gillis Divide



Figure App B.139. Map of VV2104 showing the site boundary. Notice dense vegetation directly in the middle of the site boundary. That is where the highest concentration of FCR is located.

VV2114 – Hibiscus Hollow



Figure App B.140. Map of VV2114 showing the site boundary and the location of the possible burned rock feature.

VV2115



Figure App B.141. Map of VV2115 showing site boundary.

Stone Alignment and Cairn Sites

VV2039 – *Sunrise Point*



Figure App B.142. View of the stone alignment at VV2039 looking west. The western portion of the alignment is formed by the bedrock outcrop in the background of the photo. The large flake is located in the center of the alignment.

VV2102 – Sheep Horn Cairn



Figure App B.143. View of VV2102 looking northwest. Notice how the rocks on the downslope side (left) appear to be sliding downhill.

Lithic Procurement Sites

VV2040 – Sunrise Quarry



Figure App B.144. Map of VV2040 showing the site boundary.

Lithic Scatters

VV2043 – *Sheep Horn Overlook*



Figure App B.145. Map of VV2043 showing the site boundary.

VV2105 – *Sunrise Flat*



Figure App B.146. Map of VV2105 showing the site boundary.

VV2110



Figure App B.147. Map of VV2110 showing the site boundary. VV2064, a large burned rock midden site, is located just north of VV2110.

VV2111



Figure App B.148. Map of 41VV2111 showing site boundary.



Figure App B.149. Untyped projectile point (left) and broken biface (right) recovered from VV2111)

VV2112



Figure App B.150. Map of VV2112 showing the site boundary. Note road on west edge of site.

VV2116 – Windmill Divide



Figure App B.151. Map of VV2116 showing the site boundary. Goat pens are located in the western portion of the site and the windmill is in the eastern portion.

VV2118 – Windmill Canyon Overlook



Figure App B.152. Map of VV2118 showing the site boundary.



Figure App B.153. Paisano projectile point recovered from VV2118.

VV2119 – Dead Man’s Creek Flat



Figure App B.154. Map of VV2119 showing site boundary.

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