

ANTIQUITY AND PALEOENVIRONMENT OF
THE TAMAULIPAN BIOTIC PROVINCE OF SOUTHERN TEXAS:
THE ZOOARCHAEOLOGICAL PERSPECTIVE

A Thesis

by

ANNA LEE PRESLEY

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

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August 2003

Major Subject: Anthropology

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August 2003

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ABSTRACT

Antiquity and Paleoenvironment of the Tamaulipan Biotic Province of Southern Texas:

The Zooarchaeological Perspective. (August 2003)

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The Tamaulipan Biotic Province (TBP) is an ecotonal community that has been characterized in the twentieth century as a mixture of plains, woodland, and desert-adapted mammalian taxa. Some authors have proposed that this heterogeneous mixture of animals is a result of human influence on the environment in the post-European contact period. Others have proposed that the characteristically disharmonious mixture of fauna has been present in south Texas since prehistory. By considering the presence of certain key taxa across the archaeological record of the area this thesis demonstrates that the fauna characteristic of the Tamaulipan Biotic Province can be followed back in time as far as the archaeological record allows. This work also provides complete lists of all vertebrate organisms present in the archaeological record of the area, organized by time period and also by archaeological site and citation.

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CHAPTER I

INTRODUCTION TO THE TAMAULIPAN BIOTIC PROVINCE

Humans have lived in the portion of southern Texas known as the Tamaulipan Biotic Province (TBP) (Figure 1) since the end of the Pleistocene and throughout recent geological history. To understand how prehistoric populations have adapted to the region it is necessary to know the resources that were available and the nature of the biological communities which they inhabited through time.

Synonyms for the Tamaulipan Biotic Province

Southern Texas has been characterized by naturalists in a variety of ways since the nineteenth century. Other names for the TBP in the literature give an insight into the research interests of those who coin the terms and can also indicate the relative level of sophistication in describing the area. Merriam, a naturalist of the late 1800s, proposed the concept of Life Zones for North America (1898) (Figure 2). These zones were grouped according to temperature and humidity. The TBP of Texas is wholly contained within the Lower Austral (Arid Division) Life Zone. Merriam's life zones proved to be problematic because they did not adequately explain the distribution of birds and mammals in North America. Later, more sophisticated biogeographic studies produced the concept of the Biotic Province (Dice 1943; Blair 1950). Biotic provinces consider

floral and faunal associations, physiography, and soil type, as well as climate.

According to Schmidly, contemporary mammalogists prefer to use the Ecological Regions established by Gould (1969). The division of Texas into these regions is based on vegetation.

The U.S. Department of Agriculture (Bailey 1978) refers to this area as “mesquite-acacia-savannah.” Their regional designation is used for long-term public management projects and National Science Foundation grants.

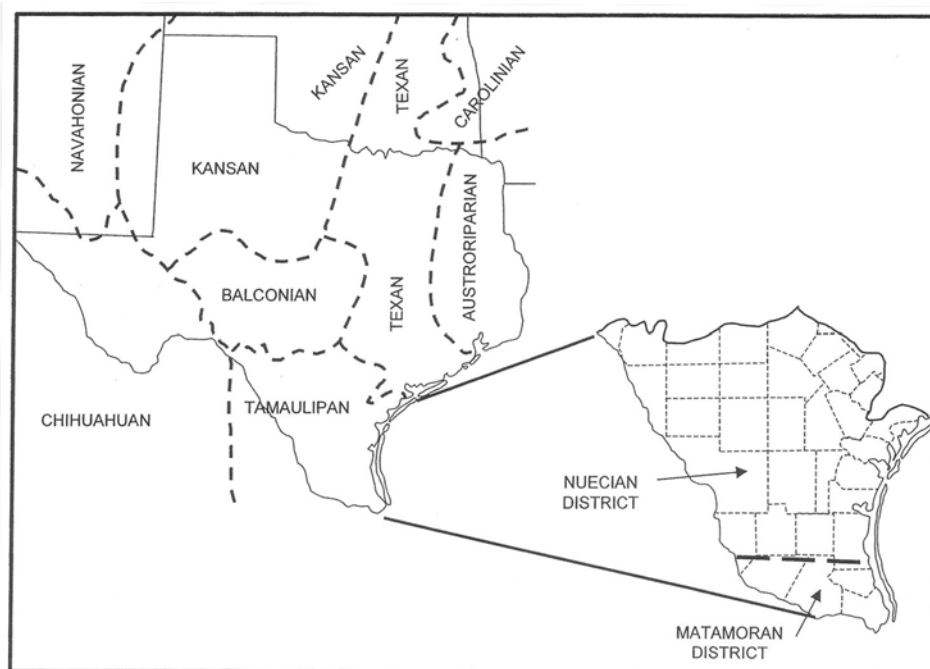


Figure 1. The Biotic Provinces of Texas featuring the Tamaulipan Biotic Province and its Subdistricts (follows Blair 1950, 1952 and Judd 2002).

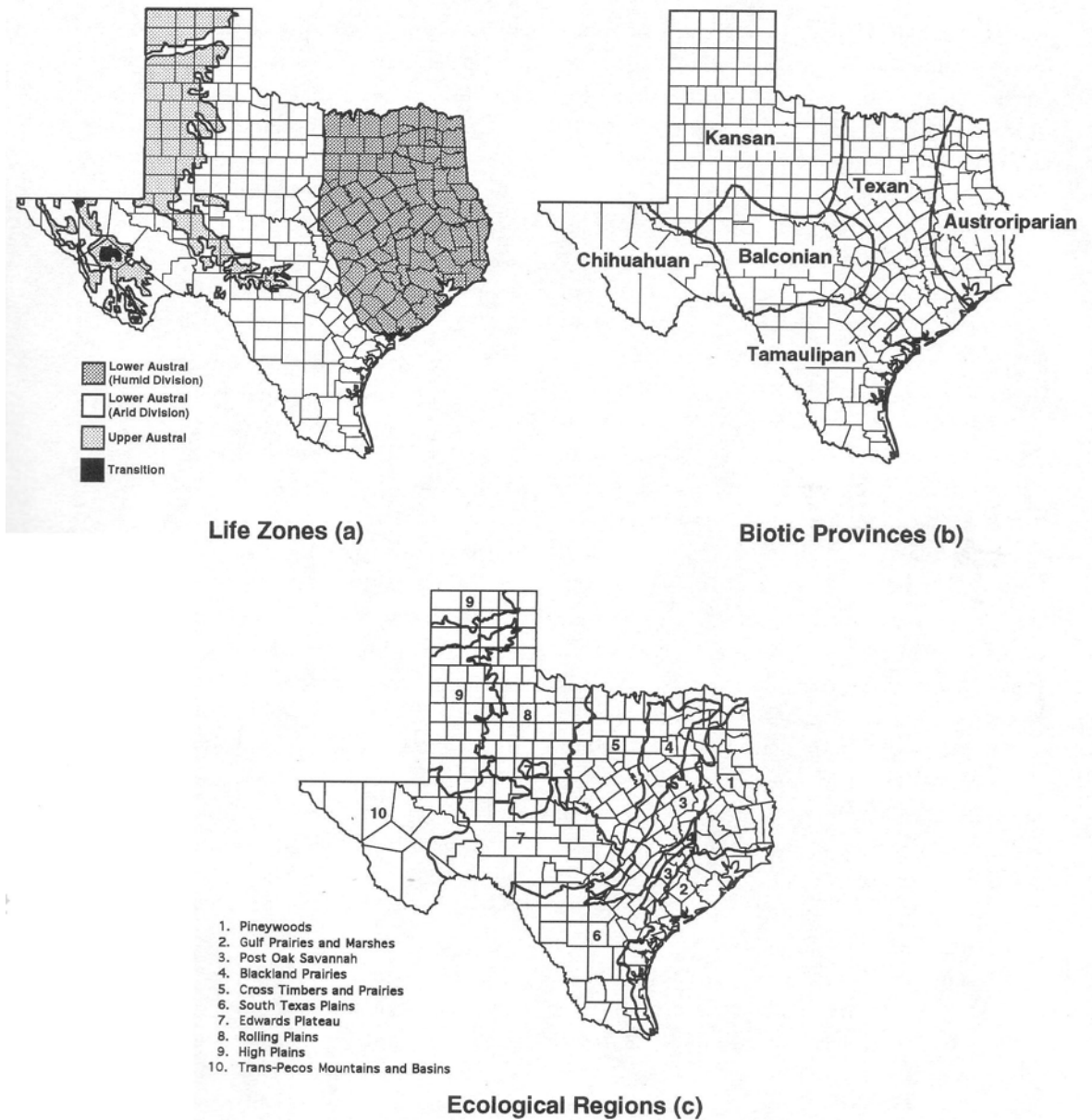


Figure 2. The Life Zones (Merriam 1898), Biotic Provinces (Dice 1943; Blair 1950), and Ecological Regions of Texas (Gould 1969) (Follows Schmidly 2002).

What is the Tamaulipan Biotic Province?

This paleoenvironmental assessment will focus on the geographic region of the southern Gulf Coastal Plain known as the Tamaulipan Biotic Province (Figure 1). This region is an ecotonal community, which is bounded by the Chihuahuan Desert to the west, the Gulf Coast deciduous forest of the Texan Biotic Province to the east and the more elevated Balcones Biotic Province to the north. In a 1950 article for the *Texas Journal of Science*, W. Frank Blair followed the concept of the biotic province as it was first defined by Dice (1943). Dice, and later Blair, utilized the particular and unique regional combinations, or ecological associations, of floral, faunal, climatic, and geologic data to define such provinces. To further clarify, Blair (1950) defined an ecological association as a relatively stable assemblage of plants and animals regardless of the stage of ecological succession.

Blair (1950) clarified the boundaries of the biotic provinces found extending into or contained within present day Texas. He did so by considering the distribution of topographic features, climate, vegetation types, and terrestrial vertebrates exclusive of birds. Those factors that are potentially variable by time and discernable from the archaeological record are of particular importance to this report. I maintain that the concept of the biotic province remains a useful heuristic device because it provides a

modern environmental standard that can be compared to archaeological material (Presley 2000).

Blair found that a mixture of flora and fauna derived from the surrounding three provinces characterizes the Tamaulipan Biotic Province: Chihuahuan, Balconian, and Texan. The environments of these provinces are characterized respectively as desert, scrub forest, and mixed grassland and forested areas. This intermixing of fauna is exemplified by the shared ecological associations of the eastern mole (*Scalopus aquaticus*), the spiny rat (*Liomys irroratus*), and the kangaroo rat (*Dipodomys ordii*) which belong to the Texan, Tamaulipan, and Chihuahuan Provinces respectively (Blair 1950). The range of fauna and vegetation characteristic of the Tamaulipan Biotic Province will be discussed in greater detail in the following Chapters of this report.

Blair divided the Tamaulipan Biotic Province into two districts: the Nuecian, or northern district, which is drained by Nueces River, and the Matamoran, or southern district, which is comprised of the Lower Rio Grande valley (Figure 1). However, I have observed that in his discussion of their distribution many of the taxa are divided along east/west lines rather than north/south ones. This distribution gradient is due to the influence of the Gulf coast and the forests of the east and may also be related to rainfall.

Blair (1950:102, 1952:230) defined the "logical" northern boundary of the province as the Balcones Escarpment/Balcones Fault. This boundary provides a physiographic barrier to the migration of certain plants and animals. Blair (1950, 1952)

defined the northeastern boundary between the Tamaulipan and Texan Biotic Provinces as the line dividing pedocal and pedalfer soils. Blair (1950) did not dwell on the southern boundary of the province since it is found south of the Rio Grande in present day Mexico (Figure 3). The present report also focuses on that portion of the province north of present day Mexico; unlike Blair, however, I am focusing on the northern part of the province not because it lies in the modern political region known as Texas but rather because a greater amount of archaeological investigation has been conducted in that part of the province (Hester 1990).

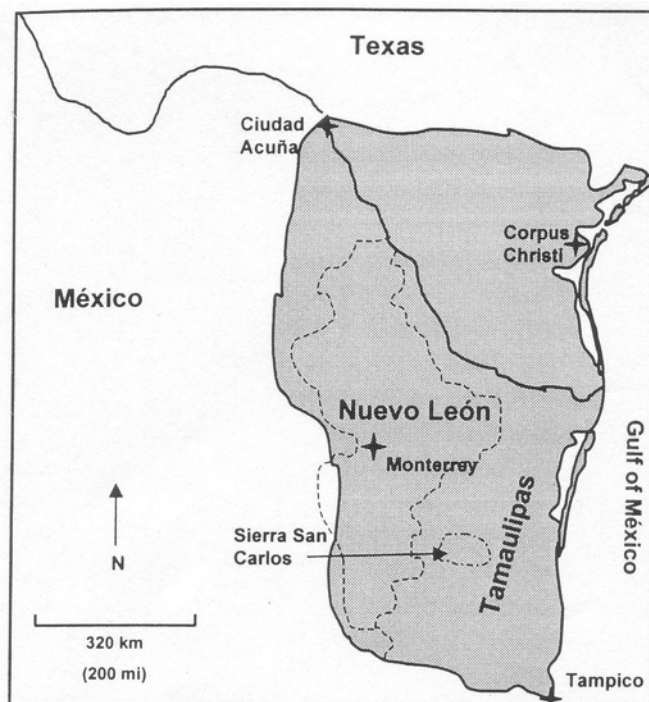


Figure 3. The Tamaulipan Biotic Province of Southern Texas and Northern Mexico (after Alvarez 1963; Judd 2002).

Descriptions of this region also use other names, such as the South Texas Plains, or South Texas Coastal Plain. The term South Texas Plains is used by contemporary naturalists and is one of the ten ecological areas of Texas recognized by Gould (1969) (Figure 2). The South Texas Plains area as identified by the U.S. Army Corps of Engineers (SWD) roughly approximates the area established by Gould (1969). As it is depicted in Hester (1989) the South Texas Plains are comprised of all the land in southern Texas below an arc that stretches from the Rio Grande, beginning at the southwest corner of Kinney County, westward to the Gulf Coast and including Matagorda Bay (Figure 4). Like Blair (1950), Hester (1989) also included the northeastern portion of Mexico within the defined area. Hester (1989:3) acknowledges that the South Texas Plains "[lie] wholly within the Tamaulipan Biotic Province as defined by Blair (1950)."

The discrepancies between the defined boundaries of these two regions lie in the research perspectives and interests of the authors. The boundary of the Tamaulipan Biotic Province is drawn with much more clarity and attention to detail than the boundary of the South Texas Plains. Specifically, the Tamaulipan Biotic Province's boundary wavers along its western end as it follows the Balcones Escarpment and then dips southward, excluding Victoria and Jackson counties for example, to follow the boundary between pedocal and pedalfer soils. Blair's intention was to focus on those unchanging geological environmental elements that contribute to defining the

Tamaulipan Biotic Province. In contrast, Hester et al.'s (1989) sweeping arc across southern Texas was based upon archaeological cultural data that distinguish this subregion, known as the South Texas Plains, from the other subregions

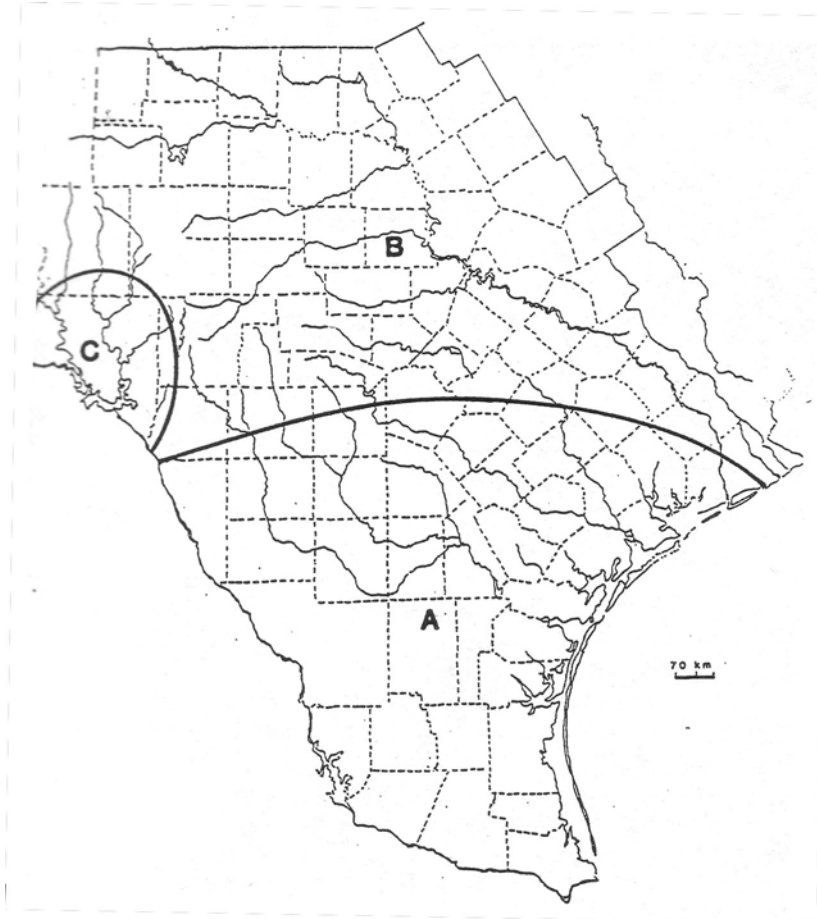


Figure 4. The South Texas Plains (A) as Established by the U.S. Army Corps of Engineers (SWD) (modified from Hester 1989).

contained within Region 3 of the Southwestern Division overseen by the U.S. Army Corps of Engineers.

Research Questions

Now that the Tamaulipan Biotic Province has been defined in a preliminary sense, questions regarding its temporal boundaries can be asked. Specifically, can the earliest coalescence of the Tamaulipan Biotic Province be identified in prehistory? Or, put another way, how far back does this characteristic mixture of faunal and vegetation components reach? Two hypotheses can be proffered. First, the province is the result of some sort of climatic shift in prehistory that might be discerned from the archaeological record of plants and animals from the area. Or, on the other hand, the province is a more recent phenomenon whose inception was influenced by human interaction with the environment, particularly that of historic period agricultural activities such as the grazing of domesticates. In order to evaluate these two hypotheses and make a choice between them I will make diachronic observations primarily of the faunal communities and support my interpretations with vegetation data wherever possible.

Methodology

I began my data collection by generating a species list of all the terrestrial vertebrates noted by Blair (1950, 1952) for the Tamaulipan Biotic Province. In the interest of accuracy, I included Blair's subspecific identifications although such identifications are usually not possible for the archaeological record. This species list

became the focal point of the data collection sheet that is central to my work (Appendix A). This form includes space to record site name and/or locality, trinomial site number, citation and author as well as species checklist. My checklists are divided by class (Mammals, Amphibians, and Reptiles) with the largest number of possible taxa among the mammals. There is also space on each sheet to record any taxa not observed by Blair (1950, 1952). These taxa are interesting in that they either represent outlier organisms not found in the modern Tamaulipan Biotic Province or they are domesticates introduced by European settlers. In either case, these are examples of deviation from the modern natural setting standardized by Blair. This subject will be discussed in greater detail in Chapter IV.

The data were collected for the most part from archaeological site reports generated by cultural resource management firms and state universities, notably the University of Texas at San Antonio. Reports published by the Texas Archaeological Society were also utilized. These reports provide primary data in the form of species lists and specimen counts.

I recorded data for every site that published information on archaeological faunal remains (see Appendix B for the complete set of species lists). In cases where subspecies or species identifications were not provided, the closest taxonomic identification was noted. In those instances, extraneous information was marked out on the data collection sheet to indicate a broader diagnosis. For each site I noted the presence of each taxon on a time-specific basis. Multicomponent sites received one

sheet per archaeological time period.

I have chosen to interpret the species list data found in these reports in terms of time rather than space. Since I am considering the Tamaulipan Biotic Province as a whole, space is treated as a single aggregate. Since I am interested in observing possible changes over time, archaeological time periods represent individual aggregates of data. Thus, in contrast to space as a single aggregate, time is a multiple aggregate.

The first step in analyzing the data was to generate species lists per time period (see Appendix C for the complete species list per time period). Some sites, twelve in all, spanned two time periods. These are separated into their own temporal categories. This resulted in seven distinct archaeological time period categories where faunal remains were observed. These categories are: Middle Archaic, Late Archaic, Late Archaic/Late Prehistoric, Late Prehistoric, Late Prehistoric/Protohistoric, Spanish Colonial, and nineteenth century.

In Chapter IV, these generated species lists will be compared directly between time periods in order to assess any change over time. I am especially interested in three categories of taxa: those that are consistently present across all time periods, those that are indicative of the ecotonal mix of fauna characteristic of the Tamaulipan Biotic Province (following Steele 1986b), and those that represent outlier organisms not observed by Blair (1950, 1952).

Faunal material from three multicomponent sites could not be included in the diachronic analysis of the faunal assemblages. The faunal analyses from these sites were

reported as single aggregates of time rather than being divided into archaeological periods. Specifically Camp Bullis/Fort Sam Houston (41BX36) (Gerstle, Kelly, and Assad 1978) contains archaeological material ranging from the Paleoindian to the Late Prehistoric period; Salado Creek (41BX300) (Katz 1987) ranges from the Early Archaic to the Late Prehistoric; and finally, the Berger Bluff/Coletto Creek site (Flynn 1983) spans from the Paleoindian period to the Late Prehistoric/Historic period. It is unfortunate that some of these sites (Gerstle, Kelly, and Assad 1978) are represented by disturbed deposits. Their faunal analyses would have made an important contribution to the understanding of the faunal record in the Paleoindian and Early Archaic periods. I intend to make broad comparisons between these sites and the diachronic analysis of the Tamaulipan Biotic Province in Chapter IV.

Why focus on species list data (nominal data) rather than quantitative data, such as NISP (number of identified specimens) or MNI (minimum number of individuals), for this analysis? Lyman (1986 following Grayson 1981, 1984) recommended species list data as an invaluable tool in paleoenvironmental reconstruction. Its utility lies in the consideration of the ecological attributes of each taxon identified in an archaeological fauna. By focusing on such nominal data as presence or, to a lesser extent, absence of a taxon, the analyst bypasses much of the interpretive problems inherent in large scale considerations of relative taxonomic abundance and other derived quantitative characters. Lyman (1986) did not completely discount the utility of quantitative zooarchaeological analysis, a subject for which he is well known. Instead, he

encouraged faunal analysts not to overlook the usefulness of species lists as a data set, both for paleoenvironmental reconstruction and for questions of human subsistence. In my own research for this work, I found that faunal species lists were the most commonly available data set. Furthermore, my survey of the literature went much the same as Lyman and Livingston's (1983) experience where older archaeological reports were not likely to have much faunal information other than species lists. In order to include the largest number of sites possible, it was necessary to focus on this most commonly reported aspect of the data. I will address these issues in greater detail in Chapter VI.

In this thesis, I will first summarize the available literature on the vegetation history (Chapter II), and faunal history (Chapter III) of the area. Next I will synthesize and evaluate the available zooarchaeological data for the area (Chapter IV). This report will be the first synthetic zooarchaeological work of its kind for the Tamaulipan Biotic Province. I will also consider the antiquity of the province's environmental parameters in terms of two competing hypotheses proposed by Hester and Steele. In Chapter V, I will test the available faunal data against Graham and Lundelius' (1984) model of coevolutionary disequilibrium. Some of the ideas expressed in Chapters IV and V have been presented to the Society for American Archaeology (Presley and Steele 1997; Presley 1999). In Chapter VI, I consider some of the methodological questions regarding the feasibility of answering the questions that were raised while analyzing the archaeological faunal material recovered from the Tamaulipan Biotic Province. Specifically, I will consider issues of interobserver error and the utility of nominal data

sets.

Culture History of the Tamaulipan Biotic Province

It is important to place the archaeological material covered in this report in its cultural context. Archaeological evidence has demonstrated that humans have occupied the Tamaulipan Biotic Province since the Paleoindian period. The following summary of the culture history of this area is modeled after Black (1989b follows Hall et al. 1986) and Hester (1995). In keeping with the environmental theme of this thesis, the focus of the following summary is on broad-level subsistence/ economic adaptation rather than on tool type chronologies.

According to Black (1989b) the Paleoindian period (11200 to 8000 B.P.) is poorly represented in the archaeological record in south Texas. His discussion of the culture history of that area was based on “extrapolation” from the archaeological record of the surrounding areas, particularly to the north and west (1989b:48). This was done because tool type chronologies for the surrounding areas are strongly comparable in their temporal sequence. Hester (1995) concurred with Black’s observation of the Paleoindian period. Although uncommon, Paleoindian artifacts are found from three of the five biogeographic regions of the South Texas Plains as they are defined by Black (1989b). He noted isolated sites within the Coastal Bend and somewhat more common surface sites in the Nueces-Guadalupe and Rio Grande subareas (Hester 1977a, 1980; Mokry and Mitchell 1985:4-5). Three inland sites are notable: Buckner Ranch, Berger

Bluff, and the Johnston site in Victoria County. The former two sites have been excavated but both are somewhat problematic. The Berger Bluff site dates to the Paleoindian period, based on chronometric and paleoenvironmental data, but does not contain diagnostic artifacts. Despite Black's (1989b) assertion that the Buckner Ranch site is of the Paleoindian period, he also noted that radiocarbon dates have not been taken for the site nor have its artifacts been fully analyzed.

Based on faunal material recovered from Baker Cave in the Lower Pecos, Black (1989b) inferred that at around 9000 B.P. the human occupants of the South Texas Plains were also utilizing small game such as reptiles and rodents rather than hunting large herd animals. His inference was based on the contemporaneous presence of *Golondrina* points in both areas.

Like the Paleoindian material, Early Archaic (8000 to 4500 B.P.) sites are also uncommon in the Tamaulipan Biotic Province. Black (1989b) noted that like the earlier material, their designation in south Texas is also based on inference from the culture histories of the surrounding areas. However, in this case radiocarbon assays have also been conducted at sites from the Coastal Bend area and the Choke Canyon project sites. In addition to the Coastal Bend and the Rio Grande Plain, where the Choke Canyon reservoir project is located, Early Archaic sites are also found in the Rio Grande Plain. Chronometric dating has indicated that the sites in the Coastal Bend are from the latest part of the period (Black 1989b). As in his discussion of the Paleoindian occupation of the area, Black suggested that human occupation on the Early Archaic was rather sparse with small bands ranging over large territories.

Early archaic sites in this area have yielded some of the oldest known subsistence material in south Texas. For example, the oldest known shell midden (*Rangia flexuosa*) is found at the McKenzie site (Ricklis 1986). The oldest faunal material (5400 B.P.) from the archaic period in this area includes freshwater invertebrates, freshwater drum, and turtle remains found at 41LK31/32 (Scott and Fox 1982).

Like the earlier cultural periods, the Middle Archaic (4500 to 2400 B.P.) in the South Texas Plains is defined by comparison of projectile point types with those of the surrounding areas. In addition, radiocarbon dates were taken from sites in the Choke Canyon Reservoir Area as well as the Loma Sandia site (Black 1989b). Sites from the Middle Archaic period are found in a wider variety of topographic locations than the preceding sites. These locations include “upland, alluvial, and tributary settings inland and along estuary bays in the Coastal Bend” (Black 1989b:49). In particular, the possible earliest occupation of the Rio Grande Delta and the Sand Sheet areas occurs during this time period (Black 1989b).

Black proposed that the Middle Archaic was a time of increased population growth and possibly of increased resource specialization. Specifically, it is in this time period when burned rock middens, that may have been used for mesquite bean or acorn processing, become more common toward the north. These burned rock middens may be related to similar features found in the Choke Canyon area (Hall et al. 1986; Black 1989b). Subsistence may have also included terrestrial and freshwater invertebrates as well as deer and other mammals. Also during this period the modern sea level is established (Prewitt et al. 1987) which allows for the beginning of the littoral/maritime

adaptation in the Coastal Bend.

The Late Archaic in the South Texas Plains ranges from approximately 2400 B.P. to 1200B.P. and perhaps as late as 800B.P. based on radiocarbon dates from the Coastal Bend (Story 1968; Black 1989b). Radiocarbon dates were also analyzed for sites from the Choke Canyon Reservoir and others.

Sites from this time period are more common than those from previous periods. In addition, an increased amount of information regarding subsistence is also available from this time period, particularly that done by Steele (1986b). From this increased data it appears that two distinct adaptation strategies have developed. Within the Coastal Bend area the strategy trends toward exploiting marine taxa. Inland sites, in contrast, were more focused on collecting plant resources and small animals (Black 1989b). Further, the burned rock/hearth features that were first noted from the Middle Archaic are even more prolific in the Late Archaic. All of these lines of evidence indicate that there was a continued increase in population density from the Middle to the Late Archaic (Black 1989b).

The Late Prehistoric is perhaps the best known archaeological time period from this region. Its temporal range (1200 to 400 B.P.) is based on numerous radiocarbon dates. This time period is noted archaeologically for its shift in tool technology to relatively small expanding stem projectile points used for bows and arrows as well as the beginning of pottery in the area. Black (1989b) divided the period into two smaller phases regarding inland sites: the Austin (1200 to 650 B.P.) and the Toyah (post 650 B.P.). The Late Prehistoric within the Coastal Bend begins at around 800 B.P. The

cultural adaptation in this area is known as the Rockport complex and is distributed between Matagorda Bay and Baffin Bay. Artifacts recovered from this complex include material from Spanish contact (Corbin 1974). The Late Prehistoric also dates to this time period in the Rio Grande Delta and is known as the Brownsville complex. This culture complex probably continued into the historic period as is evidenced by glass projectile points and ethnohistoric accounts (Salinas 1986; Black 1989b).

The Protohistoric period in southern Texas, and in the broader scope on the Plains of North America, began in the sixteenth and seventeenth centuries with the arrival of the Spanish, namely Cabeza de Vaca's northeast to southwest trek across the TBP (Hester 1995, 1999). The Protohistoric is distinct in that these sites represent a time when a relatively small amount of European trade goods were available to Native American people, but the influence of European culture was not felt strongly. The Protohistoric is indicated archaeologically by the first isolated examples of European trade goods (Hester 1995). Hester (1995) emphasized that the Protohistoric is a "culture-historical" concept rather than one bound with absolute dates; it represents a transitional period between the traditional aboriginal way of life and the lifeways of the Spanish mission.

I have chosen to divide the post-contact period archaeological sites discussed in this report into two distinct time periods: Spanish Colonial and nineteenth century. Spanish Colonial sites are typically mission settlements but may include other site types. In terms of total numbers, the nineteenth century sites included in this report represent mostly Anglo settlements in San Antonio. Sites associated with the Spanish are also

included (see site list in Chapter IV). The pertinent cultural activities of the post-contact period, those involving human-environment interaction, are discussed in detail in Chapters II and III.

CHAPTER II

VEGETATION OF THE TAMAULIPAN BIOTIC PROVINCE

Dice (1943) described the vegetation of the TBP as a mixture of small trees and dense shrubs. Blair (1950) also emphasized the presence of thorny brush in the area. Dice (1943) commented on the lack of a true forest in the Texas portion of the TBP and attributed the condition to the porous limestone bedrock and hot summers.

Blair (1952) divided the Nuecian District of the TBP into eight plant communities. Diamond et al. (1987) later further subdivided the Nuecian District within the Gulf Prairies and Marshes, Coastal Sand Plain, and South Texas Brush Country natural regions (Figure 5). Of special interest to this report are the Deciduous Forest and Deciduous Woodland of the Gulf Coast Prairies and Marshes, and the Deciduous Woodland of the South Texas Brush Country. These areas are of importance to this report because they offer moist habitats that are relatively rare in the TBP. The Deciduous Forest area of the Gulf Coast Prairie is dominated by a mixture of oak species (*Quercus*). The Deciduous Woodland area of the Gulf Coast Prairie is dominated by mixed oaks (*Quercus*), mixed oak and pecan (*Carya illinoensis* Koch), and mixed mesquite (*Prosopis glandulosa* Torrance) and huisache (*Acacia smallii* Isely) groupings. The Deciduous Woodland of the South Texas Brush Country is also characterized by a mix of mesquite and huisache (Diamond et al. 1987; Judd 2002; Kuchler 1964; McLendon 1991).

Lonard et al. (1991; Judd 2002) has divided the Rio Grande Plain, as they call the

Matamorán District of the TBP, into four habitats: Brush-Grasslands, River Floodplain, Coastal Prairies, and Barrier Islands. The Brush-Grasslands is a mixture of short trees, shrubs, and succulents such as cactus and yucca. These groupings are interspersed with small grassy sections (Judd 2002). The typical overstory includes mesquite, huisache, and Texas ebony. The understory is a thick combination of plants including multiple smaller species of *Acacia*, prickly pear, *Opuntia* sp., and other cactus. Vegetation tends to be taller near sources of water with huisache and retama (*Parkinsonia aculeata* Linnaeus) in higher concentrations (Judd 2002). In contrast, the grassy areas, underlain by deep sands, are more similar to savannah type vegetation. In these areas, larger mesquite trees are found as single individuals or in clusters, also known as mottes. The River Floodplain habitat features riparian forests dominated by mesquite, Texas ebony, cedar elm, Texas palmetto, and sometimes other small trees (Judd 2002). The Texas palmetto, a native plant, is especially important in the eastern division of the river floodplain area. Blair (1950) observed that the Texas palmetto reaches its northernmost distributional limit south of Brownsville on the Rio Grande. However, in the 1800s the Texas Palmetto stretched from near the mouth of the Rio Grande to 130 km (81 mi) inland (Clover 1937).

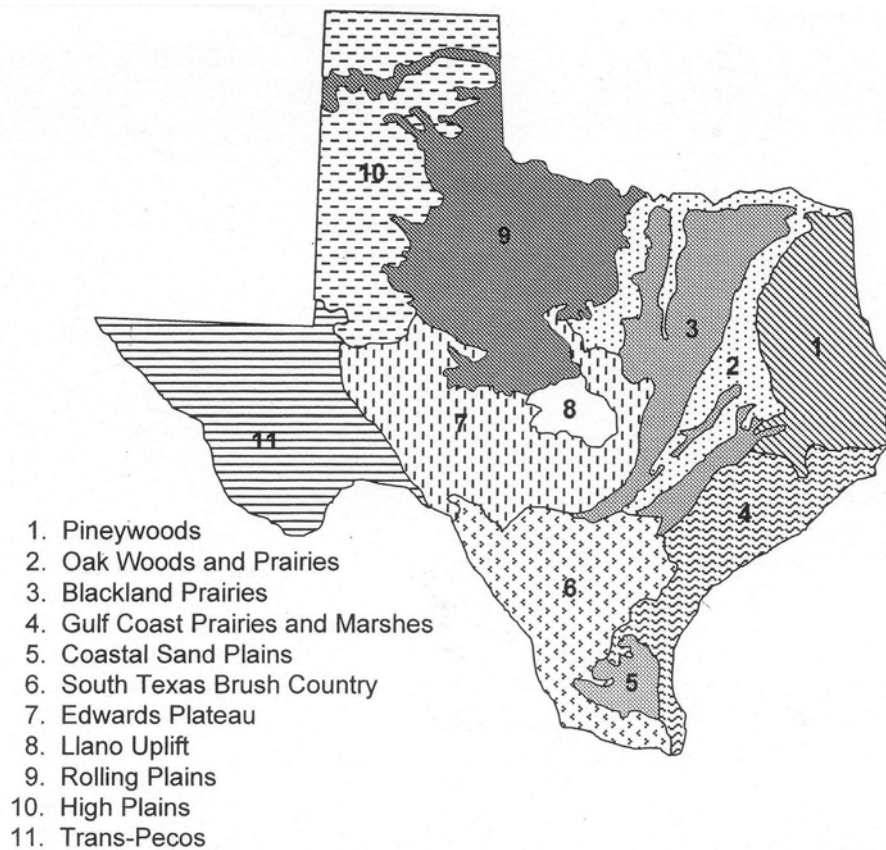


Figure 5. Ecological Regions of Texas including the Coastal Sand Plains (follows Diamond et al. 1987).

Brushlands of South Texas: Mesquite and Acacia

The relative importance of brush or shrub vegetation to grasses in the Rio Grande Plains has been an important subject for some time. Archer et al. (1988; see also Archer 1989) concluded that the area is transitioning away from grassland mixed with isolated clusters of mesquite to larger clusters of closed canopy mesquite woodland. They declined to consider the antiquity of this phenomenon and cite questionable and

contradictory evidence (Bogusch 1952; Humphrey 1958; Inglis 1964; Malin 1953) regarding its inception in the historical period. However, Inglis (1964) admitted that his sources were imprecise. Archer et al. (1988) proposed that a possible cause for the shift in mesquite distribution is a combination of human actions, such as overgrazing and brush fire control, mixed with gradual environmental change. They observed a mixture of closed mesquite canopy, associated with mesic environmental conditions, and shrub clusters, associated with more dry conditions. They proposed that the shrub clusters represent an intermediate stage between grassland and complete domination by mesquite (*Prosopis*). In this scenario, woodland development is limited by precipitation levels. They also suggested that existing isolated trees may provide a focal point for later clusters of woody plants to develop in more mesic areas.

Prior to the introduction of grazing livestock, mesquite was limited in its distribution to riparian zones. Archer et al. (1988) hypothesize that before the contact era, native herbivores and granivores may have dispersed some mesquite seeds but the subsequent seedlings may have been eliminated by local fires. The introduction of European livestock and fire control removed any limiting factors to the further dispersal of mesquite in the Rio Grande Plains (Archer et al. 1988). In a later report Archer (1989) concluded that most mesquite clusters on the current landscape appeared some time after the late 1800s. The typical life span of mesquite, approximately 200 years, combined with the low rates of mortality found in plants greater than 30 years of age, suggests that the plants found in the subject population (Alice, Texas) are the “recently established” descendants of “a few scattered pioneers” (Archer 1989:9).

Grasslands of the Tamaulipan Biotic Province

In his evaluation of the grasslands of southern Texas and northeastern Mexico Johnston (1963) found most historical documents to be of little use due to their imprecise use of descriptive landscape terms. As a consequence, Johnston (1963) exclusively utilized the diaries of military personnel and surveyors, such as Bartlett (1854) and Furber (1848), in his reconstruction of the history of grasslands in South Texas. Johnston declined to give a beginning date for his historical reconstruction but he seems to focus on reports generated by Anglo explorers in the 1800s. He found that the area southeast of San Antonio was a prairie that included isolated examples of mesquite and clumps of prickly pear. Shrubs and cacti tended to increase in frequency near intermittent water sources. Between the above area, which Johnston (1963) calls the Blackland Prairie, and the Coastal Prairie was a band of live oak and hickory forest. This forested area lies at the northeastern border of the TBP. Johnston also found wooded areas at the lower part of the floodplains of the larger water bodies, such as the Nueces River. These were deciduous forests comprised mostly of elm and ash.

Johnston (1963) concluded his report by challenging the assertion made by writers in the late 1800s and the early 1900s that brush species have encroached upon the grasslands of southern Texas or, even worse, had “invaded” South Texas from Mexico. Instead, he asserts that the shrub species were already in place in their present distributions when “the first collector visited the region in 1828” (Johnston 1963:464).

Inglis (1964) concurred based on Spanish accounts. In the areas where relative losses of grassland have occurred examples of mesquite were already present but had been stunted by repeated fires in the area. Johnston (1963) has found mesquite increased relative to grassland in the following counties of South Texas: Atacosa, Bexar, Duval, Jim Wells, Kleberg, Nueces, and San Patricio. Johnston (1963) also proposed that anthropogenic control of grass fires since the late nineteenth century has largely influenced the loss of grasslands and the relative expansion of mesquite in South Texas (see also Schmidly 2002 p.382).

Archaeological and Paleontological Evidence

Archaeologists working in Central and South Texas have long sought to reconstruct the paleoenvironment of the area. Unfortunately, pollen remains from the TBP are almost nonexistent due to either poor preservation or limited attempt at recovery (Black 1989a; Bryant and Holloway 1985; Jones 1986). As a result, researchers have had to extrapolate from other areas, namely Central Texas. Black (1989a) suggested that there are two competing themes in the literature to explain the apparent environmental changes that have occurred since the late glacial period (14,000 B.P.) and through the Holocene: gradualism and fluctuation.

Those researchers who have focused on palynological evidence (Bryant and Shafer 1977; Bryant and Holloway 1985; see also Bryant and Riskind 1980 for adjacent Mexico) have interpreted a gradual drying and/or warming trend for Texas in general

and south Texas specifically. Pollen evidence from central Texas indicates that during the late glacial period (14,000 to 10,000 B.P.) grassland and oak savannah replaced deciduous forests (Bryant and Holloway 1985). Graham's (1976) paleontological work further reinforced the warming and/or drying trend in central Texas. He observed the loss of fauna during the late glacial-postglacial transition that were more adapted to moist cool environments.

The paucity of palynological data from south Texas is the direct result of a lack of suitable places for pollen preservation, namely peat bogs and dry caves (Bryant and Holloway 1985). Local soil conditions, such as high soil pH, low soil organic content, and poor soil drainage, also make for poor pollen preservation. Holloway (1986) was able to analyze some macrobotanical remains from one of the Choke Canyon Reservoir sites, 41LK201. He found charcoal samples from the site were comprised of mostly *Acacia* and Mesquite, and to a lesser extent riparian area taxa such as Willow (*Salix* sp. Linnaeus), Pecan, and Persimmon (*Diospyros texana* Scheele). Holloway (1986) concluded that the vegetation of the Choke Canyon area during the last 6,000 years of the postglacial period was much the same as modern native vegetation; thus, he detected no major changes in the composition of the vegetation of the area. A recent botanical analysis from the Choke Canyon Reservoir area supported Holloway (1986) in that it yielded typical plant taxa of the area, such as hackberry (*Cletis laevigata* Wield) mesquite, and unspecified acacia (Murry 1995). Jones (1986) also found the typical botanical taxa of the area such as mesquite and acacia in his analysis of the Clemente and Hermina Hinojosa site (41JW8). Bryant and Holloway (1985) have suggested,

based on only a “limited amount of information” that the climate of south Texas was relatively stable in the postglacial period but that small changes in temperature or precipitation could have created short term changes in local or regional vegetation.

Gunn et al. (1982) proposed an alternate theory of fluctuating environmental change in south Texas. They point to phenomena such as volcanic activity and sun spot activity that serve to interfere with the flow of solar energy to or through the Earth’s atmosphere. These interruptions subsequently influence atmospheric conditions (i.e. weather) and lead to fluctuations between humid and arid conditions on the ground (Gunn et al. 1982). While this author does not dispute the importance of the sun’s energy to the overall function of Earthly ecosystems, it is her opinion that more proximate evidence of environmental change, such as botanical or faunal data, is preferred.

Eighteenth and Nineteenth Century Vegetation of the TBP

Typical observations of the mid-1800s, such as this one from Refugio and Goliad counties, described south Texas as “open prairie, spotted with islands of wood” such as mesquite and live oak (*Quercus virginiana* Miller) in the south part of the counties and oaks, elm, hackberry and pecan in the north part (Weniger 1984:7). Further south and west, travelers would comment that mesquite was nearly the only tree to be found (Weniger 1984). Some have commented that the grass of the Texas prairie north of San Antonio was as much as nine feet tall, so that it might have interfered with vision while

riding on horseback (Weniger 1984). Abbe Domenech (1858) wrote of a strange occurrence in what is now Cameron county where the ground would give way beneath men and their horses. He called it a shaking prairie; local Spanish ranchers called these areas *tierras falsas*. Weniger (1984) speculated that these were either quicksand covered with vegetation or resacas that had filled with decaying vegetation to look like firm ground.

Weniger (1984) commented that there is some difficulty in translating meaning from the early Spanish accounts of the eighteenth century because their language does not have terms that clearly parallel the French-derived prairie and plain. Further complicating matters, Spanish does have the word *sabana*, which has been translated directly as savannah despite the fact that the word actually connoted a treeless plain (Weniger 1984). Despite these problems, Weniger (1984) asserted that the prairies described by eighteenth century Spanish accounts, such as those accounts set in present day Dimmit, Medina, or Bexar counties, are much the same as they are into the nineteenth century.

Historical accounts, both Spanish and Anglo indicate that tree growth in South Texas was one much more lush than it is today. In 1691, Don Domingo de Teran indicated that the forests in Maverick and Zavala county were so thick that they were an impediment to the movement of his troops, so much so that they lost some of their cattle in the forest (1932). Weniger (1984) described the forests of South Texas as *galeria* forests, an Italian term indicating that the trees overhang to produce a canopy over the streams that they parallel.

Around the mid-1800s it became fashionable for travelers to refer to the arid lands of Kenedy, Brooks, and Jim Hogg counties as the “Wild Horse Desert.” It was first reported in press by Kennedy (1841) where he described it as a virtually uninhabitable land where even insects and reptiles were rare. Weniger (1984) disagreed that this land should be called a desert. According to him, it was certainly sandy and arid, but it had enough vegetation to support the large herds of wild horses indicated in its name.

Biological Survey of Texas, 1905

Cook (1908:1) eloquently described the environmental conditions at the turn of the century when he wrote “A new order of nature is at hand in south Texas. The change has come so gradually that even those who have the most intimate acquaintance with the facts have not appreciated their significance....” At the time of Bailey’s (1905) *Survey* San Antonio was Texas’ largest city, with a population of less than 60 thousand. Most residents of the state lived and worked in rural areas. Public sentiment was not one of conservation and no federal or state parks existed in Texas (Schmidly 2002).

Schmidly (2002) has chosen to summarize the extensive physiographic reports, field notes, and photographs taken by Bailey’s team because these were left out of the *Survey*’s publication. His examination of the photographic record showed that significant changes to the landscape had already occurred by the turn of the twentieth century. The grassland areas of Texas appear to have suffered the most (Schmidly

2002).

The field agents spent a considerable amount of time in the TBP (which they called the Semiarid Lower Sonoran); nineteen percent of all field days were spent in the South Texas Plains and 15 percent were spent in the Gulf Prairies and Marshes (Schmidly 2002). Field agents working in the area where the Gulf Prairies and the South Texas Plains come together usually described it as a mesquite plain. Field agent William Lloyd's observations of Nueces County characterized the Nueces River area as a "paradise for hunters for the last twenty years" because of the wooded area following the river (Schmidly 2002:319). Lloyd went on to describe the complex physiography of the county with sandy areas between the Laguna Madre and the Rio Grande, the aforementioned woods along the Nueces River, the prairie between Santa Rosa and Alice, and the "dense scrubby jungle" that "gives considerable shelter to the smaller mammals" near the mouth of the Nueces River and around the Laguna Madre (Schmidly 2002:319). Lloyd also noted that pocket gophers and moles had increased in number concomitantly with the increase in agricultural activity.

Along the Mexican border within the TBP, Bailey and his team encountered forests of sabal palm (palmetto) as well as cedar elm and Texas ebony; recall that these are still found in the area today but are threatened (Judd 2002). The wooded areas Lloyd observed continued along the river and extended inland beyond Brownsville. Lloyd also found that the wooded areas had been thick along the river but human settlement had cleared much of the area. Outside of the remaining strips of woodland along the river he observed a plains area with occasional patches of small brush (Schmidly 2002).

Lloyd and his colleague Oberholser also collected in the more arid South Texas Plains (see Schmidly 2002 Figures 41-49 for turn of the century photographs of the area). Oberholser wrote that the area around Laredo was a chaparral with dense shrubbery in the lower elevations and weaker growth on the hills (Schmidly 2002). *Acacia* was rare in this area. Lloyd described the area around Maverick county as a mesquite flat. He also found San Lorenzo Creek, between Eagle Pass and Laredo, to be an important source of acorns, pecans, and blackberries (*Rubrus* sp.), but in the time that he spent there the yields had failed (Schmidly 2002). Other accounts provided for the area by Schmidly seem to be more concerned with water availability rather than distribution of vegetation and are not as useful to this discussion.

Twentieth Century Changes in the TBP

Schmidly asserted that while some environmental change over time is to be expected, the wholesale changes wrought in the nineteenth and twentieth centuries are the direct result of human activity. Prior to European contact, human influences on the local environments of Texas were only slight (Doughty 1983). Rapid population growth (Schmidly 2002: Figure 30 and Figure 119), from 3 million in 1900 to over 20 million people in 2000, and attendant changes in land use patterns are the most obvious agents for environmental change, especially in the sensitive arid and semiarid regions of Texas.

Human impacts on the environment of Texas include: suppression of fire, invasions of alien plants, loss of wetlands, encroachment of brush, livestock grazing, and

land fragmentation (Schmidly 2002). South Texas has been most strongly affected by fire suppression, brush encroachment, and livestock grazing. Though not cited, Schmidly essentially agreed with Johnston (1963) that the loss of natural grass fires beginning in the late nineteenth century has had a profound effect on the vegetational distribution of South Texas. The reduction in grass fires was initially caused by overgrazing of livestock that led to an overall loss in grassland vegetation. After the turn of the century, the occurrence of natural fires was further suppressed by the activities of land management agencies. According to Schmidly (2002) fire suppression lead to a loss of landscape complexity. As was implied by Johnston (1963), the coincident phenomena of livestock grazing and brush encroachment also had a strong influence on environmental change in the TBP since the late nineteenth century. Schmidly noted that mesquite was present on the South Texas Plains in the early and middle nineteenth centuries but its distribution has increased markedly in the twentieth century. For example, mesquite expanded its distribution in Texas by 1.3 million acres between 1948 and 1963 to a total of over 56.7 million acres (Smith and Rechenthin 1964).

Schmidly (2002) added water management and agricultural usage to the list of human influences on the environment of the Rio Grande Plains in the later twentieth century. Native habitats have been fragmented due to brush clearing for agriculture. He notes that “[s]ince the 1920s, more than 95 percent of the original native brushland has been converted to agricultural or urban use, and more than 90 percent of the riparian habitat along the Rio Grande has been cleared” (Schmidly 2002:390). Water

management practices, such as flood control and municipal water use, have led to changes in riverine habitats, changes in the flow of the Rio Grande, and clearing of the brushlands. Further clearing of brushlands is related to urban expansion which, in turn, leads to increased pollution (Schmidly 2002).

CHAPTER III

FAUNA OF THE TAMAULIPAN BIOTIC PROVINCE

The general characteristics of the TBP have already been discussed (see Chapter I). In this section I will focus on the animals analysts might expect to find among archaeological faunal assemblages within the province. Those animals endemic to the province are of particular importance. Like Blair (1950, 1952) I will focus on the terrestrial vertebrates of the area, excluding birds. Terrestrial vertebrates are of importance because their livelihoods are tied to a particular geographic area that may or may not be narrowly circumscribed.

Blair (1950) found that Texas is characterized by a mixture of Nearctic (both desert and forest of North America) and Neotropical fauna. Neotropical fauna are those taxa that originated in South America and have since moved into North America. It is interesting to note that the TBP is considered part of the Neotropics in Good's (1964) global vegetation scheme. The TBP represents the northernmost distribution of some mammals, snakes, lizards, and urodelans. Blair (1950: 95) described the TBP as “[having] a biota that is a Neotropical one with a strong dilution of Sonoran and Austroriparian species.” In other words, the fauna of the TBP are a mixture of Neotropical taxa, grassland taxa that extend northward into the Texan and Kansan Biotic Provinces, some Austroriparian taxa, and some Chihuahuan taxa.

In his recent summary of the area, Judd (2002) also emphasized the Neotropical fauna as the most distinguishing element of the province. Blair (1950) observed at least

61 species of mammals in the TBP, 15 of which are Neotropical and may be described as endemic (or nearly endemic) or characteristic of the TBP (see Appendix A for the complete list of species found by Blair). These include felids, suids, edentates, and rodents. See Tables 1 through 5 below for further information about the distribution of these taxa (all lists follow Blair (1950, 1952) unless otherwise noted):

Table 1. Neotropical Taxa of the Tamaulipan Biotic Province.

| | |
|-----------------------------------|----------------------------|
| <i>Didelphis virginiana</i> | Virginia Opossum |
| <i>Mormoops megalophylla</i> | Leaf-Chinned Bat |
| <i>Lasiurus intermedius</i> | Northern Yellow Bat |
| <i>Lasiurus ega</i> | Southern Yellow Bat* |
| <i>Choeronycteris mexicana</i> | Mexican Long-tongued Bat* |
| <i>Nasua narica</i> | White-nosed Coati |
| <i>Conepatus leuconatus</i> | Eastern Hog-nosed Skunk |
| <i>Felis onca</i> | Jaguar |
| <i>Felis pardalis</i> | Ocelot |
| <i>Felis wiedii</i> | Margay |
| <i>Felis yagouaroundi</i> | Jaguarundi |
| <i>Liomys irroratus</i> | Mexican Spiny Pocket Mouse |
| <i>Reithrodontomys fulvescens</i> | Fulvous Harvest Mouse |
| <i>Baiomys taylori</i> | Pygmy Mouse |
| <i>Dipodomys compactus</i> | Gulf Coast Kangaroo Rat* |
| <i>Oryzomys couesi</i> | Coues' Rice Rat |
| <i>Tayassu tajacu</i> | Collared Peccary |
| <i>Dasypus novemcinctus</i> | Nine-banded Armadillo |

*additional taxa observed by Davis and Schmidly (1994).

Table 2. Fauna Exclusively Found in the Matamorán District of the TBP.

| | |
|---|----------------------------|
| <i>Aello megalophylla (Mormoops megalophylla)</i> | Leaf-chinned Bat |
| <i>Dasypterus intermedius (Lasiurus intermedius)</i> | Northern Yellow Bat |
| <i>Conepatus leuconontus</i> | Eastern Hog-nosed Skunk |
| <i>Felis cacomitli (Herpailurus yagouaroundi cacomitli)</i> | Jaguarundi |
| <i>Liomys irroratus</i> | Mexican Spiny Pocket Mouse |
| <i>Oryzomys couesi</i> | Coues' Rice Rat |

Table 3. Fauna Also Found in the Chihuahuan Biotic Province.

| | |
|--|-------------------|
| <i>Didelphis mesamericana (Didelphis virginiana)</i> | Virginia Opossum |
| <i>Nasua narica</i> | White-nosed Coati |

Table 4. TBP Fauna That May Extend into Surrounding Provinces.

| | |
|--|-----------------------|
| <i>Felis onca (Panthera onca)</i> | Jaguar |
| <i>Felis pardalis (Leopardus pardalis)</i> | Ocelot |
| <i>Reithrodontomys fulvescens</i> | Fulvous Harvest Mouse |
| <i>Baiomys taylori</i> | Northern Pygmy Mouse |
| <i>Tayassu angulatum (Pecari tajacu)</i> | Collared Peccary |
| <i>Dasybus novemcinctus</i> | Nine-banded Armadillo |

Table 5. Small Mammals Distributed Across the TBP.

| | |
|--|----------------------------|
| <i>Citellus mexicanus (Spermophilus mexicanus)</i> | Mexican Ground Squirrel |
| <i>Perognathus hispidus</i> | Hispid Pocket Mouse |
| <i>Perognathus merriami</i> | Merriam's Pocket Mouse |
| <i>Onychomys leucogaster</i> | Northern Grasshopper Mouse |
| <i>Peromyscus leucopus</i> | White-footed Mouse |
| <i>Sigmodon hispidus</i> | Hispid Cotton Rat |
| <i>Neotoma micropus</i> | Southern Plains Woodrat |
| <i>Sylvilagus floridanus</i> | Eastern Cottontail |
| <i>Scalopus aquaticus</i> | Eastern Mole |
| <i>Dipodomys ordii</i> | Ord's Kangaroo Rat |
| <i>Geomys personatus</i> | Texas Pocket Gopher |

(modern species names in parentheses and common names follow Schmidly 2002.)

In addition to the above animals, *Felis wiedii* was thought to be exclusive to Eagle Pass. Dice's earlier (1943) treatment of the area claimed that *Nasua narica* (White-nosed Coati) and *Felis onca* (Jaguar) did not extend outside of the TBP. Alvarez (1963) found that all of the mammals observed in the Mexican portion of the TBP can also be found in Texas with the exception of *Scalopus inflatus* (Tamaulipan mole) and *Oryzomys melanotis* (Black-eared Rice Rat).

Like the mammalian fauna, Judd (2002) also emphasized the Neotropical character of the reptile and amphibian fauna of the TBP. Blair (1950) observed 57 species of reptiles and 21 species of amphibians during his field research. Thirteen of the reptile species are known only from the TBP. Those are:

Table 6. Reptiles of the Tamaulipan Biotic Province.

Gopherus berlandieri
*Sceloporu grammicus**
Crotaphytus reticulatus
Sceloporus cyanogenys
Holbrookia propinqua
Sceloporus variabilis
Eumeces tetragrammus
*Drymobius margaritiferus**
*Ficimia streckeri**
*Leptodeira septentrionalis**
*Coniophanes imperialis**
Drymarchon corais
Sonora taylori

*Found only in the Matamorán District.

It is important to note that the modern distribution of *Gopherus berlandieri* (Texas Tortoise) is “a virtual match of the geographic extent of the TBP. It is the species that best characterizes the province” (Judd 2002:53; see also Dixon 1987:map 59).

Three species of urodelans are noted in the province. Two of the species are found outside of the TBP. The first, *Amstoma tigrinum*, is found across the state. The second, *Siren intermedia*, extends into the TBP from the Texan biotic province. The final species, *Triturus meridionalis*, is exclusive to the TBP (Blair, 1950). Blair (1950) observed 19 species of anurans, five of which are exclusive to the TBP (Table 7).

Table 7. Anurans Exclusive to the TBP.

*Hyla baudinii**
*Syrrophus campi**
*Leptodactylus labialis**
Bufo marinus (*B. horribilis*)
Hypopachus cuneus

*Found only in the Matamorán District

Davis and Schmidly (1994; see also Judd 2002) have found the South Texas Plains to be one of the richest areas of the state in terms of mammalian species diversity. However, they also separated the area into two divisions, where the subtropical brushlands area exhibits some of the highest mammalian species diversity and the coastal sands area exhibits the lowest diversity (Figure 5).

Since this thesis is focused on observing evidence of the TBP in the

archaeological record, it is useful to take a closer look at some of the taxa representing the characteristic mixture of biotic communities found in the province. Following Steele's (1986b; Steele and Hunter 1986) treatment of archaeological faunal assemblages from the Choke Canyon Reservoir area, I have chosen to describe in greater detail certain mammals representing the Plains, Mexican, and Eastern Woodland biotic communities (see also Presley 2000).

Plains Mammals

Plains mammals of interest include *Antilocapra americana* (Pronghorn), *Bos bison* (Bison), and *Taxidea taxus* (Badger). Davis and Schmidly (1994) observed the greatly reduced distribution of the Pronghorn in Texas. Whereas the animal was once commonly distributed within the western two-thirds of the state, it has been recently restricted to isolated areas of the Panhandle and West Texas. The population found in the Marathon Basin belongs to the subspecies *A. americana mexicana*. This subspecies was formerly distributed westward into the southeastern corner of Arizona and southward into Coahuila and Chihuahua, Mexico. Wilson and Ruff (1999) did not indicate the reason for this subspecies' loss of distribution.

Davis and Schmidly (1994) did not comment specifically on the reason for the Pronghorn's loss of distribution but do mention that they compete directly with cattle and sheep for forage. In particular, Pronghorn prefer to eat shrubs and forbs, especially flowers and fruits. The Pronghorn is a prairie adapted species. They prefer to live in

open areas where their ability to see and also run for long distances is not impeded by woodland vegetation. Anatomically speaking, the widely spaced eyes placed at the sides of the head give the Pronghorn an exceptionally broad field of vision (Wilson and Ruff 1999). Aquatic habitats implied by the presence of woodland vegetation are also unnecessary for the Pronghorn because it is able to tolerate long periods without drinking.

The Bison is another animal whose distribution has markedly decreased from its past condition. Davis and Schmidly (1994) indicated that their former distribution was similar to that of the Pronghorn. Modern examples are confined to captivity. A detailed discussion of the reasons for the historic loss of the Bison in North America is outside the scope of this report and already familiar to those with an interest in recent American history. The modern population in North America has numbered as many as 150,000 individuals in 1995 with most of those living in captivity. The Bison (subspecies *Bos bison bison*) is a large, cow-sized artiodactyl that prefers the open prairie. Like the Pronghorn, these are also herding animals. Bison (the subspecies found in the lower portions of North America) are grazers that prefer grasses and, to a lesser extent, forbs. Schmidly (2002; see also Davis and Schmidly 1994) preferred to use Linnaeus' original generic placement of the animal in *Bos*, although this placement is not without controversy according to Wilson and Ruff (1999). Schmidly did not discuss the reasons behind this choice, but it may be due to the fact that Bison are known to be interfertile with domestic cattle (*Bos taurus*) (Wilson and Ruff, 1999).

Badgers (*Taxidea taxus* of the Family Mustelidae) are distributed widely across

Texas, exclusive of the extreme eastern portion of the state. Their distribution closely follows their favorite prey, ground squirrels. The genus *Spermophilus* (Ground Squirrel) is found in the drier areas and prairies of Texas. While badgers are able to occupy a variety of habitats, they are most commonly found in prairies and deserts in the American West. These animals typically prey on small vertebrates, and to a lesser extent, insects, by burrowing into the ground to excavate the hiding prey. They have no natural enemies other than humans (Davis and Schmidly 1994; Wilson and Ruff, 1999).

Mexican Mammals

Mexican, or xeric-adapted, taxa of interest include *Pecari tajacu* (Collared Peccary), *Dasyus novemcinctus* (Nine-banded Armadillo), *Sylvilagus audubonii* (Desert Cottontail), *Liomys irroratus* (Mexican Spiny Pocket Mouse), *Baiomys taylori* (Northern Pygmy Mouse), and *Spermophilus mexicanus* (Mexican Ground Squirrel). All but two of these taxa, *Sylvilagus audubonii* and *Spermophilus mexicanus*, are Neotropical invaders into Texas (Judd 2002).

The modern range of the Collared Peccary within Texas extends from the TBP northwest along the Rio Grande into the Big Bend area. The Peccary, while similar to the Pig, differs from its domestic relatives in its rough pelage, robust straight canines, and rugose areas of muscle attachment to bone. Peccaries, also known as Javelina, are typically found in the brushy southern part of the state, where prickly pear cactus and guajillo (scrub oak) are common. These herding animals usually feed on mesquite beans

and succulents (Davis and Schmidly 1994; Wilson and Ruff 1999).

The Armadillo (*Dasypus novemcinctus mexicanus*) is one of the most recognizable organisms from the state. While not xeric-adapted as some of the other Mexican fauna are, the Armadillo is an important icon of the Neotropical invasion into North America. The Armadillo is characterized by the protective yet flexible bony covering encasing its upper body (Davis and Schmidly 1994). Armadillo are currently widely distributed across the state, with the exception of the far western counties of the Chisos and Guadalupe Mountains. The strongest environmental influence on their distribution tends to be soil texture. Armadillo prefer soft, sandy soils where they can most easily dig for insects and other small animals. Wilson and Ruff (1999) suggested that the limiting factors are cold temperatures and drought. They offer possible reasons for the Armadillo's northern expansion such as the loss of large predators and changes in climate. Davis and Schmidly (1994) suggested that *Dasypus* has been able to successfully invade the more temperate northern areas of Texas because of its unusual reproductive capabilities. Delayed implantation allows for implantation and gestation to begin in November, despite fertilization in mid-summer. Without this process the young would be born in mid-winter, when resources are at their most scarce.

I have included a discussion of the Desert Cottontail and the Swamp Rabbit in this report in order to provide a contrast between two members of the same genus (*Sylvilagus*) found in the TBP. The Desert Cottontail (*S. audubonii*) is adapted to drier habitats such as grasslands, cactus deserts, and shrubby areas where mesquite and acacia are common (Davis and Schmidly 1994). They can also be found in prairie dog towns.

Desert Cottontails prefer to live near and raise their young in these shrub thickets. They eat vegetable matter exclusively and their diet includes mesquite beans, grasses, twigs, and prickly pear pads. Wilson and Ruff (1999) also mentioned acorns as an important food source. Like all rabbits, *S. audubonii* breed frequently, having as many as three litters per year. They are preyed upon by canids, snakes, and various species of predatory birds.

The Mexican Spiny Pocket Mouse (*Liomys irroratus*) is limited in its modern distribution to the southernmost eight counties of Texas (Davis and Schmidly 1994). It is a medium sized nocturnal mouse that tends to live in dense brush and thickets of prickly pear. They feed on the seeds of shrubs, such as mesquite and hackberry. Not much is known about their breeding habits but it is believed that they breed throughout the year. They are anatomically distinct from other pocket mice in that their upper central incisors lack the vertical groove typically associated with pocket mice (Davis and Schmidly 1994; Wilson and Ruff 1999).

The Northern Pygmy Mouse (*Baiomys taylori*) is a muroid mouse that reaches its northernmost distribution in Texas. It is most characteristic of the tropical lowlands of Mexico. Davis and Schmidly (1994) commented that early accounts placed *B. taylori* on the coast of East Texas and in the mesquite-chaparral of South Texas but reports since the turn of the twentieth century indicate that the mouse has expanded its range northward into the panhandle. The Northern Pygmy Mouse prefers to live in grassy areas but will accept other ground cover if necessary. They eat mostly vegetable matter, such as grass seeds, prickly pear, and mesquite beans, but may also consume insects and

small reptiles. It has also been reported that *Sigmodon hispidus* (Hispid Cotton Rat) competes with *B. taylori* for habitat (Wilson and Ruff 1999).

The Mexican Ground Squirrel (*Spermophilus mexicanus*) prefers grassy habitats but will also inhabit areas of mixed short grass and brushy vegetation or other arid localities (Wilson and Ruff 1999). They are distributed across the southern, central, and western parts of Texas. In the southern part of the state they are typically associated with cactus and mesquite. In the northern part of the state they tend to hibernate in winter, but this is not necessary in the TBP. They are omnivorous and will feed on green vegetation, mesquite beans, fruit, grains, insects, and small carrion (Davis and Schmidly 1994).

Eastern Woodland Mammals

Eastern Woodland adapted taxa of interest include *Sylvilagus floridanus* (Eastern Cottontail), *Microtus pinetorum* (Woodland or Pine Vole), *Ondatra zibethicus* (Muskrat), and *Scalopus aquaticus* (Eastern Mole). *M. pinetorum* and *O. zibethicus* are of particular interest because they were not reported by Blair (1950, 1952) as being found in the modern TBP. Thus any examples recorded in the archaeological record (see Chapter V) are extralimital and potentially indicative of environmental change.

The Eastern Cottontail (*S. floridanus*) is distributed across Texas with lighter concentrations in the extreme western areas of the state. It is widely distributed across the eastern half of the United States and south across Mexico and Mesoamerica. Like *S.*

audubonii and other cottontails, the Eastern Cottontail prefers to live in brushlands and other marginal habitats. Historically, it has been reported from forests and woodlands of all types as well as prairie and desert areas (Wilson and Ruff 1999). Its diet varies by season. Females may have between four and seven litters per year (Davis and Schmidly 1994; Wilson and Ruff 1999).

Current distribution of the Woodland Vole (*Microtus pinetorum*) in Texas is limited to the northeastern quadrant of the state with the southwestern limit of the distribution located in Kerr county (northeast of San Antonio). Wilson and Ruff (1999) reported an even more circumscribed distribution in Texas where the taxon is limited to the extreme northeastern corner of the state as well as an isolated group in central Texas. It has been proposed that the Woodland Vole was able to extend its distribution westward into moist grasslands during the Pleistocene. Fossil remains indicate that *M. pinetorum* was found as far southwest as Texas and northern Mexico. This western extension was drawn back with the retreat of the glaciers. Those individuals recorded from Kerr and Gillespie counties on the Edwards Plateau represent relict populations (Wilson and Ruff 1999; Davis and Schmidly 1994)

M. pinetorum prefers to live in woodland areas where it can hide under leaf litter. Davis and Schmidly (1994:203) also commented that “[t]hey are rarely, if ever, found westward of the zone of sparse rainfall.” They typically burrow shallowly underground or take over existing burrows from other fossorial mammals. *M. pinetorum* feeds on roots and tubers as well as acorns and nuts.

The Common Muskrat (*Ondatra zibethicus*) is another taxon found from the

archaeological record of the TBP in extralimital distribution. The modern distribution of the muskrat in Texas includes the northeast corner of the state as well as the northern portion of the panhandle and isolated populations in the Trans-Pecos and El Paso areas (Davis and Schmidly 1994). They are widely distributed across North America, exclusive of Florida, much of Texas, the American Southwest, and the arctic regions of Canada (Wilson and Ruff 1999). Muskrats are aquatic rodents with dense fur and partially webbed hind feet. They live in marshy areas such as along creeks and rivers as well as the brackish marshes of the coast. They build dome shaped homes of marsh vegetation that are entered from underwater. Muskrats typically eat the local marsh vegetation but will consume anything when soft vegetation is scarce (Davis and Schmidly 1994).

The Eastern Mole (*Scalopus aquaticus*) is distributed across the eastern two-thirds of Texas extending south into the eastern half of the TBP and the extreme northern portion of Tamaulipas, Mexico as well as north into the panhandle (Davis and Schmidly 1994). They are also widely distributed across the eastern half of the United States (Wilson and Ruff 1994). They are fossorial creatures that prefer to live in moist sandy soils. They will not take up residence in areas with soils that are difficult to burrow into, such as heavy clay or deep sand. Eastern Moles live most of their lives underground where they feed on insects.

Texas Fauna in the Historical Period

Whenever travelers, explorers, and naturalists of the nineteenth century commented on the fauna of south Texas they tended to mention the larger or more exotic creatures. Doughty (1983) observed that the mustang received frequent commentary. These feral horses, abandoned generations earlier by the Spanish, were especially abundant near riverine areas on the South Texas Plains. Settlers of the area had mixed feelings about the Mustang, alternately praising their “nobility” and denouncing them as “vermin” (Doughty 1983). Sheep were another important domesticated in South Texas. In the mid-eighteenth century, the missions of the San Antonio area counted several thousand head of livestock, including sheep. But, by the turn of the nineteenth century, sheep ranching was relegated to farther south on the Rio Grande Plain (Doughty 1983).

The latter half of the nineteenth century saw an era of rampant overgrazing of sheep in south Texas. In the early 1880s as many as 2 million sheep were reported in the area (Doughty 1983). The majority of these flocks were located south of the Nueces river in the native range of the mustang and antelope. Sheep were such a strong influence on the environment that local publications, such as travel brochures and county histories, indicated the “destructive” nature of their grazing behavior (Doughty 1983; Lehmann 1969).

In south Texas, the native taxa meriting comment in the historic period were the Jaguar (*Panthera onca*) and the Peccary (*Pecari tajacu*). Even in historical times, the Jaguar was rarely encountered by humans. Early accounts emphasized its ferocity and

the value of its pelt (Doughty 1983). The more commonly observed Peccary was also characterized as ferocious. Typically, the only people that didn't fear them were sportsmen. Despite their reputation, Javelina piglets were sometimes kept as pets (Doughty 1983).

Biological Survey of Texas, 1905

Between 1889 and 1905, Vernon Bailey, field naturalist for the U.S. Bureau of Biological Survey, and his team collected data on the biological diversity of Texas. They made detailed reports of climate, vegetation, animals, and human land use patterns. Their methods included collection and preservation of plant and animal specimens as well as photography. Their work was published in 1905 as the *Biological Survey of Texas*. Texas was of interest because of its large size and diverse resources. The greatest contribution of the *Survey* to Texas natural history is in its glimpse of the plant and animal communities at the cusp of the twentieth century explosion of human population in the state. Schmidly (2002:50) wrote: "Documenting and understanding the changes in Texas' diverse and unique biota depends on reliable data about the flora and fauna of the region before it was negatively affected by humans. The availability of Bailey's 1905 publication, together with the discovery of its complete archives, gives a virtual natural history picture of every region of the state as it existed a century ago."

Bailey and his agents conducted field surveys in all ecological regions of the state, including the South Texas Plains and the lower portion of the Gulf Prairies and

Marshes. The table below (Table 8) lists their survey localities as included in the TBP.

Table 8. Biological Survey of Texas Localities in the TBP.

| | |
|----------------------------------|-----------------|
| Gulf Coast Prairies and Marshes: | |
| Padre Island | Port Isabel |
| South Texas Plains: | |
| San Lorenzo Creek | Loma Vista |
| Laredo | Cotulla |
| Carrizo | San Diego |
| Roma | Rio Grande City |
| King Ranch | Hidalgo |
| Santa Rosa Ranch | Uvalde |
| San Ignacia | Castroville |
| Sauz Ranch | Runge |
| Rio Coloral | Beeville |
| Brownsville | |

Bailey (1905) suggested that previous, unnamed, researchers had overestimated the frequency of “tropical” mammals in southern Texas because the area had been a popular region for specimen collecting. His team, in their research for the 1905 *Survey*, separated these invading Neotropical taxa into species or subspecies unique to Texas. These taxa include: the Armadillo, ocelot, jaguar, red and gray cats or jaguarundi, and the spiny pocket mouse. The following table compares Bailey’s 1905 taxonomic designations to those recommended by Schmidly’s (2002) updated list (Table 9):

Table 9. Common, Historical, and Current Scientific Names of Neotropical Taxa.

| Common Name: | Bailey 1905: | Schmidly 2002: |
|--------------------|----------------------------------|--|
| Armadillo | <i>Tatu novemcinctum texanum</i> | <i>Dasypus novemcintus mexicanus</i> |
| Ocelot | <i>Felis pardalis limitis</i> | <i>Leopardus pardalis albescens</i> |
| Jaguar | <i>Felis onca hernandezi</i> | <i>Panthera onca hernandezi</i> |
| Jaguarundi | <i>Felis yaguarundi</i> | <i>Herpailurus yagouaroundsi cacomitli</i> |
| Spiny Pocket Mouse | <i>Liomys texensis</i> | <i>Liomys irroratus texensis</i> |

These changes are the result of further field collecting done during the twentieth century as well as modern taxonomic updates. For example, *P.o. hernandezi* is now reserved for the jaguar of western Mexico. The now extirpated subspecies of jaguar from Texas is *P.o.veraecrucis*. The scientific name of the ocelot was also changed by taxonomists. The jaguarundi of southern Texas is now considered to be its own subspecies.

Twentieth Century Changes in the TBP

Schmidly (2002) recently summarized changes that have occurred to the mammalian fauna of Texas since the time of Bailey's 1905 biological survey of the state. As human land use patterns have changed and expanded since the turn of the twentieth century the fauna of Texas has seen "a substantial turnover in species composition, involving both a loss and a gain..." (Schmidly 2002). As much as 35% of the total number of mammalian species have had significant losses, in terms of subspecies, or outright extinctions. Seven of the species observed by Blair (1950, 1952) have been

significantly reduced or extirpated in the latter half of the twentieth century:

Antilocapra americana (Pronghorn), *Canis lupus* (Gray Wolf), *Castor canadensis* (Beaver), *Herpailurus jaguarundi* (Jaguarundi), *Leopardus pardalis* (Ocelot), *Leopardus wiedii* (Margay), and *Panthera onca* (Jaguar). Schmidly observed that the loss of these taxa follows the recent pattern of extinction typical around the world where the large, socially complex species are most vulnerable to losses. For example, gray wolves were purposefully exterminated after the loss of their co-evolved prey, Bison, led the wolf to become a nuisance for livestock ranchers (Schmidly 2002).

CHAPTER IV

ZOOARCHAEOLOGY OF THE TAMAULIPAN BIOTIC PROVINCE

As was stated in Chapter I, this report is concerned with evaluating the antiquity and describing the paleoenvironment of the Tamaulipan Biotic Province. In order to achieve this, I have collected all available faunal data from the archaeological record of the area. This report represents the first synthetic analysis of archaeological faunal material from southern Texas.

Two contrasting hypotheses have been offered in the literature regarding the antiquity of the TBP. First, some researchers have suggested that the environmental conditions of South Texas are a recent phenomenon resulting from the “wholesale modification of the South Texas environment during the Historic era.” (Hall 1985; Hester 1975, 1980, 1981, 1995:427) This Historic, or post-contact, era modification is presumed to be the result of human interaction with the environment, in particular agricultural and ranching activities. Hester (1975:107-108) wrote: “Some ethnohistorians and archeologists have made the mistake of assuming that present-day environmental and vegetational conditions were also present in the prehistoric period. On the contrary, there is substantial historic and archeological data that much of this region was a savannah grassland, with the modern fauna supplemented by such species as bison, atelope, and prairie dog.” According to Hester (1980), this period is characterized by the expansion of mesquite distribution, the decrease of surface water availability, the loss of large predators and ungulates, and the intrusion of the Armadillo

and, to a lesser extent, the javelina. Hall (1985) suggested that the expansion of mesquite distribution began in the early years of occupation by the Spanish, when their cattle escaped confinement and roamed in “untended herds.”

In contrast, faunal analysts (Steele 1986b; Hellier, Steele, and Assad Hunter 1995) have proposed that the Tamaulipan Biotic Province is indicated, regardless of archaeological time period, by the presence of the mixed faunal communities defined by Blair (1950, 1952) in the mid-twentieth century. In his analysis of 41LK201, Steele (1986b) wrote:

If these [environmental] changes were the result of recent climatic changes in the region one would infer that prehistorically the area would have been wetter, and the apparent invasion of the mesquite, and possibly the Armadillo, were the result of a drying trend. Therefore, one would predict *few Mexican faunal elements* would be found prehistorically, and there would be more Eastern Woodland species found. In other words, the Tamaulipan Biotic Province as we know it today would be a very recent phenomenon. On the other hand, in the changes noted were principally the result of changes in the human population, then the changes could not be used to infer past prehistoric conditions, and the Tamaulipan Biotic Province could be of greater antiquity (emphasis added).

Steele emphasized the presence of Mexican or Neotropical taxa as important for identifying the characteristics of the province in prehistory (see also Judd 2002). He noted their presence as far back as approximately 2000 years ago at one of the Choke Canyon Reservoir sites, 41LK201 (1986b). He also suggested that aquatic/wetland taxa observed in the Tamaulipan assemblages, such as *Ondatra* and *Microtus pinetorum*, are members of relict populations that are eventually lost at least in part because of human manipulation of the environment in the Historic period (see Chapter V for a further discussion of this topic.) (Steele 1986b; Presley and Steele 1997).

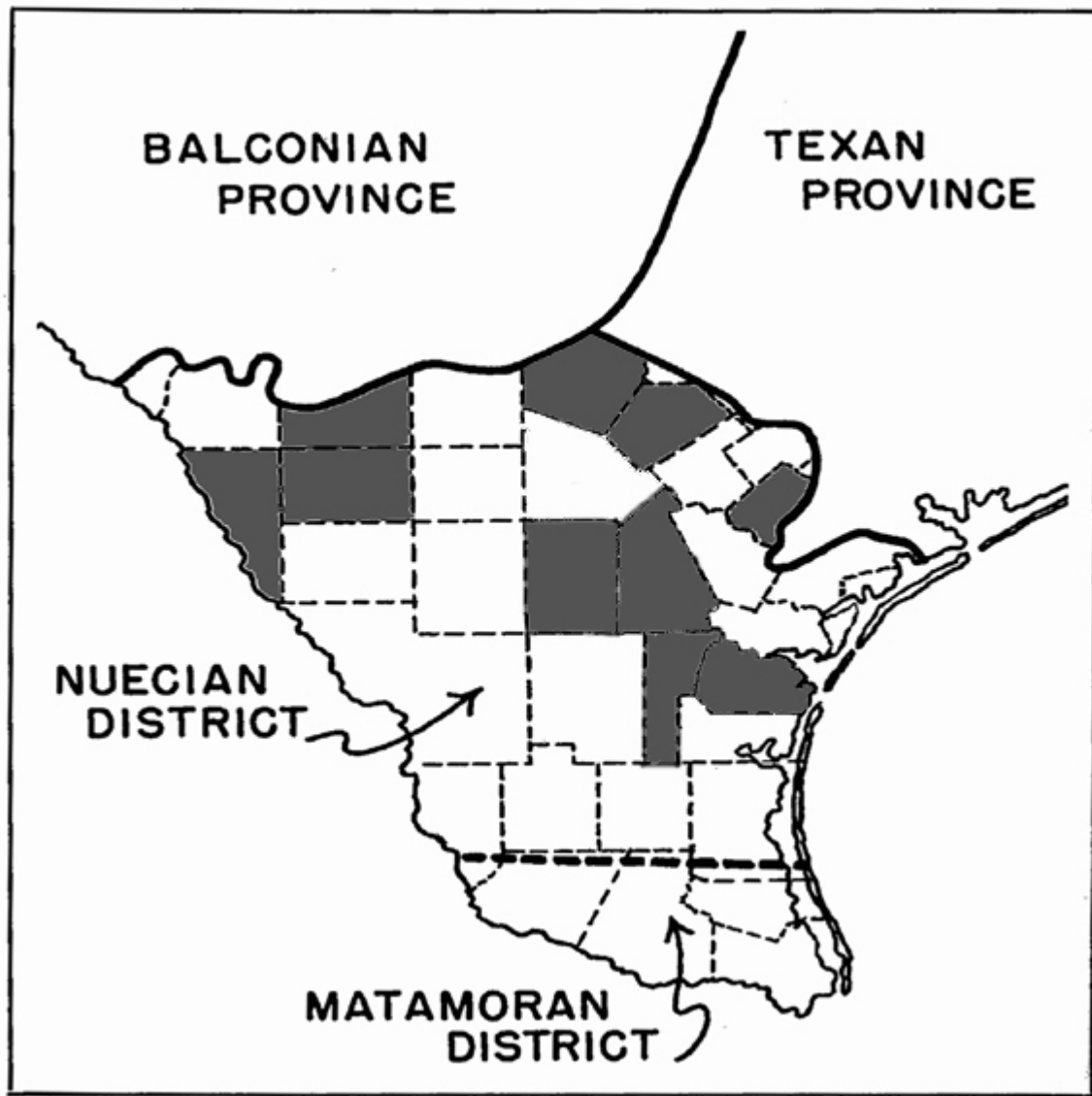


Figure 6. Counties Reporting Archaeological Faunal Remains Within the TBP. Shaded Counties Include: Maverick, Uvalde, Zavala, Bexar, Wilson, Goliad, McMullen, Live Oak, Jim Wells, and Nueces.

Because my own research interests are focused on faunal analysis, I have chosen to follow Blair's (1950, 1952) methods and observe occurrences of faunal taxa, specifically mammalian taxa, in the archaeological record. I was able to collect faunal data from 64 discrete sites distributed across ten of the 32 complete or partial counties represented in the TBP (Figure 6). Note that no archaeological faunal remains were reported from the Matamorán District

The following is a list of sites from the TBP, organized by archaeological time period*, that yielded faunal remains:

Table 10: Archaeological Site Names by Time Period

MIDDLE ARCHAIC:

Choke Canyon 41LK201 (Steele 1986b)
Loma Sandia 41LK28 (Hellier, Steele, and Assad Hunter 1995)

LATE ARCHAIC:

Culebra Creek 41BX126 (Meissner, Cargill, and Nickels 1998)
Choke Canyon 41LK201 (Steele 1986b); 41MC222; 41MC296 (Steele and Assad Hunter 1986)
Johnson site (Campbell 1947)

LATE ARCHAIC/LATE PREHISTORIC:

Camp Bullis 41BX377 (Gerstle, Kelly, and Assad 1978)
Chaparrosa Ranch 41ZV10 (Davidson 1978)
Choke Canyon 41LK201 (Steele 1986b)
Loma Sandia 41LK28 (Hellier, Steele, and Assad Hunter 1995)
Oso Creek 41NU102; 41NU103 (Steele and Mokry 1982)
41UV48 (Lukowski 1987)

LATE PREHISTORIC:

Choke Canyon 41LK201 (Steele 1986b); 41MC222 (Steele and Assad Hunter 1986)
Clemente and Hermina Hinojosa 41JW8 (Hester 1977b; Steele 1986a)
41ZV123 (Hester 1975)
41ZV152 (Hester 1975)

Table 10 continued: Archaeological Site Names by Time Period

LATE PREHISTORIC/PROTOHISTORIC:

Choke Canyon 41MC296 (Steele and Assad Hunter 1986)
 Tortuga Flat 41ZV155 (Hester and Hill 1975)
 Holdsworth II (Hester and Hill 1975)
 41ZV14 (Hester and Hill 1975)
 41ZV60 (Hester and Hill 1975)
 Scorpion Cave 41ME7 (Hester 1975)

SPANISH COLONIAL (to 1800):

Alamo:Alamo Plaza (Fox, Bass, and Hester 1976)
 Alamo Shrine 41BX6 (Eaton 1980)
 Spanish Governor's Palace Park (Fox 1977; Meissner 1997b)
 41BX38 (Meissner 1999a)
 Mission San Jose 41BX3 (Meissner 1998; Meissner 1999b)
 Mission San Francisco de la Espada 41BX4 (Gross 1997)
 Mission Espiritu Santo/Goliad State Park (Hunziker and Fox 1998)
 Mission Espiritu Santo de Zuniga at Goliad 41GD1 (deFrance 1999)
 Mission Nuestra Senora del Rosario 41GD2 (deFrance 1999)
 Rancho de las Cabras 41WN30 (Steele and DeMarcay 1985)
 San Pedro Acequia (Nickels, Cox, and Gibson 1996)
 San Bernardo Mission (Hester and Hill 1973; Adams 1975; Davidson and Valdez 1975)
 Scorpion Cave (aboriginal) 41ME7 (Hester 1975)

NINETEENTH CENTURY:

Spanish Governor's Palace Park (Fox 1977)
 Las Tiendas 41BX634; 41BX635; 41BX637 (Fox 1977)
 Alamodome sites (32 sites) (Meissner 1997a)

*Archaeological time periods follow Vierra 1998 and Nickels, Tomka, and Vierra 1999.

Faunal data from sites firmly dated to the Early Archaic or Paleoindian periods within the TBP in the strict sense were not available (see Baker and Steele 1994 for material on the periphery of the TBP; see also Baker 1994 for an undated precontact assemblage). However, mixed context assemblages that included Paleoindian or Early

Archaic material were reported in the archaeological literature. These assemblages either came from disturbed deposits (Gerstle, Kelly, and Assad 1978) or were collapsed into a single time aggregate by the authors (Flynn 1983; Highley et al. 1978; Katz 1987). I was unable to utilize these assemblages in the diachronic analysis because of their lack of temporal provenience but they can add to a general discussion of the faunal record of the area (see Appendix B for complete species lists from these sites).

A discussion of the overall character of the archaeological faunal communities of southern Texas must first be put into the context of the existing literature. When Blair (1950:102) first clarified the boundaries of Dice's (1943) biotic provinces, he began by noting that Dice had "extend[ed]" the northern border of the TBP up into the far southern portion of Texas from northeastern Mexico thus emphasizing the importance of the intrusive Neotropical species in the area. Blair (1950) subsequently extended the boundary northward to follow the distribution of thorny brush to the Balcones fault line. Faunal taxa associated with thorny brush growth, such as mesquite and acacia, are therefore also important for identifying the character of the TBP. Despite the fact that his definition of a biotic province is a holistic one that encompasses a consideration of all facets of local ecology, Blair (1950 and especially 1952) emphasized the fauna distinguished in each area. He wrote: "An orderly classification of the state into regions in which *environments for animal life are relatively uniform* and in which, consequently, *the fauna is approximately uniform* is essential for the interpretation of the facts of animal ecology and distribution in the state." (emphasis added) (Blair 1950:93).

In Steele's (1986b) environmental reconstruction of what is now the modern day

Choke Canyon Reservoir area, he followed the example set by Blair and observed that the heterogeneous fauna of the modern day were also present in the archaeological record. Steele found that the basic habitats present in the modern area, grasslands/scrublands, woody areas, and reliable water sources (see also Chapter II), were present archaeologically. Fauna recovered from 41LK201 that are indicative of specific habitats are listed in the table below (follows Steele 1986b:Table 37a; see also Appendix B of this report):

Table 11: Taxa Indicative of Specific Habitats at 41LK201.

| Grassland/Scrubland: | Forest/Forest Edge: | Aquatic Environment: |
|----------------------|---------------------|----------------------|
| <i>Antilocapra</i> | <i>Odocoileus</i> | Testudines |
| <i>Bos bison</i> | <i>Procyon</i> | <i>Osteichthyes</i> |
| <i>Pecari</i> | <i>Didelphis</i> | <i>Ondatra</i> |
| <i>Taxidea</i> | <i>Microtus</i> | |
| <i>Sigmodon</i> | | |
| <i>Neotoma</i> | | |

Steele (1986b) also found that representatives of the mixed biotic communities observed by Blair (1950, 1952) in recent history were found archaeologically at 41LK201. Steele (1986b) proposed that certain key taxa could be “reasonably correlated” with the biotic communities observed by Blair in the TBP and that the presence of the mixture of these key taxa archaeologically implies the existence of the TBP in the archaeological past. The following table lists the key taxa recommended by Steele (1986b: Table 37b; see also Chapter III of this report) with two additions, *Spermophilus mexicanus* and *Scalopus aquaticus*.

Table 12: Key Taxa of the Mixed Biotic Communities of the TBP.

| Plains Mammals: | Mexican/Southwestern Mammals: | Eastern Woodland Mammals: |
|-------------------------------|-------------------------------|------------------------------|
| <i>Antilocapra</i> | <i>Pecari</i> | <i>Sylvilagus floridanus</i> |
| <i>Bos bison</i> | <i>Dasyopus</i> | <i>Microtus pinetorum</i> |
| <i>Taxidea</i> | <i>Sylvilagus audubonii</i> | <i>Ondatra</i> |
| <i>Spermophilus mexicanus</i> | <i>Liomys</i> | <i>Scalopus aquaticus</i> |
| | <i>Baiomys</i> | |

I have added the two taxa to Steele's (1986b) list because of their habitat associations as described by Davis and Schmidly (1994). Within the TBP, *Spermophilus mexicanus* is associated with cactus and mesquite. In contrast, *Scalopus aquaticus* is associated with the soft, moist soils found in woodland or riparian habitats in the TBP.

Discussion

In this report, I have followed Steele's (1986b) method for reconstructing the paleoenvironment of south Texas based on archaeological faunal remains. I have traced the presence of the key taxa listed above within the archaeological record for all available faunal analysis reports. Table 13 shows the distribution of these key taxa across time per archaeological period. It is clear that representatives of each biotic community are present in the archaeological record across time up to the point of European contact. Thus, this table demonstrates that the heterogeneous mix of biotic communities indicative of the TBP per Blair can be traced into the archaeological past.

It is important to remember that a direct one to one correlation between the

modern faunal community of the TBP and the archaeological record should not be expected. This is due in large part to the taphonomic processes that shape the archaeological record and lead to losses of information (see Chapter VI for further discussion of this subject). Deviation in the archaeological record from Blair's (1950, 1952) modern standard can also be indicative of changes in the local or regional environment.

Deviations from Blair's standard include the loss of taxonomic diversity from the nineteenth century archaeological sites, the reduction and subsequent loss of woodland taxa beginning in the peri-contact period, the introduction of the Armadillo in the nineteenth century and the loss of the bison in the nineteenth century. It is apparent that most of the deviations away from Blair's standard occur at or near the introduction of European settlers into the area and the associated increase in human populations. In my opinion, the loss of faunal taxonomic diversity among the key taxa, as it is represented in the archaeological record, is due to a shift in land use patterns rather than an indication of any environmental change.

Table 13: Key Archaeological Taxa of the Tamaulipan Biotic Province
Distributed Across Time

| | MIDDLE ARCH. | LATE ARCH. | LA/ LPH | LATE PRE- HIST. | LPH/ PROTO HIST. | SPANISH COLONIAL | 19TH CENT. |
|---|-----------------|---------------|------------|-----------------------|------------------------|---------------------|---------------|
| PLAINS MAMMALS | | | | | | | |
| <i>Antilocapra americana</i> | | | | X | X | X | |
| <i>Bison bison</i> | X | X | X | X | X | X | |
| <i>Taxidea taxus</i> | X | | X | X | | X | |
| MEXICAN MAMMALS | | | | | | | |
| <i>Tayassu tajacu</i> | | X | X | X | | X | X |
| <i>Dasypus novemcinctus</i> | | | | | | | X |
| <i>Sylvilagus audubonii</i> | X | X | X | X | | | |
| <i>Liomys irroratus</i> | | | X | X | | | |
| <i>Baiomys taylori</i> | | | X | | | | |
| <i>Spermophilus mexicanus</i> | X | X | X | X | X | X | |
| EASTERN WOODLAND MAMMALS | | | | | | | |
| <i>Sylvilagus floridanus</i> | | | | X | X | | |
| <i>Microtus pinetorum</i> | | X | X | X | | | |
| <i>Ondatra zibethicus</i> | | | X | X | | | |
| <i>Scalopus aquaticus</i> | X | | X | X | X | | |

I do not mean to say that environmental changes did not occur in that period because ethnohistoric accounts have clearly indicated that changes have taken place since the advent of European settlement in the area (Chapters II and III). Rather, the archeological faunal record of the historic period indicates a shift away from aboriginal subsistence techniques that utilized local, native resources toward the European practice of animal domestication and husbandry (see Appendix B for complete faunal lists from each site). Excavated sites from the nineteenth century included in this report either represent Anglo settlements in San Antonio or excavations at the Alamo. Archeological sites of the Spanish Colonial period used in this report are mostly Spanish missions. Their faunal assemblages include a mixture of local fauna and domesticates.

The expansion of the Armadillo into Texas has already been addressed in the previous Chapter. Potential reasons for the loss of woodland taxa from the TBP in the post-contact period will be discussed in Chapter V.

The loss of the Bison in the historic period can also be directly correlated to the introduction of European settlers into the TBP. Because the number of historic reports of bison gradually decrease over time, Inglis (1964) suggested that this possibly indicates an actual decrease in the number animals observed since the arrival of the Spanish. Nevertheless, bison were virtually extirpated from the Plains of North America in the nineteenth century. They were lost as a result of large scale organized hunting by Anglo settlers, reaching its maximum between the years 1871 and 1882 (Wilson and Ruff 1999). Hunting was done for commercial profit as well as political gain. After the Civil War, the Texas Legislature considered placing the bison under legal protection.

Those opposed, led by General Sheridan, emphasized that the sooner the bison were gone the sooner the Native Americans, who depended on them for their livelihood, could be placed under political control. After Gen. Sheridan's victory in the legislature over 100,000 bison were killed between December 1878 and January 1879 (Schmidly 2002).

An examination of the complete record of mammal remains recovered from archeological sites in the TBP (Appendix C) reveals a relatively stable faunal community across time, with the exceptions noted above. Several taxa, commonly distributed across Texas in modern times, are common (at least five of the seven time periods, allowing for low diversity in the Middle Archaic and nineteenth century) in the archaeological record of the TBP. Common taxa include: *Didelphis virginianus*, *Geomys* sp., *Lepus californicus*, *Odocoileus virginianus*, *Pecari tajacu*, *Sigmodon hispidus*, and *Spermophilus mexicanus*. Bison are also noted from all archaeological time periods up to the nineteenth century.

Other taxa were rarely reported from the archaeological record. Larger carnivores, such as the Felids and *Ursus* sp. were not commonly recovered. For *Ursus*, this is to be expected given their rarity in Texas in modern times. Felids may have been uncommon in the archaeological record because of their relative rarity in comparison to more preferable large animal meat sources, such as bison and deer.

Bats (Order Chiroptera), as a group, were also rarely reported from the archaeological record of the TBP. Only two examples, both from the Spanish Colonial period, were noted (Davidson and Valdez 1976; Meissner 1999a). Free-tailed bats, such as *Tadarida mexicana*, are widely distributed across Texas. It may be that their paucity

in the archaeological record is due to their lack of commensality with humans or their lack of interest as a prey species. For example, bats are difficult for humans to acquire as prey without fine mesh nets. Furthermore, bats are nocturnal and their aerial behavior puts them active at different times of day than humans. Finally, bats may also be rare in the archeological record of South Texas because their relatively small size prevents their recovery during ¼ inch screening at archaeological excavations (Shaffer and Sanchez 1994).

Seventy-two mammal taxa, both generic and specific, have been recovered archaeologically from the TBP. This number includes domesticates and commensal introduced species such as Norway rats and house mice. The greatest number of taxa were recovered from the Late Archaic/Late Prehistoric (28 of 72), Late Prehistoric (26 of 72), and Spanish Colonial (43 of 72) periods. These temporal concentrations of taxonomic diversity are strongly influenced by the nature of the archaeological investigations themselves. Most of the assemblages from the Late Archaic/Late Prehistoric and Prehistoric periods are associated with excavations in the Choke Canyon reservoir area. These sites benefited from extensive excavations and large faunal assemblages (Steele 1986b).

The largest number of taxa were recovered from the Spanish Colonial period because this period had the most taxa, both native mammals and domesticates, that could potentially enter the archaeological record. These sites are a record of human culture, and subsequently regional environment, in transition. In her analysis of Mission Espiritu

Santo de Zuniga and Mission Rosario, deFrance (1999) found that the missionized Native Americans of the area still hunted local game for food, but that cattle were the predominant source of meat. In the mission setting, Spaniards provided beef as a way to transition native subsistence practices away from hunting.

Comparisons to the Late Pleistocene and Early Holocene

Faunal Record of Central Texas

Lundelius (1967) divided the faunal assemblages of the late Pleistocene in central Texas into three groups: extinct Pleistocene megafauna, extant taxa not usually found in modern central Texas (extralimital taxa) with the exception of relict populations, and Recent fauna of the area. Nearly all Recent taxa are represented in the late Wisconsin age deposits of central Texas. The only exceptions are the recent intrusions of the Armadillo and peccary. Lundelius (1967) used relative abundance data of Pleistocene proboscidians to comment on the changing paleoenvironment of central Texas. Data regarding relative abundance were not recorded for this analysis of the paleoenvironment of the TBP.

The loss of the megafauna associated with the Pleistocene indicates the beginning of the Holocene period at approximately 8,000 to 10,000 years ago. Faunal assemblages from early Holocene localities indicate a mixture of Recent taxa that continue to be found locally as well as extralimital taxa usually associated with more humid, cool climates (Lundelius 1967). Lundelius (1967) observed that the extralimital

species, certain rodents and insectivores, disappear through time from the paleontological record in a southwest to northeast trend toward their modern areas of distribution. He hypothesized that this distribution trend indicates a warming and drying trend that spread across central Texas from west to east. Based on the paleontological faunal record of sites in Val Verde and Comal counties, Lundelius (1967) suggested that the warming and drying trend had ended sometime between 4000 and 6000 years ago in central Texas. These environmental trends are also supported by Wilkins' (1992) synthesis of paleontological faunas published since Lundelius' earlier works. Lundelius (1967) also proposed that the modern faunal community of central Texas was in place by about 1000 years ago, with the exception of the relatively recent appearance of the Armadillo, the peccary, and the Botta pocket gopher (*Thomomys bottae*).

Toomey's (1993) recent analysis of vertebrate fauna recovered from Hall's Cave in Kerr County further clarified Lundelius' (1967) findings. Toomey (1993) conducted analyses or summarized information on pollen evidence, soil types, and vertebrate climatic tolerances. Using these multiple lines of evidence, Toomey tracked paleoenvironmental changes in west central Texas for the last 20,000 years. He found that the dominant vegetation of the area since that time was grassland with woodland areas concentrated near perennial water sources (Toomey 1993). His evidence also indicated that a warming and drying trend occurred between 14,500 and 12,500 years B.P. with some fluctuations within that period. The drying trend for the area increased between 12,000 and 10,400 years B.P and resulted in the loss of most of the mesic adapted vertebrate taxa identified from earlier periods. Remarkably moist conditions

prevailed between 10,400 and 9000 years B.P. After this period, the drying trend began again and reached its maximum between 5000 and 2500 years B.P. (Toomey 1993). One last increase in moisture occurred in the Hall's Cave area around 2500 years B.P. Modern environmental conditions were in place at approximately 1000 years B.P. (Toomey 1993).

Regarding the Richard Beene site 41BX831 (Applewhite Reservoir Project), Baker and Steele (1994) have offered a preliminary analysis of an archaeological faunal assemblage from the border of the Tamaulipan and Balconian Biotic Provinces. These faunal remains were recovered using both ¼ inch and 1/8 inch mesh. Dates for the assemblage range from the Late Pleistocene (12,500 years B.P.) to the Late Prehistoric (1,000 years B.P.). Baker and Steele (1994) were able to identify 11 species and/or genera. They noted with special interest the presence of *Bassariscus astutus* (Ringtail) in the Late Pleistocene material. Based on the assemblage material dated to the Early Archaic, they concluded that the faunal community of the area has been relatively stable during the Holocene. Baker and Steele (1994) also concluded that the presence of the Ringtail indicates the influence of the TBP on the study area into the Late Pleistocene (see Appendix B for the complete list of taxa from this site by time period).

Comparisons to the Late Pleistocene and Early Holocene

Faunal Record of Northeastern Mexico

The climate changes observed in central Texas in the late Pleistocene and early Holocene in central Texas are also indicated by the faunal record in northeastern Mexico (Lundelius 1980). Recovery of examples of the Bog Lemming (*Synaptomys cooperi*), the Masked Shrew (*Sorex cinereus*), and the Marmot (*Marmota* sp.) indicates a cooler, wetter climate in the Pleistocene. These specimens also represent the southernmost extension of their distribution. Their loss after the end of the Pleistocene is interpreted as evidence of the warming, drying period also experienced farther north (Lundelius 1980). By extrapolating between these two areas, it is fair to assume that the warming, drying trend also occurred in south Texas (TBP).

Archaeology in the Sierra de Tamaulipas

In the mid-1940s, Richard S. (Scotty) MacNeish conducted archaeological survey and excavation in Tamaulipas, Mexico. In 1958, he reported his findings to the American Philosophical Society regarding excavations at five caves and two “ruins.” His main intent was to establish a cultural chronology of the area based on excavated material culture but he was also able to address the paleoenvironment of the area by interpreting animal and plant remains. His cultural phases began at approximately 12,000 years B.P. and continued into the twentieth century. Macneish’s (1958)

excavations yielded over 1,000 animal bones and over 5,000 floral specimens recovered with ¼ inch screens. The faunal remains from these sites were only reported at the generic level (MacNeish 1958: Table 18). The assemblages compared very favorably to the archaeological faunal record of the TBP with only the exceptions of *Mazama* and *Cryphirellus*. According to MacNeish (1958), the decreased presence of *Mazama* (Red Deer) in favor of *Odocoileus* was indicative of a warming and drying trend across the area. This conclusion was underscored by the increasing presence of succulent plant remains in the recovered assemblages (MacNeish 1958).

The Chihuahuan Desert of Mexico

Because the influx of Mexican and arid-adapted taxa is so important to defining the character of the TBP an examination of the Chihuahuan desert region is useful. Wood rat (*Neotoma*) deposits in the area indicate that a warming and drying trend had begun by the late Pleistocene (Wells 1977). Wells (1977) also found that the vegetational community of the area came together sometime after the end of the Pleistocene (after 11,500 years B.P.).

Findley and Caire (1977) defined their conception of a Chihuahuan Desert mammalian fauna by comparing and evaluating multiple factors rather than attributing a faunal community to an arbitrarily circumscribed geographic area. They were especially interested in correlating mammalian fauna to arid climatic conditions where those environmental conditions force adaptive mechanisms upon the fauna. They found that

there is indeed a discernable Chihuahuan fauna and that it is closely related to the faunal communities of the Balconian and Tamaulipan biotic provinces. Aside from their grouping “montane species in the desert,” the combination of faunal communities from the Chihuahuan desert resembles that of the TBP.

The faunal history of the Chihuahuan desert is also similar to that of the TBP. The vegetation of the area has trended from tall grass to short grass to shrub desert during the Holocene, with overgrazing by domesticates in the Historical period providing the greatest threat to the distribution of grassland. Lost or threatened grassland species include *Microtus pennsylvanicus*, *Microtus ochrogaster*, and *Cryptotis parva*. The Chihuahuan Desert is also home to some riparian species associated with the Rio Grande, Rio Conchas, and Pecos River. These include the beaver, muskrat, Western Jumping Mouse (*Zapus princeps*), and mink (*Mustela vison*). Desert, or arid adapted, species are obviously the most important subset of the mammalian fauna of the area. The Geomyid (pocket gophers) and Heteromyid (pocket mice and kangaroo rats) are the most common arid adapted taxa found in the Chihuahuan Desert (Findley and Caire 1977).

Schmidly (1977) included grassland and desert shrub habitats into his concept of “desert” because the mammals distributed across the desert are also typically distributed across these neighboring habitats. Of the 119 species observed in the Chihuahuan Desert Region, I have found that 44 are shared with the TBP per Blair’s 1952 list of mammals. Of the 44 shared species, 19 are listed as desert-adapted and 31 are listed as members of the mesquite grassland community (Schmidly1977:Table 1). Note that

there is some overlap between these two groups. Schmidly (1977) reported that 52 of the 119 mammal taxa (44%) of the Chihuahuan Desert region are part of the “desert scrub ecosystem.” This includes the 31 shared taxa (60% of shared taxa) mentioned above.

Conclusions

Many of the points made by researchers (Hall 1985; Hester 1980; 1981; 1995:427) concerning recent changes to the environment of south Texas are correct. Agricultural and ranching activities have produced noticeable changes in the distribution of certain types of vegetation and animals. Historic accounts document the expansion of mesquite and associated scrub vegetation at the expense of grassland areas (Chapter II). Sources of surface water have been diminished (Chapter V). Large predators and ungulates have been extirpated or reduced in the area to satisfy the needs of ranchers and settlers (Chapter III). Finally, the archaeological record (this Chapter) reinforces historic accounts of the intrusion of the Armadillo in recent times. Unfortunately, I am unable to comment on Hester’s (1995) claim that the javelina has increased in number in the post-contact period because frequency data were not collected for this report. However, the javelina is present in the archaeological record of the TBP as far back as the Late Archaic. Further excavations at sites from earlier periods may possibly produce the javelina as well.

However, when Blair (1950, 1952) defined the characteristics of the TBP he

emphasized the unique mixture of fauna from the area. Recent descriptions of the TBP (Judd 2002) also emphasize the unique mixture of flora and fauna from the area. Recall that Blair extended the northern boundary of the TBP to include the northern extent of the thorny brush/scrub growth. Schmidly (1977) did the same for the northern boundary of the Chihuahuan Desert region because the arid adapted mammals characteristic of the desert are also found among the mesquite scrub growth. These arid adapted mammals are also important for defining the TBP (Blair 1950, 1952; Judd 2002; Chapter III of this report).

When Blair was making his initial evaluation of the Tamaulipan Biotic Province he and his colleagues collected data *in the field*. They were more concerned with observing the presence of native taxa rather than collecting information on how much humans had modified the environment by agricultural activities. The species lists presented by Blair (1950, 1952) represent a snapshot of the native fauna of the TBP as they existed in the mid-twentieth century, even after significant human population growth had acted on local environments since the post-contact period. In other words, Blair was looking at the TBP as a natural phenomenon rather than an anthropogenic phenomenon as has been proposed by some archaeologists. In my opinion, when making comparisons of the modern fauna of the TBP to the past, it makes sense to follow Blair's lead and focus on the native taxa of the area.

This is exactly what faunal analysts (Steele 1986b; Hellier, Steele, and Assad Hunter 1995) have done for some of the sites in the Choke Canyon Reservoir area. Like Steele (1986b), my research shows that the mixed biotic communities identified by Blair

for the Tamaulipan Biotic Province can be traced back, within the precontact period, at least as far as the Middle to Late Archaic. The archaeological faunal record (Table 13) also reinforces Hester's observations of the intrusion of the Armadillo, the presence of the javelina, and the loss of large ungulates such as bison and pronghorn. However, the rest of the archaeological faunal record (Appendix C) demonstrates the presence of the mixed biotic communities observed by Blair (1950, 1952) as well as a relatively stable faunal community in the precontact period.

The findings of some botanical analyses also complement my findings. Specifically, Johnson (1963) emphasized the long term presence of mesquite in the TBP (contra Hester 1975). Johnson wrote: "It is emphasized that many 'grasslands' were infested with the ubiquitous mesquite, *Prosopis glandulosa*, in a stunted growth form *long ago*, and that the rapid takeover of the mesquite brush involved increase in stature of the aerial parts of the plant and indensity of stand, rather than invasion of previously brush-less areas" (emphasis added). Furthermore, it is also interesting to note that the limited archaeological botanical studies done for the area also indicate the presence of key botanical taxa, such as mesquite and acacia, in the area (Jones 1986; Murry 1995).

Given the strong influence that the Chihuahuan desert has had on the TBP (per Schmidly 1977), it is fair to speculate that the components of its local environment came together at around the same time as the elements of Chihuahuan Desert, some time after the end of the Late Pleistocene (post 11,500 years B.P.).

CHAPTER V
LOSS OF WOODLAND/AQUATIC TAXA FROM THE ARCHAEOLOGICAL
RECORD OF THE TAMAULIPAN BIOTIC PROVINCE

In this Chapter I will explore some of the possible reasons for the reduction in diversity of the woodland or aquatic taxa observed in the archaeological record of the TBP. Specifically, I am interested in extralimital taxa, those reported from the archaeological record but not reported by Blair (1950, 1952) for the TBP. I have grouped together the woodland and aquatic associated taxa because in the TBP they tend to be found in association with *galeria* forests.

Table 13 demonstrates the loss of two key extralimital woodland/aquatic taxa (*Microtus pinetorum* and *Ondatra zibethicus*) from the archaeological record in the Late Prehistoric/Protohistoric transitional period. The absence of these taxa in the post-contact period may be due to a shift in land use patterns, where predator scats are not likely to be included in European settlements. Their absence from the Late Prehistoric/Protohistoric transitional period is more curious.

Many of the woodland/aquatic taxa present in the twentieth century TBP are also found archaeologically (see Appendix C). These include: *Bassariscus astutus*, *Canis latrans*, *Castor canadensis*, *Didelphis virginiana*, *Peromyscus leucopus*, and *Sciurus niger*. Each of these organisms is widely distributed across the state. It stands to reason that any environmental change that may have forced the woodland vole and the muskrat out of the TBP was not enough to significantly change the distribution of the other

woodland/aquatic taxa.

Ondatra zibethicus was reported from only one archaeological site in the TBP, 41LK28 Loma Sandia (Hellier, Steele, and Assad Hunter 1995). *Microtus* was reported from 41LK201 (Steele 1986b), 41MC296 (Steele and Assad Hunter 1986), 41UV48 (Lukowski 1987), and 41JW8 (Steele 1986a). Aside from the occurrence in Uvalde county, all other reports of *Microtus* utilized in this thesis are associated with the Choke Canyon Reservoir excavations. In his analysis of the archaeological fauna from 41JW8, Steele (1986a) reported other subfossil observations of *Microtus* from counties near the boundary of the TBP: Goliad county (Flynn 1983), Hill county (Jelks 1962), Kerr county (Roth 1972), Montague county (Dalquest 1965), and Travis county (Lundelius 1974). Late Pleistocene fossil remains of *Microtus pinetorum* (19 sites total) are noted from localities outside of Texas in Pennsylvania, West Virginia, Tennessee, Georgia, and Florida. Eighteen other Late Pleistocene localities possibly containing either *M. pinetorum* or *M. ochrogaster* are noted from Tennessee, Oklahoma, Missouri, and Texas (Lundelius et al. 1983).

Two species of vole could have potentially inhabited the TBP in prehistory: the prairie vole (*Microtus ochrogaster*) and the woodland vole (*Microtus pinetorum*). The modern range of *M. ochrogaster* in Texas is limited to the far northern portion of the panhandle and the far southeastern corner of the state near the Sabine River. Since the woodland vole is found across northeast Texas and continues south as far as Kerr county it becomes a much more likely former inhabitant of the TBP.

These two species are similar morphologically but differ slightly in size and in

dental morphology (see Chomko 1990 Figures 53 and 54). Graham and Semken (1987) urged faunal analysts to exercise caution when distinguishing between *M. pinetorum* and *M. ochrogaster*. They proposed that it is too difficult to find differences in the dental morphology of the two species aside from SEM observation of enamel microstructure. They also expressed concern over making species diagnoses based on geographic location. I have had the opportunity to personally inspect the *Microtus* specimens from the Choke Canyon Reservoir area excavations and agree with the original assessment that they compare favorably with *M. pinetorum*. However, in deference to Graham and Semken (1987), for the remainder of this report, I will refer to these specimens only by their generic name, *Microtus*, with the understanding that they compare favorably to *M. pinetorum*.

Why might the extralimital taxa mentioned in the beginning of this Chapter have disappeared from the archaeological record? Two alternate hypotheses are considered:

Coevolutionary Disequilibrium

It is commonly accepted that generalized environmental change has occurred within the TBP. However, such change, as it is characterized in the Coevolutionary Disequilibrium model, may or may not provide an adequate explanation for the absence of *Microtus* from the TBP. Graham and Lundelius' (1984) model considered the ways in which generalized environmental change has affected particular plant-animal coevolutionary interactions. Note that the model was developed to evaluate

environmental changes in the Pleistocene but is also useful for the present discussion. The model presupposed that certain species within communities are coevolved. In other words, these are species that do not exchange genetic material with each other, rather, their adaptive responses to the environment are mutually reinforced. These coevolved relationships tend to be between animal predators and their animal or plant food resources. Disequilibrium occurs when these relationships are disrupted. Graham and Lundelius (1984) proposed that as each species has responded individually to environmental change, their ranges expanded or contracted individually, creating a “mosaic pattern of evolution.”

Three points raised by the Coevolutionary Disequilibrium model are relevant here. First, extinction should not be restricted to a particular class of animals: but, in their model large herbivores bear the brunt of extinction due to their close association with the evolving plants. Second, paucity of an organism in the fossil record indicates either a limited distribution of the living organism or an “inadequate sampling of past biotas by the fossil record” (Graham and Lundelius 1984:232). If the fossil record of a species is reflective of low abundance then that particular species is more susceptible to extinction. This is indicative of a specialized rather than generalist adaptation. It is my opinion that the fossil record of *Microtus* in the TBP reflects a limited distribution of the genus in that area. Third, the time of an extinction event in a geographic area is correlated with the reorganization of the biotic community. This is independent of the appearance, or activity of human culture in the area. Graham and Lundelius (1984) mentioned specifically the disharmonious faunas of central Texas and northern Mexico.

An Alternative to Coevolutionary Disequilibrium

Generalized environmental change, such as that noted in the Coevolutionary Disequilibrium model, may not be the best explanation for the loss of *Microtus* from the TBP. Conversely, the presence or absence of a small taxon, such as *Microtus*, should not necessarily be taken as proof of generalized environmental change. With that in mind, the following are my responses to the application of the above mentioned points concerning Coevolutionary Disequilibrium to the subfossil/archaeological distribution of *Microtus* in the TBP.

First, Graham and Lundelius (1984) required a broad range of extinctions within their model. However, the fauna of the present day TBP is much the same as it has been found to be in the archaeological record, with the exceptions noted at the beginning of this Chapter.

Second, as mentioned above, I agree that the paucity of *Microtus* in the archaeological record of the TBP is indicative of its limited distribution in the archaeological record.

The retention of other similarly sized mammals in the archaeological record (see Appendix C) demonstrates that *Microtus* was not left out due to any screening bias.

Third, Graham and Lundelius (1984) suggested that the time of the extinction event is independent of human activity. This is an appropriate point for the Pleistocene but should not be extended into the Holocene. Steele (1986b) has suggested that human activity has been a likely factor in the disappearance of riparian habitats in the TBP that

would be suitable for *Microtus*.

For the Choke Canyon Reservoir area, Steele (1986b) suggested that generalized environmental trends are responsible for the heterogeneous mix of Plains, Eastern Woodland, and Mexican/Southwestern taxa at the site. Specifically, he noted that the “presumed loss of climatic equability caused by the retreat northward and eastward of the species tolerant of moist conditions and intolerant of hot summers” such as *Microtus* (Steele 1986b:219). Recall, however, that the loss of species due to coevolutionary disequilibrium is independent of the direction or type of environmental change.

At 41LK201, *Microtus* is associated with the forest/forest edge habitat. Within the site, the specimen was probably located near a pond or creek. It has been suggested that the climate of the area during prehistoric times was more mesic; thus, northern taxa were able to live further south because the area was not subjected to hot summers. In sum, climatic conditions that led to the heterogeneous faunal communities found today in the TBP existed into the archaeological past.

It is also possible that a greater combination of microhabitats existed in the past. This would allow for the existence of *Microtus*, and also *Ondatra*, in moist habitats in conjunction with taxa that require more xeric conditions. This scenario would not require a great deal of climatic change. Instead, a change in water table and associated surface water could have been effected by human activity, such as overgrazing or plowing (Steele 1986b). At 41LK201, the presence of *Microtus* indicates a poorly drained grassland probably near the creek associated with the site (Schmidly 1983). All other taxa found at the site, with the exception of the muskrat, continue to be associated

with the local environment. This point can also be extended to the TBP at large.

Hester (1981) hypothesized that water availability influenced the cultural landscape of the TBP in prehistory. He divided microenvironment types into high density resource areas and low density resource areas. High density areas are located near permanent sources of water, such as the Rio Grande, Nueces, and Frio Rivers. These areas tended to be densely forested and provided a wide range of plant resources as well as small and medium sized mammals. Low density resource areas are associated with less dependable sources of water. The members of these microhabitats were more dispersed but the microhabitats themselves were more evenly distributed across the area than the high density resource areas.

High density resource areas, such as riparian habitats, were more likely to accumulate archaeological material. Hester (1981) hypothesized that the inhabitants of these areas were likely to be less mobile, tended to occupy the areas on a seasonal basis, and tended to reoccupy favorable campsites. He interpreted the Chapparosa Ranch and Choke Canyon localities as high density resource areas.

Permanent springs may also be interpreted as high density resource areas. In his book, *Springs of Texas* (2002), Brune made a pointed discussion of the progressive drop in ground water levels and the widespread loss of springs in Texas. He did not believe that the aboriginal inhabitants of the area had any significant effect on the water table, even though they made shallow wells and engaged in small scale horticulture. Instead, the arrival of European settlers marked the beginning of the loss of the springs. Well drilling and overgrazing were the initial steps. Overgrazing interferes with the recharge

action of the soil. Increased transpiration due to the subsequent expansion of mesquite and other scrub vegetation further dropped the water table. The final and hardest blow came from nineteenth century ranchers who drilled deep wells to satisfy the needs of their herds. Brune (2002:36) wrote: “Water from a well south of San Antonio reaching the Edwards Limestone rose 26 meters above the surface of the ground. Nothing could have had a more disastrous effect upon spring flows than the release of these tremendous artesian pressures through flowing wells.” Historical accounts prior to 1860 report springs from the following counties in the TBP: Bexar, Wilson, Atacosa, Live Oak, Medina, Uvalde, Kinney, Frio, and Zavala (Weniger 1984).

Conclusion

My consideration of these two alternate hypotheses for the loss of woodland/aquatic taxa from the TBP is dependent upon matters of scale. Graham and Lundelius’ (1984) Coevolutionary Disequilibrium Model provides a large-scale explanation. Specifically, the hallmark of coevolutionary disequilibrium is a mixture of disharmonious fauna. This type of taxonomic mixture is characteristic of the TBP.

The local scale hypothesis proposes that the apparent shift in distribution of *Microtus* and *Ondatra* out of southern Texas may be due to something more particular than generalized environmental change. *Microtus* requires a fairly moist localized habitat. Specifically, it does not typically venture far away from its own nest. It is possible that a change in localized moisture, such as a change in the water table, at the

microhabitat level may have forced *Microtus* away from its cozy home while leaving the rest of the disharmonious fauna of a particular area intact as was noted by Steele (1986a) for 41JW8. This hypothesized change in water table and surface water availability may have occurred either due to climatic change or recent human activity.

CHAPTER VI

THEORETICAL AND METHODOLOGICAL ISSUES

Why is it that faunal analysts, either archaeologists or paleontologists, believe they can reconstruct past environments? What techniques allow for such topics to be investigated? In this Chapter, I will elaborate on these questions. I will briefly address such topics as uniformitarianism, issues regarding paleoenvironmental reconstructions in paleontology and archaeology, how taphonomy affects the fossil record, and zooarchaeological theory regarding faunal analysis and interpretation. It is my hope that this Chapter will demonstrate both the strengths as well as the weaknesses of my analysis of the Tamaulipan Biotic Province.

Uniformitarianism

The concept of uniformitarianism, made famous by Lyell, is central to geology and other related subjects within natural science (Lyman 1994). Discussions of Stephen Jay Gould's writings on uniformitarianism have found their way into the literature on cultural anthropology/archaeology (Fletcher 1992) as well as zooarchaeology (Lyman 1994). According to Fletcher (1992), following uniformitarian principles allows the researcher to make certain conclusions based on isolated data. For example, a paleoanthropologist can come to some conclusions regarding the life history of a new species of hominid based solely on isolated, fragmentary dental remains. In this case,

isolated and sparse data can inform large scale interpretations of evolution.

Gould's (1965) idea of methodological uniformitarianism is the most appropriate here. Methodological uniformitarianism is typically applied to natural processes where these processes "... and operational conditions are the same over time but the substantive products are particular to each period of time and each region" (Fletcher 1992:43). Fletcher used genetic reproduction and natural selection as an analogy to explain the workings of methodological uniformitarianism. In his, and Gould's (1965) construct, the processes of natural selection work in the same way, across time, to modify the genetic composition of a population. At the same time, sexual reproduction can be counted upon to provide variety in the hypothetical population. While the operational processes are the same (selection for or against traits) across time, the products of such processes can vary at any given time (Fletcher 1992). Methodological uniformitarianism allows for the explanation of extinctions in the midst of other continuing forms of life.

Methodological uniformitarianism allows researchers to make connections between current phenomena and their "equivalents" in the past (Fletcher 1992; Lyman 1994). This must be done with care, however, because these comparisons are between phenomena of different scales. In the case of my research it is between the short term (1950s) observations of Blair and the long term accumulation of the fossil record (in some cases as far back as the late Pleistocene).

Paleoenvironmental Reconstruction

Attempts at paleoenvironmental reconstruction in Texas have a long standing history in the paleontological literature (Lundelius 1967, 1998; Graham and Semken 1987). In particular, the work of Ernest Lundelius has contributed greatly to the understanding of Late Quaternary vertebrate fauna (Graham and Semken 1987). Lundelius' (1967) analysis of central Texas Pleistocene and post-Pleistocene assemblages focused on material recovered from caves. He pointed to the presence of new taxa, such as the Armadillo and peccary, and the absence of extinct Pleistocene taxa as indicators of a gradual drying trend and increased seasonality in the area. Lundelius (1980) has also related the composition of faunal assemblages from Late Pleistocene Mexico to the paleoenvironment of that area. He has recommended that his analysis and also further consideration of the faunal history for the area have important implications for archaeological research (Lundelius 1980).

An analysis of Holocene environmental change based solely on paleontological sites is problematic due to the relative scarcity of these assemblages. Semken (1983;182) believed that the scarcity is due to a "lack of interest" in these assemblages by paleontologists. Holocene assemblages fail to peak the interest of paleontologists because these assemblages lack extinct Pleistocene fauna. According to Semken (1983) vertebrate paleontologists tend to see Holocene assemblages as weak in their ability to inform such subjects as evolution, taxonomic relationships, and biostratigraphy. A survey of research supported by the University of Texas, a leader in paleontological

studies in North America, shows the paucity of recent theses and dissertations regarding Late Quaternary vertebrate assemblages. Of the 68 theses and dissertations published through their Vertebrate Paleontology Lab, only eight are concerned with late Pleistocene and Holocene assemblages (Texas Memorial Museum 2003).

Graham and Semken (1987) enumerated some concerns they have regarding the interpretation of fossil and subfossil faunal assemblages. They stressed the importance of accurate identification of faunal material. Since most ecological studies are conducted at the species level, Graham and Semken (1987) insisted that equivalent diagnoses be made in the fossil record whenever possible. Of course, this becomes problematic when species are distinguished by soft tissue characters, such as pelage color or tail color and length. They cited as an example the difficulty in separating *Microtus pinetorum* from *Microtus ochrogaster* (see also Chapter V of this report). They emphasized the need for faunal analysts to include their reasoning behind challenging taxonomic diagnoses into their reports whenever possible. DeFrance's (1999) analysis of faunal remains from three Spanish missions in south Texas provides an excellent example of distinguishing locally available fauna from introduced domesticates. Her study provides more information about cultural choices than local environment, but her detailed methodology underscores the point made by Graham and Semken (1987).

Toomey (1993) also expressed concern over the ability to distinguish species of *Peromyscus*, *Neotoma*, and *Reithrodontomys* based solely on skeletal characters. He gave these taxa relatively low priority in his paleoenvironmental analysis of Hall's Cave

due his opinion on their relatively difficult identification.

Graham and Semken (1987) also emphasized the critical need for a reliable chronology to be established for each assemblage. Dates, either radiometric or relative, are essential for any evaluation of change over time in a fossil assemblage. They are willing to accept local cultural chronologies for archaeological faunal assemblages as long as they can be related to a larger regional chronology.

There becomes then a conflict in studying Recent faunal assemblages in North America. Paleontologists prefer not to excavate localities with potentially important cultural material. Conversely, archaeological excavation is not typically undertaken unless there is a high likelihood of recovering artifacts (Semken 1983). Semken also noted that there can be some difficulty in temporally identifying paleontological sites because those that contain extinct taxa are “automatically” assigned to the Pleistocene and those that do not are assumed to be Holocene without benefit of radiometric dating.

Semken (1983;183) suggested that paleontologists do not entirely trust faunal assemblages from archaeological sites because they are potentially biased by what he called the “cultural filter.” While archaeological faunal assemblages are by their very nature subject to the “cultural filter,” in my opinion this is not an insurmountable problem. As long as the agent of accumulation can be surmised, whether that is a human depositing refuse in a midden or a predator leaving a scat in a cave, then the potential biases can also be surmised. Regarding the archaeological faunal assemblages considered for this report, it is clear that each assemblage represents the end result of certain cultural activities, in particular subsistence techniques in the pre-contact and

post-contact periods, as well as the activities of local commensal taxa (see Appendix C).

Graham and Semken (1987) recommended a comparison of archaeological faunal assemblages to non-cultural faunal analyses (paleontology as opposed to archaeology) of similar locality and time period as the best way to remove any bias resulting from the “cultural filter.” While this technique was not directly possible for this report, an effort was made to compare the archaeological faunal assemblages of the TBP to non-cultural assemblages from the immediately surrounding areas (Chapter IV).

Semken and Graham (1987) commented on some other limiting factors regarding paleoenvironmental reconstruction utilizing archaeological faunal remains. They noted that not all archaeological investigations include the kind of intensive sampling and recovery techniques that are required to produce the large samples of microvertebrates ideal for paleoecological study. This is usually due to limited budgets. Semken and Graham (1987) also expressed concern over the paucity of analysts interested in conducting paleoenvironmental studies as opposed to evaluating hypotheses more closely related to cultural activities.

Graham and Semken (1987) recommended two methods of paleoenvironmental reconstruction based on faunal analysis. The first method, mapping areas of sympatry, was outside of the scope of this report. Aspects of the second method were utilized for this report, namely species composition. This technique focuses on the environmental limiting factors for taxa. It also allows for the consideration of microhabitats and microenvironments rather than the larger scale homogenizing done on areas of sympatry. In this method, extralimital species become especially important. Data regarding other

aspects of Graham and Semken's (1987) second method, namely relative frequency and clinal variation, were not collected for this report.

Taphonomy

Taphonomy is the study of the manner in which materials become buried. More specifically, it addresses the inclusion of plant and animal remains into the fossil record; i.e., the transition from the biosphere to the lithosphere. This concept is important for both paleontologists and archaeologists, especially zooarchaeologists and paleoethnobotanists. It increased in importance as middle-range theory came to prominence in archaeological studies (Lyman 1994). Taphonomic analysis relies on both principles of uniformitarianism and actualistic studies performed by middle-range theorists. The concept of taphonomy introduces the idea that the fossil record is an imperfect subsample of the living community and that taphonomy provides a way in which to assess and explain its lack of completeness. While specific taphonomic data were not collected from the archaeological reports utilized in this thesis, it is important to keep in mind that taphonomic processes act on all faunal assemblages. Thus, my resulting data set is only a sample of the living faunal communities of the past.

Figure 7 diagrams the loss of information from the fossil record for a hypothetical faunal assemblage (after Clark and Kietzke 1967). Note that the decreasing size of the shaded area indicates the loss of information from the fossil record between each stage. "Exposure" can be by natural geological or physiological activities such as

erosion and/or purposeful excavation by paleontologists or archaeologists. I personally think that our activities as archaeologists are underrepresented in this diagram. The space between “collection” and “curation” also includes any sampling and analysis of the material that might be conducted by a researcher.

It is also important to remember here that the death assemblage is not necessarily an exact replica of the life assemblage. Shipman (1981) pointed out that even assemblages formed by catastrophic mortality may not completely reflect the living community. Furthermore, Klein and Cruz-Urbe (1984) emphasized that if an entire fossil assemblage (possibly the entire site?) is excavated then the fossil assemblage and the sample assemblage will be equivalent. Of course, this is usually the exception rather than the rule in excavation techniques.

A consideration of taphonomic processes by the faunal analyst also includes observations of surface modifications to bones. These can include various types of weathering, breakage, and burning. A detailed discussion of these concepts is not necessary here (the reader is referred to Lyman 1994 and Shipman 1981). It is sufficient to say that these factors, especially weathering, can affect recovery of a specimen and possibly its taxonomic identification.

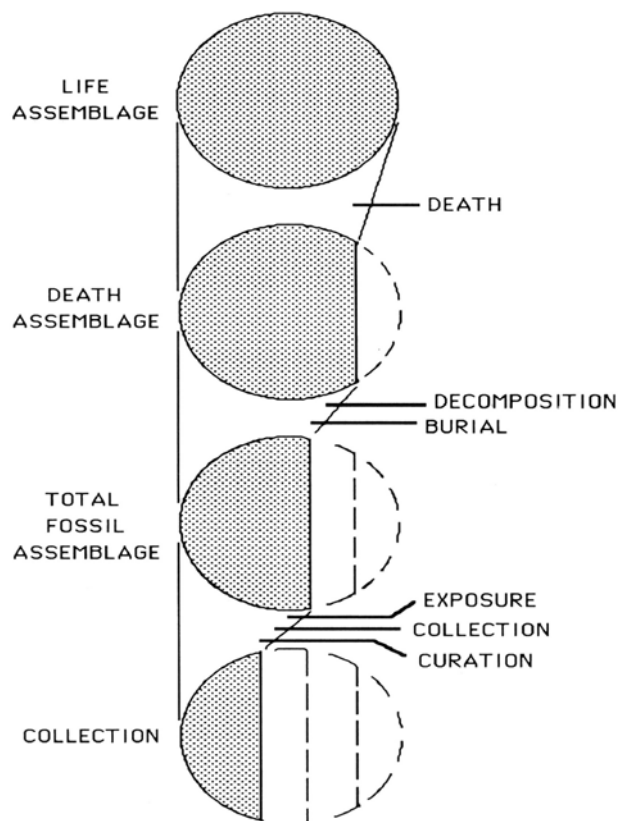


Figure 7. The Transition Between the Life Assemblage and the Analyzed Assemblage (Follows Clark and Kietzke 1967; Lyman 1994).

Zooarchaeological Theory

In their recent overview of the discipline, Reitz and Wing (1999) divided zooarchaeology into three aspects: methodological research, anthropological research, and biological research. Biological research as it pertains to zooarchaeology includes such subjects as domestication, animal morphology, and paleoenvironmental studies.

Biological research in zooarchaeology also adds to our understanding of zoogeography and historical ecology.

Zooarchaeology, as a subdiscipline of archaeology, is concerned with human-environment interactions. Reitz and Wing (1999:7) described evidence of this interaction in the archaeological record: “Most animal remains are the result of complex human and non-human behaviors with resources in the environment, cultural perceptions of those resources, and the technological repertoire used to exploit them.” Animals are mainly used by humans as sources of nutrition but may also contribute to the material culture of human society, be utilized as labor providers, or be associated with worldview or belief systems. To the best of my knowledge, the archaeological fauna referred to in this report were used as either food or labor resources.

Black (1989a) has expressed concern that making modern analogies to past environments in the TBP are not adequate. Merely comparing the archaeological record to the modern condition is inappropriate for the area because of the “extreme degree of historic alteration of the environment...” (Black 1989a:16). Black recommended merging modern analogy with historical accounts and paleoenvironmental data in order to make the most thorough evaluation of the paleoenvironment of the area, a recommendation I have tried to follow here.

As has been emphasized by the paleontological literature, careful identification of each specimen is imperative in faunal analysis. Taxonomic identifications are the baseline data set of any faunal analysis from any time period, and as has been stated previously, they are sometimes the only data set. Taxonomic identifications are usually

made by comparing archaeological material to a comparative collection of modern skeletal material of known species (Klein and Cruz-Uribe 1984). Specimens from the comparative collection should have provenience data, such as date and place of collection, so that geographic species can be more readily identified.

Methodological Problems

A certain level of trust in one's colleagues is required when conducting the kind of synthetic analysis of reported data that has been done here. The archaeological faunal record of the TBP has been evaluated by multiple analysts (mainly Davidson, Meissner, and Steele) using multiple comparative collections published over a span of approximately 30 years. A certain level of interobserver error is possible given these conditions. Furthermore, faunal analysts may have areas of taxonomic expertise that lead to better diagnoses of certain groups of animals over others.

As was demonstrated in Chapter IV, the archaeological faunal assemblages from the TBP tend to closely mirror the modern faunal community of the area (38 of the 62 mammal species recorded by Blair 1952 were recovered archaeologically). While it is my interpretation that this resemblance is a true one; i.e. the heterogeneous faunal communities of recent times extend into the archaeological past, other possibilities do exist. It is possible that a faunal analyst might unwittingly tend to match an archaeological assemblage to his or her own comparative collection. If the comparative collection were locally circumscribed this would limit the possibility of identifying

extralimital taxa. Rather, these taxa might be reported as merely unidentifiable rodent or unidentifiable reptile, etc.

The data are also limited in their time depth. Multiple assemblages are attributed to each archaeological time period from the Late Archaic through the nineteenth century. Limited material from two assemblages are available from the Middle Archaic. Archaeological material predating the Middle Archaic is available but not attributed to a particular time period. Time-collapsed analyses of faunal assemblages (see Appendix B) may be the unfortunate byproduct of budgetary or time constraints.

Archaeological faunal analysis has become increasingly sophisticated over the last 30 years of research done in south Texas. Quantitative techniques have become more important. In order to use the widest range of reports available, I chose to focus on the only aspect of the data that was consistently reported – species lists. The wide range of assemblage sizes also limits comparison of quantitative data.

The paucity of non-mammal faunal data is also cause for concern. There are several reasons why the assemblages considered in this report lack a significant number of reptile and amphibian species. First, it may be due to their relatively small numbers in the “life assemblage.” Second, it may be due to poor preservation. The cortical surface of reptile and amphibian bones tends to be porous and therefore the bones may be more susceptible to disintegration. Lyman (1994) cautioned that the taphonomy of reptiles and amphibians is still poorly known and needs further study. Finally, reptile and amphibian remains may have been lost due to screen recovery bias. The small size of many reptile and amphibian taxa, comparable to Shaffer and Sanchez’s

(1994) smallest experimental category, leads them to be lost from ¼ inch and possibly even 1/8 inch screens.

Steele and Demarcay (1986) evaluated the contribution of fine screening to the analysis of faunal remains recovered from 41LK201. They found that using ¼ inch screening alone at the site would have reduced the total amount of rodents recovered from 89% to only 10% of the total sample of faunal remains. The use of fine screening for artifact recovery also documented the importance of small fish to the economy of the site's inhabitants. The recovery of *Microtus* from the fine-screened matrix at 41LK201 has proven to be an important clue to the prehistoric environment of the area.

As a final point it should also be noted that the archaeological investigations conducted in southern Texas are not distributed equally across the area (Figure 6). Thus, the archaeological faunal community is not equally represented across space as well as time. The reader should keep in mind that much of the archaeological material of the pre-contact period comes from sites associated with the Choke Canyon Reservoir project, a state-sponsored example of infrastructure improvement. Also, much of the Spanish Colonial and nineteenth century material is from the San Antonio municipal area.

CHAPTER VII

SUMMARY AND CONCLUSIONS

This thesis has addressed several overall themes: paleoenvironment and paleobiogeography, human/environment interaction, the utility of attribute data, and methodological issues of faunal analysis. These themes can be viewed as a descending matter of scale, where paleoenvironment and paleobiogeography are large scale considerations and attribute data and aspects of zooarchaeological method are small scale considerations.

Regarding paleoenvironment and paleobiogeography, I have considered the distributions of flora and fauna across space and time within the Tamaulipan Biotic Province. Whenever possible, relevant aspects of the TBP were “bookended” temporally as well as spatially. For example, my synthesis of the archaeological faunal record of the TBP is compared to the Recent analyses of the area by Bailey (1905), Blair (1952), and Schmidly (2002), historical accounts reported by Weniger (1984), and Late Pleistocene analyses from central Texas (Graham 1976; Lundelius 1967; Toomey 1993) and the Chihuahuan Desert (Schmidly 1977). Late Pleistocene analyses of vegetation indicate a generalized drying trend for both the Chihuahuan Desert and central Texas since that time period. Analyses of Late Pleistocene faunal assemblages have reinforced this conclusion. My analysis of the archaeological fauna of the TBP corroborates the conclusions of Steele and colleagues (Presley 2000; Steele 1986a, 1986b; Steele and Assad Hunter 1986) that the modern faunal community was in place as far back as the

Archaic Period. However, the presence of aquatic/woodland adapted extralimital taxa implies that there was a greater availability of moist microhabitats in prehistory than in modern times.

Evidence of human/environment interaction is apparent in the post European contact period. This is not to say that the aboriginal inhabitants of the TBP never affected their environment. It is only that the effects of human impact were more obvious in the post-contact period. Historical accounts document the presence of “exotic” large taxa, the importance of domesticates, and the spread of mesquite scrub land at the expense of tall grass prairie. The advent of European settlement in the area marks an important turning point. Specifically, the introduction of grazing domesticates and the increases in human population led to significant changes in the environment of south Texas.

Regarding more small scale themes, this thesis represents a continuation of the paleontological tradition of utilizing assemblage attribute data. Nearly 20 years ago R. Lee Lyman promoted the usefulness of species list data for paleoenvironmental reconstruction of archeological sites. The presence of an individual specimen of a key taxon, faunal or botanical, in an archaeological assemblage can have significant implications. Lyman (1986) and others have stressed the importance of extralimital taxa for paleoenvironmental reconstruction. As was mentioned above, extralimital taxa noted in the archaeological fauna of the TBP may have critical implications for the paleoenvironment of the area.

It is important to remember that an archaeological faunal assemblage is an

imperfect sample of the living community it represents. It is up to the analyst to infer the communities of the past based on uniformitarian principles. Once-living faunal communities are subject to several filters. Cultural and taphonomic processes influence which members of the community become part of the fossil assemblage (Klein and Cruz-Uribe 1984). After excavation, the faunal material is then subject to analysis. The sophistication of this analysis has not been consistent over time and may be subject to interobserver error. Faunal analysis may also be limited by certain aspects of excavation bias such as screen size and geographic distribution of excavations. This was the case with the archaeological faunal assemblages of the TBP. Despite its limitations, it is my opinion that the archeological faunal record of the TBP has much to offer to future researchers in zoogeography, vertebrate paleontology and archaeology.

Human/environment interaction is perhaps the most important theme addressed in this thesis as well as for zooarchaeology as a discipline. I agree completely with Reitz and Wing's (1999:312) characterization of humanity as an agent of environmental change: "Human disturbance has complex and far-reaching consequences for plant and animal populations. This is not just a phenomenon limited to the industrial world and its burgeoning human population. The loss, change, and displacement of plant and animal species is found throughout time. To survive, all species must adjust to environmental changes and to other organisms with which they share the environment, move to ecological zones which meet their requirements, or survive as relict populations of a once widespread species." Human influence on the past environments of the TBP, when evaluated across time, can be seen as a matter of scale both in terms of population size

and type of cultural adaptation.

In final summation, there are two main points to be taken from this study. First, the archaeological faunal record of the Tamaulipan Biotic Province shows that members of the mixed biotic communities observed in the modern era have been in place since early in prehistory as demonstrated by Steele and colleagues (Presley 2000; Steele 1986a, 1986b; Steele and Assad Hunter 1986). Second, significant environmental changes, in terms of groundwater availability, vegetational distribution, and loss of faunal diversity, have been effected by the immigration of new human populations into the region and the non-native domesticates they introduced.

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APPENDIX A

DATA RECORDING SHEET

All taxonomic names follow Blair 1950 and 1952.

* Indicates Neotropical taxa.

County: _____

Page ___ of ___

Site number: _____

Site name: _____

Date/Time Period: _____

MAMMALS (62):

- | | |
|--|--|
| ___ <i>Aello megalophylla</i> | ___ <i>Geomys breviceps attwateri</i> |
| ___ <i>Antilocapra americana</i> | ___ <i>Geomys personatus</i> |
| ___ <i>Baiomys taylori taylori</i> * | ___ <i>Lasiurus borealis borealis</i> |
| ___ <i>Bassariscus astutus flavus</i> | ___ <i>Lasiurus cinerus</i> |
| ___ <i>Canis latrans</i> | ___ <i>Lepus californicus merriami</i> |
| ___ <i>Canis lupus monstrabilis</i> | ___ <i>Liomys irroratus texensis</i> * |
| ___ <i>Castor canadensis frondator</i> | ___ <i>Mephitis mephitis varians</i> |
| ___ <i>Citellus mexicanus parvidens</i> | ___ <i>Mormoops megalophylla senicula</i> * |
| ___ <i>Citellus spilosoma annectens</i> | ___ <i>Mustela frenata frenata</i> |
| ___ <i>Citellus tridecemlineatus texensis</i> | ___ <i>Myotis velifer incautus</i> |
| ___ <i>Conepatus leuconotus texensis</i> * | ___ <i>Nasua narica</i> * |
| ___ <i>Conepatus mesoleucus mearnsii</i> | ___ <i>Neotoma micropus micropus</i> |
| ___ <i>Cryptotis parva berlandieri</i> | ___ <i>Notiosorex crawfordi crawfordi</i> |
| ___ <i>Dasypterus intermedius</i> * | ___ <i>Nycticeius humeralis</i> |
| ___ <i>Dasypterus novemcinctus mexicanus</i> * | ___ <i>Odocoileus virginianus texanus</i> |
| ___ <i>Didelphis mesamericana</i> | ___ <i>Onychomys leucogaster longipes</i> |
| ___ <i>Didelphis virginiana texensis</i> * | ___ <i>Oryzomys palustris texensis</i> |
| ___ <i>Dipodomys ordii</i> * | ___ <i>Oryzomys couesi aquaticus</i> * |
| ___ <i>Felis cacomitli</i> * | ___ <i>Panthera onca onca</i> |
| ___ <i>Felis concolor stanleyana</i> | ___ <i>Perognathus hispidus hispidus</i> |
| ___ <i>Felis onca</i> * | ___ <i>Perognathus merriami merriami</i> |
| ___ <i>Felis pardalis albescens</i> * | ___ <i>Peromyscus eremicus eremicus</i> |
| ___ <i>Felis rufus texensis</i> | ___ <i>Peromyscus leucopus texanus</i> |
| ___ <i>Felis wiedii</i> * | ___ <i>Peromyscus maniculatus pallescens</i> |
| | ___ <i>Pipistrellus subflavus subflavus</i> |
| | ___ <i>Procyon lotor</i> |
| | ___ <i>Reithrodontomys fulvescens</i> |
| | ___ <i>intermedius</i> * |
| | ___ <i>Scalopus aquaticus texanus</i> |

___ *Sciurus niger limitis*
 ___ *Sigmodon hispidus berlandieri*
 ___ *Spilogale gracilis leucoparia*
 ___ *Spilogale putorius indianola*
 ___ *Sylvilagus audubonii parvulus*
 ___ *Sylvilagus floridanus chapmani*
 ___ *Tadarida mexicana*
 ___ *Taxidea taxus*
 ___ *Tayassu angulatum**
 ___ *Tayassu tajacu*
 ___ *Urocyon cinereoargenteus*
 ___ *Ursus sp.*

REPTILES (57):

___ *Arizona elegans*
 ___ *Cnemidophorus gularis*
 ___ *Coleonyx brevis*
 ___ *Coluber flagellum*
 ___ *Coniophanes imperialis*
 ___ *Crotalus atrox*
 ___ *Crotaphytus reticulatus*
 ___ *Drymarchon corais*
 ___ *Drymobius margaritiferus*
 ___ *Eumeces tetragrammus*
 ___ *Ficimia streckeri*
 ___ *Gopherus berlandieri*
 ___ *Holbrookia propinqua*
 ___ *Leptodeira septentrionalis*
 ___ *Natrix erythrogaster*
 ___ *Natrix rhombifera*
 ___ *Phrynosoma cornutum*
 ___ *Sceloporus cyanogenys*
 ___ *Sceloporus grammicus*
 ___ *Sceloporus olivaceus*
 ___ *Sceloporus undulatus*
 ___ *Sceloporus variabilis*
 ___ *Sonora taylori*
 ___ *Terrapene ornata*
 ___ *Thamnophis marcianus*
 ___ *Thamnophis sauritus*

AMPHIBIANS (22):

___ *Acris gryllus*
 ___ *Ambystoma tigrinum*
 ___ *Bufo compatilis*
 ___ *Bufo marinus (horribilis)*
 ___ *Bufo valliceps*
 ___ *Siren intermedia*
 ___ *Hyla baudinii*
 ___ *Hypopachus cuneus*
 ___ *Leptodactylus labialis*
 ___ *Microhyla olivacea*
 ___ *Pseudacris clarkii*
 ___ *Rana catesbiana*
 ___ *Rana pipiens*
 ___ *Syrrophus campi*
 ___ *Scaphiopus couchii*
 ___ *Triturus meridionalis*

APPENDIX B

TAXA LISTS BY TIME PERIOD AND SITE NAME AND/OR NUMBER

An * denotes mammal, reptile, or amphibian taxa not observed by Blair (1950, 1952). Blair's observations did not include birds and fish. Taxa names follow Davis 2002 and Schmidly 2002. All specimens are from 1/4" screened material unless otherwise noted.

LATE PLEISTOCENE

| | |
|---------------------------------------|---------------|
| County: Bexar | Passeriformes |
| Site Number: 41BX831 | |
| Site Name: Richard Beene (Applewhite) | FISH: |
| Date/Time Period: Late Pleistocene | None reported |
| Citation: Baker and Steele 1994 | |

MAMMALS:

Antilocapra/Odocoileus
Antilocapra americana
 Artiodactyla
Bassariscus astutus
 Cf. *Bassariscus astutus*
 Carnivora
 Leporidae
Odocoileus sp.
 Sciuridae
Sigmodon sp.
Sylvilagus sp.

REPTILES:

Chrysemys sensu lato
 Cf. *Chrysemys sensu lato*
 Serpentes
 Testudinata
Trionyx sp.

AMPHIBIANS:

Anurans

BIRDS:

Aves

LATE PALEOINDIAN

County: Bexar

Site Number: 41BX831

Site Name: Richard Beene (Applewhite)

Date/Time Period: Late Paleoindian

Citation: Baker and Steele 1994

MAMMALS:

Artiodactyla

Geomyidae

Leporidae

Neotoma sp.

REPTILES:

Serpentes

AMPHIBIANS:

None reported

BIRDS:

None reported

FISH:

Osteichthyes

EARLY ARCHAIC

County: Bexar
Site Number: 41BX831
Site Name: Richard Beene (Applewhite)
Date/Time Period: Early Archaic
Citation: Baker and Steele 1994

MAMMALS:

Antilocapra/Odocoileus
Antilocapra americana
Artiodactyla
Cf. *Canis*
Carnivora
Erethizon dorsatum
Geomyidae
Leporidae
Neotoma sp.
Odocoileus sp.
Sciuridae
Sigmodon sp.
Sylvilagus sp.

REPTILES:

Kinosternidae
Serpentes
Testudinata
Trionyx sp.

AMPHIBIANS:

None reported

BIRDS:

None reported

FISH:

Osteichthyes

MIDDLE ARCHAIC

County: Live Oak
 Site Number: 41LK201
 Site Name: Choke Canyon
 Date/Time Period: Middle Archaic
 Citation: Steele 1986b

MAMMALS:

Artiodactyla
*Bos bison**
Lepus californicus
Neotoma sp.
Odocoileus virginianus
Sigmodon hispidus
Sylvilagus audubonii
Taxidea taxus

REPTILES:

Testudines

AMPHIBIANS:

None reported

BIRDS:

Reported without taxon

FISH:

None reported

County: Live Oak
 Site Number: 41LK28
 Site Name: Loma Sandia
 Date/Time Period: late Middle Archaic
 Citation: Hellier, Steele, and Assad
 Hunter 1995

MAMMALS:

Bovidae*
 Canidae
 Felidae

*Geomys bursarius**
Geomys personatus
Lepus californicus
Lepus sp.
Liomys irroratus
Neotoma sp.
Odocoileus sp.
Peromyscus sp.
Scalopus aquaticus
 Sciuridae
Sigmodon hispidus
Spermophilus mexicanus
Sylvilagus sp.

REPTILES:

Agkistridon sp.*
*Chrysemys scripta**
Crotalus atrox
Crotalus sp.
Kinosternon sp.*
Terrapene sp.*
Trionyx sp.*

AMPHIBIANS:

None reported

BIRDS:

Bubo virginianus
Colinus virginianus

FISH:

Aplodinotus grunniens
Ictalurus sp.
Lepisosteus osseus
Lepisosteus sp.

County: Bexar
 Site Number: 41BX831

Site Name: Richard Beene (Applewhite)
Date/Time Period: Middle Archaic
Citation: Baker and Steele 1994

MAMMALS:

Antilocapra americana
Antilocapra/Odocoileus

REPTILES:

None reported

AMPHIBIANS:

None reported

BIRDS:

None reported

FISH:

None reported

LATE ARCHAIC

County: Bexar
 Site Number: 41BX126
 Site Name: Culebra Creek
 Date/Time Period: Late Archaic
 Citation: Meissner, Cargill, and Nickels
 1998

MAMMALS:

Canis sp.
Lepus californicus
Neotoma sp.
Odocoileus virginianus
Sciurus sp.
Sigmodon hispidus
Sylvilagus sp.

REPTILES:

Unidentified highly fragmented
 specimens

AMPHIBIANS:

Rana sp.

BIRDS:

None reported

FISH:

Aplodinotus grunniens

County: Live Oak
 Site Number: 41LK201
 Site Name: Choke Canyon
 Date/Time Period: Late Archaic
 Citation: Steele 1986b

MAMMALS:

Artiodactyla

Lepus californicus
Liomys irroratus
Microtus cf. *pinetorum**
Neotoma sp.
Odocoileus virginianus
Reithrodontomys sp.
Sigmodon hispidus
Sylvilagus audubonii
Pecari tajacu

REPTILES:

Gopherus berlandieri
 Testudines

AMPHIBIANS:

None reported

BIRDS:

Aves

FISH:

Aplodinotus sp.
 Ictaluridae

County: McMullen
 Site Number: 41MC222
 Site Name: Choke Canyon
 Date/Time Period: Late Archaic
 Citation: Steele and Assad Hunter 1986

MAMMALS:

*Bos bison**
Canis sp.
Felis sp.
Lepus sp.
Neotoma sp.
Odocoileus sp.
 Sciuridae
Sylvilagus sp.

REPTILES:

Chrysemys sp.*

Crotalus sp.
Testudines

AMPHIBIANS:
None reported

BIRDS:
None reported

FISH:
Lepisosteus sp.
Osteichthyes

Serpentes
Terrapene sp.

AMPHIBIANS:
Anurans

BIRDS:
Anas sp.
Meleagris sp.

FISH:
Aplodinotus sp.
Ictaluridae
Lepisosteus sp.

County: McMullen
Site Number: 41MC296
Site Name: Choke Canyon
Date/Time Period: Late Archaic
Citation: Steele and Assad Hunter 1986

MAMMALS:
Artiodactyla
*Bos bison**
Canis sp.
Didelphis sp.
Geomys sp.
Lepus sp.
Liomys irroratus
*Microtus pinetorum**
Neotoma sp.
Odocoileus sp.
Sciuridae
Sigmodon sp.
Spermophilus sp.
Sylvilagus audubonii

REPTILES:
Chrysemys sp.*
Crotalus sp.
Iguanidae
Kinosternon sp.
Sceloporus sp.

County: Refugio
Site Number: None reported
Site Name: Johnson site
Date/Time Period: cf. Late Archaic
Citation: Campbell 1947

MAMMALS:
*Bos bison**
Canis sp.
Lepus californicus
Odocoileus sp.
Pecari sp.
Procyon sp.
Thomomys sp.*

REPTILES:
Chelydra sp.
Terrapene sp.

AMPHIBIANS:
None reported

BIRDS:
Anatidae

Anas acuta None reported
Anas americana
Anas platyrhynchos
Buteo sp.
Gavia immer
Spatula clypeata

FISH:

Ballistes sp
Chaetodipterus sp.

County: Bexar
 Site Number: 41BX831
 Site Name: Richard Beene (Applewhite)
 Date/Time Period: Late Archaic
 Citation: Baker and Steele 1994

MAMMALS:

Antilocapra/Odocoileus
 Artiodactyla
Canis sp.
Castor canadensis
 Geomyidae
 Leporidae
Neotoma sp.
 Cf. *Neotoma* sp
Odocoileus sp.
Sylvilagus sp.

REPTILES:

Cf. *Chrysemys* sensu lato
 Serpentes
 Testudinata

AMPHIBIANS:

Anurans

BIRDS:

None reported

FISH:

**LATE ARCHAIC/
LATE PREHISTORIC**

County: Bexar
Site Number: 41BX377
Site Name: Camp Bullis
Date/Time Period: Late Archaic/Late Prehistoric
Citation: Gerstle, Kelly, and Assad 1978

MAMMALS:
*Odocoileus hemionus**
Odocoileus virginianus

REPTILES:
None reported

AMPHIBIANS:
None reported

BIRDS:
None reported

FISH:
None reported

County: Zavala
Site Number: 41ZV10
Site Name: Chaparossa Ranch -9
Date/Time Period: AD 1150+40 (Late Archaic/Late Prehistoric)
Citation: Davidson 1978

MAMMALS:
Artiodactyla
Bassariscus astutus
Geomys sp.
Lepus californicus
Mephitis mephitis

Neotoma sp.
Neotoma micropus
Odocoileus sp.
Odocoileus virginianus
Perognathus sp.
Procyon lotor
Sigmodon hispidus
Spermophilus spilosoma
Sylvilagus sp.

REPTILES:
Agkistridon sp.*
Cnemidophorus sp.
Coluber sp.
Crotalus sp.
Elaphe sp.*
Natrix sp.
Phrynosoma sp.
Pityophis sp.*
Terrapene sp.
Thamnophis sp.

AMPHIBIANS:
Rana sp.
Rana catesbiana
Rana pipiens

BIRDS:
None reported

FISH:
Lepisosteus sp.

County: Live Oak
Site Number: 41LK28
Site Name: Loma Sandia
Date/Time Period: Late Archaic/Late Prehistoric (Zone 1)
Citation: Hellier, Steele, and Assad Hunter 1995

MAMMALS:

Bovidae
 Canidae
Geomys personatus
Lepus sp.
Lepus californicus
Liomys irroratus
Mephitis mephitis
Neotoma sp.
Odocoileus sp.
*Ondatra zibethicus**
Perognathus sp.
Scalopus aquaticus
 Sciuridae
Sigmodon hispidus
Spermophilus mexicanus
Sylvilagus sp.
Taxidea taxus

REPTILES:

Agkistridon sp.*
*Chelydra serpentina**
Chrysemys sp.*
*Chrysemys scripta**
Crotalus sp.
Crotalus atrox
Kinosternon sp.*
Terrapene sp.
Trionyx sp.

AMPHIBIANS:

None reported

BIRDS:

Anas sp.
Bubo virginianus
Colinus virginianus
Spatula clyptea

FISH:

Chondrichthyes
 Osteichthyes

Aplodinotus grunniens
Ictalurus sp.
Lepisosteus sp.
Lepisosteus osseus

County: Live Oak
 Site Number: 41LK201
 Site Name: Choke Canyon
 Date/Time Period: Late Archaic/Late
 Prehistoric
 Citation: Steele 1986b

MAMMALS:

Artiodactyla
Baiomys taylori
Canis sp.
Felis rufus
Lepus californicus
Microtus cf. *pinetorum**
Odocoileus virginianus
Reithrodontomys sp.
Sciurus niger
Sigmodon hispidus
Sylvilagus audubonii

REPTILES:

Serpentes
 Testudines
Kinosternon sp.*
Terrapene ornata

AMPHIBIANS:

None reported

BIRDS:

Aves
Meleagris sp.

FISH:

Ictaluridae
Lepisosteus sp.

County: Nueces
 Site Number: 41NU102 and 41NU103
 Site Name: Oso Creek
 Date/Time Period: Late Archaic/Late
 Prehistoric
 Citation: Steele and Mokry 1983

MAMMALS:

*Bos bison**
Canis sp.
Didelphis virginiana
Geomys sp.
Lepus cf. *californicus*
Neotoma micropus
Odocoileus virginianus
Pecari tajacu
Perognathus hispidus
Sigmodon hispidus
Sylvilagus sp.

REPTILES:

Colubridae
Crotalus cf. *atrox*
Gopherus berlandieri
Phrynosoma cornutum

AMPHIBIANS:

Rana sp.

BIRDS:

Cf. *Colinus* sp.
 Cf. Rallidae

FISH:

Arius felis
Cynoscion arenarius
Cynoscion nebulosus
Micropogonius undulatus
Pogonius cromis
Sciaenops ocellata

County: Uvalde
 Site Number: 41UV48
 Site Name: none reported
 Date/Time Period: Late Archaic/LPH
 Citation: Lukowski 1987

MAMMALS:

*Canis domesticus**
Canis latrans
Lepus californicus
Microtus sp.*
Neotoma sp.
Odocoileus virginianus
Sigmodon hispidus
Spermophilus sp.
Sylvilagus audubonii
Taxidea taxus

REPTILES:

Crotalus sp.
*Elaphe guttata**
Masticophis sp.*

AMPHIBIANS:

None reported

BIRDS:

Meleagris gallopavo

FISH:

None reported

LATE PREHISTORIC

County: Live Oak
 Site Number: 41LK201
 Site Name: Choke Canyon
 Date/Time Period: Late Prehistoric
 Citation: Steele 1986b

MAMMALS:

Antilocapra americana
*Bos bison**
Canis sp.
Dasyopus novemcinctus (probably
 intrusive)
Didelphis virginiana
Lepus californicus
Liomys irroratus
Neotoma sp.
Odocoileus virginianus
*Ondatra zibethicus**
Pecari tajacu
Perognathus hispidus
Peromyscus sp.
Procyon lotor
Sciurus sp.
Sigmodon sp.
Sylvilagus audubonii
Sylvilagus floridanus
Taxidea taxus

REPTILES:

Alligator sp.*
Chrysemys sp.*
Crotalus sp.
Gopherus sp.
Kinosternon sp.*
Sceloporus sp.
 Serpentes
Terrapene cf. *ornata*
*Trionyx spiniferus**

AMPHIBIANS:

Anurans

BIRDS:

Aves
Meleagris gallopavo

FISH:

Aplodinotus grunniens
 Ictaluridae
Lepisosteus sp.

County: McMullen
 Site Number: 41MC222
 Site Name: Choke Canyon
 Date/Time Period: Late Prehistoric
 Citation: Steele and Assad Hunter 1986

MAMMALS:

Artiodactyla
*Bos bison**
Felis sp.
Lepus sp.
Neotoma sp.
Odocoileus virginianus
Pecari tajacu
Sciurus sp.
Sigmodon sp.
Spermophilus sp.
Sylvilagus sp.

REPTILES:

Alligator sp.*
Chrysemys sp.
Crotalus sp.
 Iguanidae
Terrapene sp.

AMPHIBIANS:

Anurans

BIRDS:

None reported

FISH:

Ictaluridae

Lepisosteus sp.

County: Jim Wells

Site Number: 41JW8

Site Name: Clemente and Hermina
HinojosaDate/Time Period: Late Prehistoric
Toyah Period (1250-1500 A.D.)

Citation: Hester 1977b; Steele 1986a

MAMMALS:

*Antilocapra americana**Antilocapra/Odocoileus**Bos bison***Canis latrans**Canis lupus**Chaetodipus* sp.

Cricetidae

*Cryptotis parva**Didelphis virginiana**Geomys* sp.*Lepus californicus**Mephitis* sp.*Microtus* cf. *pinetorum***Neotoma micropus**Odocoileus virginianus**Ondatra zibethicus***Pecari tajacu**Procyon lotor**Scalopus aquaticus**Sigmodon hispidus**Spermophilus* sp.*Spermophilus mexicanus**Sylvilagus audubonii*

REPTILES:

Chrysemys sp.**Coluber* sp.

Crotalidae

Crotalus sp.*Elaphe* sp.**Gopherus berlandieri**Nerodia* sp.*Pseudemys* sp.*

Serpentes

Terrapene ornata

Testudines

AMPHIBIANS:

Rana sp.

BIRDS:

Aves

Anatidae

Cf. *Adura* sp.*Meleagris gallopavo*

Falconiformes

Ardeidae

Geococcyx californianus

FISH:

Osteichthyes

Ictaluridae

Ictalurus sp.*Aplodinotus grunniens*

County: Zavala

Site Number: ZV123

Site Name: None reported

Date/Time Period: Late Prehistoric

Citation: Hester 1975

MAMMALS:

*Bos bison***Odocoileus virginianus**Sylvilagus audubonii**Sigmodon* sp.

REPTILES:

None reported

AMPHIBIANS:

None reported

BIRDS:

Mimus polyglottos

County: Zavala

Site Number: 41ZV152

Site Name: None reported

Date/Time Period: Late Prehistoric

Citation: Hester 1975

MAMMALS:

*Lepus californicus**Sigmodon* sp.*Spermophilus mexicanus**Sylvilagus audubonii*

REPTILES:

None reported

AMPHIBIANS:

None reported

BIRDS:

None reported

FISH:

Lepisosteus osseus

UID Fish

County: Bexar

Site Number: 41BX831

Site Name: Richard Beene (Applewhite)

Date/Time Period: Late Prehistoric

Citation: Baker and Steele 1994

MAMMALS:

Large Mammal

REPTILES:

Serpentes

AMPHIBIANS:

Anurans

BIRDS:

None reported

FISH:

None reported

**LATE PREHISTORIC/
PROTOHISTORIC**

County: McMullen
 Site Number: 41MC296
 Site Name: Choke Canyon
 Date/Time Period: Late Prehistoric/
 Protohistoric Scallorn Period (800 to
 1200 A.D.)
 Citation: Steele and Assad Hunter 1986

MAMMALS:

Antilocapra sp.
 Artiodactyla
*Bos bison**
Canis sp.
Geomys sp.
Lepus sp.
Neotoma sp.
Odocoileus sp.
Perognathus sp.
Scalopus sp.
 Sciuridae
Sigmodon sp.
Sylvilagus sp.

REPTILES:

Chrysemys sp.*
Crotalus sp.
 Iguanidae
Sceloporus sp.
 Serpentes
Terrapene sp.
*Trionyx spiniferus**

AMPHIBIANS:

Anurans
Rana sp.

BIRDS:

Aves
Meleagris sp.

FISH:

Osteichthyes
Aplodinotus sp.
Lepisosteus sp.
 Ictaluridae
Pomoxis sp.

County: McMullen
 Site Number: 41MC296
 Site Name: Choke Canyon
 Date/Time Period: Late Prehistoric/
 Protohistoric Perdiz Period (1200 to
 1700 A.D.)
 Citation: Steele and Assad Hunter 1986

MAMMALS:

Antilocapra sp.
*Bos bison**
Canis sp.
Geomys sp.
Lepus sp.
Neotoma sp.
Odocoileus sp.
Sigmodon sp.
Spermophilus sp.
Sylvilagus sp.

REPTILES:

Iguanidae
Chrysemys sp.
Crotalus sp.
Sceloporus sp.
Terrapene sp.

AMPHIBIANS:

Rana sp.
 Anurans

BIRDS:

Aves
Meleagris sp.

FISH:

Osteichthyes
Lepisosteus sp.
 Ictaluridae
Aplodinotus sp.

County: Zavala
 Site Number: 41ZV155
 Site Name: Tortuga Flat
 Date/Time Period: Late
 Prehistoric/Protohistoric
 Citation: Hester and Hill 1975

MAMMALS:

Antilocapra americana
 Antilocaprid
*Bos bison**
Canis latrans
*Cynomys ludovicianus**
Geomys sp.
*Geomys bursarius**
Lepus californicus
Marmota sp.*
Neotoma micropus
Odocoileus virginianus
Peromyscus sp.
Procyon lotor
Sigmodon hispidus
Sylvilagus floridanus
Sylvilagus sp.
Urocyon cinereoargenteus
 UID Artiodactyla
 UID Lagomorpha

REPTILES:

Elaphe sp.*
*Pituophis melanoleucus**
Terrapene sp.
 UID Testudinata

AMPHIBIANS:

None reported

BIRDS:

UID Bird

FISH:

UID Fish

County: Zavala
 Site Number: none reported
 Site Name: Holdsworth II
 Date/Time Period: Late
 Prehistoric/Protohistoric
 Citation: Hester and Hill 1975

MAMMALS:

Canis latrans
Cratogeomys sp.
*Cynomys ludovicianus**
Didelphis virginiana
Lepus californicus
Lynx rufus
Neotoma micropus
Odocoileus virginianus
Perognathus sp.
Peromyscus sp.
Sigmodon hispidus
Spermophilus mexicanus
Sylvilagus floridanus

REPTILES:

Coluber sp.
Crotalus sp.
Elaphe sp.
Phrynosoma cornutum
*Pituophis melanoleucus**
Pseudemys sp.
Terrapene ornata

AMPHIBIANS:

UID Frog

BIRDS:
UID Bird

FISH:
None reported

County: Zavala
Site Number: 41ZV14
Site Name: none reported
Date/Time Period: Late
Prehistoric/Protohistoric
Citation: Hester and Hill 1975

MAMMALS:
Lepus californicus
Neotoma micropus
Odocoileus virginianus
Sigmodon hispidus
Sylvilagus floridanus

REPTILES:
*Pituophis melanoleucus**
Pseudemys sp.
Terrapene ornata

AMPHIBIANS:
None reported

BIRDS:
None reported

FISH:
None reported

County: Zavala
Site Number: 41ZV60
Site Name: none reported
Date/Time Period: Late

Prehistoric/Protohistoric
Citation: Hester and Hill 1975

MAMMALS:
Artiodactyla
Canis latrans
Lepus californicus
Neotoma micropus
Odocoileus virginianus
Sigmodon hispidus
Sylvilagus floridanus

REPTILES:
Natrix sp.

AMPHIBIANS:
None reported

BIRDS:
Meleagris gallopavo

UID Bird

FISH:
Lepisosteus spatula

County: Medina
Site Number: 41ME7
Site Name: Scorpion Cave
Date/Time Period: Late
Prehistoric/Protohistoric
Citation: Hester 1975

MAMMALS:
Bassariscus astutus
Bovidae
Castor canadensis

Dasypus novemcinctus
Geomys sp.
Mephitis mephitis
Neotoma sp.
Odocoileus virginianus
Procyon lotor
Sigmodon sp.
Spermophilus mexicanus
Sylvilagus audubonii
Ursus americanus

REPTILES:

Coluber sp.
Crotalus atrox
Elaphe sp.
Kinosternon sp.
Terrapene ornata
Trionyx sp.

AMPHIBIANS:

Rana cf. *berlandieri*

BIRDS:

Anas cf. *discors*
Anas sp.
Branta canadensis
Buteo sp.
Meleagris gallopavo
Mimus polyglottos
Passer sp.

FISH:

None reported

SPANISH COLONIAL

County: Bexar
 Site Number: none reported
 Site Name: Alamo Plaza
 Date/Time Period: Spanish Colonial
 post 1700
 Citation: Fox, Bass, and Hester 1976

MAMMALS:

Bovidae
Canis sp.
Capra sp.*
Equus sp.
Lepus californicus
Neotoma sp.
Odocoileus virginianus
Ovis sp.*
Procyon lotor
Sciurus sp.
Sigmodon hispidus
*Sus scrofa**
Sylvilagus sp.

REPTILES:

Crotalus sp
Kinosternon sp.*
Pseudemys sp.*
Terrapene sp.
Trionyx sp.*
Zenaldura cf. *macroura**

AMPHIBIANS:

Rana sp.

BIRDS:

Chen sp.
Gallus gallus
Meleagris gallopavo

FISH:

Aplodinotus grunniens
Ictalurus sp.
Lepisosteus sp.
Micropterus sp.

County: Bexar
 Site Number: 41BX6
 Site Name: Alamo Shrine: Mission San
 Antonio de Valero
 Date/Time Period: Spanish Colonial
 ~1744
 Citation: Eaton 1980

MAMMALS:

Bovid
Capra sp.*
*Equus assinus**
Neotoma sp.
Odocoileus virginianus
*Rattus norvegicus**
Sciurus niger
Sylvilagus sp.

REPTILES:

None reported

AMPHIBIANS:

None reported

BIRDS:

Gallus gallus

FISH:

Ictalurus sp.

County: Bexar

Site Number: None reported
 Site Name: Alamo – south transept
 Date/Time Period: Spanish
 Colonial/Historic
 Citation: Meissner 1996

MAMMALS:

*Bos taurus**
*Canis familiaris**
*Capra hircus**
*Capra/Ovis**
Lepus californicus
Mephitis mephitis
*Mus musculus**
Oryzomys palustris
Pecari tajacu
Peromyscus maniculatus
*Rattus rattus**
Sciurus niger
Sigmodon hispidus
*Sus scrofa**
Sylvilagus sp.

REPTILES:

Trionyx sp.*

AMPHIBIANS:

None reported

BIRDS:

Gallus gallus
Meleagris gallopavo

FISH:

None reported

Date/Time Period: Spanish Colonial
 Citation: Meissner 1997b

MAMMALS:

Artiodactyla
 Bovid
*Bos taurus**
*Canis familiaris**
*Capra hircus**
*Capra/Ovis**
Equus sp.
Neotoma cf. *albigula*
Neotoma micropus
Odocoileus virginianus
Pecari tajacu
*Rattus rattus**
*Sus scrofa**
Sylvilagus sp.

REPTILES:

*Pseudemys scripta**
Trionyx sp.

AMPHIBIANS:

None reported

BIRDS:

Gallus gallus
Meleagris gallopavo

FISH:

None reported

County: Bexar
 Site Number: none reported
 Site Name: Spanish Governor's Palace

County: Bexar
 Site Number: none reported
 Site Name: Spanish Governor's Palace
 Park

Date/Time Period: Spanish Colonial
eighteenth century
Citation: Fox 1977

MAMMALS:

Bovid

Capra sp.*

Didelphis virginiana

*Sus scrofa**

REPTILES:

Trionyx sp.

UID Turtle

AMPHIBIANS:

None reported

BIRDS:

Gallus gallus

UID Bird

FISH:

Ictalurus furcatus

Lepisosteus sp.

Micropterus sp.

Pylodictis olivaris

*Capra hircus**

*Capra/Ovis**

Chiroptera

Didelphis virginiana

Equus cf. *asinus**

Equus cf. *caballus**

Felis concolor

Lepus californicus

Mephitis mephitis

Neotoma sp.

Odocoileus virginianus

*Ovis aries**

Pecari tajacu

Sciurus sp.

Sigmodon hispidus

*Sus scrofa**

Sylvilagus sp.

Urocyon cinereoargenteus

Ursus cf. *americanus*

REPTILES:

*Alligator mississippiensis**

*Chelydra serpentina**

Crotalus atrox

*Lampropeltis getulus**

Pituophis sp.*

Pseudemys sp.

Terrapene sp.

*Trionyx spiniferus**

AMPHIBIANS:

Bufo sp.

BIRDS:

Anatidae

Branta cf. *canadensis*

Gallus gallus

Meleagris gallopavo

FISH:

Aplodinotus grunniens

Ictalurus sp.

Lepisosteus sp.

County: Bexar

Site Number: 41BX438

Site Name: Mission San Antonio de
Valero (Alamo)

Date/Time Period: Spanish Colonial

Citation: Meissner 1999a

MAMMALS:

Antilocapra americana

*Bos bison**

*Bos taurus**

Canis cf. *familiaris**

Canis lupus

Micropterus sp.
Pylodictus punctatus

Trionyx sp.
Viperidae

AMPHIBIANS:

Bufo sp.

BIRDS:

Gallus gallus
Meleagris gallopavo

FISH:

None reported

County: Bexar
Site Number: 41BX3
Site Name: Mission San Jose
Date/Time Period: Spanish Colonial
Citation: Meissner 1998

MAMMALS:

Artiodactyla
Bovidae
*Bos taurus**
Canis latrans
Canis sp.
*Capra hircus**
*Capra/Ovis**
Didelphis virginianus
*Equus caballus**
*Felis domesticus**
Geomys sp.
Lepus californicus
Neotoma sp.
Odocoileus virginianus
*Ovis aries**
Pecari tajacu
Procyon lotor
*Rattus rattus**
Sciurus niger
Sigmodon hispidus
*Sus scrofa**
Sylvilagus sp.

REPTILES:

Colubridae
Crotalus atrox
Elaphe sp.*
*Lampropeltis getulus**
Pseudemys sp.
Testudinata

County: Bexar
Site Number: 41BX3
Site Name: Mission San Jose and
Mission Miguel de Aquayo
Date/Time Period: Spanish Colonial
Citation: Meissner 1999b

MAMMALS:

Artiodactyla
*Bos bison**
*Bos taurus**
Bovid
Canis sp.
*Capra hircus**
*Capra/Ovis**
Carnivora
Didelphis virginianus
Equus sp.*
Geomys sp.
Mephitis mephitis
Neotoma cf. *albigula*
Odocoileus virginianus
*Ovis aries**
Procyon lotor
*Rattus rattus**
Sciurus sp.

Sigmodon hispidus
*Sus scrofa**
Sylvilagus sp.

REPTILES:

*Alligator mississippiensis**
*Chelydra serpentina**
Chrysemys sp.
 Colubridae
Crotalus atrox
Lampropeltis sp.*
Pituophis sp.*
Pseudemys sp.*
 Serpentes
Terrapene sp.
Thamnophis sp.
Trionyx sp.*

AMPHIBIANS:

None reported

BIRDS:

Anser sp.
Branta sp.
Buteo sp.
 Columbidae
Gallus gallus

FISH:

Ictalurus sp.
Pylodictus oliverus

County: Bexar
 Site Number: 41BX4
 Site Name: Mission San Francisco de la Espada
 Date/Time Period: Spanish Colonial/Post-colonial
 Citation: Gross 1997

MAMMALS:

*Bos taurus**
*Bos taurus/bison**
*Capra/Ovis**
*Sus scrofa**
Sylvilagus sp.

REPTILES:

None reported

AMPHIBIANS:

None reported

BIRDS:

Gallus gallus
Meleagris gallopavo

FISH:

Ictalurus sp.

County: Goliad

Site Number: none reported

Site Name: Mission Espiritu Santo – Goliad State Park

Date/Time Period: Spanish Colonial

Citation: Hunziker and Fox 1998

MAMMALS:

Artiodactyla
*Bos taurus**
 Bovidae
 Rodentia
Sylvilagus sp.

REPTILES:

Testudinata
Trionyx sp.

AMPHIBIANS:

None reported

BIRDS:

Anser sp.
Meleagris gallopavo

FISH:

None reported

County: Goliad and Victoria
Site Number: 41GD1; 41GD2; 41VT11
Site Name: Mission Espiritu Santo de
Zuniga at Goliad; Mission Nuestra
Senora del Rosario; Mission Espiritu
Santo de Zuniga
Date/Time Period: Spanish Colonial
Citation: deFrance 1999

MAMMALS:

*Bos bison/taurus**
Canidae
*Canis familiaris**
Didelphis virginiana
*Equus asinus**
*Equus caballus**
Leporidae
Mephitis mephitis
Odocoileus virginianus
*Ovis/Capra**
Pecari tajacu
Rodentia
*Sus scrofa**
Sylvilagus sp.
Urocyon cinereoargenteus
Ursus cf. *americanus*

REPTILES:

Alligator mississippiensis
Apalone ferox
Emydidae
Gopherus berlandieri
Kinosternidae
Pseudemys sp.
Serpentes

AMPHIBIANS:

None reported

BIRDS:

Accipitridae
Anas platyrhynchos
Anatidae
Anser sp.
Charadriidae cf. *Puvialis* sp.
Chen sp.
Coragypus atratus
Corvus sp.
Cygnus sp.
Gallus gallus
Meleagris gallopavo
Tympanuchus cupido

FISH:

Carcarhinus sp.
Ictaluridae
Ictalurus sp.
Lepisosteus sp.

County: Wilson
Site Number: 41WN30
Site Name: Rancho de las Cabras
Date/Time Period: Spanish Colonial
Citation: Steele and DeMarcay 1985

MAMMALS:

Bos sp.*
*Capra hircus**
Capridae
Didelphis sp.
Geomys cf. *bursarius*
Mephitis cf. *mephitis*
Neotoma sp.
Odocoileus sp.
*Ovis aries**
Sigmodon sp.

Spermophilus sp.
*Sus scrofa**
Sylvilagus sp.

REPTILES:

Alligator sp.*
Chrysemys sp.*
Lampropeltis sp.*
 Testudines
Trionyx sp.*

AMPHIBIANS:

None reported

BIRDS:

Aves

FISH:

Ictalurus sp.

County: Bexar
 Site Number: none reported
 Site Name: San Pedro Acequia
 Date/Time Period: Spanish Colonial
 1700s
 Citation: Nickels, Cox, and Gibson
 1996

MAMMALS:

*Bos taurus**
Canis sp.
Didelphis virginianus
*Felis domesticus**
Oryzomys palustris
Procyon lotor
*Rattus rattus**
Sciurus niger
Sigmodon hispidus
*Sus scrofa**
Sylvilagus sp.

REPTILES:

Thamnophis sp.

AMPHIBIANS:

None reported

BIRDS:

Anatinae
Columba sp.
Gallus gallus
Meleagris gallopavo

FISH:

None reported

County: Maverick; Guerrero, Coahuila,
 Mexico
 Site Number: none reported
 Site Name: San Bernardo Mission --
 North
 Date/Time Period: Spanish Colonial
 turn of eighteenth century
 Citation: Hester and Hill 1973; Adams
 1976

MAMMALS:

Bassariscus astutus
 Bovidae
Canis latrans
Canis sp.
Capra sp.*
Castor canadensis
*Equus caballus**
Equus cf. *asinus**
Equus sp.*
Felis concolor
*Felis domesticus**
Lepus californicus
Lynx rufus
Mephitis mephitis
Neotoma sp.

Neotoma micropus
Odocoileus virginianus
Ovis sp.*
Pecari tajacu
Perognathus sp.
Perognathus hispidus
Peromyscus sp.
Procyon lotor
Sigmodon hispidus
Spermophilus sp.
Sylvilagus sp.
Taxidea taxus
Urocyon cinereoargenteus

REPTILES:

*Chelydra serpentina**
Crotalus sp.
Drymarchon corais
Elaphe sp.*
Gopherus sp.
Kinosternon sp.*
Pseudemys sp.*
Sceloporus sp.
Terrapene sp.
Trionyx sp.*
 UID Turtle

AMPHIBIANS:

Rana sp.
Rana catesbiana

BIRDS:

Anas cf. *cardinensis*
Gallus gallus
Geococcyx californianus
Meleagris gallopavo

FISH:

Aplodinotus grunniens
Ictalurus sp.
Lepisosteus sp.
Pylodictis olivaris
 UID fish

County: Maverick; Guerrero, Coahuila, Mexico

Site Number: none reported

Site Name: San Bernardo Mission – East and San Juan Bautista

Date/Time Period: Spanish Colonial ~1700

Citation: Davidson and Valdez 1976

MAMMALS:

*Bos taurus/bison**
Canis sp.
Canis latrans
Canis lupus
Capra sp.*
Didelphis virginiana
Equus cf. *asinus**
Equus cf. *caballus**
Felis concolor
Lepus californicus
Lynx rufus
Mephitis mephitis
Myotis sp.
Neotoma sp.
Neotoma micropus
Odocoileus virginianus
Ovis sp.*
Pecari tajacu
Perognathus sp.
Peromyscus sp.
Procyon lotor
Reithrodontomys sp.
 Rodentia
Sigmodon hispidus
*Sus scrofa**
Sylvilagus sp.
Tadarida mexicana
Taxidea taxus
Ursus americanus

REPTILES:

Coluber sp.
Crotalus atrox
Drymarchon sp.
Elaphe sp.*
Gopherus sp.
Masticophis sp.*
Pseudemys sp.*
Sceloporus sp.
Terrapene sp.
Trionyx sp.*
 UID Lizard
 UID Snake

AMPHIBIANS:

Bufo sp.
Rana sp.
Rana pipiens

BIRDS:

Anas sp.
Gallus gallus
Meleagris gallopavo
 UID Bird

FISH:

Aplodinotus grunniens
Ictalurus sp.
Ictalurus punctatus
Ictiobus cyprinellus
Lepisosteus sp.
Micropterus sp.
Pyladactis oliverus
 UID Fish

County: Medina
 Site Number: 41ME7
 Site Name: Scorpion Cave
 Date/Time Period: Spanish
 Colonial/aboriginal
 Citation: Hester 1975

MAMMALS:

Bassariscus astutus
 Bovidae
*Capra hircus**
Castor canadensis
Dasypus novemcinctus
Didelphis virginiana
Geomys sp.
Myotis velifer
Neotoma sp.
Odocoileus virginianus
Sciurus niger
Sigmodon sp.
*Sus scrofa**
Sylvilagus audubonii

REPTILES:

Coluber sp.
Crotalus atrox
Elaphe sp.
Kinosternon flavescens
Kinosternon sp.
Terrapene ornata
Trionyx sp.

AMPHIBIANS:

Rana cf. *berlandieri*

BIRDS:

Anas cf. *discors*
Anas sp.
Branta canadensis
Buteo sp.
Meleagris gallopavo
Mimus polyglottos
Passer sp.

FISH:

Aplodinotus grunniens

NINETEENTH CENTURY

County: Bexar
 Site Number: none reported
 Site Name: Spanish Governor's Palace
 Park (Alamo)
 Date/Time Period: nineteenth century
 Citation: Fox 1977

MAMMALS:

Bovidae
Canis sp.
Capra sp.*
Odocoileus virginianus
Rattus sp.*
*Rattus norvegicus**
Sigmodon hispidus

REPTILES:

None reported

AMPHIBIANS:

None reported

BIRDS:

Anas sp.
Gallus gallus
Meleagris gallopavo

FISH:

UID Fish

County: Bexar
 Site Number: 41BX634; 41BX635;
 41BX637
 Site Name: Las Tiendas
 (Vanderstratton site; Faska site; Mueller
 site)
 Date/Time Period: Late eighteenth and
 nineteenth centuries
 Citation: Fox 1977

MAMMALS:

*Bos taurus**
*Canis familiaris**
*Capra hircus**
Didelphis virginianus
*Felis domesticus**
Geomys sp.
Geomys personatus
Lepus californicus
*Mus musculus**
Neotoma sp.
Odocoileus virginianus
Pecari tajacu
*Rattus norvegicus**
Sciurus niger
*Sus scrofa**
Sylvilagus sp.

REPTILES:

None reported

AMPHIBIANS:

Bufo sp.
Rana catesbiana
Scaphiophus sp.

BIRDS:

Anas cf. *americana*
Anas cf. *discors*
Anas cf. *platyrhyncos*
Branta canadensis
Cardinalis cardinalis
Colinus virginianus
Columba livia
Gallus gallus
Icterus cf. *galbula*
Mimus polyglottos
Passer domesticus
Zenaida macroura

FISH:

Aplodinotus grunniens
Archosargus probatocephalus
Cynoscion nebulosus
Cyprinus carpio
Ictalurus cf. melas
Ictalurus punctatus
Lepomis sp.
Micropterus salmoides
Pogonius cromis
Sciaenops ocellatus

County: Bexar
 Site Number: multiple – see below
 Site Name: Alamodome sites
 Date/Time Period: mid-late 1800s
 Citation: Meissner 1997a

MAMMALS:

*Bos taurus**
Canis sp.
*Canis familiaris**
*Capra hircus**
*Capra/Ovis**
Dasypus novemcinctus
Didelphis virginianus
 Equid
*Erethizon dorsatum**
 Felidae
*Felis domesticus**
Geomys sp.
Lepus californicus
Neotoma sp.
Odocoileus virginianus
Ovis sp.*
Pecari tajacu
*Rattus rattus**
Sciurus niger
Sigmodon hispidus
*Sus scrofa**
Sylvilagus sp.

REPTILES:

Testudinata

AMPHIBIANS:

None reported

BIRDS:

Anas platyrhynchos
Anas sp.
Branta canadensis
 Columbidae
Gallus gallus
Meleagris gallopavo
 Phasianidae
Turdus migratorius

FISH:

Aplodinotus grunniens
Ictalurus sp.
Micropterus sp.
Perna flavescens

ALAMODOME SITE NAMES AND NUMBERS:

| | |
|---------|-------------------|
| 41BX881 | Oeffinger site |
| 41BX882 | Haas site |
| 41BX883 | King site |
| 41BX884 | Griesen Peck site |
| 41BX885 | Mendit Shop site |
| 41BX890 | Biesenbach site |
| 41BX891 | Horn site |
| 41BX892 | Rilling site |
| 41BX893 | Czernecki site |
| 41BX895 | Garza Store site |
| 41BX896 | Demazieres site |
| 41BX897 | Webb site |
| 41BX898 | E. Glaeser site |
| 41BX900 | Gordon site |
| 41BX926 | Doering site |
| 41BX927 | Schulze site |

41BX928 Eckenroth site
41BX930 Ries Well site
41BX931, 41BX932, and 41BX936 to
41BX944 Runge Street sites
41BX945 Pauly site
41BX956 W. Hoefgen site

UNDATED ASSEMBLAGES

County: Goliad
 Site Number: 41GD30A
 Site Name: Berger Bluff (Coletto Creek)
 Date/Time Period: Paleoindian to Late
 Prehistoric/Historic
 Citation: Flynn 1983

MAMMALS:

*Bos bison/taurus**
Canis latrans
Canis sp.
*Capra/Ovis**
Didelphis virginianus
Dipodomys sp.
Geomys sp.
Lepus californicus
Lynx rufus
Mephitis mephitis
*Microtus pinetorum**
Neotoma sp.
Odocoileus virginianus
Pecari tajacu
Perognathus sp.
Procyon lotor
Reithrodontomys sp.
Scalopus aquaticus
Sciurus niger
Sigmodon hispidus
*Sus scrofa**
Sylvilagus floridanus

REPTILES:

Agkistridon contortix
Agkistridon piscivorous
Chelydra serpentina
Chrysemys scripta
Chrysemys cocinna
Elaphe guttata
Elaphe obsoleta
Heterodon nasicus
Natrix sp.

Pituophis melanoleucus
Trionyx spiniferus

AMPHIBIANS:

None reported

BIRDS:

None reported

FISH:

Lepisosteus osseus
Lepisosteus sp.
Miropterus sp.

County: Bexar
 Site Number: 41BX36
 Site Name: Fort Sam Houston (Camp
 Bullis)
 Date/Time Period: Paleoindian to Late
 Prehistoric
 Citation: Gerstle, Kelly, and Assad
 1978

MAMMALS:

Antilocapra americana
*Bos bison**
*Bos sp.**
Canis sp.
Geomys bursarius
Lepus californicus
*Microtus sp.**
Neotoma sp.
Odocoileus virginianus
Pecari tajacu
Perognathus sp.
Peromyscus sp.
Procyon lotor
Sciurus niger
Sigmodon hispidus
Spermophilus mexicanus
*Sus scrofa**

Sylvilagus floridanus
Thomomys sp.

REPTILES:

Sceloporus sp.
UID Snake
UID Turtle

AMPHIBIANS:

Rana sp.

BIRDS:

Cassidix mexicanus
Cathartes aura
Colinus virginianus
Polyborus audubonii
Zenaidura macroura

FISH:

None reported

County: Bexar
Site Number: 41BX300
Site Name: Salado Creek
Date/Time Period: Early Archaic to
Late Prehistoric
Citation: Katz 1987

MAMMALS:

Antilocapra americana
Dasypus novemcinctus
Odocoileus virginianus
Pecari tajacu
Procyon lotor
Sigmodon hispidus
Sylvilagus floridanus

REPTILES:

Chelydra serpentina

AMPHIBIANS:

None reported

BIRDS:

Caracara cheirway

FISH:

None reported

County: Medina

Site Number: 41ME7

Site Name: Scorpion Cave

Date/Time Period: Archaic to Historic

Citation: Highley et al. 1978

Note: Analysis of faunal remains by
time period on file at the Center for
Archaeological Research, University of
Texas at San Antonio

MAMMALS:

Bassariscus astutus

Bovid

Canis sp.

Capra sp.*

Castor canadensis

Didelphis virginiana

Geomys personatus

Mephitis mephitis

Myotis sp.

Myotis velifer

Neotoma sp.

Odocoileus virginianus

Procyon lotor

Sciurus niger

Sigmodon hispidus

Spermophilus mexicanus

*Sus scrofa**

Sylvilagus sp.

Ursus americanus

REPTILES:

Coluber sp.

Crotalus atrox

Elaphe sp.
Kinosternon flavescens
Pituophis sp.
Pseudemys sp.
Terrapene ornata
Trionyx sp.

AMPHIBIANS:

Rana sp.
Rana pipiens

BIRDS:

Anas sp.
Anas carolinensis
Branta canadensis
Bunto sp.
Dendroica sp.
Gallus gallus
Meleagris gallopavo
Mimus polyglottis
Passerella cf. iliaca

FISH:

Aplodinotus grunniens
Pylodictis olivaris

County: San Patricio
 Site Number: 41SP158
 Site Name: None reported
 Date/Time Period: None reported
 Citation: Baker 1994

MAMMALS:

Antilocapra/Odocoileus
Bos bison/taurus
Canis sp.
 Cricetidae
 Leporidae
Odocoileus sp.

Pecari/Sus
Procyon lotor
Sus scrofa (intrusive)
Sylvilagus sp.

REPTILES:

Colubridae
 Emydidae
 Serpentes
 Testudinata
 Viperidae

AMPHIBIANS:

None reported

BIRDS:

Aves

FISH:

Arius felis
 Chondrichthyes
Cynoscion nebulosus
Micropogonias undulatus
 Osteichthyes
 Perciformes
Pogonias cromis
 Sciaenidae
Sciaenops ocellata
 Siluriformes
 Sparidae

County: Live Oak
 Site Number: 41LK201
 Site Name: Choke Canyon
 Date/Time Period: non-specific
 Citation: DeMarcay and Steele 1986
 Note: list represents taxa reported only
 from 1/8" fine screened matrix

MAMMALS:

Baiomys sp.

*Microtus cf. pinetorum**
Reithrodontomys sp.

REPTILES:

None reported

AMPHIBIANS:

None reported

BIRDS:

None reported

FISH:

None reported

APPENDIX C

ARCHAEOLOGICAL FAUNA OF THE TAMAULIPAN BIOTIC PROVINCE

BY PERIOD

RODENTS OF THE TAMAULIPAN BIOTIC PROVINCE:

| TAXON | MIDDLE ARCH. | LATE ARCH. | LA/ LPH | LATE PRE- HIST. | LPH/ PROTO- HIST. | SPANISH COLONIAL | 19 th CENT. |
|--------------------------------|-----------------|---------------|------------|-----------------------|-------------------------|---------------------|---------------------------|
| Found in Blair 1952 | | | | | | | |
| <i>Baiomys taylori</i> | | | X | | | | |
| <i>Castor canadensis</i> | | | | | X | X | |
| <i>Chaetodipus hispidus</i> | | | X | X | | | |
| <i>Chaetodipus</i> sp. | | | X | | X | X | |
| <i>Geomys personatus</i> | X | | X | | | | |
| <i>Geomys</i> sp. | X | X | X | X | X | X | X |
| <i>Liomys irroratus</i> | | | X | X | | | |
| <i>Myotis velifer</i> | | | | | | X | |
| <i>Neotoma micropus</i> | | | X | X | X | X | |
| <i>Neotoma</i> sp. | X | X | | | | | X |
| <i>Oryzomys palustris</i> | | | | | | X | |
| <i>Peromyscus</i> sp. | X | | | X | X | X | |
| <i>Reithrodontomys</i> sp. | | X | X | | | X | |
| <i>Sciurus niger</i> | | | X | | | X | X |
| <i>Sciurus</i> sp. | | X | | | | | |
| <i>Sigmodon hispidus</i> | X | X | X | X | X | X | X |
| <i>Spermophilus mexicanus</i> | X | | X | X | | | |
| <i>Spermophilus spilosoma</i> | | | | | X | | |
| <i>Spermophilus</i> sp. | | X | | X | X | X | |
| Not Found in Blair 1952 | | | | | | | |
| <i>Cratogeomys</i> sp. | | | | | X | | |
| <i>Cynomys ludovicianus</i> | | | | | X | | |
| <i>Erethizon dorsatum</i> | | | | | | | X |
| <i>Marmota</i> sp. | | | | | X | | |
| <i>Microtus pinetorum</i> | | X | X | X | | | |
| <i>Microtus</i> sp. | | | X | | | | |
| <i>Neotoma albigula</i> | | | | | | X | |
| <i>Ondatra zibethicus</i> | | | X | X | | | |

CARNIVORES OF THE TAMAULIPAN BIOTIC PROVINCE

| TAXON | MIDDLE ARCH. | LATE ARCH. | LA/ LPH | LATE PRE- HIST. | LPH/ PROTO- HIST. | SPANISH COLONIAL | 19 th CENT. |
|---------------------------------|-----------------|---------------|------------|-----------------------|-------------------------|---------------------|---------------------------|
| Found in Blair 1952 | | | | | | | |
| <i>Bassariscus astutus</i> | | | X | | X | X | |
| <i>Canis sp.</i> | | X | | | | | X |
| <i>Canis latrans</i> | | | X | X | X | X | |
| <i>Canis lupus</i> | | | | X | | X | |
| <i>Felis sp.</i> | | X | | X | | | |
| <i>Lynx rufus</i> | | | X | | X | | |
| <i>Mephitis sp.</i> | | | | X | | | |
| <i>Mephitis mephitis</i> | | | X | | X | | |
| <i>Procyon lotor</i> | | | X | X | X | X | |
| <i>Puma concolor</i> | | | | | | X | |
| <i>Taxidea taxus</i> | X | | X | X | | X | |
| <i>Urocyon cinereoargenteus</i> | | | | X | X | X | |
| <i>Usus americanus</i> | | | | | X | X | |

OTHER MAMMALS OF THE TAMAULIPAN BIOTIC PROVINCE

| TAXON | MIDDLE ARCH. | LATE ARCH. | LA/ LPH | LATE PRE- HIST. | LPH/ PROTO HIST. | SPANISH COLONIAL | 19 th CENT. |
|-------------------------------|-----------------|---------------|------------|-----------------------|------------------------|---------------------|---------------------------|
| DIDELPHIMORPHIA | | | | | | | |
| <i>Didelphis virginiana</i> | | X | X | X | X | X | X |
| XENARTHRA | | | | | | | |
| <i>Dasypus novemcinctus</i> | | | | X | | | X |
| INSECTIVORA | | | | | | | |
| <i>Cryptotis parva</i> | | | | X | | | |
| <i>Scalopus</i> sp. | | | | | X | | |
| <i>Scalopus aquaticus</i> | X | X | X | | | | |
| CHIROPTERA | | | | | | | |
| <i>Tadarida mexicana</i> | | | | | | X | |
| ARTIODACTYLA | | | | | | | |
| <i>Antilocapra americana</i> | | | | X | X | X | |
| <i>Bison bison</i> * | X | X | X | X | X | X | |
| <i>Odocoileus hemionus</i> * | | | X | | | | |
| <i>Odocoileus virginianus</i> | X | X | X | | X | X | X |
| <i>Pecari tajacu</i> | | X | X | X | | X | X |
| LAGOMORPHA | | | | | | | |
| <i>Lepus californicus</i> | X | | | X | X | X | X |
| <i>Sylvilagus</i> sp. | | | X | | X | X | X |
| <i>Sylvilagus audubonii</i> | X | X | X | X | | | X |
| <i>Sylvilagus floridanus</i> | | | | X | X | | |

* Not found in Blair 1952.

APPENDIX D

INDEX OF SCIENTIFIC AND COMMON NAMES

Index includes all current scientific names, their historical synonyms (per Bailey (1905) and/or Blair (1950, 1952)) and common name equivalents. Current scientific names follow Schmidly (2002), Dixon (2002), the American Ornithologists Union (1998), Oberholser (1974), and Hoese and Moore (1977).

MAMMALS

| Old Name | Current Name | Common Name |
|------------------------------|---|----------------------------|
| <i>Antilocapra americana</i> | <i>Antilocapra americana</i> (Ord) | Pronghorn |
| <i>Peromyscus taylori</i> | <i>Baiomys taylori</i> (Thomas) | Northern Pygmy Mouse |
| <i>Bassariscus astutus</i> | <i>Bassariscus astutus</i> (Lichtenstein) | Ringtail |
| <i>Bison bison</i> | <i>Bos bison</i> (Linnaeus) | Bison |
| <i>Canis estor</i> | <i>Canis latrans</i> (Say) | Coyote |
| <i>Canis ater</i> | <i>Canis lupus</i> (Linnaeus) | Gray Wolf |
| <i>Castor canadensis</i> | <i>Castor canadensis</i> (Kuhl) | American Beaver |
| <i>Cratogeomys</i> | <i>Cratogeomys</i> sp. (Baird) | Yellow-faced Pocket Gopher |
| <i>Perognathus hispidus</i> | <i>Chaetodipus hispidus</i> (Baird) | Hispid Pocket Mouse |
| <i>Blarina parva</i> | <i>Cryptotis parva</i> (Say) | Least Shrew |
| <i>Cynomys ludovicianus</i> | <i>Cynomys ludovicianus</i> (Ord) | Black-tailed Prairie Dog |
| <i>Tatu novemcinctum</i> | <i>Dasybus novemcinctus</i> (Linnaeus) | Nine-banded Armadillo |
| <i>Didelphis marsupialis</i> | <i>Didelphis virginiana</i> (Kerr) | Virginia Opossum |
| <i>Erethizon epixanthum</i> | <i>Erethizon dorsatum</i> (Linnaeus) | Porcupine |
| <i>Geomys personatus</i> | <i>Geomys personatus</i> (True) | Texas Pocket Gopher |
| <i>Lepus merriami</i> | <i>Lepus californicus</i> (Gray) | Black-tailed Jackrabbit |
| <i>Heteromys alleni</i> | <i>Liomys irroratus</i> (Gray) | Mexican Spiny Pocket Mouse |
| <i>Lynx rufus</i> | <i>Lynx rufus</i> (Schreber) | Bobcat |
| <i>Mephitis mesomelas</i> | <i>Mephitis mephitis</i> (Schreber) | Striped Skunk |
| <i>Microtus pinetorum</i> | <i>Microtus pinetorum</i> (Le Conte) | Woodland Vole |
| <i>Myotis velifer</i> | <i>Myotis velifer</i> (J.A. Allen) | Cave Myotis |
| <i>Neotoma albigula</i> | <i>Neotoma leucodon</i> (Hartley) | White-throated Woodrat |
| <i>Neotoma micropus</i> | <i>Neotoma micropus</i> (Baird) | Southern Plains Woodrat |
| <i>Odocoileus hemionus</i> | <i>Odocoileus hemionus</i> (Rafinesque) | Mule Deer |
| <i>Odocoileus couesi</i> | <i>Odocoileus virginianus</i> (Boddaert) | White-tailed Deer |
| <i>Fiber zibethicus</i> | <i>Ondatra zibethicus</i> (Linnaeus) | Muskrat |
| <i>Oryzomys palustris</i> | <i>Oryzomys palustris</i> (Harlan) | Marsh Rice Rat |
| <i>Tayassu angulatum</i> | <i>Pecari tajacu</i> (Linnaeus) | Collared Peccary |
| <i>Procyon lotor</i> | <i>Procyon lotor</i> (Linnaeus) | Raccoon |
| <i>Felis cougar</i> | <i>Puma concolor</i> (Linnaeus) | Mountain Lion |
| <i>Reithrodontomys</i> | <i>Reithrodontomys</i> sp. (Baird) | Harvest Mouse |
| <i>Scalopus aquaticus</i> | <i>Scalopus aquaticus</i> (Linnaeus) | Eastern Mole |
| <i>Sciurus ludovicianus</i> | <i>Sciurus niger</i> (Linnaeus) | Eastern Fox Squirrel |
| <i>Sigmodon hispidus</i> | <i>Sigmodon hispidus</i> (Say and Ord) | Hispid Cotton Rat |

| Old Name | Current Name | Common Name |
|--------------------------------|--|-------------------------|
| <i>Citellus mexicanus</i> | <i>Spermophilus mexicanus</i> (Erxleben) | Mexican Ground Squirrel |
| <i>Citellus spilosoma</i> | <i>Spermophilus spilosoma</i> (Bennett) | Spotted Ground Squirrel |
| <i>Lepus arizonae</i> | <i>Sylvilagus audubonii</i> (Baird) | Desert Cottontail |
| <i>Lepus floridanus</i> | <i>Sylvilagus floridanus</i> (Allen) | Eastern Cottontail |
| <i>Nyctinomus mexicanus</i> | <i>Tadarida taxis</i> (I. Geof. St.-Hilaire) | Mexican Free-tailed Bat |
| <i>Taxidea taxus</i> | <i>Taxidea taxus</i> (Schreber) | Badger |
| <i>Urocyon cineroargenteus</i> | <i>Urocyon cineroargenteus</i> (Schreber) | Gray Fox |
| <i>Ursus americanus</i> | <i>Ursus americanus</i> (Pallas) | Black Bear |

REPTILES

| Current Name | Common Name |
|---|---------------------------------|
| <i>Agkistridon contortix</i> (Baird) | Copperhead |
| <i>Agkistridon piscivorous</i> (Stejneger) | Cottonmouth |
| <i>Alligator mississippiensis</i> (Gray) | American Alligator |
| <i>Chelydra serpentina</i> (Schweigger) | Snapping Turtle |
| <i>Chrysemys picta</i> (Gray) | Painted Turtle |
| <i>Cnemidophorus</i> sp. (Wagler) | Whiptail Snakes |
| <i>Coluber</i> sp. (Linnaeus) | Racer |
| <i>Crotalus atrox</i> (Baird and Girard) | Western Diamondback Rattlesnake |
| <i>Drymarchon corais</i> (Amaral) | Indigo Snake |
| <i>Elaphe guttata</i> (Dumeril) | Corn Snake |
| <i>Elaphe obsoleta</i> (Garman) | Rat Snake |
| <i>Gopherus berlandieri</i> (Stejneger) | Texas Tortoise |
| <i>Heterodon nasicus</i> (Baird and Girard) | Western Hog-nosed Snake |
| <i>Kinosternon</i> sp. (Spix) | Mud Turtle |
| <i>Lampropeltis getula</i> (Cope) | Common King Snake |
| <i>Masticophis</i> sp. (Baird and Girard) | Whip Snake |
| <i>Nerodia</i> sp. (Baird and Girard) | Water Snake |
| <i>Phrynosoma cornutum</i> (Gray) | Texas Horned Lizard |
| <i>Pituophis ruthveni</i> (Conant) | Louisiana Pine Snake |
| <i>Pseudemys concinna</i> (Gray) | River Cooter |
| <i>Sceloporus</i> sp. (Weigmann) | Spiny Lizard |
| <i>Terrapene ornata</i> (Baur) | Western Box Turtle |
| <i>Thamnophis</i> sp. (Fitzinger) | Garter Snake |
| <i>Trionyx spiniferus</i> (Le Sueur) | Spiny Soft-shelled Turtle |

AMPHIBIANS

| Current Name | Common Name |
|-----------------------------------|-----------------------|
| <i>Bufo</i> sp. (Laurenti) | Toad |
| <i>Rana catesbiana</i> (Shaw) | Bullfrog |
| <i>Rana pipiens</i> (Schreber) | Northern Leopard Frog |
| <i>Scaphiophus</i> sp. (Holbrook) | Spadefoot Toad |

BIRDS**Current Name****Common Name**

| | |
|--|----------------------|
| <i>Anas cf. americana</i> (Gmelin) | American Wigeon |
| <i>Anas cf. discors</i> (Linnaeus) | Blue-Winged Teal |
| <i>Anas cf. platyrhynchos</i> (Linnaeus) | Mallard |
| <i>Anas clyptea</i> (Linnaeus) | Northern Shoveler |
| <i>Anser</i> sp. (Linnaeus) | Goose |
| <i>Branta canadensis</i> (Linnaeus) | Canada Goose |
| <i>Bubo virginianus</i> Gmelin | Great Horned Owl |
| <i>Buteo</i> sp. (LaCepede) | Hawk |
| <i>Caracara audubonii</i> (Merriam) | Caracara |
| <i>Cardinalis cardinalis</i> (Linnaeus) | Northern Cardinal |
| <i>Cathartes aura</i> (Linnaeus) | Turkey Vulture |
| <i>Chen</i> sp. (Boie) | Goose |
| <i>Colinus virginianus</i> (Linnaeus) | Northern Bobwhite |
| <i>Columba livia</i> (Gmelin) | Rock Dove |
| <i>Geococcyx californianus</i> (Lesson) | Greater Roadrunner |
| <i>Icterus cf. galbula</i> (Linnaeus) | Baltimore Oriole |
| <i>Quiscalus mexicanus</i> (Gmelin) | Great-Tailed Grackle |
| <i>Meleagris gallopavo</i> (Linnaeus) | Wild Turkey |
| <i>Mimus polyglottos</i> (Linnaeus) | Northern Mockingbird |
| <i>Passer domesticus</i> (Linnaeus) | House Sparrow |
| <i>Turdus migratorius</i> (Linnaeus) | American Robin |
| <i>Zenaidura macroura</i> (Linnaeus) | Mourning Dove |

FISH**Current Name****Common Name**

| | |
|--|--------------------|
| <i>Aplodinotus grunniens</i> (Rafinesque) | Freshwater Drum |
| <i>Archosargus probatocephalus</i> (Walbaum) | Sheepshead |
| <i>Arius felis</i> (Linnaeus) | Sea Catfish |
| <i>Cynoscion arenarius</i> (Ginsberg) | Sand Seatrout |
| <i>Cynoscion nebulosus</i> (Cuvier) | Spotted Seatrout |
| <i>Cyprinus carpio</i> (Linnaeus) | Carp |
| <i>Ictalurus punctatus</i> (Linnaeus) | Channel Catfish |
| <i>Ictiobus cyprinellus</i> (Rafinesque) | Smallmouth Buffalo |
| <i>Lepisosteus osseus</i> (Linnaeus) | Gar |
| <i>Lepomis</i> sp. (Rafinesque) | Sunfish |
| <i>Micropogon undulatus</i> (Linnaeus) | Atlantic Croaker |
| <i>Micropterus salmoides</i> (Lacepede) | Largemouth Bass |
| <i>Pogonias cromis</i> (Linnaeus) | Black Drum |
| <i>Pylodictis olivaris</i> (Rafinesque) | Flathead Catfish |
| <i>Sciaenops ocellata</i> (Linnaeus) | Red Drum |

VITA

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