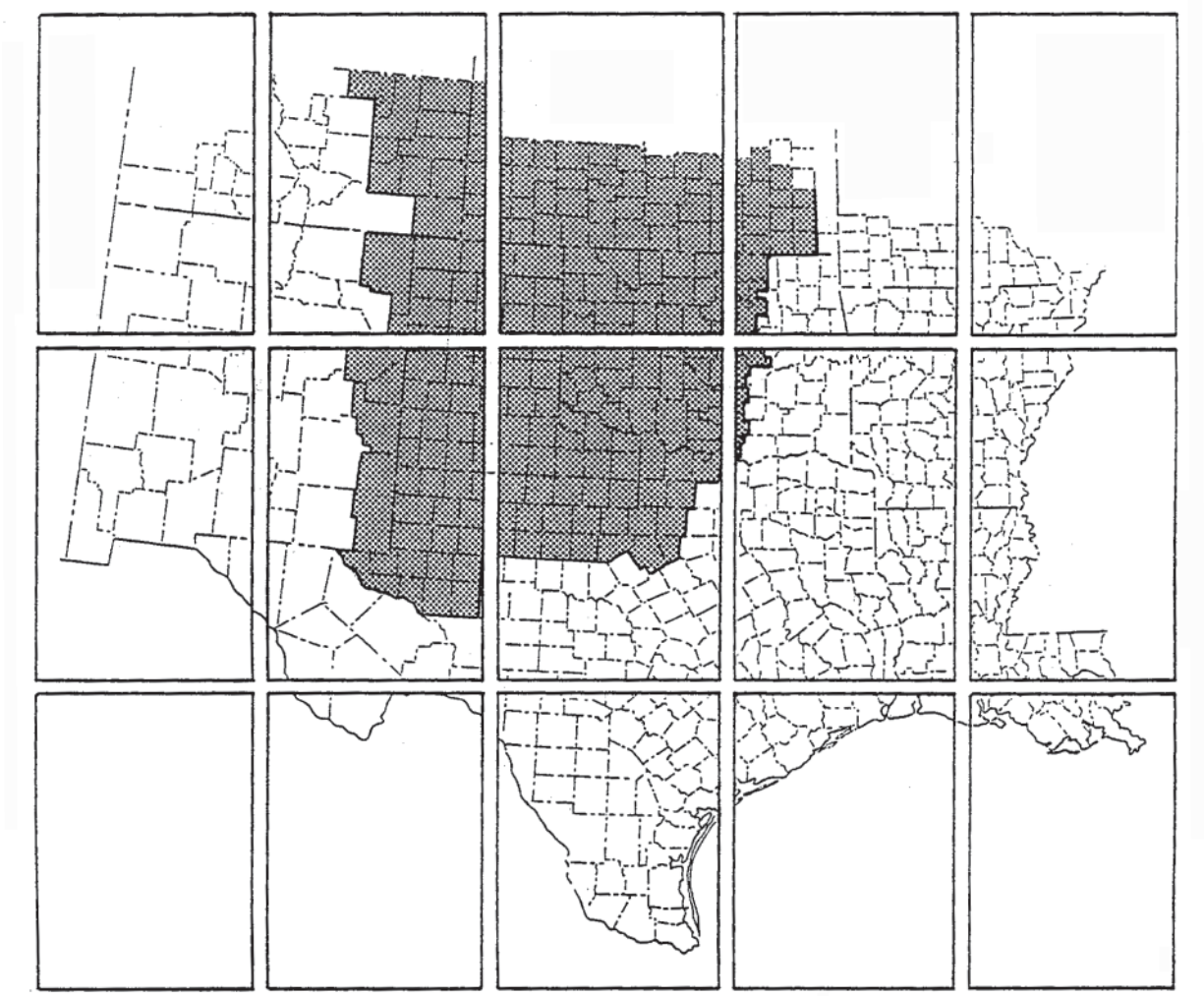
# From Clovis to Comanchero: Archeological Overview of the Southern Great Plains

by Jack L. Hofman, Robert L. Brooks, Joe S. Hays, Douglas W. Owsley, Richard L. Jantz, Murray K. Marks, and Mary H. Manhein



Prepared by the Oklahoma Archeological Survey of the University of Oklahoma and the Louisiana State University, with the Arkansas Archeological Survey

Final Report Submitted to the U.S. Army Corps of Engineers, Southwestern Division. Study Unit 5 of the Southwestern Division Archeological Overview

Contract DACW63-84-C-0149

1989

Library of Congress Catalog Card Number 89-084616
ISBN 1-56349-063-3
Arkansas Archeological Survey
Fayetteville, Arkansas 72702

Printed in the United States of America
Third printing June 1997 Offset Printing by the Arkansas Department of Corrections, Wrightsville.
Fourth printing July 2001 University of Arkansas Copy Services

Abstract

This volume presents an overview of archeology -and the nature of archeological resources -in the Southern Great Plains, specifically, the Great Plains subregion of the U.S. Army Corps of Engineers, Southwest Division. A brief sketch of the region's environment is presented as well as an account of the history and development of archeological research in the Southern Plains. The area of concern is bordered by the foothills of the Rocky Mountains on the west and by the Cross Timbers on the east. The north to south extent is from the Arkansas to Pecos rivers, respectively. A traditional cultural-historical summary including mention of the numerous archeological taxonomic units from the earliest prehistoric groups to the fully historic period is presented in a series of chapters. The Native American groups who are represented in the area in historic times are surveyed in Appendix I, although almost no archeology has been conducted on the sites of most of these groups. The current status and limited history of bioarcheological research is summarized for the region and significant new data are presented especially concerning Late Prehistoric cultural groups. A detailed summary of known prehistoric and historic skeletal remains from the region is provided. Bioarcheology is already add substantially to our understanding of prehistoric cultural events and processes in the region. A synthesizing chapter is presented using the concept of Adaptation Types in which the various archeological taxa are grouped and discussed in general economic terms disregarding the problems caused by modern political boundaries and archeological research histories. The various prehistoric and historic adaptation types are summarized with regard to economy, technology, bioarcheology, environment, important research problems, and significant data gaps. The concluding chapter presents some of the highlights of the study and discusses some of the current problems confronting archeological research in the region.

# CONTENTS

FIGURES

TABLES

# ACKNOWLEDGMENTS

The completion of this archeological overview has been the result of continuing support of numerous people for more than three years. There are several people who have contributed significantly since the inception of this project and without whose help the project would not have been initiated, much less completed. Special thanks are extended to Larry Banks, Fred Limp, and Don Wyckoff. Specialists from several states took time to review the manuscript or portions of it in various stages of completion. Others provided key source materials. These individuals include Jan Guy, Tom Hester, Dee Ann Story, Carolyn Spock, and Helen Simmons in Texas; Marsha Jackson in New Mexico; Martin Stein and Tom Witty in Kansas; personnel from the Colorado Historical Society; Marvin Jeter, Ann Early, Fred Limp, George Sabo, and Mary Lynn Kennedy of the Arkansas Archeological Survey, and Marshall Gettys of the Oklahoma Historical Society. Substantial assistance with the bibliography was provided by Ines Pennella, Kent Buehler and Mary McClain. Graphic assistance was provided by Julie Rachel. Others at the Oklahoma Archeological Survey who helped in various ways such as critical reading and providing references include Debbie Farris, Richard Drass, Larry Neal, Neva Grotts, Lois Albert, and Don Wyckoff. To these and all who have helped in various ways during this effort, but whom we have failed to mention, our sincere appreciation.

Jack L. Hofman and Robert L. Brooks

The bioarcheology section was completed with support and information provided by several colleagues. We greatly appreciate their assistance. Special recognition is due William Bass, Billy Harrison, Jack Hughes, and P. Willey for allowing access to their personal files and assisting with interpretation of field records. Our literature survey was enhanced by information provided by James Boone, Mei Wan Campbell, Henry Case, Belinda Cullen, G. Meeks Etcheison, Michael Finnegan, Vivian Forsythe, Neva Grotts, Elaine Guthrie, Jeff Homburg, Alicia Hughes-Jones, David Hughes, Alfred Johnson, Sandy Karhu, Robert Mann, Pat Mercado-Allinger, Sondra Ridgway, Dwight Schmidt, Roberta Speer, Martin Stein, Dee Ann Story, Robert Timberlake, and Thomas Witty. Computer and statistical analysis of the data was aided by Janet Beck, Douglas Bryant, and Jimmy Ringo. Editorial and bibliographic assistance was provided by Dana Bovee. Robert Brooks, Jack Hofman and Joe Hays provided archeological and environmental data essential for interpretation of the osteological data and burial provenience.

Examination of collections curated at the Archeological Research Laboratory, West Texas State University, the Panhandle Plains Historical Museum, the Oklahoma Archeological Survey, The Museum, Texas Tech University, and Stovall Museum of Science and History was essential to this investigation. Permission to examine the collections was provided by Julie Droke, Billy Harrison, Jack Hughes, Eileen Johnson and Donald Wyckoff. Visits to research institutions were a highlight of the project. Timothy Baugh made arrangements that enabled osteological study of the Grant, Heerwald, and McLemore site skeletal collections.

Physical anthropologists working on other sections of the Southwestern Division Overview provided background information, site records, and guidance that assisted our research. We thank Ben Olive, Jerry Rose, Gentry Steele and Am Stodder. Jerry Rose fostered our interest in this project and helped plan our research design. Support for this overview was provided by the U.S. Army Corps of Engineers Southwestern Division, as administered by the Arkansas Archeological Survey. Additional financial assistance was provided by Louisiana State University, the Smithsonian Institution, and grants from the National Science Foundation (BNS-8311117 to Timothy Baugh and BNS-8510588 to Douglas Owsley). Larry Banks and W. Fredrick Limp deserve special credit for their guidance, moral support, and patience.

Douglas W. Owsley

Chapter 1

# INTRODUCTION

*Robert L. Brooks and Jack L. Hofman*

This study represents a synthesis of information on archeological resources within the Southern Plains region. It was prepared by the Oklahoma Archeological Survey for the Southwestern Division, U.S. Army Corps of Engineers. The area of the Southern Plains (referred to as Region 5) in relation to other portions of the Southwest Division's study area is depicted in Figure 1.

This overview is part of a pilot project by the Southwestern Division of the Corps of Engineers (COE) to develop a comprehensive synthesis of the archeology in its management area. The divisional boundaries for this project extend from the Mississippi River Valley to the Rocky Mountains and includes portions of seven states: Arkansas, Colorado, Kansas, Louisiana, New Mexico, Oklahoma, and Texas. The


**Figure 1. Region encompassed by the Southwestern Division of the U.S. Army Corps of Engineers**

purpose of the pilot study is to establish overviews which are not based on political (state) boundaries and which can serve as management tools for supervisory personnel within the various COE districts comprising the Southwestern Division.

Region 5 is the largest in the Southwestern Division, covering portions of five states. Included here are the western two-thirds of Oklahoma, the southern two-thirds of Kansas, the eastern periphery of New Mexico, southeastern Colorado, and roughly one-third of the state of Texas (Figure 2). The Plains region contains 207 counties and a surface area of approximately 328,297 km$^2$.

It is not surprising that such an extensive area also covers a number of environmental areas. Basically, it extends from the Arkansas River in north-central Kansas to the Pecos River of Texas in the south. The western boundary is marked by the presence of the foothills of the Rocky Mountains and the Pecos River Valley, whereas the Cross Timber of Oklahoma and Texas define the eastern margin. Across the area, a diversity of physiographic provinces and vegetation zones can be found. Despite this variability, other factors (e.g., climate) have worked to produce considerable homogeneity, permitting identification of the region as constituting a "Southern Plains" environment. More detailed discussion of the rich and varied environment of the region is presented in Chapter 2.

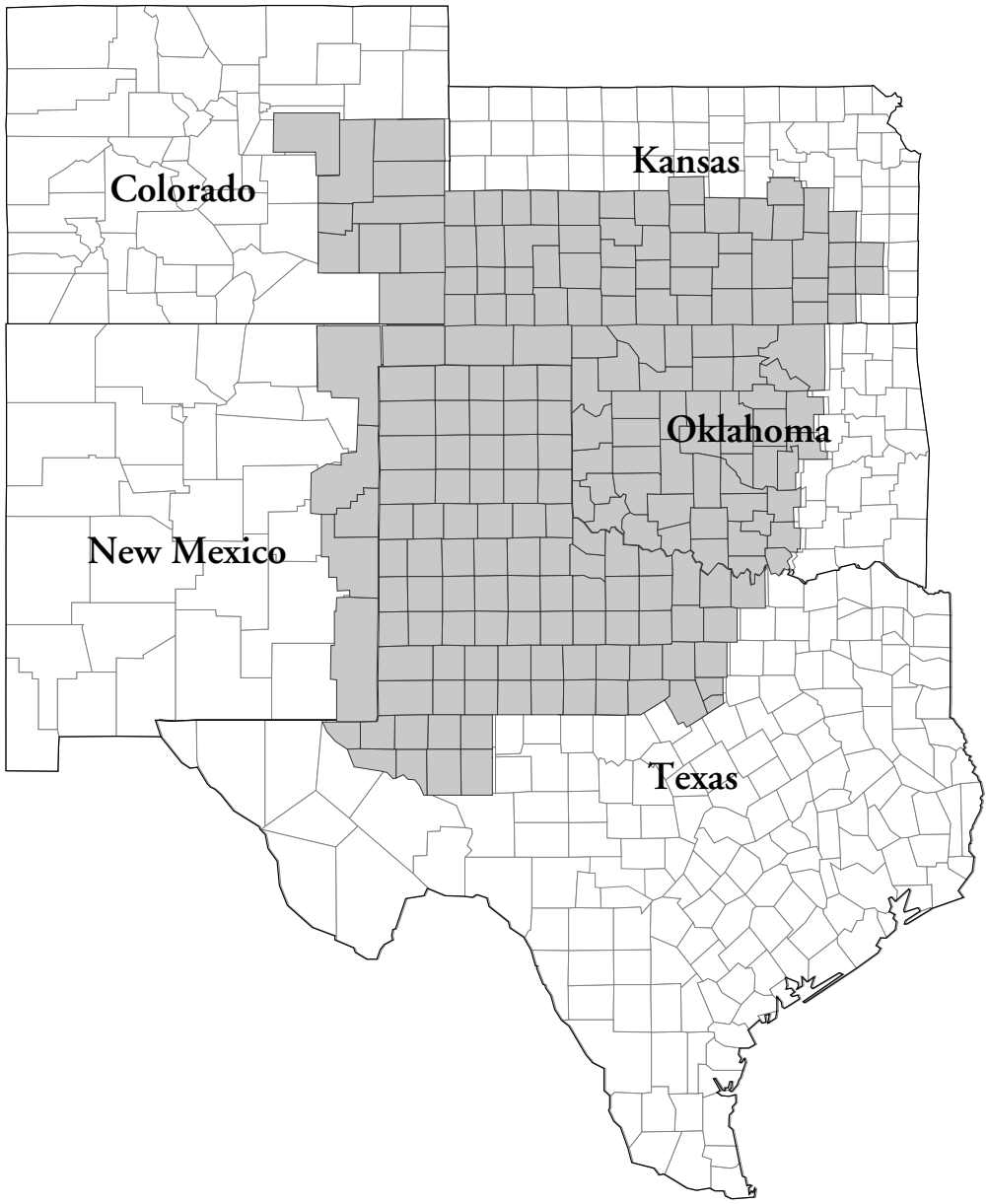



**Figure 2. The Southern Great Plains study area (Region 5).**

Historically, the Southern Plains has been viewed as an area which prehistoric cultures avoided until relatively recent times. Anthropologists and archeologists in the early 1900s generally assumed that the area was used primarily as a hunting territory with few permanent residents. However, beginning with the work at notable Paleo-Indian sites such as Folsom and Blackwater Draw in the late 1920s and 1930s, and subsequent investigations at Plains Village sites in Oklahoma, Texas, and Kansas, however, this image changed. Archeologists learned that the Southern Plains was inhabited by resident populations for at least 11,000 years. Particularly during Plains Village times (ca 450 to 950 years ago), the region was occupied by large Native American populations ancestral to the Wichitas, Pawnees, Apaches, and numerous other tribes. Archeological research conducted since the 1940s has continued to build on this information. Currently, over 15,000 archeological sites are known for the Southern Plains region and include remains ranging from 20,000 year old possible mammoth kills to historic Native American villages and Euramerican trading posts, military posts, and towns. The historical background to this accumulation of information is more thoroughly outlined in Chapter 3.

Region 5 has some of the highest quality information on early hunters and gatherers in the Southwestern Division. Early work at the Folsom and Blackwater Draw sites drew national attention to the issue of the antiquity of man in the New World. It prompted similar research in other regions of the country as well as fostering additional study on hunters and gatherers living in the Southern Plains. Work on these sites also involved a multidisciplinary approach and considerations of complex climatic and geomorphological questions. Consequently, information on hunters and gatherers, particularly specialized big-game hunters, is better documented than some later cultural periods in Region 5. Because the nature of this research and its results which had national implications deserves comprehensive treatment, Chapter 4 presents a thorough discussion of the research on hunters and gatherers and the results of this work.

Unfortunately, data on Woodland peoples inhabiting the Southern Plains is somewhat more enigmatic than that for early hunters and gatherers. Over most of the region, little is known of these incipient food producers. However, because Woodland period developments in economic, social, political, and religious life served as a base for the Plains Village cultural pattern which followed, the Woodland period is critical to our understanding of this time of dynamic cultural change. The Woodland period was a time of decreasing emphasis on regionalization, thus reflecting a "settling in" phenomenon. The effects of this phenomenon are striking especially in terms of remains reflecting a greater focus on local resources available to a Woodland population. Unlike the Paleo-Indian period, none of the Woodland sites known for the region have national notoriety. Instead, we have numerous sites with considerable local importance. What has been learned of this Woodland cultural pattern is discussed in Chapter 5.

The following Plains Village period is the best documented of the prehistoric culture patterns in the region. There are thousands of Plains Village sites known for the Southern Plains. Many of these have been excavated and studied over the past 50 years. Consequently, we have a considerable data base from which to interpret these village farmers. Information on these groups is also critical because they represent the immediate ancestors of many Native American tribes inhabiting the Southern Plains in historic times (e.g., the Wichita and associated subtribes, Pawnee, Kansa, and Apache. The current state of knowledge regarding these Plains Villagers is summarized in Chapter 6.

Although little archeological research has been conducted on the Protohistoric and Historic periods, these eras are critical to understanding the development of the Southern Plains as a culture area. During protohistoric and historic times, dynamic cultural change took place in Region 5 as a result of contact between the indigenous populations and French, Spanish, and Anglo-Americans. These contacts brought about changes in the settlement and subsistence practices of most tribes. More importantly, during the nineteenth and early twentieth centuries, it also brought the tribes into contact with the federal government and their policies for opening the west to settlement. Large areas of Oklahoma and portions of Kansas served as reservation lands for resettlement of Southeastern tribes such as the Creeks, Cherokees, Choctaws, and numerous smaller tribal units from the Northeast (e.g., Delaware, Miamis, Pottawatomies, etc.). This resettlement brought about conflicts between the indigenous groups, resettled tribes and early white traders and settlers, forcing development of a series of military posts. The later history of the region witnessed Native American involvement in the Civil War and subsequent reallocation of lands and opening of the area to white settlement. Excavated and studied sites for the Protohistoric and Historic periods are few and scattered. An outline of the Protohistoric period is presented in Chapter 7. Archeological work on the Historic period is presented in Chapter 8. Appendix A presents a description of the many tribal units which inhabited Oklahoma as Indian Territory.

While much of this overview has focused on the archeological aspects of the Southwestern Division's prehistory and history, another critical part of the pilot project has been a bioarcheological evaluation of human skeletal remains in each study area. In most of the regions, information derived from these evaluations have provided invaluable new data and insights into the physical populations. The Southern Plains is no exception. Chapters 9-11 by Owsley and his colleagues have given us our first synthesis on the history of bioarcheology in the region and our first glimpse of what synthetic interpretations of the osteological data can tell us about the lives of Native American groups inhabiting Region 5.

Chapters 3 through 8 of this volume represent a traditional discussion of the region's culture history. The emphasis is on basic cultural periods with detailed description of the numerous cultural complexes occupying the Southern Plains during prehistoric and historic times. Chapter 12 represents a significant

departure from traditional archeological classification systems (cf. McKern 1934; Wiley and Phillips 1955) and introduces the concept of the adaptation type. The adaptation type models the complex set of relationships that exist between cultural groups and their environments (Fitzhugh 1975:341). This construct also attempts to relate regional environmental conditions to specific levels of socioeconomic and technological organization in human society. General models of adaptation types can be developed which integrate essential features of particular human adaptation systems (e.g., economic, social, and religious themes) with specific environmental contexts in a given region (Sabo et al. 1988). For example, early Holocene hunter-gatherers refers to cultural systems using a hunting and gathering organizational structure during the early Holocene. The adaptation type construct also represents the adaptive strategy of John Bennett (1969) as it functions at the regional and interregional levels. By using the adaptation type model, it is possible to classify basic sociocultural integration independent of chronological period and taxonomic identification. The adaptation type also functions as a synthetic structure, thus permitting identification of cultural manifestations which cross state boundaries. For this reason, the adaptation type is a useful concept for management purposes and serves to reduce the complexity where states use of different taxonomic classification systems. In Chapter 12, each adaptation type is discussed in terms of their critical components. Included here are the temporal range, environmental and cultural contexts, technology and subsistence, settlement pattern, trade and exchange, and belief systems. During this study, it was discovered that in a number of cases the adaptation types do not follow conventional cultural historical syntheses. For example, the Apishapa phase is traditionally assigned to the Plains Village period although it has been placed in the incipient horticulturalists adaptation type.

Lastly, Chapter 13 of this overview summarizes our work. This chapter reiterates some of the information presented in previous chapters and also serves to address basic problem issuesperceived in the archeological data and to suggest directions for future research.

Chapter 2

# LAND OF SUN, WIND, AND GRASS

*Jack L. Hofman*

Wedel (1961) has characterized the Plains as a "land of sun and wind and grass." Webb (1931:506) referred to the Plains as "nothing but earth, sky, grass, and wind." Certainly the salient aspects of the ecology of the region are largely a result of the limited rainfall, generally high potential evapotranspiration, dominance of grasses, and limited topographic relief. In the following pages, information is provided concerning general characteristics of the Southern Great Plains region which is the focus of this archeological overview. The area of concern includes portions of five states, roughly from the Arkansas River basin on the north to the Pecos on the south and from the Cross Timbers on the east to the scrub grasslands at the foot of the Rocky Mountains on the west. Ten counties in southeastern Colorado are included and comprise the northwestern portion of the study area. This area is primarily High Plains and dissected badlands and the Colorado portion includes 46,296 km$^2$. The southern one-third of Kansas is also included and extends from the Flint Hills on the east to the western border of the state on the High Plains. A total of 51 counties in Kansas are included and these represent an area of 108,788 km$^2$. The eastern tier of counties in New Mexico forms the western border of the study area. These five New Mexico counties contain 38,731 km$^2$ and consist principally of High Plains and eroded badlands. The western two-thirds of Oklahoma forms the core of the study area and includes 52 counties, an area of 124,056 km$^2$. The Oklahoma section extends from the Cross Timbers on the east to the High Plains on the west. A total of 89 counties in the northwestern one-third of Texas form the southern portion and 212,613 km$^2$ of the study area. From the Pecos River on the southwest to the Blackland Prairie on the east the Texas portion of the study area includes a diverse physiography from the High Plains of the Llano Estacado on the west across the broken rolling redbeds to the tall grass prairie and Cross Timbers on the east. The total area included in all states is 530,484 km$^2$ and falls primarily within the Great Plains region or Northern Temperate Grasslands as defined by Shelford (1963).

## Geology

The geology of the Great Plains region as a whole has been widely discussed and many localized studies have been published. One of the early general studies of primary importance is that of W. D. Johnson (1900). Through extensive study of surface topography, stream terraces, buried gravel deposits, and vertebrate fossil remains Johnson documented that the Great Plains region as it is now recognized was built up as a broad relatively flat outwash apron or series of alluvial fans at the base of the Rocky Mountains. Wedel (1961:25) has described the process as follows.

> The surface [of the Great Plains] is largely a result of repeated, widespread uplifts of the Rocky Mountain region occurring in Tertiary time, ten million years or more ago, and continuing into Pleistocene time. Ultimately, this upwarping of a zone hundreds of miles across, produced elevations of ten to eleven thousand feet along the Continental Divide. As the land rose, the streams descending from the heights became increasingly active in widening, deepening, and lengthening their valleys. Enormous quantities of eroded materials were carried from the highlands, to be deposited as gravels, sands, clays, and silts where the overloaded and slowing streams reached more gentle grades east of the mountains. Here their channels gradually became choked with sediments; and the streams, constantly seeking the lowest places to drop their loads, shifted from sided to side as they made their way across the growing alluvial fans. Eventually, the accumulating deposits merged and lengthened into an immense apron of waste, many hundreds of feet thick and sloping gently eastward from the base of the mountains.... Over most of the region, the surface of this great outwash plain has been modified in some measure by subsequent erosion. Probably its original character, if not necessarily its original surface, is best exemplified by the High Plains section.

Webb (1931:12-13) has also provided a brief synopsis of the processes which resulted in development of the Great Plains region. Key elements in this process included: (1) the supply of precipitation in the Rocky Mountain region which drains toward the east, (2) the steep gradient of these streams which increased their erosional potential and enabled them to carry substantial loads of silt and debris, (3) the decreasing capacity of the streams as they reached the relatively arid and level region east of the mountains, (4) the deltalike formation of alluvial aprons as the stream gradients decreased and deposited their loads, (5) constant aggradation resulted in raised stream courses which then overflowed into lower channels and repeated the process, and (6) a continuance of these processes by numerous small streams emanating from the mountains and joining into a few larger rivers which carry across the Plains region to the Mississippi or Gulf coast.

The surface geology of the Southern Great Plains is dominated by sedimentary materials of Pliocene, Pleistocene, and Recent age, but extensive exposures of Permian, Triassic, and Cretaceous deposits also occur, as well as Pennsylvanian exposures in the eastern prairie and Cross Timbers regions. The region is underlain by igneous

deposits of Cambrian age, but these are only exposed in a few locations such as the Wichita Mountains in southwestern Oklahoma and the Arbuckle Mountains of south-central Oklahoma. Precambrian, Ordovician, Devonian-Silurian, Mississippian, and Pennsylvanian deposits also occur in the latter area (Branson and Johnson 1972; Evans and Brand 1956).

During the Permian most of the region of interest was covered periodically by a sea which extended from the Gulf of Mexico to Nebraska (Hood and Underwood 1978; Myers 1959). The Permian sea fluctuated greatly in size throughout this period. Extensive sand dunes developed in many regions when the sea level dropped. The Permian deposits in the Southern Plains are composed of bedded gypsum, sandstone, dolomite, siltstone, claystone, and shale and represent a number of distinctive formations including the Quartermaster and Blaine formations and the Whitehorse group (Patton 1923; Fay 1964). Extensive exposures occur primarily east of the Llano Estacado in Texas, across much of western Oklahoma and in the Flint Hills region of Kansas. The regionally important Florence chert (Kay County Flint) is of Permian age and occurs in the Florence member of the Barneston formation in north-central Oklahoma and south-central Kansas (Banks 1984).

Of late Permian age, the Quartermaster formation in the Texas Panhandle contains a dolomite member named Alibates by Gould (Patton 1923). This dolomite contains locally abundant lenses and nodules of chert or agatized dolomite usually referred to as Alibates flint (Bowers 1975; K. Bryan 1950; Green and Kelly 1960; Moorehead 1931; Shaeffer 1958; Wyckoff 1988). The primary source area for this material is along both sides of the Canadian River north of Amarillo, Texas. Alibates National Monument near Fritch, Texas was established in recognition of the importance of the stone to prehistoric peoples in the region. This material was extensively utilized throughout the Southern Plains region, especially during the Paleo-Indian and Late Prehistoric periods. Alibates is also found in the stream gravels along the Canadian river in Oklahoma well east of the outcrop and quarry area (Hofman 1973:175; Wyckoff 1988). The Day Creek dolomite in northwestern Oklahoma is a lateral equivalent of Alibates and contains lower quality chert nodules which were of only local importance (Banks 1984:74).

Unconformably overlaying the Permian throughout much of central Kansas are Cretaceous age deposits. In the northwestern portion of the state the Cretaceous includes the Niobrara group which is of archeological interest because of the presence of an important lithic material variously referred to as Smokey Hill jasper, Niobrara jasper, Graham jasper, or Niobrarite (Merriam 1963; C. Wright 1985; Wedel 1986). Important outcrops of this material occur in Graham, Trego, Grove, and Norton counties. The material was heavily utilized throughout the Nebraska, Colorado, Kansas, and Oklahoma area during the Paleo-Indian and Late Prehistoric periods.

In the Oklahoma Panhandle the Dakota formation of Cretaceous age produces abundant quartzites which were intensively utilized by prehistoric people. These quartzites are the lateral equivalent of those from better known Plains quarries such as Spanish Diggings in Wyoming (Banks 1984).

In west-central Texas, the Cretaceous Edwards formation is of importance because of bedrock exposures, residual deposits, and gravels containing nodules of high quality chert (Tunnell 1978). Edwards chert from central Texas was used extensively during Paleo- Indian and protohistoric occupations of the Southern Plains region (J. Hester 1972) and continued to be used in the source areas throughout the prehistoric period. Occurrences of high quality Edwards chert are present in the gravels in the Fisher County area of northwest Texas in the upper Brazos drainage (Tunnell 1977), but reliable sources of this chert are not documented further to the north and west. Materials which are macroscopically similar to both Alibates and Edwards cherts have been reported to the west of the Caprock Escarpment and the Pecos River by Shelley (1984), but the significance of these sources during the early prehistoric period in the region is undocumented. Further analyses and perhaps trace element source studies will help clarify the extent to which materials from these sources were transported in prehistoric times.

For much of the Texas and Oklahoma Panhandle region and eastern New Mexico, the Permian is overlain by upper Triassic materials primarily of the Dockum group. The lower unit of the Dockum group is the Tecovas formation which in the vicinity of Quitaque, Texas and elsewhere along the eastern edge of the Llano Estacado contains lenses of Tecovas jasper (Holliday and Welty 1981). This material often occurs in colors and patterns very similar to Alibates, but is usually opaque rather than translucent. A small area of the Tecovas formation occurs in the Oklahoma Panhandle (Banks 1984), but it is not known whether there is usable jasper in these exposures.

Members of the Triassic Trujillo formation which overlies the Tecovas are exposed along the Canadian River and Mescalero Escarpment in eastern New Mexico (Hammack 1965; Judson 1953), and appear again along the Caprock Escarpment on the eastern edge of the Llano. Some gravels occur in this formation but the intensity of their use by prehistoric knappers is undocumented.

The most widespread lithic materials used for manufacture of stone artifacts by prehistoric people in the Southern Plains consist of gravels from the Ogallala formation of late Tertiary age (Patton 1923; Hood and Underwood 1978; Holliday and Welty 1981; Reeves 1976; J. Walker 1978). These gravels are derived from outwash which occurred during the development of the Plains as a result of the uplift of the Rocky Mountains (Frye and Leonard 1957; J. Walker 1978). The Rocky Mountain orogeny occurred during the Miocene on the order of 10 million years ago and the Ogallala formation was deposited during and after that event. The Ogallala formation gravels are generally considered to be of Pliocene age and occur in braided concentrations underlying Pleistocene deposits in much of the High Plains region. These gravels also occur commonly on ridge tops and erosional remnants in the Low Plains where they have often become concentrated as a result of deflation and slope erosion. The gravels contain a wide variety of quartzites and cherts, fossil wood, and other knappable materials. These gravels were uti-

lized intensively during the Holocene period and were apparently most consistently relied upon during the Archaic. Reasons for this pattern have been suggested by several students (Hammatt 1976; Hofman 1973, 1978a; Leonhardy 1966b; R. Saunders 1974). It is possible that exposures of these gravels were much less common and so the materials may have been less accessible during Paleo-Indian times. Mid-Holocene drying and erosion may have exposed many of these gravel sources to prehistoric people for the first time. During the Late Prehistoric period higher quality materials were traded extensively and the "local" gravels became less important for many aspects of the lithic assemblages.

Overlying the Ogallala and other earlier formations in some localities is Pleistocene and Holocene age "cover sand" and valley alluvium (Frye and Leonard 1965). The sand dune areas occur primarily on the leeward side of rivers (usually the east and north sides) where sand has been wind deposited from the often dry stream beds. Also, extensive dune fields occur such as in west Texas and the southeastern corner of New Mexico. The Monahans formation (Wendorf et al. 1955) includes the recent active dune fields in this area, but other terminologies are used in different localities (Haynes 1975:Table 4.1). These sands are referred to as the Blackwater Draw formation in the northern portion of the Southern High Plains (Holliday and Allen 1987). Investigations along tributary streams and primary rivers in the area have documented a dynamic geomorphic picture of Holocene alluvial history. Periods of valley filling, stability, and downcutting are documented (Albert and Wyckoff 1984; Albritton 1966; Artz 1986a; Ferring 1982, 1987; Goss et al. 1972; Hall 1982; Haynes 1975; Hofman 1988a; Holliday and Allen 1987) and regional patterns in these events are beginning to be recognized (Hall 1988). Recently, investigations in Oklahoma County, central Oklahoma have revealed evidence of paleosols in a small stream valley fill which are buried up to 13 m below the surface and date to within the past 10,000 years (Hofman and Drass 1988). The dynamic nature of Holocene surface geomorphology is only beginning to be appreciated and documented. The impact of these factors on the archeological record are also only beginning to be fully realized (Hall 1988; J. Taylor 1986; Wyckoff 1984).

### Topography and Drainage.

The topography of the Southern Plains is largely a reflection of the regional geology and drainage systems. The primary streams in the area (Figure 3) include the Arkansas on the north and progressing southward the Cimarron River, North Canadian, Canadian, Washita, Red, Peace, Brazos, Colorado, and Pecos river systems. Between the Canadian River and Pecos, none of these primary drainages has a permanent flow of water extending across the High Plains. The Red, Brazos, and Colorado river systems have their modern headwaters in the eastern Caprock Escarpment of the Llano Estacado. The general pattern of these drainages in the study area is toward the southeast although most have highly circuitous courses. These streams usually have broad sand-choked channels and are bordered by gallery forests of which the primary species are cottonwood, elm, and willow in the bottomlands and juniper on the upper breaks.

The upland ridges between these valleys in the western portion of the region often have erosional promontories which offer panoramas of considerable territory. Examples of these settings include the Callahan Divide between the Colorado and Brazos rivers in western Texas, the Copper Breaks between the Pease and Red rivers, and the Red Hills between the Cimarron and Arkansas. In the eastern portion of the study area, the Wichita Mountains and Arbuckle Mountains rise 200 m and more above the surrounding plains. Numerous buttes also occur throughout the eroded western portion of the rolling plains or Low Plains region. These features are particularly common in west Texas east of the Caprock and include Singnal Mountain in Howard County and Double Mountain in Stonewall County, Texas and the Creta Hills, Hydro Mounds, and Antelope Hills in western Oklahoma. In the eastern prairie of the Osage Plains, cuestas are extremely common and often rise 50 m above the plain.

The Mescalero and Caprock escarpments demark the eastern border of the Pecos River basin in east-central and southeastern New Mexico along the southwestern edge of the study area. Northeastern New Mexico is drained by the Cimarron and Canadian systems. The Caprock and Mescalero escarpments, with elevations of 1200 to more than 1500 m asl, also define the western edge of the High Plains and represent a sharp ecotone between the plains and the broken badlands to the west. Due to the eastern dip of the bedrock formations and the general slope of the Llano Estacado, the western edge is substantially dryer and has less springs than the Caprock Escarpment on the east of the Llano. Annual precipitation also increases from west to east across

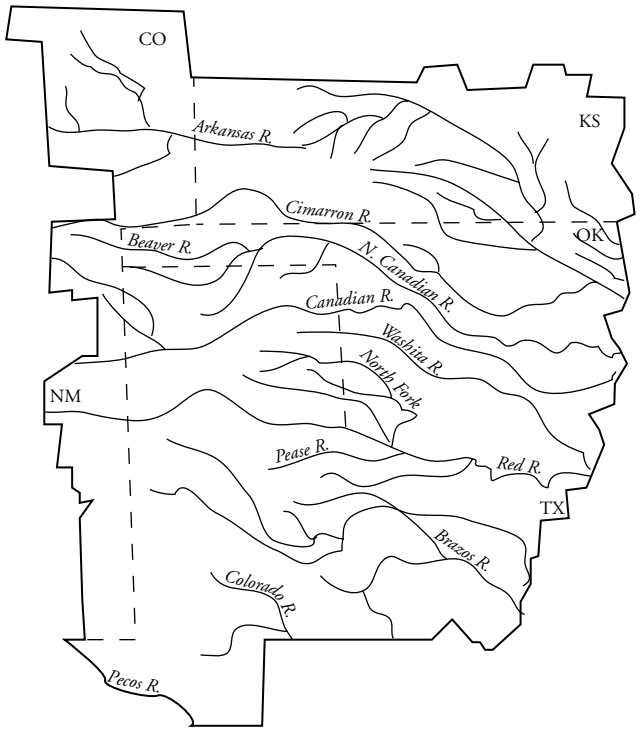



**Figure 3. Primary rivers in the Southern Great Plains.**

the Llano (Wendorf 1975:Figure 1.2). The eastern edge of the Llano is probably the most extensive and singularly important topographic feature and ecotonal boundary in the Southern Plains region. This escarpment has an extremely diverse biota, hundreds of high quality springs, good lithic resources, and represents the contact between the High Plains to the west and the low rolling Plains to the east.

In northeastern New Mexico and southeastern Colorado, the foothills of the Rocky Mountains and Pleistocene age volcanism have produced the dominant features of the landscape. Features such as Black Mesa in the northwestern corner of the Oklahoma Panhandle, Johnson Mesa, Sierra Grande, and Capulin Mountain in Union County New Mexico, Mesa de Maya and Two Butte Mountain in southeastern Colorado all offer ecotonal settings, diverse resources, and also panoramic views of the adjacent plains. Two Butte, located midway between Springfield and Lamar, Colorado, represents a volcanic feature in the High Plains province and is a notable landmark.

In general, however, topographic relief is limited throughout the study region. This is nowhere more evident than on the Llano Estacado or southern portion of the High Plains. This is an area some 80,000 $km^2$ in extent. On the Llano, the land slopes gently to the southeast at approximately 30 m per 16 km (Evans 1956; Wendorf 1975). No permanent stream drainage exists from the Canadian on the north to the southern end of the Llano. Major topographic features of the Llano include shallow draws which hold water or have running water temporarily after rainstorms or heavy snows. Historic settlement on the Llano focused on locations which had permanent springs (e.g., Lubbock), or were adjacent to large "permanent" playa lakes (e.g., Amarillo). Playa lakes are distinctive features of the High Plains in general and especially on the Llano. They are especially common in some areas such as Crosby, Floyd, and Randall counties. These features are interpreted to have formed during the Pleistocene as a result of wind deflation (Reeves 1976; Holliday and Allen 1987) or solution of underground caliche (J. Walker 1978:21-22). Walker (1978:25, Figure 17) has documented approximately 37,000 playa lakes on the Llano and mapped their occurrence. His research has documented that these lake basins occur most commonly in the eastern (and wettest) portion of the Llano and that they correlate strongly with buried stream valleys of pre-Ogallala age. If the playas were primarily the result of wind deflation, we might expect them to occur more commonly in the western and dryer portion of the Llano and to show no correlation with ancient drainages which are buried below the Llano surface. These features, regardless of their formation, represent significant locations in the prehistoric use and settlement in the region. The sediments in the playa lakes provided an environment conducive to the excellent preservation of bone beds of late Pleistocene fauna at the Selby and Dutton sites slightly to the north of this study area near Wray, Colorado (Stanford 1979), and the Miami site in Roberts County in the Texas Panhandle (Sellards 1952). Each individual playa, until determined otherwise, is a potential location of buried and usually well preserved Paleo-Indian or later materials and associated paleoenvironmental data. The correlation of Paleo- Indian and later bison-hunting peoples' campsites with the leeward sides of the playas has been recognized for many years (Wendorf and Hester 1962; 1975; Dawson and Judge 1969; Judge 1973).

### Climate and Weather.

In general the climate of the Southern Great Plains region can be considered as a semiarid to subhumid continental one (Borchert 1950). The weather is strongly influenced by three major upper air systems which converge, with distinctive seasonal configurations, in the region. From the west the warm dry Cordilleran air mass enters the region from over the Rocky Mountains. The Southern Plains is in the rain shadow of the Rockies and receives little moisture from the west. From the north a cold and usually dry arctic air mass is an important seasonal factor in the regional weather pattern, and lastly warm moist tropical maritime air from the Gulf of Mexico introduces the majority of the precipitation into the region. The movements and collisions of these dominant upper air masses provide the ingredients for a dynamic weather pattern, especially in the spring and fall, and often will produce radically different weather conditions in rapid succession (Worster 1979). Rapid and extreme drops or increases in temperature within a few hours are common, as are occurrences of torrential rains (25 cm or more within a 24 hour period are widely reported), thunderstorms (50 or more per year), hailstorms, and tornadoes.

The overall pattern for the region is for a decreasing length of growing season from south to north and from lower to higher elevations. Average temperatures decrease in the same directions. Precipitation increases relatively steadily from west to east as does the relative humidity. Average annual rainfall for southeastern Colorado and the southeastern corner of New Mexico and adjacent Texas is about 35 cm. For most of the north-south area defined by the Colorado- Kansas and Texas-New Mexico borders, the average precipitation is about 40 cm annually. This amount increases toward the east so that on the eastern edge of the study area in the Cross Timbers region the average annual precipitation is over 76 cm. The average wind is between 16 and 24 km per hour and is from the south or southwest. Summer day time temperatures reach 38°C for at least a few days throughout the region, whereas winter extremes commonly drop below -18°C for a short period. Because of the usually low relative humidity, the temperature extremes generally cause less discomfort than in more humid areas. Because of the typically strong prevailing winds and predominance of sunny days, the evapotranspiration potential for most of the region equals or greatly exceeds the actual precipitation.

Severe winter storms are often of relatively short duration, especially south of about 36° north longitude. In the northwestern portion of the study area, snow may cover the ground for up to a few weeks at a time and can contribute substantially to the annual total precipitation. Spring snow melt usually produces significant increases in stream flow of the Arkansas, Canadian, and Pecos rivers. Otherwise, streamflow is more controlled by local more sporadic snow fall and thunder showers. The region as a whole is known for extremes of temperature and precipitation with occasional periods of intense drought is well known

(Worster 1979). Rainfall occurs primarily during the growing season, generally April through September, but often occurs as cloudbursts and is prone to rapid runoff and evaporation. Potential evapotranspiration generally increases from east to west. Details of weather conditions and a summary of weather records for localities throughout the Southern Plains can be found in Orton (1974) for Texas, Houghton (1974) for New Mexico, Robb (1974) for Kansas, J. Berry (1974) for Colorado, and Curry (1974) for Oklahoma.

A summary of selected weather information from stations located in various parts of the study area is presented in Table 1 and Figure 4. An important factor to consider in using or referring to statistics on mean precipitation, temperature and other factors is that these measures often reflect an extreme degree of variability and yearly fluctuation and are not usually reliable guides for specific seasonal conditions in specific locations.

Table 1
Selected climatological data for the Southern Great Plains

| Location | Recorded (years) | Elev. (m) | Grow[1] (days) | Precip. (cm) | Wind (kmph) |
|---|---|---|---|---|---|
| COLORADO: | | | | | |
| Cheyenne Wells | 30 | 1309 | 151 | 37.6 | — |
| Limon | 10 | 1639 | 136 | 37.8 | — |
| KANSAS: | | | | | |
| Dodge City | 30 | 791 | 184 | 52.3 | 24.3 |
| Wichita | 30 | 403 | 210 | 77.9 | 21.7 |
| NEW MEXICO: | | | | | |
| Clayton29 | 1515 | 166 | 36.8 | — | |
| Clovis | 30 | 1299 | 198 | 44.5 | — |
| OKLAHOMA: | | | | | |
| Elk City | 25 | 594.4 | 208 | 57.9 | — |
| Oklahoma City | 30 | 392 | 223 | 78.2 | 21.2 |
| TEXAS: | | | | | |
| Abilene | 10 | 537 | 231 | 59.2 | 19.6 |
| Amarillo | 10 | 1098 | 191 | 50.0 | 22.0 |
| Midland | 23 | 868.5 | 218 | 36.1 | 16.7 |
| Weatherford | 10 | 321 | 224 | 81.0 | — |

TEMPERATURE

| Location | Jan(C) | Jul(C) | Ann(C) |
|---|---|---|---|
| COLORADO: | | | |
| Cheyenne Wells | -1.4 | 24.4 | 11.1 |
| Limon | -2.4 | 22.1 | 12.8 |
| KANSAS: | | | |
| Dodge City | 0.9 | 26.6 | 12.8 |
| Wichita | 0.0 | 27.2 | 13.9 |
| NEW MEXICO: | | | |
| Clayton | 0.7 | 23.6 | 11.7 |
| Clovis | 3.0 | 25.8 | 14.4 |
| OKLAHOMA: | | | |
| Elk City | 3.3 | 27.7 | 15.7 |
| Oklahoma City | 2.8 | 28.0 | 15.7 |
| TEXAS: | | | |
| Abilene | 7.0 | 28.4 | 17.9 |
| Amarillo | 2.6 | 27.0 | 14.8 |
| Midland | 6.7 | 18.3 | 17.9 |
| Weatherford | 6.4 | 18.8 | 17.8 |

[1]Length of Growing Season

Data derived from "Climates of the States" by Officials of the National Oceanic and Atmospheric Administration. U.S. Department of Commerce (1974). The locations of these stations is shown in Figure 4.

## Physiography, Soils, Flora, and Fauna

Physiographic descriptions of the Southern Great Plains are presented in Arbingast et al. (1973), Blair (1950), Blair and Hubbell (1938), Bruner (1931), Duck and Fletcher (1943), Fenneman (1931), Shelford (1963), Kuchler (1974). Major factors contributing to the regional and local physiographic conditions include geology, soils, rainfall pattern, temperature, wind and the resultant plant and animal associations. For purposes of this discussion, four general physiographic subdivisions of the Southern Plains will be considered: the Rocky Mountain foothills, the shortgrass High Plains, the Low or Rolling Plains, and the Cross Timbers. Each of these subdivisions have a variety of ecological configurations which will not be emphasized here. Of the four parts, the Low Plains probably includes the most diverse array of biomes or plant associations. These areas are grossly outlined in Figure 5, with the exception of the foothills section which is represented minimally in the northwestern fringe of the study area.

In the Southern Plains region matured soils are characterized by a dark rich surface layer which varies from very dark gray brown or black in the east to lighter brown in the west. Also, soil thickness generally decreases to the west. A layer of alkaline salts or caliche generally develops below this soil except in the eastern portion of the area where rain is sufficient to leach it to greater depth. Valley fills exhibit a series of buried soils along many streams in the region, but these have only begun to be studied systematically (Hall 1988; Madole 1987). Reflecting this gradational east-west change in soils and precipitation, there is a correlated change in plant communities and even a substantial change in the size and nature of specific species across the region (Bruner 1931:Table 6). Trees tend to grow larger and faster in the eastern portion of the study area than in the west.

The eastern portion of the Southern Plains is bordered by the Cross Timbers or the Oak-Hickory Savanna (Bruner 1931). Bruner (1931:142) defines the Oak-Hickory Savanna as follows,

> It is separated rather sharply from the true prairie on the west by the transition from sandstone soils to the heavier soils originating from clays and shales. The eastern boundary is the climax deciduous forest. Thus the savannah forms a belt usually 50 or more miles in width extending across the state [Oklahoma]. Many islands of savannah woodland occur in the true and mixed prairie on sandstone outcrops. Grassland alternating with limited areas of open woodland is characteristic of the northern and southern extremities, while throughout the central part the woodland dominates and grassy areas occur only locally.

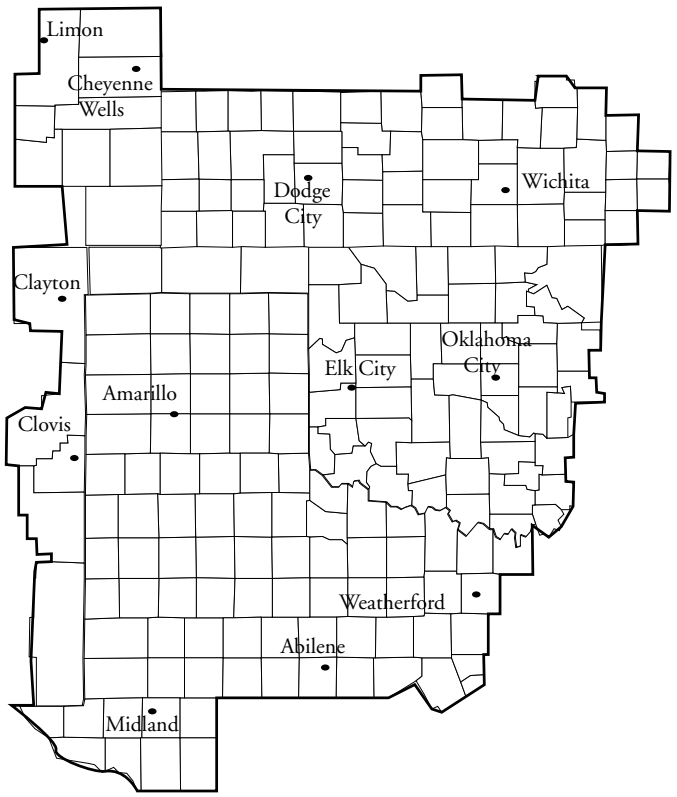



**Figure 4. Locations of weather stations listed in Table 1.**

The Oak Savanna or Cross Timbers extends well into Texas, but is only minimally represented in Kansas (Figure 5). In Texas the Cross Timbers are separated into two distinct belts, the Eastern and Western Cross Timbers. They extend southward from the Red River to the northern edge of the Edwards Plateau and the Llano Uplift, respectively. These southern extensions are separated by about 64 km of blackland prairie. Other than the Cross Timbers, the only extensive forest occurrence in the study area is along major streams which are lined with a floodplain gallery forest. In the Southern Plains these forests are generally dominated by cottonwood, willow and associated species. Scrublands also occur which are dominated by shinnery oak in sandy areas or mesquite in clayey soils. These associations are found primarily in southwestern Oklahoma and western Texas. Junipers occur in upland situations, especially on ridges and escarpments in broken dissected terrain, such as the canyon lands along the eastern Caprock of the Llano.

The prairie or low plains is an extremely diverse admixture of ecological settings, but is typified by a dominance of grasses with trees principally occurring along drainages. Included within the low plains are the Flint Hills, Red Hills and Smokey Hills of Kansas, the Gypsum Hills, Wichita Mountains, Osage Prairie, Sandsage Prairie, Tall-grass Prairie, Mixed-grass Prairie, Salt Plains, and Mesquite grasslands, dune fields, and eroded badlands of Oklahoma and Texas. A selected summary listing of important plant species found in the region is provided in Table 2.

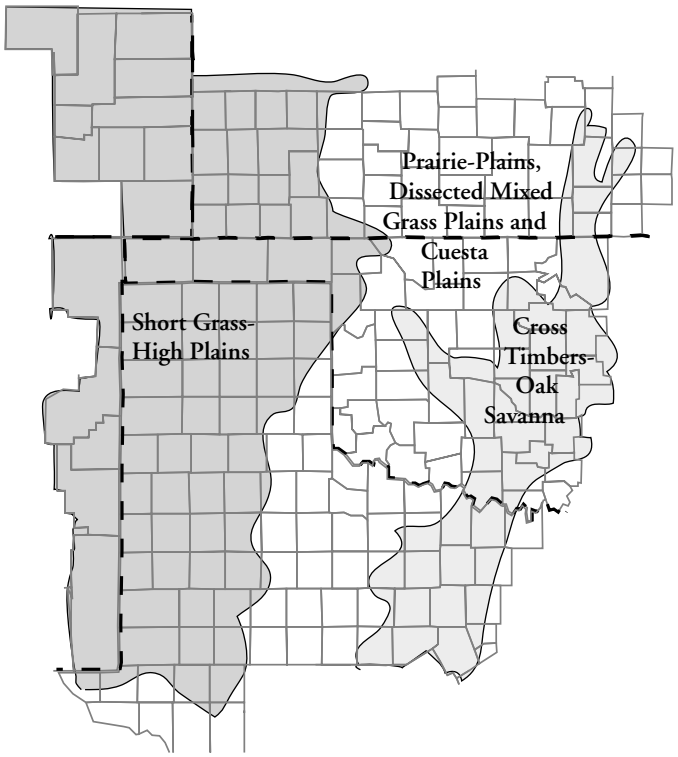



**Figure 5. General physiographic subdivisions of the Southern Plains.**

Animal life in the prairie and plains regions can be classified into subterranean, cursorial, and arboreal (Shelford 1963), with some species occupying more than one life zone during different phases of life. An abbreviated listing of animal species which are historically documented for the region is presented in Table 3.

The extensive nature of root systems for many grasses and forbs in the region (Weaver and Albertson 1956) provide food for many small mammals and invertebrates. The dynamic nature of Plains soils is due in large part to the activities of hundreds of species of animals which are subterranean feeders or nesters. Many Plains mammals are gregarious, such as the prairie dog, antelope, and bison. They can have dramatic local impacts on the terrain and vegetation. Trampling by herd animals also helps mix the upper soil zone which is fertilized by the excrement and decaying plant and animal matter. Excavations by prairie dogs commonly extend more than 4 m below the surface. The combined number of subterranean-dwelling small mammals can reach extremely high densities in undisturbed areas.

Many species of ants occur such as the harvester ant which will clear all vegetation for an area of several meters around their den and develop extensive underground nests. Actions of such "pests" actually serve to enrich the soil. In addition to their "grass roots" significance in the prairie ecosystem, many insect species may have been important food sources for aboriginal plainsmen during some seasons or lean periods. Wedel (1986:27) reports that dried insects such as grasshoppers, cicada, and wasps provide two to three times as much protein as pork or beef and that even dried ants are comparable to beef in protein. The density

Table 2
Selected listing of important flora in the Southern Plains

| Common Name | Scientific Name | 1 | 2 | 3 | Common Name | Scientific Name | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|---|---|
| TREES: | | | | | | | | | |
| cottonwood | *Populus deltoides,* | x | x | | Mormon tea | *Ephedra antisiphilitica* | x | | |
| willow | *Salix nigra* | x | x | | lambsquarter | *Chenopodium album* | | x | x |
| shinnery oak | *Quercus harvardi* | x | x | | smartweed | *Polygonum hydropiper* | | x | x |
| blackjack oak | *Quercus marylandica* | | x | x | mustard | *Brassica arvensis* | | x | |
| post oak | *Quercus stellata* | | x | x | morning glory | *Ipomoea* spp. | | x | x |
| sand plum | *Prunus angustifolia* | | x | x | ground cherry | *Physalis* spp. | | | |
| sumac | *Rhus* spp. | | x | x | Indian tea | *Ceanothus* sp. | | | |
| red cedar | *Juniperus virginiana* | | x | | grapes | *Vitus* spp. | | x | x |
| salt cedar | *Tamarix aphylla* | x | | | rush | *Scirpus americanus* | | x | x |
| pinyon pine | *Pinus edulis* | x | | | saltbush | *Atriplex canescens* | x | | |
| hackberry | *Celtis reticulata* | | x | x | rush | *Eleocharis* spp. | | x | x |
| chinaberry | *Sapindus drummondi* | | x | | cattail | *Typha angustifolia* | | x | x |
| elm | *Ulmus americana* | | x | x | horsetail | *Conyza canadensis* | | x | x |
| mesquite | *Prosopsis glandulosa* spp. | | x | | yarrow | *Achillea lanulosa* | | x | |
| mountain mahogany | *Cercocarpus montanus* | x | | | forestiera | *Forestiera* sp. | | x | x |
| catclaw | *Mimosa biuncifera* | x | x | | nettles | *Urtica* spp. | x | x | x |
| dogwood | *Cornus* sp. | | x | x | cockle burr | *Xanthium strumarium* | | x | x |
| Osage orange | *Maclura pomifera* | | x | | GRASSES: | | | | |
| persimmon | *Diospyros virginiana* | | | x | little bluestem | *Andropogon scoparius* | x | x | x |
| FORBS and WOODY PLANTS: | | | | | big bluestem | *Andropogon gerardi* | x | x | |
| sage | *Artemisia filifolia* | x | x | | buffalo grass | *Buchloe datyloides* | x | x | |
| soapweed/beargrass | *Yucca glauca* | x | x | | side oats grama | *Bouteloua curtipendula* | | x | x |
| prickley pear | *Opuntia* spp. | x | x | | blue grama | *Bouteloua gracilis* | x | x | |
| loco weed | *Astragalus racemosus* & spp. | x | x | x | hairy grama | *Bouteloua hirsuta* | | x | |
| purple cone flower | *Echinacea angustifolia* | x | x | | threeawn | *Aristida* spp. | x | x | |
| prairie potato | *Psoralea esculenta* | x | x | | wiregrass | *Aristida roemeriana* | | | |
| sunflower | *Helianthus* spp. | x | x | | dropseed | *Sporobolus cryptandrus* | | | |
| gourd | *Curcurbita foetidissima* | | x | x | wheatgrass | *Agropyron smithii* | | x | x |
| marshelder | *Iva* spp. | | x | x | sandbur | *Cenchrus pauciflorus* | | x | x |
| poke | *Phytolacca americana* | | x | x | switchgrass | *Panicum virgatum* | | | |
| goldenrod | *Aplopappus heterophyllus* | | x | | windmillgrass | *Chloris verticillata* | | x | x |
| evening primrose | *Oenothera* spp. | | x | x | needle grass | *Stipa* spp. | x | x | |
| ragweed | *Ambrosia* spp. | x | x | x | wild rye | *Elymus canadensis* | | x | |
| ironweed | *Vernonia baldwinii* | x | x | | sedge | *Carex* spp. | | | |
| ironweed | *Prionopsis ciliata* | | x | x | | | | | |

Areas of Primary Occurrences
1 High Plains
2 Low Plains
3 Cross Timbers

Sources used in compilation of this table include Wright (1978), Shelford (1963), Weaver and Albertson (1956), Wyckoff (1984x), Risser (1974), Baugh and Wyckoff (1982), Thompson (1987), Willey (1987).

Table 3
Selected listing of important fauna in the Southern Plains

| Common Name | Scientific Name | 1 | 2 | 3 |
|---|---|---|---|---|
| MAMMALS: | | | | |
| bison (buffalo) | *Bison bison* | x | x | |
| antelope | *Antilocapra americana* | x | | |
| white-tailed deer | *Odocoileus virginianus* | | x | x |
| mule deer | *Odocoileus hemionus* | x | | |
| elk (wapiti) | *Cervus elaphus* | x | x | |
| black bear | *Ursus americanus* | | x | x |
| mountain lion | *Felis concolor* | | x | x |
| bobcat | *Felis rufus* | x | x | x |
| gray wolf | *Canis lupus* | x | x | x |
| red wolf | *Canis rufus* | x | x | x |
| coyote | *Canis latrans* | x | x | |
| red fox | *Vulpes vulpes* | x | x | x |
| gray fox | *Urocyon cinereoargenteus* | | x | x |
| swift fox | *Vulpes velox* | x | | |
| jack rabbit | *Lepus californicus* | x | x | |
| cottontail | *Sylvilagus floridanus* | | x | x |
| desert cottontail | *Sylvilagus audubonii* | x | | |
| raccoon | *Procyon lotor* | | x | x |
| ringtail | *Bassariscus astutus* | x | x | x |
| opossum | *Didelphis virginianus* | | x | x |
| armadillo | *Dasypus novemcinctus* | x | x | |
| badger | *Taxidea taxus* | x | x | |
| beaver | *Castor canadensis* | x | x | x |
| striped skunk | *Mephitis mephitis* | x | x | x |
| spotted skunk | *Spilogale putorius* | | x | x |
| porcupine | *Erethizon dorsatum* | x | x | |
| black-footed ferret | *Mustela nigripes* | | | |
| long-tailed weasel | *Mustela frenata* | x | x | x |
| mink | *Mustela vison* | x | x | x |
| plains pocket gopher | *Geomys bursarius* | x | x | x |
| ground squirrel | *Spermophilus* spp. | x | x | x |
| prairie dog | *Cynomys ludovicianus* | x | | |
| fox squirrel | *Sciurus niger* | | x | x |
| kangaroo rat | *Dipodomys ordii* | x | x | |
| woodrat | *Neotoma micropus* | x | x | |
| eastern woodrat | *Neotoma floridana* | | x | x |
| hispid cotton rat | *Sigmodon hispidus* | x | x | x |
| pocket mice | *Perognathus* spp. | x | x | x |
| white-footed mouse | *Peromyscus leucopus* | x | x | x |
| mole | *Scalopus aquaticus* | | x | x |
| prairie vole | *Microtus ochrogaster* | | x | x |
| least shrew | *Cryptotis parva* | | x | x |
| short-tailed shrew | *Blarina hylophaga* | | x | x |
| bats | *Chiroptera* | | | |
| BIRDS: | | | | |
| eagle | *Aquila chrysaetos* | | | |
| hawk | *Accipiter* spp. & *Buteo* spp. | | | |
| falcons | *Falco* spp. | | | |
| owl | order *Strigiformes* | | | |
| vulture | *Cathartee aura* | | | |
| crow | *Corvus brachyrhynchos* | | | |
| prairie chicken | *Tympanuchus pallidincictus* | | | |
| quail | *Colinus virginianus* | | | |
| sage grouse | *Centrocerus urophasianus* | | | |
| turkey | *Meleagris gallopavo* | | | |
| meadow lark | *Sturnelle neglecta* | | | |
| dove | *Zenaidura macroura* | | | |
| roadrunner | *Geococcyx californianus* | | | |
| geese and ducks | order *Anseriformes* | | | |
| REPTILES: | | | | |
| bullsnake | *Pituophis melanoleucus* | | | |
| plains rattlesnake | *Elaphe guttata* | | | |
| diamondback rattlesnake | *Crotalus atrox* | | | |
| hognose snake | *Heterodon nasicus* | | | |
| copperhead | *Agkistrodon contortrix* | | | |
| rat snake | *Elaphe obsoleta* | | | |
| water snake | *Natrix* spp. | | | |
| king snake | *Lampropeltis* spp. | | | |
| racer | *Coluber constrictor* | | | |
| box turtle | *Terrapene* spp. | | | |
| red-eared turtle | *Pseudemys scripta* | | | |
| softshell turtle | *Trionyx* spp. | | | |
| mud turtle | *Kinosternon flavescens* | | | |
| snapping turtle | *Chelydra serpentina* | | | |
| Fence lizard | *Sceloporus undulatus* | | | |
| Texas horned lizard | *Phrynosoma cornutum* | | | |
| skink | *Eumeces* spp. | | | |
| glass lizard | *Ophisaurus attenuatus* | | | |
| collared lizard | *Crotaphytus collaris* | | | |
| AMPHIBIANS: | | | | |
| toads | *Bufo* spp. | | | |
| frogs | *Rana* spp. | | | |
| FISH: | | | | |
| catfish | *Ictalurus* spp. | | | |
| sunfish | family *Centrarchidae* | | | |
| drum | *Aplodinotus grunniens* | | | |
| gar | *Lepisosteus platostomus* | | | |
| INVERTEBRATES: | | | | |
| grasshoppers | *Dissosteira longipennis* | | | |
| | *Melanoplus mexicanus* | | | |
| May beetles | *Phyllophaga* spp. | | | |
| beetles | order *Coleoptera* | | | |
| bees, wasps, ants | *Hymenoptera* | | | |
| cicadas | *Tibicen* spp. | | | |
| flies | suborder *Brachycera* | | | |
| black widow spider | *Latrodectus mactans* | | | |
| brown recluse | *Loxosceles reclusa* | | | |
| tarantula | *Eurypelma* spp. | | | |
| crayfish | *Cambarus diogenes* | | | |
| scorpion | *Centurus* spp. | | | |
| earthworms | *Lumbricidae* | | | |
| mussels | *Pelecypoda* | | | |
| snails | *Gastropoda* | | | |

Area of Primary Occurrence
1 High Plains
2 Low Plains
3 Cross Timbers

Sources used in the compilation of this table include Jones, Armstrong and Choate (1985), Risser (1974), Shelford (1963), Baugh and Wyckoff (1982), and Willey (1978).

and biomass of insects in most Plains regions between May and September can be extremely high (Shelford 1963:Figure 13.3). Insects provide basic subsistence for other animals such as the armadillo. At the same time, subterranean activities of many insects contribute to bioturbation effects on archeological sites to such an extent that they must always be given consideration in site interpretations.

The potential density of small mammals in the Plains also provides food for thought concerning their potential economic importance as backup resources. Shelford (1963:336) provides this summary of Wooster's study of small mammal populations in the Fort Hays, Kansas area.

The plains harvest mouse, between 1931 and 1936, averaged 716 per square mile. They eat the seeds of switch grass, buffalo grass, and sunflower and grasshoppers. The deer mouse averaged 1728 per square mile. They utilized the seeds of 7 grasses and 17 forbs, including sunflower. Insects, however, especially grasshoppers, were preferred. The prairie vole averaged 2462 per square mile. They stored their nests with seeds of two short grasses, two mid grasses, and some perennial ragweed. The thirteen- lined ground squirrel was present in numbers of 1952 per square mile during a part of the year. They utilized buffalo grass and wild onion bulbs along with grasshoppers, crickets, beetles, and spiders for food and short and mid grasses for nests. The remainder of the population was made up of the short-tailed shrew which had 337 per square mile and the least shrew with a population of 614 per square mile. Prairie dogs, pocket gophers, and pocket mice had been extirpated.

In the same region a study of jackrabbits revealed an average density of 185 per square mile in 1946 (Shelford 1963:335), and that the pellets from these rabbits contained 7.7 pounds of seed per acre during the one month period of October. These seeds were found to germinate in significantly higher frequencies than hand picked seeds. These figures are included here in order to provide a general appreciation for the potential productivity of the prairie-plains environment and the interrelated nature of the ecosystem. The area has a generally fragile ecosystemic balance such that overkill of single species, such as the coyote, can result in a ballooning population of other species, such as rabbits, mice and so forth. It is possible that the population of coyotes and similar predators was low in the Fort Hays study area at the time the above studies were conducted.

To the west of the low prairie-plains region is the short-grass High Plains. The zone between these two Plains regions is a dynamic ecotone which, "probably shifted back and forth over 160 km during periods of years when the size of animal populations or the amount of rainfall varied (Shelford 1963:335). The same ecological tension was also present on the Cross Timbers and Prairie border. The more arid High Plains of the study area are typified by the Llano Estacado located in west Texas and eastern New Mexico. According to Wendorf (1975:1,3,8-9),

> The surface of the Llano is one of the flattest landscapes on Earth....Elevation above sea level ranges from 4,800 feet in the northwest corner near Tucumcari, New Mexico to 2,700 feet at Midland, Texas near the southeastern edge.
>
> The only permanent water on the Llano occurs in a few large basins or playas...which...were once considerably larger.
>
> The Llano is...in a marginal position which provides an ideal situation of environmental tension between the plant and animal communities in the more arid and warmer areas of the lower Pecos and Rio Grande valleys south of the Llano and the more moist regions which adjoin the Llano on all other sides.... Changes in the prevailing temperatures and precipitation have produced significant modification in the environment which are recorded in Pleistocene and recent deposits....
>
> Trees and larger bushes are rare on the Llano and are confined to the slopes and bottoms of the shallow drainages, the lower slopes of the playas, and the edges of the surrounding escarpments.

Two major plant communities have been recognized on the Llano by Allred (1956) and Wendorf (1975a). On the flat upland portion of the Llano occurs the Mixed Prairie Climax community which consists of buffalo grass species and some mid grasses such as gramma and bluestem. The more extensive community referred to as the High Plains Bluestem Postclimax community occurs on margins of escarpments and on slopes or areas of deep sandy soils. Grasses include _bluestem and gramma with shinnery oak and sand sage occurring in some sandy areas. Mention should also be made of wild plums which are common along draws and streams, especially off the Llano, and were commonly mentioned in early historic accounts of the region as well as being found in archeological deposits.

## SUMMARY

The Southern Great Plains is often considered by those unfamiliar with the region as a barren, desertlike land of little relief or interest. It is, however, both subtle and majestic in its ecology and topography and dynamic in terms of weather. Diversity abounds in the fauna and flora, yet dominant species in many places may appear to overshadow the accompanying variation. Harsh blizzards and oppressive august sun are part of the annual scene, but so too are mild winter days and summer nights. The region forms an ecological transition between the Eastern Deciduous Forests and the Desert Southwest. It is also a tension zone which encompasses the 50 cm rainfall isohyate, west of which dry land agriculture is marginal at best. Prehistoric Plains Villagers pushed corn horticulture to its ecological limits in this region 600 to 800 years ago.

Key factors in understanding and interpreting the climate and ecology of the region include the erratic nature and limited quantity of precipitation, the fragile nature of soils and drainage systems, the hardiness and diversity of plants and animals, the extreme and incessant effects of wind and sun, and the pronounced seasonal and daily temperature fluctuations. The extreme seasonality of the modern climate is notable, but was apparently less of a factor during the late Pleistocene and early Holocene when human groups first occupied the region.

The area considered in this study extends from the foot hills of the Rocky Mountains on the west to the Cross Timbers on the east .with elevations ranging from more than 2,653 m asl at Sierra Grande peak in New Mexico to less than 305 m in the Weatherford, Texas area. These extremes in elevation are on the margins of an area having a rolling dissected surface which is predominantly between 1,525 and 3,660 m asl and which generally slopes toward the southeast. The growing season for the area ranges from about 135 days, or less depending upon elevation, in southeastern Colorado, to about 225 days in north-central Texas. Precipitation generally increases from west to east across the area and ranges from about 35.5 cm annually in the west to 76 cm or more in the east. These gradients of elevation, growing season, and precipitation are well reflected in the regional ecology. Semiarid scrub grasslands occur in the extreme west, short grass High Plains in a broad belt across western Kansas and the Oklahoma and Texas panhandles, mixed grass and then tall grass prairies dominate the landscape to the east of the short grass, and these interfinger with the Cross Timbers which represent the westernmost expression of the Eastern Deciduous Forest.

Rivers and streams flow generally toward the east or southeast across this open country with the river bottomlands forming ribbons of plant life and focused animal activity. The treeless plains also have a variety of distinctive and productive plant and animal communities. When juxtaposed with playas, springs, or rivers, the Plains provide an especially diverse and rich environment for hunters and gatherers since their earliest arrival in the New World. In the western half of the area, except along perennial stream valleys, villages of horticultural groups A.D. 1150 to 1450) either did not occur or were relatively short lived. For much of the western portion of the study area, good evidence is lacking that corn, bean, and squash horticulture was ever practiced prehistorically, although horticultural groups commonly used the region for hunting and trading. From the perspective of prehistoric horticultural economies, the region was truly a marginal one. The extreme western limits of the Southern Plains horticultural villager adaptation is represented. The survival of this economy in the High Plains region was very short term, and for much of the region, horticulture simply provided an important supplement for a basically hunting and gathering lifeway.

## Chapter 3

# A HISTORY OF ARCHEOLOGICAL RESEARCH ON THE SOUTHERN GREAT PLAINS

*Jack L. Hofman and Joe S. Hays*

The history of archeological development in North America has been summarized in a number of accounts and this overall history will not be recounted here (Meltzer, Fowler and Sabloff 1986; Watson 1986; Wilmsen 1973; Willey and Sabloff 1980). Archeological research in the Great Plains region lagged behind developments and early activity in the Eastern Woodlands and the Southwest, due in part to the sparse early settlement in the region and to the prevailing anthropological views of the nineteenth century. There is no record of archeological activity or interests in the Southern Plains region until the late 1800s, and this period falls within what Willey and Sabloff (1984) have referred to as the "classificatory- descriptive period." Wedel (1981) and Frison (1973) have provided historical summaries of archeological research on the Plains as a whole, and several papers pertain specifically to the history of archeological research in the Southern Plains area (Lintz 1986; Anderson 1985a; Albert 1984; Suhm, Krieger and Jelks 1954). Additionally, several bibliographies pertain to the archeology of the region and provide documentation of early archeological literature (Campbell 1960; Bell 1978; Hughes 1977; Jones 1986; Lintz 1976; Petsche 1968)

Archeological research in the Plains was given considerable impetus during the late 1920s and 1930s upon the discovery and widespread acceptance of the association between Pleistocene faunas and human artifacts. Work at the Folsom site (Figgins 1927; Wormington 1957), Blackwater Draw (Howard 1935), and other Early Man sites (Schultz 1983), and Strong's (1936) study of remains from Signal Butte and other Nebraska localities provided solid evidence for a long record of human occupations in the Great Plains region. Prior to these studies it was widely accepted that aboriginal occupation of the Plains was dependent upon utilization of the bison and this was considered by many scholars to have been impractical or impossible without the aid of the horse. By this reasoning, it was logical that the Plains area would not have been much used during prehistoric times, with the exception of the more habitable eastern Plains margin and Rocky Mountain foothills.

Early reports on archeological materials from the region, such as Udden's (1900) study of a Great Bend aspect site in central Kansas (which produced a piece of Spanish chain mail) generally presented nothing which could not be accounted for by the prevailing dogma that settlement of the Plains region occurred very late in time. As long as this position was accepted, there was little incentive or reason to pursue archeological research in this cultural "desert" when more obvious and enticing remains were evident to the east and in the Southwest. Frison (1973) also suggests that it was not until the blossoming of Paleo-Indian studies on the Plains in the 1930s that archeological research in the area gained a substantial degree of respectability and widespread interest. The history of Paleo-Indian research in North America has been detailed by Wilmsen (1965), and a reading of this paper documents the importance of the Plains area in the development of Paleo-Indian studies.

Despite the important finds and documents on Plains archeology which appeared in the 1930s, the opinion persisted for many years, and in places still does, that aboriginal life on the Plains had a very shallow and undistinguished history. Kroeber, in a widely read text written primarily in 1931 but not published until 1939, presented one of the last formal statements arguing for limited aboriginal cultural activity on the Plains until the arrival of the horse. The following quotations are typical of the latter nineteenth and early twentieth century anthropological thought concerning Plains area culture history.

> Essentially the view held is that the Plains culture has been one of the well developed and characterized cultures of North America only since the taking over of the horse from Europeans, and that previously there was no important Plains culture, the chief phases in the area being marginal to richer cultures outside. In brief, the historic Plains culture was a late high-pressure center of culture in a region which previously had been rather conspicuously low pressure. That there is nothing revolutionary in such a view is shown by the fact that as long ago as 1916 Sapir in a sentence analyzed the recent Plains culture into non-Plains origins. (Kroeber 1939:76)

Furthermore, Kroeber (1939:77) argued strongly against Wissler's (1914) view that "The horse was simply put into the old patterns and made these more productive," and suggests that the "true" Plains culture would not have been possible by use of only dog traction. Wissler's view, of course, was based in large part on the ethnohistoric records from early Spanish entradas into the Southern Plains region (Winship 1896). Kroeber (1939:78) continues,

> It is scarcely contendable that the western plains were wholly uninhabited before the horse was available. Agricultural groups from the east and west probably strayed in now and then and tried to farm. Small groups could make a living by combining bison and riverbottom

> hunting with berry and root gathering. But the population probably clung in the main to the foot of the Rockies, where wood, water, and shelter were more abundant, fauna and flora more variegated, a less specialized subsistence mechanism sufficient; and from there they made incursions into the plains to hunt their big game, much as the prairie and parkland and even forest tribes ranged in from the east in the historic period.

Kroeber (1939:79) goes further to state that the Southern Plains was not only adjacent to the Southwest but is "more or less dependent on it."

## HISTORICAL EPISODES IN SOUTHERN PLAINS ARCHEOLOGICAL RESEARCH

Willey and Sabloff (1980) have defined, using a very broad perspective, several periods of research in American archeology including all of the New World. The history of archeological research in the Southern Plains region is much less complex and covers a shorter interval than some of the other areas discussed by Willey and Sabloff. For convenience in this historical discussion, We have divided the archeological activity in the Southern Plains region into four periods, based on the nature and focus of the research and partially upon the methodologies and primary sources of funding.

### Period I: Exploration (ca 1846-1925)

There was no archeology, per se, done in the Southern Plains region before the nineteenth century. However, the accounts of various early European explorers provide important limited information pertaining to the aboriginal people who occupied the region. Especially significant historical documents include accounts from the early Spanish entradas of Coronado, Onate, and others (Winship 1914; Vehik 1986; M. Wedel 1982). This historical information is of utmost importance to the region's archeology, but is appropriate for ethnohistoric discussions (e.g., John 1975) rather than an archeological overview. Prior to 1900 very little activity in the Southern Plains region could realistically be referred to as archeological research. Several early explorers in the area referred to native peoples in various, but always limited, detail and mention is made of some sites and areas of significance to the aboriginal inhabitants (Wedel 1981:17-20). Important among these is Abert's (1846) recording of the Alibates quarries in the Texas Panhandle. Until 1874, scientific activity in the Oklahoma and Texas Panhandle region was risky due to the dominance of nomadic tribes in the area, especially the Kiowa, Comanche, and Kiowa-Apache.

Most of the archeological investigations in the region during this period were conducted with the intention of gathering artifacts for museums or private collections, or by local citizens out of curiosity and attempts to evaluate local folklore pertaining to sites. The great majority of work in the Southern Plains during this period resulted from interested individuals who possessed no direct archeological training. Work by Udden (1900) and Williston and Martin (1900) in Kansas, research by Pearce on Texas archeology began prior to 1920 (Campbell 1960:235-236), and Thoburn's investigations of Oklahoma archeology which began prior to World War I but were not published until the 1920s, were among the earliest relatively systematic archeological investigations in the region. Moorehead's (1931) pioneering research in the Arkansas and Canadian river valleys conducted up to 1920 provided a brief perspective on the area's archeology and gave national attention and documentation to the archeological record of the Southern Plains.

Some significant early research resulted as a spinoff from paleontological investigations. For example, the Folsom, New Mexico, Colorado City, Texas, and Twelve Mile Creek, Kansas bison kills were being studied as paleontological sites when associations of human artifacts were encountered.

### Period II: Harvesting the Record (1925-1945)

Clarke (1968:3) refers to the traditional activities of many archeologists as a seasonal harvest of artifacts. To a large extent this diagnosis is appropriate for much of the archeological research which was conducted in the Southern Plains region prior to World War II. Southern Plains archeological resources became better recognized as extensive, substantial, and important by 1930. It is during this period that systematic archeological research began in the region (e.g., Renaud 1929a,b, 1930a,b), including the founding of important organizations such as the Texas Archeological and Paleontological Society and the Plains Archeological Conference. Federal funding for archeological field and laboratory work was supported by the Work Projects Administration. Information generated by such archeology provided the basis for a substantial amount of subsequent analysis and interpretation of the region's archeological record (e.g., Bell and Baerreis 1951; Krieger 1946). There are several distinctive methodological characteristics of the archeology during this period. These include the lack of absolute dating techniques (for the Plains area), the general practice of retaining only the artifacts and discarding the stone debris, selective collection of fauna while discarding broken and less easily identifiable pieces, and importantly the rare use of screens so that recovery was nonsystematic and generally biased to items of relatively large size.

An extremely important development for regional archeology during this period was interdisciplinary studies coordinated through archeological research interests. The research directed by Howard (1935, 1936) at Clovis, New Mexico provides a lasting testimony to the importance of interdisciplinary research. Stimulus for this work derived in part from the need for more precise dating of the deposits containing human artifacts and extinct fauna, and through the desire to document the nature of the environment which had changed dramatically in the area since the Pleistocene. It is unfortunate that most subsequent archeological research in the region did not address the problems of environmental changes and integrate interdisciplinary studies. Subsequent Paleo-Indian studies tended to be done following

the standard set by Howard's work (e.g., Leonhardy 1966), but it has only been in recent years that Southern Plains archeological research pertaining to the middle Holocene and Late Prehistoric records have taken an explicitly integrated interdisciplinary research approach (e.g., Ferring 1982). Later development of the radiocarbon dating technique provided archeologists with an expedient, precise, and more direct means of dating sites and collections of interest. The time-consuming interdisciplinary coordination of geological and paleontological efforts unfortunately became less necessary for addressing questions

of cultural history. Much of the archeology during this time was descriptive with primary efforts to establish time relationships between archeological complexes.

### Period III: Salvage Archeology and Chronology Building (1945-1970)

After World War II the focused development of inland waterways and reservoirs had a tremendous impact on archeology in the Plains region. River basin survey projects, funded by the National Park Service, operated in all the Plains states through the efforts of the Interagency Archaeological Salvage Program and volumes of descriptive archeological reports resulted (Petsche 1968). This was the period of radiocarbon dating, chronology building, coarse screens, development of archeological taxonomies and cultural histories, and normative views of cultural behavior as reflected in the archeological record (Willey and Phillips 1958). The "New Archeology" of the middle and late 1960s had little immediate impact on the practice of archeology in the Plains region, with few exceptions (e.g., Deetz 1965; Krause and Thorne 1971; Wood 1969).

Although federal funding was the primary supporter of archeological work during this period, university field schools and the work of local archeological societies were instrumental in the field investigations conducted in federal project areas, and importantly, outside of these reservoir impact areas as well. For the Oklahoma area these projects have been summarized by Albert (1984:Tables 2.2 and 2.3), and discussed in some detail by Brooks (1987). Information on the history of research in the Oklahoma Panhandle area is provided by Lintz (1980). Most active archeologists during this period were associated with academic institutions with local laborers and students providing the staffing for field crews.

Archeological research on major reservoirs in the region began in earnest during this period. Table 4 provides a summary of primary archeological research which has been conducted at the major reservoirs within the Southern Great Plains region. The locations of these reservoirs are shown in Figure 6. While not all of these studies were conducted within this time period, the vast majority were at least begun during this time. Those reservoir projects reported upon during the 1970s and 1980s are included in this list for sake of completeness. Many, but certainly not all, of these later studies pertain to shoreline surveys or restudies of established reservoirs.

The standard excavation during this period was done using five-foot squares, six-inch levels and usually quarter-inch dry

Table 4
Man-made reservoirs within the Great Plains study region

| Name | Drainage | County | Funding | References |
|---|---|---|---|---|
| TEXAS | | | | |
| Abilene | Clear F.,Brazos | Taylor | City of Abiline | |
| Amon G. Carter (Bowie) | West F. Trinity | Montague | Locally Owned | |
| Arrowhead(Halsell) | Little Wichita | Clay Archer | Wichita Falls | Shafer (1966) |
| Baylor Creek | Red | Childress | City of Childress | |
| Bivins | Red | Randall | City of Amarillo | |
| Breckenridge | Brazos | Stephens | | |
| Bridgeport | West F. Trinity | Wise Jack | Locally owned | |
| Buffalo Lake | Red | Randall | USFWS | Creel (1980); Hays (1986) |
| Canal Creek | Red | Foard | COE | |
| Catherine | Brazos | Knox | | |
| Champion Creek | Colorado | Mitchell | TESC | Tunnell (1960) |
| Clyde | Colorado | Callahan; Coleman | SCS | |
| Lake Colorado City | Colorado | Mitchell | | |
| Coyote | Brazos | Bailey | | |
| Croton | Brazos | Dickens; Kent; Stonewall | | Skinner (comp. 1973) |
| Crowell | Red | Cottle; Foard; King; Knox | COE | Hughes (1972); Etchieson et al. (1979) |
| Daniel | Brazos | Stephens | City of Breckenridge | |
| Davis Lake | Brazos | Knox | League Ranch | |
| Diversion | Wichita | Baylor; Archer | City of Wichita Falls; WCWCID2 | |
| Double | Brazos | Lynn | | |
| Dove | Brazos | King; Stonewall | | |

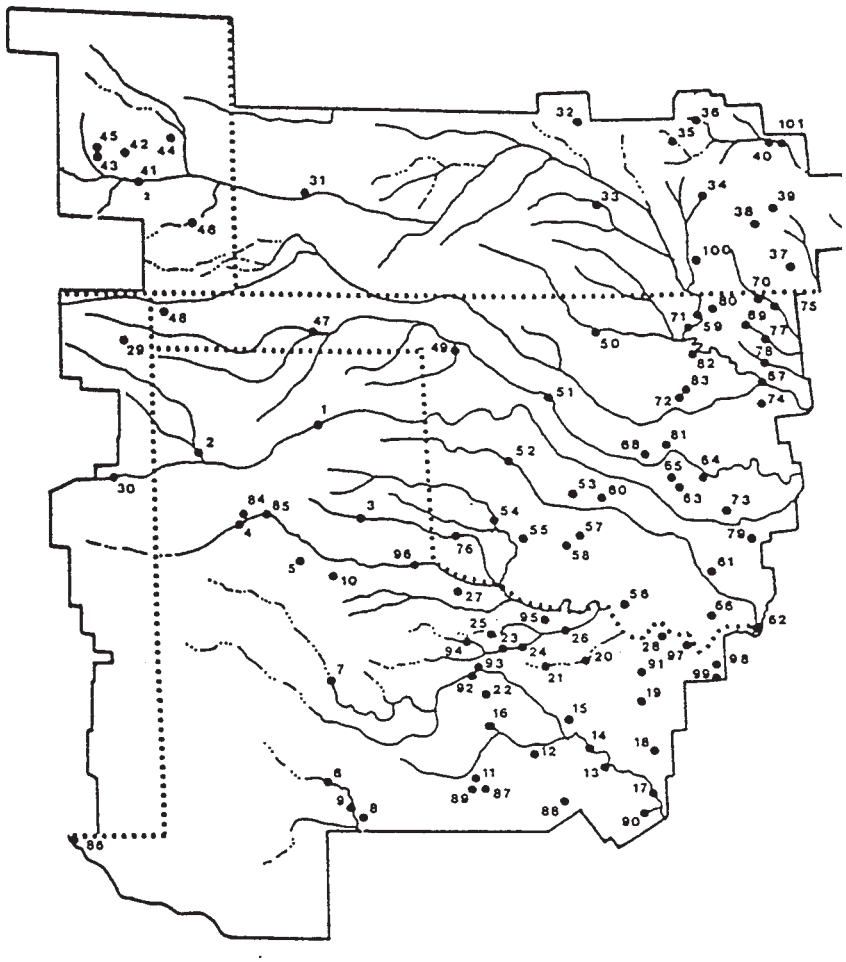
| Name | Drainage | County | Funding | References |
|---|---|---|---|---|
| Dry Salt Creek | Red | Childress; Hall; Collingsworth | COE | Hughes (1973) |
| Eagle Mountain | Trinity | Tarrant; Wise | Locally Owned | |
| Electra City | Red | Wilbarger | City of Electra | |
| Farmers Creek (Nocona) | Red | Montague | NMCWSD | Jelks (1960) |
| Fort Phantom Hill | Clear F. Brazos | Jones | City of Abilene | |
| Graham | Brazos | Young | | |
| Granbury (DeCordova Bend) | Brazos | Hood | BRA | Jelks (1954); Skinner (1968, 1971); Lorrain (1967) |
| Greenbelt | Salt F. Red | Donley | GMIWA | Hughes (1959) |
| Guthrie | Brazos | Lynn | | |
| Hubbard Creek | Clear F. Brazos | Stephens | WCTMWD | |
| Hubert H. Moss (Fish Creek) | Red | Cooke | City of Gainesville | Lorrain (1969) |
| Illusion | Brazos | Lamb | | |
| J.B. Thomas (Colorado City Res.) | Colorado | Borden; Scurry | CRMWD | Jelks (1952) |
| Justiceburg | Brazos | Garza; Kent | City of Lubbock | Boyd et al. (1988) |
| Keeche Creek | Brazos | Jack | | |
| Kemp | Wichita | Baylor | Wichita Falls, WCWCID2 | |
| Kickapoo | Little Wichita | Archer | Wichita Falls | |
| Kiowa | Trin ity | Cooke | Lake Kiowa, Inc. | |
| Kiowa Peak | Brazos | King | COE | |
| Kirby | Brazos | Taylor | City of Abilene | |
| Lelia Lake | Red | Donley | | |
| Leon | Brazos | Eastland | ECWSD | |
| Little Red River | Red | Hall | COE | Hughes (1973) |
| Lytle | Brazos | Taylor | | |
| Mackenzie | Red | Briscoe; Swisher | MMWA | Malone (1970); Katz & Katz (1976); Hughes and Willey (1978) |
| McClellan | North F. Red | Gray | | |
| Miller's Creek | Brazos | Baylor; Throckmorton | | Malone and Briggs (1970) |
| Mineral Wells | Brazos | Parker | PPCMWD1 | |
| Mound | Brazos | Terry | | |
| North Buffalo Creek Res. | Wichita | Wichita | WCWCID3 | |
| Olden | Brazos | Eastland | | |
| Olderi | Brazos | Eastland | | |
| Palo | Duro | Canadian | Hansford | Peterson ARI (1987) |
| Palo Pinto | Brazos | Palo Pinto | PPCMWD1 | |
| Paluxy | Brazos | Erath | | |
| Pauline | Red | Hardeman | | |
| Possum Kingdom (Morris Lake) | Brazos | Palo Pinto; Stephens; Young | | Hughes (1942); Krieger (1946); Brayshaw (1970) |
| Post | Brazos | Garza | City of Lubbock | |
| Ray Roberts Res.(Aubrey) | Trinity | Cooke; Denton; Grayson | COE | Bousman |
| Red Bluff Res. | Pecos | Loving | | |
| Rita Blanca | Canadian | Hartley | SCS | |
| Salt Creek (Graham Eddleman) | Brazos | Young | | |
| Sanford (Lake Meredith) | Canadian | Moore; Hutchinson; Potter | USBR | Green (1986); Etchieson (1981); Phillips (1985); Davis (1985); Duffield (1962); Schmidt-Couzzourt (1983); Etchieson and Couzzourt (1987) |
| Santa Rosa Lake | Wichita | Wilbarger | WTWE | |
| Silver | Brazos | Cochran; Hockley | | |
| South Bend | Brazos | Stephens; Young | TAMU 1987-1988 | |
| Squaw Creek Lake | Brazos | Somervell; Hood | | Skinner & Humphreys (1973) |
| Stamford (Paint Creek) | Clear F. Brazos | Haskell | | Jelks and Mooreman (1953) |
| Stephenville | Brazos | Erath | | |
| Sweetwater (Trammel) | Brazos | Nolan | City of Sweetwater | |
| Tanglewood | Red | Randall | | |
| Texoma (USDI) | Red | Cooke | COE | Kelly (1944, 1945) |
| (Denison) | Washita | Grayson | | Prewitt and Lawson (1972) |
| Theo | Red | Briscoe | | Harrison and Smith (1975) Harrison & Killen (1978) |

| Name | Drainage | County | Funding | References |
|---|---|---|---|---|
| Truscott Brine Control Lake | North Wichita | Knox; King | COE | Etchieson et al. (1970) |
| Upper Pecan Bayou | Colorado | Callahan; Coleman | | |
| Weatherford | Clear F. Trinity | Parker | Locally Owned | |
| White River | Salt F. Brazos | Crosby | WRMWD | Green (1961) |
| Wichita | Wichita | Wichita; Archer | Wichita Falls | Rohrt et al. (1975) |
| NEW MEXICO | | | | |
| Clayton | Beaver | Union | | |
| Ute Lake | Canadian | Quay | USBR | Hammack (1965); Hays (1985) |
| KANSAS | | | | |
| Cedar Point Res. | Cottonwood | Chase | | Barr (1951); Wood (1977) |
| Cheney Res. | Arkansas | Reno | | Witty (1963a) |
| Council Grove Lake | Neosho | Morris | COE | Witty (1961; 1962a; 1963c; 1965) |
| El Dorado Lake | Walnut | Butler | COE | Adair (1981); Fulmer (1976; 1977); Roberts (1981a,b; 1983); Brockington (1982) |
| Elk City Lake | Elk | Montgomery | COE | Witty (1962b); Frantz (1964); Marshall (1965, 1966a, b 1967, 1972); Weakly (1965); Brogan(1979, 1981) |
| Fall River | Fall | Greenwood | | Eoff and Johnson (1967); Elcock and O'Brien (1979) |
| John Redmond Res. | Neosho | Coffey | COE | Witty (1961b) (1963d; 1964; 1980); Schmits (1980); Thies (1981) |
| Kanopolis | Smoky Hill | Ellsworth | | Kivett (1947b) ; Mattes (1947); Smith (1949) |
| McKinney | Arkansas | Kearny | | |
| Marion | Cottonwood | Marion | COE | Witty (1963b) |
| Toronto Lake | Verdigris | Woodson; Greenwood | COE | Moorman (1953); Greenwood and Johnson (1957); Howard (1964); Rohn et al. (1980) |
| Winfield City Lake | Walnut | Cowley | | |
| Wolf Creek Res. | Neosho | Coffey | | Rohn Stein and Glover (1977) |
| COLORADO | | | | |
| Adobe Creek Res. | Arkansas | Kiowa; Bent | | |
| Henry | Arkansas | Crowley | | |
| John Martin Res. | Arkansas | Bent | COE | Eddy (1982) |
| Meredith | Arkansas | Crowley | | |
| Neenoshe Res. | Arkansas | Kiowa | | |
| Two Buttes Res. | Arkansas | Baca | | |
| OKLAHOMA | | | | |
| Altus Reservoir (W.C. Austin Proj.) | North F. Red Kiowa | Greer | USBR | Steinacher and Brooks (1985) Agogino and Etchieson (1985); Boyd (1985); Button and Agogino (1986); Burton and Burton (1971); Schneider (1967); Wallis (1983) |
| Arbuckle | Washita | Murray | | Barr (1965); Steinacher and Brooks (1985) |
| Arcadia | Deep Fork River | Oklahoma | COE | Neal (1973a); Hartley (1976) |
| Birch Creek | Verdigris | Osage | COE | Barr (1964); Barr (1966); Perino 1972a; Gettys et al. (1976); Henry (1977b) |
| Bluestem | Arkansas | Osage | | |
| Candy | Bird Creek | Osage | | Leehan (1977) |
| Canton | N. Canadian | Blaine; Dewey | COE | Bell (1949) |
| Carl Blackwell | Cimarron | Payne | | |
| Chickasha | Washita | Caddo | | |
| Chisholm Trail | Washita | Stephens | | |
| Copan | Caney | Washington | COE | J.A. Howard (1970); Rohn and Smith (1972); Vaughan (1975); Henry (1977a);Vehik and Pailes (1979) |

| Name | Drainage | County | Funding | References |
|---|---|---|---|---|
| Duncan | Washita | Stephens | | |
| Ellsworth | Red | Comanche | | Leonhardy (1964) |
| Fort Cobb Res.1958-59 | Washita | Caddo | USBR | Williams (1955); Steinacher and Brooks (1985) |
| Fort Supply Lake | N. Canadian | Woodward | COE | |
| Foss Reservoir 1958-61 | Washita | Custer | USBR | Williams (1955); Gallaher (1951); Buck (1959); Steinacher and Brooks (1985); Agogino et al. (1985) |
| Fuqua | Washita | Stephens | | |
| Great Salt Plains Lake | Salt F. Arkansas | Alfalfa | COE | |
| Hefner | North Canadian | Oklahoma | | |
| Heyburn | Arkansas | Creek | COE | Bell (1949) |
| Hulah | Caney | Osage | COE | Bell (1949) |
| Humphrey's | Washita | Stephens | | |
| Kaw | Arkansas | Kay; Osage | COE | Wyckoff (1964a); Bastian (1969); Rohrbaugh (1973; 1974); Hartley (1974a; 1975); Hartley and Miller (1977); Young (1978); Galm (1979b); George (1982); Artz (1983) |
| Keystone | Cimarron, Salt F. Ar. | Osage; Creek; Payne | | Brighton (1952); B. Moore (1980) |
| Konowa | Canadian | Seminole | | |
| Lawtonka | Red | Comanche | | |
| Mangum Reservoir | Salt Fork | | | Wyckoff (1963) |
| (never constructed) Red | Harmon | | | Leonhardy (1966b) |
| McMurtry | Cimarron | Payne; Noble | | |
| Murray | Red | Carter; Love | | |
| Optima | N. Canadian | Texas | COE | Lees (1983) |
| Overholser | N. Canadian | Oklahoma | | |
| Parker Reservoir | Muddy Boggy | Hughes; Coal; Pontotoc | | Neal (1972) |
| Ponca | Arkansas | Kay | | |
| Sand | Caney | Osage | | |
| Shawnee | N. Canadian | Pottawatomie | | |
| Shidler | Arkansas | Osage | | Neal (1973b) |
| Skiatook | Verdigris | Osage | COE | Rohrbaugh and Wyckoff (1969); Perino (1972b); Gettys et al. (1976); Henry (1977c) |
| Snyder Dam and Lake Removed 1971-1977 | | | | |
| Sooner | Arkansas | Pawnee; Noble | | |
| Stanley Draper | Canadian | Cleveland | | |
| Taylor | Washita | Grady | | |
| Texoma | Red | Love | | Bell (1954, 1958) |
| (Denison) | Washita | Marshall | | Bell and Baerreis (1951); M.A. Ray (1960); Wyckoff (1964c); Prewitt and Lawson (1972); Good (n.d.) |
| Thunderbird (Norman) | Canadian | Cleveland | | B. Williams (1955); Boyd (1982); Steinacher (1984); Steinacher and Brooks (1985) |
| Tom Steed Lake (Mountain Park Res. 1977) | North F. Red | Kiowa | USBR | Steinacher and Brooks (1985) |
| Waurika | Red | Stephens; Jefferson; Cotton | COE | Lawton (1958a); Bastian (1967); Rohrbaugh (1972a); Hartley (1974b); Stevens and Hays (1977a, b) |

Abbreviations:
USBR - U.S. Bureau of Reclamation
COE - U.S. Army Corps of Engineers
USFWS- U.S. Fish and Wildlife Service
SCS - U.S. Soil Conservation Service
WCTMWD - West Central Texas Municipal Water District
ECWSD - Eastland County Water Supply District
PPCMWD1 - Palo Pinto County Municipal Water District No. 1
NCTMWD - North Central Texas Municipal Water District
WRMWD - White River Municipal Water District
TESC - Texas Electric Service Company
CRMWD - Colorado River Municipal Water District
GMIWA - Greenbelt Municipal and Industrial Water Authority
WTWE - W.T. Waggoner Estate
WCWCID2 - Wichita County WC & ID No.2
WCWCID3 - Wichita County WC & ID No.3
NMCWSD - North Montague County Water Supply District
MMWA - Mackenzie Municipal Water Authority
BRA - Brazos River Authority

1. Lake Meredith (Texas)
2. Rita Blanca Reservoir (Texas)
3. Greenbelt Reservoir (Texas)
4. Buffalo Lake (Texas)
5. Mackenzie Reservoir (Texas)
6. Lake J. B. Thomas (Texas)
7. White River Lake (Texas)
8. Champion Creek Reservoir (Texas)
9. Colorado City Reservoir (Texas)
10. Lake Theo (Texas)
11. Fort Phantom Hill Reservoir (Texas)
12. Hubbard Creek Reservoir (Texas)
13. Lake Palo Pinto (Texas)
14. Possum Kingdom Lake (Texas)
15. Lake Graham (Texas)
16. Lake Stamford (Texas)
17. Lake Granbury (Texas)
18. Weatherford Lake (Texas)
19. Bridgeport Reservoir (Texas)
20. Lake Arrowhead (Texas)
21. Lake Kickapoo (Texas)
22. Miller's Creek Reservoir (Texas)
23.Lake Kemp (Texas)
24. Lake Diversion (Texas)
25. Santa Rosa Lake (Texas)
26. Lake Wichita (Texas)
27. Lake Pauline (Texas)
28. Farmer's Creek Reservoir (Texas)
29. Clayton Lake (New Mexico)
30. Ute Lake (New Mexico)
31. Lake McKinney (Kansas)
32. Kanopolis Lake (Kansas)
33. Cheney Reservoir (Kansas)
34. El Dorado Lake (Kansas)
35. Marion Lake (Kansas)
36. Council Grove Lake (Kansas)
37. Elk City Lake (Kansas)
38. Fall River Lake (Kansas)
39. Toronto Lake (Kansas)
40. John Redmond Reservoir (Kansas)
41. John Martin Reservoir (Colorado)
42. Adobe Creek Reservoir (Colorado)
43. Lake Meredith (Colorado)
44. Neenoshe Reservoir (Colorado)
45. Lake Henry (Colorado)
46. Two Buttes Reservoir (Colorado)
47. Optima Lake (Oklahoma)
48. Lake Carl Etling (Oklahoma)
49. Fort Supply Lake (Oklahoma)
50. Great Salt Plains Lake (Oklahoma)
51. Canton Lake (Oklahoma)
52. Foss Reservoir (Oklahoma)
53. Fort Cobb Reservoir (Oklahoma)
54. Altus Reservoir (Oklahoma)
55. Tom Steed Lake (Oklahoma)
56. Waurika Lake (Oklahoma)
57. Lake Ellsworth (Oklahoma)
58. Lake Lawtonka (Oklahoma)
59. Kaw Lake (Oklahoma)
60. Lake Chickasha (Oklahoma)
61. Arbuckle Reservoir (Oklahoma)
62. Lake Texoma (Oklahoma)



63. Lake Thunderbird (Oklahoma)
64. Shawnee Reservoir (Oklahoma)
65. Lake Stanley Draper (Oklahoma)
66. Lake Murray (Oklahoma)
67. Keystone Lake (Oklahoma)
68. Lake Hefner (Oklahoma)
69. Bluestem Lake (Oklahoma)
70. Hulah Lake (Oklahoma)
71. Lake Ponca (Oklahoma)
72. Lake Carl Blackwell (Oklahoma)
73. Lake Konowa (Oklahoma)
74. Heyburn Lake (Oklahoma)
75. Copan Lake (Oklahoma)
76. Mangum Reservoir (Oklahoma)*
77. Birch Creek Reservoir (Oklahoma)
78. Skiatook Reservoir (Oklahoma)
79. Parker Reservoir (Oklahoma)*
80. Shidler Reservoir (Oklahoma)
81. Arcadia Reservoir (Oklahoma)
82. Sooner Lake (Oklahoma)
83. Lake McMurtry (Oklahoma)
84. Bivins Lake (Texas)
85. Lake Tanglewood (Texas)
86. Red Bluff Reservoir (Texas)
87. Lake Clyde (Texas)
88. Leon Reservoir (Texas)
89. Lake Abilene (Texas)
90. Squaw Creek Lake (Texas)
91. Lake Amon G. Carter (Texas)
92. Davis Lake (Texas)
93. Lake Catherine (Texas)
94. Truscott Brine Control Lake (Texas)
95. North Buffalo Creek Reservoir (Texas)
96. Baylor Lake (Texas)
97. Hubert H. Moss Lake (Texas)
98. Lake Kiowa (Texas)
99. Ray Roberts Reservoir (Texas)
100. Winfield City Lake (Kansas)
101. Wolf Creek Reservoir (Kansas)

*never constructed

**Figure 6. Selected man-made reservoirs in the Great Plains study region.**

screening. Special studies of fauna, human remains, or soil analyses were sometimes included as appendices to archeological reports. Rarely was concern expressed for systematic sampling or with recovery bias, and only occasionally did studies address settlement or land use patterns on a regional scale (Wendorf and Hester 1962; Wyckoff 1970).

An increasing concern for environmental considerations is evident in the archeological research during this period (Wedel 1941, 1963), but the documentation and incorporation of paleoenvironmental information into specific studies was beyond the competence and time which most archeologists could bring to their specific projects and only rarely was the help of specialists sought and included within site studies. One factor of considerable importance to the archeology of this period was the substantial degree of continuity in the archeologists working within particular regions. Most of the research conducted during this period was under the direction of a very few professional archeologists and their students. Field work was usually done with a full awareness of previous investigations and a strong familiarity with the region.

### Period IV: Behavioral Archeology and CRM (1970-1985)

A recent volume has provided a useful synopsis and multiple perspectives on Plains archeology during the period of behavioral archeology and cultural resources management (Osborn and Hassler 1987). Brooks (1987) has divided archeological research in Oklahoma during this period into the Contractual Era (1972-1980) and the Survey and Planning Era (1979-1989). Accepting that there are important differences in the nature of archeological work in the region during these two eras, they are, nevertheless, combined here as a more general perspective is of concern. The passing of federal legislation intended to provide some level of protection for cultural resources resulted in a dramatic increase in federally funded archeological research in the Southern Plains region. This resulted in advantages and disadvantages for learning about the archeological record. Many projects were conducted outside of major river basins, and increasingly stringent contract requirements resulted in a more even documentation of the variety of site types and study of many nonspectacular but important sites and localities. There was a dramatic increase in the number of federal agencies, state institutions, and private organizations involved in doing archeological research in the region. Many of the archeologists involved had relatively little prior experience or training in the region or familiarity of standing research questions or with documents pertaining to previous work. Many reports were produced in extremely limited number so that the increase in archeological fieldwork did not result in a concomitant jump in the quantity of widely available information about the region.

One increasingly important and distinctive aspect of the archeological reports for this period is the use of statistics. Although some of the statistical work was unquestionably superfluous (see discussions in Thomas 1976), it resulted in an increased awareness of the limitations of normative qualitative comparisons within and among samples. Documenting the statistical nature and significance of variability, and application of statistical tests with known confidence levels are critically important developments in archeology. Related to this, the increasingly fundamental place of computers in data management, processing, and analysis continues to have a profound impact on archeological research.

Sampling has always been practiced in various forms in archeological work, but systematic sampling based on information about size and diversity of sites or survey areas has become a standard practice in archeology during the past 15 years. The truly unfortunate thing about sampling practices in contemporary Plains archeology is that the samples are generally too small and the establishment of specific sampling procedures are usually based on inadequate information. An unfortunate circumstance is that samples of approximately 10% (of a site or a region) are often considered "adequate" for mitigation and resource management purposes. This has been done irrespective of the limitations placed on addressing research questions and despite the fact that there is generally no basis for assuming that 10% of a study area is in any real sense representative of the remaining 90%. In fact, in many instances it is more than likely that what we think we know of cultures represented in these sites is considerably distorted from the reality because of the limited nature of the excavations. For many questions we have about the past, information on only 10% of a site or area will not enable us to reach answers.

Despite limitations of unpublished and nondistributed reports, problems with inadequate familiarity with regional archeology, and the often inadequate scale of mitigation studies, the progress of Southern Plains archeology during the last 15 years has been considerable. Many of the kinds of information which are recovered and studied today were generally not even considered 25 years ago. The systematic use of fine screening and flotation recovery, and the integration of paleoethnobotany, soils, geomorphology, lithic use wear, microfaunal studies, taphonomy, and the focused study of debris classes in addition to artifacts demonstrate a more resourceful and intensive use of the archeological record for documenting variability and addressing questions at very specific and broad scales.

Another important factor which is difficult to assess in actual numbers is the increased public awareness which has resulted from increased federal funding and increased archeological activity. Also, the large number and variety of investigations resulted in many communities feeling the "impact," both financial and social, of archeological crews working in their vicinities. There has also been an increased effort to make the results of archeological studies available to the interested public through popular publications (e.g., Goodman 1980; K. Wallis 1978).

Numerous recent synthetic studies indicate that a considerable amount of information has been assimilated about the archeology in this region during the past two decades. Many prob-

lems have been clearly delineated and definite gaps in our knowledge and understanding of the past are evident (Brown and Simmons 1987; Stuart and Gauthier 1981; Wyckoff and Brooks 1983). These large synthetic works stand in contrast to the intensively specialized technical studies which are often associated with modern archeology. The latter sometimes have such an intimate focus on specific analytical "trees" that they contribute little to understanding or seeing the archeological "forest." On the other side, many synthetic studies continue to be little more than refined cultural historical reviews embellished with new radiocarbon dates but hollow in terms of theoretical position. The latter must receive work and concerted effort just as we work to develop chronologies.

One development which has resulted from the cultural resource management years is the "preservation ethic." This is a "catch-22" for archeological resources (as opposed to standing architectural structures) in that it is often necessary to dig (destroy) archeological resources in order to learn about them. Federal laws and funds have been apportioned in response to the recognition that it is important to learn about the past, that our cultural heritage is significant. In most archeological situations we do not learn from preservation, we learn through excavation and analysis. In this perspective, preservation for archeology can never be more than a temporary measure if we truly want to learn about the past. It is important, however, to preserve when possible some portion of the archeological record for future researchers. The practice of site avoidance as an alternative to mitigation is incomplete when no provisions are made for follow-up studies to determine how many "avoided" sites are subsequently disturbed or destroyed by development, vandals, or natural processes. Avoidance demands a long term commitment to site monitoring and protection. Most agencies are inadequately funded and staffed to provide such prolonged protection.

In a discussion of American archeology in the 50 years since the founding of the Society for American Archaeology in 1935, Jennings (1986:60) considers cultural resource management "a mixed blessing, which has often led to grave mistakes and has had costs far beyond its scientific rewards; while there are a few bright spots in the record, on balance CRM has generally harmed our discipline." I see this assessment as extreme, though not without some basis. Archeology in the United States since 1970 has received a significant boost through federally mandated support. This has resulted in an enormous increase in bureaucratic costs and in many archeologists working within federal organizations. While the costs of some projects has been comparatively high, much of the expense is in the bureaucratic level and not from excessive spending at the field or laboratory level. Some parallels are present with the WPA era archeology when for the first time an "enormous" amount of federal money was used in support of archeology. Many mistakes were made in this earlier period as well. On the whole, we believe the contribution of CRM archeology will hold its own with the contribution of WPA archeology in the long term development of the field. The critical need is for integration of this work with the broad objectives and goals of methodological and theoretical archeology.

## ARCHEOLOGICAL ORGANIZATIONS

Within the five-state study region of the Southern Great Plains, a number of archeological organizations exist which have contributed substantially to the study and documentation of the region's archeology. Much of what is known about the archeology of this region has been documented by professional and avocational archeologists through the vehicles of amateur societies. Organizations include at least one in each state, in addition to at least three regional organizations. These societies have played and continue to play an instrumental role in the development and documentation of archeology in the Southern Plains. Brief mention of some of them here is intended to highlight the fundamental position these organizations in the history of archeology in the area.

The Plains Anthropological Society (formerly the Plains Anthropological Conference) is the primary regional professional organization. The first Plains Conference was held in 1930 in South Dakota and has met annually since 1947 which was the date of the fifth conference meeting. The Society has published the *Plains Anthropologist* (formerly the *Plains Archeological Conference News Letter*) since 1947. Twenty-one memoirs have been published as of 1986.

The Southwest Federation of Archeological Societies is a regional organization established and operated by avocational archeologists from a number of member societies in western Texas and eastern New Mexico. The involvement and contributions of specific cooperating societies has varied considerably through time, but the overall structure has remained intact since 1965. The organization publishes a volume each year entitled *Transactions of the Regional Archeological Symposium for Southeastern New Mexico and Western Texas,* which is now in its twenty-fourth year. Participating archeological societies include or have included the El Llano and Lea County societies in New Mexico and the El Paso, Gaines County, Iraan, Lower Plains, Panhandle, Midland, and South Plains archeological societies in Texas. In addition to the *Transactions,* several of these societies also publish their own report series. These include *The Artifact* (El Paso Archeological Society), *Bulletin of the South Plains Archeological Society,* and the Panhandle Archeological Society publications. Most of the societies also have newsletters. In general, this group of amateur archeological societies works in a region which has received minimal attention by professional archeologist and which is often considered as marginal to both the Plains region and to the Southwest. These groups have done an extremely commendable job of documenting and enhancing our understanding of a region which without their efforts would be much less well known. It is appropriate to mention that the single most critical and recurrent problem with private artifact collections in this region, as in others, is that provisions are generally not made for long term curation. Specific collections generally become lost, dispersed, neglected or unknown by two genera-

tions after they were made. The research potential and importance of such collections goes from high to extremely low once separated from records or the person knowledgeable about them.

A third regional organization is the Flint Hills Archaeological Conference which has an informal organization and has met annually since 1979. Participants include archeologists working in the Flint Hills region of Kansas and Oklahoma, and papers presented at the meetings relate primarily to current research in the area. The organization does not have its own publication.

Each of the states in the Southern Great Plains region has archeological organizations which are based on active participation by avocational and professional archeologists. The Colorado Archaeological Society was established in 1935 by C. T. Hurst and has been a moving force in Colorado archeology since that time. Its publication, *Southwestern Lore,* is an important state and regional journal which has been published since 1935. The society also publishes a memoir series. Cassells (1983) has documented the involvement of many important figures in Colorado archeology along with a very useful overview of the state's archeology.

In Kansas, the Kansas Anthropological Association, established in 1955, published a newsletter for 24 years through 1979 and began publication of the J*ournal of the Kansas Anthropological Association* in 1980. The Archaeological Association of South-Central Kansas (at Wichita State University) also publishes a newsletter. O'Brien (1984) has published a popular guide to Kansas archeology which includes information on professional reports pertaining to Kansas archeology and where these can be obtained. A more comprehensive and current overview of Kansas archeology has been prepared by Brown and Simmons (1987).

For New Mexico the organizations which focus on the eastern or Plains portion of the state have been mentioned above.

In Oklahoma the primary organization is the Oklahoma Anthropological Society, established by Robert Bell in 1952. This society publishes a newsletter, annual bulletin, and a memoir and special bulletin series. Several affiliated chapters also publish limited distribution newsletters. A bibliography of Oklahoma archeology to 1976 has been published by Bell (1978), and an edited volume on Oklahoma archeology is available which is fairly comprehensive up to about 1980 (Bell 1984). Albert (1984) has a chapter in this volume which details the activities and history of various organizations involved in archeology in Oklahoma.

In Texas, the Texas Archeological Society is the primary organization. Several smaller groups have been mentioned above and a number of others also exist. Notable among these is the Dallas Archeological Society formed in 1936 and which has published *The Record* since 1939. The TAS was founded in 1928 through the efforts of Cyrus Ray and others and is one of the older and more reputable archeological organizations west of the Mississippi. The organization was originally called the Texas Archeological and Paleontological Society until 1955. The society publishes *Texas Archeology,* a quarterly newsletter, and a yearly bulletin. Davis (1979) has provided a useful and insightful history of the Texas Archeological Society.

In addition to these archeological societies, a number of state agencies and institutions work exclusively with archeological preservation problems in the region. These include the Office of Archaeology and Historic Preservation of the Colorado Historical Society, the Kansas State Historical Society; Laboratory of Anthropology, Historic Preservation Division at the Museum of New Mexico; the Oklahoma Archaeological Survey; the Texas Historical Commission; Office of the State Archaeologist, and the Texas Archaeological Research Laboratory in Austin. These organization conduct a considerable amount of research which is published through their own series and provide significant public outreach programs. Importantly, these agencies also provide the training grounds for many student archeologists.

# PREHISTORIC CULTURE HISTORY: HUNTERS AND GATHERERS IN THE SOUTHERN GREAT PLAINS

*Jack L. Hofman*

There are a number of reports available for the archeology of the Southern Great Plains region, on which the present summary and following chapters rely. In addition, many chronologically or geographically specific summaries have been presented which provide the basis for much of what is presented here. General summaries of primary importance are provided by Wedel (1961, 1978, 1986). Archeological overviews at the regional or state level include Cassells (1983), Eighmy (1984), and Gunnerson (1987) for Colorado; Brown and Simmons (1987), O'Brien (1984), and Wedel (1959) for Kansas; Stuart and Gauthier (1981) for New Mexico; Bell and Baerreis (1951), Bell (1984), and Wyckoff and Brooks (1983) for Oklahoma; Collins (1968), Lynott (1981), Prewitt (1981), and Suhm, Krieger and Jelks (1954) for Texas. Early Man surveys or collected works which are of particular note for this chapter include Frison (1978), Sellards (1952), Wormington (1957), Wormington and Forbis (1965), Shutler (1983), Hester (1972), Johnson (1977), Ericson, Taylor, and Berger (1982), Wendorf and Hester (1962), Wilmsen (1965). Paleoenvironmental studies and edited volumes include Wendorf and Hester (1975), Mead and Meltzer (1985), Martin and Klein (1984), and Dort and Jones (1970). General studies pertaining to the Archaic, in addition to the above mentioned volumes, include Hester (1976), D. Hughes (1980), Ivey (1986), and Johnson 1979. Late Prehistoric summaries are found in Baugh (1986), Bell (1984), Blakeslee (1978), Campbell (1976), Kelly (1961), Krieger (1946), and Lintz (1986).

## PALEO-INDIAN

The earliest incontestable evidence of human occupation in the Americas dates to about 12,000 years ago and these most ancient Americans, since Roberts (1940) introduced the term, are generally referred to as Paleo- Indians (Jennings 1978; Shutler 1982; Willey 1966). The key characteristics of the Paleo-Indian period, which is here considered to have lasted from at least 12,000 until approximately 8,000 years ago, include an economic focus on hunting and the use of various distinctive lanceolate, unnotched projectile points for spear or dart tips. On a continental scope, primary prey species included mammoth, mastodon, bison, caribou, deer and to a lesser extent camel, horse, and a variety of smaller animals. For the Great Plains region after 11,000 years ago, bison is unquestionably the species of primary economic importance.

Recurrent but minimal evidence from a variety of sites indicates that structural remains during this period were of a temporary or ephemeral nature (Dawson and Judge 1969; Frison and Bradley 1980; Frison and Stanford 1982; Gardner 1974; Gramley 1982; Irwin 1971; Stanford and Patton 1984; Wilmsen and Roberts 1978). Burial practices are very poorly documented and consist of only a few scattered finds of which the majority are poorly dated, badly disturbed, or only minimally reported (e.g., Taylor 1968; Stafford et al. 1984; Lahren and Bonnichsen 1974; Wendorf, Krieger and Albritton 1955; Wendorf and Krieger 1959).

The social organization and mobility patterns of these early groups are not understood at present but a few basic tenets regarding their cultural situation can be offered. Of key importance is the fact that the earliest arrivals to the New World, whether during Clovis times or earlier, had no human competition and would have encountered animal populations which were not accustomed to human predation. This should have provided a virtual "Garden of Eden" for hunting-oriented peoples who would have been familiar, because of their origins in the Upper Paleolithic cultures of northeastern Siberia, with the behavior of key prey species. Economic focus on large mammals would have reduced in large degree the problems created by lack of familiarity with a specific region or terrain (Kelly and Todd 1988, West 1983). In such a "frontier" situation detailed knowledge of animal behavior patterns under various conditions and settings would have alleviated ignorance of specific places. These earliest hunter-gatherers were probably species oriented rather than place oriented (Kelly and Todd 1988). As stated by West (1983:377), "hunters of large mammals have skills that transfer readily and widely." An alternative view to this position which lacks strong material evidence has been presented by Meltzer and Smith (1986).

Given that people entered the New World by way of the Bering Land Bridge, we can further argue that their technological system would have been fairly highly developed and generally comparable to those of Upper Paleolithic peoples who colonized eastern Russia and northern China and Japan during the late Pleistocene (Dennell 1986; Soffer 1985; West 1983). A high degree of mobility is very likely, but the nature of any patterning in aggregation and dispersal of family groups, bands, and multiple band units is unknown at present. Social relationships beyond the extended family group would have been critical to maintain a reproductively viable lineage (e.g., Gamble 1981; Wiessner 1982). Whether the basic subsistence groups were large enough to enable in-group marriages is unknown, but it is perhaps more likely that relatively small extended family groups maintained at least intermittent contact with one another. These subsistence groups would have benefited markedly from long

term intergroup contacts which involved exchanges of information pertaining to resource locations, hunting conditions, sharing of windfall resources, as well as from trade of material goods. Intergroup marriages would have enhanced the solidarity of the larger reproductive groups, provided avenues for sharing of information and materials, strengthened the overall social fiber, and enhanced the long term adaptive viability of the cultural system. The viability and structure of potential intergroup relationships may have varied significantly, even during Paleo-Indian times, due to changes in local and regional population and mobility.

Variation in these early hunter-gatherer groups can be expected due to differences in key prey species (e.g., mammoth versus bison versus caribou) which have different behavioral patterns and subsistence needs and require different hunting techniques for successful predation. Studies in optimal foraging theory in conjunction with modern hunter-gatherers (Hawkes and O'Connell 1981; Hawkes, Hill, O'Connell 1982) indicate that when the population of large mammal prey species is relatively high, the hunting is much more productive in terms of caloric return for time investment than are vegetal resources. It is undoubtedly naive to simply lump all Paleo-Indian groups together as having had the same organizational, economic, and mobility patterns. There are many details of their lifeways which are poorly understood or not documented. As more is learned about Paleo-Indian groups in the Great Plains region, we will become increasingly concerned with documenting and interpreting variability within the large archeologically recognized group, Paleo-Indian. Table 5 is provided as a guide to the Paleo-Indian complexes which are discussed below. The geographical extent and temporal range of several complexes are poorly documented at present, but this table will provide some basic information for quick reference.

Table 5
Summary of Paleo-Indian complexes in the Southern Plains

| Complex | Site | Age B.P.* |
|---|---|---|
| Clovis (Llano) | Blackwater Draw, NM | 11,500-10,900 |
| Folsom | Folsom, NM | 10,800-10,200 |
| Midland | Scharbaurer, TX | same as Folsom? |
| Plainview | Plainview, TX | 10,100-9800 |
| Agate Basin | Agate Basin, WY | 10,500-9800 |
| Hell Gap | Hell Gap, WY | 10,000-9500* |
| Cody (Firstview) | Horner, WY | 10,000-8500 |
| Allen/Frederick | Allen and Hell Gap, WY | 9000-8000* |
| Milnesand | Milnesand, NM | same as Plainview? |
| Plano | | 10,000-8000 |
| Portales | Blackwater Draw, NM | obsolete complex |

* Age estimate for the Southern Plains, not precisely dated.

## Pre-Clovis

Prior to 12,000 years ago no distinctive cultural complexes have been defined and widely recognized in North America (Humphreys and Stanford 1979; West 1983). Several researchers have argued that the technological systems focused on bone tools and a nonformalized series of stone artifacts, usually lacking bifaces but including flake tools, choppers, and other large coarse implements (Simpson 1982; Krieger 1964; McNeish 1979; Morlan 1983; Adovasio et al. 1982; Stanford 1982:213). Other potentially early assemblages include blades (Aigner and Del Bene 1982; West 1985), or such distinctive artifacts as bola stones (Dillehay 1986), but questions concerning the dating and contextual relationships of these pre-Clovis materials continually arise. A few sites with distinctive tools assemblages which include at least some distinctive Upper Paleolithic tools (e.g., Reagan et al. 1978) are relatively poorly dated and are not appreciably older than Clovis. The unwillingness of the archeological community to wholeheartedly accept the presence of pre-Clovis occupations and assemblages in North America is based on at least three problems. The first of these is the demonstrably erroneous or highly questionable early dates which have been attributed to some deposits or "assemblages" (Stafford et al. 1984; Haynes and Agogino 1986; Stanford 1982, 1983; Waters 1985; West 1983). A second factor is the eclectic nature of assemblages attributed to this early period. In contrast to the assemblages of Clovis age which contain distinctive, recurrent, and widely distributed tool types, assemblages attributed to pre-Clovis occupations represent a hodgepodge of forms and levels of complexity. This is not to imply that all pre-Clovis materials should represent a single stylistic and technological tradition, but simply that no widespread pre-Clovis assemblages are now recognized. The third problem is simply that of distinguishing stone and bone artifacts from specimens created as a result of natural processes including animal, chemical, and mechanical factors (Grayson 1984; LeMoine and MacEachern 1983; Shipman 1981). Continuing studies in controlled situations and experimental replication are contributing significantly to the resolution of some of these problems and enhancing more realistic interpretations of potentially early archeological deposits. At present the burden of proof for the presence of pre-Clovis occupations is with the field researchers. It will undoubtedly require multiple finds of technologically comparable assemblages which are well dated, have good contextual control, and are demonstrably not the result of patterned natural processes before there can be general agreement among archeologists as to whether bonafide pre-Clovis manifestations exist in the New World south of the ice sheets. Stanford (1983:65) has outlined a set of criteria which must be met before pre- Clovis sites will be widely accepted. These are:

(1) a clearly defined stratigraphy,

(2) reliable and consistent radiometric dates,

(3) consonance of data from relevant interdisciplinary studies, and

(4) the presence of unquestionable artifacts in an indisputable primary context.

The Pleistocene period was substantially cooler and wetter than the present environment in the Plains region (Porter 1983; Wendland 1978; Wendorf and Hester 1975). The chronology of climatic fluctuations has been fairly well established for the late Pleistocene (Dort and Jones 1970; Martin and Klein 1984), and it is known to have been a period of dynamic fluctuations in climate, vegetation, and animal populations. The environment

of many localities was apparently distinct from that presently known. The changes were not simply a matter of north-south shifts in biotic districts, but include numerous occurrences which are considered disharmonious when compared to modern biotic associations (Graham 1979; 1986; Graham and Lundelius 1984; Guthrie 1984). As Guthrie (1984:263-267) and others have suggested, the ecological zonation typical of the Holocene was apparently not prevalent during the Pleistocene when a more patchy or mosaic pattern of plant and animal distributions was widespread. For the vast majority of species composing the Rancholabrean fauna, including bison, mammoth, mastodon, horse, camel, dire wolf, ground sloth, and giant armadillo, there is no unequivocal evidence of human involvement or predation prior to Clovis times.

Within or near the Southern Plains region, potential pre-Clovis sites, or sites once thought to be pre-Clovis in age, include the Cooperton site in southwestern Oklahoma (Anderson 1975), the Bartow site in northwestern Oklahoma (Kerr 1964; Agenbroad 1984), the Burnham site in northwestern Oklahoma (Flynn et al. 1988), Lewisville in north-central Texas (Stanford 1982), Friesenhahn Cave in central Texas (Graham 1976), and the Dutton and Selby sites in eastern Colorado (Stanford 1979, 1982). Locations of these sites are shown in Figure 7, except Friesenhahn Cave which is substantially outside the study area. The Dutton and Selby sites are located slightly north of the study area in northeastern Colorado. At present none of these sites are unequivocally thought to have evidence of pre-Clovis human occupation and some decidedly have no such evidence.

The Cooperton site is located in Kiowa County, Oklahoma and was investigated in 1961 by the Museum of the Great Plains (Anderson 1975; Albritton 1975; Bonfield 1975; Mehl 1975; Nichols 1975). This work revealed the remains of a single immature male mammoth (*Mammuthus Columbi*) in generally fine alluvial sediments. Several cobbles interpreted as hammerstones and a small boulder suggested to be an anvil were the only potential stone artifacts recovered. Several of the mammoth elements exhibited green-bone fractures and are interpreted to have been intentionally broken by people who were interested in the bone for use as tools and/or in the bone marrow for food (Anderson 1975). There was no evidence (e.g., projectile points) to suggest that the mammoth had been killed by hunters, and it has therefore been interpreted as a location where people may have scavenged from a carcass. Analysis of the fractures indicated that several bones had been "green" when broken or at least not

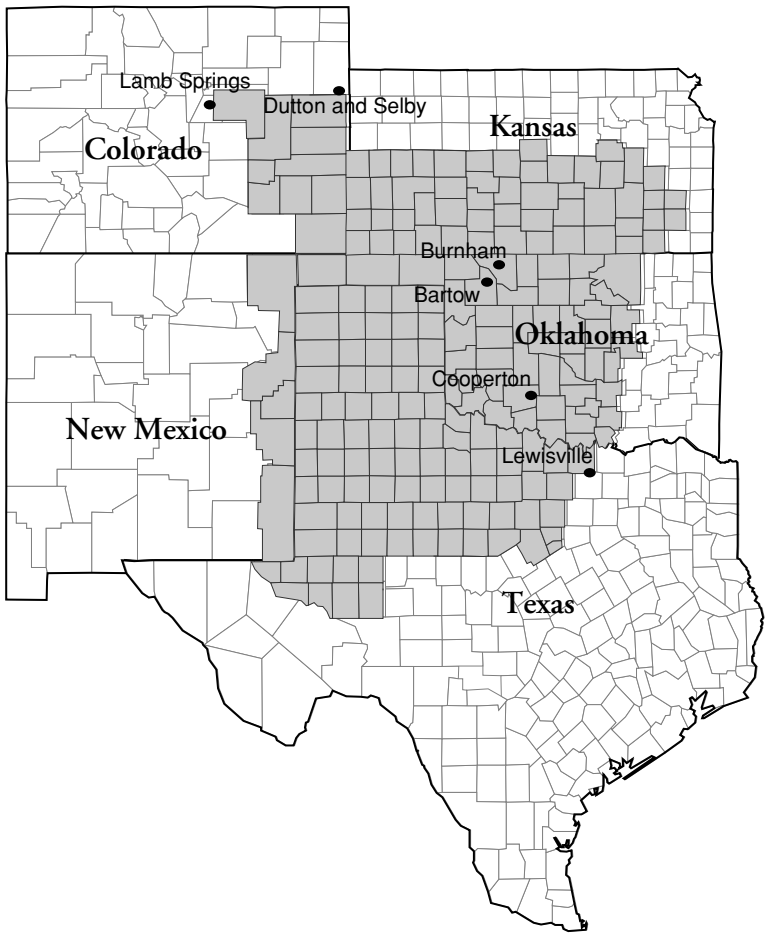



**Figure 7. Map of pre-Clovis sites in the Southern Plains region.**

severely weathered or dehydrated. Because of the limited overburden and fine particle size of the sediments, it was argued that the fractures did not occur as a result of natural geological or pedogenic processes (Bonfield 1975). The possibility of trampling and disturbance of elements by mammoth or other animals could, however, account for such fractures (Stanford 1982; G. Haynes 1984).

A series of three radiocarbon dates for the Cooperton mammoth (Table 6) are available and are based on bone apatite samples (Anderson 1975:156). The dates fall within the period 17,000 and 21,000 B.P. and appear consistent and reliable. This early series of dates is a primary factor in the limited acceptance of Cooperton as a site of early Paleo-Indian activity. In conjunction with the absence of definitive diagnostic artifacts and the common occurrence of green bone fractures in noncultural deposits (Myers et al. 1980; G. Haynes 1983), the Cooperton site can at best be considered a possible, though not probable, location of human scavenging or bone quarrying activity in pre-Clovis times. In this regard the site is very similar to the "pre-Clovis" component at Lamb Spring, Colorado where a large boulder was found in association with flaked mammoth bone (Stanford, Wedel, and Scott 1981; Stanford 1982). Another site which can be mentioned as once having been considered as evidence for Pleistocene age man in America was located at a gravel pit north of Frederick, Oklahoma (Cook 1927; Gould 1929; Gettys 1984). A variety of artifacts, some of Archaic and later age, were recovered from the quarry area and were originally argued to be comparable in age to a variety of Pleistocene fauna recovered from the pit.

The Bartow Mammoth site, 34WD13, was the site of a single mammoth skeleton in Woodward County, northwestern Oklahoma which, like Lamb Springs, produced a radiocarbon date slightly older than Clovis and did not reveal any definite or diagnostic artifacts (Kerr 1964). A single radiocarbon date of 11,990 ± 170 (A-582) based on organic matter from a rib (Meltzer and Mead 1985; Haynes et al. 1971) indicates that the Bartow mammoth is slightly older than most Clovis sites. Kerr (1964:5) states that,

> In the process of working around the ribs a flint rock was unearthed which was angular in form. At the intersection of two of its faces was a series of small, irregular flakes as might have been removed incidental to scraping activity. Shortly thereafter, a quartzite flake or chip was found near the same spot. These were the only two angular lithic pieces found during the first days work. A few very small river-worn pebbles were recovered during this time in the clay zone most of which did not exceed 10 mm in diameter.

The mammoth remains were contained in a well sorted sand deposit lacking pebbles and gravels and overlying a caliche-rich clay layer. The possibility of human association has not been adequately determined for this site. Its age is close enough to the Clovis time frame that, considering the vagaries of radiocarbon dating of bone, there is no good justification at present for suggesting it represents pre-Clovis activity.

Recent research in Woods County Oklahoma at the Burnham site (34WO73) has produced evidence of giant Pleistocene bi-

Table 6
Selected radiocarbon dates from
some Southern Plains Paleo-Indian sites

| Site | Date | Reference |
|---|---|---|
| CLOVIS DATES | | |
| Blackwater Draw #1 (New Mexico) | 11,630 ± 350 (A-491)<br>11,170 ± 110 (A-481)<br>11,040 ± 240 (A-490) | Haynes et al. 1984 |
| Murray Springs (Arizona) | 10,900 ± 50, ave. 8 | Haynes et al. 1984 |
| Domebo (Oklahoma) | 11,220 ± 500 (si-172)<br>11,200 ± 9600 (si-175)<br>11,045 ± 647 (smu-695) | Leonhardy 1966 |
| Lubbock Lake (Texas) | 11,200 ±100 (smu-548)<br>11,100 ± 80 (smu-263) | Holliday et al. 1983 |
| FOLSOM DATES | | |
| Folsom (New Mexico) | 10,260 ± 110 (smu-179) | Haynes et al. 1984:T2 |
| Lindenmeier (Colorado ave.) | 10,780 ± 135 (I,-141)<br>11,200 ± 400 (Gx-1282)<br>10,820 ± 130 | Haynes and Agogino 1960; Wilmsen and Roberts 1978:40; Haynes et al. 1984:T2 |
| Blackwater Draw #1 (Clovis Site) (New Mexico ave.) | 10,250 ± 320 (A-379-80)<br>10,490 ± 900 (A-386)<br>10,170 ± 250 (A-488)<br>10,490 ± 200 (A-492)<br>10,380 ± 140 | Haynes 1967; Hester 1972; Haynes et al. 1984:T2 |
| Lubbock Lake (Texas) | 10,880 ± 90 (smu-292)<br>10,530 ± 90 (smu-285)<br>10,780 ± 80 (si-3202)<br>10,369 ± 80 (si-3200)<br>10,060 ± 170 (smu-251)<br>9905 ± 140 (si-4975)<br>10,195 ± 165 (si-4976) | Holliday et al. 1983, 1985; Holliday and Johnson 1986 |
| Bonfire Shelter (Texas) | 10,230 ± 160 (Tx-153)<br>10,100 ± 300 (Tx-658)<br>9920 ± 150 (Tx-657)<br>ave. 10,080 ± 100 | Dibble and Lorrain 1968; Haynes et al. 1984:T2. |
| Kincade Shelter (Texas) | 10,025 ± 185 (Tx-17)<br>10,065 ± 185 (Tx-19)<br>10,365 ± 110 (Tx-20) | Haynes 1967; Sellards 1952 |
| 12-Mile Creek (Kansas) | 10,435 ± 260(Gx-5812A)<br>10,245 ± 335 (?) | Rogers and Martin 1984 |
| PLAINVIEW AND LATE PALEO-INDIAN DATES | | |
| Plainview (Texas) | 9800 ± 500 (L-303)<br>9860 ± 180 (Tx-3908)<br>10,200 ± 400 (Tx-3907) | Campbell 1959; Speer 1986 |
| Lake Theo (Texas) | 8010 ± 100 (Tx-2880)<br>9360 ± 170 (Tx-2879)<br>9950 ± 110 (smu-866) | Harrison and Killen 1978; Johnson et al. 1982 |
| Lubbock Lake (Texas) | 9883 ± 350 (c-558)<br>9330 ± 70 (smu-759)<br>9960 ± 80 (smu-275)<br>9990 ± 100 (smu-278) | Holliday et al. 1983 |
| Rex Rodgers (Texas) | 9390 ± 100 (smu-274) | Speer 1978 |
| Blackwater Draw #1 | 9890 ± 290 (A-489) | Hester 1972 |
| Olsen-Chubbock | 10,150 ± 500 (A-744) | Wheat 1972 |

son and chert flakes and implements in what appears to be pre-Clovis context (Flynn et al. 1988; D. G. Wyckoff personal communication). Further research at the site is planned and more detailed results of this apparent association between man- made stone items and a large Pleistocene form of bison are anticipated.

The Lewisville site (Crook and Harris 1957, 1962) in Denton County, Texas is located on a high terrace of the Elm Fork of the Trinity River and was first excavated during the 1950s and later work was done in 1979 and 1980 (Stanford 1982; 1983:70). The site was the topic of considerable controversy for many years because of a series of extremely old radiocarbon dates which were based on samples from hearths at the site. A Clovis point, found in place in one of the 21 hearths or burned areas, and six other artifacts were originally found in the site area with an extensive collection of Pleistocene faunal material. Hearths and fauna were represented in several different strata and the fauna, including bison, mammoth, horse, camel, deer, peccary, bear, and many smaller species indicate significant Pleistocene deposits representing several time periods. Several radiocarbon dates from the burned areas indicated a minimal age of approximately 40,000 years. When the site was first reported there were no available dates for Clovis and although there was considerable skepticism, some accepted the dates as at least plausible. Recent work at the Lewisville site by Stanford (1982:208-209) demonstrated that the burned areas which were originally dated contained lignitic coal and the 40,000 year old dates can be rejected as too early because of this ancient carbon. The coal may have been brought to the area by Early Man, but there is no evidence to suggest that pre-Clovis (pre-11,500 B.P.) occupations occurred.Just outside the study area, two sites in Yuma County, Colorado have been carefully studied and provide evidence which some argue may be the result of pre-Clovis activity (Stanford 1979). Stratigraphically below a Clovis component at the Dutton site and in the same stratigraphic unit at the Selby site were found late Pleistocene faunas dominated by mammoth, camel, bison, and horse. These deposits are lacustrine in nature. The age structure of the assemblage is dominated by old and juvenile animals which is typical of natural death accumulations rather than catastrophic kill events (Stanford 1979:107). Also, significant carnivore activity is evidenced by the element frequencies and breakage patterns, but whether the selective breakage and dispersal of long bones, which have a high meat and marrow yield, was done by canids, humans, or other meat eaters is undetermined. The patterned occurrence of bone "expediency tools," limb bones fractured for access to the marrow, and bone flakes has led Stanford to suggest possible human involvement in the accumulation and modification of the faunal assemblage.

Arguments that the earliest arrivals to the New World would have had limited access to and knowledge of lithic material sources whereas they would have had an adequate supply of bone for tools are plausible and deserve continued research and evaluation (Bonnichsen 1979; Bonnichsen and Young 1982). Current research in taphonomy (e.g., LeMoine and MacEachern 1983) will aid in further evaluations of such sites where the primary evidence rests with the interpretation of faunal remains. The taphonomic study of natural catastrophic death sites of bison should add substantially to interpretation of natural versus cultural modification of bone assemblages (e.g., Todd 1987). The statement made by West (1983:378) with regard to the question of pre-Clovis occupation of North America that, "a chain of weak evidence does not gain strength by being made longer" perhaps exemplifies the attitude of many archeologists involved in Early Man studies. In the early 1970s many researchers believed we were on the verge of discovering conclusive and widespread evidence of pre-Clovis occupations in the Americas (Wormington 1971, 1983). The last 15 years, however, have failed to bring such conclusive and unequivocal evidence to light. Clovis remains the earliest unquestioned cultural manifestation in North America.

### Clovis or Llano Complex

The Llano complex was first defined by Sellards (1952:17-45), and is characterized by an elephant hunting economy and distinctive fluted projectile points called Clovis (Figure 8). The latter are named after the Clovis site (Blackwater Draw) in Roosevelt County south of Clovis, New Mexico (Howard 1935, 1936). Since Sellards's paper was published, a number of radiocarbon dates are now available for the Clovis occupation of North America and these dates are from the Lehner, Murray Springs, and Naco sites in Arizona, Domebo in Oklahoma, Clovis (Blackwater Draw #1) in New Mexico, Dent and Dutton in Colorado, and Colby, U.P. Mammoth, and Sheaman in Wyoming (Haynes et al. 1984; Frison 1978; Frison and Todd 1986; Frison and Stanford 1982; Leonhardy 1966; Stafford et al. 1987). These dated sites indicate that the Clovis occupation of the Great Plains region occurred between approximately 11,000 and 11,500 years ago. The dates for several Clovis, or similar fluted point tradition, occupation and kill/butchery sites in eastern North America are slightly later than those in the West (Haynes et al. 1984:Figure 2).

Much of the environmental information pertaining to this period in the study area has been developed through studies conducted on the Llano Estacado region of the High Plains (Wendorf and Hester 1975; Stafford 1981, 1984; Haynes 1967, 1985; Holliday 1983, 1985a 1985b; Holliday and Johnson 1986), and to a lesser degree from the Prairie-Plains region (Bryant 1977; Schultz 1967; Slaughter 1966; Leonhardy 1966; Lundelius 1967; Lundelius et al. 1983:340-341, Table 16-3). This period encompasses the Pleistocene-Holocene transition and is a dynamic one in terms of climatic changes and biotic communities. By soon after 11,000 years ago the Rancholabrean fauna became extinct (Haynes 1967, 1982, 1985; Kurten and Anderson 1980; Martin, Thompson and Long 1985). Climatic and ecological reconstructions vary between investigators and depending on the study location and the type of ecological data used, but the overall pattern of change is generally agreed upon.

For the Southern Great Plains, the period prior to 12,000 years ago was cooler, moisture, and more equitable with less extreme temperature fluctuations between winter and summer than during the Holocene. Lower summer maximums and less

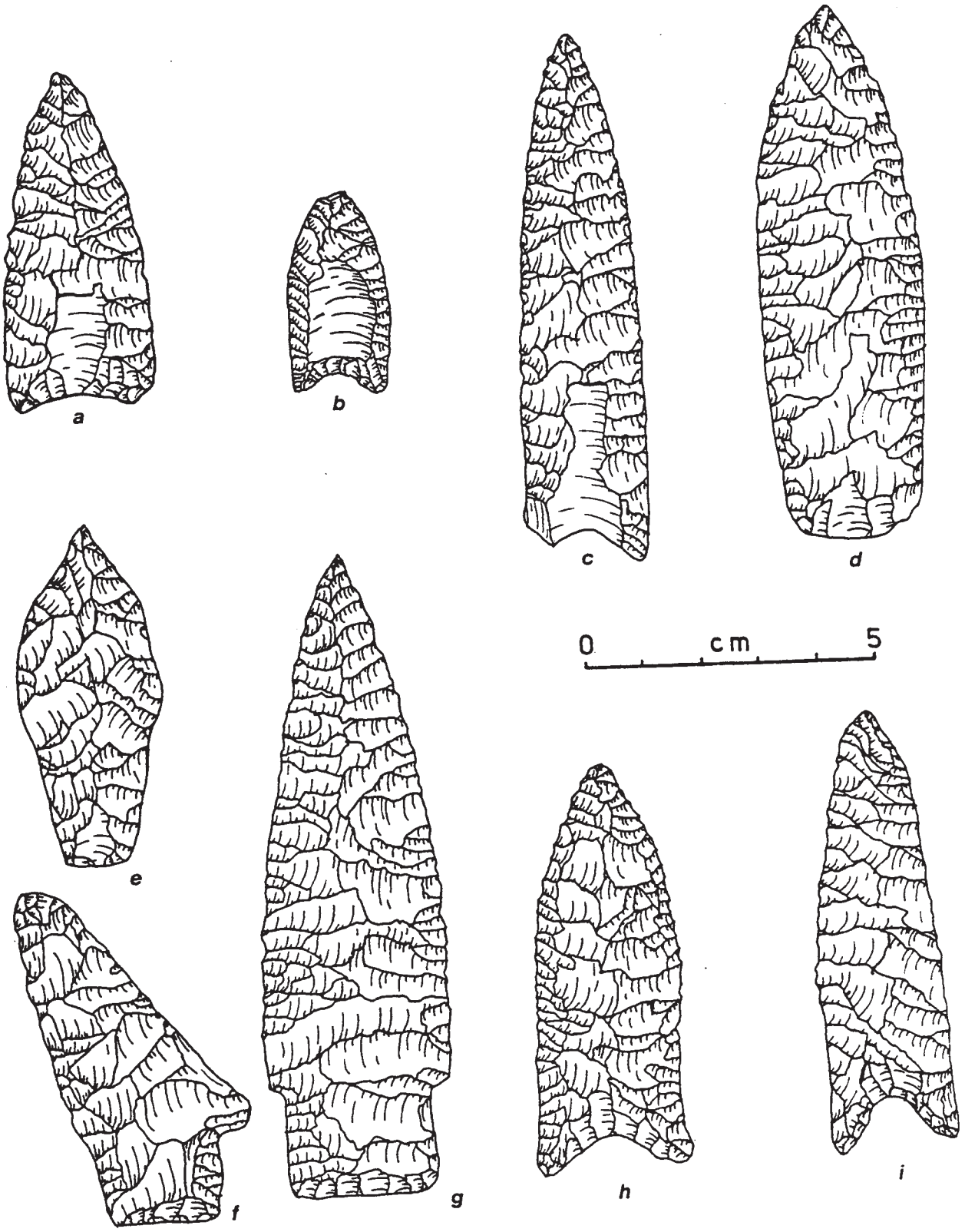



**Figure 8. Selected Paleo-Indian projectile point types from the Southern Plains: a. Clovis; b. Folsom; c. Plainview; d. Agate Basin; e. Hell Gap; f. Cody knife; g. Scottsbluff; h. Golondrina; i. Frederick/Allen**

severe winter temperatures (with an absence or rarity of extended hard freezes), in conjunction with greater effective moisture resulted in a rich and diverse fauna and flora probably not directly comparable to any that exists at present (Lundelius et al. 1983). Perhaps the primary distinction between the late Pleistocene and Holocene climates is the increased seasonality during the Holocene which acted to restrict the ranges of many species that are (were) sensitive to extremes of temperature and moisture. Animal taxa which survived this transition are generally those which were able to accommodate the competitive and climatic stresses. Often this was accomplished in part by reduction in body size (e.g., bison, beaver, armadillo) and changes in social behavior (e.g., larger herd size for bison).

Continental glaciers were retreating rapidly by 12,000 years ago but still covered a significant proportion of North America. By 4000 B.P. the glacial ice had reached its approximate modern position, and by 6,000 years ago the ice was restricted to northern Canada (Wendland 1978). There was not a simple northward movement of biotic provinces following the glaciers, but a complex reorganization of ecological communities (Graham and Lundelius 1984; Graham 1979, 1985; Guthrie 1984; Lundelius et al. 1983). The Southern Great Plains region was not glaciated, but the area was dramatically impacted by the climatic, geomorphic, and biological changes associated with the close of the Wisconsin glaciation. Co- occurrences of species in faunas from the Pleistocene/Holocene transition which today are nonsympatric (disharmonious) has led to the discussion of biotic provinces which are distinct from those presently known (Holman 1976; Graham 1979; Martin, Rogers, and Neuner 1985) and which included the co-occurrence of species now restricted to boreal or tropical climates.

As stated by Graham and Lundelius (1984:224), "the degree of diversity of late Pleistocene disharmonious biotas suggests that they existed during times when the climate was equable and seasonal extremes in temperature and effective moisture were reduced." Also, "many late Pleistocene communities had higher species densities than their modern counterparts" (Graham 1985:139) which is related in part to the fact that "there is a positive correlation between increased species diversity and decreased climatic variability as measured by winter-summer differences in mean temperature" (Graham and Lundelius 1984:224). Specific animal taxa of particular significance include mammoth, horse, camel, giant armadillo, giant tortoise, short-faced bear and a variety of others which become extinct by 11,000 years ago or soon thereafter.

Palynological information for the Pleistocene/Holocene transition in the Southern Plains area is most well known from study of ponded sediments located on the Llano Estacado (Oldfield 1975; Schoenwetter 1975; Wendorf 1970, 1975). The suggestion that there were periods of pine- and spruce- dominated boreal forest covering the Llano Estacado immediately prior to Clovis times (Tahoka Episode of 18,000 to 12,000 B.P.), and during the Lubbock subpluvial of Folsom times (11,000 to 10,000 B.P.) has recently been questioned on several grounds. Records of modern pine pollen influx across the Llano Estacado (Hall 1985:Figure 3) indicate that the presence of such aboreal pollen is to be expected in the region even though pine forests occur at some distance. Also, reinspection of earlier samples with consideration given to taphonomic factors indicates that much of the pine and spruce pollen was "corroded or degraded" which may indicate redeposition or transport over long distances (Holliday, Johnson, Hall, and Bryant 1985). Also, the occurrence of stable land surfaces, such as at Lubbock Lake around 10,000 B.P., may have resulted in the concentration of wind-blown pollen in some depositional units. Furthermore, soil studies (Holliday 1986, 1985a, 1985b) provide no support for the presence of a coniferous forest in the region during the terminal Pleistocene or early Holocene. Evidence from pollen and macrobotanical remains from the 12-Mile creek site in western Kansas, however, indicates that conifers were present in that area at approximately 10,300 B.P. (Wells and Stewart 1986).

There is general agreement, however, that despite fluctuations the close of the Pleistocene was generally cooler and wetter (less severe summers and more effective moisture) than at present, and there was a general warming and drying trend during the early Holocene.

A number of Clovis kill and camp sites are located within the Southern Great Plains region (Figure 9), and primary among these is the Clovis site or Blackwater Draw Locality #1 (Hester 1972) where Clovis points were found stratigraphically below Folsom artifacts during excavations in 1936 and 1937. Other early finds of Clovis points in association with mammoth remains were made at the Dent site in north-central Colorado in 1932 and 1933 (Cassells 1983:44-49), and at the Miami site in the Texas panhandle in 1934 (Sellards 1952:18-26). These sites did not have the stratigraphic record which was present at Blackwater Draw and so the relationship with the previously recognized Folsom complex could not be determined in the absence of radiocarbon dates. Investigation of other Clovis sites such as McLean in Texas (Ray and Bryan 1938; Sellards 1952:36) and Escapule in Arizona (Hemmings and Haynes 1969) has supported the relationship between man and mammoth in the late Pleistocene. More detailed information about the environment and ecology of the Clovis period has been derived from studies of sites such as Domebo (Leonhardy 1966), Lubbock Lake (Johnson 1983, 1987; Johnson and Holliday 1985), as well as Blackwater Draw (Hester 1972; Wendorf and Hester 1975).

Subsistence information for the Llano complex is dominated by the presence of mammoth remains which occur at all Clovis kill-processing sites presently known from the Plains area. Additional species which are recurrent include bison (Bison antiquus) which is recorded at Murray Springs, Arizona (Haynes 1980, 1983), Blackwater Draw (Hester 1972), and Lubbock Lake, Texas (Johnson 1983). Horse, camel, bear, and rabbit species also appear to have been utilized by Clovis hunters at Murray Springs, Lehner, and Lubbock Lake (Haynes 1980:117; Hemmings 1970; Johnson 1983:Table 6). Present evidence overwhelmingly suggests that the primary economic pursuit was hunting and that the species most sought and utilized were large mammals, primarily mammoth and secondarily bison with significantly more limited contribution to the diet by other species. There was undoubtedly opportunistic use of a variety of plant and ani-

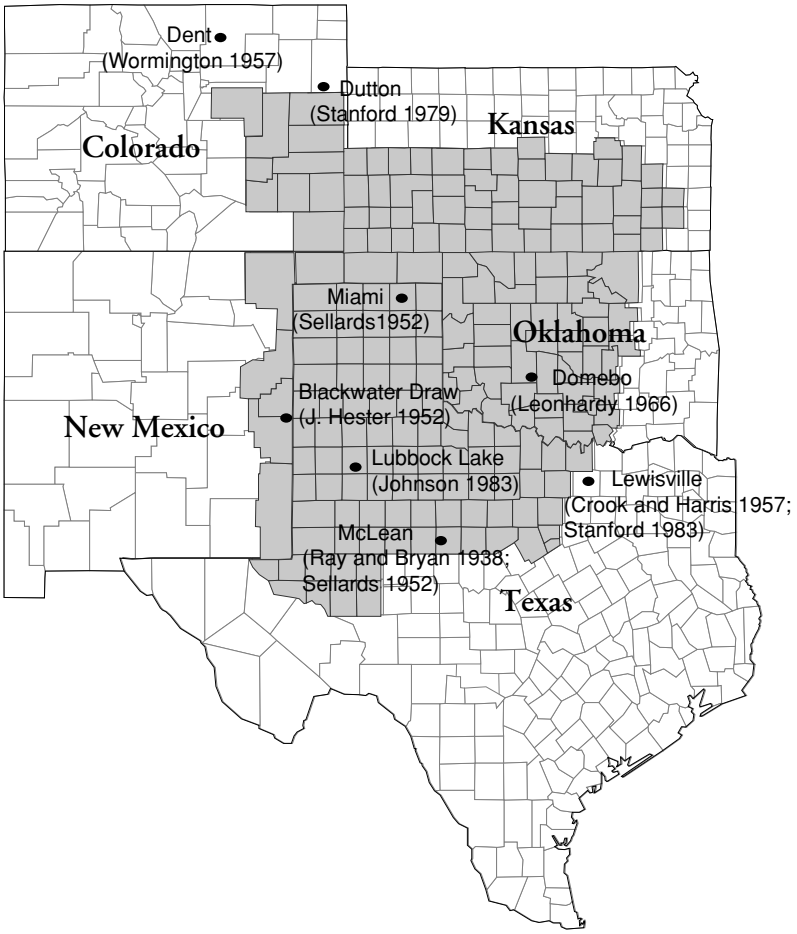



**Figure 9. Map of Clovis site locations in the Southern Plains region.**

mal species, as suggested by remains at the Shawnee-Minisink site in Delaware where fish and fruit remains were recovered in an early Paleo-Indian context (McNett 1985). Hunting methods have been discussed and speculated upon by numerous writers and the suggestions for the actual techniques employed in mammoth hunting range from opportunistic killing of disabled, immobile, isolated, or weakened individuals, to driving and trapping or stampeding small herds, to head-on assault of entire matriarchal herds (Frison 1978; Frison and Todd 1986; Haynes 1980; Hester 1967; Jelinek 1967; Johnson, Dawano and Ekker 1980; Saunders 1980; Sellards 1952). Whether thrusting spears or atlatls were utilized is unknown, but arguments have been presented for both weapons (Frison 1978; Frison and Todd 1986; Haynes 1980; Hofman 1978a). While artifacts attributed to grinding activities have been documented in possible Clovis contexts (Alexander 1963), there is at present simply no good evidence for intensive (or even limited) use or processing of plant foods during Clovis times (West 1983). There is currently no evidence for intensive processing or storage of such vegetal resources.Information pertaining to Clovis technology, organization and site structure has been derived from detailed studies of the Murray Springs site (Hemmings 1970; Haynes 1982, 1983), and the Colby site (Frison 1976; Frison and Todd 1986). In addition to fluted, bifacial projectile points which are generally considered to have been used on a foreshaft attached to a spear or possibly a dart, there are a variety of chipped stone tools. These include scrapers on large biface thinning flakes, endscrapers which are often spurred on one corner, large bifaces which represent blanks or preforms for Clovis points, and possibly blades (Green 1963; Hammatt 1970). The large bifaces were apparently at the heart of the Clovis lithic reduction system and these large blanks served as tools, “cores” or sources for biface thinning flakes to be used as tools or tool blanks, and as preforms for

projectile point manufacture. Transport of these large bifaces over long distances is evidenced at several sites (Hemmings 1970; Davis et al. 1985; Haynes 1980). Bone implements include long cylindrical points (Frison and Stanford 1982; Lahren and Bonnichsen 1974; Sellards 1952; Wilmeth 1968), and a shaft wrench from Murray Springs (Haynes and Hemmings 1968) which is directly comparable to specimens from Russian Upper Paleolithic sites (Klein 1969; Soffer 1985). In general, most researchers agree that the overall technological system of Clovis people was derived from and is generally comparable to that found at Paleolithic sites in Siberia which date primarily since 35,000 B.P. (Dennell 1986; Haynes 1980, 1983; Klein 1969, 1973; Soffer 1985; West 1983).

Evidence from Murray Springs (Haynes 1980, 1983) indicates that Clovis hunters camped near the kill sites and were involved in processing meat and hides and repairing tool kits. No evidence of structures has been found on the western Clovis sites, but possible habitation features are reported from the Thunderbird site in Virginia (Gardner 1974). Possible shelters or structures may be represented by several concentrations of materials near hearths at the Vail and Debert sites in the Northeast (MacDonald 1968; Gramley 1982). There do not appear to be sites with long term occupation. Instead some localities, such as Blackwater Draw (Hester 1972), were apparently the focus of numerous relatively brief visits involving hunting, processing game, maintenance of equipment and temporary camping.

Mobility patterns are poorly understood, but most of the primary high quality lithic sources were known and widely utilized. Clovis points are often made of materials which have source areas more than 320 km from their place of recovery (Erwin 1971; Wheat 1971; Stanford 1986; Broilo 1971; Hester 1972). Broilo's (1971) study of surface-collected Clovis points from the Blackwater Draw area indicates that movement and activities of Clovis hunters, and perhaps entire groups, was not solely along water courses or draws, but that their movement covered broad areas and they were active in areas far removed from active streams or rivers. This may reflect the wide ranging foraging pattern of mammoths as a key prey species of these hunters, if the foraging patterns of modern African elephants can be used as a general indication. By comparison to the preceding climatic regime, Clovis times were drier and forage and water for mammoth herds may have become less productive and more dispersed (C. V. Haynes 1984; Wendorf and Hester 1975; Holliday 1985). Increased mobility is a primary response by large mammals when under such stress (Kelly and Todd 1988). More localized reliable occurrences of water may have focused the movements of mammoth and their hunters. Permanent water holes, especially in areas with relatively few water sources, in a relatively dry environment (by comparison to previous conditions) may have become reliable sites for ambushing mammoth and for finding sick or hurt individuals. Given the apparent lack of permanent settlements, there seems little likelihood that long distance trade patterns would have been established (Meltzer 1987). In contrast to Hayden (1981), it is very plausible that the intensive use of high quality siliceous stones from distant sources during Paleo-Indian times was the result of mobility patterns and not primarily trade. Most trading between groups would probably have been incidental and unpredictable. The importance of intergroup contacts and exchanges may have been very important (e.g., Wiessner 1982, 1984; Gamble 1981), but may not have been highly patterned or reliable.

Evidence for ritual activity is also minimal. However, the occurrence of red ocher at several sites documents the importance of this substance to Clovis peoples and particular uses may be indicated by occurrences in Russian Upper Paleolithic structures, burials, and painting (Soffer 1985). Three sites, Simonson in Idaho, Anzick or Wilsall in Montana, and Drake in northeastern Colorado have produced caches of Clovis points and/or large bifaces. The Anzick site is most spectacular, although it was badly disturbed, and revealed a cache which was covered with red ocher in association with the cremated remains of a child (Bonnichsen and Young 1985; Taylor 1969; Lahren and Bonnichsen 1974; Haynes 1983). The cache included large Clovis points, large bifacial blanks, cylindrical bone points and ocher. The Simonson site revealed a number of large bifaces and Clovis points (Butler 1963; Butler and Fitzwater 1965), and the Drake cache included 13 large Clovis points thought to have possibly been associated with a burial (Stanford 1986). A number of the Drake Clovis points were made from Alibates agatized dolomite from the Texas Panhandle source located approximately 485 km southeast of the find spot (Stanford and Jodry 1988).

Evidence from the Colby site in Wyoming (Frison 1976, 1978; Frison and Todd 1986) indicates that meat caching was practiced by Clovis hunters. At Colby, stacked mammoth bones were found in two bone piles which covered selected articulated and disarticulated elements which have high meat and marrow yield. Under bone pile 2 at Colby was a complete projectile point interpreted to have been intentionally placed and possibly representing an offering or marker. These bone piles are interpreted to have been meat caches for storage and protection of surplus meat derived from mammoth kills. Frison and Todd argue, based on taphonomic evidence, that several kill episodes are represented at Colby. Perhaps bones from previous kills in the local area were used to protect surplus meat from subsequent events. The caching of meat and/or bones (for marrow, tools, and fuel) by these early hunters is comparable to evidence from Russian Upper Paleolithic sites (Soffer 1985:253-258). Such storage practices were probably quite different from those found in late prehistoric times on agricultural sites. The Clovis hunters may have used these stored resources as security caches (Binford 1981) because the future hunting results were unpredictable. Such insurance caches would only be used in the event of future shortages. In comparison, storage among agricultural groups is generally required in order to offset the predictable stress from late winter-early spring economic shortfall, and for seed grain. Insurance caching may have been a common practice among Clovis hunters and other highly mobile Paleo-Indian groups. The Colby site is certainly the best evidence of such practice to date.

## Goshen Complex

The transition from Clovis to Folsom has been assumed by most students of Paleo-Indian studies to represent a continuum of a single cultural tradition during its response to a rapidly changing environment. Although Clovis and Folsom assemblages and projectile point types are generally considered highly distinctive and separate, there are in fact and in theory technologically intermediate artifacts and perhaps complexes. Judge (1973) has recognized a variety of Folsom points from sites along the central Rio Grande valley in New Mexico which may represent a "transitional type" between Clovis and Folsom. The only defined complex, still poorly known, which represents this Clovis to Folsom transition has been designated Goshen and is known primarily from work at the Hell Gap site in Wyoming (Irwin 1968; Irwin et al. 1973). Recent work at the Milliron site in southern Montana indicates that the Goshen complex may be relatively widespread and an important, though probably short lived, cultural complex (Frison 1986). Artifacts from the Southern Great Plains region which may technological transitional between Clovis and Folsom have been found at a number of localities, but further research at sites with good contextual and chronological control is needed before southern assemblages can be assessed as to potential relationships with the Goshen complex of the northwestern Plains. It is useful to note that many sites, such as the Domebo Clovis site in southwestern Oklahoma and Rex Rogers in the Texas Panhandle (Willy, Harrison, and Hughes 1978) have revealed artifacts in good contextual association which may represent transitional forms between traditionally recognized Paleo-Indian types. The Goshen point type has been noted to be very similar to Plainview, or to some Plainview points. Chronologically, however, Plainview is known to postdate Folsom on the Southern Plains, whereas Goshen is pre-Folsom in age on the Northern Plains.

## Folsom Complex

The Folsom period has continued to receive considerable research interest since the discovery and reporting of the Folsom type site in northeastern New Mexico, where the association of projectile points with an extinct form of bison was first unequivocally demonstrated 60 years ago (Cook 1927; Figgins 1927; Wormington 1957). During more than a half century of research many aspects of Folsom period economy, environment, site distribution, age, and technology have been documented. The Folsom complex is known to date between 10,000 and 11,000 years ago based on a number of radiocarbon dates (Table 5), and may actually be limited to the period between 10,200 and 10,800 B.P. The distribution of Folsom sites extends from Montana (Forbis and Sperry 1953) and North Dakota (Schneider 1982) southward through the Plains and Rockies into southern Texas (Sellards 1952; T. R. Hester 1969). Scattered finds occur outside this area (e.g., Pettipas 1970; Wormington and Forbis 1965), but sites exhibiting typical Folsom technology are not yet reported in detail. The distribution of reported Folsom sites in the study area is shown in Figure 10.

The basic elements in the Folsom technological system were documented during the 1930s through a series of reports pertaining to the Lindenmeier site (Roberts 1935, 1936, 1937, 1940). Subsequently, more complete documentation of the Lindenmeier sample (Wilmsen and Roberts 1978), and in- depth studies of other sites such as Hanson (Frison and Bradley 1980), Hell Gap (Irwin 1968), Agate Basin (Frison and Stanford 1982), Blackwater Draw Locality No. 1 (Hester 1972), and Elida (Hester 1962) have shown something of the range of technological variability expressed in Folsom assemblages in terms of both lithic and bone material. Hallmarks of the Folsom technological system, beyond the classic fluted projectile points (Bell 1958), include bifacial knives and/or preforms, endscrapers of which more than half have spurs at the juncture of the distal end and one or both lateral margins, delicate spurs or gravers made on thin flakes, and a variety of versatile, multipurpose or compound flake tools (Irwin and Wormington 1970; Judge 1973; Wilmsen and Roberts 1978; Hester 1966, 1972; Frison and Bradley 1980; Frison and Stanford 1982).

Overall the lithic technological system is highly portable and has at its center the production of bifaces and large biface thinning flakes which can be routed through a variety of possible functional and morphological stages depending upon immediate requirements and on the long term plans of the group. Judge's discussion of Folsom technology in the central Rio Grande valley was one of the earlier arguments for a highly curated and versatile lithic reduction system during Folsom times. Judge (1973:192) states,

> Folsom people were quite conservative in their use of lithic material, and . . . this is manifest in the production of a preform as a primary focal unit. By-products of this process served as blanks for other tools, which then served multipurpose rather than specialized needs. It is tempting to suggest that this efficiency in utilization of raw material and the multipurpose usage of a minimum number of tool types represents an adaptation to a highly mobile way of life. This is certainly a possible explanation for this phenomenon in the central Rio Grande valley.

Continuing research seems to support Judge's conclusion (Wilmsen and Roberts 1978; Hester 1962; Jodry 1986), although the terminology and meaning of terms like "specialized" varies among authors. In Folsom site situations where raw material is abundant, such as at the Hanson site in Wyoming (Frison and Bradley 1980), specialized tool forms and bifaces were at the heart of the production system (Ingbar 1986). According to Ingbar (1986:7-8):

> the Hanson assemblage indicates that even in situations of raw material abundance, specialized tool forms were produced—such as borers, backed flakes, etc. From this standpoint, then, one has to consider this technological organization as oriented toward the efficient completion of very specific tasks.
>
> Removing generalized bifaces from a quarry context may be one of the best ways to provide oneself with raw material for the manufacture of highly specialized tool forms. Folsom technologies in general use flake tools made on biface thinning flakes to a huge extent. . . . By

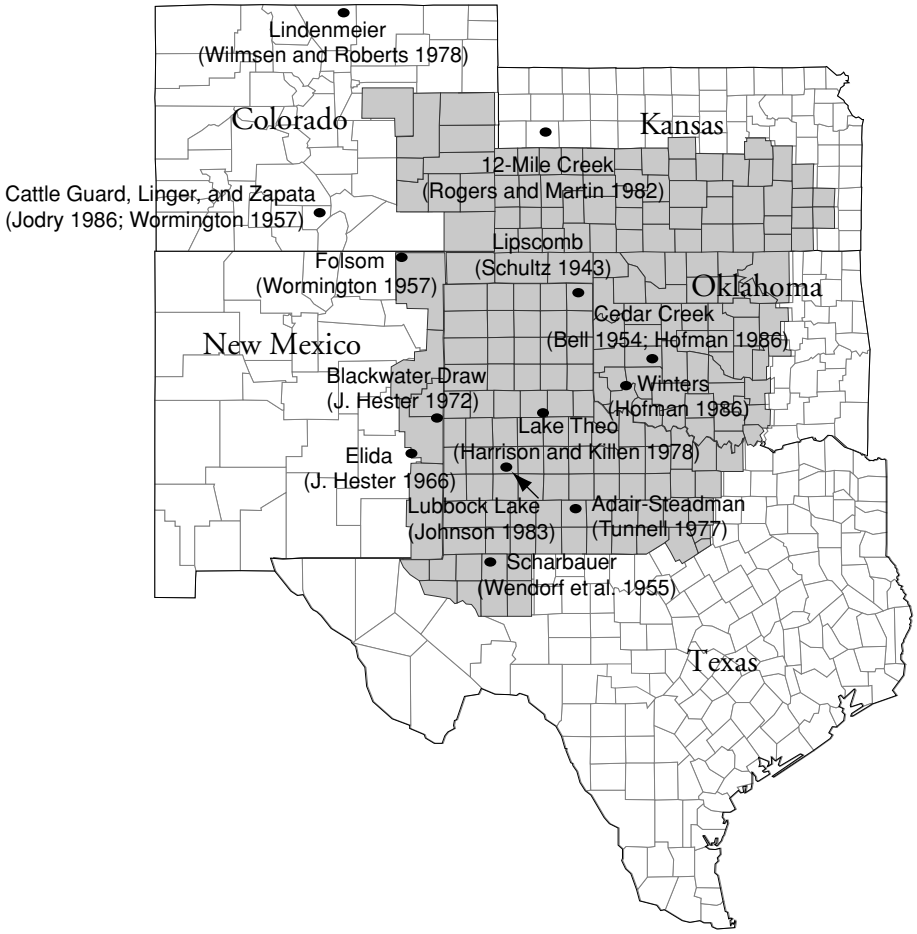



**Figure 10. Map of Folsom site locations in the Southern Plains region.**

the time a biface's utility as a core is exhausted (having perhaps also served as a tool as well) it may be reduced down to a stage 4 biface and be ready for production into a very highly specialized form: a Folsom point.

Projectile points, apparently, are only one functional end result of the chipped stone technology which includes heavy bifacial tools (including early stage preforms), and which generates sharp biface reduction flakes that can be used in unmodified form or transformed into a variety of tool types. Channel flakes from fluting provide a sharp and delicate cutting tool. Heavy duty cutting/butchering/chopping/hammering tools also occur and are commonly manufactured from more durable stones (often locally derived) distinct from materials used for point manufacture (Wilmsen and Roberts 1978; Frison and Bradley 1980; Frison and Stanford 1982). Abraders made of coarse textured stones are also well represented, though not especially common.

The bone technology is also varied and well developed. One of the more important and recurrent elements in the bone technology of Upper Paleolithic cultures and Folsom people was the eyed needle (Dennell 1986, 1983:90, Table 4, Figure 12). These specimens have been recovered from several Folsom sites and at least one Midland site (Wilmsen and Roberts 1978; Frison and Stanford 1982; Frison and Bradley 1980; Blaine and Wendorf 1972). The importance of tailored clothing to groups who entered North American via the Bering land bridge has been noted by many researchers, and the early occurrence of eyed needles in Paleo-Indian assemblages supports the view that these early Americans possessed a technological system and skills comparable to the European and

Eurasian Upper Paleolithic (Soffer 1985).

In addition, bone projectile points are documented from a Folsom bison kill at Agate Basin (Frison and Zeimens 1982), and may represent a development from the cylindrical bone and ivory points (or foreshafts) manufactured during Clovis times (Hester 1972; Lahren and Bonnichsen 1974). Another interesting Folsom bone tool type documented at Agate Basin was a T-shaped crutch or punch manufactured from elk antler which may have been used in projectile point manufacture (Frison and Bradley 1981). A variety of incised, ground, or otherwise modified bone is represented at several Folsom sites but functional applications for most of these pieces have not been proposed (Frison 1982; Wilmsen and Roberts 1978).

In general, the majority opinion holds that the technological system (though not necessarily including fluted points) of Folsom and the preceding Clovis people was derived in highly developed form from the Old World Upper Paleolithic (Frison and Bradley 1980; Haynes 1982, 1987; Jelinek 1971; Klein 1969; Muller-Beck 1966; Soffer 1985; West 1983).

Aspects of Folsom economy and environment have also been highlighted through several research projects. The environment on the Southern High Plains during Folsom times has been investigated during research at the Scharbaurer site (Wendorf, Krieger, and Albritton 1955), Blackwater Draw Locality #1 (Hester 1972), Lubbock Lake (Johnson 1983; Holliday et al. 1983, 1985a; Holliday 1985; Holliday and Johnson 1986), Lake Theo (Harrison and Killen 1978), and several other localities (Wendorf and Hester 1975). All indications are that the climate was less severe (less extreme summer and winter temperatures) with more effective moisture (perhaps more even distribution of rainfall throughout the year, less evaporation, and/or greater precipitation), and there was a greater diversity of plant and animal species in the region than found in later Holocene times (Graham and Lundelius 1984; Guthrie 1984). The arguments for the expansion of pine forest over much of the Southern High Plains during Folsom times (10,000 to 11,000 B.P.; an event referred to as the Lubbock Subpluvial [Wendorf 1970, 1975:268-274]), has now been strongly questioned (Holliday et al. 1985b) on the basis of soil studies and renewed study of the pollen evidence. Even though there was probably not a pine forest on the Llano Estacado during Folsom times, it is evident that conditions were significantly different and that the environment was more hospitable than at present. There is evidence, however, for the expansion of coniferous forest eastward onto the Plains during the Folsom period. At the 12-Mile Creek site in west-central Kansas pine needles as well as pine pollen were recovered in the bone bed sediments which are dated to about 10,300 years ago (Wells and Stewart 1985; Rogers and Martin 1984). Environmental data for the Folsom period in the rolling plains and tall grass prairie areas to the east of the Llano are not currently available.

The economy of Folsom peoples was strongly oriented toward bison hunting. A number of other species such as antelope and rabbit are documented from several Folsom components (Johnson 1983; Harrison and Killen 1978; Wendorf, Krieger, and Albritton 1955; Walker 1982). Many of these remains, however, do not demonstrate unequivocal evidence of modification or use by Folsom people. Furthermore, the potential contribution to the diet of these few smaller animals is small by comparison with bison. Bison remains are the primary fauna represented at all Folsom sites. It is important to note, however, that Folsom bison kills tend to include only a small number of animals (usually less than 25). An additional pattern which deserves further investigation is the consistent occurrence of only partially butchered or essentially articulated bison skeletons at these small Folsom kills (Hofman and Ingbar 1988: Table 3). The repeated finding of bison skeletons at Folsom kills which exhibit minimal butchering evidence suggests that either there were not enough people in the groups to utilize the bison killed before they became putrefied, or the people moved from the site taking only selected high quality portions. A suggested reason for the latter behavior, sometimes referred to as a gourmet style butchering pattern (Todd 1983, 1987), is that these hunting bands would have greater long term security by maintaining contact with known bison herds than they would by exploiting a specific kill until the resource was totally depleted, and only then beginning to look for and monitor the movements of another herd. This general argument has been most elaborately presented by Kelly and Todd (1988) and deserves further consideration and evaluation. As noted by West (1983:377), the hunting skills and techniques of these early large mammal hunters could have been easily transferred to different areas and terrains.

The Lipscomb site in the northeast Texas Panhandle provides a good example of an "under-utilized" bison kill made by Folsom hunters. Folsom people apparently selectively butchered the animals and camped at the site for a short period before moving. It is plausible that they moved in order to maintain contact with a known bison resource. Ongoing study of the faunal material from Lipscomb in an attempt to evaluate the season of the kill will aid interpretation of the site. Schultz (1943:246-248) provided these remarks pertaining to the butchering and occupation of the Lipscomb site.

> At the north end of the quarry the fossils were badly broken and scattered, but those to the south were mainly complete and in most cases articulated. Fourteen articulated skeletons, including skulls, were located in a section which was only twelve feet wide and twenty feet long. The skeletons were headed chiefly in an easterly or southerly direction and overlapped one another, considerably. Nine additional skulls were unearthed in the area immediately surrounding the skeletons. The skeletal remains of some individuals were entire, even including the caudal vertebrae. From a paleontological standpoint, the Lipscomb bison quarry is an important site because of the completeness and preservation of the bones, including skulls.
>
> Charcoal and ashes were associated with the bones in many parts of the quarry, especially in the southern portion, where there was evidence of individual fires. Along the north and east sides of the deposit the bones were scattered and many of them had been split and cut

by the ancient hunters.

If we consider the nature of the Folsom and Clovis periods at a general level, several factors should be recognized in researching these early Paleo-Indians. First of all, 10,200 to 11,500 years ago was a period of very low human population in North America. There is no comparable situation in the study of modern hunter-gatherer (nonfarming) groups. That is, no ethnographically known hunting people had as highly developed a technological system and such a low regional population density in such a rich and productive environment. Folsom and Clovis people were not restricted to areas unoccupied by agriculturalists, nor were their movements circumscribed by high population, competition, or packing of many groups together in a limited area. The study of early Paleo-Indian lifeways through archeology can provide a glimpse of human adaptation in a situation very unlike those observable today. Also, the impact of dramatic climatic change at the Pleistocene/Holocene boundary provides a stage on which to evaluate technological and organizational changes as well as the factor of population growth. It is notable that even though Clovis and Folsom groups are generally considered among the early Paleo-Indians to occupy the Plains region, they were aware of and utilized all the known major sources of high quality lithic materials. Because of this, these people cannot be considered as newcomers uninformed about the key resources of the region. In summation, we can argue that Folsom people were technologically advanced hunters with an economic focus on bison and whose security came from high mobility, an intimate knowledge of bison behavior, and a social network which served to link relatively small dispersed subsistence groups together.

Information on ritual and ceremonial aspects of Folsom life is extremely limited and based primarily on inferences which might apply to many hunting-gathering groups which have an economic focus on hunting large game and are highly mobile. Frison and Bradley (1980, 1982) have suggested that the fluting of Folsom points may have had more than purely technofunctional aspects. Based on recurrent finds of fluted and unfinished or fluted and intentionally broken Folsom points, they have suggested that in some situations it was the act of fluting, or the fluting process, which was of primary importance rather than the production of a projectile point. The fluting process may have served as a focal point for instruction, indoctrination of young hunters, reiteration of tales, and retelling of specific hunting scenarios. All such activities would have been important to the successful transfer of hunting skills and knowledge between generations of hunters whose livelihood depended upon an intimate knowledge of animal behavior and hunting tactics.

The intensive use of red ocher is also evident at the Hanson site in Wyoming, and recurrent limited evidence suggests that this material was of particular significance to Paleo-Indian groups. Specific uses for this material were apparently varied (Frison and Bradley (1980:9, 90; Frison 1982).

Bone disc "ornaments" are reported from Blackwater Draw and Lindenmeier in Folsom contexts and may represent items of importance beyond the secular realm.

## Midland Complex

The Midland or Scharbauer site in Midland County, Texas at the southern end of the Llano Estacado is of archeological significance for several reasons (Wendorf, Krieger, Albritton, and Stewart 1955; Wendorf and Krieger 1959). The site has produced fragments from one of the earlier human skeletons so far documented for North America. Though the specific age of the remains are unknown, they are generally accepted as being of at least Folsom age. Geologic, paleontological, and stratigraphic study of the Scharbauer site area provided a base line for continued investigation of the geology of other sites in the sandy semi-desert country in southwest Texas and southeastern New Mexico. The Scharbauer site study revealed an assemblage of Paleo-Indian artifacts which has continued to stimulate controversy and discussions on point typology and the definition of cultural complexes through archeological materials. In direct association at the Scharbauer site were classic fluted Folsom points and very thin unfluted points of a general Folsom shape termed Midland points. Several interpretations as to the relationship between these two types still persist in the literature. Two primary positions have been argued. One holds that Midland points are fully contemporary with Folsom and are actually part of the same technological system, but that they represent specimens which have been reworked from Folsom points or were made from blanks which were simply too thin to flute (Judge 1970). This argument is supported by the repeated and widespread occurrence of unfluted points comparable to the Midland type in definite and highly probable Folsom contexts (Frison and Bradley 1980; Bradley 1982; Broilo 1971; Hester 1962, 1972; Irwin et al. 1973; Wilmsen and Roberts 1978). In fact, approximately 25% of the projectile points from the Folsom component at the Lindenmeier site were unfluted (Wilmsen and Roberts 1978). Many of the "pseudo-fluted" Lindenmeier specimens do not, however, exhibit the degree of controlled lateral thinning evident on most Midland points. Evidence of the original flake blank surface is found on many Midland points. The predominant use of the same lithic materials in the manufacture of Folsom and Midland points might also be seen as supporting the argument for a close relationship between the two types (e.g., Broilo 1971).

The opposing view holds that Midland points represent a distinct and separate complex (Blaine 1968; Irwin 1971). This position argues that Midland may represent a different cultural group perhaps closely related to Folsom in time, technology and economic orientation. The reported occurrence of sites which produce solely Midland points to the exclusion of Folsom (Agogino 1969; Blaine 1968; Broilo 1971:68) is one of the primary arguments used to support the existence of a separate Midland complex. This argument, however, is based on the assumption that the full range of point and artifact forms used by a cultural group will be represented at every site they occupy, otherwise one could argue that the generally small samples from the "pure" Midland sites represented only a portion of the entire range of tool forms which might include classic Folsom points. Other tools in the Midland assemblages are directly comparable to Folsom assemblages. There is an additional argument that not

all Midland points were "too thin" to flute which is certainly true. The possibility that Midland points continued to be used after Folsom fluted points were no longer being manufactured is an important consideration and one that may be resolved with future research. Evidence for chronological overlap of Folsom and Midland may be present at the Hell Gap site in Wyoming where Midland points apparently continue in use after Folsom (Irwin 1968; Irwin-Williams et al. 1973). There are a number of projectile points which share attributes with both Midland and Plainview types and could represent the transitional period from Folsom to late Paleo-Indian. A number of collections in the west Texas and eastern New Mexico area include lanceolate Paleo-Indian projectile points which do not fit well within the established typological framework or which share distinctive attributes of more than one type (e.g., Polyak and Williams 1986). The vast majority of Midland sites have been located in highly eroded sand dune country on the Llano Estacado and the need for investigation of sites with good stratigraphic control and bone preservation is great.

### Plano Complex

Defined by Jennings (1955), the Plano "culture" or complex is a general term used to refer to a number of potentially distinct cultural groups recognized by distinctive unfluted, lanceolate projectile points which are known or assumed to be of post-Folsom or late Paleo-Indian age. The unifying theme of the Plano complex, as used by most, is that it represent late Paleo-Indian, ca 10,000 to 7500 B.P., groups with an economic focus on bison hunting in the Plains. As such it incorporates a number of more specific and often more temporally or geographically restricted complexes found throughout the region. In a typological sense, it is often used in much the same way that "Yuma" was used during the 1930s and 1940s, until it was decided to abandon use of the Yuma terminology (Howard 1943; Wormington 1957). Since its introduction, Plano has become widely accepted as a useful term and has been applied to many late Paleo-Indian materials which are not assignable to a specific late Paleo-Indian complex, or when reference is made to late Paleo-Indian materials dating from after 10,000 years ago as a single encompassing group (Cassells 1983; O'Brien 1984; Brown and Simmons 1987; Krieger 1964; Spencer and Jennings 1965; Wedel 1978). Jennings (1974, 1978) has included materials (stemmed and notched points) within his discussion of Plano, which most other researchers consider to be Archaic. An informative discussion of the Plano complex, with an interpretation of regionally distinct co-traditions during late Paleo-Indian times, is presented by Pettipas (1982).

### Plainview Complex

Investigations at the Plainview site in 1945 provided a significant and lasting contribution to late Paleo-Indian studies by providing an anchor or primary reference assemblage. This bison kill site is located in Hall County, Texas in the town of Plainview (Sellards, Evans, and Mead 1947). The projectile points from Plainview were used to define the Plainview type by Krieger and were suggested by him to be chronologically and typologically "intermediate" between Folsom and Cody complex types. The technological and morphological similarities between some Plainview points and Clovis and Folsom points has been noted repeatedly (Leonhardy and Anderson 1966; Jennings 1978; Willey, Harrison and Hughes 1978; Wormington 1957). A comparative analysis of the Plainview site sample and the MacHaffie site late Paleo-Indian (Cody complex) sample documented numerous general technological similarities between these widely separated assemblages (Knudson 1983). Shott (1986) has discussed the Plainview and MacHaffie site samples with regard to implications for mobility of the different groups. Unfortunately, Shott includes the Plainview site within the Cody complex which adds unnecessary confusion to the archeological taxonomy. Also, most of the factors pertaining to the two assemblages which he attributes to differences in curation and distinctive mobility patterns (Shott 1986:36-46) simply reflect the kinds of differences one should expect between a kill site (Plainview) and a lithic workshop and campsite (MacHaffie), even if the overall mobility and social organization of the two groups were very similar.

Continued research at the Plainview site (Guffee 1979; Speer 1986; Holliday 1986) has improved the available information on the site and documented its temporal relationships with other Paleo-Indian complexes. Two radiocarbon dates for Plainview were made available in the 1950s based on shell collected by Glen L. Evans and on bone which had been exposed on the surface for years (Speer 1986:55). The shell date has been reported in two ways (Krieger 1957; Campbell 1961), but the correct calculation is apparently 9800 ± 500 B.P. (Speer 1986:55). The date on the surface bone was 7100 ± 160 B.P. and is justifiably considered too recent. More recently (Speer 1986:59), bone from the original excavation at Plainview has been dated and two dates based on bone apatite are 10,200 ± 400 (Tx-3907) and 9860 ± 180 (Tx-3908). These dates are consistent and compare well with the previous shell date from Plainview. Also, they suggest that the Plainview material is slightly younger in age than Folsom and older than the Cody complex, supporting Krieger's original assessment. Additional radiocarbon dates on sediments from several strata in the Plainview site area are consistent with an age of 10,000 years ago for the Plainview bison kill (Holliday 1986).Additional research pertaining to the Plainview occupation of the region has been conducted at the Lubbock Lake site (Johnson 1983; Johnson and Holliday 1980; Holliday and Johnson 1981, 1986; Bamforth 1985). Lubbock Lake is located approximately 65 km south of Plainview (Figure 11). At Lubbock Lake, Plainview materials were found to occur immediately above Folsom and, as at Plainview, they date to approximately 10,000 years ago (Johnson and Holliday 1980:104; Holliday and Johnson 1981). Plainview period activity at Lubbock Lake was primarily in the form of small bison kills (six individuals were butchered in the area FA6-11 which has been most studied) and associated processing and camp sites (Bamforth 1985; Johnson and Holliday 1980). Lubbock Lake provides the best information on details of Plainview camp life and bison processing methods. Additional evidence of a Plainview campsite is documented at the Lake Theo site located about 65 km north-

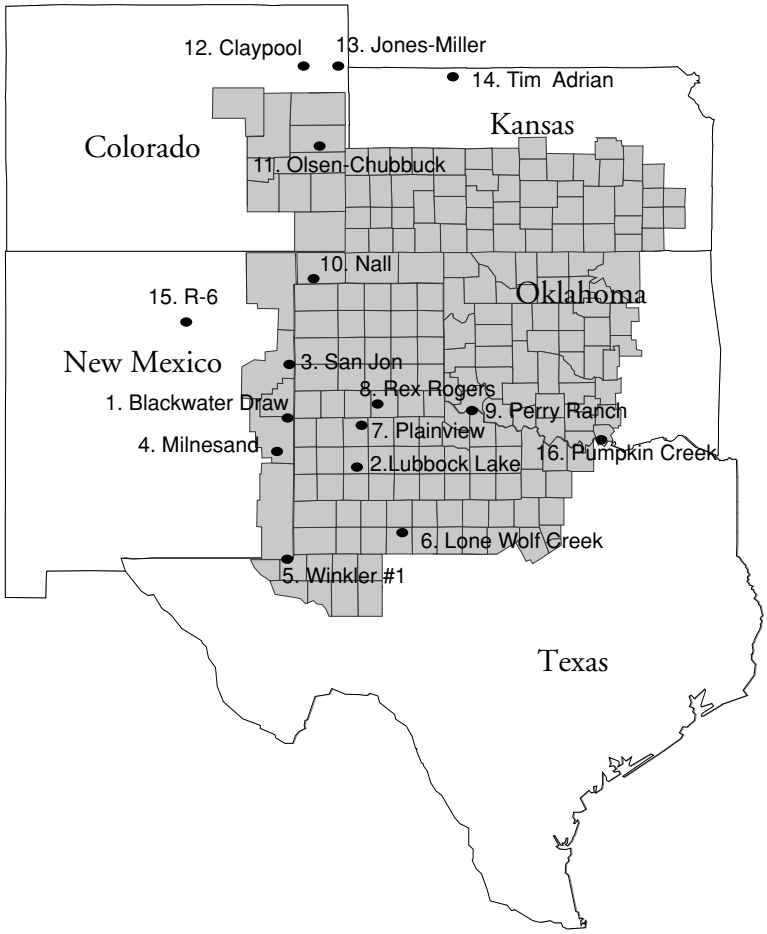



**Figure 11. Map of Late Paleo-Indian site locations in the Southern Plains region.**

east of Plainview (Harrison and Killen 1978). A radiocarbon date on the Plainview level at Lake Theo is 9950 ±110 (Johnson, Holliday, and Neck 1982:Table 3), which is in close agreement with other Plainview dates.

The remnants of a Plainview bison kill in Jackson County, southwestern Oklahoma have been excavated and studied (Saunders and Penman 1979). Although much of the site had been destroyed by erosion, investigation revealed two Plainview points (one recovered from the surface) and the remains of at least two or three bison (estimated to be as many as eight bison). The single radiocarbon date based on bone (Tx-2190) is 7030 ± 190 B.P. Although considered to be acceptable as a late Plainview date at the time (Saunders and Penman 1979:58), more recent and consistent dates from the Plainview and Lubbock Lake sites and those from Bonfire Shelter (Dibble 1970) indicate that the date is almost certainly too recent. The only other dates ascribed to Plainview which are in the 7000 B.P. range are the late bone date from the Plainview site and two dates from Zone IV at Levi Shelter which probably represents a Golondrina component. Golondrina is a distinctive type very common in central and southern Texas (Turner and Hester 1985), and distinctly thicker and usually larger than Plainview (T. C. Kelly 1982). The extreme shallowness of the Perry Ranch deposit makes the possibility of humic acid contamination and infiltration by surface water carbonates extremely likely.

One of the projectile points from Perry Ranch has slightly recurved lower blade edges, similar to the Golondrina type. Such blade forms, however, also occurred at the Plainview site. Johnson and Holliday (1980:103-104) argue that the Perry Ranch kill represents Golondrina rather than Plainview activity, and also argue that the Perry Ranch date is too recent for Plainview. The considerable morphological range in Plainview points from the Plainview site in terms of basal and blade outline has resulted in many typological headaches and not unexpectedly some confusion as to the assignment of specific points to the type and sites to the complex. The variability in Plainview points provides an important example of the problems in using highly restrictive

morphological types in archeological study rather than recognizing variability which results from technological restraints and point reworking. Most larger Paleo-Indian kill sites have produced a diverse array of morphological forms among projectile points used at the same time by the same cultural group (Bradley and Frison 1987; Dibble and Lorrain 1968; Frison 1974; Frison and Stanford 1982; Haury 1959; Schultz and Eisley 1935; Wheat 1972, 1976; Willey, Harrison, and Hughes 1978). The relationship between the Meserve type and Plainview is also of interest, but most are willing to accept that Meserve represents the reworking of a lanceolate form, sometimes to retip a broken point and also to sharpen the edges of points used as hafted knives (Wormington 1957:114). Myers and Lambert (1983) and others have suggested a close relationship between Meserve and Dalton points which are usually found in areas of deciduous forest at approximately the same time as Plainview (Goodyear 1982; Wyckoff 1985; Wyckoff and Taylor 1971). Other forms are also closely related to Plainview as illustrated by the co-occurrence of Plainview points and San Patrice (Rex Rodgers Side-Hollowed) points in the bone bed at the Rex Rodgers site, located about 48 km northeast of Plainview in Briscoe County, Texas (Willey, Harrison, and Hughes 1978). Remains of six bison and five projectile points were found at the site. A radiocarbon date of 9118 ± 80 B.P. is available (Hughes 1978:38; Speer 1978:94). The variety of projectile points recovered at Rex Rodgers further illustrates the problems, incompleteness, and limitations of our available typological framework for Paleo-Indian assemblage studies in the Southern Plains region. There will continue to be many instances in which isolated points and small samples will not fit easily within established types. Continued studies of variability and technological aspects of "large" samples from good contexts, such as Knudson's (1983) work on the Plainview assemblage, are needed in order to increase the understanding of Paleo-Indian point typology.

### Milnesand Complex

Investigations at the Milnesand site in the 1950s documented a bison kill with a distinctive series of projectile points (Sellards 1955). In most attributes these points are very similar to Plainview with the primary difference being the basal outline which on Milnesand points is usually straight or squared to slightly convex and on Plainviews is generally concave (Sellards 1955; Warnica and Williamson 1968; Johnson, Holliday, Warnica and Williamson 1986). Also, the number and length of basal "thinning" flakes varies between the two types with Plainview points having fewer and longer basal thinning flakes and Milnesand points usually having an abrupt base with numerous short flake removals, more comparable to Cody complex types. Sellards (1955:343-344) further comments that the Milnesand points are distinctly different from Plainview and Scottsbluff specimens which he inspected.

Very close to the Milnesand site is the Ted Williamson site which is in a similar setting and also represents the remains of a bison kill with an associated camp. Projectile points from the Ted Williamson site have been attributed to the Plainview type (Johnson, Holliday, Warnica, and Williamson 1986) and the sites are believed to be essentially contemporaneous, based on geological evidence, and to date between 9000 and 10,000 B.P. The argument for a close generic relationship between Plainview and Milnesand is plausible and possibly supported by the early find at Lone Wolf Creek where a typical Plainview and Milnesand point were found together in the bison bone bed (Wormington 1957:110-111). Johnson and Holliday (1980:103), however, have reevaluated the Plainview point from Lone Wolf Creek and state that, "the apparent basal concavity of the incomplete specimen is the result of a single hinge flake having been removed from the base. Otherwise, the broken artifact exhibits the same attributes as the complete Milnesand point." Hester (1972:136-137) and others (Agogino, Patterson, and Patterson 1976:211) have reported evidence that Milnesand points occur with and may be closely related to Eden and Scottsbluff (Firstview) points at Blackwater Draw in the upper bone bed at Station E. Cody complex and Firstview materials are well established as being later than Plainview, by perhaps 1000 years. Cody and Firstview complex dates fall primarily between 8500 and 9000 B.P. (Agogino, Patterson, and Patterson 1976; Frison 1978; Wheat 1972, 1979; Holliday and Johnson 1986; Holliday et al. 1985), therefore we might interpret Milnesand as transitional between Plainview and Firstview and so related to both complexes. There are also typological and nomenclature problems with both Plainview and Milnesand (Wheat 1972; Knudson 1983), and it is probably the case that the variability expressed within specific late Paleo-Indian types overlaps with the variability in other types. Such a continuum of variation is to be expected in situations where the same broad cultural group and technological tradition is present in an area during many centuries.

### Agate Basin Complex

The Agate Basin complex is named after the Agate Basin site in eastern Wyoming (Roberts 1961), one area of which was called the Brewster site (Agogino and Frankforter 1960). The complex is known primarily from research at the type site (Frison and Stanford 1982) and the Hell Gap site (Irwin-Williams et al. 1973) which is located about 112 km southwest of Agate Basin. In the Northern Plains, Agate Basin is fairly well dated (Frison 1982:179; Irwin-Williams et al. 1973), based on radiocarbon assays and stratigraphic evidence, to the interval between 10,500 and about 10,000 B.P. This age suggests that Agate Basin points may be at least partially contemporaneous with Folsom and with Plainview. Evidence from Hell Gap, Agate Basin, and Blackwater Draw indicates that Agate Basin immediately postdates the Folsom components at these sites. The diagnostic Agate Basin projectile point is lanceolate, unnotched, with a convex or straight base, and slightly convex blade edges. The range of variability within this type has been well documented at the Agate Basin site where variations in length, tip shape, and basal form are shown to result largely from breakage and reworking of specimens (Peterson 1978; Bradley 1982). Shelley and Agogino (1983) have noted some technological similarities which exist between Folsom and Agate Basin. In the southern Plains region, Agate Basin points are fairly common in collections of Early Man materials, but few occurrences are known which have good contex-

tual control. Agate Basin is represented at Blackwater Draw 1 stratigraphically above Folsom components (Agogino and Rovner 1969; Stanford et al. 1986:109). The Packard site in eastern Oklahoma has revealed evidence of an Agate Basin component in a deeply stratified terrace deposit (Wyckoff 1964, 1984, 1985). This site's Agate Basin component provided a radiocarbon date of 9416 ± 193 which is several hundred years later than the accepted dates for Agate Basin on the Northern Plains. Also, the Packard site points were recovered stratigraphically below Dalton materials, with the latter interpreted as dating 10,000 years ago by some researchers (Goodyear 1980). Agate Basin bison hunters were apparently active in the Southern Plains region, but the relationships between this complex and the Folsom and Plainview assemblages in the region has yet to be fully established.

### Hell Gap Complex

Immediately following the Agate Basin complex on the Northern Plains is the Hell Gap complex, named after the Hell Gap site (Irwin-Williams et al. 1973; Irwin 1968), but which is also well known from a number of other sites in Wyoming and Colorado (Agogino 1961; Agogino and Galloway 1965; Frison 1974; Frison and Stanford 1982; Stanford 1975, 1978). The Hell Gap complex is dated to the period between 10,000 and 9,500 radiocarbon years ago (Frison 1974, 1978, 1982) and is best known from bison kill sites such as Casper and Carter/Kerr-McGee in Wyoming (Frison 1974, 1984), Jones- Miller in Colorado (Stanford 1975, 1978), and camp sites including Hell Gap and Sister's Hill in Wyoming (Agogino and Galloway 1965; Haynes and Gray 1965). O'Brien (1984) has reported on a quarry/lithic workshop site in Norton County in northwest Kansas where a Hell Gap point, possible Hell Gap preforms, and Paleo-Indian tool forms have been found. The lithic material worked at the Tim Adrian site was Niobrara jasper (discussed as Graham jasper by Wedel 1986), which is common in northwestern Kansas and southwestern Nebraska, and is represented by artifacts at the Jones-Miller Hell Gap kill site located in eastern Colorado approximately 160 km to the west (Stanford 1978). Hell Gap projectile points are fairly common in the Southern Plains region (Polyak and Williams 1986; Hofman 1971; Jensen 1968; Wyckoff and Spivey 1984; Wyckoff and Taylor 1984), but as yet no undisturbed component has been located and studied.

Evidence from the Jones-Miller site suggests that ritual activities may have been associated with bison kill operations at that site. Stanford (1975, 1978, 1979) reports the occurrence of a postmold near the center of the kill area adjacent to which were found a diminutive Hell Gap point, a bird bone whistle or flute, and a butchered dog skeleton. These artifacts and associated feature are closely comparable to the paraphernalia used by shamans of some historic Plains tribes during bison hunts. Certainly there is evidence of well planned and organized bison hunting during Hell Gap times and for the late Paleo-Indian groups in general. Another aspect of Paleo-Indian life, possibly of Hell Gap age, is represented by the burial of a 25-30 year old female (originally reported as a male [Anderson 1966]) who was just under 152 cm tall at the Gordon Creek site in north-central Colorado (Breternitz, Swedlund, and Anderson 1971). The body was placed in a flexed position and was covered with red ocher. A fire on or near the body destroyed some of the evidence, but is believed to have been part of the burial ritual. A number of artifacts were recovered with the skeleton, but none were diagnostic of a specific cultural group. One radiocarbon date based on bone is 9,700 ± 250 years ago which suggests that the burial is of Hell Gap age.

### Portales Complex

Although most famous for its Clovis and Folsom components, Blackwater Draw Locality 1 has produced evidence of an array of later Paleo-Indian and more recent materials. In organizing the information pertaining to post- Folsom occupation at Blackwater Draw, Sellards (1952:72-74; Sellards and Evans 1960) defined the Portales complex which was based primarily on specimens recovered in association with bison skeletons in Horizon (Stratum) 5 at Blackwater Draw. Sellards (1952:Figures 35-38) illustrated 19 of the 23 projectile points and four of the scrapers used by him to define the Portales complex, but no detailed report of the late Paleo- Indian or Stratum 5 material from Blackwater Draw has been published, although Hester (1972) brought together the available information. The contexts in which most of these artifacts were found, and so their precise relationships, remain unclear. All of the specimens apparently reflect bison kill and butchering activity at Blackwater Draw between about 10,000 and 8,000 years ago. The variety of point forms included in this complex suggests that more than one time period or cultural group is represented. Sellards (1952:74) notes the similarity of some of the specimens with Eden points, others are similar to Scottsbluff, and some closely comparable to the San Jon type (Roberts 1942). Another specimen was compared favorably with Plainview.

Wormington (1957:112) suggests that most of the specimens are very similar to the Milnesand type which Sellards defined subsequent to definition of the Portales complex. Sellards (1955) also noted the similarities between the Milnesand site points and the majority of those in the Portales complex. Hester (1972:137) suggests that the Portales complex as defined by Sellards includes too large a time span, too much variability in projectile points, and inadequate contextual control. Hester (1972) argues that there is, however, good context and provenience information to support the association between Milnesand and Scottsbluff and Eden points in the upper bone bed of Station E at Blackwater Draw. This conclusion is upheld by more recent work at the site (Agogino, Patterson, and Patterson 1976:221). Hester further argues that the majority of the specimens Sellards included in the Portales complex are representative of the previously defined Cody complex and that the lack of detailed reporting and contextual information has made the continued use of the Portales complex problematic and of little utility (Hester 1972:136-137). A similar conclusion is reached by Johnson and Holliday (1981:188). The discordant nature of the Portales complex has become especially obvious because several of the projectile points originally included in Sellards' Portales complex represent distinctive types which do not occur in good contexts with San Jon

and Firstview points. These include an Agate Basin, Plainview, and an Allen/Frederick point (Sellards 1952:Figures 36e, 36f, and 37c, respectively).

Wheat (1972:153-154;1979) includes most of the Stratum 5 points from Blackwater Draw within the Firstview and San Jon types which are the primary diagnostics of the Firstview complex which he defined based on work at the Olsen-Chubbuck site in Colorado. The Firstview complex is considered by Wheat to be the Central and Southern Plains equivalent of the Cody complex on the Northern Plains (Wheat 1972:157). However, the Cody complex is itself a complicated archeological construct having multiple interpretations (Agogino, Patterson, and Patterson 1976:221; Bonnichsen and Keyser 1982; Bradley and Frison 1987; Frison 1978, 1987; Fulgham and Stanford 1982; Stanford and Patton 1984; Wormington 1957:136; Wormington and Forbis 1965).

More recent investigations at Blackwater Draw, primarily by Eastern New Mexico University and cooperating groups or institutions have further documented the presence of a substantial Cody complex component at the site (Agogino and Haynes 1966; Agogino and Rovner 1969; Agogino, Patterson, and Patterson 1976; Stanford et al. 1986; Stevens 1973). There seems little doubt that the majority of diagnostic projectile points from Sellards' original definition of the Portales complex are primarily of a type(s) which are closely related to Cody complex or Firstview complex industries. Though there is no consensus, majority opinion holds that the Firstview assemblage at Blackwater Draw represents a regional expression of the Cody complex. The economic focus of these people was certainly bison, but remains from the Lubbock Lake site document that a wide spectrum of vertebrate species were available and may have been used during the time of the Firstview complex (Johnson 1983:Table 6). It is evident that the Portales complex as originally constructed is not a particularly meaningful or useful archeological construct and should probably no longer be used in the archeological literature. However, there are many problems which remain with interpretation of the time interval and cultural groups who were represented by the materials first included in the Portales complex.

### Cody and Firstview Complexes

With increased interest in and awareness of Early Man artifacts following the Folsom discovery, there began a significant series of reports pertaining to early point finds in the Colorado area (e.g., Renaud 1932, 1934; Gebhard 1949). Most of these artifacts were referred to as Yuma or Yuma-Folsom by Renaud and others. A considerable variety of different styles or types was eventually included in the Yuma "type" including almost all unfluted lanceolate points and this resulted in the name having little real meaning or utility in comparative archeological research. Wormington (1948, 1957) argued that the term Yuma should be dropped from the literature and that at least two distinct types were represented including Eden-Yuma and Scottsbluff-Yuma. The Yuma suffix has since been dropped. Eden points were named after the Finley site near Eden, Wyoming (Howard 1943; Moss et al. 1951), and Scottsbluff points were named after finds at the Scottsbluff bison kill site in Nebraska (Schultz 1932). Research at the Horner site in northern Wyoming (Jepsen 1953; Frison and Todd 1987) documented the co-occurrence of Eden and Scottsbluff points at a dated kill site situation. These types were found with Cody Knives at Horner, the Claypool site in eastern Colorado (Dick and Mountain 1960), the Finley site in western Wyoming (Moss et al. 1951; Satterthwaite 1957), and more recently at the Medicine Lodge Creek site in northern Wyoming (Frison 1976). The variety of artifacts and cultural debris at Claypool indicate that it was probably a campsite. The Medicine Lodge Creek site was also a camp and is located on the northwestern edge of the Big Horn Mountains in a protected setting against a canyon wall.

Component II at the MacHaffie site located near Helena, Montana is an important Cody complex site where the manufacture of Scottsbluff points occurred (Forbis and Sperry 1952; Knudson 1983). It is an important site because of insights into Cody complex biface reduction techniques and general campsite activities.

The Cody complex was suggested by Wormington (1957:136) as the term to be used to designate this range of artifact types, including Eden and Scottsbluff points and Cody knives which were believed to be closely associated. The term Cody was selected because the Horner site, located near Cody, Wyoming, was the primary site where numbers of these artifacts had been found in situ (Wormington 1957:136). Age of the Cody complex (tradition ?) is not fully understood, but recent evidence from the Horner site and elsewhere suggests it may be a longer technological tradition than usually reported (Frison and Todd 1987). The time frame of 9000 to 8500 B.P. may begin as much as 1,000 years too late.

Another aspect of the Cody complex is the Alberta point which is a large version of the Scottsbluff type having a larger more bulbous stem and base. Alberta is commonly referred to as a separate complex, but is generally acknowledged as being the forerunner of the Cody complex. Research at the Fletcher site in Alberta (Forbis 1968), and at the Hudson- Meng site in Nebraska (Agenbroad 1978), has documented that Alberta points are slightly older than Scottsbluff and Eden. Also, Agenbroad (1978) has demonstrated the association of the Cody knife with Alberta points at Hudson-Meng, and he argues that the Cody complex should include the Alberta type as the earliest variant or expression of the Cody complex. Recent research at the Horner site (Frison and Todd 1987) has documented two distinct areas of the site. Area II, investigated by Frison between 1977 and 1980, has produced an assemblage which is interpreted as intermediate between typical Alberta and Cody materials (Frison 1987; Bradley and Frison 1987). Radiocarbon dates support this conclusion. The points are referred to as Alberta/Cody points.

On the Southern Plains, the Firstview complex has already been discussed with reference to the previously defined but ambiguous "Portales complex," and present evidence indicates that Firstview is simply a southern variant or expression of the Cody complex as witnessed further north. Bonnichsen and Keyser (1982) have correctly pointed out that the Cody complex is

ambiguously defined and includes an extreme range of morphologically variable hafted bifaces. Most studies comparing multiple Cody complex assemblages have been based on morphology rather than on technological analyses (but see Frison and Bradley 1987; Stanford and Bradley 1987). The fundamental problem with comparative studies based on morphological attributes, such as Wheat's (1972) and Reid's (1982) analyses, is that the shape of Cody complex points often changes dramatically during the life history of the specimens (Wheat 1976, 1979; Huckell 1978).

Investigation of several areas at the Jurgens site near the South Platte River in Weld County, north-central Colorado revealed camp and butchering areas related to a Cody complex bison kill (Wheat 1979). Wheat considers the projectile points at Kersey to be distinctive enough that he proposed the name Kersey points, to distinguish them from Eden, Scottsbluff, San Jon, and his previously defined Firstview type. A basic similarity with other Cody complex materials is evident, and Wheat documents a significant amount of reworking of the projectile points recovered from the Jurgens site. Research at the Frasca site northwest of Sterling, Colorado (Fulgham and Stanford 1982), about 80 km northeast of Jurgens, revealed evidence of a Cody complex bison kill dated to 8910 ± 90 years ago. The projectile points at Frasca are closely comparable to specimens from the Jurgens site which have been called Kersey points by Wheat (1979). Fulgham and Stanford (1982), however, argue that such a separation is premature and ascribe the Frasca site artifacts to the Eden and Scottsbluff types, arguing that Cody complex is still the most appropriate designation for these materials.

Study of the Olsen-Chubbuck site provided the first intensive analysis of a Cody complex site in the Southern Plains region (Wheat 1972). Olsen- Chubbuck was a bison kill located in Cheyenne County, Colorado near the settlement of Firstview. This kill site involved the use of an arroyo across which a herd of bison was stampeded and which resulted in about 190 animals being killed. Spears or darts were used by the hunters to kill or finish many of the animals, and excavation of the site produced an interesting collection of projectile points and fragments. Two basic forms of points were recognized from the bone bed by Wheat's analysis. Firstview points are similar to the Scottsbluff type but lack distinct shoulders. Grinding of the lower blade edges leaves a subtle change in edge outline or "shoulder" on some specimens. San Jon points, which apparently represent reworked specimens of the Firstview type, exhibit a more typical Scottsbluff form with distinct shoulders. The latter specimens are also shorter on the average than Firstview. San Jon points are named after a specimen from the type site in northeastern New Mexico as described and illustrated by Roberts (1942; see also Wormington 1957; Knudson 1983).

One of the more problematic aspects of the Olsen-Chubbuck site is the early radiocarbon date of 10,150 ± 500 B.P. (Wheat 1972:156-158). This is significantly earlier than most other dates for the Cody complex, and the fact that the date is based on bison bone may be a factor (Agogino, Patterson, and Patterson 1976:221). Some indirect support for this early assay (especially if we consider the younger end of the date range) is given by dates from the Hudson-Meng site (Agenbroad 1978:116) which also predate other Cody complex determinations. Furthermore, recent dates from the Horner site area II (Frison 1987b: Table 4.1) indicate that early Cody complex Alberta/Cody points at Horner may date to nearly 10,000 years ago or roughly contemporary with the Olsen-Chubbuck site.

Wheat has defined the Firstview complex as being characterized by Firstview and San Jon points, and as being earlier than Cody. The possibility that this assemblage predates other Cody complex materials in the region is a problem deserving further consideration. Research at Lubbock Lake, however, suggests that Firstview components there date to approximately 8600 B.P. (Johnson 1986:29). Also, stratigraphic evidence at Blackwater Draw indicates that Cody complex points comparable to Firstview material from Olsen-Chubbuck occur stratigraphically above Agate Basin and Folsom and so are probably close chronologically to most Cody complex dates from the Northern Plains area (Haynes and Agogino 1966; Agogino, Patterson, and Patterson 1976; Stanford et al. 1986).

Another important Southern Plains site which has an interesting assemblage of Cody complex artifacts including projectile points, preforms, scrapers, gravers, hammerstones, abraders, and Cody knives is the R-6 site located in north-central New Mexico (Stanford and Patton 1984). Manufacture of bifaces for replacement of preforms and projectile points was a primary activity at this site, but a variety of other camp and maintenance activities are also indicated. A semicircular arrangement of large stones associated with artifact and debris concentrations may represent a structure. A local outcrop of felsite was the primary source of lithic material used, but nonlocal materials are also represented. The site is important in documenting the southern occurrence of Cody knives, which are also known from the Oklahoma area (White 1981). Some of the felsite artifacts represented at the Claypool site may be derived from New Mexico in the area of the R-6 site (Bradley and Stanford 1987).

### Allen/Frederick Complex

From approximately 8,500 years ago there is a widespread pattern in much of the Plains which is marked by the appearance of parallel obliquely flaked lanceolate projectile points (Frison 1978). From a regional perspective, this period is one of the more poorly documented and least understood in Plains prehistory. The makers and users of these points apparently represent the last of the classic Paleo-Indian groups possessing a highly mobile lifeway and having an economic focus on bison hunting. Dramatic climatic change by 8000 B.P. or soon thereafter—perhaps in combination with increased population—resulted in a widely recognized transition to a more localized foraging way of life which is usually referred to as the Archaic.

Several key sites provide information about the terminal Paleo-Indian period, here referred to as the Allen/Frederick complex. The James (Jimmy) Allen, Mummy Cave, and Hell Gap sites in Wyoming and the Long site in South Dakota are of particular importance. Investigation of the James Allen site near Laramie, Wyoming was probably the first good documentation of the materials here subsumed under Allen/Frederick. The Allen site was a bison kill which produced a number of lanceolate points with oblique parallel flaking and concave bases. A single radio-

carbon assay based on bone from the site provided a date of 7900 ± 200 years (Mulloy 1959). Projectile points closely comparable to those from the Allen site are found throughout much of the Great Plains region (Frison 1978; George 1981; Gettys 1984; McClung 1979; Wormington and Forbis 1965).

Work in the Angostura Reservoir area of South Dakota at the Long site (Hughes 1949) produced evidence of an early component with lanceolate points originally called Long points and then renamed Angostura points (Wheeler 1954). Wormington (1957) illustrated a specimen which has generally been taken to represent a classic Angostura point, but which is actually distinct from the specimens at the Long site. Wormington (Wormington and Forbis 1965:22-23) later concluded that the specimens from the Long site were not typologically like Angostura but more similar to Agate Basin. She encouraged the abandonment of the term Angostura until a more detailed report on the Long site specimens was made available and suggested that the specimens previously referred to a Angostura were more appropriately called Frederick based on recent work at the Hell Gap site. At about the same time, others (Agogino, Rovner, and Irwin-Williams 1964) discussed the distinctiveness of the Agate Basin and Angostura types, giving added incentive for continued use of the latter. Research at the Hell Gap site resulted in definition of the Frederick complex (Irwin 1968; Irwin-Williams et al. 1973) which was considered to include the Jimmy Allen site material (Irwin 1968). The Frederick complex remains poorly defined, however, and there is a need for fuller description of the Frederick materials from the Hell Gap site. At present, therefore, I have chosen to use the compound term Allen/Frederick because the Allen site material was the first well documented and dated component of what is now commonly referred to as the Frederick complex. The term Angostura should probably be laid to rest until the original sample from the Long site can be adequately compared and contrasted with Agate Basin, Allen/Frederick and other potentially comparable Plano materials. Evidence from the Hell Gap site suggests that Frederick people used temporary circular dwellings (Irwin 1971; Irwin-Williams et al. 1973).

Several site, including shelters along the Big Horn River (Husted 1969), other shelter sites in the northern Big Horn Mountains (Frison 1976, 1978; Frison and Gray 1980), and Mummy Cave in northwestern Wyoming (Wedel et al. 1968; McCracken 1979), have stratified deposits which have produced parallel obliquely flaked lanceolate or stemmed points stratigraphically below various notched and stemmed Archaic point forms. Other sites and tentatively defined point types are known from the northwestern Plains area which pertain to this latest Paleo-Indian period, but the Southern Plains region is essentially lacking well documented and reported sites attributable to the transitional 8000 to 7000 B.P. interval which links the Paleo-Indian and Archaic occupations. This culturally and ecologically dynamic period is of critical importance in the study of changing lifeways in the Great Plains region and deserves focused research effort on the part of archeologists. Many questions with regard to cultural change and continuity have yet to be adequately addressed.

## Summary of Paleo-Indian Complexes and Research Needs

The study of Early Man in the Southern Plains region has benefited since the earliest efforts from problem-oriented interdisciplinary research projects. Due in part to the lack of simple and expedient methods of dating (such as radiocarbon) during the 1930s and 1940s, archeologists working on the problem of when man arrived in the New World and what his culture was like generally sought the expertise of geologists and paleontologists to help unravel the chronological, stratigraphic, and climatic situations. The immediate concern for past environmental conditions is also evident in this early work, because of the apparent association of cultural materials with "ice-age" animals. It was obviously not appropriate to use the modern environment as an analogy for interpreting the climate during Paleo-Indian times. The interdisciplinary, or at least multidisciplinary, approach which is evident in the earliest work at Blackwater Draw (Antevs 1936, 1949; Bryan 1938; Cotter 1938a, 1938b; Howard 1935; Hester 1972; Patrick 1938; Price 1944; Stock and Bode 1937) and several other sites set a pattern for Paleo-Indian research which has continued to the present (Black 1974; Frison 1974; Frison and Todd 1986, 1987; Frison and Stanford 1982; Holliday 1986; Leonhardy 1966; Sellards et al. 1947; Wendorf and Hester 1975; Wendorf et al. 1955).

Problems of archeological typology and taxonomy were also of considerable interest since the beginning of Paleo-Indian studies. In considering the Southern Plains in general terms it may be argued that Paleo-Indian studies have often been of more far reaching impact, more problem oriented, and more state-of-the-art than have studies of Archaic, Woodland, and Late Prehistoric sites. It is fortunate that recent investigations of later sites have begun to include interdisciplinary efforts for more complete use of the archeological record (Ferring 1982; Henry 1978; Henry, Butler and Hall 1979; Johnson and Holliday 1986; Speth 1983). Probably more than any other factor, the presence of long standing, clear cut goals in Paleo-Indian research has resulted in relatively programmatic research even though this research has been conducted over a period of decades by many institutions and archeologists. Some of the underlying and continuing research problems or goals of Paleo-Indian research in the Southern Plains region include the following.

1. When did people first arrive and how did they live? This problem emphasizes the need for chronometric, paleontological, and stratigraphic dating. Importantly, because of the continued controversial nature of this subject archeologists concerned with the problem have been particularly interested in documenting contexts and with verifying stratigraphic interpretations. This has encouraged meticulous field recording and reporting procedures.

2. What was the environment like during the Wisconsin glaciation and during the Pleistocene-Holocene transition? The nature of the environmental transition which is correlated with the extinction and extirpation of many species has been the focus of much attention and discussion since the beginning of Early Man research. This has necessitated the coordination of efforts among archeologist, paleontologist, geologists, soil scientists, palynolo-

gists and various paleoenvironmental specialists. The results of these studies have encouraged cross checking of multiple data sets in deriving conclusions pertaining to site occupancy, environmental setting, and economic behavior.

3. What was the nature of subsidiary subsistence practices assumed to have complemented the big game hunting of Paleo-Indians? Although characterized as big-game hunters, it has long been recognized that Paleo-Indians probably relied on smaller game and plant food for part of their subsistence. This has encouraged the detailed analyses of the often elusive small animal and plant remains from early sites.

4. What are the relationships, cultural, chronological, and spatial, among the array of distinctive Paleo-Indian projectile point types? This problem has encouraged typological studies and careful evaluation of type definitions and type concepts (Krieger 1944; Reid 1982; Knudson 1983). It has further stimulated the study of projectile point variability due to resharpening, raw material variability, and resource acquisition factors (Wheat 1976).

5. What are the sources of the high quality stone materials represented in the Paleo-Indian assemblages? Investigation of the sources of lithic raw materials represented at Paleo-Indian sites has emphasized the importance of accurate raw material identification and the need for good information pertaining to the sources of these materials.

## ARCHAIC

In the Southern Plains region the Archaic period is manifest by the utilization of a diverse array of modern species usually in diffuse foraging economies. The common occurrence of grinding equipment for processing vegetal foods, roasting ovens, rock-lined hearths, a more restricted and perhaps more consistently scheduled mobility pattern as indicated by intensive repeated occupation at some sites, local resource usage, and a variety of diagnostic notched and stemmed projectile point- knives serve to further differentiate Southern Plains Archaic complexes from those of the preceding Paleo-Indian period. The absence of pottery or bow and arrow technologies distinguishes the Archaic from the following Woodland and Late Prehistoric periods. The increased seasonality evident for the Holocene climate of the region coupled with increased human population (on a regional scale), apparently resulted in greater reliance upon plant food resources and probably encouraged cyclical nomadism (Mulloy 1954), a patterned seasonal round of activities and group organization, or tethered nomadism in arid areas (Taylor 1964), and increased seasonal scheduling of activities (e.g., Flannery 1968; Martin and Martin 1984, 1986). Tethered nomadism is a concept developed by Taylor to describe hunting-gathering groups who were tied to specific limited water sources (springs or rivers) in arid regions. Such groups would make logistical forays for resources away from their water source(s) and return on a regular basis. In this sense they were tethered to a key resource of limited occurrence—water.

Economic orientations tend to correspond to differences in biotic and physiographic districts. Fluctuations in species productivity or reliability apparently spurred changes in subsistence as mobility became a less feasible option to counteract economic shortfalls. The apparent reduction in mobility is assumed to have resulted from population increases and from the changing nature of the resource base during the post-Pleistocene. For much of the area during Archaic times, highly mobile large game animals were apparently less plentiful or not reliable enough for all Archaic groups to consistently rely on such animals as bison for their primary food resource.

The Archaic has been referred to by a number of terms including "Meso- Indian" (Hughes and Willey 1978) and Middle period (Mulloy 1954). In general, the archeologically defined complexes for the middle and late Holocene cover restricted geographic areas, significantly smaller than those recognized during the Paleo-Indian period. Some tool forms do occur across extensive regions and suggest widespread sharing of ideas and technological advances, apparently through diffusion. Examples include the Clear Fork gouge (Hofman 1978b; Hughes 1976; Ray 1941, 1961; Hester et al. 1973; Schmits 1987), pulping planes or core scrapers, and hafted scrapers made from reworked projectile points. Lithic technologies are dominated by expedient core and flake assemblages, although these core and flake assemblages often occur with highly refined and controlled bifacial reduction systems (as exemplified by the Calf Creek or Bell point type). Lithic raw material utilization commonly demonstrates intensive use of locally available materials with exotic or nonlocal materials represented primarily as formalized curated tools and bifaces. The first widespread use of intentional thermal alteration of cherts and flints in order to improve flaking quality is evidenced during the Archaic. This may reflect, in part, the increased need to use locally available lithic materials which were often times more tenacious, less controllable fracture in making chipped stone tools, than was preferred.

The Archaic period in the Southern Plains region is typically divided into Early, Middle and Late periods. The Early Archaic generally referring to the mid-Holocene Altithermal or Atlantic interval which dates from after 8000 or approximately 7500 to 5000 B.P. The Middle Archaic is commonly stated to have lasted from 5000 to approximately 3000 B.P. and the Late Archaic from 3000 B.P. to approximately the time of Christ or substantially later, depending upon the specific area. It should be noted that these time frames for Early, Middle, and Late Archaic differ substantially from those generally used for Archaic periods in the Eastern Woodlands and the Southeast, including eastern Texas and Oklahoma. Early Archaic in the Eastern Woodlands is considered to start by at least 9500 B.P. Johnson and Holliday (1986:Table 5) provide a summary of Southern Plains Archaic chronologies. Details of the differences in these three Archaic periods vary from area to area, but usually include distinctive projectile point-knife types and variations in economic pursuits. For example, bison form a minimal part of the economy for many Middle Archaic groups, but during the Late Archaic in several areas bison represent an important economic focus (Dibble and Lorrain 1968; Hughes 1977; Leonhardy 1966b; Schmits 1987).

The climatic and environmental circumstances on the Southern Plains during the Archaic period are of considerable interest because it is the environment which is often credited with an ultimately causal role in technological and organizational changes which are witnessed in the archeological record of the time. The Atlantic climatic episode (Wendland 1978:278-280) is generally argued to have been the driest/warmest period of the Holocene and to have lasted from about 8,000 to 5,000 years ago. A variety of palynological, stratigraphic, and faunal evidence suggest that this period was indeed one of significant environmental changes. The changes are witnessed by shifts in species diversity and plant community composition. Xeric species proliferated and their ranges were extended, whereas species with limited tolerance for seasonally extreme temperatures became extirpated from some areas (Albert 1981; Antevs 1955; Baker and Penteado-Orellana 1977; Benedict 1979; Bryant 1977; Bryson, Baerreis, and Wendland 1970; Dillehay 1974; Hughes 1978; Johnson and Holliday 1986; Lundelius et al. 1983; Meltzer and Collins 1986; Neck 1987; Schultz 1978; Stafford 1981; Story 1985; Wright 1970). During this period it is generally assumed that there was an expansion of grasslands to the east of the Great Plains and an expansion of short grass steppe vegetation as well. Erosion and arroyo cutting probably accelerated due to decreased vegetation cover and possibly a sporadic torrential rainfall pattern.

There was apparently a lowering of the water table in the High Plains area (Evans 1951; Green 1962; Meltzer and Collins 1987; Smith, Runyan, and Agogino 1966), and locally extensive badlands areas appeared in the dissected plains and rolling low plains areas to the east of the Llano Estacado. These areas supported a variety of xeric species which produced fruits, seeds, tubers, and fibers but which typically required intensive processing by humans for food. Important economic plants included yucca, grasses, cacti, plums, gourds, mesquite, shinnery oak, and others. Animal species which were exploited include mussels, small mammals, reptiles, fish, antelope, and deer. Bison are well represented in Archaic components in the Southern Plains region, but most of these date either before 7,000 years ago or after 3,000 (Dillehay 1974). Some mid-Holocene sites indicating small scale bison utilization are, however, known for the region (Johnson and Holliday 1986).

Current knowledge of Archaic peoples from the Plains area indicates that these groups can be classified as hunters and gatherers, which simply means they subsisted primarily by use of wild nondomesticated resources. Anthropologists have traditionally categorized human cultures in terms of social organization and complexity (degree of integration and number of component parts or social subunits), which has resulted in most contemporary or ethnographically known hunter-gatherer groups being classified as bands or tribes (Service 1972; Lee and DeVore 1968). Some "exceptional" or "unusual" hunting and gathering groups including Northwest Coast Indians are known to have developed relatively complex ranked societies described as chiefdoms. Archeologists concerned with assessing the position of prehistoric groups on the ladder of cultural complexity have generally assumed or argued that Archaic groups in North America were organized at a band level of sociocultural integration. They are usually assumed to have been egalitarian groups whereby status was attained primarily through the competence of the individual. Archeological literature suggests that there were many egalitarian bands of Archaic hunter-gatherers in the Southern Plains region between 7,000 and 2,000 years ago.

In actuality, these terms, band, hunter-gatherers, egalitarian, are relatively uninformative as to the specific organization and operation of Archaic groups. Recent ethnographic and archeological research pertaining to hunter-gatherers has documented a diverse array of adaptations and organizational types among groups which can be considered to live in egalitarian bands (Binford 1980; Leacock and Lee 1982; Schrire 1986; Lee and DeVore 1976; Vierra and Brown 1985; Watanabe 1985; Woodburn 1980). Also, prior to agricultural development, which typically resulted in displacement of hunter-gatherers by sedentary groups, many prehistoric hunter-gatherers occupied relatively rich environments. Most modern ethnographically documented hunter-gatherers, however, were located in "marginal" environments not conducive to agricultural development. Emphasis in recent years on "determining" whether Archaic groups represented egalitarian bands has done little to further our understanding of the operation and lifeways of these groups.

The fluidity of social structures and organizational variability expressed in diverse groups of modern hunter-gatherers in marginal environments can only begin to anticipate the complex array of social organizations represented by Archaic groups in North America and specifically in the Southern Plains from the Cross Timbers to the Rocky Mountains and from the Arkansas Basin to the Pecos River. It is important to consider that many of these groups may have had a dynamic organization such that the size and membership of some groups changed regularly or cyclically between periods of aggregation (maxiband or reproductive group) and dispersal (miniband or family/subsistence group). And there were almost certainly seasonally changing emphases in the plant and animal foods and natural products—hides and fibers—which were the focus of economic and maintenance activities.

The following characteristics are here believed to have been common to Archaic groups in the Southern Plains area:

a) seasonally varied economies;
b) flexible group structure with periods of aggregation and dispersal;
c) seasonally variable needs such as fuel, shelter, clothing;
d) a variety of site types which result from diverse economic, social, and maintenance activities; and,
e) a variety of alternative strategies for coping with seasonal, or yearly, economic shortfalls or windfalls.

If these are reasonable assumptions, then several factors pertaining to the archeology of Southern Plains Archaic groups are evident.

First, the size and activities of a particular Archaic social group may have varied significantly during the course of an eco-

nomic cycle. This will result in the archeological remains of the same group being represented in a variety of combinations and situations which probably will not fit easily into what an archeological "phase" (Willey and Phillips 1958) is generally "expected" to be. Resource exploitation may vary seasonally and group composition may change in concert. Dispersed family subsistence groups, for example, may act as foragers making frequent residential moves during the course of a summer in order to exploit a variety of plant foods, aquatic resources, and small terrestrial game (lizards, turtles, insects) which are abundant, but perhaps thinly distributed over the landscape during the growing season.

The same groups may join together to form a "maxiband" or large social group in the fall in an area of productive seed crops or nut masts which also provide a draw for deer, turkey, raccoons and other species which utilize such crops. The location of such an aggregation site may be determined during the late summer based on which stands of trees will be bearing fruit or which areas have a good grass crop. Benefits from aggregations include a variety of noneconomic factors such as information exchange, trade in material goods, ceremonial activities, indoctrination of the young, and mate finding opportunities (Conkey 1980; Durham 1981; Moore 1981). Such an aggregate group may operate as collectors (Binford 1980) wherein most economic activities are logistical in nature (limited composition task groups go in pursuit of specific foods or materials) and activities are focused on returning resources to the aggregate group's base camp.

Second, the economic cycle of these Archaic peoples may have varied greatly during different years because of fluctuations in resource productivity and availability. If, as one example, bison were abundant in a region through the fall and winter, the need and incentives for collection, processing, and potential storage of nut or seed crops or use of other plant and small animal resources may have been greatly diminished. During years of minimal or inadequate bison kills, the positioning strategies, site selection, and group organization (dispersal/aggregation) decisions may have been dramatically different than during years of abundant bison and successful kills. If so, then economic activities as represented at particular components (reflected by grinding stones, gouges, butchering tools, etc.) may not be reliable indicators of "cultural" differences, but simply different economic poses of the same or closely related groups.

A related problem is that the cultural behavior reflected in the archeological remains of specific components may vary significantly for the same "activity" as conducted by the same group under varying circumstances (Binford 1978). This potential problem of multiple archeological expressions of a cultural group's activity can result from more than differential vagaries of preservation and recovery. The processing of seeds or nuts, for example, may be conducted differently depending on whether mass quantities are desired for storage, or if immediate consumption is intended. Processing of bison carcasses, as indicated by Speth's (1983) study of the Garnsey site, can vary considerably depending upon the season and whether the primary interest is in the fat and marrow, meat, hides, bones for tools, or some combination of these possible needs. Also, the size of the hunting group, importance of transporting the materials, and available processing time (determined in part by temperature at the time of the kill) will influence decisions concerning the entire butchering process.

In general, it is evident that definition of phases and recognition of Archaic cultural groups has been extremely normative in nature and that archeologists have tended to pose unrealistic expectations about homogeneity in "cultural behavior" without considering the diversity of situations under which decisions were being made by prehistoric groups. Some of the most challenging and potentially rewarding research pertaining to Southern Plains Archaic lifeways will require careful consideration of how to extract information about group mobility, group organization, and subsistence activities from an archeological record dominated by shallow lithic scatters and deeply buried components.

In the following brief discussion of Archaic unit concepts which are used or have been proposed for the Southern Great Plains, it is important to consider several factors. First, the needs of archeologists and the reasons and material basis for establishing various taxonomic units has varied greatly through time and between regions. Archeological unit concepts are central to classification and comparative studies, but are in and of themselves an important topic for study. The development, modification, use, misuse, and abandonment of specific taxonomic units provides insights into the changing needs and goals of archeologists working in the region. In fact these organizational concepts provide an interesting record of changes in Americanist archeology. In the following, the terms phase and complex generally follow the definitions in Willey and Phillips (1958) and the terms focus and aspect are usually derived from McKern (1939) though have the added element of time. Most of the taxonomic units are cultural-historical in nature, whereas there is an increasing emphasis on "behavioral" analyses. This has resulted in some cases in disharmonious integration of analyses directed toward goals which are distinct from those for which the taxonomic units were defined. The taxonomic units were often defined using a different set of operational and analytical assumptions than are used by many practicing archeologists. Figure 12 depicts the locations of many of the key Archaic sites mentioned in the following discussion and Figure 13 illustrates some selected artifacts types of the Southern Plains Archaic.

## Archaic Complexes in Central and Southern Kansas

Information pertaining to Archaic cultures in Kansas is available in several sources including Brown and Simmons (1987), Grosser (1977), A. E. Johnson (1980), O'Brien (1984), Reynolds (1982), Schmits (1987), Witty (1982), and others. The summaries provided here rely heavily upon Brown and Simmons (1987).

**Munkers Creek Phase.** The Munkers Creek phase, dated to 5500-5000 B.P., has been defined and discussed by Witty (1982:202-205,218-228) and includes components in northeastern and east- central Kansas. Excavated and reported sites include William Young in the Council Grove Lake area in Morris County (Witty 1982), Cow-Killer (Area 741) in the Melvern Lake area, Osage County (Reynolds 1984), and the Coffey site on Tuttle Creek Lake in Pottawatomie County (Schmits 1976, 1978). It should be noted that the Coffey site components originally assigned to the Munkers Creek phase were later used by Schmits in defining the Black Vermillion phase. The primary sites are located in alluvial terrace settings on primary rivers and tributaries. Age of the Munkers Creek phase is based on a series of dates from the William Young and Coffey sites, and indicates that this phase dates to the last portion of the Altithermal.

Economy of the Munkers Creek people was apparently based on hunting and foraging with deer and small mammals the primary meat sources. Distinctive artifacts include Munkers Creek gouges which are made from Munkers Creek bifaces. Munkers Creek bifaces are typically large, often sickle-shaped pieces which exhibit sickle gloss on the concave edges. This polish apparently resulted from cutting wild grasses or similar plants (Witty 1982:152-157). Other important artifact types include chipped double bitted axes and lanceolate dart points of the Munkers Creek type which have poorly defined shoulders. Interesting ceramic figurines depicting human heads were found at William Young, but no other ceramic technology is known. A number of sites in eastern Kansas are assigned to this phase by Witty (1982:202-205), and more research is needed before the variety of site types and distribution of the complex is understood.

**El Dorado Phase.** Definition of the El Dorado phase is based primarily on research conducted at the Snyders site in the Walnut Creek valley in Butler County (Grosser 1973, 1977) and the Williamson site in the John Redmond Lake area in Coffey County (Schmits 1980, 1987), and several lesser components at other east-central Kansas sites (Schmits 1987:169-170; Witty

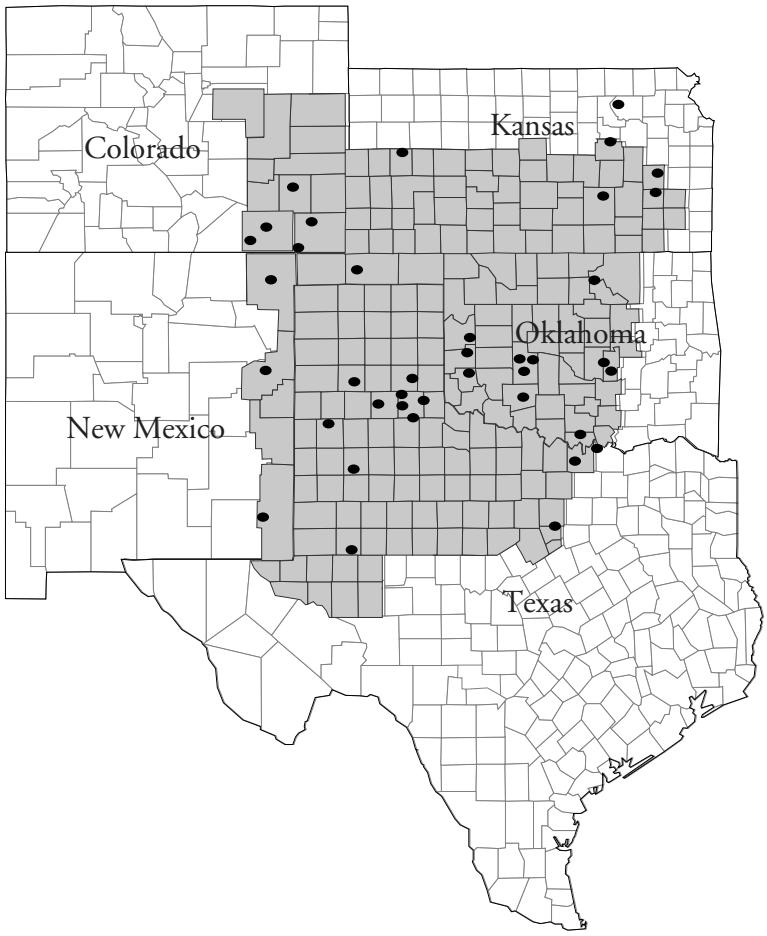



**Figure 12. Locations of selectedArchaic sites in the Southern Plains.**

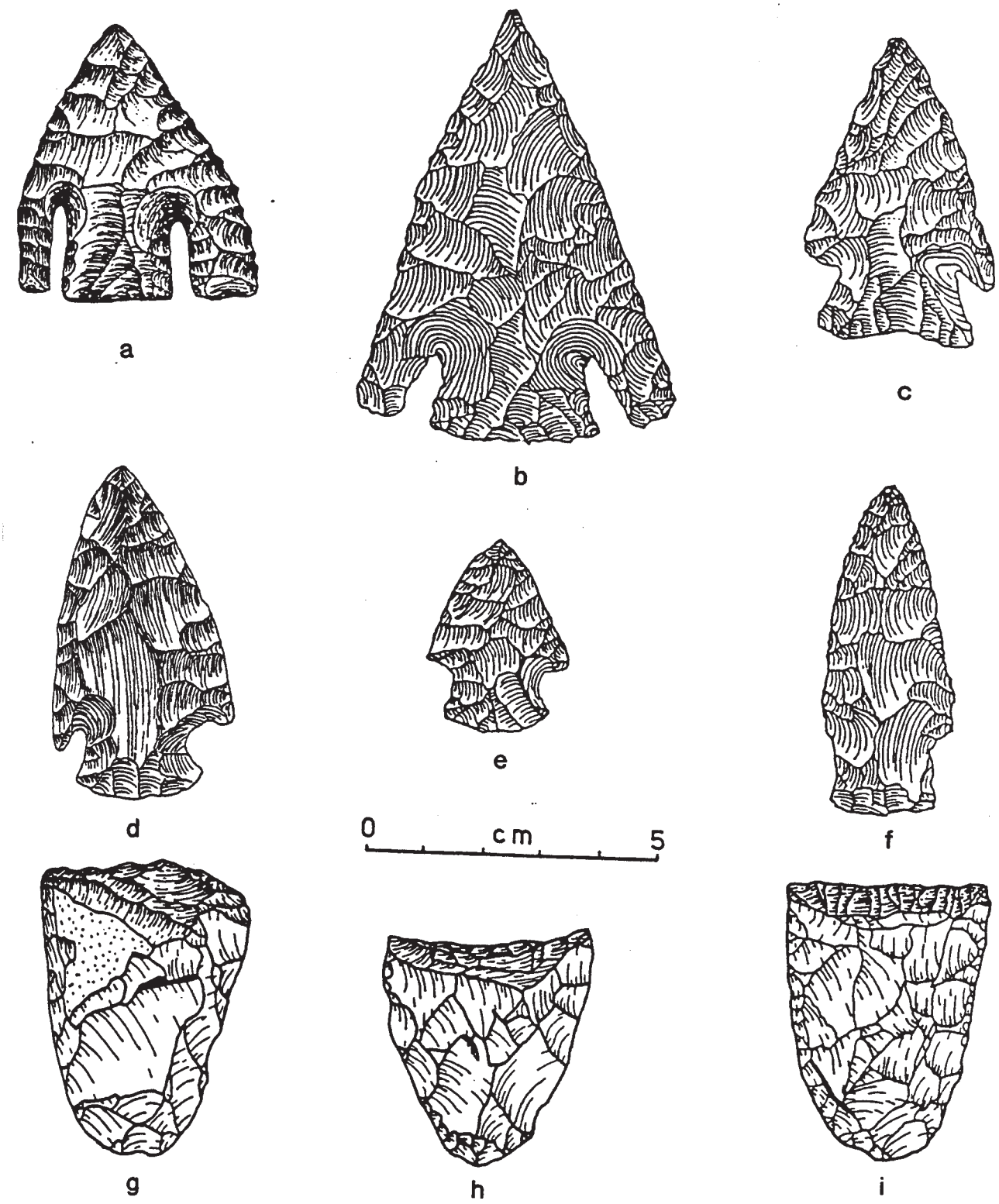



**Figure 13. Selected artifact types distinctive of the Southern Plains Archaic. a. Calf Creek; b. Castroville; c. Williams; d. Edgewood; e. Ellis; f. Yarbrough; g-i. Clear Creek Gouges (a: Perino 1968; b-f: Wier 1976b).**

1982:225-226). The complex is believed to date between 4100 and 3300 B.P. based on eight radiocarbon dates from four sites including Snyders and Williamson. Components are documented throughout the eastern third of Kansas in tall and mixed grass prairie and savanna country, and two burial mounds in north-central Kansas have been attributed to the phase (Schmits 1987). In addition to the secondary burials, a few primary burials and cremations at these mound sites, two primary flexed human burials and a dog burial were documented at the Williamson site. Artifacts diagnostic of the El Dorado phase include Table Rock stemmed, Sedalia lanceolate and especially Dustin side-notched projectile points. Tubular bone beads are also documented for this complex.

Economic pursuits are best documented at the Williamson site where the artifact inventory suggests emphases on hunting and butchering, hideworking, and chipped stone tool manufacture with minimal evidence for plant food processing (Schmits 1987:Table 4). The Williamson site is interpreted as having been used during the fall as a "residential extractive camp." Faunal remains indicate that bison was an important component of the diet with deer, antelope, beaver, and a variety of lesser species filling out the protein menu. Plant food remains were not found at the site. Shellfish processing is evidenced at the El Dorado phase component at the Faulconer site (Bradley 1973), indicating that such lesser species sometimes played an important role in the subsistence of these Archaic people. The presence of bison in the faunal assemblage helps document the post-Altithermal range of this species.

**Chelsea Phase.** The Chelsea is recognized in the southern Flint Hills of Kansas and dated to 4100-4900 B.P. The phase was first defined by Grosser (1970) based on work at the Snyder site and additional information is available on a component at the Milbourne site (Root 1981). Both sites are located in the Walnut River valley, Butler County. The Chelsea phase predates the El Dorado phase, which is recognized over a broader geographical area. Diagnostic artifacts include short shallow side-notched and long shallow corner-notched dart point/knives. Evidence of bison, deer, antelope, rabbit, and other small vertebrates in the diet is documented. Plant foods are unknown, but grinding stones do occur. Grosser (1977) attributes the change from Chelsea to El Dorado phase as being a result of more generalized foraging or utilization of a larger variety of resources.

**Nebo Hill Phase.** The Nebo Hill phase (Reed 1984) was defined from components in the Kansas City area which date to approximately 3000-4000 B.P. Nebo Hill sites are located primarily outside the study area, but related sites do occur in northeastern Kansas (Blakeslee and Rohn 1982). The Nebo Hill phase is particularly important because it represents the early use by hunters and gatherers of tropical cultigens, principally squash, and is central to the study of the long sequence of systemic changes leading to an economy focused on horticulture in the central United States area. Nebo Hill people are interpreted by Reid (1980, 1983, 1984; Reeder 1980) to have had a cyclical pattern of mobility and organizational change. Summers, the growing season, were spent in nucleated settlements in the uplands, but during winters the social groups dispersed and lived in protected lowland settings. The material culture of these people is distinctive and includes large, though often resharpened, lanceolate projectile point/knives, bifacial gouges, adzes, ground stone axes, grinding stones, and fiber-tempered pottery. Other than fragmentary ceramic vessels which may have been so used, there is little evidence of systematic or intensive storage. The complex is believed to be a precursor for Woodland developments in the region, which developed due to a series of cultural and economic shifts which are not presently understood. Although settlement of the Nebo Hill people is believed to have been seasonally permanent, evidence for structural remains is limited. Possible structure areas are identified at the Nebo Hill site (Reid 1984:Figure 23) and a possible pole structure is reported from site 14MM27 in Miami County, Kansas (Blakeslee and Rohn 1982). Limited information pertaining to mortuary practices indicates that ridgetop cemeteries were used.

**Black Vermillion Phase.** The Black Vermillion phase was defined by Schmits (1978) for components at the Coffey site which date between 5700 and 4900 B.P. and are distinguished in part by triangular basal and corner-notched dart point/knives. Sites are located in the Flint Hills and western Osage Cuestas just to the north of the study region. The known sites are located on terraces above permanent water courses. The primary distinction between Black Vermillion and Munkers Creek phases is in the projectile point forms. Munkers Creek points are usually shallow side- notched or lanceolate forms whereas Black Vermillion phase points are basal or corner-notched (Schmits 1978), and the majority appear to have been derived from basally notched triangular blanks (Miller 1980). A variety of simple bone tools are reported as is a single fired clay bead. The economy is documented by research at the Coffey site where a wide range of plant and animal species were represented. A variety of weedy plants, fish, reptiles, birds, small mammals, deer, and bison are reported. The occupations were during the latter portion of the Altithermal period or Atlantic climatic episode.

**Walnut Phase.** The Walnut phase, 3000-2000 B.P. is represented by sites in the Flint Hills province and was defined for a component at the Snyder site in Butler County (Grosser 1970). Other components include a dated occupation at the Coffey site (Schmits 1978, 1981) and other Butler County sites. Small projectile points named "Walnut Valley Corner Notched" may represent an early arrowpoint type in the Plains region. No evidence of pottery is reported and subsistence data is limited to faunal remains. Bison, deer and small mammals are represented. Similar early dates for arrowpoints are known from the Canyon Road site in Oklahoma (Taylor 1987).

**Logan Creek Phase.** Originally defined for the Logan Creek site in Nebraska (Kivett 1962; Wedel 1978; Witty 1957), sites with comparable material have been found in the northern Flint Hills of Kansas (Brown and Simmons 1987; Wood 1977; Witty 1982). The available dates for this phase are from the Logan Creek and Spring Creek sites in Nebraska and indicate a time of about 6300-5200 B.P. (Grange 1980). A number of sites in Iowa are attributed to the Logan Creek phase where the complex is believed to have a much longer time span (Anderson and Semken 1980). The Logan Creek phase dates to the Altithermal or Atlan-

tic climatic episode (Wendland 1978) and the economy included use of bison, deer, antelope, smaller mammals, and mussels. Distinctive artifacts include endscrapers and side-notched triangular projectile points which exhibit much variety but often have basal grinding. In addition to campsites, bison kills and burial sites have been attributed to this phase (Brown and Simmons 1987), but these studies are from Central and Northern Plains sites. No Logan Creek phase sites have been excavated and dated in Kansas to the present time, but the potential for such materials or related materials in the northern Kansas area must be borne in mind.

**Colvin Phase.** This poorly known complex was based on research at the Colvin site in the Wolf Creek Reservoir area of the Neosho River valley of Coffey County in east-central Kansas (Rohn, Stein, and Glover 1977). No radiocarbon dates are available but the phase is estimated to date between 3500 to 2500 B.P. based on typology of the projectile points. Concentrations of fire-reddened limestone and sandstone apparently reflect cooking or food processing activities. As the distinctiveness of this phase has not been well documented, use of the term should be dependent upon further study and more complete information concerning the original materials.

**Other Archaic Manifestations in Kansas.** A variety of Archaic materials have been reported from Kansas which are not presently attributed to a particular phase or defined complex. One example is site 14Lo8, which was apparently a limited activity or short term campsite in Logan County on the Smokey Hill River (Schock 1965). Limited testing at the site revealed the remains of a campfire, three fragmentary dart points and large bone fragments. The bone could not be identified but some was apparently of bison or deer size. Numerous other accounts of preceramic occupations in Kansas occur (e.g., Rogers 1984). Early Archaic projectile points including Dalton points are reported from a number of locations, but as yet no early Archaic components have been excavated or studied in detail (Brown and Logan 1986).

## Archaic Complexes in Southeastern Colorado

Information pertaining to the preceramic or Archaic occupation of southeastern Colorado is derived primarily from Cassells (1983), Eighmy (1984), Campbell (1969), Wood et al. (1981), Anderson and Hall (1977), and Anderson (1985a, 1985b). Cassells' (1983:92) comment that, "Of all the work to be done in Colorado by future generations of archeologists, delineating the Archaic of the mountains and plains will probably be the most challenging" provides acknowledgment of the limited amount of research and understanding of the Archaic hunters and gatherers in this region. The same can be said of the nearby portions of Kansas, Oklahoma, Texas, and New Mexico.

The Archaic in the southeast portion of Colorado has been almost always discussed in terms of a three-part scheme: Early, Middle, and Late Archaic. Specific archeological complexes or phases have not been established from research at Archaic sites in the region. Several specific complexes defined for Archaic materials from other areas are, however, relevant to discussions of the Archaic in the Plains region of southeastern Colorado. Before discussing these complexes, some general comments on the southeastern Colorado Archaic are appropriate. The Early Archaic in the area is considered to have lasted from at least 7000 B.P. to around 5000 B.P., the Middle Archaic from 5000 to 3000 B.P., and the Late Archaic from 3000 to at least 2000 B.P. Characteristics of the area's Archaic occupations include the fairly intensive use of rockshelters (Campbell 1969; Hagar 1976; Kingsbury and Nowak 1980; Wood 1976), common occurrence of grinding stones many of which were apparently used in preparation of vegetal foods, notched and stemmed projectile points assumed to have been used on darts in conjunction with atlatls and which were probably fastened to removable foreshafts which would have served as hafted cutting tools. Pottery is absent and many sites occur as open lithic scatters where expedient core technology (nonpatterned flake removal) is evidenced with assemblages made primarily from local or nearby sources of stone. Both campsites and limited activity sites are known with the former generally containing hearth areas, grinding stones, and a variety of chipped stone artifacts. Many campsites were apparently occupied repeatedly, but the social groups are assumed to have been relatively small at least for the majority of the year.

Settlement data is limited but several studies (Alexander, Hartley, and Babcock 1982; Eddy et al. 1982; Lutz and Hunt 1979) have suggested that there is distinct patterning in the location of base camps and limited activity extractive camps. A certain degree of transhumance may be represented in the combined use of the mountains and foothills during the warmer months and a postulated use of protected settings in lower elevations during the winters (Lutz and Hunt 1979; Eddy et al. 1982). Whether periods of group aggregation and dispersal into smaller subsistence foraging units occurred has not been evaluated. Such a pattern is plausible, but whether extractive activities were primarily logistical forays by special task groups or whether the subsistence was based primarily on movements of the entire residential group is unknown. It is very possible that some combination of these patterns was in effect, depending upon the seasonal and yearly fluctuation in resources and competition. It is evident that Archaic sites, in various forms, are more common in southeastern Colorado than are Paleo-Indian sites. This may indicate increased regional population, but the factors of site visibility, destruction, and the longer time span for the Archaic (than for the Clovis to Plano sequence) are factors which must be considered. The lack of reported Archaic bison kill/butchery sites in the region in combination with the evidence for increasing use of plant foods and small animals, suggests that there was indeed important climatic changes as well as probable regional population increase. Use of bison in this area during the Archaic is not evident in the record until after about 3000 B.P.

Relatively permanent Late Archaic settlements are known to occur at sites such as McEndree Ranch, 5BA30, (Scott 1982; Shields 1980; Cassells 1983) which is located in northwest Baca County. The remains of a nearly 2,500- year-old semisubterranean house floor was found at McEndree Ranch as were several hearths. Two radiocarbon dates from the site are based on samples from the hearths, but the structure is stratigraphically contemporary. Other Late Archaic structures have been reported in the

foothills and mountain region to the west (Cassells 1983), but these are beyond the concern of this overview other than to note their presence and the need for additional information pertaining to Archaic habitation structures in the region.

Bison bone recovered from McEndree Ranch may reflect secondary processing, perhaps for grease or marrow (Shields 1980). A study of plant remains and pollen (Scott 1982) documented the presence of pine, juniper, willow, and minimal evidence of alder and elm. These species could indicate an environmental situation comparable to that in the area today, a prairie habitat with riparian species occurring along the stream valleys. The evidence for several weedy plants at McEndree Ranch provides information on possible economic and technological pursuits. Fibers from yucca and flax (*Linum*) may reflect the use or manufacture of basketry, cordage, and so forth. Ephedra, knotweed, composites and goosefoot or pigweed pollen indicate other economically useful plants were available. One reason the McEndree Ranch site is so important is that its study has provided one of the few detailed glimpses into the ecology and vegetal materials which were a central part of the Archaic livelihood.

Considerable discussion has been generated concerning the impact of the warmer and drier Altithermal period on hunters and gatherers in the Plains region between about 7,500 and 4,000 years ago (Hurt 1966; Reeves 1971; Wedel 1964; Frison 1978; Frison, Wilson, and Wilson 1976; Benedict 1979, 1981; Benedict and Olson 1979). The possibility that there was a "cultural hiatus" in the region of the Western High Plains during the Altithermal is a research problem in need of further evaluation. It is an oversimplification to suggest that the area was completely abandoned during the entire Altithermal interval. It is not unrealistic, however, to expect a significant impact on settlement and economic activities, and dramatic changes in subsistence resources such as herd animals. The nature and frequencies of archeological site types and changes in repetition of site use may be expected. Evidence for two extremely warm and dry periods during the Altithermal is now reported (Benedict 1979, 1981; Johnson and Holliday 1986:44). As we learn more it may become apparent that the Altithermal was in itself a period of important climatic fluctuation, rather than being uniformly dry and harsh. Variation in Southern Plains bison population has been effectively argued (Dillehay 1974), however the periods of relative abundance and scarcity of this herd animal probably varied substantially during Altithermal and other "absence periods" due to local relatively short term range and moisture conditions (e.g., Reher and Frison 1980). Also, the availability of bison throughout the region from the Arkansas basin south to the Brazos and southern Llano Estacado was undoubtedly highly variable at any particular time.

Although the Archaic in southeastern Colorado is generally discussed without reference to specific archeological complexes, several defined taxa are relevant to the region's Archaic record.

**McKean Complex.** The McKean complex was originally defined for a distinctive series of projectile point types and associated materials found at the McKean site in northeastern Wyoming (Wheeler 1952, 1954; Mulloy 1954). Recent summaries of the complex have been provided by Grieser (1985:91-97) and by several papers in an important volume on McKean studies (Kornfeld and Todd 1985). Site variability, distribution of McKean components, technological organization, and economic activity of social groups are discussed in these papers. Four primary point types have often been included in the McKean technocomplex and these include the McKean lanceolate type which has a concave base and is morphologically reminiscent of terminal Paleo-Indian Lusk and Allen points, Hanna points which have bi-lobed or bifurcate stems, Duncan points which have relatively long parallel stems and concave bases, and triangular Mallory points with deep side notches and a shallow basal notch. It is considered probable that there may be some significant temporal and spatial differences within these types, but some types in this technocomplex were evidently coeval. Sites which have produced McKean complex points are found throughout eastern Colorado and into the Oklahoma Panhandle (White 1987). Important central and northern Colorado components include those at Wilbur Thomas shelter (Breternitz 1971), Albion Boardinghouse site (Benedict 1975), and Magic Mountain (Irwin-Williams and Irwin 1966). Excavated and well dated components are not known for the southeastern Colorado area, but excavations at Draper Cave in Custer County (Hagar 1976) document mixed McKean components dated to about 3,600 years ago. For additional information pertaining to the McKean complex, see Kornfeld and Todd (1985), Wedel et al. (1968), Cassells (1983:97), Anderson, LeCompte, and Lintz (1986), Lintz (1985).

**Magic Mountain Complex.** This designation was assigned to Zone F at the Magic Mountain site, located in the Rocky Mountain foothills south of Golden, Colorado in Jefferson County (Irwin-Williams and Irwin 1966). This complex is distinguished by large expanding stem corner- and side-notched dart points which were found stratigraphically below McKean complex points. The time frame for this complex is approximately 5000-5500 B.P., based on radiocarbon dates and stratigraphy at Magic Mountain and LoDaisKa (Irwin-Williams and Irwin 1966:Figure 59).

**Apex Complex.** The Apex complex was based on work at Magic Mountain and is characterized by the presence of McKean technocomplex points and is dated to the period between 3000 and 5000 B.P. (Irwin-Williams and Irwin 1966). This complex overlaps with and compares favorably with Complex C and Complex D at LoDaisKa shelter (Irwin and Irwin 1959). A variety of stemmed and notched dart point forms occur with the McKean, Duncan, Hanna, and Mallory points in this complex and these other forms may represent local group variants (Greiser 1985:94). Like the Magic Mountain complex, the Apex complex is of importance to this study primarily because it represents a relatively well dated stratified sequence which has commonly been used to decipher the chronological placement of finds from the southeastern Colorado area. The Apex complex is comparable, on a regional scale, to McKean and an evaluation is needed as to the potential relationships with sites in the Plains region. One must consider the possibility that some of the differences between Apex and McKean are primarily seasonal or functional rather than cultural.

## Eastern New Mexico Archaic

A considerable portion of the prehistoric record in eastern New Mexico, the period from 7,500 to 2,000 years ago, lacks a specified cultural- historical sequence or integrative schema. Several summaries of the archeology of eastern New Mexico have emphasized the limited available information pertaining to the preceramic, post-Paleo-Indian occupation of the area (Campbell 1976; Collins 1971; Kirkpatrick 1976; Thoms 1976). Wendorf (1960) refers to these groups as "intermediate gatherers and hunters." Several early studies served to document preceramic cultural components in rockshelters and open sites (Baker and Campbell 1960; Hall 1938; Howard 1935; Renaud 1930, 1937; Roberts 1942; Steen 1955; Wendorf and Miller 1959), but little has been added to understanding the details of the region's Archaic occupations. In fact, most recent reports have principally documented surveys and cursory investigations, providing little to help resolve the typological, chronological, and taxonomic problems which are confronted in studying Archaic materials in the region. Some significant contributions have been made, but the basic groundwork of cultural history has yet to be established for the region east of the Pecos River basin and in northeastern New Mexico.

Several projects which entailed survey and limited testing have produced Archaic materials (Anderson 1975; Baker 1984; Beck 1984; Hammack 1965; Honea 1964; Jelinek 1967; Mobley 1979; Smith, Runyan, and Agogino 1966; Stuart and Gauthier 1981), but substantive information pertaining to material technologies, subsistence, chronology, and cultural relationships are generally lacking. Information pertaining to lithic workshop sites of probable Archaic age is provided by Carmichael (1984), and petroglyphs of Archaic age have been documented for the region by Schaafsma (1972:185- 187). Limited faunal evidence indicates that Archaic subsistence activities were based on an array of species as suggested by several reports (Renaud 1930, 1937; Campbell 1976; Hammack 1965). Bison was a key species in a level called the Clayton horizon at Pigeon Cliffs (Steen 1955, 1976). This level is dated to about 8,000 years ago. The occurrences of bison in this region are only well documented before 7000 B.P. and after about 3000 B.P. It is assumed that deer, antelope, rabbits, and other species would have been of increased importance to hunter-gatherers in the area during periods when bison were less plentiful.

The Pigeon Cliffs site near Clayton, New Mexico continues to be of central importance in discussions of preceramic occupation of the northeastern New Mexico area because of the early radiocarbon date and stratified deposit. Unfortunately, relatively little information is available pertaining to the assemblages, and the single date paired with a single notched projectile point does relatively little to alleviate the need for chronological control and order in the region. The early date of 8,282 ± 1000 B.P. (Wendorf 1960:57) has been discussed repeatedly with reference to the possible coexistence of Archaic and Paleo-Indian groups or technologies in the area at that time. However, the limited basis for comparison and extremely small sample from the dated unit at the site, in conjunction with the relatively well (or better) dated late Paleo- Indian materials from the region suggest that more corroborating evidence is needed before a supportable argument for Archaic and Paleo-Indian co- traditions can be made. Stratum E at Pigeon Cliffs, referred to as the Clayton Horizon (Steen 1955:177-179), contained the dated hearth, flakes, a "stemmed and tanged" projectile point and a graver which was made from Alibates flint. Bison bone was common in this unit. The underlying stratum F did not produce diagnostic artifacts during the excavation, but a local amateur had previously collected a reworked basally thinned or fluted point from this unit as well as grinding stones. Several overlapping fire hearths were recorded near the base of stratum F.

The occurrence of high altitude, above 3,350 m asl, Archaic sites to the west in the Sangre de Cristo range has been interpreted as potential summer camps of Archaic hunters (Wendorf and Miller 1959). The occurrence of Alibates at some sites suggests movement of groups from the east. Seasonal transhumance of hunter-gatherer groups between the mountains, foothills, and high plains is a plausible hypothesis, but only one of many which are in need of further investigation in the area. Prehistoric water wells which date to the middle Holocene (ca between 8500 and 5000 B.P.) have been discovered at two sites in eastern New Mexico; Blackwater Draw (Evans 1952; Green 1962) and Rattlesnake Draw (Smith, Runyan, and Agogino 1966). These wells document the lowered water table in the Southern High Plains region during this period which carries implications for the utilization of the region by prehistoric hunter- gatherers. Prehistoric cultural activity on the Llano Estacado may have been seasonally limited or tethered to key water sources. Although limited information is available on the Archaic occupations at the Blackwater and Rattlesnake Draw sites, it does testify to the activity of hunter- gatherers in the region during the driest portion of the Holocene. Whether seasonal transhumance was involved in Archaic occupation of the Southern High Plains is yet to be determined. Evidence from Mustang Draw (Meltzer and Collins 1987) and Lubbock Lake (Johnson and Holliday 1986) documents Archaic activity during the mid-Holocene on the Texas portion of the Llano Estacado as well.

The end of the Archaic in eastern New Mexico is not well dated or established. The Basketmaker occupations of the area are generally considered to have exhibited a general Archaic foraging lifeway, but the details of their subsistence and organization, as with the Archaic proper, are essentially undocumented. For much of the region, horticultural activities were never practiced and a nomadic hunting way of life continued until the time of Euramerican settlement and displacement of aboriginal groups. Early pottery occurs in the area generally in conjunction with the bow and arrow as technological overlays on an essentially unchanged traditional subsistence system. At least this is a commonly held interpretation awaiting serious evaluation. The continuance of the Archaic until A.D. 200, A.D. 1000, or even A.D. 1300 has been suggested for portions of eastern New Mexico (Mobley 1979).

**Hueco Phase.** For the desert region in southeastern New Mexico, the only formally defined archeological construct is the Hueco complex which was based primarily on early investigation in rockshelter sites in the Trans-Pecos area of Texas. The

complex was first defined by Sayles (1935), and updated by Suhm, Krieger, and Jelks (1954). The complex is undated, but is believed to be derived from a general "Cochise Culture" base and to have continued through several thousands years with Jornado Mogollon influences late in the period. A variety of perishable materials are documented from the dry cave studies and these provide an important complement to the open sites in the region where little other than lithics and occasionally bone are preserved. Important references pertaining to this complex include Cosgrove (1947) and Lehmer (1948). The age, technologies, and stylistic relationships of this complex need to be reassessed as the materials from sheltered sites in this region can provide critical clues to many aspects of prehistoric life in the area which are not commonly in evidence.

## Archaic Complexes in Oklahoma

General sources pertaining to the Archaic archeological record in the western two-thirds of Oklahoma can be found in Baerreis (1959), Bell and Baerreis (1951), Hammatt (1976), Hofman (1978x), Hughes (1980, 1984), Lintz (1978), Leonhardy (1966b), Saunders (1974), and Wyckoff (1984).

**Grove Focus.** The first Archaic complex to be defined in Oklahoma was the Grove focus (Baerreis 1951, 1959; Bell and Baerreis 1951). Excavations at the Evans, Caudill, and McConkey sites provided the basis for Baerreis' research and definition of a three part chronological scheme for the Grove focus. The general characteristics of stemmed and notched dart points, ground stone artifacts and a variety of tools showed the Grove focus material to be generally comparable to other Eastern Archaic complexes (Baerreis 1959). The chronological and stratigraphic control on the materials from these sites, is however open to question and Wyckoff (1984:135) has suggested that use of the Grove focus should be discontinued as more recent research in the area suggests that the components analyzed by Baerreis were largely mixed and not chronologically discrete. Although the original Grove focus sites are located outside of the immediate area of concern, materials attributable to Middle Archaic occupations in east-central and northeastern Oklahoma are often discussed with reference to the Grove focus. Wyckoff (1984) has provided a revised taxonomic framework for the region, based on more recent evidence and a broader data base. The Tom's Brook and Caudill complexes have replaced the Middle Archaic Grove focus (Grove A and Grove B), and the Lawrance phase supersedes the use of Grove C for the area's Late Archaic. Wyckoff, like Baerreis, believes that there is good evidence for cultural continuity in the region. Much remains to be learned concerning the cultural diversity, age, economies, organization, and relationships of these Oklahoma Archaic groups.

**Lawton Aspect.** In 1960 Shaeffer (1960, 1966) defined the Lawton aspect based on a large number of surface-collected lithic workshop and campsites in central and western Oklahoma. There was a total lack of chronological or stratigraphic control over any of the materials used. Definition of the Lawton aspect, its three "phases" and two foci (Little River focus for materials in central Oklahoma and Altus focus for materials in western Oklahoma) was done without the trouble of describing a single specific site or site assemblage. Several of the key characteristics used by Shaeffer to define the Lawton aspect, however, have continued to be reliable attributes for identifying Archaic components. These include the intensive use of local gravels, principally various quartzites, large stemmed and notched projectile points, Clear Fork gouges, large scrapers planes, and a variety of expediently produced cutting and scraping tools. Most of the sites identified by Shaeffer were located on prominent ridges and upland settings at exposed sources of ancient gravel deposits which represent Pliocene and early Pleistocene age outwash materials (Tanaka and Davis 1963). A number of papers (Burton and Burton 1971; Leonhardy 1966b; Hofman 1978; Hughes 1980; Saunders 1974) have pointed out the limitations with the Lawton aspect as originally defined. Given the extremely marginal utility of the original unit concept its use can appropriately be discontinued in discussing the area's Archaic complexes.

**Summers Complex.** The Summers complex was defined by Leonhardy (1966b), based on excavations at the Summers site, 34GR12, located in Greer County, near the Salt Fork of the Red River in southwestern Oklahoma. Limited excavation at Area 2 of the site revealed several features including a rock-filled cooking pit, a small hearth, and a concentration of bison bone. A number of stemmed and primarily corner- or basal-notched dart points were recovered and attributed to the Lange, Marshall, Ellis, Ensor, and Gary types. Other artifacts included bifacial knives or preforms used as knives, pulping planes, Clear Fork gouges, scrapers, and a few grinding stones. The predominant lithic material used by the Summers complex people, as with the Lawton aspect, was Ogallala quartzite (also referred to as Ogallala chert, Potter chert, and Potter quartzite; see J. Hughes 1955; D. Hughes 1984; Hofman 1973; Saunders 1974; Lopez and Saunders 1973). Additional materials which occurred in limited quantity include Alibates, Edwards, and unidentified cherts. These cherts occur primarily as projectile points and flake tools. This pattern was also in evidence at site CD-177 in Caddo County which produced a small assemblage comparable in most aspects to the Summers assemblage. A single radiocarbon date from the Summers site based on charcoal from Feature 1, the rock-filled pit, is 2770 ± 150 B.P. (Gak-694). Bison was the key species utilized at the site. Leonhardy (1966b:31) suggests that the Summers site represents only a portion of the economic activities of these people and that the Summers complex "is but a part of a larger cultural inventory geared to a more thorough exploitation of the environment." The Summers complex remains the best documented Late Archaic complex in western Oklahoma, despite the fact that we probably have only a small portion of the cultural material inventory and that a variety of other site types are likely to be represented, including lithic workshops, kill sites, and a variety of other temporary processing or collecting camps and domestic sites.

**Gore Pit Site.** To date, studies of Archaic materials from Gore Pit which is located along East Cache Creek in Comanche County (Bastian 1964; Cheatum 1976; Hammatt 1976; Keith and Snow 1976) make this site of central importance for western Oklahoma prehistory. The Archaic strata at Gore Pit were found deeply buried in the terrace of Cache Creek and a series of radio-

carbon dates indicate that the site was intensively utilized between 6,000 and 7,000 years ago. Approximately 30 features were noted at the base of the borrow pit and several of these were excavated over a period of several years (Bastian 1964; Hammatt 1976). Concentrations of burned rock and mussel shells were found as well as a variety of tools, projectile points, and lithic materials. Projectile point types, none of which were found in direct association with the dated hearth or burial, include primarily Trinity, Ensor, and Darl points with examples of several other types, Meserve, Frio, Gary, and Ellis, represented. These points and the majority of artifacts described by Hammatt (1976) were found on the deflated surface at the level or above burned rock Feature 3 which was dates to approximately 6,000 years ago based on two radiocarbon samples. Other artifacts included Clear Fork gouges, scraper planes, a variety of cutting and scraping tools made on flakes, choppers, grinding stones and grinding basins. Faunal material collected includes turtle, prairie dog, gopher, deer, and rabbit. No bison is reported. The single burial from Gore Pit is of particular significance due to its early date, 7100 ± 350 B.P., and because it is one of few documented Archaic burials for the region (Keith and Snow 1976). The burial was partially destroyed by borrow activity and most of the lower limb elements were missing. The position was at least partially flexed with the head oriented to the northeast. The individual was a gracile male or robust female (the latter believed most likely), 25-35 years of age at death. There was no definite cause of death determined, but fractures on the right parietal open the possibility that a traumatic blow to the head may have been fatal. No burial associations were found.

Evidence from Gore Pit indicates that intensive food processing activities, probably including mussels, plant foods, and small game, were being conducted by Altithermal period Archaic hunter-gatherers in western Oklahoma 6,000 years ago. This was apparently a site visited repeatedly by Archaic groups and probably representing a residential site perhaps used on a seasonal basis. The utilization of mussels and evidence for perennial water at the site (Cheatum 1976) suggests an occupation from late spring through early fall when mussels would have been accessible.

Gore Pit has not been assigned to a particular complex, but obviously dates to an earlier period and exhibits a different economic focus than the Summers site (Leonhardy 1966b). Studies are needed which can provide good stratigraphic and chronological control for Archaic assemblages in the region, but until such happens it is probably prudent not to create additional complexes based on materials of questionable association from uncertain contexts.

**Pumpkin Creek Complex.** A partially controlled surface collection from the Pumpkin Creek site in Love County, on a tributary stream of the Red River in south-central Oklahoma, yielded an important series of early Archaic artifacts (Wyckoff and Taylor 1971; Wyckoff 1984). A detailed technological analysis and discussion of site activities is presented by Wyckoff and Taylor (1971). Apparently the site was primarily a lithic workshop for refurbishing and maintenance of hunting equipment. Also, some other processing activities are indicated by gravers, scrapers, flake tools and a drill. Projectile points provide an interesting combination of attributes and types reflecting late Paleo-Indian materials to the west and Early Archaic types to the east. The savanna region of central Oklahoma has apparently long been a place for cultural contacts and influences derived from east and west, or between Plains and Woodland adapted cultural groups (Wyckoff 1984). Projectile point types at Pumpkin Creek include specimens referable to the Scottsbluff, Plainview, Meserve, and Dalton types. The lack of subsistence information, radiocarbon dates, and stratigraphic control leaves this complex in need of considerable additional study. The traits and point types found at Pumpkin Creek, however, are recurrent at a number of sites in the Cross Timbers region from the Lake Texoma area to central Oklahoma (Bell 1954; Ray 1960; Wyckoff 1964; Pertulla et al. 1983; Lopez et al. 1979). This complex helps to organize the information available on materials believed to date between 9,000 and 7,000 years old in this region, but considerably more information is needed in order to gain an accurate picture of the cultural relationships, material assemblages, and organizational aspects of the hunters and gatherers represented.

**Other Oklahoma Archaic Studies.** In addition to the above mentioned sites and complexes, there are several important studies pertaining to the Archaic prehistory of Oklahoma which are concerned with factors other than culture-history, and several sites have been reported which are not assigned to a defined phase or complex. Specific Archaic site studies for unassigned sites include the Nall site in Cimarron County (Baker, Campbell, and Evans 1957), and the Johnson-Cline (Lintz 1978), and Muncy sites (White 1987) in Texas County. All three of these locations produced collections of material which contain artifacts representing Paleo-Indian through protohistoric occupations. Each of the sites has a number of diagnostic Archaic notched and stemmed dart points and document the presence of Archaic activity in the upland High Plains region of the Oklahoma Panhandle. No dates are available for the components, but diagnostic dart points suggest Middle and Late Archaic activity.

Whether this activity was limited to short term hunting camps or if the area supported a sizable Archaic population throughout the Holocene is unknown. The occurrence of an Altithermal, mid-Holocene, hiatus in occupation or a dramatic change in the nature of occupations has not been evaluated. The abundance of apparent Late Archaic artifacts in the upland areas of the Panhandle suggests that by 3,000 years ago there was considerable activity in the area, possibly focused on bison hunting in the vicinity of playa lakes. A number of Archaic sites have been documented by surveys in the Cimarron County area (Haury 1982; Saunders 1978; Saunders and Saunders 1982). Sites similar to Nall and Johnson-Cline extend eastward in the upland areas of northwestern Oklahoma (e.g., Hofman 1987). Further research is needed in the area to evaluate the impact of the Altithermal on bison and human populations in this portion of the High Plains. Such study will require controlled samples in situations which can provide environmental information.

Several archeological surveys in western Oklahoma have produced evidence of small Archaic sites which are often situ-

ated in upland settings and generally have limited tool inventories (Burton and Burton 1971; Ferring 1978; Ferring, Crouch, and Spivey 1976; Hofman 1973; Lintz and Vehik 1986; Lopez et al. 1979; Moore 1984; Northcutt 1979; Spivey et al. 1977; Wallis 1979; 1981; 1983; 1986; Wyckoff 1963). Sites attributable to Archaic activity often have fire-cracked rock, heavily used and reworked projectile point-knives which are stemmed or notched, a variety of flake tools and debris, and a preponderance of local lithic materials represented in the debris. The impression from most collections is that they contain relatively few curated tools (points and gouges and sometimes grinding stones) and are dominated by a variety of expediency tools (flake tools used for various tasks and discarded).

Several studies have focused on economic aspects of Archaic occupation in western Oklahoma. Important subsistence information has been recovered from such sites as Gore Pit, Summers, and the lower levels of Duncan- Wilson shelter (Lawton 1968). The protected setting at Duncan-Wilson, under an east facing canyon wall 10 m or more below the surrounding prairie, would have made it a likely winter campsite. The abundance of wood and wildlife and permanent water in such canyons would also have been conducive to winter camping by small groups.

Hakenberger and Bousman (1978) have proposed a model for regional Archaic subsistence and settlement in southwestern Oklahoma and for the Fort Sill area in Comanche County in particular (see also Bousman 1978a, 1978b; Ferring 1978b). This model is derived from Jochim (1976) and formulated from known local resources (Bousman 1978a, 1978b) with estimates as to their potential availability and season of predominant use. Consideration is given to population and the economic and social needs for group aggregations. Despite obvious limitations and probable flaws, the model is largely testable and provides a refreshing attempt to carry the study of western Oklahoma Archaic materials beyond descriptive and historical considerations.

The poignant comment that "what has been lacking in southwest Oklahoma archeology is long term research goals" (Hackenberger and Bousman 1978:213) is certainly true, although this has been remedied in part by Wyckoff and Brooks (1983:251-290). The final model derived by Hackenberger and Bousman (1978:Tables 9-1,9-3) provides a useful baseline for discussion and comparison, but cannot be assumed to be of particular relevance to interpretation of specific site situations.

In their model, bison provide approximately 45% of the resources used during all seasons. Obviously, as they note, during periods when bison are not available, are not located, or are scarce, the model would have to be dramatically revised. Present evidence suggests that bison were not abundant in the Southern Plains region between 7,000 and 3,500 years ago. Also, their model is determined almost totally by economic needs or food resources without consideration for other factors such as the need for sheltered sites during winter occupations, the need for fire wood, the competition for resources with other human groups and with other species (see, for example, Shelford [1963:32-33] and Gage [1979] for discussions of competition for nut crops). Finally, the nature of social group change and flexibility throughout the economic and seasonal cycle needs further consideration, as does the factor of population growth. Hackenberger and Bousman (1978:Table 9-2) do suggest that the most likely periods for group aggregation are during the summer and fall because of generally abundant resource concentrations and productivity. Regardless of specific problems or limitations, development and refinement of models such as presented by Hackenberger and Bousman can significantly enhance our perspectives on hunter-gatherers in the Southern Plains region.

A few studies have confronted the problem of functional analysis at what appear to be limited activity sites. Tainter (1979) analyzed a small sample from an upland lithic scatter at the Croton Creek site. The tool assemblage consisted of a few cutting tools, two hammerstones, and a number of blocky core tools identified as pulping planes or scraper planes. The tools were all considered to be expedient in nature and are interpreted to have been used primarily in cutting, pounding, and shredding of yucca fibers (Kowta 1969; Osborne 1965). Such processed fibers could have been used in making a variety of materials and implements such as cordage, baskets, sandals, rope, matting and so forth as indicated by remains recovered from dry cave sites to the west (e.g., Shafer and Bryant 1977). The small sample of tools from the Croton Creek site (n=34) over an area of approximately 5,000 $m^2$ highlights the problems of sampling and excavation at such sites. The co-occurrence of gravel outcrops and yucca concentrations on high terraces and hill slopes in the region suggests that numerous such limited activity sites with expediency tools should be present.

A similar limited activity site may be represented by the Shaller site, 34Rm36, which produced a concentration of eight Clear Fork gouges in a very small area of a large upland cobble outcrop (Hofman 1977, 1978b). Again yucca is a common plant on the site area and the intensive use of hafted (curated) Clear Fork gouges was perhaps related to yucca processing. Such a site may represent the location of manufacture of replacement gouges for worn out specimens in combination with fiber, wood, or hide processing activities. Several studies suggest that gouges may have been multipurpose tools employed in the processing and manufacture of many different materials (Hester et al. 1973; Howard 1973; Shiner 1975). Many upland sites have been found which have produced Clear Fork gouges, sometimes in fairly large numbers, and various dart point types are the usual diagnostics found with them (Burton and Burton 1971; Etchison, Hughes, and 1977; Northcutt 1979; Hughes 1972, 1973, White 1981). These sites seem to be most common in the rolling Low Plains region east of the Llano Estacado.

The analysis of lithic workshop debris and artifacts was the focus of an important study on two sites in Roger Mills County, Oklahoma (Saunders 1974). Though lacking chronological control, this detailed study provides one of the few documents concerning the early reduction stages of the lithic industry which is represented at many sites throughout the region. These two sites are located on prominent ridges in the dissected uplands between the Canadian and Washita rivers. Materials from the sites in-

clude cores, preforms, hammerstones, some flake tools and a predominance of lithic debris from reduction of the gravels which outcrop on the sites. These gravels are dominated by quartzites most of which are tenacious (difficult to control the fractures during manufacture) but were generally successfully utilized by the Archaic knappers. Beyond an analysis of lithic workshop materials at these limited activity sites, Saunders (1974:106-109) provides a discussion of the Archaic hunter-gatherer occupation of the region including an outline of site types which can be expected. Some of these have been anticipated in the previous discussion. The types of Archaic sites which are predicted or known to occur include kill sites (e.g., D. Hughes 1977), hunting camps, lithic workshop sites, and base camps. We might add to this group specialized extractive camps such as Tainter's (1979) "yucca fiber processing sites." In discussion of the base camps, Saunders provides these remarks,

> the base camp is the focus of the social system, and the other camps and sites represent but subsystems exploiting various environmental resources . . . . The base camp need not be a permanent settlement. If seasonal exploitation of an environment is occurring, movement of a base camp may be as continual as the remainder of the site types.

In these comments Saunders recognized the essential difference between what has more recently been called residentially mobile "forager" and logistically mobile "collector" strategies in hunter-gatherer land-use patterns (Binford 1980). Mobility and group organization of Archaic groups in temperate North America probably varied significantly because of seasonal, circumstantial, population, and competition factors (Hofman 1984a; Phillips and Brown 1983).

Of key importance in the study of Southern Plains Archaic and development of research is the recognition of the geomorphic factors which have severely modified the nature of the archeological record in the region. An extremely important study by Reid and Artz (1984) has documented the importance of soil and geomorphic information in locating Archaic sites in north-central Oklahoma where intact sites of this age generally occur in deeply buried settings. Reid and Artz (1984) have determined that in the Copan Lake area of the Caney River valley, the highest potential for finding intact buried Archaic sites is along the middle reaches of the streams where the gradient is neither too steep to induce erosion and rapid runoff or too gentle to encourage massive sedimentation and silting over of deposits. Such information, correlating stream drainage pattern, soil series information, and subsurface testing can provide a greatly improved means of locating and assessing Archaic deposits which merit intensive study. Most known Southern Plains Archaic sites are recognized on severely eroded uplands, whereas most Archaic sites which have provided significant information on subsistence and site structure have been found deeply buried in alluvial settings (e.g., Hammatt 1976; Johnson and Holliday 1986; Wyckoff 1964, 1986). In order for studies of Archaic settlement and livelihood to be realistic, it is important that survey and testing of sites involve more than surface reconnaissance and shovel probes. Late Archaic sites in the Copan Lake area are suggested to be affiliated with the Chelsea, El Dorado, and Walnut phases defined for eastern Kansas (Reid and Artz 1984:192-93.)

### Northwest Texas Archaic

Many Archaic complexes have been defined for Texas during the past 50 years (Suhm, Krieger and Jelks 1954; Hester 1976; Prewitt 1981), and a number of these are of only marginal relevance to the area under consideration here. Of primary concern are the Archaic complexes defined for north-central and western Texas. Archaic units defined for central, northeastern, and the Trans-Pecos areas of Texas are not of direct concern, but some of the more important of these will be briefly noted. Suhm, Krieger, and Jelks (1954:) defined the Archaic stage in Texas as the term is generally applied today, "It bridges the time between Paleo- American nomadic hunting people on the one hand, and settled agricultural, potterymaking Indians on the other. Hunting, gathering of wild plant foods and shellfish, and fishing were all pursued."

**Trinity Aspect.** The Trinity aspect was defined by Crook and Harris (1952) for a number of sites in the Dallas area in the upper Trinity River region in north-central Texas. Site studies were based on surface collections, test pits, and study of stream terraces and profiles. The Trinity aspect was divided into two foci, the Carrollton focus being the earliest and followed by the Elam focus. Only one radiocarbon date of 5945 ± 200 B.P. and attributed to late Corrollton focus age is available from this early work (Crook and Harris 1959). This date from the T-1 terrace at the Wood Pit site, located near the juncture of Elam Creek and the Trinity River, is based on shell which was found in a layer with two Clear Fork gouges and stratigraphically below Elam type dart points. Since these complexes were first defined, much has been learned concerning the actual chronological occurrences of several of the projectile point types used in defining these foci. There is little doubt that most of the Carrollton material is earlier than the Elam material, but many thousand years and a wide variety of materials probably representing multiple cultural groups was included in both foci. Although the complexes continue to be used in discussions of north-central Texas Archaic (McCormick 1976), they have little relevance to specific past cultural groups and might best be recognized as broad period names corresponding to the Middle and Late Archaic, both probably including a number of complexes. Certainly the inclusion of Plainview and other Paleo-Indian points, and points of the Calf Creek, Trinity, Carrollton, Edgewood, Wells, Castroville, and Martindale types together in a single focus suggest that a relatively long time frame is involved and unquestionably several cultural groups. This problem has been previously recognized and discussed (Hofman 1978c; Lynott 1981). In reality, the Trinity aspect is essentially a term for all Middle and Late Archaic materials in the north-central Texas region. Generally earlier types and deposits have been included in the Carrollton focus and Late Archaic materials in the Elam focus. The perpetuation of these complex names does nothing to aid our understanding of Archaic cultural groups or historical sequence in the area.

McCormick's (1976:44-45) discussion of the Archaic settlement system in the area is of interest. He suggests that the primary occupation and most permanent campsites in the region occur on the ecotone between the Cross Timbers and the Prairies, and that bison hunting was an important economic focus. McCormick further comments that, "From these camps, the specific resources of both the Cross Timbers and the prairie areas could be exploited without ever really leaving a permanent water supply."

Lynott (1981:103-104) provides some details about the possible changes in Archaic adaptations and paleoenvironments in the north-central Texas area. Lynott does not use the Trinity aspect due to the mixed nature of the components, but recognizes Early, Middle, and Late Archaic substages. His Early Archaic is distinguished by San Patrice/Dalton point types and varieties but lacks studied sites with good chronological and contextual control. He suggests that the economy was based largely on bison hunting and that the social organization was comparable to that of the Paleo- Indian groups.

The transition from Early to Middle Archaic is not dated or well understood in the area, though several unmixed Middle Archaic components are reported for the north-central Texas area (Lynott 1981:104). Lynott distinguishes between the Cross Timbers and Blackland Prairie area and the Rolling Plains in his discussion of the Archaic and suggests that the groups who occupied the Rolling Plains continued an economic focus on bison hunting and a pattern of high mobility whereas the Cross Timbers and Prairie group focused increasingly on Riverine and bottomland resources. The major stimulant for economic and social change throughout the Archaic in the region is interpreted to have been population increase with climate playing a secondary role. For the Late Archaic, Lynott argues for increased population and a broad spectrum economy focused on smaller territories. He suggests that exposure to horticultural ideas (use of squash and other domesticates?) occurred during this time and that seasonal aggregation sites became increasingly important. Aggregation sites are interpreted to have been used in the fall and winter when large quantities of food resources (nuts?) were locally abundant. Intergroup conflict is not believed to have been a problem, although we should expect such conflicts to increase as population increases and territory size decreases. Lynott suggests that Late Archaic groups on the Rolling Plains continued to focus on bison and antelope hunting.

These comments provide a general outline of several potentially testable hypotheses concerning the Archaic in northern Texas, but the paucity of stratified or single component Archaic sites which can be dated severely limits our present ability to evaluate and refine such notions about Archaic lifeways and economic change in the region. The impact of the Altithermal on Archaic life in the Cross Timbers and Plains border ecotone needs to be investigated further for it is known that substantial vegetation changes occurred in the region during the mid-Holocene (Albert 1981). That some Archaic groups utilized the Rolling Plains and the Cross Timbers/Prairie areas on a patterned, cyclical or opportunistic basis is another hypothesis meriting evaluation. Such exploitation of both ecological areas would have numerous economic benefits, especially during seasons or years when one area was unproductive and resources were not sufficiently reliable.

**LaHarpe Aspect.** The LaHarpe aspect was defined by Johnson (1962) based primarily on collections from the Miller and Yarbrough sites in northeastern Texas. The LaHarpe aspect was defined as a refinement of the previously recognized Red River aspect (Webb 1960) and the East Texas aspect (Suhm, Krieger, and Jelks 1954). This aspect was divided into three major periods and three aerial subdivisions. Problems with the LaHarpe aspects are similar to those with many other archeological taxons and derive largely from imprecise control over components and samples used in defining the complexes. As noted by Story (1985:41), in a recent discussion of the LaHarpe aspect, "There is much uncertainty about these data, mostly because the sites are characteristically multicomponent and severely mixed (Story 1976, 1981)." The LaHarpe aspect will not be discussed at length here, because is occurs primarily outside the study area and is now recognized as more or less synonymous with "Archaic" for the northeast Texas area on the western edge of the eastern woodlands.

**Edwards Plateau Aspect and Central Texas Chronology.** Located primarily to the south of the study area, the Edwards Plateau is rich in archeological resources and especially well known for its Archaic period sites. Abundant water, chert resources, and a richly diverse environment along the Balcones Escarpment of central Texas provided an appealing setting for Holocene hunter-gatherers. The historical development and use of archeological unit concepts for this area has recently been reviewed by Prewitt (1981:66-68). Initial constructs by Pearce (1932), Sayles (1935), and Kelley (1947a,b, 1959) are no longer used or have been greatly modified. The Edwards Plateau aspect is no longer a viable or widely used construct, but as originally defined (Suhm, Krieger, and Jelks 1954:102- 112), this taxon incorporated numerous previously defined but poorly documented complexes reported by Pearce (1932), Ray (1929), and Sayles (1935), and most notably by Kelley (1947a,b). Kelley's Clear Fork, Round Rock, and Uvalde foci were all included within the Edwards Plateau aspect as presented in 1954 by Suhm et al. A key characteristic of the Edwards Plateau aspect was the occurrence of extensive burned rock middens, and a variety of large stemmed and dart point types. A great many of these types occur to the north and west of the Edwards Plateau area, but chronological control on most types is coarse and cross dating is tenuous. The Edwards Plateau aspect continued to be used as a general designation for central Texas Archaic materials, although Early, Middle, and Late Archaic subdivisions have increasingly been used or acknowledged.

Johnson (1967) provided a critical assessment of the central Texas Archaic materials and proposed a series of five periods, four of which pertained to the Archaic. Sollberger and Hester (1972) proposed that a Pre-Archaic period was needed to distinguish the transition between Paleo-Indian and typical Archaic materials in central Texas. More recently, refined chronological frameworks have been proposed for these extensive Archaic materials dating between about 8,000 and 1,500 years ago (Weir

1976a,b; Prewitt 1981). Prewitt's (1981) chronological sequence is a substantially refined version of Weir's, but has met with substantial criticism (Johnson 1987) due primarily to the incomplete nature of phase definitions and selective use of radiocarbon dates. Many of the phases proposed by Prewitt might more appropriately be considered as temporal periods.

Weir (1976a:125-127, 1976b) has suggested that the economic focus of central Texas Archaic groups was based in part on the seasonally intensive exploitation of nut masts (primarily acorn) and deer with aggregation sites occurring in the fall and winter. Population increase and territory size decrease lead to more intensive exploitation of the region by Late Archaic times. Weir also provided a classification of burned rock midden sites which is of utility. Weir's hypothesis concerning the processing of acorns at burned rock midden sites has been initially evaluated by Creel (1986) who found a partial but suggestive correlation between live oak stands and burned rock middens in the upper Colorado and Concho rivers region.

**Little Sunday Complex.** In their I*ntroductory Handbook of Texas Archeology,* Suhm, Krieger, and Jelks (1954:63, 66) noted the dearth of information pertaining to the Archaic in the Panhandle region of Texas. In response to this limited documentation, Jack Hughes analyzed a collection of materials from the Little Sunday site located in eastern Randall County on a tributary of Palo Duro Canyon which is drained by the Prairie Dog Town Fork of the Red River. The Little Sunday complex is generally referred to as an adaptation to the Llano Estacado or High Plains region, but the site is in fact on the extreme eastern margin of the Llano and in a situation which would have been a useful base of operations for groups also using the low Rolling Plains to the east.

About 160 artifacts were collected primarily from the surface of the site. An eroded exposure revealed a deposit up to 60 cm thick with cultural materials which consisted primarily of stone debris, artifacts, and hearthstones. Some bison bone and charcoal was recorded as eroding out of the deposit. A variety of flake tools and scrapers were found including two Clear Fork gouges. Projectile points included primarily Ellis and Refugio types and a number of other bifaces representing knives and preforms were collected. Raw lithic material usage indicates an emphasis primarily on local resources (Tecovas jasper and Ogallala gravels) with some use of nonlocal materials from the southeast (Edwards chert), north (Alibates), and possibly west (Dakota quartzite). Similar components are documented in other portions of the region, especially to the east and along the Caprock, but a systematic classification of these has not been made. Little Sunday and similar sites are assumed to date to the Late Archaic period, or from about 3,000 to 1,500 years ago.

**Other Northwest Texas Archaic Materials.** Early Archaic components in the Texas Panhandle and north-central Texas area are poorly documented, although numerous projectile points believed to date to this period, 7,500 to 5,000 years ago have been found. One site, Bitter Creek in Hall County, reported by Hughes and Hood (1976) is believed to reflect Early Archaic occupation but no complexes have been defined for this period in the area. Many reports pertaining to the region's Archaic hunter-gatherers, or at least to their artifacts, have been produced (see Etchieson, Hughes, and Speer 1978:22-24; Harrison and Killen 1978; Hughes 1972, 1973; Hughes and Willey 1978:26-28). As noted in the above cited summaries, Archaic projectile points and other artifacts are commonly found on multicomponent sites in the region. The dissected rolling Low Plains region, however, seems often to be dominated by small Archaic camp and workshop sites with lesser evidence for Paleo-Indian and Late Prehistoric materials. Hughes (1976) has discussed the various types of Archaic sites in the region and notes that in addition to open sites, workshops, lithic quarries, bison kills, and burials, there also occur some occupations in rockshelter sites.

A number of bison kills are documented in the eastern Texas Panhandle (Tunnell and Hughes 1955; Hughes 1976; D. Hughes 1977) and the majority of these apparently date to the Late Archaic and are believed to reflect the increased abundance of bison in the region by about 3,000 years ago. During the preceding several thousand years there is minimal evidence for extensive bison herds in the region (Dillehay 1974; but see Johnson and Holliday 1986). Although the projectile points (Collins 1968; D. Hughes 1977; Tunnell and Hughes 1955) from these bison kills compare favorably with specimens from the upper bison kill at Bonfire Shelter in southern Texas dated to about 2,500 years ago (Dibble and Lorrain 1968), several radiocarbon dates, one each from four kills, indicates that the Texas Panhandle bison kills date to the middle of the first millennium A.D. or about A.D. 400-650 (D. Hughes 1977:131). All of these dates, however, are based on bone collagen and may in fact be too recent due to contamination by humic acids in ground water (Stafford et al. 1987). The dates should therefore, probably be seen as most recent or terminal estimators of these kill episodes. The bison were apparently trapped in the heads of arroyos or stampeded over or into these steep sided ravines. Typologically the dart points from these kill sites are comparable to those from the Summers site (Leonhardy 1966b), a campsite where bison were processed and which dated (based on charcoal from a hearth) to 2800 B.P. This date is more in keeping with the generally accepted cultural chronology (based on dart point styles) for the region.

## Summary of Southern Plains Archaic and Research Needs

The portion of the archeological record which is grouped under the classification of Archaic was an extremely long temporal interval lasting from about 8000 until approximately 2000 B.P. The vast area of the Southern Plains, the immense period of time represented, the rarity of well studied and dated sites, and the substantial climatic changes which occurred during this period leave us with many more questions than answers concerning the preceramic Holocene archeological record in the region. Any Archaic site with good contextual integrity, or good preservation of botanical remains, human skeletal material, or stratified deposits must be considered extremely valuable to further research. The limited information from dry cave sites to the south and west of the study area provides some insight into aspects of material culture and technology which are generally missing from

known Southern Plains sites. Study of the organization of social groups, mobility patterns, beginnings of storage and sedentism, beginnings of the use of domesticated plants (e.g., Story 1985), and the changes in regional population, exchange patterns, and intergroup relationships are open books as yet to be filled with archeological interpretation.

Some specific topics of critical research concern can be outlined as follows.

1. Present evidence suggests dramatic changes in the Holocene climate of the Southern Plains region. A better understanding of the impacts of these changes on local environments is required in order to develop an accurate picture of the settings in which Holocene hunter-gatherers operated. This will require study of environmentally sensitive data sets (e.g., pollen, small mammals, invertebrates) from localities in various ecological zones in the Southern Plains ranging from the Llano Estacado to the Cross Timbers. Study of such sites should not be limited to those possessing substantial archeological (artifactual) deposits (e.g., Albert and Wyckoff 1981). Any archeological or paleoecological sites in the region which contain deposits having datable paleoenvironmental records are of utmost importance.

2. For a substantial portion of the Southern Plains, especially the southwestern area, prehistoric horticulture was never practiced. The hunting and gathering way of life is therefore found expressed in a variety of adaptations throughout the region, lasting in the southwestern area until historic contact. Study of Holocene hunter-gatherers in the region holds considerable potential for addressing anthropological concerns such as the continuation of a hunting-gathering subsistence mode after neighboring groups are farming, interaction between hunters and farmers, and the plasticity of human organizations in the face of dramatically changing environmental and social conditions. Archeological study must reach beyond specific site studies and evaluate regional land-use patterns and shifts in economic activity and demography. For this, all datable, stratified, middle and late Holocene sites in the region must be considered extremely important. It is not enough to simply document in detail a single site of a certain age in a specific area. A series of sites are needed which can be used to document the seasonal variation in hunter-gatherer group activities as well as the long and short term temporal changes which result from factors such as environmental shifts and population changes.

3. The transition from hunter-gatherer to horticulturalist in much of the Southern Plains was a relatively late development compared to similar transitions in the Eastern Woodlands and the Southwest. The nature of this transition, in its varied expressions, its timing, and its causes are central research issues which have received only minimal attention in the Southern Plains.

4. Because so many of the Archaic or hunter-gatherer sites in the Southern Plains region are represented only by surface scatters of lithic material, it is imperative that archeologists develop new and innovative methods of deriving behaviorally relevant information from such sites. Many lithic sites have been given minimal attention because it is assumed that they can tell us little about chronology or cultural relationships and because they are likely mixed deposits. Research in the Great Basin and Africa has indicated the potential of such deposits, when addressed on a regional scale and when studied with concern for mobility patterns and variation in activities which occur across the regional landscape. We should not simply write off the potential of upland lithic scatters until their research value has been assessed in a more than cursory manner. These sites represent a substantial portion of the prehistoric cultural resources for much of the region.

5. Information on trade and ideology is extremely limited for this period and makes the significance of sites containing exotic and sociotechnic artifacts of even greater importance.

6. Bioarcheological information is sparse at best and any sites with human skeletal material from the Archaic period in the Southern Plains region is critically important. Bioarcheological research can provide information on subsistence, health, and demography which is simply not accessible through other lines of research.

# PREHISTORIC CULTURE HISTORY: WOODLAND COMPLEXES IN THE SOUTHERN GREAT PLAINS

*Jack L. Hofman and Robert L. Brooks*

By the time of Christ, or perhaps a few centuries earlier, there is evidence in the Southern Plains of technological changes which at first were simply added onto the hunting-gathering lifeway of the Archaic. The most archeologically visible evidence occurs as small projectile points generally interpreted to reflect the appearance of the bow and arrow, and the appearance of ceramics, usually cordmarked rock- or bone-tempered conical based vessels, sometime during the first half of the first millennium A.D. These minimal characteristics do not both appear in all of the Southern Great Plains at the same time, and, in fact, the first occurrences of these technological complexes (bow and arrow and ceramic) are not well dated for most of the area. The term Woodland or Plains Woodland which is commonly used in reference to this period of technological expansion is borrowed from archeological terminology developed in the Mississippi and Ohio valleys. On the Central Plains, the Missouri River basin north of the Arkansas River, and on the eastern fringes of the Southern Plains, the first Plains

Woodland developments are generally accepted to be the result of westward extensions of ideas and perhaps people from the Eastern Deciduous Forest region where these Woodland developments first occurred (Wedel 1961, 1986; Willey 1966). While we may accept that Woodland stage developments along the streams in the Eastern forests influenced groups who occupied the Southern Great Plains region, especially along its eastern prairie and savanna, not all developments in the Southern Plains during this period are the result of Eastern contacts. Developments in the Mogollon and Basketmaker cultures of the Southwest also had an impact on Southern Plains groups, especially those living on the Llano Estacado and along the western margin of the Plains. Because of these Southwestern influences, evidenced for example by Jornado Brownware ceramics on sites in the Texas Panhandle, it is somewhat of a misnomer to refer to this period in Southern Plains prehistory as "Woodland." If we accept this term as referring to an important period for technological, and perhaps social changes, rather than as an indication that all such developments are derived from the Eastern Woodlands, then the term is serviceable even if not wholly appropriate. Other terms such as Neo-Archaic (Prewitt 1981) have been used to denote this time period and technological development in central and southern Texas. In the Prairie-Plains area and along the major streams to the west, the Woodland can be considered the Formative stage in Plains prehistory (though some of the region is even marginal to the "marginal Formative" of Willey and Phillips [1958:168]), marked by the first appearance of ceramics and preceding the development of semipermanent horticultural villages.

Climatic conditions during the first millennium A.D. were by all indications generally more moist than during the preceding and following centuries (Albert 1981; Bryson 1978; Ferring 1982:191-193; Hughes 1978), although there was variation in the climate of this period. For much of the area, evidence suggests that bison were not plentiful in the Southern Plains region during this millennium as compared to the preceding and following times (Dillehay 1974; S. Baugh 1986; Bell 1962; Flynn 1982; Lintz 1974; Wedel 1978:203). This is reflected, in part, by an increased economic emphasis on deer and other species at many Woodland sites recorded in the region (e.g. Ferring 1982; Lawton 1968; Lintz 1974). Figure 14 illustrates the location of Woodland complexes and key sites in the Southern Great Plains region which are discussed below.

## Woodland Complexes in Southeastern Colorado

Cassells (1983:157-184) has referred to this period in eastern Colorado as the Post-Archaic. Discussions of the Woodland period in Colorado can also be found in Campbell (1976:52-57) and Eighmy (1984:104-115). Woodland sites in eastern Colorado include a variety of site types with a number of occupations represented in rockshelters (Breternitz 1971; Campbell 1976; Cassells 1983:160; Irwin and Irwin 1959; Irwin-Williams and Irwin 1966; Nelson 1967; Wood 1976) and open habitation sites with circular structures having horizontally laid rock foundations (Anderson 1976; Eighmy 1984; Hunt 1975). Burial ossuaries with primary and/or secondary burials are recorded for east-central and northeastern Colorado, as are game drives (Cassells 1983:161; Nelson 1971). Subsistence during the Woodland period in eastern Colorado included emphasis on wild plants and small and large game species. Although corn is represented in the upper level of Trinchera Cave (Wood 1976:160), these materials may be from recent rodent caches and no solid evidence exists for use of corn by the Woodland occupants of the site. Another site in southeastern Colorado which has corn of possible Woodland age is Metate Cave (Eddy et al. 1982) where corn was found between units dated at about A.D. 1 and A.D. 1150. Campbell (1976:53-54) suggests that maize was being used in the Chaquaqua Plateau by the middle of the first millennium A.D. Burial sites with multiple interments and including both primary and secondary depositions possibly indicate repeated seasonal use of specific localities by Woodland groups.

**Graneros Focus.** The Graneros focus was defined briefly

by Withers (1954) and has continued to be used in reference to Plains Woodland materials (cordmarked pottery and corner-notched arrowpoints) in southeastern Colorado as noted below (Anderson 1985a:25-27; Cassells 1983; Eighmy 1984).

In discussing the Woodland complexes which have been proposed for central and eastern Colorado, Cassells (1983:170) provides the following comment which seems most apt given the present state of knowledge,

> Presently, the Parker Focus signifies sites centered in the Denver Basin and to the north; the Hog Back Phase, those in the foothills and mountains west of Denver; and the Graneros Focus, sites in the southeastern part of the state. But there is no discernible difference in the corner-notched projectile points considered diagnostic for the period, and variations in ceramic styles. . .are based on such small samples as to make comparisons useful only as suggestions for future study."

Another interpretation is that the Archaic-like Parker focus precedes the Graneros phase in time, with Graneros representing a more typical Plains Woodland cultural manifestation after about A.D. 450 (Campbell 1976; Eddy et al. 1982; Eighmy 1984; Hunt 1975). In general terms, the Plains Woodland expression in Colorado is believed to date between approximately A.D. 100 and 1000, with several radiocarbon dates available from scattered sites (Cassells 1983:181, Figure 9-16). Anderson (1985a:25-28) has provided a very useful summary of the Woodland period occupation in Southeastern Colorado.

### Woodland Complexes in Southern Kansas

During the past 50 years, archeologists working in Kansas have identified a number of Woodland manifestations. Four of these cultural complexes (the Butler, Cuesta, and Greenwood phases and the Keith variant) are found within the Great Plains study area. A number of additional Woodland complexes associated with Middle Woodland (Kansas City Hopewell) are found in extreme northwestern Kansas, outside of the study area. Information on Woodland complexes in Kansas has been recently summarized by Brown and Simmons (1987) and O'Brien (1984). An extensive summary of available radiocarbon dates for Kansas Woodland components has been compiled in Brown and Simmons (1987: Appendix E).

Because of differences in classification systems used by various archeologists in Kansas, some problems exist in definitions and areal extents for the four Woodland complexes found within the study area. For example, the Greenwood, Butler, and Cuesta phases overlap both temporally and spatially. The magnitude of overlap in these complexes (Figure 14) is surprising and highlights the need for refined definitions and more complete documentation of the variation within each. The question arises as to whether they truly represent distinct cultural entities. Some archeologists have also attributed the Butler phase to associations with the Keith variant and the Grenwood phase. Until further refinement is accomplished, a certain amount of confusion and uncertainty will remain regarding the distribution and characteristics of these Woodland cultures.

The following discussion of Kansas Woodland complexes is derived primarily from Brown and Simmons (1987) and O'Brien (1984).

**Butler Phase.** Sites of the Butler phase are found in the southern Flint Hills region of Kansas. The Butler phase can be best described as a Plains Woodland cultural pattern with some evidence of influence by Middle Woodland (Hopewellian) groups to the east. Although the geographical extent of this cultural complex is unknown, Butler phase occupations are best known from sites along the Walnut River in Butler County. The site distribution appears to fall between the Verdigris and Arkansas river drainages.

There is no clear evidence for the origins of the Butler phase. Grosser (1973) views the Butler phase as an indigenous Plains Woodland culture that was influenced by Middle Woodland groups. Fulmer (1976), on the other hand, sees this phase as a local expression of the Keith variant, another Plains Woodland manifestation. It also appears that the Butler phase represents one point in the sequence of development of Plains Village groups in southeastern Kansas.

Two substantive reviews of the Butler phase have been conducted by Grosser (1970, 1973) and Fulmer (1976). Documented sites of this phase include Snyder (BU-9), Nuttle (BU-4), Holdenman (BU-19), BU-30, 32, and BU-59. Most of these sites were investigated during construction of the El Dorado Lake project (Adair 1984; Brockington 1982; Padgett and Blakeslee 1982).

Radiocarbon dates, three dates from two sites, and temporally sensitive artifacts place occupation of the Butler phase sites between A.D. 500 and 800 (Brown and Simmons 1987).

The settlement pattern consists of hamlets or homesteads of one or two houses which were reportedly occupied by semi-sedentary groups (Brown and Simmons 1987:XII-20). Although evidence is lacking, larger village sites may be present along the major drainage systems. No information is available on the variability in site types or their distribution. Hamlets (or homesteads) typically have one or two dwellings present. Based on excavations conducted at the Snyder site (BU-9), houses are small, oval residences 5 or 6 m in diameter with grass and twigs placed over a bent pole frame (Grosser 1970). Other features consist of small basin-shaped pits which occur both within and outside of houses. No information is available on the nature of burials for Butler phase people.

Subsistence activities during the Butler phase presumably involved a mixed hunting-gathering economy. Animal remains found at sites of this cultural pattern primarily consist of bison, deer, elk, and antelope and a variety of small game. Plants collected include chenopodium-amaranth, sunflower, and a diversity of edible wild plants such as smartweed, spurge, wild grape, and pokeweed. Nuts harvested consist of black walnut and hickory. Corn (one kernel) was also found at BU-57, but this may be from a later component at the site (Adair 1984).

The chipped stone inventory includes corner-notched

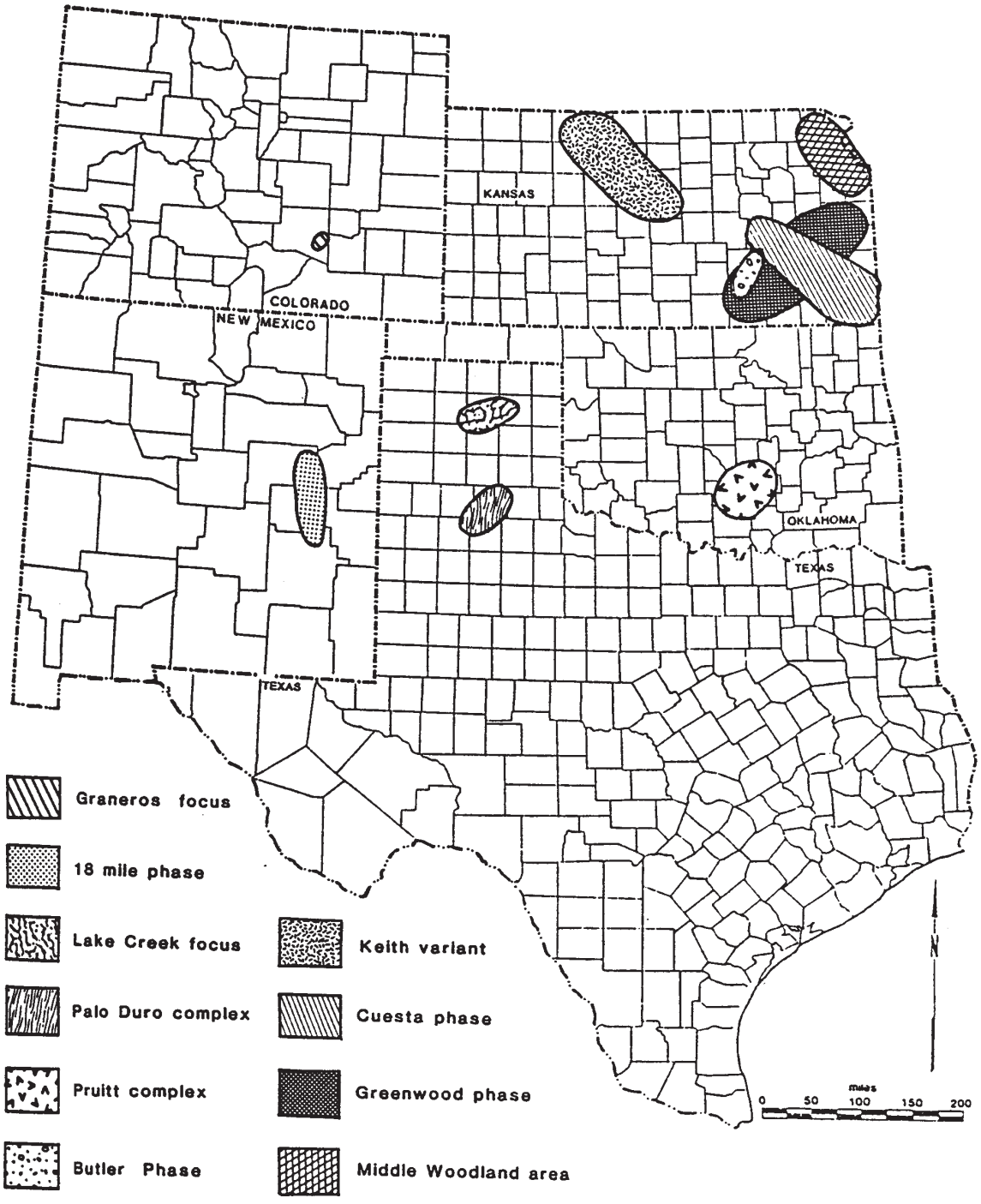



**Figure 14. Locations of Woodland complexes in the Southern Great Plains region.**

Scallorn-like serrated arrowpoints as well as unnotched arrowpoints. A variety of bifacial knives, unifacial scrapers, marginally modified flakes, and lithic debris are also found at these sites.

The ground stone inventory is not extensive but includes celts, pitted stones, and manos. Bone tools and ornaments appear to be limited and only a tubular bird bone bead is reported.

Two ceramic types are found at Butler phase occupations. The first of these is a cordmarked ware tempered with calcite, sand, clay, limestone, and feldspar (Brown and Simmons 1987). Vessels of this type are characterized by jars with straight rims, flat lips, and conical bases. These sherds are viewed as a local development of a Plains Woodland style. The second ceramic type exhibits diagonal, zoned dentate stamping with feldspar and grog temper. Rims are straight but taper slightly. These wares bear similarities to Middle Woodland (Hopewell-derived) ceramics from eastern Kansas and the Cooper site in Delaware County, Oklahoma (Baerreis 1953).

Based on available information, it is most likely that the Butler phase represents a localized Plains Woodland development which was in contact with Middle Woodland groups to the east. This cultural system probably continued to develop locally and may serve as the base for subsequent Plains Village cultures in the Butler County area of southeast and south-central Kansas (Brown and Simmons 1987).

**Cuesta Phase.** The Cuesta phase refers to a series of sites found in southeastern Kansas which are similar to Hopewellian derived manifestations in Missouri and northeastern Oklahoma. Sites of this cultural complex are found along the Elk River in Montgomery, LaBette, Greenwood, Woodson, Bourbon, Chase, and Coffee counties. A number of radiocarbon dates have been compiled on the Cuesta phase and place occupation of these sites between A.D. 700 and 1000.

Little documentation exists regarding the origins of the Cuesta phase. No evidence has been collected that supports migration versus in situ development. Thus, it is possible that the Cuesta phase represents a migration of Middle Woodland people into the region, but these alternative hypotheses need evaluation.

The Cuesta phase is one of the better documented cultural patterns in southeastern Kansas. It was initially defined by Marshall (1972) from materials recovered during excavations at the Infinity site in the Elk Creek lake area. Work conducted at Big Hill Lake in the 1970s resulted in additional documentation of this phase (Rowlingson 1977; Thies 1982, 1985; Jones and Witty 1980).

The settlement pattern consists of large, nucleated villages found along major drainages and hamlets and isolated homesteads adjacent to smaller streams. Brogan (1981) suggests that this dichotomous settlement distribution may be directly related to carrying capacity of the floodplain habitat.

Cuesta phase villages may contain from five to 10 houses. These are oval to circular structures measuring 11 to 15 m along the long axis and 8 to 12 m along the short axis (Brown and Simmons 1987:XIII-9). Although detailed information is lacking, these houses were probably of wattle and daub construction. Other features, which occur both inside and outside houses, include basin-shaped pits and hearths. Spatially defined midden areas are also found at Cuesta phase sites. Burials are generally placed in the midden areas. These burials have been interred in a flexed position. No grave goods have been recovered from Cuesta phase burials.

The subsistence economy was based primarily on hunting and gathering. Deer, beaver, raccoon, rabbit, and turkey were the principal animal species hunted. Information on plant collecting is more sketchy. The only charred seeds identified have been from the sand plum. Apparently, hickory nuts were also harvested. Corn and sunflower were found at LT-4 in LaBette County suggesting that domesticated plants and agriculture may have been important in the economy (Brogan 1981).

Chipped stone tools consist primarily of expanding stem dart points (such as Snyders and Ensor types), contracting stem dart points (Gary type), corner-notched arrowpoints (Scallorn), bifacial knives, unifacial drills and scrapers, and modified flakes. Pieces of obsidian have been found among the flaking debris.

Ground stone artifacts include gorgets, atlatl weights, celts, manos, grinding basins, and pitted stones. Bone tools and ornaments consist of pins awls, fleshers, and beads.

Investigations at the Infinity site resulted in the identification of nine ceramic types (Marshall 1971). These include Naples Stamped; Neteler Stamped; Montgomery Cord-Roughened; Cuesta Decorated, Dentate Stamped, Punctate, and Smooth Stick Impressed varieties; Cuesta Plain; and Cuesta Plain Decorated Lip variety. Vessel forms are jars with straight rims and walls and conical bottoms. Ceramics found at Cuesta phase sites are most similar to those found at Kansas City Hopewell occupations and at the Cooper site in Delaware County, Oklahoma.

The Cuesta phase appears to conform most closely to Middle Woodland cultures commonly found farther east (Mississippi, Illinois, and Ohio river valleys). Although this phase may represent a movement into southeastern Kansas by Middle Woodland peoples, no direct evidence has been found to support this assumption. Evidence pertaining to the origins of the Cuesta phase may reside in extensive analysis of their resource procurement systems, but is more likely to be found in trace element and stylistic studies of artifacts and in physical anthropological data. Ideas concerning the demise of the Cuesta phase are also tenuous. It is not known whether this group emigrated from the region or became part of the local Woodland populations which developed into village farming groups.

**Greenwood Phase.** The Greenwood phase is a Middle to Late Woodland manifestation found in southeastern Kansas. Sites of this cultural pattern are found primarily along the Neosho, Cottonwood, Verdigris, Elk, and Marais de Sygnes rivers. Because the Greenwood phase occurs in most of the counties com-

prising the central Flint Hills and western Osage Cuestas regions, it may well extend throughout much of southeastern Kansas.

Origins of the Greenwood phase are obscure. No evidence exists for direct cultural continuity with earlier Woodland or Late Archaic groups. There is also no suggestions of movement into the area by nonlocal people. Thus, it is likely that this cultural pattern developed from indigenous Archaic populations.

The Greenwood phase was initially identified based on the analysis of materials recovered from the Two Dog site in Morris County and the Cow Killer site in Osage County (Witty 1982). Other important sites include Curray in Greenwood County (Wood 1977), Stiles in Miami County (Blakeslee and Rohn 1982), Gilligan in Coffee County, and occupations at a number of sites in Chase, Montgomery, and Butler counties (Brogan 1981; Brown and Simmons 1987:XIII-17). Summaries of the Greenwood phase have been prepared by Witty (1982) and Brown and Simmons (1987).

Radiocarbon dates for the Greenwood phase range from A.D. 400 to 1000. These dates are roughly contemporaneous with those of the Butler and Keith phases (Brown and Simmons 1987:Appendix E).

As in the case of the Cuesta phase, the settlement pattern for the Greenwood phase consists of large villages (up to 8 ha) situated on the floodplains or terraces of major rivers, often where oxbows occur. Seasonal camps or hamlets are typically found on smaller streams.

Houses found at Greenwood phase villages are also similar to those at Cuesta settlements with long, oval dwellings. A structure found at the Stiles sites was 19 by 10 m with a central hearth (Blakeslee and Rohn 1982). Hearths and basin-shaped pits occur within houses and are also found scattered throughout the village. Some of the deeper pits may have been used for storage.

Subsistence practices consisted of hunting and gathering. Animals hunted include deer, elk, antelope, and bison and smaller game such as rabbit, beaver, raccoon, turkey, and prairie chicken. Information on plants collected by Greenwood phase people is less well documented. It is known only that berries were gathered and nuts harvested. However, corn was recovered during excavations at the Stiles site (Blakeslee and Rohn 1982).

A variety of corner-notched, expanding stem, and contracting stem dart points (e.g., Marshall, Ensor, Snyders, Marcos, and Langtry types) as well as corner-notched arrowpoints (Scallorn) are found at sites of this phase. Other chipped stone tools include ovate bifacial knives and unifacial scrapers.

Ground stone implements have not been well documented at Greenwood phase sites. Bone tools and ornaments present include awls and tubular beads.

Verdigris and Greenwood pottery types have been defined at Greenwood phase sites. Verdigris vessels consist of cordmarked jars with limestone temper. One variety has straight walls whereas the other variety has angular shoulders. Both varieties have conical bottoms. Greenwood vessels, on the other hand, represent a more traditional Plains Woodland pottery of globular jars with conical bottoms. Exterior surfaces are cordmarked and most specimens are limestone tempered.

O'Brien and Roger (1983:19) have suggested that the Greenwood and Butler phases are of the same cultural affiliation. Certainly, they appear to have evolved from similar localized Woodland antecedents. The Greenwood phase, however, appears to lack the Hopewellian influenced ceramics present at Butler phase sites. A gradual transition from the Greenwood phase into the Pomona variant has been proposed (Witty 1981; Brown and Simmons 1987:XIII-16).

**The Keith Phase or Variant.** The Keith variant is the current designation for a Plains Woodland manifestation that occurs in west-central and north-central Kansas. Sites of this cultural expression were initially defined as the Keith focus (Kivett 1953). Johnson (n.d.), however, has redefined the focus as a variant of the Plains Woodland theme. Wedel (1986:81-91) has recently discussed the original Keith focus as a variant or phase. Keith variant settlements occur along the Arkansas and Smoky Hill rivers in the west-central part of the state and also along the north and south forks of the Solomon River in the north-central region. Sites of this cultural pattern also extend into south-central and western Nebraska (Brown and Simmons 1987).

As is the case for many of the Plains Woodland cultures, the origins of the Keith variant are poorly understood. It is likely though that its antecedents lie with earlier Plains populations and reflect a regional development.

Over 25 Keith variant sites have been tested or excavated in Kansas and Nebraska (Brown and Simmons 1987). Reported sites include Woodruff Ossuary (Kivett 1953), West Island (Witty; 1966), Vohs (Witty 1969), Copper (Witty 1968), Doyle (Grange 1980), Coal Oil Canyon (Bowman 1960), and other sites identified in the Norton, Red Willow, and Toronto reservoirs. Although radiocarbon dates for the Keith variant are limited, Grange (1980:126), and Wedel (1986:Table 6.1) place Keith from A.D. 400 to A.D. 800.

The settlement pattern consists of small villages or hamlets (usually less than .4 ha), temporary camps, and burial mounds and ossuaries situated on terraces of principal streams and rivers. Some of the camps are also found on bluff tops and in rockshelters.

Hamlets probably contained only one or two houses. Because hamlet locations were often repeatedly reoccupied, a larger number of dwellings would sometimes be found, reflecting habitation over the total lifespan of the site. Dwellings were basinlike pit houses approximately 4 by 5.5 m in diameter with an interior hearth and shallow storage pits (Grange 1980; Brown and Simmons 1987). Hearths are also found outside of dwellings (Witty 1969). Burials are frequently encountered in Keith variant sites. They may be found under the house floor, in burial mounds, or in ossuaries (Brown and Simmons 1987; Wedel 1986). Skeletal populations reflect a typical mortuary profile and little evidence of disease other than normal degenerative conditions (e.g., abscesses from excessive tooth wear, osteoarthritis). The

population apparently represents a lighter framed, smaller body size group than the historic Sioux or Pawnee (Kivett 1953:137).

The subsistence economy of Keith variant groups focused on hunting and gathering. Animal species taken include bison, deer, antelope, and a variety of small game (e.g., cottontail and jackrabbit, beaver, raccoon, and prairie dog). Birds such as the prairie chicken, turkey, waterfowl, and raptorial species (hawks and eagles) were also hunted. The diversity of animals in the faunal assemblage is indicative of exploitation of a number of habitat types. No direct evidence is available on the types of wild plants collected, but Wedel (1986:93) has discussed a variety of native plants which were likely of considerable importance.

The cultural material is characteristic of that made by many Plains Woodland groups. Chipped stone tools consist of large barbed and stemmed dart points, Scallorn arrowpoints, and corner-notched and unnotched forms with concave bases. Also found are bifacial celts, knives, scrapers, gravers, and retouched flakes. Ground stone implements include hammerstones, manos, and abraders (Kivett 1953).

Although not extensive, the worked bone inventory attests to a diversity of tools and ornaments. Included here are tubular beads, perforated canine tooth pendants, bone beads, worked phalange sections, awls, fishhooks, shaft straighteners and a bison scapula digging tool. The latter was perhaps used primarily for excavation of house floors and storage pits rather than purely for agricultural activities. Also, extensive use was made of shells for ornaments and tools. Native mussels were used for scrapers and beads including disk, triangular, elongate, and crescent-shaped forms. Marine shell is represented by long beads from conch columella with smaller beads made from *Olivella* and *Marginella* shells (Wedel 1986:91). We assume that all these marine shell species would have been acquired through trade.

Pottery from Keith variant sites falls into a single ware or type defined as Harlan Cord Roughened (Kivett 1953). Vessels of this type are thick with large orifices, normal rims, and flat lips (Kivett 1953:131). Tempering agents include crushed calcite, hematite, and fine sand. Exterior surfaces are cord-roughened with relatively heavy cord impressions aligned vertical and parallel to the vessel body.

In summary, the Keith variant represents a rather classic Plains Woodland cultural pattern. Previous investigations had proposed the Keith focus as the origin of the early Southern Plains Village cultures (e.g., the Custer phase [Buck 1959]). More recent findings, however, provide little support for this proposition. Sometime after A.D. 800, developments in the Keith variant "blended" with other Woodland cultures to form the early Plains Village cultures found in west-central and north-central Kansas. Because of the spatial extent of the Keith variant and the heterogeneity found in the material assemblages of its sites, it is likely that a number of regionally distinct groups are represented (Johnson n.d.).

**Other Woodland Complexes in Kansas.** A number of other Woodland cultural manifestations occur on the periphery of the study area or are known in the study region only through isolated components. Two basic patterns can be discerned in remains found at these sites. One of these patterns is similar to that of documented Woodland cultures within the study area. These are essentially local Woodland developments with evidence of Middle Woodland (Hopewell) influence. Included here are the Schultz, Bemis Creek, Wakarusa, Hertha, Valley, Deer Creek, and Grasshopper Falls phases. These phases all fall within the northeastern portion of Kansas or are documented in only a single locality in the southeast section of the state. The second pattern is comprised of the characteristic Plains Woodland cultures which occur in the western two-thirds of Kansas. Typical of these occupations is the Keith variant which is found along the Smoky Hill, Arkansas, and Solomon rivers in western Kansas. More detailed information on these Woodland groups is presented in O'Brien (1984) and Brown and Simmons (1987).

### Woodland Complexes in Eastern New Mexico

The limited information on the Woodland or Basketmaker period in eastern New Mexico is striking. The most systematic work is that by Jelinek (1967) who defined the 18 Mile phase which is closely related to Jornado Mogollon complexes further west. Information on Woodland period materials in northeastern New Mexico is extremely meager.

**18 Mile Phase.** The 18 Mile phase has been defined by Jelinek (1967) for sites located along the middle Pecos River Valley in eastern New Mexico and is believed to date prior to A.D. 1000. This complex is known from surface collections and brief excavations. It is characterized by Jornado Brownware ceramics and has been subdivided into early and late subphases. The early 18 Mile phase is believed to date during the ninth century A.D. and is characterized by Jornado Plain brownware which is commonly feldspar tempered. This phase is the first in the area when "site locations suggest relatively permanent settlements in topographic situations suitable for the practice of maize cultivation" (Jelinek 1967:145). No structures are reported by Jelinek for the early 18 Mile phase. The late 18 Mile phase is believed to date between A.D. 900 and 1000, based on cross dating of sherds and projectile points. It is also identified by "well established small sedentary communities" (Jelinek 1967:146) and increased usage of Middle Pecos Micaceous Brown ceramics. Jornado Brownware and Middle Micaceous Brown are described in detail by Jelinek (1967:47-50). Several pit house type structures are known for the late 18 Mile phase and these structural remains exhibit substantial variation in size and shape. Recently Whalen (1984) has summarized the available dates for Jornado Mogollon sites and emphasizes that chronometric dating of the northern Jornado sites is very inadequate at present. The occurrences of Jornado Brownware ceramics on the Llano Estacado east of the Pecos has been discussed by Hughes (1978, Willey and Hughes 1978). It is apparent that early ceramic Southwestern influences were important in the Southern High Plains region as early as or earlier than Plains Woodland influences from the east and north.

## Woodland Complexes in Central and Western Oklahoma

Woodland complexes in western Oklahoma have recently been summarized in detail by Vehik (1984) and Brooks and Drass (1984). Summary listings of Woodland radiocarbon dates which have resulted from this work are provided by Vehik (1984:Table 8.1) and Brooks and Drass (1984:Table 2). Well dated Woodland components are also reported by Ferring (1982, 1986) for Delaware Creek in Caddo County, where detailed faunal, lithic, and spatial analyses have provided one of the better perspectives on Woodland subsistence and occupation site organization presented to date. Generally speaking, there are two areas in the Prairie-Plains portion of Oklahoma where significant research has revealed information pertaining to Woodland occupations.

In the Cross Timbers and tall grass prairie areas of north-central Oklahoma, research has been conducted in Kay and Osage counties revealing considerable information on the prehistoric people who lived there during the first millennium A.D. At present there are no definite structural remains from these sites, but many have evidence of storage pits and scattered posthole-sized features. Rockshelter sites and burned rock middens are reported from the central eastern portion of Osage County (Henry 1977a, 1977b, 1978; Howard 1970, Vehik and Pailes 1979). Open camp sites and lithic workshops are well represented in the Kaw Reservoir area of Kay County (Bastian 1969; Buehler 1982; Hartley 1974; Neal 1973; Vehik 1984b; Young 1978).

Vehik (1984; see also Vehik, Beuhler, and Wormser 1979) has subdivided the north-central Oklahoma Woodland sites into three groups, although no complexes or phases have been formally defined. The first group of sites, of which Hammons (Young 1978) and Hudsonpillar (Bastian 1969) are examples, are characterized by a limited inventory of ceramics including stamped and zoned sherds comparable to Cooper focus types (Baerreis 1953), contracting stemmed dart points (Gary type) are predominate, but corner-notched dart points are common (e.g. Williams type), and corner-notched arrowpoints (Scallorn and similar types) also occur. The ceramics are most commonly smooth surfaced, but a limited number of cordmarked sherds are recurrent. Interaction with other groups may be indicated by the presence of decorated Woodland sherds typical of the Cooper focus and by occasional pieces of obsidian. Some indirect stimulus from or limited contact with Hopewellian groups is likely for this group of sites. Stone artifacts include an abundance of grinding implements, chipped stone scrapers and drills of various forms. Radiocarbon dates for this group of sites place the time interval between A.D. 100 and 300.

The second group of Woodland sites discussed by Vehik (1984) tend to be slightly later in time, dating to the period between A.D. 300 and 600, have more abundant pottery which is typically smooth surfaced and tempered with sand or limestone (including cell tempered or leached out limestone), and show an increase in Scallorn corner-notched arrowpoints with contracting stemmed Gary points the primary dart point form. Stone tools include stemmed, disk and elongated scrapers as in the group one sites, but endscrapers and thumbnail scrapers are more common. These sites include Von Elm (Hartley 1974) and other open camps in the Kaw Reservoir area. Also, several rockshelters dating to this period have been reported from the Cross Timbers in Osage County to the east of Kaw Reservoir, and although the assemblages from these components are small, the sites may represent hunting camps or fall/winter camps used by small groups (Henry 1978).

The third group of Woodland sites in north-central Oklahoma are a mixed bag of components which date from about A.D. 800 until at least 1100. These sites, including a unit at Black Hawk Shelter dated to A.D. 845, have primarily arrowpoints but include triangular side-notched types in addition to corner-notched forms. Ceramics are variable but often smoothed and sometimes include shell temper. Scrapers are commonly of the thumbnail or small endscraper form and stone hoes are also recorded. Several sites with small mounds occur in the Cross Timbers area during this time and these have been interpreted as hunting and kill processing sites, although their use may have been geared as strongly toward processing of acorns or other vegetal food. Some of these group three Woodland components probably reflect the transition from Woodland to more settled Village horticultural occupation of the region.

**Pruitt Complex.** Plains Woodland materials from the central and south-central Oklahoma region have been grouped in the Pruitt complex as first recognized and defined at the Pruitt site in Murray County (Barr 1966). The complex is characterized by cordmarked thick ceramic jars tempered with limestone or limestone, bone, and sand, and which have vertical or insloping rims and usually concoidal or rounded bases. Occasional flat bottomed jars occur and many of the cordmarked sherds have been partially smoothed over. Projectile points include a variety of dart and arrowpoint types but include primarily corner-notched arrowpoints and contracting stemmed dart points. Other important artifact types include bone awls, shell hoes, and grinding stones of assorted forms (but primarily unifacial one-handed specimens). The economy was dependent heavily upon deer and lesser mammals with good evidence for use of reptiles and fish (Barr 1966:Table 1). Plant remains were dominated by hickory nuts, but corn is also attributed to the complex. Unfortunately, the context of the corn cobs and stalk fragments from the site are not specified and it is difficult to reassess this extremely early (for Oklahoma) occurrence of maize.

Several other sites including the Brewer site in McClain County on the Canadian River (Duffield 1953; Drass 1982, n.d.), components at the Duncan-Wilson Bluff Shelter in Caddo County (Lawton 1968), the Roulston-Rogers site in Seminole County (Drass 1979), Spring Creek in Lincoln County (Mayo 1984), and a few others (Hofman 1977a; Ferring 1982) can be compared favorably with the Pruitt complex. Dates from the Pruitt site, Duncan-Wilson Shelter, and the Roulston-Rogers site indicate an age for the complex between A.D. 500 and 900. Research

at the Delaware Canyon sites in Caddo County has documented Woodland components which lack evidence of maize and which have been dated to A.D. 100-1000 at sites 34CD257 and 34CD258-B and 258-D. Bison utilization is well documented at these sites (Ferring 1982:254), but a variety of smaller animals were also hunted including deer, rabbit, squirrel, turkey, box turtle, jackrabbit, prairie dog, and prairie chicken.

Recent reinvestigation and reanalysis of the Brewer site (Drass 1982, n.d.) has resulted in two dates and an abundance of maize. The radiocarbon dates are A. D. 1070 and 1240 with maize being recovered from the pit with the earlier date. Ceramics from Brewer site include a variety of forms and surface treatments and the interpretation that this site is multicomponent or represents a transitional incipient Plains Village period between Woodland and Washita River occupations is plausible. Pruitt and Brewer may both represent a manifestation which is in part coeval with the Custer phase in western Oklahoma which is now documented to have lasted until approximately A.D. 1200 (Drass and Moore 1987). This period represents the transitional Woodland-Village period as discussed by Ferring (1982) and Hofman (1978c).

The Roulston-Rogers site Woodland component, dated to approximately A.D. 650, would appear to represent a relatively pure Woodland, as opposed to transitional Plains Village, occupation probably predating the major occupation at Pruitt. Whether all such components should be included within the Pruitt complex is beyond this discussion, but it is evident that fairly dramatic technological changes occurred in the central Oklahoma region between A.D. 500 and 1200 and the temporal and spatial variability in these materials will probably merit definition of more than one taxonomic entity as chronologies and problems of component variability become better defined.

**Other Western Oklahoma Woodland Materials.** The history of research and findings in dry caves and rockshelters (Kenton Caves) in the canyon country near Black Mesa in northwestern Cimarron County, Oklahoma have been detailed in a recent review (Lintz and Zabawa 1984). Occupation of these caves apparently spanned the period from the Archaic through historic times, with evidence of Pleistocene fauna represented in the lower levels of at least one site. The diverse array of well preserved perishable materials including basketry, skin bags, sandals, cordage, plant remains, wooden items, and partially mummified burials which have been recovered from some of the sites had the potential to contribute substantially to the study of prehistoric peoples in the region. Unfortunately, most of the reports pertaining to the early work at these sites are very brief and the majority of the materials recovered have been lost, dispersed, poorly curated, or simply deteriorated. Enough is known of the excavations and findings, however, to document that multiple cultural groups were responsible for the remains, and to enrich interpretation of the perishable technology of the various caves' inhabitants. Wooden artifacts include an atlatl, bow, foreshafts, throwing stick, fire drills and fire-drill hearths, pegs, flattened sticks for various functions. Skin items include a moccasin or leather sandal, skin bags, and straps. Woven and corded pieces include sandals, various basketry and matting, and knotted pieces. Yucca fiber was an important material for cordage, but a variety of other materials are also represented. Cakes made from acorn meal and plum or cherry were also found and had been perforated in the center possibly for suspension or storage. Corn is represented by numerous cobs and kernels, but whether the corn relates to Woodland or later components cannot now be determined. A single radiocarbon date from one shelter in North Canyon is A. D. 560, but the associated assemblage is not presently documented (Lintz and Zabawa 1984:173). Another feature of these cave and shelter sites is the rock art which portrays a variety of geometric and anthropomorphic figures. Some of this art is probably postcontact in age, but a variety of traditions and time periods are believed to be represented. Lintz (1986) attributes at least some of the Kenton Cave materials to the Apishapa phase centered in southeastern Colorado. Numerous references to brief articles pertaining to the caves and the rock art are cited by Lintz and Zabawa (1984).

The Carrizozo Bridge site in Cimarron County (Saunders 1983) has provided evidence of Woodland activity south of Black Mesa at the Oklahoma and New Mexico border. Three radiocarbon dates indicate that the site was occupied between A.D. 850 and 1050 which compares well with a date attributed to an unidentified Woodland occupation at Black Mesa State Park (Haury 1982:58). The site is located on a terrace of Carrizozo Creek and revealed evidence of several rock-lined hearths and dispersed hearth areas as well as concentrations of fresh water mussels. The site appears to have been used repeatedly by foraging people. No evidence of domesticated plants is reported, but the dated charcoal samples are unidentified and recovery techniques involved only quarter inch mesh screens. Grinding stones indicate that plant food processing may have occurred on the site. Faunal remains include evidence of bison, unidentified bird, and mussels. Projectile points from the Woodland component include small to medium notched and stemmed arrow and dart points. Lithic raw materials are primarily local but include pieces of Alibates and obsidian. Ceramics are represented by a single smooth brown ware sherd with sandy paste.

The Swift Horse site in Roger Mills County, Oklahoma on a minor tributary in the Washita River drainage (Briscoe 1987), has produced an interesting assemblage attributed to the Lake Creek complex and dated to between A.D. 250 and 450, based on five radiocarbon assays. The artifacts include a corner-notched arrowpoint and several corner-notched or expanding stemmed dart points. Three cordmarked sherds were recovered and are tempered with crushed rock. Grinding stones and flake tools are also well represented and a large quantity of fire-fractured cobbles was found indicating the presence of hearths and possibly roasting or stone boiling activities. The artifact assemblages from most Lake Creek sites in the Texas Panhandle area are so small or briefly reported that adequate comparisons and assignment of components is difficult at best. Based on the limited evidence,

however, the Swift Horse site compares favorably with what is known from Lake Creek sites further west.

The Currie site in Garvin County has generally been discussed in conjunction with Woodland components in the south-central Oklahoma area. Information on the site has been only briefly reported, but a series of 12 radiocarbon dates are available from a rectangular house represented by a post pattern containing four central supports and an entryway extending to the southeast. The radiocarbon dates average about A.D. 1200 and the artifacts include primarily thick vessels with plain surfaces and flat bases, generally comparable to some Washita River phase ceramics. Arrowpoints are stemmed and notched forms unlike the triangular side-notched points of late Plains Village time. The site is probably best considered as transitional or very early Plains Village, perhaps related to the Custer phase (Hofman 1984), rather than strictly Woodland (Lintz 1974).

## Woodland Complexes in Northwestern Texas

Most discussions of Woodland materials in the Texas Panhandle region include these materials in the early Neo-American stage (Hughes 1978; Etchieson, Speer, and Hughes 1978; Hughes and Willey 1978:28), but Collins (1971:87) begins the Neo-Indian period following Woodland times. In the west-central and central portions of Texas, the "Woodland" period is recognized by the occurrence of ceramics and arrowpoints on an otherwise Archaic technology and lifeway and is referred to by Prewitt (1981) and others as the Neo-Archaic. Couzzourt (1985) has provided a detailed and useful summary of the Plains Woodland and Jornado Mogollon materials from the Texas Panhandle area in his discussion of the Tascosa Creek site in Oldham County.

**Lake Creek Focus.** Hughes (1962) studied the Lake Creek site located in eastern Hutchinson County on a tributary of the Canadian River. A surface collection and limited testing at the site produced a sample of 154 artifacts including almost 50 potsherds, about a dozen projectile points, and numerous chipped stone tools and grinding stones. The aerial extent of this complex is not established but is assumed to extend throughout much of the northern Texas Panhandle area. Other sites which apparently belong with this complex are mentioned by Hughes (Hughes and Willey 1978:28). Age is also estimated to the period between A.D. 500 to 1000, there are presently no radiocarbon dates available for this site.

The assemblage is distinguished by distinctive thick cordmarked pottery with lumpy coarse paste containing quartz and limestone temper. Feldspar- and scoria-tempered sherds of plain brownware attributable to the Jornado Mogollon are also represented at Lake Creek and similar sites. Diagnostic projectile points are small to medium arrowpoints and small dart points (Scallorn and Ellis-like forms). Economic pursuits are indicated by the presence of bison, jackrabbit, and turtle bones, a few mussel shells, and a variety of grinding stones which were presumably used in part for processing plant foods such as seeds.

**Palo Duro Complex.** Excavation at Dead Man's Shelter (41SW23) in the MacKenzie Reservoir area of Swisher County near the eastern margin of the Llano Estacado produced an important large assemblage of materials which has been designated the Palo Duro complex (Willey and Hughes 1978:148-190). The components in Strata B and D at the Dead Man's Shelter site have been dated to A.D. 100-300 and A.D. 400 to 800 respectively, for a total range of Woodland occupation at the site between A.D. 100 and 800. These components are characterized by distinctive Deadman's arrowpoints which have long tangs and stems, deep basal notches, and serrated blade edges. Ceramics are composed entirely of Jornada Brownware sherds made with andesite temper from the Sierra Blanca region of New Mexico some 375 km to the southwest (Willey and Hughes 1978:185). A variety of chipped stone artifacts are represented as are a large number of grinding stones and some bone tools. Lithic materials are dominated by locally available stone types (Willey and Hughes 1978:Table 42). Some decorated bone and shell artifacts are also documented. Recorded features include both rock-lined and unlined basin-shaped hearths, but no structures are presently known.

A flexed burial was documented at the site and had a number of bone artifacts in association. Other previously reported burials in the region are attributable to the Palo Duro complex based on artifact associations (Tunnell 1964; Witt 1955). The economy was focused on deer, small mammals, and plant foods with very minimal evidence of bison. This is interpreted to generally support Dillehay's (1974) interpretation of a period of low bison abundance on the Southern Plains during Woodland times. The presence of the prairie vole *(Microtus ochrogaster)* in the fauna from Dead Man's Shelter is interpreted to indicate a period of more moist and somewhat cooler climate during the first millennium A.D. than at present.

In addition to the burials, other components from the region are attributed to the Palo Duro complex by Willey and Hughes (1978:190), but reports on most of these are not presently available. Couzzourt (1985) has published a detailed account of preliminary research at the Tascosa Creek site in northeastern Oldham County, Texas. At Tascosa Creek materials referable to both Plains Woodland (Lake Creek complex ?) and Palo Duro complex (with Jornado Brownware) are represented. Couzzourt suggests that the Canadian River drainage may be a cultural borderland between relatively more intensive Jornado Mogollon related or influenced groups to the south and Plains Woodland (influenced) groups to the north (and east of the cap rock). Couzzourt (1985) provides an extended discussion of the distinctiveness of Woodland and Jornado materials and economy in the Panhandle and relationships with the subsequent Panhandle Aspect occupation.

A Woodland component at the Chalk Hollow site located on a tributary of Palo Duro Canyon in Randall County, Texas, 120 km south of the Lake Creek site and 60 km north of Dead Man's Shelter, is in some ways comparable to the Palo Duro complex (Wedel 1975). From this component at Chalk Hollow, Wedel

reports six radiocarbon dates spanning the period from A.D. 400 to 850 and bison is reportedly present in the faunal assemblage from the site. Arrowpoints are corner-notched forms, but not closely comparable to the Dead Man's type. Scrapers, bifaces and a variety of lithic materials are represented by the stone artifacts. Ceramics consist of a small sample of "nonlocal" plain brownware sherds (possibly Jornado Brownware), and a variety of bone tools and grinding implements are represented.

The occurrence of Jornado Brownware at sites throughout much of the Llano Estacado area indicates potentially very significant influences on the Southern High Plains groups as a result of interaction with groups living to the west and southwest. West of the Llano Estacado in the Pecos Valley, Jelinek (1967) has defined the 18 Mile phase, dating prior to A.D. 1000, the early portion of which is characterized by Jornado Brownware (see Jelinek 1967:47-49 for a description). Present evidence suggests that this early Southwestern influence "collided" on the eastern portion of the High Plains and western Prairie-Plains with eastern Plains Woodland influences, and these contacts resulted in a distinctive overlay of new technologies on an Archaic population which is assumed to have been present and well established in the region.

### Southern Great Plains Woodland Period Research Needs

At the present time there is a fundamental need for basic research in documenting and dating assemblages of the Woodland period cultures in the Southern Plains region. For the area as a whole, we have an extremely limited understanding of chronological developments, a limited number of well defined assemblages and radiocarbon dates, and meager substantive information pertaining to subsistence practices. This situation has improved considerably during the last decade, but the understanding of group mobility and organizational aspects of Woodland groups has only received minimal attention. Questions concerning the origin of horticultural activities, the introduction of domestic cultigens, and the potential intensive use of native plants during this period need to be pursued. Such concerns tie in directly with study of the regional development of more horticulturally oriented groups representing the Panhandle aspect, Apishapa, and the Custer and Wasita River phases.

Distinctive cultural characteristics of the Woodland period, especially ceramics and changed projectile point forms (initial widespread use of the bow and arrow) need to be studied as to their origins and their effects on the Woodland economies in the region. The pre-Woodland occupants of the area were apparently dramatically impacted by these technological and organizational developments, but whether this was through diffusion, immigration, or both is undetermined and might best be addressed through physical anthropological studies. A more fundamental concern is why these changes occurred, whether borrowed or imposed by new residents, and what problems these natives were contending with during this change in their economic and technological systems. Evidence for a changing (ameliorating) environment is increasing (e.g., Willey and Hughes 1978; Ferring 1982; Hall 1982), and the impact of these factors needs to be more fully assessed in developing a refined picture of Woodland period adaptations and change in the area. Factors influencing the final acceptance of a semisedentary horticultural lifeway during the Plains Village period may be discernible in the archeological record during Woodland times.

# Chapter 6

## VILLAGE FARMING SOCIETIES

*Robert L. Brooks*

During late prehistoric times, the Great Plains study area was occupied by societies who produced a number of recognized archeological manifestations. These groups exhibit a set of common characteristics which is generally referred to as the Plains Village tradition. Societies living on the eastern margin of the area, however, exhibited some characteristics of the Eastern Woodlands-oriented Mississippian tradition while, at sites on the western periphery, influences from Puebloan cultures of the southwestern United States are seen.

Thousands of sites belonging to the Plains Village tradition have been recorded on the Southern Plains. Because of the large number of recorded Plains Village sites and their recent formation (ca 1000 to 500 years ago), they provide excellent research opportunities. Consequently, Plains Village settlements have been more extensively studied than any other prehistoric cultural tradition in the study area. Because the tools, trash, and features that make up these sites have been well documented, they are particularly amenable to taxonomic classification. Thus, numerous variants, aspects, phases, foci, and complexes have been described for Plains Village cultural patterns in southeastern Colorado, Kansas, western Oklahoma, eastern New Mexico, and northern and central Texas. Unfortunately, taxonomic classification has not been consistently or systematically applied (see Willey and Phillips 1955 or McKern 1939 for two of the more widely used classification systems).

There have been only a few instances where archeologists in adjacent states have adopted commonly accepted regional chronologies and taxonomic labels. Consequently, taxonomic labels may change when state boundaries are crossed. In some cases, the name of the cultural unit may change as well. The inconsistency in classification also presents problems to the researcher working at the regional level. For example, the extent of assemblage variation found at Pomona sites in eastern Kansas prompted Kansas archeologists to adopt use of the term Pomona variant containing four phases. In Oklahoma, a similar variation in assemblage composition was found for sites along the Washita and Canadian rivers. However, archeologists in Oklahoma retained use of the term Washita River phase with the recognition that one or more subphases might be present.

There is also a diversity of opinions regarding the level of documentation necessary for creation of a cultural unit. Some archeologists within the study unit have assigned phase definition to a limited number of sites with very little documentation on the nature of the assemblage or the local chronology. In other instances, an existing phase definition will be applied to newly examined sites merely for convenience in labeling. These situations point to a serious need for refinement in our classification procedures and greater regional cooperation in standardization of taxonomic labels.

The Plains Villagers occupied the Southern Plains region for about 700 years, from approximately A.D. 800 to A.D. 1500. Re-

Table 7.
Cultural complexes on the Southern Plains during the Village Farming period

| Culture Complex | Area | Chronology | Reference |
|---|---|---|---|
| Custer phase | south-central and western Oklahoma | A.D. 800-1250 | Hofman 1984 |
| Washita River phase | south-central and western Oklahoma | A.D. 1250-1450 | Bell 1984a |
| Upper Canark variant | southeast Colorado, northeast New Mexico, Texas and Oklahoma panhandles | A.D. 940-1500 | Lintz 1986 |
| Antelope Creek phase | Texas and Oklahoma panhandles | A.D. 1200-1500 | Lintz 1986 |
| Apishapa phase | northeast New Mexico, southeast Colorado, Cimarron County, Oklahoma | A.D. 940-1390 | Campbell 1969 |
| Buried City complex | Texas Panhandle, Ellis County, Oklahoma | A.D. 1150-1330 | Hughes 1986 |
| Zimms complex | western Oklahoma | A.D. 1265-1425 | Flynn 1986 |
| Henrietta complex | north-central Texas | A.D. 1575? | Krieger 1946 |
| Bluff Creek complex | south-central Kansas | A.D. 1050 | Brown and Simmons 1987 |
| Pratt complex | central Kansas | ? | Wedel 1959 |
| Pomona variant | eastern Kansas | A.D. 960-1450 | Brown 1984 |
| Clinton phase | eastern Kansas | A.D. 960-1430 | Brown 1984 |
| Wolf Creek phase | eastern Kansas | A.D. 980-1325 | Brown 1984 |
| May Brook phase | eastern Kansas | A.D. 1150-1285 | Brown 1984 |
| Apple Valley phase | eastern Kansas | A.D. 1300-1430 | Brown 1984 |

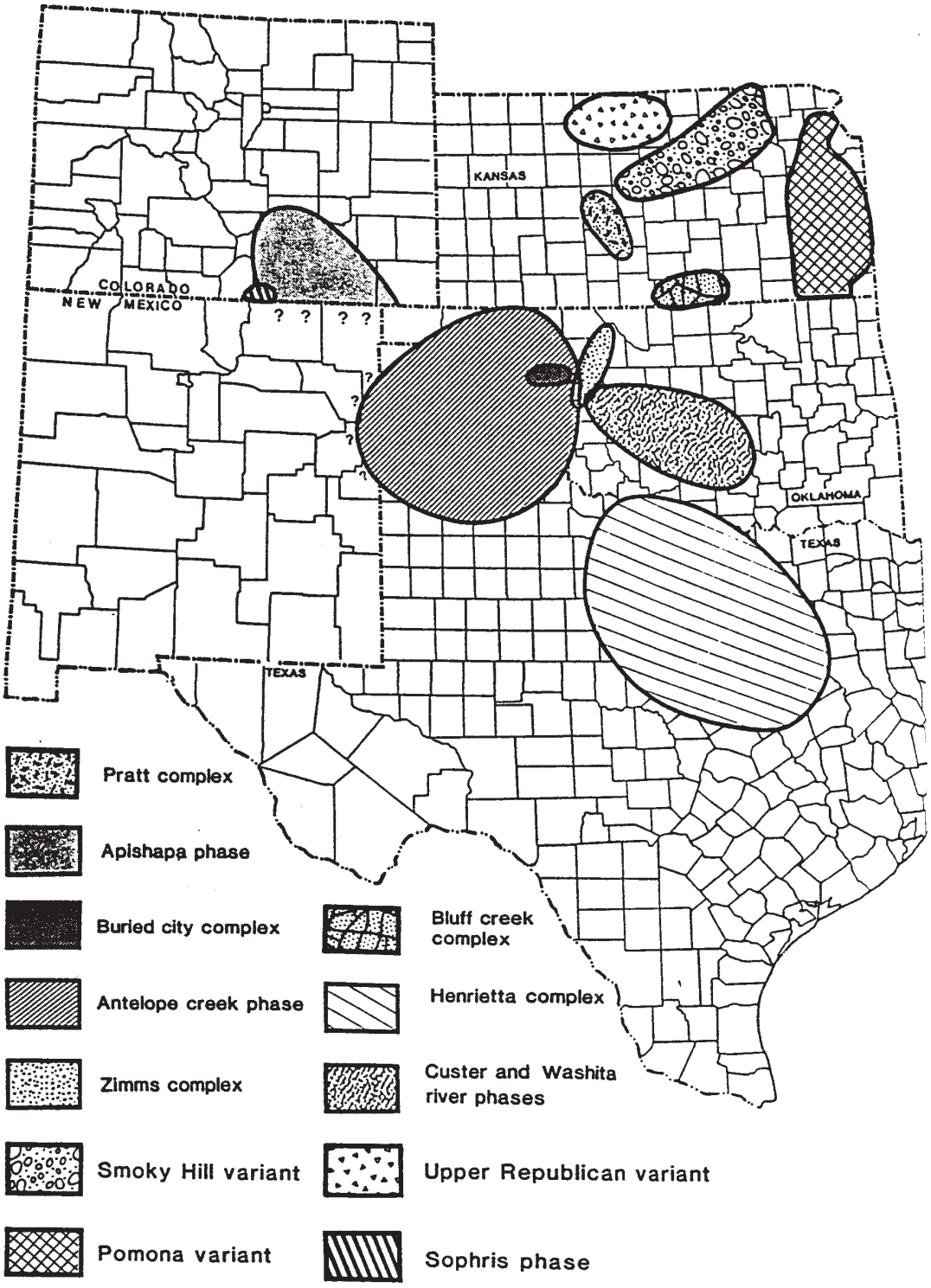



**Figure 15. Cultural complexes identified for the Plains Village period.**

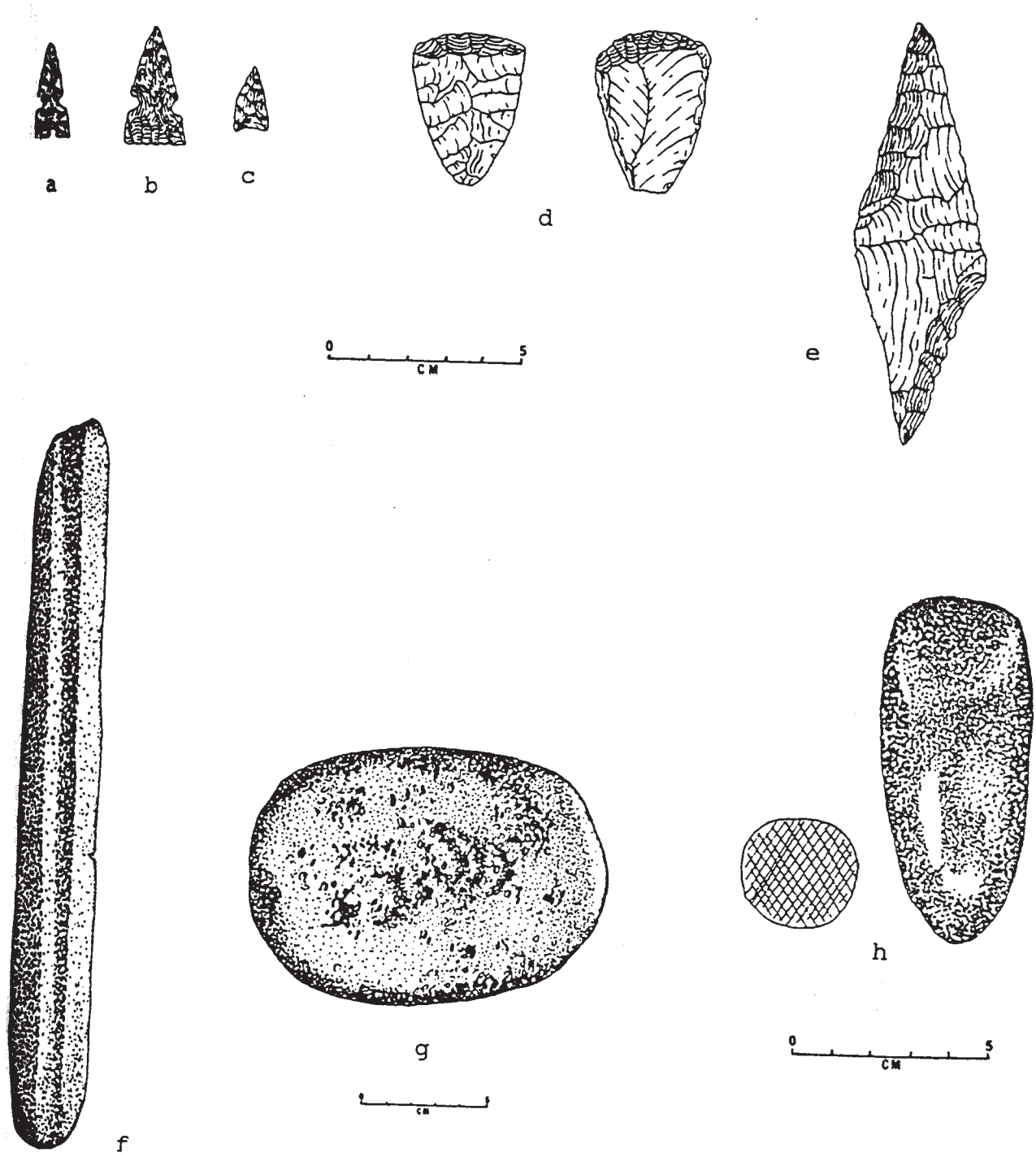



**Figure 16. Chipped and ground stone artifacts characteristic of the Plains Village period: a. Harrell point; b. Washita point; c. Fresno point; d. unifacial scraper; e. alternately beveled knife; f. sandstone abrader; g. mano; f. celt (drawings modified from Bell 1980).**

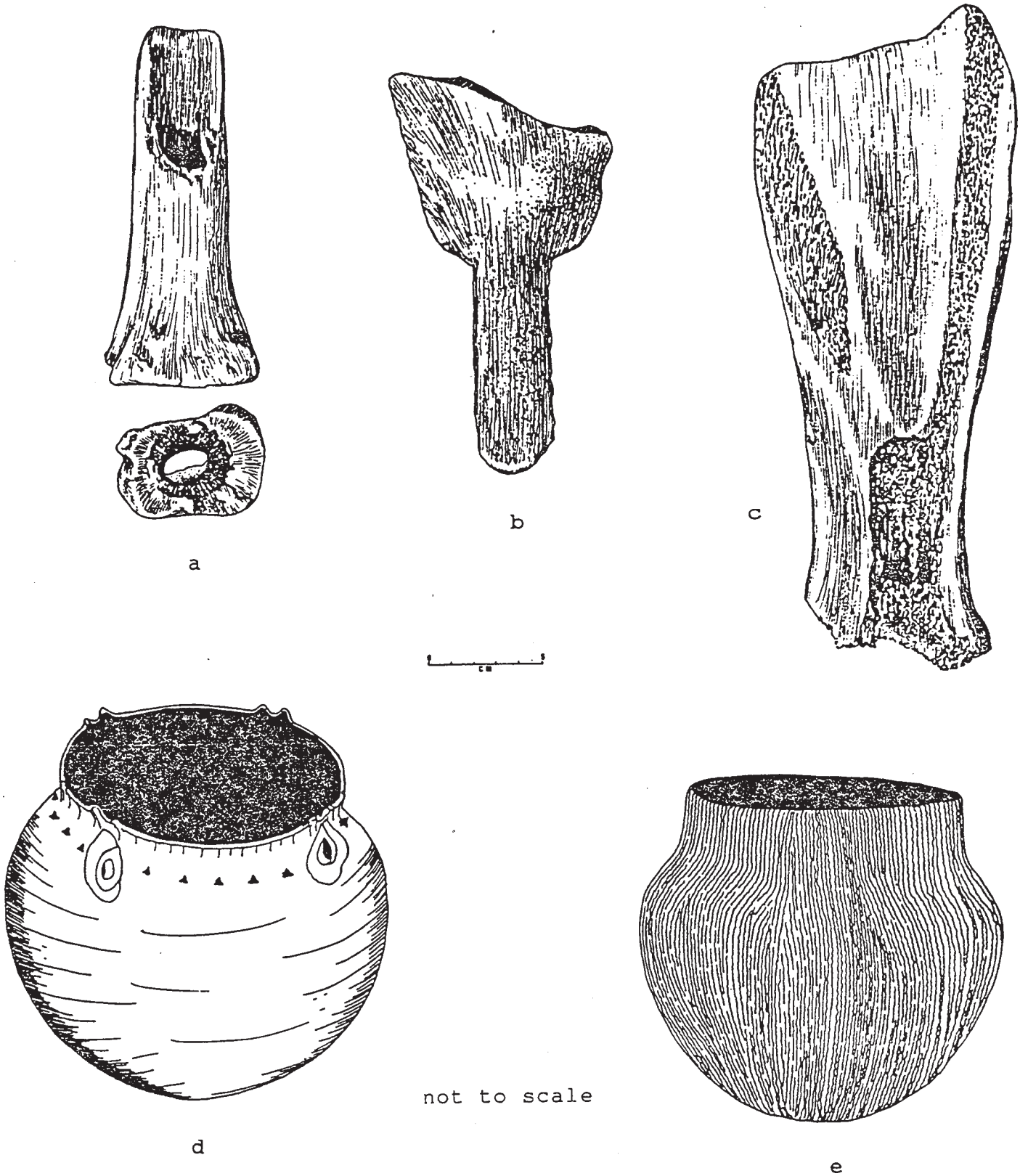



**Figure 17. Bone tools and ceramics characteristic of the Plains Village period: a. bison tibia digging stick; b. bison horn core hoe; c. bison scapula hoe; d. vessel with plain surface; e. cordmarked vessel (drawings modified from Bell 1980 and the Oklahoma Archeological Survey photo files).**

mains of their villages are found primarily along major stream drainages where fertile floodplain soils fostered the development of a simple gardening economy. This small scale farming was complemented by a strong reliance on the hunting of game and the collecting of wild plants. Based on this mixed but stable subsistence economy, numerous Plains Village societies developed within the study area (Figures 15-17, Table 7). The principal groups considered here as representative of this Plains Village tradition are the Custer and Washita River phases and the Zimms complex of Oklahoma; the Antelope Creek phase of Texas and Oklahoma; the Apishapa phase of southeast Colorado; the Henrietta and Buried City complexes of Texas; and the Bluff Creek and Pratt complexes of Kansas. Another manifestation exhibiting many Plains characteristics is the Pomona variant of eastern Kansas. Groups on the periphery of the study area, the Smoky Hill and Upper Republican variants of western, northwest and north-central Kansas, and the Sopris phase of the Upper Purgatoire Valley are also Plains societies or exhibit Plains influence.

Although differences exist between these Plains Village societies, they share a general way of life that contrasts significantly from that of groups inhabiting adjacent regions. One feature which is common to all of these groups is their economic utilization of bison. This animal not only provided them with meat, but the skins furnished raw materials for clothing, bedding, fibers, containers, etc., and the bones were used for making a wide variety of tools, implements, and various pieces of household equipment. Bison remains tend to dominate the bone refuse and debris at the Village sites, with deer and other animal bones reflecting a secondary importance. It is quite likely that the bison also occupied a dominant position in the thinking and sacred life of these people.

This emphasis on the bison, however, was complemented by the hunting of other game animals, fishing and the collection of shellfish, the collection of wild plant products, and growing of garden crops of various kinds. Corn and beans are well documented in the archeological record, but squash, tobacco, and other crops were probably grown as well. These diverse resources contributed to a broader economic base which could mean survival at times when crop failure or a scarcity of shifting bison herds might threaten the normal supplies. This subsistence pattern is common to all of the Southern Plains villages and provides the major focus for all economic activity.

The Village sites are small in size and most of them would be contained in an area of .2 to 1.5 ha. They are located on both major streams and tributary creeks close to a reliable water supply and alluvial soils which were amenable to cultivation with simple tools. Frequently, several small settlements were clustered close together, suggesting a scattered, almost rural, community comprised of several family groups. In other situations, a larger site appears as the central community with scattered smaller sites located up and down the river valley. Relatively isolated sites (e.g., homesteads, farmsteads, hunting camps) also occur. Thus, it appears unlikely that a large number of people occupied any single village. The villages are characterized by the presence of houses, numerous cache or storage pits, scattered areas of sheet midden, and occasional burials or a cemetery area. There are no mounds, evidence for earthworks or fortifications, or suggestions of purposeful village planning. Many of the sites have thick midden accumulations up to three or four feet in depth, indicating a lengthy and apparently continuous occupation.

## Paleoenvironmental Conditions

Previous studies have documented the nature of climatic and geomorphological conditions on the Southern Plains during the Plains Village period (Bryson, Baerreis, and Wendlund 1970; Bond 1966; Hall 1982, 1983; Reid and Artz 1984; and Taylor 1986). Changes in climatic conditions and resultant geomorphological processes brought about significant adaptations in Plains Village cultures. Although previous paleoenvironmental research has focused on a diversity of settings ranging from canyons to alluvial valleys, some correspondence can be established between the results of the various studies. In general, the period from approximately 750-500 B.C. to 0 A.D. can be viewed as a period of drier conditions. This climatic subperiod was followed by wetter conditions until approximately A.D. 900. From A.D. 900 until A.D. 1500-1600, the climate was drier and somewhat warmer. As will be documented later, these changes had a profound affect on the settlement pattern as well as the subsistence activities of various Plains Village societies.

## Origins

The origins of the Southern Plains villagers remain obscure at this time, but it seems quite likely that they are derived from poorly documented Woodland groups known to have existed in the region. These Plains Woodland groups, identified primarily by the presence of cordmarked pottery, were not yet focused on bison exploitation but were continuing to follow a Woodland economic pattern while venturing onto the Southern Plains. With the exploitation of the bison and the cultural adaptation to this new resource within the region, the Woodland groups became transformed into various expressions of the Plains Villagers. Differences which one can note within the Plains Villages partly reflect varying Woodland origins as well as influences from surrounding groups which molded their regional development.

**The Custer Phase.** The term Custer focus was initially suggested by Bell and Baerreis (1951) for a series of sites found along the Washita River in Custer County, Oklahoma. Because the Custer County sites appear to differ from the Washita River focus to the east in their geographical location and artifact assemblages, the name Custer focus was proposed. A subsequent review of material remains, features, and radiocarbon dates by Hofman (1978a) resulted in the Custer focus being redefined as a phase which preceded the Washita River cultural pattern. Additional research by Drass (1989) and Drass and Moore (1987) at sites in south-central as well as western Oklahoma has contributed to further refinements in the temporal and geographical distributions of the Custer phase.

A substantial number of sites assigned to the Custer phase are found in Custer County, although they are also known to occur in Washita, Beckham, and Roger Mills counties and thus

cover a large section of west-central Oklahoma. Additional sites belonging to this cultural pattern have been identified in Garvin, McClain, and Murray counties in the south-central portion of the state. WPA-sponsored tests or excavations conducted at the Goodman II (Cu-2), Shahan I (Cu-3), Shahan II (Cu-7), McLaughlin I (Cu-4), McLaughlin II (Cu-5), and Williams (Cu-6) are reported by Brighton (1951). Gallaher (1951) reported on Goodman I (Cu-1), which was more extensively excavated than any of the other sites mentioned. More recent research has shown however, that Goodman I falls within the Washita River phase rather than the Custer phase. In 1959, Buck reported on the Phillips (Cu-11) and Mouse (Cu-25) sites and provided a discussion of the Custer phase with a suggested internal chronology (Buck 1959). Shaeffer (1965, 1966) has reported upon the Heerwald (Cu-27) and Hubbard (Bk-4) sites which occur in this area, but which have mixed characteristics so that their relationship to the Custer phase sites remain unclarified. Shaeffer assigns Heerwald to a generalized Custer-Washita River relationship, and he views the Hubbard site as more closely associated with the Panhandle aspect. Additional research at Heerwald (Drass, Baugh, and Flynn 1987) revealed that this site falls within the Washita River phase. Another Custer phase site is that described by Eighmy (1970), the Edwards I (Bk-44) site, in Beckham County. The Currie site (Gv-22) in Garvin County can also be considered as a Custer phase occupation although Custer sites in south-central Oklahoma differ slightly from their western counterparts.

Most recently, excavations have taken place at the Linville site (Rm-492) in Roger Mills County where 21 trash pits were salvaged (Drass and Moore 1987). In addition to this work, reanalysis of the Brewer site (Ml-3) in McClain County and the Pruitt site (Mr-3) in Murray County have shown these sites to contain Custer phase features and material assemblages. Previous work at Brewer by Duffield (1953) and at Pruitt by Barr (1966) had suggested Plains Woodland origins for these occupations. Numerous additional sites are known from surveys, especially those of Williams (1955), Barr (1966), and Moore (1984), but none of these have been excavated.

Over 20 radiocarbon dates are available from six Custer phase sites, Linville, Edwards II, Mouse, Currie, Brewer, and Pruitt. MASCA dendrochronology corrections (Klein et al. 1982) for these dates place the range of Custer between A.D. 800 and 1250. Earlier dates from Pruitt (ca A.D. 650), however, may represent transitional Plains Woodland-early Plains Village developments.

The best information for the Custer phase is derived from six sites: Linville, Mouse, and Edwards II in the west and Currie, Brewer, and Pruitt in the south-central area. These sites are small, situated on a terrace or ridge toe above the floodplain, with features including storage and/or refuse pits, fireplaces, scattered sheet middens, and occasional houses and burials. These settlements are typically less than 2 ha in size and seldom contain extensive midden deposits. Thus, it is likely that Custer phase sites reflect semipermanent occupations by groups of less than 50 individuals.

Only two Custer phase houses have been excavated, consequently architectural patterns are not well known. Those reported differ somewhat in size and internal characteristics. They are similar in that they are made of wall posts with a wattle and daub construction outlining a square or rectangular structure with an interior fireplace. Measurements for these dwellings range from 4.5 x 6 m to around 25 $m^2$. A fireplace area is located at the approximate center of the house, and interior cache pits may or may not be present. The house from the Mouse site lacked any interior roof supports, whereas the house from the Currie site has four central roof supports. Because of the small number of structures identified, the most typical form is not known.

Round or oval cache or storage pits are common throughout most camps or hamlets. These are either basin-shaped or cylindrical in form with a flat bottom, averaging about 1 m in diameter and ranging from .5 to 1 m in depth. There is considerable variation, however, in both form and size. The pits, when excavated, commonly contain quantities of Village debris including numerous fire-cracked rocks and evidence for use as a fireplace. It has been suggested that the more shallow basins are earth ovens which have been filled with trash whereas the deeper bell-shaped pits were initially used for storage. Scattered fireplaces and debris from Village living are also to be found throughout the occupational area.

Information about burials is also limited to small samples. The skeletons were placed in a flexed position within oval or rounded grave pits. Grave offerings were present with three or four reported burials and consist of pottery, chipped stone tools and shell beads. There is no indications of status differentiation.

Artifacts and debris from the Village sites indicate a typical Southern Plains economy based upon hunting, gathering, and horticulture. Although corn is fairly common at Custer phase sites, it is thought that the growing of crops was not as extensively practices as during later times (e.g., the Washita River phase). This suggestion is based on the absence of other tropical cultigens (beans and squash) and the limited number of bone tools used for tilling the soil—bison scapula and horn core hoes, etc. A variety of edible wild plants were collected: burgrass, barley, maygrass, chenopodium/amaranth, sunflower, wild mustard, smartweed, and portulaca. In addition various nutcrops such as hickory, walnut, and pecan were used for food as well as fuel. Animal remains found at Custer phase sites attest to use of a wide variety of large and small game. These include bison, deer, antelope, cottontail and jackrabbit, squirrel, raccoon, gopher, turkey, a variety birds and fish, and considerable quantities of box turtle. It appears however, that bison was not as extensively hunted as during later Plains Village times. This though may be a function of the smaller size of the Custer settlements. Or, it may be because bison becomes more abundant with environmental changes leading to drier conditions occurring in the late 1200s and 1300s.

Artifacts found at the sites are quite similar except for minor differences or changes in frequency which may reflect time differences. Chipped stone materials are plentiful in terms of projectile points, scrapers, drills, knives, unfinished or reject materials, and chipping debris. Projectile points are represented by small arrowpoints, chiefly simple triangular (Fresno), side-notched triangular (Washita and Harrell), and small corner-

notched forms (Scallorn and variants). There is the suggestion that corner-notched forms are dominant but are gradually replaced through time by side-notched and unnotched forms. Flint scrapers are also abundant, with endscrapers, side scrapers, simple flint scrapers, and pointed scrapers being represented. Knives include the diamond-shaped alternate-beveled form, ovate and triangular forms, and simple flake knives. Flint drills, preforms, and unidentified or unique flint pieces also occur.

The ground stone inventory consists of manos, grinding basins (both circular and trough style metates), sandstone abraders, celts, and elbow pipes. Much of the ground stone is made of local sandstone although some red granites from the Wichita Mountains have been used to make the large metates.

Artifacts made from bone also occur and are usually made from either deer or bison bone. Bone tools include bison scapula hoes, bison tibia digging stick tips, bone knives or fleshing tools, bone awls or perforators, arrowshaft wrenches, antler flaking tools, antler handles (socketed), notched ribs (musical rasp), deer toe tinklers, and tubular bone beads.

Items made from shell are not plentiful but some pieces are present. Mussel shell was used for spoons or scrapers and large disk-shaped beads. The shell beads are also found in various stages of manufacture, roughed-out disks, smoothed disks, and perforated finished beads. *Olivella* shell beads are also reported.

Miscellaneous items include pieces of hematite and limonite which were utilized as sources of pigment.

Items made of clay include perforated sherd disks, a few fragments of crude human figurines, daub, and pottery vessels. The pottery is represented by Stafford Plain and Stafford Cordmarked, Lindsay Cordmarked, and occasionally Lee Plain. In the west, temper is often caliche although fossiliferous shale may also be used. In the east, limestone and a grog mixture of shell and limestone is most common. An important characteristic of these pottery types is the dominance of the cordmarked wares. Particularly in the west, cordmarked pottery comprises 50-60% of the total ceramic assemblage. Typical vessels are small to large conical-shaped jars with a rounded or flattened base and a slightly flaring rim. Attachments or decorations other than cordmarking are rare although handles, small lip tabs, attached clay fillets and nodes, fingernail punctates, and incising occur. Also present are fragments of small thick walled poorly fired clay cups having a corncob-roughened surface.

Little evidence exists pointing to extensive trade with other early Plains Village groups. Trade with people to the west may be indicated by the presence of material from the Alibates quarries near Amarillo. However, these pieces may also be obtained from gravel deposits. Better evidence exists for the use of granites from the Wichita Mountains to the south although it not known whether this stone was directly procured or traded for. Some sherds from the Linville site (Rm-492) are similar to Spiro Engraved pottery from the Caddoan area although these items could be replicas. Even if they are replicas, they are still indicative of direct or indirect contact with Caddoan groups to the east. One flake of obsidian found at the Mouse site apparently came from New Mexico.

The Custer phase represents an early expression of the Southern Plains villages that has its roots in a Plains Woodland source. The Custer phase shares many characteristics both with the Washita River phase and Upper Canark variant cultures to the west, but appears most closely aligned with the Washita River phase. In fact, the Custer phase may serve as the developmental base for the Washita River phase cultural pattern.

**The Washita River Phase.** The Washita River phase has been designated for a series of Village sites located along the Washita River in south-central and west-central Oklahoma. The complex had been initially identified as the Grant focus (Krieger 1947) based upon unpublished work by Lynn Howard at the Grant and Braden sites. With the identification of additional sites and the work of Schmitt (1950) at the Lee I site, the name Grant focus was replaced by the Washita River focus (Bell and Baerreis 1951). Based on subsequent excavations by University of Oklahoma students at the McLemore, Lee II, Lacy, and Brown sites and a number of radiocarbon dates, it was subsequently redefined as the Washita River phase (Hofman 1978a). In addition, during the late 1970s, the Oklahoma Archaeological Survey developed a "Southern Plains Adaptations" research program which focused on the Washita River phase (Wyckoff and Brooks 1983). During the past eight years, this program has resulted in intensive systematic surveys, test excavations, and excavation programs at Washita River phase sites. This work has contributed substantial new data regarding settlement and subsistence patterns of this cultural pattern as well as refinements in the temporal and spatial characteristics of this phase.

These sites are found chiefly along the Washita River in Garvin, Grady, Caddo, Custer, Washita, and Roger Mills counties of central and west-central Oklahoma, although villages are to be found around the peripheries of this region, including the South Canadian River valley. The general region appears to extend from the South Canadian River valley on the north to the Wichita and Arbuckle mountain areas on the south. The eastern margins are marked by the Cross Timbers while the western margins abut against or overlap with the short grass prairies occupied by groups exhibiting characteristics of the Upper Canark variant.

The origins of the Washita River people remain somewhat obscure. There is some evidence for development from Plains Woodland cultural background. Cultural similarities with the Custer phase, however, cannot be ignored, and suggest a historical relationship. It seems possible that the Washita River phase has dual roots, one associated with Plains Woodland groups and the other derived from direct historical ties to the preceding Custer phase. In either case, the ultimate source would be various Plains Woodland groups already adapted to a Southern Plains environmental setting.

A large number of Washita River focus sites are known from survey records and surface collections, and a number of these have been tested or excavated. The best known sites include Braden (Gv-1), Grant (Gv-2; Sharrock 1961), Lee I (Gv-3; Schmitt 1950; Richards 1971), Lee II (Gv-4; Pillaert 1962), Lacy (Gv-5; Oakes 1953), VanSchuyver (Pt-20; Sharrock 1959), Willingham (Ml-5; Sharrock 1959), Brown (Gd-1; Schmitt and Tolden 1953), Max Thomas (Gd-4; Lawton 1958), Duncan Wil-

son (Cd-11; Lawton 1968), and McLemore (Wa-5; Pillaert 1963). More recently, work has been conducted at the Arthur (Gv-32, Brooks 1987), Gv-90, Carl McLemore (Wa-44), Wilson (Gv-43, Drass and Brooks 1984), and Heerwald (Cu-5, Drass, Flynn and Baugh 1987) sites. The Grant, McLemore, and Arthur sites have the largest amount of excavation; the Braden site remains unpublished. In addition to these studies, a systematic survey along the middle course of the Washita River has provided our first substantive information on the distribution of Washita River phase settlements (Brooks, Drass, and Swenson 1985).

Approximately 25 radiocarbon and archeomagnetic dates are available from 10 sites. Recent reevaluation and MASCA corrections for these dates place the range of the Washita River phase between A.D. 1250 and 1450 (Drass and Swenson 1986). Once additional dates are collected, it may be possible to further refine this range into early, middle, and late subperiods.

Washita River phase sites consist of small to moderate sized villages of 5 to 20 houses occurring at relatively regular intervals along the principal river systems and major streams; These villages are often found spaced from 2.4 to 3.2 km apart along the Washita River proper (Brooks 1983a). Over 200 Washita River phase sites have been recorded for western and south-central Oklahoma. Village remains include houses, sheet middens, house middens, storage/refuse pits, fireplaces, and cemetery areas. Rockshelters were also occupied, either as permanent sites or temporary camps.

Examples of houses are limited but consist of square or rectangular structures made of upright wooden wall posts with a wattle and daub construction. Interior posts, fireplaces, and cache pits are commonly present. One house from the Lacy site (Hofman 1976) is rectangular, measuring 7.6 m by 8.5 m with a central fireplace and six large roof supports arranged in two rows of three on each side of the fireplace. The McLemore house (Pillaert 1963), although disturbed by numerous intrusive pits, measures 6 m by 6.7 m, with scattered interior pots which form no clear pattern. Houses reported from the Braden site (Bell and Baerreis 1951) are square with four central roof supports, a central fireplace, and extended entranceway similar to Gibson aspect structures (Wallace 1962). Our best information comes from the Arthur site where five houses were excavated (Brooks 1987). Four of the houses are rectangular, measuring 6.5 m by 4.5 m whereas, a fifth house is square, measuring 37 $m^2$. All houses at the Arthur site have two central support posts, numerous small internal posts for benches and platforms, and a centrally located prepared clay hearth. Most houses at the Arthur site have a large storage/refuse pit in the southeast corner. In addition, the number of pits in the dwelling is directly related to the length of occupation; the longer the duration of use, the greater the number of pits. Houses recorded at the Wilson (Gv-43), Carl McLemore (Wa-44), and Goodman I (Cu-1) sites also have house patterns where only two central support posts are documented. Based on the studies of the amount of usable floor space available, it has been suggested that Washita River phase houses held from five to eight individuals. This household groups is thought to correspond to the nuclear family in size. Based on evidence from the Arthur site, it is possible that some of these structures were also used for religious/ceremonial purposes (Brooks 1987).

Cache or storage pits are common at villages, occurring both within houses and in the general village area. Most are cylindrical in form with a flat bottom, 1 to 1. 5 m in depth and carefully prepared. Some also have a sealed clay cap and contain stored materials such as tool preforms, raw clay, or corn.

The Village sites also include hearths and occasional postholes which represent arbors, drying racks, or some other unidentified Village feature. Midden debris is widely scattered and commonly occurs as thick layers, up to 60 to 90 cm in depth, indicating a long term occupation. Other midden deposits represent dumping episodes from individual houses. Broken bone tools, pottery, bison and deer bones, and charred plant debris dominate the midden deposits.

Burials are sometimes found as isolated graves within the village area, but are more likely to occur within a more formal cemetery area adjacent to the village. The burials are usually single interments placed in a flexed or semiflexed position within a shallow grave pit. The skeletons appear to have been placed with the head to the east (Lopez 1970), and burial offerings, although simple, occur with about 60% of the graves. A study of the skeletal remains from the McLemore site by Brues (1962) indicates a heterogeneous population and short life expectancy. However, more recent work by Owsley and others (this volume, Chapters 9-11) attests to Washita River phase peoples being relatively healthy with greater life expectancy than those on the Northern Plains. Owsley's research has also supported the dependance on corn for this Plains Village population. There are no indications of cranial deformation such as that found in Caddoan populations to the east.

Because of the increase in Village size over the preceding Custer phase, subsistence practices are intensified. Horticultural pursuits are probably a mainstay of the diet, particularly in the more eastern sites. This is suggested because of the large number of bone tools such as socketed bison tibia digging sticks, and bison scapula, innominate, and horn core hoes as well as the abundance of manos and grinding basins. Tropical cultigens grown include popcorn as well as 8-10- or 12-row flint corn, squash (and/or gourd), and beans. A variety of edible wild plants were also collected. These include: marshelder, smartweed, sunflower, chenopodium/amaranth, persimmons, sand plum, and a variety of nuts (pecan, acorn, walnut, and hickory). In addition to plants used as food, other species such as morning glory, creeping cucumber, and spurge were apparently collected for medicinal and ceremonial uses. In general, plants grown or collected by Washita River phase people reflect an emphasis on use of the bottomland forest habitat. A wide variety of animals were hunted. The primary species exploited were bison, deer, antelope, elk, jackrabbit, cottontail, gopher, prairie dog, fox squirrel, raccoon, and beaver. Bison exploitation appears more intensive than in the preceding Custer phase. The ratio of bison to deer exploited also increases as one travels from east to west along the Washita

River drainage. Hunting practices of these groups also included a diversity of birds and riverine species. Birds taken include wild turkey, prairie chicken, wood duck, and numerous raptorial species. Reptiles were also not ignored. Some of the more frequently found remains at villages sites are those of the ornate box turtle. Remains of leatherbacks and snapping turtles are also relatively common. Species of fish identified consist of catfish, sunfish, drum,and gar. Washita River phase people also collected freshwater mussels from the river which may have been used for food as well as for tempering pottery and making tools and ornaments.

Artifacts of chipped stone include projectile points, scrapers, drills, knives, and a few miscellaneous items. The projectile points are small arrowpoints, most commonly simple notched or plain triangular forms. There is considerable variation in form, however, and numerous identified types do occur (e.g., Fresno, Washita, Harrell, Scallorn, Morris, Bonham, Huffaker, and others). Some larger dart points (e.g., Gary, Williams) also occur, but they appear to be atypical. Scrapers are also abundant and occur in a variety of forms: small endscrapers, side scrapers, pointed scrapers, and simple flake scrapers. Drills or perforators are present, with several forms being represented. Chipped stone knives include ovate, triangular, and diamond-shaped alternate-beveled forms, the latter being most characteristic although they are less common in the eastern part of the study area. Numerous retouched flakes were apparently also used as knives. Rough unfinished or preform materials, cores, flakes, and other flaking debris are also represented in a minor quantity. Analysis of chert materials from which these tools were made indicates not only utilization of local river and upland gravel resources but also materials derived from sources outside the region: Frisco chert from near Fittstown in Pontotoc County, Kay County (Florence A) chert from north-central Oklahoma and Alibates dolomite from quarries near Amarillo, Texas, although this latter material can also be found as river gravel in western Oklahoma.

Ground stone artifacts include celts, pipes, sandstone arrowshaft smoothers, awl abraders and hones, milling basins and metates, mortars, manos and mullers, small stone balls, perforated stone disks, and hammerstones. The most common items are manos and milling basins for food preparation, and the sandstone abraders or hones for finishing arrows or bone tools. Milling basins include both rotary grinding basins and trough metates as well as mortars. Oval manos are apparently used with grinding basins whereas loaf-shaped forms are used with the Southwestern style metates. Stone celts are generally small in size, almost round in cross section, and carefully made, usually of ferriferous sandstone or igneous rock such as diorite or granite. Stone pipes are typically a small equal-armed elbow pipe with a slightly bulbous bowl, although one example from the Lee I site has a stem projection beyond the bowl. Stone disks with several perforations and small stone balls are represented at some sites, and trade articles sometimes occur (for example, ear spools derived from Caddoan groups to the east).

There is a wide variety of artifacts manufactured from bone, most commonly from bison or deer. The bison scapula hoe and skull hoes or scoops are typical digging or gardening tools. The scapula hoes have a characteristic half-socket or large groove for attaching the handle. The bison skull hoes have been cut from the horn core and adjacent portions of the frontal bone of the skull; the horn core forming the handle with the attached skull sections forming the blade. Additional digging implements include socketed bison tibia digging stick tips, bison ulna picks, and chisel-shaped tools.

Bone awls or perforators are also common and occur in a variety of forms. Perhaps the most abundant type is an awl made from a split deer cannon bone (metatarsal). Other types include awls made from split, splintered or whole bones, rib-edge awls, flat split rib awls, bird bone awls, fish spine awls, etc. Perforated awls or needles have not been found. There are also flat, spatulate-shaped bone tools which display polish from use, possibly in weaving or basket making.

Additional bone artifacts include the deer jaw sickle, deer bone arrowshaft wrenches, beamers, knives or cutting tools made from sections of the bison scapula, and notched bone rasps.

Hollow bones and tubes are also common; more rare are deer toe tinklers, small bone balls, flat bone pendants, and fishhooks. Antler was used for handles, chipping tools or flakers, and other minor purposes. One specimen has been cut and worked as if to form part of an antler headdress. Other unique items include a bone arrowcock and pieces of a bracelet or curved ornament.

Mussel shell is relatively common throughout the middens at Washita River phase sites. The three most commonly used species are maple leafs, black sands, and pimplebacks. One of the most common uses of shell was as a tempering agent in pottery. Shell was also used for flat, disk-shaped, and tubular beads as well as for spoons and scrapers. Small disks of shell and other unidentified items sometimes occur, and these may have served as decorative attachments or insets on wood. Simple shell pendants and small circular gorgets also occur, and one example of the latter from the McLemore site was made of conch shell. Whole shells, especially small snail or *Olivella* shells, were sometimes used for beads.

Miscellaneous stone items include hematite, limonite, steatite, and selenite. Some of these were certainly utilized for pigments, while others, such as the selenite (McLemore site, Burial #34), may have been kept as a curiosity.

Clay was used chiefly for ceramics, although a number of other clay items are found. Clay was normally used as daub in house construction, and small loaf-shaped rolls of raw clay are sometimes found in storage pits or with burials. Human figurines made of clay also occur, and these are occasionally modeled or decorated to provide some anatomical detail. Other clay items include perforated disks made from pottery sherds, simple elbow type pipes, thick walled clay cups having a corncob roughened exterior, and cone-shaped objects thought to have functioned as pot supports (Hofman 1978b), and pottery vessels.

Pottery sherds are common at Washita River Village sites. The most typical ware is plain surfaced or cordmarked. In the eastern part of the region, the most common types are Nocona

Plain, Lee Plain, and Lindsay Cordmarked. The types Stafford Plain and Stafford Cordmarked occur in the more western sites. Some trade sherds and even whole vessels occur more rarely as imports.

The pottery has a variety of tempering materials including shell, caliche, crushed rock, sand, and bone. The typical vessels are globular or vase-shaped jars having a small rounded or flattened disk-shaped base. The rims may be straight or they may flare outward slightly. Bowls and bottles do occur, especially in the eastern sites. Decorations other than cordmarking are not plentiful but include both loop and strap handles, small vertical lip tabs, lugs, appliqued fillets and nodes, incising and punctations. Some slipped sherds are reported and may represent replication of Sanders type pieces from the east (Ferring and Perttula 1986). Trade wares include a human effigy bowl, animal figures attached to the rim of bowls, and identified types which are derived from the Caddoan area.

Trade and contact with neighboring groups is evident from both raw materials and ceramics with major communications extending east and west following the drainage systems. Influences from the Gibson aspect peoples of the Caddoan area become reduced as ones moves westward along the Washita River valley. However, there are increases in Southwestern materials as well as Florence A chert from north-central Oklahoma. Consequently, the Washita River villages reflect minor differences which are a result of geographical variations within their territory.

**The Upper Canark Variant.** Southern Plains Villages representing the Upper Canark variant are found in the Panhandle areas of both Texas and Oklahoma as well as southeastern Colorado and extreme northeastern New Mexico. This cultural pattern has been historically referred to by Krieger (1946), Campbell (1969), Baerreis and Bryson (1965) and many others as the Panhandle aspect. However, in a major revision based on the Willey and Phillips (1958) classification scheme (see also Lehmer 1954), Lintz (1986a) redefined the Panhandle aspect as the Upper Canark variant. This was done because the Panhandle aspect represented a unique and reasonably uniform expression of a cultural tradition which was distinguishable from other variants of the same tradition by its geographical distribution, age, and material culture. Because Lintz's study represents the only refinement of this cultural complex during the past 10 years, the term Upper Canark variant will be used here rather than the more dated label of Panhandle aspect

Based on these considerations, the Upper Canark variant can be viewed as a distinct cultural expression lying between the Canadian and Arkansas river drainages. The temporal range of the Upper Canark variant is from roughly A.D. 900 to A.D. 1500. Included within the Upper Canark variant are the Antelope Creek phase (Krieger 1946; Suhm, Krieger, and Jelks 1954; and Lintz 1986a), the Apishapa phase of southeastern Colorado's Apishapa Plateau (Campbell 1969; Lintz 1986b), and the Buried City complex or Hadley Ruins of Ociltree County, Texas (D. Hughes 1986). The villages, which are characterized by stone slab masonry architecture, are best known from sites situated along the Upper Canadian (Beaver) River valley in the Oklahoma Panhandle and from the Canadian River valley and its tributaries in the Texas Panhandle. Additional sites of the Apishapa phase are situated along the western periphery of this region.

The origins of the Upper Canark variant remain obscure except for roots within older Plains Woodland populations. Baerreis and Bryson (1965) suggest that it represents a southwestern movement of Upper Republican peoples who were forced to move from the Central Plains because of climatic deterioration. Campbell (1969) views this cultural expression as arising from local Plains Woodland cultures and a developing Apishapa phase. Hughes (1968) sees the Upper Canark peoples developing locally out of Plains Woodland and eventually abandoning the region to join their Upper Republican relatives, and subsequently, evolving into Lower Loup and Pawnee in Nebraska. As previously noted, the Custer phase also appears to contribute to these Panhandle developments, which indicates a complex situation that requires much additional research and evaluation.

Published information on the Upper Canark sites is limited and shows a wide diversity in architectural features and village patterns which are still not well understood. Lintz (1986a) attributes variability in architectural forms to functional differences, engineering constraints, and changes in design over time. Although the distinctions that previously existed between the Antelope Creek focus in Texas and the Optima focus in Oklahoma (cf. Watson 1950) have been resolved by placement of the Optima focus within the Antelope Creek phase, other problems remain. The most critical of these concern the distinctions in architecture, material culture, and subsistence practices between the Buried City complex, the Apishapa phase, and the Antelope Creek phase. Until these problems are more fully resolved, it is perhaps better to view each of these as a separate entity within the broader context of the Upper Canark pattern.

**Antelope Creek Phase.** Krieger (1946), Suhm, Krieger, and Jelks (1954), Watson (1950), Campbell (1969), Schneider (1969), and most recently Lintz (1978, 1982, 1986a) have provided summary data on Antelope Creek phase sites in the Oklahoma and Texas panhandles. Important published reports for Texas include: Antelope Creek 22 (Holden 1930; Johnson 1939); Duffield 1970), Antelope Creek 24 (Duffield 1970), Chimney Creek (Baker and Baker 1941), Coetas Creek Ruin 55 (Studer 1934), Alibates 28 (Duffield 1970), Tarbox (Holden 1930), Saddleback (Holden 1933; Green 1967), Arrowhead Point (Green 1967), Medford Rock (Duffield 1964), Spring Canyon, Conner, Pickett, Roper, Sanford, and Canyon City (Duffield 1970), Chicken Ranch (Couzzourt 1980), and Landergin Mesa (Lintz n.d.). Sites in Oklahoma include: Stamper (Watson 1950), Roy Smith (Schneider 1969), Two Sisters (Lintz 1979a), and McGrath (Lintz 1976). Other incompletely reported sites are mentioned in accounts by Krieger (1946), Studer (1931), Moorehead (1931), and Mason (1929).

Lintz (1986a) presents a series of over 50 radiocarbon and four archeomagnetic dates taken from 16 different sites and has identified a temporal range for Antelope Creek from approximately A.D. 1200 to A.D. 1500. These dates place Antelope Creek

somewhat later than the Custer phase but contemporaneous with the Washita River phase.

Village sites usually situated on top of steep terraces or elevated knolls in the floodplain, or occasionally, in the west, on isolated mesas. The few intensive surveys which have been conducted for the Antelope Creek phase are suggestive of a settlement pattern where a higher density of sites occur along principal tributaries of the major rivers than along the primary river systems (Etchieson 1981; Guidry et al. 1979). However, because of the limited number of surveys conducted and the absence of standardized site recording procedures, settlement patterns for the Antelope Creek phase remain essentially unqualified.

Antelope Creek phase sites include temporary camps, possibly bison kill/processing stations, isolated farmsteads/homesteads, hamlets, and villages. Settlements often contain several house units forming a scattered community. They are marked by stone slab masonry which formed the wall base, arranged as single units or compound joined multiple structures. Other Village features include storage pits, shallow pits or possible borrow areas, burials, and midden deposits. In size they range from single family dwellings up to compound multiroomed structures, resembling single story pueblos and having as many as 30 or more rooms.

A characteristic feature of Village dwellings is the use of large stone slabs for wall construction. These were placed vertically to form the wall base and were held in place by adobe mortar. Details of masonry construction however, vary greatly from site to site, and often from structure to structure. Circular, oval, square, rectangular, and irregular structures occur in various sizes, most commonly with a large square or rectangular room having smaller attached rooms which apparently served as storage areas. These units may range in size from less than 5 m to large rooms up to 60 $m^2$. Additional features include passageway entrance, four interior roof support posts, central fireplaces, floor pits, or other features such as internal benches and possibly alters. Storage pits are found, either within the houses or within the village areas. These are either plain circular or oval pits, and were sometimes lined with stone labs.

Burials generally consist of single interments placed in a shallow pit covered with stone slabs. These burials frequently occur on hilltops or mesas overlooking the village although they sometimes are found in trash pits, middens, or within the largest house. When they are placed in a dwelling however, it is usually after it has been abandoned (Lintz 1986a). Individuals are usually placed in semiflexed position with no particular orientation to the skull or body. Grave goods typically found with burials are chipped stone tools, bone tools or ornaments, shell necklaces, and/or domestic pottery. These goods are also rather uniformly distributed within the burial population. Thus, there appears to be little status differentiation reflected in the burial population.

The subsistence economy of Antelope Creek phase groups was based on the growing of tropical cultigens, the collection of edible wild plants, and the hunting of a variety of game animals. In general, dietary practices were similar to those of western groups of the Washita River phase where hunting probably played an equal or greater role than horticultural pursuits. Because of the high meat yield, hunting activities focused on bison although deer and antelope were also taken (Duffield 1970; Lintz 1986a). The meat diet was supplemented by smaller game animals such as cottontail and jackrabbit, prairie dog, ground squirrel, gopher, rat, bobcat, raccoon, badger, and fox. In addition to these mammals, amphibians and reptiles (ornate box turtles, snapping turtles and frogs), fish, and migratory birds (ducks and geese) were also exploited. Mussels were collected from the nearby streams and rivers. Farming consisted primarily of gardening activities along the fertile terrace along the major streams. Here, tropical cultigens such as popcorn and flint corn, squash, and beans were grown. In addition, wild plants including hackberry, mesquite, buckwheat, grasses, cattail, sand plum, persimmon, prickly pear, and Indian mallow were collected (Green 1967; Kellar 1975). These resources illustrate use of a variety of habitats including the river valley as well as upland prairies.

Artifacts manufactured of chipped stone are most commonly made of chert derived from the Alibates quarries north of Amarillo, Texas. Chert items include projectile points, numerous scrapers, knives, drills or perforators, crude hoes, and preforms or unfinished items. Arrowpoints are the most plentiful projectile points although some dart points do occur. Typical arrowpoints are triangular forms with or without side notches (Fresno, Washita, and Harrell types). Corner notched and other forms occur, but they are not abundant at most sites. Chert end and side scrapers made from flakes are common and indicate an extensive skin dressing activity. Knives occur in various forms such as ovate and narrow curved forms, but the alternate-beveled diamond-shaped knife is most typical of these sites. Some notched or corner-tanged knives made from flakes are also present. Perforators or drills occur in several varieties: simple pin-shaped drills, T-shaped drills, and flake drills. They are typically of small diameter and delicate in construction. Although rare, some sites have produced double-bitted notched implements of quartzite, possibly used as hoes or axes.

Implements of ground stone include grinding basins, manos, abraders, hammerstones, ornaments, pipes, and celts. The milling stones typically have oval basins for grinding by a rotary motion with a small hand stone. Trough type metates similar to those in the Southwest are more rare. Wedge-shaped manos are present, suggesting that the metate was well known. There are also some bedrock mortars and sharpening stones at some sites where rock outcrops were handy. Sandstone abraders for smoothing arrowshafts or sharpening bone tools are also common. Stone ornaments include small disk type beads and small turquoise pendants. Stone pipes are represented by equal-armed elbow pipes which usually have a barrel-shaped expanding bowl. The stone celt is found occasionally, but it appears to be a trade item derived from the Washita River or Caddoan peoples living to the east.

Tools and implements made from bone are also common at Antelope Creek villages. Bison and deer bones were preferred although other animal bones were sometimes used. Bone artifacts include the bison scapula hoe, bison tibia digging stick tips, scapula knives, beamers made from bison bone, hide grainers

made from the bison femur head, notched ribs or the musical rasp, arrowshaft wrenches, bone awls, antler flakes, antler tapping tools, spatulas, and tubular bone beads. Bone awls are probably the most plentiful bone artifact, and these occur in several varieties: split bone awls, splinter awls, turkey bone awls, split rib awls, and rib edge awls. Certain varieties were specifically prepared with a square cross section and all four sides carefully smoothed. Perforated awls or needles also occur, but are rare. Rattles made from whole turtle shells are also reported.

Mussel shells occur in the middens and were sometimes used for scrapers, spoons, or shredders. Occasional specimens have notched or denticulate edges and were probably used as a shredder or sawlike tool. Mussel shell has also used for small shell pendants and flat perforated disk beads. Imported shells include *Olivella* and conch shell. There are also some specimens of conch shell, apparently columella sections, which were drilled for tubular-shaped beads.

In addition to items of clay, there are a few additional artifacts such as small pieces of hematite and limonite which were used as a source for pigments. Shaped pieces of microcline are found at some sites along with mica and flakes of obsidian. There are known samples of basketry manufactured with a plaited, twined, or coiled technique. Garden products, other than corn and beans remain to be confirmed by additional discoveries.

Clay was used for several purposes with pottery being the most common items. Perforated pottery disks made from sherds, daub with grass impressions, short tubular pipes, and clay beads are reported, but the tubular pipes and beads are uncommon. Pottery represents the most plentiful clay product at all sites.

The pottery is represented by two types: Borger Cordmarked and Stamper Cordmarked. Differences between the two are minor with Stamper Cordmarked offering greater variations in the rim form, simple decoration, and common presence of mica in the paste. The vessels are typically a globular jar form with a rounded base; the rims are straight, either vertical or with a slight outward flare. The bodies are covered with cordmarks, usually placed vertically except in the basal sections of the vessel. The paste has been tempered with crushed rock, commonly quartz, and sand, but may also have mica, bone, or other materials present. Shell tempering appears to be absent. Decoration is minimal and is more likely to occur on the Stamper Cordmarked variety; it includes lip notches, fingernail punctates, raised fillets parallel to the rim, and incisions. These are limited to the neck or rim area, usually forming a single row of design elements extending around the circumference of the vessel. Small lip tabs rarely occur, but handles remain unreported.

Southwestern pottery trade sherds occur at many of the Panhandle sites. These are typically a black-on-white ware or examples of the glazed wares from northeastern New Mexico. Examples of Abiquiu Black-on-Gray, Aqua Fria Glaze-on-Red, Cieneguilla Red-on-Yellow, St. Johns Polychrome, Rowe Black-on-White, and Lincoln Black-on-Red are reported and evaluated by Baerreis and Bryson (1966). Other trade materials such as obsidian, turquoise, the tubular pipe, and perhaps the *Olivella* shells are also derived from the Southwest. Contacts toward the east are less important, apparently, although conch shell and stone celts indicate some relationships in this direction.

In general, the Antelope Creek sites appear as the most divergent of the Southern Plains villages. This is largely due to the utilization of stone slab construction and differences in the ceramics. The proximity to the Southwest and possibility of multiple origins also contribute to this variation.

**Apishapa Phase.** The Apishapa phase has been summarized by Campbell (1969), Ireland (1968), and Lintz (1986b). Reports on sites of this cultural pattern include: Snake Blakeslee (Chase and Stigler 1949), Trinchera Cave (Wood-Simpson 1976), Pyeatt Rockshelter, Umbart Cave, Steamboat Island Fort, Homestead Enclosure, and other sites on the Chaquaqua Plateau (Campbell 1969), 50OT-79 (Gebhard 1943), Torres Cave (Hoyt 1979), Avery Ranch (Watts 1971; Ireland 1968), Mary's Fort (Zier and Kalasz 1985), 5LA-5554, 5LA-5320, 5LA-5305, and other sites in the Pinyon Canyon area (Lintz et al. 1985), 5LA-1722, 5LA-2169, 5LA-1052, and other sites on the Carrizzo Ranch (Kingsbury and Nowak 1980; Nowak and Berger 1982).

Lintz (1986b) compiled a series of 22 radiocarbon dates from 17 sites and identified a temporal range from approximately A.D. 940 to A.D. 1390. These dates place the Apishapa phase as occurring during the early portion of the Antelope Creek phase and overlapping the latter part of the Custer phase and the early portion of the Washita River phase.

Settlements of the Apishapa people include rockshelters, temporary camps, and open settlements ranging from single room slab enclosures (the most common form) to villages of nearly 60 rooms (Campbell 1969). There appears to be less emphasis on villages compared to the Antelope Creek phase. For example, nearly one-third of the Apishapa sites on the Chaquaqua Plateau are rockshelters (Lintz 1986b). Villages are often situated on mesas or in upper canyon areas. Little work has been done of the nature of Apishapa phase settlement pattern or its divergence from the more typical Antelope Creek pattern.

Villages are characterized by stone walled structures made of contiguous horizontal and vertical stone slabs. Room size varies from free-standing single units to paired adjacent dwellings. Architectural design differs from site to site and reflects adjustments to local situations. The most common floor design is circular although oval, semicircular, and D-shaped rooms also occur. Rectangular rooms such as those found in the Antelope Creek phase are extremely rare. Room size may range from 1 to over 100 $m^2$¶ (Lintz 1986b). Larger structures contain single or double central support posts and central hearths. Apishapa phase sites differ from Antelope Creek phase architectural patterns in their relative absnce of semisubterranean floors, definable entranceways and central floor channels.

Little information exists on storage pits, or other intramural or extra mural features at Apishapa villages. Because Apishapa peoples were thought to be only marginally involved with agri-

culture, the need for large storage facilities may have been less critical.

Only a few burials have been recorded. Burial practices however, are reminiscent of Antelope Creek. Typically, they represent single interments in a shallow pit. Individuals are usually placed in a flexed position and are not generally accompanied by grave goods. Based on existing data, there appears to have been little status differentiation within Apishapa populations.

Subsistence practices reflect a hunting and gathering economy, supplemented by small scale gardening (Lintz 1986b). The reduced importance of horticulture compared to its importance to Antelope Creek phase peoples is attested to by the small recovered quantities of tropical cultigens, the relative absence of bison bone agricultural tools (scapula hoes and digging sticks), and Apishapa phase villages' distance from the fertile terrace soils of the river valleys. Tropical cultigens identified from rockshelters include corn, beans, and gourds. Edible wild plants collected consist of choke cherry, wild plum, grape, yucca, cactus, pinon, chenopodium and amaranth, and purslane (Campbell 1969; Van Ness 1985). Animals hunted by Apishapa peoples include deer, antelope and occasionally bison, and smaller game such as cottontail and jackrabbit, prairie dog, gopher and rats.

The chipped stone assemblage of Apishapa phase groups consists of small unnotched (Fresno) and side-notched (Washita) arrowpoints, bifacial and unifacial knives, scrapers, and drills, and modified flakes. Notably absent are the diamond-beveled knives and the pin- and T-shaped drills found in the Antelope Creek phase. Most of these implements are made of local cherts, jasp›ers, and quartzites with Alibates comprising less than 5% of the chipped stone tool assemblage (Lintz 1986b).

Pecked and ground stone tools include abraders, manos, and shallow grinding basins. The Southwestern style trough metates are rarely found. Ornaments of ground stone are primarily gypsum/calcite pendants.

Only a limited inventory of bone tools has been documented for Apishapa phase sites. Absent from these sites are the bison bone tools such as scapula hoes made from bison skulls, and bison tibia digging sticks associated with tilling of the soil. The most common bone tool forms are deer metapodial shaft wrenches and a variety of awls including splinter, split metatarsal, modified ulna, and a distinctive diamond-shaped awl. Shell artifacts consist of pendants, discs, and scrapers.

Ceramics are the major clay items although unfired figurines are also thought to occur at Apishapa phase sites (Wood-Simpson 1978). Typical pottery vessels are globular cordmarked jars somewhat similar to Antelope Creek wares although exhibiting less decoration in the form of nodes, appliques strips, and lip tabs.

Another important aspect of Apishapa material culture is the perishable items recovered from dry rockshelters in the Chaquaqua Plateau. Here, better preservation conditions has led to items such as sandals, basketry, mats, feathered blankets, skin bags, cordage, snares, and a variety of other goods being found.

Trade goods are occasionally found. Most of these specimens are of Southwestern origin and include *Olivella* and *Neogastropodia* shell beads, marine shell pendants, Santa Fe and Galisteo B/W sherds, Taos Plain sherds, and possibly micaceous wares.

In summary, the Apishapa phase appears to be based on the presence of stone slab architecture and primarily a hunting and gathering economy. Lacking in this pattern are the horticultural base, some architectural elements, the more extensive material inventory, and the cultural dynamics ‹found in the Antelope Creek phase. These conditions may have been brought about by a long term in situ development and relative isolation from the mainstream of the Upper Canark variant (Lintz 1986b:20).

**The Buried City Complex.** The Buried City complex refers to a particular expression of the Upper Canark variant found along Wolf Creek, a tributary of the North Canadian (Beaver) River in the northeast corner of the Texas Panhandle. The complex also apparently extends into Ellis County in western Oklahoma.

Because of the recent identification of this complex as separate from the Antelope Creek phase, D. Hughes (1985, 1986) has presented the only summaries of this cultural pattern. Important sites of the Buried City complex include: Gould Ruins, Buried City or the Handly Ruins (Eyerly 1912; Moorehead 1930), Courson B, and Kit Courson (Hughes 1985, 1986). Additional sites of this complex have also been reported for other portions of the northeast Texas Panhandle. A series of sites along Wolf Creek in Ellis County, Oklahoma may also relate to these developments.

Seven radiocarbon dates from the Courson B site place the temporal range of the Buried City complex from A.D. 1150 to A.D. 1330. Thus, these remains are roughly contemporaneous with the earlier part of the Antelope Creek phase.

In view of the preliminary nature of the information on the Buried City complex, detailed discussion of settlement and community patterns must await further survey data. To date, only hamlets and villages have been identified. With one exception (the Gould Ruin), all structures at these sites represent single units without interior dividing walls. Individual structures may consist of four or five houses up to 20 or more dwellings. Most villages appear to be placed well away from the creek adjacent to the valley wall (D. Hughes 1986).

The architecture of structures along Wolf Creek is quite similar to Antelope Creek phase houses. A major difference ‹however, is the absence of vertical slabs for the walls. Instead, boulders of caliche are used as foundation. This technique is somewhat reminiscent of some Apishapa phase structures. Houses of the Buried City complex also contain larger benches and/or alters than those found in Antelope Creek phase houses and may cover areas up to 65 $m^2$.

Other features normally associated with houses include straight sided refuse filled storage pits and semicircular or D-shaped rooms attached to the southeast corner of the dwellings (Hughes 1986).

Little information is available on burial practices. A few adult females and one child have been excavated from the village at Courson B. Additional burials have been reported from along the valley rim. These data suggest a pattern of loosely flexed interments with no particular orientation to the body. In contrast to the Antelope Creek phase, burials of the Buried City complex appear to contain greater variety in grave goods.

Subsistence practices have not been documented. However, the presence of bison tools related to agricultural activities are indicative of the growing of crops such as corn, beans, and squash. It is suspected that the subsistence pattern will be similar to that practiced by people of the Antelope Creek phase.

The material inventory is also similar to that of the Antelope Creek phase. Lithic artifacts and debris include typical side-notched and unnotched triangular arrowpoints comparable to Washitas and Fresnos. Diamond-beveled knives, flake drills, a variety of bifacial and unifacial scraper forms, and an assortment of other stone tools are also present. Alibates does not commonly occur indicating that people of the Buried City complex were not involved in the Southern Plains trade network which include the Antelope Creek phase.

A limited variety of ground stone items have been found. These consist of poorly formed metates made of local sandstone and simple manos of quartzite. Several pieces of amazonite used for pendants and inlays have also been recovered.

Bone tools are those common to other Plains Village tradition cultures. Included here are: bison scapula hoes, bison skull hoes, bison tibia digging sticks, bison scapula smoothers, deer metapodial awls, and deer mandible sickles. Marine shell items are rare. However, mussel shell pendants do occur at some sites of the complex.

Ceramics differ significantly from those found at Antelope Creek phase villages. Ceramics are typically sand tempered with minor amounts of bone, shell, and clay. The most common vessel form is a large globular jar with an occasional rounded form. Many of the vessels are thick, poorly fired, and exhibit a soft paste (D. Hughes 1986). Unlike Antelope Creek wares, many of the sherds from the Buried City complex exhibit decoration in the form of single, double, and triple rows of fingernail impressions around the vessel neck, chevron designs, and crenulated rims. Other design ele‹ments include applique and fillet, punctation, incising, strap handles, fabric and corncob impressed surfaces, and in one case, a polished surface. Ceramics from the Buried City sites are thought to bear their greatest similarities to pottery found at Upper Republican sites in west-central Kansas (D. Hughes 1986).

**The Zimms Complex.** Sites of the Zimms complex are found primarily in Roger Mills County in western Oklahoma although one site of this complex has been recorded in Woodward County in the northwestern part of the state. At this time, the geographical extent of the Zimms complex is unknown. In general, it appears to fall between the Washita and the North Canadian river drainages. Zimms complex sites are distinguished by an Antelope Creek house floor plan (without stone slab masonry) and a material inventory analogous to the Washita River phase.

Origins of the Zimms complex are unclear. It is suspected however, to have stemmed in part from preceding Woodland developments in the Texas Panhandle and western Oklahoma. Antelope Creek style house plans may also indicate early contact with Upper Canark variant groups.

Summaries of the Zimms complex are presented by Flynn (1984, 1986), Moore (1985), and Drass and Moore (1987). Documented sites of the Zimms complex include Zimms (Flynn 1984), New Smith (Moore 1985), and Hedding (Shaeffer 1965). Other sites include Pyeatts #4 (Moore 1984), and Chalfant (Briscoe 1983).

Four radiocarbon dates and one archeomagnetic date from the Zimms site and one radiocarbon date from New Smith indicate a range for the Zimms complex between A.D. 1265 and A.D. 1425. Thus, the Zimms complex is roughly contemporaneous with the Antelope Creek and Washita River phases.

Settlements consist of small hamlets or isolated homesteads situated on high terraces or ridge toes above principal tributary streams rather than major river valleys. Sites documented to date contain only one or two houses.

It is t‹he nature of the structures which serves to identify the Zimms complex as a distinct cultural expression. Houses excavated at the Zimms and Hedding sites are semisubterranean structures with central, depressed floor channels and a raised floor platform on the west wall. Both houses are square to rectangular (6 x 6 m) and contain a central hearth and two central support posts. Instead of stone slab masonry, walls were plastered with daub to a height of 40 cm. Except for the absence of the vertically placed stone slabs, this architectural pattern is most like houses found among the Antelope Creek phase. Similar structural design elements are present at the Jack Allen and the Footprint sites in the Texas Panhandle.

Other features include steep sided storage/refuse pits, hearths, burials, and arbors. Two arbors were excavated at the New Smith site in association with burials. The arbors were apparently placed over the remains.

Our only information on Zimms complex burials comes from the two features at the New Smith site. These interments are suggestive of a pattern quite different from those of the Antelope Creek phase or the Washita River phase. One burial at the site consists of a woman and child placed in a shallow pit in a tightly flexed position with the woman's head facing south. A woven tapestry was placed over them. An arbor was either constructed over the burial and burned or the individuals were placed under the arbor which was then burned. A second burial was too badly disturbed to fully document, but the pattern is much like the first. The only grave goods found with the two interments were chipped stone knives. Twelve pits were found around the two burned arbors. Each pit contained an expended bison bone tools in the upper level. The only other material in these pits was turtle bone and carapace fragments. These features are viewed as representing an activity set specifically related to a mortuary ceremony.

The subsistence economy of Zimms complex peoples is thought to be similar to that of the Washita River phase although operating at a smaller scale. Evidence for horticulture activities is not extensive. The only tropical cultigen identified is corn from

a refuse pit at the New Smith site. However, bison scapula hoes have been found at the Zimms site. No wild plants except for unidentified grasses have been recovered. There is slightly better evidence for hunting practices. Game animals taken include bison, deer, cottontail rabbit, and prairie dog. Ornate box turtle and birds were also exploited. Based on impressions of these meager data, the Zimms complex subsistence may have focused around hunting and gathering supplemented by gardening. Because of the small size of the settlements, and apparently, a dispersed settlement pattern, such an economic system would have been a viable alternative for these people compared to the more intensive agricultural economy of the Washita River and Antelope‹ Creek phases.

Chipped stone artifacts include unnotched (Fresno) and side-notched (Washita, Harrell) triangular arrowpoints and a limited number of larger dart point styles. Other tools forms consist of diamond-beveled and ovate bifacial knives, unifacial end and side scrapers and knives, and marginally modified flakes. Bifacial drills have also been reported. Although Alibates and local chert gravels are commonly used for tool manufacture, some Florence A chert from the Flint Hills region of north-central Oklahoma is also found.

Ground stone pieces are limited but include manos, grinding basins, sandstone abraders, and diorite celts.

Bone tools consist of bison scapula hoes, bison tibia digging sticks, deer bone metapodial awls, and antler tine arrowpoints.

Ceramics at Zimms complex sites bear strong resemblances to wares found at Washita River phase sites. The dominant pottery type is Quartermaster Plain, a thin compact pottery tempered with shell, limestone, fossiliferous shale, and occasionally grit (Moore 1984). Vessel forms are not well documented but they are probably similar in shape to those found at other Southern Plains Villages. Decoration consists of nodes, rim tabs, and fillet strips. Other pottery found in smaller percentages include Lee Plain and Lindsay Cordmarked.

A few trade items are present at Zimms complex sites. Florence A chert from Kay County occurs in small percentages. There is also some evidence of ceramic trade wares. A few sherds apparently from the Caddoan area (East Incised?) as well as one Taos black on white sherd from New Mexico have been found at the Zimms and New Smith sites.

**The Henrietta Complex.** The Henrietta complex represents the southernmost manifestation of the Southern Plains Village tradition with all of the identified sites located in north-central Texas. The complex was initially defined by Krieger (1946) as the Henrietta focus, based largely upon the presence of shell-tempered pottery and other associated traits. However, because of the poorly documented nature of the cultural pattern and the large, nebulously defined geographical area, Henrietta is more appropriately defined as a complex. This conservative perspective is substantiated by an absence of research on Henrietta complex sites over the past 20 years. The sites are found over a rather large area including several counties of north-central Texas. They occur along the Red River valley and its tributaries, especially the Wichita, Little Wichita (Witty 1936), and Peace rivers. Sites also occur in the headwater region of the Trinity (Harris 1936) and Brazos drainages.

Origins for the Henrietta phase remain uncertain although Lorrain (1969) suggests that it is derived from Plains Woodland cultures such as that represented by the Fish Creek complex in Cooke County, Texas. Lorrain views the Fish Creek complex as traditional between the Plains Woodland and early Plains Village tradition. Corrected radiocarbon dates from the Chicken House site (Valestro and Davis 1970) representing the Fish Creek complex range from A.D. 1287 to A.D. 1687. These dates appear to be too late for a transitional phase from Plains Woodland to a Plains Village culture such as Henrietta unless the Henrietta complex is considerably later than developments to the north. The dates are based upon charred corncobs, however, and consequently, may provide erroneously late assignments.

The M. D. Harrell site, Young County, Texas, serves as the type site. Krieger (1946:137) included a number of sites such as Onion Creek, Pilot Creek, Ragland, Farmerville, and various unnamed sites with which he was familiar, but he relied chiefly upon the Harrell site (Hughes 1942) for his primary data. Little information has been added since 1946 except for the work at the Coyote site (Woodall 1967) and the Glass site (lorrain 1967), in the Red River valley, and notes published in the Dallas Archeological Society Record. Krieger's original report (1946) remains as the only primary source on the Henrietta phase.

The only radiocarbon date attributed to the Henrietta complex proper is A.D. 1575 ± 145 (Harris 1959). However, because of the problem with multiple occupations at Henrietta complex sites, this date is late and of uncertain affiliation.

Henrietta phase villages are located upon sandy knolls or terraces overlooking the river valleys. Most of the sites are small in size, ranging from .5 to 2 ha, but they frequently have middens of considerable thickness indicating a lengthy occupation. Village features not only include midden deposits, but numerous rock hearths, storage pits, houses, and burials. Fireplaces or rock hearths are common at the Harrell site; they are either flat or shallow dish-shaped hearths often lined with limestone slabs or smaller fire-cracked rocks. Storage pits include simple irregularly shaped pits as well as larger more carefully prepared storage pits. Information about houses is scanty. Lorrain (1967) reports a single structure from the Glass site. It is represented by an oval floor area measuring 6.6 m by 4.8 m within a saucerlike depression. There were four postholes irregularly spaced around the margins of the floor area roughly at the sides and ends of the structure. No fireplace was present nor were any peripheral wall support posts noted. It is possible that other architectural elements were destroyed by intrusive cache pits into the house area. It is more likely however, that this is an arborlike structure constructed by later occupants of the site.

Burials occur as flexed or semiflexed skeletons placed within a cemetery area. The graves contain either single or multiple burials, sometimes having stone slabs placed around and over the grave. Burial offerings are not common but sometimes include personal ornaments such as shell beads. Harris (1945) reports an unusual flexed burial from the Pilot Creek site which contained eight bison scapula hoes placed upon a bed of mussel shells and charcoal. Refuse deposits at the site appear as sheet

middens scattered throughout the village area.

Projectile points are the most common chipped stone artifacts at the Harrell site. Arrowpoints such as Fresno, Washita, Harrell, and Scallorn types are most typical, but Alba, Bonham, and Perdiz types also occur in small numbers, suggesting contacts to the east and south. Numerous dart points were also found at the Harrell site, but they probably distinguish an earlier component at the site. Additional chipped stone implements include knives, scrapers, drills, and unfinished items. The flint knives are typically a leaf-shaped form, either wide or narrow and frequently asymmetrical, or the diamond-shaped alternate beveled type. Chert scrapers are represented by small endscrapers, side scrapers, including spokeshave forms, and oval scrapers. Numerous scrapers have graver tip projections. Drills or perforators are present, either a stemmed form with a T-shaped or rectangular base, or simply a drill shaft worked upon an otherwise unmodified flake. Simple serrated flakes or flint "saws" and obsidian are also reported.

Ground stone artifacts include milling basins, manos, hones and abraders, celts, pipes, and hammerstones. The milling basins include both the Southwestern type metate and the milling slab. Manos are common and include a variety of forms, with large two-handed manos appearing in the Red River valley area. Sandstone hones and abraders for smoothing arrowshafts and sharpening bone tools are characteristic of the Village sites. Celts are represented by two main forms: a small celt made from hematite, and a larger, thick, polished stone celt similar to those found to the east in the Caddoan area. Stone pipes are represented by small equal-armed elbow pipes, usually made from a fine grained sandstone or siltstone.

Bone and antler artifacts are common at the Henrietta Village sites, especially those along the Red River. Gardening tools are represented by the bison scapula hoe, with and without a complete socket for hafting, and the bison skull hoe or scoop. Bison bones were also used for making digging stick tips, notched ribs or rasps, scapula knives and scraping tools (beamers?), and rib-edge awls. Awls are plentiful but are more commonly made from deer or other animal bones. They include awls made from split deer cannon bones having various amounts of finish and shaping, splinter awls, and fish bone awls. Flat spatula-shaped bone items as well as fishhooks also occur, but they are not common. Tubular bone beads and bone tubes are present, and some of the bone tubes from the Harrell site have been carefully decorated with incised designs. Deer antler is represented by antler-tip flaking tools and cut antler sections for drifts and tapping tools.

Shell items other than whole mussel shells from the middens are scarce in Henrietta phase sites. Some whole shells were apparently used as small containers, spoons, or scrapers. Some shells having serrated edges occur and were used as saws or shredders. A number of shells have rough perforations placed close to the hinge and may have served as pendants, crude hoes, or as a source for shell in making beads. Shell disks, pieces of shaped shell, and flat disk-shaped beads also occur. The *Olivella* shell bead is rare but occurs at some sites.

Some miscellaneous items not mentioned above are also present. These include pieces of meteorite, blocks of hematite showing striations from preparing pigment, chert hammerstones, and pottery impressions of coiled basketry. Small sandstone balls, apparently shaped from concretions occur at the Harrell site.

Clay was used primarily for pottery, but a few other clay items appear. These include fragments of crude figurines, a single broken pottery bead, and disks shaped from pottery sherds. The dominant pottery type is represented by Nocona Plain which is commonly found at eastern Washita River phase sites. Nocona Plain sherds are typically shell tempered with large reduced shell pieces present on the surface. Vessel forms are limited to simple bowls and deep jars having a bulging shoulder and outflaring rim; the bases are rounded or flat. Handles appear to be absent and decorations are rare, being limited to small appliqued nodes applied around the neck section. There are also a few sherds of a thick corncob-roughened ware, similar to the small cylindrical cups found in the Washita River phase in Oklahoma. Occasional trade sherds indicate contacts with the Caddoan area as well as the Southwest. Other trade contacts are suggested by the presence of obsidian and Alibates chert.

The Henrietta complex remains as one of the poorest documented Village complex in the Southern Plains area. There are also noticeable differences between remains found along the Red River valley and the regions to the south, which suggests that further subdivisions may be necessary. Moreover, there are numerous similarities with the contemporary Wylie phase (Suhm, Krieger, and Jelks 1954; Stephenson 1952) located to the east, and some parallels with the older Sanders phase as manifest at the Sanders site (Krieger 1946). How these affect the Henrietta complex remains unclear. Considerably more information is necessary in order to properly assess the Southern Plains villages in north-central Texas.

J. Hughes (1968) has suggested that the Henrietta complex represents an early Kichai occupation, being derived from the Washita River phase in Oklahoma. While this is a reasonable argument, there is other evidence to suggest that indigenous Red River valley peoples also contributed to its formation.

**Bluff Creek Complex.** The Bluff Creek complex refers to a series of villages occurring in southern Kansas adjacent to the Oklahoma border. Bluff Creek exhibits similarities to the Central Plains tradition (e.g., Great Bend aspect), and the Washita River phase in Oklahoma. Sites belong to this complex are found along Bluff Creek, a tributary of the Chickaskia River in Hayes and Sumner counties, Kansas. This cultural pattern may also extend northward to the Arkansas River drainage in Harvey County (Witty 1978).

Origins of the Bluff Creek complex are unclear. Brown and Simmons (1987) attribute its development to Southern Plains influences (the Washita River and Custer phases) and the Central Plains tradition. However, based on radiocarbon dates of around A.D. 1050, these sites appear to be contemporaneous with the Custer phase rather than the Washita River pattern. Because these dates reflect relatively early Plains Village developments, origins for Bluff Creek are probably to be found in local Plains Woodland cultures.

Reports on the Bluff Creek complex have been limited. Witty

(1978), O'Brien (1984), Brown (1986), and Gould (1975) have presented summaries. Reports dealing with specific sites include Armstrong (Gould 1975), and Buresh and Nulik (Witty 1969, 1978).

Radiocarbon dates obtained for the Buresh site place Bluff Creek around A.D. 1050 (Witty 1978:63).

The settlement pattern consists of small villages or hamlets often situated on high terraces or ridges overlooking the stream valley. As in the case of the Zimms complex, there is a tendency for sites to be located on principal tributaries rather than in the major river valleys. No information is currently available on the variability in site types or their distribution.

Villages characteristically have two or three earth lodges. These lodges are usually present as low circular mounds. Based on four structures excavated at the Buresh site, the earth lodges are square, oval, or rectangular in shape and may contain up to 35 $m^2$ in floor area (Witty 1969). At least one structure had an extended entranceway. Only one house had a central hearth suggesting that meals may have been prepared outside. Interior features consist of cylindrically shaped storage pits and large, basin-shaped trash pits. The storage pits are also usually filled with trash. The exterior walls appear to have been partially covered with daub. There are also shallow depressions adjacent to each houses where the mud was borrowed. These depressions were subsequently filled with household trash. The only features other than those found associated with houses were external storage pits and basin-shaped trash pits. No individual burials or cemeteries have been reported.

Subsistence of the Bluff Creek people probably focused around a horticultural economy supplemented by hunting and gathering. Currently though, data supporting this assumption are quite limited. Agriculture is evidenced by the presence of charred corncobs and bison scapula hoes. No remains have been analyzed to indicate the types of wild plants collected. Even ident‹ification of their hunting practices is limited to the knowledge that bison and deer were being exploited.

The chipped stone tool inventory includes side-notched (Washita) and basally notched (Harrell) arrowpoints, diamond-beveled knives, and unifacial scrapers. Most of these items are made of Florence A chert from the Flint Hills region of north-central Oklahoma and south-central Kansas.

No discussion of ground stone tools found at Bluff Creek sites has been presented. However, they are likely to contain a typical Plains Village ground stone assemblage of manos, grinding basins, sandstone abraders, small celts, and stone pipes.

A variety of bone tool forms occur. They include bison scapula hoes, skull hoes, and tibia digging sticks as well as shaft wenches made from deer tibias (Witty 1978:62-63). Not reported are pins, awls, or other miscellaneous bone pieces.

Ceramics from Bluff Creek complex sites have generated considerable discussion (Witty 1969, 1978; Brown 1986; O'Brien 1984). The common pottery type at these sites is a globular vessel form with flattened or slightly concave bases and occasionally strap handles. Exterior surfaces are generally cord roughened or sometimes plain. Tempering materials include sand and crushed and burned bone. In some instances, these vessels have collared rims similar to those found in Central Plains villages. A smaller percentage of the pottery consists of shell-tempered wares with smooth exteriors, strap handles, and applique strips around the vessel neck. These are thought to represent Lee Plain type vessels traded from Washita River phase sites in south-central or west-central Oklahoma.

Based on the presence of Lee Plain sherds and other items in the material inventory (e.g., Harrell points), Witty (1978:63) suggest that Bluff Creek bears similarities to Southern Plains Village sites. The occurrence of earth lodges and globular, cordmarked pottery also points to considerable influence from the Central Plains. Thus, the Bluff Creek complex represents a mixture of both cultural patterns. This perception of Bluff Creek contains a few problems. As noted earlier, the radiocarbon dates are too early for Bluff Creek to be contemporaneous with the Washita River phase. A connection with earlier Custer phase peoples would resolve this concern. This is unlikely though, because Custer phase sites do not contain large percentages of shell-tempered pottery or Harrell points. It appear that either the dates are erroneous (too early) or that the Buresh site is multicomponent and the dates and material assemblage are from different occupations. The exact nature of the Bluff Creek complex's relationship to other cultural groups on the Central and Southern Plains must await further study and documentation.

**The Pratt Complex.** The Pratt complex was initially defined by Wedel (1959) on the basis of materials recovered from the Pratt site in Pratt County, Kansas. This complex exhibits similarities to both Central Plains sites and Southern Plains developments (e.g., the Washita River phase). Pratt complex sites appear to be located in the Upper Ninnescah River drainage (Witty 1978) and generally between the Medicine Lodge River and the Arkansas and Smoky Hill rivers in south-central and west-central Kansas. The complex is not well documented with excavated sites recorded for only three Kansas counties: Pratt, Pawnee, and Rush (Brown and Simmons 1987).

Origins of the Pratt complex have not been identified. Wedel (1959:510) attributes its development to Central Plains cultures, and potentially, to the Washita River phase in Oklahoma.

There have been no detailed summaries of Pratt but Wedel (1959), Witty (1970), and Brown and Simmons (1987) provide reviews of this cultural pattern. In addition to Pratt, the type site, investigations have been conducted at the Seuser site (Witty 1970) and the Larned site (Monger 1970). A few other unnamed sites also have s‹urface materials resembling the Pratt complex.

No radiocarbon dates are available for the Pratt complex. Wedel (1959:510) suggests a date of A.D. 1400-1500 based on Southwestern trade sherds at Pratt and the presence of a Great Bend variant component overlying the Pratt occupation.

Information on settlement patterns are meager. Pratt complex sites have been found along oxbows (e.g., the Larned site) as well as on terraces. Sites are typically villages of 5-10 earth lodges. No other site types have been reported.

Earth lodges at these villages contain rounded and braced corners, four interior support posts, and a central hearth. Cylindrical-shaped storage pits also occur within the houses. Pratt complex structures appear similar in size to those of the Bluff

Creek complex, being approximately 6 x 6 m. No information is available on exterior features. Burials have also not been reported at any of the excavated sites.

The subsistence economy was probably based on agriculture, hunting, and gathering, much like the Bluff Creek sites as well as other Central Plains villages (Brown 1986). Charred corn and bison scapula hoes were recovered from the Seuser site (Witty 1970) indicating some relatively intensive agriculture practices. Some knowledge of hunting activities have been obtained from the presence of large quantities of bison and deer bone at the Larned site. The Larned site also contains some evidence of plant collecting in the form of charred sand plum pits and charred berry seeds.

Characteristic chipped stone tools consist of notched and unnotched triangular arrowpoints and diamond-beveled knives. No discussion has been presented on ground stone specimens found at Pratt complex sites. Bone tools are also not specifically inventoried although a variety are reported to exist at the villages.

Four indigenous ceramic wares have been described for the Pratt complex (Wedel 1959). The first of these, Ware A, is sand tempered and cordmarked with flaring or excurvate rims. Decoration consists of short diagonal incising or punctations. Ware B is similar except that it is plain surfaced rather than cordmarked. The third ware (Ware C) is much like the previous two except that it is plain surfaced, has a very fine sand temper, and straight rims. The fourth pottery type (Ware E) differs markedly in being shell tempered with flared rims, and decoration consisting of diagonal incised lines and applique strips around the vessel neck. The fourth ware is thought to bear similarities to Washita River phase pottery such as Lee Plain.

A number of trade goods were found at Pratt complex sites. These include Rio Grande Glaze and Biscuit B (Bandelier Black on Gray) pottery from Pratt and other Southwestern sherds from a site in Rice County. Other items include turquoise from the Pratt site and Larned sites and *Olivella* shell beads from the Larned site (Brown and Simmons 1987).

Wedel (1959:510) suggests that the Pratt complex stands intermediate, temporally and culturally, between the Washita River phase of south-central Oklahoma and the Great Bend variant sites in west-central Kansas.

**Pomona Variant.** Village farming sites of the Pomona variant are found throughout the eastern one-third of Kansas. This manifestation was initially viewed as a complex and subsequently defined as a focus (Witty 1967). Based on the presence of Pomona traits within other phases, Brown (1984) recently reclassified it as a major cultural theme for eastern Kansas during Village farming times. This redefinition was merited because the Pomona variant represents a distinct cultural unit separate from other late prehistoric cultural complexes and traditions occurring in Kansas and the southern. These differences are in the areas of the architectural form of houses and ceramic attributes.

The Pomona variant is thus viewed as a distinct cultural expression found between the Missouri River and the Oklahoma-Kansas state line. The eastern one-third of Kansas where Pomona variant sites are found includes the Glaciated region, the Osage Cuestas, the Chatauqua Hills, and the Cherokee Lowlands. Four subdivisions have been described for the Pomona variant: the Clinton, Wolf Creek, May Brook, and Apple Valley phases. In general, these phases can best be viewed as reflecting a blend of Eastern Woodland and Plains material cultural. The origins of Pomona are generally attributed to indigenous Woodland groups such as the Butler and Greenwood phases. Some similarities to the Keith variant of western Kansas are also seen in the ceramic assemblage (Witty 1978; Brown 1984). There are no definitive explanations for the disappearance of the Pomona variant. The Apple Valley phase extends from A.D. 1300 to A.D. 1430 with no evidence for the demise or changes that may have occurred in the Pomona cultural expression.

Wilmot (1970), Witty (1967, 1978, and 1981), O'Brien (1974), Brown(1984), and Brown and Simmons (1987) have provided detailed summaries of the Pomona variant. Important sites of the Pomona variant include: Roth (Brogan 1982), Dead Hickory, Anderson, Keen (Witty l983), Kroll (Witty 1983), Infinity (Witty l967), as well as numerous other sites including those present in Elk City Lake (Brogan 1978) and Perry Lake (Witty 1983).

Approximately 30 radiocarbon dates have been compiled on Pomona sites and place the temporal span of this cultural complex between A.D. 900 and 1450 (Brown and Simmons 1987:Appendix E 9-10). Based on this information and variability in the cultural assemblages, dates were assigned to the four phases comprising the Pomona variant: Clinton phase (A.D. 960 to 1430), Wolf Creek phase (A.D. 980 to 1325), May Brook phase (A.D. 1150 to 1285), and the Apple Valley phase (A.D. 1300 to 1430). Brown's (1984) analysis of these dates is also suggestive of a southeast to northwest movement over this span of time. The range in these dates place Pomona fully within Village farming times and contemporaneous with the Custer, Washita River, and Antelope Creek phases.

The settlement pattern of the Pomona variant consists of small villages or hamlets, isolated homesteads, temporary camps, butchering stations, and a variety of other limited activity sites (Blakeslee and Rohn 1982). Most sites are situated on terraces or floodplains of principal streams and rivers. Small villages or hamlets are often characterized by widely dispersed residences forming a community settlement structure. Dwellings are variably shaped, wattle and daub structures up to 10 by 11 m. These dwellings seldom display internal hearths or benches and platforms commonly found with Village farming residences. Other features associated with habitation sites include hearths, basin-shaped, straight-walled, and bell-shaped pits, and burials. Pits sometimes occur within houses whereas, as noted above, hearths are seldom found as intramural features.

Limited information is available on burial practices. Only 20 burials from four sites have been analyzed (Brown and Simmons 1987). These are typically flexed or semiflexed single interments. Burials of infants, children, and adults of both sexes are generally found adjacent to residences or in midden areas.

Burial furniture found with these remains include small ceramic bowls. chipped stone tools, and occasionally bone ornaments. Grave goods are also occasionally found with infant burials (Marshall 1972). The available information however, is not suggestive of any major status differentiation based on age or sex.

Subsistence activities were focused around a gardening economy supplemented by hunting and gathering. Tropical cultigens grown by Pomona variant peoples include corn, beans, and squash. Sunflower was also grown, probably in open areas around houses. Excavations at JA115 in the Little Blue River valley of western Missouri have provided documentation on the variety of wild plants collected by these groups (Brown and Ziegler 1981). Included here are chenopodium/amaranth, chickweed, giant ragweed, spurge, purslane, and hackberry. Hazelnuts, hickory nuts, acorns, and walnuts were also harvested. Less information is available on the animal species exploited. The absence of these is primarily a function of poor bone preservation at most Pomona sites. Despite these constraints, there is evidence for the hunting of bison, elk, white-tailed deer, raccoon, cottontail rabbit, and gopher. Because much of the information on plant and animal remains has been drawn from a small number of sites, variability in diet composition and the economic mix of hunting, gathering, and farming practices is not fully understood.

Material remains present at sites representative of the four phases of the Pomona variant are diverse but also exhibit common characteristics, particularly in the ground and chipped stone and ceramic assemblages. Chipped stone items include projectile points, bifacial knives and drills, unifacial scrapers and knives, as well as flake knives, scrapers, and gravers. Although a few corner-notched dart points occur at Pomona sites, small triangular arrowpoints with corner notches, side notches, and basal notches (Scallorn varieties, Washita, and Harrell types) are much more frequently encountered. Substantial numbers of bifacial and unifacial knives and scrapers attest to considerable emphasis on hide working. However, the diamond-beveled bifacial knives commonly found on the Plains are absent from sites of the Pomona variant. There is some significance to variations in the chert material types used in chipped stone tool manufacture (Brown 1984). The Wolf Creek and May Brooks phases make extensive use of nonlocal cherts for arrowpoints whereas the Clinton and Apple Valley phases use primarily local materials. These may reflect differences in trade emphases or perhaps differences in the types of sites under investigation. Temporary camps, for example, may have greater percentages of arrowpoints made of nonlocal chert because of the nomadic movements of the group.

Ground stone implements include manos and metates, pitted stones, hammerstones, abraders, celts, limestone elbow pipes, and shaped pieces of hematite and galena. Metates are in the form of oval to irregularly shaped grinding basins. Manos are flat, oval stones suitable for use with grinding basins rather than those made for use with trough style metates. The celts are usually oval to rectangular and are made of sedimentary, igneous, and metamorphic rock. Three different varieties of abraders are found at Pomona variant sites. These include tabular, irregularly shaped pieces, rectangular grooved stones, and incised stones (Brown and Simmons 1987). All three forms exhibit V-shaped and U-shaped grooves and were probably used as shaft smoothers as well as in bone tool manufacture. Worked pieces of hematite found at these sites are often in the form of discoidals.

Bone tools are rare at Pomona occupations. Again, this is primarily due to poor bone preservation. Bison scapula hoes occur at three sites (Winn, Slough Creek, and Harsh) while other items such as pins/awls or tubular beads are infrequently found at Pomona sites (Brown 1984).

The ceramic assemblage is distinguished by considerable homogeneity. Pomona wares were initially described by Wilmeth (1970) based on the analysis of sherds recovered during excavations at the Hart site (14OS305). Vessel forms consist of globular jars and bowls with flared or excurvate rims and occasionally collared or constricted necks. Witty (1983) however, views the latter form as a trade item. Tempering agents include grog, clay, limestone, and shell. Brogan (1981) has also found grit temper in Pomona ceramics at the Roth site. Exterior surfaces usually exhibit cordmarked impressions below the vessel neck. Brown (1984) has identified three types of Pomona wares based on rim form and decoration: (1) Pomona Plain Rims, (2) Pomona Decorated Rims and Lips, and (3) Pomona Knobbed Rims and Lips. He views these variations in rim form to be temporally and spatially sensitive and uses them in phase identification.

The importance of trade in the Pomona variant has not been elaborated on. There is however, some evidence for exchange with other groups. Witty (1983), in his work at the Keen and Kroll sites recovered pottery which he attributes to trade with Mississippian groups to the east as well as with Plains societies to the west. Some Florence A or Kay County chert from north-central Oklahoma has also been found at Pomona variant sites.

The Pomona variant is viewed as a Village farming society which exhibits Plains as well as Eastern Woodlands characteristics. The ceramic assemblage and the exploitation of prairie habitat species (bison) bear affinities to Plains Villagers living in the Flint Hills, Smoky Hills, Wellington-McPherson Lowlands, and Arkansas River valley regions to the west. The architecture of Pomona houses however, shows ties with Eastern or indigenous Woodland groups. The disappearance of the Pomona variant cannot be easily explained. This manifestation is not easily recognized in the historic tribes of the region nor is there evidence to suggest emigration from the area. There has been some recent speculation that the latter portion of the Pomona variant is proto-Kansa, but this argument has little supporting documentation.

**Other Complexes and Phases.** Besides the cultural units discussed in detail here, other Village societies exist on the periphery of the study area. These include the Smoky Hill and Upper Republican variants of north-central and northwest Kansas and the Sopris phase of the Upper Purgatoire River valley in southeast Colorado. The Smoky Hill and Upper Republican variants are Plains Village manifestations occurring in central and western Kansas between approximately A.D. 1000 and 1500 (Witty

1978; Wedel 1959; O'Brien 1984; Ludwickson 1978; Lippincott 1978). People of these two cultural complexes practiced small scale farming supplemented by communal bison hunting. Their sites are typically scattered settlements of three to four earth lodges or isolated lodges. The material assemblages are characterized by globular cordmarked pottery, a chipped stone inventory dedicated to bison hunting and butchering and processing, and gardening tools (e.g., hoes and digging sticks) made primarily from bison bone. Some arguments have been made for these cultures developing into historic Pawnees (Ludwickson 1975, 1978).

The Sopris phase of southeast Colorados repreents a semi-sedentary Village farming society which exhibits considerable evidence for Southwestern (Puebloan) influence (Eighmy 1979; Lintz 1985). The three subphases of Sopris (early, middle, and late) date between A.D. 1000 and 1225 (Wood and Bair 1980). Sites of this cultural pattern consist of semi-sedentary settlements characterized by pithouses during the early subphase and later by adobe and stone slab architecture. The material assemblage contains corner-notched arrowpoints, Sopris Plain, Taos gray, and Southwestern style pottery, and Southwestern style manos and metates (Lintz 1985). The Sopris phase is viewed as an early Athabascan group which adopted Plains Woodland and Southwestern characteristics (Wood and Bair 1980). This manifestation is viewed as culturally distinct from northern Anasazi groups.

Many other sites in the study area undoubtedly reflect the existence of additional Village societies. Excavated sites such as Bell in Comanche County, Kansas (Brown and Simmons 1987:XVII-2), and Manwell (Brooks 1989) and Uncas (Galm 1979; Vehik and Flynn 1981; Vehik and Ashworth 1983) in central and north-central Oklahoma provide examples of undefined or less well defined cultural complexes. In the case of the Manwell site, the people who occupied this camp may represent our first well documented evidence of hunter-gatherers the Plains Village period in the study area. Until their cultural expressions are

better documented, these sites cannot be readily distinguished from the many identified occupations in the area representing typical Plains-influenced Village farming societies.

## Summary

In reflecting upon societies of Southern Plains Villagers such as those groups discussed for the study area, they are viewed as developing a way of life which represents cultural adaptations to the bison and a Southern Plains environment. These adaptations were probably initiated by various Plains Woodland peoples some 1400 to 2000 years ago. Within the Southern Plains area, this transition from a Plains Woodland pattern to an early Plains Village scheme first takes place in the Custer phase area, sometime between A.D. 850 and A.D. 900. By A.D. 1200-1250 the Plains Village pattern had become well established and was flourishing throughout all of the Southern Plains region. This pattern was characterized by exploitation of bison rather than deer and by propagation and/or cultivation of tropical cultigens and edible wild native plants. These rather dramatic changes were probably stimulated by changing climatic conditions (Brooks 1986; Drass 1986). As conditions became drier during the period from roughly A.D. 900 to A.D. 1600, this fostered the development of prairie habitats more favorable to bison herds. With the greater abundance of bison, Plains Villagers increasingly sought these herbivores as a source of food, hides, and bones for tools. The drier conditions also forced villagers to move to the river valleys and principal tributary streams where they were somewhat buffered from the full effects of the drought (Brooks 1987). Such movement would facilitate gardening activities in the fertile floodplain soils. It would also account for the high density of settlements in this habitat during the middle and late Plains Village period. Differences which exist, and which are indicated by the various named phases and complexes, reflect diverse Woodland origins, influences derived from neighboring peoples or variations in local resources.

To summarize briefly, the Southern Plains Village tradition emerges from a Plains Woodland population who eventually developed a bison hunting/plains economy during the period between A.D. 850 and A.D. 1000. During the following 400 to 500 years, from A.D. 100 to A.D. 1500, these Plains Villagers were successfully established throughout the study area, but especially in central and western Oklahoma, the Texas Panhandle, the Red River Valley, and south-central Kansas. Consequently, they appear to represent the most successful adaptation to the area in prehistoric times. The identity of these Plains Village societies in regard to historic tribes also deserves additional discussion. All evidence points to ancestral linkages with various groups of the Wichita (the Wichita proper, Iscani, Taovayas, Tawakoni, Waco, and Kichai), the Pawnee, and the Kiowa-Apache. By the time of Coronado's entrada in 1541, many of these tribes were firmly established in various parts of the Southern Plains.

Chapter 7

# PROTOHISTORIC CULTURE HISTORY ON THE SOUTHERN GREAT PLAINS

*Jack L. Hofman*

In the Southern Plains region the Protohistoric period begins with the first Spanish entrada of Coronado in 1541 (Bolton 1916; Gunnerson 1984; John 1975; Kessell 1979; Schroeder 1962; Wedel 1986:Table 8.1; Winship 1896; Vehik 1986). The Protohistoric period is encompassed by the time when there were limited European contacts with the area and brief records of these journeys, but no proper history. Following Linton (1936:386-392) we can recognize two distinctive, though not mutually exclusive types of cultural groups on the Plains during this period, the semi-sedentary villagers on the east in the Prairie region and the nomadic hunters/traders on the west in the Plains proper. The distinction between Protohistoric and Historic is somewhat arbitrary, and early written accounts of the indigenous peoples provide limited and uneven coverage of the region and of the cultural groups. The transition to the "fully" Historic period varies from area to area and depends upon the group under consideration. Generally, it is after 1750 or even 1800 that historic documentation becomes more complete for this region. The final gasp of the free roaming lifeway for native inhabitants of the region occurred in 1874 as a result of the MacKenzie campaign on the Southern Plains (P. B. Hughes 1978; Nye 1968). Some archeologists have referred to this period as the Late Ceramic (Brown and Simmons 1987), or occasionally as Late Neo-Indian (J. Hughes n. d.).

In general the High Plains region or western portion of the study area was dominated by Apachean groups from an indeterminate period until about 1725 (Forbes 1960; D. Gunnerson 1974; Wilcox 1981). The problems of Athabaskan migration routes and time of entry into the Southwest and Southern Plains has a considerable literature and there are a variety of migration models which need not detain us here. The interested reader is directed to these important papers: D. Gunnerson (1974), John (1975), Schlesier (1972), Thomas (1935), and Wilcox (1981). By the mid-1700s the Western Plains region was dominated by Comanches and their Ute allies (Cassels 1983; P. B. Hughes 1978; Wallace and Hoebel 1952).

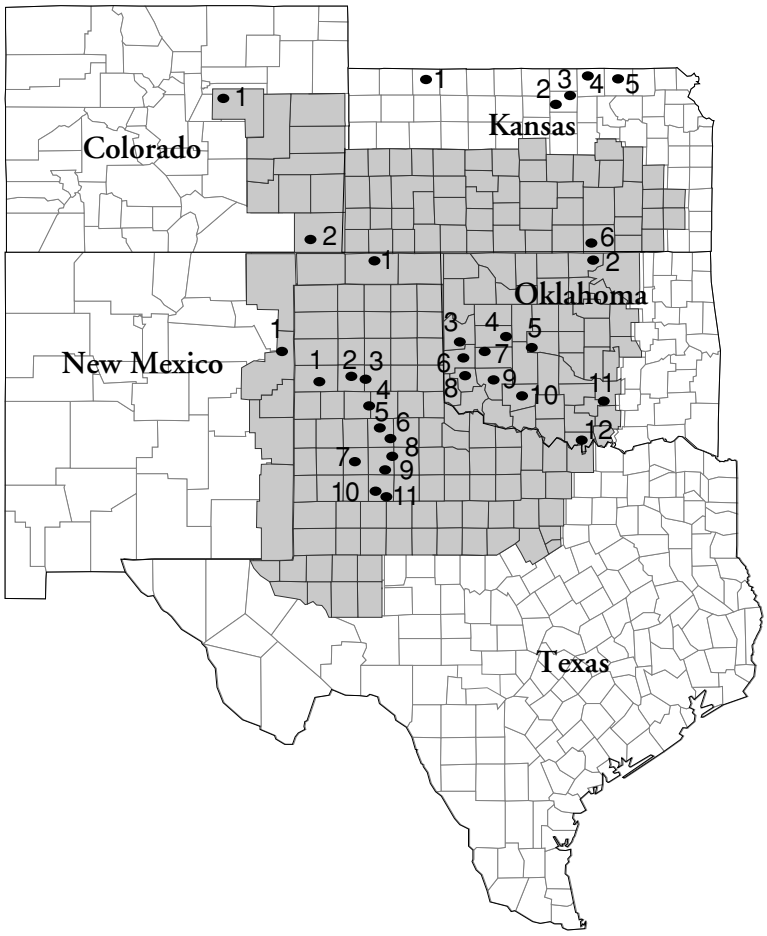
Other groups of considerable importance in the region during this later period include the Kiowa, Cheyenne, and Arapahoe (Lowie 1954; Wedel 1961). Puebloan refugees were also active in the region and variously allied with the Apaches during the late seventeenth and early eighteenth centuries (Early 1975; Opler 1971, 1975, 1982). The Apache and later the Comanche conducted active trading and sometimes raiding with the eastern Pueblo groups such as Pecos and Picuris (Baugh 1982; Ford 1972; Riley 1984; Spielmann 1982; W. Wedel 1982) as well as similar interaction with the Caddoan and Siouan horticultural groups to the east. On the Prairie Plains these more eastern groups who were ancestral to the Wichita, Hasinai, Pawnee, and others were involved in trade with the Plains nomads and to some extent with the French and later American frontiersmen (Bell 1981; M. Wedel 1981, 1982; Bell, Jelks, and Newcomb 1967). This period was one of dynamic cultural interaction with technological and economic changes which influenced many facets of social life, group organization and material culture. The rapidity of economic and technological changes during the period between A.D. 1550 and 1800 has presented keen problems for interpreting the "traditions" of cultural groups via the archeological record during this period. It is especially difficult to convincingly assign particular assemblages of this age to specific cultural groups, even though this is a problem which has received considerable archeological and ethnohistorical attention.

The horse-using and bison-hunting Plains cultures of early Historic times represent a convergence of adaptations by groups with distinct ethnic and economic backgrounds (Oliver 1962). The impact of the horse on trade, mobility, economy, relationships between groups, and internal social structures was considerable. In conjunction with the introduction of increasingly accessible European and Euramerican trade goods and diseases, the rapidity of culture change in the area was probably much greater than that witnessed by any other comparable temporal segment of the Southern Plains archeological record.

In the Western Plains region, the Dismal River aspect is the most well known Protohistoric archeological complex and will be discussed first as it is manifest in the High Plains region of several states. Complexes specifically defined for Protohistoric sites in Kansas, Oklahoma, and Texas will then be discussed. Key Protohistoric archeological sites in the Southern Plains region are indicated in Figure 18.

### Dismal River Aspect.

The Dismal River aspect was first defined by Strong (1935) based on collections from sites on the Dismal River




Colorado
1. Cedar Point
2. 5LA1721

Kansas
1. Scott County Pueblo (14SC1)
2. Tobias (14RC8)
3. Thompson (14RC9) and Malone (14RC5)
4. Paint Creek (14MP1)
5. Marion sites
6. Larcom-Haggard (14CO1) and Elliott(14CO2)

New Mexico
1. LA5543 (Quay County)

Texas
1. Tierra Blanca (A264)
2. Fifth Green
3. Cita Mouth (A288)
4. Sand Pit (41BI46)
5. Country Club (41FL1)
6. Montgomery (41FL17)
7. Lubbock Lake (41LU1)
8. Pete Creek (41CD1)
9. Bridwell (41CB27)
10. Garza (41GA40)
11. Lott (41GA56)

Oklahoma
1. Lucas Vessel (Texas County)
2. Deer Creek (34KA3) and Bryson Paddock (34KA5)
3. Goodwin-Baker (34RM14)
4. Little Deer (34CU10)
5. Scott (34CN2)
6. Edwards I (34BK2)
7. Duncan (34WA2)
8. Taylor (34GR8)
9. Devils Mouth (34KI1)
10. Parade Ground (34CM322)
11. Lowrance (34MR10)
12. Longest (34JF1)

**Figure 18. Locations of selected protohistoric sites on the Southern Plains.**

in Hooker County, western Nebraska. More complete documentation was provided by research at the Lovitt site, 25Ch1, in Chase County (Hill and Metcalf 1942), at Ash Hollow Cave (Champe 1946) and at White Cat Village in Harlan County (Champe 1949; Gunnerson 1960; see also Wedel 1986:137-151). The Stinking Water focus was defined for these materials in the western Nebraska region (Hill and Metcalf 1942?). The age of these sites as determined by Southwestern Pueblo sherds, tree ring dates and occasional finds of European goods (Gunnerson 1968; Wedel 1986) has been established between A.D. 1675 and 1725. Characteristics of this complex include numerous triangular chipped stone arrowpoints, abundant scraping and hide processing tools, double ended drills, serrated fleshing tools, and a ceramic complex dominated by thin dark sand and/or micaceous tempered sherds. These generally represent small globular vessels with shoulders and gently flaring rims generally comparable to utilitarian wares of the Upper Rio Grande Pueblos such as Pecos and Picuris. Surface treatments include lip impressions and various punctations on the rim with smooth or simple stamped vessel surfaces. Attributes of these ceramics reflect similarities with both Puebloan and Plains Villager ceramic traditions, but are generally distinct from the latter (Wedel 1986:144).

Architectural evidence comes primarily from two of these sites (Lovitt and White Cat Village) and is interpreted to represent roughly circular structures 6 to 7 m in diameter with five central support posts and a central unlined hearth. The walls were apparently made by leaning poles against the main frame and covering them with brush or skins. It has been suggested that these five-post structures were similar to the forked stick hogans used by the Navajo (Gunnerson 1960). The floor was at the ground surface or in a shallow excavation and no interior storage pits have been recorded. Baking pits or roasting pits and shallow "borrow pit" type features are reported from several sites. The classic bell-shaped storage pits common to Plains Villager sites are not documented from Dismal River components, and this supports the interpretation that these groups were only minimally dependent upon storage of crops. The limited occurrence of horticultural tools is also suggestive. They appear to have had their economic focus on hunting and trading, although ethnohistoric documents do indicate that they raised some corn in small gardens. As indicated by Wedel (1986:142), the Dismal River sites occur primarily in a region which may not have been conducive to horticulture and this may have been a factor in their limited horticultural endeavors.

A second form of structure often attributed to the Dismal River people is documented from western Kansas and northeastern New Mexico. Small Pueblos containing seven contiguous rooms, prepared interior rectangular hearths, and other distinctly Puebloan characteristics have been reported from Scott County, Kansas (Wedel 1959; Witty 1983) and from Colfax County, New Mexico (Gunnerson 1969, 1979). These structures are most probably of Puebloan construction (Opler 1971, 1975, 1982), but the occurrence of Dismal River materials on the sites is also well documented. These sites may reflect the activities of refugee Puebloan people from the Upper Rio Grande (Pecos and Picuris) area during the period of and following the Pueblo Revolt in 1680 (Early 1975; Kassels 1979).

In western Kansas repeated research at the Scott County Pueblo site (Gunnerson 1969; Wedel 1959; Williston and Martin 1900; Witty 1983) documented the presence of Dismal River materials in association with a Puebloan structure. This complex was defined as the Scott focus (Wedel 1959), and additional related material is known from a number of other western Kansas sites (e.g., Bowman 1960).

Materials attributed to Apacheans and related to the Dismal River aspect are reported from northeastern New Mexico (Gunnerson 1969, 1968, 1979; Gunnerson and Gunnerson 1971, 1970; Hammack 1965). In southeastern Colorado, Apachean occupation has been suggested for sites such as Cedar Point Village (Cassells 1983; Wood 1971), and a number of stone circles and other sites, some of which have ceramics comparable to Dismal River aspect material. Anderson (1985:37-38) provides a detailed discussion of previous studies which have attributed southeastern Colorado sites to Apachean activity. An important recent study dealing with the problem is by Kingsbury and Gabel (1983) who have documented a number of tipi ring sites in the southeastern Colorado area, some of which may be attributable to the Apache. Other groups who utilized the area, such as the Comanche, Ute, Cheyenne, and Arapahoe may also be responsible for the construction of stone circle sites in the region (Wood 1971).

For the Texas Panhandle region possible Apachean, Pueblo-influenced, and perhaps Dismal River-related materials are reported from several sites (Baugh 1986; Habicht-Mauche 1987; Hughes 1978; Katz and Katz 1976; Keller 1975; Parker 1982; Parsons 1967; Runkles and Dorchester 1986; Willey and Hughes 1978; Word 1963, 1965). These assemblages and collections bear resemblances to Dismal River but have been organized into other archeological units and will be discussed separately.

In western Oklahoma materials have been reported from several sites which compare favorably with Dismal River assemblages (Baugh 1982; Dale 1973; Hofman 1978f; Wyckoff 1971, 1973), but the cultural affiliation of these collections remains obscure. Much of the Oklahoma material has been subsumed within complexes which can be discussed separately from Dismal River.

### Protohistoric Complexes in Kansas

Information pertaining to the Protohistoric archeological complexes in Kansas has been recently summarized in Brown and Simmons (1987), O'Brien (1984), and Wedel (1986). In

addition to the Dismal River aspect and Scott focus discussed above, well known Protohistoric archeological complexes in Kansas include the Great Bend aspect, the Oneota aspect, and the Lower Loup aspect. Only the Great Bend aspect is of particular relevance to the area of this discussion.

**Great Bend Aspect.** The Great Bend aspect was defined by Wedel (1935, 1941, 1959) for materials excavated in McPherson, Rice, and Cowley counties, Kansas. Study of the Paint Creek site was first made and reported by Udden (1900). The complex was first referred to as the Paint Creek focus, and has been subsequently defined as the Great Bend aspect by Wedel (1959) who defines two separate foci: Little River and Lower Walnut. Both complexes are accepted as representing the proto-Wichita groups and include the villages of "Quivira" visited by Coronado in 1541. The age of the Great Bend sites predates the 1541 Spanish entrada by an undetermined but relatively short time. The few radiocarbon dates have indicated "modern" sample ages or dates back to about 1700 (Wedel 1986; Rohn and Emerson 1984). Origins of the Great Bend aspect have been discussed by several authors with the primary differences being whether the contribution from Caddoan groups to the south in the Oklahoma area was substantial and involved migration of peoples (Wedel 1959, 1968), or was more a matter of in situ development from already established Caddoan groups (Vehik 1976). Significant similarities exist between the Great Bend sites and the Neosho focus, Washita River phase, and Antelope Creek phase. An improved understanding of the Pratt and Bluff Creek complexes in south-central Kansas and other late ceramic materials in the area may aid in evaluating these interpretations.

Information on the south-central Kansas proto-Wichita villages comes from both ethnohistoric and archeological documentation (Bell, Jelks, and Newcomb 1967; M. Wedel 1982; W. Wedel 1959, 1961, 1968a, 1968b; Rohn and Emerson 1984). The villages are large and cover from 50 to 250 ha, consisting of clusters of circular or oval, grass covered beehive-shaped houses and numerous low refuse mounds. To date, no evidence for fortifications is reported for the Kansas sites, but palisades do occur on Oklahoma sites occupied by these peoples during the eighteenth century. Large bell-shaped storage pits are common and reflect the economic emphasis on maize, beans, and squash horticulture. The Wichita economy was also focused substantially upon bison hunting and the groups are known to have taken seasonal (especially fall) bison hunts. During these hunts the "permanent" villages may have been almost completely abandoned. Arbors as well as houses are probably represented, but the most intriguing features are referred to as Council Circles and may represent ceremonial structures associated with solstice observances (Wedel 1967).

There is a general geographic difference between the Little River and Lower Walnut foci with the Little River sites located in the Great Bend region between the Smoky Hill and Arkansas rivers. These sites include the Paint Creek site in McPherson County studied by Udden (1900), and the Thompson, Tobias, and Malone sites in Rice County (Wedel 1959). The Lower Walnut focus is well known from study of the Larcom-Haggard, Arkansas City Country Club, and Elliott sites in Cowley County along the Lower Walnut. More recently, research on related sites on the Cottonwood River in the Marion, Kansas area has provided additional information pertaining to structures, dates, and material assemblages (Rohn and Emerson 1984).

Differences in cultural materials between the Kansas foci are primarily in terms of ceramics and a few minor traits. Little River focus pottery is primarily of two types, Geneseo Plain and Geneseo Simple Stamped both of which are tempered with sand or grit (Wedel 1959). The vessels are rarely flat and more commonly jars with round bases, prominent shoulders, and usually direct or slightly everted rims. Decorations are limited to punctation or incised lines on the lip and rim area and occur on about 50% of the vessels. Strap handles and rim tabs occur occasionally. Red slipped sherds and cordmarked sherds also occur in limited frequency.

The Lower Walnut ceramics are distinct in having fine crushed shell temper. These vessels are referred to the Cowley Plain type and include bowls as well as jars which usually have flat bases and are shouldered with flaring rims. Strap handles are riveted to the shoulder and rim and rim tabs as well as applique decorations are fairly common. These attributes compare well with those found on earlier ceramics in central and eastern Oklahoma in the Washita River phase and Fort Coffee phase (Lopez 1973; Vehik 1976; Hofman 1978f). The differences in temper may relate in part to availability and abundance of mussel shells. Additional ceramics occur as trade wares from the Southwest and include a variety of Rio Grande Glaze types which date between circa 1650 and 1750 (Wedel 1982). Other Southwestern materials which occur on these sites has been summarized by Wedel (1982).

Bone artifacts of the Great Bend aspect sites include types present in many Plains Villager sites such as bison scapula hoes, antler flaking tools, antler tine scraper handles, bone projectile points, shaft straighteners, knives made from scapulae ("squash knives"), serrate fleshers and beamers made of metapodials from bison and deer respectively, hide working tools, and paint brushes made from the cancellous ends of humeri and femurs, curved strip of bone which may have been bracelets, and a variety of awls. Bone beads occur as do various forms of shell beads and most of the latter are apparently made from local mollusks.

Stone artifacts include triangular arrow points which are commonly unnotched (Fresno type) or less commonly side notched (Washita type), ubiquitous small to medium planoconvex end and side scrapers made on flakes, bifacially flaked beveled knives which often have a notched or squared

hafting end, less formal bifacial knives, and informal flake tools for cutting and scraping. Drills with expanding bases are common, and distinctive ensiform (cigar-shaped) pipe drills are especially indicative of this time period and complex. Catlinite pipes of an L-shape are well represented and other ground stone artifacts include grooved mauls, arrowshaft smoothers, sandstone disks, awl sharpener abraders, and grinding equipment including rotary and back-and-forth metates or grinding basins and circular and loaf-shaped hand stones. Ground stone celts and chipped stone double-bitted axes are reported the Lower Walnut focus. Raw materials used in manufacture of stone tools are dominated by Niobrara jasper in the Little River focus and by Florence (Flint Hills) chert in the Lower Walnut focus. Exotic stones include Alibates, Obsidian, and occasional pieces of turquoise.

Artifacts of European origin are found occasionally in the Little River sites. Most well known of these are pieces of Spanish chain mail which have been found at five sites (W. Wedel 1975). Other European materials include blue glass beads, iron items such as an axe head and awl, and rolled tubular copper beads (W. Wedel 1959:579). Wedel (1959, 1961, 1968b) and others (Bolton 1916, 1949) have accepted these Great Bend villages as the ones called Quivira by the earliest Spanish explorers in central interior North America.

### Protohistoric Complexes in Oklahoma

**Protohistoric Wichita.** Following the occupation of Great Bend aspect sites in central and southern Kansas which lasted until sometime before 1700, tribal groups known historically as the Wichita apparently moved south along the Arkansas River in northern Oklahoma where they were reported by DuTisne in 1719 (Bell 1984, 1981; Bell, Jelks and Newcomb 1967; Hartley and Miller 1977; John 1975; Sudbury 1976; M. Wedel 1981). The Wichita actually included several related tribes which had merged by Historic times. These included the "Wichita, Iscani, Taovayas, Tawakoni, Waco, and Kichai" (Bell 1984c:363). The village sites on the Arkansas in Kay County, Oklahoma include the Deer Creek site, 34Ka3 (Sudbury 1976; M. Wedel 1981), and the Bryson-Paddock site, 34Ka5 (Hartley and Miller 1977). During occupation of the northern Oklahoma sites the Wichita were intimately involved in trading with the French, primarily hides, furs, and salt for a variety of European manufactured items such as guns, gun flints, kettles, mirrors, beads, and iron tools. One of the distinctive native-made artifacts of this period is the large scraper, both end and side retouched forms, made of Florence chert. It is likely that the Wichita controlled access to some of the primary sources of this material for several generations. Other distinctive aboriginal artifacts include triangular unnotched arrowpoints, expanded base drills, various bone tools including possible projectile points, weaving tools, awls, and hoes. Ceramic artifacts include elbow pipes, shell-tempered plain sherds from large shouldered jars with strap handles and direct or slightly everted rims. A small percentage of simple stamped pottery is also present as are occasional incised sherds and sand tempered sherds. Remains of corn, beans, squash and other plant foods are documented and a variety of faunal material is dominated by bison and deer, but with smaller mammals, birds, turtles, fish, and shellfish represented. Cultural features include the large refuse mounds typical of Great Bend aspect sites, circular to oval structures apparently covered by grass thatch, and at the Deer Creek site a circular ditch or fortification.

During this period the Wichita were in conflict with the Osage. Apparently in order to improve trading conditions, the Wichita abandoned their villages on the Arkansas and moved to south-central Oklahoma by about 1750. Primary sources on the southern Oklahoma Red River Wichita sites include Bell and Bastian (1967) and Duffield (1965). The Longest site (34Jf1) was studied as part of the Wichita pilot study project (Bell, Jelks, and Newcomb 1967) and is interpreted to represent the fortified Taovayas village which was attacked by the Spanish under Parrilla in 1759 (Duffield 1965). The excavations at the Longest site provided good information pertaining to the circular grass covered lodges of the Wichita and documented the presence of a circular fortification enclosure. The cultural materials at the Longest site are dominated by items of European manufacture and the last gasp of native technology is represented by the assemblage. Abandonment of the Red River villages by the Wichita is not well documented. A large Wichita encampment is reported on the North Fork Red River in Devil's Canyon, Kiowa County, Oklahoma in 1834 by the U. S. Army Dragoons under Colonel Dodge. The site layout was sketched by the ailing George Catlin based on a word-of-mouth description, but the site has received only brief study (Bell and Bastian 1967:120-121). During the 1850s Wichita villages were located on Rush Creek in Grady County, Oklahoma. During the Civil War the Wichita moved to Kansas and later returned to settle primarily in the vicinity of Anadarko, Oklahoma (Bell and Bastian 1967:122).

**Wheeler Complex.** The Wheeler complex was defined by Bell and Bastian (1967:123-126) during an initial survey of potential Wichita archeological sites in Oklahoma. A series of three sites served as the primary basis for this definition and all were located in west-central Oklahoma; the Little Deer site in Custer County (34CU10), the Scott site in Canadian County (34Cn2), and the Wilson Springs site in Caddo County (34Cd5). The sites are distinguished by the common occurrence of triangular unnotched arrowpoints, very common large planoconvex end and side scrapers, expanding base drills, dark thin sandy paste pottery of a type now referred to as Edwards Plain (Baugh 1986), abundant bison bone, a few items of Southwestern origin (Glaze sherds, turquoise, and obsidian), possible native-made gunflints, and an extremely

limited amount of European trade material including beads. The chipped stone items are most commonly made from Florence chert which has primary source areas in the Kay and Osage county area of Oklahoma and adjacent portions of Kansas. The intensive use of Florence chert and the distinctive large scrapers of this material, which are directly comparable to those from known Protohistoric Wichita sites in north-central Oklahoma on the Arkansas River (Hartley and Miller 1977; Sudbury 1976; M. Wedel 1981), provided the basis for discussing these sites in conjunction with possible Wichita locations in the region (Bell 1984c). None of the sites have been excavated and only the collection from the Little Deer site has been described in detail (Hofman 1978f).

The age of the Wheeler complex has been fairly well established by cross dating of distinctive Southwestern and Plains artifact types to the period between A.D. 1650 and 1725, or essentially contemporaneous with the Dismal River aspect and with the Wichita settlements in southern Kansas and northern Oklahoma in the Arkansas drainage. Important artifacts for the cross dating of the sites include the large scrapers of Florence chert which do not become common on the Arkansas River Wichita sites until after 1650, the predominance of triangular unnotched arrowpoints, toothed metapodial fleshers, elaborate form tubular pipes probably from Pecos, ensiform (cigar-shaped) "pipe drills," Glaze V sherds, possible native-made gun flints, and rare European items including glass beads and lead sprues (Hofman 1978f:72-74, 1984c).

The ethnic identity of the Wheeler complex people has been discussed repeatedly and a consensus as to what specific historical group is represented has not been reached (Bell and Bastian 1967; Baugh 1982, 1986; Hofman 1978f, 1984c; Swenson 1986). The majority opinion holds that these assemblages reflect the activities of Wichita (or Wichita-related Caddoans) who are historically related to the Late Prehistoric villagers who occupied the region until at least A.D. 1450. Historic documentation of Wichita "trade fairs" and seasonal hunting in the area provides reason to expect sites of these groups to occur there. As noted by Bell and Bastian (1967:126), "the ceramics, in combination with the other traits, distinguish the complex from other known archaeological cultures in Oklahoma." But, they continue,

> Identification of the Wheeler complex as Wichita is speculative, although the artifact content and temporal position, whether relatively early or late, indicate that, if not Wichita, it must have been participating in the same sphere of interaction as known Wichita sites. Ethnohistoric data suggest that Caddoan and Wichita groups were living on the Canadian River in western Oklahoma in 1601 (Schroeder 1962:18-19). The Wichita are known to include a number of subdivisions such as the Tawakoni, Waco, Taovayas, Iscani, as well as other subtribal or band groupings. Possibly the Wheeler complex represents a westerly subdivision of the Wichita group which is different from those represented by the Deer Creek or Longest occupations. (Bell and Bastian 1967:124)

Analysis of the Wheeler complex is done with considerable handicap due to the fact that none of the Wheeler sites have been excavated. The nature of structures and features remains undocumented. The amount of horticultural activity is ill defined as there are grinding stones but no definite bone horticultural tools. Excavations could reveal whether bell-shaped storage pits are present (as with the Wichita villages) which would suggest some importance for storage of horticultural products, or whether such storage pits do not occur (as with the Dismal River sites) which would suggest limited emphasis on storage corn and associated crops. The problem would remain, however, as to whether Wheeler sites might represent seasonal hunting and trading villages of Wichita or other Caddoans, perhaps used during the fall. Such sites would appear substantially different from the horticulturally oriented Wichita villages located along the Arkansas in northern Oklahoma.

Encampments of the Apache and related groups in western Oklahoma during this time would also be expected to reflect an emphasis on hunting, minimal horticulture, and extensive trading. An artifact assemblage which exhibits elements from distinct cultural groups is in keeping with expectations for both nomadic Apachean hunters-traders and for Wichita or related horticulturalists involved in hunting and trading. The lithic assemblage of the Wheeler sites is dominated by raw material which is directly comparable to Wichita sites in northern Oklahoma, but the artifact forms are well represented in both Wichita and Dismal River assemblages. The ceramics from Wheeler sites, however, do not compare well with the documented proto-Wichita assemblages. The collection from the Little Deer Site provide an example.

Unquestionably, this pottery has its closest similarity with the Dismal River type Lovitt Plain (Metcalf 1949). The pottery is not like ceramic wares believed to be of Wichita manufacture. Pottery from Bryson and Deer Creek, from Great Bend aspect sites, and from Washita River sites suggest a long tradition of pottery making which is easily distinguishable from the primary Little Deer pottery. If the Wichita are responsible for the Wheeler component, then there seems no plausible explanation for the Dismal River-like pottery. It is doubtful that the Wichita would have made one kind of utilitarian pottery at Bryson and Deer Creek and a completely distinct type using different techniques at the Wheeler sites. With their long standing tradition of pottery manufacture there is no apparent reason why the Wichita would require foreign culinary pottery. Furthermore, the presence of the fairly large quantity of pottery at Little Deer suggests that the site was more than a temporary, satellite hunting-processing camp. (Hofman 1978f:83).

This normative argument with regard to pottery manufacture by a "single group" does not rule out Wichita activity or participation in events at the Wheeler sites. It is simply an argument against accepting the Wichita as the authors of the Wheeler complex ceramics. In a trade fair setting we could expect such combinations of elements. Alternatively, if nomadic hunters were trading hides to the Wichita on the Arkansas, they might commonly acquire good hide working tools from the Wichita to aid them in the preparation of hides for marketing. During the years of the Pueblo Revolt, which was coincident with the Wheeler complex, the hide trade and exchange systems to the west (Rio Grande Pueblo area) may have suffered and become less reliable. During such periods, increased emphasis on trading with the Wichita to the east might be expected by some Apachean groups.

Alternatively, the ethnic responsibility for the Wheeler complex pottery has been argued by Baugh (1982:217, 1986) to belong with the Wichita. Baugh (1986) has interpreted the Wheeler complex and Edwards complex, another western Oklahoma Protohistoric complex, to represent a single cultural unit and believes the ceramic assemblages reflect an in place continuum of development from the preceding Washita River phase. The key link in Baugh's developmental model is the ceramic type Little Deer Plain. Little Deer Plain as defined by Baugh (1982:77-81, 1986:172) is clay or grog tempered utilitarian pottery argued to be very similar to, and to have developed from Lee Plain, a common Washita River phase type in central Oklahoma. The Little Deer Plain type has in fact a very minor occurrence at sites with Washita River phase components (Brooks et al. 1985:Table 7) and is also a minor type at the Wheeler sites. It is most abundant at the Edwards site where it represents slightly more than 8% of the ceramics, but at most sites it is no more frequent than might be expected for imported pottery.

The determination of whether such indigenous pottery reflects gradual change in style, response to specific ecological restraints, or the combination of elements from separate ceramic traditions will require more than recording the frequencies of sherd types at a number of sites. The Wheeler complex remains a distinctive archeological unit and logical arguments can be made and to some extent supported for the ethnic identity of these people with either Plains Caddoans or Athabaskans. A major problem in evaluating these alternative interpretations resides in meshing the archeological and ethnohistorical records, and working to reduce the limitations in each by systemic analyses. The available information on the Wheeler complex documents alternative interpretations and many unanswered questions (Baugh 1982, 1986; Bell and Bastian 1967; Hofman 1978f, 1984c; Swenson 1986; Wyckoff 1973)

**Edwards Complex.** The Edwards complex was defined in 1979 based on assemblages from the Edwards (34Bk2), Taylor (34Gr9), and a component at the Goodwin-Baker site (34Rm14) all in western Oklahoma. Before the 1979 manuscript was published (Hofman 1984c), work at the Duncan site (34Wa2) indicated the presence of another similar assemblage. Sites assigned to the Edwards complex, contrary to Baugh (1986:167-168), were not originally part of the Wheeler complex and subsequently separated from it. Prior to the definition of the Edwards complex, these sites had no archeological taxonomic assignment. This fact is of interest in regard to Baugh's (1986) recent combining of all Edwards and Wheeler complex sites together into the Wheeler phase. Despite this reassignment, I still believe the Edwards and Wheeler complexes to be distinctive at the assemblage level. They merit taxonomic differentiation based on the cultural materials from these sites, regardless of interpretations pertaining to the ethnic identity of the groups involved.

The Edwards complex is interpreted to date between A.D. 1500 and 1650, based on radiocarbon and obsidian hydration dates (Baugh 1986:Tables 2 and 3; Perkins and Baugh 1986). The Duncan site appears to date primarily between A.D. 1400 and 1600, after consideration of corrected dates and the context of dated samples. The complex is characterized by thin, gray-black to brown, sandy paste ceramics usually representing small jars, which have rounded or occasionally flat bases. Ceramic temper is primarily sand but may include particles of mica, sandstone, and other materials. The most common type is defined as Edwards Plain (Brooks et al. 1985; Baugh 1986). This ceramic ware is comparable to Upper Rio Grande Pueblo utility wares except that it is believed to be made using a coiling and paddle and anvil technique rather than a coiling and scrape and drag technique typical of the Pueblo utility wares (Habicht-Mauche 1987). Further work is needed to determine the reliability of sorting small sherds of these types based on this technological difference. Ceramic pipes are also represented and include fragments of Pecos elaborate form pipes.

Imported ceramics include traded sherds from the Caddoan area to the southeast and from the Pueblo area. Exchange between the Red River Caddoan area and the Edwards site apparently occurred throughout much of the history of the Edwards site occupation. Caddoan types represented include Nash Neck Banded, Emory Punctate, Avery Engraved, Sanders Plain and Engraved, and a variety of other types (Baugh 1982). Southwestern Pueblo trade sherds include Glaze Paint Wares from the Rio Grande, Plain Red Wares and various corrugated utilitarian wares (Baugh 1982).

Lithic tools are dominated by small triangular arrowpoints lacking notches (Fresno type, about 70%), with side-notched and basally notched arrowpoints and side-notched arrowpoints less common. Expanded base drills and numerous end and side scrapers are also characteristic. The scrapers are small to medium sized, rather than the large style distinctive of the Wheeler complex and Protohistoric Wichita sites. Lithic materials include Obsidian from several sources

(Baugh 1986), Edwards chert from central Texas, and Florence chert, but are dominated by Alibates and Tecovas from the Texas Panhandle area.

Bone artifacts include awls, toothed fleshers, bone and shell beads, antler tine tools, "squash knives," and possibly scapula hoes.

Notable among the Edwards sites is the presence of large circular enclosures measuring approximately 50 m in diameter which may represent fortifications. These features are present at the Edwards site in Beckham County, the Duncan site in Washita County, and possibly at the Taylor site in Greer County. Other features include numerous post molds but no definitive house patterns have been documented. Pit features apparently do not include deep bell-shaped storage pits common to more eastern Plains Villager sites. At least these features are very infrequent in occurrence.

The economy of Edwards complex people was apparently focused heavily on bison hunting and trading. Trade probably involved bison products such as hides, dried meat, selected bones, fat or grease, and other items such as salt. Trade included interaction with Rio Grande Pueblo groups and Caddoans living further to the east as indicated by ceramics and other imported items. During the last of the Edwards complex items of European manufacture probably entered into this trade system. Detailed discussions of the nature of this trade can be found in Baugh (1982), Spielmann (1981, 1983), Ford (1973), Speth (1983). Subsistence included intensive use of turtles and other small animals to supplement the bison. The nature of bison hunting by Edwards people is not well documented. Several kills of Late Prehistoric or Protohistoric age are known in the area and these are primarily single animal or small herd kills (Brooks and Flynn 1988; Anderson and Chappibitty 1968; Hofman 1980; Johnson et al. 1977). More extensive kill-processing sites are thought to be present but have not been investigated. Further to the southwest, but possibly contemporary with the early Edwards complex, the Garnsey bison kill site and campsite has received intensive study (Speth 1983; Speth and Parry 1980; Parry and Speth 1984). This site represented at least one springtime kill dated to about A.D. 1500 at which there is evidence for intensive selective processing of the bison remains for fat and grease. These products may have been of considerable importance for trade with Rio Grande Pueblo groups, especially during the spring which is a season of high stress (Speth and Spielmann 1982).

**Wheeler Phase.** The Wheeler complex and Edwards complex were recently combined into a single archeological taxon by Baugh (1986). The reasons for this are stated to be the result of finding an assemblage at the Duncan site, located geographically intermediate to the Edwards I site and the Little Deer site, which exhibits elements of both the Edwards and Wheeler complexes in terms of lithics and ceramics. Baugh (1986:168) argues for an east to west "clinal variation" in assemblages and states that, "these two cultural units should continue *[sic]* to be considered one manifestation and that the number of sites and available radiocarbon, archeomagnetic, and obsidian hydration dates argue for a single phase designation for these localities."

As the number of sites and number of chronometric dates have little bearing on the distinctiveness of site assemblages, much of Baugh's argument is poorly supported. The fact remains that the Wheeler sites have assemblages which are easily distinguishable from Edwards sites and that it is probably premature to simply lump these under a single archeological taxonomic unit. We cannot "continue" to consider these as a single phase as the sites had never been included within the same complex prior to Baugh's writing. If it is important to define a single Wheeler phase, then I would suggest that at least two subphases corresponding to the Wheeler complex and Edwards complex need to be recognized. The position of sites such as Duncan and Lowrance (Wyckoff 1973) need to be clarified, but the cavalier assessment that the Duncan and Goodwin-Baker sites are single component is unsupported and improbable given the tendency for key site settings in the region to have been repeatedly occupied. More fundamentally, it is not critical whether the sites are multicomponent or single component, but whether the components can be separated and justifiably distinguished one from another. The rapidity of change in the material culture of Protohistoric groups in the region is another factor which is of concern. The technology and assemblage composition of single groups may have changed rapidly and more dramatically between A.D. 1500 and 1800 than during any preceding time in the aboriginal occupation of the region. Therefore, we need to monitor differences as closely as possible in order to gain clues as to ethnic, functional, temporal, and trade orientation variability between components. The hunting camps, winter villages, and trading sites of the same group may all exhibit substantially different assemblages. Evaluation of these problems can be done more effectively if distinctive differences between components are considered as problems to be explained rather than glossed over by combining considerable variation within a single taxonomic framework. The structures at the Goodwin-Baker site have been attributed to the Wheeler phase by Baugh (1986) and include a possible arbor as well as square houses with post and waddle and daub walls and interior hearths (Swenson 1986). The possibility of multiple components at Goodwin-Baker may be supported by the diverse assemblage which has as yet not been reported in detail, and by the available chronometric dates.

## Protohistoric Complexes in Texas

**Garza Complex.** The Garza complex has been defined by Hughes (n.d.) and discussed in some detail by Baugh (1986), and Johnson et al. (1977). The Garza site and point type were originally defined by Runkles (1964) based on study of a Garza County site, and detailed site studies have been presented for the Country Club and Montgomery sites in Floyd County (Word 1963, 1965; Northern 1979), the Pete Creek site (Parsons 1967) and Bridwell site (Parker 1982), in Crosby County, the Lubbock Lake site near Lubbock (Johnson et al. 1977), and the potentially affiliated Garnsey Spring Campsite and bison kill in Chaves County, New Mexico (Speth 1983; Parry and Speth 1984). The Garza complex is dated between A.D. 1500 and 1650 (Holliday et al. 1983; Baugh 1986), and again the economy was apparently focused heavily on bison hunting with minimal evidence of horticulture. Ceramics are distinguished by a high frequency of Southwestern sherds, with other materials of Southwestern origin occurring in varying frequency but including obsidian, turquoise, and *Olivella* beads. The predominant utilitarian ceramics at these sites includes thin, dark sandy and micaceous paste wares similar to Gunnerson's (1971) Perdido Plain and the recently defined Tierra Blanca Plain. Some sherds have a micaceous slip similar to some Pueblo utilitarian ware. Lithics include materials similar to the Edwards complex, but basally notched triangular arrowpoints of the Garza and Lott types are common. No evidence of permanent structures has been documented.

**Tierra Blanca Complex.** The Tierra Blanca complex was defined by Hughes (n.d.; see also Habicht-Mauche 1987), and is best known from research at the Tierra Blanca site (A264) in Deaf Smith County (Spielmann 1981). Three structures were documented and three periods of occupation are believed to be represented extending from about A.D. 1400 until the Historic period. A tipi ring, semisubterranean slab-lined circular structure, and a windbreak or small arbor type structure are reported. Permanent structures are also reported to occur on other Tierra Blanca sites (Hughes n.d.). Other sites attributed to this complex include Fifth Green (A1363) and Cita Mouth (A288). The occurrence of Glaze wares and thin dark utilitarian ceramics distinguishes the Tierra Blanca sites. Also, they generally lack or have rare occurrences of the basally notched Garza and Lott arrowpoint types typical of the Garza complex sites. Habicht-Mauche (1987:176) suggests a time frame for the Tierra Blanca complex between A.D. 1400 and 1650, and her ceramic analysis indicates a close genetic relationship between the Tierra Blanca striated utilitarian wares and the Upper Rio Grande Pueblo faint striated utility wares. The Tierra Blanca complex is believed to represent nomadic bison hunters who were actively involved in trading with the Upper Rio Grande Pueblos. The relationships between the Tierra Blanca complex, the Garza complex, and the Edwards and Wheeler complexes have yet to be well defined. Important differences and similarities exist between the various assemblages and continued study of these materials provides one of the more fascinating problem areas in Southern Plains archeology, due in part to the possibility of linking the material remains with the dynamic cultural groups who are known to have been active in the region during the Protohistoric period.

## Protohistoric Summary and Research Needs

Between 1541 and 1800 the ethnic groups, economies, population densities, settlement patterns, military dominance, and nature of cultural interactions in the Southern Plains oscillated dynamically. These activities and changes left a diverse veneer of archeological materials on an expansive landscape which had been used by Native Americans for 12,000 years or more. Many of the locations used by Protohistoric hunting and trading groups and their farming neighbors have subsequently been severely disturbed by modern land use: primarily agriculture, roads, construction, and reservoirs of various sizes. These recent archeological deposits generally have not been "protected" from industrial development by deep burial. This fact in conjunction with the brief time interval represented makes the archeological record of the Protohistoric period a precious but precariously endangered resource.

To some extent the limited Protohistoric archeological data base is supplemented by historic narrative and first hand accounts of the land and the peoples of the period. There were a number of "big events" during this period which dramatically and irreversibly influenced the native cultures, and so the archeological record, of the region. These big events include:

1. The introduction of the horse with its subsequent impact on mobility, trade, economy, and overall lifeways.2. Introduction of European diseases and the demographic impacts brought about by rapid population reduction. The importance of this factor on convergence and joining of previously distinct cultural groups must be considered when addressing the "ethnic distinctiveness" of the archeological record.

3. The involvement of both hunting societies and horticulturalists in the Anglo-American economic sphere through trading. This had dramatic impacts upon group relationships and intragroup organization which affected the archeological record. Locations of "trade fairs" provide archeological opportunity and the potential for considerable "confusion" in attempts to sort archeological assemblages by ethnic groups.

4. One of the more interesting anthropological concerns which can be addressed through study of the Protohistoric materials in the Southern Plains is the relationship between hunters-traders and sedentary horticultural groups. Trade relationships between economically and ethnically distinct groups and competition for trade made for a dynamic history and complex archeological record. This record, however, has the potential to inform us about aspects of the period which will not be forthcoming from document sources.

# CHAPTER 8

## HISTORICAL ARCHEOLOGY IN THE SOUTHERN GREAT PLAINS

*Joe S. Hays, Robert L. Brooks, and Jack L. Hofman*

Historical archeology in the Great Plains study area has been inadequately defined and explored. Several factors are responsible for this phenomenon. The principal problem was that professional archeologists in the region were slow to accept historic sites as having equal research potential to prehistoric sites (cf. Table 8). Prior to the mid-1970s, few projects dealt with historic remains and even fewer had historic site archeology as their primary focus. For example, the first 50 volumes of the *Texas Archeological Society Bulletin* contained only four articles pertaining to nonaboriginal historical archeology (Fox 1983:13). Because of the large number of historic settlements, missions, and forts in Texas, this attests to the archeological neglect of historical remains in the region. Parallel conditions also exist in the literature for other states within the study area. With the passage of federal laws requiring that both historic and prehistoric archeological sites receive equal consideration and treatment in project planning however, more historic sites have been recorded and investigated (cf. Beck 1984; Couch 1978; Lintz 1984; Moir, Lee, and Sanders 1982; O'Brien and Lewarch 1984; Northcutt, Beckman, and Fisher 1983; Science Applications, Inc. 1982; Wallis 1984). Other factors which have affected the development of historical archeological studies include the recent white settlement of most portions of the study area and the architectural aspect of many historic sites, an element which the majority of archeologists are inadequately trained to investigate.

Table 8
Published historic site reports for the Southern Plains

| Site/Project/Location | Site Type/Function | Date | Adapt. | Worktype/Emphasis | References |
|---|---|---|---|---|---|
| TEXAS | | | | | |
| Clay County Cache; Clay Co. | Native Cache | | 5920 | -?- | Ozee 1955 |
| Adobe Walls; Hutchinson Co. | Anglo Civilian Trading Post | 1874 | 5940 | Excavation/H.Arch | Harrison 1986 |
| Merrell-Taylor; Floyd Co. | Hispanic Civilian Dugouts | 18th c. | 5940 | Excavation/H.Arch | Guffee 1976 |
| George Jowell Ranch; Palo Pinto Co. | Anglo Civilian Structures | ? | 5941 | Test/Excav./Architec. | Jackson 1975 |
| Midland Well 41 Md 18; Midland Co. | Anglo Urban Water Well | 20th c. | 5942 | Excavation/H. Arch | Stickney 1975 |
| Brazos Salt Control; Kent, King, Stonewall Co. | Anglo Civilian Dugouts | 20th c. | 5940 | Survey/H.Arch | Thurmond et al. 1981 |
| OKLAHOMA | | | | | |
| Longest 34Jf-1; Jefferson Co. | Native Wichita Village | 18th c. | 5923,5920 | Excavation | |
| Little Axe; Cleveland Co. | Native Shawnee Burial | 19th c. | 5928 | Excavation/H.Arch | Boyd 1982 |
| Claremore Village; Rogers Co. | Native Osage Village | 19th c. | 5923 | Survey/H.Arch | Chapman 1982; Perino 1971 |
| Copan Lake; Washington Co. | Nat. Delaware Relig. Sites | 19th c. | 5926 | ?/Ethnohis. | Prewitt 1981 |
| Pottawatomie; Pontotoc Co. | Native Potowat Log Cabin | 19th c. | 5928 | Survey/Prehist | Buehler 1982 |
| Salt Creek; Osage Co. | Native Osage Burials | 20th c. | 5928 | Site Visitation | Vehik et al. 1979 |
| 34Cm-232; Comanche Co. | US Military Commissary | 19th c. | 5940 | Excavation/H.Arch | Crouch 1978 |
| Fort Holmes- Hughes Co. | US Military Post | 19th c. | 5940 | Testing/H.Arch | Hale 1975 |
| Fort Sill; Comanche Co. | US Military Post | 19th c. | 5940 | Survey, Test/H.Arch | Ferring 1978 |
| Fort Sill Dump; Comanche Co. | US Military Trash Dump | 19th c. | 5940 | Excavation/H.Arch | Spivey et al. 1977 |
| Cantonment; Blaine Co. | US Military Post | 19th c. | 5940 | Survey/H.Arch | Lintz 1975 |
| Oklahoma Archeological Salvage; Greer Co. | US Military Burial | 19th c. | 5940 | Excavation/H.Arch | Shaeffer 1958,1959 |
| Salt Plains Survey; Alfalfa Co. | Civilian Dugouts | ? | 5941 | Survey/H.Arch | Ferring et al. 1976 |
| Salt Plains Survey; Alfalfa Co. | Civilian Ranch Hdqtrs | 19th c. | 5941 | H. Marker/History | Ferring et al. 1976 |
| Cherokee Sandy; Garvin Co. | Civilian Burials | 1900 | 5942 | Cem. Reloc./H.Arch | Galm 1979a |
| Wolf Creek Basin | Civilian House Dugout | 19th c. | 5941 | Survey/Prehist | Drass and Turner 1987 |
| Old Hardesty; Texas Co. | Civilian Townsite | 19th c. | 5941 | Test/Excav/H.Arch | Lees 1983 |
| Waurika Pipe; Comanche Co. | Civilian House, Trading Post | 1869 | 5940 | Excavation/H.Arch | |
| Upper Little River; Cleveland Co. | Civilian His. Scatters | 20th c. | 5941 | Coll Survey/Prehist | Steinacher 1986 |

Table 8, concluded.

| Site/Project/Location | Site Type/Function | Date | Adapt. | Worktype/Emphasis | References |
|---|---|---|---|---|---|
| Copan Reservoir; Washington Co. | Civ/Native Homesteads, scatters | 19th c. | 5928, 5942 | Test/Excav./Prehist | Vaughn 1975 |
| Salt Creek; Osage Co. | Civilian Homesteads | 19-20 c. | 5926 5928 | Survey/Prehist | Vehik et al. 1979 |
| 34BI-39,34BI-40; Blaine Co. | Industrial Salt Evap. | 1900 | 5942 | Survey/H.Arch | Ferring et al. 1976 |
| KANSAS | | | | | |
| Walnut Crk. 14BT301; Barton Co. | African-American?/Native Battle | 19th c. | 5940 5922 | Excavation/Bioarch. | Finnegan 1976 |
| COLORADO | | | | | |
| John MartinRes; Bent Co. | CivilianFarmsteads | 19th c. | 5941 | Survey | Resources Sci. |
| | Civilian Ranch Sites | 19th c. | 5941 | Survey | Applic.Inv, 1982 |
| | Civilian Trash Scatters | 19th c. | 5942 | Survey | |
| | Civilian Townsite | 20th c. | 5942 | Survey | |
| | Civilian Santa FeTrail | 19th c. | 5940 | Remote Sens./H.Arch | Lintz1987 |
| | CivilianTownsite | 20th c. | 5942 | Text/Excav./H.Arch | Earls et al. 1987 |
| Bent's Old Fort; Otero Co. | Civilian Trading Post | 20th c. | 5942 | Text/Excav./H.Arch | J.W. Moore 1973 |

## HISTORICAL DEVELOPMENTS IN THE SOUTHERN GREAT PLAINS

The Historic period in archeology is unique in that modern political boundaries had a significant impact on cultural developments and the nature and type of remains encountered. This overview, however, presents data on historic resources in terms of events at a regional level (the Southern Great Plains), rather than focusing on individual states. This orientation is consistent with other sections of this overview and the general project design (see Chapter 1).

Although the period of exploration and trading was briefly discussed in Chapter 7, additional information is presented in this chapter on early French, Spanish, and Anglo-American activities in the Southern Great Plains. While no white settlements were established in the region until the latter part of the eighteenth century, pre-1750 events can be appropriately discussed in terms of their impact on indigenous groups and how these explorations paved the way for future white settlement. Thus, historic times, as defined here, encompass a relatively short duration of about 400 years (ca A.D. 1540 to A.D. 1930) for the five states within the study area with most historic events taking place during the last two centuries (A.D. 1750 to about 1930). Activities for the Historic period involve Native American dominance, Spanish and French exploration and trade, Anglo-American exploration following conflicts between natives and whites, the removal and confinement of native populations to reservations and subsequent use of the land by the newly dominant Anglo-American cultural pattern which has continued into the present. It is recognized that these developments on the Southern Great Plains represents a rich and diverse area for the study of rapid culture change and cyclical decline of rural (both Native American and white) adaptations to the landscape since the initial "wave" of white settlement in the region.

## EXTENT OF HISTORIC ARCHEOLOGY IN THE SOUTHERN PLAINS

While the full potential of historic archeological resources in the study area has yet to be realized, a diversity of archeological resources have been recorded and studied. In this discussion of historic sites in the Southern Great Plains, topical areas have been grouped based on historic themes and archeological data. Because so little information exists in the historical archeological record, basic themes in the historic period have been augmented with historical data. This chapter also focuses on white activities. Native American groups are elaborated on in Appendix I. Anglo-American remains can be basically grouped under a number of thematic headings which correspond to the general development of historic events in the region. These include the following:

Exploration and Trade (A.D. 1541 - A.D. 1820)
Early Settlement (A.D. 1820 - A.D. 1860)
Civil War (A.D. 1860 - A.D. 1865)
Late Settlement (A.D. 1865 -A.D. 1900)
Depression (A.D. 1900-1940)

In addition to these thematic periods, some studies have focused on material culture. Information on these reports is presented in Table 9.

## EXPLORERS AND TRADERS

A number of French and Spanish explorers and traders passed through the Great Plains study area during expeditions occurring between A.D. 1541 and the early 1800s (Gunnerson 1984). The first of these was Coronado's search for Quivira in 1541 which led him through eastern New

Mexico, the Texas and Oklahoma panhandles and southern Kansas where he encountered the Wichita (Bolton 1959). These sites have been identified with a number of villages occurring in the Great Bend region in Rice County, Kansas (Wedel 1965). Sixty years later, Juan de Onate set out on the trail of two adventurers who were attempting to reach Quivira without permission of the Spanish government (Vehik 1986). The two adventurers, Francisco de Bonilla and Antonio Gutie'rrez de Humana with a band of thirty followers apparently reached Native Americans living on the Arkansas River in southern Kansas (possibly the Wichita). Later, Bonilla was murdered by Humana after a quarrel. Subsequently, most of the party, including Humana, were killed by natives (the Wichita?). Upon reaching the area, Onate was informed by the Escanjaques that the Wichita were responsible for the murder of Humana's group. Onate's initial intention was to punish those responsible for the murder of Humana's party. However, his force of seventy men was greatly outnumbered and after visiting a number of the same villages encountered by Coronado, he returned to Santa Fe, but not without a fight with the "Escanjaques" over his failure to allow them to plunder the Wichita villages (Zornow 1957:25-26). There were a number of subsequent expeditions from New Mexico into the Southern Plains. These included Ulibarri's travels in 1706 to El Qartelejo, Valverde's route in 1719 to the Arkansas River in southeastern Colorado, Villasur's expedition of 1720 which ended near the juncture of the Platte and Loup rivers in Nebraska, Bustamante's travels in 1723 which dealt with Comanche hostilities in eastern New Mexico, and Vial's journey of 1804 (Gunnerson 1984: 49-70). In addition, the Spanish mounted numerous entradas into southern Texas. Most of these expeditions focused on the Gulf Coast and the area from San Antonio to Nagodotches, Texas (Fox 1983:54-78). Only four principal Spanish excursions into the extreme southern Great Plains occurred after the sixteenth and early seventeenth centuries. These were Parrilla's battle with Wichitas at Old Spanish Fort on the Red River in 1759, Athanase de Me'zieres visit to this same complex of villages in 1778, and Pedro Vial and his fellow explorers stay at the village in the 1780s (John 1982). This site is well documented as being the Longest site in Jefferson County, Oklahoma and companion sites on the Texas side of the Red River (Bell, Jelks, and Newcomb 1967). Between 1786 and 1788, Vial made three journeys across the Southern Great Plains where he encountered the Wichita in either south-central Kansas or north-central Oklahoma. In 1808, Francisco Amangual also traveled from San Antonio to Santa Fe crossing much of the southern portion of the study area.

The French presence in the Southern Great Plains occurred somewhat later. The first well documented evidence of French expeditions to the area occur in the early 1700s. However, the Wichita obviously had contacts with the French by either the late 1600s or the early 1700s. For example, it is alleged that the French (or at least French fusils) were involved in the Wichita's attack on the Apache settlement El Cuarteljo in Scott County, Kansas in either 1714 or 1719. In 1719, Charles Claude du Tisne' traveled westward from Osage villages in Missouri encountering Wichita or Pawnees in southern Kansas (M. Wedel 1972). He may also have reached the eastern portion of north-central Oklahoma. These villages may be two sites found in Wilson County, Kansas which contain early historic materials. In the same year, Bernard de La Harpe traveled north from his Nassonite trading post on the south side of the Red River in what is now Bowie County, Texas to the Arkansas River where he participated in a trade fair with various groups of Wichitas somewhere in the vicinity of Tulsa, Oklahoma (M. Wedel 1981).

In 1988, a historic site containing early eighteenth century French goods was found during work at a Kimberly Clark paper plant (Odell 1989). This site could potentially be one of those at the extensive site complex visited by La Harpe in 1719. There were also a number of cases where French traders traveled from Arkansas Post across the Southern Plains to Santa Fe. On at least two occasions, these travelers visited Native American villages (M. Wedel 1981:10-11). In 1749, Felipe de Sandoval and a party of five or six Frenchmen and a German left Arkansas Post and arrived in Santa Fe. Another group of three French soldiers apparently left Arkansas Post in 1748 and were arrested in Santa Fe in 1749. Both of these parties may have passed through the Deer Creek and Bryson-Paddock sites in Kay County, Oklahoma. They undoubtedly also had contact with the Comanches who led them from the Wichita villages to Santa Fe.

Between 1750 and 1800, the French consolidated their influence in Kansas, Nebraska, and the Central and Northern Plains. Lewis and Clarke identified an abandoned French trading post on the Kansas River in northeast Kansas in 1803. Another French trading post was also established by 1806 near Claremore, Oklahoma (Chapman 1982). At least one or more groups of the Osage were also settled at this or nearby locations by the early 1800s (Perino 1971; Good 1971).

In 1803, the French sold their holdings west of the Mississippi River to the United States in an agreement known as the Louisiana Purchase. This acquisition initiated a legitimate U.S. presence in the Southern Great Plains. To better identify the nature of this territory and to find a route to the Pacific Ocean, President Thomas Jefferson authorized Meriwether Lewis and William Clark to explore the new territory. In 1804, Lewis and Clark began their journey. Their travels took them through much of the Northern Plains. However, they also passed through northeastern Kansas in their journey up the Missouri. In this portion of the expedition, they found a number of villages of the Kansas Native Americans as well as some French traders (Zornow 1957:34-35). A second expedition to explore the Plains was ordered in 1806 with Zebulon Pike as its leader. Pike and a party of 20 soldiers and two civilians traveled through northern and central Kansas. In their study, they encountered the Osage, the Kansas, and the Pawnee. They visited a Pawnee village on the Republican River and learned that a Spanish force of some 600 men under the command of Lieutenant Don Malgares had been sent by the Spanish governor of Chihuahua to expel Pike and any other Americans from what the Spanish still regarded as their territory. Pike managed to avoid the Spanish in Kansas and eventually passed through the state into what is now Wyoming.

Another survey expedition through the study area during this time was Major Stephen Long's travels across Kansas in

Table 9
Published historic site reports for the Southern Plains

Baker, William E. and T. N. Campbell
1959 Metal Projectile points from the Oklahoma Panhandle. *Bulletin of the Oklahoma Anthropological Society* 7:51-54. Oklahoma City.

Davison, Claire C. and R.K. Harris
1974 Chemical Profile of Glass Trade Beads from Archeological Sites in Texas and Oklahoma. *Bulletin of the Texas Archaeological Society* 45:209-217.

Derven, Daphne
1980 A Field Guide to Historic Artifacts: Ceramics in Oklahoma. *Bulletin of the Oklahoma Anthhropological Society* 29:103-142. Oklahoma City.

Gettys, Marshall and Alicia Hughes-Jones
1981 Log Pens and Lifestyles: The Aykesworth Photograph Collection. *Bulletin of the Oklahoma Anthropological Society* 30:51-66. Oklahoma City.

Hart, Alyce
1972 English Inscription Stone. In *Transactions of the Seventh Regional Archaeological Symposium for Southeastern New Mexico and Western Texas,* pp. 41-46.

Huntington, R.T.
1967 Dragoon Accoutrements and Equipments, 1834-1849: an Identification Guide. *Plains Anthropologist* 12(38):345-355.

Jones, Walter H.
1966 Cartridge Cases and Projectiles from the Tyree site, 34Cm132. *Bulletin of the Oklahoma Anthropological Society* 14:87-92. Oklahoma City.

Rickney, Don
1963 Metal Spear Point. *Oklahoma Anthropological Society Newsletter* 11(1):5-6. Norman.

Schmitt, Karl and Robert E. Bell
1954 Historic Indian Pottery from Oklahoma. *Bulletin of the Oklahoma Anthropological Society* 2:19-34. Oklahoma City.

Shaeffer, James B.
1961 Glass Flake Scrapers. *Plains Anthropologist* 6(14):275-276.

Simmons, Marc and Frank Turley
1980 *Southwestern Colonial Ironwork: The Spanish Blacksmithing Tradition from Texas to California.* Museum of New Mexico Press, Santa Fe

Skinner, S. Alan
1978 Historic Wichita Figurines from the Edge of the Llano Estacado. *Great Plains Journal* 17:41-48. Institute of the Great PLains, Lawton.

Smith, Mary Margaret and Heinz W. Pyszcyk
1988 *A Selected Bibliography of Historical Artifacts: c. 1760-1920.* Archaeological Survey of Alberta Manuscript Series No. 11. Edmonton.

Spivey, Towana (editor)
1979 A Historical Guide to Wagon Hardware and Blacksmith Supplies. *Contributions of the Museum of the Great Plains* Number 9. Lawton.

Steen, Charlie
1953 Two Early Historic Sites on the Southern Plains. *Bulletin of the Texas Archaeological Society* 24:177-188. Austin.
1955 Baked Clay Figurines from the Spanish Fort Site. *Panhandle-Plains Historical Review* 28:107-109. Canyon, Texas.

Sudbury, Byron
1982 Three Eighteenth Century Pottery Vessels from North-Central Oklahoma. In *Pathways to Plains Prehistory: Anthropological Perspectives on Plains Natives and their Pasts,* edited by Don G. Wyckoff and Jack L. Hofman. Oklahoma Anthropological Society Memoir 3. The Cross Timbers Heritage Association Contribution 1. Duncan.

1984 A Sixteenth Century Spanish Colonial Trade Bead from Western Oklahoma. *Bulletin of the Oklahoma Anthropological Society* 33:31-36. Oklahoma City.

Terry, Kenneth and Ina Terry
1960 Chain Mail and Other Materials from South Central Kansas. *Newsletter of the Kansas Anthropological Association* 6(4):29-32.

Wedel, Waldo R.
1970 Antler Tine Scrapers in the Central Plains. *Plains Anthropologist* 15(47):36-45.

1975 Chain Mail in Plains Archeology. *Plains Anthropologist* 20(69):187-196.

1819. During his journey, Long crossed much of Kansas and had visited with both the Kansas and Osage (Zornow 1957:39-40). Two other excursions which were primarily restricted to Oklahoma were James Wilkinson's travels down the Arkansas in 1806-1807 and Colonel George Sibley's journey on the Salt Fork of the Arkansas in 1811. The southern part of the study area received far less treatment in terms of exploration. This is probably because most of the area had been previously traversed by both the French and the Spanish. The one notable event was the dispatching of Anthony Glass by U.S. Indian Agent John Sibley to revive trade with the Wichitas. In 1808, Glass traveled to the Wichita village at Spanish Fort (the Longest site in Jefferson County, Oklahoma). Glass stayed with the Wichitas for approximately eight months and traveled over a large area of north-central and west-central Texas (John 1982).

Information on these early explorers and traders has two significant aspects. First, it appears that most of the contact between whites and natives was very transitory. There are only a few accounts of French, Spanish, or Americans having extended stays in the Native American villages. Me'zieres and Vial stayed with the Wichita at Spanish Fort as did Glass somewhat later. It has also been suspected that French traders were living at the Deer Creek site in Kay County, Oklahoma. The only evidence for white settlements are the French trading posts of La Harpe in Bowie County, Texas, Chouteau's Post in Rogers County, Oklahoma, and the abandoned post found on the Kansas River in northeast Kansas. Thus, historical archeology must necessarily be focused on the Native American villages where limited evidence of white contact may be found. This contact, in terms of trade goods, is the other notable attribute. With white settlements absent or very few in number, the best opportunity to identify the nature of the contact and the impact of these goods on culture change lies with the study of the Native American cultural assemblages.

## EARLY SETTLEMENT

Because of the presence of "hostile" Native Americans such as the Apache and Comanche and somewhat later, the Cheyenne and Kiowa, white settlement of the Southern Plains was not accomplished until the latter part of the nineteenth century. Thus, the primary white occupations in the area between 1820 and 1860 were trading and military posts. It as also during this time that many midwestern and southeastern tribes were removed to Indian Territory (Oklahoma and Kansas).

White settlements were widely scattered over the landscape and primarily represented aggregations of traders and soldiers. Even as late as the 1840s, there were only a limited number of habitation settlements in the region, most of which could be found in the northern part where the Native American populations had ceded their lands to the United States. These included the towns of Abilene and Wichita in Kansas (Zornow 1957:56). Other settlements near or adjacent to the area were primarily trading posts such as Chouteau's found near the present day city of Vinita, Oklahoma (Chapman 1982); Adobe Walls in the Texas panhandle (Baker and Harrison 1986); Bent's Old Fort in southeastern Colorado (Moore 1973; Lavender 1954); Allison's Ranch and Trading Post in Kansas (O'Brien 1984); and Warren's Trading Post at the mouth of Cache Creek in Cotton County, Oklahoma. There were also numerous Comanchero trading sites (Guffee 1976; Levine and Freeman 1982).

The principal formal settlements in the region between 1820 and 1860 were Native American and came about as the result of President Jackson's policy of their forced removal from lands east of the Mississippi. In the period between 1820 and 1840, most southeastern tribes and many from the Midwest were resettled in Oklahoma and Kansas. Because the Osage and Kansas had given their lands in Kansas to the United States, some of these holdings were subsequently reserved for tribes such as the Otoe/Missouri, Iowa, Sauk and Fox, Kickapoo, Delaware, Shawnee, Chippewa, Ottawa, Peoria and Kaskaskia, Wea and Piankashaw, Pottawatomi, Miami, New York natives, Cherokee, and Quapaw (Zornow 1957:48). The Kansas, Osage, and Pawnee also held other lands in the state. Since many of the midwestern tribes had partially adopted a white socio/economic system, they were better able to establish themselves in the territory. The Plains tribes found it more difficult to adjust to a white society and were less successful in their attempts to develop an Anglo-American lifestyle. In Oklahoma, a similar scene occurred with the forced immigration of the Five Civilized Tribes (the Cherokee, Choctaw, Chickasaw, Creek and, Seminole). Here, much of the southern portion of Oklahoma before 1860 was settled by the Choctaw and Chickasaw. In the central and northern areas of the state, removal tribes consisted of the Seminole, Creek, and Cherokee. During the early years of removal, the southeastern tribes were displacing indigenous native peoples. This led to conflict with native groups such as the Osage, Apache, Comanche, and occasionally, the Wichita. By the latter part of this period, the more western areas of Oklahoma Territory were reserved for the Cheyenne, Wichita, Caddo, Apache, and Comanche. Only in the extreme eastern portions of the area did established settlements develop. In areas of southeastern Oklahoma and eastern Kansas, a number of Native American towns were settled. Especially in south-central Oklahoma, Native American schools and missions were also established. These include examples such as the Darlington Agency in Canadian County, Oklahoma administered by Quaker and later Mennonite missionaries and the Mount Pleasant Mission in Bryan County, Oklahoma established among the Choctaws in 1849 by Presbyterian missionaries. Throughout the remainder of "Indian Territory" a Native American settlement pattern consisting of isolated homesteads and transitory villages were present. Although WPA archeologists investigated a few Chickasaw sites in Bryan County in the 1930s, very little work has been done on native American settlements dating to the 1820s-1860s (Kassel 1949).

Beginning around the 1830s, due to hostilities between whites and Native Americans and removal tribes and indigenous groups, it became necessary to establish a series of military forts and posts. These include Forts Scott, Hays, Mann, MacKay, and Atkinson in Kansas; Forts Arbuckle, Holmes, and Washita in Oklahoma and; Forts Belknap, Worth, Phantom Hill, and Chadbourne in Texas. Other forts just outside the area are Fort Washita in Bryan County, Fort Towson in Choctaw County, and Fort Gibson in Muskogee County, Oklahoma. Several of these posts have been the subject of archeological investigations. Fort Washita is the property of the Oklahoma Historical Society and was excavated during its reconstructive development (Wyckoff and Spivey 1971; Lewis 1975; Penman 1975; Lopez 1975; Blaine 1975). Fort Holmes in Hughes County, Oklahoma was also tested (Hale 1975). A number of the military posts established in Texas at this time have also been investigated by the Texas Department of Parks and Wildlife prior to their reconstruction (Fox 1983:239-284). The Kansas Historical Society has conducted excavations at Fort Hays and Fort Scott. In addition, Fort Larned in Kansas was excavated by the University of Colorado (O'Brien 1984; Scott 1973; Barr 1969, 1970a,1970b). On the eastern periphery of the Southern Plains, Fort Gibson is owned by the Oklahoma Historical Society and has been the subject of a number of small studies while Fort Towson in Choctaw County has been the focus of two major excavations (cf. Lees and Lees 1983).

Accounts of military roads and trails can be found in archival records although most are poorly documented in the archeological literature. These roads/trials were designed to serve as communication links between the various military posts (McReynolds 1976). Despite the numerous economic and social factors creating hostilities between Native Americans and whites, different tribal societies, and various political powers (e.g., the French, Spanish, and Americans), most conflicts during the early settlement period were small. With the exception of the Mexican War, major hostilities did not break out until the Civil War. However, the engagements that took place during the Mexican War were south of the study area.

## THE CIVIL WAR

Although the Civil War (1860-1865) was an important period in respect to political and social developments in the Southern Great Plains, there was only limited military action. Kansas

volunteers fought Confederate forces throughout much of the South but fought only one battle on Kansas soil, the Battle of Mine Creek. However, guerrillas and border-raiders from the South left considerable destruction in southern Kansas counties (Zornow 1952:106-117). In Texas, the engagements were along the Gulf Coast where Union forces attempted to take control of the shipping routes. No Civil War battles were fought in the state although many Texans served in the Confederate forces and fought in battles throughout the south as well as in limited engagements in New Mexico. A somewhat different situation existed in Indian Territory (Oklahoma). In the eastern part of the territory there were numerous skirmishes in addition to the Battle of Honey Springs fought in 1863 (Wright and Fischer 1966). Residents of Colorado were only slightly involved in the war. The First Regiment of Colorado Infantry served in New Mexico in 1862 and participated in the Battle of Glorieta Pass (Abbott, Leonard, and McComb 1982:65-66). Aside from this battle, New Mexico was spared any major conflict and remained a part of the Union.

The Civil War had a number of direct and indirect impacts on the study area. First, the war brought about a significant change in Native American landholdings. While members of the Cherokee, Creek, and Seminole tribes were almost equally split in their support of the Confederate and Union causes, the Choctaw and Chickasaw principally supported the Confederates. By treaties settled at the end of the war, the Five Civilized Tribes were required to relinquish half their lands in Indian Territory. These lands were in turn given to tribes being removed from Kansas (e.g., the Ponca, Pawnee, Osage, Kansas). Thus, the southeastern tribes suffered from sociopolitical divisions and a considerable loss of land with an increased number of tribes being settled in Indian Territory. Although there was no attempt to divest individuals of their plantations or estates, many wealthy Southeastern Native Americans on both sides suffered financially from the war.

A second effect of the war was to open up the region to more intensive settlement. This primarily occurred with the disbursement of Union and Confederate forces after the war and the displacement of many Southern families.

Because of the limited number of military engagements in the Southern Plains, few archeological investigations have been conducted at battle sites. The closest major action was the Battle of Honey Springs in eastern Oklahoma (Yates, Baugh, and Wyckoff 1980). However, some of the excavations at military posts in Texas and Kansas recovered materials dating to this period.

## LATE SETTLEMENT

Between 1866 and 1900, most of the Southern Great Plains experienced increases in white settlement. As noted above, the release of large numbers of men from military conscription probably contributed to these increases. However, economic and demographic causes were equally important. With the disruption of the South's plantation economy, many southerners moved west in search of land and better economic conditions. The United States was also experiencing sizable population growth, from natural increase as well as immigration. It was natural that the relatively unsettled lands west of the Mississippi were looked upon as a solution to the population pressure (Turner 1920). The development of the railroad system also served to facilitate the movement west.

Settlement of the Southern Plains portion of Texas began during this late period. Beginning around the 1870s, sheepherders (pastores) from New Mexico established numerous homesteads in the Cimarron, Canadian, and Red River valleys (P.B. Hughes 1978; Roberts and Roberts 1978:137). These Hispanic settlers may have previously been comancheros or ciboleros (Mexican buffalo hunters). In some cases, their herds exceeded 250,000 head. However, the sheep industry in the panhandle was short-lived. By roughly the 1880s, cattle ranchers, attracted by the extensive rangeland, had forced them out of the area (Fox 1983:206). Pastor settlements were usually located near a dependable water supply and consisted of houses of adobe or sandstone, outbuildings, and livestock pens. A number of pastor homesteads/ranches were found during a survey on the Llano Estacado (Taylor 1980). The Merrell-Taylor Village site in Floyd County, Texas is one such pastor site which has been excavated. This site consisted of three dugouts and a plaza with most artifacts reflecting use by pastores (Guffee 1976). This site remains the only studied pastore occupation in the region. However, recent work by Hofman (1982) and others has shown the potential of researching historic sheepherders.

Prior to the cattle industry, there were also sporadic attempts by Anglo-Americans to settle the area. One site in the region which has been studied is the Soda Lake Ruins. Consisting of two stone-walled rooms, outbuildings, and a corral, it was initially thought to represent a base camp for comancheros. Investigations at the site, however, have revealed it to be Anglo-American (Guffee 1980). It is suspected that the Soda Lake occupation was by an Anglo-American family who attempted to establish a homestead based on shepherding and gardening.

Beginning as early as the 1870s and continuing well into the twentieth century, cattle ranching has been an economic mainstay of the Southern Plains. A number of historic ranch-related sites are documented throughout Oklahoma, Texas, Kansas, eastern New Mexico and southeastern Colorado. Some of the better known names from this period are the headquarters of the J. A. and the X.I.T ranches in Texas and the 101 Ranch in Kay County, Oklahoma. Such operations centered around renowned individuals such as Charles Goodnight, Jesse Chisholm, and the Miller brothers (Roberts and Roberts 1978). The cattle ranching has been divided into three phases (Roberts and Roberts 1978):

Era 1: 1876-1880s, Individualistic, local enterprise.

Era 2: 1880s, "Beef bonanza", corporate enterprise (British investment)

Era 3: 1886-1900, Breaking up of the big ranches, individualistic.

Archeological investigations have been conducted at a number of these ranching complexes (Jackson 1975; Science Appli-

cations, Inc. 1982; Ferring et al. 1976). Comments on ranch archeology can also be found in several additional sources (Fontana 1967; Kornfeld 1984; and Ward, Abbink, and Stein 1978). The routes of most famous cattle trails are known and traces of activities along these pathways may hold some archeological potential (McReynolds 1976). Famous cattle trails include the Montana Trail, the Chisholm Trail, the Goodnight-Loving Trail, and the Shawnee Trail. Research into the early rail head stations which are found at the end of the big cattle trails may also prove fruitful. Major rail heads in the 1870s and 1880s were primarily in Kansas and included Dodge City, Abilene and Ellsworth (Zornow 1957).

In addition to ranching, the other major economic activity of this period was farming. Throughout the study area, family-based farmsteads became firmly established. These farmsteads typically consist of a residence, associated outbuildings (e. g., privies, root cellars, wells, and windmills), sometimes a corral, and related agricultural fields. White farmsteads were most extensively developed in Kansas where sizable tracts of land were available for homesteading after the Civil War. Tribes (e.g., the Pottawatomies, Sac and Fox, Delawares, Shawnees, etc.) which had previously held the land in Kansas had been removed to Indian Territory (Oklahoma) prior to the Civil War. In Oklahoma, however, white settlement was not permitted until the land run of 1889 during which thousands of homesteads sprung up overnight. It was reported that 50,000 people were competing for 12,000 homesteads (Hoig 1989). In addition, many areas of Oklahoma were not open to white settlement until after 1901.

The broad distribution of these farmsteads has led to the documentation of numerous historic archeological sites in the five states that comprise the Southern Great Plains study unit. Many of these have been recorded as a consequence of federally funded projects (cf. New World Research 1981; Lintz 1984). However, very few late nineteenth century homesteads have received investigations beyond initial documentation. An exception has been Charles Wallis' work in Oklahoma. Wallis, over the past 15 years, has been involved in recording historic materials ranging from trash scatters to homesteads to cemeteries. Three of his recent reports demonstrate the level of investigation which historic sites need in the Southern Plains in order to properly document these resources (Wallis 1984, 1988a and 1988b).

As farms were firmly established within the region, needs for goods and services led to the development of central places in the form of town and hamlets. These, in turn, attracted transportation nodes and corridors in the form of railways and roads (Berry 1966). For most of the region, town sites grew most dramatically after 1875, when the nomadic tribes (the Cheyenne, Kiowa, Apache, and Comanche) were confined to Oklahoma reservations. Some of the earliest towns in this more western area were Old Mobeetie (near Fort Elliot), Tascosa (an old Comanchero site), Old Clarendon in the Texas panhandle and Old Hardesty, Doan's Store, and Mangum in Oklahoma. In Colorado, Old Las Animas was an early townsite in the southeastern part of that state but unrelated to the gold rush that occurred in the mountains to the north and northwest around the time of the Civil War. By the latter part of the nineteenth century, a substantial number of small towns and hamlets had been established. Most of these though, failed in their efforts to become commercial centers and now exist as "ghost towns."

Archeological investigations of these settlements include excavations at Old Hardesty (Lees 1982), Old Las Animas (Science App. Inc. 1982; Earls et al. 1987), and excavations of a hand-dug well in Midland, Texas (Stickney 1975). J. Hughes has also conducted some work at Old Clarendon which is situated 8 km north of present Clarendon in Donley County, Texas (known locally as Saint's Roost). The town was promoted as a Christian colony and at one time in its early existence had seven ministers (Rathjen 1973:232). As an example of how historic archeology can "clarify" history, Hughes' (personal communication to Joe Hays) said of the archeological testing at the Saint's Roost dump that he had never seen so many whiskey bottles in his life. Unfortunately, few studies are available for town sites in the study area. However, Wallis' work at the Thomas dump in Custer County, Oklahoma demonstrates the potential of such sites (Wallis 1986).

While Native American towns, schools, missions, and agencies had their start during the early settlement period, it was in the post-1875 era, the "reservation era" that continuing efforts to acculturate the now resettled tribes had its greatest impact. Although Native American schools and missions had a devastating impact on their traditional culture, they represent important historical sites, most of which are located in Indian Territory (Oklahoma). Such sites include the Darlington Agency in Canadian County, the Kaw Agency in Kay County, the Levering Mission in Hughes County, the Mekasukey Academy in Seminole County, the Osage Agency in Osage County, the Pawnee Agency in Pawnee County, the Ponca (White Eagle) Agency in Kay County, the Red Moon Cheyenne Indian School and Sub-agency in Custer County, the Sac and Fox Agency in Lincoln County, the Sacred Heart Mission in Pottawatomie County, the Whirlwind Mission in Blaine County, the Colony (Seger Indian Industrial) School in Washita County, the Fort Sill Indian School in Comanche County, and the Riverside Indian School in Caddo County. Some of these facilities are still active today. Despite the historical archeological potential of these localities, none have received any attention other than historical research.

In addition to the missions, schools, and agencies, Native Americans were also involved in establishing farmsteads and ranches. As in the case of white farmsteads, little has been done with these remains. Some pioneering work has been done, however, on early attempts at ranching by Native Americans (e.g., the Cheyenne Arapaho; Briscoe and Bussey 1988).

All activities related to Native Americans was not necessarily devoted to their acculturation. Tribes such as the Comanche, Apache, Kiowa, and Cheyenne remained threats to white settlement of the Southern Plains. Particularly in the Texas panhandle

and the west central part of the state, white settlement was delayed as a consequence of Native American hostilities. Thus, in 1866 and 1867, a series of additional forts were established along what was termed the western line of defense in west Texas (Fox 1983:240). These included Fort Richardson (1866), Fort Griffin (1867), and just south of the study area, Ft. Concho (1867). In Oklahoma, a number of military posts were also established. Beginning in 1869, Forts Sill, Cobb, Reno, and Cantonment, and Camps Auger, Supply, Nichols, and Radziminski were constructed. Other forts constructed during the period included Fort Bascom in San Miguel County, New Mexico and Fort Lyon in Colorado. In Kansas, this included Forts Hays, Larned, Zariah, and Dodge. Another fort built somewhat later was Fort Elliott in the eastern Texas panhandle. Fort Elliott was constructed primarily to check to activities of reservation Native Americans slipping away from Fort Sill and to help control illegal activities such as "whiskey running" to the Native Americans (Roberts and Roberts 1978). Archeological investigations have been conducted at Fort Sill (Couch 1978; Durham 1974; Ferring 1978; Shaeffer 1961; Spivey et al. 1978), the Fort Supply dump, Camp Radziminski (Northcutt, Beckham, and Fisher 1983), and the Cantonment (Lintz 1975). In Texas, research has been conducted at Fort Richardson (Dickson 1976; Westbury 1976) and Fort Griffin (Fox 1976). Kansas forts occupied at this time have been excavated by the University of Colorado (O'Brien 1984; Scott 1973: Barr 1969; 1970a, 1970b).

In addition to the forts constructed during the late settlement period, there were also a number of battle sites. A couple of the more important ones were the location of the Walnut Creek Massacre in Kansas (Finnegan 1976; O'Brien 1984), the Battle of Soldier Springs, and the Battle of the Washita ("the Black Kettle Massacre") in Oklahoma. In contrast to activities conducted at the military forts, little archeological research has been focused on battle settings and we know little more than what is described in the historical accounts.

## THE DEPRESSION

Between 1900 and 1940, the Southern Great Plains experienced continued white settlement and economic development. This was accompanied by a corresponding decrease in Native American cultural patterns. A major event during the period was the Depression. From the crash of the stock market in 1929 until the latter part of the 1930s, most of the Southern Plains experienced a severe and prolonged economic depression. This was accentuated by a regional drought which was unparalleled in historic times. Thus, in western Kansas, western Oklahoma, western Texas, and the Texas and Oklahoma panhandles, massive migration took place with many of the emigrants destined for California. The history of the "Dust Bowl" has been extensively treated (Worster 1979). With the changes brought about by economic and climatic deterioration, much about this period warrants further study. In particular, industrial development was not emphasized in the study area until the 1900s. This lag in development is particularly significant for understanding the modern day context of the five state region.

By the 1920s and 1930s, white settlement throughout the region was extensive. Both farming and ranching complexes were well developed. There was also a trend to smaller land holdings. This is particularly true of ranches where the large spreads of the nineteenth century were divided into smaller units. In general, there was a gradient from farming in the eastern margins to ranching in the more western areas. However, with the use of deep well irrigation, farming also became practical in the more arid areas. Farming and ranching complexes usually consisted of the primary residence, outbuildings (including bunkhouses), stables and corrals, and agricultural fields. By the 1900s, most of the lands were also fenced. Fencing brought about a number of changes. First, it established property boundaries. Secondly, it restricted the movement of cattle herds and facilitated the establishment of agricultural fields. The nature of the fencing also serves to permit identification of the spatial pattern in the ranches and farms. With the onset of the Depression and the Dust Bowl, many of these ranching and farming complexes were abandoned. Today, they comprise one of the most frequently encountered archeological resources. Despite the large numbers of ranches and farmsteads founded during this period, little has been done toward documenting the nature of these agricultural and ranching establishments. A substantial number of post-1900 farmsteads and ranches have been recorded during contract surveys although research on these sites has been limited (cf. Ferring et al. 1981; Lintz 1984; Wallis 1983; New World Research 1981).

With the maturation of economic development in the region, industrial complexes began to form. Examples of such industrial sites are 34Bl-39 and 34Bl-40, early salt evaporation plants, in Blaine County, Oklahoma (Ferring et al. 1976). Brick factories were relatively common and have been described by Robison (1980) although no historical archeology has been conducted at these plant sites. Thurmond, Freeman, and Andrews (1981) also reported on an early copper mine in the Salt Fork of the Brazos.

One of the most important industries of the study area during the early 1900s was oil. This early oil boom led to rapid expansion of many urban areas and the development of some oil towns almost over night. In a short length of time, oil and gas became the dominant industry of the region. The history of the Cushing oil field provides an excellent guide to these developments (Caney 1981). Other work on early oil field resources include Drass' (1985) study of the Bird Creek area and Duncan's (1977) report on the Tulsa oil field.

A variety of additional industrial summaries are also available. Ellifritt (1974) conducted a study of transportation and industry in Oklahoma while Hofsommer (1977) describes developments in the logging industry, mining, and railroads. By this time, the military posts can also be viewed as industrial complexes of a sort. All of these areas have received little attention from archeologists.

In the 1900s, Anglo-American and Hispanic patterns clearly dominate the cultural landscape. Native American cultural patterns, while in evidence, has been thoroughly assimilated into the broader context of statehood. Most Native American schools and missions were abandoned or consolidated with education and religious activities with many groups being absorbed into white society. Even in Oklahoma where statehood was not achieved until 1907, Native American culture had lost parity with Anglo-Americans. Much of this can be attributed to the Dawes Act of the late 1800s. The Dawes Act reapportioned lands to individuals in the tribes, thus diluting the political power of the tribes. These individual allotments were easily procured by whites through graft and corruption. No archeological research has been conducted on early twentieth century Native American sites although some work has been done on contemporary Native American residences (Kent 1984). It is suspected however, that they would be only marginally different from Anglo sites.

## SPECIALIZED SITES

This category includes specialized communities/localities such as cemeteries, schools, churches, ceremonial grounds, bridges, roads, rodeo grounds, and sports arenas that cannot be identified to a specific period or ones that extend through a number of periods. Others include specialized processing and storage facilities such as feed lots, peanut dryers, cotton gins, and grain elevators. Cemetery relocations have been frequently conducted during construction of reservoirs or other land-alteration projects (cf. Wyckoff 1964; Rohrbaugh 1972; Shaeffer 1959). For more specific information on historic cemeteries and Native American burials, consult the tables in Appendix I. Other groups of sites types identified here have not been the target of archeological research although vision quest locations have received some attention (Fredlund 1969; Graham and Graham 1986).

## SUMMARY

Historic archeological sites on the Southern Plains have traditionally been studied because of:

1. Their exceptional or obvious nature which attracts attention during field investigations.

2. Their relationship with famous historic persons or events.

3. Incidentally, as part of the prehistoric site study. 4. As part of the development plan for historic properties.

In order for historic archeology to reach its full potential, the definition of significant historical resources must be broadened. Standardized field procedures are needed so that historic sites are routinely documented in the archeological record, and given the same recognition as prehistoric sites. Although these are requirements of federally funded projects, they are not always fully met. And in the case of private research, there is often no effort to deal with historic sites.

An area of great potential for archeology lies with remains of the Five Civilized Tribes, most of which occupied lands along the eastern border of the study area in Oklahoma during the nineteenth century. Sites belonging to the Choctaw, Chickasaw, Creek, and Seminole tribes have received minimal attention (e.g., Parmalee 1980). At present, we cannot distinguish between Native American, Native American slave, and Anglo-American occupations at many early settlements.

Recent Anglo-American sites have also been neglected by archeologists, due in part to their redundant nature, and because such sites are not generally perceived as archeologically significant. Sites dating to the late nineteenth and early twentieth centuries can, however, help document the dramatic changes in American culture and technology during the past century. Much of the change evidenced in the Southern Plains region reflect the decline of rural life (Fite 1977). It is fortunate that historic preservation policies provide for the preservation of outstanding structures of all time periods and representative of various themes. It is the archeologists' responsibility to study and preserve what remains of the less notable or outstanding remains. Early industrial sites are beginning to systematically be recorded and we should eventually have good documentation for economic activities such as logging, mining, oil and gas exploration, ranching, farming, and numerous smaller industries.

Archeologists must also work to ensure that a representative sample of historic sites are preserved for addressing historical and archeological research questions. Sites such as military forts have considerable public appeal whereas, an 1880s trash dump may appear rather insignificant. Yet, this dump may hold information on diet, economic conditions, and social structure.

The historic record is also incomplete. Developing an adequate understanding of early lifeways and social/economic/religious systems on the Southern Plains will require systematic archeological analyses to complement, broaden, and in many situations to supplant the historic records. It is critical to acknowledge that most historical documents were written with specific goals, biases, and audiences in mind. Political, military, and heroic events are most often recorded (correctly or otherwise), but documenting much of the economy and organization of daily life will require careful archeological investigation, because even informants have variable memories and personal biases. The archeological record, however, has no such bias and can be used to objectively interpret historic events.

# HUMAN SKELETAL SAMPLES IN THE SOUTHERN GREAT PLAINS

*Douglas W. Owsley, Murray K. Marks, and Mary H. Manhein*

Bioanthropological studies have long played an integral role in the interpretation of archeological site data in the Southern Plains. This report examines these contributions from several perspectives including those of archeological recovery and curation of human remains, historical background pertaining to preeminent research objectives and themes of more than half a century of osteological research, and future directions leading to systematic and comprehensive investigations in skeletal biology. Future research will emphasize a comparative framework, as facilitated by computers and advances in analytical technology. The horizon is bright but tempered by concerns about attitudes that jeopardize the preservation of this irreplaceable source of scientific information.

This overview of bioarcheology in the Southern Plains was undertaken as one component of a larger synthesis concerned with archeological and bioarcheological research in the Southwestern Division of the U.S. Army Corps of Engineers. A subcontract for this service was formalized between Louisiana State University (LSU), and later the National Museum of Natural History, Smithsonian Institution (SI), and the Arkansas Archeological Survey. The Survey served as coordinator for the total project. In accordance with guidelines provided by Rose and Marks (n.d.), the LSU/SI contract identified specific research objectives pertaining to human burials of archeological context in 210 counties of five states. This region represents the Southern Great Plains study area and includes the counties of southeastern Colorado, southern Kansas, the eastern border of New Mexico, western Oklahoma, and the north-central and panhandle portions of Texas. Primary research directives were (1) to develop a comprehensive inventory of archeological sites that have documented mortuary components, (2) to present an initial synthesis of the major research themes and specific research hypotheses that have been addressed with osteological data, and (3) to provide a preliminary synthesis of existing bioarcheological data using a comparative framework based on prehistoric adaptation types. The third objective addresses the issue of ongoing and future research. In this regard, we have attempted to consolidate this phase of the investigation into an overall consideration of a rigorous research design for future osteological studies concerned with Southern Plains populations. Physical anthropologists and contracting agencies must strive for some degree of standardization in coding and level of analysis to facilitate future comparative studies with objectives that surpass initial investigative or contract requirements. Furthermore, bioarcheological research support, often minimal, requires revaluation. Otherwise, questions will remain unanswered and the data required to test future hypotheses will be unavailable.In fulfillment of our objectives, a comprehensive investigation was undertaken that involved an extensive bibliographic search, survey of existing museum collections, and osteological analysis of selected population samples. The results are presented in three chapters. This chapter focuses on the geographical and temporal distribution of human skeletal remains reported in the archeological literature for the region. Chapter 10 presents the history of osteological research as developed in the Southern Plains. This discussion highlights past research themes and objectives as explored by specific investigators and notes significant contributions. Chapter 11 considers current methodology, future research design, and the types of questions that can be explored with osteological data. These issues should be addressed through comparative research that considers temporal and geographical variation in Southern Plains demography, pathological conditions, and skeletal morphology. This section draws upon current osteological research focused on Northern and Central Plains populations for comparative perspective. Chapter 11 attempts initial integration of Southern Plains osteological data into the Northern Plains data base. There are compelling reasons for this comparison and this study defines some of them. Ultimately, this preliminary investigation must be expanded, as the information to be gained has value when measured in terms of historical insight and biomedical relevance.

## DEVELOPING AN OSTEOLOGICAL DATA BASE FOR THE SOUTHERN GREAT PLAINS

Geographically, the boundaries for the Southern Plains region include 10 counties in the state of Colorado, 52 counties in Kansas, 5 counties in New Mexico, 54 counties in Oklahoma, and 89 counties in Texas (Table 10; Figure 19). This unit shares the Plains macroenvironment although three physiographic zones can be distinguished: (1) the short grass prairies of the High Plains including the Llano Estacado and the Edwards Plateau in the western part of the region, (2) the dissected mixed-grass and tall grass of the eastern prairies, and (3) the Cross Timbers-Oak Savanna zone of the eastern perimeter (Baugh 1982; Blair and Hubbell 1938; Wyckoff 1984).

Table 10
Counties in the Great Plains study area

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COLORADO | | | | OKLAHOMA | | | | | | | | | |
| Baca | BA | Gray | GY | Alfalfa | AL | Nobel | NB | Crane | CR | Lynn | LY | | |
| Bent | BN | Greeley | GL | Beaver | BV | Okfuskee | OF | Crosby | CB | Martin | MT | | |
| Cheyenne | CH | Greenwood | GR | Beckham | BK | Oklahoma | OK | Dallam | DA | Midland | MD | | |
| Crowley | CW | Hamilton | HM | Blaine | BL | Osage | OS | Dawson | DS | Mitchell | MH | | |
| Elbert | EL | Harper | HP | Caddo | CD | Pawnee | PW | Deaf Smith | DF | Montague | MU | | |
| Kiowa | KW | Harvey | HV | Canadian | CN | Payne | PY | Dickens | DK | Moore | MO | | |
| Kit Carson | KC | Haskell | HK | Carter | CA | Pontotoc | PN | Donley | DY | Motley | MY, | | |
| Lincoln | LN | Hodgeman | HO | Cimarron | CI | Pottawatomie | PT | Eastland | EA | | | | |
| Otero | OT | Kearney | KY | Cleveland | CL | Roger Mills | RM | Ector | EC | Nolan | NL | | |
| Prowers | PW | Kingman | KM | Comanche | CM | Seminole | SM | Erath | ER | Ochiltree | OC | | |
| | | Kiowa | KW | Cotton | CT | Stephens | ST | Fisher | FS | Oldham | OL | | |
| N.MEXICO | | Lane | LA | Creek | CR | Texas | TX | Floyd | FL | Palo Pinto | PP | | |
| Curry | CY | Lyon | LY | Custer | CU | Tillman | TI | Foard | FD | Parker | PR | | |
| Lea | LE | Marion | MN | Dewey | DW | Tulsa | TU | Gaines | GA | Parmer | PM | | |
| Quay | QU | McPherson | MP | Ellis | EL | Washington | WN | Garza | GR | Potter | PT | | |
| Roosevelt | RV | Meade | MD | Garfield | GF | Washita | WA | Glasscock | GC | Randall | RD | | |
| Union | UN | Montgomery | MY | Garvin | GV | Woods | WO | Gray | GY | Reagan | RG | | |
| | | Morris | MO | Grady | GD | Woodward | WD | Hale | HA | Roberts | RB | | |
| KANSAS | | Morton | MT | Grant | GT | | | Hall | HL | Scurry | SC | | |
| Allen | AN | Neosho | NO | Greer | GR | TEXAS | | Hansford | HF | Shackelford | SF | | |
| Barber | BA | Ness | NS | Harmon | HR | Andrews | AD | Hardeman | HX | Sherman | SH | | |
| Barton | BT | Pawnee | PA | Harper | HP | Archer | AR | Hartley | HT | Somervell | SV | | |
| Butler | BU | Pratt | PT | Jackson | JK | Armstrong | AM | Haskell | HK | Stephens | SE | | |
| Chase | CS | Reno | RN | Jefferson | JF | Bailey | BA | Hemphill | HH | Stonewall | SN | | |
| Chatauqua | CT | Rice | RC | Johnston | JN | Baylor | BY | Hockley | HQ | Swisher | SW | | |
| Clark | CK | Rush | RH | Kay | KA | Borden | BD | Hood | HD | Taylor | TA | | |
| Coffey | CF | Scott | SC | Kingfisher | KG | Briscoe | BI | Howard | HW | Terry | TY | | |
| Comanche | CM | Sedgwick | SG | Kiowa | KI | Callahan | CA | Hutchinson | HC | Throckmorton | TH | | |
| Cowley | CO | Seward | SW | Lincoln | LN | Carson | CZ | Jack | JA | Upton | UT | | |
| Edwards | ED | Stafford | SF | Logan | LG | Castro | CS | Jones | JS | Ward | WR | | |
| Elk | EK | Stanton | ST | Love | LV | Childress | CI | Kent | KT | Wheeler | WE | | |
| Ellsworth | EW | Stevens | SV | Major | MJ | Clay | CY | King | KG | Wichita | WC | | |
| Finney | FY | Sumner | SR | Marshall | MA | Cochran | CQ | Knox | KX | Wilbarger | WG | | |
| Ford | FD | Wichita | WT | McClain | ML | Collingsworth | CG | Lamb | LA | Winkler | WK | | |
| Grant | GT | Wilson | WN | Murray | MR | Cooke | CO | Lipscomb | LP | Wise | WS | | |
| | | Woodson | WO | | | Cottle | CT | Loving | LV | Yoakum | YK | | |
| | | | | | | | | Lubbock | LU | Young | YN | | |

The first step in this synthesis required systematic survey of a wide variety of sources in order to prepare state inventories identifying sites with mortuary components. This phase of the investigation encompassed several strategies of data collection which extended beyond the published literature and emphasized personal field records and site data forms. Descriptive records were completed for each site with documented evidence of human skeletal remains. These records were maintained in a data base system (dBASE 3Plus). The files contain the following categories of information: state, county, site number, site name, major drainage system, excavation date, principal investigator(s) responsible for the archeological project or burial recovery, the individual(s) completing the osteological study, the level of osteological analysis, the total number of burials identified at the site, numbers of adult males and females and adult sex unknown skeletal remains, the number of preadult burials, a general assessment of the degree of bone preservation, cultural affiliation, adaptation type, and information pertaining to burial context. The quality of the record for each site varied greatly. This variation dictated the amount of information that could be transcribed accurately. If data were missing, the category was left blank. Inclusion in the Southern Plains data base required provenience identification at the

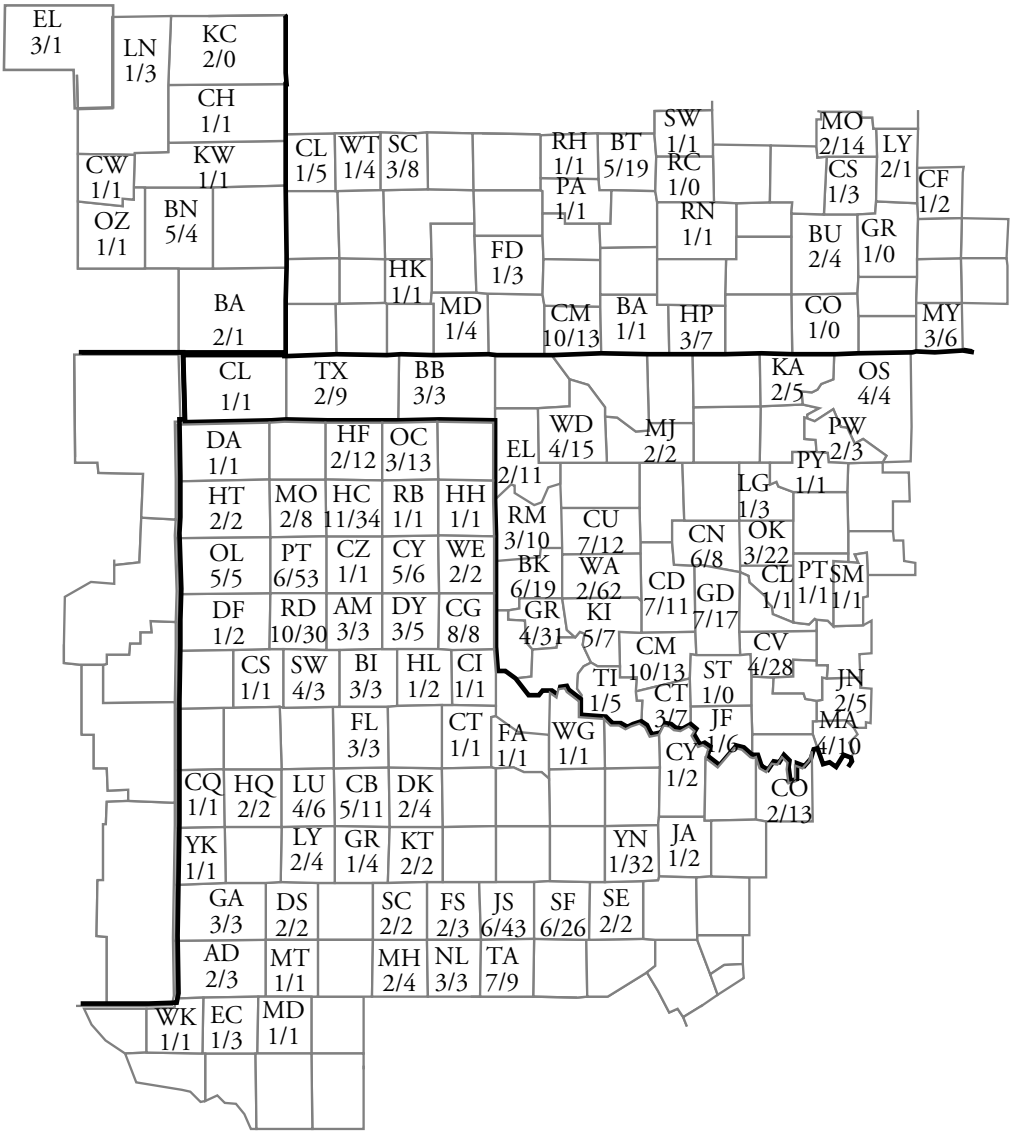



**Figure 19. Number of sites with mortuary components and number of excavated burials in the Southern Plains region.**

county level. Occasional sources noting remains attributed to general regions (e.g., the Texas Panhandle), but not to specific counties, were excluded.

Site designations were identified using the trinomial system (34Cm131, the Gore Pit site) of the Smithsonian Institution when available. Sites recorded by archeologists of the Panhandle Plains Historical Museum, Canyon, Texas, were identified using an archeological site "A" coding system (i.e., A679, Big Blue Cemetery). If site numbers were not available and presumably not assigned, these entries were given standard Smithsonian state and county numeric and alphabetical abbreviations and site numeric designations of 00 (i.e., 41Lu00, Johnston Ranch Cave). Placement of sites relative to major river drainage basins was accomplished with the aid of Robert Brooks (Kansas and Oklahoma) and Sandy Karhu (Colorado), and with reference to the Texas Heritage Conservation Plan Computerization Program Manual (Mallouf et al. 1981).

A variety of reports provided information for this data base. These records included field notes, burial records, site files, museum accession files, laboratory records, archeological site reports, and osteological reports. Each source of information mentioning the discovery or recovery of burials

was evaluated as to the quality of the osteological data presented. Three general categories were used: none, descriptive, and comparative. The term "none" indicated no analysis of the skeletal remains. Descriptive studies provided, at the minimum, basic information as to age or sex and might also include observations pertaining to pathological conditions, skeletal measurements, or other descriptive information. Comparative studies identified reports attempting to integrate osteological data within the broader context of relevant comparative data for other collections within or outside the region, given the research themes and objectives current at the time of the research. This designation does not imply completed or even comprehensive research but rather the use of osteological data to explore problems at a level that surpasses primary description.

Each record was checked for information pertaining to the minimum number of individuals represented and generalized demographic composition by age (i.e., adult, preadult) and sex. If strong evidence indicated that human remains had been exposed at a site but precise counts were not available, the site was entered into the data base with total counts listed as 0. Total counts were generally available although the demographic composition was often unknown. The degree of skeletal preservation was assessed from the burial description as good, fair, or poor. Good (G) condition indicated that the bones were generally complete or easily reconstructed. Fair (F) condition reflected slight to moderate deterioration and breakage although some reconstruction is possible. Poor (P) condition indicated that the bones show advanced deterioration and fragmentation.

Cultural affiliation and adaptation types were assigned to the burials of each site using the codes and definitions described in Hofman, Brooks and Hays (1987). Background information for each site was compiled and then evaluated by both the bioarcheologists and the archeologists in order to make these assignments. Final assessments were determined by Robert Brooks, Joe Hays and Douglas Owsley. Information provided by Billy Harrison for Texas and Sandy Karhu for Colorado was extremely helpful in these classifications. The following cultural affiliation codes were used: Paleo-Indian, Archaic, Woodland (Formative), Late Prehistoric, Protohistoric, and Historic. This general classification system allowed integration of data from a variety of sources reporting burials attributed to numerous archeological complexes. Adaptation types and corresponding numerical codes used for the Southern Great Plains are summarized in Table 11. Four primary categories have been identified by Hofman, Brooks and Hays (1987): Hunters and Gatherers, Plant Food Producers, Contact and Acculturating Groups, and Euramerican-Anglo. Specific subcategories of these primary adaptive types are listed in Table 11.

The development of the bioarcheological data base depended on several lines of investigation. One approach involved systematic survey of the archeological literature, both published and unpublished, in the library collections of Louisiana State University, Baton Rouge; the Kansas State Historical Society, Topeka; the Oklahoma Archaeological Survey, Norman; and the Panhandle Plains Historical Museum, Canyon, Texas. National, regional, and local anthropological and archeological journals, bulletins, and newsletters were checked for osteological citations. Travel to these institutional facilities in Kansas, Oklahoma and Texas enabled access to less widely circulated publications, monographs, miscellaneous contributions, unpublished cultural resource management reports, survey reports, and master's theses.

Table 11.
Adaptation types for the Southern Great Plains

| Adaptation Types | Codes |
|---|---|
| Hunter-Gatherers | 5900 |
| First Arrivals | 5901 |
| Early Specialized Hunter-Gatherers | 5902 |
| Broad Spectrum Hunter-Gatherers | 5903 |
| Late Hunter-Gatherers/Traders | 5904 |
| Plant Food Producers | 5910 |
| Incipient Horticulturist-Gardeners | 5911 |
| Developed Village Horticulturists | 5912 |
| Contact and Acculturating Groups | 5920 |
| Equestrian Nomadic Hunters/Traders | 5921 |
| Coalesced Village Farmers | 5922 |
| Reservation Farmers | 5923 |
| Reservation Hunters/Raiders | 5924 |
| Allotment and Removal Period Amerindians | 5925 |
| Frontiersmen/Explorers/Early Pioneers | 5930 |

*Hoffman, Brooks and Hays (1987)

The personal libraries of William Bass and P. Willey (University of Tennessee, Knoxville), Billy Harrison (Panhandle Plains Historical Museum, Canyon), and Jack Hughes (West Texas State University, Canyon) were graciously made available and included field records, osteological data sheets, and student papers. Student-compiled bibliographies and descriptive reports of skeletal samples or burial excavations occasionally surfaced in these holdings (May 1966; McKee 1965; Rogers 1978; Taylor 1975). For example, McKee's (1965) paper for Anthropology 174, taught by William Bass (then at the University of Kansas), was entitled "Archeological Sites in Kansas with Human Skeletal Remains." Several burial sites were initially identified in these citations and then additional information was acquired through cross reference to state site files and other sources. Several bibliographies helped expand the data base (Brown and Simmons 1987; Hughes 1977; Lintz 1980; Lintz and Baugh 1978). Lintz and Baugh (1978) provide a multiple index listing for the first 24 years of the *Oklahoma Anthropological Society Bulletins, Special Bulletins,* and two *Memoirs.* One cross-index identified physical anthropological studies with topics pertaining to human biology, population profiles by age and sex, traumatic injuries, pathologies, nutrition, and racial affinities.

Computer-based searches of state site files and museum accession records helped identify sites with burials. The Oklahoma Archaeological Survey Information System (OASIS) computerized data file was accessed by Robert Brooks for Oklahoma Regions 4 and 5. This printout listed 60 sites in

the study area. The literature search yielded not a single publication describing burials in the designated counties of southeastern Colorado. Thus, the Colorado data base is derived entirely from a computerized search of site records that include human burial(s) as a feature. This listing was provided by the Office of Archeology and Historic Preservation, Colorado Historical Society. The Kansas State Historical Society computerized site inventory is in the early phases of implementation. At the date of retrieval, approximately 600 site records were entered of an estimated 6,000 to 8,000 recorded archeological sites (Belinda Cullen, Robert Timberlake, personal communication). A search of this limited series yielded a listing of 22 Kansas sites. This listing was supplemented by literature sources and consultation with archeologists and physical anthropologists with research interests in the prehistory of Kansas, principally William Bass (University of Tennessee, Knoxville), Michael Finnegan (Kansas State University, Manhattan), and Martin Stein, Robert Timberlake, and Thomas Witty (Kansas State Historical Society, Topeka). In addition, the Kansas state files for 765 sites were manually checked to determine whether this general approach was comprehensive. Only three new sites were identified in this manner. As a general estimate, approximately 1% of the known Kansas sites are believed to include mortuary features (Belinda Cullen, Kansas State Historical Society, personal communication).

Computerized museum inventories for the Texas Archeological Research Laboratory (TARL), University of Texas, Austin, and the National Museum of Natural History (NMNH), Smithsonian Institution were obtained courtesy of Dee Ann Story and James Boone, TARL, and the Department of Anthropology, NMNH. These accession records were screened for relevant entries. Human skeletal collections at Killgore Research Center, the Museum of Texas Tech University, the Panhandle Plains Historical Museum, and Stovall Museum of Science and History were examined in order to complete preliminary inventories of curated skeletal remains. Pertinent field and laboratory notes were copied.

Preliminary examination of the collections was particularly helpful for several reasons. It was possible to collect information on the number of individuals represented, age and sex, bone preservation, and other observations (e.g., pathological conditions). These observations supplemented information acquired from the literature review and thereby expanded the Southern Plains data base. This survey also helped define the research potential of the existing collections.

## NUMBER AND DISTRIBUTION OF SKELETAL SAMPLES IN THE SOUTHERN GREAT PLAINS

The bioarcheological resource base for the Southern Plains is presented in Table 12. Site numbers and names are listed for archeological sites with mortuary components for counties in Colorado, Kansas, Oklahoma, and Texas. This listing also provides available information about cultural affiliation, adaptation type (identified using codes presented in Table 11), river drainage system, number of burials per site and the state total count, degree of bone preservation, and level of osteological investigation. Two hundred and five archeological sites have documented evidence of mortuary components. The total number of identified skeletal remains is 846, as identified in 118 counties comprising the search area and listed in Table 10. Large sample sizes are extremely rare. The number of individuals represented at each site was usually less than five and often only one or two. Only three sites have population samples of more than 20 individuals. The only relatively large series in this region was 59 individuals. In general, the distribution of samples and our knowledge about them varies greatly from state to state.

Seventeen sites are identified in the Colorado site file as having burials. With only one exception, these burials have not been analyzed and cultural affiliation and adaptation type designations are difficult to assess. Indeed, the precise number of burials identified in the field is not recorded in the literature or the state records.

The Kansas data base is comprised of 35 sites from 23 counties. The total burial count is 96 individuals. Two sites, Walnut Creek (14Bt301) and Curry (14Gr301), have the largest site totals with 10 each. Bone preservation is variable although often in the fair to poor range. Relative to other states, descriptive reports are available for a higher percentage of the Kansas samples and several studies have utilized a comparative approach in the investigation of specific research problems.

Our survey of 51 counties in western Oklahoma identified 105 sites and a total burial count of 344. The McLemore site (34Wa5) of Washita County provides the largest series (N = 59) available for a Southern Great Plains population. This series is an exceptional research collection because of good bone preservation, the effort given to systematic field recovery and recording of archeological provenience data, and the curatorial care expended to make this collection available for scientific analysis.

The total burial count (N = 344) for western Oklahoma is less than reported for the eastern portion of the state. Burnett, Harcourt and Rose's (1988) survey of 21 counties in eastern Oklahoma identified 88 sites with burials, and a total burial count of 3020. The largest sample for a single site was 582 from Spiro (34Lf40). Several factors influenced the recovery of burials in eastern Oklahoma including large reservoir salvage projects and academic interests focused on large mounds containing burials (Burnett, Harcourt and Rose 1986).

The Texas data base has a total inventory of 393 burials from 148 sites. The common pattern reflected in this series is one of isolated burials containing the skeletal remains of one or at most a few individuals. Only 15 sites have five or more individuals identified in their inventories. The largest count (N = 32) was reported for two Late Prehistoric sites, Footprint (41Pt25), and Harrell (41Yn1).

The listing presented in Table 12, although not complete, is comprehensive. Figure 19 graphically illustrates the distribution of these sites and provides total burial counts on a per county basis. Of note, information pertaining to three

Table 12
Bioarchaeology Data Base for the Great Plains Study Area.

| County | Site Number | Site Name | Culture | Adaptation | Drainage | Total Burials | Preserv. vation | Analysis |
|---|---|---|---|---|---|---|---|---|
| Colorado | | | | | | | | |
| Baca | 5Ba10 | | | | Cimarron | 0 | | None |
| Baca | 5Ba317 | Whitby Shelter | | | Cimarron | 1 | | None |
| Bent | 5Bn87 | | | | Arkansas | 3 | | None |
| Bent | 5Bm89 | | | | Arkansas | 0 | | None |
| Bent | 5Bn95 | | | | Arkansas | 0 | | None |
| Bent | 5Bn96 | Lone Tree | | | Arkansas | 0 | | None |
| Bent | 5Bn390 | | | | Arkansas | 1 | | None |
| Cheyenne | 5Ch3 | Chubbock Burial | Protohistoric | | Arkansas | 1 | | Descriptive |
| Crowley | 5Cw14 | Gregory/Allen | | | Arkansas | 1 | | None |
| Elbert | 5E110 | | | | South Platte | 0 | | None |
| Elbert | 5E166 | | Woodland | 5911 | South Platte | 1 | P | None |
| Elbert | 5E167 | | Woodland | 5911 | South Platte | 0 | | None |
| Kiowa | 5Kw5 | | | | Arkansas | 1 | | None |
| Kit Carson | 5Kc7 | | | | Republican | 0 | | None |
| Kit Carson | 5Kc17 | | | | Republican | 0 | | None |
| Lincoln | 5Ln32 | | | | Arkansas | 3 | P | None |
| Otero | 50t84 | | | | Arkansas | 1 | | None |
| Kansas | | | | | | | | |
| Barber | 14Ba401 | | L. Prehistoric | 5912 | Arkansas | 1 | G | Descriptive |
| Barton | 14Bt301 | Walnut Creek | Historic | 5930 | Arkansas | 10 | F | Comparative |
| Barton | 14Bt407 | Bissell Point Mound | Woodland | 5911 | Arkansas | 3 | P | None |
| Barton | 14Bt467 | | Woodland | 5911 | Arkansas | 1 | F | Descriptive |
| Barton | 14Bt468 | Wallker's Station | Historic | 5930 | Arkansas | 4 | | None |
| Barton | 14Bt478 | | Historic | 5930 | Arkansas | 1 | G | Comparative |
| Butler | 14Bu00 | Mead | | | Arkansas | 3 | | None |
| Butler | 14Bu9 | Snyder | Archaic | 5903 | Arkansas | 1 | P | Descriptive |
| Chase | 14Cs1 | Roeniger | Woodland | 5911 | Neosho | 3 | P | Descriptive |
| Coffey | 14Cf330 | Williamson | Archaic | 5903 | Neosho | 2 | P | Comparative |
| Cowley | 14Co3 | Country Club | Protohistoric | 5922 | Arkansas | 0 | | None |
| Ellsworth | 14Ew24 | Hudson | | | Smoky Hill | 1 | P | None |
| Ford | 14Fd00 | | | | Cimarron | 3 | P | None |
| Greeley | 14G1405 | Herl | Archaic | 5903 | Smoky Hill | 5 | P | Descriptive |
| Greenwood | 14Gr301 | Curry | Woodland | 5911 | Verdigris | 10 | P | Comparative |
| Harper | 14Hp1 | Anthony | l.Prehistoric | 5912 | Arkansas | 1 | F | Comparative |
| Harper | 14Hp3 | Poundston | | | Arkansas | 4 | P | Descriptive |
| Harper | 14Hp5 | Armstrong | Woodland | 5911 | Arkansas | 2 | P | None |
| Haskell | 14Hk1 | Cox | Woodland | 5911 | Cimarron | 1 | | None |
| Lyon | 14Ly304 | | | | Verdigris | 0 | F | None |
| Lyon | 14Ly354 | | | | Neosho | 1 | | None |
| Meade | 14Md401 | Conrad | | | Cimarron | 4 | F | Descriptive |
| Montgomery | 14My305 | Infinity | | | Verdigris | 3 | P | Descriptive |
| Montgomery | 14My317 | | Woodland | 5911 | Verdigris | 1 | P | None |
| Montgomery | 14My335 | | L. Prehistoric | 5912 | Verdigris | 2 | P | None |
| Morris | 14Mo314 | Morris | Woodland | 5911 | Neosho | 7 | P | Descriptive |
| Morris | 14Mo323 | White Mound | L. Prehistoric | 5912 | Neosho | 7 | P | Descriptive |
| Pawnee | 14Pa412 | | | | Arkansas | 1 | P | Comparative |
| Reno | 14Rn306 | | L. Prehistoric | 5912 | Arkansas | 1 | F | Descriptive |
| Rice | 14Rc3 | Hayes | Protohistoric | 5922 | Arkansas | 0 | | None |
| Rush | 14Rh307 | | Historic | 5930 | Arkansas | 1 | P | Descriptive |
| Scott | 14Sc02 | Young | Woodland | 5911 | Smoky Hill | 6 | P | Comparative |
| Scott | 14Sc103 | Dismal River | Protohistoric | 5911 | Smoky Hill | 1 | G | Comparative |
| Scott | 14Sc405 | | | | Smoky Hill | 1 | P | None |
| Wichita | 14Wt305 | Beaver Creek | Historic | | Smoky Hill | 4 | F | Descriptive |
| Total | | | | | | 96 | | |
| Oklahoma | | | | | | | | |
| Beaver | 34Bv16 | Smith | | | Beaver - N. Can. | 1 | G | Descriptive |
| Beaver | 34Bv19 | Lockhart Burial | L.Prehistoric/His. | 5912 | Beaver - N. Can. | 1 | | None |
| Beaver | 34Bv63 | Wynn | L. Prehistoric | 5912 | Beaver - N. Can. | 1 | G | None |
| Beckham | 34Bk00 | | | | N. Fork Red | 1 | P | Descriptive |
| Beckham | 34Bk1 | Sandstone Creek #1 | L.Prehistoric | 5912 | Washita | 5 | G | None |
| Beckham | 34Bk2 | Edwards I | Protohistoric | 5912 | N. Fork Red | 2 | P | Descriptive |
| Beckham | 34Bk4 | Hubbard | L. Prehistoric | 5912 | Washita | 4 | P | Descriptive |
| Beckham | 34Bk6 | Fowler | L.Prehistoric | 5912 | Washita | 5 | G | None |
| Beckham | 34Bk62 | Frostbite | | | N. Fork Red | 2 | P | None |
| Caddo | 34Cd00 | Hinton | | | Washita | 1 | F | None |
| Caddo | 34Cd112 | | | | Washita | 3 | P | None |
| Caddo | 34Cd244 | Takoah | Arc./Woodl. | 5904 | Washita | 2 | F | Descriptive |
| Caddo | 34Cd53 | | L.Prehistoric | 5912 | Washita | 1 | P | None |
| Caddo | 34Cd76 | | Arc./Woodl. | 5904 | Washita | 1 | P | Descriptive |
| Caddo | 34Cd79 | Easter Ranch Burial | | | Washita | 1 | G | None |
| Caddo | 34Cd85 | Waterfall Burial | Historic | 5924 | Red | | 2 | None |
| Canadian | 34Cn11 | Brandt | L. Prehistoric | 5912 | S. Canadian | 2 | P | None |
| Canadian | 34Cn17 | Powers | | | S. Canadian | 1 | | None |
| Canadian | 34Cn45 | Barrett Burial | | | S. Canadian | 1 | G | Descriptive |
| Canadian | 34Cn46 | | Archaic | 5904 | S. Canadian | 2 | P | None |
| Canadian | 34Cn7 | | | | S. Canadian | 1 | F | None |
| Canadian | 34Cn76 | Cedar Lake Canyon | Archaic | 5904 | S. Canadian | 1 | P | None |

| County | Site Number | Site Name | Culture | Adaptation | Drainage | Total Burials | Preserv. vation | Analysis |
|---|---|---|---|---|---|---|---|---|
| Cimarron | 34Ci00 | | | | Cimarron | 1 | G | None |
| Cleveland | 34Cl00 | Little Axe Burial | Historic | 5925 | S. Canadian | 1 | P | Descriptive |
| Comanche | 34Cm131 | Gore Pit | Archaic | 5903 | Red | 1 | P | Comparative |
| Comanche | 34Cm134 | Rabbit Hill I | Historic | 5924 | Red | 1 | | None |
| Comanche | 34Cm135 | Brass Bracelet | Historic | 5924 | Red | 1 | | None |
| Comanche | 34Cm136 | Rabbit Hill | Historic | 5924 | Red | 1 | P | Descriptive |
| Comanche | 34Cm137 | Cross Mountain | Historic | 5924 | Red | 1 | | None |
| Comanche | 34Cm215 | Poafpybitty | Historic | 5923 | Red | 2 | G | Comparative |
| Comanche | 34Cm221 | Cared | Historic | 5924 | Red | 1 | G | Descriptive |
| Comanche | 34Cm223 | Hald | Historic | 5924 | Red | 1 | | None |
| Comanche | 34Cm323 | | | | Red | 2 | P | Descriptive |
| Comanche | 34cM337 | | | | Red | 2 | P | Descriptive |
| Cotton | 34Ct12 | | L.Prehistoric | 5912 | Red | 1 | P | None |
| Cotton | 34Ct17 | Henry | L. Prehistoric | 5912 | Red | 2 | G | None |
| Cotton | 34Ct39 | Burton | Woodland | 5904 | Red | 4 | F | None |
| Custer | 34Cu00 | FC8402309 | L.Prehistoric | 5911 | Washita | 1 | G | Descriptive |
| Custer | 34Cu1 | Goodman I | L.Prehistoric | 5912 | Washita | 2 | G | Descriptive |
| Custer | 34Cu11 | Phillips | L.Prehistoric | 5911 | Washita | 1 | G | Descriptive |
| Custer | 34Cu25 | Mouse I | L.Prehistoric | 5911 | Washita | 2 | G | Descriptive |
| Custer | 34Cu27 | Heerwald | L.Prehistoric | 5912 | Washita | 3 | G | Descriptive |
| Custer | 34Cu41 | Cotter - Hutson | L.Prehistoric | 5912 | Washita | 2 | G | Descriptive |
| Custer | 34Cu42 | Arinton | L.Prehistoric | 5912 | Washita | 1 | | None |
| Ellis | 34El00 | | | | S. Canadian | 1 | G | Descriptive |
| Ellis | 34El10 | Parker | L.Prehistoric | 5912 | S. Canadian | 10 | G | None |
| Garvin | 34Gv19 | Stephens | L.Prehistoric | 5912 | Washita | 7 | | None |
| Garvin | 34Gv2 | Brant | L.Prehistoric | 5912 | Washita | 19 | G | Descriptive |
| Garvin | 34Gv32 | Arthur | L.Prehistoric | 5912 | Washita | 1 | P | None |
| Garvin | 34Gv43 | Wilson | L.Prehistoric | 5912 | Washita | 1 | P | None |
| Grady | 34Gd1 | Brown | L.Prehistoric | 5912 | Washita | 1 | | None |
| Grady | 34Gd119 | Sparks | L.Prehistoric | 5912 | Washita | 0 | | None |
| Grady | 34Gd16 | Selzer | L.Prehistoric | 5912 | Washita | 7 | G | Descriptive |
| Grady | 34Gd18 | Lack | L.Prehistoric | 5912 | Washita | 0 | | None |
| Grady | 34Gd24 | Jones | L.Prehistoric | 5912 | Washita | 1 | G | Descriptive |
| Grady | 34Gd78 | Horn | L.Prehistoric | 5912 | Washita | 7 | F | None |
| Grady | 34Gd97 | | | | Washita | 1 | P | None |
| Greer | 34Gr3 | | L.Prehistoric | 5912 | N. Fork Red | 1 | P | Descriptive |
| Greer | 34Gr4 | Rattlesnake Slough | L.Prehistoric | 5912 | N. Fork Red | 3 | P | None |
| Greer | 34Gr5 | | Woodland | 5911 | N. Fork Red | 10 | | Descriptive |
| Greer | 34Gr6 | | L.Prehistoric | 5912 | N. Fork Red | 17 | P | Descriptive |
| Jefferson | 34Jf1 | Longest | Historic | 5922 | Red | 6 | P | Descriptive |
| Johnston | 34Jn28 | Converse #2 | Woodland | 5911 | Washita | 2 | | None |
| Johnston | 34Jn30 | Wildlife Refuge #1 | Historic | 5925 | Washita | 3 | G | Descriptive |
| Kay | 34Ka172 | Uncas | L.Prehistoric | 5912 | Arkansas | 4 | P | Descriptive |
| Kay | 34Ka21 | Bryson Homestead | Historic | 5922 | Arkansas | 1 | P | Descriptive |
| Kiowa | 34Ki00 | | | | N. Fork Red | 1 | G | None |
| Kiowa | 34Ki1 | Devils Canyon | Historic | 5922 | N. Fork Red | 2 | G | None |
| Kiowa | 34Ki3 | | L.Prehistoric | 5912 | N. Fork Red | 2 | G | Descriptive |
| Kiowa | 34Ki47 | Cline Ranch | | | Washita | 1 | | None |
| Kiowa | 34Ki5 | Parrish | | | Washita | 1 | | None |
| Logan | 34Lg49 | Fields Burial | | | Cimarron | 3 | G | None |
| Major | 34Mj11 | Fairview Burial | Historic | | Cimarron | 1 | G | Descriptive |
| Major | 34Mj16 | Tanner | | | Cimarron | 1 | P | None |
| Marshall | 34Ma1 | Boat Dock | L.Prehistoric | 5912 | Red | 1 | G | None |
| Marshall | 34Ma2 | Buncombe Creek | Archaic | 5904 | Red | 6 | F | None |
| Marshall | 34Ma22 | Chapman | | | Red | 1 | | None |
| Marshall | 34Ma23 | Wheeler | Historic | | Red | 1 | G | None |
| McClain | 34Ml1 | Alcorn | L.Prehistoric | 5912 | S. Canadian | 9 | P | Descriptive |
| McClain | 34Ml3 | Brewer | L.Prehistoric | 5911 | Canadian | 2 | P | Descriptive |
| Oklahoma | 34Okl00 | Chevrole | Arc./Wodl. | 5911 | Canadian | 1 | P | Descriptive |
| Oklahoma | 34Ok4 | Nagle | L.Prehistoric | 5912 | N. Canadian | 16 | G | Comparative |
| Oklahoma | 34Ok7 | Bross | Archaic | 5904 | Canadian | 5 | P | Descriptive |
| Osage | 34Os97 | Craddock Shelter | | | Arkansa | 1 | G | None |
| Osage | 34Os99 | Waston | Arc./Woodl. | 5904 | Caney | 1 | P | Descriptive |
| Osage | 34Os104 | | Historic | 5925 | Caney | 1 | G | Descriptive |
| Osage | 34Os106 | | | | Caney | 1 | G | Descriptive |
| Pawnee | 34Pw54 | Zickefosse | L.Prehistoric | 5912 | Cimarron | 2 | F | None |
| Pawnee | 34Pw8 | Baker | | | Cimarron | 1 | | None |
| Payne | 34Py1 | | | | Arkansas | 1 | G | Descriptive |
| Pottewatomie | 34Pt29Trite | | Historic | 5925 | Canadian | 1 | G | Descriptive |
| Roger Mills | 34Rm128 | | | | Washita | 1 | | None |
| Roger Mills | 34Rm29 | Wickham #3 | L.Prehistoric | 5912 | Washita | 3 | F | Descriptive |
| Roger Mills | 34Rm400 | New Smith | L.Prehistoric | 5912 | Washita | 6 | P | Descriptive |
| Seminole | 34Sm5 | | L.Prehistoric | 5912 | Canadian | 1 | G | Descriptive |
| Stephens | 34St2 | Blackie Cox #1 | | | Red | 0 | | None |
| Texas | 34Tx1 | Stamper | L.Prehistoric | 5912 | Beaver - N. Canadian | 8 | | None |
| Texas | 34Tx60 | Boatstone | Archaic | 5904 | Beaver - N. Canadian | 1 | | None |
| Tillman | 34Ti8 | Hamill IV | L.Prehistoric | 5912 | Red | 5 | | None |
| Washita | 34Wa4 | Hine | L.Prehistoric | 5912 | Washita | 3 | F | Descriptive |
| Washita | 34Wa5 | McLemore | L.Prehsitoric | 5912 | Washita | 59 | G | Comparative |
| Woodward | 34Wd1 | | | | Cimarron | 0 | | None |
| Woodward | 34Wd12 | Fred Loomis | L.Prehistoric | 5912 | Cimarron | 11 | P | Descriptive |

| County | Site Number | Site Name | Culture | Adaptation | Drainage | Total Burials | Preserv. vation | Analysis |
|---|---|---|---|---|---|---|---|---|
| Woodward | 34Wd2 | Hedding | L.Prehistoric | 5912 | Cimarron | 3 | P | Descriptive |
| Woodward | 34Wd48 | McCarty Cave | | | Cimarron | 1 | | None |
| | Total | | | | | 344 | | |
| Texas | | | | | | | | |
| Andrews | 41Ad00 | | | | Colorado | 1 | P | None |
| Andrews | 41Ad2 | Salt Cedar | L.Prehistoric | 5904 | Colorado | 2 | | None |
| Armstrong | A174 | Opal Cave | Historic | 5920 | Red | 1 | G | None |
| Armstrong | A329 | | Archaic | 5903 | Red | 1 | P | None |
| Armstrong | A426 | | Archaic | 5903 | Red | 1 | F | None |
| Briscoe | A1063 | Taylor Ranch Burial | Archaic | 5903 | Red | 1 | F | Descriptive |
| Briscoe | A568 | | Archaic | 5903 | Red | 1 | F | None |
| Briscoe | A605 | | | | Red | 1 | P | None |
| Carson | A186 | | Historic | 5921 | Canadian | 1 | G | None |
| Castro | A580 | | Archaic | 5903 | Red | 1 | P | None |
| Clay | 41Cy00 | | | | Red | 2 | P | None |
| Cochran | 41Co00 | | Colorado | | | 1 | P | None |
| Collingsworth | 41Cg00 | | Historic | 5920 | Red | 1 | G | None |
| Collingsworth | 41Cg00 | | | | Red | 1 | P | None |
| Collingsworth | 41Cg00 | | | | Red | 1 | | None |
| Collingsworth | 41Cg00 | | | | Red | 1 | P | None |
| Collingsworth | 41Cg00 | | | | Red | 1 | | None |
| Collingsworth | 41Cg00 | | | | Red | 1 | F | None |
| Collingsworth | 41Cg00 | | | | Red | 1 | F | None |
| Collingsworth | A21 | | | | Red | 1 | F | None |
| Collingsworth | A520 | | Archaic | 5903 | Red | 1 | G | Descriptive |
| Cooke | 41Co174 | Dillard | L.Prehistoric | 5912 | Red | 12 | G | None |
| Cottle | 41Ct00 | | Historic | 5923 | Red | 1 | | None |
| Cottle | 41Ct00 | Donald Love | | | Red | 1 | F | None |
| Crosby | 41Cb00 | | | | Brazos | 1 | P | None |
| Crosby | 41Cb00 | | | | Brazos | 1 | P | None |
| Crosby | 41Cb00 | Blanco Canyon | | | Brazos | 1 | G | None |
| Crosby | 41Cb00 | Ralls | Historic | 5920 | Brazos | 1 | P | None |
| Crosby | X41Cb2 | Morgan Jones | Historic | 5921 | Brazos | 1 | G | Descriptive |
| Dallam | A379 | | | | Canadian | 1 | F | None |
| Dawson | 41Ds00 | | Historic | 5921 | Colorado | 1 | G | None |
| Dawson | 41Ds00 | Moore's Shelter | | | Colorado | 1 | G | Descriptive |
| Deaf Smith | A283 | | Historic | 5920 | Red | 2 | F | None |
| Dickens | 41Dk00 | Brazos | | | | 3 | P | None |
| Dickens | 41Dk16 | Old Ton Burial | Archaic | 5903 | Brazos | 1 | P | None |
| Donley | 41Dy00 | Double Indian Burial | | | Red | 2 | P | None |
| Donley | A1137 | | L.Prehistoric | 5904 | Red | 1 | P | None |
| Donley | A616 | | L.Prehistoric | 5912 | Red | 2 | P | None |
| Ector | 41Ec00 | | | | Colorado | 3 | F | None |
| Fisher | 41Fs00 | | Archaic | 5903 | Brazos | 2 | P | None |
| Fisher | 41Fs1 | W.H. Watson | Historic | 5921 | Brazos | 1 | G | Descriptive |
| Floyd | 41Fl00 | Long Hollow Burial | Historic | 5921 | Red | 1 | | None |
| Floyd | 41Fl00 | Wooden Bow Burial | Protohistoric | 5904 | Red | 1 | | None |
| Floyd | 41Fl45 | Cogdell Burial | Historic | 5921 | Red | 1 | G | Descriptive |
| Foard | 41Fd00 | | | | Red | 1 | P | Comparative |
| Gaines | 41Ga00 | | | | Colorado | 1 | P | None |
| Gaines | 41Ga00 | | Archaic | 5903 | Colorado | 1 | F | None |
| Gaines | 41Ga00 | Cedar Lake | | | Colorado | 1 | G | None |
| Garza | 41Gr60 | Lane | L.Prehistoric | 5904 | Brazos | 4 | F | Descriptive |
| Gray | 41Gy00 | | | | Red | 1 | | None |
| Gray | 41Gy00 | | | | Red | 1 | G | None |
| Gray | A188 | | Historic | 5920 | Red | 2 | P | None |
| Gray | A428 | | Archaic | 5903 | Red | 1 | G | None |
| Gray | A444 | | Woodland/L.Pre. | 5911 | Red | 1 | F | None |
| Hall | 41Hl2 | Jim Arnold | L.Prehistoric | 5904 | Red | 2 | F | Comparative |
| Hansford | A1685 | | | | Canadian | 1 | | None |
| Hansford | A546 | | L.Prehistoric | 5912 | Canadian | 11 | G | None |
| Hartley | A481 | | Archaic | 5903 | Canadian | 1 | P | None |
| Hartley | A655 | | | | Canadian | 1 | P | None |
| Hemphill | 41Hh00 | | | | Canadian | 1 | G | None |
| Hockley | 41Hq00 | | L.Prehist/Historic | | Brazos | 1 | G | Comaprative |
| Hockley | 41Hq00 | Whitharrel | | | Brazos | 1 | G | Comparative |
| Hutchinson | 41Hc00 | | | | Canadian | 1 | | None |
| Hutchinson | 41Hc2 | Tarbox | L.Prehistoric | 5912 | Canadian | 3 | P | None |
| Hutchinson | 41Hc23 | Antelope Creek 22 | L.Prehistoric | 5912 | Canadian | 1 | | Comparative |
| Hutchinson | 41Hc23 | Antelope Creek 22A | L.Prehistoric | 5912 | Canadian | 18 | | Comparative |
| Hutchinson | 41Hc25 | Antelope Creek 23 | L.Prehistoric | 5912 | Canadian | 1 | | None |
| Hutchinson | 41Hc3 | Sanford Ruin | L.Prehistoric | 5912 | Canadian | 2 | | None |
| Hutchinson | A118 | Cottonwood Creek | Woodland | 5911 | Canadian | 1 | | None |
| Hutchinson | A473 | | L.Prehistoric | 5912 | Canadian | 2 | F | None |
| Hutchinson | A490 | | L.Prehistoric | 5912 | Canadian | 2 | P | None |
| Hutchinson | A588 | | L.Prehsitoric | 5912 | Canadian | 1 | F | None |
| Hutchinson | A592 | | L.Prehsitoric | 5912 | Canadian | 2 | P | None |
| Jack | 41Ja00 | Trinity | | | | 2 | F | None |
| Jones | 41Js00 | | Archaic | 5903 | Brazos | 1 | | None |
| Jones | 41Js00 | | Archaic | 5903 | Brazos | 1 | P | None |

| County | Site Number | Site Name | Culture | Adaptation | Drainage | Total Burials | Preserv. vation | Analysis |
|---|---|---|---|---|---|---|---|---|
| Jones | 41Js00 | Henderson | Archaic | 5903 | Brazos | 5 | F | None |
| Jones | 41Js00 | Jim Alexander #1-4 | Archaic | 5903 | Brazos | 17 | P | Descriptive |
| Jones | 41Js00 | Triplett | | | Brazos | 4 | P | None |
| Jones | 41Js31 | Roberts Covered Md | Archaic | 5903 | Brazos | 15 | F | Comparative |
| Kent | 41Kt00 | | | | Brazos | 1 | F | Descriptive |
| Kent | 41Kt00 | | | | Brazos | 1 | | None |
| Lubbock | 41Lu00 | | | | Brazos | 1 | P | None |
| Lubbock | 41Lu00 | Johnston Ranch . | Historic | 5920 | Brazos | 3 | F | None |
| Lubbock | 41Lu00 | Smart's Ranch | | | Brazos | 1 | G | None |
| Lubbock | 41Lu00 | Yellowhouse Canyon | Historic | 5921 | Brazos | 1 | G | Descriptive |
| Lynn | 41Ly00 | | | | Brazos | 3 | F | None |
| Lynn | 41Ly00 | | | | Brazos | 1 | P | None |
| Martin | 41Mt00 | | Historic | 5921 | Colorado | 1 | G | None |
| Midland | 41Md1 | Scharbauer | Paleoindian | 5902 | Colorado | 1 | P | Comparative |
| Mitchell | 41Mh00 | | | | Colorado | 3 | P | None |
| Mitchell | 41Mh00 | | Historic | 5920 | Colorado | 1 | P | Descriptive |
| Moore | A175 | | L.Prehistoric | 5912 | Canadian | 2 | G | None |
| Moore | 4678 | Big Blue Cemetery | L.Prehistoric | 5912 | Canadian | 6 | | None |
| Nolan | 41Nl00 | | | | Brazos | 1 | P | None |
| Nolan | 41Nl00 | | | | Brazos | 1 | G | None |
| Nolan | 41Nl8 | | Historic | 5920 | Brazos | 1 | | None |
| Ochiltree | 41Ot00 | Gould Ruin | L.Prehistoric | 5912 | Canadian | 7 | F | None |
| Ochiltree | 41Oc1 | Kent #1 | L.Prehistoric | 5912 | Canadian | 1 | G | Descriptive |
| Ochiltree | 41Oc27 | Courson B | L.Prehistoric | 5912 | Canadian | 5 | P | Descriptive |
| Oldham | Al203 | Gun Sight Shelter | Archaic | 5903 | Canadian | 1 | P | Descriptive |
| Oldham | A533 | | Woodland | | Canadian | 1 | F | None |
| Oldham | A641 | | Archaic | 5903 | Canadian | 1 | G | None |
| Oldham | A698 | | Archaic | 5903 | Canadian | 1 | G | None |
| Oldham | A2060 | Tasocsa Creek | Woodland | | Canadian | 1 | P | Descriptive |
| Potter | 41Ptll | Alibates Ruin 28 | L.Prehistoric | 5912 | Canadian | 15 | P | Comparative |
| Potter | 41Pt2 | Coetas Ruin | L.Prehistoric | 5912 | Canadian | 2 | P | None |
| Potter | 41Pt25 | Footprint | L.Prehistoric | 5912 | Canadian | 32 | P | Comparative |
| Potter | A249 | | L.Prehistoric | 5912 | Canadian | 2 | P | None |
| Potter | A293 | | | | Canadian | 1 | P | None |
| Potter | A769 | | Woodland | 5904 | Canadian | 1 | P | Descriptive |
| Randall | A1Rd00 | | | | Red | 2 | F | None |
| Randall | 41Rd00 | | | | Red | 1 | G | None |
| Randall | 41Rd00 | | | | Red | 2 | P | None |
| Randall | A138 | | Archaic | 5903 | Red | 1 | P | None |
| Randall | A16 | | Woodland | 5911 | Red | 1 | P | None |
| Randall | A180 | | L.Prehistoric | 5912 | Red | 6 | G | None |
| Randall | A227 | | L.Prehistoric | 5912 | Canadian | 14 | G | None |
| Randall | A4 | Wright | Archaic | 5903 | Red | 1 | P | None |
| Randall | A5 | Schaeffer Shelter | Archaic | 5903 | Red | 1 | P | None |
| Randall | A585 | | L.Prehistoric | 5904 | Red | 1 | | None |
| Roberts | 41Rb00 | | | | Canadian | 1 | P | None |
| Scurry | 41Sc00 | | | | Colorado | 1 | P | None |
| Scurry | 41Sc00 | | | | Colorado | 1 | P | None |
| Shackelford | 41Sf00 | | | | Brazos | 1 | G | None |
| Shackelford | 41Sf00 | | Archaic | 5903 | Brazos | 18 | G | Descriptive |
| Shackelford | 41Sf00 | De La Fosse Mound #1 | Archaic | 5903 | Brazos | 1 | P | None |
| Shackelford | 41Sf00 | J.C. Putnam | Archaic | 5903 | Brazos | 1 | G | Descriptive |
| Shackelford | 41Sf00 | Matthews Ranch | Archaic | 5903 | Brazos | 2 | P | Comparative |
| Shackelford | 41Sf00 | W. Myatt | Archaic | 5903 | Brazos | 3 | G | Descriptive |
| Stephens | 41Se00 | | Archaic | 5904 | Brazos | 1 | | None |
| Stephens | 41Se3 | G.W. Gritzer | | | Brazos | 2 | P | None |
| Swisher | 41Sw00 | | | | Red | 1 | G | None |
| Swisher | 41Sw00 | | | | Red | 0 | | None |
| Swisher | 41Sw23 | Deadman's Shelter | L.Prehistoric | 5904 | Red | 1 | G | Comparative |
| Swisher | A1652 | | Historic | 5921 | Red | 1 | G | Descriptive |
| Taylor | 41Ta00 | | Archaic | 5903 | Brazos | 1 | P | None |
| Taylor | 41Ta00 | Alexander Mound | Archaic | 5903 | Brazos | 2 | G | Comparative |
| Taylor | 41Ta00 | Beyer | Archaic | 5903 | Brazos | 1 | G | Descriptive |
| Taylor | 41Ta00 | Sutman Lease Mound | Archaic | 5903 | Brazos | 1 | F | None |
| Taylor | 41Ta00 | Coon Hollow Ranch | | | Brazos | 2 | G | Descriptive |
| Taylor | 41Ta00 | Heffaner | Archaic | 5903 | Brazos | 1 | P | Descriptive |
| Taylor | 41Ta00 | Waterless Camp | Archaic | 5903 | Brazos | 1 | P | None |
| Wheeler | 41We00 | | | | Red | 1 | G | None |
| Wheeler | 41We00 | | | | Red | 1 | P | None |
| Wilbarger | 41Wg00 | | Historic | 5920 | Red | 1 | G | None |
| Winkler | 41Wk21 | Shifting Sands | Paleoindian | 5902 | Pecos | 1 | P | None |
| Yoakum | 41Yk00 | White | Historic | 5921 | Colorado | 1 | F | Descriptive |
| Young | 41Yn1 | Harrel | L.Prehistoric | 5912 | Brazos | 32 | P | None |
| | Total | | | | | 393 | | |

Oklahoma counties (Hughes, Tulsa, and Washington) shown on this map are reported in Rose, Harcourt and Burnett (1988). No remains were identified for the eastern border counties of New Mexico. Other gaps in the Southern Plains record are apparent. In all respects, sample sizes are limited. Without question, human skeletal remains in the Southern Plains are rare and large sample sizes, which contribute greatly to certain investigations (e.g., demography), are practically nonexistent. Moreover, the actual number of skeletons available for scientific study is considerably less than the total count of 846 individuals. There are reasons for this discrepancy and some of them are addressed in the next chapter.

In any case, these observations do not negate the overall importance of the available collections for future research. The fact that a number of these samples have not yet been analyzed or need to be reexamined using modern techniques emphasizes the importance of a comprehensive research design applicable to the Southern Great Plains. In this regard, it is useful to consider composition of the bioarcheological data base as ordered by the assigned classifications. Tenable sample sizes for future studies emphasizing a comparative perspective are attainable by combining data from related sites. Possible aggregates include collapsing units on the basis of cultural affiliation and adaptation type.

The distribution of human skeletal remains by cultural affiliation is presented in Table 13. With exception of the Colorado data base, classification of 78 to 89% of the burials was possible. Only two Paleo-Indian discoveries were identified. A partial cranial vault and fragmented postcranial elements were recovered at the Scharbauer site (41Md1), Midland County Texas, and a fragmentary set of teeth was found at the Shifting Sands site (41Wk21), Winkler County in west-central Texas. Of the total collection, most remains (53.0%) represent Late Prehistoric populations, especially in the states of Oklahoma (70.9% of the state total) and Texas (48.9%). Archaic samples are second in overall frequency (13.5%) especially in the Texas inventory. Woodland, Protohistoric, and Historic period burials are not common. Historic remains from Kansas include whites and blacks (14Bt301, 14Bt478), who died during Indian raids, including the Walnut Creek massacre (Finnegan 1976, 1980; Reynolds 1980).

Total counts given in the previous summary are partitioned in Table 14 by sex and age as either adult (male, female, sex unknown) or preadult. This table provides a general assessment of the demographic composition of the Southern Plains data base. These numbers are potentially useful when planning future research, especially if considering the applicability of specific design strategies that require selected age segments of the population (e.g., skeletal growth research). Of note, row counts by age and sex seldom equal total counts because of inadequate reporting of the osteological data. Site burial counts were usually available although additional breakdown by age and sex was occasionally omitted in the original sources. Male (N = 200) or female (N = 170) assignments were given (as also supplemented by our museum surveys) to 72% of the adults. The Southern Plains skeletal collection is comprised of 514 adults and 222 children. In view of the broad spectrum of reference material used to compile the data base, further age/sex classification is impractical at this time.

Burials assigned specific cultural affiliations are classified by major river drainages in Table 15. Most Archaic burials (N = 75) fall within the boundaries of the Brazos River drainage. Late Prehistoric burials have been reported in several areas but especially along the reaches of the Washita (Oklahoma) and the Canadian (Texas) Rivers.

Table 16 provides information about the quality of bone preservation (identified as poor, fair, or good) in 156 sites. This subset of the data base represents sites with this information available as assessed from the literature or personal examination and with identified cultural affiliation. State specific data are tabulated as well as summary statistics. Older samples representing Paleo-Indian, Archaic, and Woodland populations generally show poor preservation as well as limited numbers of burials recovered. From a future management perspective, early sites with unusually good bone preservation are a particularly valuable source of scientific information. Late Prehistoric, Protohistoric, and Historic sites have good bone preservation in about 50 to 61% of the cases. Although a recent date does not insure good preservation, samples from many sites will often permit detailed osteological research.

Table 13
Distribution of Human Skeletons by Cultural Affiliation

| Affiliation | Colorado | | Kansas | | Oklahoma | | Texas | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | N | % | N | % | N | % | N | % | N | % |
| Paleoindian | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 2 | 0.5 | 2 | 0.2 |
| Archaic | 0 | 0.0 | 8 | 8.3 | 16 | 4.7 | 90 | 22.9 | 114 | 13.5 |
| Woodland | 1 | 7.7 | 34 | 35.4 | 16 | 4.7 | 5 | 1.3 | 56 | 6.6 |
| L. Prehistoric | 0 | 0.0 | 12 | 12.5 | 244 | 70.9 | 192 | 48.9 | 448 | 53.0 |
| Protohistoric | 1 | 7.7 | 1 | 1.0 | 2 | 0.6 | 1 | 0.3 | 5 | 0.6 |
| Historic | 0 | 0.0 | 20 | 20.8 | 27 | 7.8 | 30 | 7.6 | 77 | 9.1 |
| Unknown | 11 | 84.6 | 21 | 21.9 | 39 | 11.3 | 73 | 18.6 | 144 | 17.0 |
| Total | 13 | | 96 | | 344 | | 393 | | 846 | |

Table 14
Number of Human Skeletons by Age, Sex and Cultural Affiliation

| Affiliation | M | F | Unkn. | Preadult | Burials |
|---|---|---|---|---|---|
| Paleoindian | 0 | 1 | 1 | 0 | 2 |
| Archaic | 27 | 31 | 29 | 25 | 114 |
| Woodland | 11 | 12 | 7 | 21 | 56 |
| Late Prehistoric | 86 | 84 | 70 | 142 | 448 |
| Protohistoric | 2 | 0 | 2 | 0 | 5 |
| Historic | 37 | 17 | 6 | 11 | 77 |
| Unknown | 37 | 25 | 29 | 23 | 144 |
| TOTAL | 200 | 170 | 144 | 222 | 846 |

*These totals are not compiled from the preceding columns.

Table 15
Distribution of Human Skeletons by
Cultural Affiliation and River Drainage

| Drainage | Paleoamer. | Archaic | Woodland | L.Prehis. | Proto. | Historic |
|---|---|---|---|---|---|---|
| Colorado | | | | | | |
| Arkansas | 0 | 0 | 0 | 0 | 1 | 0 |
| Cimarron | 0 | 0 | 0 | 0 | 0 | 0 |
| Republican | 0 | 0 | 0 | 0 | 0 | 0 |
| South Platte | 0 | 0 | 1 | 0 | 0 | 0 |
| Kansas | | | | | | |
| Arkansas | 0 | 1 | 6 | 3 | 0 | 16 |
| Cimarron | 0 | 0 | 1 | 0 | 0 | 0 |
| Neosho | 0 | 0 | 10 | 7 | 0 | 0 |
| Smoky Hill | 0 | 5 | 6 | 0 | 1 | 4 |
| Verdigris | 0 | 0 | 11 | 2 | 0 | 0 |
| Oklahoma | | | | | | |
| Arkansas | 0 | 0 | 0 | 4 | 0 | 1 |
| Beaver-N. Can. | 0 | 1 | 0 | 9 | 0 | 0 |
| Canadian | 0 | 6 | 0 | 3 | 0 | 1 |
| Caney | 0 | 1 | 0 | 0 | 0 | 1 |
| Cimarron | 0 | 0 | 0 | 16 | 0 | 0 |
| North Canadian | 0 | 0 | 0 | 16 | 0 | 0 |
| North Fork Red | 0 | 0 | 10 | 23 | 2 | 2 |
| Red | 0 | 7 | 4 | 10 | 0 | 17 |
| South Canadian | 0 | 3 | 0 | 21 | 0 | 1 |
| Washita | 0 | 3 | 2 | 142 | 0 | 3 |
| Texas | | | | | | |
| Brazos | 0 | 75 | 0 | 36 | 0 | 14 |
| Canadian | 0 | 4 | 4 | 129 | 0 | 1 |
| Colorado | 1 | 1 | 0 | 2 | 0 | 4 |
| Pecos | 1 | 0 | 0 | 0 | 0 | 0 |
| Red | 0 | 10 | 2 | 25 | 1 | 11 |
| Trinity | 0 | 0 | 0 | 0 | 0 | 0 |

Table 17 provides the distribution of human skeletons in the region by adaptation type. The adaptation type categories presented in Tables 11 and 17 follow a hierarchical framework, whereby a general category (e.g., Plant Food Producers) has subcategories (e.g., Incipient Horticulturists-Gardeners, Developed Village Horticulturists). In practice, assignment of a given burial complex to these subcategories was usually possible. If a specific classification could not be justified but general classification was warranted, this less specific designation was applied. Each burial was assigned only one designation depending on available background information.

Approximately 83% of the total series was classified using this conceptual approach. Hunter-Gatherers represent 16.2% of the total sample and most of these were identified as Broad-Spectrum Hunter-Gatherers (11.6%). A total of 37 burials were classified as Post-Archaic Hunter-Gatherer-Traders (4.4%). Only the Midland (Scharbauer site) partial skeleton and teeth found at the Shifting Sands site were tentatively assigned to the Early Specialized Hunters adaptation type. Most skeletal remains (58.3%) in the Southern Great Plains are associated with populations having subsistence strategies based on horticulture. Of this percentage, 58 burials (6.9%) represent the incipient stages of plant food production. Historic period remains are rare.

Table 18 reports the number of burials that have been analyzed. The osteological record for each site was assigned to one of three categories indicating no analysis, basic description, or comparative analysis that used osteological data to test hypotheses or investigate specific research questions by comparison to other groups.

The level of analysis classification was assigned to samples derived from 301 archeological sites. A total of 196 (65.1%) samples have not been analyzed. Descriptive information is available for 80 (26.6%) samples. Osteological data gathered from 25 (8.3%) Southern Plains sites have been used in comparative studies. Table 18 presents additional information about the levels of analysis as tabulated using cultural affiliation as an organizational format. Half or more of the sites from all time periods/cultures lack detailed study. Cultural affiliation samples designated "unknown" often have

Table 16
Human Bone Preservation in Archeological Sites Listed by State and Cultural Affilation

| | Colorado | | | Kansas | | | Oklahoma | | | Texas | | | Total Poor | | Total Fair | | Total Good | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Affiliation | P | F | G | P | F | G | P | F | G | P | F | G | N | % | N | % | N | % |
| Paleoindian | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 2 | 100.0 | 0 | 0.0 | 0 | 0.0 |
| Archaic | 0 | 0 | 0 | 3 | 0 | 0 | 4 | 1 | 0 | 15 | 8 | 9 | 22 | 55.0 | 9 | 22.5 | 9 | 22.5 |
| Woodland | 1 | 0 | 0 | 7 | 1 | 0 | 0 | 1 | 0 | 2 | 2 | 0 | 10 | 71.4 | 4 | 28.6 | 0 | 0.0 |
| Late Prehistoric | 0 | 0 | 0 | 2 | 2 | 1 | 15 | 4 | 19 | 11 | 5 | 18 | 28 | 36.4 | 11 | 14.3 | 38 | 49.4 |
| Protohistoric | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 50.0 | 0 | 0.0 | 1 | 50.0 |
| Historic | 0 | 0 | 0 | 1 | 2 | 1 | 4 | 0 | 8 | 3 | 3 | 11 | 8 | 24.2 | 5 | 15.2 | 20 | 60.6 |

*Percentages are based on row totals; P-poor; F-fair; G-good

Table 17
Distribution of Human Skeletons by Adaptation Types

| Adaptation | Colorado | | Kansas | | Oklahoma | | Texas | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | N | % | N | % | N | % | N | % | N | % |
| Hunters-Gatherers | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| First Arrivals | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| Early Specialized Hunter-Gatherers | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 2 | 0.5 | 2 | 0.2 |
| Broad-Spectrum Hunter-Gatherers | 0 | 0.0 | 8 | 8.3 | 1 | 0.3 | 89 | 22.7 | 98 | 11.6 |
| Post-Archaic Hunter-Gatherers/Traders | 0 | 0.0 | 0 | 0.0 | 23 | 6.7 | 14 | 3.6 | 37 | 4.4 |
| Plant Food Producers | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| Incipient Holticulturist-Gardeners | 1 | 7.7 | 35 | 36.5 | 19 | 5.5 | 3 | .8 | 58 | 6.9 |
| Developed Village Horticulturists | 0 | 0.0 | 12 | 12.5 | 241 | 70.3 | 181 | 46.2 | 434 | 51.4 |
| Contact and Acculturating Groups | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 19 | 4.8 | 19 | 2.3 |
| Equestrian Nomads | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 10 | 2.6 | 10 | 1.2 |
| Coalesced Farmers | 0 | 0.0 | 0 | 0.0 | 9 | 2.6 | 0 | 0.0 | 9 | 1.1 |
| Reservation Farmers | 0 | 0.0 | 0 | 0.0 | 2 | .6 | 1 | 0.3 | 3 | 0.4 |
| Reservation Hunter-Raiders | 0 | 0.0 | 0 | 0.0 | 8 | 2.3 | 0 | 0.0 | 8 | 1.0 |
| Allotment Period Amerindians | 0 | 0.0 | 0 | 0.0 | 6 | 1.8 | 0 | 0.0 | 6 | 0.7 |
| Euramerican Dominant | 0 | 0.0 | 16 | 16.7 | 0 | 0.0 | 0 | 0.0 | 16 | 1.9 |
| Unknown | 12 | 92.3 | 25 | 26.0 | 34 | 9.9 | 73 | 18.6 | 144 | 17.1 |
| Total | 13 | | 96 | | 343 | | 392 | | 844 | |

*These totals are not compiled from the preceding columns.

Table 18
Level of Analysis of Southern Plains Skeletal Samples Classified as No Analysis (N), Descriptive (D), or Comparative (C)

| | Colorado | | | Kansas | | | Oklahoma | | | Texas | | | Total N | | Total D | | Total C | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Affiliation | N | D | C | N | D | C | N | D | C | N | D | C | N | % | N | % | N | % |
| Paleoindian | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 50.0 | 0 | 0.0 | 1 | 50.0 |
| Archaic | 0 | 0 | 0 | 0 | 2 | 1 | 4 | 1 | 1 | 22 | 9 | 3 | 26 | 60.1 | 12 | 27.9 | 5 | 11.6 |
| Woodland | 2 | 0 | 0 | 4 | 3 | 2 | 2 | 1 | 0 | 3 | 2 | 0 | 11 | 57.9 | 6 | 31.6 | 2 | 10.5 |
| Late Prehistoric | 0 | 0 | 0 | 1 | 3 | 1 | 21 | 22 | 2 | 21 | 3 | 6 | 43 | 53.8 | 28 | 35.0 | 9 | 11.3 |
| Protohistoric | 0 | 1 | 0 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 3 | 50.0 | 2 | 33.3 | 1 | 16.7 |
| Historic | 0 | 0 | 0 | 1 | 2 | 2 | 7 | 9 | 1 | 13 | 7 | 0 | 21 | 50.0 | 18 | 42.9 | 3 | 7.1 |
| Unknown | 14 | 0 | 0 | 6 | 3 | 1 | 21 | 8 | 0 | 50 | 3 | 3 | 91 | 83.5 | 14 | 12.8 | 4 | 3.7 |

*Percentages are based on row totals.

-

not been analyzed because little archeological documentation is available for these sites, to which the lack of osteological analysis contributes. These statistics underscore the necessity of a systematic research strategy applicable to the existing collections. In the future, contracting agencies concerned with osteological samples should make special efforts to insure adequate study by qualified personnel.

The limited progress indicated by this summary reflects inadequate funding and a severe shortage of trained professionals whose research interests and experience qualify them to expertly investigate human skeletal material from archeological contexts. Many American archeologists have not appreciated the full potential of osteological research as a source of information on biocultural behavior and human adaptation. Many of these views persist, as reflected in an archeologist's statement to a reporter visiting a field school excavation: "Human bones don't provide that much information. After all, we know that they are Indians" (*Colorado Springs Gazette Telegraph,* March 30, 1987).

The composition of the bioarcheological data base reflects many factors including spatial and temporal variation in population density, aboriginal burial practices which increased or decreased the probability of later discovery, and amateur and professional ollecting strategies. The next chapter provides insight into these issues through historical reflection that gives attention to basic research themes and the investigators engaged in Southern Plains bioarcheological research.

# THE HISTORY OF BIOARCHEOLOGICAL RESEARCH IN THE SOUTHERN GREAT PLAINS

*Douglas W. Owsley*

The preceding chapter examined the spatial and temporal representation of burials in the Southern Great Plains. The skeletons from many sites have not been analyzed, and the importance of these collections as a source of information about Southern Plains populations awaits future explication. As a general statement, however, this assessment is inappropriate and fails to acknowledge significant bioarcheological research. Plains skeletal samples and the archeological data describing burial contexts have been used to address many issues pertaining to population variation, adaptation, and biocultural behavior. These accomplishments provide the foundation for future research.

This chapter surveys the bioarcheological literature, highlighting individual contributions, specific research themes, and significant publications. The discussion begins with a historical focus that considers contributions made by dedicated professionals and amateurs. In their works, we see efforts to define and demonstrate the importance of osteological research to archeological studies. Sources of research support and the types of archeological recovery situations or projects that have yielded burials are noted.

Many of the publications concerned with osteological data can be attributed to a limited number of physical anthropologists. William Bass and several of his former students, including Walter Birkby, Terrell Phenice, Douglas Ubelaker, and P. Willey, have reported on skeletal material from Kansas, Oklahoma, and Texas (Bass and Birkby 1962; Owsley 1988; Mann, Owsley and Baugh 1988; Phenice 1969; Willey and Bass 1978; Willey and Ubelaker 1976). Bass, now at the University of Tennessee, Knoxville, and formerly at the University of Kansas, Lawrence, has contributed either as author or faculty advisor to the analysis of skeletal samples recovered from more than nineteen Southern Plains sites, among them the Longest site (34Jf1), the Foard County site (41Fd00), the Roeniger site (14Cs1), the Poundston site (14Hp3), and the Infinity site (14My305) (Bass and Ubelaker n.d.; Bass and Birkby 1962; Phenice 1969; Bass and McWilliams n.d.; Turner and Bass 1972). His research in the Southern Plains began in 1959 with travel sponsored by the River Basin Surveys Program of the Smithsonian Institution to examine and measure the collection curated at the University of Oklahoma. This survey gathered data for 10 Oklahoma sites and included 12 individuals representing three Washita River phase sites and five individuals from two Custer phase sites (Bass 1959).

Alice Brues of the University of Oklahoma Medical Center, Oklahoma City, examined skeletal samples from several Southern Plains sites including Fred Loomis (34Wd12), Grant (34Gv2), Hedding (34Wd2), Heerwald (34Cu27), Hubbard (34Bk4), McLemore (34Wa5), and Nagle (34Ok4) (Brues 1957, 1962, 1963; Shaeffer 1965, 1966; Sharrock 1961). Her summaries reported age and sex distributions, dental and bone pathological lesions, traumatic injuries, descriptions and typological assessments of cranial morphology, and presence and types of cranial deformation. Brues was active in the Oklahoma Anthropological Society and served as its president. Her studies provide clear evidence of the interaction between the physical anthropologist, archeologist, and law enforcement agencies in the recovery and analysis of human bones. In 1957, for example, several skeletons were recovered by the Beckham County Sheriff's Office after spring flooding on the property of Cecil Hubbard. The remains were sent to the State Crime Bureau and then forwarded to Brues. She identified the materials as prehistoric and notified the Oklahoma Archeological Salvage Project, which conducted further testing at the Hubbard site (34Bk4) (Shaeffer 1966).

Human skeletal remains from archeological context frequently are investigated by law enforcement personnel upon initial discovery. Physical anthropologists trained in the forensic sciences often examine and report on these materials. Richard McWilliams, a member of the Oklahoma State Medical Examiners Office, and Clyde Snow, recently retired from the Federal Aviation Administration and now a private consultant in forensic anthropology, have reported osteological data for several sites in Western Oklahoma (Howard and Brown 1973; Jackson 1972; Keith and Snow 1976; McWilliams n.d., 1962, 1963, 1967, 1969; McWilliams and Jones 1976).

In addition to Drs. Bass and Brues, other physical anthropologists in academic departments who have contributed to the Southern Plains literature include Ernest Hooton, Harvard University; Marcus Goldstein and Thomas McKern, University of Texas, Austin; and Michael Finnegan, Kansas State University, Manhattan (Hooton 1933; Goldstein 1934; McKern 1964; Finnegan 1976, 1979a, 1979b, 1980). Three Smithsonian scientists, Ales Hrdlicka, T. Dale Stewart and Douglas Ubelaker have reported on skeletal samples from the Southern Plains (Hrdlicka 1938; Stewart 1941, 1945; Willey and Ubelaker 1976). The master's theses of Deborah Patterson (1974) and David Patterson (1974) of Eastern New Mexico University examined dental and skeletal variation and pathological conditions in three Antelope Creek phase sites of the Texas Panhandle.

Avocational archeologists have contributed to the recovery and analysis of skeletal samples. Dedicated amateurs

have been acknowledged in the literature for reporting discoveries that enabled salvage excavation, and for volunteer hours spent surveying, excavating, and monitoring sites under the direction of professionals (Agogino and Button 1985; Boyd 1985; Button and Agogino 1986; Ray and Jelks 1964). For example, an infant skeleton with unusual grave associations was found eroding out of a creek bank by a student at West Texas State University. The student encased the burial in a plaster-of-paris jacket and brought it to the Panhandle-Plains Historical Museum in Canyon, Texas for cleaning and analysis (Harrison and Griffin 1973). The Fred Loomis site (34Wd12) burials were excavated by the Kay County Chapter of the Oklahoma Anthropological Society. This excavation was conducted at the request of Robert E. Bell (Department of Anthropology, University of Oklahoma) after learning that the site was being destroyed by indiscriminate digging. The report on the Fred Loomis site was prepared by chapter members. The skeletal remains were delivered to Alice Brues for analysis (Kay County Chapter 1963). Amateur archeologists have occasionally described osteological findings, as for example, LeVick and LeVick's report (1966) on a burial with a projectile point in the right ulna.

Finnegan's (1980) analysis of a pioneer grave (14Bt478) discovered in Barton County, Kansas was greatly facilitated by historical information provided by a resident historian. After reading a newspaper article about the burial, Ray Schulz notified Finnegan of an earlier report detailing the events surrounding the mutilation of a ranchhand by renegade Native Americas in 1868:

> It is of great interest to note the cooperation of professional and amateurs in the recovery and analysis of this material: the excellent excavation of the material by Witty and amateur archeologists of the area, the detailed skeletal analysis conducted in the osteology laboratory, and the historical research done by an advanced amateur historian specializing in this time period in the area of Great Bend, Kansas. With the continuation of this high level of cooperation, the written and natural histories of Kansas will be greatly augmented with all the residents of Kansas becoming beneficiaries (Finnegan 1980: 53).

Questions about tribal affiliation of historic period burials, as found at the Jared (34Cm221) and Poafpybitty (34Cm215) sites, have partially been resolved by consultation with Native Americans about traditional mortuary practices and preferred burial locations (e.g., ravine, crevice, or open area) (Jackson 1972; McWilliams and Jones 1976). The historic Little Axe burial (34Cl00) in Cleveland County, Oklahoma was attributed to the Absentee Shawnee. With permission of the tribal office, the remains were removed for examination. After checking land allotment records and consulting with tribal elders, the tribal office could not determine the person's identity; permission was then granted for the skeletal remains to be cataloged into a museum collection (Boyd 1982).

By persuasion and example, archeologists and physical anthropologists have emphasized the value of osteological research. In this regard, George Agogino of Eastern New Mexico University recently summarized the kinds of information that can be gained through skeletal analysis in a U.S. Bureau of Reclamation contract report:

> Forensic physical anthropologists seek to define the age, sex, race, and size of individuals using clearly defined criteria and characteristics developed from studies of populations. Pathologies and abnormalities can be described, and in some cases, the evidence of the cause of death is visible (Agogino and Ferguson 1985:1).

Other sections of this report (Agogino et al. 1985) provided osteological data for skeletal material salvaged from eroding sites along the Altus and Foss reservoirs in southwestern Oklahoma (Boyd 1985; Agogino 1985).

A detailed description of pathological lesions in a child's skeleton from the Cotter-Hutson site (34Cu41) was expressly written to demonstrate and promote comprehensive study of human skeletons:

> The authors hope that this burial analysis will prove to be meaningful and informative to both the layman and professional human biologist. As we have said, it is somewhat unusual for a well-preserved child's skeleton to be exhumed. It is even more of a rarity that a very detailed report dealing with such a burial is published. For this reason, the authors have attempted to make this particular analysis as comprehensive as time and space allowed. The desirability of more complete skeletal studies is quite evident, for these studies are the bases of paleodemography which endeavors to reconstruct the population picture of prehistoric man (Keith, Snow and Snow 1976:125).

The analysis of this skeleton was multidisciplinary and combined the expertise of the forensic anthropologist and the radiologist in the application of an advanced non-destructive radiographic technique. Their report provided information about the child's age, sex, physical size, and the disease process that resulted in death.

In the Southern Great Plains region, most osteological analyses performed in conjunction with contract archeology reports were generated by individual interest rather than by contractual mandate. Indeed, financial support from any source for analysis of skeletal remains is and always has been limited in the Southern Plains. As a consequence, the primary bioarcheological data are not being collected. For example, this statement was made in a recent contract report prepared for the Soil Conservation Service concerning a burial recovered from 34Cm337: "The lack of artifacts hints at an Archaic age, but this is at present a wild guess. Budget limitations prevent extensive analysis of the burial material by a physical anthropologist" (Northcutt 1980:34).

Salvage recovery situations have shaped the basic composition of the Southern Plains bioarcheological data base. The majority of burials listed in Chapter 9, Table 12 were

initially exposed by man-made incursion or natural erosion that prevented preservation in place. Of note, however, relatively few excavations of burials can be attributed to salvage recovery by federally sponsored programs. In the years that followed the 1929 Depression, the Work Projects Administration (WPA) was developed by the federal government to create employment and construct public works. Funds were concurrently appropriated for the reclamation of archeological resources threatened by these projects, which often included dams that inundated large tracts of land. In Oklahoma, the archeological reclamation program was supervised by Forest E. Clements of the University of Oklahoma. Most work was completed in the eastern third of the state, especially in Le Flore County. Archeological work was carried out in many locations where sites were being destroyed, including but not limited to reservoir project sites. The WPA salvage program made little provision for analysis and the entire program was ultimately discontinued because of World War II. As a result, many samples were underreported and in at least one case, the Grant site, the archeological report and initial osteological study were not undertaken until two decades later (Sharrock 1961). Chapter 11 of this volume reexamines the Grant skeletal sample in more detail.

Other WPA projects that recovered burials included excavations by Ele and Jewel Baker at Alibates Ruins 28 and 28A (41Hc23) and Antelope Creek 23 (41Hc25); Forest Clements (1945) at the Stamper site (34Tx1); and Joe Ben Wheat at Johnston Ranch Cave (41Lu00) and the Triplett site (41Js00) (Baker and Baker 1939a, 1939b, 1939c, 1940a, 1940b, 1941b; Clements 1945; Wheat 1940). Other federal agencies sponsored investigations in the post-WPA period.

Archeological salvage in the Sanford Reservoir area in Texas was conducted by F.E. Green of Texas Technological College under the sponsorship of the National Park Service (Green 1967). During this investigation, Antelope Creek phase ossuary burial pits were excavated at the Footprint site (41Pt25). Osteological data for this series were later collected by Deborah Patterson (1974) and David Patterson (1974). Christopher Lintz (1986) recently offered further interpretation of the mortuary practices reflected in these unusual features.

In 1971, the U.S. Army Field Artillery Museum at Fort Sill, Oklahoma conducted a survey of Fort Sill and the surrounding vicinity for nineteenth century Plains Indian crevice burials "so that they could be properly marked or protected if threatened by destruction" (Pearson 1974:1). Looted or otherwise disturbed burials were to be excavated in order to preserve for analysis any remaining materials. Only one undisturbed burial was found and this was preserved in place. Three burial sites were excavated and three were surface collected (Pearson 1974).

The U.S. Bureau of Reclamation has conducted salvage excavations of burials eroding out along the Altus and Foss reservoirs in southwestern Oklahoma. Reports on burials from 34Gr3, 34Gr5, and 34Gr6 describe the archeological context and osteological data relating to age, sex, race, pathological conditions, and anthropometrics (Agogino et al. 1985; Button and Agogino 1986). These researchers are to be commended for their work with these samples which often lack the provenience data, temporal context, and grave associations that allow assessment of cultural affiliation. Button and Agogino (1986) not only report on thirteen individuals discovered in the fall of 1985, but also summarize all burials recovered from 34Gr5 and 34Gr6 (N = 26) and address the problem of temporal context by obtaining radiocarbon dates on two bone samples. This work and related studies (Agogino et al. 1985) reflect the considerable effort given to the restoration and description of fragmented remains. Their interpretations of burial practices and the skeletal data are based on the cumulative consideration of the total sample which was salvaged on different occasions. However, these investigations cannot be taken as model reports. The misidentification of pathological lesions, the incorrect classification of certain cranial discrete traits, and the less than cautious assessments of sex in poorly preserved and incomplete skeletons of subadults point to the need for care in accepting, without reservation, their conclusions. For example, the cause of death for one adult male was attributed to a brain tumor or infection as described below:

The endocranial area shows evidence of a severe infection. A bloodline groove is visibly enlarged and is partly destroyed by two sizable pits. Below the landmark bregma, there is a large area of general bone deterioration and three more pits. This appears to be the center of the abscess which caused the extensive destruction of the interior of the skull. A brain infection of the severity indicated was probably fatal, perhaps the result of a brain tumor (Button and Agogino 1986:7, with photograph on page 8).

The text description and the photographic documentation identifies these as Pacchionian depressions, normal anatomical features of the human endocranium. The small depressions or pits on the endocranial surface of the frontal and parietal bones near the sagittal sulcus mark the location of arachnoid granulations, which are small protrusions of the arachnoid meninge surrounding the brain (Shipman et al. 1985). The vascular markings are the grooves of the middle meningeal arteries (Bass 1987). Thus, this individual exhibits no endocranial lesions to which his death can be attributed.

## RESEARCH THEMES IN SOUTHERN GREAT PLAINS OSTEOLOGY

Research interests in the human skeleton have changed during the last fifty years and technologically advanced analytical procedures have been developed to support new lines of scientific inquiry. This section examines basic questions or issues frequently emphasized in the literature for the Southern Plains. This shift from a historical focus to a topical orientation considers four research themes: (1) the antiquity of human populations, (2) archeological studies of mortuary practices, (3) studies of population relationships, and (4) investigations of population demography, health, and disease. Separate discussion of each general theme allows recogni-

tion of major contributions, changes in view, and changes in approach or methodology. Above all, we note continued interest in these issues to the present day.

### The Antiquity of Human Populations

During the first half of this century, many scholars believed the antiquity of human occupation in the New World extended back only a few millennia.

This cautious outlook was a reaction against the more theoretically based evolutionary schemes of the nineteenth century on this subject. Much had then been written and discussed in support of this view and anyone who favored an earlier existence for man in America was sure to have his conclusions attacked and his means of investigation discounted. It was only through the definite association of lithic artifacts with extinct forms of Pleistocene megafauna at the Folsom, Lindenmeier, and other sites that such ideas were slowly and grudgingly changed (Komara 1978:1).

Cyrus N. Ray, an osteopathic surgeon, began searching for Early Man in the Abilene area of central west Texas in 1929 after reading about a nearby archeological site that yielded bones of a Pleistocene form of bison in association with Folsom artifacts (Komara 1978). Ray was convinced of man's antiquity in Texas. As a pioneer investigator, he searched stream banks for deeply buried sediments that presumably would yield very old artifacts and human burials. From the cultural and skeletal materials uncovered by this strategy, he identified the Clear Fork culture and Abilene Man. Because Paleo-Indian artifacts and the bones of Pleistocene megafauna were occasionally intermixed with artifacts assigned to the Clear Fork complex, Ray proposed that Clear Fork and Folsom period artifacts were contemporaneous (Ray 1939; Roberts 1940). This assessment was controversial and was later rejected, the Clear Fork complex being identified as a local Archaic manifestation (Komara 1978; Wulfkuhle 1986). Ray's work has been criticized for inadequate geological interpretations, inaccurate placement of artifacts within the archeological context, and vague site descriptions (Komara 1978). These shortcomings, although serious, do not overshadow Ray's many contributions including his promotion of public interest in the archeology of Texas and his efforts to involve specialists, including physical anthropologists, in his investigations.

During his lifetime Ray assembled a collection of more than 50 human skeletons which collectively represented "Abilene Man." Ray identified several "primitive" or "formative" skeletal features in Abilene Man that suggested great antiquity. These traits primarily concerned craniofacial morphology including dolichocephaly (long-headedness), thick frontal bones, pronounced browridges, and low, flat vaults with receding foreheads (Ray 1929a,b, 1933). He recognized pronounced anterior-posterior bowing of the femora and midshaft flattening of the tibiae (platycnaemy) in his initial discoveries. These features suggested a gait similar to that attributed to Neanderthals during the early part of this century (Ray 1929a,b; Roberts 1945).

To answer his questions and to gain support for his observations, Ray sent human skeletal samples to several eminent physical anthropologists, notably Ernest A. Hooton of Harvard University, Harry L. Shapiro of the American Museum of Natural History, and Ales Hrdlicka and T. Dale Stewart of the Smithsonian Institution (Hrdlicka 1938). Hooton (1933) described five incomplete crania from Mitchell, Jones, and Taylor counties, Texas with special reference to their extreme dolichocephaly. He emphasized that the crania were not Neanderthaloid in form, but instead represented anatomically modern man, although likely an "earlier strata of the American population, since it is probable that dolichocephalic groups preceded the round-heads" (Hooton 1933: 37). A few years later, Ray sent three male skulls and a series of humeri, femora, and tibiae to Ales Hrdlicka of the U.S. National Museum (Hrdlicka 1938). These specimens from the Roberts Covered Mound, Alexander Mound and Matthews Ranch (Jones, Taylor, and Schackelford counties, Texas) were of "exceptional interest, primarily because of their pronounced dolichocephaly" (Hrdlicka 1938:169). Hrdlicka also concluded that these crania were morphologically modern and not of an ancient type encountered in Early Man. Length measurements for the long bones were generally longer than the average of North American native, indicating greater than average height. The shapes of the femoral and tibial shafts showed several interesting features. Hrdlicka attributed these characteristics to secondary developments of functional origin, related to powerful and sustained demands on the leg musculature probably caused by "exceptionally developed and common running habits" (Hrdlicka 1938:184).

With the recovery of the J. C. Putnam skeleton in 1943 from more deeply buried deposits than any other remains found in the Abilene region, Frank H. H. Roberts of the Bureau of American Ethnology, Smithsonian Institution, visited and reported on the site:

> Several features about the skeleton impressed Dr. Ray and the writer as being indicative of a somewhat primitive form of recent man. This was especially true in the case of the very heavy brow ridge, the thickness of the frontal bone, the apparently sharply receding forehead, the lower border of the nasal aperture, and the conformation of the long bones. In the latter a certain bowing of the femora and the manner in which they and the tibiae articulated suggested the possibility of at least a slight bent-knee gait (Roberts 1945:25).

Roberts served as an intermediary in the transfer of the J. C. Putnam skeleton to Shapiro and later Stewart, who reconstructed the cranium. Both Shapiro and Stewart agreed that the morphological features were not exceptionally primitive (Stewart 1945).

Although these discussions focused primarily on materials recovered from west-central Texas, the 1937 recovery of a skull from a depth of about 8 m in Ellis County, Oklahoma drew similar attention (Carter 1942). The skull was sent to

the American Museum of Natural History at the request of the Science Editor of the Associated Press. Harry Shapiro responded:

> The skull is, however, exceptional in the extremely flat brow and in the lowness of the cranial vault; indeed, the outline tracing of the skull when super-imposed on that of the Peking man indicates that the Ellis County Skull is little if any higher than the Chinese fossil in absolute height. Moreover, the brow ridges are exceptionally heavy but not outside the range of recent man. The combinations, therefore, of browlessness, low vault and heavy structure in the zygomatic arches and the occipital bone do tend to endow the skull with a superficially primitive appearance which, in my opinion, is misleading. But as soon as the jaw and face are examined it becomes plain that this pseudo-primitive appearance is confined to the vault formation. Frankly, I cannot offer any demonstrable hypothesis to explain the peculiar character of the skull. It may represent a local variant of an extreme order or it may be simply a morphologically degenerate type (Carter 1942:24).

The final consensus concerning the primitive affinities of these several specimens emphasized that the remains were morphologically modern and not representative of Archaic Homo sapiens or "Neaderthaloids" and that the antiquity of American skeletal remains must be established on a geological basis rather than by their morphological structure.

Given this stance, later studies of fossilized remains placed emphasis on stratigraphic context in conjunction with the application of chemical (i.e. fluorine, radiocarbon) and physical tests of the bones and associated materials. A partial skull found at the Scharbauer site 8 km south of Midland, Texas was extensively studied to gain evidence of its antiquity (Wendorf and Krieger 1959; Wendorf, Krieger, Albritton and Stewart 1955). The calvarium and a few fragments of the postcranial skeleton were exposed by wind erosion in sand deposits that also included the bones of extinct Pleistocene fauna. Test excavations were conducted to establish site stratigraphy and the association of the human remains within the strata:

> When the human skull was first discovered by Keith Glasscock it was being exposed by wind erosion. There were no indications of a burial pit or other disturbance. On the other hand, particles of gray sand adhered to the skull and were covered by a calcium deposit; and the skull appeared to be fully as fossilized as the Pleistocene faunal remains from the white and gray sands. The real proof, however, of the skull's primary association with the gray sand rested upon an exhaustive series of chemical analyses which showed conclusively: a, that these fossils differed greatly in their chemical content from modern animal bones, b, that fossils from within the white, gray, and red sands all were similar in their chemical content and therefore essentially contemporaneous; and c, that the human fossil was unquestionably contemporaneous with the Pleistocene fauna from this site (Wendorf and Krieger 1959:67).

These investigations lacked sufficient data for conclusive age determination of the Midland fossils. The preferred interpretation dated the discovery to 13,400 ± 1200 B.P. (Wendorf and Krieger 1959). Stewart's (Wendorf et al. 1955) analysis of the skull acknowledged the long and continuous history for the narrow dolichocephalic cranial form in Texas, as represented by Abilene Man, the Gulf Coast, and the Midland site.

Fragmentary teeth found in situ in the Folsom-Midland level of the shifting sands site (41Wk21) is the only other possible example of Paleo-Indian age human remains found in the Southern Plains (Hofman, Amick and Rose n.d.). The teeth were found by Richard O. Rose about 1982, and recently were forwarded to the Smithsonian Institution for restoration and analysis.

Other early finds have been described by physical anthropologists working in the Southern Plains. An Archaic human burial from the Gore Pit site (34Cm131) in southwestern Oklahoma was dated by apatite fraction from the ribs to 7100 ± 350 B.P. (Hammatt 1976; Keith and Snow 1976). Klepinger (1972) reported on a skeleton from the Snyder site (14Bu9), an Archaic site dated about 1800 B.C. This burial was thought to be the second oldest skeleton found in Kansas, the Lansing remains being older. Plains burials of Paleo-Indian or Archaic age are rare and seldom recognized because of their isolated context and characteristic lack of grave artifacts that enable typological dating. As suggested by Hammatt (1976), radiocarbon dates obtained from bone samples may be the only answer.

### Mortuary Practices in the Southern Plains

One aspect of bioarcheological research in the Southern Plains has emphasized the description and interpretation of mortuary practices discerned from the archeological record and osteological determinations of age and sex. This interest is reflected in both earlier and more recent studies. Cyrus Ray documented variation in burial location in the Abilene region, noting hilltop and river margin locations. He also recorded variation in individual grave construction. The most common form of burial studied by Ray was the below-ground stone slab cist. Within the cists, he identified three forms of burial treatment: (1) primary flexed burial, (2) primary or secondary cremation, and (3) bundle burial without evidence of cremation or burning (Ray 1931, 1933, 1937, 1939).

At the Harrell Site (41Yn1) in north-central Texas, Jack Hughes (1942) master's thesis described burial patterning and variability in body positions and orientation of 32 individuals found in excavation "3." "Of the twenty-one flexed and semiflexed burials, ten were on the right side and three probably so, seven on the left side and one probably so. In both flexed and semiflexed burials the hands were usually placed before the face; in one burial they were under the skull" (Hughes 1942:39). Two multiple burials, two flexed burials and a sitting burial were covered with stone slabs. Burial as-

sociations were rare although one multiple burial with three adults contained four arrowpoints in positions suggesting possible cause of death (Hughes 1942:42).

Unusual mortuary observations have been reported at several sites (e.g., Parsons, Hill and Parker 1979; Tunnell 1964). A Late Archaic-Plains Woodland burial (A769) in Potter County, Texas of a child aged about two years included a large number and variety of artifacts:

> If this burial was typical of the people who made it, then it can be inferred that their custom was to bury a dead infant on a stream terrace in a shallow oval pit barely large enough to accommodate the body in a flexed position, on its right side with head to the east, and accompanied by a quantity of ornaments and other objects, including, in this instance, numerous tubular bone beads of three different sizes, some hackberry seed beads, some prairie dog palates, a couple of mussel shell beads, an obsidian pendant, and a Scallorn-like arrow point (Harrison and Griffin 1973:67).

Gunnerson (1969) used information and photographs provided by amateur archeologists in order to describe a Dismal River Apache baking pit (14Sc103) containing the skeleton of a young male aged 22-23 years, believed to be a Cuartelejo Apache of ca 1700 A.D. Agogino and Button's (1986) report on five individuals buried in a mass grave near Lake Altus considered the age and sex distribution and skeletal evidence of physical trauma as suggesting violent death. Projectile points and bone penetration wounds were the probable cause of death of an adult male, whose partially cremated remains were recovered during emergency salvage at Wickham #3 site (34Rm29) (Wallis 1984).

In addition to the description of unique grave associations and burial features, occasional studies have compared patterns observed at nearby or related sites (e.g., Button and Agogino 1986; Cheek 1976; Kay County Chapter 1963; Watson 1950; Young 1978). The largest number of burials in the Southern Great Plains is from the McLemore site (34Wa5). Descriptions of individual burials are provided by Pillaert (1963) along with the summary statistics reproduced in Table 19.

Table 19
Burial Position at the McLemore Site (34Wa5), Pillaert (1963)

| Position | N | % |
|---|---|---|
| Flexed | 24 | (46.2) |
| On back | 9 | 17.3 |
| On right side | 5 | 9.6 |
| On left side | 9 | 17.3 |
| On stomach | 1 | 1.9 |
| Indeterminate | 14 | (26.9) |
| Semiflexed | 9 | (17.3) |
| On back | 5 | 9.6 |
| On left side | 4 | 7.7 |
| Extended | 5 | (9.6) |
| On back | 3 | 5.8 |
| On left side | 1 | 1.9 |
| On stomach | 1 | 1.9 |

The general topic of Southern Plains burial practices has received more attention than other domains of bioarcheological research. Nevertheless, our level of knowledge remains limited and a comprehensive synthesis of mortuary customs in the region is problematic. General impressions as to the frequency and distribution of selected burial characteristics can be obtained from data gathered as a part of this survey of the bioarcheological resources of the region. The data base developed for each site recorded general information about types of burials observed, noting whether primary, secondary (i.e. bundle), or cremation interments were encountered. The data for Kansas, Oklahoma, and Texas appear in Table 20, which lists primary burials as either flexed (includes semiflexed) or extended, secondary burials as bundle and cremation, all cross-indexed on the basis of cultural affiliation. Colorado and New Mexico were excluded because available data are not sufficient. The numbers refer to site counts rather than actual burials recovered. The total number of sites in each category is indicated by parentheses. Subcategory values may not equal parenthesized numbers because the archeological context and descriptions of the burials are not reported in some site records. Also, a given site may be included more than once if more than one burial type was observed.

Table 20
Number of Sites by Type of Burial

| Burial Type | | A | W | L | P | H |
|---|---|---|---|---|---|---|
| Kansas (N) | | 3 | 9 | 5 | 3 | 5 |
| Primary | flexed | 2 | 5 | 3 | 2 | 0 |
| | extended | 0 | 0 | 0 | 0 | 2 |
| Secondary | bundle | 1 | 2 | 1 | 0 | 0 |
| Cremation | | 0 | 3 | 1 | 0 | 0 |
| | | | | | | |
| Oklahoma (N) | | 6 | 3 | 45 | 1 | 16 |
| Primary | flexed | 4 | 2 | 25 | 0 | 2 |
| | extended | 0 | 0 | 8 | 0 | 5 |
| Secondary | bundle | 0 | 0 | 2 | 0 | 0 |
| Cremation | | 0 | 0 | 2 | 0 | 0 |
| | | | | | | |
| Texas (N) | | 34 | 4 | 29 | 1 | 19 |
| Primary | flexed | 24 | 3 | 16 | 1 | 3 |
| | extended | 0 | 0 | 0 | 0 | 1 |
| Secondary | bundle | 2 | 0 | 1 | 0 | 1 |
| Cremation | | 2 | 0 | 0 | 0 | 0 |

A = Archaic; W = Woodland; L = Late Prehistoric; P = Protohistoric; H = Historic

Primary burials with flexed or semiflexed burial positions were common in this region. Bundle burials and cremations occurred less frequently. In most Archaic sites, the common burial type was a flexed position primary interment although bundle burials have been reported in Kansas and Texas and two Texas sites have provided evidence of cremation. Bundle burials and cremations are found during the Woodland period in Kansas and at a few sites during the Late Prehistoric period. Primary burials with bodies placed in an extended position are, with the exception of eight Late Prehistoric sites in Oklahoma, unique to the Historic period. Of note, the historic sites in this survey include pioneer burials

although the majority are Native Americans. The more common occurrence and widespread distribution of this burial type undoubtedly reflects the process of acculturation. As a general indicator of relative date, extended position primary interments are associated with the Historic period.

A few studies that describe burials dating to the latter half of the nineteenth century emphasize artifactual content. This archeological documentation has contributed specific information on trade routes and Southern Plains burial practices rarely reported in the ethnohistorical record. "Reports by travelers, captives, and soldiers do offer some data; but they are often inconsistent, conflicting, and probably incorrect" (Jackson 1972: 316). Historic burials are extremely rare and seldom recovered intact (cf. Pearson 1978; Ray and Jelks 1964).

During the fall and winter of 1971, the U.S. Army Museum at Fort Sill, Oklahoma surveyed the Wichita Mountains for historic burial sites. Several disturbed "crevice" burials were located with the remains at these sites primarily consisting of surface scatters of glass trade beads (Pearson 1978). Beads, shell hair pipes and metal artifacts found at the Rabbit Hill burial (34Cm136) indicated a date of 1865-1885 with tentative assessment of the tribal affiliation as Kiowa Apache. Other related sites include putative Comanche burials at the Cogdell (41Fl45), Jared (34Cm221), White (41Yk00), and Yellowhouse Canyon (41Lu00) sites, which date to the middle to late nineteenth century; the Poafpybitty site (34Cm215), a Kiowa burial dating to the 1870s; and an Osage crevice burial found at 34Os104 (Buikstra 1972a; Jackson 1972; McWilliams and Jones 1976; Newcomb 1958; Pearson 1978; Suhm 1962; Word and Fox 1975). The W. H. Watson (41Fs1) burial represents a possible Comanche grave dated 1820-1840 (Ray and Jelks 1964). The Morgan Jones site (X41Cb2), a small rockshelter in the rim of the Caprock near Crosbyton, Texas, provides one other example of a putative Comanche burial, ca A.D. 1790-1830 (Butler 1967; Parsons 1967).

Tribal identifications have been based on artifactual content and burial location (e.g., open area, ravine, rock crevice). The variation of features in skeletal morphology has not been used as an aid in these assessments although Newcomb (1958) acknowledged this deficiency almost two decades ago: "Unfortunately little is known, at least in detail, of the distinguishing physical characteristics of the various Southern Plains Indians, so that the tribal affinity of the Yellowhouse burial cannot be determined by a comparison of relevant measurements" (Newcomb 1958:11). Newcomb also lamented that so few historic sites or burials had been examined that the relationship of Late Prehistoric archeological complexes to historic tribes was impossible to trace, an observation that remains valid today (Newcomb 1958). Word's and Fox's (1975) synthesis of historic burial characteristics was based on inferences derived from only thirteen burials. At the time of their survey, seven of these burials were unreported. The burial artifacts included horse trappings, personal adornments, European tools, utensils, weapons, and possible food offerings. In these cases, quantities of grave offerings were extended to both men and women, and at the White site to a small child. They noted 14 Comanche burial traits reported in ethnographic sources that could be directly or inferentially verified with the archeological data:

> These are as follows: body flexed and bound in position; face and/or body painted with vermilion; body dressed in finest clothes; wrapped in buffalo robe or blanket; flexed body buried in sitting position or on side; body taken to grave site on a horse; buried in crevice or secluded place; body faced to east; deceased's possessions buried with him; saddle and bridle included in burial goods; grave covered with rocks; ceremonial fire built; favorite horse killed; and life after death (Word and Fox 1975:48).

Variability and additional customs were suggested by their analysis of behavioral patterns associated with historic burials at other Southern Plains sites (Word and Fox 1975). The burial archeology of early pioneer graves has also augmented the historical record for this region. Finnegan (1976) reported on eight white and two black males buried at the Walnut Creek crossing (14Bt301), Barton County, Kansas in July, 1864. The men were teamsters killed during an Indian raid on a freight train bound from Fort Leavenworth, Kansas to Fort Union, New Mexico along the Santa Fe trail. A careful consideration of the burial placement, skeletal age, race and genetic traits enabled the probable identification of a father and son pair. At another site, near Fort Zarah, Kansas, the archeological record combined with the osteological analysis and historical information led to the tentative identification of a mid-1800 pioneer burial. The skeleton, although seemingly articulated and buried in an extended position, was missing the left clavicle, the left patella, bones of the right hand, and portions of both feet. These losses seemingly could not be attributed to preburial scavenger activity nor to postinterment rodent activity. The missing skeletal elements, coupled with a correspondence in age, sex, and race, identify this person as a ranchhand captured and mutilated by natives, an event referred to in an early interview with a local rancher (Finnegan 1980).

In conclusion, two final studies of Southern Plains mortuary data must be acknowledged from both a methodological and a theoretical perspective as significant research contributions. Reports by Lintz (1986), concerning Antelope Creek phase burials, and Lopez (1970), for the Washita River phase McLemore cemetery, searched for correlations between demographic variables (i.e., age, sex), grave artifacts, and body positioning as an indicator of social differentiation. The intent was to elucidate patterns that reflect status, thus providing insight as to the social organization of these prehistoric communities. The distribution and kinds of artifacts placed with different age and sex categories enable the recognition of ascribed versus achieved status (Lintz 1986).

> Burial practices consist of a technical aspect of disposing of the body and a ritual or symbolic aspect consisting of expressing appropriate respect to the deceased. In many societies, different mortuary treat-

> ment is accorded the social persona most often along lines of age, sex, relative rank or social status, or social affiliations within the broader social units, although peculiar circumstances surrounding the death may alter the obligations of the survivors (Lintz 1986:163)

Cluster analysis was used to search the McLemore cemetery data for associations between selected burial attributes and specific age or sex groupings (Lopez 1970). The analysis detected considerable homogeneity reflecting, in general, an egalitarian society although a few distinctions provided evidence of an ascribed or ranked social system. One social custom also held demographic significance as an indicator of seasonal mortality. The burial orientation followed an east-west axis following a practice of aligning the body with the rising or setting sun. Seasonal deaths were inferred by grouping the burials according to alignments with the solstices and equinoxes. "From this data it has been possible to hypothetically infer a year-round occupation of the site and the approximate time of burial can be established within a 50 day range" (Lopez 1970:138). The deaths of most infants occurred in late winter and early spring. Burial activity at 34Wa5 dropped to a low during the summer months, possibly indicating that most of the people had moved to hunting camps for the season.

The sample of Antelope Creek phase burials was comprised of 47 burials, representing approximately 65 individuals from nine sites (Lintz 1986). The most common form of burial was a flexed or semiflexed shallow primary interment placed inside habitation structures or in nearby midden areas or cemeteries. Relatively few grave goods were included and these were usually of a utilitarian nature, with some trade artifacts and jewelry found with women and children. Lintz interpreted these observations as reflecting an egalitarian society with a matricentered rule of descent. In sharp contrast, a different burial practice was indicated at the Footprint site (41Pt25). The bones of an estimated 32 individuals were scattered throughout the fill of a large room and in three subfloor ossuary pits (Green 1967; David Patterson 1974). This sample includes 10 skulls which may be trophies acquired from non-Antelope Creek people. Lintz's (1986) interpretation of the Footprint mortuary complex draws heavily on information obtained from osteological analysis.

### Typology, Skeletal Measurements and Population Relationships

The osteological analyses on human remains completed before 1960 emphasized the skull and reported principal cranial measurements, indices, and morphological observations (e.g. Hooton 1933; Hrdlicka 1938; Stewart 1945). Cranial features were classified into graded levels of trait expression, with the standard unit of comparison being the amount of development found in an average adult male skull of northwestern Europe (Hooton 1933). The skull was considered most useful in establishing population relationships. More recent publications have shifted the emphasis from solely on the cranium to a more comprehensive skeletal analysis concerned not only with genetic affinity but also with demography, bone disease, and adaptation to the environment (Brues 1957, 1962). Cranial morphology has remained an important focus of osteological research with the methodology of the 1960s and early 1970s based on typological assessment especially using the types defined by Neumann (1952). Brues' (1962) description of cranial morphology at the McLemore site noted considerable variety in cranial type with three basic forms recognized: (1) a Basketmaker-like type, (2) a proto-Australoid type, and (3) a Pueblo type. The McLemore people seemed clearly distinguishable from groups in eastern Oklahoma with fairly consistent features including mesocephaly or brachycephaly, long faces, and the development of parietal bosses and sagittal ridges. Several females presented "excellent facsimiles of classic Pueblo types" (Brues 1962:75).

Other examples help illustrate the use of skeletal typology in the evaluation of archeological questions. At the Nagle site, the ceramics, shell, and ground stone work were more similar to artifacts found in eastern Oklahoma than to those of the geographically closer Washita River phase (Shaeffer 1957). The osteological data provided additional evidence of discontinuity. The distinctive type of cranial deformation found at this site and the cranial form indicated possible Southeastern affiliations, which combined with skeletal evidence for warfare suggested an intrusive group in conflict with their neighbors to the west (Shaeffer 1957). Howard and Brown's (1973) report on the isolated Fairview Burial (34Mj11) in western Oklahoma similarly integrated both archeological observations and osteological information to establish that this individual was culturally as well as physically from a Puebloan or Pueblo-influenced group.

In the Southern Plains literature, the most thorough discussion and critical evaluation of the typological approach to skeletal identification was made by Gunnerson (1969) in his analysis of a skeleton found in a Cuartelejo Apache baking pit. Typological classification problems have also been reported in the Northern and Central Plains (Bass 1964). These difficulties raised serious concerns about the usefulness of Neumann's types as an indicator of ethnic affiliation.

More recent studies have not followed a typological interpretive model, but rather have only presented the metric variables and nonmetric attributes for future reference in the hope that a useful comparative data base will emerge (e.g., Hood 1983). Only David Patterson's research (1974) has applied multivariate distance statistics to the evaluation of genetic distances. In this respect, Southern Plains bioarcheological research has lagged far behind other regional studies and has not begun to realize the full potential of its data in the tracing of population history. Many archeological hypotheses concerning population relationships will benefit from the systematic application of computer-processed multivariate distance statistics. Although sample sizes are often small, it is now possible to integrate the Southern Plains data into larger comparative data sets developed during the past 15 years for the Northern and Central Plains.

## Population Demography and Pathological Conditions

The reconstruction of paleodemographic structure including mortality rates and population size is crucial to our understanding of human adaptation to the Southern Plains environment. Most studies of bioarcheological samples from this region are descriptive, providing documentation of age, sex, and unusual pathological conditions or anomalous features of a single specimen or sample. These descriptive studies are the bases for future comparisons addressing questions about ecological adaptation and population history.

Useful demographic data can be found in several research reports, most notably for 34Gr5 and 34Gr6 (Button and Agogino 1986), for the McLemore and Nagle sites analyzed by Brues (1957, 1962), and for Antelope Creek phase burials studied by David Patterson (1974). Although site sample sizes are small and must be interpreted cautiously, differing mortality patterns are indicated.

The Lake Altus sample of 26 individuals includes 15 adults, seven children, three infants, and one person of undetermined age and sex. The age distribution for this reservoir salvage sample, tentatively radiocarbon dated to the Woodland period, ca 650 A.D., suggests a fairly low life expectancy (Button and Agogino 1986).

Variation in degrees of cranial suture closure and tooth wear were used to assign ages to the skeletal samples from McLemore and Nagle (Brues 1957, 1962). At McLemore, only 38.5% of the individuals lived through infancy and childhood to the age of puberty and only 17.3% of the burial sample was assigned ages of 35 years or older. Adult longevity was thought to be less than 55 years. Brues interpreted this pattern as suggesting "as rugged a life as will permit the survival of a human population at all" (Brues 1962:73).

Age-specific death rates at McLemore may not have been as high as originally assessed by Brues. The Nagle series reflects a severe mortality profile, associated with pronounced evidence of bone disease. The age distribution for the Nagle site was compared to Pecos Pueblo, and was judged as reflecting a low life expectancy even in terms of this similarly stressed Prehistoric population (Brues 1957). The majority of the burials from the Nagle site involved the young.

> It is probable that the 25% infant mortality indicated in the Nagle series is normal for a primitive group. However, of the deaths occurring after infancy, more than half in the Nagle series were age 22 or less, as compared with about 20% of this age in the Pecos series. This indicates excessive mortality in a period which, even in primitive peoples, should have the lowest death rate of any part of the life span (Brues 1957:103).

Brues provided only limited information about the ages of adults from the Grant site using general terms such as "middle-aged" (Sharrock 1962). Brues' (1957, 1962) description of the McLemore and Nagle burials included observations on bone and dental pathological conditions, specifically arthritic changes, infections, osteoporosis, and traumatic injuries. The presence of carious lesions, alveolar bone abscesses, hypercementosis due to chronic gingivitis, and dental attrition were mentioned. At Nagle, two individuals showed bilaterally raised roughened areas on the subperiosteal surfaces of the tibiae. Consultation with a pathologist and consideration of other findings such as acute osteoporosis in the skull of an infant and pronounced evidence of poor dental health suggested dietary deficiencies, possibly scurvy, and a syphilis-like bone disease (Brues 1957). The McLemore collection showed less indication of disease affecting the bones. Brues (1962) emphasized the marked contrast in the good health of this population relative to groups living in the eastern half of Oklahoma.

The pathology profile for the Nagle sample seems to align more closely with that of groups to the east. McLemore adults suffered from vertebral and appendicular joint arthritic changes and from excessive tooth wear that caused abscessing and tooth loss, especially of the posterior teeth. This series exhibits few of the pathological conditions reported for Nagle or eastern Oklahoma samples. As suggested by Brues (1957), bone lesions seen in a few Southern Plains skeletons may reflect treponemal infection.

A young adult male from 34Os104 shows pathological characteristics of congenital or tertiary syphilis (Buikstra 1972b). Changes described as diffuse osteitis affected nearly the entire skeleton.

The Keith, Snow and Snow (1976) report on pathological lesions in a child's skeleton from the Cotter-Hutson site (34Cu41) represents a particularly detailed study in paleopathology. This study documents age, sex, cranial and postcranial measurements, and gross pathologic and radiographic findings. The child suffered from chronic otitis media (middle ear infection) which caused an epidural abscess that perforated the endocranial surface and an ectocranial post-auricular abscess of the mastoid process of the temporal bone (Figure 27). The external perforation measures 5 mm in diameter and is surrounded by a larger area of roughened, reactive spongy bone (Figure 28).

Several osteological reports have cited evidence of traumatic injuries and violence, as reflected both in skeletal defects, simultaneous burial of several individuals, or unusual body positioning within the grave shaft. At the Hubbard site (34Bk4), Shaeffer (1965) reported a burial oriented in an east-west axis with the face down and the arms extended above the head. This position was believed atypical and the result of rapid interment without the benefit of traditional rituals. Similarly unorthodox burials were noted at the Hedding (34Wd2) and Heerwald (34Cu27) sites (Shaeffer 1965).

The skeleton of a young woman, pregnant at the time of her death, found at the Heerwald site provided definite evidence of a violent death (Bovee and Owsley 1988; Shaeffer 1965). A large Harrel type point was located between the ribs and a second smaller basal notched point was embedded in a


**Figure 27. Child's skull (34Cu41, Burial 2) showing perforation of the right temporal caused by chronic otitis media**

lumbar vertebra (Figure 29). Projectile points found in multiple burials at the Harrell site (41Yn1) were not believed to be grave offerings (Hughes 1942). In a secondary interment of two individuals at the Uncas site (34Ka172), a small point was found in the vertebra of a man aged 30-35 years (Earman 1979). A man buried at Wickham #3 (34Rm29) had the base of a Washita type point lodged in the sternum and additional penetration cuts in one rib and a scapula (Wallis 1984). Two arrowpoints were found. After cleaning, the "ossified" fragments of a point were discovered embedded in the proximal end of the right humerus, most likely from a healed injury incurred in an earlier hostile encounter (Wallis 1984:7).

Three Antelope Creek phase burials were reported as having projectile points embedded in bone or in direct association with the skeletons (Lintz 1986; Patterson 1974). Lintz (1986), in particular, has addressed the issue of warfare and has presented evidence of increasing population stress reflecting a decline in exploitable resources due to changing climatic conditions. The scattered and partially articulated remains found in the fill of a structure at the Footprint site (41Pt25) were interpreted as evidence of a massacre that destroyed the village. The partially dismembered bodies were interred and the structure was burned. At a later date, skulls

**Figure 28. Close-up of postauricular abscess of the right temporal bone (34Cu41, Burial 2)**

possibly acquired during subsequent retaliatory raids were placed in a subfloor pit (Lintz 1986).

Skeletal remains at other sites including Burial 10 at Nagle, Burial 13 at McLemore, and two skeletons excavated in Shackelford County, Texas, provide osteological and artifactual evidence of violent death (Brues 1957, 1962; Forrester 1951). The cultural conflict exemplified by these specimens is not limited to the Late Prehistoric period. For instance, Keith and Snow (1986) identified two semicircular fractures of the right parietal that probably caused traumatic disruption of the middle meningeal artery and death of the woman buried at the Archaic period Gore Pit site (34Cm131). Other cases suggesting warfare and interpersonal violence have been reported and indicate that investigators should be alert to evidence of conflict on recovered skeletal material. For example, only one cranium in the region has been reported as having cut marks caused by scalping, a young adult female from Pawnee County, Kansas (14Pa412) (Willey and Bass 1978). Most researchers have not recognized the evidence for scalping, as other cases were observed during the osteological inventory completed for this bioarcheological survey. Burial 10 from the Nagle site (Figure 30) and the young woman from Heerwald both show evidence of this practice. Cut and intentionally modified human postcranial bones were found at the Edwards I site (34Bk2) (Mann, Owsley, and Baugh 1988).

Cultural practices that produce alterations in skeletal morphology have been reported. Cranial deformation seems to have been absent at most Southern Plains sites with some exceptions including Alcorn (34Ml1), Nagle (34Ok4), and the Fairview Burial (34Mj11) (Brues 1957; Howard and Brown 1973). A single skull at the Grant site also showed possible evidence of deformation (Sharrock 1961). Figure 31 illustrates moderate fronto-occipital deformation of the cra-

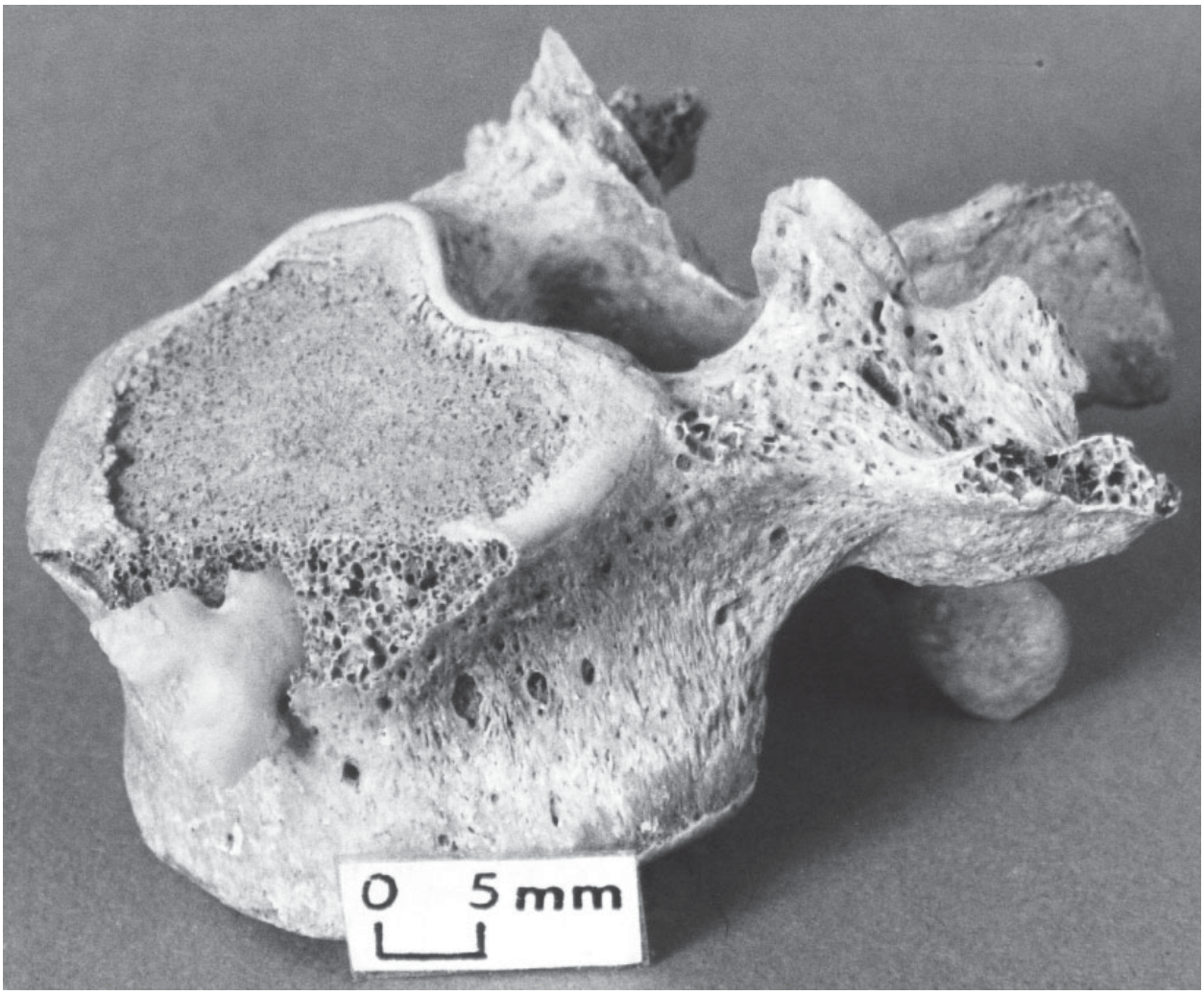



**Figure 29. Lumbar vertebra of a young adult female with a projectile point embedded in the centrum (34Cu27, Burial 1A)**

nium of an adult male from the Nagle site. At Nagle, only males showed evidence of frontal and occipital bone deformity produced during infancy by the application of bindings and flexible boards (Brues 1957).

In addition, a cultural practice affecting the dentition has been reported. Willey and Ubelaker (1976) have described two examples of filed teeth found at the Gun Site Shelter (A1203) and Taylor Ranch (A1063). These notched teeth from the Texas Panhandle have been interpreted as the result of intentional filing. Of the two, the Taylor Ranch burial provides the best example having sharply defined V-shaped notches in both the maxillary and mandibular dentition. When in occlusion, the notches do not exactly match and show size differences in opposing grooves. This pattern suggests intentional notching rather than incidental wear caused by using the teeth to strip fibers or in some other task. The Gun Sight Shelter burial shows anterior occlusal surface grooves in association with such extreme dental attrition that essen-

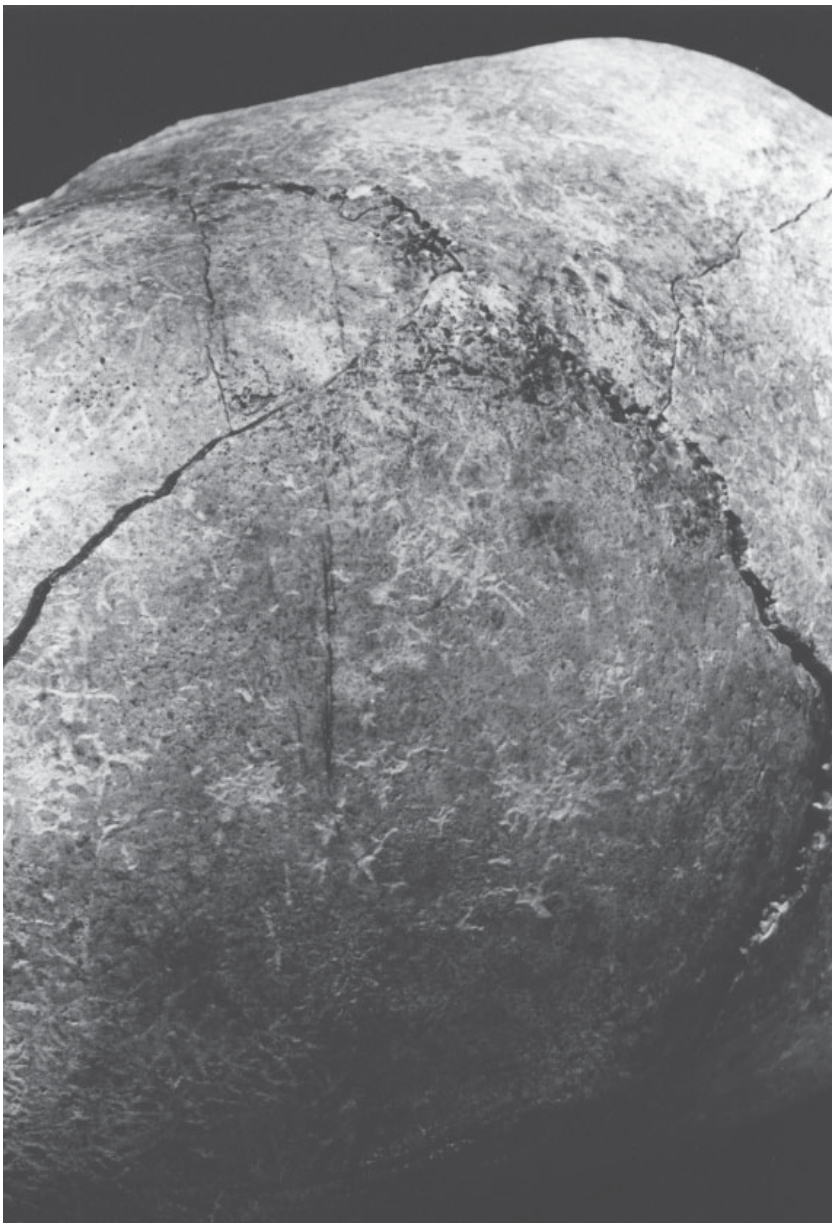


**Figure 30. Cut marks from scalping on the frontal bone of an adult male from the Nagle site (34Ok4, Burial 10)**

tially only the notched root stubs remain. This wear was caused by using the teeth in a task activity. If these grooves were made by purposeful filing, they would have worn away long before death as a result of attrition.

## Conclusion

This overview has highlighted the principal themes addressed in the bioarcheological literature of the Southern Plains. Much has been accomplished and these contributions have added greatly to our knowledge of the past. The questions asked at the turn of the century differ from the present perspective. In the Texas literature, for instance, the earliest reports mentioning the archeological recovery of human remains considered questions of antiquity, origin, and racial identification. Today these issues remain important, but our bases of interpretation have changed dramatically and the research questions have been refined and expanded. Roberts (1898), for example, was firmly convinced that the Prehistoric mound builders of Louisiana and Texas were a differ-


**Figure 31. Cranium of an adult male from the Nagle site (34Ok4, Burial 10) with fronto-occipital deformation**

ent race and that it was highly improbable that the Native Americans descended from this extinct race. T. L. Eyerly's (1907) Wolf Creek expedition to examine the "Buried City" ruins tested this perception through excavation noting that Indian oral tradition attributed these ruins to the work of the white men. With this initial assessment of racial classification disproven, later studies focused on typological assessments and basic craniometry as a means of tracing population relationships. Archeological context and chronometric dating techniques were recognized as essential information for the interpretation of skeletal specimens as reliance on skeletal form (i.e., morphological dating) proved unreliable as an indicator of antiquity. New themes entered into bioarcheological investigations including an interest in mortuary customs, paleodemography, and paleopathology. In general, most studies have followed a descriptive format although a few have emphasized sample comparisons. There is a definite need for continued osteological research in this region. Many questions about human occupation and adaptation to the Plains environment await future resolution through the application of new analytical procedures and a comprehensive research design. The following chapter addresses this issue more completely by offering a specific research strategy that will facilitate the systematic investigation of future Plains skeletal samples. My intent is to note certain observations and data collection procedures that should be included in the scope of work of bioarcheological contracts initiated by the U.S. Army Corps of Engineers and other federal agencies.

# A SYSTEMATIC APPROACH TO THE SKELETAL BIOLOGY OF THE SOUTHERN GREAT PLAINS

*Douglas W. Owsley and Richard L.Jantz*

The past two decades have witnessed the development by osteologists of a multidisciplinary approach directed toward the evaluation of the adaptive efficiency of prehistoric populations. In this research design, skeletal data are incorporated in the construction of ecological models of human adaptation. Bioarcheologists with an interest in the various parameters of population biology, demographic structure, and biocultural behavior not only evaluate archeologically derived hypotheses by means of comparison to the osteological data but also propose hypotheses founded in the biological data that can be tested in archeological contexts. Moreover, the results of such research are of basic concern to archeologists who, in the past, frequently relegated osteological reports to appendixes. These advances in osteological research take full advantage of newly developed analytical techniques and benefit greatly from the use of computers, statistics, and paradigms that emphasize hypothesis testing and comparative research.

The Southern Plains human skeletal collection is a valuable and irreplaceable resource providing a wealth of information about the past. It is imperative that the existing Plains skeletal collections currently held in trust in regional, state and national museums be maintained in perpetuity for ongoing and future scholarly research.

Southern Plains skeletal collections are small, and many groups, as defined either temporally or geographically, are poorly represented. The resolution of present-day research questions depends on access to large skeletal collections representing diverse populations. Large and well documented skeletal samples are necessary for the kinds of quantitative and statistical studies that constitute the basis of modern scientific investigation. Many questions are addressed in terms of the frequency of occurrence and variability of traits within and between populations. Although isolated examples often provide interesting and unique data, the systematic and comprehensive study of population biology requires adequate samples to accurately describe population characteristics, especially as partitioned by age, sex, and other relevant demographic or socioeconomic variables.

Unfortunately, Chapter 9 presents an inflated count of existing Southern Plains museum collections because the listings given in Table 12 identified burials with field and/or museum documentation. Many of the skeletons from these burials were reburied without study or were never placed in the care of legitimate repositories and are unavailable for scientific research. Countless others were discarded without having been reported. Many reports mention the destruction of burial sites due to looting (e.g. Bass, McWilliams and Jones 1967; Pearson 1974). The looting of prehistoric graves has been a major focus of hobbyists in the Southern Plains region, a practice facilitated by the use of stone markers by some prehistoric peoples to commemorate and/or protect interments. Considerable information has been lost because of this looting. "Carefully excavated and reported burials are outnumbered a hundredfold by those which are carelessly excavated and unreported" (Parsons, Hill and Parker 1979:70).

In this regard, the extant collections are extremely important and are an irreplaceable resource. Every effort should be given to their continued preservation and systematic documentation of their scientific data. Furthermore, every effort should be made to insure that newly discovered burials are properly excavated by trained bioarcheologists.

The study of human remains can contribute greatly toward the resolution of archeological and historical research questions. Archeological publications often address issues that can be evaluated using skeletal data as a source of information. As an example, consider Wyckoff's (1982) article entitled "Prehistoric People and Western Oklahoma." His overview of Southern Plains populations—the Paleo-Indian, Plains Woodland, and Plains Village stages—notes how little is known of these people's physical appearance and raises questions about population origins, relationships with other groups, and subsistence patterns. For example, were the semisedentary horticulturalists recognized as the Custer phase ancestors of the later Washita River phase and the Panhandle aspect peoples?

> Although many Panhandle Aspect sites have been studied and several are radiocarbon dated, the dynamic history of these hardy farmers is just beginning to be understood. As yet these people's origins are unclear. Perhaps, they were descendants of indigenous Plains Woodland folk, but maybe their ancestors were Custer Phase villagers who moved into the High Plains around A.D. 1000 (Hughes 1968:185-210; Lintz 1976:101-102). Panhandle Aspect pottery and tools, however, are also similar to those of the Upper Republican Aspect, a Plains Village culture common to south-central Nebraska and north-central Kansas (Hughes 1968:174-185, 188-194; Kreiger 1946:55-61; Lintz 1978a; Wedel 1961:142-144). In fact, because of these similarities and the dates available for Panhandle Aspect sites, some archeologists and climatologists believe that Upper Republican farmers

> migrated to the Southern High Plains during the 13th Century when droughts became prevalent in the Central Plains (Baerreis and Bryson 1965, 1966; Bryson, Baerreis, and Wendland 1970:67- 69; Bryson and Murray 1977:42-43).
>
> Whatever their origins, the Panhandle aspect people persisted in the Southern Plains for some 250 years. (Wyckoff 1982:42)

Then what happened? Were the Southern Plains abandoned due to warfare or malnutrition? What were the ties of the Late Prehistoric Plains Villagers to historic Southern Plains tribes? What were the effects of the transition from hunting and gathering to semisedentary and sedentary horticulture societies on the demographic structure, health, childhood growth and development, and physical size? How successful were the various subsistence strategies (e.g., horticulture) in the ecologically varied subareas of the Great Plains (Wyckoff 1982:44)? Is Lintz's (1986) model invoking increasing population stress during the Antelope Creek phase reflected in biological indicators of morbidity and environmental stress? The questions are numerous and within the potential domain of resolution through bioarcheological research. When properly addressed, osteological data can contribute substantially toward the resolution of these problems where traditional archeological data have been inadequate. What is called for is an integrated bioarcheological approach founded both on osteology and archeology.

This chapter offers specific suggestions concerning a research methodology applicable to the Southern Plains. The following presentation is not an argument for strict regimentation of data collection procedures and reporting of data. Collections may have unique features that can be recognized by the experienced osteologist, examined in greater depth, and highlighted in publications. Moreover, the authors do not pretend to have either the background or the wisdom to foresee future technological, theoretical or interpretive advances in bioarcheological research. The field of bioarcheology is rapidly advancing, and our present skills surely will seem primitive two decades hence. We do believe, however, that a more systematic approach to the skeletal biology of the Southern Plains populations will contribute positively to Plains studies. Where appropriate, future efforts should emphasize comparative research because only with a broader regional and temporal perspective will it be possible to fully comprehend Plains adaptations.

The authors offer in the following pages one approach to data collection being used in the Northern and Central Plains. In presenting this data collection strategy, we are necessarily brief. Further insight may be gleaned from appropriate bioarcheological publications, contract reports, and the authors. Sample code forms and partial instructions are integrated into the text. More importantly, we also attempt to demonstrate the utility of this approach through the examination of Southern Plains samples.

Data were obtained for the Late Prehistoric McLemore and Grant site collections and compared to data from a Northern Plains (South Dakota) late protohistoric horticultural population from the Four Bear site (39Dw2) (Hurt 1962; Owsley, unpublished data). These samples, representing Caddoan populations, differ regionally and temporally. Thus, they provide a useful illustration of variations found in demographic, osteometric, and paleopathological data sets even among skeletal populations living within the Plains macroenvironment and having putative genetic affiliation. Differences between these collections reflect environmental and historical factors. Additional archeological and bioarcheological study is necessary to elucidate and explain these differences. In highlighting the results of this limited osteological comparison, only cursory attention can be given to the interpretation of the greater environmental and historical context. Our approach is primarily methodological as illustrated by example. We are very interested in the results suggested by these analyses and, in the future, plan to give greater attention to their interpretation.

This comparative approach considers population demography, skeletal and dental pathological lesions, nutritional status, group relationships, and populational adaptive efficiency. The unit of analysis is the population rather than the individual. We are interested in population parameters including demographic characteristics, mortality rates, morbidity, population growth or decline, group variation in physical size, and ecological variables that affect these characteristics. Paleodemographic and paleopathological data and other osteological indicators of environmental stress are the generalized and specific indicators of relative adaptive success (i.e., population viability).

The present analysis contributes toward the development of a Southern Plains bioarcheological data base. The concept of adaptation type as developed within the archeological sections of the Southern Plains overview is fully compatible with the proposed osteological research design. Four Bear, Grant, and McLemore represent the adaptation type Plant Food Producers-Developed Village Horticulturalists. As such, our data base applies to this level of classification. We have decided to generate original data for this analysis because information gathered from the Southern Plains literature is of varied quality and of such limited quantity. Rather than producing a data synthesis based solely on the literature, where different methodologies and coding systems vary with each observer, it seems more appropriate to initiate a detailed study of two of the larger skeletal collections from the Southern Plains (i.e., Grant and McLemore). Grant and McLemore were selected because the number of preserved skeletons available for study is sufficient to produce sample sizes that are statistically meaningful. Further, both represent populations types that are most often present in Southern Plains museum collections, i.e., plant food producers/horticulturists. Standardization in data collection enables the preliminary integration of Southern Plains observations into the Northern Plains data

base and in the future will facilitate other contrasts either by adaptation type or culture (e.g., Antelope Creek phase vs. Washita River phase).

## METHODOLOGY AND APPLICATION TO SOUTHERN PLAINS SAMPLES

### Determination of Age, Sex, Race and Bone Inventory

Accurate determinations of age, sex, and race are essential for sample comparisons with other skeletal series. Cross-population interpretations of mortality trends and morbidity patterns are based upon sound demographic profiles established through careful consideration of applicable up-to-date morphological, metric, and multivariate criteria.

Individual bone inventories should be obtained for each skeleton to facilitate statistical evaluation of the collection. Each skeleton should be examined for elements present or absent. The coding format is designed for computer analysis and provides a comprehensive inventory of the entire skeleton. Elements are scored as complete or partial. This detailed format is designed specifically for the derivation of precise bone element baseline counts required for paleopathological analysis. In general, it is seldom adequate to base the frequency of pathological observations on the total number of individuals found in a skeletal series. This approach, although perhaps ideal, is impractical because of the vagaries of skeletal preservation, recovery, and curation. While some skeletons may be well preserved and nearly complete, usually only partial skeletons are recovered. Given this variation in bone preservation and recovery, it is essential to list the elements present in any collection being investigated. Such a system enables precise bone counts by side including proximal and distal joint surfaces for all major long bones. Thus, when evaluating arthritic changes in the distal femur, it is possible to tabulate the number of complete and partial distal femoral epiphyses by age, sex, and side. A sample inventory form and corresponding coding instructions are provided in Appendix II. Specific guidelines are followed in the identification and coding of each element as to completeness (i.e., complete or partial) (Owsley, Manhein and Marks 1987; Owsley, Orser, Montgomery and Holland 1985). For example, long bones are scored using a detailed format. Each bone diaphysis is subdivided into three sections or thirds representing the proximal, middle, and distal third of the bone. Each component is scored as complete if at least 66% of that segment is present. If less than 33% of any section is present, that portion is scored as missing. Proximal and distal epiphyses are scored on the inventory form under the category of "joint surfaces" according to the surface area percentages listed on the coding instruction form. As described, completeness does not reflect total bone preservation. Instead, it identifies the number of elements which are nearly complete and can be scored for the presence or absence of pathological features.

In our preliminary survey, the skeletal remains of 59 individuals from McLemore and 72 individuals from Four Bear have been identified and inventoried. Table 21 lists the age and sex distributions for these two sites. Data assembled by Brues (1962) for 52 McLemore skeletons are also shown. Our survey includes burials from this site recovered by the landowner after Brues' initial study, plus the inclusion of a few other sets of commingled remains that were separated during our analysis. The mortality distributions for these two

Table 21
Age and Sex Distributions of Skeletons from McLemore (34Wa5) and Four Bear (39DW2)

| Age Interval (years) | McLemore Male N | % | Female N | % | Total N | % | Four Bear Male N | % | Female N | % | Total N | % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0- 0.5 | - | - | - | - | 21 | 35.6 | - | - | - | - | 24 | 33.3 |
| 0.5- 4 | - | - | - | - | 17 | 28.8 | - | - | - | - | 19 | 26.4 |
| 5- 9 | - | - | - | - | - | 0.0 | - | - | - | - | 9 | 12.5 |
| 10-14 | 0 | 0.0 | 1 | 6.3 | 1 | 1.7 | 1 | 16.6 | 1 | 7.1 | 2 | 2.8 |
| 15-19 | 0 | 0.0 | 1 | 6.3 | 1 | 1.7 | 0 | 0.0 | 5 | 35.7 | 5 | 6.9 |
| 20-24 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 2 | 14.3 | 2 | 2.8 |
| 25-29 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 1 | 16.6 | 0 | 0.0 | 1 | 1.4 |
| 30-39 | 0 | 0.0 | 5 | 31.3 | 5 | 8.5 | 1 | 16.6 | 2 | 14.3 | 3 | 4.2 |
| 40-49 | 1 | 20.0 | 3 | 18.8 | 4 | 6.8 | 1 | 16.6 | 0 | 0.0 | 1 | 1.4 |
| 50-59 | 4 | 80.0 | 6 | 37.5 | 10 | 16.9 | 1 | 16.6 | 4 | 28.5 | 5 | 6.9 |
| 60+ | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 1 | 16.6 | 0 | 0.0 | 1 | 1.4 |
| Total | 5 | | 16 | | 59 | 100.0 | 6 | | 14 | | 72 | 100.0 |

| Age Interval (Years) | McLemore* Male N | % | Female N | % | Total N | % |
|---|---|---|---|---|---|---|
| 0- 0.5 | - | - | - | - | 19 | 36.5 |
| 0.5- 1 | - | - | - | - | 0 | 0.0 |
| 1- 2 | - | - | - | - | 11 | 21.2 |
| 2- 5 | - | - | - | - | 0 | 0.0 |
| 6-13 | - | - | 1 | 7 .7 | 3 | 5.8 |
| 14-20 | - | - | - | - | 0 | 0.0 |
| 20-35 | 2 | 33.3 | 7 | 53.8 | 10 | 19.2 |
| 36-55 | 4 | 66.6 | 5 | 38.5 | 9 | 17.3 |
| Total | 6 | | 13 | | 52 | 100.0 |

*Brues(1962)

'Brues (1962)

samples are quite different. Four Bear can be characterized as a series comprised of infants, children, and young adults. The McLemore sample, although including a large number of young children, has greater representation of older adults. This greater longevity and the lack of appreciable numbers of deaths during the ages of 5 to 29 years signifies a different mortality pattern. In all likelihood, the McLemore community suffered less morbidity and had a lower mortality rate than the villagers at Four Bear, a post-contact population experiencing the introduction of new infectious diseases and other stresses. By comparing these two samples, we gain an impression of possible changes in mortality patterns during the Late Prehistoric and the Protohistoric periods. This difference in age structure must be considered in later comparisons of paleopathological conditions.

Demographic data in the Southern Plains literature are very sketchy. In addition to the McLemore data provided by Brues (1962; Table 21), age and sex information were also reported for the Fred Loomis (34Wd12) and Nagle (34Ok4) sites (Brues 1957, 1963; Table 22). Although both samples are small, 11 and 20 individuals respectively, interesting trends are implied by the data and suggest the need for further study. The Fred Loomis collection is comprised only of adults, reflecting differential preservation, possible excavation problems or cultural practices. The absence of infants and children skews the mortality distributions and complicates interpretation. Nevertheless, the adult data are of great interest and may be compared to samples from other sites. The individuals aged by Brues were classified as older adults aged 36 to 55 years. No young adults were reported although seven individuals were not assigned specific ages. If this general pattern is accurate, then at least superficially the Fred Loomis burials suggest a mortality profile for adults that resembles McLemore. In contrast, the Nagle series includes small children, adolescents and a fairly high percentage of young adults aged 20-35 years. The Nagle mortality profile suggests a highly stressed population. Brues' (1957) description of the bone lesions also suggests a totally different series of health problems than is typical in sites like McLemore, Grant, and probably also Fred Loomis. The nature of these differences requires clarification.

Table 22
Age and Sex Distributions of Skeletons from Fred Loomis (34Wd12)[1] and Nagle (34Ok4)[2]

| Interval | Male | | Female | | Total[3] | | Male | | Female | | Total[3] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (Years) | N | % | N | % | N | % | N | % | N | % | N | % |
| 0-0.5 | - | - | - | - | 0 | 0 | - | - | - | - | 1 | 5 |
| 0.5-4 | - | - | - | - | 0 | 0 | - | - | - | - | 5 | 25 |
| 5-9 | - | - | - | - | 0 | 0 | - | - | - | - | 1 | 5 |
| 10-14 | - | - | - | - | 0 | 0 | - | - | - | - | 3 | 15 |
| 15-19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20-35 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 50 | 3 | 100 | 5 | 25 |
| 36-55 | 3 | 50 | 1 | 100 | 4 | 36.4 | 1 | 25 | 0 | 0 | 1 | 5 |
| Adult | 3 | 50 | 0 | 0 | 7 | 63.6 | 1 | 25 | 0 | 0 | 4 | 20 |
| Total | 6 | | 1 | | 11 | | 4 | | 3 | | 20 | |

1 Synthesis based on Brues (1963)
2 Synthesis based on Brues (1957)
3 Totals include adults of unknown sex

Detailed cranial and postcranial bone and joint surface counts are given in Tables 23 to 26 for adults from Four Bear, McLemore and the Grant site. Table 23 concerns cranial elements. Table 24 gives a sample listing of vertebral element counts (e.g., for lumbar vertebrae). The coding system used for long bones makes it possible to derive specific counts for each diaphyseal bone section as well as epiphyseal joint surfaces. Table 25 lists long bone diaphyseal and epiphyseal counts. The number of relatively complete long bones can also be determined. Table 26 gives counts of complete long bones in these samples, and, as such is a simplified subset listing of Table 25. The data are tabularized by sex and by age as either young (15-29 years) or older adults (30+ years). Of note, only partial inventories (i.e., cranial and selected postcrania) are given although comparable data can be obtained for other elements.

## Bone Lesions

All bones should be examined and X-rayed for pathological lesions, when practical. Identification and interpretation of pathological conditions should be based upon several sources including Moskowitz, Howell, Goldberg and Mankin (1984), Ortner and Putschar (1981), Resnick and Niwayama (1981), Steinbock (1976) and other relevant literature. The scoring system we have followed represents a detailed coding format directed toward systematic computer frequency tabulation of pathological features. The computer coding format, which consists of 18 data sheets, is presented in Appendix III. In addition, descriptive notes are recorded. These records document additional or unique observations useful in differential diagnoses or interpretation of the pathological response.

Table 23
Bone Inventory for McLemore, Grant, and Four Bear by Age and Sex: Cranial Bones

| Site | Age/Sex | Frontal | | Parietal L | | Parietal R | | Occipital | | Temporal L | | Temporal R | | Zygomatic L | | Zygomatic R | | Maxilla L | | Maxilla R | | Mandible | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
| McLemore | Combined | | | | | | | | | | | | | | | | | | | | | | |
| (34Wa5) | Adults (15+) | 9 | 4 | 14 | 2 | 13 | 3 | 12 | 4 | 11 | 4 | 13 | 1 | 7 | 2 | 8 | 6 | 7 | 5 | 8 | 5 | 11 | 1 |
| | Males (15-29) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Females (15-29) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Males (30+) | 3 | 1 | 4 | 0 | 4 | 0 | 3 | 2 | 4 | 0 | 4 | 0 | 2 | 0 | 3 | 1 | 2 | 1 | 3 | 1 | 3 | 0 |
| | Females (30+) | 6 | 3 | 10 | 2 | 9 | 3 | 9 | 2 | 7 | 4 | 9 | 1 | 5 | 2 | 5 | 5 | 5 | 4 | 5 | 4 | 8 | 1 |
| Grant | Combined | | | | | | | | | | | | | | | | | | | | | | |
| (34Gv2) | Adults (15+) | 3 | 1 | 2 | 1 | 3 | 0 | 1 | 2 | 1 | 3 | 2 | 3 | 0 | 2 | 1 | 0 | 2 | 0 | 2 | 0 | 1 | 4 |
| | Males (15-29) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Females (15-29) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Males (30+) | 2 | 1 | 1 | 1 | 2 | 0 | 0 | 2 | 0 | 3 | 1 | 1 | 0 | 2 | 1 | 0 | 2 | 0 | 2 | 0 | 1 | 3 |
| | Females (30+) | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Four Bear | Combined | | | | | | | | | | | | | | | | | | | | | | |
| (39Dw2) | Adults | 14 | 0 | 14 | 1 | 14 | 1 | 14 | 1 | 14 | 0 | 14 | 0 | 13 | 1 | 14 | 0 | 13 | 1 | 12 | 2 | 13 | 2 |
| | Males (15-29) | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| | Females (15-29) | 6 | 0 | 6 | 0 | 6 | 0 | 6 | 0 | 6 | 0 | 6 | 0 | 6 | 0 | 6 | 0 | 6 | 0 | 5 | 1 | 6 | 0 |
| | Males (30+) | 2 | 0 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 0 | 2 | 0 | 2 | 0 | 2 | 0 | 2 | 0 | 2 | 0 | 1 | 2 |
| | Females (30+) | 5 | 0 | 5 | 0 | 5 | 0 | 5 | 0 | 5 | 0 | 5 | 0 | 4 | 1 | 5 | 0 | 4 | 1 | 4 | 1 | 5 | 0 |

Key: 1 = Complete; 2 = Partial

Table 24
Bone Inventory for McLemore, Grant, and Four Bear by Age and Sex: Vertebrae

| | | | | | | | Lumbar Vertebrae | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1-5 | | | | | 1 | | 2 | | 3 | | 4 | | 5 | |
| Site | Age/Sex | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
| McLemore | Combined | | | | | | | | | | | | | | | |
| (34Wa5) | Adults (15+) | 1 | 1 | 1 | 3 | 11 | 17 | 0 | 14 | 0 | 13 | 2 | 14 | 2 | 15 | 0 |
| | Males (15-29) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Females (15-29) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Males (30+) | 0 | 0 | 1 | 0 | 4 | 5 | 0 | 4 | 0 | 2 | 2 | 3 | 2 | 5 | 0 |
| | Females (30+) | 1 | 1 | 0 | 3 | 7 | 12 | 0 | 10 | 0 | 11 | 0 | 11 | 0 | 10 | 0 |
| Grant | Combined | | | | | | | | | | | | | | | |
| (34Gv2) | Adults (15+) | 0 | 3 | 0 | 0 | 1 | 2 | 2 | 2 | 1 | 1 | 2 | 1 | 0 | 1 | 0 |
| | Males (15-29) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Females (15-29) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Males(30+) | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| | Females (30+) | 0 | 2 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Four Bear | Combined | | | | | | | | | | | | | | | |
| (39Dw2) | Adults (15+) | 0 | 0 | 1 | 2 | 9 | 6 | 4 | 7 | 4 | 8 | 3 | 8 | 3 | 6 | 4 |
| | Males (15-29) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Females (15-29) | 0 | 0 | 1 | 0 | 4 | 3 | 1 | 3 | 1 | 3 | 1 | 3 | 1 | 3 | 1 |
| | Males (30+) | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 2 |
| | Females (30+) | 0 | 0 | 0 | 2 | 3 | 3 | 1 | 3 | 2 | 4 | 1 | 4 | 1 | 3 | 1 |

Key: Counts for lumbar vertebrae 1-5 represent the number of skeletons with specific vertebral element counts. Vertebrae listed separately are presented as numbers complete (1) and partial (2).

Table 25
Bone Inventory for McLemore, Grant, and Four Bear by Age and Sex: Diaphyses and Joint Surfaces

| | Humerus | | | | | | | | | | | | | | Radius | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Proximal Joint Surface | | | | Proximal | | Middle | | Distal | | Distal Joint Surface | | | | Proximal Joint Surface | | | | Proximal | | Middle | | Distal | | Distal Joint Surface | |
| | L | | R | | | | | | | | L | | R | | L | | R | | | | | | | | L | | R | |
| Site Age/Sex | 1 | 2 | 1 | 2 | L | R | L | R | L | R | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | L | R | L | R | L | R | 1 | 2 | 1 | 2 |
| McLemore | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA (15+) | 13 | 0 | 13 | 2 | 14 | 14 | 18 | 14 | 16 | 15 | 13 | 1 | 13 | 2 | 8 | 1 | 11 | 0 | 8 | 11 | 10 | 12 | 8 | 12 | 8 | 1 | 13 | 0 |
| M (15-29) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| F (15-29) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| M (30+) | 5 | 0 | 5 | 0 | 5 | 4 | 5 | 4 | 5 | 4 | 5 | 0 | 5 | 0 | 2 | 0 | 3 | 0 | 1 | 3 | 1 | 3 | 1 | 3 | 2 | 0 | 4 | 0 |
| F (30+) | 8 | 0 | 8 | 2 | 9 | 10 | 12 | 10 | 10 | 11 | 8 | 1 | 8 | 2 | 6 | 1 | 8 | 0 | 7 | 8 | 8 | 9 | 7 | 9 | 6 | 1 | 9 | 0 |
| Grant | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA(15+) | 3 | 0 | 5 | 0 | 5 | 6 | 5 | 4 | 7 | 4 | 5 | 0 | 4 | 0 | 5 | 0 | 4 | 1 | 6 | 5 | 5 | 6 | 5 | 5 | 5 | 0 | 4 | 0 |
| M (15-29) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| F (15-29) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| M (30+) | 1 | 0 | 2 | 0 | 2 | 3 | 2 | 2 | 4 | 1 | 3 | 0 | 1 | 0 | 2 | 0 | 1 | 1 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 0 | 2 | 0 |
| F (30+) | 2 | 0 | 3 | 0 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 0 | 3 | 0 | 3 | 0 | 3 | 0 | 3 | 3 | 2 | 4 | 2 | 3 | 2 | 0 | 2 | 0 |
| Four Bear | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA (15+) | 9 | 3 | 9 | 1 | 13 | 12 | 13 | 14 | 13 | 12 | 9 | 2 | 8 | 0 | 6 | 3 | 4 | 1 | 11 | 8 | 11 | 9 | 10 | 8 | 8 | 0 | 5 | 1 |
| M (15-29) | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| F (15-29) | 3 | 1 | 3 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 3 | 1 | 3 | 0 | 2 | 1 | 2 | 1 | 5 | 4 | 5 | 5 | 5 | 5 | 3 | 0 | 3 | 0 |
| M (30+) | 1 | 1 | 1 | 0 | 2 | 2 | 2 | 3 | 2 | 3 | 1 | 0 | 2 | 0 | 1 | 1 | 1 | 0 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 0 | 2 | 0 |
| F (30+) | 4 | 1 | 4 | 0 | 5 | 4 | 5 | 5 | 5 | 3 | 4 | 1 | 2 | 0 | 3 | 1 | 1 | 0 | 4 | 2 | 4 | 2 | 3 | 1 | 3 | 0 | 0 | 1 |

| | Ulna | | | | | | | | | | | | | | Femur | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| McLemore | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA (15+) | 9 | 1 | 11 | 0 | 10 | 10 | it | 9 | 8 | a | 9 | 0 | 8 | 0 | 14 | 1 | 14 | 0 | 17 | 16 | 17 | 16 | 14 | 15 | 13 | 0 | 13 | 1 |
| M (15-29) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| F (15-29) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| M (30+) | 3 | 0 | 3 | 0 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 0 | 3 | 0 | 5 | 0 | 4 | 0 | 5 | 4 | 5 | 5 | 4 | 4 | 4 | 0 | 4 | 0 |
| F (30+) | 6 | 1 | 8 | 0 | 8 | 8 | 8 | 7 | 6 | 6 | 6 | 0 | 5 | 0 | 9 | 1 | 10 | 0 | 11 | 12 | 11 | 11 | 10 | 11 | 9 | 0 | 9 | 1 |
| Grant | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA (15+) | 7 | 1 | 7 | 0 | 8 | 7 | 9 | 7 | 7 | 4 | 5 | 1 | 3 | 0 | 7 | 2 | 7 | 0 | 10 | 7 | 8 | 7 | 7 | 5 | 7 | 0 | 6 | 0 |
| M (15-29) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| F (15-29) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| M (30+) | 4 | 0 | 2 | 0 | 4 | 2 | 4 | 2 | 2 | 2 | 1 | 0 | 1 | 0 | 4 | 2 | 4 | 0 | 6 | 4 | 5 | 3 | 4 | 3 | 4 | 0 | 3 | 0 |
| F (30+) | 3 | 1 | 5 | 0 | 4 | 5 | 5 | 5 | 5 | 2 | 4 | 1 | 2 | 0 | 3 | 0 | 2 | 0 | 4 | 3 | 3 | 4 | 3 | 2 | 3 | 0 | 2 | 0 |
| Four Bear | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CA (15+) | 6 | 4 | 7 | 1 | 11 | 9 | 12 | 9 | 9 | 7 | 8 | 0 | 4 | 1 | 12 | 1 | 8 | 2 | 13 | 11 | 13 | 11 | 13 | 11 | 12 | 2 | 8 | 3 |
| M (15-29) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 |
| F (15-29) | 3 | 2 | 4 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 3 | 0 | 2 | 0 | 4 | 1 | 2 | 2 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 0 | 3 | 2 |
| M (30+) | 0 | 1 | 1 | 0 | 1 | 2 | 2 | 2 | 1 | 2 | 2 | 0 | 2 | 1 | 2 | 0 | 2 | 0 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 0 | 2 | 0 |
| F (30+) | 3 | 1 | 2 | 0 | 5 | 2 | 5 | 2 | 3 | 0 | 3 | 0 | 0 | 0 | 5 | 0 | 4 | 0 | 5 | 4 | 5 | 4 | 5 | 4 | 4 | 1 | 3 | 1 |

Table 26 cont.

| | Tibia | | | | | | | | | | Fibula | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Proximal Joint Surface | | | | Proximal | | Middle | | Distal | | Distal Joint Surface | | | | Proximal | | Middle | | Distal | |
| | L | | R | | | | | | | | L | | R | | | | | | | |
| Site Age/Sex | 1 | 2 | 1 | 2 | L | R | L | R | L | R | 1 | 2 | 1 | 2 | L | R | L | R | L | R |
| McLemore | | | | | | | | | | | | | | | | | | | | |
| CA (15+) | 15 | 0 | 14 | 0 | 14 | 14 | 11 | 13 | 12 | 12 | 12 | 0 | 13 | 0 | 8 | 8 | 9 | 10 | 9 | 9 |
| M (15-29) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| F (15-29) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| M (30+) | 4 | 0 | 4 | 0 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 0 | 4 | 0 | 3 | 2 | 3 | 2 | 3 | 2 |
| F (30+) | 11 | 0 | 10 | 0 | 10 | 10 | 7 | 9 | 8 | 8 | 8 | 0 | 9 | 0 | 5 | 6 | 6 | 8 | 6 | 7 |
| Grant | | | | | | | | | | | | | | | | | | | | |
| CA (15+) | 4 | 0 | 4 | 0 | 4 | 4 | 3 | 4 | 5 | 4 | 5 | 0 | 4 | 0 | 3 | 1 | 5 | 2 | 5 | 1 |
| M (15-29) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| F (15-29) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| M (30+) | 2 | 0 | 1 | 0 | 2 | 1 | 2 | 3 | 3 | 2 | 3 | 0 | 2 | 0 | 2 | 1 | 4 | 1 | 4 | 0 |
| F (30+) | 2 | 0 | 3 | 0 | 2 | 3 | 1 | 1 | 2 | 2 | 2 | 0 | 2 | 0 | 1 | 0 | 1 | 1 | 1 | 1 |
| Four Bear | | | | | | | | | | | | | | | | | | | | |
| CA (15+) | 11 | 0 | 10 | 2 | 11 | 12 | 11 | 12 | 11 | 12 | 10 | 1 | 9 | 3 | 8 | 9 | 8 | 10 | 9 | 9 |
| M (15-29) | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| F (15-29) | 5 | 0 | 4 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 0 | 5 | 0 | 4 | 4 | 4 | 5 | 4 | 5 |
| M (30+) | 2 | 0 | 2 | 0 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 0 | 1 | 1 | 1 | 2 | 1 | 2 | 1 | 2 |
| F (30+) | 4 | 0 | 3 | 1 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 1 | 2 | 2 | 3 | 3 | 3 | 3 | 4 | 2 |

Joint Surface Key: 1 = Complete; 2 = Partial; CA-combined adult; M-male; F-female.; see other tables for site numbers

Table 26
Bone Inventory for McLemore, Grant, and Four Bear by Age and Sex: Complete Long Bones

| | | Humerus | | Radius | | Ulna | | Femur | | Tibia | | Fibula | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| site | Age/Sex | L | R | L | R | L | R | L | R | L | R | L | R |
| McLemore | Combined | | | | | | | | | | | | |
| (34Wa5) | A (15+) | 13 | 14 | 8 | 11 | 8 | 7 | 14 | 15 | 11 | 12 | 8 | 8 |
| | M (15-29) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | F (15-29) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | M (30+) | 5 | 4 | 1 | 3 | 2 | 2 | 4 | 4 | 4 | 4 | 3 | 2 |
| | F (30+) | 8 | 10 | 7 | 8 | 6 | 5 | 10 | 11 | 7 | 8 | 5 | 6 |
| Grant | Combined | | | | | | | | | | | | |
| (34Gv2) | A (15+) | 5 | 3 | 5 | 4 | 6 | 4 | 6 | 4 | 3 | 2 | 3 | 0 |
| | M (15-29) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | F (15-29) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | M (30+) | 2 | 1 | 3 | 2 | 2 | 2 | 4 | 2 | 2 | 1 | 2 | 0 |
| | F (30+) | 3 | 2 | 2 | 2 | 4 | 2 | 2 | 2 | 1 | 1 | 1 | 0 |
| Four Bear | Combined | | | | | | | | | | | | |
| (39Dw2) | A (15+) | 13 | 11 | 10 | 7 | 9 | 7 | 13 | 11 | 11 | 12 | 8 | 8 |
| | M (15-29) | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| | F (15-29) | 5 | 5 | 5 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 4 |
| | M (30+) | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 2 | 1 | 2 |
| | F (30+) | 5 | 3 | 3 | 1 | 3 | 0 | 5 | 4 | 4 | 4 | 3 | 2 |

## Coding Format

Pathological changes due to infection are scored using a hierarchical approach that codes lesions descriptively according to the predominant bone cell response: (1) bone loss, (2) bone increase, or (3) resorption plus apposition (Appendix III, code sheets 1-7). This basic classification references the major changes possible in living bone. A second more precise designation is then recorded using specific descriptors to explain the nature of the pathological lesion.

Bone Cell Response (Does not include lesions due to traumatic injury).

General Specific

1. Bone Loss
    1. Resorptive lesion - lytic
    2. Loss of density - bowing
    3. Loss of density - porosity
    4. Loss of volume - cortical thinning
2. Bone Increase
    1. Increase in density - weight, X-ray
    2. Increase in volume - periostitis
    3. Increase in volume - osteomyelitis
    4. Increase in volume - tumor, button osteoma, osteochondroma
    5. Increase in volume - ossified cartilage
    6. Increase in volume - ossified connective tissue (enthesopathy, myositis ossificans)
    7. Increase in volume - periostitis and osteomyelitis
3. Bone Resorption and Apposition

All of the above were coded for (1) severity, (2) state of the lesion (i.e., active, healing), (3) extent of involvement (i.e., local versus widespread), and (4) specific location. The code categories were as follows:

Severity:

1. Mild
2. Moderate
3. Severe

State:
1. Active (rough, granular)
2. Healed (generally smooth)

Extent:
1. Local
2. Widespread

Location:

Cranial bones (frontal, parietals, occipital)
1. Endocranial
2. Ectocranial

Cranial bones (temporals)
1. Temporomandibular joint
2. Zygomatic process
3. Mastoid process
4. Squamous

Postcranial bones (long bones)
1. Proximal 1/3 shaft
2. Middle 1/3 shaft
3. Distal 1/3 shaft
4. Distal joint surface
5. Proximal joint surface
6. Proximal tuberosity
7. Distal tuberosity
8. More than one of the above

Postcranial bones (innominate)
1. External surface of the ilium
2. Internal surface of the ilium
3. Both surfaces (1 and 2)
4. Acetabulum
5. Pubic bone
6. Symphysis and pubic ramus
7. Ischium

Postcranial bones (sacrum)
1. Ventral
2. Dorsal 3. Articular facet 4. Promontory

Postcranial bones (vertebrae)
1. Centrum
2. Neural arch
3. Both

Frontal bone cribra orbitalia, cranial porosis and vault porotic hyperostosis were scored as slight, moderate, or severe (cf. Angel 1966, 1967, 1978; El-Najjar, Lozoff and Ryan 1975).

Changes due to degenerative joint disease (osteoarthritis) were scored as present and severity of hypertrophic bone formation (osteophytes), porosity, and eburnation (Appendix III, code sheets 8-13). Each joint surface may have different severity scores for osteophytes, porosity, and eburnation (modified and adapted from Chapman 1972; Jurmain 1975; Ortner 1968; Palkovich 1978):

Osteophyte formation

Porosity formation

Eburnation formation
1. Slight
2. Moderate
3. Severe
4. Bony ankylosis (only for osteophyte formation)

The following location codes were used:

Location (joints, vertebral articular facets)
1. Articular surface
2. Articular margin
3. Both

Location (vertebral centrum)
1. Surface
2. Margin
3. Both

Traumatic injuries (fractures) were coded separately using a similarly detailed descriptive computer coding format (Appendix III, code sheets 14-18). Skull fractures involving the frontal, occipital, parietals, and temporals were coded for shape, the presence of radiating fractures, severity of wound and size, number of separate fractures per bone, and state. Fractures involving the zygoma, maxillae, and mandible were coded for presence and state. The numerical data are illustrated by anatomical drawings that document on standardized cranial forms the exact location and nature of the fracture. This approach provides a detailed record of lesions for computer tabulation as well as a verbal and graphic description that will enhance future comparative study. Skull fracture computer codes are as follows:

Skull fracture:
1. Present

Shape and character: (reflects shape of weapon used)
1. Blunt round
2. Blunt oval
3. Edged
4. Crushed

Presence of radiating fractures:
1. Present
2. Absent

Severity:
1. Outer bone table involvement only
2. Involvement of inner bone table

State:
1. No healing (perimortem fracture)
2. Active (healing)
3. Healed

Stress indicators such as enamel hypoplasias, transverse lines of arrested growth in the long bones, rates of long bone growth, and nutritional assessment through radiographic measurement of femoral cortical thickness have provided useful information in the analysis of population adaptation, morbidity, and nutritional status in the Northern Plains (Jantz and Owsley 1984; Owsley 1985; Tiffany et al. 1988). The methodology followed in these studies is found in the aforementioned publications and also is addressed in detail in a recent master's thesis (Cashion 1987). Cashion examined temporal and geographic variation in Plains native populations, particularly the Arikara and Pawnee and included observations of the McLemore sample.

Table 27 provides an initial tabulation of Four Bear and Grant/McLemore pathology codes indicating bone increase and bone loss. The base counts are derived from the inventory. These pathological lesion counts reflect evidence of bone response, either destructive or appositional, without regard to specific types of response or severity. The data for Grant and McLemore have been pooled to increase the sample sizes for the Southern Plains series.

The Northern and Southern Plains collections have very different patterns reflected in the observed pathological features. For most variables, the Four Bear frequencies are lower. This difference, in part, reflects the younger demographic composition of the Four Bear adults. Many of the changes reflected in Grant/McLemore reflect degenerative features or changes caused by activity related to sustained physical stress. Four Bear adults generally died at a younger age and, as a consequence, do not have many of the pathological conditions found in the Southern Plains series.

The theoretical ramifications of this contrast are significant. Traditional views concerning the interpretation of frequency differences in pathological lesions have assumed that higher frequencies reflect greater population stress. This generalization is not necessarily applicable to the present ex-

Table 27
Bone Loss and Bone Increase in Adult Males and Females at Four Bear and Grant/McLemore

| | FOUR BEAR | | | | | | | | | GRANT/MCLEMORE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Males | | | | Females | | | | | Males | | | | Females | | | | |
| | N | Loss | % | Increase % | N | Loss | % | Increase % | | N | Loss | % | Increase % | N | Loss | % | Increase % | |
| | 3 | 0 | 0.0 | 2 66.7 | 11 | 1 | 9.1 | 0 | 9.1 | 8 | 2 | 25.0 | 1 12.5 | 10 | 5 | 50.0 | 1 | 10.0 |
| | 4 | 0 | 0.0 | 1 25.0 | 11 | 0 | 0.0 | 0 | 0.0 | 8 | 2 | 25.0 | 1 12.5 | 13 | 7 | 53.8 | 2 | 15.4 |
| | 4 | 0 | 0.0 | 1 25.0 | 11 | 0 | 0.0 | 0 | 0.0 | 8 | 2 | 25.0 | 1 12.5 | 13 | 7 | 53.8 | 0 | 0.0 |
| | 4 | 0 | 0.0 | 0 0.0 | 11 | 0 | 0.0 | 0 | 0.0 | 10 | 4 | 40.0 | 0 0.0 | 12 | 10 | 83.3 | 0 | 0.0 |
| | 3 | 0 | 0.0 | 0 0.0 | 11 | 0 | 0.0 | 0 | 0.0 | 8 | 0 | 0.0 | 0 0.0 | 12 | 0 | 0.0 | 0 | 0.0 |
| | 3 | 0 | 0.0 | 0 0.0 | 11 | 0 | 0.0 | 0 | 0.0 | 8 | 0 | 0.0 | 0 0.0 | 13 | 0 | 0.0 | 1 | 7.7 |
| Zygmatic, left | 3 | 0 | 0.0 | 0 0.0 | 11 | 0 | 0.0 | 0 | 0.0 | 4 | 0 | 0.0 | 0 0.0 | 7 | 0 | 0.0 | 0 | 0.0 |
| right | 3 | 0 | 0.0 | 0 0.0 | 11 | 0 | 0.0 | 0 | 0.0 | 8 | 0 | 0.0 | 0 0.0 | 10 | 0 | 0.0 | 0 | 0.0 |
| Maxilla, left | 3 | 0 | 0.0 | 0 0.0 | 11 | 0 | 0.0 | 0 | 0.0 | 6 | 0 | 0.0 | 0 0.0 | 9 | 0 | 0.0 | 0 | 11.1 |
| right | 3 | 0 | 0.0 | 0 0.0 | 11 | 0 | 0.0 | 0 | 0.0 | 8 | 1 | 12.5 | 0 0.0 | 9 | 0 | 0.0 | 0 | 0.0 |
| Mandible | 3 | 0 | 0.0 | 0 0.0 | 11 | 0 | 0.0 | 0 | 0.0 | 6 | 0 | 0.0 | 1 16.7 | 10 | 0 | 0.0 | 0 | 0.0 |
| Lumbar vertebrae, | | | | | | | | | | | | | | | | | | |
| L1 | 2 | 0 | 0.0 | 0 0.0 | 8 | 0 | 0.0 | 0 | 0.0 | 7 | 0 | 0.0 | 0 0.0 | 14 | 0 | 0.0 | 0 | 0.0 |
| L2 | 2 | 0 | 0.0 | 0 0.0 | 9 | 0 | 0.0 | 0 | 0.0 | 6 | 0 | 0.0 | 0 0.0 | 11 | 0 | 0.0 | 0 | 0.0 |
| L 3 | 2 | 0 | 0.0 | 0 0.0 | 9 | 0 | 0.0 | 0 | 0.0 | 6 | 0 | 0.0 | 0 0.0 | 12 | 0 | 0.0 | 0 | 0.0 |
| L4 | 2 | 0 | 0.0 | 0 0.0 | 9 | 0 | 0.0 | 0 | 0.0 | 6 | 0 | 0.0 | 0 0.0 | 11 | 0 | 0.0 | 0 | 0.0 |
| L5 | 2 | 0 | 0.0 | 0 0.0 | 8 | 0 | 0.0 | 0 | 0.0 | 6 | 0 | 0.0 | 0 0.0 | 10 | 0 | 0.0 | 0 | 0.0 |
| Humerus, left | 3 | 0 | 0.0 | 0 0.0 | 10 | 0 | 0.0 | 1 | 10.0 | 7 | 1 | 14.3 | 1 14.3 | 11 | 1 | 9.1 | 0 | 0.0 |
| right | 3 | 0 | 0.0 | 0 0.0 | 8 | 0 | 0.0 | 1 | 12.5 | 5 | 1 | 20.0 | 1 20.0 | 12 | 1 | 8.3 | 1 | 8 .3 |
| Radius, left | 2 | 0 | 0.0 | 0 0.0 | 8 | 0 | 0.0 | 0 | 0.0 | 4 | 0 | 0.0 | 0 0.0 | 9 | 0 | 0.0 | 1 | 11.1 |
| right | 2 | 0 | 0.0 | 0 0.0 | 5 | 0 | 0.0 | 0 | 0.0 | 5 | 0 | 0.0 | 0 0.0 | 10 | 0 | 0.0 | 2 | 20.0 |
| Ulna, left | 1 | 0 | 0.0 | 0 0.0 | 8 | 0 | 0.0 | 0 | 0.0 | 4 | 0 | 0.0 | 2 50.2 | 10 | 1 | 10.0 | 1 | 10.0 |
| right | 2 | 0 | 0.0 | 0 0.0 | 5 | 1 | 20.0 | 1 | 20.0 | 4 | 0 | 0.0 | 0 0.0 | 7 | 0 | 0.0 | 1 | 14.3 |
| Femur, left | 3 | 0 | 0.0 | 0 0.0 | 10 | 0 | 0.0 | 1 | 10.0 | 8 | 0 | 0.0 | 2 25.0 | 12 | 1 | 8.3 | 2 | 16.7 |
| right | 2 | 0 | 0.0 | 0 0.0 | 9 | 0 | 0.0 | 0 | 0.0 | 6 | 0 | 0.0 | 2 33.3 | 13 | 2 | 15.4 | 0 | 0.0 |
| Tibia, left | 2 | 0 | 0.0 | 1 50.0 | 9 | 0 | 0.0 | 2 | 22.2 | 6 | 2 | 33.3 | 3 50.0 | 8 | 1 | 12.5 | 3 | 37.5 |
| right | 3 | 0 | 0.0 | 33.3 | 9 | 0 | 0.0 | 1 | 11.1 | 5 | 0 | 0.0 | 2 40.0 | 9 | 4 | 44.4 | 5 | 55.6 |
| Fibula, left | 1 | 0 | 0.0 | 0 0.0 | 7 | 0 | 0.0 | 1 | 14.3 | 5 | 0 | 0.0 | 4 80.0 | 6 | 0 | 0.0 | 0 | 0.0 |
| right | 2 | 0 | 0.0 | 1 50.0 | 6 | 1 | 16.7 | 0 | 0.0 | 2 | 0 | 0.0 | 1 50.0 | 6 | 0 | 0.0 | 2 | 33.3 |

ample. Arikara population size decreased rapidly during the Late Protohistoric and Historic periods because of intertribal warfare and the introduction of acute crowd infections (e.g., measles, smallpox, cholera) (Jantz and Owsley 1985; Owsley and Bass 1979; Owsley, Berryman and Bass 1977). Death often followed a brief period of infection such that skeletal involvement was rare. Clearly, the interpretation of paleopathological data depends on many variables including demographic composition, types of lesions observed, and available historical and archeological information.

The Grant/McLemore data show high frequencies of pathological changes involving new bone formation in the tibiae and fibulae of both sexes. This increase is in the form of raised linear areas of subperiosteal bone. In the tibiae, these new-bone areas are typically located along the soleal line and, in the fibulae, along the interosseous membrane and ligamentous attachment sites. Although raised soleal and interosseous membrane attachment sites need not necessarily reflect a pathological condition (pseudoperiostitis), they do, however, reflect a bone response to activity and repeated minor stress. The Grant/McLemore sample also has a higher incidence of developed supinator crests of the ulnae, especially in males, than seen in the Four Bear osteological collection. Developed supinator crests reflect strenuous twisting movements of the forearm (Kelley and Angel 1987).

The males in the Four Bear group show a high frequency of bone increase in the outer table of the frontal bone. Although some of this increase reflects button osteomata (benign tumors), there is also evidence of healed periostitis due to minor acute trauma and infection in some of the skulls.

Both sexes in the Grant/McLemore sample exhibit higher percentages of bone loss in the tibiae, parietal, and occipital bones. Cranial bone loss is more common in females and is represented by pinpoint porosity over most of the ectocranial surface other than muscle attachment sites. Probably this porosity reflects bony changes caused by anemia, possibly due to iron deficiency. The Four Bear sample shows no porosity in any of the outer table surfaces of the parietals or occipital bones. Although both Four Bear and Grant/McLemore employed a mixed Plains horticultural and hunting subsistence strategy, these preliminary data suggest important differences in nutritional adequacy. Past research has shown that heavy dependence on maize can lead to iron deficiency (El-Najjar et al. 1975). Preliminary interpretation of the present observations suggests greater dependence on corn in the Southern Plains and a lower availability of iron-rich animal protein. In order to fully explore possible causes, we recommend the completion of trace element and carbon and nitrogen stable isotope analyses of bone and elemental compositional analysis of tooth enamel (Habicht- Mauche et al. 1988; Levendowsky 1987; Schneider 1984; Schoeninger 1979, 1982; Schoeninger, DeNiro and Tauber 1983; Sillen and Kavanagh 1982). In addition, the coding of dental lesions provides useful data essential for this kind of interpretation.

Arthritic changes involving osteophyte formation and porosity of joint surfaces are relatively common in Grant/McLemore skeletons, but not in the Four Bear series (Table 122). Demographic differences in these samples are clearly reflected in the percentages, and future comparisons will need to control for this variable. Of note, most of the arthritic changes observed in the McLemore series were classifed as slight or occasionally moderate in expression and generally seemed to be a normal consequence of advancing age. In the future, it will be very interesting to obtain comparable data for other Plains populations, with particular reference to Antelope Creek phase skeletons. During our survey of Antelope Creek skeletal remains, several extreme examples of arthritic changes were noted. Although perhaps this assessment is premature, there may be marked differences in the frequency and severity of osteoarthritis between populations of western Oklahoma and the Texas Panhandle. These differences, if verified, probably can be traced to higher load levels imposed by more strenuous activities, possibly related to the construction of stone structures or from procurement of lithic materials from local chert quarries.

## Dental Pathological Conditions

The human dentition provides a valuable record of selected aspects of health and adaptation. One variable that should be considered is tooth decay, one of the oldest diseases affecting humans (Mandel 1979). Dental caries are caused by bacterial infection that results in progressive demineralization of tooth enamel and dentin (Larsen 1980; Moorey and Nelson 1970; Shaw 1978). Cariogenic bacteria flourish in an oral environment created by the fermentation of dietary sugars and other carbohydrates.

The frequency and pattern of dental caries has been used as an indicator of dietary composition and consistency (Mandel 1979; Moore-Jansen, Rose, Abernathy and Powell 1980; Rose, Clancy and Moore-Jansen 1981; Turner 1979; Wells 1975). Ingredients of the diet and the mechanical nature of the food are important in the etiology of dental decay. Coarse, unprocessed plant foods abrade tooth surfaces and encourage salivary action keeping the mouth relatively clean (Mandel 1979). Advancing attrition tends to eliminate grooves and fissures of the posterior teeth and interproximal contact areas which reduces surface susceptibility to attachment by debris and subsequent decay. In contrast, highly processed agricultural products and refined sugars have a soft, sticky consistency that adheres to the teeth and produces a destructive oral environment. A mechanically abrasive diet consisting of low-carbohydrate foods typifies a hunting and gathering subsistence pattern. Higher frequencies of carious lesions are associated with subsistence economies dependent on foods higher in carbohydrates.

In this preliminary study, the dental pathology data for Grant and McLemore were scored in a format that has been used with Northern Plains collections. Carious lesions were

Table 28
Arthritic Changes in Adult Males and Females at Four Bear and Grant/McLemore

| | FOUR BEAR | | | | | | GRANT/McLEMORE | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Males | | | Females | | | Males | | | Females | | |
| | N | Response | % | N | Response | % | N | Response | % | N | Response | % |
| Tibia, Proximal, Left | 2 | | 9 | 6 | | | 13 | | | | | |
| Osteophyte | | 0 | 0.0 | | 1 | 11.1 | | 1 | 16.7 | | 4 | 30.8 |
| Porosity | | 0 | 0.0 | | 0 | 0.0 | | 1 | 16.7 | | 3 | 23.1 |
| Right | 3 | | | 9 | | | 5 | | | 13 | | |
| Osteophyte | | 0 | 0.0 | | 1 | 11.1 | | 2 | 40.0 | | 5 | 38.5 |
| Porosity | | 0 | 0.0 | | 0 | 0.0 | | 1 | 40.0 | | 5 | 38.5 |
| Tibia, Distal Left | 2 | | | 9 | | | 7 | | | 10 | | |
| Osteophyte | | 0 | 0.0 | | 0 | 0.0 | | 0 | 0.0 | | 0 | 0.0 |
| Porosity | | 0 | 0.0 | | 0 | 0.0 | | 0 | 0.0 | | 0 | 0.0 |
| Right | 3 | | | 9 | | | 6 | | | 11 | | |
| Osteophyte | | 0 | 0.0 | | 0 | 0.0 | | 1 | 16.7 | | 2 | 18.2 |
| Porosity | | 0 | 0.0 | | 0 | 0.0 | | 0 | 0.0 | | 1 | 9.1 |
| First Lumbar Vertebra | 2 | | | 9 | | | 7 | | | 14 | | |
| Facet Osteophyte | | 0 | 0.0 | | 2 | 22.0 | | 1 | 14.3 | | 4 | 29.6 |
| Facet Porosity | | 0 | 0.0 | | 0 | 0.0 | | 0 | 0.0 | | 1 | 7.1 |
| Centrum Osteophyte | | 0 | 0.0 | | 0 | 0.0 | | 1 | 14.3 | | 6 | 42.9 |
| Centrum Porosity | | 0 | 0.0 | | 0 | 0.0 | | 1 | 14.3 | | 4 | 28.6 |
| Fourth Lumbar Vertebra | 2 | | | 9 | | | 7 | | | 11 | | |
| Facet Osteophyte | | 0 | 0.0 | | 0 | 0.0 | | 3 | 42.9 | | 6 | 54.5 |
| Facet Porosity | | 0 | 0.0 | | 0 | 0.0 | | 3 | 42.9 | | 2 | 18.2 |
| Centrum Osteophyte | | 0 | 0.0 | | 4 | 44.4 | | 7 | 100.0 | | 10 | 90.9 |
| Centrum Porosity | | 0 | 0.0 | | 3 | 33.3 | | 3 | 42.9 | | 8 | 72.7 |
| Radius, Proximal Left | 2 | | | 7 | | | 4 | | | 12 | | |
| Osteophyte | | 0 | 0.0 | | 1 | 14.3 | | 1 | 25.0 | | 2 | 16.7 |
| Porosity | | 0 | 0.0 | | 1 | 14.3 | | 2 | 50.0 | | 3 | 25.0 |
| Right | 1 | | | 4 | | | 5 | | | 11 | | |
| Osteophyte | | 0 | 0.0 | | 0 | 0.0 | | 1 | 20.0 | | 3 | 27.3 |
| Porosity | | 0 | 0.0 | | 0 | 0.0 | | 1 | 20.0 | | 2 | 18.1 |
| Radius, Distal Left | 2 | | | 6 | | | 5 | | | 9 | | |
| Osteophyte | | 0 | 0.0 | | 3 | 50.0 | | 1 | 20.0 | | 4 | 44.4 |
| Porosity | | 0 | 0.0 | | 0 | 0.0 | | 1 | 20.0 | | 1 | 11.1 |
| Right | 2 | | | 4 | | | 6 | | | 11 | | |
| Osteophyte | | 1 | 0.0 | | 0 | 0.0 | | 1 | 16.7 | | 4 | 36.4 |
| Porosity | | 1 | 0.0 | | 0 | 0.0 | | 0 | 0.0 | | 1 | 9.1 |
| Femur, Proximal Left | 3 | | | 10 | | | 11 | | | 13 | | |
| Osteophyte | | 0 | 0.0 | | 0 | 0.0 | | 0 | 0.0 | | 0 | 0.0 |
| Porosity | | 0 | 0.0 | | 0 | 0.0 | | 0 | 0.0 | | 0 | 0.0 |
| Right | 2 | | | 8 | | | 8 | | | 13 | | |
| Osteophyte | | 0 | 0.0 | | 0 | 0.0 | | 0 | 0.0 | | 2 | 15.4 |
| Porosity | | 0 | 0.0 | | 0 | 0.0 | | 0 | 0.0 | | 0 | 0.0 |
| Femur, Distal Left | 4 | | | 10 | | | 8 | | | 12 | | |
| Osteophyte | | 0 | 0.0 | | 3 | 30.0 | | 2 | 25.0 | | 5 | 41.7 |
| Porosity | | 0 | 0.0 | | 2 | 20.0 | | 0 | 0.0 | | 2 | 16.7 |
| Right | 2 | | | 9 | | | 7 | | | 13 | | |
| Osteophyte | | 0 | 0.0 | | 3 | 33.3 | | 3 | 42.9 | | 5 | 38.5 |
| Porosity | | 0 | 0.0 | | 1 | 11.1 | | 1 | 14.3 | | 2 | 15.4 |
| Humerus, Proximal Left | 3 | | | 9 | | | 6 | | | 10 | | |
| Osteophyte | | 0 | 0.0 | | 0 | 0.0 | | 2 | 33.3 | | 5 | 50.0 |
| Porosity | | 0 | 0.0 | | 0 | 0.0 | | 2 | 33.3 | | 2 | 20.0 |
| Right | 2 | | | 8 | | | 7 | | | 13 | | |
| Osteophyte | | 0 | 0.0 | | 0 | 0.0 | | 3 | 42.9 | | 4 | 30.8 |
| Porosity | | 1 | 50.0 | | 0 | 0.0 | | 1 | 14.3 | | 3 | 23.1 |
| Humerus, Distal Left | 2 | | | 9 | | | 8 | | | 11 | | |
| Osteophyte | | 0 | 0.0 | | 2 | 22.2 | | 4 | 50.0 | | 7 | 63.7 |
| Porosity | | 0 | 0.0 | | 1 | 11.1 | | 3 | 37.5 | | 4 | 36.4 |
| Right | 3 | | | 5 | | | 6 | | | 13 | | |
| Osteophyte | | 0 | 0.0 | | 0 | 0.0 | | 3 | 50.0 | | 5 | 38.5 |
| Porosity | | 0 | 0.0 | | 0 | 0.0 | | 1 | 16.7 | | 3 | 23.1 |
| Ulna, Proximal Left | 1 | | | 9 | | | 7 | | | 11 | | |
| Osteophyte | | 0 | 0.0 | | 1 | 11.1 | | 4 | 57.1 | | 5 | 45.5 |
| Porosity | | 0 | 0.0 | | 0 | 0.0 | | 0 | 0.0 | | 3 | 27.3 |
| Right | 1 | | | 7 | | | 5 | | | 13 | | |
| Osteophyte | | 1 | 100.0 | | 0 | 0.0 | | 3 | 60.0 | | 4 | 30.8 |
| Porosity | | 0 | 0.0 | | 0 | 0.0 | | 2 | 40.0 | | 2 | 15.4 |
| Ulna, Distal Left | 2 | | | 6 | | | 4 | | | 11 | | |
| Osteophyte | | 0 | 0.0 | | 1 | 16.7 | | 0 | 0.0 | | 1 | 9.1 |
| Porosity | | 0 | 0.0 | | 1 | 16.7 | | 1 | 25.0 | | 0 | 0.0 |
| Right | 3 | | | 2 | | | 4 | | | 7 | | |
| Osteophyte | | 0 | 0.0 | | 0 | 0.0 | | 0 | 0.0 | | 2 | 28.6 |
| Porosity | | 0 | 0.0 | | 0 | 0.0 | | 0 | 0.0 | | 1 | 14.3 |

identified on the basis of visible cavitation and the use of a probe. The location of the lesion on the crown was identified by tooth surface (i.e., buccal, interproximal, lingual, and occlusal) and classified according to severity of involvement using the following format:

1 - Pit or slight fissural start of lesion
2 - Lesion ranging from more than degree "1" to less than one-half of the crown surface
3 - Destruction of more than one-half of the surface, although not complete destruction
4 - Complete destruction of the tooth surface
5 - Caries involving the root (caries at the cemento-enamel junction)

This coding system allows for analyses that tabulate percentages of carious teeth as based on numbers of each specific tooth, tooth type, or per individual. Other observations concern alveolar bone abscessing and resorption, dental calculus deposits, and artificial abrasion (interproximal or occlusal surface grooves). Periodontal and periapical abscesses are based on macroscopic or radiographic evaluation of each tooth socket with normal and pathological observations scored as follows:

1 - No disease evident
2 - Periodontal abscess with destruction of the alveolar crest
3 - Periapical abscess with perforation of cortex or destruction of bone
4 - Antemortem tooth loss due to abscess (remodeling in progress)
5 - Antemortem tooth loss with alveolar bone resorption

Table 123 presents the frequencies of carious teeth by mandibular and maxillary tooth types for the Four Bear and Grant/McLemore adult dentitions. The values for males and females are fairly similar within samples. Differences between groups are suggested. Southern Plains total frequencies are twice as high as observed in Northern Plains males and females. Further evaluation of this pattern must control for the age distributions of these two samples as this difference could be an age effect. Additional samples must be included in order to examine the pattern of these frequency differences using age-stratified groups. If the suggested overall pattern is validated, it provides additional evidence for greater reliance on maize in the Southern Plains.

Alveolar bone infections were common in the adults of both collections (Table 124). These percentages were calculated as the number of tooth sockets affected by active periodontal or periapical abscesses plus the number of tooth sockets that showed antemortem tooth loss relative to the inventory base count. Total frequencies are higher in the Southern Plains, especially for females. The percentages are high with 37-42% of the Grant/McLemore alveolar bone sockets showing signs of pathological response. The frequency distribution of these disease conditions needs to be determined and causes of tooth loss need to be explored. Was dental decay the primary cause of alveolar bone disease, or were other factors, including high levels of attrition caused by food processing techniques that increased dietary grit, partially responsible?

Table 29
Distribution of Carious Permanent Teeth in Adult Males and Females from Four Bear and Grant/McLemore

| | FOUR BEAR | | | | | | GRANT/McLEMORE | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Males | | | Females | | | Males | | | Females | | |
| Tooth Type | N | Caries | % | N | Caries | % | N | Caries | % | N | Caries | % |
| Maxilla | | | | | | | | | | | | |
| Incisors | 5 | 0 | 0.0 | 25 | 0 | 0.0 | 13 | 1 | 7.7 | 24 | 1 | 4.2 |
| Canines | 4 | 0 | 0.0 | 17 | 0 | 0.0 | 10 | 3 | 30.0 | 11 | 5 | 45.5 |
| Premolars | 8 | 0 | 0.0 | 36 | 4 | 11.1 | 15 | 0 | 53.3 | 21 | 8 | 38.1 |
| Molars | 7 | 0 | 0.0 | 45 | 7 | 15.6 | 10 | 2 | 20.0 | 18 | 6 | 33.3 |
| Subtotal | 24 | 0 | 0.0 | 123 | 11 | 8.,9 | 48 | 14 | 29.2 | 74 | 20 | 27.0 |
| Mandible | | | | | | | | | | | | |
| Incisors | 4 | 1 | 25.0 | 37 | 0 | 0.0 | 16 | 0 | 0.0 | 25 | 4 | 16.0 |
| Canincs | 3 | 0 | 0.0 | 20 | 0 | 0.0 | 12 | 2 | 16.7 | 16 | 0 | 0.0 |
| Prcmolars | 6 | 0 | 0.0 | 35 | 5 | 14.3 | 22 | 2 | 9.1 | 29 | 3 | 10.3 |
| Molars | 15 | 2 | 13.3 | 46 | 10 | 21.7 | 27 | 8 | 29.6 | 25 | 9 | 36.0 |
| Subtotals | 28 | 3 | 10.7 | 138 | 15 | 10.9 | 77 | 12 | 15.6 | 95 | 16 | 16.8 |
| Total | 52 | 6 | 11.5 | 261 | 26 | 10.0 | 125 | 26 | 20.8 | 169 | 36 | 21.3 |

Table 30
Alveolar Bone Pathology in Adult Males and Females from Four Bear, Grant and McLemore

| | FOUR BEAR | | | | | | GRANT/McLEMORE | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Males | | | Females | | | Males | | | Females | | |
| Tooth Type | N | Pathology | % | N | Pathology | % | N | Pathology | % | N | Pathology | % |
| Maxilla | | | | | | | | | | | | |
| Incisors | 8 | 2 | 25.0 | 42 | 7 | 16.7 | 18 | 6 | 33.3 | 34 | 6 | 17.6 |
| Canines | 3 | 0 | 0.0 | 21 | 1 | 4.8 | 10 | 3 | 30.0 | 17 | 6 | 35.3 |
| Premolars | 12 | 4 | 33.3 | 43 | 4 | 9.3 | 24 | 12 | 50.0 | 31 | 18 | 58.1 |
| Molars | 18 | 12 | 66.7 | 59 | 23 | 39.0 | 28 | 20 | 71.4 | 35 | 29 | 82.9 |
| Subtotal | 41 | 18 | 43.9 | 165 | 35 | 21.2 | 80 | 41 | 51.3 | 117 | 59 | 50.4 |
| Mandible | | | | | | | | | | | | |
| Incisors | 9 | 2 | 22.2 | 43 | 8 | 18.6 | 25 | 6 | 24.0 | 36 | 11 | 30.6 |
| Canines | 5 | 1 | 20.0 | 22 | 0 | 0.0 | 14 | 2 | 14.3 | 18 | 0 | 0.0 |
| Premolars | 10 | 1 | 10.0 | 43 | 6 | 14.0 | 26 | 3 | 11.5 | 36 | 8 | 22.2 |
| Molars | 18 | 7 | 38.9 | 65 | 19 | 29.2 | 39 | 16 | 41.0 | 52 | 31 | 59.6 |
| Subtotal | 42 | 11 | 26.2 | 173 | 33 | 19.1 | 104 | 27 | 26.0 | 142 | 50 | 35.2 |
| Total | 83 | 29 | 34.9 | 338 | 68 | 20.1 | 184 | 68 | 37.0 | 259 | 109 | 42.1 |

N = Numbers of tooth sockets
Pathology = Numbers of tooth sockets affected by periodontal or periapical abscess or antemortem tooth loss
% = Percent pathological

## Cranial Measurements and Metrics of the Postcranial Skeleton

The relevance of craniometric studies to our understanding of Historical relationships among Prehistoric populations in the Plains has been demonstrated (Bass 1964; Jantz 1974, 1977; Jantz, Owsley and Willey 1978; Key 1983; Owsley, Slutzky, Guagliardo, and Dietrick 1981; Owsley and Symes 1981). The basic principle of these comparisons is that similar craniofacial morphology reflects genetic affiliation. Biological distance matrices can be constructed that provide a mathematical representation of suggested relationships as gauged by the level of similarity. A data set of 65 measurements is the current standard used in the Northern and Central Plains; data for more than 1,000 crania have been recorded using this system. These measurements are generally examined within a multivariate context such as canonical analysis. For purposes of illustration, it seems appropriate to compare the cranial measurements of McLemore and Grant to data for Four Bear (Arikara), Pawnee crania from 25Wt1, and also a St. Helena Central Plains tradition sample from 25Dk3. The data for these reference samples were derived from the aforementioned Plains craniometric database assembled primarily by Richard Jantz and Patrick Key.

Sample sizes, means, and standard deviations for the 14 cranial measurements used in this analysis are given in Table 125 for each group. These data were subjected to canonical discriminant analysis using the CANDISC subroutine in the SAS package (SAS Institute, Inc. 1985). Two significant canonical functions were extracted.

Figure 32 shows the group centroids plotted on the first two canonical discriminant axes, surrounded by their 90% confidence circles. There is a clear pattern in the intergroup relationships. The Washita River and the St. Helena Central Plains samples form a relatively tight cluster in the upper left part of the plot, while the Four Bear and Historic Pawnee samples form a looser cluster in the lower right of the plot. These results are in accord with those of David Patterson (1974) who argued that crania from the Antelope Creek sites were similar to Central Plains crania.

The correlation of original variables with the canonical discriminant scores is given in Table 126. These allow interpretation of the variables responsible for the pattern of variation shown in the plot. The primary loading on CAN 1 is cranial length (GOL), with basion-nasion length (BNL), nasal height (NLH), and nasion radius (NAR) having smaller loadings. CAN 2 receives contributions from nearly all variables, only cranial base angle (CBA), frontal subtense (FRS), and zygomaxillare angle (SSA) approach zero. The positive contribution of most variables to CAN 2 indicates that it reflects size variation, much of which is due to sexual dimorphism. However, there is also some intergroup shape variation seen on this axis.

The craniometric differences between the Washita River-Central Plains tradition groups and the Coalescent tradition groups may be summarized as follows: the former group is characterized by shorter, higher vaults with less projection at nasion. Frontals may also be characterized as flatter. Through this type of analysis, we believe it is possible to evaluate many of the proposed population relationships discussed in the Southern Plains literature.

Similar biometric techniques are applicable to the analysis of the postcranial skeleton. Until recently, postcranial

Table 31
Cranial Measurement Means and Standard Deviations by Group and Sex

| | | Four Bear | | | Grant | | McLemore | | | Hancock | | | Hill-Pike | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Variable | Sex | N | Mean | S.D. | N | Mean | N | Mean | S.D. | N | Mean | S.D. | N | Mean | S.D. |
| GOL | M | 3 | 185.7 | 1.53 | | | 3 | 175.7 | 3.06 | 10 | 172.0 | 5.54 | 6 | 177.5 | 5.24 |
| | F | 9 | 172.4 | 3.78 | 1 | 168.0 | 3 | 169.0 | 8.19 | 7 | 162.6 | 5.56 | 4 | 168.0 | 4.55 |
| ENL | M | 3 | 105.7 | 2.31 | | | 3 | 103.7 | 0.58 | 10 | 102.0 | 5.50 | 6 | 101.5 | 3.56 |
| | F | 9 | 96.4 | 4.36 | 1 | 95.0 | 3 | 97.3 | 4.62 | 7 | 96.4 | 3.26 | 4 | 96.3 | 2.63 |
| BBR | M | 3 | 134.7 | 3.21 | | | 3 | 141.3 | 1.53 | 10 | 136.3 | 6.02 | 6 | 131.2 | 3.97 |
| | F | 9 | 126.9 | 6.35 | 1 | 132.0 | 3 | 135.3 | 2.52 | 7 | 128.4 | 4.35 | 4 | 121.8 | 7.46 |
| XCB | M | 3 | 142.0 | 3.46 | | | 3 | 140.0 | 5.57 | 10 | 143.3 | 5.70 | 6 | 139.8 | 5.31 |
| | F | 9 | 136.0 | 4.85 | 1 | 140.0 | 3 | 145.0 | 6.00 | 7 | 135.4 | 4.31 | 4 | 138.8 | 6.08 |
| NPH | M | 3 | 74.7 | 3.21 | | | 3 | 78.3 | 3.06 | 10 | 71.3 | 5.54 | 6 | 72.5 | 2.07 |
| | F | 9 | 68.1 | 4.73 | 1 | 65.0 | 3 | 72.7 | 2.89 | 7 | 65.6 | 3.15 | 4 | 66.5 | 1.73 |
| NLR | M | 3 | 57.3 | 3.79 | | | 3 | 56.0 | 1.00 | 10 | 52.8 | 3.12 | 6 | 53.8 | 1.47 |
| | F | 9 | 50.9 | 3.89 | 1 | 49.0 | 3 | 51.7 | 2.08 | 7 | 48.0 | 2.77 | 4 | 50.3 | 2.50 |
| NLB | M | 3 | 26.3 | 1.15 | | | 3 | 26.3 | 1.15 | 10 | 25.7 | 2.16 | 6 | 25.7 | 1.37 |
| | F | 9 | 24.4 | 2.01 | 1 | 27.0 | 3 | 24.7 | 1.53 | 7 | 25.0 | 1.63 | 4 | 24.3 | 1.50 |
| FRC | M | 3 | 112.7 | 1.53 | | | 3 | 113.7 | 3.06 | 10 | 112.5 | 5.53 | 6 | 107.2 | 4.02 |
| | F | 9 | 106.8 | 4.32 | 1 | 107.0 | 3 | 111.0 | 4.58 | 7 | 104.0 | 4.32 | 4 | 104.8 | 3.59 |
| FRS | M | 3 | 23.7 | 1.53 | | | 3 | 20.3 | 3.06 | 10 | 23.6 | 2.41 | 6 | 20.7 | 2.58 |
| | F | 9 | 24.0 | 2.35 | 1 | 18.0 | 3 | 23.0 | 2.65 | 7 | 22.3 | 2.50 | 4 | 22.8 | 2.50 |
| NAR | M | 3 | 99.3 | 1.15 | | | 3 | 96.0 | 1.00 | 10 | 95.8 | 4.26 | 6 | 96.2 | 4.17 |
| | F | 9 | 91.2 | 2.28 | 1 | 84.0 | 3 | 89.7 | 6.11 | 7 | 90.0 | 4.43 | 4 | 91.3 | 2.22 |
| BAR | M | 3 | 14.3 | 2.08 | | | 3 | 16.0 | 4.00 | 10 | 12.5 | 3.63 | 6 | 15.0 | 2.19 |
| | F | 9 | 14.3 | 3.94 | 1 | 18.0 | 3 | 15.0 | 7.00 | 7 | 13.3 | 3.35 | 4 | 11.3 | 1.89 |
| SSA | M | 3 | 125.7 | 3.51 | | | 3 | 126.0 | 6.56 | 10 | 128.1 | 4.09 | 6 | 126.3 | 2.42 |
| | F | 9 | 125.2 | 4.12 | 1 | 136.0 | 3 | 125.7 | 2.06 | 7 | 127.0 | 3.83 | 4 | 129.8 | 8.14 |
| FRA | M | 3 | 134.0 | 3.00 | | | 3 | 140.3 | 5.51 | 10 | 134.3 | 3.92 | 6 | 137.7 | 4.32 |
| | F | 9 | 131.1 | 3.55 | 1 | 143.0 | 3 | 134.3 | 3.21 | 7 | 133.4 | 3.69 | 4 | 132.0 | 4.40 |
| CBA | M | 3 | 155.0 | 3.61 | | | 3 | 152.0 | 6.56 | 10 | 158.1 | 6.79 | 6 | 133.8 | 4.36 |
| | F | 9 | 154.0 | 6.38 | 1 | 147.0 | 3 | 153.7 | 11.93 | 7 | 155.0 | 6.53 | 4 | 159.5 | 2.65 |

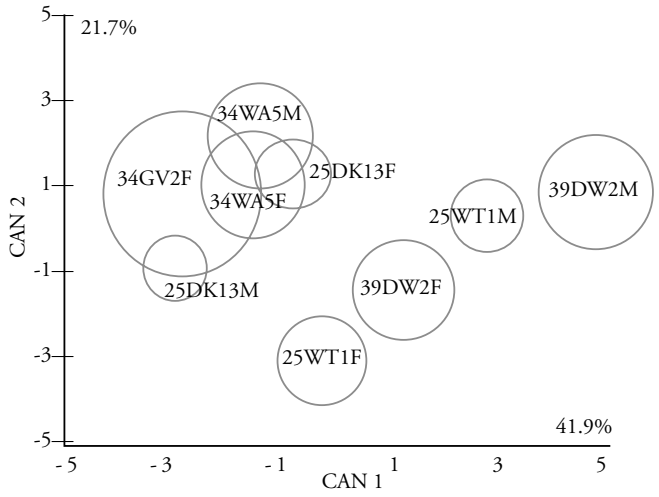



**Figure 25. Plot of group centroids on the first and second canonical variates (cranial measurements)**

Table 32
Correlation of Original Variables with Canonical Discriminant Scores

| Measurement | CAN1 | CAN2 |
|---|---|---|
| GOL | 0.742 | 0.399 |
| BNL | 0.305 | 0.602 |
| BBH | -0.060 | 0.848 |
| XCB | 0.053 | 0.487 |
| NPH | 0.295 | 0.650 |
| NLH | 0.484 | 0.536 |
| NLB | 0.056 | 0.404 |
| FRC | 0.102 | 0.660 |
| FRS | 0.070 | -0.155 |
| NAR | 0.444 | 0.476 |
| BAR | 0.095 | 0.179 |
| SSA | -0.188 | -0.021 |
| FRA | -0.031 | 0.491 |
| CBA | -0.034 | -0.094 |

skeletons have served primarily as age and sex markers. With the rise of ecologically oriented paleopathology, however, they have been examined as indicators of health and nutritional status. Metrical analyses of postcranial morphological variation have not been emphasized in these contexts. Postcranial metrics have been limited mainly to long bone lengths as a reflection of growth sufficiency (Jantz and Owsley 1984; Johnston 1968; Merchant and Ubelaker 1977; Nickens 1976). Morphometrics have played a somewhat larger role in examination of sexual dimorphism as a response to cultural and ecological conditions (Frayer 1980; Hamilton 1975; Larsen 1980). Multivariate morphometric studies of sexual dimorphism in individual bones have proven to be very useful (France 1983; Van Gerven 1971).

Work with Northern Plains Arikara collections has employed an extensive morphometric analysis of the postcranial skeleton (Puskarich 1984; Zobeck 1983). Several hypotheses concerned with human adaptation and environmental response require future evaluation. In general, these hypotheses reflect ideas developed in other geographical areas, and it would be useful to test their applicability to the Plains. For example, we are interested in investigating the relationships between variations in bone size, robusticity, and sexual dimorphism and changes in subsistence patterns or activities.

The Plains database for the postcranial skeleton includes more than 50 measurements. Measurements for the innominates and sacrum have been described by Puskarich (1984) and for the remainder of the postcranial skeleton by Zobeck (1983). Complete data sets for individual skeletons are often rare. Thus it may be necessary to construct measurement subsets tailored to the hypotheses being examined. These subsets will normally consist of measurements from individual bones, or in some instances segments, such as the proximal or distal ends. This is somewhat unfortunate in that the bone rather than the individual becomes the unit of analysis. Apart from general size, however, most covariation is within rather than among long bones (Zobeck 1983). Future analyses should follow a multivariate approach because of covariation among measurements.

Four Bear, Grant, and McLemore adult male and female summary data for 13 femur, humerus, and tibia measurements are given in Table 127 as an example. These measurements were analyzed using canonical discriminant analysis. For each bone we used maximum length and measures of robusticity such as head, midshaft, or distal end diameters.

The femur and humerus each yielded two significant functions and the tibia only one. In all three bones, the first function separates the sexes; in the humerus and femur the second function reflects group differences. Figures 33 and 34 show the group centroids for the humerus and femur plotted on the first two canonical functions. Both bones show Four Bear to be distinct from McLemore and Grant, the distinction being greater in the femur.

Table 128 gives the correlation of the original variables with the canonical discriminants. The femur variables of maximum length and head diameter correlate most strongly with the first (sex) function, while in the humerus, maximum length and epicondylar breadth correlate strongly with sex.

Group variation in the femur involves shape variation in the midshaft as reflected in the opposite loadings for these dimensions. Thus Four Bear shafts can be characterized as nearly round, anterior-posterior and mediolateral dimensions being almost equal. McLemore and Grant shafts are flattened mediolaterally and expanded anterior-posteriorly. These two measurements are often combined to form the pilastric index, designed to evaluate development of the linea aspera (Comas 1960). In these terms, the Oklahoma femora have more highly developed linea aspera than the South Dakota femora.

Group variation in the humerus involves size of the distal and proximal ends. While humeral head diameters seem to lack patterning, the Oklahoma groups have uniformly larger epicondylar breadths. Future research should make it possible to discern patterning in postcraniometric variation in the Great Plains, as well as provide insight as to its significance.

## CONCLUSIONS

Like archival holdings, skeletal collections are a record of the past and must be available for study if that past is to be understood. Further, if changes in human viability through time can be documented and causally explained, there may be benefits of biomedical significance. Information remains to be extracted from these samples as scientific understand-

Table 33
Means and Standard Deviations for Femora and Humeri by Group and Sex

| Variable | Sex | Four Bear (39Dw2) N | Mean | S.D. | Grant (34Gv2) N | Mean | S.D. | McLemore (34Wa5) N | Mean | S.D. |
|---|---|---|---|---|---|---|---|---|---|---|
| Femur | | | | | | | | | | |
| FML | M | 3 | 463.3 | 14.84 | 4 | 462.0 | 14.67 | 4 | 451.8 | 6.29 |
| | F | 11 | 411.6 | 15.13 | 4 | 414.3 | 12.28 | 11 | 412.8 | 13.25 |
| APS | M | 3 | 30.7 | 2.52 | 7 | 32.7 | 1.25 | 3 | 33.7 | 3.06 |
| | F | 11 | 25.0 | 1.90 | 6 | 30.0 | 1.79 | 11 | 27.6 | 2.66 |
| MLS | M | 3 | 27.7 | 0.58 | 7 | 25.1 | 0.69 | 4 | 24.5 | 2.38 |
| | F | 11 | 23.6 | 2.25 | 6 | 24.2 | 1.17 | 11 | 23.5 | 1.51 |
| Humerus | | | | | | | | | | |
| EML | M | 3 | 336.0 | 13.89 | 1 | 352.0 | —— | 4 | 322.5 | 9.47 |
| | F | 8 | 287.4 | 7.67 | 3 | 307.0 | 16.64 | 9 | 293.6 | 14.16 |
| MDH | M | 3 | 46.7 | 2.08 | 3 | 46.3 | 4.04 | 4 | 44.5 | 1.00 |
| | F | 8 | 40.6 | 4.07 | 4 | 42.8 | 1.50 | 9 | 39.1 | 1.90 |
| EBR | M | 4 | 59.8 | 2.63 | 3 | 60.7 | 2.08 | 4 | 62.0 | 1.83 |
| | F | 5 | 53.2 | 1.30 | 4 | 57.0 | 2.16 | 9 | 56.6 | 4.16 |

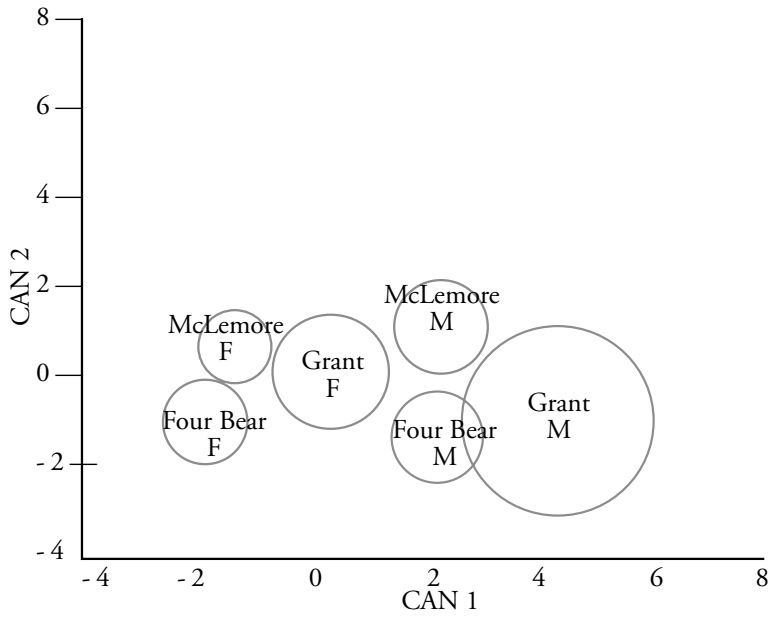



**Figure 26. Plot of group centroids on the first and second canonical variates (humerus)**

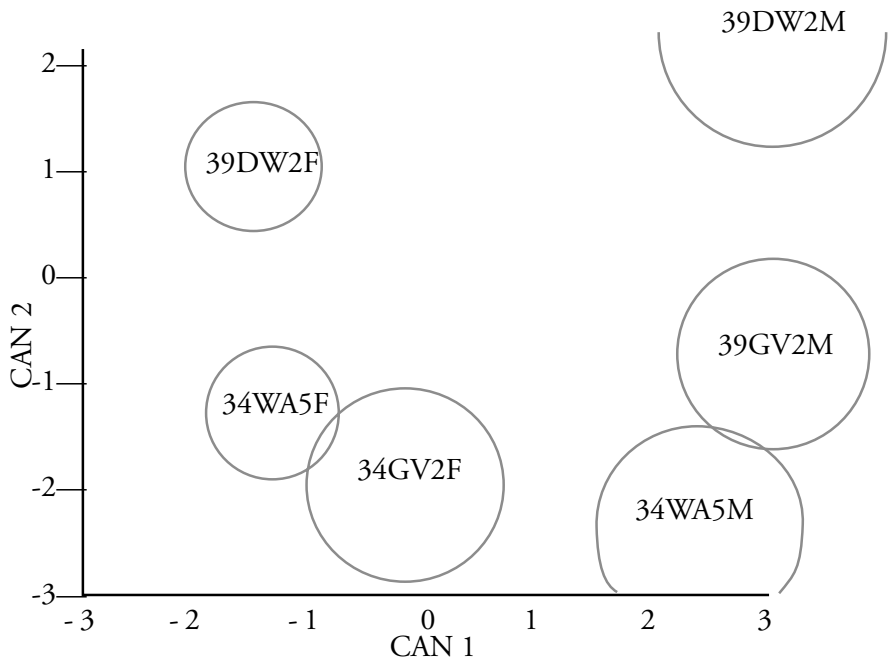



**Figure 27. Plot of group centroids on the first and second canonical variates (femur)**

Table 34
Correlation of Original Variables with Canonical Discriminant Scores

| Variable | CAN1 | CAN2 |
|---|---|---|
| Femur | | |
| FML | 0.941 | 0.104 |
| APS | 0.870 | -0.455 |
| MLS | 0.537 | 0.364 |
| HHD | 0.927 | 0.239 |
| Humerus | | |
| HML | 0.920 | -0.218 |
| MDH | 0.793 | -0.477 |
| EBR | 0.924 | 0.355 |

ing expands and new investigative methods are devised. Techniques are now being developed, for example, that allow for more critical evaluation of the relationships between diet and disease through the study of trace element and stable isotope ratios. Although it is now possible to assess nutritional dependence on particular dietary items in Prehistoric populations through analytical chemistry, the first publication on this topic appeared as recently as 1973 (A. Brown 1973). Such biomedical studies provide important Historical information and contribute to our understanding of bone growth and metabolism. These anatomical and physiological issues are complex and must be viewed both within and between populations having different genetic and environmental backgrounds.

Moreover, there is an urgent need for continued in-depth analysis of skeletal samples from archeological contexts. The accomplishments of past researchers are numerous and future investigations must build on them, taking full advantage of recent technological advances and more sophisticated research designs. Existing museum collections require careful analysis and reanalysis. Furthermore, contracting agencies should insure that bioarcheological research is an integral part of the project's scope and that the completed analysis is of high quality. Investigators should compare new data to the existing body of information and should not be content solely with a descriptive approach. Contracting agencies should also recognize that investigations of new samples will often be greatly enhanced through the evaluation of relevant museum holdings, and allowances for such requests should

be supported. Adequate funding for bioarcheological research is a necessity.

This bioarcheological survey has examined the history of osteological research in the Southern Plains. We have offered a model for research applicable to current investigations. Bioarcheological research is rapidly expanding and evolving. While sensitive attitudes concerning human remains must be balanced, it is important to recognize the potential of meticulous bioarcheological research as the primary source for elucidating the lives of past peoples.

Chapter 12

# ADAPTATION TYPES FOR THE SOUTHERN GREAT PLAINS REGION

*Jack L. Hofman, Robert L. Brooks, Joe S. Hays, and Douglas Owsley*

The concept of adaptation types as developed and used by Fitzhugh (1975) is a framework which integrates information about environment and technology in categorizing or summarizing lifeways of human groups at a level which is intermediate between the more general and encompassing stage and the smaller more particularistic phase (Willey and Phillips 1958). The importance of comparative studies in archeology, studies which involve larger than traditional units of archeological analysis, is undeniable. The broadened perspective which results from comparative studies should in and of itself provide the incentive for such pursuits. When addressing questions which reach beyond the culture history of a specific region, expanded comparative analysis is necessary. In turn, such broadened perspective will potentially enhance recognition of distinctive and significant aspects of local archeological remains. With the potential of archeology to contribute to anthropological comparative studies in mind, Fitzhugh (1975:341-342) provides these remarks concerning the purpose for the concept of adaptation type.

> to compare culture units and traditions from different historical and geographic areas, a new concept which links environmental potential and technological capabilities is required.
>
> Adaptation type performs this function suitably since it describes a nonspecific cultural or chronological unit which may be archeological or ethnographic, and its particular usage may depend on the definition ascribed to it in the context of the discussion. As such its use is similar to that of the term "complex" in archeological systematics. Further, an adaptation type may include a series of subtype variants which may be defined to correspond with demographic and economic realities.

The adaptation types and subtypes outlined in this section generally follow the concept as defined by Fitzhugh and as applied by Sabo et al. (1982). For each adaptation type recognized in the Southern Great Plains region, a series of information categories will be addressed. These include the date range, environmental context, cultural context, technology and subsistence activities, settlement and site distribution, ideology, trade and exchange, areas with high probability of site occurrence, and finally data gaps and critical research questions.

Fitzhugh (1975) based his definitions of General Northern Maritime and Riverine Adaptation Types on the economy and "core" technological and integrative elements of several hunter-gatherer groups in the Arctic region. In this study, the large encompassing category of hunter-gatherers is subdivided into five primary adaptation types based on known or inferred information pertaining to economy, population, environmental conditions, and cultural situations. These five adaptation types are First Arrivals, Early Specialized Hunters, Broad Spectrum Foragers, Incipient Horticulturalists, and Late Aboriginal Hunter-Gatherer-Traders. The Village Horticulturalist adaptation type is the final adaptation type recognized for the aboriginal prehistoric and protohistoric groups. Historic period adaptation types include reservation period Native Americans, and a series of European settlement adaptation type variants.

## First Arrivals Adaptation type

**Date Range.** The date range for this adaptation type is that portion of the Pleistocene prior to 12,000 B.P. when early hunters occupied the New World. Before 12,000 years ago, evidence for human occupation of the Southern Great Plains, and for the entire New World, is equivocal. No available evidence remains entirely unquestioned and completely accepted by the archeological community as a whole (e.g., Stanford 1982; Waters 1985). Two facts are generally accepted; sometime before 12,000 years ago there were no humans present in the New World, and by soon after 12,000 B.P. (radiocarbon years) there is widespread and well accepted evidence of human activity in both North and South America (Bryan 1978; Schutler 1981). First arrivals were those peoples who are assumed by many researchers to have inhabited the New World before the time of the well known Clovis or Llano cultural complex. The time frame for this archeologically poorly known interval extends from 12,000 years ago to some undetermined earlier time which marked the first entry of human groups into the New World.

**Environmental Context.** The Pleistocene period was substantially cooler and wetter than the present environment in the Plains region (Porter 1983; Wendland 1978; Wendorf and Hester 1975). The chronology of climatic fluctuations has been fairly well established for the late Pleistocene (Martin and Klein 1984), and it is known to have been a period of dynamic fluctuations in climate, vegetation, and animal populations. The environment of many localities were apparently distinct from those presently known, and the changes were not simply a matter of north-south changes in biotic districts, but include numerous occurrences which are considered disharmonious when compared to modern biotic associations (Graham and Lundelius 1984). For the vast majority of species composing the Rancholabrean fauna, including mammoth, mastodons, horse, camel, dire wolf, and ground

sloth, there is no unequivocal evidence of human involvement or predation before Clovis times.

**Cultural Context.** Information pertaining to social organization, mobility, and demography is lacking for the pre-Clovis period. There is general agreement that population density was very low during this period and that any groups present would have been egalitarian hunter-gatherers. Assuming their derivation from the eastern area of the U.S.S.R. via Beringia, we may expect technological organization similar to that expressed at Paleolithic sites such as described by Sofer (1985). Sofer has argued for two primary periods of relatively intense occupation on the Russian plain of the Ukraine, one between 24,000 and 30,000 B.P. and the second between 12,000 and 18,000 B.P. (radiocarbon years).

**Technology and Subsistence.** It is likely that the first arrivals in North America would have possessed a technology generally comparable to that of the Russian Upper Paleolithic (Sofer 1985). Controlled use of fire and manufacture of bone and stone artifacts, clothing and shelter is assumed. These people would have had access to a variety of Pleistocene fauna which would probably have provided the primary economic focus. Furthermore, these animal populations would have had little or no previous interaction with human predators and may have been particularly susceptible to hunting. A variety of studies including research in optimal foraging theory indicate that large mammals generally provide a first line resource and that smaller animals, invertebrates, and plant resources become increasingly important as economic pressures or population increase and territory sizes decrease (Winterhalder and Smith 1981; Pianka 1984). Plant foods were probably not as economically important as in many ethnographically recorded hunter-gatherer groups because of the abundance of animal foods. Also, detailed knowledge of a variety of new plant species would have required a longer term familiarity with local areas and some degree of "settling in." This would not be conducive in a highly mobile hunting economy. In colonizing a new region we can expect an economic focus on already familiar animal species rather than the less secure information on new plants in an unfamiliar terrain.

**Settlement Pattern.** Information pertaining to site distributions is not available for specific areas. Few sites potentially attributable to this time period are known, and most of these are widely dispersed.

**Trade and Exchange.** No information is available concerning interactions among groups of this time period. We assume that such supposedly small, mobile groups would have required interaction with other such groups in order to be viable. Exchange of information pertaining to specific resources and localities would have been of considerable benefit. Exchange of marriage partners was probably essential to long term group fitness and maintenance of intergroup contacts and alliances (e.g., Gamble 1982).

**Ideology.** Specific information pertaining to religious activities and ceremonies is not available.

**Bioarcheology**. No human remains attributable to this period and adaptation type have been documented in the Southern Great Plains region.

**Areas of High Site Probability.** Only landscapes of pre-Holocene age will have the potential to contain sites of this adaptation type. In alluvial bottomlands Pleistocene age deposits tend to be deeply buried, but these situations have the potential to contain relatively well preserved land surfaces and so archeological sites of pre-Clovis age. Upland areas, terraces, and terrace slopes of late Pleistocene age provide the best opportunity to encounter archeological remains from the First Arrivals, however, the problems of component mixing and dating make adequate evaluation of such sites less feasible. The best chances of finding unequivocal evidence of the earliest occupants of the Southern Plains region is probably in cave deposits, stratified alluvium, loess, or stratified ponded sediments (Drew 1979; Holliday 1982; Kornfeld 1980).

**Data Gaps and Critical Research Questions.** Because so little is known about this period, any site bearing evidence of human activity before 12,000 years ago is of considerable significance. Site locations are not predictable at present except that late Pleistocene land forms are typically deeply buried in alluvial valleys, buried beneath Holocene dune fields, or exposed in prominent terrace faces or upland ridges. As dating of these sites will be a critical consideration, those with primary research potential will occur in buried situations (below dunes, in playa deposits, in buried terrace deposits) where there is the potential for faunal and floral remains. Upland sites are likely to be deflated or heavily weathered and unlikely to produce materials which would allow verification for the age of artifacts which might be recovered from the surface or upper portion of Pleistocene age deposits.

### Early Specialized Hunters Adaptation Type

**Date Range.** An increasing number of radiocarbon dates pertaining to Paleo-Indian kill and habitation sites are available which document the activities of mammoth and bison hunting groups in the Southern Plains region to the period between 12,000 to 8,000 radiocarbon years B.P. (Haynes 1987; Hofman 1988a; Wedel 1986). Examples of defined cultural complexes which are included in this adaptation type are Clovis, Folsom, Plainview, Cody, and Allen/Frederick.

**Environmental Context.** Much of the environmental information pertaining to this period in the study area has been developed through studies conducted on the Llano Estacado region of the High Plains (Wendorf and Hester 1975; Stafford 1981, 1984; Haynes 1967, 1985; Holliday 1983; Holliday 1985, 1986), and to a lesser degree from the Prairie-Plains region (Bryant 1977; Dort and Jones 1970; Leonhardy 1966; Lundelius 1967; Lundelius et al. 1983:340-341, Table 16-3; G. E. Schultz 1967; Slaughter 1966). This period encompasses the Pleistocene-Holocene transition and is a dynamic one in terms of climatic changes and biotic communities. By soon after 11,000 years ago the Rancholabrean fauna became extinct (Haynes 1967, 1982, 1985; Kurten and Anderson 1980; Martin, Thompson and Long 1985). Climatic and ecological reconstructions vary between investigators and depending on the study location and the type of ecological data used, but the overall pattern of change is generally agreed upon.

For the Southern Great Plains, the period before 12,000 years ago was cooler, moister, and more equitable with less extreme temperature fluctuations between winter and summer than during the Holocene. Lower summer maximums and less severe winter temperatures (with an absence or rarity of extended hard freezes), in conjunction with greater effective moisture resulted in a rich and diverse fauna and flora probably not directly comparable to any that exists at present. Perhaps the primary distinction between the late Pleistocene and Holocene climates is the increased seasonality during the Holocene which acted to restrict the ranges of many species that are (were) sensitive to extremes of temperature and moisture. Animal taxa which survived this transition are generally those which were able to accommodate the competitive and climatic stresses. Often this was accomplished in part by reduction in body size (e.g., bison, beaver, armadillo) and changes in social behavior (e.g., larger herd size for bison).

Continental glaciers were retreating rapidly by 12,000 years ago but still covered a significant proportion of North America. By 6,000 years ago the ice was restricted to northern Canada (Wendland 1978), and by 4,000 B.P. the glacial ice had reached its approximate modern position. There was not a simple northward movement of biotic provinces following the glaciers, but a complex reorganization of ecological communities (Lundelius et al. 1983; Graham and Lundelius 1984; Graham 1979, 1985; Guthrie 1984). The Southern Great Plains region was not glaciated, but the area was dramatically impacted by the climatic, geomorphic, and biological changes associated with the close of the Wisconsin glaciation. Co-occurrences of species in faunas from the Pleistocene/Holocene transition which today are nonsympatric (disharmonious) has led to the discussion of biotic provinces which are distinct from those presently known (Holman 1976; Graham 1979; Guthrie 1984; Martin, Rogers, and Neuner 1985) and which include species now restricted to boreal or tropical climates.

As stated by Graham and Lundelius (1984:224), "the degree of diversity of late Pleistocene disharmonious biotas suggests that they existed during times when the climate was equable and seasonal extremes in temperature and effective moisture were reduced." Also, "many late Pleistocene communities had higher species densities than their modern counterparts" (Graham 1985:139) which is related in part to the fact that "there is a positive correlation between increased species diversity and decreased climatic variability as measured by winter-summer differences in mean temperature" (Graham and Lundelius 1984:224). Specific animal taxa of particular significance include mammoth, horse, camel, giant armadillo, giant tortoise, short-faced bear and a variety of others which become extinct by 11,000 years ago or soon thereafter (Johnson 1977; Harris 1981).

Palynological information for the Pleistocene/Holocene transition in the Southern Plains area is most widely known from study of ponded sediments located on the Llano Estacado (Oldfield 1975; Schoenwetter 1975; Wendorf 1970, 1975). The suggestion that there were periods of boreal forest dominated by pine and spruce covering the Llano Estacado immediately before Clovis times (Tahoka Episode of 18,000 to 12,000 B.P.), and during the Lubbock Subpluvial of Folsom times (11,000 to 10,000 B.P.) has recently been questioned on several grounds. Records of modern pine pollen influx across the Llano Estacado (Hall 1985:Figure 3) indicate that the presence of such aboreal pollen is to be expected in the region even though pine forests occur at some distance. Also, reinspection of earlier samples with consideration given to taphonomic factors, indicates that much of the pine and spruce pollen was "corroded or degraded" which may indicate redeposition or transport over long distances (Holliday, Johnson, Hall, and Bryant 1985; Holliday 1987). Also, the occurrence of stable land surfaces, such as at Lubbock Lake around 10,000 B.P., may have resulted in the concentration of wind-blown pollen in some depositional units. Furthermore, soil studies (Holliday 1986, 1985a, 1985b) provide no support for the presence of a coniferous forest in the region during the terminal Pleistocene or early Holocene. Evidence from pollen and macrobotanical remains from the 12-Mile Creek site in western Kansas, however, indicates that conifers were present in that area at approximately 10,300 B.P. (Wells and Stewart 1986).

There is general agreement, however, that despite fluctuations the close of the Pleistocene was generally cooler and wetter (less severe summers and more effective moisture) than at present, and there was a general warming and drying trend during the early Holocene.

**Cultural Context.** The terminal Pleistocene is the first period during which there is evidence of a substantial human population in the Southern Plains region. With due consideration to the fact that "absence of evidence is not evidence of absence" (Thomas 1978), prehistoric people during this period did not inhabit permanent occupation sites, but were apparently mobile hunter-gatherers whose economy focused to varying extent on large herbivores. The social groups were probably small bands, but the structure and organizational variation of these is not known. Flexibility in group composition can be expected, but group sizes and dynamics of group aggregation and dispersal are not known. If the basic premise is correct that these early hunters were highly mobile and not keyed into specific locations but rather to specific resources such as large herbivores (Kelly and Todd 1988), then it is unlikely that cyclical or seasonally regular aggregations would occur at the same location for more than a few consecutive years. Intergroup relationships would have been maintained or established in order to provide marriage partners and to enhance information "networks" pertaining to resource locations and conditions. These networks may have been very extensive and of the anucleate nature discussed by Yellen (1977).

**Technology and Subsistence.** A highly developed stone and bone technology is documented for the Paleo-Indian groups in the Plains region. Direct information pertaining to the perishable technology is essentially lacking. Possible structural remains of Paleo-Indian age attributable to the Early Specialized Hunter adaptation type are documented at the Hell Gap site in Wyoming (Irwin 1968, 1971; Irwin-Williams et al. 1973), and consist of relatively small roughly circular patterns of shallow postmolds in the Agate Basin and Midland components. A possible stone

circle of Frederick age is also present at the site. Possible evidence of temporary structures is also reported from the Folsom components at the Agate Basin (Frison and Stanford 1982) and Hanson sites (Frison and Bradley 1980) in Wyoming. All evidence suggests that whatever structures where used were of a light frame and temporary nature. Another form of structure documented at the Colby mammoth site in Wyoming (Frison and Todd 1986) is interpreted to have been a security cache where meat was stored under a pile of mammoth bones (probably combined with snow or ice) in order to protect it from scavenging carnivores.

The stone technology was highly versatile and consisted of bifacial blanks or preforms which could serve as tools, sources for large flakes for various scrapers and knives, and as preforms for production of projectile points. Distinctive tool forms for the adaptation type include delicate gravers, spurred endscrapers, composite scraping-graving-cutting tools, and a variety of nonstylized tools made from large thin flakes of bifacial reduction. Bone technology included projectile points, at least during Clovis and Folsom times, and the use of eyed needles. The latter were apparently an important component in the manufacture of tailored clothing which would have been integral to adaptation in many areas during the late Pleistocene.

**Settlement Pattern.** Variability in the "settlement" or land use patterns of Early Specialized Hunters has been documented primarily through the study of lithic raw material utilization and source area studies. At the Blackwater Draw locality and other sites in the Southern Plains region, there is a distinctive change in lithic material utilization between Clovis and Folsom components (Broilo 1971; Hester 1972; Hofman 1987a). Such differences may reflect changes in directions or patterns of group movement. As noted above, the occupation sites exhibit only minimal evidence for the presence of habitation structures. Mobility of groups was apparently extensive, but the specific nature of movements is not well documented (Kelly and Todd 1988; Wheat 1971). Evidence from kill-butchery sites indicates that the processing and consumption of large animal such as bison by Paleo-Indian groups was distinctly different than during the Late Prehistoric period. Todd (1983, 1987) has referred to one common pattern as a gourmet butchering strategy in which only selected portions of the animals were utilized. Factors such as small groups size and high mobility would have influenced decisions pertaining to butchering and intensity of resource use. High mobility may have been a factor providing increased security for early hunters (Wilmsen 1973; Kelly and Todd 1988).

Because of mobility and related factors, patterning of Early Specialized Hunter sites is probably biased and is certainly poorly understood. Animal kill sites where faunal remains have been preserved have an increased likelihood of being observed and reported, whereas many camp and bivouac sites would have been temporary in nature and located in settings which preserve minimal archeological evidence (Hofman and Ingbar 1988). Dawson and Judge (1969; Judge 1973), and Hester and Grady (1977) have provided useful discussions of site variability and occurrences which hold considerable promise for developing refined models of land-use patterning by Early Specialized Hunters. In the High Plains region, the occurrence of sites on stable dunes located on the leeward side of playa lake beds has been noted repeatedly. Often, however, these sites contain materials from later components. The occurrence of kill sites in sand dunes or dissected and eroded areas of small tributary valleys is also a recurrent pattern. The presence of kills in situations which apparently lacked distinctive topographic features is also documented (Stanford 1978, 1979; Frison and Todd 1987) and suggests that the use of deep snow or constructed "corrals" may have been important options in procurement of large animals during this period.

Recognized site types for this adaptation type include animal kill-processing sites, caches, campsites, hunting overlooks, lithic workshops, and possible burials.

**Trade and Exchange.** Determining the nature and importance of trade and exchange in the Early Specialized Hunter adaptation type is a problem which has received varied attention. Opinions differ as to the extensiveness and importance of trade, with some researchers (Hayden 1981) suggesting that the common occurrence of "exotic" raw materials is a result primarily of trading between groups of Paleo-Indians. Others believe that this extensive pattern of raw material use resulted from mobility of the early hunting groups (Wheat 1971; Irving 1971; Kelly and Todd 1988). Exchanges between hunting bands can be expected to have occurred, based on what is known of the operation of modern mobile hunter gatherers (Weiss 1982, 1983). Such exchanges of materials and ideas probably went hand-in-hand with intermarriage between bands and served to provide extended networks of information and economic support.

**Ideology.** A recurrent theme at several sites of the Early Specialized Hunter adaptation type is the presence of intensive use of red ocher. A variety of uses are indicated for this material including painting of artifacts, covering burials (Anzick site in Montana), use or intentional deposition in occupation area (Frison and Stanford 1982; Frison and Bradley 1980), and a variety of artifacts have been recovered for the processing of red ocher into powder (Wilmsen and Roberts 1978). Ritual activities have been interpreted for Jones Miller site in eastern Colorado where there is evidence of ceremonial activities associated with a Hell Gap-age bison kill which show close similarities to the prekill ceremonies of the Cree tribe (Stanford 1978, 1979).

**Bioarcheology.** Minimal human remains have been recovered and reported which pertain to the Early Specialized Hunters adaptation type. The Midland or Scharbauer site in southwestern Texas has provided the only well documented human skeletal remains which may represent the Early Specialized Hunter adaptation type in the Southern Great Plains region. Additional remains of relevance, but to the south of the study area are reported from Horn Shelter (Redder 1985; Turpin 1985), and the Wilson-Leonard site, also in Texas.

**Areas of High Site Probability.** Archeological sites representing the Early Specialized Hunters adaptation type are docu-

mented in a variety of open settings as well as cave sites. These sites will occur on land surfaces which are of late Pleistocene and early Holocene age, but will be buried, if preserved, in stream bottoms containing middle and late Holocene sediments. Prominent terrace scarps, buttes, and other elevated settings will potentially provide evidence of short term camps or hunting overlooks, but usually lack good preservation or stratified archeological deposits. Campsites and kill-butchery sites or often exposed in sand dune regions which were usually near ponds or lakes in the past, but which may lack nearby water sources at present. Key sites of the Early Specialized Hunters are definitely not limited to present-day water courses or stream valleys. Distinctive ponded or lake sediments of late Pleistocene and early Holocene age occur in many localities in the Southern Great Plains region (Antevs 1935; Holliday 1986; Hofman 1987, 1988; Wendorf and Hester 1975). These deposits have good potential for preservation of faunal and floral remains and represent potential situations for the occurrence of highly significant Paleo-Indian activity. Often the paleoecological information which can be gained from such sites is of considerable importance whether or not archeological materials are found. The occurrence of occupation sites of Early Specialized Hunter buried in alluvial situations has been widely documented (Davis 1962; Holliday 1986; Howard 1935; Wyckoff 1964).

**Data Gaps and Critical Research Questions.** The number of Early sites which have provided quality information pertaining to the Early Specialized Hunters for the period between 12,000 and 8,000 years ago is few and the locations are scattered. There remain many gaps in the basic information for the various archeological complexes recognized which represent this adaptation type. Finding sites of this age is hampered not only by the age of the deposits, but also by the relatively limited human population of the time. Therefore, any site of this age is potentially highly significant, even if perishable materials are not preserved.

Detailed studies of intrasite structure are needed, regional studies of site distributions have met with limited success due to the small data base, and documentation of assemblage variability and site functional differences have only been addressed at a cursory level. A key problem, certainly not limited to the sites of this adaptation type, is the ability of archeologists to distinguish between repeated use of site areas and long term habitation. Archeological research focused on distinguishing the nature of occupations, whether repeated short term camps or long term habitation, must go hand in hand with investigation of prehistoric sites.

The problems of studying group organization and mobility patterns through the archeological record are just beginning to be developed. The Paleo-Indian or Early Specialized Hunters adaptation type is represented by groups of hunter-gatherers who possessed a highly developed technology, comparable to the later Upper Paleolithic of the Old World, and who lived in bountiful environments where they were essentially unfettered in their movements. This provides an important scenario for the study of hunter-gatherers in general terms and with regard to the impacts of population growth, environmental change, subsistence change, and the eventual adoption of more intensive subsistence systems. Because of the extreme importance of these sites for addressing a variety of anthropological, environmental, technological, and historical questions, and due to their relatively rare occurrence, all site of the Early Specialized Hunters deserve careful consideration and evaluation of their research potential.

Much of the available information pertaining to this adaptation type, with regard to occurrence, density, and nature of artifacts and sites, is in the hands and minds of nonprofessional archeologists and interested laymen. Recognition of many early sites will only be possible through cooperative work between field archeologists and interested local persons. Recent work in Texas and Oklahoma involving surveys of Paleo-Indian projectile points (Meltzer 1987; Hofman 1986) has provided encouraging results for the use of information which can be gained only through cooperation between archeologists and interested laymen. Figure 28 provides an example of a form which is currently being used to record artifacts in private collections. Several hundred of these have been completed, many by interested individuals with no formal training. It is increasingly evident that short term visits and studies (from a few hours to a few months) of an area provide a limited view not only of regional archeology, but also of the potential of specific sites. Reliance upon avocational input can provide a substantial increase of information potential for CRM and other projects.

The transitional period between the Early Specialized Hunters and Broad-Spectrum Hunter-Gatherer adaptation types represents an interval of significant ecological, technological, and perhaps social changes which is poorly documented or understood. Many projectile point types occur which may pertain to this period, but most have received minimal study. The assemblages associated with these potentially early point types are not well documented and the regional/temporal variation in these materials is essentially unknown. Focused research is needed on the earliest Holocene period in order to better define the climate and technologies of this dynamic period. Documenting the changes which lead to what we recognize as the Broad-Spectrum adaptation type is an important regional research theme.

## Broad-Spectrum Hunter-Gatherer-Forager Adaptation Type

**Date Range.** This adaptation type on the Southern Plains is considered to date primarily between 8000 and 2000 B.P. with this adaptation type possibly lasting until the historic period in some of the extremely arid parts of the region. The variety of Archaic complexes defined in Kansas, Oklahoma, and Texas are subsumed within this adaptation type as well as the Plains Archaic materials from Colorado and New Mexico.

**Environmental Context.** Several lines of evidence indicate that the mid-Holocene period from about 8,000 until almost 4,000 years ago was the hottest and most dry since the Pleistocene. The Altithermal climatic period was first recognized by Antevs (1955) based on stratigraphic evidence primarily in the Southwest. On the eastern prairie and deciduous forest border, several

OKLAHOMA FLUTED POINT SURVEY  Specimen Data Sheet  6/29/88  JLH

Date:_____ Recorder:_____ Specimen Number:_____ Type:_____

Collection of:_____

Provenience:

State:_____ County:_____ River System:_____

Site:_____ Legal Description:____S:____ T:___ R:___

Type of Specimen: oint--fluted/unfluted  preform--fluted/unfluted

Portion Represented (complete, base, blade, tip, edge, channel flake):

_____

Lithic Material:

_____

Breakage types:

_____

Measurements:

Length:_____ Width:_____ Basal Width:_____(cm or inch)

Thickness:_____ Fluted Thickness:_____ Basal Depth:_____

Flute A: length_____ width_____; Flute B: length_____ width_____

No. Flake Scars/cm:_____ Weight:_____(gm/oz)

Reworking: (tip/base/edge)_____

Distal end of flute A:

interrupted by flake scars:____ ends in hinge:____ extends to tip:_____

Distal end of flute B:

interrupted by flake scars:____ ends in hinge:____ extends to tip:_____

Nipple: (present/absent/remnant)_____

Basal Outline:_____ Edge Outlines:_____

Base Angle A:_____ Base Angle B:_____ Tip Angle:_____

Edge Grinding A:_____ Edge Grinding B:_____ Basal Grinding:_____

Flaking Pattern:_____ Abrasion/Patina:_____

Specimen found by:_____ Date Found:_____

Other Specimens from Site Area:_____

_____

Notes:_____

_____

_____

Draw Specimen on back.  Photographs: yes/no  black&white color slides

Return form to:  Jack L. Hofman, Oklahoma Archeological Survey, 1808 Newton Drive, Norman, Oklahoma 73019. (405)-325-7211

Figure 28. Oklahoma fluted point survey form used to record artifacts in private collections

palynological and paleoclimatic studies have documented the occurrence of a mid-Holocene dry and warm period (Albert 1981; Johnson and Holliday 1986; King 1981; Wendland 1978). This period is variously referred to as the Hypsithermal or Atlantic episode and may not have been a single event with progressively drier and warmer climate. Evidence from Colorado and Texas suggest that the Hypsithermal was a relatively dynamic period with at least two intensive dry periods (Benedict 1979; Johnson and Holiday 1986). Evidence from several sites strongly suggests that there was a dramatic lowering of the water table during the mid-Holocene and that utilization of the High Plains or more arid portions of the Southern Plains was significantly impacted. Sites with such evidence include Rattlesnake Draw in southeastern New Mexico (Smith, Runyan, and Agogino 1966), Blackwater Draw (Evans 1951; Green 1962), and Mustang Springs east of Midland, Texas (Meltzer and Collins 1987).

Several lines of evidence indicate that seasonal variability was more extreme and species diversity was significantly less than during the late Pleistocene. Bison were relatively scarce during this period between about 7,000 and 4,000 (Dillehay 1973) B.P. when they were once again well established in the region and their remains commonly occur in archeological deposits (Tunnell and Hughes 1955; D. Hughes 1977). Vegetation of the Southern Plains changed during the first several millennia of the Holocene (Albert 1981; Johnson 1988; Wilson 1966; Wendorf and Hester 1975) and there was generally an increase in xeric species throughout the region. The mammalian faunal record for the Holocene of the Southern Plains strongly supports the occurrence of a substantially warmer and dryer period between 8,000 and 4,000 years ago (Graham 1987; L. C. Davis 1987)

**Cultural Context.** There is a substantial increase in the number of reported Archaic archeological sites for the middle and late Holocene period, but whether this evidence resulted from population increase, a different pattern of land use and occupation types, increased proportion of exposed sites, the ability of archeologists to recognize the sites, or some combination of these factors is not well established. On a continental scale there is general agreement that Native American populations increased in North America. This was not, however, a steady increase in all areas of the Plains throughout the period. Localized foraging territories seem to have been the pattern with a relatively limited amount of long distance trade or mobility, if the pattern of lithic raw material usage is a reliable indication. Hunter-gatherer groups are expected to have operated as foragers (Binford 1980) during much of the year, maintaining a high degree of group flexibility which would enable effective use of various resource patches on a seasonal basis. Group size is likely to have varied from occasional or regularly patterned aggregations of multiple family groups to dispersed small groups of foragers operating within a familiar area. Aggregation sites may appear in the archeological record as "base camps" especially if they were repeatedly utilized, even though they may have been occupied only briefly. Collecting, processing, and short term camp sites—including lithic workshops—are the most common expression of Holocene Broad Spectrum foragers in the Southern Plains. Regional population density probably varied depending upon productivity and reliability of key resources such as bison, deer, turkey, fish, grasses, fruits, and nuts. Artifacts indicative of long distance trade and interaction are relatively rare in these assemblages, at least until late in time. No reliable information is currently available pertaining to group size from a site or regional perspective.

**Technology and Subsistence.** The technological repertoire included atlatls, a variety of hafted knives and scraper forms including Clear Fork gouges, ground stone tools and a wide range of stemmed projectile points which probably also served commonly as cutting tools. Features include common hearths and roasting pits containing fire-cracked rock and sometimes extensive burned rock middens. This constellation of features probably reflects the intensive processing of tenacious plant foods including grasses, yucca, mesquite, and perhaps acorns which required parching and/or leaching. Bison appear to have been limited in occurrence, distribution and availability on the Southern Plains during the middle Holocene, and were apparently not abundant in the region until after 4,000 B.P. Smaller animal resources figured prominently in the subsistence of the Broad Spectrum Forager's adaptation, but relatively few sites have been studied which exhibit good faunal preservation (Carson 1987; Graham 1987). The technology is thought to have been largely an expedient one, with relatively few curated tool forms and a predominance of unpatterned core-flake assemblages. Such assemblages are generally considered to reflect foraging activities conducted with limited planning depth and limited efforts toward storage. For some areas and during some periods, the importance of plants such as yucca in production of sandals, matting, garments, twine, and so forth was extremely important. The versatile and widely useful bison and deer products were not always accessible or bountiful. A significant portion of the technological system of these foragers was focused on processing of vegetal materials for purposes other than food.

**Settlement Pattern.** Evidence of structural remains is extremely limited for the Broad Spectrum foragers, although many researchers believe such evidence will be forthcoming. Late Archaic structural evidence from the McEndree Ranch site in Colorado (Cassells 1983) is extremely important but only briefly reported. Semisubterranian structures are now known to occur on the western Plains and Rocky Mountain foothills (Metcalf and Black 1987). Utilization of rockshelter sites becomes extremely important during the middle and late Holocene with evidence of occupation in most areas which have shelters or caves in the vicinity of water and other resources. It is likely that seasonal aggregations occurred and these may be reflected at sites such as burned rock middens or locations of high bison density during the fall of the year. To date there has been little effort directed toward documenting the occurrence or timing of aggregate activities by Holocene foraging groups.

**Trade and Exchange.** Few artifacts recovered from sites of the Broad Spectrum Forager adaptation type provide evidence of long distance or intercultural trading. Relatively few occurrences of bannerstones, gorgets, pipes, axes or other such curated

objects made from "exotic" materials are known in the Southern Plains region (e.g., Neal 1986), and the context of most such finds is poorly understood. It is probable that trade was conducted between groups in a variety of perishable and durable commodities and that the need for intergroup contact and interaction was important for long term group viability. Marriage partners would usually have been sought outside the immediate extended family. Trade and marriage relationships between groups, perhaps being focused during specific seasons, would have been extremely important to these groups but the details of these relationships have not been studied effectively through the archeological record.

**Ideology.** It is during the middle and late Holocene when cemeteries first appear in the archeological record of the Southern Plains, but whether this reflects an increased concern for the deceased or simply a decreased mobility pattern with redundant use of burial sites is not known. Burials are most often flexed interments which possess utilitarian offerings, shell pieces, or most commonly, no preserved offerings at all. There does not seem to be a consistent use of red ocher, burial orientation, or other such pattern, but the number of burials for this adaptation type for specific areas is very low (Owsley, Marks, and Manhein, this volume), especially when we consider the long time span this adaptation type represents in the region.

**Bioarcheology.** The vast majority of burials attributable to this adaptation type come from sites where only one or two burials are documented. (Owsley, Marks, and Manhein this volume: Table 9.3). Only three reported sites for this type have more than 10 burials, and these are in Jones and Shackelford counties, along the Brazos River north of Abilene, Texas (Forrester 1951; Ray 1939). Almost 80% of the middle and late Holocene hunter-gatherer burials from the Southern Plains region are documented in Texas, primarily within the Brazos drainage. The variation in burial occurrence is believed primarily to reflect the vagaries of archeological research and preservation rather than different population densities. Burial variability is also poorly understood for this adaptation type, but the majority of burials are flexed with relatively few bundle internments and cremations. Detailed analyses of Archaic burials is extremely rare for the region and no comparative data base have been developed. Study of the Gore Pit burial (Keith and Snow 1976) is rare in its completeness and detail, but is an isolated island in an expanse of poorly documented bioarcheological information.

**Areas of High Site Probability.** Deeply buried land surfaces in alluvial settings provide one of the prime areas for occurrence of Broad Spectrum Hunter-Gatherer sites. However, the majority of reported sites attributed to the Archaic or Broad Spectrum adaptation type are located in eroded or otherwise exposed upland settings. Sites of primary importance for providing information on subsistence, site structure, and relatively unmixed assemblages, however, are usually those found in alluvial settings. Even though our best information may be derived from stratified buried sites, these are extremely difficult to locate and expensive to study. Depth of burial of old land surfaces, often demarked by buried A horizon paleosols, depends upon local geomorphic history and stream characteristics. Any interest in study of middle Holocene or early late Holocene archeological sites in stream valley settings must necessarily consider the potential and importance of buried sites. Effective location, evaluation, and study of stream valley sites requires cooperative integration of archeological, geomorphological, and soils studies. Rockshelter sites appear to have been intensively utilized by the Broad Spectrum Foragers, but these sites tend to have higher visibility and are more readily recognized than those in deep alluvial settings.

**Data Gaps and Critical Research Questions.** One of the prominent gaps in our information pertaining to the Broad Spectrum Foragers pertains to the dearth of information on physical anthropology, mortuary practices, and the relationship of these data to the organization and structure of the forager societies. Many of the archeological sites recorded for the Southern Plains region reflect the activities, primarily or in part, of Broad Spectrum Foragers. The number of available detailed studies, reliably dated components, economic subsistence studies, settlement and land use studies, and technological analyses does not reflect the richness of the archeological record or the potential it holds for interpretations which reach beyond cultural historical concerns. On a regional scale, so little is known about the Broad Spectrum Forager adaptation type that any site which has good integrity and potential for functional, economic, technological, or bioarcheological study should receive special consideration. Dramatic changes apparently occurred in the region's climate and natural resource productivity. Changes in economy throughout the region and during the long time span of the Archaic have been hinted at in numerous studies, but the details of these changes and the seasonal or yearly variation in behaviors of groups have not been investigated.

### Late Aboriginal Hunter-Gatherer-Traders

It should be noted that this adaptation type, like some others, does not represent a discrete temporal or geographic unit, nor is it restricted to a single cultural group in the Southern Plains. It overlaps temporally with prehistoric horticultural groups and several distinct ethnic groups are represented during the course of this adaptation type.

**Date Range.** The date range estimated for this adaptation type extends from about 900 to 150 B.P. (A.D. 1000 until 1800). Groups representing this adaptation type apparently depended in part upon the presence of, and trade with, relatively sedentary horticulturalist. Examples of defined archeological complexes which are believed to represent this adaptation type include the Garza complex, Dismal River aspect, and the Edwards and Wheeler complexes. The presence of a bison-oriented and trading economy was certainly in place by 650 B.P. (A.D. 1300) at least on a seasonal basis. The time depth of this adaptation is presently unknown as is the ethnic (linguistic) identity of the groups who followed this pattern.

**Environmental Context.** In general terms the climate of this late Holocene period was comparable to present, but potentially

significant climatic variation is thought to have occurred during this period. Lintz (1986:63-65) has recently provided a useful synopsis of regional paleoenvironmental changes for this time. Several studies indicate that beginning about 950 B.P. (A.D. 1000) and extending to the present there has been a regional drying trend (Hall 1982). The cooler Neo-Boreal or "Little Ice Age" which has been documented for the Rocky Mountain region and Northern Plains between circa 450 to 150 B.P. (A.D. 1500 and 1800), is as yet not strongly supported by the Southern Plains evidence. Bison populations apparently increased and became increasingly important to local economies in the region during the period between 1950-150 B.P. (A.D. 1000 to 1800), after having previously been less common and apparently of less widespread economic importance in the area (S. Baugh 1986; Dillehay 1974; Ferring 1982). Bison, in conjunction with other natural resources of the region, most notably salt, are perceived to have been key elements in the economy of this adaptation type.

**Cultural Context.** One of the more intensive analyses of the cultural context of the Southern Plains nomadic hunter-gatherer-traders during the protohistoric period is that of E. A. H. John (1973). A symbiotic relationship with Plains Village farmers and Pueblo groups is assumed to have existed throughout this period, with the intensity of the relationships generally increasing through time. Although the ethnic identity of the specific groups varied substantially, highly nomadic Plains-oriented bison hunting groups (including Apachean groups and later Comanches and Kiowas), provide the basis upon which this adaptation type is defined. The cultural setting was dynamic with dramatic changes occurring in population, economy, and cultural contacts during the period. European contacts, though often secondary in nature, had a fundamental social impact upon these groups, the commodities of trade, and the nature and extent of mobility. Significant population movements and dramatic economic changes occur on the Southern Plains during this period.

**Technology and Subsistence.** With mobility as a key element in the adaptation of these late prehistoric hunter-gatherer-traders, the personal gear and structures were predominantly highly portable and often ephemeral as reported by Coronado's chroniclers and later Spanish entradas. Archeological sites which remain are predominantly small and unimpressive. Bison kill sites should be common, but are poorly documented for this period in the region (Speth 1983). In prehorse days the dog *Travois* was used extensively, but was increasingly replace by horses after A.D. 1600. Bison represented the economic focus, with the hides, meat, skulls, selected bones, fat, sinew, and other products forming not only important components within the technological systems of these nomads, but also serving as key elements in their trading relationships with more sedentary horticultural groups to the east and west. Subsistence also depended significantly upon smaller game such as land turtles, rabbits, and other animal and plant foods economy depends in part on symbiotic trading/raiding relationships with Pueblos to west and Caddoans to east (Baugh 1982; Gunnerson 1979; Hofman 1978f, 1984c; John 1973; Riley 1984; Speilmann 1982). As European contacts and trading increased, there was also an increased use of horses, increased trading in slaves and dramatic changes in disease, and competition for resources.

The technology of these groups appears to have focused on bison hunting with the bow and arrow complex, and during the later period, on the use of horses. The technological system was highly portable and versatile. Knowledge of horticulture and variable use of garden crops such as corn, squash, and sunflowers is assumed and highly likely. These materials were apparently secondary in the economy, however, as these hunter-trader groups had a lucrative subsistence without the necessary extra energy of settling down and relying heavily upon horticulture as a central part of their subsistence. Trade for garden produce was probably more reliable and almost certainly less labor intensive than growing it in an arid short grass Plains environment. Plants such as squash and sunflower were probably encouraged to grow, and likely enjoyed some "volunteer" growth at camp sites where conditions were conducive. The Hunter-Gatherer-Trader adaptation type was probably supported primarily in the more arid portions of the Southern Plains, but extended to the eastern Prairie-Plains as well.

**Settlement Pattern.** The primary sites pertaining to this adaptation type which have been reported represent semipermanent seasonal camps, or possibly even year-round occupations by at least a portion of the group (Baugh 1986; Hofman 1984c). Fortified villages are in evidence during this time period and probably become of considerable importance after widespread use of the horse in trading and raiding activities. Fortifications may relate to seasonally permanent villages, perhaps at sites which were used repeatedly for seasonal hunting or trading. Many smaller camps were used during logistical forays such as hunting, collecting salt or lithics, trading and in traveling to and from such activities. Tipi ring sites in the Southern High Plains region may be referable to this adaptation type, although specific cultural assignment of many such sites is problematic. Some selected sites may have been used repeatedly as the location for trade fairs, especially between some horticultural Wichita or Caddoan groups and the Plains hunters. Trade with the Puebloan groups to the west apparently occurred most intensively in the vicinity of the Rio Grande pueblo towns (Baugh 1982; Ford 1973; Gunnerson 1979; Hofman 1984c; John 1973; Riley 1984; Speilmann 1982). We assume that this trading was a continuation of patterns established prehistorically before the introduction of horses and European goods. The specific nature of trading and intensity undoubtedly changed, however, after European involvement.

**Trade and Exchange.** The nature of trade between the nomadic Plains bison hunters and the Pueblos and Plains Villagers, and the commodities of primary significance in these exchanges have been discussed in numerous studies (Baugh 1982, 1986; Ford 1973; Gunnerson 1979; Hofman 1984c; John 1973; Speilmann 1982). Trade was most intensive on a seasonal basis, primarily late fall and early spring. Materials which figured prominently in these exchanges include blankets, carbohydrate rich vegetal produce, European trade items such as beads, knives, kettles, ceramic vessels, horses, obsidian, and turquoise from the

Pueblos; similar horticultural products, flint, and European trade items including guns from the Wichita and Caddo; and bison products, salt, bow wood, nuts, and flint on the part of the Plains hunters.

**Ideology.** Little is known about this aspect of this adaptation type. No studies specifically dealing with the overall religious patterns has been produced. Burial information indicates that cemeteries were not commonly used, although clusters of burials may occur in area which were intensively used. Single flexed burials with a variety of grave offerings seem to be the common interment form with the use of crevices and other natural features emphasized rather than burial in a excavated pit. The increasing influence of Spanish and French Christian influences began to be felt in the region during this time period and had an unknown impact on the Plains hunting peoples. A potential avenue of study into the ideology of the various hunting-gathering-trading groups who utilized the region is the rock art which they have left, especially in the western portion of the study area.

**Bioarcheology.** Limited evidence exists except for the later (historic) part of this adaptation type (Hays, this volume Appendix I; Owsley, Marks, and Manhein, this volume). The skeletal sample consists primarily of single isolated individuals often of problematic tribal affiliation. Samples of adequate size to conduct population studies or biological distance studies are not available. Most studies which have considered burials representing this adaptation type have been concerned primarily with the cultural materials present in the graves rather than with study of the skeletal remains.

**Areas of High Site Probability.** Sites belonging to the Hunter-Gatherer-Trader adaptation type are generally located on modern land surfaces or buried at only very shallow depths, under historic presettlement alluvium. As a result, these sites are extremely susceptible to modern activities or developments which disturb the ground surface. Portions of the short grass Plains and High Plains which have not been subject to cultivation are areas which have the potential for preserved habitation and temporary sites. Sites are common on prominent terrace or overlook situations near streams or playas, and in sheltered bottomlands in the vicinity of salt springs and potable water. The variety of site types including fortified villages, temporary camps, bison kills, burials, trading sites, and so forth suggest that sites will occur in a number of settings and landforms. No effort has been made toward developing predictive models of site location for this period, although such should become feasible as available information is studied and synthesized.

**Data Gaps and Critical Research Areas.** Few sites of this adaptation type in the region have been excavated and reported in detail, but quite a number are known to exist or are only minimally reported. Linking the material culture of the several historically known tribal groups to the archeological record of the region presents one fundamental research concern. Also, the study of cultural change of these hunting-trading people is of considerable interest given their involvement with the broader systems of horticulturalists and European expansion. These problems are of particular interest: (1) the spread and retraction of agriculture in marginal areas; (2) the continued reliance on a hunting-gathering economy by peoples in full knowledge of agriculture; (3) the symbiotic relationships between hunters and gardeners; (4) the investigation of cultural "convergence" in a niche which was occupied by groups representing a variety of ethnic and economic backgrounds; and (5) the impact of European thought, trade, and diseases on the regional native population. Definition of cultural assemblages based on detailed research pertaining to the subsistence activities, age, and variability of materials in the archeological record are needed. Documenting the variety and change in cultural materials of specific groups during the several centuries before 1800 is a major problem. Tracking specific tribal or cultural groups is extremely difficult due to the rapidity of change in material culture and the tremendous amount of trading and exchange which occurred. Developing adequate methods to deal with these problems represent key goals in Southern Plains archeological research and represent important concerns on a methodological level as well.

### Incipient Horticulturalists Adaptation Type

**Date Range.** The time frame for this adaptation type is roughly the first millennium following Christ, 2000 to 1000 B.P. (A.D. 1 to A.D. 1000). Examples of defined archeological complexes which are included in this Adaptation type are the Pruitt Complex, Lake Creek complex, Palo Duro complex, Keith focus, Greenwood phase, and the Cuesta phase.

**Environmental Context.** Available evidence suggests that the first millennium A.D. was more moist with generally more mesic conditions than immediately preceding or following the period (Ferring 1982; Hall 1982). Bison were apparently less common in the Prairie-Plains region during this period and there was apparently an expansion of forest and tall grass prairie at the expense of short grass plains. Deer remains are common in the archeological deposits of the time and there is a tendency throughout the region east of the Llano for deer to represent a substantially higher proportion of the faunal remains, in relation to bison, than during any other period in the area's prehistory (Henry 1977, 1980; Hughes and Willey 1978; Lintz 1974; Ferring 1982; Vehik 1984). Evidence from geomorphology, land snails, vertebrate fauna and pollen all suggest that this period was substantially cooler and wetter or had less severe summers than previously (Hall 1982; Albert 1981; Hughes and Willey 1978; Graham 1987).

**Cultural Context.** The Woodland or Incipient Horticulturalist adaptation type was relatively short lived by comparison to the preceding Archaic tradition. Population size in relation to the Archaic has not been studied in a systematic manner. Archaic sites are more plentiful in many area, but upon consideration of the longer time depth for the Archaic and potential problems in recognition of Woodland sites, the possibility of population increase during the Incipient Horticulturalist adaptation type remains an open question. Whether or not populations increased substantially during this period, it is probable that native population growth had read a point where continued expansion using traditional hunter-gatherer-forager tactics was becom-

ing less feasible. Settlement appears to have become increasingly localized with a concomitant increase in trading activity. Significant diffusion occurred during this period with the widespread acceptance and development of the bow and arrow technology and ceramics.

**Technology and Subsistence System.** The key technological developments distinguishing this adaptation type are earthenware ceramic vessels and the bow and arrow. Use of atlatls continued and is evidenced by fairly common finds of "boatstones" and other forms of atlatl weights. The ceramic technology varies considerably from east to west across the region. On the western portion of the Southern Plains the earliest ceramics apparently derive from contact or influence from the Mogollon culture area of southern New Mexico. These early ceramics, dating to the first few centuries A.D. are generally plain brownwares with rock temper. Between 1500 and 1100 B.P. (A.D. 500 and 800) there are widespread occurrences of cordmarked vessels, conical to globular in shape, across much of the Southern Plains and these ceramics are typically tempered with stone, bone, and or clay. Use of these vessels was apparently as much for storage as for cooking, as evidenced by numerous instances of mending holes and the common large conical shape. On the northern eastern portion of the region early ceramics reflect contact or influence from the Hopewell societies to the east and north, with stamped and incised pottery occurring by soon after the time of Christ.

The bow and arrow was in use in the region, based primarily on a relatively dramatic decrease in the size of some projectile points, at the beginning of the Christian Era and soon thereafter. Replacement of dart points with arrowpoints may have occurred sooner or more rapidly in the Plains and Prairie areas than in the Woodlands (Vehik 1984). The earliest arrowpoints are typically elongated with corner notches, but there are a number of intermediate sized projectile points which were possibly versatile in use and appear intermediate in form between some late Archaic dart points and typical corner-notched arrowpoints. The elongated and serrated Dead Man's point from the Texas Panhandle region is one of several distinctive point types for this period (Hughes and Willey 1978).

Subsistence for the Incipient Horticulturalists was focused to a variable but increasing degree upon plant foods, with the widespread utilization of native domesticates occurring during this period. Squash and possibly other domesticates were probably known to the Archaic people of the region, based on finds in adjacent areas (Story 1985), but significant involvement in propagation of domesticates is not evidenced until after Christ. Spread of native cultigens is difficult to monitor, but intensive use of these garden plants apparently was adopted at different times throughout the region. Variation in the plants and their adaptation to relatively hostile and variable climate probably had an important influence upon when particular species become evidenced in the archeological record. Many native nondomesticated plant foods were also utilized by these groups. A variety of nonplant foods were used with continuing emphasis upon small animals such as turtles, turkeys, mussels, and small mammals. Deer was apparently a staple protein supply for many groups, although bison was widely utilized when available. Dogs are fairly well represented in the faunal remains of these groups, and were probably used as hunting aids and as a backup food resource. The overall economic focus was decidedly riverine in nature. Seasonal variability in group structure and regional occupation patterns have been suggested for these peoples in northern Oklahoma (Henry 1980). These factors will have an important bearing upon the nature of assemblages and "apparent subsistence patterns" as reflected at sites occupied during specific seasons.

**Settlement Pattern.** An appropriate description of the settlement for the Incipient Horticulturalists may be "entrenched mobility." This simply is intended to suggest that, while the groups were not entirely sedentary, they apparently utilized the same sites repeatedly (probably seasonally) over a period of many years. Several site types are documented, but extensive village sites are not known. Small hamlets or midden sites along stream valleys are common, and there is significant use of small tributary stream valleys away from major rivers. Rock mounds attributed to this adaptation type are recorded on the eastern Prairie border and Cross Timbers area and may reflect nut or vegetable food processing sites. Some use of rock mounds for burials is also evidenced. Rockshelter sites were intensively utilized by the Incipient Horticulturalists where ever they occur throughout the region. The size of many of these natural shelter sites suggests that group size was small, at least during some seasons. House patterns are unknown for most complexes, but post molds and partial structure outlines have been reported from several sites. The presence of relatively permanent structures is assumed, but their form and variability are poorly documented.

For the Butler phase in the southern Flint Hills of Kansas, oval structures five to six meters in diameter are documented and these were made on a pole frame with wattle and daub walls. These structures are only known to occur at a frequency of one or two per site. Burial mounds in the classic Hopewellian expression are not known for most of the region, but burials of this age are reported from rockshelters and open midden sites. Low burial mounds with a central chamber, which may be rock lined, occur as part of the Schultz phase in the northern Flint Hills region of Kansas. Study of these sites has documented the complexity of the burial practices which includes cremation and defleshing. Specialized extensive burial sites used by the Incipient Horticulturalists are not documented for most of the Southern Plains region. Within the study region, the majority of reported Woodland burials occur in Kansas, but, with the exception of the Schultz phase interments, most of these occur as one or a few individuals per site.

**Trade and Exchange.** Distinctive ceramics provide some evidence for trade during the Incipient Horticultural adaptation type. In the western portion of the Southern Plains Jornado Brownware occurs at a number of sites and is often considered to have been traded in due to its distinctive paste and lack of preceding ceramic tradition. Most of the ceramics which exhibit Hopewellian characteristics in the northeastern portion of the study area appear to be made from local pastes and more likely reflect diffusion of ideas rather than direct trade in vessels.

Pieces of obsidian may support the interpretation that some Woodland groups in northeastern Oklahoma participated marginally in the Hopewell Interaction Sphere. People of the Cuesta phase in southeastern Kansas, and similar groups from Oklahoma, were apparently in contact with or influenced by Hopewell people in the Kansas City area or further east. Ceramics exhibit comparable manufacture and decorative techniques, but whether any of these ceramics were traded into the area rather than being made locally has not been adequately investigated.

**Ideology.** Ceremonial sites or burial mounds only occur in the northeastern portion of the study region, but relatively elaborate mortuary rituals are suggested by the diverse and intensive modifications of the deceased (including defleshing and cremation). Some of this variability may, however, relate to mobility and group aggregation patterns as much as to specific burial ideology (Hofman 1986x). Ritual activities associated with burial may have been elaborate for some of these groups or in specific instances, but the highly imaginative reconstructions sometimes offered (e.g., O'Brien 1971) are not compelled by the evidence and are unrealistic. It is probable that repeated use of burial sites intensified during this period, and it is during this adaptation type that sites used specifically for repeated burial are first well documented. These factors reflect changing settlement and land use patterns which go in hand with changing ideology and ritual practices. The changes in ideology which occurred during this adaptation type represent an important research topic, but one which will require substantially more information for most of the recognized complexes.

**Bioarcheology.** The number of reported burials for the Incipient Horticulturalist adaptation type is limited, and well documented cases within the study area are extremely rare (Phenice 1969; Button and Agogino 1987). Burials are most commonly flexed single interments, but multiple burials and cremations are documented.

**Data Gaps and Critical Research Areas.** Several distinctive ceramic traditions occur in the Southern Great Plains region during the Incipient Horticulturalists adaptation including materials comparable to Kansas City Hopewell, Plains Woodland, and Mogollon. The users of these diverse ceramics apparently shared a variety of social and economic similarities including relatively large regional population, decreasing territory sizes, emphasis upon plant foods and nonherd animals, use of domesticated plants, and repeated burial in selected or preferred locations. This adaptation type represents a relatively short lived period in the prehistory of the Southern Plains, but an extremely dynamic and important one from the historical perspective of cultural and technological developments in the region. The correlation of temporary camps, shelter sites, and burials with semipermanent habitation sites presents a significant problem to be confronted. This and other problems of intersite comparisons will require substantially refined information on the ages of and variability within assemblages. There are many components and collections presently assigned to the "Woodland" period simply because they do not fit within the defined or recognizable Archaic or Late Prehistoric complexes.

The development of the Incipient Horticulturalists technological and economically in a region which is largely marginal for horticultural pursuits provides an important setting for the study of important anthropological issues such as the interface between hunter-gatherers and food producers. Also, important is the documentation of cultural changes necessary to cope with environmental, population, and economic change. The adoption of new technologies (ceramics and the bow and arrow complex), changing settlement, and changing resource use are probably all factors which relate to solving general problems which were facing the peoples of this region. The possibility of population movements into the Plains area during the Woodland period deserves consideration and might be monitored through detailed study of skeletal samples. Also, the changes in diet and nutrition which may occur with the Incipient Horticulturalist adaptation may be reflected in bone chemistry. If intensification of horticultural activities reflects increased presure from population increase, decreased size of hunting or resource use territories, and/or environmental changes, then these pressures may also be reflected through evidence of increased competition or even conflict between groups.

## Developed Village Horticulturalists Adaptation Type

**Date Range.** This adaptation type refers to the uniform expression of sedentary villages found over much of the Southern Plains study area between 1200 and 400 years ago. Identified archeological manifestations include the Custer, Washita River, and Antelope Creek phases, the Pomona variant and the Buried City, Zimms, Henrietta, Bluff Creek, and Pratt complexes. Because their subsistence economy is less focused on agricultural pursuits, the Apishapa phase of southeastern Colorado has been placed in the Incipient Horticulturalists/ Gardeners adaptation type.

**Environmental Context.** The Late Holocene environment in which these groups lived represents essentially a modern setting. The success of these people was primarily due to the development of adaptive strategies which maximized use of this plains environment. Villages were placed along the terraces and floodplains of major streams where fertile alluvial soils were especially suitable for farming practices. Abundant rainfall in the late winter and spring brought about floodwaters which annually deposited alluvium that served to rejuvenate these lands. In the fall, the emphasis turned to the hunting of bison and other game found in the upland prairies and scrub timbered areas. Although the environmental setting represents current conditions, climatic fluctuations and changes in geomorphological processes resulted in changes in the geographical distribution of habitat types. It is unlikely, however, that these fluctuations resulted in the breakdown of habitat composition. Instead, changes were probably observed in the relative abundance of certain species of plants and animals and in their exploitative efficiency. These changes, in turn, forced Plains Village societies to modify their subsistence strategies.

In the early part of the period for this adaptation type, rainfall was more abundant. Consequently, it is thought that wood-

land habitat types spread at the expense of grasslands. There was also greater availability of water resources. Thus, lack of critical resources would have been less a factor in settlement location. Beginning sometime around the middle of the thirteenth century, climatic conditions changed significantly. There was a decrease in rainfall. More importantly, rainfall patterns became increasingly unstable; periods of drought were followed by heavy storms leading to greater runoff and erosion. Such changes in precipitation patterns and cumulative geomorphological effects prompted adjustments in settlement locations and subsistence strategies.

**Cultural Context.** Groups participating in the Intensive Horticulturalists socioeconomic system have been commonly referred to as "Village Farmers" or "Plains Villagers." These are appropriate labels although they fail to convey the prevalence of this cultural system on the Southern Plains or the extensive adaptive strategies employed by these village societies in their adjustment to changes in the Plains environment. It must also be recognized that these groups represent a continuation of sedentism and horticultural practices beginning in Woodland times. In general, Plains Villagers exemplify small-farming societies who lived in sedentary communities. A variety of raw materials (e.g., stone, bone, shell, wood, and clay) were used in the production of tools needed by sedentary farmers. Similar materials were also used to manufacture ornaments and items of personal adornment. Despite the diversity in goods produced, the material inventory is perceived as highly utilitarian and not elaborate. Unfortunately, this utilitarian theme is often ascribed to other aspects of the cultural system (e.g., sociopolitical organization and religious practices) even though their structures were quite complex.

**Technology and Subsistence.** Subsistence practices consisted of the growing of corn, beans, and squash, the hunting of game (particularly bison), and the collecting of seasonally available wild plant foods. Hunting not only provided food but hides and bones which were used to make a variety of tools ranging from digging sticks to pins and awls. Evidence of these subsistence activities is well documented in the nature of archeological materials found at sites of this adaptation type. Hunting activities are evidenced by the presence of large quantities of animal bones in the refuse deposits, numerous arrowpoint styles which were used in hunting, and bifacial knives and unifacial knives and scrapers used in butchering and processing the remains. Farming activities are represented by charred seeds and corn cobs in trash deposits, an extensive inventory of bone tools used in working the soil, an abundance of manos and grinding basins, and numerous deep storage pits(often within structures).

In the early developmental period of this adaptation type, farming practices were apparently not as intensive as during its latter stages. This is suggested by smaller quantities of agricultural tools (e.g., bison scapula and skull hoes) and fewer storage pits. These conditions have been noted at Custer phase occupations and have been used to support arguments of lesser agricultural activity (Drass and Moore 1987; Hofman 1978d).

**Settlement Pattern.** The emphasis on farming and increasing sedentism brought about significant changes in topographic locations selected for settlement and in the use of certain habitats. Because of the increased need for fertile soils conducive to agriculture, most Plains Village sites occur along terraces or floodplains of principal streams and rivers. There was also some use of upland areas in the earlier portion of the period because of lesser need for large areas of alluvial soil. The primary use of upland areas however, was for the exploitation of plants and animals found in the prairie habitat. Upland areas also contained abundant quantities of lithic materials which were used in the manufacture of chipped and ground stone tools. Increasing sedentism and possible year-round occupation of villages also resulted in a reduction in the diversity in site types. The primary site type is the semipermanent or permanent habitation settlement. These occur as homesteads/farmsteads, hamlets, and moderate size villages of up to 100-150 people. Settlements are typically focused along stream valleys and represent substantial population aggregations. For example, in the Washita River phase of south-central Oklahoma, village of 10 to 20 houses are found every 2.4 km along the middle course of the Washita River (Brooks 1983).

Similar settlement densities have also been recognized for the Antelope Creek phase along the Canadian River in the Texas Panhandle (Lintz 1986). There are few site types other than those designed for habitation. Occasionally, bison kill or processing sites are reported (Anderson and Chappabitty 1968; Brooks and Flynn 1988; Hofman 1980; Lintz 1978), although they are not large communal kills such as those known for the Northern Plains. Temporary hunting/processing camps or stopover stations may have been used but are difficult to identify as occupations of horticulturalists. Some such sites have, however, been documented (Ferring 1982). Another site type, cobble workshops are abundant throughout the area. However, they have been used repeatedly through time and are not necessarily distinctive of Plains Villagers. Occupation of rockshelter sites is widely evident where these features occur, but is well documented for only a few sites (Lawton 1968). The intensive repeated use of rockshelter sites suggests seasonal variation in settlement and possibly changes in group composition through the course of each year.

**Social Organization.** Plains societies have been traditionally viewed as being based on egalitarian principles with power/prestige obtained through achievement in hunting, war, and leadership abilities. Consequently, the social organization of historic as well as prehistoric Plains groups is considered as less complex than that of ranked societies. This perception of Plains culture, however, was primarily derived from the study of equestrian bison hunters whose cultural systems had been significantly impacted by European goods (Lowie 1954). Holder (1974) has found that agricultural societies living on the Plains (e.g., the Arikara, Mandan, and Hidatsa) display evidence of greater social complexity. It can be argued that the sedentary lifestyles of these groups necessitated logistical planning and the use of a more structured (or complex) decision making apparatus.

No evidence exists to support the presence of a complex sociopolitical system among Intensive Horticulturalists. Bell

(1984) suggests that a community form of settlement and organization was practiced by the Washita River phase. This form of organization may also have been prevalent among other Village Farmers. There are also hints of organization in economic activities operating at the village level. Indications of craft specialization were observed in household units at the Arthur site, a Washita River phase village in south-central Oklahoma (Brooks 1987).

**Trade and Exchange.** Although goods were obviously exchanged between groups of Village Farmers, there are no indications that trade was strongly developed at this time. Well established trade networks are frequently found with more complex societies. In the case of Intensive Horticulturalists, trade is not well developed in the early portion of this period and occurs within a limited range of materials. Particularly in the case of the Washita River phase, recent work by Ferring and Pertula (1986) points to some items thought to be of nonlocal origin being replicas rather than trade items. Toward the end of this adaptation type, however, trading had intensified. Materials such as Kay County (Florence A) chert (Vehik 1985, 1986) and olivella shell were traded over wide areas, ranging from south-central Texas to central Kansas, and are indicative of the operation of an extensive network of interaction.

**Ideology.** Little information exists on the nature of belief systems employed by these Village Farmers. Goods found in association with burials are typically utilitarian items or common ornaments (e.g., shell beads, bone gorgets, pendants, etc.). Small numbers of engraved shell gorgets as well as engraved conch shell however, have been found with isolated Washita River phase burials. There is no evidence for complex mortuary practices such as mound construction although ceremonialism can be suggested from some burials. Good evidence is present, however, for patterning in the placement of the deceased with a strong pattern for orienting the bodies with the head toward the east. An important study of the McLemore site suggests that the position of the head and grave orientation reflected the position of the rising sun (Lopez 1970). The association of specialized or exotic burial offerings with young individuals suggests that the status ascribed to some individuals was not totally egalitarian, or that some families were significantly more prosperous than others. Features found in association with two burials at a Zimms complex site (New Smith) point to a set of activities related to mortuary ritual (Moore 1984). Evidence of ceremonialism or ritual is also found in village settings. House 4 at the Arthur site, a Washita River phase village, contained little domestic refuse, but did have charred morning glory, creeping cucumber, and purslane seeds (Brooks 1987). Morning glory seeds are known for their hallucinogenic properties, creeping cucumber seeds are a cathartic and purslane seeds are thought to have medicinal value. Other items in this structure include cut shell inlays and raw materials used in the manufacture of bone tools and clay objects. This structure is currently viewed as the location of ritual and/or curing activities associated with the village shaman.

**Bioarcheology.** Because of the large number of excavated burials for the Intensive Horticulturalists, data on bioarcheological characteristics greatly exceeds that of other adaptation types identified for the Southern Plains study region. The remains of approximately 435 individuals have been documented in collections housed at various museums, universities, and research institutions within the region. Based on information obtained from evaluation of physical characteristics of these village farmers, it appears that more than one population group is involved with the development of this adaptation type. For example, considerable cranial variation exists between Washita River and Antelope Creek phase skeletal populations. These variations are significant for they attest to independent adjustments to a common set of adaptive strategies within the Southern Plains region.

More detailed analysis has also provided valuable information on the health status of Village Farmers. Overall, Intensive Horticulturalists living on the Southern Plains are a relatively healthy population. Approximately 20% of the individuals examined had caries. This is much higher than the percentage of caries in Northern Plains groups or contemporaneous Caddoan groups of the Ozark-Arkansas River-Ouachita Study Unit (Sabo et al. 1988). Such a carie rate is indicative of an economy based on extensive use of foods high in starch content, a pattern typically associated with agricultural societies. Alveolar reabsorption and abscesses are often found in association with individuals exhibiting evidence of pronounced tooth decay. Incidents of osteoarthritis and other degenerative conditions were found in moderate percentages of the skeletal samples. Extreme arthritic deterioration was noted on some Antelope Creek phase skeletons. This condition may represent the cumulative effects of working in stone quarrying when the stone was used for tools manufacture (Alibates agatized dolomite) or house construction. Other commonly observed characteristics were traumas such as fractures. There were also a few cases of combat injuries ranging from fractures to arrowpoint wounds. In addition, some skulls exhibited evidence of scalping. These traits attest to a moderate level of intertribal conflict although. It is doubtful though that this conflict reached the levels observed on the Northern Plains during protohistoric or early historic times. What is absent from the skeletal samples is high levels of infectious diseases normally found with population experiencing environmental stress.

**Areas of High Site Probability.** Sites of Intensive Horticulturalists hold their greatest importance in providing information on prehistoric adaptations and developments occurring immediately before historic contact. Major village sites hold particular value for studying a variety of research topics. The locations of these villages along principle stream valleys make major drainages a particularly sensitive area regarding potential treatment of Intensive Horticulturalist occupations. Because of their location in alluvial valleys, there is also a high likelihood for buried sites. In many instances, these locations can be correlated with stable paleosols. Projects undertaken in these settings should necessarily entail both surface and subsurface examinations for village farming occupations.

**Data Gaps and Critical Research Questions.** Despite the extensiveness of past research, we have only skimmed the surface of information on these village farmers. Major gaps remain throughout much of the region. However, one of the more poorly documented areas is that occupied by the Henrietta complex where little to no research has been done in the past 20 years. Gaps also occur in a number of areas including basic chronology, settlement and subsistence patterns, community structure, and social and religious practices. practices. Better chronological control over the Washita River and Antelope Creek phases, combined with ongoing research on economics, and material cultural differences may permit us to refine these cultural systems as being comprised of a number of different phases or subphases. Such accomplishments would provide a better basis for understanding tribal developments in these areas during protohistoric and historic times. Additional survey work and analysis can also fill in notable gaps in the areas being used by the Zimms, Bluff Creek, and Pratt complexes. Most importantly, addressing these gaps in our knowledge may aid us in establishing a new perspective on Plains Village societies, one which is not constrained by too great a reliance on historic and ethnohistoric records of highly acculturated Plains tribes which have served to distort the accomplishments and cultural systems of one of the most successful adaptations to the Southern Plains environment.

## Contact and Acculturating Groups Adaptation Type

This adaptation type is a composite for the historic period and represents an outgrowth of the hunter-gatherer-trader and developed horticulturalist adaptation types for these groups after they had come under the domination of Anglo-Americans. For this adaptation type, the native groups had lost much autonomy and the ability to control fully how they lived and where they lived. The Removal, Reservation, and Allotment periods highlight this adaptation type which is still in progress.

**Date Range.** Initial contact between Europeans and Southern Plains natives was made by the Coronado expedition in 1541. Cultural impact is thought to have been most intensive after the 1600s when Spanish settlements of colonization in New Mexico and French trading operations in the Red and Arkansas River basins began. The impact of European diseases, however, may have been substantial from the very earliest period of contact.

The beginning of the historic period for the Southern Plains is given as approximately 1750. The distinction between protohistoric and fully historic is not well defined, because contact was continuously being made with new groups from 1541 to the middle eighteenth century. In addition, most of the sixteenth and seventeenth century documents on Southern Plains natives provide precious little information, as to their ways of life. The end range for the contact and acculturating groups is given as 1906, the formal end of the reservation period in Oklahoma when tribal members were largely settled on private allotment lands and were supposedly following economic pursuits similar to those of their Anglo contemporaries.

**Environmental Context.** The environment of the contact period is considered to have been fully modern with fluctuations on the order of those recorded historically.

**Cultural Context.** The cultural context for the Southern Plains groups is largely influenced by the historical events of political groups just outside the region. During this time cultural patterns were continuously being interrupted, relocated and modified. The native groups of the region were affected by the regional struggles such as the competition between France and Spain for the region, the Mexican independence from Spain, the establishment of Texas as a Republic then as a state, the settlement and statehood of Kansas and Colorado, and the removal and relocation of nonindigenous tribes to Indian Territory.

On a more local level, the historical events affecting the lines of the native tribes to the region included trade in all directions, impacts of the Santa Fe Trail, the American military buildup after 1845, the conflicts between the Southeastern tribes (Chickasaws, Seminoles, Cherokees, Creeks, and Choctaws) with the free-roaming Plains tribes to the west of Indian Territory, and the commercial slaughter of bison by Anglo hunters.

Through time there was a decrease in population, due largely to introduced diseases, decrease in territories, and an increasing dependency on the Euramerican subsistence items they bartered so intensively for. Horses were possessed by all groups by 1750 and enabled the nomadic Kiowa, Comanche, Kiowa-Apache and others to become extremely mobile, but also enhanced the mobility of settled agricultural Wichitas and Caddos.

**Technology and Subsistence.** Ideally this discussion should be divided into farmers on the one hand and nomadic hunters on the other. Groups such as the Wichita, Osage, and Caddo lived in settled villages at least part of the year and carried out farming activities nearby. The nomadic contact and acculturating groups include various Apache groups, most of which are believed to have been forced out of the Southern Plains by the Comanches in the years around 1700. After the first quarter of the eighteenth century, the Comanche clearly dominated the area and allied themselves with the Wichita. The Kiowas were also a very powerful group in the region. The Kiowa-Apache were a small tribe who lived in close proximity to the Kiowas. The Cheyenne and Arapahoe groups who came down from the Northern Plains later also figured significantly as nomadic groups under the influences of external events.

More realistically, farming represented only a part of the Caddo, Osage, and Wichita subsistence. They, like the nomads were extremely active in foraging activities, bison hunting, intertribal trade, and Euramerican trading. Members of certain nonindigenous tribes played roles in the economic activities of the Southern Plains. For example, tribes which settled on the two Republic of Texas reservations, nomadic Kickapoo middlemen traders, Delawares who are believed to have introduced many of the silver working techniques known to the nomads, and Tonkawas who served as military scouts, affected the lives of

the "native" tribes seeking to make a living and to preserve their traditional, but everchanging, lifestyles.

With regard to technology of the Southern Plains natives for this adaptation type, one overriding assumption is held—technologies are generally adequate for the people who depend upon them (barring external climatic or social disruption). Comparison of the native technologies with our own or with the European technology of the same time too often has led to oversimplification or belittlement of the natives' capabilities and creativity. Taken within the context of their own time, lifestyle, and goals, the effectiveness of their technological complexes cannot be questioned, witness the horse-buffalo technological complex. In addition, most applications of the native technology required more skill (not necessarily more work) on the part of the individual with less emphasis on the functional performance of the tool, weapon, or machine. Beyond the native's own technological adaptations it is generally assumed, and can be verified archeologically and historically, that historic groups had access to and made use of the more portable products of which ever Euramerican society they were in contact with at a particular time. They were also adept at customizing or recycling many less desirable European items into forms appropriate to their specific needs.

**Settlement Pattern.** Considerable information on the localities of sites relatively to historic contact groups is believed to be available in State records throughout the region. However, no formal study of settlement patterns or site distributions is known. The nature of the habitation sites should be radically different and easily distinguishable for the groups with different economic focus within this adaptation type. The habitation sites relating to the nomadic tribes may be predominantly shallow, with low artifact densities whereas the more permanent village sites of the Wichita, for example, should contain evidence of structures, storage facilities, garden areas and so forth. The seasonal variation in activities of diverse Southern Plains groups, hunting camps of the horticulturalists, sites used repeatedly by nomads and/or gardeners for trading purposes, seasonally permanent villages of the nomadic hunters and others situations present considerable difficulty in interpreting the archeological record pertaining to specific sites.

Historic documentation of sites can be used to supplement data on site distribution. Bell and Bastian (1967) treat Wichita village site distribution and indicate numerous lines for future research. Although marginal to the study region, investigation of Osage sites include Chapman (1982) and Perino (1971). Documented sites for the nomadic groups include the Little Robe site (34El22) (Agnew 1971), a Comanche occupation site; and the Washita battlefield site in Roger Mills County (Hoig 1976). In addition to habitation sites, burial sites pertaining to these groups are a valuable source of information (see Appendix I). Settlement during this period was increasingly confined to defined reservation areas and hunting territories. Through time the specificity of these tracts increased and their size dwindled dramatically. Historic documentation of reservations and allotments provide a valuable source of information for addressing problems of tribal change and deterioration of traditional values and practices.

**Trade and Exchange.** Trading was intensively practiced within and between tribal groups, but much of the documented trade pertains to interaction with Whites or with European goods.

**Ideology and Ceremonies.** Revitalization movements, notably the Ghost Dance and Peyote Cult (now the Native American Church) are most well known of the native ceremonies which have been important in the region during the last century (Lowie 1954). Many pow wows and give-a-ways are common at a tribal level, and these have only been unevenly studied and documented (Ottaway 1970; Hill and Beals 1966; Baugh 1970; Beals 1971). Increasingly native Americans have become involved with Christianity. The remaining (though constantly changing) traditional ideologies and ceremonies deserve special documentation and continued study.

**Bioarcheology.** Information pertaining to documented historic Native American burial samples has been summarized in chapters 9 and Appendix I. Although a number of burials from the contact period are known, relatively few of these have been studied in detail using methods of contemporary skeletal biology. Many of the remains occur as isolated skeletons and are not well documented as to tribal affiliation. There is a tremendous need for detailed study of historic period skeletal remains of known tribal affiliation as this would aid immeasurably in the study and evaluation of prehistoric and later materials of unknown affiliation. Also, information pertaining to health conditions and intertribal relationships could be documented.

**Data Gaps and Critical Research Areas.** From an archeological perspective, little systematic study has been given to the Native American remains during the fully historic period. These remains are of special significance for several reasons. The height of the acculturation period was a very brief, lasting less than a century, but extremely important in the lives and culture of Native Americans. Documents pertaining to this period include photographs, allotment records, and military records. While the history of treaties, reservation changes, and land control records are relatively well documented, the daily lives and economy of Native American groups during the terminal free-roaming days, Reservation period, and Allotment period remain essentially unstudied. This untapped resource could provide a wealth of information pertaining to native lifeways during this historically critical period. The potential for ethnoarcheological research on these materials is extremely good and would benefit both the history and archeology of the region. A number of reservation period and early historic sites of specific tribal affiliation are documented in the literature or historical records. Very few of these have been investigated in detail, but all such sites represent extremely important resources for developing an adequate picture of life during the contact and acculturating period.

### Frontiersmen-Explorer Adaptation Type

**Date Range.** The period of this adaptation type extends from approximately A. D. 1541 through 1875.

**Environmental Context.** An essentially modern climatic regime is assumed to have been present during this period.

**Cultural Context.** This was a period of intensive exploration, expansion, and exploitation by European nation states. For the Southern Plains region it was a period of dramatic demise in Native American populations due partially to introduced disease. Products from the region, first furs, then bison robes, then cattle, were brought into the world market. Much activity in the region resulted from the strategic location of the Southern Plains in linking eastern and western developments in the United States, and as a frontier region for both the Spanish dominated Southwest and the early French dominated Mississippi valley. The approaches and interests of these different European cultural groups in the region were substantially different (Foreman 1930; Johns 1975; Spicer 1962; Webb 1931).

**Technology and Subsistence System.** The technology of the region during this period was based primarily on hand labor and horse-drawn power. Industrial developments such as steam and industrial manufacturing had limited direct impact on the region during this period, although many items of European or American manufacture were imported into the region. Subsistence was based largely upon small group or family hunting-gathering-farming. Trade and commerce were important factors drawing people into and through the region during this time. Establishment of military posts provided points for focused interactions and cultural developments and were generally related to Euramerican commerce and settlement activities.

**Settlement Pattern/System.** Settlement was closely tied to the various economic endeavors. The highly mobile hunter-trappers and explorers left limited evidence except, possibly, at selected repeatedly utilized trading sites. Native American camps, kill/butchery sites, battle sites, and special activity sites occur throughout the region but have received limited study. Travel corridors such as the Santa Fe Trail and the California road were intensively utilized, but often leave very little artifactual evidence. Camp sites along these trails were often repeatedly utilized, but as yet have received almost no archeological attention. Military posts greatly influenced the settlement of Euramericans in the region during this period.

**Trade and Exchange.** Trading was an important activity during this period with a great demand by Native Americans for products of European and American manufacture. This provided increased incentive for production of native commodities which were of interest to Euramerican traders. The increased focus on bison hunting by Southern Plains natives

**Ideology and Ceremonies.** A diverse array of ideological systems converged in the Southern Plains region during this period with various forms of Christianity dominating most of the region.

**Bioarcheology.** Bioarcheological information for this period is extremely limited, especially for non-native American groups.

**Data Gaps and Critical Research Areas.** The small number of sites and short time frame of this adaptation type makes all sites in the region attributable to this period potentially highly significant. It is extremely rare to find sites of this period which have not been intensively modified by more recent historic developments. The daily life, subsistence economy, and interactions of these earliest Europeans in the region are all areas of interest which can be addressed through archeological studies.

### Ranching-Farming Complex Adaptation type

**Date Range.** The beginning of this period was approximately 1876, following the "Red River Wars" when permanent settlement by Euramerican ranchers occurred in the region. By this time the nomadic tribes who had dominated the region were supressed and confined to reservations, and no longer presented a threat to settlement. This adaptation type continues to be of central importance in the region today, but we will use an arbitrary cutoff for this type of 1945. Major technological developments since World War II have had dramatic impacts on the nature of agricultural industries in the region.

**Environmental Context.** The environmental conditions during this period were modern in all essential details, although substantial fluctuation from the average is assumed to have occurred during these years.

**Cultural Context.** A mosaic of cultural influences and patterns is represented in the region by this adaptation type. Much of the early settlement was by displaced or pioneering Southerners. Early shepherding ventures, predominantly by pastores operating out of the New Mexico area, were relatively short lived and were eventually largely displaced by cattlemen. Cattle ranching ventures went through three distinctive periods before 1945. These were the initial local enterprise efforts of individuals, the following period of large ranches owned by corporate foreign investors, and finally the breakup of the huge ranches with their purchase by individuals. Distinctly American cultural patterns developed and spread during this period, among the more notable and colorful of these was the Cowboy complex (Erickson 1978).

The homesteader acts and opening of Native American lands for settlement resulted in a population explosion in the region, with households established on many quarter section plots. The juxtaposition of "sodbusters" and ranchers resulted in substantial disagreements and occasional conflicts. The immigration of peoples from various European nations and regions produced a cultural melting pot in the Southern Plains. Dry land farming was generally pushed to its westernmost limit and ranching continued to be the primary enterprise on the nonarable portions of the Southern Plains, prior to developmentof deep well irrigationsystems (primarily following World War II).

**Technology and Subsistence System.** Technology changed dramatically during this period with transportation technology being of fundamental importance. The introduction of railroads, motorized vehicles, electricity, and an increasingly cash economy have been major factors in the technological and subsistence

changes in the region for this adaptation type. Initially, the potential of this land for ranching and farming would not have been effectively realized without the aid of windmills and barbed wire (Webb 1931). Subsistence at the family level for ranchers and farmers depended largely upon the products of their own land with cattle, sheep, horses, and cash crops used to purchase, or as exchange commodities for, other food stuffs or manufactured items which could not be effectively produced at home.

**Settlement Pattern/System.** The distribution of homesites, schools, and settlements across the Southern Plains landscape was greatest during the decades immediately before and following 1900. Since that time, for most of the region, there has been a relatively steady decline in the number and size of families, the number and size of small rural communities, and a consolidation of small schools and churches. Much of this change in the distribution of rural population and rural public facilities has resulted from improved transportation, improved farming and ranching technologies, and from the common exodus of people to industrial and urban centers in pursuit of more lucrative or diverse job opportunities. There have been dramatic changes in the settlement of the Southern Plains region since the beginning of the Farming/Ranching adaptation type, and these are relatively poorly documented in the geographic, historic, and anthropological literature. Many site types such as cattle camps, sheepherder camps, windmill locations, key gates in fences, corrals, outbuildings, and cellars occur across the landscape and reflect the ranching/farming adaptation, but have been little studied by archeologists.

**Trade and Exchange.** Trade and exchange during this adaptation type was focused at small community stores for many families, but especially at railheads and urban-industrial centers. It was during this period that the region became actively involved in the modern world system of economic and political interactions.

**Ideology and Ceremonies.** The entire region was dominated by Christian denominations and churches. Secular ceremonies include a variety of multifamily group activities.

**Bioarcheology.** No bioarcheological research has been conducted on the human remains representing this adaptation type in this region.

**Data Gaps and Critical Research Areas.** Very limited archeological research has been conducted which pertains to this period, although recording of site locations and inventories of historic materials at farm and ranch locations has increasingly become standard practice in archeological surveys in the region.

### Developed Settlement Adaptation Type

**Date Range.** This adaptation type includes an extremely complex array of site types, but is primarily composed of urban centers, towns, locations of petroleum or mineral extraction, and heavy industry. The urban centers in the region began to develop primarily during the last quarter of the nineteenth century, although most industrial development and mining did not occur until slightly later. Military posts were established during the early portion of this period in lieu of well developed civil authority. Some of these military centers have continued to operate though their functions have changed substantially since

**Environmental Context.** The environmental setting for this adaptation type is a fully modern one.

**Cultural Context.** A complex mosaic of European, Native American, African, and Asian peoples were represented in the region by the late 1800s. Euramericans were dominant in the region, although enclaves of specific ethnic groups or religious sects developed.

**Technology and Subsistence System.** The technology was that of the early part of the modern industrial era with horse, wind, and water power rapidly giving way to motorized vehicles and electricity. Wind and water power, however, remain as substantial components in the modern technology, whereas working horses have been largely supplanted by various motorized vehicles. Subsistence is predominantly based on wage earning jobs and cash exchange for mass produced commodities.

**Settlement Pattern/System.** Settlement was largely determined by railroads and other transportation routes during the early part of this period. Most streams were not navigable by large vessels and municipal water was generally derived from wells. Specialized settlements developed in an near locations of highly productive natural resource exploitation such as oil fields and mining areas.

**Trade and Exchange.** Trade focused on urban centers of various size with interpersonal or interfamily exchanges of relatively minor importance. Most exchange was based on a modern cash economy.

**Ideology and Ceremonies.** The dominant religious activities during this period reflect Christian ideals and influences.

**Bioarcheology.** The bioarcheology of the historic Euramerican occupation of the Southern Plains region has received almost only study, representing an extremely limited segment of the regional population.

**Data Gaps and Critical Research Areas.** Limited archeological research has been conducted for this period in the Southern Plains. Kent's (1983) study provides one of the few efforts to use the modern cultural record of the region to enhance archeological model building and evaluation of interpretations of activity areas and spatial organization at the household level.

# SUMMARY DISCUSSION: SOUTHERN PLAINS ARCHEOLOGY IN THE LATE TWENTIETH CENTURY

*Jack L. Hofman and Robert L. Brooks*

An archeological overview of the Southern Great Plains including portions of Colorado, Kansas, New Mexico, Oklahoma, and Texas has summarized temporal and spatial aspects of the prehistoric and historic records in the region. This study has intended to highlight data gaps and limitations in the archeological record of the area as well as document the general current state of knowledge. It is intended that this information is useful for both management and research needs. The Southern Great Plains archeological overview has provided an opportunity to address research and management problems at a regional rather than local level, and has highlighted some of the recurrent management and research issues. A primary difference in this study and several recent syntheses is that most have been directed to the state level or confined to state boundaries, rather than by broad "natural" ecological areas (Bell 1984; Biesaart, et al. 1985; Cassells 1983; Eighmy 1984; Brown and Simmons 1987; O'Brien 1984; Stuart and Gauthier 1981).

Archeological research in the Southern Great Plains region has been conducted almost entirely since the turn of the twentieth century, with the exception of a small number of dispersed studies (Wedel 1981). Many of these early studies were essentially "shots in the dark" in an archeologically unknown region. Unfortunately, archeological research planning has continued to be done in some cases without the benefit of a regional perspective for addressing problems in specific project areas. Scopes of work for CRM projects have usually been conducted under the assumption that the information of primary significance is that collected during the contract period by the contract archeologist, either from the surface or through excavation. This is an extremely limited position, and one not particularly conducive to learning about the past, or to assessing the nature and significance of the archeological record.

Progress in archeology as a science depends upon identifying areas of ignorance or limitations in our knowledge of the archeological record and how we interpret it, and then developing the means to reduce these unknowns. Our ignorance is only limited by what we know or think we know, but as we learn more, new and unprecedented problem areas develop. Usually, the more we learn, the more we need to know. A “basic assumption of science is that we cannot assume we possess a sufficient knowledge of the subject matter. . . . We must assume there is something to learn” (Binford 1986:402).

There should be explicit reasoning behind why we, as archeologists, do what we do; how we spend our time and our available funding. We cannot do all the mitigation and research which needs to be done. Neither our time or monies are limitless, nor will the sites always be available for study. Therefore, we need, as always, a sound basis for evaluating our knowledge, recognizing important problems, and making decisions about where to direct archeological research. The COE overview is an important step in this direction, by providing, in an updatable format, a broad scale initial assessment of what we think we know about the archeological record of a region.

The problem of how and where we spend our efforts is closely related to the issue of significance. If we accept that archeology is a science, then significance can only be assessed from the perspective of research problems and archeological goals, and is not inherent in materials or places. Significance can be assessed only in relation to existing knowledge. As our perception of what we know and what we want to find out (and how we go about finding out) change, our perceptions of what resources are most significant should change in concert. [Significance can vary widely depending upon the time period, the cultural complex, the area of concern, nature of perceived "data gaps," and the investigators' interests.] Learning about the archeological record and about the past involves many levels of integrated study. Critical decisions are repeatedly made on how to invest our archeological time and money based on limited encounters with the sites or areas being studied. One-time walkover surveys are prone to be very misleading, whether the consideration is a specific site or a specific project area. Grab-bag samples from single visits to archeological sites are often, unfortunately, the primary evidence used in making decisions about significance and where to conduct research. Surface conditions and previous artifact collecting are only two of the many factors which influence what an archeologist might encounter on a particular visit to an area.

Management and research decisions must be made based on available information, but the quality of this information can often be substantially enhanced at a minimum of extra expense. The input of avocational archeologist often provides a long term perspective on the nature of, productivity, and changes in the archeological record of a site or region. Tracking down and interviewing avocational archeologists and documenting their collections from a site or area of interest must be considered no less critical to our work than filling up bags with a harvest of flakes and sherds from sites which often have been collected for decades. There is, fortunately, an increasing awareness of the importance of avocational archeologists as critical sources of information about specific sites, regional site patterns, and the nature of biases which result from the long term activity of collectors (e.g. Lintz 1988).

Examples of problems with single visit surveys and one-time evaluation of sites are numerous. Key sites are often not recognized due to surface conditions, ground cover, geomorphic factors, extensive previous artifact collecting, or unrealistic expectations about what a "significant" site should look like on the surface or through limited testing. Not all significant sites have middens, house patterns, or dense lithic scatters. Finally, archeology is an approach to learning about the recent or remote past by means of studying material remains. It is not just limited in utility to periods or places for which there are no written records. Archeology is complementary to history and ethnohistory and is generally not made obsolete simply by the existence of minimal written records which may pertain to an area or period. Many aspects of the daily life and economy of the early and recent historic period settlers in the region can be enhanced through archeological research.

## The Study Area and Its Archeological Sites

The Southern Great Plains portion of the U.S. Army Corps of Engineers' Southwestern Division archeological overview includes substantial portions of five states (see Chapters 1 and 2). In geographic terms the region extends from the foothills of the Rocky Mountains on the west to the Cross Timbers on the east and from the Arkansas River drainage on the north to the Pecos River system on the south. The area of concern is dominated by short grass high plains and the low rolling plains or prairie plains, the total encompassing more than 528,360 km$^2$. Within the study portions of these five states are included 207 counties (Table 35), and 15,377 archeological sites as of 1987 (Table 36).

For the region as a whole the density of recorded archeological sites is one site per 33.6 km$^2$. As shown in Figure 29, 38 counties or about 18% of the total have less than 10 reported sites (25% in Texas and Kansas). These are truly black holes from a management and research perspective. By way of contrast, 46 counties (22% of the total) have at least 100 reported archeological sites (Figure 30). Counties with large site counts are those where archeological research projects have been subsidized by federal funding and/or where avocational archeologists have been actively cooperating with state archeological offices. The significance of avocational input in reporting and recording archeological sites can be illustrated with the Oklahoma example. For the western two-thirds of Oklahoma approximately 16% of the site report forms on file were prepared by avocational archeologists, primarily members of the Oklahoma Anthropological Society. This group has contributed more site forms than any other, next to the staff of the Oklahoma Archaeological Survey. The actual contribution of avocationalists is, however, much greater than these figures might suggest, because many of the site forms filed by professionals are based on information and initial reports provided by avocationalists.

Table 35
Summary of political units in the Plains study area

| State | No. of Counties | Size of County | Sites/County Mean | Sites/County No. |
|---|---|---|---|---|
| Colorado | 10 | 2880 km$^2$ | 150.0 | (26-368) |
| Kansas | 51 | 1326 km$^2$ | 52.9 | (0-258) |
| New Mexico | 52 | 1593 km$^2$ | 190.8 | (24-490) |
| Oklahoma | 52 | 1481 km$^2$ | 116.2 | (4-535) |
| Texas | 89 | 1483 km$^2$ | 48.6 | (0-520) |

Table 36
Summary of site frequencies in the Plains study area

| State | Sites | #Counties with Sites | >100 Sites | | <10 sites | |
|---|---|---|---|---|---|---|
| Colorado | 1350 | 21 | 0 | (0%) | 5 | (55%) |
| Kansas | 2702 | 3 | 12 | (24%) | 9 | (18%) |
| New Mexico | 954 | 0 | 0 | (0%) | 3 | (60%) |
| Oklahoma | 6042 | 45 | 1 | (2%) | 19 | (37%) |
| Texas | 4329 | 70 | 25 | (28%) | 10 | (11%) |

Archeological sites which are on the National Register of Historic Places occur primarily in the counties which have more than 100 sites reported and where federally supported archeological work has been conducted. The generally low frequencies of National Register sites (from 0 to 16 per county; Table 36), however, should not be taken as an indication of the number of significant sites. Many sites encountered during federally supported projects are never nominated to the Register once they have been deemed eligible. Each state has slightly different methods of determining and assigning eligibility at the state and local level and of recording these properties. Also, other factors which skew the figures presented here include practices such as done in Kansas where sites are removed from the National Register once they have been destroyed. Many of the National Register sites are on private lands, as this is a primary means of offering some protection to significant properties which are not under federal or state jurisdiction. On an interstate basis, the means for retrieving and comparing information about site eligibility is highly variable and the resultant figures are not directly comparable. Therefore, National Register properties do not provide a particularly useful or reliable source of information as to the total number or distribution of known highly significant sites.

The general status of archeological research in the Southern Plains can be summarized briefly, if in a somewhat oversimplified manner, as follows. Further discussion of limitations in our archeological information and in present approaches to archeological research in the region is provided in the next section.

1. The majority of published archeological research for the region pertains to the Village Farming and Paleo-Indian periods. Substantially less documented research is available for the other time period and adaptation types.

2. Most of the "quality" data or highly useful and broadly relevant information has come from major excavations rather than from survey or testing programs.

3. A considerable portion of the information from excavated sites is the result of research conducted prior to the establish-

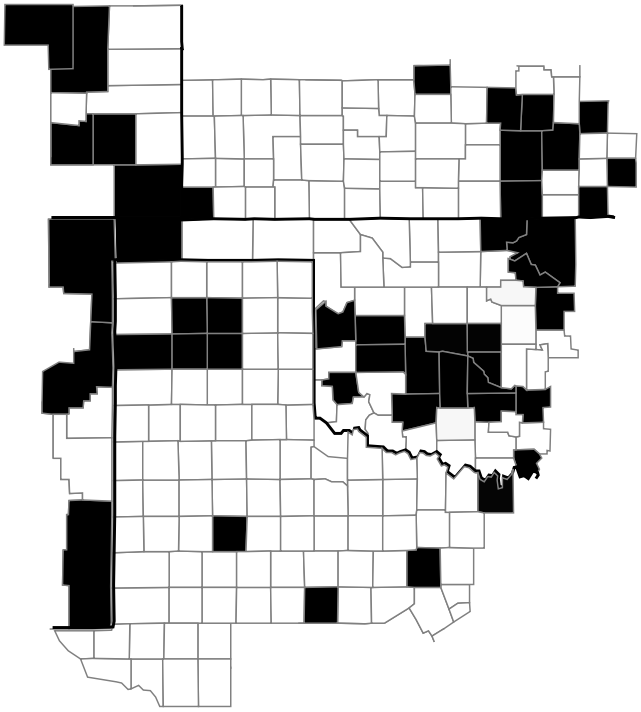


**Figure 29. Counties in the Southern Plains region with 100 or more reported archeological sites.**

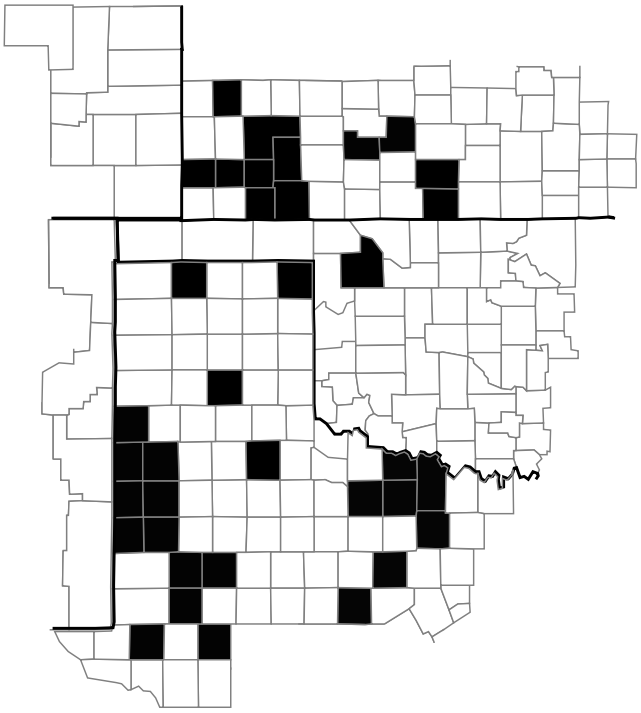


**Figure 30. Counties in the Southern Plains region with 10 or fewer archeological sites.**

ment of current federal regulations and before many of the currently acceptable data recovery techniques were developed.

4. Bioarcheological information for the region as a whole is extremely limited and there does not appear to have been an appreciable increase in the quality of recovery, recording, or analysis of human skeletal remains in the past two decades.

## SUMMARY OF RESEARCH NEEDS AND PROBLEMS FOR SELECTED ADAPTATION TYPES

The importance of avocational input, regional perspective, and variation in what constitutes significance in the archeological record can be illustrated with reference to the Folsom and Plains Village sites in the Southern Great Plains region. Research and management needs for other adaptation types are also reviewed in this brief discussion.

### Early Specialized Hunters Adaptation: Folsom Example

The Folsom occupation of the Southern Plains is most well known from the study of several significant kill sites and campsites (Figure 5) including Folsom, Blackwater Draw, and Elida in New Mexico, Lipscomb, Lubbock Lake, Adair-Steadman, Scharbaurer, and Lake Theo in Texas, and Cedar Creek in Oklahoma (Bell 1954; Hester 1962, 1972; Johnson 1987; Schultz 1943; Tunnell 1977; Wendorf et al. 1955; Wormington 1957). The Folsom complex is included in the Early Specialized Hunters Adaptation Type for the Southern Great Plains region, and has been recently summarized for this area in general terms (Hofman 1988a). There are many aspects of the Folsom complex which remain poorly understood, but a time interval for this complex from between 10,200 and 10,800 years ago in now well supported (Frison 1978; Haynes 1988). A highly mobile technological system focused on bison hunting with supplemental use of other species is also documented. Land use patterns and aspects of group organization are topics of diverse interpretations (e.g., compare Hester and Grady [1977] and Meltzer and Smith [1986] with Kelly and Todd [1988]). The bioarcheology of these and other Early Specialized Hunters is essentially unknown, with the most famous skeletal remains being from the Scharbauer site near Midland.

From a regional perspective we can make several observations about the Folsom occupation of the Southern Great Plains. The distribution of Folsom sites is not well understood, but many key sites occur in upland settings, along minor tributaries, or in areas distant from modern water sources. Paleoenvironmental research documents that climatic and ecological conditions were substantially different in the region during the very early Holocene and that we cannot expect modern moisture conditions or water sources to provide a reliable key for interpreting or predicting Folsom site occurrences. The most productive means of locating or surveying for Folsom age sites is to identify, through geomorphological investigations, and carefully monitor land surfaces or buried deposits of the appropriate age. Currently our ability to predict Folsom site locations is very low.

Because of high mobility and a highly curated technology, specific Folsom sites often produce only a small segment of the range of Folsom artifact types. An adequate interpretation of the technology can usually be gained only through comparative study of multiple assemblages (Hofman 1988b).

For example, the relationships between the rare large bifacial cores (Stanford and Broilo 1981) and large bifacial thinning flakes, and between Folsom and unfluted Folsom (and Midland) points becomes evident only on a regional scale. Consideration must be given to lithic sources, requirements of a curated technology in lithic-poor areas, and comparison of multiple assemblages which may have diverse appearances (Hofman 1988b).

Also, at a regional scale, it is important to acknowledge that very few large or extensive Folsom sites exist. Excavations have been documented at fewer than 10 Folsom sites in the more than 500,000 $km^2$ region. Many Folsom sites, however, are extremely ephemeral and would be very expensive to excavate if we consider the artifact recovery ratio to investment. The significance of small, ephemeral sites can be argued, however, to be equally important from an explanatory standpoint to sites with more robust collections (Hofman and Ingbar 1988). The study of hunting camps, overlooks, and other "locations" is critical to gaining a realistic picture of Folsom land-use patterns and to complementing information gained from more substantial kill and camp sites. Many of the sites which have been documented with a very small quantity of diagnostic Folsom material have been considered too limited, disturbed, or shallow to merit detailed study. Collectively, however, study of such sites could allow us a much better view of Folsom technological and organizational variation than we now have. Significance is not directly referable to site size or artifact density.

The significance of avocational input to the study of Folsom research can be documented with the Oklahoma case. Oklahoma has traditionally been considered to be on the fringe of the primary Folsom occupation area, commonly stated as being the High Plains (Wormington 1957). A recent survey of sites, records, and avocational collections, however, has documented a sizable number of verified Folsom finds and sites from the state (Hofman 1986, 1987a). Furthermore, recent geomorphic studies and dating of buried paleosols has documented the presence throughout much of central Oklahoma of deeply buried (circa 10 m and deeper) 9,000 to 11,000 year old land surfaces (Leonhardy 1966; Hofman 1987b, 1988c; Artz 1986). The limited natural exposures of these land surfaces may account in part for the relative scarcity of reported early Holocene materials for much of the prairie-plains area.

It is important to note, that of approximately 125 Folsom points and preforms known from Oklahoma, only one has been found as a result of a federal- or state-funded research project (Hughes 1978). All others have been found by avocationalists.

In considering the research needs for the Specialized Hunters adaptation type, several issues are evident. Paleoecological studies are critical for this dynamic period representing the transition from the Pleistocene to Holocene periods. Integrated multidisciplinary studies are required in order to effectively exploit and interpret the available geoarcheological record for this time. Such studies must not be limited to the context of archeological sites, but to a variety of depositional environments which may or may not include cultural materials. The study of small and relatively "unproductive" sites is also important as these provide a substantial portion of the record which is available for study. Much research has remained oriented toward material culture studies, rather than toward a holistic perspective on the prehistoric environments and people

### Broad Spectrum Holocene Hunter-Gatherer-Forager Adaptation.

The middle Holocene period from approximately 8,000 to 2,000 years ago has received very minimal archeological coverage in the Southern Great Plains. As noted previously, on a regional scale so little is documented pertaining to this period that any site which has the potential to provide information on subsistence, technology, bioarcheology, or environment should receive special attention. The importance of documenting the dynamic nature of the Holocene environment is evidenced by the importance of and common reference to the Ferndale Bog study (Albert 1981). This study is of central importance to archeologists in the region because of its paleoecological record, which occurs in the absence of a cultural assemblage.The social organization of Holocene hunting and gathering peoples, the structure and flexibility of the bands, group sizes and seasonal variation, and mobility patterns are unknown. Approaching these problems will require detailed site studies as well as developing methodologies for realistic interpretation of assemblage patterning. Another recurrent problem pertains to geomorphic factors, landform changes, and deeply buried archeological sites. Repeated studies have now shown that much of the Southern Plains archeological record dating prior to 1,000 years ago is deeply buried in terraces along stream valleys. Archeological survey, inventory, and assessment programs must acknowledge this situation and include deep testing and buried site studies if our information on these early periods are to be appreciably enhanced.

### Incipient Horticulturalists Adaptation

By the first millennium A.D., substantial technological changes are evidenced in the Southern Great Plains region which represent the diffusion of ceramic and bow and arrow technologies into the area. Evidence of domestic cultigens in the area during the early part of this period is meager, but by comparison to the preceding Archaic period an intensified more localized foraging economy is suggested. Changes in territory size or population pressure may be responsible for the first appearance of repeatedly used burial sites in the region. Distinctive ceramic technologies, from the east (Hopewellian), north (Plains Woodland), and southwest (Mogollon) result in the juxtaposition of distinctive traditions in the region during a time of substantial technological and economic changes. Bison are relatively less significant in the economy than in the immediately preceding and following periods, with deer and smaller animals rising in overall representation.

A variety of research questions pertaining to this period deserve considerable attention. These include the refinement of local cultural chronologies which should provide a background for assessing the relationships between the various complexes which are represented. The definition of material assemblages has also been inadequately developed, partially because many reported sites are short term ephemeral camps such as rockshelters and the integrated study of assemblages from multiple sites has not been a primary concern. Economic aspects of the various "Woodland" groups across the region are beginning to be documented in the past decade, but much remains to be learned about seasonal variability, economic territories, and change within this period. Intergroup contacts are not understood and have not been thoroughly addressed, but the interface of distinctive ceramic and chipped stone technologies is an important problem which can only be addressed after chronological control and assemblage definitions have been improved.

### Village Horticulturalist Adaptation

For the Plains Village Farmers, the situation is substantially different. Excavations have been conducted at approximately 100 such sites in the study region (Brooks et al. 1985; Brown and Simmons 1987; Lintz 1986). Sites are located along modern rivers and major tributaries, and in contrast to Paleo-Indian sites, village site locations are relatively predictable (Brooks et al. 1985; Lintz 1986). From a regional perspective site distribution is tied to permanent water courses and arable land. Toward the west and southwest in more arid parts of the region, evidence of Village Farmers does not occur. Unlike hunter-gatherer sites, major Plains Village sites are rarely found in arid upland areas, although they occur in high protected settings near water sources. Site variability is also best perceived on a regional scale with stylistic and technological variation documenting the presence of distinctive cultural groups. Small camps and occasional kill sites (Brooks and Flynn 1988; Hofman 1980) are widely scattered and poorly documented. Bioarcheological data is better for this period than any other in the area, but is still extremely spotty and of uneven coverage for the several archeological complexes which conform to the Developed Village Horticulturalist adaptation type (see Chapters 9 through 11).

Much of the technological repertoire for Village Farmers occurs at all of the village sites. Significance, given our present knowledge, comes more from specific classes of data analysis focused at specific problems (paleoethnobotanical, architectural, economic, bioarcheological, site distribution patterns) rather than from sites per se.

Avocational input has been critical in recording these sites, but perhaps most significant is the assistance of avocational volunteers during excavations at Kansas, Oklahoma, and Texas Vil-

lage Farmer sites. Many of these could not have been as completely explored, if excavated at all, without this volunteer labor force (Brooks 1987; Hughes and Hughes 1987; Lawton 1968; Richards 1971).

### Late Aboriginal Hunter-Gatherer-Trader Adaptation

The relatively brief period between A.D. 1500 and 1800 in the Southern Plains region was an incredibly dynamic one in terms of cultural interactions, culture contacts, and culture change. The region provides a laboratory for investigation of the relationships between nomadic hunter-gatherers and more settled horticultural groups (Speth and Spielmann 1983). The impact of the horse dramatically changed mobility, acculturation and trade resulted in a rapid demise of native American technologies, and the radical decrease in population as a result of diseases are all problems which deserve thoughtful anthropological attention. At present, however, research has focused primarily on the definition of material assemblages for this historically brief period, and on discussions of the potential tribal authorship of these assemblages. The flexible and often unstable nature of intergroup relationships during this period resulted in what appears to be a baffling array of material culture combinations. These resulted from trading, raiding, intermarriage, diffusion, and other interactions. The composition of tribal groups, their structure, economy, and organization often changed radically during the protohistoric period. Historically recognized tribal groups often represent the confederated remnants of previously larger relatively distinct tribes. Because there are many unanswered questions in the ethnohistoric record, archeology promises to play an increasingly important role in fleshing out the cultural dynamics of this period. Relatively few protohistoric sites in the region have had adequate archeological investigation, although testing or limited work has been conducted at a number of important locations. Because the period is so brief and the number of well preserved so few, all sites of this period are potentially extremely important. Bioarcheological data for this period is essentially lacking, but could prove highly valuable for documentation of intergroup relationships and historical and biological connections between protohistoric archeological complexes.

### Historic Archeology

It is not true that things must be old to be of interest to archeologists. It is evident, however, that archeologists in the Southern Plains region have generally not given adequate attention to the historic period, to its potential for developing archeological methodology, and as a complement to the written history of the region. Historic archeology should not be just a last chance effort to learn more about places of known historical significance. Historic sites archeology should not take its importance just from a particular event which occurred or person who once lived in a location. To relocate an item once belonging to a famous person, or a structure used in a famous gathering are very limited kinds of goals for archeological research (Binford 1983:169- 178). Historical archeology holds the potential to contribute substantially to the development of archeological method and theory and to the study and enlightenment of those aspects of the historic past which have not been transformed into the written record. As documented in chapter 9 and Appendix I, archeological research pertaining to the historic period in the Southern Great Plains study area has been minimal, and the much of the published work has been completed during the past decade. Military sites have received the greatest attention, but even in these cases the work has been minimal. The rapidity of technological change in the past century is unequaled previously and much of the nature of these changes can be best documented through archeological studies of the material culture. Archeology as a discipline also stands to benefit substantially from historic archeological investigations where field and analytical methodologies can be developed and improved upon.

### Bioarcheology

Of all the research areas discussed for the Southern Plains region, bioarcheology is perhaps most in need of an improved data base. Educating archeologists and managers of the central importance of systematic, integrated, and comparative investigation of skeletal samples regardless of their size remains to be effectively done. Skeletal studies have developed dramatically during the past two decades and are beginning to provide essential and critical information for the interpretation of prehistoric diets, lifeways, and historical/genetic relationships between past groups represented by skeletal series. The summary of previous work and presentation of a research methodology by Owsley and others in this overview provides a quantum leap in the study of bioarcheology for the Southern Plains. The utility of available information and the potential of continued collection and careful curation of skeletal remains has been documented. Most importantly, the key role of bioarcheology in the study of regional prehistory must be recognized. Human osteology is not an eccentric sideline for muddling anthropologists, but an invaluable key for unlocking substantial basic information about past lifeways. All skeletal remains must be excavated and curated with extreme care and their study integrated with the overall archeological investigation. For the Southern Plains region, the Developed Village Farmers adaptation type is the only one with samples which allow detailed statistical comparative studies, and this information comes primarily from very few sites. For all other time periods, from Paleo-Indian through Woodland and including the protohistoric and historic periods, samples for study are woefully inadequate. Importantly, in retrospect the track record of archeologists, museums, and curators for adequately preserving and storing skeletal remains needs considerable upgrading.

### Summary of Concerns for Southern Plains Archeology

In summary, there are both black holes and bright lights in the archeology of the Southern Great Plains. Many localities have received almost no archeological attention, and many mistakes have been made in the process of learning about this archeological record. Avenues for productive future research are becoming

better defined. The central importance of a regional perspective, avocational involvement, and a continuing critical assessment of the interpretation of archeological significance are all fundamental to advancing the science of archeology in the Southern Great Plains region.

Frison (1984:310-311) has recently pointed out some pertinent key issues and concerns concerning CRM archeology in the Plains region. To quote,

> The CRM archeologists derive their power from federal and state law. The contractors have little if any power in CRM but must follow the guidelines as those are interpreted by federal and state regulators. The academic archeologist has some power through peer pressure, but is in much the same position as the contractor in terms of constraint by rules and regulations. . . . Under the present system, CRM programs have the power to control the destiny of archeological resources, particularly in areas where large percentages of land are under federal ownership and control . . . . Cultural resource managers should always remember that the proper use or exploitation of archeological resources is to see that they are researched in such a manner as to produce the maximum amount of information.

First and foremost, the concept of "inventory and avoidance" of cultural resources without a strong parallel program of research should be abandoned. The present policy is seriously hampering the study of archeology as an academic discipline in areas where half or more of the land is federally owned and controlled. Cultural resource management that fails to recognize the need for continuing research is as sterile as teaching without research.

Cultural resource managers should therefore be either well trained in research or expected to seek the expertise and guidance of those who are so trained. Since it is not possible to either save or investigate all archeological resources, cultural resource managers must, in addition, be able to establish priorities and make proper decisions. Poor management not only diminishes our data base, but it also continually deteriorates the public image of archeology and archeologists.

In summary, a few salient points should be reiterated concerning the archeological record and research in the Southern Plains region.

1. The Archaic, Woodland, Protohistoric, and Historic periods are very poorly documented in terms of assemblage analyses, site distributions, comparative studies, economic analyses, cultural interactions, settlement systems, and dating. Even though the Paleo-Indian period and Plains Village periods have received more attention, there also remain substantial gaps in the study of these periods, especially with regard to evenness of coverage, specialized analyses of subsistence, bioarcheology, and paleoenvironmental reconstruction.

2. Paleoecological studies are needed which are coordinated with archeological site studies, but not limited to archeological site areas. The broad outlines of climatic and ecological change for the region during the past 12,000 years have been discerned, but additional refined site-specific studies are needed in order to develop regionally specific conditions and to enable broad scale comparisons (Hall 1988). Knowledge of the climate, plant, and animal associations are integral to interpretation of the operation and change in the various cultural systems which were present in the region. Key periods include the Pleistocene-Holocene transition, the mid-Holocene Altithermal period and its impact on the economy and organization of hunter-gatherers, and the documentation of apparently dramatic climatic fluctuations during the past 2,000 years which may correlate with incipient horticultural developments, expansion of the Plains Village cultures, and the fluorescence of protohistoric hunters and traders. The continuing investigation of fluctuations in the prehistoric bison populations in the region is one research question critical to interpretation of a key economic resource in the area (Dillehay 1974).

3. Cultural transitions, like their ecological counterparts, are key topics on which research should be focused. Archeological research commonly is compartmentalized to the point of discussing and investigating particular, though often generalized, adaptations with limited consideration given to the processes or historical events involved in the transitions from one form of adaptation to another. There were substantial fluctuations in the Southern Plains region in both time and space with regard to economic and technological (and presumably social-organizational) shifts. For example, the acceptance of an intensive horticultural economy apparently spread rapidly across much of the Southern Plains after a relatively slow period of development. The demise of this system was, then, apparently quite abrupt especially across the western portion of the region. The resurgence of a predominantly hunting-trading economy in an area which had previously been largely horticulturally oriented presents an important case for investigation. The marginal environmental position of much of the Southern Plains for prehistoric horticulture, emphasizes the need for integrated paleoecological studies to be conducted with archeological research. Other key transitions which need focused attention are the Paleo-Indian/Archaic, Archaic/Woodland, and Woodland/Plains Village. What problems were prehistoric peoples trying to solve through these dramatic shifts in their lifestyles?

4. Integrated multidisciplinary research is critical to quality archeological investigations and should be viewed as standard procedure. Paleobotany (including pollen and phytoliths), geomorphology, soils analysis, taphonomy, bioarcheology and zooarcheology, should be integral parts of site and regional studies along with standard analyses of material culture.

5. Sampling is a key and recurrent issue. Predictive modeling has proven to be of little utility in locating key sites. On a site basis samples have typically been too small to ascertain salient characteristics of occupations and information on site structure. Percent of area excavated or surveyed should be dependent upon the setting, previous knowledge, and the questions being addressed rather than on some magical 10% or other random figure. The need for a regional perspectives in field work and analysis cannot be overemphasized, even a quarter of a century after the classic plea for a regional approach (Binford 1964), most investigations are restricted to single stream valleys or even smaller

artificially circumscribed areas. The correlated problem of deep site location and sampling presents a major hurdle for many archeological projects, but the integration of geomorphology and focused investigation on key sites will be essential if the prehistoric record for many portions of the Plains is to be appreciably enhanced. A regional perspective does not necessitate that we only do a small amount of investigation at a large number of sites. Rather it should be feasible to assess the character of site variability and occurrence in a project area and then select key sites for intensive investigation. Greater precision data and more complete study of selected sites will advance many research goals which can never be attained through shotgun samples and a scattered array of sites. Random samples of randomly selected sites generally provides little new significant information.

6. The utilization of avocational archeologist input can often provide not only a better assessment an analysis of an area's archeology, but also serves to enhance the public conception of archeology. Public awareness, education, and appreciation for archeological resources is the only truly effective means of preserving the record and of dissuading vandalism and illegal trafficking in artifacts.

# REFERENCES CITED


Abert, James W.
1846 *Reconnaissance by J.W. Abert, Topographical Engineers, 1845*. 29th Congress, 1st Session, Senate Document 438. Washington, D.C.

Abbott, Carl, Stephen J. Leonard, and David McComb
1982 *Colorado: A History of the Centennial State*. Colorado Associated University Press, Boulder.

Adair, Mary J.
1981 *Prehistory and History of the El Dorado Lake Area, Kansas (Phase II)*. University of Kansas Museum of Anthropology, Project Report Series 47, Lawrence.

1984 *Prehistoric Cultivation in the Central Plains: Its Development and Importance*. Ph.D. Dissertation, Department of Anthropology, University of Kansas, Lawrence.

Adovasio, J. M., J. D. Gunn, J. Donahue, and R. Stuckenrath
1982 Meadowcroft Rockshelter, 1973-1977: A Synopsis. In *Peopling of the New World*, edited by J. E. Ericson, R. E. Taylor, and R. Berger, pp. 97-132. Ballena Press Anthropological Papers 2, Los Altos.

Agenbroad, Larry D.
1978 The Hudson-Meng Site: An Alberta Bison Kill in the Nebraska High Plains. *Plains Anthropologist* 23 (82,Part 2):128-131.

1984 New World Mammoth Distribution. In *Quaternary Extinctions, a Prehistoric Revolution*, edited by P.S. Martin and R. G. Klein, pp. 90-108. University of Arizona Press, Tucson.

Agnew, Brad
1971/72 The 1858 War Against the Comanches. *Chronicles of Oklahoma* 49:211-229.

Agogino, George A.
1961 A New Point Type from Hell Gap Valley, Eastern Wyoming. *American Antiquity* 26:558-560.

1969 The Midland Complex: Is it Valid? *American Anthropologist* 71:1117-1118.

1985 Detailed Analysis of a Human Skeleton from the Shore of Foss Reservoir, Custer County, Oklahoma. In *Salvage Excavations of Prehistoric Human Burials at Altus and Foss Reservoirs, Southwestern Oklahoma: 1980-1984*, edited by George Agogino et al. U.S. Bureau of Reclamation, Amarillo.

Agogino, George A., and Van Tries Button
1985 A Secondary Burial of Human Cranial Fragments from 34Gr6, a Prehistoric Cemetery on the Shoreline of Lake Altus, Greer County, Oklahoma. In *Salvage Excavations of Prehistoric Human Burials at Altus and Foss Reservoirs, Southwestern Oklahoma: 1980-1984*, edited by George Agogino et al. U.S. Bureau of Reclamation, Amarillo.

Agogino, George A. and Meeks Etchieson
1985 A Partial, Disturbed Burial from 34GR3, Lake Altus, Greer County, Oklahoma. In *Salvage Excavations of Prehistoric Human Burials at Altus and Foss Reservoirs, Southwestern Oklahoma: 1980-1984*, edited by George Agogino et al. U.S. Bureau of Reclamation, Amarillo.

Agogino, George A. and Bobbie Ferguson
1985 Capabilities and Approach of Physical Anthropology. In *Salvage Excavations of Prehistoric Human Burials at Altus and Foss Reservoirs, Southwestern Oklahoma, 1980-1984*, edited by George Agogino et al. U.S. Bureau of Reclamation, Amarillo.

Agogino, George A. and W. D. Frankforter
1960 A Paleo-Indian Bison-Kill in Northwestern Iowa. *American Antiquity* 25:414-415.

Agogino, George A. and Eugene Galloway
1965 The Sister's Hill Site. A Hell Gap Site in North-Central Wyoming. *Plains Anthropologist* 10:90-195.

Agogino, George A. and C. Vance Haynes
1966 Prehistoric Springs and Geochronology of the Clovis Site, New Mexico. *American Antiquity* 31:812-821.

Agogino, George A., D. K. Patterson, and D. E. Patterson
1976 Blackwater Draw Locality No. 1, South Bank: Report for the Summer of 1974. *Plains Anthropologist* 21:213-223.

Agogino, George A. and I. Rovner
1969 Preliminary Report of a Stratified Post-Folsom Sequence at Blackwater Locality No. 1. *American Antiquity* 34:175-176.

Agogino, George A., I. Rovner, and C. Irwin-Williams
1964 Early Man in the New World. *Science* 143(3612):1350-1352.

Agogino, George, Doug Boyd, Van Tries Button, Meeks Etchieson, and Bobbie Ferguson
1985 *Salvage Excavations of Prehistoric Human Burials at Altus and Foss Reservoirs, Southwestern Oklahoma, 1980-1984*. U.S. Bureau of Reclamation, Amarillo.

Aigner, Jean S. and Terry Del Bene
1982 Early Holocene Maritime Adaptation in the Aleutian Islands. In *Peopling of the New World*, edited by J. E. Ericson, R. E. Taylor, and R. Barger, pp. 35-68. Ballena Press Anthropological Papers 23, Los Altos.

Albert, Lois E.
1981 *Ferndale Bog and Natural Lake: Five Thousand Years of Environmental Change in Southeastern Oklahoma*. Oklahoma Archeological Survey, Studies in Oklahoma's Past 7, Norman.

1984 Survey of Archaeological Activity in Oklahoma. In *Prehistory of Oklahoma*, edited by R. E. Bell, pp. 45-63. Academic Press, New York.

Albert, Lois E. and Don G. Wyckoff
1984 Oklahoma Environments: Past and Present. In *Prehistory of Oklahoma*, edited by R. E. Bell, pp. 1-44. Academic Press, New York.

Albritton, C. C., Jr.
1966 Stratigraphy of the Domebo Site. *Contributions of the Museum of the Great Plains* 1:10-13.

1975 Stratigraphy of the Cooperton Site. *Great Plains Journal* 14:133-139.

Alexander, Herbert L.
1963 The Levis Site: A Paleo-Indian Campsite in Central Texas. *American Antiquity* 28:510-528.

Alexander, Robert K., J. D. Hartley, and T. F. Babcock
1982 *A Settlement Survey of the Fort Carson Military Reservation*. Grand River Consultants Report 7900. Submitted to Interagency Archeological Services, Denver.

Allred, B. W.
1956 Mixed Prairie in Texas. In *Grasslands of the Great Plains: Their Nature and Use*, by J. E. Weaver and F. W. Albertson. Johnson Publishing Company, Lincoln.

Anderson, Adrian D.
1975 The Cooperton Mammoth: An Early Man Bone Quarry. *Great Plains Journal* 14:130-173.

Anderson, Adrian D. and F. L. Chappibitty
1968 A Bison Kill from Domedo Canyon. *Great Plains Journal* 8:48-52.

Anderson, Duane C.
1966 The Gordon Creek Burial. *Southwestern Lore* 32:1-9.

Anderson, Duane C. and H. A. Semken, Jr.
1980 *The Cherokee Excavations, Holocene Ecology and Human Adaptations in Northwestern Iowa*. Academic Press, New York.

Anderson, Jane L.
1976 A Techno-Functional Analysis of the Flaked Lithic Materials from Three Woodland Period Sites on the High Plains, Southeastern Colorado. Unpublished Ms., Colorado Historical Society, Denver.

1985a Chronological Framework. In *A Chronological Framework of the Fort Carson Pinyon Canyon Maneuver Site, Las Animas County, Colorado*, edited by Christopher Lintz, pp. 14-52. Denver University, Center for Archaeological Research, Fort Carson Pinyon Canyon Cultural Resource Project Contribution 2.

1985b Regional Chronology. In *A Chronological Framework of the Fort Carson Pinyon Canyon Maneuver Site, Las Animas County, Colorado*, edited by C. R. Lintz, pp. 491-513. Denver University, Center for Archaeological Research, Fort Carson Pinyon Canyon Cultural Resource Project Contribution 3.

Anderson, Morris R. and David M. Hall
1977 *A Reconnaissance Survey of Archeological and Historical Site Densities in Six Alternative Flood Control Closures on Fountain Creek, Pueblo County, Colorado*. Laboratory of Contract Archeology, Trinidad State Junior College, Trinidad, Colorado.

Anderson, Jane L., Janet LeCompte, and Christopher Lintz
1986 *A Literature Review and Limited Archaeological Reconnaissance of Cultural Resources on the Banning Lewis Project Area, El Paso County, Colorado*. Pioneer Archaeological Consultants, Denver.

Angel, J. L.
1966 Porotic Hyperostosis, Anemias, Malarias, and Marshes in the Prehistoric Eastern Mediterranean. *Science* 153:760-763.

1967 Porotic Hyperostosis or Osteoporosis Symmetrica. In *Diseases in Antiquity*, edited by D. Brothwell and A. T. Sandison, pp. 1-12. C. C. Thomas, Springfield.

1978 Porotic Hyperostosis in the Eastern Mediterranean. *Medical College of Virginia Quarterly* 14:10-16.

Anonymous
1907 Kansa. *Bureau of American Ethnology, Bulletin* 30 (1):653-656.

Antevs, Ernst
1937 The Occurrence of Flints and Extinct Animals in Pluvial Deposits near Clovis, New Mexico, Part II—Age of the Clovis Lake Clays. *Proceedings of the Academy of Natural Sciences of Philadelphia* 87:304-312.

1949 Geology of the Clovis Sites. In *Ancient Man in North America*, by H. M. Wormington, pp. 185-192. Denver Museum of Natural History, Popular Series 4.

1955 Geologic - Climatic Dating in the West. *American Antiquity* 20:317-335.

Antle, H. R.
1934 Excavations of a Caddoan Earth Lodge. *Chronicles of Oklahoma* 12:444-446.

Arbingast, S. A., L. G. Kennames, R. H. Ryan, A. Lo, D. L. Karney, C. P. Zlatkovich, M. E. Bonine, and R. G. Steele
1973 *Atlas of Texas*. Bureau of Business Research, University of Texas, Austin.

Artz, Joe A.
1983 *Archeological Site Assessment at Kaw Lake, Kay and Osage Counties, Oklahoma: 1982*. Laboratory of Archeology, University of Tulsa.

1986a A Soil-Geomorphic Approach to Locating Buried Late Archaic Sites in Northeast Oklahoma. *American Archeology* 5:142-150.

1986b Geomorphic Setting and Alluvial Stratigraphy. In *The Prehistory and Paleoenvironment of Hominy Creek Valley: 1982-1983 Field Season*, assembled by Cherie Haury, pp. 5-23. Laboratory of Anthropology, University of Tulsa.

Baerreis, David A.
1951 *The Preceramic Horizons of Northeastern Oklahoma*. Museum of Anthropology, University of Michigan Anthropological Papers No. 6, Ann Arbor.

1953 Woodland Pottery of Northeastern Oklahoma. In *Prehistoric Pottery of the Eastern United States*, edited by J. B. Griffin. Museum of Anthropology, University of Michigan, Ann Arbor.

1959 The Archaic as Seen from the Ozark Region. *American Antiquity* 24:270-275.

Baerreis, David A. and Reid A. Bryson
1965 Historical Climatology and the Southern Plains: A Preliminary Statement. *Bulletin of the Oklahoma Anthropological Society* 13:69-75.

1966 Dating the Panhandle Aspect Cultures. *Bulletin of the Oklahoma Anthropological Society* 14:105-116.

Baird, Donald
1964/65 Some Eighteenth Century Gun Barrels from Osage Village Sites. *Great Plains Journal* 4:49-62.

Baird, W. David
1974 *The Osage*. Phoenix Books, Phoenix.

1980 *The Quapaw Indians: A History of the Downstream People*. University of Oklahoma Press, Norman.

Baker, Ele M. and Jewel A. Baker
1939a (Second) Quarterly Report (1939) West Texas State College WPA Archaeological Project. Ms. on file, Panhandle Plains Historical Museum, Canyon.

1939b (Third) Quarterly Report (1939) West Texas State College WPA Archaeological Project. Ms. on file, Panhandle Plains Historical Museum, Canyon.

1939c WPA - West Texas State College Archaeological Project, Quarterly Report, October 1, 1939 to December 1, 1939. Ms. on file, Panhandle Plains Historical Museum, Canyon.

1940a WPA - West Texas State College Archaeological Project, Quarterly Report, January 1, 1940 to March 1, 1940. Ms. on file, Panhandle Plains Historical Museum, Canyon.

1940b WPA - West Texas State College Archaeological Project, Quarterly Report, October 1, 1940 to December 31, 1940. Ms. on file, Panhandle Plains Historical Museum, Canyon.

1941 Final Report Archaeological Survey - O.P. 665-66-3-404, State Application 30976. Ms. on file, Panhandle Plains Historical Museum, Canyon.

Baker, Ele M.
1941 WPA - West Texas State College Archaeological Survey, Quarterly Report, April 1, 1941 to July 5, 1941. O.P. 165-1-66-447, WP-17589. Ms. on file, Panhandle Plains Historical Museum, Canyon.

Baker, T. Lindsay and Billy R. Harrison
1986 *Adobe Walls: The History and Archeology of the 1874 Trading Post*. Texas A&M University Press, College Station.

Baker, Thomas R.
1984 A Preliminary Discussion of an Archaeological Inventory Conducted at Concho Reservoir, San Miguel County, New Mexico. In *Papers of the Philmont Conference on Archaeology of Northeastern New Mexico*, edited by Carol Condie, pp. 233-250. New Mexico Archaeological Council Proceedings 6.

Baker, V. R. and M. M. Penteado-Orellana
1977 Adjustment to Quaternary Climatic Change by the Colorado River in Central Texas. *Journal of Geology* 85:395-422.

Baker, W. E. and T. N. Campbell
1960 Artifacts from Preceramic Sites in Northeastern and Southern New Mexico. *El Palacio* 67:78-86.

Baker, W. E., T. N. Campbell, and G. L. Evans
1957 The Nall Site: Evidence of Early Man in the Oklahoma Panhandle. *Bulletin of the Oklahoma Anthropological Society* 5:1-20.

Bamforth, Douglas B.
1985 The Technological Organization of Paleo-Indian Small Group Bison Hunting on the Llano Estacado. *Plains Anthropologist* 30:243-258.

Banks, Larry
1984 Lithic Resources and Quarries. In *Prehistory of Oklahoma*, edited by R.E. Bell, pp. 65-95. Academic Press, New York.

Bareis, Charles
1952 Two Historic Indian Burials from Pittsburg County, Oklahoma. *Chronicles of Oklahoma* 29:408-414.

Barr, Thomas
1951 Appraisal of the Archeological Resources of the Cedar Reservoir, Chase County, Kansas. Ms. on file, Kansas Historical Society, Topeka.

1964 *An Archeological Survey of the Birch Creek Reservoir*. Oklahoma River Basin Survey Project, General Survey Report 6. University of Oklahoma, Norman.

1965 A*rcheological Survey of the Lake of the Arbuckles Reservoir, Murray County, Oklahoma*. Oklahoma River Basin Survey, General Survey Report 5. University of Oklahoma, Norman.

1966a *Archaeological Survey of the Upper Elk Creek Watershed, Washita, Beckham, and Kiowa Counties*. Oklahoma River Basin Survey Project, General Survey Report 7. University of Oklahoma, Norman.

1966b *The Pruitt Site: A Late Plains Woodland Manifestation in Murray County, Oklahoma*. Oklahoma River Basin Survey Project, Archaeological Site Report 5. University of Oklahoma, Norman.

1969 The 1968 Archeological Work at Fort Hays and Fort Scott. *Kansas Anthropological Association Newsletter* 17(3):2.

1970a The 1969 Field Season at Old Fort Hays. *Kansas Anthropological Association Newsletter* 15(7):13.

1970b Fort Hays Archeology 1970. *Kansas Anthropological Association Newsletter* 16(4):12.

Bass, William M.
1959 Laboratory Notes on Burials from Ten Oklahoma Sites. Ms. on file, Department of Anthropology, University of Tennessee, Knoxville.

1964 The Variation in Physical Types of the Prehistoric Plains Indians. *Memoir 1, Plains Anthropologist* 9(24): 65-145.

1987 *Human Osteology*. 3rd ed. Missouri Archaeological Society, Columbia.

Bass, William M. and Walter H. Birkby
1962 A Human Calvarium from Foard County, Texas. *Transactions of the Kansas Academy of Science* 65:80-86.

Bass, William M. and Richard McWilliams
n.d. Analysis of Human Skeletal Material from 14Hp3, the Poundston Site, Harper County, Kansas. Ms. on file, Department of Anthropology, University of Tennessee, Knoxville.

Bass, W. M., R. McWilliams, and B. A. Jones
1967 Archeological Investigations at Five Sites in Lyon, Jefferson, and Phillips County, Kansas. *Transactions of the Kansas Academy of Science* 70:471-489.

Bass, William M. and Douglas H. Ubelaker
n.d. An Analysis of Skeletal Material from an Eighteenth Century Witchita Indian Village, the Longest Site, 34Jf1. Ms. on file, Department of Anthropology, University of Tennessee, Knoxville.

Bastian, Tyler
1964 Radiocarbon Date for an Archaic Site in Southwestern Oklahoma. *Oklahoma Anthropological Society Newsletter* 12(9):1-4.

1965 *An Archaeological Survey of the East Cache Creek Local Flood Protection Project, Comanche County, Oklahoma*. Museum of the Great Plains, Lawton.

1967 Recommendations for Salvage Archaeology in the Waurika Reservoir: Cotton, Jefferson, and Stephens Counties, Oklahoma. Ms. on file, Oklahoma Archeological Survey, Norman.

1969 *The Hudsonpillar and Freeman Sites North-Central Oklahoma*. Oklahoma River Basin Survey Project, Archaeological Site Report 14. University of Oklahoma, Norman.

Baugh, Susan
1986 Late Prehistoric Bison Distributions in Oklahoma. In *Current Trends in Southern Plains Archaeology*, edited by Timothy G. Baugh. *Memoir 21, Plains Anthropologist 31* (114, Part 2):83-96.

Baugh, Timothy G.
1986 Culture History and Protohistoric Societies in the Southern Plains. In *Current Trends in Southern Plains Archaeology*, edited by Timothy G. Baugh. *Memoir 21, Plains Anthropologist 31* (114, Part 2):167-187.

Baugh, Timothy G. (editor)
1982 *Edwards I (34Bk2): Southern Plains Adaptations in the Protohistoric Period*. Oklahoma Archaeological Survey, Studies in Oklahoma's Past No. 8, Norman.

1986 Current Trends in Southern Plains Archaeology. *Memoir 21, Plains Anthropologist 31* (114, Part 2).

Baugh, Timothy G. and Don G. Wyckoff
1982 The Southern Plains Environment. In *Edwards I (34BK2): Southern Plains Adaptations in the Protohistoric Period*, edited by T. G. Baugh, p. 1-50. Oklahoma Archeological Survey, Studies in Oklahoma's Past No. 8, Norman.

Bauxer, J. J.
1957 Yuchi Ethnoarchaeology. *Ethnohistory* 4:279-302, 369-464.

Beck, Colleen M.
1984 Results of an Archaeological Survey near Logan and Quay, New Mexico. In *Papers of the Philmont Conference on the Archeology of Northeastern New Mexico*, edited by Carol J. Condie, pp. 251-269. New Mexico Archaeological Council Proceedings 6.

Bell, Robert E.
1948 Caddoan Prehistory. *Bulletin of the Texas Archeological and Paleontological Society* 19:148-154.

1949 Recent Archeological Research in Oklahoma. *Chronicles of Oklahoma* 27:303-312.

1954a Excavations at Lake Texoma, Marshall County, Oklahoma. *Oklahoma Anthropological Society Newsletter* 3(3):2-3.

1954b Projectile Points from West-Central Oklahoma: Dan Base Collection. *Bulletin of the Oklahoma Anthropological Society* 2:11-18.

1958a Archaeological Investigations at the Boat Dock Site, Ma-1, in the Lake Texoma Area, Marshall County, Oklahoma. *Bulletin of the Oklahoma Anthropological Society* 6:37-47.

1958b *Guide to the Identification of Certain American Indian Projectile Points*. Oklahoma Anthropological Society, Special Bulletin 1.

1962 Precolumbian Prairie Settlement in the Great Plains. *Great Plains Journal* 2:22-28.

1968 Dating the Prehistory of Oklahoma. *Great Plains Journal* 7:1-11.

1973 The Washita River Focus of the Southern Plains. In *Variations in Anthropology, Essays in Honor of John C. McGregor*, edited by D. W. Lathrap and J. Douglas, pp. 171-188. Illinois Archaeological Survey, Urbana.

1978 *Oklahoma Archaeology: An Annotated Bibliography*. University of Oklahoma Press, Norman.

1980 *Oklahoma Indian Artifacts*. Contributions from the Stovall Museum, University of Oklahoma No. 4, Norman.

1981 Wichita Indians and the French Trade on the Oklahoma Frontier: 1719-1757. *Bulletin of the Oklahoma Anthropological Society* 30:11-17.

1984a The Plains Villagers: The Washita River. In *Prehistory of Oklahoma*, edited by Robert E. Bell, pp. 307-324. Academic Press, New York.

1984b Protohistoric Wichita. In *Prehistory of Oklahoma*, edited by Robert E. Bell, pp. 363-378. Academic Press, New York.

Bell, Robert E. (editor)
1984 *Prehistory of Oklahoma*. Academic Press, New York.

Bell, Robert E. and David Baerreis
1951 A Survey of Oklahoma Archaeology. *Bulletin of the Texas Archeological and Paleontological Society* 22:7-100.

Bell, Robert E. and Tyler Bastian
1967 Preliminary Report upon Excavations at the Longest Site, Oklahoma. In *A Pilot Study of Wichita Indian Archaeology and Ethnohistory*, assembled by R. E. Bell, E. B. Jelks, and W. W. Newcomb, pp. 119-127. Final Report to the NationalScience Foundation.

Bell, Robert E. and Robert L. Brooks
n.d. Southern Plains Villagers. In *Handbook of North American Indians, The Plains*, Vol. 13, edited by Raymond DeMallie (in preparation). Smithsonian Institution Press, Washington D.C.

Bell, Robert E., Edward B. Jelks, and W. W. Newcomb
1967 *A Pilot Study of Wichita Indian Archaeology and Ethnohistory*. Final Report to the National Science Foundation by Southern Methodist University, Dallas.

Benedict, James B.
1975 The Albion Boardinghouse Site: Archaic Occupation of a High Mountain Valley. *Southwestern Lore* 41(3):1-12.

1979 Getting Away From It All: A Study of Man, Mountains, and the Two-Drought Altithermal. *Southwestern Lore* 45(3):1-2.

1981 *The Fourth of July Valley Site*. Research Report No. 2. Center for Mountain Archaeology, Ward.

Benedict, James B. and B. L. Olson
1978 *The Mount Albion Complex: A Study of Prehistoric Man and the Altithermal*. Research Report 1, Center for Mountain Archaeology, Ward.

Bennett, John W.
1969 *Northern Plainsmen: Adaptive Strategy and Agrarian Life*. Aldine Publishing Company, Chicago.

Bennett, R. A.
1968 Dawson County Historical Burial. *Transactions of the Fourth Regional Archeological Symposium for Southeastern New Mexico and Western Texas*, p. 78.

Berry, B., C. Chapman, and J. Mack
1944 Archaeological Remains of the Osage. *American Antiquity* 10:1-12.

Berry, Brian
1967 *Geography of Market Centers and Retail Distribution*. Prentice-Hall, Englewood Cliffs, New Jersey.

Berry, J. B.
1936 The Missouri Indians. *Southwestern Social Science Quarterly* 17:113-124.

Berry, Joseph W.
1974 The Climate of Colorado. In *Climates of the States, Vol. II -Western States*, pp. 595-613. Officials of the National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Port Washington, New York.

Berthrong, Donald J.
1963 *The Southern Cheyennes*. University of Oklahoma Press, Norman.

Biesaart, L. A., W. R. Roberson and L. C. Spotts
1985 *Prehistoric Archeological Sites in Texas, a Statistical Overview*. Texas Historical Commission, Office of the State Archeologist Special Report 28, Austin.

Binford, Lewis R.
1964 A Consideration of Archaeological Research Design. *American Antiquity* 29:425-441.

1978 *Nunamiut Ethnoarchaeology*. Academic Press, New York.

1980 Willow Smoke and Dog's Tails: Hunter Gatherer Settlement Systems and Archaeological Site Formation Processes. *American Antiquity* 45:4-20.

1981 *Bones: Ancient Man and Modern Myths*. Academic Press, New York.

1983 Historical Archaeology: Is It Historical or Archaeological? In *Working at Archaeology*, edited by L. R. Binford, pp. 169-178. Academic Press, New York.

1986 Data, Relativism and Archaeological Science. *Man* 22:391-404.

Black, Craig C. (editor)
1974 History and Prehistory of the Lubbock Lake Site. *The Museum Journal* 15. West Texas Museum Association, Lubbock.

Blaine, Jay C.
1968 A Preliminary Report of an Early Man Site in West Texas. *Transactions of the Third Regional Archaeological Symposium for Southeastern New Mexico and Western Texas*, pp. 1-11. South Plains Archaeological Society, Lubbock.

Blaine, Jay C. and Fred Wendorf
1972 A Bone Needle from a Midland Site. *Plains Anthropologist* 17:50-51.

Blaine, Martha Royce
1979 *The Ioway Indians*. University of Oklahoma Press, Norman.

1982 The Wichita-Pawnee Visitation Cycle: Historic Manifestation of an Ancient Friendship. In *Pathways to Plains Prehistory: Anthropological Perspectives of Plains Natives and Their Pasts, Papers in Honor of Robert E. Bell*, edited by Don G. Wyckoff and Jack L. Hofman, pp. 113-134. Cross Timbers Press, Duncan.

Blair, W. F.
1950 The Biotic Provinces of Texas. *Texas Journal of Science* 2:93-116.

Blair, W. F. and T. H. Hubbell
1938 The Biotic Districts of Oklahoma. *American Midlands Naturalist* 20:425-454.

Blakeslee, Donald J.
1978 *The Central Plains Tradition: Internal Development and External Relationships*. Office of the Iowa StateArcheologist. University of Iowa, Report 11, Iowa City.

Blakeslee, Donald J. and Arthur Rohn
1982 *Man and Environment in Northeastern Kansas: The Hillsdale Lake Project*, Vols. 1-6. U.S. Army Corps of Engineers, Kansas City District, Kansas City.

Bolton, Herbert E.
1916 *Spanish Explorations in the Southwest, 1542-1706*. Charles Scribner's Sons, New York.

1949 *Coronado: Knight of Pueblos and Plains*. University of New Mexico Press, Albuquerque.

1987 *The Hasinais: Southern Caddoans as Seen by the Earliest Europeans*. University of Oklahoma Press, Norman.

Bolton, Herbert E. (editor)
1959 *Spanish Explorations in the Southwest: 1542-1706*. Reprint of 1916 volume. Barnes and Noble, New York.

Bond, Timothy A.
1966 *Palynology of Quaternary Terraces and Floodplains of the Washita and Red Rivers, Central and Southeastern Oklahoma*. Ph.D. dissertation, Department of Geology, University of Oklahoma, Norman.

Bonfield, William
1975 Deformation and Fracture Characteristics of the Cooperton Mammoth Bones. *Great Plains Journal* 14:158-164.

Bonnichsen, B. Robson
1979 *Pleistocene Bone Technology in the Beringian*. Refugium. National Museum of Man Mercury Series, Archaeological Survey of Canada Paper 89.

Bonnichsen, B. Robson and James Keyser
1982 Three Small Points: A Cody Complex Problem. *Plains Anthropologist* 27:137-144.

Bonnichsen, B. Robson and D. Young
1980 Early Technological Repertoires: Bone to Stone. *Canadian Journal of Anthropology* 1:123-128.

Borchert, J. R.
1950 The Climate of the Central North American Grassland. *Annals of the Association of American Geographers* 40:1-39.

Bousman, Britt
1978a Biotic Resources of the Fort Sill Area. In *Archaeological Reconnaissance of Fort Sill, Oklahoma*, assembled by C. R. Ferring. Contributions of the Museum of the Great Plains 6, Lawton.

1978b Data Base for Subsistence Model. In *Archaeological Reconnaisance of Fort Sill,Oklahoma*, assembled by C. R. Ferring. Contributions of the Museum of the Great Plains 6, Lawton.

Bovee, Dana L. and Douglas W. Owsley
1988 Evidence of Warfare at the Heerwald Site (34Cu27), Oklahoma. Paper delivered at the 46th Annual Plains Conference, Wichita, Kansas.

Bowers, Roger L.
1975 *Petrography and Petrogenesis of the Alibates Dolomite and Chert (Permian), Northern Panhandle of Texas*. Master's thesis, University of Texas at Arlington.

Bowman, Peter W.
1960 *Coal-Oil Canyon (14Lo1)*. Bulletin of the Kansas Anthropological Association 1.

Boyd, Douglas K.
1982 *The Little Axe Burial, Cleveland County, Oklahoma*. U.S. Bureau of Reclamation, Southwest Region, Amarillo.

1985 Human Skeletal Remains from 34Gr6, Greer County, Oklahoma. In *Salvage Excavations of Prehistoric Human Burials at Altus and Foss Reservoirs, Southwestern Oklahoma, 1980-1984*, edited by George Agogino et al. U.S.Bureau of Reclamation, Amarillo.

Bradley, B. A.
1982 Flaked Stone Technology and Typology. In *The Agate Basin Site: A Record of the Paleoindian Occupation of the Northwestern High Plains*, edited by G. C. Frison and D. J. Stanford, pp. 181-208. Academic Press, New York.

Bradley, B. A. and George C. Frison
1987 Projectile Points and Specialized Bifaces from the Horner Site. In *The Horner Site: The Type Site of the Cody Cultural Complex*, edited by G. C. Frison and L. C. Todd, pp. 199-231. Academic Press, Orlando.

Bradley, B. A. and D. J. Stanford
1987 The Claypool Study. In *The Horner Site: The Type Site of the Cody Cultural Complex*, edited by G. C. Frison and L. C. Todd, pp. 405-434. Academic Press, Orlando.

Bradley, L. E.
1973 *Subsistence Strategy at a Late Archaic Site in South-Central Kansas*. Master's thesis, University of Kansas, Lawrence.

Branson, Carl C. and Kenneth S. Johnson
1972 *Generalized Geologic Map of Oklahoma*. Oklahoma Geological Survey Educational Publication 1, Norman.

Breternitz, David A.
1971 Archaeological Investigations at the Wilbur Thones Shelter, Carr, Colorado. *Southwestern Lore* 36:53-99.

Breternitz, David A., A. C. Swedlund, and D. C. Anderson
1971 An Early Burial from Gordon Creek, Colorado. *American Antiquity* 40:86-94.

Briggs, John Ely
1969 Omaha, Oto, and Missouri. *Palimpsest* 50:219-221.

Brighton, Harold D.
1951 Archaeological Sites in Custer County, Oklahoma. *Bulletin of the Texas Archaeological and Paleontological Society* 22:164-187.

1952 The Archaeological Survey of the Keystone Reservoir: A Preliminary Report. Ms. on file, Oklahoma Archeological Survey, Norman.

Briscoe, James D.
1983 *An Archaeological Survey along Segments of the Geo-Seismic Services, Broken Leg Prospect Seismic Line No. 2*. Report submitted to the U.S. Forest Service, Cibola National Forest, Albuquerque.

1987 Radiocarbon Dates from the Swift Horse Site, 34RM501, Roger Mills County. *Oklahoma Anthropological Society Newsletter* 35(5):8-9.

Briscoe, James M. and Stanley D. Bussey
1988 *Archeological Survey and Testing at the Little Bird Homestead (34Wa-163) in Washita County, Oklahoma*. Report submitted to Helmerich and Payne, Oklahoma City.

Brockington, Paul E. (Editor)
1982 *Archaeological Investigations at El Dorado Lake, Butler County, Kansas* (Phase III). University of Kansas, Museum of Anthropology Project Report Series 51, Lawrence.

Brogan, W. T.
1979 1978 Investigations at Elk City Lake. *Kansas Anthropological Association Newsletter* 24(7-8):1-10.

1981a *1978 Archeological Investigations at Elk City Lake, Kansas*. Anthropology Department, Kansas State Historical Society, Topeka.

1981b *The Cuesta Phase: A Settlement Pattern Study*. Kansas State Historical Society Anthropological Series 9, Topeka.

1982 *The Roth Site: An Early Pomona Focus Manifestation in Eastern Kansas*. Kansas State Historical Society, Contract Archaeology Publication 1, Topeka.

Broilo, F. J.
1971 *An Investigation of Surface Collected Clovis, Folsom, and Midland Projectile Points from Blackwater Draw and Adjacent Localities*. Master's thesis, Department of Anthropology, Eastern New Mexico University, Portales.

Brooks, Robert L.
1983 Community Structure and Settlement Distributions in the Washita River Phase. Paper presented at the 41st annual Plains Conference, Rapid City.

1986 Resource Exploitation Practices of a Plains Village Society on the Cross Timbers-Mixed Grass Prairie Interface. Paper presented at the 10th annual Prairie Conference, Denton, Texas.

1987a Archaeology Past and Present: Contributions and Problems on the Southern Plains. In *Perspectives on Archaeological Resources Management in the Great Plains*, edited by A. J. Osborn and R. C. Hassler, pp. 369-384. I&O Press, Omaha.

1987b *The Arthur Site: Settlement and Subsistence Structure at a Washita River Phase Village*. Oklahoma Archeological Survey, Studies in Oklahoma's Past No. 15, Norman.

1988 Excavations at the Manwell Site: A Plains Village in North-Central Oklahoma. *Bulletin of the Oklahoma Anthropological Society* 37:151-190.

Brooks, Robert L. and Richard R. Drass
1984 Archeological Background. In *Contributions to Cross Timbers Prehistory*, edited by Patricia L. Kawecki and Don G. Wyckoff, pp. 21-34. Oklahoma Archeological Survey, Studies in Oklahoma's Past No. 12, Norman.

Brooks, Robert and Margaret Flynn
1988 Tx.-71: A Late Prehistoric Bison Processing Station in the Oklahoma Panhandle. *Plains Anthropologist* 33:467-487.

Brooks, Robert L., R. R. Drass, and F. E. Swenson
1985 *Prehistoric Farmers of the Washita River Valley: Settlement and Subsistence Patterns during the Plains Village Period*. Oklahoma Archaeological Survey Report 23, Norman.

Brown, A.
1973 *Bone Strontium Content as a Dietary Indicator in Human Skeletal Populations*. Ph.D. dissertation, University of Michigan, Ann Arbor

Brown, James A. and Robert K. Vierra
1983 What Happened in the Middle Archaic? Introduction to an Ecological Approach to Koster Site Archaeology. In *Archaic Hunters and Gatherers in the American Midwest*, edited by J. L. Phillips and J. A. Brown, pp. 165-195. Academic Press, New York.

Brown, Kenneth L.
1982 Archeological Testing of Historic Sites in the El Dorado Lake Area. In *Archeological Investigations at El Dorado Lake, Butler County, Kansas (Phase III)*, assembled by Paul E. Brockington, Jr., pp. 473-550. Museum of Anthropology, University of Kansas, Project Report Series 51, Lawrence.

1984 *Pomona: A Plains Village Variant in Eastern Kansas and Western Missouri*. Ph.D. dissertation, Department of Anthropology, University of Kansas, Lawrence.

Brown, Kenneth L. and Brad Logan
1986 The Distribution of Paleoindian Sites in Kansas. Paper presented at Midwest Friends of the Pleistocene, 33rd Field Conference.

Brown, Kenneth L. and A. H. Simmons
1987 *Kansas Prehistoric Archaeological Preservation Plan*. Office of Archaeological Research, Museum of Anthropology, and Center for Public Affairs, Lawrence.

Brown, Kenneth L. and Alan Ziegler (editors)
1981 *Prehistoric Cultural Resources wthin the Right-of-Way of the Proposed Little Blue River Channel, Jackson County, Missouri*. U.S. Army Corps of Engineers, Kansas City District.

Brues, Alice M.
1957 Skeletal Material from the Nagle Site. *Bulletin of the Oklahoma Anthropological Society* 5:93-99.

1962 Skeletal Material from the McLemore Site. *Bulletin of the Oklahoma Anthropological Society* 10:69-78.

1963 Skeletal Material from the Fred Loomis Site. *Bulletin of the Oklahoma Anthropological Society* 11:128.

Bruner, W. E.
1931 The Vegetation of Oklahoma. *Ecological Monographs* 1:99-188.

Bryan, A. L.
1978 *Early Man in America from a Circum-Pacific Perspective*. University of Alberta, Department of Anthropology, Occasional Papers 1, Edmonton.

Bryan, Frank
1938 A Review of the Geology of the Clovis Finds Reported by Howard and Cotter. *American Antiquity* 4:91-130.

Bryan, Kirk
1950 Flint Quarries - the Source of Tools and, at the Same Time, the Factories of the American Indian. *Papers of the Peabody Museum of American Archaeology and Ethnology* 17(3).

Bryant, V. M., Jr.
1977 A 16,000 Year Pollen Record of Vegetational Change in Central Texas. *Palynology* 1:143-156.

Bryson, R. A., D. A. Baerreis, and W. M. Wendlund
1970 Tentative Climatic Patterns for Some Late Glacial and Post-glacial Episodes in Central North America. In *Life, Land and Water*, edited by W. J. Mayer-Oakes, pp. 271-298. University of Manitoba Press, Winnepeg.

1970 The Character of Late Glacial and Post Glacial Climatic Changes. In *Pleistocene and Recent Environments of the Central Great Plains*, edited by W. R. Dort and J. K. Jones, Jr. pp. 53-77. University of Kansas Department of Geology, Publication 3, Lawrence.

Bryson, Reid A. and Thomas J. Murray
1977 *Climates of Hunger*. University of Wisconsin Press, Madison.

Buck, Dewey A., Jr.
1959 The Custer Focus of the Southern Plains. *Bulletin of the Oklahoma Anthropological Society* 7:1-31.

Buehler, Kent J.
1982 Spatial and Temporal Aspects of Prehistoric Chert Exploitation in North Central Oklahoma. In *Pathways to Plains Prehistory: Anthropological Perspectives of Plains Natives and Their Pasts*, edited by Don G. Wyckoff and Jack L. Hofman, pp. 77-86. Cross Timbers Press, Duncan.

1982 Survey of Selected Archaeological Sites in Pottawatomie and Pontotoc Counties: An Update. Ms. on file, Oklahoma Archeological Survey, University of Oklahoma, Norman.

Buikstra, Jane E.
1972a Osteology of an Osage Crevice Burial. In *An Historical-Cultural Assessment of the Skiatook Reservoir, Osage County, Oklahoma*, edited by Gregory Perino, pp. 48-53. U.S. Army Corps of Engineers, Tulsa District.

1972b Osteology of the Skeleton Found in Rock Shelter OS-106. In *An Historical-Cultural Assessment of the Skiatook Reservoir, Osage County, Oklahoma*, edited by Gregory Perino, pp. 54-73. U.S. Army Corps of Engineers, Tulsa District.

Burton, R. J. and S. S. Burton
1971 *An Archaeological Survey of the Lake Altus Shoreline, Greer and Kiowa Counties*. Oklahoma River Basin Survey Project, Archaeological Site Report 12, Norman.

Bushnell, D. I.
1927 Burials of the Algonquians, Siouans, and Caddoan Tribes. *Bureau of American Ethnology, Bulletin* 83:55-60.

Butler, B. Robert
1963 An Early Man Site at Big Camas Prairie, South-Central Idaho. *Tebiwa* 6:22-33.

Butler, B. Robert and R. J. Fitzwater
1965 A Further Note on the Clovis Site at Big Camas Prairie, South-Central Idaho. *Tebiwa* 8:38-40.

Butler, Barbara H.
1967 Skeletal Analysis of Burial from the Morgan Jones Site (X41CB2). In *Archeological Investigations in Crosby and Dickens Counties, Texas*, edited by Mark L. Parsons, pp. 105-108. State Building Commission Archeological Program No. 7, Austin.

Button, Van Tries and George Agogino
1986 *A Report on Additional Human Skeletal Material Exposed by Reservoir Induced Erosion at Lake Altus, Southwestern Oklahoma*. U.S. Bureau of Reclamation, Amarillo.

Callendar, Charles
1978a Shawnee. In *Handbook of North American Indians, The Northeast*, Vol. 15, edited by Bruce G. Trigger, pp. 622-635. Smithsonian Institution, Washington, D.C.

1978b Fox. In *Handbook of North American Indians, The Northeast*, Vol. 15, edited by Bruce G. Trigger, pp. 636-647. Smithsonian Institution, Washington, D.C.

1978c Sauk. In *Handbook of North American Indians, The Northeast*, Vol. 15, edited by Bruce G. Trigger, pp. 648-655. Smithsonian Institution, Washington, D.C.

Callendar, Charles, Richard K. Pope, and Susan M. Pope
1978 Kickapoo. In *Handbook of North American Indians, The Northeast*, Vol. 15, edited by Bruce G. Trigger, pp. 656-667. Smithsonian Institution, Washington, D.C.

Campbell, Lyle and Marianne Mithun
1979 *The Languages of Native America: Historical and Comparative Assessment*. University of Texas Press, Austin.

Campbell, Robert G.
1968 Dating Prehistoric Rock Art of Southeastern Colorado. *The Florida Anthropologis*t 21(1)

1969 *Prehistoric Panhandle Culture on the Chaquaqua Plateau, Southeast Colorado*. Ph.D. dissertation, University of Colorado. University Microfilms, Ann Arbor.

1976 *The Panhandle Aspect of the Chaquaqua Plateau*. Texas Tech, University Graduate Studies 11, Lubbock.

Campbell, T. N.
1961 Texas Archeology: A Guide to the Literature. *Bulletin of the Texas Archeological Society* 29:177-254.

Carmichael, David L.
1984 Lithic Procurement Activities Near Clayton, New Mexico. In *Papers of the Philmont Conference on the Archaeology of Northeastern New Mexico*, edited by Carol J. Condie, pp. 169-186. New Mexico Archaeological Council Proceedings 6.

Carney, Champ Clark
1961/62 The Historical Geography of the Chickasaw Lands of Oklahoma. *Dissertation Abstracts* 22:1575.

Carney, George O.
1981 *Cushing Oil Field: Historic Preservation Survey*. Department of Geography, Oklahoma State University, Stillwater.

Carter, T. C.
1942 A Preliminary Report of the Ellis County Skull. *Proceedings of the Oklahoma Academy of Science* 22:24-26.

Cashion, M. A.
1987 *A Diachronic Assessment of Stress Indicators in Three Plains American Indian Populations*. Master's thesis, Department of Geography and Anthropology, Louisiana State University, Baton Rouge.

Cassells, E. S.
1983 *The Archaeology of Colorado*. Johnson Books, Boulder.

Champe, John L.
1946 *Ash Hollow Cave: A Study of Stratigraphic Sequence in the Central Great Plains*. University of Nebraska Studies, New Series 1, Lincoln.

1949 White Cat Village. *American Antiquity* 14(4, Part 1): 285-292.

Chapman, Berlin B.
1938 Removal of the Osage from Kansas. *Kansas Historical Quarterly* 7:287-305.

1944 Dissolution of the Wichita Reservation. *Chronicles of Oklahoma* 22:192-209, 300-314.

1946 The Pottawatomie and Absentee Shawnee Reservation. *Chronicles of Oklahoma* 24:293-305.

1948 The Otoe and Missouria Reservation. *Chronicles of Oklahoma* 26:132-158.

1959 Oklahoma City, Public to Private Property, Part II. *Chronicles of Oklahoma* 37:336-353.

1960 Oklahoma City, Public to Private Property, Part III. *Chronicles of Oklahoma* 37:440-479.

1965 The Otoes and Missourias: A Study in Indian Removal and the Legal Aftermaths. *Oklahoma City Times Journal* 18.

1982 Cherokee Allotments in the Outlet. *Chronicles of Oklahoma* 59:401-421.

Chapman, Carl H.
1959/60 The Origin of the Osage Indian Tribe: An Ethnographical, Historical, and Archaeological Study. *Dissertation Abstracts* 20:1525.

1965 Continued Excavations on the Little Osage Indian Village Site in the Kaysinger Bluff Reservoir Area. *Plains Anthropologist* 10(51).

1982 Osage Indians in Missouri and Oklahoma, A.D. 1796-1825. In *Pathways to Plains Prehistory: Anthropological Perspectives of Plains Natives and Their Pasts, Papers in Honor of Robert E. Bell,* edited by Don G. Wyckoff and Jack L. Hofman, pp. 19-28. Cross Timbers Press, Duncan.

Chapman, Carl H. and Eleanor F. Chapman
1964 *Indians and Archaeology of Missouri*. University of Missouri Press, Columbia.

Chapman, F. H.
1972 Vertebral Osteophytosis in Prehistoric Populations of Central and Southern Mexico. *American Journal of Physical Anthropology* 36:31-38.

Chase, Hal and Robert Stigler
1949 Field Journal of the Columbia University High Plains Expedition. Ms. on file, Department of Anthropology, University of Denver.

Cheatum, Elmer
1976 Molluscan Fauna of the Gore Pit Site in Comanche County, Oklahoma. *Plains Anthropologist* 21(74):279-282.

Cheek, Annetta L.
1976 Excavations at Cd244 Caddo County, Oklahoma. Archeological Research Associates Research Report 8, Tulsa.

Clarke, David L.
1968 *Analytical Archaeology.* Columbia University Press, New York.

Clements, Forest
1945 Historical Sketch of Spiro Mound. *Contributions from the Museum of the American Indian* 14:48-69. Heye Foundation, New York.

Clifton, James A.
1978 Potawatomi. In *Handbook of North American Indians, The Northeast,* Vol. 15, edited by Bruce G. Trigger, pp. 725-742. Smithsonian Institution, Washington, D.C.

Collins, Michael B.
1968 *The Andrews Lake Locality: New Archeological Data from the Southern Llano Estacado, Texas*. Master's thesis, Department of Anthropology, University of Texas, Austin.

1971 A Review of Llano Estacado Archaeology and Ethnohistory. *Plains Anthropologist* 16(52):85-104.

Collins, Michael K.
1975 *Historic Artifacts from Choctaw Sites in Clarke and Jasper Counties, Mississippi*. Mississippi Department of Archives and History, Jackson, Mississippi.

Comas, Juan
1960 *Manual of Physical Anthropology.* Charles Thomas, Springfield.

Conkey, Margaret W.
1980 The Identification of Prehistoric Hunter-Gatherer Aggregation Sites: The Case for Altamira. *Current Anthropology* 21:609-630.

Conn, Richard G.
1955 *A Classification of Aboriginal North American Clothing*. Master's thesis, University of Washington, Seattle.

1986 *A Persistent Vision, Art of the Reservation Days: The L. D. and Ruth Box Collection of the Denver Art Museum.* Denver Art Museum, Denver.

Conners, Mrs. R. S., Mr. and Mrs. Rex Allison, and Frank A. Runkles
n.d. The Caprock Site: A Historic Indian Burial in Garza County, Texas. Unpublished Ms. on file with the Oklahoma Archeological Survey. Norman.

Cook, H. J.
1927 New Geological and Paleontological Evidence Bearing on the Antiquity of Mankind in America. *Natural History* 7:240-247.

Corbyn, Ronald C.
1974 *Applications of Archeology to Historical Work.* Oklahoma Museums Association Bulletin 2, Oklahoma City.

Cosgrove, C. B.
1947 Caves of the Upper Gila and Hueco Areas in New Mexico and Texas. *Papers of the Peabody Museum of American Archaeology and Ethnology* 24(2). Harvard University, Cambridge.

Cotter, John L.
1938 The Occurrence of Flints and Extinct Animals in Pluvial Deposits near Clovis, New Mexico, Part IV, Report on Excavation at the Gravel Pit, 1936. *Proceedings of the Philadephia Academy of Natural Sciences* 89:1-16.

Cotterill, R. S.
1954 *The Southern Indians*. University of Oklahoma Press, Norman.

Couzzourt, Jim
1985 Preliminary Report: Testing at the Tascosa Creek Site, Oldham County, Texas. *Transactions of the 20th Regional Archeological Symposium for Southeastern New Mexico and Western Texas,* pp. 65-141.

1988 Tascosa Creek Site. *The Transactions of the 23rd Regional Archeological Symposium for Southeastern New Mexico and Western Texas,* pp. 44-79.

Creel, Darrell
1980 *Results of a Non-Collective Archeological Survey at Buffalo Lake National Wildlife Refuge, Randall County, Texas*. Texas Antiquities Committee Inundation Study. Texas Historical Commission, Austin.

Crook, W. W., Jr. and R. K. Harris
1952 Trinity Aspect of the Archaic Horizon: The Carrollton and Elam Foci. *Bulletin of the Texas Archeological and Paleontological Society* 23:7-38.

1957 Hearths and Artifacts of Early Man Near Lewisville, Texas and Associated Faunal Material. *Bulletin of the Texas Archeological Society* 28:7-97.

1959 News: C-14 Date for Late Carrollton Focus Archaic Level: 6,000 B.P. *Oklahoma Anthropological Society Newsletter* 8(3):1-2.

1962 Significance of a New Radiocarbon Date from the Lewisville Site. *Bulletin of the Texas Archaeological Society* 32:327-330.

Crouch, Daniel J.
1978 *Archaeological Investigations of the Kiowa and Comanche Indian Agency Commissaries, 34-Cm-232*. Contributions of the Museum of the Great Plains 7, Lawton.

Curry, Billy R.
1974 The Climate of Oklahoma. In *Climates of the States, Vol. II -Western States*. The National Oceanic and Atmospheric Administration, U.S. Dept. of Commerce, Port Washington, New York.

Cushman, Horatio B.
1972 *History of the Choctaw, Chickasaw and Natchez Indians,* edited by Angie Debo. Russell and Russell, New York.

Dale, Vincent
1973 A Unique Vessel from the Oklahoma Panhandle. *Bulletin of the Oklahoma Anthropological Society* 21: 187-190.

Davis, E. Mott
1979 The First Quarter Century of the Texas Archeological Society. *Bulletin of the Texas Archeological Society* 50:159-194.

Davis, L. C.
1987 Late Pleistocene/Holocene Environmental Changes in the Central Plains of the United States: The Mammalian Record. In *Late Quaternary Mammalian Biogeography and Environments of the Great Plains and Prairies,* edited by R. W. Graham, H. A. Semeken, and M. A. Graham, pp. 88-143. Illinois State Museum, Springfield.

Davis, Leslie B., Sally T. Greiser, and Nicholas Toth
1985 Use-Wear Analyses of Paleoindian Unifaces from the Initial Late-Glacial Occupation at the Indian Creek Site. *Current Research in the Pleistocene* 2:45-46.

Davis, W. A.
1985 *Appraisal of the Archeological Resources of Sanford Reservoir, Hutchinson, Moore, and Potter Counties, Texas*. Panhandle Archeological Society Publication 3, Amarillo.

Davison, Claire C. and R. K. Harris
1974 Chemical Profile of Glass Trade Beads from Archeological Sites in Texas and Oklahoma. *Bulletin of the Oklahoma Anthropological Society* 45:209-217.

Dawson, Jerry and W. James Judge
1969 Paleo-Indian Sites and Topography in the Middle Rio Grande Valley of New Mexico. *Plains Anthropologist* 14:149-163.

Debo, Angie
1940 *And Still the Waters Run: The Betrayal of the Five Civilized Tribes*. Princeton University Press, Princeton.

1941 *The Road to Disappearance*. University of Oklahoma Press, Norman.

Deetz, James
1965 *The Dynamics of Stylistic Change in Arikara Ceramics*. Illinois Studies in Anthropology 4, Urbana.

Dennell, Robin
1983 *European Economic Prehistory: A New Approach*. Academic Press, New York.

1986 Needles and Spear-Throwers. *Natural History* 10(86):70-78.

Dibble, David S.
1970 On the Significance of Additional Radio-Carbon Dates from Bonfire Shelter, Texas. *Plains Anthropologist* 15:251-254.

Dibble, David S. and D. Loraine
1968 *Bonfire Shelter: A Stratified Bison Kill Site, Val Verde County, Texas*. Miscellaneous Papers 1, Texas Memorial Museum, Austin.

Dick, H. W. and B. Mountain
1960 The Claypool Site: A Cody Complex Site in Northeastern Colorado. *American Antiquity* 26:223-235.

Dickson, D. B.
1976 *Archeological Research at Fort Richardson State Park, Summer 1975*. Anthropology Laboratory, Texas A&M University, Report 28, College Station.

Dillehay, Tom D.
1974 Late Quaternary Bison Population Changes on the Southern Plains. *Plains Anthropologist* 19:180-196.

1986 The Cultural Relationships of Monte Verde: A Late Pleistocene Settlement Site in the Subantarctic Forest of South-Central Chile. In *New Evidence for the Pleistocene Peopling of the Americas,* edited by Alan Lyle Bryan, pp. 319-338. Center for the Study of Early Man, University of Maine at Orono.

Din, Gilbert and A. P. Nasatir
1983 *The Imperial Osages: Spanish-Indian Diplomacy in the Mississippi Valley*. University of Oklahoma Press, Norman.

Dort, W. R. Jr. and J. K. Jones, Jr. (editors)
1970 *Pleistocene and Recent Environments of the Central Great Plains*. University of Kansas Department of Geology, Publication 3, Lawrence.

Drass, Richard R.
1979 Roulston-Rogers: A Stratified Plains Woodland and Late Archaic Site in the Cross Timbers. *Bulletin of the Oklahoma Anthropological Society* 28:1-35.
1982 A Radiocarbon Date from the Brewer Site, 34Ml3. *Oklahoma Anthropological Society Newsletter* 30(7):2.

1984 The Barkheimer Site, 34Sm-29: A Late Archaic/Woodland Camp in Central Oklahoma. In *Contributions to Cross Timbers Prehistory*, edited by PatriciaKawecki and Don G. Wyckoff, pp. 149-230. Oklahoma Archaeological Survey, Studies in Oklahoma's Past 12, Norman.

1985 *Archeological Resources in the Bird Creek Basin*. Oklahoma Archeological Survey, Archeological Resource Survey Report 21, Norman.

1986 Early Prehistoric Adaptations to the Prairie/Cross Timbers in Oklahoma. Paper presented at the 10th annual Prairie Conference, Denton, Texas.

1988 A Reanalysis of the Brewer Site: An Early Plains Village Settlement in Central Oklahoma. *Bulletin of the Oklahoma Anthropological Society* 37:1-110.

Drass, Richard R. and Robert L. Brooks
1984 A Boatstone and Atlatl Hook from Central Oklahoma. *Oklahoma Anthropological Society Newsletter* 32(2):7-10.

Drass, Richard R. and Michael C. Moore
1987 The Linville II Site (34 Rm. 492) and Plains Village Manifestations in Far Western Oklahoma. *Plains Anthropologist* 32:404-418.

Drass, Richard R. and Fern Swenson
1986 Variation in the Washita River Phase of Central and Western Oklahoma. *Plains Anthropologist* 31:35-50.

Drass, Richard and Christopher L. Turner
1987 An Archeological Reconnaissance of the Wolf Creek Drainage Basin, Ellis County, Oklahoma. Ms. on file, Oklahoma Archeological Survey, Norman.

Drass, Richard R., Timothy G. Baugh, and Peggy Flynn
1987 The Heerwald Site and Early Plains Village Adaptations in the Southern Plains. *North American Archaeologist* 8:151-190.

Drew, Darrell L.
1979 Early Man in North America and Where to Look for Him: Geomorphic Contexts. *Plains Anthropologist* 24:269-281.

Duck, L. G. and J. B. Fletcher
1943 *A Game Type Map of Oklahoma*. State of Oklahoma Game and Fish Department, Oklahoma City.

Duffield, Lathel F.
1953 The Brewer Site: A Preliminary Report. *Bulletin of the Oklahoma Anthropological Society* 1:61-68.

1962 Archeology of the Sanford Reservoir in the Texas Panhandle. Abstract of a paper presented at the 19th Plains Conference, Lawrence. *Plains Anthropologist* 7(16):79.

1964 Three Panhandle Aspect Sites at Sanford Reservoir, Hutchinson County, Texas. *Bulletin of the Texas Archaeological Society* 35:19-81.

1965 The Taovayas Village of 1759: In Texas or Oklahoma? *Great Plains Journal* 4:39-48.

1970 *Some Panhandle Aspect Sites in Texas: Their Vertebrates and Paleoecology*. Ph.D. dissertation, University of Wisconsin, Madison.

Duffield, Lathel and Edward B. Jelks
1961 *The Pearson Site, a Historic Site in Iron Bridge Reservoir, Rains County, Texas*. Archeology Series 14. Department of Anthropology, University of Texas, Austin.

Duncan, Kelley C.
1977 *Cultural Resources in the Tulsa Urban Study Area*. Archeological Research Associates Research Report 14. Tulsa.

Durham, Dale
1974 The Oklahoma Anthropological Society Fall Dig at Fort Sill, Oklahoma. *Oklahoma Anthropological Society Newsletter* 22(1):2-8.

Durham, William H.
1981 Overview: Optimal Foraging Analysis in Human Ecology. In *Hunter-Gatherer Foraging Strategies*, edited by Bruce Winterhalder and Eric A. Smith, pp. 218-231. University of Chicago Press, Chicago.

Eagleton, N. Ethie
1955 An Historic Indian Cache in Pecos County. *Bulletin of the Texas Archeological Society* 26.

Earls, Amy C., Richard F. Carrillo, Nick Trierweiler, and John C. Acklen
1987 *Evaluation of Old Las Animas (5BN176), a Late Nineteenth Century Town on the Arkansas River, Bent County, Colorado*. Prepared by Mariah Associates, Albuquerque for the U.S. Army Corps of Engineers, Albuquerque District.

Early, Frank L.
1975 *The Great Pueblo Rebellion of 1680*. Museum of Anthropology, Arapahoe Community College, Littleton.

Earman, Marjorie Hammett
1979 A Preliminary Analysis of Human Remains from the Uncas Site. In *The Uncas Site: A Late Prehistoric Manifestation in the Southern Plains,* by Jerry R. Galm, p. 86. Archaeological Research and Management Center, Research Series 5, University of Oklahoma, Norman.

Eddy, Frank
1982 *The Cultural Resources Inventory of the John Martin Dam and Reservoir, Bent County, Colorado*. Report on file, State Historic Preservation Office, Colorado Historical Society, Denver.

Eddy, Frank W., P. D. Friedman, R. E. Oberlin, T. R. Farmer, D. L. Dahms, J. J. Reining, and B. Leichtman
1982 *The Cultural Resource Inventory of the John Martin Dam and Reservoir, Bent County, Colorado*. Report submitted to the U.S. Army Corps of Engineers, Albuquerque District. Science Applications, Golden.

Edwards, John
1932 The Choctaw Indians in the Middle of the Nineteenth Century. *Chronicles of Oklahoma* 10:392-425.

Eighmy, Jeffrey
1970 Edwards II: Report of an Excavation in Western Oklahoma. *Plains Anthropologist* 15:255-281.

1984 *Colorado Plains Prehistoric Context: For Management of Prehistoric Resources of the Colorado Plains*. Office of Archaeology and Historic Preservation, Colorado Historical Society, Denver.

El-Najjar, M. Y., B. Lozoff, and D. J. Ryan
1975 The Paleoepidemiology of Porotic Hyperostosis in the American Southwest: Radiological and Ecological Considerations. *American Journal of Roentgenology, Radium Therapy and Nuclear Medicine* 125:918-924.

Elam, Earl Henry
1971 *The History of the Wichita Indian Confederacy to 1868*. Ph.D. dissertation, Texas Technological University, Lubbock.

Elcock, D. G. and P. J. O'Brien
1979 *Cultural Resources Survey of Fall River Lake*. Report submitted to the U.S. Army Corps of Engineers, Tulsa District.

Ellifrit, Duane S.
1974 *Historic American Engineering Record: State of Oklahoma-Inventory*. School of Civil Engineering, Oklahoma State University, Stillwater, Oklahoma.

Eoff, John D. and Alfred E. Johnson
1967 An Archaeological Survey of the Fall River Watershed, Greenwood, Butler, and Chase Counties, South Central Kansas. Ms. on file. Smithsonian Institution River Basin Surveys, Washington D.C.

Erickson, Kenneth C.
1978 Hats and Boots. In *Some Regional and Temporal Aspects of the Cowboy Complex as seen in the Photographic Record,* pp. 1-11. *Wyoming Contributions to Anthropology* 1, Laramie.

Ericson, J. E., R. E. Taylor, and R. Berger (editors)
1982 *Peopling of the New World*. Anthropological Papers 23. Ballena Press, Los Altos.

Estep, Raymond
1960 Lieutenant William E. Burnet: Notes on the Removal of Indians from Texas to Indian Territory. *Chronicles of Oklahoma* 38:274-309.

1961 Lieutenant William E. Burnet: Notes on Removal of the Texas Indians and the Founding of Fort Cobb. *Chronicles of Oklahoma* 39:15-41.

Etchieson, Gerald M.
1979 *Archeological Investigations in the Crowell Reservoir Area, Cottle, Foard, King, and Knox Counties, Texas*. Archeological Research Laboratory, Killgore Research Center, West Texas State University, Canyon.

1981 *Archaeological Survey at Lake Meredith Recreation Area, Moore, and Potter Counties, Texas*. U.S. Department of the Interior, Water and Power Resources Service, Southwest Region, Amarillo, Texas.

Etchieson, Gerald M., Roberta D. Spear, and Jack T. Hughes
1977 *An Archeological Survey of Certain Tracts in and Near Caprock Canyon State Park in Eastern Briscoe County, Texas*. Archaeological Research Laboratory, Killgore Research Center, West Texas State Univesity, Canyon.

1979 *Archeological Investigations in the Crowell Reservoir Area, Cottle, Foard, King, and Knox Counties, Texas*. Report submitted to the U.S. Army Corps of Engineers, Tulsa District.

Evans, Glen L.
1956 Ceneozoic Geology. In *Eastern Llano Estacado and Adjoining Osage Plains. Guidebook, 1956 Spring Field Trip, pp. 16-26*. West Texas Geological Society and Lubbock Geological Society.

1951 Prehistoric Wells in Eastern New Mexico. *American Antiquity* 17:1-9.

Evans, Glen L. and John P. Brand
1956 *Eastern Llano Estacado and Adjoining Osage Plains. Guidebook, 1956 Spring Field Trip*. West Texas Geological Society and Lubbock Geological Society.

Ewers, John Canfield
1939 *Plains Indian Painting: A Description of an Aboriginal American Art*. Stanford University Press, Palo Alto.

1957 *Hair Pipes in Plains Indian Adornment*. Bureau of American Ethnology, Bulletin 164. Washington, D. C.

Eyerly, Thomas L.
1907 The Wolf Creek Expedition. *The Student Annual of the Canadian Academy* 11:3-17. Canadian, Texas.

1912 The Buried City of the Panhandle. *The Archaeological Bulletin* 3:1-5, Madison, Indiana.

Failor, Kenneth M. and Eleonora Hayden
1974 *Medals of the United States Mint*. U.S. Government Printing Office, Washington, D.C.

Fay, George
1971 *Treaties between the Potawatomie Tribe of Indians and the United States of America, 1789-1867*. University of Northern Colorado Museum of Anthropology Occasional Publication in Anthropology, Ethnology Series 19, Greeley.

Fay, Robert O.
1964 *The Blaine and Related Formations of Northwestern Oklahoma and Southern Kansas*, Bulletin of the Oklahoma Geological Survey Bulletin 98, Norman.

Feder, Norman
1962 Plains Indian Metalworking. *American Indian Tradition* 8(2-3).

Fehrenbach, T. R.
1974 *Comanches: The Destruction of a People*. Alfred A. Knopf, New York.

Fenneman, Nevin M.
1931 *Physiography of the Western United States*. McGraw-Hill, New York.

Ferring, C. Reid
1982 *The Late Holocene Prehistory of Delaware Canyon, Oklahoma*. Institute of Applied Sciences, North Texas State University, Denton.

1986 Late Holocene Cultural Ecology in the Southern Plains: Perspectives from Delaware Canyon, Oklahoma. In *Current Trends in Southern Plains Archaeology*, edited by Timothy G. Baugh, pp. 55-82. *Memoir 21, Plains Anthropologist* 31(114, Part 2):55-82.

Ferring, C. Reid (assembler)
1978 *An Archaeological Reconnaissance of Fort Sill, Oklahoma*. Contributions of the Museum of the Great Plains 6, Lawton.

Ferring, C. Reid (editor)
1987 *Late Quaternary Stratigraphy, Neotectonics and Geoarchaeology of Southwestern Oklahoma*. Guidebook of the Fifth Annual Field Trip, Friends of the Pleistocene.

Ferring, C. Reid, D. J. Crouch, and T. D. Spivey
1976 *An Archaeological Reconnaissance of the Salt Plains Area of Northwestern Oklahoma*. Contributions of the Museum of the Great Plains 4, Lawton.

Ferring, Reid and Timothy Perttula
1986 Defining the Provenance of Red-Slipped Pottery from Texas and Oklahoma by Petrographic Methods. Unpublished Ms., Oklahoma Archeological Survey, Norman.

Figgins, Jesse D.
1927 The Antiquity of Man in America. *Natural History* 27(3):220-239.

Fightmaster, Maxine
1972 Sacred Heart Mission among the Potawatomi Indians. *Chronicles of Oklahoma* 50:156-176.

Finnegan, Michael
1976 Walnut Creek Massacre: Identification and Analysis. *American Journal of Physical Anthropology* 45:737-742.

1979a Reports on Osteological Analysis of a Single Burial from a Middle Ceramic Period Site (14Rn306), Reno County, Kansas. *Journal of the Kansas Anthropological Association* 1:4-16.

1979b Preliminary Analysis of Skeletal Material from Site 14Ba401, Barber County, Kansas. Ms. on file, Kansas State Historical Society, Archeology Department, Topeka.

1980 Osteological Examination and Possible Historical Record from Site 14BT478, near Fort Zarah, Barton County, Kansas. *Journal of the Kansas Anthropological Society* 1:42-63.

Finney, F. F.
1957 The Kaw Indians and Their Indian Territory Agency. *Chronicles of Oklahoma*. 35:416-424.

Fite, Gilbert C.
1979 The Great Plains: Promises, Problems, and Prospects. In *The Great Plains: Environment and Culture*, edited by

Brian W. Blouet and Frederick C. Luebke, pp. 187-203. University of Nebraska Press, Lincoln.

Fitzhugh, William W.
1975 A Comparative Approach to Northern Maritime Adaptations. In *Prehistoric Maritime Adaptations of the Circumpolar Zone*, edited by W.W. Fitzhugh, pp. 339-386. Mouton, The Hague.

Flannery, Kent V.
1968 Archeological Systems Theory and Early Mesoamerica. In *Anthropological Archaeology in the Americas*, edited by Betty J. Meggers, pp. 67-87. Anthropological Society of Washington, Washington, D.C.

Fletcher, Alice C.
1907 Caddo. *Bureau of American Ethnology Bulletin* 30(1):179-182, Washington, D.C.

Fletcher, Alice C. and F. La Flesche
1906 The Omaha Tribe. *Bureau of American Ethnology, Annual Report* 27:137-157, Washington, D.C.

Flynn, Peggy
1983 Distribution of Prehistoric Bison Populations on the Southern Plains: A Test of Dillehay's Model. University of Oklahoma, Department of Anthropology, *Papers in Anthropology* 32:7-35, Norman.

1984 An Analysis of the 1973 Test Excavations at the Zimms Site (34RM72). In *Archaeology of the Mixed Grass Prairie Phase I: Quartermaster Creek*, edited by Timothy G. Baugh, pp. 215-290. Oklahoma Archaeological Survey, Archaeological Resource Survey Report 20, Norman.

1986 Analysis of Text Excavations at the Zimms Site (34RM72), Western Oklahoma. In *Current Trends in Southern Plains Archaeology*, edited by Timothy G. Baugh. *Memoir 21, Plains Anthropologist* 13 (114, Part 2):129-140.

Flynn, Peggy, Don G. Wyckoff, Brian Carter, Wakefield Dort, Larry Martin, and Larry Todd
1988 Beyond Clovis: A Glimpse from the Burnham Site? Paper presented at the 46th Plains Conference, Wichita.

Fontana, Bernard L.
1967 The Archaeology of Post 19th Century Ranches in the United States. *Historical Archaeology* 1.

Forbes, Jack D.
1960 *Apache, Navaho, and Spaniard*. University of Oklahoma Press, Norman.

Forbis, Richard G.
1968 Fletcher: A Paleo-Indian Site in Alberta. *American Antiquity* 33:1-10.

Forbis, Richard G. and John D. Sperry
1953 An Early Man Site in Montana. *American Antiquity* 18:127-133.

Ford, Richard I.
1972 Barter, Gift, or Violence: An Analysis of Tewa Intertribal Exchange. In *Social Exchange and Interaction*, edited by E. N. Wilmsen, pp. 21-45. Museum of Anthropology, University of Michigan, Anthropological Papers 46, Ann Arbor.

Foreman, Carolyn Thomas
1959 The Yuchi: Children of the Sun. *Chronicles of Oklahoma* 37:480-496.

Foreman, Grant
1930 *Indians and Pioneers: The Story of the American Southwest before 1830*. University of Oklahoma Press, Norman.

1934 *The Five Civilized Tribes*. University of Oklahoma Press, Norman.

Forrester, Robert E., Jr.
1951 A Series of Eighteen Indian Skeletons Excavated in Shackelford County, Texas. *Bulletin of the Texas Archeological and Paleontological Society* 22:132-143.

Fox, Ann
1976 A*rchaeological Investigations at Fort Griffin State Historic Park, Shakleford County, Texas*. Center for Archaeological Research, The University of Texas at San Antonio, Archaeological Survey Report 23, San Antonio.

Fox, Daniel E.
1983 *Traces of Texas History: Archeological Evidence of the Past 450 Years*. Corona Publishing Company, San Antonio.

France, D. L.
1983 *Sexual Dimorphism in the Human Humerus*. Ph.D. dissertation, University of Colorado, Department of Anthropology, Boulder.

Frantz, Wendell
1964 1963 Excavations in the Elk City Reservoir. *Kansas Anthropological Association Newsletter* 9(6):1-4.

Frayer, D. W.
1980 Sexual Dimorphism and Cultural Evolution in the Late Pleistocene and Holocene of Europe. *Journal of Human Evolution* 9:399-415.

Fredlund, D.
1969 Vision Quest Sites and Structures. *Archeology in Montana* 10:14-52.

Freeman, Ethel Cutler
1964 The Least Known of the Five Civilized Tribes: The Seminoles of Oklahoma. *Florida Anthropologist* 17:139-152.

Frison, George C.
1973 The Plains. In *The Development of North American Archaeology*, edited by J. E. Fitting, pp. 151-184. Anchor Press/Doubleday, Garden City.

1974 *The Casper Site: A Hell Gap Bison Kill on the High Plains*. Academic Press, New York.

1976 Cultural Activity Associated with Prehistoric Mammoth Butchering. *Science* 194:728-730.

1978 *Prehistoric Hunters on the High Plains*. Academic Press, New York.

1982a Paleo-Indian Winter Subsistence Strategies on the High Plains. In *Plains Indian Studies,* edited by D. H. Ubelaker and H. J. Viola, pp. 193-201. Smithsonian Contributions to Anthropology 30, Washington, D.C.

1982b Folsom Components. In *The Agate Basin Site: A Record of the Paleoindian Occupation of the Northwestern High Plains,* edited by G. C. Frison and O. J. Stanford, pp. 76-77. Academic Press, New York.

1984 The Carter/Kerr-McGee Paleoindian Site: Cultural Resource Management and Archaeological Research. *American Antiquity* 49:288-314.

1986 The Goshen Paleoindian Cultural Complex: A Possible Clovis Variant and the Technological Predecessor of Folsom. Paper presented at the 44th Plains Conference, Denver.

1987a The Tool Assemblage, Unfinished Bifaces, and Stone Flaking Material Sources for The Horner Site. In *The Horner Site: The Type Site of the Cody Cultural Complex*, edited by G. C. Frison and L. C. Todd, pp. 233-278. Academic Press, Orlando.

1987b Prehistoric, Plains-Mountain, Large-Mammal, Communal Hunting Strategies. In *The Evolution of Human Hunting*, edited by M. H. Nitecki and D. V. Nitecki, pp. 177-223. Plenum Press, New York.

Frison, George C. and Bruce A. Bradley
1980 *Folsom Tools and Technology at the Hanson Site, Wyoming*. University of New Mexico Press, Albuquerque.

1982 Fluting of Folsom Projectile Points. In *The Agate Basin Site: A Record of the Paleo-Indian Occupation of the Northwestern High Plains*, edited by G. C. Frison and O. J. Stanford, pp. 209-212. Academic Press, New York.

Frison, George C. and Donald C. Grey
1980 Pryor Stemmed: A Specialized Paleo-Indian Ecological Adaptation. *Plains Anthropologist* 25:27-46.

Frison, George C. and Dennis J. Stanford (editors)
1982 *The Agate Basin Site: A Record of Paleoindian Occupation of the Northwestern High Plains*. Academic Press, New York.

Frison, George C. and L. C. Todd (editors)
1986 *The Colby Site: Taphonomy and Archaeology of a Clovis Kill in Northern Wyoming*. University of New Mexico Press, Albuquerque.

1987 *The Horner Site, the Type Site of the Cody Cultural Complex*. Academic Press, Orlando.

Frison, George C., M. Wilson, and D. J. Wilson
1976 Fossil Bison and Artifacts from an Early Altithermal Period Arroyo Trap in Wyoming. *American Antiquity* 4:28-57.

Frison, George C. and G. M. Zeimens
1982 Bone Projectice Points: An Addition to the Folsom Cultural Complex. *American Antiquity* 45(2):231-237.

Frye, J. C. and A. B. Leonard
1957 Studies of Cenozoic Geology along the Eastern Margin of Texas High Plains, Armstrong to Howard Counties. University of Texas Bureau of Economic Geology, *Report of Investigations* 32:1-62, Austin.

1965 Quaternary of the Southern Great Plains. In *The Quaternary of the United States*, edited by H. E. Wright, Jr. and D. G. Frey, pp. 203-216. Princeton University Press, Princeton.

Fulgham, T. and D. Stanford
1982 The Frasca Site: A Preliminary Report. *Southwestern Lore* 48:1-9.

Fulmer, D. W.
1976 *Archaeological Excavations within the El Dorado Reservoir Area, Kansas, 1974*. U.S. Department of the

Interior, National Park Service, Interagency Archaeological Services, Denver.

1977 *Archeological Investigations in the El Dorado Reservoir Area, Kansas (1975)*. University of Kansas Museum of Anthropology, Lawrence.

Gage, Timothy
1979 The Competitive Interactions of Man and Deer in Prehistoric California. *Human Ecology* 7:253-268.

Gallaher, Art
1951 The Goodman I Site, Cuter County, Oklahoma. *Bulletin of the Texas Archaeological and Paleontological Society* 22:18-216.

Galm, Jerry
1979a *A Cultural Resource Survey and Assessment of Proposed Multi-Purpose Structure 17M of the Cherokee Sandy Watershed, Garvin County, Oklahoma*. Archeological Research and Management Center, University of Oklahoma, Norman.

1979b *The Uncas Site: A Late Prehistoric Manifestation in the Southern Plains*. Archaeological Research and Management Center, University of Oklahoma, Research Series 5, Norman.

Gamble, Clive
1982 Interaction and Alliance in Paleolithic Society. *Man* 17:92-107.

Gardner, William M.
1974 *The Flint Run Paleo-Indian Complex: A Preliminary Report 1971-1973 Seasons*. Department of Anthropology, Catholic University of America, Occasional Paper 1, Washington, D.C.

Gebhard, Paul H.
1943 *The Excavation of an Archaeological Site on the Purgatorie River, Southeast Colorado*. Papers of the Excavator's Club 2(2), Cambridge.

1949 An Archaeological Survey of the Blowouts of Yuma County, Colorado. *American Antiquity* 15:132-143.

George, Preston
1981 An Oblique Parallel-Flaked Point Section Found in Oklahoma. *Oklahoma Anthropological Society Newsletter* 29(6):10-12.

1982 *Kaw Lake Shoreline Archeology in 1979*. Oklahoma Archeological Survey, Archeological Survey Resource Report 14, Norman.

Gettys, Marshall
1984 Early Specialized Hunters. In *Prehistory of Oklahoma*, edited by R. E. Bell, pp. 97-108, Academic Press, Orlando.

Gettys, Marshall, Robert Layhe, and Sheila Bobalik
1976 *Birch Creek and Skiatook Reservoirs: Preliminary Report upon Archeological Investigations in 1974*. Oklahoma River Basin Survey Project, Archeological Site Report 31, University of Oklahoma, Norman.

Gibson, Arrell M.
1961 An Indian Territory United Nations: The Creek Council of 1845. *Chronicles of Oklahoma* 39:398-413.

1963 *The Kickapoos; Lords of the Middle Border*. University of Oklahoma Press, Norman.

1971a *The Chickasaws*. University of Oklahoma Press, Norman.

1971b Chickasaw Ethnography: An Ethnohistorical Reconstruction. *Ethnohistory* 18:99-118.

Gilmore, Kathleen K.
1967 *A Documentary and Archeological Investigation of Presidio San Luis de las Amarillas and Mission Santa Cruz de San Saba*. State Building Commission Archeological Program 9, Austin.

Goddard, Ives
1978 Delaware. In *Handbook of North American Indians, The Northeast*, Vol. 15, edited by B. G. Trigger, pp. 213-239. Smithsonian Institution, Washington, D.C.

Goldstein, Marcus
1934 Anthropometry of the Comanche. *American Journal of Physical Anthropology* 19:289-319.

Good, Mary E.
n.d. Historical Assessment for the Denison Dam (Lake Texoma) Restudy. Ms. on file, Oklahoma Archeological Survey, Norman.

1971 Osage in Oklahoma: 1802-1840. *Bulletin of the Oklahoma Anthropological Society* 20:99-100.

Goodman, James M.
1977 Physical Environments of Oklahoma. In *Geography of Oklahoma*, edited by John W. Morris, pp. 9-24. Oklahoma Historical Society, Oklahoma City.

Goodyear, Albert C.
1979 *A Hypothesis for the Use of Cryptocrystalline Raw Materials among Paleo-Indian Groups of North America*. Research Manuscript Series 156. Institute of Archeology and Anthropology, University of South Carolina, Columbia.

1982 The Chronological Position of the Dalton Horizon in the Southeastern United States. *American Antiquity* 47:382-395.

Goss, D. W., A. R. Ross, P. B. Allen, and J. W. Naney
1972 Geomorphology of the Central Washita River Basin. *Proceedings of the Oklahoma Academy of Science* 52:145-159.

Gould, C. N.
1929a Fossil Bones and Artifacts at Frederick, Oklahoma. *Proceedings of the Oklahoma Academy of Science* 9:90.

1929b On the Recent Finding of Another Flint Arrowhead in the Pleistocene at Frederick, Oklahoma. *Journal of the Washington Academy of Sciences* 19:66-68.

Gould, Richard R.
1975 *An Archaeological Survey of the Bluff Creek Drainage System*. Master's thesis, Department of Anthropology, Wichita State University, Wichita.

Graebner, N. A.
1945a Pioneer Indian Agriculture in Oklahoma. *Chronicles of Oklahoma* 23:232-248.

1945b The Public Land Policy of the Five Civilized Tribes. *Chronicles of Oklahoma* 23:107-118.

Graham, R. W.
1976 *Pleistocene and Holocene Mammals, Taphonomy, and Paleoecology of the Friesenhahn Cave Local Fauna, Bexar County, Texas*. Ph.D. dissertation, University of Texas, Austin.

1979 Paleoclimates and Late Pleistocene Faunal Provinces in North America. In *Pre-Llano Cultures of the Americas: Paradoxes and Possibilities*, edited by R. L. Humphrey and D. J. Stanford, pp. 49-64. The Anthropological Society of Washington, Washington, D.C.

1985 Diversity and Community Structure of the Late Pleistoncene Mammal Fauna of North America. *Acta Zool. Fenn*. 170:181-182.

1986 Plant-Animal Interactions and Pleistocene Extinctions. In *Dynamics of Extinction*, edited by D. K. Elliot, pp. 131-154. John Wiley and Sons, New York.

Graham, Russell W. and Mary Ann Graham
1986 Vision Quests: An Alternative Hypothesis for Signal Fires along Seminole Canyon, Val Verde County, Texas. *Plains Anthropologist* 31:73-76.

Graham, R. W. and E. L. Lundelius, Jr.
1984 Coevolutionary Disequilibrium and Pleistocene Extinctions. In *Quaternary Extinctions: A Prehistoric Revolution,* edited by P. S. Martin and R. G. Klein, pp. 223-299. The University of Arizona Press, Tucson.

Gramly, Richard Michael
1982 The Vail Site: A Paleo-Indian Encampment in Maine. *Bulletin of The Buffalo Society of Natural Sciences* 30.

Grange, R. T., Jr.
1962/63 Ceramic Relationships in the Central Plains. *Dissertation Abstracts* 23:1335-1336.

1963 Pawnee Pottery Sequences: An Interpretation. Abstract of a paper presented at the 20th Plains Conference, Lincoln. *Plains Anthropologist* 8(20):126.

1968 *Pawnee and Lower Loup Pottery*. Nebraska Historical Society, Publications in Anthropology 3, Lincoln.

1980 *Archeological Investigations in the Red Willow Reservoir*. Nebraska State Historical Society Publications in Anthropology 9, Lincoln.

Grayson, Don K.
1984 *The Establishment of Human Antiquity*. Academic Press, Orlando.

Green, F. Earl
1961 Archaeological Survey of the White River Reservoir Area, Crosby County, Texas. Ms. on file, Texas Tech University, Lubbock.

1962 Additional Notes on Prehistoric Wells at the Clovis Site. *American Antiquity* 28:230-234.

1963 The Clovis Blades: An Important Addition to the Llano Complex. *American Antiquity* 29:145-165.

1967 *Archeological Salvage in the Sanford Reservoir Area*. National Park Service Report #14-10-0333-1126. Alibates National Monument, Texas.

Green, F. Earl and Jane H. Kelly
1960 Comments on Alibates Flint. *American Antiquity* 25:413-414.

Gregg, John B. and P. S. Gregg
1987 *Dry Bones: Dakota Territory Reflected*. Sioux Printing, Sioux Falls.

Gregory, Hiram Ford (editor)
1983 *A Caddo Sourcebook*. Garland Publishing, New York.

Greiser, Sally Thompson
1985 Predictive Models of Hunter-Gatherer Subsistence and Settlement Strategies on the Central High Plains. *Memoir 20, Plains Anthropologist Memoir* 30(110, Part 2).

Griffith, W. J.
1954 The Hasinai Indians of East Texas as Seen by Europeans, 1687-1772. *Middle American Research Institute, Philological and Documentary Studies* 2:43-165.

Grinnell, George B.
1972 *The Cheyenne Indians: Their History and Ways of Life*. University of Nebraska Press, Lincoln. (reprint, 2 vols.)

Grosser, R. D.
1970 *The Snyder Site: An Archaic-Woodland Occupation in South-Central Kansas*. Master's thesis, Department of Anthropology, University of Kansas, Lawrence.

1973 A Tentative Cultural Sequence for the Snyder Site, Kansas. *Plains Anthropologist* 18:228-238.

1977 *Late Archaic Subsistence Patterns from the Great Plains: A Systemic Model*. Ph.D. dissertation, University of Kansas, Lawrence.

Guffee, Eddie J.
1976 *The Merrell-Taylor Village Site: An Archeological Investigation of Pre-Anglo, Spanish-Mexican Occupation on Quitaque Creek in Floyd County, Texas*. Archeological Research Laboratory, Llano Estacado Museum, Wayland Baptist College Plainview.

1979 *The Plainview Site: Relocation and Archeological Investigation of a Late Paleo-Indian Kill Site in Hale County, Texas*. Archeological Research Laboratory, Llano Estacado Museum. Plainview.

1980 *The Soda Lake Ruins: An Archaeological Investigation of Anglo Occupation in the Sandhills of Lamb County, Texas*. Archeological Research Laboratory, Llano Estacado Museum, Wayland Baptist College, Plainview.

Guidry, Marion et al.
1979 *An Environmental Profile of the Palo Duro Creek Basin*. Kilgore Research Institute, West Texas State University. Report submitted to the U.S. Army Corps of Engineers, Contract No. DAC-W56-78-C-0203.

Gunnerson, Dolores A.
1974 *The Jicarilla Apaches: A Study in Survival*. Northern Illinois University Press, De Kalb.

Gunnerson, James H.
1960 *An Introduction to Plains Apache Archaeology: The Dismal River Aspect*. Bureau of American Ethnology, Bulletin 173, Washington, D.C.

1968 Plains Apache Archaeology: A Review. *Plains Anthropologist* 13:167-189.

1969 Apache Archaeology in Northeastern New Mexico. *American Antiquity* 34:23-39.

1979 Southern Athapaskan Archaeology. In *Handbook of North American Indians,The Southwest*, Volume 9, edited by A. Ortiz, pp. 162-170. Smithsonian Institution, Washington, D.C.

1984 Documentary Clues and Northeastern New Mexico Archaeology. In *Papers of the Philmont Conference*, edited by Carol J. Condie, pp. 43-76. New Mexico Archaeological Council Proceedings 6.

1987 *Archaeology of the High Plains*. Bureau of Land Management, Cultural Resource Series 9, Denver

Gunnerson, James H. and Dolores A. Gunnerson
1970 Evidence of Apaches at Pecos. *El Palacio* 76:1-6.

1971 Apachean Culture: A Study in Unity and Diversity. In *Apachean Culture History and Ethnology*, edited by Keith H. Basso and Morris E. Opler, pp. 7-27. Anthropological Papers of the University of Arizona 21, Tucson.

Gunnerson, Scott
1969 A Human Skeleton from an Apache Baking Pit. *Plains Anthropologist* 14:46-56.

Guthrie, R. Dale
1984 Mosaics, Allelochemics and Nutrients, an Ecological Theory of Late Pleistocene Megafaunal Extinctions. In *Quaternary Extinctions, a Prehistoric Revolution*, edited by P. S. Martin and R. G. Klein, pp. 259-298. University of Arizona Press, Tucson.

Habicht-Mauche, Judith A.
1987 Southwestern-Style Culinary Ceramics on the Southern Plains: A Case Study of Technological Innovation and Cross-Cultural Interaction. *Plains Anthropologist* 32:175-189.

Habicht-Mauche, Judith A., Alytia A. Levendosky, and Margaret Schoeninger
1988 Testing Models of Antelope Creek Phase Subsistence Using Bone Chemistry Analysis. Paper delivered at the 46th Plains Conference, Wichita.

Hackenberger, Steven and Britt Bousman
1978 Resource Utilization and Hunter-Gatherer Demography: An Application of Jochim's Model. In *An Archaeological Reconnaissance of Fort Sill, Oklahoma*, assembled by C. Reid Ferring, pp. 212-234. Contributions of the Museum of the Great Plains 6, Lawton.

Hagan, W. T.
1958 *The Sac and Fox Indians*. University of Oklahoma Press, Norman.

Hagar, Ivol K.
1976 5CR1 — Draper Cave Excavation and Research Report. *Southwestern Lore* 42:1-13.

Hail, Barbara
1980 *Hau Kola!: The Plains Indian Collection of the Haffenraffer Museum of Anthropology*. Brown University. Bristol.

Hale, Duane
1975 *Fort Holmes: An Exercise in Historic Site Archeology, Hughes County, Oklahoma, A Preliminary Report*. University of Oklahoma, Anthropology Department, Norman.

Hall, E. T.
1938 Canadian River Rock Shelters. Ms. on file, Laboratory of Anthropology, Museum of New Mexico, Santa Fe.

Hall, Stephen A.
1982 Late Holocene Paleoecology of the Southern High Plains. *Quaternary Research* 17:391-407.

1983 Geology and Holocene Sediments and Buried Trees of Carnegie Canyon. In *The Geomorphology and Archaeology of Carnegie Canyon, Ft. Cobb Laterals Watershed, Caddo Co., Oklahoma,* by Christopher Lintz and Stephen A. Hall, pp. 15-46. Oklahoma Conservation Commission, Archaeological Research Report 10.

1985 Quaternary Pollen Analysis and Vegetational History of the Southwest. In *Pollen Records of Late-Quaternary North American Sediments*, edited by V. M. Bryant, Jr., and R. G. Holloway, pp. 95-123. American Association of Stratigraphic Palynologists Foundation.

1988 Environment and Archaeology of the Central Osage Plains. *Plains Anthropologist* 33:203-217.

Hamilton, M.
1975 *Variation among Five Groups of Amerindians in the Magnitude of Sexual Dimorphism*. Ph.D. dissertation, University of Michigan, Ann Arbor.

Hammack, L. C.
1965 *Archaeology of the Ute Dam and Reservoir*. Museum of New Mexico Papers in Anthropology 14, Santa Fe.

Hammatt, Hallet H.
1970 A Paleo-Indian Butchering Kit. *American Antiquity* 35:141-152.

1976 The Gore Pit Site: An Archaic Occupation in Southwestern Oklahoma and a Review of the Archaic Stage in the Southern Plains. *Plains Anthropologist* 21:245-277.

Harris, Arthur
1985 *Late Pleistocene Vertebrate Paleoecology of the West*. University of Texas Press, Austin.

Harris, R. K.
1936 Indian Campsites of the Upper Trinity Drainage. *Bulletin of the Texas Archaeological and Paleontological Society* 8:113-133.

1945 Bone Implement Burial, Collin County, Texas. *Bulletin of the Texas Archeological and Paleontological Society* 16:84-89.

1959 C-14 Date on Henrietta Focus in Texas. *Oklahoma Anthropological Society Newsletter* 8(3):2.

Harris, R. K. and Inus Marie Harris
1961 Spanish Fort, a Historic Trade Site. *The Record, Journal of the Dallas Archeological Society* 16:2-5.

1967 Trade Beads, Projectile Points and Knives. In *A Pilot Study of Wichita Indian Archeology and Ethnohistory*, edited by R. E. Bell, E. Jelks, and W. W. Newcomb, pp.129-162. Report submitted to the National Science Foundation by Southern Methodist University, Dallas.

Harrison, Billy and Bob T. Griffin
1973 An Infant Burial in the Texas Panhandle. *Bulletin of the Texas Archeological Society* 44:45-68.

Harrison, Billy R. and K. L. Killen
1978 *Lake Theo: A Stratified Early Man Bison Butchering and Camp Site, Briscoe County, Texas*. Panhandle-Plains Historical Museum, Special Archaeological Report 1, Canyon.

Harrison, Billy R. and Henry C. Smith
1975 A Test Excavation at the Lake Theo Site, Briscoe County, Texas. *Plains-Panhandle Historical Review* 48:70-108.

Hart, Herbert M.
1980 *Tour Guide to Old Western Forts*. Pruett Publishing, Boulder.

Hartley, John D.
1974a *The Von Elm Site: An Early Plains-Woodland Complex in North-Central Oklahoma*. Oklahoma River Basin Survey Project, Archaeological Site Report 28, University of Oklahoma, Norman.

1974b *A Report on Excavations in the Waurika Reservoir, Jefferson County, Oklahoma*. Oklahoma River Basin SurveyProject, Archeological Site Report 36, University of Oklahoma, Norman.

1975 *Kaw Reservoir: The Northern Section*. Oklahoma River Basin Survey Project, Archeological Site Report 26, University of Oklahoma, Norman.

1976 *A Resurvey and Assessment of the Prehistoric Resources of Arcadia Lake, Oklahoma County, Okahoma*. Oklahoma River Basin Survey Project, General Survey Report 16, University of Oklahoma, Norman.

Hartley, John D. and A. F. Miller
1977 *Archaeological Investigations of the Bryson-Paddock Site, An Early Contact Period Site on the Southern Plains*. Oklahoma River Basin Survey, Archaeological Site Report 32, University of Oklahoma, Norman.

Hasskarl, Robert A., Jr.
1962 The Culture and History of the Tonkawa Indians. *Plains Anthropologist* 7:217-231.

Hatcher, M. A.
1927 Descriptions of the Tejas or Asinai Indians. S*outhwestern Historical Quarterly* 30:206-218, 283-304; 31:50-62, 150-180.

Haury, Cherie E.
1982 *The Prehistory and Paleoenvironment of the Black Mesa Locality, Cimarron County, Oklahoma*. Laboratory of Archaeology, University of Tulsa.

Haury, E., E. B. Sayles, and W. W. Wasley
1959 The Lehner Mammoth Site, Southeastern Arizona. *American Antiquity* 25:2-30.

Hawkes, Kristen, and James F. O'Connell
1981 Affluent Hunters? Some Comments in Light of the Alyawara Case. *American Anthropologist* 83:622-626.

Hawkes, Kristen, Kim Hill, and James F. O'Connell
1982 Why Hunters Gather: Optimal Foraging and the Ache of Eastern Paraguay. *American Ethnologist* 9:379-398.

Hayden, Brian
1981 Interaction Parameters and the Demise of Paleo-Indian Craftsmanship. *Plains Anthropologist* 27:109-124.

Haynes, C. Vance, Jr.
1967 Carbon-14 Dates and Early Man in the New World. In *Pleistocene Extinctions: The Search for a Cause*, edited by P. S. Martin and H. E. Wright, Jr. Yale University Press, New Haven.

1971 Time, Environment, and Early Man. *Arctic Anthropology* 8:3-14.

1975 Pleistocene and Recent Stratigraphy. In *Late Pleistocene Environments of the Southern High Plains*, edited by F. Wendorf and J. J. Hester. Publications of the Fort Burgwin Research Center 9, Southern Methodist University, Dallas.

1980 The Clovis Culture. *Canadian Journal of Anthropology* 1:115-121.

1982 Were Clovis Progenitors in Beringia? In *Paleoecology of Beringia*, edited by D. M. Hopkins, J. V. Matthews, Jr., C. E. Schweger, and S. B. Young, pp. 383-398. Academic Press, New York.

1984 Stratigraphy and Late Pleistocene Extinctions in the United States. In *Quaternary Extinctions, a Prehistoric Revolution*, edited by P. S. Martin and R. G. Klein, pp. 345-353. University of Arizona Press, Tucson.

1985 *Late Quaternary Geochronology of the Lower Pomme de Terre River, Missouri*. Geological Society of America Special Publication.

1987 Clovis Origins Update. *The Kiva* 52:83-93.

Haynes, C. Vance, Jr. and G. A. Agogino
1986 *Geochronology of Sandia Cave*. Smithsonian Contributions to Anthropology 32, Washington, D.C.

Haynes, C. Vance, Jr. and D. C. Grey
1965 The Sister's Hill Site and Its Bearing on the Wyoming Postglacial Alluvial Chronology. *Plains Anthropologist* 10:196-203.

Haynes, C. Vance, Jr., and E. Thomas Hemmings
1968 Mammoth-Bone Shaft Wrench from Murray Springs, Arizona. *Science* 159:186-187.

Haynes, C. Vance, Jr., D. C. Grey, and Austin Long
1971 Arizona Radiocarbon Dates VIII. *Radiocarbon* 13:1-18.

Haynes, C. V., Jr., D. J. Donahue, A. J. T. Hull, and T. H. Zabel
1984 Application of Accelerator Dating to Fluted Point Paleoindian Sites. *Archaeology of Eastern North America* 12:184-191.

Haynes, Gary
1983 Frequencies of Spiral and Green-Bone Fractures on Ungulate Limb Bones in Modern Surface Assemblages. *American Antiquity* 48:102-14.

1984 Age Distribution of Elephant and Mammoth Assemblages. Ms. on file, National Museum of Natural History, Washington, D.C.

Hays, Joe S.
1986 *An Archaeological Survey of Portions of the Buffalo National Wildlife Refuge, Randall County, Texas*. U.S. Department of the Interior, Bureau of Reclamation, Amarillo.

Hemmings, E. Thomas
1970 *Early Man in the San Pedro Valley, Arizona*. University Microfilms, Ann Arbor

Hemmings, E. Thomas and C. Vance Haynes, Jr.
1969 The Escapule Mammoth and associated projectile points, San Pedro Valley, Arizona. *Journal of the Arizona Academy of Science* 5:184-188.

Henry, Donald O.
1977a *The Prehistory of the Little Caney River, 1976 Field Season*. Laboratory of Archeology, Contributions to Archeology 1, University of Tulsa.

1977b *The Prehistory and Paleoenvironment of Birch Creek Valley*. Laboratory of Archeology, contributions to Archeology 3, University of Tulsa.

1977c *Prehistory and Paleoenvironments of the Hominy Creek Valley*. Laboratory of Archaeology. University of Tulsa.

1978 Big Hawk Shelter in Northeastern Oklahoma: Environmental, Economic, and Cultural Changes. *Journal of Field Archeology* 5:269-287.

1978 *The Prehistory and Paleoenvironment of Hominy Creek Valley, 1977 Field Season*. Laboratory of Archeology, Contributions to Archeology 4, University of Tulsa.

Henry, D. O., B. H. Butler, and S. A. Hall
1979 The Late Prehistoric Human Ecology of Birch Creek Valley, Northeastern Oklahoma. *Plains Anthropologist* 24:207-238.

Hester, James J.
1962 A Folsom Lithic Complex from the Elida Site, Roosevelt County, New Mexico. *El Palacio* 69:9-113.

1966 Origins of the Clovis Culture. *36th Congreso Internacional de Americanistas Espana, 1964, Actas y Memorias* 1:129-149.

1972 *Blackwater Locality No. 1: A Stratified Early Man Site in Eastern New Mexico*. Fort Burgwin Research Center Publication 8, Albuquerque.

Hester, James J. and James J. Grady
1977 Paleoindian Social Patterns on the Llano Estacado. *The Museum Journal* 17:78-96, Lubbock.

Hester, Thomas R.
1968 Folsom Points from Southwest Texas. *Plains Anthropologist* 13:117.

1968 Notes on Some Historic Indian Artifacts Found near Ozona, Texas. *Newsletter, Midland Archeological Society,* June, pp. 2-4.

Hester, Thomas R., D. Gilbow, and A. D. Albee
1973 A Functional Analysis of "Clear Fork" Artifacts from the Rio Grande Plain, Texas. *American Antiquity* 38:90-96.

Hester, Thomas R.
1976 Late Pleistocene Aboriginal Adaptations in Texas. In *Papers on Paleo-Indian Archeology in Texas*, pp. 1-14. Center for Archaeological Research, University of Texas at San Antonio, Special Report 3.

Hewitt, J. N. B.
1910 Sauk. *Bureau of American Ethnology Bulletin* 30:471-480. Washington, D.C.

1939 Notes on the Creek Indians, edited by J.R. Swanton. *Bureau of American Ethnology, Bulletin* 123:119-159. Washington, D.C.

Hibben, Frank C.
1941 *Evidence of Early Occupation in Sandia Cave, New Mexico, and Other Early Sites in The Sandia-Manzano Region*. Smithsonian Miscellaneous Collections 99(23), Washington, D.C.

Hill, A. T. and George Metcalf
1942 A Site of the Dismal River Aspect in Chase County, Nebraska. *Nebraska History* 22:158-226.

Hodges, Bert
1965 Notes on the History of the Creek Nation and Some of Its Leaders. *Chronicles of Oklahoma* 43:9-18.

Hofman, Jack L.
1971 A Surface Survey of the Ross Site, Cd-69, Caddo County, Oklahoma. *Bulletin of the Oklahoma Anthropological Society* 20:101-114.

1973 Cd-177: A Small Archaic Camp in West Central Oklahoma. *Bulletin of the Oklahoma Anthropological Society* 22:171-206.

1974 The Hodge Site, Cu-40: A Late Prehistoric Site on the Southern Plains. In *Reports of the ARKLA Salvage Project*. Oklahoma Archeological Survey, Contract Archaeology Series 1:22-68, Norman.

1976 The Lacy Site; Gu-51 House Plan: A Washita River Phase House in Garvin County. *Oklahoma Anthropological Society Newsletter* 24(9):4-7.

1977a A Technological Analysis of Clear Fork Gouge Production. *Bulletin of the Oklahoma Anthropological Society* 26:105-121.

1977b Heilager, Cd-71: Surface Evidence from a Woodland Component in Caddo County. *Oklahoma Anthropological Society Newsletter* 25(9):2-8.

1978a An Alternative View of Some Southern Plains Archaic Stage Characteristics. *Plains Anthropologist* 23:311-317.

1978b Variation in Breakage of Paleoindian Projectile Points from Kill Sites: A Case for the Use of Thrusting Spears in Llano Times. Paper presented at the 36th Plains Anthropological Conference, Denver.

1978c The Development and Northern Relationships of the Archaeological Phases in the Southern Plains Subarea. In *The Central Plains Tradition: Internal Development and External Relationships*, edited by Donald J. Blakeslee, pp. 6-35. University of Iowa, Office of the State Archeologist, Archeological Report 11, Iowa City.

1978d Identification of Perforated Ceramic Cone-Shaped Artifacts from the Southern Plains and Adjacent Areas. *Plains Anthropologist* 23:7-11.

1978e An Analysis of Surface Material from the Little Deer Site, 34-CU-10, of Western Oklahoma: A Further Investigation of the Wheeler Complex. *Bulletin of the Oklahoma Anthropological Society* 27:1-109.

1980a Scapula Skin-Dressing and Fiber Processing Tools. *Plains Anthropologist* 25:135-141.

1980b Notes on a Bison Kill in White Canyon 34Cd-202, Caddo County. *Bulletin of the Oklahoma Anthropological Society* 29:1-7.

1982 Exploring Intrasite Patterning and Assemblage Variation on Historic Sheepherder Camps. *North American Archeologist* 3(2):89-111.

1984a Hunter-Gatherers in the Nashville Basin of Tennessee, 8000-5000 B.P. *Tennessee Anthropologist* 9:129-192.

1984b The Plains Villagers: The Custer Phase. In *Prehistory of Oklahoma*, edited by Robert E. Bell, pp. 287-307. Academic Press, New York.

1984c The Western Protohistoric: A Summary of the Edwards and Wheeler Complexes. In *Prehistory of Oklahoma*, edited by R. E. Bell, pp. 347-362. Academic Press, New York.

1986a An Initial Survey of the Folsom Complex in Oklahoma. Paper presented at the 44th Plains Anthropological Conference, Denver.

1986b *Hunter-Gatherer Mortuary Variability: Toward an Explanatory Model*. Ph.D. dissertation, University of Tennessee, Knoxville.

1987a The Occurrence of Folsom Points in Oklahoma. *Current Research in the Pleistocene* 4:57-59.

1987b Recent Studies of Late Pleistocene and Early Holocene Sites in Western Oklahoma. Paper presented at the 45th Plains Anthropological Conference, Columbia.

1988a Folsom Research in Western Oklahoma: Rethinking the Folsom Occupation of the Southern Plains. *Transactions of the 23rd Regional Archeological Symposium for Southeastern New Mexico and Western Texas,* pp. 6-30, Amarillo.

1988b Folsom Sites in Oklahoma and the Texas Panhandle: Recognition and Interpretation of Folsom Technological Variability. Paper presented at the symposium, "Ice-Age Hunters of the Rockies," Denver Museum of Natural History, Denver.

1988c Dating the Lower Member of the Domebo Formation in Western Oklahoma. *Current Research in the Pleistocene* 5:86-88.

Hofman, Jack L. and Richard Drass (editors)
1988 A Survey of Archeological Resources and an Evaluation of Buried Site Potential in Northwestern Oklahoma County, Oklahoma. Ms. on file, Oklahoma Archaeological Survey, Norman.

Hofman, Jack L. and E. Ingbar
1988 A Folsom Hunting Overlook in Eastern Wyoming. *Plains Anthropologist* 33:337-350.

Hofman, Jack L., Daniel S. Amick, and Richard O. Rose
n.d. Shifting Sands: A Folsom-Midland Assemblage from a Campsite in Western Texas. Unpublished Ms., Oklahoma Archaeological Survey, Norman.

Hofsommer, Donovan L. (editor)
1977 *Railroads in Oklahoma*. Oklahoma Historical Society, Oklahoma City.

Hoig, Stan
1976 *The Battle of the Washita, The Sheridan-Custer Indian Campaign of 1856-69*. Doubleday, Garden City.

1984 War for Survival: The Wichita Indians during the Civil War. *Chronicles of Oklahoma* 62:266-283.

1989 Making the Run. *Oklahoma Today* 39(2):8-17.

Holden, W. C.
1930 The Canadian Valley Expedition of March, 1930. *Bulletin of the Texas Archaeological and Paleontological Society* 2:21-32.

1934 Excavations at Saddleback Ruin. *Bulletin of the Texas Archaeological and Paleontological Society* 5:39-52.

Holder, Preston
1970 *The Hoe and the Horse on the Plains: A Study of Cultural Development among North American Indians*. University of Nebraska Press, Lincoln.

Holliday, V. T.
1985a Archaeological Geology of the Lubbock Lake Site, Southern High Plains of Texas. *Geological Society of America Bulletin* 96:1483-1492.

1985b New Data on the Stratigraphy and Pedology of the Clovis and Plainview Sites, Southern High Plains. *Quaternary Research* 23:388-402.

1986 Late Pleistocene Vegetation of the Southern High Plains: A Reappraisal. *Current Research in the Pleistocene* 3:53-54.

Holliday, V. T. (editor)
1983 *Guidebook to the Central Llano Estacado*. Friends of the Pleistocene, South-Central Cell Field Trip, Icasals and the Museum, Texas Tech University, Lubbock.

1986 *Guidebook to the Archaeological Geology of Classic Paleoindian Sites on the Southern High Plains, Texas and New Mexico*. Geological Society of America Guidebook, Department of Geography, Texas A&M University, College Station.

Holliday, V. T. and B. L. Allen
1987 Geology and Soils. In *Lubbock Lake: Late Quarternary Studies on the High Plains*, edited by E. Johnson, pp. 14-21. Texas A&M University Press, College Station.

Holliday, V. T. and E. Johnson
1981 An Update on the Plainview Occupation at the Lubbock Lake Site. *Plains Anthropologist* 26:251-53.

1986 Re-evaluation of the First Radiocarbon Age for the Folsom Culture. *American Antiquity* 51:332-338.

Holliday, V. T. and C. Welty
1981 Lithic Tool Resources of the Eastern Llano Estacado. *Bulletin of the Texas Archeological Society* 52:201-214.

Holliday, V. T., E. Johnson, S. A. Hall, and V. M. Bryant
1985b Re-evaluation of the Lubbock Subpluvial. *Current Research in the Pleistocene* 2:119-121.

Holliday, V. T., E. Johnson, H. Haas, and R. Stuckenrath
1983 Radiocarbon Ages from the Lubbock Lake Site, 1950-1980: Framework for Cultural and Ecological Change on the Southern High Plains. *Plains Anthropologist* 28:165-182.

Holman, J. A.
1976 Paleoclimatic Implications of "Ecologically Incompatible" Herpetological Species (Late Pleistocene: Southeastern United States). *Herpetologica* 32:290-295.

Honea, K. H.
1964 *A Late Archaic Horizon Site near Folsom, New Mexico*. Museum of New Mexico Laboratory of Anthropology Notes 3(29), Santa Fe.

Hood, Archie, Jr.
1983 Examination of Human Burials from Carnegie Canyon, Caddo County, Oklahoma. In *The Geomorphology and Archeology of Carnegie Canyon,* by Christopher Lintz and Stephen A. Hal, pp. 197-210. Oklahoma Conservation Commission Report 10, Oklahoma City.

Hood, H. C. and J. R. Underwood, Jr.
1978 Geology of Palo Duro Canyon. *Panhandle-Plains Historical Review* 50:3-34.

Hooton, Ernest A.
1933 Notes on Five Texas Crania. *Bulletin of the Texas Archeological and Paleontological Society* 5:25-38.

Hotz, Gottfried
1970 *Indian Skin Paintings from the American Southwest*. Translated by Johannes Malthauer. University of Oklahoma Press, Norman.

Houghton, Frank E.
1974 The Climate of New Mexico. In *Climates of the States, Vol. II -Western States*. National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Port Washington, New York.

Howard, Calvin D.
1973 A Study of the Clear Fork Gouge. *Bulletin of the Texas Archaeological Society* 44:51-60.

Howard, Edgar B.
1935 Evidence of Early Man in North America. *University of Pennsylvania Museum Journal* 24(2-3).

1936 The Occurrence of Flints and Extinct Animals in Fluvial Deposits near Clovis, New Mexico, Part 1—Introduction. *Proceedings of the Academy of Natural Sciences of Philadelphia* 87:299-303.

1943 The Finley Site: Discovery of Yuma Points in situ Near Eden, Wyoming. *American Antiquity* 8:224-234.

Howard, James H.
1955/56 The Persistence of Southern Cult Gorgets among the Historic Kansa. *American Antiquity* 21:301-303.

1964 *Archeological Investigations in the Toronto Reservoir Area, Kansas*. Bureau of American Ethnology, River Basin Survey Paper 38, Washington. D.C.

1965 *The Ponca Tribe*. Bureau of American Ethnology, Bulletin 195, Washington, D.C.

1970 1969 Archaeological Investigations at the Weston and Hogshooter Sites, Osage and Washington Counties. *Bulletin of the Oklahoma Anthropological Society* 19:61-99.

1981 *Shawnee!: The Ceremonialism of a Native American Indian Tribe and Its Cultural Background*. Ohio University Press, Athens.

Howard, James H. and Donald W. Brown
1973 A Puebloid Burial from Western Oklahoma. *Bulletin of the Oklahoma Anthropological Society* 22:207-216.

Hoyt, Anne K.
1968 *Bibliography of the Cherokees*. Northeastern State College, Division of Library Science. Tahlequah, Oklahoma.

Hoyt, Steven D.
1979 Archaeological Investigations of Torres Cave. *Southwestern Lore* 45:1-21.

Hrdlicka, Ales
1938 Skeletal Remains from Northern Texas. *Bulletin of the Texas Archeological and Paleontological Society* 10:169-192.

Huckell, Bruce
1978 Hudson-Meng Chipped Stone. In *The Hudson-Meng Site: An Alberta Bison Kill in the Nebraska High Plains*, by L. D. Agenbroad, pp. 153-189. University Press of America, Washington, D.C.

Hughes, David T.
1977 *Analysis of Certain Prehistoric Bison Kills in the Texas Panhandle and Adjacent Areas*. Master's thesis, Department of Anthropology, University of Arkansas, Fayetteville.

1978 A Folsom Point from Comanche, Oklahoma. *Oklahoma Anthropological Society Newsletter* 26(1):5-6.

1980 Archaic Nomenclature in Western Oklahoma. In *Archaic Prehistory on the Prairie-Plains Border*, edited by A. E. Johnson, pp. 121-144. University of Kansas Publications in Anthropology 12, Lawrence.

1984 The Foragers: Western Oklahoma. In *Prehistory of Oklahoma*, edited by R. E. Bell, pp. 109-117. Academic Press, New York.

1985 1985 Excavations in the Wolf Creek Valley, Ociltree County, Texas. Paper presented at the annual meeting of the Texas Archaeological Society, San Antonio.

1986 The Courson 1986 Archaeological Project. Paper presented at the Annual Meeting of the Texas Archaeological Society, Laredo.

Hughes, David T. and Alicia A. Hughes-Jones
1987 *The Courson Archeological Projects, 1985 and 1986*. Innovative Publishing, Perryton.

Hughes, Jack T.
1942 *An Archaeological Report on the Harrell Site of North-Central Texas*. Master's thesis, Department of Anthropology, University of Texas, Austin.

1949 Investigations in Western South Dakota and Northeastern Wyoming. *American Antiquity* 14:266-277.

1955 Little Sunday: An Archaic Site in the Texas Panhandle. *Bulletin of the Texas Archeological Society* 32:65-84.

1955 Field Notes on file at Panhandle-Plains Historical Museum, Canyon.

1959 *Archeological Survey of the Greenbelt Reservoir, Donley County, Texas*. Panhandle-Plains Museum, West Texas State University, Canyon.

1962 Lake Creek: A Woodland Site in the Texas Panhandle. *Bulletin of the Texas Archeological and Paleontological Society* 32:65-84.

1968 *Prehistory of the Caddoan-Speaking Tribes*. Ph.D. dissertation, Department of Anthropology, Columbia University, New York.

1969/70 Prehistory of the Caddoan Speaking Tribes. *Dissertation Abstracts* 30:950B.

1972 Archeology. In *Ark-Red Chloride Control Part 1, Areas VII, VIII, and X, Texas*. U.S. Army Corps of Engineers, Tulsa District.

1973 Archeology. In *Environmental Inventory and Assessment of Areas VI, IX, XIII, XIV and XV, Red River Chloride Control Project, Oklahoma and Texas*. U.S. Army Corps of Engineers, Tulsa District.

1976 The Panhandle Archaic. In *The Texas Archaic: A Symposium*, edited by T. R. Hester, pp. 28-38. Center For Archaeological Research, The University of Texas at San Antonio, Special Report 2, San Antonio.

1977 A Chronological Bibliography of the Oklahoma Panhandle. Ms. on file, Killgore Research Center, West Texas State University, Canyon.

1978 Archaeology of Palo Duro Canyon. *Panhandle-Plains Historical Review* 51:35-58.

1987 A Chronology of Hunting Cultures on the Southern Plains. *Oklahoma Anthropological Society Newsletter* 35(7)11-12.

n.d. Cultural Developments During the Archaic and Neoindian Stages on the Texas High Plains. Ms. in possession of authors, Oklahoma Archeological Survey, Norman.

Hughes, Jack T. and H. C. Hood
1976 *An Archeological Survey in the Lakeview Watershed*. Report submitted to the Soil Conservation Service by West Texas State University, Canyon.

Hughes, Jack T. and P. S. Willey
1978 *Archaeology at Mackenzie Reservoir*. Texas Historical Commission, Office of the State Archaeologist Archeological Survey Report 24, Austin.

Hughes, Pollyanna B.
1978 History. In *Archaeology at MacKenzie Reservoir*, edited by J. T. Hughes and P. S. Willey, pp. 32-41. Texas Historical Commission, Office of the State Archaeologist Archaeological Survey Report 24, Austin.

Humphrey, Robert L. and Dennis Stanford (editors)
1979 *Pre-Llano Cultures of the Americas: Paradoxes and Possibilities*. Anthropological Society of Washington. Washington, D. C.

Humphreys, Gerald and William Singleton
1978 Historic Archeology in Texas. In *Texas Archeology: Essays Honoring R. King Harris* edited by Kurt D. House, pp. 69-92. Institute for the Study of Earth and Man, Reports of Investigations 3, Dallas

Hunt, G. O.
1975 *The Archaeology of the Belwood Site*. Master's thesis, Department of Anthropology, Denver University, Denver.

Hurt, W. Jr., W. G. Buckles, E. Fugle, and G. A. Agogino
1962 *Report of the Investigations of the Four Bear Site, 39DW2 Dewey County, South Dakota, 1958-1959*. Archaeological Studies, Circular No. 10. W. H. Over Museum, State University of South Dakota, Vermillion.

Hurt, Wesley R.
1966 The Altithermal and the Prehistory of the Northern Plains. *Quaternaria* 8:101-114.

Husted, W. M.
1969 *Bighorn Canyon Archaeology*. Smithsonian Institution, River Basin Surveys Publications in Salvage Archaeology 12. Washington, D.C.

Hyde, George E.
1951 *Pawnee Indians*. University of Denver Press, Denver.

Ingbar, Eric E.
1986 Lithic Reduction Sequences and Spatial Analysis of a Folsom site: The Hanson site (48BH329). Paper presented in the Symposium, "New Developments in Northwestern Plains Archaeology" at The Joint Meeting of the Wyoming Archaeological Society and the Montana Archaeological Society, Cody.

Ireland, Stephen K.
1968 *Five Apishapa Focus Sites in the Arkansas Valley*. Master's thesis, Department of Anthropology, University of Denver, Denver.

Irvin, S. M., and W. Hamilton
1853 Iowa and Sac Tribes. In *Information Respecting the History, Condition, and Prospects of the United States*, Vol. 3, edited by H. R. Schoolcraft, pp. 259-277. Philadelphia.

Irving, W. N.
1971 Recent Early Man Research in the North Arctic. *Arctic Anthropology* 8:68-82.

Irwin, Cynthia and Henry Irwin
1959 *Excavations at the La Daiska Site in the Denver, Colorado Area*. Denver Museum of Natural History, Proceedings 8.

1966 *Excavations at Magic Mountain: A Diachronic Study of Plains - Southwest Relations*. Denver Museum of Natural History, Proceedings 12.

Irwin-Williams, Cynthia, Henry Irwin, George Agogino, and C. Vance Haynes, Jr.
1973 Hell Gap: Paleo-Indian Occupation on the High Plains. *Plains Anthropologist* 18:40-53.

Irwin, Henry
1968 *The Itama: Early Late-Pleistocene Inhabitants of the Plains of the United States and Canada and the American Southwest*. Ph.D. dissertation, Harvard University, Cambridge.

1971 Developments in Early Man Studies in Western North America, 1960-1970. *Arctic Anthropology* 8:42-67.

Irwin, Henry T. and H. M. Wormington
1970 Paleo-Indian Tool Types in the Great Plains. *American Antiquity* 35:24-34.

Ivey, Paula K.
1986 Early Holocene Transitions of the Llano Estacado: the Archaic and Altithermal Evidence. *Transactions of the 21st Regional Archeological Symposium for Southeastern New Mexico and Western Texas*, pp. 97-110.

Jackson, J. Brantley
1972 The Jared Site: A Comanche Burial at Fort Sill, Oklahoma. *Plains Anthropologist* 17:316-325.

Jackson, Marsha F.
1975 *The George Jowell Ranch Complex: A Report on the Preliminary Testing and Evaluation of the Archeological and Architectural Features*. Texas Historical Commission, Office of the State Archeologist Report 27, Austin.

Jantz, R. L.
1974 The Redbird Focus: Cranial Evidence in Tribal Identification. *Plains Anthropologist* 19:5-13.

1977 Craniometric Relationships of Plains Populations: Historical and Evolutionary Implications. In *Trends in Middle Missouri Prehistory: A Festschrift Honoring the Contributions of Donald J. Lehmer*, edited by W. Raymond Wood, pp. 162-176. Memoir 13, Plains Anthropologist 22(78, Part 2):162-176.

Jantz, R. L. and D. W. Owsley
1982 Long Bone Growth Variation among Arikara Skeletal Populations. Unpublished Ms., University of Tennessee, Knoxville.

1984 Long Bone Growth Variation among Arikara Skeletal Populations. *American Journal of Physical Anthropology* 63:13-20.

1985 Patterns of Infant and Early Childhood Mortality in Arikara Skeletal Populations. In *Status, Structure, and Stratification: Current Archaeological Reconstructions,* edited by M. Thompson, M. T. Garcia, and F. J. Kense, pp. 209-213. Proceedings of the Sixteenth Annual Conference of the Archaeological Association of the University of Calgary, Alberta, Canada.

Jantz, R. L., D. W. Owsley, and P. Willey
1978 Craniometric Relationships of Central Plains Populations. In *Central Plains Tradition: Internal Development and External Relationships*, edited by D. J. Blakeslee, pp. 144-156. Office of the State Archaeologist, University of Iowa Report 11, Iowa City.

Jelinek, Arthur J.
1967a *A Prehistoric Sequence in the Middle Pecos Valley, New Mexico*. Museum of Anthropology, University of Michigan, Anthropological Papers No. 31, Ann Arbor.

1967b Man's Role in the Extinction of Pleistocene Faunas. In *Pleistocene Extinctions: The Search for a Cause*, edited by P. S. Martin and H. E. Wright, Jr., pp. 193-200. Yale University Press, New Haven.

1971 Early Man in the New World: A Technological Perspective. *Arctic Anthropology* 8:15-21.

Jelks, Edward B.
1952 *Appraisal of the Archeological and Paleontological Resources of the Colorado City Reservoir, Borden and Scurry Counties, Texas*. Smithsonian Institution, River Basin Surveys, Washington, D.C.

1960 *Appraisal of the Archeological Resources of Farmer's Creek Reservoir, Montague County, Texas*. Texas Archeological Salvage Project, University of Texas, Austin.

1962 The Norteno Focus: A Historic Complex of North Central Texas. *Plains Anthropologist* 7:95-96.

1966 The Gilbert Site: A Norteno Focus Site in Northeastern Texas. *Bulletin of the Texas Archeological Society* 37:1-248.

Jelks, Edward B. and Edward H. Mooreman
1953 *Survey and Appraisal of the Archeological Resources of Paint Creek Reservoir, Haskell County, Texas*. Smithsonian Institution, River Basin Surveys, Washington, D.C.

Jelks, Edward B. and Curtis D. Tunnell
1959 Appraisal of the Archeological Resources of Proctor Reservoir, Comanche County, Texas. Ms. on file, University of Texas, Austin.

Jennings, Jesse D.
1955 *The Archaeology of the Plains: An Assessment (with special reference to the Missouri River Basin*.. Report to the National Park Service (Memorandum of Agreement No. 14-10-0100-287, June 1954). University of Utah, Department of Anthropology, Salt Lake City.

1974 *Prehistory of North America* (2nd ed.). McGraw-Hill, New York.

1985 River Basin Surveys: Origins, Operations, and Results, 1945-1969. *American Antiquity* 50:281-296.

Jennings, Jesse D. (editor)
1978 *Ancient Native Americans*. W. H. Freeman, San Francisco.

Jensen, Harold P., Jr.
1968 Report on Excavations at the Field Ranch Site (X41CO-10) Cooke County, Texas. *Bulletin of the Texas Archaeological Society* 39:133-146.

Jepsen, Glenn L.
1953 Ancient Buffalo Hunters of Northwestern Wyoming. *Southwestern Lore* 9:19-25.

1953 Ancient Buffalo Hunters. *Princeton Alumni Weekly* 53(25):10-12.

Jester, Margo
1961 Peace Medals. *American Indian Tradition* 7(5).

Jochim, Michael A.
1976 *Hunter-Gatherer Subsistence and Settlement: A Predictive Model*. Academic Press, New York.

Jodry, M. A.
1987 *Stewart's Cattle Guard Site: A Folsom Site in Southern Colorado*. Master's thesis, Department of Anthropology, University of Texas, Austin.

John, Elizabeth A. H.
1975 *Storms Brewed in Other Men's Worlds, the Confrontations of Indians, Spanish and French in the Southwest, 1540-1795*. Texas A&M University Press, College Station.

1982 Portrait of a Wichita Village, 1808. *Chronicles of Oklahoma* 60:412-437.

Johnson, Alfred E.
1957 *Appraisal of the Archeological Resources of the Toronto Reservoir, Greenwood and Woodson Counties, Kansas*. Smithsonian Institution, River Basin Surveys, Washington, D.C.

1980 *Archaic Prehistory on the Prairie Plains Border*. University of Kansas Publications in Anthropology 12, Lawrence.

Johnson, C. Stuart
1939 A Report on the Antelope Creek Ruin. *Bulletin of the Texas Archeological and Paleontological Society* 11:190-203.

Johnson, D. L., P. Dawano, and E. Ekker
1980 Clovis Strategies of Hunting Mammoth (*Mammuthus columbi*). *Canadian Journal of Anthropology* 1:107-114.

Johnson, E.
1977 Animal Food Resources of Paleoindians. In *Paleoindian Lifeways,* edited by E. Johnson, pp. 65-77. *The Museum Journal* 17.

1983 The Lubbock Lake Paleoindian Record. In *Guidebook to the Central Llano Estacado*, edited by V. T. Holliday, pp. 81-105. Friends of the Pleistocene, South-Central Cell Field Trip, Icasals and The Museum, Texas Tech University, Lubbock.

1986 Late Pleistocene and Early Holocene Paleo Environments and Vertebrates on the Southern High Plains, U.S.A. *Geographie Physique et Quaternaire* 40:249-261.

1986 The 1949 Bone Bed from the Carbonaceous Unit at Blackwater Draw Locality #1. *Current Research in the Pleistocene* 3:7-9.

Johnson, E. (editor)
1987 *Lubbock Lake: Late Quaternary Studies on the Southern High Plains*. Texas A&M University Press, College Station.

Johnson, E. and V. T. Holliday
1980 A Plainview Kill/Butchering Locale on the Llano Estacado—the Lubbock Lake Site. *Plains Anthropologist* 25:89-11.

1985 A Clovis Age Megafaunal Processing Station at the Lubbock Lake Landmark. *Current Research in the Pleistocene* 2:17-19.

Johnson, E., Vance T. Holliday, and Raymond W. Neck
1982 Lake Theo: Late Quaternary Paleoenvironmental Data and New Plainview (Paleoindian) Date. *North American Archaeologist* 3:113-138.

Johnson, E., V. T. Holliday, M. J. Kaczor, and R. Stuckenrath
1977 The Garza Occupation at the Lubbock Lake Site. *Bulletin of the Texas Archaeological Society* 48:83-109.

Johnson, E., V. T. Holliday, J. Warnica, and T. Williamson
1986 The Milnesand and Ted Williamson Paleoindian Sites, East-Central New Mexico. *Current Research in the Pleistocene* 3:9-11.

Johnson, LeRoy, Jr.
1962 The Yarbrough and Miller Sites of Northeastern Texas, with a Preliminary Definition of the La Harpe Aspect. *Bulletin of the Texas Archeological Society* 32:141-284.

1967 *Toward a Statistical Overview of the Archaic Cultures of Central and Southwestern Texas*. Texas Memorial Museum, University of Texas, Bulletin 12, Austin.

1987 A Plague of Phases: Recent Sociocultural Taxonomy in Texas Archeology. *Bulletin of the Texas Archeological Society* 57:1-26.

1988 Great Plains Interlopers in the Eastern Woodlands during Late Paleo-Indian Times: The Evidence from Oklahoma, Texas, and Areas Close By. Unpublished Ms. in possession of the authors, Oklahoma Archeological Survey, Norman.

Johnson, Leroy, Jr. and Edward B. Jelks
1958 The Tawakoni-Yscani Village, 1760: A Study in Archaeological Site Identification. *Texas Journal of Science* 10:405-422.

Johnson, W. D.
1900 The High Plains and Their Utilization. *U.S. Geological Survey, 21st Annual Report,* Part 4, pp. 601-741.

Johnston, F. E.
1968 Growth of the Skeleton in Earlier Peoples. In *The Skeletal Biology of Earlier Human Populations*, edited by D. R. Brothwell, pp. 57-66. Symposia of the Society for Study of Human Biology 8.

Johze, Benedict
1961 A Brief History of the Fort Sill Apache Tribe. *Chronicles of Oklahoma* 39:427-432.

Jones, B. A. and T. A. Witty
1980 *The Gilligan Site, 14 CF322. In Salvage Archaeology of the John Redmond Lake, Kansas*, edited by T. A. Witty, pp. 67-125. Kansas State Historical Society Anthropological Series 8, Topeka.

Jones, Buddy Calum
1968 *The Kinsloe Focus: A Study of Seven Historic Caddoan Sites in Northeast Texas*. Master's thesis, University of Oklahoma, Norman.

Jones, J. Knox, Jr., David M. Armstrong, and Jerry R. Choate
1985 *Guide to Mammals of the Plains States*. University of Nebraska Press, Lincoln.

Jones, W.
1913 Kickapoo Ethnological Notes. *American Anthropologist* 15:32-335.

Jones, William K.
1969 *Notes on the History and Material Culture of the Tonkawa Indians*. Washington, D.C.

Judge, W. James
1970 Systems Analysis and the Folsom-Midland Question. *Southwestern Journal of Anthropology* 26:40-51.

1973 *The Paleo-Indian Occupation of the Central Rio Grande Valley, New Mexico*. University of New Mexico Press, Albuquerque.

Judson, S.
1953 *Geology of the San Jon Site, Eastern New Mexico*. Smithsonian Miscellaneous Collections 121. Washington, D.C.

Jurmain, R. D.
1975 *Distribution of Degenerative Joint Disease in Skeletal Populations*. Ph.D. dissertation, Harvard University, Cambridge.

Kassel, Marilyn E.
1949 *An Analysis of Archaeological Materials Attributed to the Chickasaws*. Master's thesis, University of Oklahoma, Norman.

Katz, Susanna R. and Paul R. Katz
1976 *Archaeological Investigations in the Lower Tule Canyon, Briscoe County, Texas*. Office of the State Archaeologist, Texas Historical Commission Survey Report 16, Austin.

Kay County Chapter
1963 The Fred Loomis Site, a Small Group Burial near Freedom, Oklahoma. *Bulletin of the Oklahoma Anthropological Society* 11:123-133.

Kay, Marvin
1968 Two Historic Indian Burials from an Open Site, 23AD95, Adair County, Missouri. *Plains Anthropologist* 13:103-115.

Keith, Kenneth D. and Clyde C. Snow
1976 The Gore Pit Skeleton: Earliest Dated Human Burial from Oklahoma. *Plains Anthropologist* 21:283-289.

Keith, Kenneth, Clyde C. Snow, and James B. Snow
1976 A Child's Skeleton from Western Oklahoma. *Bulletin of the Oklahoma Anthropological Society* 20:115-131.

Keller, Gordon N.
1961 *The Changing Position of the Southern Plains in the Late Prehistory of the Great Plains Area*. Ph.D. Dissertation, Department of Anthropology, University of Chicago, Chicago.

Keller, John E.
1975 *Black Dog Village*. Texas Highway Publications in Archaeology Report 5, Austin.

Kelley, J. Charles
1947a The Cultural Affiliations and Chronological Position of the Clear Fork Focus. *American Antiquity* 13:97-109.

1947b The Lehmann Rockshelter: A Stratified Site of the Toyah, Uvalde, and Round Rock Foci. *Bulletin of the Texas Archaeological Society* 18:115-128.

1959 The Desert Cultures and the Balcones Phase: Archaic Manifestations in the Southwest and Texas. *American Antiquity* 24:276-288.

Kelley, J. O. and J. L. Angel
1987 Life Stresses of Slavery. *American Journal of Physical Anthropology* 72:199-211.

Kelly, Robert L. and Lawrence C. Todd
1988 Coming into the Country, Early Paleoindian Hunting and Mobility. *American Antiquity* 53:231-244.

Kelly, T. C.
1982 Criteria for Classification of Plainview and Golondrina Projectile Points. *La Tierra* 9:2-25.

Kent, Susan
1984 *Analyzing Activity Areas*. University of New Mexico Press, Albuquerque.

Kerr, Hank
1964 The Bartow Mammoth Site. *Oklahoma Anthropological Society Newsletter* 12(5):4-8.

Kessell, John L.
1979 *Kiva, Cross, and Crown: The Pecos Indians and New Mexico, 1540-1840*. National Park Service, Washington, D.C.

Key, Patrick J.
1983 *Craniometric Relationships among Plains Indians: Culture-Historical and Evolutionary Implications*. Department of Anthropology, University of Tennessee, Report of Investigations 34, Knoxville.

Kingsbury, L. A. and M. Nowak
1980 *Archaeological Investigations on Carrizo Ranches, Inc*. Colorado College Publications in Archaeology 2, Colorado Springs.

Kingsbury, L. A. and L. H. Gabel
1983 Eastern Apache Campsites in Southeastern Colorado: A Hypothesis. In From Microcosm to Macrocosm: Advances in Tipi Ring Investigation and Interpretation, edited by Leslie B. Davis. Memoir 18, *Plains Anthropologist* 28 (102, Part 2):319-325.

Kirkpatrick, David T.
1976 The Prehistory of Northeast New Mexico. In *Guidebook of Vermejo Park, Northeastern New Mexico, 27th Field Conference*, edited by R. C. Ewing and B. S. Kues, pp. 77-82. New Mexico Geological Society.

Kivett, Marvin F.
1947a *Preliminary Appraisal of the Archeological and Paleontological Resources of Cedar Bluff Reservoir, Trego County, Kansas*. Smithsonian Institution, River Basin Surveys, Washington D.C.

1947b *Preliminary Appraisal of the Archeological and Paleontological Resources of Kanopolis Reservoir, Ellsworth County, Kansas*. Smithsonian Institution, River Basin Surveys, Washington, D.C.

1953 *The Woodruff Ossuary: A Prehistoric Burial Site in Phillips County, Kansas*. Bureau of American Ethnology, Bulletin 154.

1962 Logan Creek Complex. Ms. on file, Nebraska State Historical Society, Lincoln.

Kivett, Marvin (editor)
1979 Toward Plains Caddoan Origins: A Symposium. *Nebraska History* 60 (2).

Klein, J., J. C. Lerman, P. E. Damon, and E. K. Ralph
1982 Calibration of Radiocarbon Dates: Tables Based on

the Consensus of the Workshops on Calibrating the Radiocarbon Time Scale. *Radiocarbon* 24:103-150.

Klein, Richard G.
1969 *Man and Culture in the Late Pleistocene: A Case Study*. Chandler Publishing, San Francisco.

1973 *Ice-Age Hunters of the Ukraine*. University of Chicago Press, Chicago.

Klepinger, Linda
1972 An Early Human Skeleton from the Snyder Site, 14Bu9, Butler County, Kansas. *Plains Anthropologist* 17:71-72.

Klippel, Walter E.
1976 Euroamericans and the Kickapoo in the Illinois Prairie. *The Explorer* 18:9-13.

Knudson, Ruthann
1983 *Organizational Variability in Late Paleoindian Assemblages*. Washington State University, Laboratory of Anthropology, Reports of Investigations 60, Pullman.

Koch, Ronald P.
1977 *Dress Clothing of the Plains Indians*. University of Oklahoma Press, Norman.

Komora, Gregory L.
1978 *A Reevaluation of the Chronology and Analysis of the Artifacts from the Clear Fork Silts*. Master's thesis, Department of Anthropology, Eastern New Mexico University, Portales.

Kornfeld, Marcel
1983 A Model of High Plains and Intermountain Stockraising Settlement Systems. *North American Archaeologist* 4:51-62.

Kornfeld, Marcel and L. C. Todd
1985 *McKean/Middle Plains Archaic: Current Research*. Occasional Papers on Wyoming Archaeology 4, Laramie.

Kowta, Makoto
1969 *The Sayles Complex: A Late Milling Stone Assemblage from Cajon Pass and the Ecological Implications of Its Scraper Planes*. University of California Publications in Anthropology 6, Berkeley.

Krause, Richard A. and Robert M. Thorne
1971 Toward a Theory of Archaeological Things. *Plains Anthropologist* 16:245-257.

Krieger, Alex D.
1944 The Typological Concept. *American Antiquity* 9:271-288.

1946 *Culture Complexes and Chronology in Northern Texas*. University of Texas Publication 4640, Austin.

1947 The First Symposium on the Caddoan Archaeological Area. *American Antiquity* 13:198-207.

1957 Early Man, Notes and News. *American Antiquity* 22:321-323.

1964 Early Man in the New World. In *Prehistoric Man in the New World*, edited by J. D. Jennings and E. Norbeck, pp. 23-84. University of Chicago Press, Chicago.

Kroeber, A. L.
1939 *Cultural and Natural Areas of Native North America*. University of California, Publications of American Archaeology and Ethnology 38, Berkeley.

Kuchler, A. W.
1974 A New Vegetation Map of Kansas. *Ecology* 55:586-604.

Kurten, B. and E. Anderson
1980 *Pleistocene Mammals of North America*. Columbia University Press, New York.

Lahren, L. A. and R. Bonnichsen
1974 Bone Foreshafts from a Clovis Burial in Southwestern Montana. *Science* 186:147-150.

Landes, Ruth
1970 *The Prairie Potawatomie; Tradition and Ritual in the Twentieth Century*. University of Wisconsin, Madison.

Lang, Charles H.
1957 Plains-Southwestern Intercultural Relations in the Historic Period. *Ethnohistory* 4:150-173.

Larsen, C. S.
1980 Dental Caries: Experimental and Biocultural Evidence. In *The Skeletal Biology of Aboriginal Populations in the Southeastern United States*, edited by P. Willey and F. H. Smith, pp. 75-80. Tennessee Anthropological Association, Miscellaneous Papers 5, Knoxville.

Lavender, David
1954 *Bent's Fort*. University of Nebraska Press, Lincoln.

Lawton, Sherman P.
1958a Report of Surface Survey of Archeological Sites, Waurika Reservoir: Jefferson, Cotton, and Stephens Counties, Oklahoma. Ms. on file, Department of Anthropology, University of Oklahoma, Norman.

1958b The Max Thomas Site, Gd-4. *Bulletin of the Oklahoma Anthropological Society* 6:83-88.

1968 The Duncan-Wilson Bluff Shelter: A Stratified Site of the Southern Plains. *Bulletin of the Oklahoma Anthropological Society* 16:1-94.

Leacock, Eleanor and R. B. Lee (editors)
1982 *Politics and History in Band Society*. Cambridge University Press, New York.

Lee, Richard and Irven DeVore (editors)
1968 *Man the Hunter*. Aldine Publishing, Chicago.

Leehan, Kevin D.
1977 *Archaeological Investigations at Candy Lake, Osage County, Oklahoma*. Archaeological Research Associates Research Report 8, Tulsa.

Lees, William B.
1983 Hardesty, Oklahoma Territory: Archeological Perspectives on the Late 19th Century Frontier in No Man's Land. *Bulletin of the Oklahoma Anthropological Society* 32:83-97.

Lees, William B. and K. M. K. Lees
1983 *Fort Towson: The Sutler's Store 1978-1980 Collections*. Office of Historic Preservation, Oklahoma Historical Society, Oklahoma City.

Lehmer, D. J.
1948 *The Jornada Branch of the Mogollon*. University of Arizona Bulletin 19(2).

Lehmer, Donald
1954 *Archaeological Investigations in the Oahe Dam Area, South Dakota, 1950-1951*. Bureau of American Ethnology Bulletin 158, River Basin Survey Paper 7, Washington, D.C.

LeMoine, G. M. and A. S. MacEachern (editors)
1983 *Carnivores, Human Scavengers and Predators: A Question of Bone Technology*. Proceedings of the Fifteenth Annual Chacmool Conference, The Archaeological Association of the University of Calgary.

Leonhardy, Frank C. (editor)
1966a *Domebo: A Paleo-Indian Mammoth Kill in the Prairie Plains*. Contributions of the Museum of the Great Plains 1, Lawton.

1966b *Test Excavations in the Mangum Reservoir Area of Southwestern Oklahoma*. Contributions of the Museum of the Great Plains 2, Lawton.

Leonhardy, Frank C. and Adrian D. Anderson
1966 The Archaeology of the Domebo Site. In *Domebo: A Paleo-Indian Mammoth Kill in the Prairie-Plains*, edited by F. C. Leonhardy, pp. 14-26. Contributions of the Museum of the Great Plains 1, Lawton.

Levendosky, Alytia A.
1987 *A Dietary Analysis of Antelope Creek Phase Using Bone Chemistry Analyses to Test Dietary Models Based on Archaeological Evidence and Environmental Reconstruction*. Honors thesis, Department of Anthropology, Harvard College, Cambridge.

LeVick, G. and Lawrence LeVick
1966 The Case of the Aching Ulna or Would You Believe a Projectile Point in an Elbow? *Oklahoma Anthropological Society Newsletter* 14(9):9-10.

Levine, Francis, and Martha Doty Freeman
1982 *A Study of Documentary and Archeological Evidence for Comanchero Activity in the Texas Panhandle*. Report submitted to the Texas Historical Commission, Austin.

Lewis, Anna (editor)
1943 The Diary of Sue McBeth. A Missionary to the Choctaws, 1860-1861. *Chronicles of Oklahoma* 21:186-195.

Lewis, Kenneth E. (editor)
1975 *Fort Washita from Past to Present: An Archeological Report*. Oklahoma Historical Society Series 1, Oklahoma City.

Linton, Ralph
1936 *The Study of Man*. Appleton, New York.

Lintz, Chris
1974 An Analysis of the Custer Focus and Its Relationship to the Plains Village Horizon in Oklahoma. Department of Anthropology, University of Oklahoma, Norman. *Papers in Anthropology* 15(2):11-72.

1975 *A Cultural Resource Assessment of Cantonment Recreation Vehicle Park, Blaine County, Oklahoma*. Submitted to McCaleb, Nusbaum and Thomas Architectural and Engineering Firm, Edmond, Oklahoma.

1976 The McGrath Site of the Panhandle Aspect. *Bulletin of the Oklahoma Anthropological Society* 25:1-110.

1978a The Johnson-Cline Site (34-Tx-40): An Upland Dune Site in the Oklahoma Panhandle. *Bulletin of the Oklahoma Anthropological Society* 27:111-140.

1978b Panhandle Aspect and Its Early Relationship with Upper Republican. In *The Central Plains Tradition: Internal Development and External Relationships*, edited by Donald Blakeslee, pp. 36-55. Office of the Iowa State Archaeologist, University of Iowa Report, 11, Iowa City.

1979 Radiocarbon and Archaeomagnetic Dates from the Two Sisters Site, 34Tx-32, Texas County, Oklahoma. *Oklahoma Anthropological Society Newsletter* 27(6):1-9.

1979 The Southwestern Periphery of the Plains Caddoan Area. *Nebraska History* 60:161-182.

1980 *An Archaeological Bibliography of the Oklahoma Panhandle*. Oklahoma Archaeological Survey, Occasional Publication 3, Norman.

1984 The Plains Villagers: Antelope Creek. In *Prehistory of Oklahoma*, edited by Robert E. Bell, pp. 325-346. New York, Academic Press, New York.

1985 *A Chronological Framework of the Fort Carson Pinyon Canyon Maneuver Site, Las Animas County, Colorado*. Vol. 3. University of Denver, Center for Archaeological Research Contribution 2.

1986a *Architecture and Community Variability within the Antelope Creek Phase*. Oklahoma Archaeological Survey, Studies in Oklahoma's Past 14, Norman.

1986b The Upper Canark Regional Variant: Comparisons and Contrast of the Antelope Creek and Apishapa Phases of the Southwestern Plains. Paper presented at the 44th Plains Conference, Denver.

1987 *Assessment of Gravel Operation Damage to Prehistoric Sites and Recording the Santa Fe Trail within the John Martin Reservoir Project Area, Bent County, Colorado*. Prepared by Mariah Associates, Albuquerque, for the U.S. Army Corps of Engineers, Albuquerque District.

1988 Archeological Survey and Testing of the Melrose Bombing Range Expansion, Roosevelt and Curry Counties, New Mexico. *Transactions of the 23rd Regional Archeological Symposium for Southeastern New Mexico and Western Texas*, pp. 105-120, Amarillo.

Lintz, Christopher R. and Timothy G. Baugh
1978 A Cross Listed Index of the Oklahoma Anthropological Society Bulletins, Special Bulletins, and Memoirs: 1953-1976. *Bulletin of the Oklahoma Anthropological Society* 27:155-169.

Lintz, Christopher and Rain Vehik
1986 *The Archeology of Impoundment 16, Lower Clear Boggy Creek Watershed, Johnston County, Oklahoma*. Oklahoma Conservation Commission, Archaeological Research Report 13, Oklahoma City.

Lintz, Christopher and George Zabawa
1984 The Kenton Caves of Western Oklahoma. In *Prehistory of Oklahoma*, edited by R. E. Bell, pp. 161-174. Academic Press, Orlando.

Lippincott, Kerry
1978 Solomon River Upper Republican Settlement Ecology. In *The Central Plains Tradition: Internal Development and External Relationships*, edited by D. Blakeslee, pp. 81-93. Office of the State Archaeologist, University of Iowa, Report 11, Iowa City.

Lopez, David
1970 The McLemore Cemetery Complex: An Analysis of Prehistoric Burial Customs. *Bulletin of the Oklahoma Anthropological Society* 19:137-150.

1973 The Wybark Site, a Late Prehistoric Village Complex in the Three Forks Locale, Muskogee County, Oklahoma. *Bulletin of the Oklahoma Anthropological Society* 22:111-126.

Lopez, David and Kenneth L. Keith (editors)
1979 *Oklahoma Highway Archaeological Survey, Highway Archaeological Reconnaissance Program: 1972-1978*. Oklahoma Department of Transportation, Oklahoma Highway Archaeological Survey, Papers in Highway Archaeology 6. Norman.

Lopez, David and Roger Saunders
1973 Current Lithic Studies in Oklahoma. *Oklahoma Anthropological Society Newsletter* 21(9):1-4.

Lorrain, Dessamae
1967 The Glass Site. In *A Pilot Study of Wichita Indian Archaeology and Ethnohistory* by R. E. Bell, E. B. Jelks, and W. W. Newcomb, pp. 24-44. Final Report submitted to the National Science Foundation.

1969 *Archaeological Excavations in the Fish Creek Reservoir*. Southern Methodist Contributions No. 4, Dallas.

Lowie, Robert H.
1954 *Indians of the Plains*. American Museum of Natural History, New York.

Ludwickson, John L.
1975 *The Loup River Phase and the Origins of Pawnee Culture*. Master's thesis, Department of Anthropology, University of Nebraska, Lincoln.

1978 Central Plains Tradition Settlements in the Lower Loup Basin: The Loup River Phase. In *The Central Plains Tradition: Internal Developments and External Relationships*, edited by D. Blakeslee, pp. 96-112. Office of the State Archaeologist, University of Iowa, Report 11, Iowa City.

Lundelius, E. L.
1967 Late-Pleistocene and Holocene Faunal History of Central Texas. In *Pleistocene Extinctions: The Search for a Cause*, edited by P. S. Martin and H. E. Wright, Jr. Yale University Press, New Haven.

Lundelius, E. L., Jr., R. W. Graham, E. Anderson, J. Guilday, J. A. Holman, D. Steadman, and S. D. Webb
1983 Terrestrial Vertebrate Faunas. In *Late Quaternary Environments of the United States, Vol. 1, The Late Pleistocene*, edited by S. C. Porter, Jr., pp. 311-353. University of Minnesota Press, Minneapolis.

Lutz, B. J. and W. J. Hunt
1979 *Models for Patterns and Change in Prehistoric Settlement Subsistence Systems of the Purgatoire and Apishapa Highlands*. Office of Public and Contract Archeology, University of Northern Colorado, Greely.

Lyford, Carrie A.
1940 *Quill and Beadwork of the Western Sioux*. Johnson Publishing, Boulder.

Lynott, Mark J.
1981 A Model of Prehistoric Adaptation in Northern Texas. *Plains Anthropologist* 26:97-110.

MacCauley, C.
1884 The Seminole Indians of Florida.*Bureau of American Ethnology, Annual Reports* 5, pp. 469-531.

MacDonald, G. F.
1968 *Debert: A Paleo-Indian Site in Central Nova Scotia*. National Museum of Canada Anthropology Papers 16.

Madole, Richard F.
1987 *The Meers Fault: Quaternary Stratigraphy and Evidence for Late Holocene Movement*. Oklahoma Geological Survey Guidebook 24, Norman.

Mails, Thomas E.
1974 *The People Called Apache*. Prentice-Hall, Englewood Cliffs, New Jersey.

Mallouf, Robert J., Helen Simons, Robert L. Wilson, Susan L. Andrews, J. Barto Arnold III, and David Moore
1981 *Texas Heritage Conservation Plan Computerization Program Manual*. Texas Historical Commission, Austin.

Malone, James M.
1970 *Archeological Reconnaissance in the Mackenzie Reservoir Area of Tule Canyon*. Texas Historical Commission Archeological Survey Report 8, Austin.

Malone, James M. and Alton K. Briggs
1970 *Archeological Reconnaissance in the Miller Creek Reservoir Area*. Texas Historical Commission Archeological Survey Report 6, Austin.

Mandel, I. D.
1979 Dental Caries. *American Scientist* 67:680-688.

Mann, R. W., Douglas W. Owsley, and Timothy Baugh
1988 Culturally Modified Human Bones from the Edwards I Site (34BK2), Oklahoma. Paper delivered at the 46th Plains Conference, Wichita.

Mann, R. W. and Douglas W. Owsley
1989 Anatomy of Uncorrected Talipes Equinovarus in a Fifteenth Century American Indian. *Journal of the American Podiatric Medical Association*.

Marshall, James O.
1965 Recent Excavations in the Elk City Reservoir. *Kansas Anthropological Society Newsletter* 11(2).

1966a An Interpretive Summary of the Archeological Evidence from the Elk City Reservoir, Montgomery County, Kansas. *Kansas Anthropological Association Newsletter* 12(1):1-4.

1966b Salvage Archeology in the Elk City Reservoir, 1965. *Abstract of a paper presented at the 23rd Plains Conference, Topeka. Plains Anthropologist* 11(32):165-166.

1967 The Archeology of the Elk City Reservoir: A Variation of the Hopewellian Tradition in Southeast Kansas. Ms. on file, Kansas Historical Society, Topeka.

1972 *The Archeology of the Elk City Reservoir: A Local Archeology Sequence in Southeast Kansas*. Kansas State Historical Society, Anthropological Series 6, Topeka.

Martin, L. D. and J. B. Martin
1984 The Effect of Pleistocene and Recent Environments on Man in North America. *Current Research in the Pleistocene* 1:73-75.

1986 Equability in the Late Pleistocene. In *Quaternary Environments of Kansas*, edited by W. C. Johnson, pp. D1-D5. 33rd Field Conference of the Midwest Friends of the Pleistocene. Kansas Geological Survey Guidebook Series 5 (Preliminary version), Lawrence, Kansas.

Martin, L. D., R. A. Rogers, and A. M. Neuner
1985 The Effect of the End of the Pleistocene on Man in North America. In *Environments and Extinctions: Man in Late Glacial North America*, edited by J. I. Mead and D. J. Meltzer, pp. 15-30. Center for the Study of Early Man, University of Maine at Orono.

Martin, Paul S. and Richard G. Klein
1984 *Quaternary Extinctions: A Prehistoric Revolution*. University of Arizona Press, Tucson.

Martin, Paul S., R. S. Thompson, and A. Long
1985 Shasta Ground Sloth Extinctions: A Test of the Blitzkrieg Model. In *Environments and Extinctions: Man in Late Glacial North America*, edited by J. I. Mead and D. J. Meltzer, pp. 5-14. Center for the Study of Early Man, University of Maine at Orono.

Mason, J. Alden
1929 The Texas Expedition. *Museum Journal* 20:318-388.

Mathews, John J.
1961 *The Osages, Children of the Middle Waters*. University of Oklahoma Press, Norman.

Mattes, M. J.
1947 *Project Report on Historical Aspects of Kanopolis Reservoir on Smoky Hill River, Kansas*. Report submitted to the U.S. Army Corps of Engineers, Kansas City District, Kansas City.

May, John R.
1966 A Summary of Skeletal Material from Oklahoma. Ms. on file, Oklahoma Archaeological Survey, Norman.

Mayberry, Ruben H.
1963 A Survey of Chronic Disease and Diet in Seminole Indians in Oklahoma. *American Journal of Clinical Nutrition* 13:127-134.

Mayhall, Mildred
1962 *The Kiowas*. University of Oklahoma Press, Norman.

Mayo, Michael
1984 *Archaeological Investigations at the Spring Creek Site, (34Ln-76), Lincoln County, Oklahoma*. Oklahoma Conservation Commission, Archaeological Research Report 11, Oklahoma City.

McClung, Terry L.
1979 The Remains of Lanceolate Point Technology in Tulsa County. *Oklahoma Anthropological Society Newsletter* 27(1):2-8.

McCormick, Olin F.
1976 The Archaic Period in North Central Texas. In *The Texas Archaic: A Symposium*, edited by T. R. Hester, pp. 39-45. Center for Archaeological Research, The University of Texas at San Antonio 2.

McCracken, Harold (editor)
1979 *The Mummy Cave Project in Northwestern Wyoming*. The Buffalo Bill Historical Center, Cody.

McDermott, J. F. (editor)
1940 *Tixier's Travels on the Osage Prairies*. University of Oklahoma Press, Norman.

McKee, Marvin C.
1965 Archaeological Sites in Kansas with Human Skeletal Remains. Ms. on file, Department of Anthropology, University of Tennessee, Knoxville.

McKern, Thomas W.
1964 Indian Skeletal Material from the Jim Arnold Site. *Bulletin of the Texas Archeological Society* 35:95-99.

McKern, W. C.
1939 The Midwestern Taxonomic Method as an Aid to Archaeological Culture Study. *American Antiquity* 4:301-313.

McNeish, R. S.
1979 Earliest Man in the New World and Its Implication For Soviet-American Archaeology. *Arctic Anthropology* 16:2-15.

McNett, Charles W., Jr.
1985 *Shawnee Minisink: A Stratified Paleoindian-Archaic Site in the Upper Delaware Valley of Pennsylvania*. Academic Press, Orlando.

McReynolds, E. C.
1957 *The Seminoles*. University of Oklahoma Press, Norman.

McWilliams, K. Richard
1962 The Trice Site, Pt29. Ms. on file, Stovall Museum, University of Oklahoma, Norman.

1963 A Skeleton Salvaged from Gd24. Ms. on file, Stovall Museum, University of Oklahoma, Norman.

1967 Skeletal Material from Site BV-16, Beaver County, Oklahoma. Ms. on file, Oklahoma Archaeological Society, Norman.

1969 *Physical Anthropology of Wann and Sam, Two Fourche Maline Focus Archaic Sites in Eastern Oklahoma*. Master's thesis, Department of Anthropology, University of Oklahoma, Norman.

n.d. An Analysis of the Skeletal Material from the Shetley Shelter, My-77, Mayes County, Oklahoma. Ms. on file, Oklahoma River Basin Survey, University of Oklahoma. Norman.

McWilliams, K. Richard and William K. Jones
1976 The Poafpybitty Site: a Late Nineteenth Century Kiowa Burial from Southwestern Oklahoma. *Plains Anthropologist* 21:13-28.

Mead, J. I. and D. J. Meltzer (editors)
1985 *Environments and Extinctions: Man in Late Glacial North America*. Center for the Study of Early Man, University of Maine at Orono.

Mehl, M. G.
1975 Vertebrate Paleomorphology of the Cooperton Site. In *The Cooperton Mammoth: An Early Man Bone Quarry,* edited by A. D. Anderson. *Great Plains Journal* 14:165-168.

Meltzer, David J.
1987 The Clovis Paleoindian Occupation of Texas: Results of the Texas Clovis Fluted Point Survey. *Bulletin of the Texas Archeological Society* 57:27-68.

Meltzer, David J. and Michael B. Collins
1986 Prehistoric Water Wells on the Southern High Plains: Clues to Altithermal Climate. *Journal of Field Archaeology* 14:9-28.

Meltzer, David J. and J. I. Mead
1985 Dating Late Pleistocene Extinctions: Theoretical Issues, Analytical Bias, and Substantive Results. In *Environments and Extinctions: Man in Late Glacial North America*, edited by J. I. Mead and D. J. Meltzer, pp. 145-174. Center for the Study of Early Man, University of Maine at Orono.

Meltzer, David J., D.D. Fowler, and J.A. Sabloff (editors)
1986 *American Archaeology Past and Future*. Smithsonian Press, Washington D. C.

Merchant, V. L. and D. H. Ubelaker
1977 Skeletal Growth of Protohistoric Arikara. *American Journal of Physical Anthropology* 46:61-72.

Merriam, Daniel F.
1963 *The Geologic History of Kansas*. State Geological Survey of Kansas, Bulletin 162. Lawrence.

Metcalf, George
1949 Three Pottery Types from the Dismal River Aspect. Proceedings of the Fifth Plains Conference for Archaeology. University of Nebraska, *Laboratory of Anthropology Notebook* 1:73-78, Lincoln.

Metcalf, Michael D. and Kevin D. Black
1988 The Yarmony Site, Eagle County, Colorado: A Preliminary Summary. *Southwestern Lore* 54:10-28.

Meyer, Roy W.
1962 The Iowa Indians, 1836-1885. *Kansas Historical Quarterly* 28:273-300.

Michelson, T.
1929 *Studies of the Algonquian Tribes of Iowa and Oklahoma*. Smithsonian Institution, Explorations and Field-Work pp. 207-212.

Miller, Patricia A.
1980 Archaic Lithics from the Coffee Site. In *Archaic Prehistory on the Prairie-Plains Border*, edited by Alfred E. Johnson, pp. 107-111. University of Kansas Publications in Anthropology 12, Lawrence.

Mobley, C. M.
1979 The Terminal Archaic at Los Esteros: A Late Hunter-Gatherer Community on the Jornada-Mogollon Frontier. In *Jornada Mogollon Archeology*, edited by P. H. Beckett and R. N. Wiseman, Historic Preservation Bureau, Santa Fe.

Moir, Randall W., Reed Lee, and Joe Saunders
1982 Overview of Testing of Historic Period Properties. In *Settlement of the Prairie Margin: Archaeology of the Richland Creek Reservoir, Navarro and Freestone Counties, Texas 1980-1981*. Archaeology Research Program,Southern Methodist University, Archaeological Monographs 1, Dallas.

Monger, Earl
1970 A Preliminary Report of the Larned Site. *Kansas Anthropological Association Newsletter* 15(8):1-15.

1976 A Report on the Archeological Salvage of the Various Projects at Fort Larned National Historic Site in 1976. Ms. on file, National Park Service, Midwest Archeological Center, Lincoln.

Mooney, James
1979 *Calendar History of the Kiowa Indians*. Reprinted from the Seventeenth Annual Report of the Bureau of American Ethnology 1895-96. Smithsonian Institution Press, Washington, D.C.

Moore, Guy Powley
1939 Pawnee Traditional Customs. *Chronicles of Oklahoma* 17:151-169.

Moore, J. W., Jr.
1973 *Bent's Old Fort: An Archeological Study*. State Historical Society of Colorado, Denver.

Moore, James A.
1981 The Effects of Information Networks in Hunter-Gatherer Societies. In *Hunter-Gatherer Foraging Strategies*, edited by B. Winterhalder and E. A. Smith, pp. 194-217. University of Chicago Press, Chicago.

Moore, Michael C.
1984a A Reconnaissance Survey of Quartermaster Creek. In *Archaeology of the Mixed Grass Prairie Phase I: Quartermaster Creek*, edited by Timothy G. Baugh, pp. 51-214. Oklahoma Archaeological Survey, Archaeological Resource Survey Report 20, Norman.

1984b The New Smith Site, 34RM-400, a Late Prehistoric Mortuary Site in Western Oklahoma. Paper presented at the 42nd Plains Conference, Lincoln.

Moore-Jansen, P. H., J. C. Rose, L. C. Stewart Abernathy, and M. L. Powell
1980 Dietary Reconstruction from Observations of Enamel Wear Striations on Caddo and Fourche Maline Molars. Paper delivered at the 22nd Caddo Conference, Texarkana, Texas.

Moorehead, Warren K.
1931 *The Archaeology of the Arkansas River Valley*. Andover Press, Andover.

Moorey, L. W. and R. J. Nelson
1970 *Dental Science Handbook*. DHEW Publication No. NIH 72-336, Washington, D.C.

Moorman, Edward H.
1953 *Preliminary Survey and Appraisal of the Archeological Resources of Strawn and Toronto Reservoirs, Kansas*. Smithsonian Institution, River Basin Surveys, Washington, D.C.

Morehouse, G. P.
1908 History of the Kansa or Kaw Indians. *Kansas State Historical Society, Transactions* 10:327-368.

Morlan, R. E.
1983 Pre-Clovis Occupation North of the Ice Sheets. In *Early Man in the New World*, edited by R. Shutler, Jr., pp. 47-63. Sage Publications, Beverly Hills.

Morris, John W., Charles R. Goins, and Edwin C. McReynolds
1976 *Historical Atlas of Oklahoma*. Second Edition. University of Oklahoma Press, Norman.

Moskowitz, R. W., D. S. Howell, V. M. Goldberg and H. J. Mankin
1984 *Osteoarthritis: Diagnosis and Management*. W.B. Saunders Company, Philadelphia.

Moss, John H. and others
1951 *Early Man in the Eden Valley*. The University Museum, University of Pennsylvania, Museum Monographs 6.

Muller-Beck, Hans
1966 Paleohunters in America: Origins and Diffusion. *Science* 152:1191-1210.

Mulloy, William
1954 The McKean Site in Northwestern Wyoming. *Southwestern Journal of Anthropology* 10:432-460.

1958 *A Preliminary Historical Outline for the Northwestern Plains*. University of Wyoming Publications 22(1), Laramie.

1959 The James Allen Site, near Laramie, Wyoming. *American Antiquity* 25:112-116.

Murdock, George Peter and Timothy O'Leary
1975 *Ethnographic Bibliography of North America*. Human Relations Area Files Press, New Haven.

Murphy, Joseph Francis
1961/62 Potawatomi Indians of the West: Origins of the Citizen Band. *Dissertation Abstracts* 22:1134.

Myers, Arthur J.
1959 *Geology of Harper County, Oklahoma*. Oklahoma Geological Survey Bulletin 80, Norman.

Myers, Thomas P. and Ray Lambert
1983 Meserve Points: Evidence of a Plainsward Extension of the Dalton Horizon. *Plains Anthropologist* 28(100):109-114.

Myers, Thomas P., M. R. Voorhies, R. G. Corner
1980 Spiral Fractures and Bone Pseudotools at Paleontological Sites. *American Antiquity* 45:483-490.

Neal, Larry
1972 *An Archeological Survey and Assessment of the Prehistoric Resources in the Parker and Albany Reservoirs, Oklahoma*. Oklahoma River Basin Survey Miscellaneous Publication, University of Oklahoma, Norman.

1973a *An Assessment of the Prehistoric Cultural Resources of the Proposed Arcadia Reservoir, Oklahoma County, Oklahoma*. Oklahoma River Basin Survey Miscellaneous Publication, University of Oklahoma, Norman.

1973b *An Assessment of the Prehistoric Cultural Resources of the Proposed Shidler Lake, Osage County, Oklahoma*. Oklahoma River Basin Survey Miscellaneous Publication, University of Oklahoma, Norman.

1986 Preliminary Distribution of Bannerstones in Oklahoma. *Bulletin of the Oklahoma Anthropological Society* 35:51-68.

1988 *Archeological Survey of Clearcut Areas along Little River, McCurtain and Pushmataha Counties, Oklahoma*. Oklahoma Archeological Survey, Archeological Resource Survey Report 32, Norman.

Neck, Raymond W.
1987 Changing Holocene Snail Faunas and Environments along the Eastern Caprock Escarpment of Texas. *Quaternary Research* 27:312-322.

Neighbours, Kenneth F.
1966 Jose Maria: Anadarko Chief. *Chronicles of Oklahoma* 44:254-274.

1973 *Indian Exodus: Texas Indian Affairs 1835-1859*. Nortex Offset Publications.

Neill, W. T.
1955 An Historic Indian Burial from Columbia County, Georgia. *Southern Indian Studies* 7:3-9.

Nelson, Charles E.
1967 The Archaeology of Hall-Woodland Cave. *Southwestern Lore* 33:1-13.

1971 The George W. Lindsay Ranch Site, 5JF11. *Southwestern Lore* 37:1-14.

Neuman, Robert W.
1974 Data Relative of the Historic Locations of Certain Historic Tribes. In *Caddoan Indians II*. Garland Publishing, New York.

Neumann, George K.
1952 Archeology and Race in the American Indian. In *Archeology of Eastern United States*, edited by James B. Griffin, pp. 13-34. University of Chicago Press, Chicago.

New World Research, Inc.
1981 *A Cultural Resources Survey of the Proposed Transanadarko Pipeline System, Texas, Oklahoma, Arkansas, and Louisiana*. New World Research, Report of Investigations 37.

Newcomb, W. W.
1955 *An Historic Burial from Yellowhouse Canyon, Lubbock County.* Bulletin of the Texas Archeological Society 26.

1958 The Skeleton of Yellowhouse Canyon. *Texas Memorial Museum Notes* 8:1-13.

1961 *The Indians of Texas: From Prehistoric to Modern Times*. University of Texas Press, Austin.

1976 *The People Called Wichita*. Indian Tribal Series, Phoenix.

Nichols, J. D.
1975 Soil at the Cooperton Site. *Great Plains Journal* 14:139-143.

Nickens, P. R.
1976 Stature Reduction as an Adaptive Response to Food Production in Mesoamerica. *Journal of Archaeological Science* 3:31-41.

Nieberding, Velma
1966 The Nez Perce in the Quapaw Agency. *Chronicles of Oklahoma* 44:22-30.

Northcutt, John D.
1979 *An Archaeological Survey of the Gypsum Breaks on the Elm Fork of the Red River*. Contributions of the Museum of the Great Plains 8, Lawton.

1980 *A Cultural Resource Survey on Lower Bayou in Love County and Big Beaver Creek in Comanche and Stephens Counties, Oklahoma*. Museum of the Great Plains Anthropology Series, No. 1, Lawton.

Northcutt, John D., John Beckman, and Paul Fisher
1983 *Historical Site Survey for Comanche, Cotton, and Tillman Counties,* Museum of the Great Plains, Lawton.

Northern, M. J.
1979 *Archaeological Investigations of the Montgomery Site, Floyd County, Texas*. Unpublished Master's thesis, Department of Anthropology, Texas Tech University, Lubbock.

Nowak, Michael
1982 *Archaeological Investigations in Southeastern Colorado*. Colorado College Publications in Archaeology 5, Colorado Springs.

Nowak, Michael and C. A. Berger
1982 *Archaeological Investigations in Southeastern Colorado*. Colorado College Publications in Archaeology 5, Colorado Springs.

Nye, W. S.
1968 *Carbine and Lance*. University of Oklahoma Press, Norman.

Oakes, John U.
1953 The Lacy Site, Garvin County, Oklahoma. *Bulletin of the Oklahoma Anthropological Society* 1:17-24.

O'Brien, M. J., R. E. Warren, and D. E. Lewarch (editors)
1982 *The Cannon Reservoir Human Ecology Project: An Archaeological Study of Cultural Adaptations in the Southern Prairie Peninsula*. Academic Press, New York.

O'Brien, P. J.
1984 *Archeology in Kansas*. University of Kansas Museum of Natural History, Public Education Series 9, Lawrence.

O'Brien, P. J. and H. B. Rager
1983 *Cultural Resources Survey of Council Grove Lake, Kansas*. Report submitted to the U.S. Army Corps of Engineers, Tulsa District.

Odell, George H.
1989 *Final Report on Archaeological Excavations Conducted between May and July, 1988 at the Lasley Vore Site (34Tu-65), Jenks, Oklahoma*. Report submitted to the Kimberly-Clark Corporation, Greenville, South Carolina.

Oklahoma Historical Society
1970 *Oklahoma Statewide Historic Sites Survey and Preservation Plan*. Oklahoma Historical Society, Oklahoma City.

Oldfield, F.
1975 *Pollen Analytical Results, Part 2*. Southern Methodist University Publication of the Fort Burgwin Research Center 9, pp. 121-148.

Oliver, Symmes
1962 *Ecology and Cultural Continuity as Contributing Facts in the Social Organization of the Plains Indians*. University of California Publications in American Archaeology and Ethnology 48, pp. 1-90.

Olsen, Stanley J.
1963 Dating Early Plains Buttons by their Form. *American Antiquity* 28(4):551-553.

Opler, Morris E.
1971 Pots, Apache, and the Dismal River Culture Aspect. In *Apache Culture History and Ethnology*, edited by Keith A. Basso and Morris E. Opler, pp. 29-33. Anthropological Papers of the University of Arizona 21, Tucson.

1975 Problems in Apachean Culture History, with Special Reference to the Lipan Apache. *Anthropological Quarterly* 48:182-192.

1982 The Scott County Pueblo Site in Historical, Archaeological, and Ethnological Perspective. In *Pathways to Plains Prehistory*, edited by Don G. Wyckoff and J. L. Hofman, pp. 135-144. Cross Timbers Heritage Association Contributions 1, Duncan.

1983 Chiricahua Apache. In *Handbook of North American Indians, The Southwest, Vol. 10,* edited by Alfonzo Ortiz, pp. 401-418. Smithsonian Institution, Washington, D.C.

Orchard, William C.
1929 *Beads and Beadwork of the American Indians.* Museum of the American Indian, Heye Foundation Contributions No. 11. New York.

Orr, K. G.
1952 Survey of Caddoan Area Archeology. In *Archeology of Eastern United States*, edited by J. B. Griffin, pp. 239-254. University of Chicago Press, Chicago.

Ortner, D. J.
1968 Description and Classification of Degenerative Bone Changes in the Distal Joint Surfaces of the Humerus. *American Journal of Physical Anthropology* 28:139-156.

Ortner, D. J. and W. G. J. Putscher
1981 *Identification of Pathological Conditions in Human Skeletal Remains*. Smithsonian Contributions to Anthropology 28. Washington, D.C.

Orton, Robert B.
1974 The Climate of Texas. In *Climates of the States, Vol. 2: Western States*. The National Oceanic and Atmospheric Administration. Water Information Center, Port Washington, New York.

Osborn, Alan J. and Robert C. Hassler (editors)
1987 *Perspectives on Archaeological Resources Management in the Great Plains*. I&O Publishing, Omaha.

Osborne, Carolyn M.
1965 The Preparation of Yucca Fibers: An Experimental Study. In *Contributions of the Wetherill Mesa Archeological Project*, assembled by Douglas Osborne, pp. 45-50. Memoirs of the Society for American Archaeology 19.

Ottaway, Harold N.
1970 A Possible Origin for the Cheyenne Sacred Arrow Complex. *Plains Anthropologist* 15:94-98.

Owsley, D. W.
1985 Post-Contact Period Nutritional Status and Cortical Bone Thickness of South Dakota Indians. In *Status, Structure and Stratification: Current Archaeological Reconstructions,* edited by M. Thompson, M. T. Garcia, and R. J. Kense, pp. 199-207. Proceedings of the 16th Annual Chacmool Conference. The Archaeological Association of the University of Calgary, Calgary, Alberta.

1988 Bio-Archaeology in the Southern Plains. Paper delivered at the 46th Plains Conference, Wichita.

Owsley, D. W. and W. M. Bass
1979 A Demographic Analysis of Skeletons from the Larson Site 39WW2 Walworth County, South Dakota: Vital statistics. *American Journal of Physical Anthropology* 51:145-154.

Owsley, Douglas W. and Robert W. Mann
n.d. An American Indian Skeleton with Clubfoot From the Cabin Burial Site (A1184), Hemphill County, Texas. Submitted to *Plains Anthropologist*.

Owsley, D. W. and S. A. Symes
1981 Morphological Differences Between the Mandan and Historic Arikara Crania. In *Progress In Skeletal Biology of Plains Populations*, edited by R. L. Jantz and D. H. Ubelaker, pp. 49-55. Memoir 17, *Plains Anthropologist* 35(128):93-101.

Owsley, D. W., H. E. Berryman and W. M. Bass
1977 Demographic and Osteological Evidence for Warfare at the Larson Site, South Dakota. In *Trends in Middle Missouri Prehistory: A Festschrift Honoring the Contributions of Donald J. Lehmer*, edited by W. R. Wood, pp. 119-131. Memoir 13, *Plains Anthropologist* 22(78, Part 2):119-131.

Owsley, D. W., Mary H. Manhein and Murray K. Marks
1987 Burial Archaeology and Osteology of Charity Hospital/Cypress Grove II Cemetery, New Orleans. Ms. on file, Department of Geography and Anthropology, Louisiana State University, Baton Rouge.

Owsley, D. W., G. D. Slutzky, M. F. Guagliardo, and L. M. Dietrick
1981 Interpopulation Relationships of Four Post-Contact Coalescent Sites from South Dakota: Four Bear (39DW2), Oahe Village (39HU2), Stony Point Village (39ST235) and Swan Creek (39WW7). In *Progress in Skeletal Biology of Plains Populations*, edited by R. L. Jantz and D. H. Ubelaker. Memoir 17, *Plains Anthropologist* 26(94, Part 2):31-42.

Owsley, Douglas W., Charles E. Orser, Jr., Robert Montgomery, and Claudia C. Holland
1985 *An Archaeological Study of the First Cemetery in New Orleans, Louisiana*. Report to the Louisiana Division of Archaeology, Office of Cultural Development, Department of Culture, Recreation and Tourism, Baton Rouge.

Ozee, Delevan Worsham
1955 An Historic Indian Cache in Clay County. *Bulletin of the Texas Archeological Society* 26:256-257.

Padgett, W. M. and D. J. Blakeslee
1982 *El Dorado Prehistory: Investigations of Some Early Campsites in Butler County, Kansas*. Archaeology Laboratory, Wichita State University, Wichita.

Palkovich, A. M.
1978 *A Model of the Dimensions of Mortality and its Application to Paleodemography*. Ph.D. dissertation, Department of Anthropology, Northwestern University, Evanston, Illinois.

Parker, Wayne
1982 *Archaeology at the Bridwell Site*. Crosby County Pioneer Memorial Museum, Crosbyton, Texas.

n.d. *A Preliminary Report: The Valley of Tears Burial in Floyd County, Texas*. Crosby County Historical Commission, Crosbyton, Texas.

Parmalee, Paul W.
1980 Notes on the Animal Food Resources of an Indian Family in Eastern Oklahoma. *Tennessee Anthropologist* 5:159-165.

Parmalee, Paul W. and Walter E. Klippel
1983 The Role of Native Animals in the Food Economy of the Historic Kickapoo of Central Illinois. In *Lulu Linear Punctated: Essays in Honor of George Irving Quimby*, edited by R. C. Dunnell and D. K. Grayson, pp. 253-324. Museum of Anthropology, University of Michigan, Anthropological Papers 72, Ann Arbor.

Parry, W. J. and J. D. Speth
1984 *The Garnsey Spring Campsite: Late Prehistoric Occupation in Southeastern New Mexico*. Museum of Anthropology, University of Michigan, Technical Reports 15, Ann Arbor.

Parsons, E. C.
1941 Notes on the Caddo. *American Anthropological Association Memoirs* 57:1-76.

Parsons, Mark L.
1967 *Archeological Investigations in Crosby and Dickens Counties, Texas during the Winter, 1966 -1967*. State Building Commission Archeological Program, Report 7.

Parsons, Mark L., Ronnie Hill, and Wayne Parker
1979 The Old Tom Burial, Dickens County, Texas. *Bulletin of the Texas Archeological Society* 60:69-87.

Patrick, R.
1938 The Occurrence of Flints and Extinct Animals in Pluvial Deposits near Clovis, New Mexico, Part V—Diatom Evidence from the Mammoth Pit. *Proceedings of the Philadelphia Academy of Natural Sciences* 90:15-24.

Patterson, David
1974 *An Analysis of the Human Skeletal Material from the Antelope Creek Focus of Northern Texas*. Master's thesis, Department of Anthropology, Eastern New Mexico University, Portales.

Patterson, Deborah
1974 *Dental Variation among Panhandle Aspect Populations*. Master's thesis, Department of Anthropology, Eastern New Mexico University, Portales.

Patton, Leroy T.
1923 *The Geology of Potter County.* The University of Texas Bulletin 233D, Austin.

Pearce, J. E.
1932 The Present Status of Texas Archaeology. *Bulletin of the Texas Archaeological and Paleontological Society* 4:44-54.

Pearson, Charles E.
1974 Glass Trade Beads from Fort Sill, Oklahoma. Ms. on file, Fort Sill Museum, Fort Sill, Oklahoma.

1978 The Rabbit Hill Site: A Late Nineteenth Century Southern Plains Indian Burial at Fort Sill, Oklahoma. *Bulletin of the Oklahoma Anthropological Society* 27:171-177.

Penman, John T.
1975 Hospital Complex. In *Fort Washita: From Past to Present,* edited by K. E. Lewis, pp. 145-198. Oklahoma Historical Society, Papers in Anthropology 1, Oklahoma City.

1976 Historic Choctaw Towns of the Southern Division. Mississippi Department of Archives and History. Paper presented to the Fourth French Regime Symposium, Mobile, Alabama.

1977 *Archaeological Survey in Mississippi, 1974-1975*. Mississippi Department of Archives and History Archeological Report 2, Jackson.

1983 Archaeology and Choctaw Removal. In *Southeastern Natives and Their Pasts, Papers Honoring Dr. Robert E. Bell*, edited by Don G. Wyckoff and Jack L. Hofman, pp. 283-299. Oklahoma Archeological Survey Studies in Oklahoma's Past No. 11, Norman.

Perino, G.
1968 *Guide to the Identification of Certain American Indian Projectile Points*. Oklahoma Anthropological Society, Special Bulletin 3.

1971 The Will Rogers State Park Site, 34RO-10. *Bulletin of the Oklahoma Anthropological Society* 20:91-99.

1972a *An Historical-Cultural Assessment of the Skiatook Reservoir, Osage County, Oklahoma*. U.S. Army Corps of Engineers, Tulsa District.

1972b *An Historical-Cultural Assessment of the Proposed Birch Creek Reservoir, Osage County, Oklahoma*. U. S. Army Corps of Engineers, Tulsa District.

Perkins, S. M. and T. G. Baugh
1986 Radiocarbon Dates from the 1984 Test Excavations at the Duncan Site 34WA-2. *Oklahoma Anthropological Society Newsletter* 35(7):2-4.

Pertulla, Timothy K.
1985 The Quince Site: A Stratified Paleoindian to Woodland Occupation in the Ouachita Mountains of Southeast Oklahoma. *Current Research in the Pleistocene* 2:25-26.

Perttula, Timothy K. and Chet Shaw
1980 *Archeological Investigations at Historic Structure 3, Fort Larned National Historic Site*. National Park Service, Midwest Archeological Center, Lincoln.

Perttula, Timothy K., Paul McGuff, C. Reid Ferring, and Bonnie Yates
1983 McGee Creek Archaeology: A Consideration of Western Ouachita Mountains Prehistory. *Bulletin of the Oklahoma Anthropological Society* 32:23-54.

Peterson, Robert R., Jr.
1978 Projectile Point Re-utilization Patterns at the Agate Basin site. *Wyoming Contributions to Anthropology* 1:139-149. University of Wyoming Publications, Laramie.

Petsche, Jerome E.
1968 *Bibliography of Salvage Archaeology in the United States*. Smithsonian Institution River Basin Survey, Publications in Salvage Archaeology 10, Smithsonian Press, Washington, D.C.

Pettipas, Leo
1970 Early Man in Manitoba. In *Ten Thousand Years, Archaeology in Manitoba*, edited by Walter M. Hlady, pp. 5-28, Manitoba Archaeological Society.

1982 A Reconsideration of Late Paleo-Indian (Plano) Prehistory. *Manitoba Archaeological Quarterly* 6:44-77.

Phenice, Terrell W.
1969 *An Analysis of the Human Skeletal Material from the Burial Mounds in North Central Kansas*. University of Kansas Publications in Anthropology 1, Lawrence.

Phillips, J. L. and J. A. Brown (editors)
1983 *Archaic Hunters and Gatherers in the American Midwest*. Academic Press, New York.

Phillips, John W.
1985 *Excavated Sites near Lake Meredith*. Panhandle Archeological Society Publication 2, Amarillo.

Pianka, Eric R.
1983 *Evolutionary Ecology*, Third Edition. Harper and Row, New York.

Pillaert, Elizabeth
1962 Test Excavations at the Lee Site, Gv-4, Garvin County, Oklahoma. *Bulletin of the Oklahoma Anthropological Society* 10:79-101.

1963 The McLemore Site of the Washita River Focus. *Bulletin of the Oklahoma Anthropological Society* 11:1-113.

Pollitzer, William S., et. al.
1970 The Seminole Indians of Oklahoma: Morphology and Serology. *American Journal of Physical Anthropology* 33:15-29.

Polyak, Victor and Monty Williams
1986 Gaines County Paleo-Indian Projectile Point Inventory and Analysis. *Transactions of the 21st Regional Archeological Symposium for Southeastern New Mexico and Western Texas*, pp. 25-96, El Paso.

Porter, S. C. (editor)
1983 *Late Quaternary Environments of the United States, Vol. 1, the Late Pleistocene*. University of Minnesota Press, Minneapolis.

Prewitt, Elton R.
1981 Cultural Chronology in Central Texas. *Bulletin of the Texas Archeological Society* 52:65-91.

Prewitt, Elton R. and D. A. Lawson
1972 *An Assessment of the Archeological and Paleontological Resources of Lake Texoma, Texas-Oklahoma*. Texas Archeological Salvage Project Survey Report 10, University of Texas, Austin.

Prewitt, Terry J.
1981 T*radition and Culture Change in the Oklahoma Delaware Big House Community: 1867-1924*. Laboratory of Archaeology, University of Tulsa, Contributions in Archaeology 9.

Price, W. Armstrong
1944 The Clovis Site: Regional Physiography and Geology. *American Antiquity* 9:401-407.

Puskarich, C. L.
1984 *Metric Variation in the Arikara Pelvis*. Ph.D. dissertation, Department of Anthropology, University of Tennessee, Knoxville.

Quimby, G. I. and A. Spoehr
1950 Historic Creek Pottery from Oklahoma. *American Antiquity* 15:249-251.

Rathjen, Frederick W.
1973 *The Texas Panhandle Frontier*. University of Texas Press, Austin.

Ray, Cyrus N.
1929a New Evidence of Ancient Man in America. *Scientific American* 140:430-431.

1929b A Differentiation of the Prehistoric Cultures of the Abilene Section. *Bulletin of the Texas Archeological and Paleontological Society* 1:7-22.

1931 Recent Archeological Researches in the Abilene Section. *Bulletin of the Texas Archeological and Paleontological Society* 3:76-89.

1933 Multiple Burials in Stone Cist Mounds of the Abilene Region. *Bulletin of the Texas Archeological and Paleontological Society* 5:14-24.

1937 More Evidence Concerning Abilene Man. *Bulletin of the Texas Archeological and Paleontological Society* 9:193-221.

1938 The Clear Fork Culture Complex. *Bulletin of the Texas Archeological and Paleontological Society* 10:193-207.

1939 Some Unusual Abilene Region Burials. *Bulletin of the Texas Archeological and Paleontological Society* 11:226-285.

1941 Various Types of Clear Fork Gouges. *Bulletin of the Texas Archeological and Paleontological Society* 13:152-162.

1961 Deductions Concerning the Clear Fork Gouge. *Bulletin of the Texas Archeological Society* 30:199-208.

Ray, Cyrus N. and Kirk Bryan
1938 Folsomoid Point Found in Alluvium beside H. Mammoth's Bones. *Science*, New Series 88(2281):257-258.

Ray, Cyrus N. and Edward B. Jelks
1964 The W. H. Watson Site: A Historic Indian Burial in Fisher County, Texas. *Bulletin of the Texas Archeological Society* 35:127-141.

Ray, Max
1960 The James Site, Br-11, An Archaeological Site in Bryan County, Oklahoma. *Bulletin of the Oklahoma Anthropological Society* 8:53-74.

Redder, Albert J.
1985 Horn Shelter Number 2: The South End, a Preliminary Report. *Central Texas Archeologist* 10:37-65.

Reeder, R. L.
1980 The Sohn Site: A Lowland Nebo Hill Complex Campsite. In *Archaic Prehistory on the Prairie-Plains Border*, edited by A. E. Johnson, pp. 55-66. University of Kansas Publications in Anthropology 12, Lawrence.

Reeves, Brian O.K.
1973 The Concept of the Altithermal Cultural Hiatus in Northern Plains Prehistory. *American Anthropologist* 75:1221-1253.

Reeves, C. C., Jr.
1976 Quaternary Stratigraphy and Geologic History of Southern High Plains. In *Quaternary Stratigraphy of North America*, edited by W. C. Mahaney, pp. 213-234. Dowden, Hutchinson and Ross, Stroudsburg.

Regan, M. J., R. M. Rowlett, E. G. Garrison, W. Dort, V. M. Brysant, and C. J. Johansen
1978 Flake Tools Stratified below Paleo-Indian Artifacts. *Science* 200:1272-1275.

Reher, C. A. and G. C. Frison
1980 The Vore Site, 48CK302, a Stratified Buffalo Jump in the Wyoming Black Hills. Memoir 16, *Plains Anthropologist 25* (88, Part 2).

Reid, Dwight W.
1982 Toward a Theory of Archaeological Classification. In *Essays on Archaeological Typology*, edited by R. Whallon and J. A. Brown, pp. 56-92, Center for American Archaeology Press, Evanston.

Reid, Kenneth C.
1980 *Nebo Hill: Archaic Political Economy in the Riverine Midwest*. Ph.D. dissertation, University of Kansas, Lawrence.

1983 The Nebo Hill Phase: Late Archaic Prehistory in the Lower Missouri Valley. In *Archaic Hunters and Gatherers in the American Midwest*, edited by J. L. Phillips and J. A. Brown, pp. 11-39. Academic Press, New York.

1984 *Nebo Hill and Late Archaic Prehistory of the Southern Prairie Peninsula*. University of Kansas, Publications in Anthropology 15, Lawrence.

Reid, Kenneth C. and Joe Alan Artz
1984 *Hunters of the Forest Edge: Culture, Time, and Process in the Little Caney Basin (1980, 1981, and 1982 Field Seasons)*. Oklahoma Archeological Survey, Studies in Oklahoma's Past 13, Norman.

Renaud, E. B.
1929a Basketmakers in Oklahoma. *El Palacio* 27:187-188.
1929b Archaeological Research in Northwestern New Mexico and Western Oklahoma. *El Palacio* 27:23-24.

1930a Prehistoric Cultures of the Cimarron Valley, Northeastern New Mexico and Western Oklahoma. *Colorado Scientific Society Proceedings* 12:113-150, Denver.

1930b A Summary of Prehistoric Cultures of the Cimarron Valley. *El Palacio* 29:123-129.

1932 *Yuma and Folsom Artifacts (New Material)*. Proceedings of the Colorado Museum of Natural History 11(2), Denver.

1934 *Archaeological Survey of Western Nebraska*. University of Denver, Department of Anthropology, on file at National Park Service, Midwest Archaeological Center, Lincoln.

1937 *The Archaeological Survey of the High Western Plains. Northeastern New Mexico*. Ninth Report, University of Denver, Archaeological Survey, Department of Anthropology, Denver.

Resnick, D. and G. Niwayama
1981 *Diagnosis of Bone and Joint Disorders*, Vol. 3. W. B. Saunders, Philadelphia.

Reynolds, J. D.
1980 A Brief Description of Archeological Investigations at Site 14BT478, Barton County, Kansas. *Journal of the Kansas Anthropological Association* 1:40-42.

1982 *Archeological Investigations at the Cow-Killer Site, 14OS347*. U.S. Army Corps of Engineers, Kansas City District.

1984 *The Cow-Killer Site, Melvern Lake, Kansas*. Kansas State Historical Society, Anthropological Series 12, Topeka.

1980 A Brief Description of Archeological Investigations at Site 14Bt78, Barton County, Kansas. *Journal of the Kansas Anthropological Association* 1:40-42.

Richards, Michael K.
1971 The Lee Site, A Late Prehistoric Manifestation in Garvin County, Oklahoma. *Bulletin of the Oklahoma Anthropological Society* 20:1-82.

Riley, Carroll L.
1982 *The Frontier People: The Greater Southwest in the Protohistoric Period*. Center for Archaeological Investigations, Occasional Papers 1, Carbondale.

Risser, Paul G.
1974 *Field Guide to Oklahoma*. Oklahoma Biological Survey, University of Oklahoma, Norman.

Ritzenthaler, R. E. and F. A. Peterson
1956 *The Mexican Kickapoo Indians*. Public Museum of the City of Milwaukee, Publications in Anthropology 2.

Robb, A. D.
1974 The Climate of Kansas. In *Climates of the States, Vol. II -Western States*. National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Port Washington, New York.

Roberts, Frank H. H., Jr.
1935 A Folsom Complex: Preliminary Report on Investigations at the Lindenmeier Site in Northern Colorado. *Smithsonian Miscellaneous Collections* 94(4):1-35, Washington, D.C.

1936 Additional Information on the Folsom Complex: Report on the Second Season's Investigations at the Lindenmeier Site in Northern Colorado. *Smithsonian Miscellaneous Collections* 95(10):1-38, Washington, D.C.

1937 New Developments in the Problem of the Folsom Complex. In *Explorations and Fieldwork of the Smithsonian Institution in 1936*, pp. 69-74. Smithsonian Institution Press. Washington, D.C.

1940a Developments in the Problem of the North American Paleo-Indian. In *Essays in the Historical Anthropology of North America,* pp. 51-116. Smithsonian Miscellaneous Collections 10, Washington, D.C.

1940b Excavations at the Lindenmeier Site Contribute New Information on the Folsom Complex. *Explorations and Fieldwork of the Smithsonian Institution in 1939,* pp. 79-82. Smithsonian Press, Washington D. C.

1942 *Archaeological and Geological Investigations in the San Jon District, Eastern New Mexico*. Smithsonian Miscellaneous Collections 103(4), Washington D.C.

1945 A Deep Burial on the Clear Fork of the Brazos River. *Bulletin of the Texas Archeological and Paleontological Society* 16:9-30.

1961 The Agate Basin Complex. In *Homenaje a Pablo Martinez del Rio*. Instituto Nacional de Antropologia y Historia, Mexico.

Roberts, O. M.
1898 Prehistoric Races in Texas. *The Quarterly of the Texas State Historical Association* 1:145-149.

Roberts, Ricky L.
1981 An Introduction to Historic Sites Archeology in the El Dorado Lake Area. In *Prehistory and History of the El Dorado Lake Area, Kansas (Phase II)*, edited by Mary J. Adair, pp. 462-571. Museum of Anthropology, University of Kansas, Project Report Series 47, Lawrence.

1982 Preliminary Excavations at the New Chelsea Site, 14BU1007: The Blacksmith Shop. In *Archeological Investigation at El Dorado Lake, Butler County, Kansas (Phase III)*, assembled by Paul E. Brockington, Jr., pp. 551-604. Museum of Anthropology, University of Kansas, Project Report Series 51, Lawrence.

1983 Further Investigations of the Historic Period in the El Dorado Lake Area. In *Phase IV Archaeological Investiga-*

*tions at El Dorado Lake, Butler County, Kansas, Summer 1980*. edited by A. E. Johnson, pp. 112-184 . University of Kansas, Museum of Anthropology Report Series 52, Lawrence.

Robertson, Pauline Durrett and R. L. Robertson
1978 *Panhandle Pilgrimage: Illustrated Tales Tracing History in the Texas Panhandle*. Paramount Publishing, Amarillo, Texas.

Robison, Luke
1980 *Made Out-a Mud*. Luke Robison, Oklahoma City.

Rogers, J. Daniel
1978 The Chapman Site, 34Ma22. Ms. on file, Oklahoma Archaeological Survey, Norman.

Rogers, R. A.
1984 *Kansas Prehistory: An Alluvial Geomorphological Perspective*. Ph.D. dissertation, University of Kansas, Lawrence.

Rogers, R. A. and L. D. Martin
1984 The 12 Mile Creek Site: A Reinvestigation. *American Antiquity* 49:757-764.

Rohn, A. H. and A. M. Emmerson
1984 *Great Bend Sites at Marion, Kansas*. Wichita State University Publications in Anthropology 1, Wichita.

Rohn, A. H. and M. R. Smith
1972 *Assessment of the Archaeological Resources and an Evaluation of the Impact of the Construction of the Copan Dam and Lake*. Archaeology Laboratory, Wichita State University, Wichita.

Rohn, A. H., S. T. Cacioppo, and M. K. King
1980 *Survey and Assessment of the Cultural Resources Toronto Lake Project*. Archaeology Laboratory, Wichita State University, Wichita.

Rohn, A. H., M. Stein, and G. Glover
1977 *Wolf Creek Archaeology, Coffey County, Kansas*. Archaeology Laboratory, Wichita State University, Wichita.

Rohrbaugh, Charles L.
1972a *Archeological Resources in the Vicinity of Waurika Reservoir Dam, Jefferson County, Oklahoma*. Oklahoma River Basin Survey Miscellaneous Publication, University of Oklahoma, Norman.

1972b Historic Burials at Lake Eufaula. *Oklahoma Anthropological Society Newsletter* 20(7):5-6.

1973 *Kaw Reservoir: The Southern Section*. Oklahoma River Basin Survey Archeological Site Report 25, University of Oklahoma, Norman.

1974 K*aw Reservoir: The Central Section*. Oklahoma River Basin Survey Archeological Site Report 27, University of Oklahoma, Norman.

1982 An Hypothesis for the Origin of the Kichai. In *Pathways to Plains Prehistory: Anthropological Perspectives on Plains Natives and Their Pasts, Papers in Honor of Robert E. Bell*, edited by Don G. Wyckoff and Jack L. Hofman, pp. 51-64. Cross Timbers Press, Duncan.

Rohrbaugh, Charles L. and Don G. Wyckoff
1969 *The Archaeological Survey of the Proposed Skiatook Reservoir, Osage County, Oklahoma*. Oklahoma River Basin Survey General Survey Report 11, University of Oklahoma, Norman.

Rohrt, Margaret, James Garber, and Nancy Woolley
1975 *Assessment of Archaeological and Historical Resources in the Lake Wichita Area, North Central Texas*. Report submitted to the U. S. Army Corps of Engineers, Tulsa District, by the Archaeology Research Program, Southern Methodist University.

Root, M. J.
1981 *The Milbourne Site: Late Archaic Settlement in the Southern Flint Hills of Kansas*. Master's thesis, University of Kansas, Lawrence.

Rose, J. C., P. M. Clancy, and P. H. Moore-Jansen
1981 Bioarchaeology of the Roden Site. In *Archaeological Investigations at the Roden Site (Mc-215) McCurtain County, Oklahoma*, Appendix. Museum of the Red River 1, Potsherd Press, Idabel, Oklahoma.

Rose, Jerome C. and Murray K. Marks
n.d. Bioarchaeological Overview of the Southwestern Division of the U.S. Army Corps of Engineers. Ms. on file, Arkansas Archeological Survey, Fayetteville.

Rose, Jerome C., James P. Harcourt, and Barbara A. Burnett
1988 Bioarcheology of the OAO Study Area. In *Human Adaptation in the Ozark and Ouachita Mountains*, by George Sabo III, Ann M. Early, Barbara Burnett, Jerome C. Rose, Barbara A. Burnett, Louis Vogele, Jr., and James P. Harcourt, pp. 171-192. Arkansas Archeological Survey. Final report submitted to the U.S. Army Corps of Engineers, Southwestern Division, Study Unit 1, Southwest Division Overview.

Rowlingson, D. D.
1977 *A Report of Archeological Investigations at the Big Hill Lake Project, Southeastern Kansas*. Report submitted to the U.S. Army Corps of Engineers, Tulsa District, Tulsa.

Runkles, Frank A.
1964 The Garza Site: A Neo-American Campsite Near Post, Texas. *Bulletin of the Texas Archeological Society* 35:101-126.

Runkles, Frank A. and E. D. Dorchester
1986 The Lott Site (41GR56): A Late Prehistoric Site in Garza County, Texas. *Bulletin of the Texas Archeological Society* 57:83-115.

Sabo, George III, Ann M. Early, Barbara A. Burnett, James P. Harcourt, Jerome C. Rose, and W. Frederick Limp
1989 Historic Native Americans. In *Human Adaptation in the Ozark and Ouachita Mountains*. Arkansas Archeological Survey, Final report submitted to the U.S. Army Corps of Engineers, Southwest Division, Study Unit 1 of the Southwest Division, Division Overview.

SAS Institute, Inc.
1985 *User's Guide: Statistics*. SAS Institute, Cary, North Carolina.

Satterthwaite, L.
1957 *Stone Artifacts at and near the Finley Site Near Eden, Wyoming*. University Museum, Museum Monographs, Philadelphia.

Saunders, Jeffrey J.
1980 A Model for Man-Mammoth Relationships in Late Pleistocene North America. In *The Ice-Free Corridor and Peopling of the New World*, edited by N. W. Rutter and C. E. Schweger, pp. 87-98. Canadian Journal of Anthropology 1.

Saunders, Roger
1974 The Clay and Roberts Sites: Two Lithic Workshop Sites in Western Oklahoma. In *Report of the ARKLA Salvage Project*, pp. 73-112. Oklahoma Archeological Survey, Contract Archaeology Series 1, Norman.

1978 *Archaeological Resources of Black Mesa State Park, Cimarron County, Oklahoma*. Oklahoma Archeological Survey, Archeological Resource Survey Report 7, Norman.

1983 *The Carrizozo Creek Bridge Site: A Plains Woodland Site on the Oklahoma/New Mexico Border*. Oklahoma Department of Transportation, Papers in Highway Archaeology 7, Oklahoma City.

Saunders, Roger and John Penman
1979 Perry Ranch: A Plainview Bison Kill on the Southern Plains. *Plains Anthropologist* 24:51-65.

Saunders, Roger S. and K. E. Saunders
1982 Distribution and Density Patterns of Lithic Materials in Cimarron County, Oklahoma. In *Pathways to Plains Prehistory: Anthropological Perspectives of Plains Natives and Their Pasts*, edited by D. G. Wyckoff and J. L. Hofman, pp. 99-110. Cross Timbers Press, Duncan.

Sayles, E. B.
1935 *An Archaeological Survey of Texas*. Medallion Papers 17, Globe, Gila Pueblo, Arizona.

Schaafsma, P.
1972 *Rock Art in New Mexico*. New Mexico State Planning Office, Sante Fe.

Schlesier, Karl H.
1972 Rethinking the Dismal River Aspect and the Plains Athapaskans, A.D. 1692-1768. *Plains Anthropologist* 17:101-133.

Schmidt-Couzzourt, Beverly
1982 *The Chicken Creek Site: Archaeological Testing in the Lake Meredith Recreation Area, Potter County, Texas*. United States Department of the Interior, Bureau of Reclamation, Southwestern Region, Amarillo.

Schmits, Larry J.
1976 *The Coffey Site: Environment and Cultural Adaptation at a Prairie Plains Archaic Site*. Submitted to the National Park Service, Interagency Archaeological Services, Denver.

1978 The Coffey Site: Environment and Cultural Adaptation at a Prairie Plains Archaic Site. *Mid-Continental Journal of Archaeology* 3:69-185.

1980 The Williamson, Salb and Dead Hickory Sites. In *Salvage Archeology of the John Redman Lake, Kansas*, edited by T. A. Witty, Jr., pp. 13-66, 126-162. Kansas State Historical Society Anthropological Series 8, Topeka.

1981 *Archaeological and Geological Investigations at the Coffey Site, Tuttle Creek Lake, Kansas*. Submitted to the Interagency Archaeological Services Branch, National Park Service, Denver.

1987 The Williamson Site and the Late Archaic El Dorado Phase in Eastern Kansas. *Plains Anthropologist* 32:153-174.

Schmitt, Karl
1950 The Lee Site, Gv-3, of Garvin County, Oklahoma. *Bulletin of the Texas Archaeological and Paleontological Society* 21:69-89.

1954 Two Creek Pottery Vessels from Oklahoma. *Florida Anthropologist* 3:3-8.

Schmitt, Karl and Robert E. Bell
1954 Historic Indian Pottery from Oklahoma. *Bulletin of the Oklahoma Anthropological Society* 2:19-34.

Schmitt, Karl and Raymond Tolden, Jr.
1953 The Brown Site, Gd-1, Grady County, Oklahoma. *Bulletin of the Texas Archaeological Society* 24:141-176.

Schneider, Fred E.
1967 Burial from Lake Altus. *Oklahoma Anthropological Society Newsletter* 15(3):5.

1969 The Roy Smith Site, Bv-14, Beaver County, Oklahoma. *Bulletin of the Oklahoma Anthropological Society* 18:119-179.

1982 A Preliminary Investigation of Paleo-Indian Cultures in North Dakota. *Manitoba Archaeological Quarterly* 6:16-43.

Schneider, Kim N.
1984 *Subsistence, Nutrition, and Dental Disease among Prehistoric Ohio Amerinds*. Ph.D. dissertation, Ohio State University, Department of Anthropology, Columbus.

Schneider, Mary Jane
1968 Plains Indian Clothing: Stylistic Persistence and Change. *Bulletin of the Oklahoma Anthropological Society* 17.

1980 Plains Indian Art. In *Anthropology on the Great Plains,* edited by W. Raymond Wood and Margot Liberty. University of Nebraska Press, Lincoln.

Schock, Jack M.
1965 14LO8, a Hunting Camp in Logan County, Kansas. *Kansas Anthropological Association Newsletter* 10(7-9):6-8.

Schoeninger, M. J.
1979 Diet and Status at Chalcatzingo: Some Empirical and Technical Aspects of Strontium Analysis. *American Journal of Physical Anthropology* 51:295-309.

1982 Diet and Evolution of Modern Human Form in the Middle East. *American Journal of Physical Anthropology* 58:37-52.

Schoeninger, M. J., M. J. DeNiro, and H. Tauber
1983 15N/14N Ratios of Bone Collagen Reflect Marine and Terrestrial Components of Prehistoric Human Diet. *Science* 220:1381-1383.

Schoenwetter, J.
1975 Pollen-Analytical Results, Part 1. In *Late Pleistocene Environments of the Southern High Plains*, edited by Fred Wendorf and James J. Hester, pp. 103-120. Publications of Fort Burgwin Research Center 9. Ranches de Taos, New Mexico.

Schrire, Carmel
1984 *Past and Present in Hunter Gatherer Studies*. Academic Press, Orlando.

Schroeder, Albert H.
1962 A Re-Analysis of the Routes of Coronado and Onate into the Plains in 1541 and 1601. *Plains Anthropologist* 7:2-23.

1968 Shifting for Survival in the Spanish Southwest. *New Mexico Historical Review* 43:291-310.

Schult, C. B.
1932 Association of Artifacts and Extinct Mammals in Nebraska. *Nebraska State Museum Bulletin* 33:171-183.

Schultz, C. Bertrand and Loren C. Eisley
1935 Paleontological Evidence of the Antiquity of the Scottsbluff Bison Quarry and Its Associated Artifacts. *American Anthropologist* 3:306-318.

Schultz, C. B.
1943 Some Artifact Sites of Early Man in the Great Plains and Adjacent Areas. *American Antiquity* 8:242-249.

Schultz, Gerald E.
1967 Four Superimposed Late-Pleistocene Vertebrate Faunas from Southwest Kansas. In *Pleistocene Extinctions: The Search for a Cause,* edited by P. S. Martin and H. E. Wright, pp. 321-336. Yale University Press, New Haven.

1978 Micromammals. In Archeology at MacKenzie Reservoir, by Jack T. Hughes and Patrick S. Willey. *Texas Historical Commission Office of the State Archaeologist, Archeological Survey Report* 24:114, Austin.

Science Applications Inc.
1982 *A Cultural Resources Inventory of the John Martin Reservoir, Colorado*. U.S. Army Corps of Engineers, Albuquerque District.

Scott, Douglas D.
1973 *The Archeology of Fort Larned National Historic Site, Kansas*. Master's thesis, University of Colorado, Boulder.

1974a *Archeological Salvage during the Enlisted Barracks Restoration at Fort Larned National Historic Site*. National Park Service, Midwest Region, U.S. Department of the Interior.

1974b Archeological Data: 1973 Excavations at Fort Larned National Historic Site, Kansas. In *Historic Furnishing Study, Historical and Archeological Data, Fort Larned National Historic Site, Kansas*, prepared by J. Albright and D. D. Scott, pp. 271-489. National Park Service, Denver Service Center, Denver.

1975a *A Report on the Archeological Salvage of the North Side of HS1, Fort Larned National Historic Site*. National Park Service, Midwest Region, Lincoln.

1975b *1974 Excavations at Fort Larned National Historic Site, Kansas*. National Park Service, Denver Service Center, Denver.

Scott, Linda J.
1982 Pollen and Fiber Analysis of the McEndree Ranch Site, 5 BA30, Southwestern Colorado. *Southwestern Lore* 48:18-24.

Sebeok, Thomas A. (editor)
1976 *Native Languages of the Americas*. Vol. 1. Plenum Press, New York.

1977 *Native Languages of the Americas*. Vol. 2. Plenum Press, New York.

Sellards, E. H.
1952 *Early Man in America*. University of Texas Press, Austin.

1955 Fossil Bison and Associated Artifacts from Milnesand, New Mexico. *American Antiquity* 20:336-344.

Sellards, E. H. and G. L. Evans
1960 The Paleo-Indian Culture Succession in the Central High Plains of Texas and New Mexico. In *Men and Cultures*. Selected Papers of the 5th International Congress of Anthropological and Ethnographical Sciences, 1956.

Sellards, E. H., G. L. Evans, and G. E. Meade
1947 Fossil Bison and Associated Artifacts from Plainview, Texas, with Description of Artifacts by Alex D. Krieger. *Bulletin of the Geological Society of America* 58:927-954.

Sellards, E. H., G. L. Evans, G. E. Meade, and Alex D. Krieger
1947 Fossil Bison and Associated Artifacts from Plainview, Texas. *Bulletin of the Geological Society of America* 58:927-954.

Service, Elmon R.
1972 *Primitive Social Organization*. Random House, New York.

Shaeffer, James B.
1957 The Nagle Site Ok-4. *Bulletin of the Oklahoma Anthropological Society* 5:93-99.

1958 Salvage Project Activities. *Oklahoma Anthropological Society Newsletter* 6(17):4-5.

1959 A Military Burial at Lake Altus. *Chronicles of Oklahoma* 36:411-415.

1961 Six Sites on the Fort Sill Military Reservation. *Plains Anthropologist* 6:13-54.

1965 Salvage Archaeology in Oklahoma, Volume I. Papers of the Oklahoma Archaeological Salvage Project, Nos. 8-15. *Bulletin of the Oklahoma Anthropological Society* 13:77-151.

1966 Salvage Archaeology in Oklahoma, Volume II. Papers of the Oklahoma Archaeological Salvage Project, Nos. 18-21. *Bulletin of the Oklahoma Anthropological Society* 14:1-86.

Shafer, Harry J. and Vaughn M. Bryant, Jr.
1977 *Archeological and Botanical Studies at Hinds Cave, Val Verde County, Texas*. Annual Report to the National Science Foundation. Texas A&M University Anthropology Laboratory Special Series 1, College Station.

Sharrock, Floyd W.
1959a Preliminary Report on the Van Scuyver Site, Pottawatomie County, Oklahoma. *Bulletin of the Oklahoma Anthropological Society* 7:33-40.

1959b Test Excavations at the Willingham Site, Ml-5, McClain County, Oklahoma. *Bulletin of the Oklahoma Anthropological Society* 7:41-50.

1961 The Grant Site of the Washita River Focus. *Bulletin of the Oklahoma Anthropological Society* 9:1-66.

Shaw, J. H.
1978 Cariology. In *Textbook of Oral Biology,* edited by J. H. Shaw, E. G. Sweeny, C. C. Cappucino, and S. M. Meyer. W. B. Saunders, Philadelphia.

Shelford,
1963 *Ecology of North America*. Chicago University Press, Chicago.

Shelley, Philip H.
1984 Paleoindian Movement on the Southern High Plains: A Re-evaluation of Inferences Based on the Lithic Evidence from Blackwater Draw. *Current Research in the Pleistocene* 1:35-36.

Shelley, Philip H. and George Agogino
1983 Agate Basin Technology: An Insight. *Plains Anthropologist* 28:115-118.

Sherzer, Joel
1976 *An Areal-Typological Study of American Indian Languages North of Mexico*. Vol. 20, North-Holland Linguistic Series, edited by S. C. Dik and J. G. Kooij.

Shields, Wayne L.
1980 Preliminary Investigations at the McEndree Ranch Site, 5 BA30. *Southwestern Lore* 46:1-17.

Shiner, Joel L.
1975 The Clear Fork Gouge Revisited. *Bulletin of the Texas Archaeological Society* 46:179-188.

Shipman, Pat
1981 *Life History of a Fossil: An Introduction to Taphonomy and Paleoecology.* Harvard University Press, Cambridge.

Shipman, Pat, Alan Walker and David Bichell
1985 *The Human Skeleton*. Harvard UniversityPress, Cambridge.

Shott, Michael
1986 Technological Organization and Settlement Mobility: An Ethnographic Examination. *Journal of Anthropological Research* 42:15-51.

Shutler, Richard, Jr. (editor)
1983 *Early Man in the New World.* Sage Publications, Beverly Hills.

Sillen, A. and M. Kavanaugh
1982 Strontium and Paleodietary Research: A Review. *Yearbook of Physical Anthropology* 25:67-90.

Silverberg, J.
1957 The Kickapoo Indians. *Wisconsin Archeologist* 38:61-181.

Simmons, Marc and Frank Turley
1980 *Southwestern Colonial Ironwork.* Museum of New Mexico Press, Santa Fe.

Simpson, Ruth Dee
1982 The Calico Mountains Archaeological Project: A Progress Report. In *Peopling of the New World,* edited by Jonathon E. Ericson, R. E. Taylor and Rainer Berger, pp. 181-192. Ballena Press, Anthropological Papers 23, Los Altos.

Skinner, Alanson B.
1923/35 Observations on the Ethnology of the Sauk Indians. *Bulletin of the Public Museum of the City of Milwaukee* 5(1-3).

1926 Ethnology of the Ioway Indians. *Bulletin of the Public Museum of the City of Milwaukee* 5:181-354.

1970 *Observations on the Ethnology of the Sauk Indians*. Westport, Greenwood Press.

Slaughter, B. H.
1966 The Vertebrates of the Domebo Local Fauna, Pleistocene of Oklahoma. In *Domebo, a Paleo-Indian Mammoth Kill in the Prairie-Plains,* edited by F. C. Leonhardy, pp. 31-35. Contributions of the Museum of the Great Plains 1, Lawton.

Smith, C. S.
1949 Archeological Investigations in Ellsworth and Rice Counties, Kansas. *American Antiquity* 14:292-343.

Smith, Calvin, John Runyon, and George Agogino
1966 A Progress Report on a Pre-Ceramic Site at Rattlesnake Draw, Eastern New Mexico. *Plains Anthropologist* 11:302-313.

Smith, Ralph A.
1952 The Tawehash in French, Spanish, English, and American Imperial Affairs. *West Texas Historical Association Yearbook* 28:18-49.

Soffer, Olga
1985 *The Upper Paleolithic of the Central Russian Plain.* Academic Press, Orlando.

Spears, W. S.
1978 Archeological Investigations of Historic Building #3, Fort Larned National Historic Site, Kansas. Ms. on file, National Park Service, Midwest Archeological Center, Lincoln.

Speck, F. G.
1909 *Ethnology of the Yuchi Indians*. Pennsylvania University Museum, Anthropological Publications 1.

Speer, R. D.
1978 Bison Remains from the Rex Rodgers Site. In *Bison Procurement and Utilization: A Symposium,* edited by L. M. Davis and M. Wilson, pp.113-127. Memoir 14, *Plains Anthropologist* 23(82, Part 2):113-127.

1986 History of the Plainview Site. In *Guidebook to the Archaeological Geology of Classic Paleoindian Sites on the Southern High Plains, Texas and New Mexico,* edited by V. T. Holliday, pp. 52-59. Geological Society of America Guidebook, Department of Geography, Texas A&M University. College Station.

Spencer, J.
1908 *The Kaw or Kansas Indians*. Kansas State Historical Society Transactions 10, Topeka.

Spencer, R. F. and J. D. Jennings
1965 *The Native Americans: Prehistory and Ethnology of the North American Indians*. Harper and Row, New York.

Speth, J. D.
1983 *Bison Kills and Bone Counts: Decision Making by Ancient Hunters*. University of Chicago Press, Chicago.

Speth, J. D. and W. J. Parry
1980 *Late Prehistoric Bison Procurement in Southeastern New Mexico: The 1978 Season at the Garnsey Site (LA-18399*). Museum of Anthropology, University of Michigan, Technical Report 12, Ann Arbor.

Speth, J. D. and K. A. Spielmann
1982 Energy Source, Protein Metabolism, and Hunter-Gatherer Subsistence Strategies. *Journal of Anthropological Archaeology* 2:1-31.

Spielmann, K. A.
1982 *Inter-Societal Food Acquisition among Egalitarian Societies: An Ecological Study of Plains/Pueblo Interaction in the American Southwest* (Volumes I and II). Ph.D. dissertation, University of Michigan, Ann Arbor.

1983 Late Prehistoric Exchange between the Southwest and Southern Plains. *Plains Anthropologist* 28:257-272.

Spivey, Towana, C. Reid Ferring, Daniel J. Crouch, Kathy Franklin
1977 *Archaeological Investigations along the Waurika Pipeline, Comanche, Cotton, Jefferson and Stephens Counties, Oklahoma*. Contributions of the Museum of the Great Plains 5, Lawton.

Spoehr, A.
1941a "Friends" among the Seminole. *Chronicles of Oklahoma* 19:252.

1941b Oklahoma Seminole Towns. *Chronicles of Oklahoma* 19:377-380.

Spring, Otto F.
1966 Prehistoric Chert Quarries in Kay County: A Report. *Chronicles of Oklahoma* 44:5-11.

Stafford, T. W., Jr.
1981 Alluvial Geology and Archaeological Potential of the Texas Southern High Plains. *American Antiquity* 46:548-565.

1984 *Quaternary Stratigraphy, Geochronology, and Carbon Isotope Geology of the Alluvial Deposits in the Texas Panhandle*. Ph.D. dissertation, Department of Geosciences, University of Arizona, Tucson.

Stafford, T. W., Jr., A. J. T. Jull, T. H. Zabel, D. J. Donahue, R. C. Duhamel, K. Brendel, C. V. Haynes, Jr., J. L. Bishiff, L. A. Payen, and R. F. Taylor
1984 Holocene Age of the Yuha Burial: Direct Radiocarbon Determinations by Accelerator Mass Spectrometry. *Nature* 308:446-447.

Stafford, T. W., Jr., A. J. T. Jull, Klaus Brendel, Raymond C. Duhamel, and Douglas Donohue
1987 Study of Bone Radiocarbon Dating Accuracy at the University of Arizona NSF Accelerator Facility for Radioisotope Analysis. *Radiocarbon* 29:24-44.

Stanford, Dennis J.
1975 The 1975 Excavations at the Jones-Miller Site, Yuma County, Colorado. *Southwestern Lore* 41:34-34.

1978 The Jones-Miller Site: An Example of Hell Gap Bison Procurement Strategy. In *Bison Procurement and Utilization: A Symposium*, edited by L. B. Davis and M. Wilson, pp. 90-97. Memoir 14, *Plains Anthropologist* 23(82,Part 2):90-97.

1979 The Selby and Dutton Sites: Evidence for a Possible Pre-Clovis Occupation of the High Plains. In *Pre-Llano Cultures of the Americas: Paradoxes and Possibilities*, edited R. L. Humphrey and D. J. Stanford, pp. 101-125. Anthropological Society of Washington, Washington, D.C.

1982 A Critical Review of Archaeological Evidence Relating to the Antiquity of Human Occupation of the New World. In *Plains Indian Studies: A Collection of Essays in Honor of John C. Ewers and Waldo R. Wedel*, edited by D. H. Ubelaker and H. J. Viola, pp. 202-218.

Smithsonian Contributions to Anthropology 30, Washington, D.C.

1983 Pre-Clovis Occupation South of the Ice Sheets. In *Early Man in the New World*, edited by R. Shutler, Jr., pp. 65-72. Sage Publications, Beverly Hills.

Stanford, Dennis J. and F. Broilo
1981 Frank's Folsom Campsite. Essays in Honor of Mark Wimberly, edited by M. S. Foster. *The Artifact* 19(3-4):1-13.

Stanford, Dennis J. and M. A. Jodry
1988 The Drake Clovis Cache. *Current Research in the Pleistocene* 5:21-22.

Stanford, Dennis J. and Robert Patton
1984 R-6, a Preliminary Report of a Cody Site in North-Central New Mexico. Papers of the Philmont Conference on the Archaeology of Northeastern New Mexico. *New Mexico Archaeological Council Proceedings* 6(1):189-199.

Stanford, Dennis J., W. R. Wedel, and Glenn R. Scott
1981 Archaeological Investigations of the Lamb Springs Site. *Southwestern Lore* 47:14-27.

Stanford, Dennis J., C. V. Haynes, Jr., J. J. Saunders, and G. A. Agogino
1986 Blackwater Draw Locality 1: History, Current Research and Interpretations. In *Guidebook to the Archaeological Geology of Classic Paleo-Indian Sites on the Southern High Plains, Texas and New Mexico*, edited by V. T. Holliday, pp. 82-112. Department of Geography, Texas A&M University, College Station.

Steen, Charlie
1953 Two Early Historic Sites on the Southern Plains. *Bulletin of the Texas Archeological and Paleontological Society* 24:177-188.

1955 The Pigeon Cliffs Site: A Preliminary Report. *El Palacio* 62:174-180.

1976 Excavations at Pigeon Cliff. In *Collected Papers in Honor of Marjorie Ferguson Lambert*, edited by Albert Schroeder, pp. 19-36. Papers of the Archaeological Society of New Mexico 3, Albuquerque.

Steinacher, Terry L.
1986 *An Archeological Reconnaissance of the Upper Little River Basin in Cleveland County, Oklahoma, 1984*. Oklahoma Archeological Survey Archeological Resource Survey Report 25, Norman.

Steinacher, Terry L. and Robert L. Brooks
1985 *An Archeological Resources Records Review for the U.S. Dept. of Interior, Bureau of Reclamation Projects: Fort Cobb, Norman, Foss, Altus, Mountain Park, and Arbuckle, Oklahoma*. U.S. Department of the Interior, Bureau of Reclamation, Amarillo.

Steinbock, R. T.
1976 *Paleopathological Diagnosis and Interpretation: Bone Diseases in Ancient Human Populations*. Charles C. Thomas, Springfield.

Stephenson, Robert L.
1952 The Hogge Bridge Site and the Wylie Focus. *American Antiquity* 17:299-312.

Stevens, Dominique
1973 *Blackwater Draw Locality No. 1, 1963-1972, and Its Relevance to the Firstview*. Master's thesis, Eastern New Mexico University, Portales.

Stevens, Dominique and Thomas R. Hays
1977a *Archeological Mitigation at the Waurika Lake Reservoir, Southwestern Oklahoma*. Archaeology Program, Institute of Applied Sciences, North Texas State University, Denton.

1977b *Recommendations Concerning National Register Eligibility of Archaeological Sites in the Waurika Lake Reservoir, Southwestern Oklahoma*. Archaeology Program, Institute of Applied Sciences, North Texas State University, Denton.

Stewart, T. D.
1941 The Circular Type of Cranial Deformity in the United States. *American Journal of Physical Anthropology* 28:343-351.

1945 Report on J. C. Putnam Skeleton from Texas. *Bulletin of the Texas Archeological and Paleontological Society* 16:31-39.

Stickney, Francis and Teddy Stickney
1975 Midland Well Site 41Md-18. In *Transactions of the Tenth Regional Archeological Symposium for Southeastern New Mexico and Western Texas*. South Plains Archeological Society.

Story, Dee Ann
1976 The East Texas Archaic. In *The Texas Archaic: A Symposium*, edited by T. R. Hester, pp. 46-59. Center for Archaeological Research, Special Report 2, University of Texas, San Antonio.

1985 Adaptive Strategies of Archaic Cultures of the West Gulf Coastal Plain. In *Prehistoric Food Production in North America*, edited by Richard I. Ford, pp. 19-56. Museum of Anthropology, University of Michigan Anthropological Papers 75, Ann Arbor.

Strong, William D.
1935 *An Introduction to Nebraska Archaeology*. Smithsonian Miscellaneous Collections 93(10), Washington, D.C.

Stuart, David E. and Rory P. Gauthier
1981 *Prehistoric New Mexico: Background for Survey*. Department of Finance and Administration, State Planning Division, Santa Fe.

Studer, Floyd V.
1931 Some Field Notes and Observations Concerning Texas Panhandle Ruins. In *Archaeology of the Arkansas River Valley,* by W. K. Moorehead, pp. 131-145. Andover Press, Andover.

1934 Texas Panhandle Culture Ruin No. 55. *Bulletin of the Texas Archeological and Paleontological Society* 6:80-96.

Sudbury, Byron
1976 Ka-3, The Deer Creek Site: An Eighteenth Century French Contact Site in Kay County, Oklahoma. *Bulletin of the Oklahoma Anthropological Society* 24:1-136.

Suhm, Dee Ann
1961 The White Site: An Historic Indian Burial in Yoakum County, Texas. *Bulletin of the Texas Archeological Society* 32:85-121.

Suhm, Dee A., Alex D. Krieger, and Edward B. Jelks
1954 *An Introductory Handbook of Texas Archeology.* Bulletin of the Texas Archaeological Society 25.

Swanton, John R.
1927 Social and Religious Beliefs and Usages of the Chickasaw Indians. *Bureau of American Ethnology Annual Report* 44:169-273, Washington, D.C.

1931 The Caddo Social Organization and Its Possible Historical Significance. *Washington Academy of Sciences, Journal* 21:203-206.

1942 Source Material on the History and Ethnology of the Caddo Indians. *Bureau of American Ethnology, Bulletin* 132:1-332, Washington, D.C.

1970 *Early History of the Creek Indians and Their Neighbors*. Johnson Reprint, New York.

Swenson, Fern E.
1986 *A Study in Cultural Adaptations to Climatic Shifts on the Southern Plains: Washita River Phase and Edwards Complex Cultural Continuity*. Master's thesis, University of Oklahoma, Norman.

Tainter, J. A.
1979 A Functional Analysis of the Croton Creek Lithic Scatter, Roger Mills County, Oklahoma. *Bulletin of the Oklahoma Anthropological Society* 28:137-146.

Tanaka, H. H. and L. V. Davis
1963 *Ground Water Resources of the Rush Springs Sandstone in the Caddo County Area, Oklahoma*. Oklahoma Geological Survey, Circular 61, Norman.

Tanner, Helen Hornbeck
1974 *The Territory of the Caddo Tribe of Oklahoma. In Caddoan Indians IV*. Garland Publishing, New York.

Tate, Michael L.
1986 *The Indians of Texas: An Annotated Research Bibliography*. Native American Bibliography Series 9. The Scarecrow Press, Metuchen, New Jersey and London.

Taylor, A. J.
1975 *A Report on the Longhollow Burial Site*. Class Report in Problems in Anthropology, West Texas State University, Canyon, Texas.

1980 *Pastores in the Texas Panhandle, 1876-1884*. Hale County History: Quarterly of the Hale County Historical Commission 10(1). Plainview, Texas.

Taylor, Dee C.
1969 The Wilsall Excavations: An Exercise in Frustration. *Proceedings of the Montana Academy of Sciences* 29:147-150.

Taylor, James W.
1986 A Canyon in Western Canadian County: Archaeological and Geomorphological Clues from Non-Destructive Testing. *Bulletin of the Oklahoma Anthropological Society* 35:69-134.

1987 Oklahoma's Oldest Arrowpoint? Salvage of an Ancient Hearth at the Canyon Road Site (34CN46), Canadian County. *Oklahoma Anthropological Society Newsletter* 35(7):7-9.

Taylor, Walter W.
1964 Tethered Nomadism and Water Territoriality: An Hypothesis. *Acts of the 35th International Congress of Americanists*, pp. 197-203, Mexico City.

1966 Archaic Cultures Adjacent to the Northeastern Frontiers of Mesoamerica. In *Handbook of Middle American Indians*, edited by G. F. Ekholm and G. R. Willey, pp. 59-94. University of Texas Press, Austin.

Texas Historical Commission
1984 *Completion Report (Project: Landegrin Mesa*). Report submitted to the National Register of Historic Places. Project No. 48-84-OJB-48.11.

Thies, Ronald M.
1981 *Archeological Investigations at John Redmond Reservoir, East Central Kansas, 1979*. U.S. Army Corps of Engineers, Tulsa District.

1982 *Archeological Investigations at Big Hill Lake, Southeastern Kansas, 1980*, Report submitted to the U.S. Army Corps of Engineers, Tulsa District.

1985 *Arrowhead Island: A Middle Woodland Village in East Central Kansas*. Kansas State Historical Society Contract Archeology Publication 3, Topeka.

Thomas, Alfred B. (editor)
1935 *After Coronado: Spanish Exploration Northeast of New Mexico, 1696-1727*. University of Oklahoma Press, Norman.

Thomas, David H.
1976 *Figuring Anthropology: First Principles of Probability and Statistics*. Holt, Rinehart, and Winston, New York.

1978 *Archaeology*. Holt, Rinehart, and Winston, New York.

Thompson, V. H.
1955 A History of the Quapaw. *Chronicles of Oklahoma* 33:360-383.

Thoms, Alston
1976 Review of Northeast New Mexico Archaeology. *Awanyu* 4:8-36.

Thurmond, J. Peter, Martha Doty Freeman, and Susan L. Andrews
1981 *A Preliminary Assessment of the Cultural Resources in the Brazos Natural Salt Pollution Control Project, Kent, King, and Stonewall Counties, Texas*. Reports of Investigations, Number 18. Prewitt and Associates, Consulting Archeologists, Austin.

Tiffany, J. A., S. J. Schermer, J. L. Theler, D. W. Owsley, D. C. Anderson, E. A. Bettis III, and D. M. Thompson
1987 *The Hanging Valley Site (13HR28): A Stratified Woodland Burial Local in Western Iowa*. The University of Iowa, Iowa City.

Todd, L. C.
1983 *The Horner Site: Taphonomy of an Early Holocene Bison Bonebed*. Ph.D. dissertation, University of New Mexico, Albuquerque
1987 Taphonomy of the Horner II Bone Bed. In *The Horner Site: The Type Site of the Cody Cultural Complex,* edited by G. C. Frison and L. C. Todd, pp. 107-198. Academic Press, Orlando.

Trenholm, Virginia C.
1970 *The Arapahoes, Our People*. University of Oklahoma Press, Norman.

Tunnell, Curtis D.
1964 Two Burials from the Jim Arnold Site in Northwest Texas. *Bulletin of the Texas Archeological and Paleontological Society* 35:83-125.

1977 Fluted Point Production as Revealed by Lithic Specimens from the Adair-Steadman Site in Northwest Texas. *The Museum Journal* 17:140-168.

1978 *The Gibson Lithic Cache from West Texas*. Texas Historical Commission, Office of the State Archeologist, Report 30, Austin.

Tunnell, Curtis D. and J. T. Hughes
1955 An Archaic Bison Kill in the Texas Panhandle. *Panhandle-Plains Historical Review* 28:63-70.

Turner, C. G. II
1979 Dental Anthropological Indications of Agriculture among the Jomon People of Central Japan. *American Journal of Physical Anthropology* 51:619-636.

Turner, E. S. and T. R. Hester
1985 *A Field Guide to Stone Artifacts of Texas*. Texas Monthly Press, Austin.

Turner, Frederick J.
1893 The Significance of the Frontier in American History. A*nnual Report of the American Historical Association for the Year. 1893*:199-227.

Turner, Kenneth R. and William M. Bass
1972 A Human Skeleton from the Infinity Site, 14My305. In *The Archeology of the Elk City Reservoir,* by J. O. Marshall, pp. 265-269. Kansas State Historical Society Anthropological Series 6, Topeka.

Udden, J. A.
1900 *An Old Indian Village*. Lutheran Augustana Book Concern, Rock Island, Illinois.

United States Department of Commerce
*Climates of the States*. National Oceanic and Atmospheric Administration.

Unrau, William E.
1971 *The Kansa Indians: A History of the Wind People, 1673-1873*. University of Oklahoma Press, Norman.

Van Gerven, D. P.
1971 *The Contribution of Size and Shape Variation to Patterns of Sexual Dimorphism of the Human Femur.* Ph.D. dissertation, Department of Anthropology, University of Massachusetts, Amherst.

Van Ness, Margaret
1985 Flotation Analysis from a Hearth at 5BA320 in Southeastern Colorado.In *Archaeological Investigations in Southeastern Colorado* by Michael Nowak and Christopher Jones, pp. 107-116. Colorado College Publications in Archaeology 8, Colorado Springs.

Vaughan, Sheila J.
1975 *Archaeological Investigations for the Copan Reservoir, Northeastern Oklahoma and Southeastern Kansas*. Oklahoma River Basin Survey Archeological Site Report 29, University of Oklahoma, Norman.

Vehik, Susan C.
1976 The Great Bend Aspect: A Multivariate Investigation of its Origins and Southern Plains Relationships. *Plains Anthropologist* 21:199-205.

1984 The Woodland Occupations. In P*rehistory of Oklahoma,* edited by Robert E. Bell, pp. 175-197. Academic Press, New York.

1985 *Cultural Resource Assessments in Osage and Kay Counties, Northcentral Oklahoma*. Draft report submitted to the Historic Preservation Office, Oklahoma Historical Society, Oklahoma City.

1986 Onate's Expedition to the Southern Plains: Routes, Destinations, and Implications for Late Prehistoric Cultural Adaptations. *Plains Anthropologist* 31:13-33.

Vehik, Susan and Kenneth A. Ashworth
1983 *Kaw Lake Hydropower: Further Archaeological Investigations at the Uncas Site (34KA-172*). Report submitted to the U.S. Army Corps of Engineers, Tulsa District.

Vehik, Susan and Peggy Flynn
1981 *Archaeological Excavations at the Early Plains Village Uncas Site (34Ka-172*). Report submitted to the U.S. Army Corps of Engineers, Tulsa District.

Vehik, Susan and Richard Pailes
1979 *Excavations in the Copan Reservoir of Northeastern Oklahoma and Southeastern Kansas*. University of Oklahoma, Archaeological Research and Management Center, Research Series 4, Norman.

Vehik, Susan C., Kent J. Buehler, and Alan J. Wormser
1979 *A Cultural Resource Survey of the Salt Creek Valley, Osage County, Oklahoma*. Oklahoma Archeological Survey, Archeological Resources Survey Report 9, Norman.

Walker, D. N.
1982 A Late Pleistocene Ovibos from Southeastern Wyoming. *Journal of Paleontology* 56:486-491.

Walker, Jimmy R.
1978 *Geomorphic Evolution of the Southern High Plains*. Baylor Geological Studies Bulletin 35, Waco.

Wallace, B. J.
1964 The Oklahoma Kickapoo: An Ethnographic Reconstruction. *Wisconsin Archeologist* 45:1-69.

1962 Prehistoric House Patterns of Oklahoma. *Bulletin of the Oklahoma Anthropological Society* 10:27-68.

Wallace, Ernest and E. Adamson Hoebel
1952 *The Comanches: Lords of the South Plains*. University of Oklahoma Press, Norman.

Wallis, Charles S., Jr.
1979 *Review Report, Archeological Sites, Upper Muddy Boggy Creek Watershed, Pontotoc and Hughes Counties*. Oklahoma Conservation Commission, Miscellaneous Report Series 3, Oklahoma City.

1981 *Archeological and Historical Review of Multipurpose Impoundment 4M Robinson Creek Watershed, Lincoln County*. Oklahoma Conservation Commission General Survey Report 1981-5, Oklahoma City.

1983 *Cultural Resources Documentary Search: Lugert-Altus Water Management RC&D Measure Program, and Possible Impact on Prehistoric and Historic Sites within Kiowa, Greer, and Jackson Counties, Oklahoma*. Oklahoma Conservation Commission, Miscellaneous Report Series 16, Oklahoma City.

1984a Summary of Notes and Earlier Analysis of the Wickham #3 Site, 34Rm-29, Roger Mills County, Oklahoma. *Bulletin of the Oklahoma Anthropological Society* 33:1-29.

1984b *Report of Archeological Work Conducted in the Okfuskee County Tributaries Watershed Between 1979 and 1984; and Analysis of the Historic Components at the Cow Creek Site, 34Of-24*. Oklahoma Conservation Commission, General Survey Report 1984-3, Oklahoma City.

1986 *An Assessment of Cultural Resources within the Deer Creek Watershed, Custer, Caddo, Blaine and Dewey Counties*. Oklahoma Conservation Commission, General Survey Report 1986-1, Oklahoma City.

1988a *February 1988 Archeological Review, Five Proposed Critical Area Treatment Projects within the Deer Creek Watershed, Custer and Dewey Counties*. Oklahoma Conservation Commission General Survey Report 1988-1, Oklahoma City.

1988b *Report on Survey of Binger Site, Sugar Creek Watershed, Caddo County, Oklahoma*. Oklahoma Conservation Commission General Survey Report (1988-2, Oklahoma City.

Wallis, Kathleen
1978 *People of the Past: A Brief Guide to the McClellan-Kerr Arkansas River Navigation System from Catoosa to Ft. Smith*. Prepared for the U.S. Army Corps of Engineers, Tulsa District.

Ward, Albert E., Emily K. Abbink, and John R. Stein
1977 Ethnohistorical and Chronological Basis of the Navajo Material Culture. In *Settlement and Subsistence along the Lower Chaco River: The CGP Survey*, edited by Charles A. Reher, pp. 217-278. University of New Mexico Press, Albuquerque.

Warnica, James and Ted Williamson
1968 The Milnesand Site—Revisited. *American Antiquity* 33:16-24.

Watanabe, H.
1985 The Chopper - Chopping Tool Complex of Eastern Asia: An Ethnoarchaeological-Ecological Reexamination. *Journal of Anthropological Archaeology* 4:1-18.

Waters, Michael R.
1985 Early Man in the New World: An Evaluation of the Radiocarbon Dated Pre-Clovis Sites in the Amricas. In *Environments and Extinctions: Man in the Late Glacial North America*, edited by J. I. Mead, and D. J. Meltzer, pp. 125-144. Center for the Study of Early Man, University of Maine at Orono.

Watson, I. A.
1950 Creek Indian Burial Customs Today. *Chronicles of Oklahoma* 28:95-102.

Watson, Virginia
1950 The Optima Focus of the Panhandle Aspect: Description and Analysis. *Bulletin of the Texas Archeological and Paleontological Society* 21:7-68.

Watt, Frank W.
1968 The Waco Indian Village and Its People. *Central Texas Archeologist* 9.

Watts, Howard
1971 *The Archaeology of the Avery Ranch Site on Turkey Creek, Southeastern Colorado*. Master's thesis, Department of Anthropology, University of Denver.

Weakly, Ward F.
1965 1964 Archeological Salvage in the Elk city Reservoir. Abstract of a paper presented at the 22nd Plains Conference, Lincoln. *Plains Anthropologist* 10(27):52.

Weaver, J. E. and F. W. Albertson
1956 *Grasslands of the Great Plains: Their Nature and Use*. Johnson Publishing, Lincoln.

Webb, Clarence H.
1960 A Review of Northeast Texas Archaeology. *Bulletin of the Texas Archaeological Society* 29:35-62.

Webb, Walter Prescott
1931 *The Great Plains*. Grosset and Dunlap, New York.

Wedel, Mildred Mott
1979 The Ethnohistoric Approach to Caddoan Origins. *Nebraska History* 60:183-196.

1981 *The Deer Creek Site, Oklahoma: A Wichita Village Sometimes called Ferdinandina, an Ethnohistorian's View*. Oklahoma Historical Society, Series in Anthropology 5, Oklahoma City.

1982 The Wichita Indians in the Arkansas River Basin. In *Plains Indian Studies: A Collection of Essays in Honor of John C. Ewers and Waldo Wedel*, edited by Douglas H. Ubelaker and Herman J. Viola, pp. 18-134. Smithsonian Contributions to Anthropology 30, Smithsonian Institution Press, Washington, D.C.

Wedel, Waldo R.
1924 Archeological Remains in Central Kansas and Their Possible Bearing on the Location of Quivira. *Smithsonian Miscellaneous Collections* 101:1-24, Washington, D.C.

1936 *An Introduction to Pawnee Archeology*. Bureau of American Ethnology, Bulletin 112, Washington, D.C.

1938 The Direct Historical Approach in Pawnee Archeology. *Smithsonian Miscellaneous Collections* 97(7), Washington, D.C.

1941 Environment and Native Subsistence Economies in the Central Great Plains. *Smithsonian Miscellaneous Collections* 100:291-352, Washington D.C.

1946 *The Kansa Indians*. Kansas State Historical Society, Transactions 49:1-35.

1959a *An Introduction to Kansas Archaeology*. Bureau of American Ethnology, Bulletin 174, Washington, D.C.

1959b *The Kansa*. Bureau of American Ethnology Bulletin 174, Washington, D.C.

1961 *Prehistoric Man on the Great Plains*. University of Oklahoma Press, Norman.

1963 The Great Plains. In *Prehistoric Man in the New World,* edited by J. D. Jennings and E. Norbeck, pp. 193-222. University of Chicago Press, Chicago.

1967 The Council Circles of Central Kansas: Were they Solstice Registers? *American Antiquity* 32:54-63.

1968a After Coronado in Quivara. *The Kansas Historical Quarterly* 34:369-385.

1968b Some Thoughts on Central Plains—Southern Plains Archaeological Relationships. *Great Plains Journal* 7:53-62.

1975 Chalk Hollow: Cultural Sequences and Chronology in the Texas Panhandle. *Actas del XLI Congresso Internacional de Americanists* 1:270-278, Mexico City.

1975 Some Early Euro-American Percepts of the Great Plains and Their Influence on Anthropological Thinking. In *Images of the Plains,* edited by B. W. Blouet and M. P. Lawson, pp. 13-20. University of Nebraska Press, Lincoln.

1978a The Prehistoric Plains. In *Ancient Native Americans;* edited by Jesse D. Jennings, pp. 183-219. W. H. Freeman, San Francisco.

1978b Plains Archeology in 1977. *Great Plains Journal* 17:25-39.

1979 House Floors and Native Settlement Populations in the Central Plains. *Plains Anthropologist* 24:85-98.

1981 Toward a History of Plains Archeology. *Great Plains Quarterly* 1:16-38.

1982 Further Notes on Puebloan-Central Plains Contacts in Light of Archaeology. In *Pathways to Plains Prehistory: Anthropological Perspectives of Plains Natives and Their Pasts,* edited by D. G. Wyckoff and J. L. Hofman, pp. 145-152. Cross Timbers Press, Duncan.

1986 *Central Plains Prehistory: Holocene Environments and Culture Change in the Republican River Basin*. University of Nebraska Press, Lincoln.

Wedel, Waldo R., Wilfred Husted, and John Moss
1968 Mummy Cave: Prehistoric Record from the Rocky Mountains of Wyoming. *Science* 160:184-186.

Wedel, Waldo R. and Mildred M. Wedel
1976 Wichita Archeology and Ethnohistory. In *Kansas and the West: Bicentennial Essays in Honor of Nyle H. Miller*, edited by Forrest R. Blackburn, et al., pp. 8-20. Kansas State Historical Society, Topeka.

Weir, Frank A.
1976a *Archaeology on State Highway 16*. Publications in Highway Archaeology 7, State Department of Highway and Transportation, Austin.

1976b The Central Texas Archaic Reconsidered. In *The Texas Archaic: A Symposium*, edited by T. R. Hester, pp. 60-66. Center for Archaeological Research Special Report 2, University of Texas, San Antonio.

Wells, C.
1975 Prehistoric and Historic Changes in Nutritional Diseases and Associated Conditions. *Progress in Food and Nutrition Science* 1:729-779.

Wells, P. V. and J. D. Stewart
1987 Spruce Charcoal, Conifer Macrofossils, and Landsnail and Small Vertebrate Faunas in Wisconsinan Sediments on the High Plains of Kansas. In *Quaternary Environments of Kansas*, edited by W. C. Johnson, pp. 129-140. Kansas Biological Survey Guidebook Series 5.

Weltfish, Gene
1965 *The Lost Universe*. Basic Books, New York.

Wendland, Wayne M.
1978 Holocene Man in North America: the Ecological Setting and Climatic Background. *Plains Anthropologist* 23:273-287.

Wendorf, Fred
1960 The Archaeology of Northeastern New Mexico. *El Palacio* 67:55-65.

1970 The Lubbock Subpluvial. In *Pleistocene and Recent Environments of the Central Great Plains*, edited by W. Dort and J. K. Jones, Jr., pp. 23-26. Department of Geology, University of Kansas, Special Publication 3, Lawrence.

1975a The Modern Environment. In *Late Pleistocene Environments of the Southern High Plains*, edited by F. Wendorf and J. J. Hester. Publications of the Fort Burgwin Research Center 9, Ranchos de Taos, New Mexico.

1975b Summary and Conclusions. In *Late Pleistocene Environments of the Southern High Plains,* edited by F. Wendorf and J. J. Hester,pp. 257-278. Publications of the Fort Burgwin Research Center 9, Ranchos de Taos, New Mexico.

Wendorf, Fred and James J. Hester
1962 Early Man's Utilization of the Great Plains Environment. *American Antiquity* 28:159-171.

Wendorf, Fred and J. J. Hester (editors)
1975 *Late Pleistocene Environments of the Southern High Plains*. Publications of the Fort Burgwin Research Center 9, Ranchos de Taos, New Mexico.

Wendorf, Fred and Alex D. Krieger
1959 New Light on the Midland Discovery. *American Antiquity* 25:66-78.

Wendorf, Fred and P. Miller
1959 Artifacts from High Mountain sites in the Sangre de Cristo Range, New Mexico. *El Palacio* 66:37-52.

Wendorf, Fred, A. D. Krieger, C. C. Albritton, and T. D. Stewart
1955 *The Midland Discovery*. University of Texas Press, Austin.

West, Frederick H.
1983 The Antiquity of Man in America. In *Late Quaternary Environments of the United States, Vol. 1. The Late Pleistocene*, edited by S. C. Porter, pp. 364-382. University of Minnesota Press, Minneapolis.

Westbury, William
1976 *Archeological Investigations at Fort Richardson State Park, 1976*. Anthropology Laboratory, Texas A&M University, Report 31, College Station.

Whalen, Michael E.
1985 Chronological Studies of the Jornado Area. In *Views of the Journado Mogollon*, edited by Colleen Beck pp. 136-142. Eastern New Mexico University, Contribution in Anthropology 12, Portales.

Wheat, Joe Ben
1940 WPA Quarterly Report Archeological Project O.P. #665-66-3-411, Texas State Application #31313. Ms. on file, Panhandle Plains Historical Museum, Canyon.

1972 *The Olsen-Chubbuck Site, a Paleo-Indian Bison Kill*. Society for American Archaeology, Memoir 26.

1976 Artifact Life Histories: Cultural Templates, Typology, Evidence, and Inference. In *Primitive Technology and Art*, edited by J. S. Raymond, et al., pp. 7-15. The University of Calgary Archaeological Association.

1979 The Jurgens Site. Memoir 15. *Plains Anthropologist* 24(84).

Wheeler, Richard P.
1952 Plains Ceramic Analysis: A Checklist of Features and Descriptive Terms. *Plains Archeological Conference Newsletter* 5(2):76-32.

1954 Selected Projectile Point Types of the United States: II. *Bulletin of the Oklahoma Anthropological Society* 2:1-6.

White, Ralph W.
1981a A Cody Knife Found in the Oklahoma Panhandle. *Oklahoma Anthropological Society Newsletter* 29(2):8-9.

1981b Clear Fork Gouges Found in the Oklahoma Panhandle. *Bulletin of the Oklahoma Anthropological Society* 30:19-25.

1987 The Muncy Site in the Oklahoma Panhandle: Indian Cultural Evidence over a Long Time Span. *Bulletin of the Oklahoma Anthropological Society* 36:39-103.

Whitman, W.
1937 The Oto. *Columbia University Contributions to Anthropology* 28:1-32.

Wiessner, Polly
1982 Risk, Reciprocity and Social Influence on Kung San Economies. In *Politics and History in Band Societies,* edited by E. R. Leacock and R. B. Lee, pp. 61-84. Cambridge University Press, Cambridge.

Wilcox, D. R.
1981 The Entry of Athapaskans into the American Southwest: The Problem Today. In *The Protohistoric Period in the North American Southwest, A.D. 1450-1700*, edited by D.R. Wilcox and B. Masse, pp. 213-256. Anthropological Research Papers 24, Arizona State Museum, Tempe.

Willey, Gordon R.
1966 *An Introduction to American Archaeology, Vol I, North and Middle America*. Prentice Hall, Englewood Cliffs.

Willey, Gorden and Phillip Phillips
1958 *Method and Theory in American Archaeology*. University of Chicago Press.

Willey, Gordon and Jeremy Sabloff
1980 *A History of American Archaeology*. W. F. Freeman, San Francisco.

Willey, Patrick S.
1988 Tascosa Creek Site Skeleton. In *The Transactions of the 23rd Regional Archeological Symposium for Southeastern New Mexico and Western Texas*, pp. 80-87.

Willey, Patrick S. and William M. Bass
1978 A Scalped Skull from Pawnee County. *Newsletter of the Kansas Anthropological Society* 24(1):1-11.

Willey, Patrick S. and Jack T. Hughes
1978 The Deadman's Shelter Site. In *Archaeology at Mackenzie Reservoir*, edited by Jack T. Hughes and Patrick S. Willey, pp. 149-204. Texas Historical Commission, Office of the State Archaeologist, Archaeological Survey Report 24, Austin.

Willey, Patrick S. and Douglas H. Ubelaker
1976 Notched Teeth from the Texas Panhandle. *Journal of the Washington Academy of Science* 66:239-246.

Willey, Patrick S., B. R. Harrison, and J. T. Hughes
1978 The Rex Rogers Site. In *Archaeology at MacKenzie Reservoir*, edited by J. T. Hughes and P. S. Willey, pp. 51-114. Texas Historical Commission, Office of the State Archaeologist, Archaeological Survey Report 24, Austin.

Williams, Bobbie J.
1955 A Preliminary Appraisal of the Archaeological Resources of the Fort Cobb, Foss, and Norman Reservoirs. Ms. on file, Oklahoma Archaeological Survey, Norman.

Williams, Stephen
1964 The Aboriginal Location of the Kadohadacho and Related Tribes. In *Explorations in Cultural Anthropology: Essays in Honor of George Peter Murdock*, edited by Ward H. Goodenough. McGraw-Hill, New York.

Williston, S. W. and H. T. Martin
1900 Some Pueblo Ruins in Scott County, Kansas. *Transactions of the Kansas State Historical Society, 1897-1900* 6:124-130.

Wilmeth, Roger
1970 *Excavations in the Pomona Reservoir*. Kansas State Historical Society, Anthropological Series 5, Topeka.

Wilmeth, Roscoe
1960 Kansa Village Locations in the Light of McCoy's 1928 Journal. *Kansas Historical Quarterly* 26:152-157.

1968 A Fossilized Bone Artifact from Southern Saskatchwan. *American Antiquity* 33:100-101.

Wilmsen, Edwin N.
1965 An Outline of Early Man Studies in the United States. *American Antiquity* 31:172-192.

1973 Interaction, Spacing Behavior, and the Organization of Hunting Bands. *Journal of Anthropological Research* 29(1):1-31.

Wilmsen, Edwin N. and F. H. H. Roberts, Jr.
1978 *Lindenmeier, 1934-1974: Concluding Report on Investigations*. Smithsonian Contributions to Anthropology 24, Washington, D.C.

Wilson, Terry P.
1985 *Bibliography of the Osage*. Native American Bibliography Series 6. The Scarecrow Press, Metuchen, New Jersey.

Winship, G. P.
1896 *The Coronado Expedition, 1540-1542*. Bureau of American Ethnology, Fourteenth Annual Report for the Years 1892-1893, Part 1, pp. 329-613. Washington, D.C.

Winterhalder, Bruce and Eric A. Smith
1981 *Hunter-Gatherer Foraging Strategies: Ethnographic and Archaeological Analyses*. University of Chicago Press, Chicago.

Withers, Arnold M.
1954 Reports of Archaeological Fieldwork in Colorado, Wyoming, New Mexico, Arizona, and Utah in 1952 and 1953—University of Denver Archaeological Fieldwork. *Southwestern Lore* 19:1-3.

Witte, Adolf H.
1936 Kitchen Middens of the Upper Red River Drainage. *Bulletin of the Texas Archaeological and Paleontological Society* 8:71-86.

1938 Spanish Fort, an Historic Wichita Site. *Bulletin of the Texas Archeological and Paleontological Society* 10:234-244.

1955 A Double Indian Burial from Donley County, Texas. *Panhandle-Plains Historical Review* 28:82-86.

Witty, Thomas A., Jr.
1957 The Logan Creek Site (25BT3). Ms. on file, Nebraska State Historical Society, Lincoln.

1961a *Appraisal of the Archeological Resources of the Council Grove Reservoir, Morris County, Kansas*. Kansas State Historical Society, Topeka.

1961b *Appraisal of the Archeological Resources of the John Redmond Reservoir, Coffey and Lyon Counties, Kansas*. Kansas State Historical Society, Topeka.

1962a Archeological Salvage in the Milford and Council Grove Reservoirs. Abstract of a paper presented at the 19th Plains Conference, Lawton. *Plains Anthropologist* 7(16):79-80.

1962b Archeological Survey of the Elk City Reservoir. *Kansas Anthropological Society Newsletter* 7(6-8).

1963a Appraisal of the Archeological Resources of the Cheney Reservoir, Reno, Kingman, and Sedgewick Counties, Kansas. *Kansas Anthropological Society Newsletter* 8(5).

1963b Appraisal of the Archeological Resources of the Marion Reservoir, Marion County, Kansas. *Kansas Anthropological Society Newsletter* 9(1).

1963c Archeology of the Council Grove Reservoir, Kansas. *Plains Anthropologist* 8(20):117.

1963d 1963 Excavations in the John Redmond Reservoir. *Kansas Anthropological Society Newsletter* 9(2).

1964 Radiocarbon Dates from the John Redmond Reservoir. *Kansas Anthropological Society Newsletter* 9(9).

1965 1964 Excavations in the Council Grove Reservoir, Morris County, Kansas. Abstract of a paper presented at the 22nd Plains Conference, Lincoln. *Plains Anthropologist* 10(27):51-52.

1966 The West Island Site 14PH10, a Keith Focus Plains Woodland Site in Kirwin Reservoir, Phillips County, Kansas. *Plains Anthropologist* 11:127-135.

1967 The Pomona Focus. *Kansas Anthropological Association Newsletter* 12(5):1-2.

1968 K.A.A. Fall Dig, 1968. *Kansas Anthropological Association Newsletter* 14(2):1-2.

1969 The Caldwell Dig. *Kansas Anthropological Association Newsletter* 15(2):1-3.

1970 K.A.A. Fall Dig, 1970. *Kansas Anthropological Association Newsletter* 16(3):1-3.

1972 K.A.A. Summer Dig, 1972, Fort Zarah. *Kansas Anthropological Association Newsletter* 18(3).

1978 Along the Southern Edge: The Central Plains Tradition in Kansas. In *The Central Plains Tradition: Internal Developments & External Relationships*, edited by Donald J. Blakeslee, pp. 56-66. Office of the State Archaeologist, University of Iowa, Report 11, Iowa City.

1980 *Salvage Archaeology of the John Redmond Lake, Kansas*. Kansas State Historical Society Anthropological Series 8, Topeka.

1981 The Pomona Focus, Known and Unknown. *The Missouri Archaeologist* 42:77-83.

1982 *The Slough Creek, Two Dog and William Young Sites, Council Grove Lake, Kansas*. Kansas State Historical Society, Anthropological Series 10, Topeka.

1983 *Four Archaeological Sites in Perry Lake, Kansas*. Kansas State Historical Society, Anthropological Series 11, Topeka.

1983 An Archeological Review of the Scott County Pueblo. *Bulletin of the Oklahoma Anthropological Society* 32:99-106.

Wood, Caryl E.

1976 *Trinchera Cave: A Rock Shelter in Southeastern Colorado*. Master's thesis, Department of Anthropology, University of Wyoming, Laramie.

1977 *Report of Archeological Test Excavations at the Proposed Cedar Point Lake, Kansas*. Report submitted to the U.S. Army Corps of Engineers, Tulsa District, Tulsa.

1986 Archaeology of the Upper Purgatoire River Valley, Las Animas County, Colorado: Chronology and Origins. *The Wyoming Archaeologist* 29:125-143.

Wood, Caryl E. and Gerald A. Bair

1980 *Trinidad Lake Cultural Resources Study, Part II: The Prehistoric Occupation of the Upper Purgatoire River Valley, Southeastern Colorado*. Report submitted to Interagency Archeological Services, Denver.

Wood, Caryl E., Penny Price-McPherson, Cheryl A. Harrison, and Howard M. Davidson

1981 *The Cultural Resources of the Flank Field Storage Area, Baca County, Colorado*. Reports of the Laboratory of Public Archaeology 36, Colorado State University, Fort Collins.

Wood, W. Raymond

1957 Perforated Elk Teeth: A Functional and Historical Analysis. *American Antiquity* 22.

1959 Notes on Ponca Ethnohistory 1705-1804. *Ethnohistory* 6:1-27.

1962/63 A Stylistic and Historical Analysis of Shoulder Patterns of Plains Indian Pottery. *American Antiquity* 28:25-40.

1965 *The Redbird Focus and the Problem of Ponca Prehistory*. Memoir 2, *Plains Anthropologist* 19(28):79-145.2.

1969 Two House Sites in the Central Plains: An Experiment in Archaeology. Memoir 6, *Plains Anthropologist* 14 (44, Part 2).

1971 Pottery Sites Near Limon, Colorado. *Southwestern Lore* 37:53-85.

1977 *Report of Archeological Test Excavations at the Proposed Cedar Point Lake, Kansas*. U.S. Army Corps of Engineers, Tulsa District.

Woodall, J. Ned
1967 The Coyote Site. In *A Pilot Study of Wichita Indian Archeology and Ethnohistory*, by R. E. Bell, E. B. Jelks, and W. W. Newcomb, pp. 15-23. Final Report submitted to the National Science Foundation.

Woodburn, James
1980 Hunters and Gatherers Today and Reconstructions of the Past. In *Soviet and Western Anthropology,* edited by Ernest Gellner, pp. 95-117. Columbia University Press, New York.

Woodward, Arthur
1970 *The Denominators of the Fur Trade: An Anthology of Writings on the Material Culture of the Fur Trade*. Westernlore Press, Pasadena.

Word, J. H.
1963 Floydada Country Club Site, 41-FL-1. *South Plains Archaeological Society Bulletin* 1:37-63.

1965 The Montgomery Site in Floyd County, Texas. *South Plains Archeological Society Bulletin* 2:55-102.

Word, James H. and Anne Fox
1975 The Cogdell Burial in Floyd County, Texas. *Bulletin of the Texas Archeological Society* 46:1-67.

Wormington, H. Marie
1948 *Report of a Survey Conducted by the Denver Museum of Natural History in the Cherry Creek Reservoir Area, Arapahoe County, Colorado*. Report submitted to National Park Service, Midwest Archaeological Center, Lincoln, Nebraska.

1957 *Ancient Man in North America*. The Denver Museum of Natural History, Popular Series 4, Denver.

1971 Comments on Early Man in North America, 1960-1970. *Arctic Anthropology* 8:83-91.

1983 Early Man in the New World: 1970-1980. In *Early Man in the New World*, edited by R. Shutler, pp. 191-195. Sage Publications, Beverly Hills.

Wormington, H. M. and Richard Forbis
1965 *An Introduction to the Archaeology of Alberta, Canada*. Denver Museum of Natural History, Proceedings 11, Denver.

Worster, Donald
1979 *Dust Bowl, The Southern Plains in the 1930s*. Oxford University Press, New York.

Wright, Carl M.
1985 The Complex Aspects of the "Smoky Hill Jasper," Now Known as Niobrarite. *Journal of the Kansas Anthropological Association* 5(3):87-90.

Wright, H. E. Jr.
1970 Vegetational History of the Central Plains. In *Pleistocene and Recent Environments of the Central Great Plains*, edited by W. Dort, Jr., and J. K. Jones, Jr., pp. 157-172. Department of Geology, University of Kansas Special Publication 3, The University Press of Kansas, Lawrence.

Wright, Muriel H.
1951 *A Guide to the Indian Tribes of Oklahoma*. University of Oklahoma Press, Norman.

1956 Notes and Documents: The Collection of Relics and Artifacts from Ferdinandina, Oklahoma's First White Settlement. *Chronicles of Oklahoma* 34:353-356.

1967 Chief Moses George Harragarra, Last Medal Chief of the Oto and Missouri Tribe. *Chronicles of Oklahoma* 45:220-222.

Wright, Muriel H. and Leroy H. Fischer
1966 Civil War Sites in Oklahoma. *Chronicles of Oklahoma* 44:158-215.

Wulfkulhe, Virginia A.
1986 *Investigations into the Prehistory of the Upper Clear Fork of the Brazos River, Fisher and Jones Counties, Texas*. Master's thesis, University of Texas, Austin.

Wyckoff, Don G.
1963 *Archaeological Survey of the Mangum Reservoir, Greer and Harman Counties, Oklahoma*. Oklahoma River Basin Survey, General Survey Report 2, University of Oklahoma, Norman.

1964a The Archeological Report of the Buncombe Creek Site, Marshall County, Oklahoma. *Bulletin of the Oklahoma Anthropological Society* 12:103-140.

1964b *The Archeological Survey of Kaw Reservoir, Kay and Osage Counties, Oklahoma*. Oklahoma River Basin Survey General Survey Report 6, University of Oklahoma, Norman.

1964c *The Cultural Sequence at the Packard Site, Mayes County, Oklahoma*. Oklahoma River Basin Survey, Archaeological Site Report 2, University of Oklahoma, Norman.

1964d The Hartshorne Burial Ground. *Oklahoma Anthropological Society Newsletter* 12(1):6.

1970a Archaeological and Historical Assessment of the Red River Basin in Oklahoma. In *Archeological and Historical Resources of the Red River Basin*, edited by H. A. Davis, pp. 67-134. Arkansas Archeological Survey Research Series 1, Fayetteville.

1970b University of Oklahoma Field School in Archaeology: Research in Western Oklahoma. Paper presented at the 28th Plains Anthropological Conference, Tulsa.

1972 Archaeological Investigations at Fort Washita. *Chronicles of Oklahoma* 49:492-503.

1973 The Lawrance Site of Murray County: 1969 Excavations by the Oklahoma Anthropological Society. *Oklahoma Anthropological Society Bulletin* 21:1-155.

1980 *Caddoan Adaptive Strategies in the Arkansas Basin, Eastern Oklahoma*. Ph.D. dissertation, Washington State University, Pullman.

1982 Prehistoric People and Western Oklahoma. In *Edwards I (34Bk2): Southern Plains Adaptations in the Protohistoric Period*, edited by Timothy Baugh, pp. 33-50. Oklahoma Archaeological Survey, Studies in Oklahoma's Past 8, Norman.

1984 The Foragers: Eastern Oklahoma. In *Prehistory of Oklahoma*, edited by R. E. Bell, pp. 119-160. Academic Press, New York.

1984 The Cross Timbers: An Ecotone in Historic Perspective. In *Contributions to Cross Timbers Prehistory,* edited by Patricia L. Kawecki and Don G. Wyckoff, pp. 1-20. Oklahoma Archaeological Survey, Studies in Oklahoma's Past 12, Norman.

1985 The Packard Complex: Early Archaic, Pre-Dalton Occupations on the Prairie-Prairie-Woodlands Border. *Southeastern Archaeology* 4:1-26.

1988 An Introductory Study of Alibates Gravel Occurrences along Western Oklahoma's Canadian River. Ms. on file, Oklahoma Archeological Survey, Norman.

Wyckoff, Don G. and Robert L. Brooks
1983 *Oklahoma Archeology: A 1981 Perspective*. Oklahoma Archeological Survey, Archeological Resource Survey Report 16, Norman.

Wyckoff, Don G. and Towana Spivey
1971 A Preliminary Summary of Archaeological Investigations in the South Barracks, Fort Washita, Bryan County, Oklahoma. Ms. on file, Oklahoma Archeological Survey, Norman.

1984 Traces of Oklahoma's Earliest Occupants, Part 2 *Oklahoma Anthropological Society Newsletter* 32(2):10-12.

Wyckoff, Don G. and Lyonel Taylor
1971 The Pumpkin Creek Site: An Early Archaic Site on the Southern Plains Border. *Plains Anthropologist* 16:20-51.

1984 Traces of Oklahoma's Earliest Occupants, Part 3 *Oklahoma Anthropological Society Newsletter* 32(4):7-10.

Yates, Catherine, D. G. Wyckoff, T. G. Baugh, and J. A. Harrington
1980 *A Survey of Prehistoric and Historic Sites in the Honey Springs Area, McIntosh and Muskogee Counties, Oklahoma*. Oklahoma Archeological Survey, Archeological Resource Survey Report 11, Norman.

Yellen, John
1977 *Archaeological Approaches to the Present*. Academic Press, New York.

Young, David E. and Robson Bonnichsen
1982 *Understanding Stone Tools: A Cognitive Approach*. Center for the Study of Early Man, University of Maine at Orono.

Young, D. E.
1986 *The Paleoindian Skeletal Material from Horn Shelter, Number 2, in Central Texas—An Analysis and Perspective*. Master's thesis, Texas A&M University, College Station.

Young, Mary
1971 Indian Removal and Land Allotment: The Five Civilized Tribes and Jacksonian Justice. In *The American*

*Indian: Past and Present*, edited by Roger L. Nichols and George Adams, pp. 132-145. Xerox College Publishing, Waltham.

Young, Wayne
1978 *Kaw Reservoir—The Northern Section: Part II. Report of Phase V Research of the General Plan for Investigations of the Archaeological Resources of Kaw Reservoir, North-Central Oklahoma*. Oklahoma River Basin Survey, Archaeological Site Report 23, University of Oklahoma, Norman.

Zalucha, L. A. and D. E. Olinger
1977 Archeological Investigations, Fort Larned National Historic Site, Kansas, 1976. Ms. on file, National Park Service, Midwest Archeological Center, Lincoln.

Zier, Christian and Stephen Kalasz
1985 *Archaeological Survey and Test Excavations in the Multi-Purpose Range Complex Area, Fort Carson Military Reservation, Colorado*. Centennial Archaeology, Fort Collins.

Zobeck, T. S.
1983 *Postcraniometric Variation among the Arikara*. Ph.D. dissertation, Department of Anthropology, University of Tennessee, Knoxville.

Zornow, William F.
1957 *Kansas: A History of the Jayhawk State*. University of Oklahoma Press, Norman.

# HISTORIC TRIBAL GROUPS IN THE SOUTHERN GREAT PLAINS

*Joe S. Hays*

This discussion of historical Native American activity in the study area is focused on Oklahoma, where the majority of the tribes were settled or confined. Table I-1 presents a summary of tribes living in Oklahoma, Table I-2 diagrams linguistic divisions of tribes in the study area, and Table I-3 identifies the contemporary name for tribes residing in the study area. Most activity by Native American tribes in adjacent states was carried out before the Reservation and Allotment periods. For a breakdown by temporal units for the Historic period see Table I-4. Additional information is presented in Figures I-1 and I-2.

Culturally similar tribes will be discussed together under a linguistic framework. Primary topics to be discussed about selected tribal groups include: the tribal name and any associated subgroupings, their previous prehistoric and historic locations, historic migrations, present locations, pre-Anglo-American dominant economic adaptations, material culture, previous archeological work, potential for archeological research, and key references. There are several useful bibliographic references which provide researchers with additional historical, ethnographic, and archeological references for the included groups. These include Murdock and O'Leary (1975), Bell (1978), and Tate (1986). Some tribal groups are treated here only briefly, but those who occupied much of the region in the pre-Reservation period are given emphasis. The Wichita, who have a substantial archeological heritage in the area are addressed from an archeological perspective in Chapters 7 and 8 and thus only key Historic period references are listed here.

## ALGONQUIAN FAMILY

### Arapaho and Cheyenne

The Southern Arapaho and Southern Cheyenne have only been separated from their northern kinsmen since the first half of

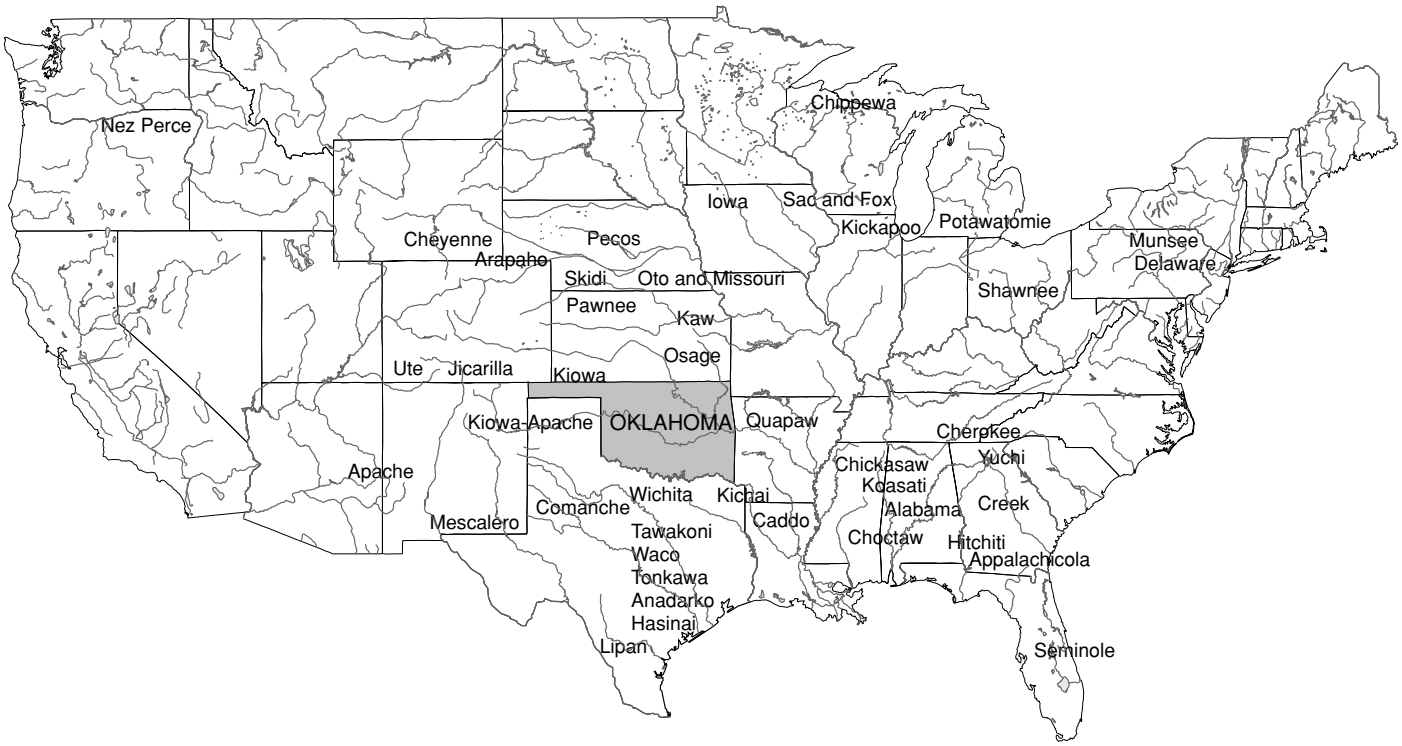



**Figure I-1. Tribal locations before removal (adapted from Morris et al. 1976).**

Table I-1
Native American population by tribe In Oklahoma, 11980

| Tribe | Total | Male | Female | Tribe | Total | Male | Female |
|---|---|---|---|---|---|---|---|
| Total Native Americans | 171092 | 84233 | 86859 | Modoc | 35 | 24 | 11 |
| Alabama Coushatta | 49 | 23 | 26 | Nanticoke | 30 | 6 | 24 |
| Alaskan Athabaskans | 50 | 30 | 20 | Navajo | 890 | 422 | 468 |
| Doyon | 33 | 25 | 8 | Omaha | 48 | 20 | 28 |
| Apache | 1097 | 615 | 482 | Oregon Athabaskan | 42 | 32 | 10 |
| Apache | 861 | 466 | 395 | Osage | 3029 | 1506 | 1523 |
| Fort Sill Apache | 59 | 42 | 17 | Oto | 1013 | 612 | 401 |
| Kiowa-Apache | 119 | 56 | 63 | Ottawa | 189 | 112 | 77 |
| Arapaho | 886 | 387 | 499 | Paiute | 116 | 50 | 66 |
| Arikara | 36 | 23 | 13 | Papago | 93 | 56 | 37 |
| Assiniboine | 33 | 22 | 11 | Pawnee | 1269 | 662 | 607 |
| Blackfoot | 223 | 131 | 92 | Peoria | 253 | 136 | 117 |
| Caddo | 1231 | 572 | 659 | Pima | 43 | 13 | 30 |
| Canadian and Latin American | 142 | 74 | 68 | Ponca | 1424 | 764 | 660 |
| Cherokee | 59270 | 28256 | 31014 | Potawatomi | 2296 | 1219 | 1077 |
| Cheyenne | 3364 | 1695 | 1669 | Citizen Band | 287 | 124 | 163 |
| Cheyenne | 3302 | 1667 | 1635 | Potawatomie | 1986 | 1089 | 897 |
| Northern Cheyenne | 43 | 20 | 23 | Pueblo | 219 | 114 | 105 |
| Chickasaw | 6027 | 2903 | 3124 | Hopi | 57 | 29 | 28 |
| Chippewa | 322 | 155 | 167 | Pueblo | 67 | 44 | 23 |
| Choctaw | 24162 | 12400 | 11762 | Quapaw | 347 | 146 | 201 |
| Choctaw | 24001 | 12353 | 11648 | Sac and Fox-Mesquakie | 1272 | 577 | 695 |
| Clifton Choctaw | 161 | 47 | 114 | Seminole | 5037 | 2517 | 2520 |
| Colville | 91 | 32 | 59 | Seminole | 4998 | 2489 | 2509 |
| Comanche | 4244 | 1987 | 2257 | Seminole Nation | 38 | 28 | 10 |
| Cree | 32 | 17 | 15 | Shawnee | 1876 | 865 | 1011 |
| Creek | 15421 | 7552 | 7869 | Absentee Shawnee | 277 | 131 | 146 |
| Creek | 15371 | 7525 | 7846 | Shawnee | 1599 | 73 | 865 |
| Thlopthlocco | 42 | 21 | 21 | Shoshone | 153 | 80 | 73 |
| Crow | 92 | 49 | 43 | Sioux | 1024 | 516 | 508 |
| Delaware | 1689 | 805 | 884 | Cheyenne River Sioux | 34 | 17 | 17 |
| Houma | 53 | 31 | 22 | Oglala Sioux | 64 | 40 | 24 |
| Iowa | 196 | 94 | 102 | Sioux | 868 | 433 | 435 |
| Iroquois | 1258 | 569 | 689 | Stockbridge | 34 | 11 | 23 |
| Iroquois | 38 | 20 | 18 | Tonkawa | 209 | 128 | 81 |
| Mohawk | 128 | 53 | 75 | Ute | 51 | 17 | 34 |
| Seneca | 436 | 197 | 239 | Wichita | 405 | 197 | 208 |
| Seneca-Cayuga | 265 | 108 | 157 | Winnebago | 46 | 26 | 20 |
| Wyandot | 342 | 130 | 212 | Yakima | 55 | 23 | 32 |
| Kaw (Kansa) | 342 | 130 | 212 | Yuchi | 138 | 59 | 79 |
| Kickapoo | 953 | 494 | 459 | Yman | 33 | 10 | 23 |
| Kiowa | 5004 | 2444 | 2560 | Other Specified | 512 | 229 | 283 |
| Klamath | 42 | 13 | 29 | Not Reported | 20441 | 10626 | 9815 |
| Miami | 297 | 146 | 151 | | | | |

Data based on a sample; total Native Americans includes tribes not shown separately.

Table I-2
Linguistic associations in the Southern Plains region

Algonquian. Algonquian-Wakashan.
- Central-Eastern
  - Central
    - Sac & Fox, Kickapoo
    - Potawatomie , includes Chippewa
    - Shawnee
    - Delaware, includes Munsee remnants
  - Western
    - Cheyenne
    - Arapaho

Athapascan. Na - Dene.
- Apachean
  - Chiricahua (Fort Sill), Mescalero, Jicarilla
- Lipan
  - Kiowa-Apache, includes Lipan remnants

Caddoan. Hokan-Siouan.
- Caddo
  - Caddo, includes Anadarko, Hasinai (Hainai) remnants
  - Kitsai (Kichai), (extinct)
- Pawnee
  - Pawnee
- Wichita
  - Wichita, includes Tawakoni, Waco, Kichai (Caddo dialect) remnants

Iroquoian. Hokan-Siouan.
- Southern Iroquoian
  - Cherokee

Kiowa-Tanoan. Aztec-Tanoan.
- Kiowa

Muskogean. Hokan-Siouan.
- Western Muskogean
  - Choctaw, Chickasaw
- Eastern Muskogean
  - Seminole, Creek (Muskogee), Creek, includes Apalachicola, Alabama, Hitchiti, Koasati sub-tribes

Sahaptian. Northern Penutian. Macro-Penution.
- Nez Perce

Siouan. Hokan-Siouan.
- Mississippi Valley
  - Winnebago
    - Iowa, Oto-Missouri
  - Dhegiha
    - Kansa (Kaw), Osage, Ponca, Quapaw

Tonkawan.
- Tonkawa

Uto-Aztecan. Aztec-Tanoan.
- Central Numic
  - Shoshonean
  - Comanche
- Southern Numic
  - Ute

Yuchian.
- Yuchi, identified with Creek Nation

Sources: Campbell and Mithum (1977), Seboek (1976, 1977), Sherzer (1976), and Wright (1951).

Table I-3
Contemporary tribal entities within the Southern Plains, region

| Historic Tribal Name | Officially Recognized Name |
|---|---|
| Algonquian Linguistic Family: | |
| Arapaho | Cheyenne-Arapaho Tribes of |
| Cheyenne | Cheyenne-Arapaho Tribes of Oklahoma |
| Chippewa | (Identified with Potawatomi Tribe) |
| Delaware | Delaware Tribe of Western Oklahoma |
| Kickapoo | Kickapoo Tribe of Oklahoma (includes Texas Band of Kickapoo Indians) |
| Potawatomi | Citizen Band Potawatomi Indian Tribe of Oklahoma |
| Sac and Fox | Sac and Fox Tribe of Indians of Oklahoma |
| Shawnee | Absentee - Shawnee Tribe of Indians of Oklahoma |
| | Eastern Shawnee Tribe of Oklahoma |
| Athapascan Linguistic Family: | |
| Chiricahua Apache | Fort Sill Apache Tribe of Oklahoma |
| Kiowa-Apache | Apache Tribe of Oklahoma |
| Caddoan Linguistic Family: | |
| Caddo | Caddo Indian Tribe of Oklahoma |
| Pawnee | Pawnee Indian Tribe of Oklahoma |
| Wichita | Wichita Indian Tribe of Oklahoma |
| Iroquoian Linguistic Family: | |
| Cherokee | Cherokee Nation of Oklahoma |
| | United Keetoowah Band of Cherokee Indians, Oklahoma |
| Kiowa-Tanoan Linguistic Family: | |
| Kiowa | Kiowa Indian Tribe of Oklahoma |
| Muskogean Linguistic Family: | |
| Chickasaw | Chickasaw Nation of Oklahoma |
| Choctaw | Choctaw Nation of Oklahoma |
| Creek | Creek Nation of Oklahoma |
| | Alabama-Quassarte Tribal Town of the Creek Nation of Oklahoma |
| | Kialegee Tribal Town of the Creek Nation of Oklahoma |
| | Thlophlocco Tribal Town of the Creek Nation of Oklahoma |
| Seminole | Seminole Nation of Oklahoma |
| Sahaptian Linguistic Family: | |
| Nez Perce | (Allowed to remove in 1885. No longer counted among the Oklahoma tribes.) |
| Siouan Linguistic Family: | |
| Iowa | Iowa Tribe of Oklahoma |
| Kansa (Kaw) | Kaw Indian Tribe of Oklahoma |
| 0sage | Osage Tribe of Oklahoma |
| Oto | Otoe-Missouria Tribe of Oklahoma |
| Ponca | Ponca Tribe of Indians of Oklahoma |
| Quapaw | Quapaw Tribe of Oklahoma |
| Tonkawan Linguistic Family: | |
| Tonkawa | Tonkawa Tribe of Indians of Oklahoma |
| Uto-Aztecan Linguistic Family: | |
| Comanche | Comanche Indian Tribe of Oklahoma |
| Yuchian Linguistic Family: | |
| Yuchi | (Considered part of the Creek Nation) |

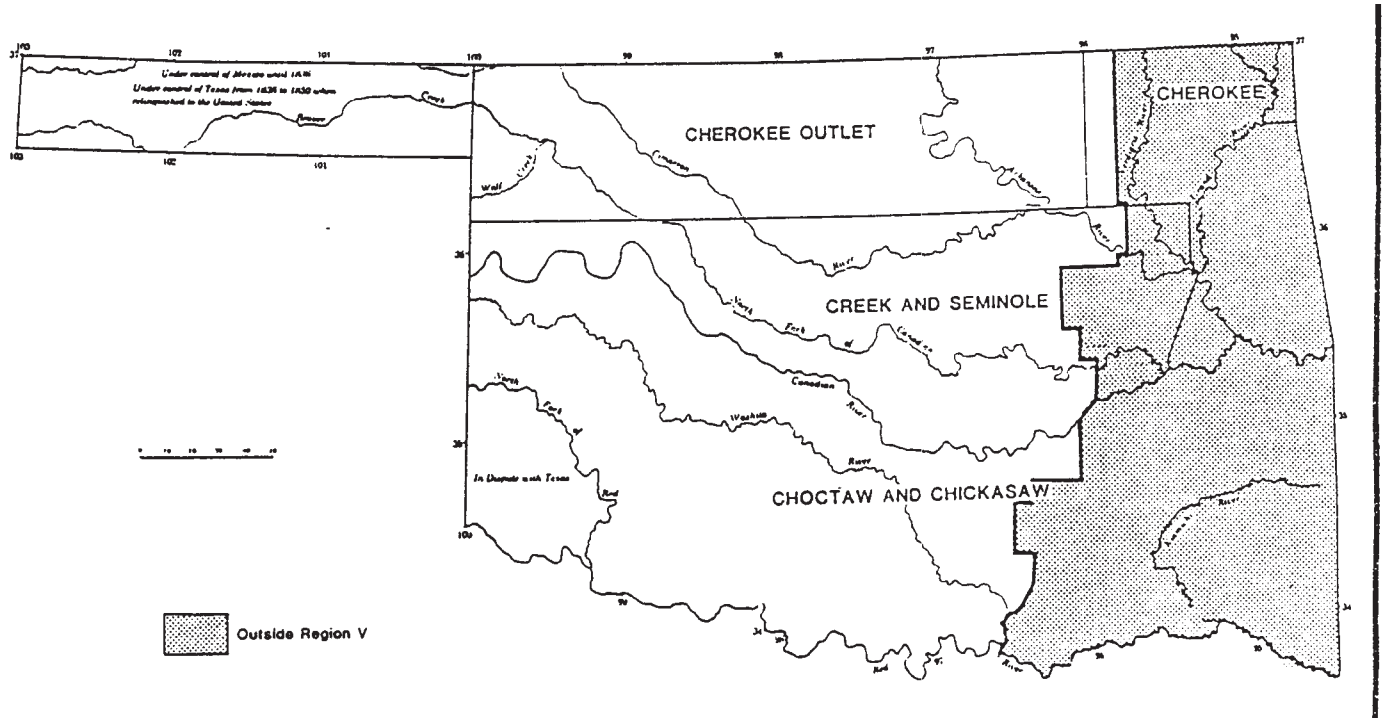



**Figure I-2. Lands in Indian Territory, 1830-1855 (adapted from Morris et al. 1976).**

Table I-4
Temporal units of the Protohistoric and Historic periods

| | |
|---|---|
| Southern Plains: | |
| Protohistoric | 1500-1750 |
| Historic | 1750-present |
| Historic, Indian Dominant | 1750-1875 |
| Historic, Anglo Dominant | 1875-present |
| Removal, Indian Territory | 1830-1842 |
| Reservation, Oklahoma Territory | 1875-1905 |
| Allotment | 1889-1906 |

the nineteenth century. The Northern Arapaho are located on the Wind River Reservation in Wyoming whereas, the southern group are confederated with the Cheyenne in western Oklahoma. The Northern Cheyenne Tribe is located on the Northern Cheyenne Indian Reservation, Montana while the Southern Cheyenne reside in western Oklahoma. Prehistorically, the Arapaho and Cheyenne are believed to have occupied the Great Lakes region, primarily the area of Minnesota. They then moved onto the Northern and Central Plains where they practiced a nomadic bison hunting way of life (Grinnell 1972). During this time, their range included adjoining portions of Colorado, Kansas, Nebraska, and Wyoming. Claims to these lands were ceded to the United States except for a small reservation in southeast Colorado after the Fort Wise Treaty in 1861. Since the 1860s, the Southern Cheyenne and Southern Arapaho have been affiliated on the Southern Plains. Following the Treaty of Medicine Lodge in 1867 and a Presidential Proclamation in 1869, the Southern Arapaho and Southern Cheyenne were settled on reservations in western Oklahoma. The Cheyenne-Arapaho "surplus" lands were opened to settlement on April 19, 1892. Arapaho members of the Cheyenne-Arapaho tribes of Oklahoma presently are concentrated in Blaine and Washita counties. Southern Cheyennes are located primarily in Custer, Roger Mills, Canadian, Kingfisher, Blaine, and Dewey counties.

The historic material culture of the Southern Cheyenne and Arapaho are virtually identical, differing only in patterns of style and ornamentation. Aside from several studies of historic tipi ring sites which cannot firmly be attributed to a particular tribe, little work has been done in regard to historic Cheyenne-Arapaho archeology (Wood 1971). With this in mind, several statements can be made regarding future research. First, little difference in utilitarian items can be expected between the Southern Cheyenne-Arapaho and other plains bison nomads. Second, the greatest potential for Cheyenne-Arapaho archeological remains would be in camp site areas and historic contact points such as forts or

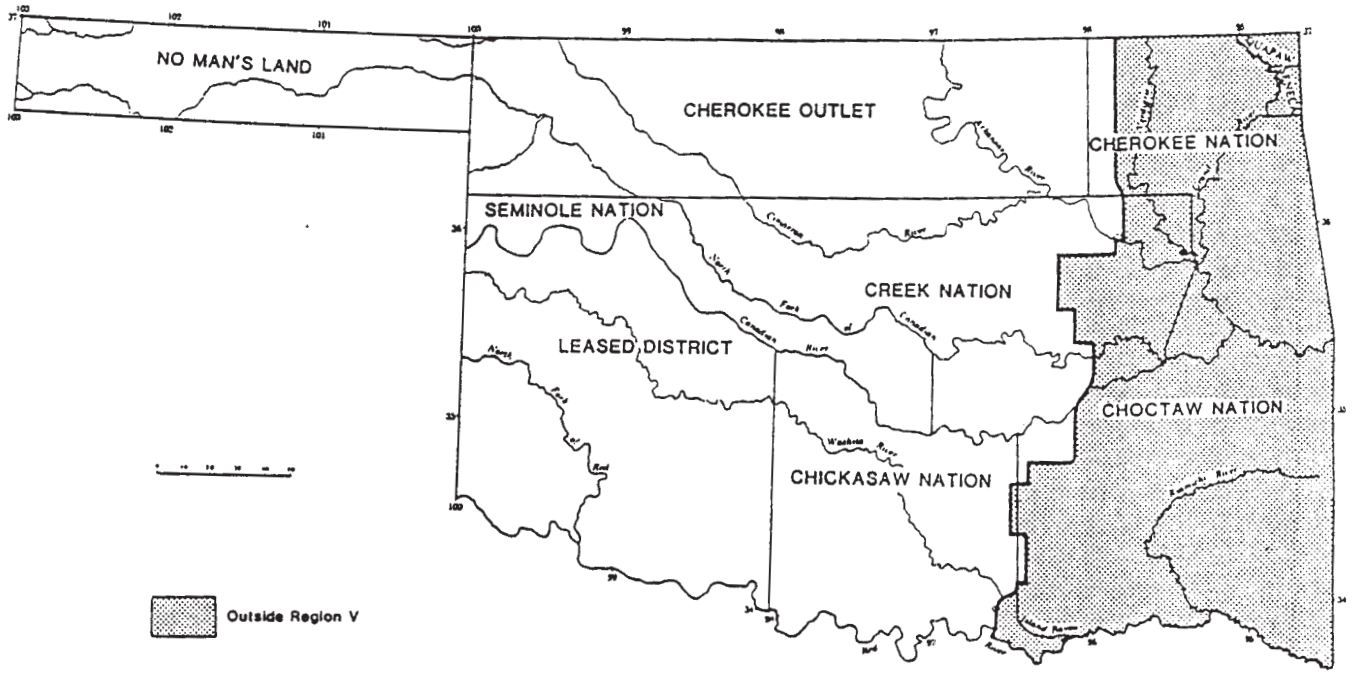



**Figure I-3. Lands in Indian Territory, 1855-1866 (adapted from Morris et al. 1976).**

trading establishments. For Reservation period locations, settlements should occur which are transitional between tipi camps and settled agricultural sites. These sites may be difficult to distinguish from Anglo-American settlements of the same period. Items diagnostic of the Cheyenne-Arapaho in an archeological context would be primarily trade goods such as glass beads, metal ornaments, and less frequently, metal tools. By comparison to trade goods with known assemblages from museum collections and other ethnographic evidence such as nineteenth century photographs, a determination of what could be expected from a Cheyenne-Arapaho site can be made. Historical and archeological references for the Southern Cheyenne-Arapaho include: Trenholm (1970), Grinnell (1972), Lintz (1975), Wright (1951), Morris et al. (1976), Baker and Harrison (1986),and Berthrong (1963).

### Kickapoo and Sac & Fox

In early Historic times, the Kickapoo tribe was located in southern Wisconsin and later in southern Illinois. They ceded all lands in Illinois to the United States in 1819 and subsequently have occupied reservations in Missouri and northeastern Kansas. A portion of the tribe chose to settle in Texas and allied themselves with the Texas Cherokee. In 1839, they settled briefly in the Choctaw Nation in present-day Garvin County, Oklahoma. This band went to live in Coahuila, Mexico in 1850-1851 and have since come to be known as the Mexican Kickapoo. In 1883, a reservation was established for the Kickapoo which lay between the Deep Fork and Canadian rivers in Indian Territory (Figure I-4). Under much protest, this reservation was ceded and land allotted to tribal members in 1895. Members of the Kickapoo tribe of Oklahoma are presently settled in Pottawatomie County with the tribal headquarters in McLoud, Oklahoma.

Traditionally the Kickapoo have been farmers, supplemented by hunting and gathering (Callendar, Pope, and Pope 1978:685). They have retained much of their traditional culture, many aspects of which are actively carried on today. The Oklahoma Kickapoo still maintain ties with the Mexican band. The material culture of the Kickapoo is similar to other tribes that have resided in the same Midwestern Prairie homeland (e.g., the Sac & Fox, and Shawnee).

Very limited work has been done with Kickapoo archeology although the potential for such is good (Klippel 1976; Parmalee and Klippel 1983). The greatest potential for sites is in areas historically used by the tribe during early Contact, Reservation and Allotment times. For example, historic sites such as Fort Arbuckle are known to have been occupied by members of the Texas band prior to their migration to Mexico (Wight 1951:67). Overlap in reservation and allotment areas with previous inhabitants such as the Sac & Fox, Creek, Seminole, Iowa, Potawatomie, or Shawnee may make distinction of Kickapoo sites a problem (Figures I-2 and I-4). A good treatment of Kickapoo history and culture is given in Calendar, Pope, and

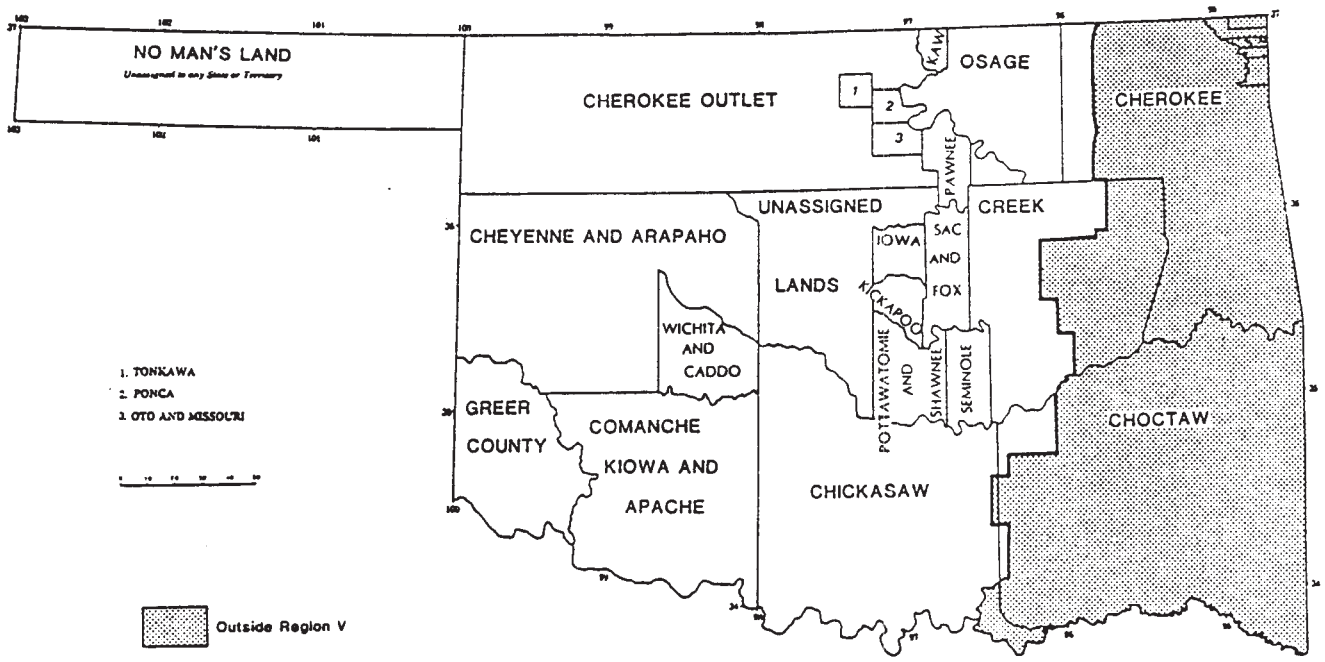



**Figure I-4. Lands in Indian Territory, 1866-1889 (adapted from Morris et al. 1976).**

Pope (1978). Other references for Kickapoo history and ethnology include: Gibson (1963), W. Jones (1913), Michelson (1929), Ritzenthaler and Peterson (1956), Silverberg (1957), Wallace (1964), M. Wright (1951).

The Sac and Fox Tribe of Oklahoma are closely related to the Kickapoo and live in close proximity to them. The Sac and Fox tribe have their headquarters near Stroud, Oklahoma. Historically, the Sac (Sauk) and Fox have been closely allied and associated with the Kickapoo and the Potawatomi. Since residing in Oklahoma they have incorporated into a single tribe (M. Wright 1951:222). Like the Kickapoo, the Sac and Fox are an agricultural people whose homelands were in the Great Lakes area (Figure I-1).

Following the Black Hawk War of 1831-32, the Sac and Fox migrated to Iowa. After losing their lands in Iowa, Nebraska, and Kansas through several treaties, most of the tribal members were limited to two reserves in Osage and Doniphan Counties, Kansas. Another group of Sac and Fox purchased land and settled in Iowa, where their descendants live near Tama. Following the sale of the Osage County, Kansas lands, the Sac and Fox were assigned a reservation in Indian Territory in 1867 (Figure I-4). On this reserve which included parts of Payne, Lincoln, and Pottawatomie counties, Oklahoma, they maintained a weak economy of farming and stock raising. After allotment, Sac and Fox lands were opened to settlement in 1891 (Wright 1951). In recent times the Sac and Fox tribe has proven to be very successful, making economic progress and overcoming the barriers placed on modern tribes.

Like most other Eastern Algonquian tribes, the archeology of the Sac and Fox is largely unknown. One site in Adair County, Missouri (Kay 1968) is thought to represent two Sauk burials from 1785 to 1809. The best overview to date is Callendar's (1978) treatment of Sauk and Fox culture history. Other references for Sac and Fox include Hagan (1958), Hewitt (1910), Skinner (1923, 1925, 1970).

### Potawatomi, Shawnee, and Delaware

The Potawatomi (Citizen band) came to Oklahoma in 1867 after selling their reservation lands in Kansas. Another group of Potawatomi settled near Council Bluffs, Iowa. There is also a Potawatomi reservation in Jackson County, Kansas. In Indian Territory, the Potawatomi shared lands with members of the Absentee Shawnee band until allotment in 1890. Prior to a series of treaty-induced removals, the Potawatomi lived in the Great Lakes area of Michigan, Ohio, Illinois, and Indiana. They traditionally practiced an agricultural economy and are regarded as an Eastern Woodlands tribe. The extent of archeological sites among the Potawatomi in Oklahoma is largely unknown. It is believed that Potawatomi sites would be difficult to distinguish from Anglo-American settlements or activity sites of other tribes who have shared the same geographic range. In addition, sites

relating to Potawatomi activity in Kansas should not be overlooked. References for the Potawatomi in Oklahoma include Clifton (1978), Chapman (1946), Fay (1971), Fightmaster (1972), Landes (1970), Murphy (1961/1962), Wyatt (1962).

The Shawnee are summarized in Wright (1951), Goddard (1978), Howard (1981). Like the other Eastern Algonquians very little is known regarding their archeological sites. An Absentee Shawnee burial was recovered from Cleveland County and was reported by Boyd (1982). See also Sabo et al. (1988). The Absentee Shawnee came to their present location in Cleveland and Pottawatomie counties, Oklahoma in 1868 from the Wichita-Caddo reservation (Wright 1951).

The Delaware are summarized in Goddard (1978), see also Sabo et al. (1988) and Prewitt (1981). The greatest potential for archeological work in the Southern Plains region lay with that part of the Delaware Tribe which settled near Anadarko. The Delaware residing near the Anadarko area are primarily descended from Delawares that lived on the Brazos Reservation in Texas during the middle of the nineteenth century.

## ATHAPASCAN FAMILY

### Fort Sill Apache

The Fort Sill Apaches are descendants of members of the Chiricahua, Warm Springs, and Nednai Apache tribes (Johze 1961-62). In Historic times, these groups made their homes in Arizona, New Mexico, and adjacent states of northern Mexico. The members of these three Apache tribes were brought to the Fort Sill Reservation, Oklahoma Territory as prisoners of war in 1894, being transferred from prisons in Florida and Alabama. In 1913, they were released from prisoner of war status and given the choice of going to New Mexico or remaining in Oklahoma. While 87 remained in Oklahoma, around 200 individuals went to live among the Mescalero Apaches on their reservation near Ruidoso, New Mexico. Many members of the Fort Sill Apache Tribe currently make their homes in Comanche and Caddo counties, Oklahoma. The Fort Sill Apaches have maintained some aspects of their southwestern traditions, such as ceremonies and regalia. This is significant as they represent the only Southwestern group relocated to Oklahoma. No known archeological work has been conducted with Fort Sill Apache sites. The greatest potential lies in the examination of Apache P.O.W. camps located in the Fort Sill area. Some of these sites were documented photographically with the backdrop of the Wichita Mountains. The likelihood for relocating the areas would thus be good (Towana Spivey and Don Wyckoff, personal communication). Key references for the Fort Sill Apaches include: Johze (1961), Wright (1951), Mails (1974), and Opler (1983).

### Kiowa-Apache

The Kiowa-Apache are culturally very similar to the Kiowa tribe and are considered in this study as a subgrouping of the Kiowa. Refer to the section of this report describing the Kiowa and Comanche tribes. The linguistic associations in Table I-2 indicate that the Kiowa-Apache are linguistically farther removed from the Mescalero and Jicarilla Apaches than are the Fort Sill Apaches.

## CADDOAN FAMILY

The Caddoan speakers, primarily the Caddo and Wichita tribes are considered among the few indigenous tribes to Oklahoma. The Pawnee whose principle historic habitation was in Nebraska and Kansas, made frequent excursions into the state but did not arrive to settle on reserve land until 1875 and after (Hyde 1951:329; Blaine 1982). Since early Historic times, the Wichita have been located within the Southern Great Plains. Because many of the Protohistoric and Late Prehistoric period remains relate to Caddoan speakers, more research has been conducted with these groups than any others in the study area. Although the principle territory of the Caddo is outside the Southern Great Plains, they were settled for a few years on the Brazos Reserve in Young County, Texas. They were subsequently removed to the Wichita Agency near Fort Cobb in Caddo County, Oklahoma in 1859. This ability to directly relate archeological remains to these historic groups through ethnohistorical methods has resulted in an enormous body of literature useful in the study of the histories and prehistories of Caddoan-speaking groups. The relations between the Caddoan groups in Prehistoric times has been studied in depth. Publications devoted to this subject are Bell, Jelks, and Newcomb (1967), B. Jones (1968), Hughes (1968, 1969/70), and Kivett (1979).

### Caddo

Caddo and Caddo subtribe references include Antle (1934), Bell (1948), Bolton (1987), Estep (1960, 1961), Fletcher (1907), Gilmore (1967), Griffith (1954), Hatcher (1927), Hughes (1968, 1969/70), Jones (1968), Neighbours (1966), Orr (1952), E. C. Parsons (1941), Swanton (1931, 1942), S. Williams (1964), and Wyckoff (1980).

### Wichita

References relating to the Wichita include Bell (1981, 1984), Bell, Jelks, and Newcomb (1967), M. Blaine (1982), Davison (1974), Duffield and Jelks (1961), Elam (1971), Estep (1960, 1961), Harris and Harris (1961), Hoig (1984), Jelks (1962, 1966), Johnson and Jelks (1958), Lange (1957), Newcomb (1976), Rohn and Emerson (1984), Rohrbaugh (1982), Rohrt, Garber and Woolley (1975), R. A. Smith (1952), Spring (1966), Steen (1953), Sudbury (1976), Watt (1968), M. Wedel (1979, 1981, 1982), W. Wedel (1924, 1968a, 1979), Wedel and Wedel (1976), Witte (1938), Wright (1956).

### Pawnee

The majority of published literature on the Pawnee deals with their existence previous to migrating to the reservation in Oklahoma with a considerable amount devoted to prehistoric and protohistoric Pawnee remains. Some of these references are Grange (1962, 1963, 1963, 1968), Hotz (1970), Hughes 1968, 1969/70, Hyde (1951), Moore (1939), W. Wedel (1936, 1938), Weltfish (1965), W. R. Wood (1962/1963).

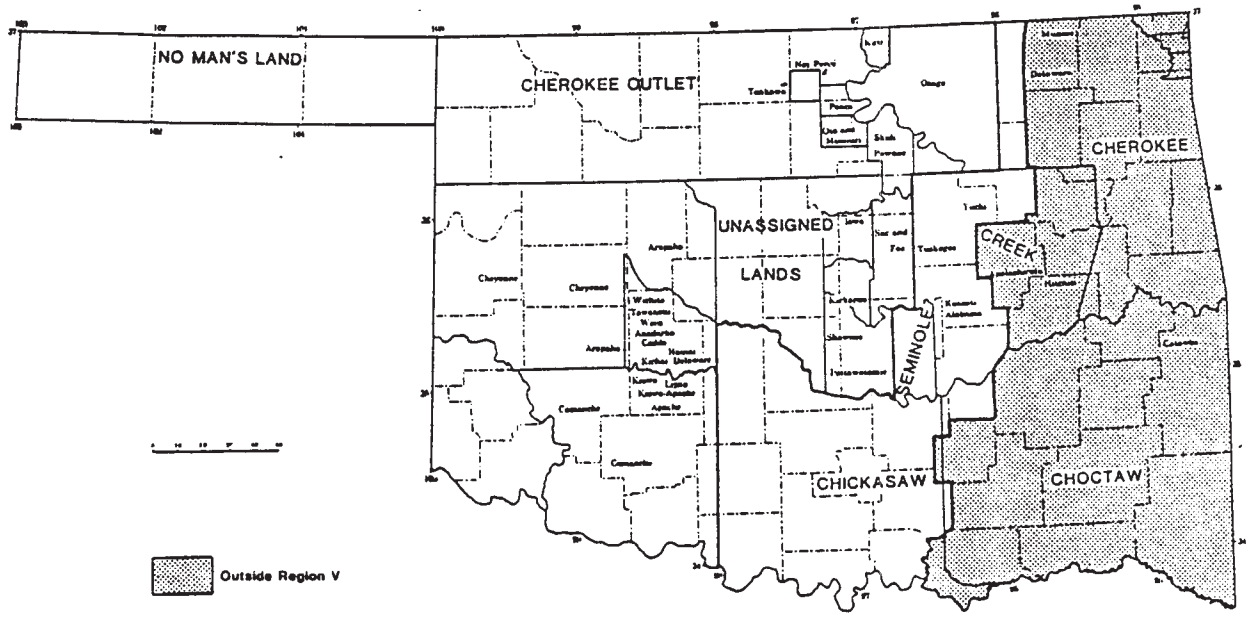



**Figure I-5. Openings of Native American lands (adapted from Morris et al. 1976).**

## IROQUOIAN FAMILY

### Cherokee

For a summary of Cherokee history in Oklahoma, see Sabo et al. (1988). Archeologically, Cherokee sites in Oklahoma that are within the Great Plains study area could be expected in Washington and Tulsa counties (see Figure I-2 and Figure I-6) as well as the Ozark Mountain-Arkansas River Valley-Ouachita Mountain study area. The sites would date beginning from the removal period and probably be similar to other relocated southeastern tribes and to Anglo-American settlements of the same time period. Hoyt (1968) has compiled a bibliography for the Cherokee.

## KIOWA-TANOAN AND UTO-AZTECAN FAMILIES

### Kiowa and Comanche

These two tribes are considered together based on similarities of culture and history. During the Historic period they were the dominant tribes on the Southern Plains. In pre-Reservation times, both tribes subsisted on a nomadic, equestrian, bison hunting economy, combined with trading and raiding of various groups on their perimeters. The remains of this raiding and trading economy provide us with the majority of the archeological data concerning the historic Comanche and Kiowa tribes. For our purposes the Kiowa-Apache tribe is considered as a band or subunit of the Kiowa. While differing linguistically from the Kiowa, the economic and material culture concerns of the Kiowa-Apache are essentially those of the Kiowa. For documentation of the Kiowa-Apache, Kiowa relationship see Mooney (1979:156). The ultimate origins of these groups may be in the Southwest (Jelinek 1967).

The Kiowa are said to have come to the Southern Plains from what is now western Montana, near the sources of the Yellowstone and Missouri Rivers (Mooney 1979:153). In Historic times the primary range of the Kiowa was from south of the Arkansas River to the headwaters of the Red River (Mooney 1979:154). From this core territory contacts were made by the Kiowa with peoples in every direction. Enemies of the Kiowa were the Tonkawas and Caddos to the south and east, as well as the Jicarilla, Ute, and Navaho to the west. The Kiowa were more at peace with the Mescalero and allied themselves with the Wichita Confederation which included the Wichitas, Taovayas, Tawakoni, Kichais, and Wacos. Also friendly with the Kiowa, at least at times, were the Crows, Arapahoes, Hidatsas, Arikaras, Mandans, Flatheads, and Shoshonis. The Kiowa sometimes fought the Cheyenne, at least until 1840 when peace between the two tribes was made. The Kiowa were constant enemies of the Dakota, Pawnee, and Osage (Mayhall 1962:19). In about 1790, the Kiowa and Kiowa-Apache stopped fighting the Comanche and made a lasting peace with that tribe (Mayhall 1962:15).

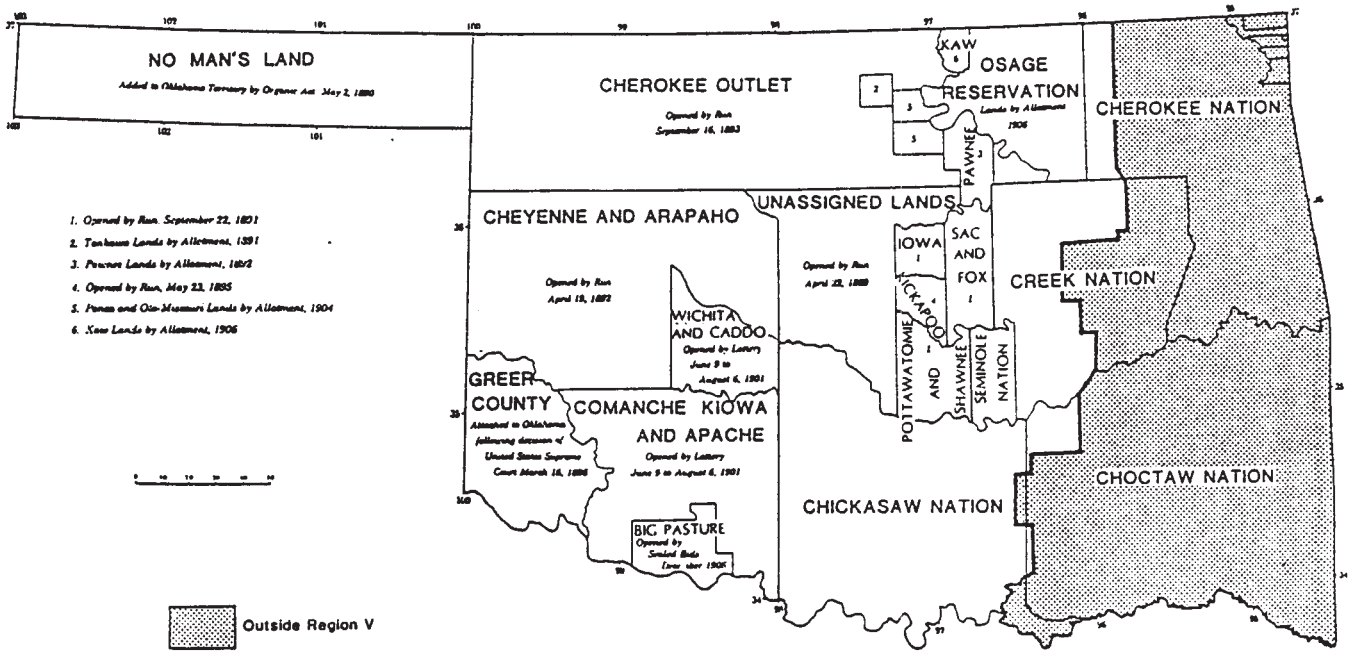



**Figure I-6. Present tribal locations in Oklahoma (adapted from Morris et al. 1976).**

Prehistoric origins for the Comanche tribe are with the other Shoshonean- or Numic-speaking peoples of the Plateau region. The Comanche are an offshoot of the Shoshone tribe and are believed to have made their way to the Southern Plains around the end of the seventeenth century after leaving their homeland in Wyoming, Utah, and Southern Idaho. As to whether the move to the Southern Plains was the result of pressure by other tribes, or a move by choice to an area more suitable for their needs is unknown. Certainly they were one of the first tribes to obtain horses, thereby putting themselves in a geographic and economic position to control the flow of horses northward on the plains from the northernmost settlements of New Spain and Mexico (Wallace and Hoebel 1952:10,11).

The Comanche presence on the Southern Plains was first documented in 1705 when they are identified in New Mexico by Spanish records. By 1836 the Comanche had totally displaced the Apache (Jicarilla, Lipan, Mescalero) to the edges of the Southern Plains and controlled the territory south of the Arkansas River down to the Mexican settlements along the Rio Grande. Their range on the west extended to the Pecos River or foothills of the Rockies all the way across the Plains to the Cross Timbers on the east (Wallace and Hoebel 1952:12). Thus, in Historic times until 1875 the majority of the Southern Great Plains was occupied and dominated by the Comanche and Kiowa.

The collapse of Comanche/Kiowa dominance came about not from conflicts with other tribes, or the Spanish, Mexicans, French, or Texans, all of whom had much to gain by taking over the Comanches and their territory. All except the French made military advances into Comanche territory. The French were unsuccessful because of their previously established trade with traditional enemies of the Comanche such as the Pawnee (Fehrenbach 1974:184-191).

Instead, the demise of the Comanche came from the Indian policies of the United States. A string of treaties were signed by individual chiefs representing the semi-autonomous bands of the Comanche, but interpreted by the U.S. officials to bind the entire tribe. Such treaties continually reduced their overall range. These treaties include the first between the U.S. and the Comanche at Camp Holmes, 1835; some Comanches also signed the treaty between the Kiowa and the U.S. at Fort Gibson in 1837; the Council Springs Treaty of 1846 (Butler-Lewis Treaty) represented by only some members of the Penateka Comanche band; Fort Atkinson, Kansas in 1853 which was represented only by members of the Yamparika Comanche band; the Fort Arbuckle Treaty of 1859 where the Penateka were represented; the Little Arkansas River Treaty (in Kansas) in 1865 between the U.S. and the Comanche and Kiowa; and the Treaty of Medicine Lodge (in Kansas) in 1867 (M. Wright 1951:121-126). Two treaties were also signed by the Comanches with the Confederacy during the Civil War but these had little historical impact since the area was so far removed from the bulk of the Union aggression and since the Comanches saw it

as a treaty of alliance between themselves and the Texans (a traditional enemy) whom they still viewed as distinct from other Americans. Members of the Quahadi Comanche band who inhabited the Texas Panhandle signed few if any of these treaties with the United States.

One of the worst deals for the Comanches came when Texas lost their status as a republic and and joined the union as a state in 1845. Texas differed from the other states in that Texas kept title to all her public lands upon becoming a state. After 1845, Texas wanted the U.S. Government to remove all natives from Texas including the Comanches (Fehrenbach 1974:378-374, Neighbours 1973). The U.S. Government no longer had the right to grant the Comanches land in Texas by treaty, even though the land was only occupied by Comanches. Nevertheless, in the 1865 Little Arkansas River Treaty, the Comanches and Kiowas were granted "undisturbed use and occupation" of the lands from the eastern boundary of New Mexico to the ninety-eighth meridian which lies just west of present Chickasha, Oklahoma (M. Wright 1951:154). Thus, the U.S. commissioners could not legally give any of these lands in Texas to the Comanches and Kiowas as a reservation (Fehrenbach 1974:471). The range of the Kiowas and Comanches was further restricted to Indian Territory (Oklahoma) by the Treaty of Medicine Lodge in 1867 (Fehrenbach 1974:471-478) when the tribes ceded back to the United States all lands except those shown in Figure I-4. The last Comanches did not come into the Oklahoma reservation until 1875 and sporadic raiding and hunting off the reservation continued into Texas well into the 1880s (Wallace and Hoebel 1952). Since this time Comanche and Kiowa tribal members have been concentrated in the general area of Kiowa, Comanche, Caddo, and Cotton counties, Oklahoma (M. Wright 1951).

The material culture of the Comanche, Kiowa, and Kiowa-Apache is very similar in form. It typified Southern Plains material culture in Historic times and heavily influenced neighboring tribes such as the Tonkawa, Wichita, and Jicarilla. The regional characteristics of Southern Plains decoration often features the extensive use of painted leather, fine fringe, usually a conservative application of beadwork, and a profusion of metal cones and other metal ornaments such as conchos. Metal objects seemed to fall out of style around 1880 on the Southern Plains (Koch 1977). One dominant feature of historic Southern Plains life was the abundance of Spanish/Mexican trade goods. Many of the items for which the Kiowa, Kiowa-Apache and Comanche were dependent upon were brought in from New Mexico by Hispanic traders known as Comancheros. Trading was done at sites in New Mexico such as the annual trade fairs at Taos, also at specified locations in northwest Texas such as Quitaque, Mucho Que, and Tascosa. A large volume of trade was also conducted at the Native American campsites themselves (Levine and Freeman 1982). The economic pursuits of these Hispanic New Mexicans may have shifted seasonally from being Comancheros (traders), to Ciboleros (buffalo hunters), to Pastores (sheepherders; Guffee 1976); Hughes (1987:12).

The significance of the Comanchero trade should not be underestimated when considering the archeology of the Southern Plains tribes. Most of what is known about the material culture of the Comanches and Kiowas in the pre-Reservation period comes from recovered burial sites. Relative to other historic groups, more sites associated with the Comanche, Kiowa, and Kiowa-Apache have been investigated than any other set of tribes in the Southern Plains. The great majority of artifacts recovered from these sites were probably obtained primarily from the Comanchero trade, secondarily from raiding or bartering from other groups. In addition to Hispanic traders coming to the Southern Plains from the west, English, French, and American trade goods are known to have reached the Comanche and Kiowa. French goods were obtainable via the Wichita who were allied with the Comanche (Word and Fox 1975). Table I-5 presents many of the reported sites which are thought to relate to Comanche, Kiowa, or Kiowa-Apache activities.

It should be noted that certain of these burial sites were removed by individuals lacking in archeological field training. Some of the burial remains were treated in a manner lacking the dignity which human remains deserve. We are indebted to the efforts of individuals who were able to salvage what they could and report upon these most significant sites. In particular, the Cogdell burial, Longhollow burial, W.H. Watson site, and the Valley of Tears burial were virtually destroyed prior to being examined by more responsible and knowledgeable persons. The relatively young age of these burials is such that tribal interests in the exhumed individuals should be taken into consideration before any additional graves are excavated.

The greatest potential for study of the archeological remains of the Comanche and Kiowa is believed to be in the survey and testing of habitation sites and in the more comprehensive analysis of the artifacts from sites like those listed in Table I-5. Efforts to locate historic habitation sites in the range of these tribes would be assisted by examination of records from area institutions. Sites listed as tipi ring sites, and sites which have yielded artifacts such as those listed in Table I-6 hold the highest probability of being Comanche, Kiowa, or Kiowa-Apache campsites. Table I-6 is a listing of the artifacts recovered from the sites listed in Table I-5. Jack Hughes in his extensive fieldwork done over the last forty years in the Texas Panhandle is known to have recorded observations of historic materials and tipi ring sites in his field notes which are deposited at the Panhandle-Plains Historical Museum in Canyon, Texas.

It is believed that a sufficient number of historic Comanche, Kiowa, and Kiowa-Apache burial sites have been excavated to provide us with a wealth of archeological information on these three historic tribes. While reports such as Word and Fox (1975) treat the descriptions and implications of the recovered artifacts very thoroughly, most reports do not fully explore what can be learned about the artifacts associated with these deceased individuals, or the systems of which they were a part.

The borrowing of techniques from related historical approaches would certainly help archeologists establish a more extensive framework for analysis of the recovered artifacts. If one compares the artifacts with historic photographs, sketches, paintings, and written descriptions of the same time period much

Table I-5
Selected Comanche, Kiowa, and Kiowa-Apache Sites in the Southern Plains region

| Site Name | Author (Date) | Site Type |
|---|---|---|
| Bridwell | Parker (1982) | Historic Component |
| Cogdell Burial | Word and Fox (1975) | Comanche Burial, Male |
| Yellowhouse Canyon | Newcomb (1955) | Comanche Burial, Male |
| A1652 (PPHM) | Hughes (1978) | Comanche Burial, Female |
| Longhollow Burial | Taylor (1975) | Comanche Burial, Sex Unkown |
| A186 (PPHM) | Hughes (1955) | Comanche Burial, Child |
| Biddy Burial (TTU) | in Word and Fox (1975) | |
| W.H. Watson Site | Ray and Jelks (1964) | Comanche Burial, Female |
| White Site | Suhm (1961) | Comanche, Kiowa, or Kiowa-Apache Burial, Child |
| McKaskle Burial | Kelley in Word and Fox(1975) | Comanche Burial, Male |
| Poafpybitty Site | McWilliams and Jones (1976) | Kiowa Burials, 1 Female, 1 Child |
| Morgan Jones Site | Parsons (1967) | Comanche Burial, Female |
| ? | Kelley 1964 at (TTU)** | Hist. Indian Burial, Female |
| Caprock Burial | Conner,Allison, and Runkles (ms) | Comanche Burial, Female |
| Dawson Co. Burial | Bennett (1968) | Adult Burial, Sex Unknown |
| ? | Hester (1968) | Historic Indian Burial |
| Rabbit Hill Site, 34 Cm-136 | Pearson (1978) | Kiowa-Apache, Male |
| Sand Pit Site | Hughes (1978) | Comanche Occupation Camp. |
| Valley of Tears | Parker (n.d.) | Comanche Burial, Child |
| Dean Ranch Site (TTU) | in Word and Fox (1975) | Hist. Indian Burial, Female |
| Jared, 34 Cm-221 | Jackson (1972) | |
| Pecos Co. Cache | Eagleton (11955) | Historic Indian Cache |
| Merrell Burial | in Word and Fox (1975) | |
| Collinsworth Co. Burial (PPHM) | in Word and Fox (1975) | |
| Child Burial(PPHM) | in Word and Fox (1975) | |
| Sandman, 34 Wd-47 | Okla. Site Files | Hist. Indian Burial, Male |
| Little Robe 34 EI-22 | Agnew (1971/72) | Comanche Occupation Site |
| 34 Dw-3 | Okla. Site Files | Hist. Indian Cemetery |
| Rainy Mtn, 34 Ki-16 | Okla. Site Files | Kiowa and Kiowa-Apache |
| Ration Dist. Site 1967-85 | | |
| Soldier Springfield, 34 Ki-20 | Ok. Site Files | Comanche Camp & Battlefield Site |
| Rainy Mtn School, 34 Ki-69 | Ok. Site Files | Reservation Indian School |
| Waterfall Burial, 34 Cd-85 | Ok. Site Files | Kiowa or Comanche Burials, Adult and Child |
| 34 Cm-86 | Shaeffer (1966) | Historic Camp |
| Brass Bracelet Site, 34 CM-135 | OK. Site Files | Hist. Indian Burial |
| Rabbit Hill I, 34 Cm-134 | Ok. Site Files | Hist. Indian Burial |
| Cross Mtn Site, 34 Cm-137 | Ok. Site Files | Hist. Indian Burial |
| Medicine Falls, 34 Cm-165 | Ok. Site Files | Historic Artifacts, Possible Potted Burial |
| Medicine Park, 34 Cm-169 | Ok. Site Files | Possible Looted Burial |
| Quanah Parker Lake Shltr Site, 34 Cm-175 | Ok. Site Files | Crevice Burial, Kiowa or Comanche |
| Cutthroat Gap Site, 34 Cm-218 | Ok. Site Files | Kiowa Camp and Massacre Site |

PPHM = Panhandle-Plains Historical Museum, TTU = Texas Tech University

can be learned. The "direct historical approach" (Wedel 1936) is very applicable in the region. Comparative ethnological museum collections also provide complete specimens of what is usually fragmentary in an archeological context. Furthermore, many of the artifact types in use at the time of interment are still being manufactured and used by tribal members. Items such as beads, metal cones, bone hairpipe, and conchos are important elements in contemporary Native American ceremonial life (Table I-7). Tribal members, especially elders, are often familiar with history, style, form, and function of many items. A taxonomic classification system developed from terms already in use by Native Americans, students of material culture, and museum professionals for these trade goods is thought to be comprehensive enough to use in the analysis of materials recovered Archeologically. Table I-7 is drawn from Table I-6 and presents the artifacts which have not fallen into disuse by Comanche, Kiowa, and Kiowa-Apache people as well as resources for additional study and classification of these artifact types.

What is currently known and has been published concerning

Table I-6
Artifacts reported from selected historic Native American sites in the Southern Plains region.

Parker (1982): Glass trade beads, Civil War military buttons, 1859 Canadian one-cent piece.

Word and Fox (1975): Cotton shirt, beaded moccasins, necklace beads, beaded leggings, beaded strips, shell hairpipe, saddlery, eye hoe, buckles, bit salivator, cordage, travois poles, travois brace, brass bracelets, hair ornaments, finger ring, conchos, mirror, silver buckle tongue, elk tooth pendants, abalone shell discs, blankets, bison robe, leather, wood, glass lens, lead ball, brass ram pipe, brass chain.

Newcomb (1955): .44 cap and ball revolver, metal cap container with leather holder on a belt, officer's buckle, butcher knife and scabbard, leather saddle bag, cinnabar (red pigment), glass beads and metal cones, bone hairpipe, breastplate, cloth shirt, copper pectoral ornament, ornamented bridle, iron bit, two-quart Army issue kettle, copper bells, sheet copper discs, copper finger ring, copper buttons, antler flaking tool.

Hughes (1978a, PPHM field notes): Copper bracelets, flannel blanket, iron artifacts.

Taylor (1975): Bridle ornaments, water keg, copper bucket, bridle bit, bottles?, saddle, leather pouch, 2 revolvers, rifle.

Hughes (1955a, PPHM field notes): Silver trade gorget, iron bracelets

Biddy Burial (TTU): Conchos, brass and copper bracelets, Spanish roller bit, files and hammer, beads, Mexican pesos.

Ray and Jelks (1964): Necklace beads, seed beads, hawk bells, brass button, wire and strap finger rings, brass wire bracelets, mirror, iron axe, woolen textile fragments, saddle fragments.

Suhm (1961): Hawk bells, copper finger ring, glass buttons, copper and brass buttons, embossed copper seal (Rep of Texas?), copper brass jingles (shoe buttons), copper bangles or tinklers (copper cones), shell hairpipe, seed beads, beaded clothing fragments, 4 scabbards (1 awl case?), brass wire bracelets, stamped sheet bracelets; copper, brass, and German silver conchos, concho belt, textile fragments, leather strike-a-light pouch containing red pigment (vermilion), one knife, animal skin fragments, cordage fragments, brass bugle, bit, saddle fragments, saddlery rings and buckles, bridle ornaments, chipped stone points and chipped stone scraper.

Kelley (1964) (TTU): Iron bracelets, incised bone tube, two bison bone fleshers, glass beads, iron pipe, metal tablespoon, metal knife.

Kelley (1964): Buffalo robe, deer skin, Navaho blanket, blue cloth with white beads, bear claw necklace, metal rings, iron bracelets, silver concho, buckle, wooden bow, flint knives, elbow pipe, bone whistle, saddle, wooden bowl.

McWilliams and Jones (1976): Brass and German silver stamped sheet bracelets, brass wire bracelets, chain bracelet, hairpipe bracelet, German silver armbands, axe head, square nail, cancellous bone paint brushes, brass tack belt, 2 concho belts, spherical brass beads (shoe buttons), 1872 military helmet, shell hairpipe breastplate, U.S. Grant peace medal, parasol, mirrors, metal projectile points, 2 pocketknives, 7 metal tablespoons, metal pitcher, metal cup, pencil leads, sewing kit, sheet metal finger rings, seed beads, glass buttons, hard rubber button, iron buttons, glass bottle, hair plates (metal conchos), saddle, 2 snaffle bits, German silver ornamented headstall.

Parsons (1967): Whelk shell artifact, elk tooth pendants, brass buckle, cinch buckle, iron axe head, seed beads.

Conner, Allison, and Runkles (ms), Caprock burial, see Word and Fox (1975:46): Horse gear, bracelets, glass beads, finger rings, conchos, leather garments, tinklers (cones), wrapped body, shell pendants, mirror.

Bennett (1968): Spanish bit, brass kettle, brass bracelet, grubbing hoe, bone handled iron knife, sharpening stone, strike-a-light steel, striking flints.

Hughes (1978b): Hearths (historic), chipped stone tools, sherds, large glass bead, seed beads, olivella shell bead, modified bone, metal knife fragment, metal flesher, metal tinklers (cones).

Parker (n.d): Preliminary listing includes silver and copper conchos, brass bracelets, silver plated copper pendants, silver conchos on leather, silver buckle, brass buckle, silver headstall, horse gear, copper pectoral ornaments, 2 leather pouches—1 is beaded (strike-a-light bags), glass trade beads, finger rings, bone hairpipe breast plates, multiple saddles, pony beads, seed beads, Spanish bit with salivators, adze, horse bits with reins, wooden pack saddle with brass tacks, Spanish stirrups (tapedores), whiskey bottle, barrel keg, cloth fragments including saddle blanket, 3 shirts, red cloth, gloves?, levi denim, round mirrors, brass hair ornaments, tools or awls possibly with leather pouches, bear claws, saddle bags.

Dean Ranch Site (TTU), see Word and Fox (1975:46): Horse gear, bracelets, glass beads, European tools, Indian artifacts,, metal knives, barrel keg.

Pearson (1978): Seed beads, necklace beads, brass wire bracelets, German silver hairplate (concho), German silver button, chain earrings, leather fragments, shell hairpipes.

Jackson (1972): Rubber coated cloth tarpaulin or poncho, brass wire bracelets, skin bag, saddle fragments, iron strap fragments, galvanized pail.

Eagleton (1955): Fire-drill stick, leather straps, complete iron axe, unbleached white cotton cloth, calico paint bags, leather paint bags: aquamarine, cinnamon, red, and yellow pigments, calico dress sleeve, bison skin bags, antelope skin bags, bison cannon bone flesher, deerskin rope, bison hide fragments, grass shears, hide pouch containing gunpowder, lead, pouch containing stone and shell ornaments.

Table I-7
Artifact types in continued use by Southern Plains natives.

| ARTIFACT TYPE | USAGE | REFERENCES |
|---|---|---|
| Glass Beads | necklaces, embroidery, ornamentation | Harris and Harris (1967), Hail (1980), Conn (1986), Lyford (1940), Orchard (1929), Woodward (1970) |
| Clothing | Moccasins, dresses, shirts, leggings, breechcloths | Schneider (1968), Conn (1955) |
| Metal Jewelry | Conchos belts, hairplates, bracelets, pins, earrings, finger rings, armbands, slides | Feder (1962a,b), Woodward (1970) |
| Hairpipe (bone) | Breastplates, chokers, necklaces, bangles | Ewers (1957) |
| Blankets | Wraps, seating markers, gifts, ceremonial dress | Koch (1977) |
| Metal Cones and Metal Ornaments | Trim on moccasins, dresses, bags and pouches | Koch (1977), Olsen (1963) |
| Pigments | Paint for face, clothing, ceremonial and dress items | Ewers (1939) |
| Bells | Decoration of items, part of male dance attire | Koch (1977) |
| Elk Teeth Pendants | Trim on dresses, cradle | Koch (1977), Wood (1957) |
| Metal Tools and Weapons | Specific dance and ceremonial accoutrements | Simmons and Turley (1980), Woodward (1970) |
| Peace Medals | Necklaces and pendants | Failor and Hayden (1974), Jester (1961), Woodward (1970) |

glass beads is a good example of how archeologists can apply research done by ethnological studies to the analysis of recovered historic materials. At the time of the report by Harris and Harris (1967), we were just beginning to understand about bead typology and history. Data on beads from this time period was almost purely a morphological description of beads. However recent studies of Plains Indian Art (cf. Hail 1980; Conn 1986) trace the introduction, developments, and usage of beads by various tribes. Hail (1980:27-37) presents information on regional and tribal variation of Plains artifacts, presents a discussion of the problems associated with the study of Plains goods, and tells where to look in the literature for assistance. Conn (1986) discusses changes occurring in Plains art from the nineteenth century into recent times and likewise discusses factors which affected what trade goods the Native Americans acquired. By using related historic material culture studies such as these it is believed that we can appreciably increase our knowledge concerning artifacts associated with Comanche, Kiowa, and Kiowa-Apache sites. Schneider (1980) provides a summary of Plains Indian art studies, and has discussed Kiowa family art traditions (Schneider 1982).

## MUSKOGEAN FAMILY

### Choctaws

The majority of Choctaw lands extended into the Great Plains Study Area from the years 1820-1855 and were sparsely settled by members of this tribe (see Figure I-2). For a summary of Choctaw activity in Oklahoma consult Sabo et al. (1988). Any Choctaw sites occurring in the Southern Great Plains would probably appear very similar to other native and even non-native settlements of the same time. Additional references which will be useful in the analysis of Choctaw archeological remains include Penman (1976,1977,1983), Schmitt and Bell (1954), Lewis (1943), Edwards (1932), Collins (1975), and Parmalee (1980).

### Chickasaw, Creek, and Seminole

References for the Chickasaws include Bell and Baerris (1951), Carney (1961, 1962), Cotterill (1954), Cushman (1972), Foreman (1934), Gibson (1971a,b), Kassell (1949), Swanton (1927), Young (1971).

Among the most useful references to the Creek are C. Bareis (1951), Cotterill (1954), Debo (1940, 1941), Foreman (1934), Gibson (1961), Graebner (1945),Hewitt (1939), Hodges (1965), Quimby and Spoehr (1950), Schmitt (1950), Schmitt and Bell (1954), Swanton (1970), Watson (1950).

Seminole references include Cotterill (1954), Foreman (1934), Freeman, E. (1964), Graebner (1945), MacCauley (1884), Mayberry (1963), McReynolds (1957), Pollitzer (1970), Shoemaker (1960), Spoehr (1941a, 1941b).

## SAHAPTIAN LINGUISTIC FAMILY

### Nez Perce

In 1879, members of the Nez Perce Tribe under Chief Joseph were brought to Indian Territory as prisoners of war. They were settled on lands purchased from the Cherokees which had also been occupied by the Pawnees, Ponca, Otoes and Missourias in present Kay County, Oklahoma (Nieberding 1966:22). By an Act of Congress they were allowed to return to the Colville Reservation in Washington in 1885. The Nez Perce tract was then assigned to the remnants of the Tonkawa tribe that had been living near Fort Griffin, Texas. Because of their brief stay in Oklahoma they are not counted as an Oklahoma tribe. Potential for archeological remains during this brief occupation are unknown and may be indistinguishable from the later Tonkawa, or Anglo-American settlements and homesteads. References for Nez Perce activity in Oklahoma are Wright (1951), and Nieberding (1966).

## SIOUAN FAMILY

### Iowa and Otoe-Missouria

The Iowa were given reservation lands west of the Sac and Fox Reserve in 1883 (Figure 4). These lands were broken up and allotted to the individual tribal members in 1890, with the "surplus" opened to white settlement by a land run in 1891. Among the references for the Iowa people are Blaine (1979), Irvin (1953), Meyer (1962), and Skinner (1926).

The Oto (Otoe) and Missouria tribes speak the same dialect of Siouan and have been classed as one tribe since their settlement in Indian Territory in 1881 after the selling of their reservation lands in eastern Nebraska (Wright 1951). Publications relating to the Otoes and Missourias include B. Chapman (1948,1965), Berry (1936), Chapman and Chapman (1964), M. Wedel (1967), Briggs (1969), and Whitman (1937).

### Kaw, Osage, Ponca, and Quapaw

These four tribes along with the Omaha, who in Historic times never occupied any of the area in the Southern Plains region, compose what is known as the Dhegiha group of the Siouan language family. While the Kaw and the Ponca were removed to Indian Territory in the 1870s, the Osage occupied much of their reservation lands indigenously. The Quapaw ceded large portions of the state of Oklahoma to the United States in 1818 (Morris et al. 1976) although their principal range was in Arkansas (see Figure I-1) until they were established on reservation lands in Ottawa County, Oklahoma in the early 1850s. Of all the Siouan speakers on the Southern Plains it is believed that Kaw sites in Kansas (pre-Reservation era) and Osage sites in Kansas, Oklahoma, and Arkansas (Reservation and pre-Reservation era) hold the greatest potential for archeological research.

The Kaw (Kansa) were given reservation land in present Kay, County Oklahoma in 1873 from the state of Kansas. Published references for the Kaw include Anonymous (1907), Finney (1957), Howard (1955, 1956), Morehouse (1908), Spencer (1908), Unrau (1971), Wedel (1946, 1959), Wilmeth (1960).

The Osage are discussed in Sabo et al. (1988), Baird (1964, 1965, 1980), Matthews (1961), Din (1983), Berry, Chapman, and Mack (1944), Bushnell (1927), Chapman (1938, 1959, 1960, 1965, 1982), and McDermott (1940).

The Ponca were removed to the Quapaw Agency, Indian Territory in 1877 from Nebraska. They were given a reservation of their own in 1878 (Howard 1965:35). Ponca history and archeology has been studied through the works of Fletcher and La Flesche (1906), Howard (1965), and Wood (1959, 1965).

The Quapaw are discussed in Sabo et al. (1988), Baird (1980), Fletcher and La Flesche (1906), and Thompson (1955).

## TONKAWAN FAMILY

### Tonkawa

The Tonkawa in Historic times lived in central Texas, on the fringes of the bison range. They can be considered as one of the southernmost tribes who utilized bison as their primary food resource. The Tonkawa throughout Historic times were always recorded as a small tribe, never numbering more than 1500 at the highest estimate (Wright 1951). Prehistorically, a similar area is thought to have been occupied by ancestors to the Tonkawa, and may be represented by manifestations of the Toyah focus of the Central Texas aspect (Jones 1969:65; Newcomb 1961:134-35). A more recent view is that the Tonkawa were originally from western Oklahoma.

Tonkawa activity within the Southern Plains region consists of several removals of the tribe and numerous uses of Tonkawa scouts in the campaigns against the Comanche, Kiowa and associated tribes. In 1855 the Tonkawa were settled on a 35,424 acre reserve in present Young county, Texas. They shared this reservation with the Caddo, Anadarko, Ioni (Hasinai), and other small Texas tribes until 1859 when they were removed from Texas to a reservation near Fort Cobb in the Leased District. This removal was necessitated to prevent the massacre of the tribes by mobs of outraged Texans who objected to their presence in the state (Estep 1960). The Tonkawa allied themselves with the Confederacy and were accused of murders in the area. In 1862, they were attacked by a force of Caddos, Delawares, Kickapoos, Shawnees, Comanches, and, Kiowas. The massacre took place just south of present Anadarko, Oklahoma and 137 of the 306 Tonkawas were killed (Jones 1969:71). The survivors went first to Fort Arbuckle, then back to Texas and Fort Griffin. In 1885 the Tonkawa were granted the reservation in present Kay County, Oklahoma (Wright 1951). The Tonkawa lands were opened to allotment in 1891 (Figure I-5). Most of the Tonkawas presently reside in Kay County.

Once the Tonkawa were settled on the reservations they took up farming, but continued to supplement it with hunting. Their historic material culture was very similar to other Southern Plains tribes. A large volume of Anglo-American goods are thought to have been incorporated into their lifestyles and should reflect what was being used by local whites of the same time period. Two main house types are thought to have been used by the Tonkawa, the tipi and the brush shelter which varied from conical to flat on top. Jones (1969:67-68,71,Figure 18) reports the use of conical branch covered huts and shows a 1901 photograph of a flat-topped shelter made of forked poles, planks and branches. Wright (1951:249) reports the use of tipis by the Tonkawa and Newcomb (1961:140) mentions the use of both hide tipis and various brush and pole shelters. It is believed that at least some Tonkawas used cabins or frame houses during the Reservation and Allotment periods (W. Jones 1969:71,Figure 19).

No previous archeological work directed at Tonkawa remains has been reported. The area of greatest potential for historic Tonkawa sites should be on their former reserve lands in Young County, Texas, their lands in southwest Oklahoma near Fort Cobb, and the Tonkawa area in Kay County, Oklahoma. References for the Tonkawa include: Wright (1951), Newcomb (1961), W. Jones (1969), Estep (1960), Neighbors (1973), and Hasskarl (1962).

### Yuchian Family

Yuchi: See Creek under Muskogean Family. Also see Foreman (1959, 1960), Swanton (1970), Speck (1909), Neill (1955), and Bauxar (1957).

# Bioarcheology Inventory Code Sheets

INVENTORY

| | Site | Feature | Burial No. | Card No. | State | County |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| Columns | 1-3 | 5-6 | 7-11 | 12-13 | 14-15 | 16-17 |

| CRANIAL BONES | Left | Right | Single | Column(s) |
|---|---|---|---|---|
| Frontal | | | _____ | 18 |
| Parietal | _____ | _____ | | 19-20 |
| Occipital | | | _____ | 21 |
| Temporal | _____ | _____ | | 22-23 |
| Zygomatic | _____ | _____ | | 24-25 |
| Maxilla | _____ | _____ | | 26-27 |
| Palatine | _____ | _____ | | 28-29 |
| Mandible | | | _____ | 30 |
| Hyoid | | | _____ | 31 |

| POSTCRANIAL BONES | Left | Right | Single | Column(s) |
|---|---|---|---|---|
| Sternum | | | | |
| Manubrium | | | _____ | 32 |
| Body | | | _____ | 33 |
| Xiphoid | | | _____ | 34 |
| Xiphoid | | | | |
| Scapula | _____ | _____ | | 35-36 |
| Clavicle | _____ | _____ | | 37-38 |
| Innominate | _____ | _____ | | 39-40 |
| Sacrum | | | _____ | 41 |
| Coccyx | | | _____ | 42 |
| Patella | _____ | _____ | | 43-44 |
| Foot Bones | | | | |
| Talus | _____ | _____ | | 45-46 |
| Calcaneus | _____ | _____ | | 47-48 |

LONG BONES

| | Left | Right | Column (s) |
|---|---|---|---|
| Humerus | ____ | ____ | 49-50 |
| Radius | ____ | ____ | 51-52 |
| Ulna | ____ | ____ | 53-54 |
| Femur | ____ | ____ | 55-56 |
| Tibia | ____ | ____ | 57-58 |
| Fibula | ____ | ____ | 59-60 |

| | Site | Feature | Burial No. | Card No. |
|---|---|---|---|---|
| | | | | |
| Columns | 1-3 | 5-6 | 7-11 | 12-13 |

JOINT SURFACES

| | Left | Right | Columns |
|---|---|---|---|
| Temporomandibular | ____ | ____ | 14-15 |
| Humerus (proximal) | ____ | ____ | 16-17 |
| Humerus (distal) | ____ | ____ | 18-19 |
| Radius (proximal) | ____ | ____ | 20-21 |
| Radius (distal) | ____ | ____ | 22-23 |
| Ulna (proximal) | ____ | ____ | 24-25 |
| Ulna (distal) | ____ | ____ | 26-27 |
| Innominate (acetabulum) | ____ | ____ | 28-29 |
| Innominate (sacro-iliac) | ____ | ____ | 30-31 |
| Femur (proximal) | ____ | ____ | 32-33 |
| Femur (distal) | ____ | ____ | 34-35 |
| Tibia (proximal) | ____ | ____ | 36-37 |
| Tibia (distal) | ____ | ____ | 38-39 |

SPECIAL CASES

| | Left | Right | Single | No. Complete Left | No. Complete Right | Column (s) |
|---|---|---|---|---|---|---|
| Ribs | | | | | | |
| 1st | ____ | ____ | | | | 41-42 |
| 2nd | ____ | ____ | | | | 43-44 |
| 3rd-10th | ____ | ____ | | ____ | ____ | 45-48 |
| 11th | ____ | ____ | | | | 49-50 |
| 12th | ____ | ____ | | | | 51-52 |
| Vertebrae | | | | | | |
| C1 | | | ____ | | | 53 |
| C2 | | | ____ | | | 54 |
| C3-6 | | | ____ | | ____ | 55-56 |
| C7 | | | ____ | | | 57 |
| T1-T9 | | | ____ | | ____ | 58-59 |
| T10 | | | ____ | | | 60 |
| T11 | | | ____ | | | 61 |
| T12 | | | ____ | | | 62 |
| L1-L5 | | | ____ | | | 63 |
| L1 | | | ____ | | | 64 |
| L2 | | | ____ | | | 65 |
| L3 | | | ____ | | | 66 |
| L4 | | | ____ | | | 67 |
| L5 | | | ____ | | | 68 |

COMMENTS:

CODING INSTRUCTIONS FOR INVENTORY

CRANIAL BONES

1 - complete
2 - partial
blank - missing

POSTCRANIAL BONES

1 - complete
2 - partial
blank - missing

LONG BONES

1 - complete
2 - proximal 1/3 missing only
3 - middle 1/3 missing only
4 - distal 1/3 missing only
5 - proximal 1/3 present only
6 - middle 1/3 present only
7 - distal 1/3 present only
blank - missing

JOINT SURFACES

1 - complete to 50% present
2 - missing >50% of joint surface
blank - missing all of the joint surface

SPECIAL CASES

| | |
|---|---|
| Ribs<br>3rd-10th | Under "Left", "Right", or "Single" category enter the number of bones present. |
| Vertebrae<br>C3-C6<br>T1-T9<br>L1-L5 | Where applicable, under "No. Complete" category enter the number of bones scored as complete.<br>Blank - missing |

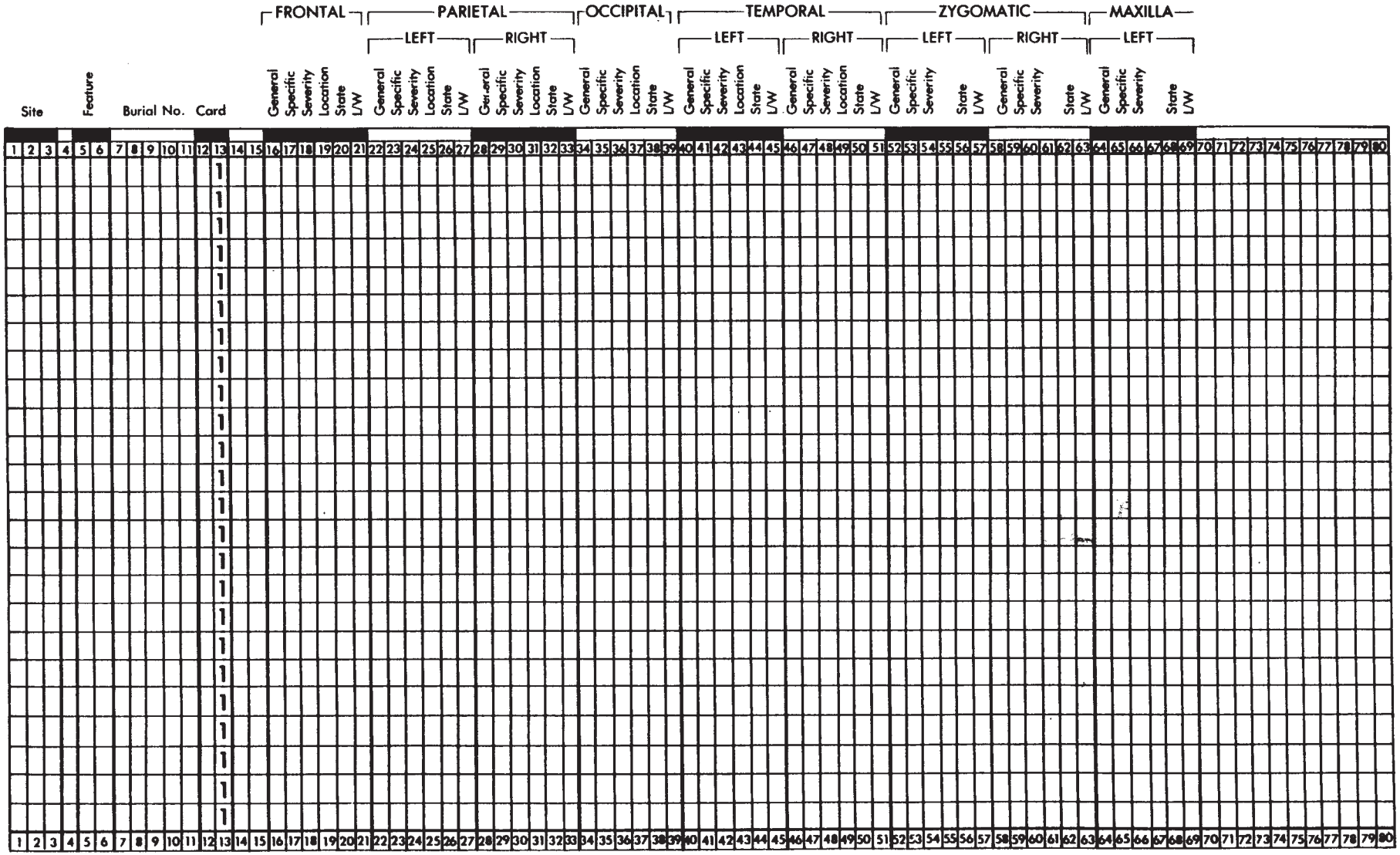
Otherwise:
1 - complete
2 - partial
blank - missing

## Appendix III

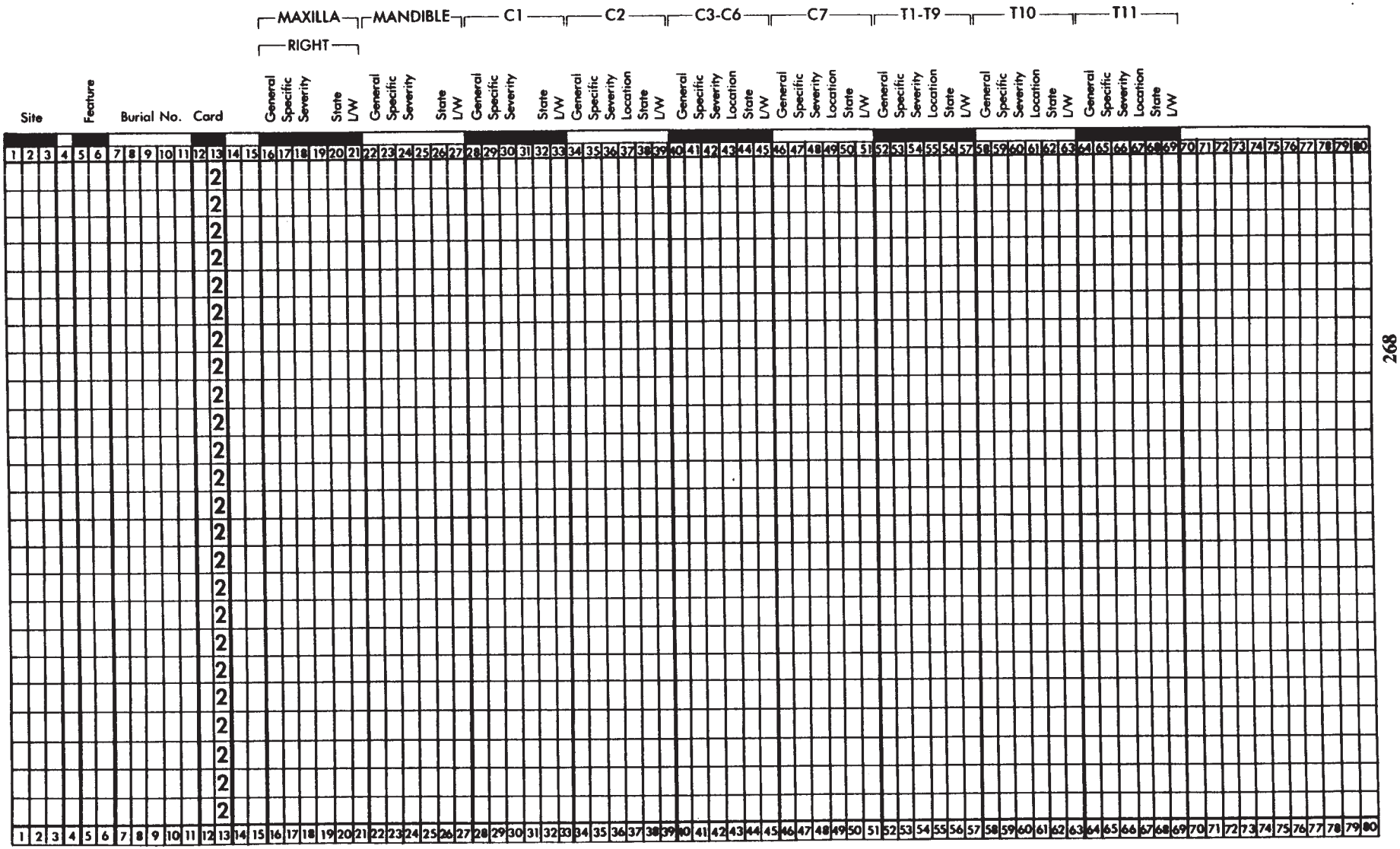
## Computer Data Sheets for Pathological Features

# BONE LESIONS: GENERAL (1)

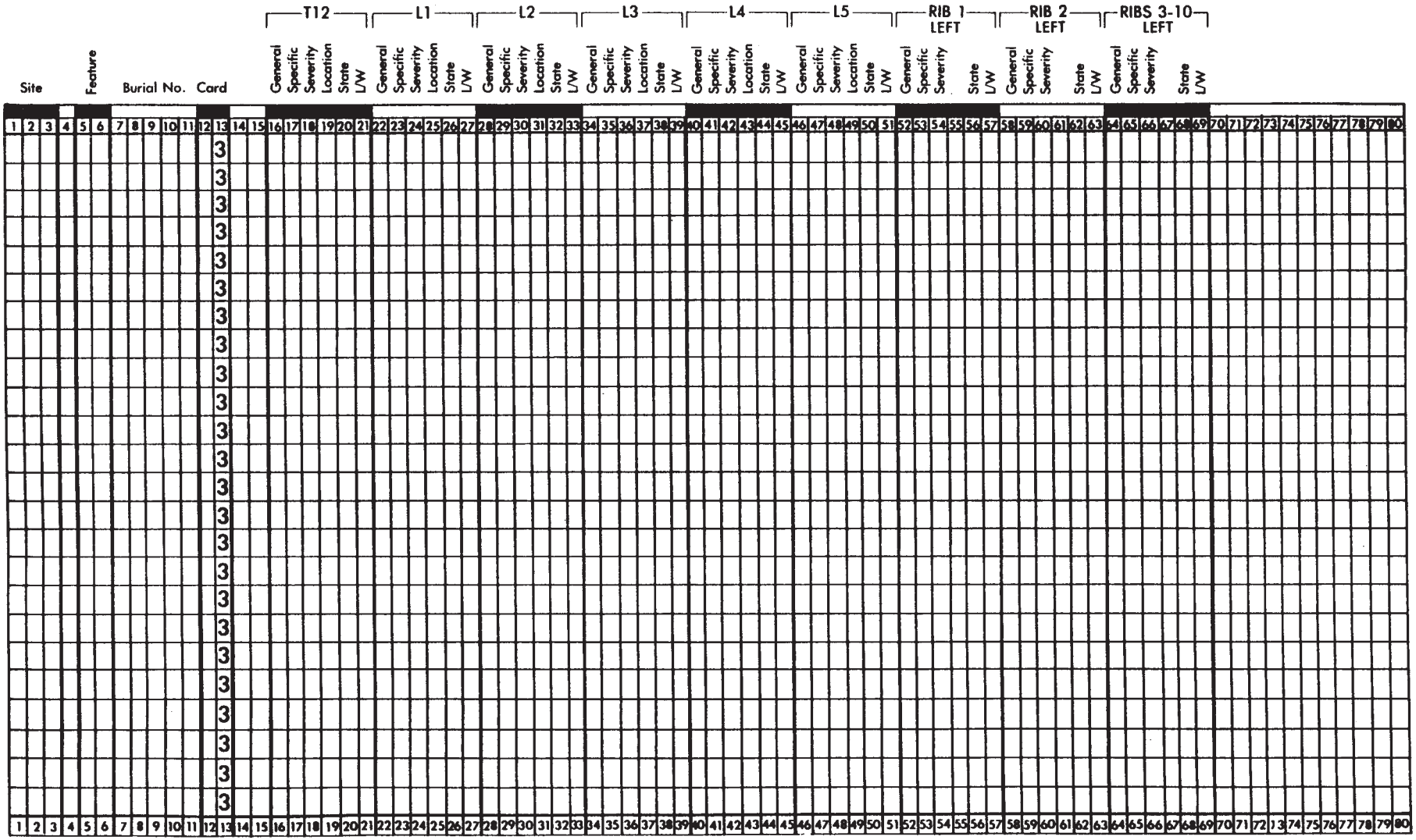
D. W. Owsley/B. Bradtmiller



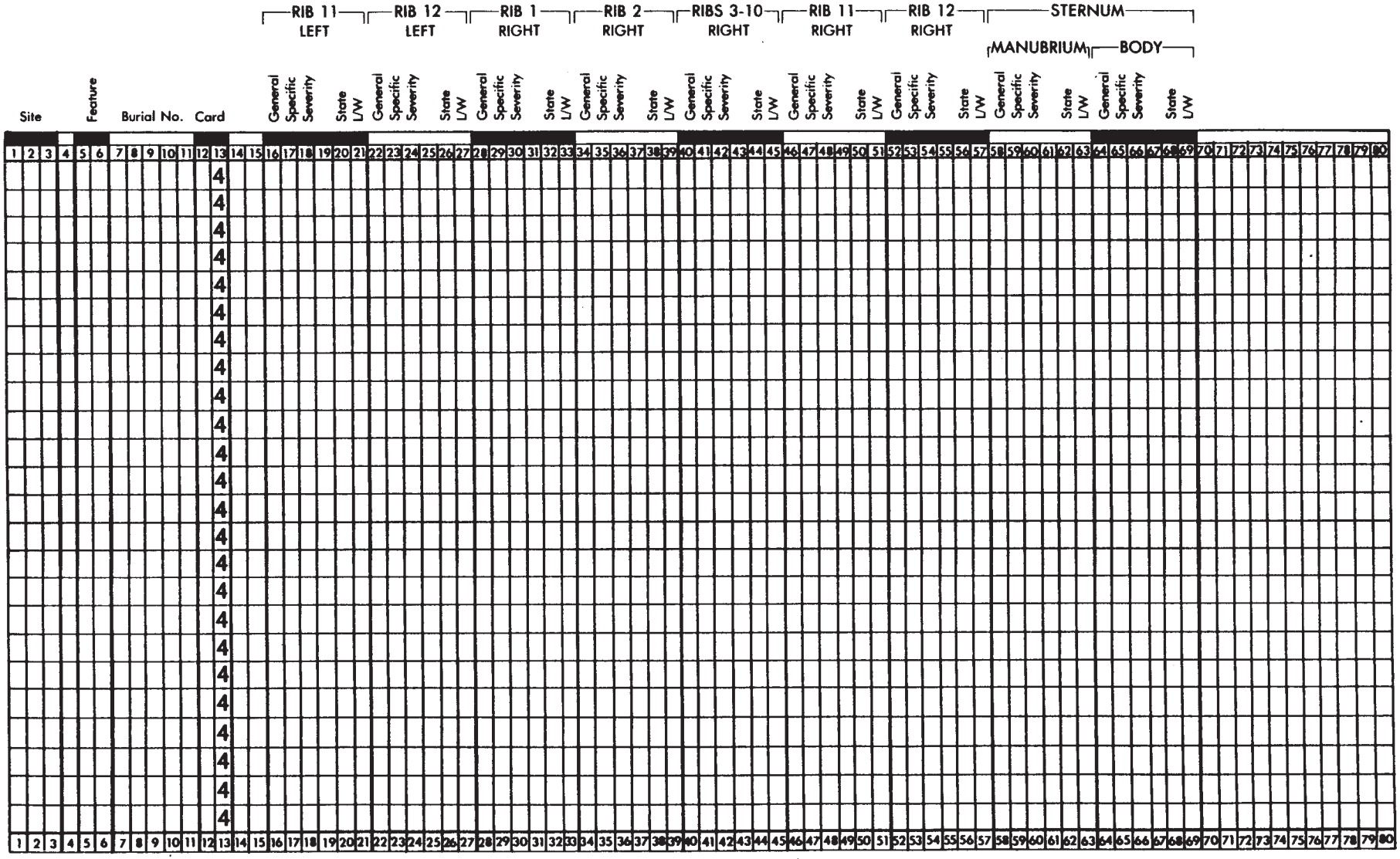
# BONE LESIONS: GENERAL (2)



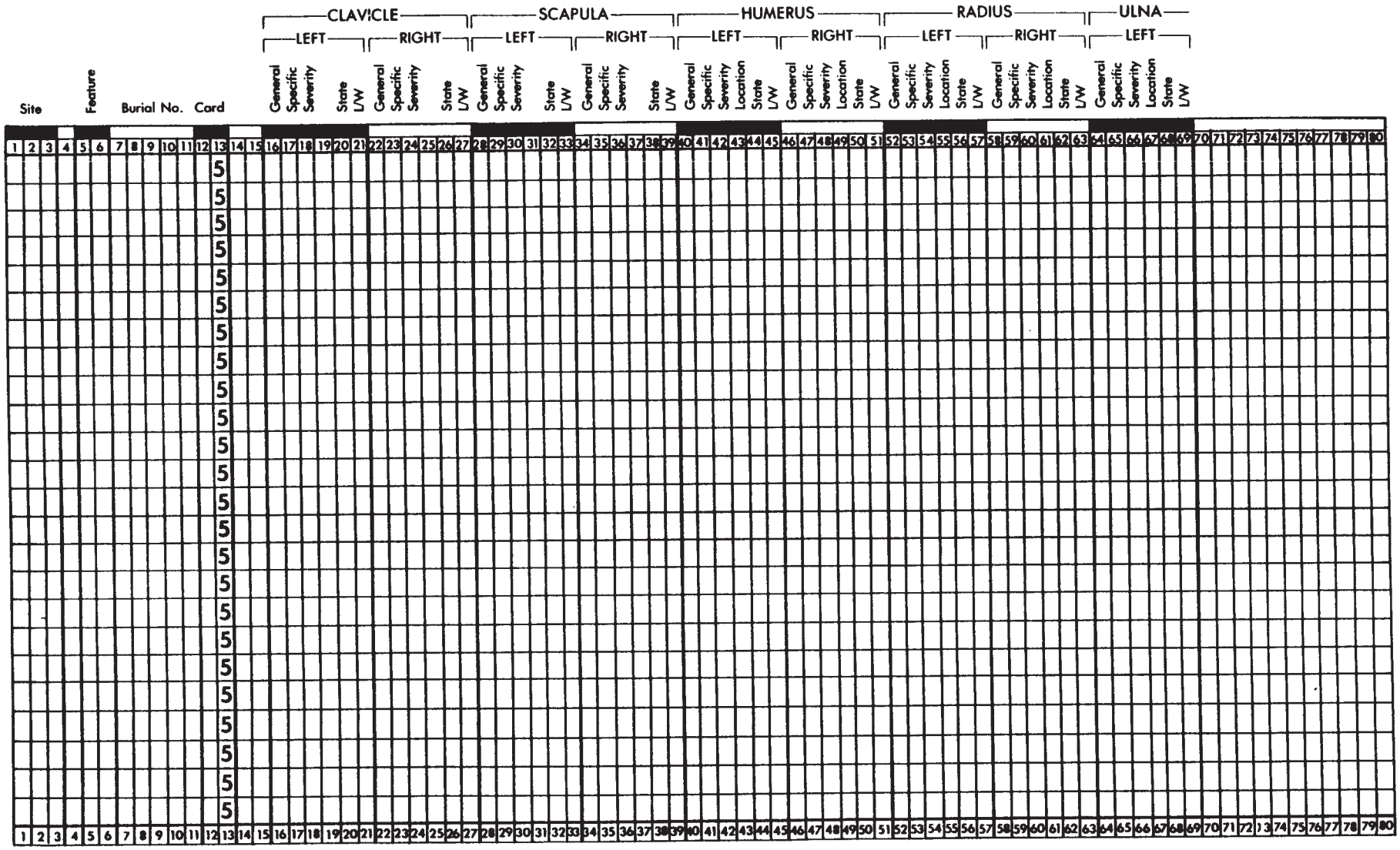
# BONE LESIONS: GENERAL (3)



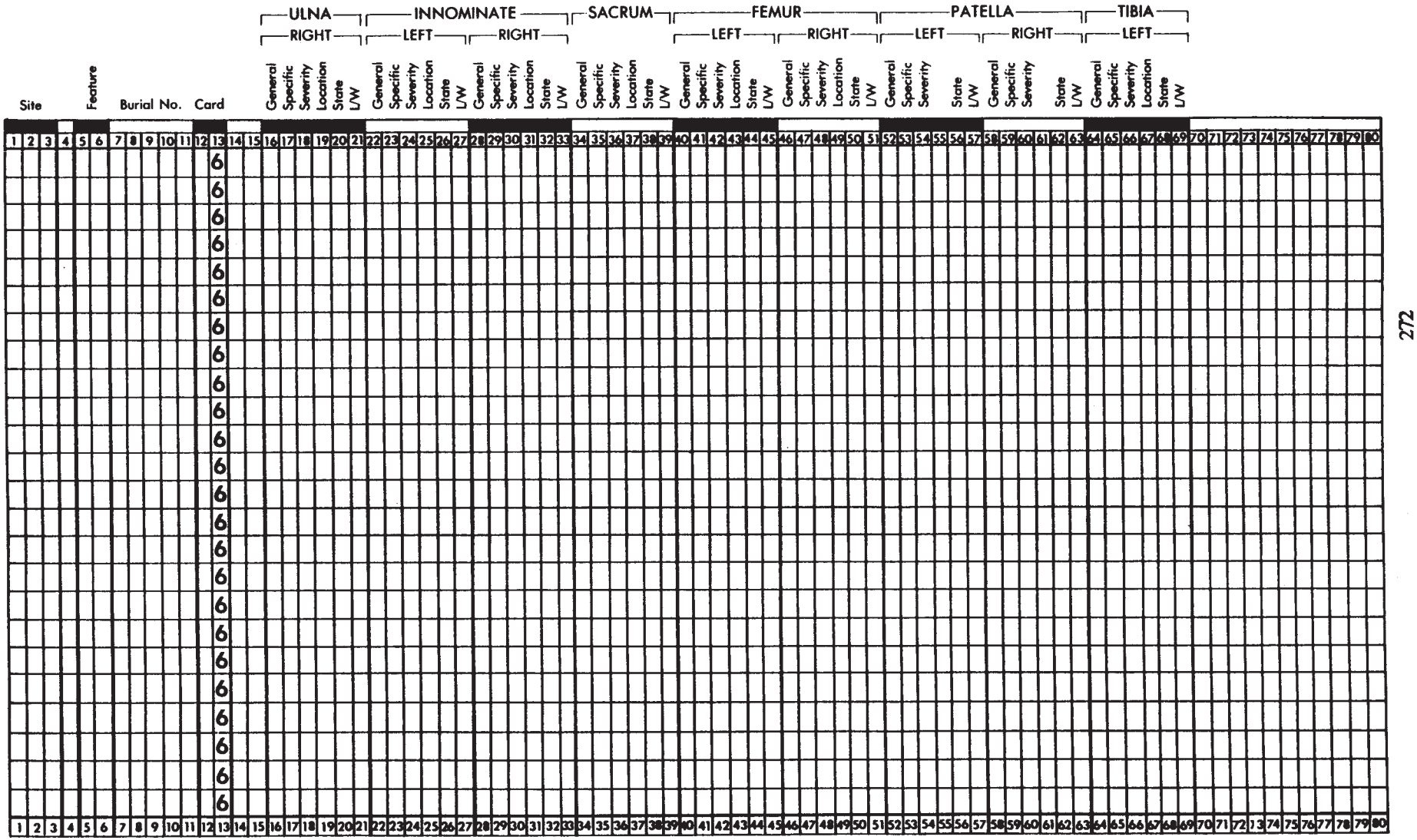
# BONE LESIONS: GENERAL (4)



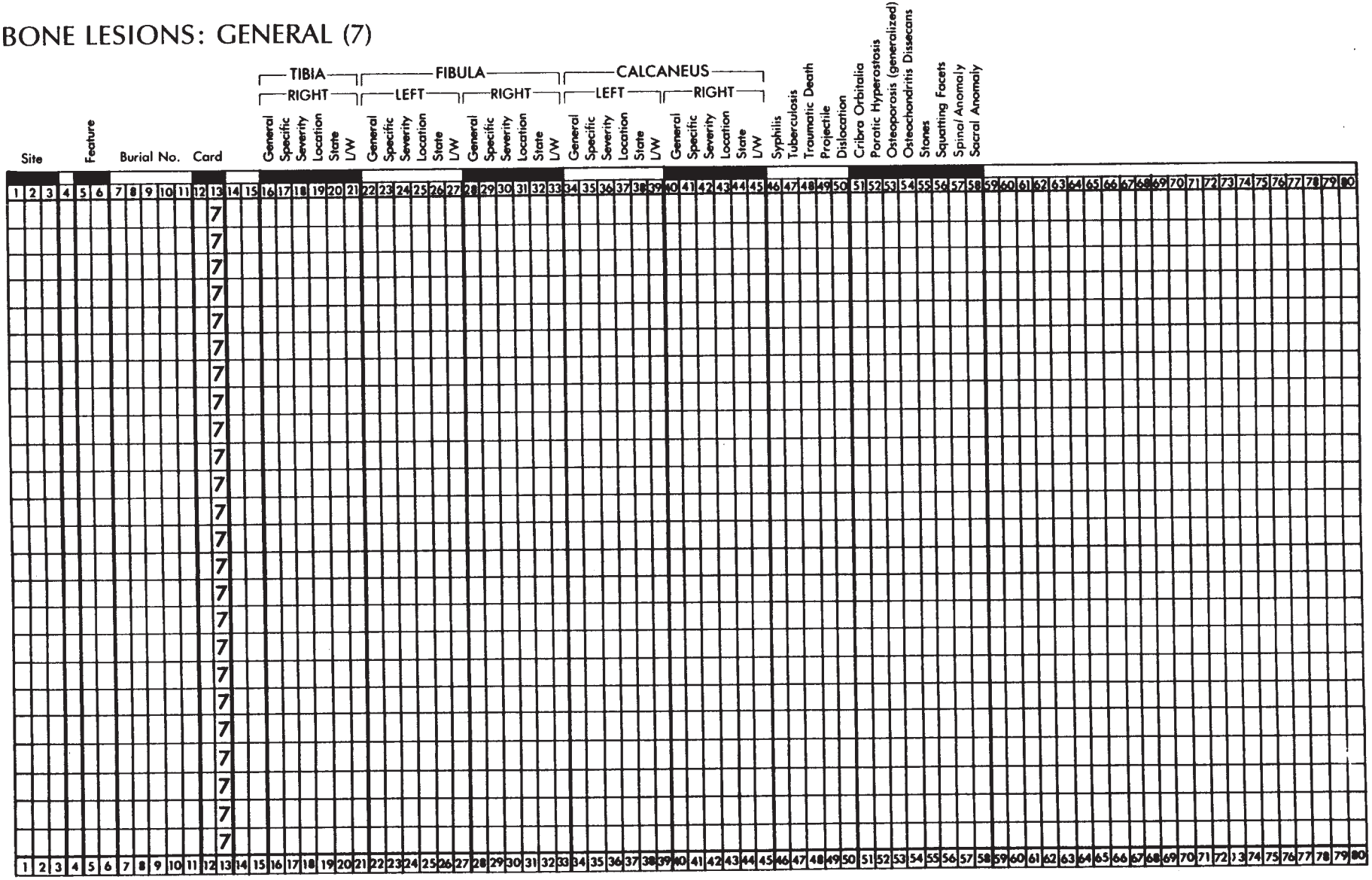
# BONE LESIONS: GENERAL (5)



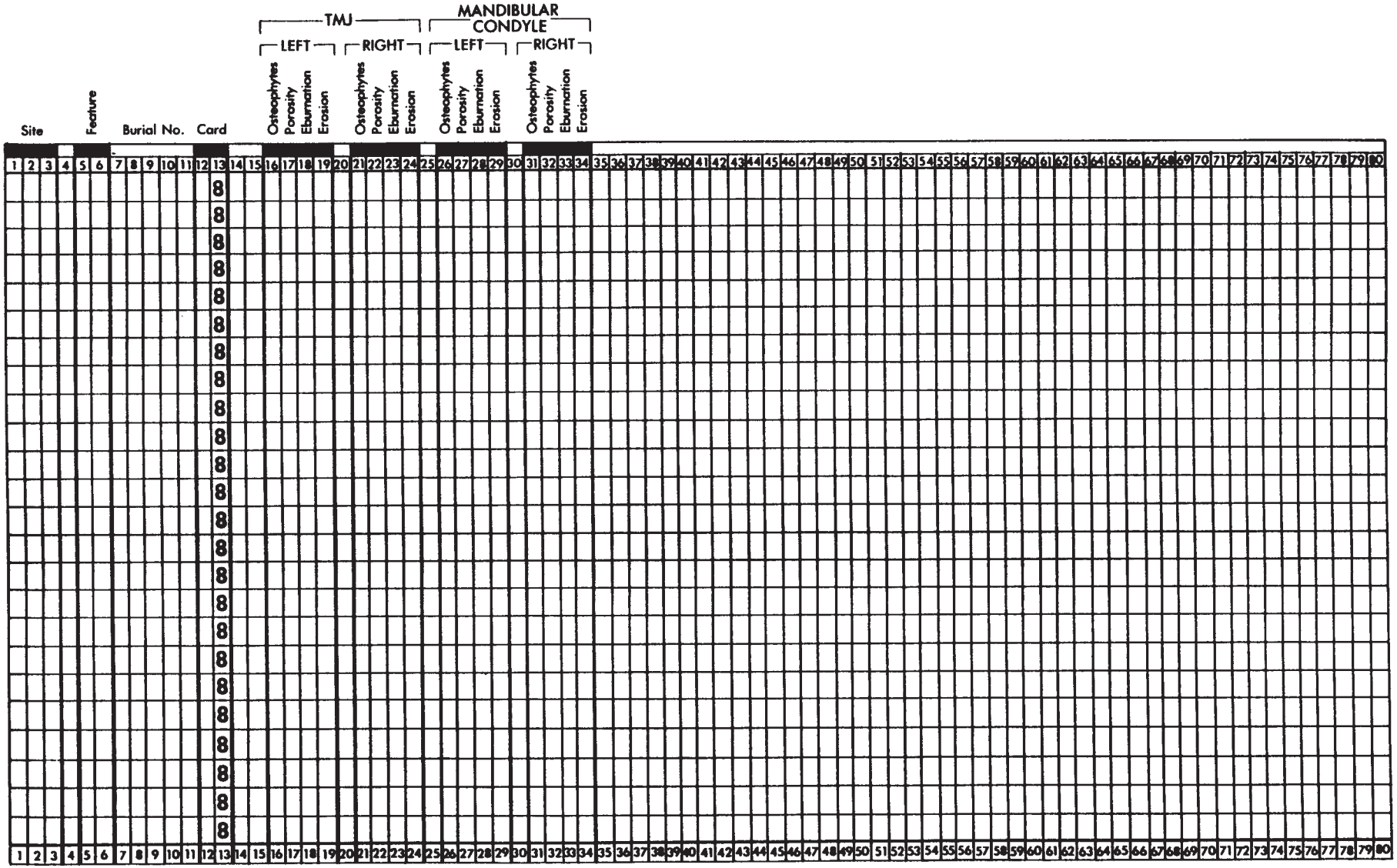
# BONE LESIONS: GENERAL (6)



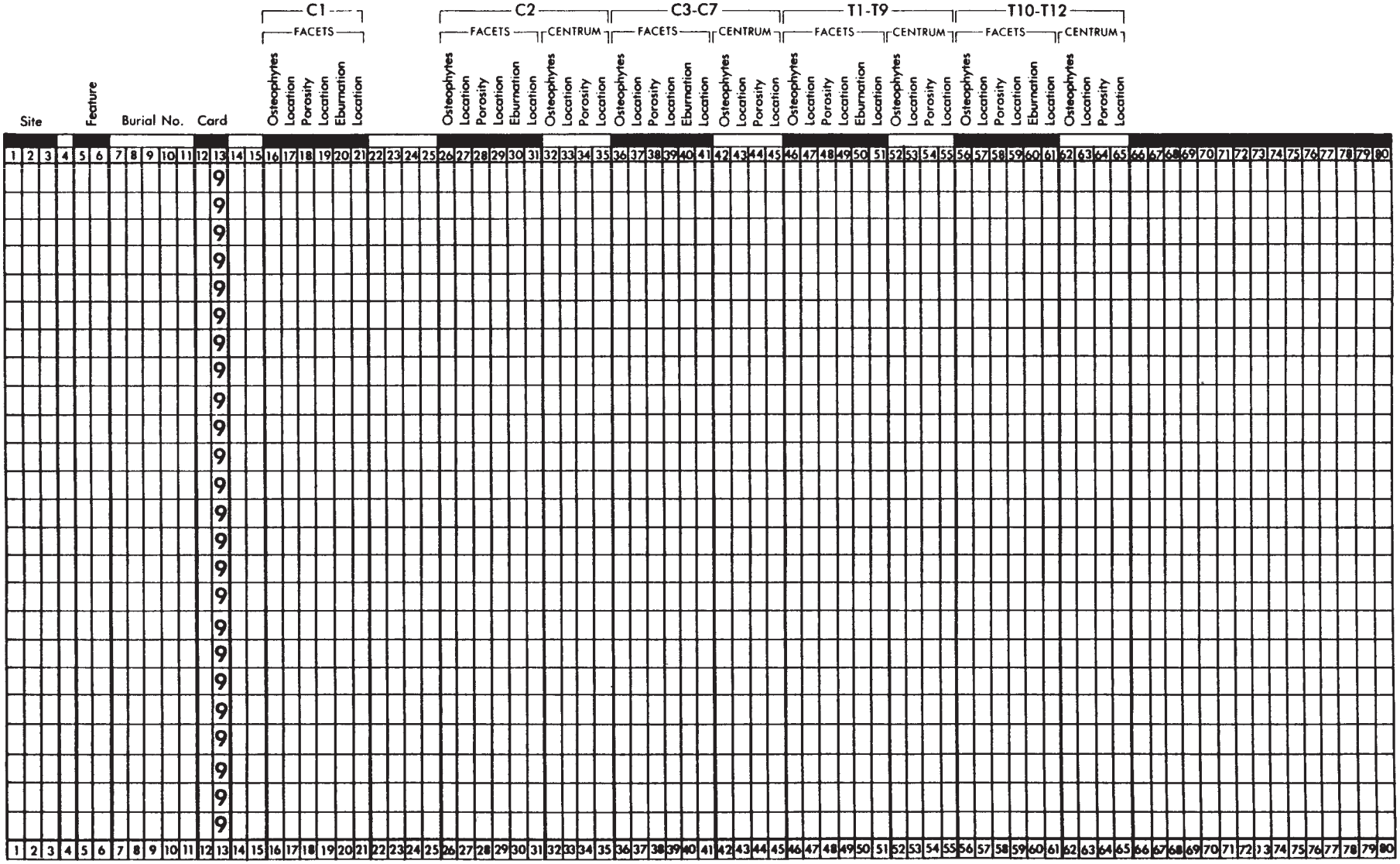
# BONE LESIONS: GENERAL (7)



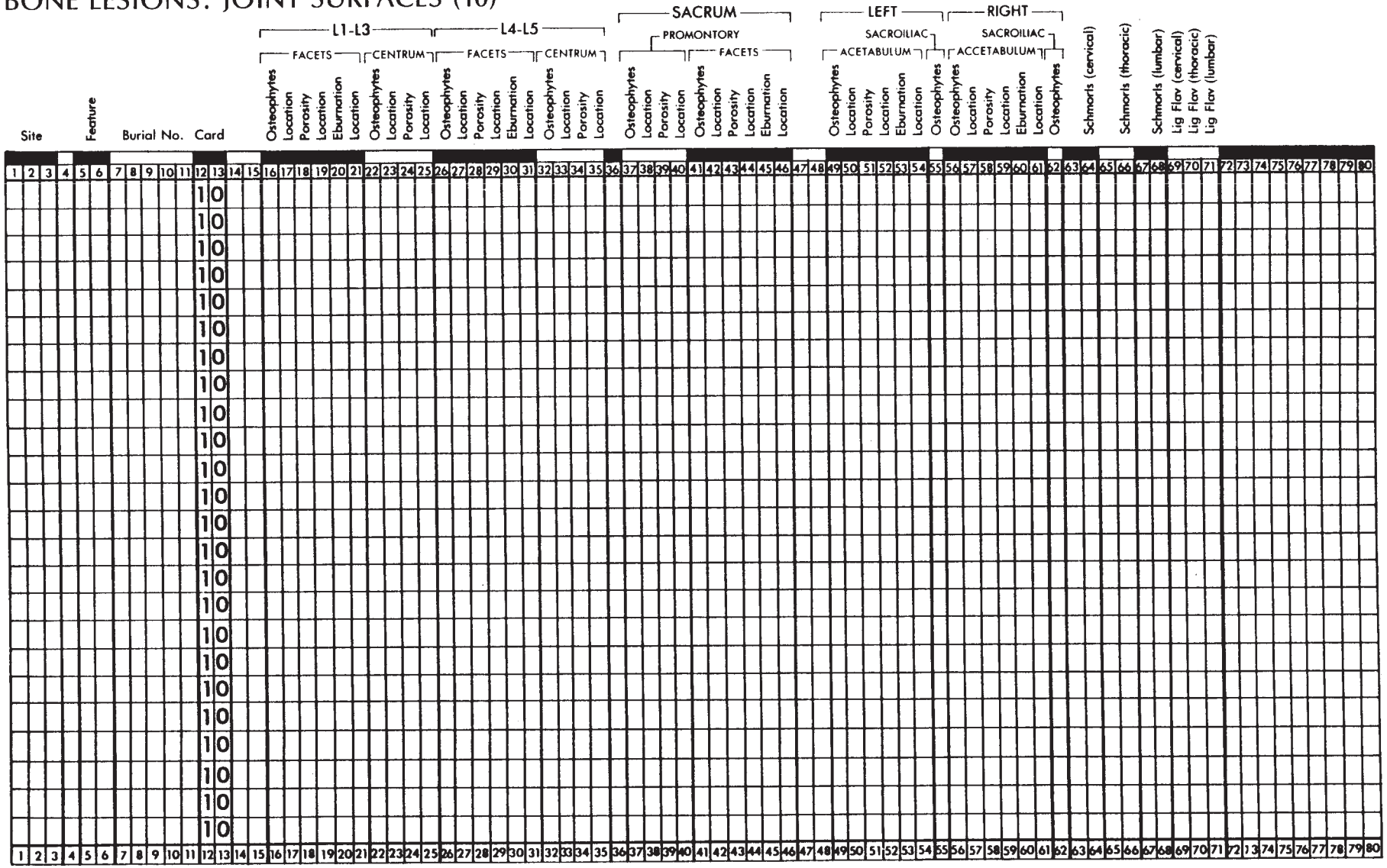
# BONE LESIONS: JOINT SURFACES (8)



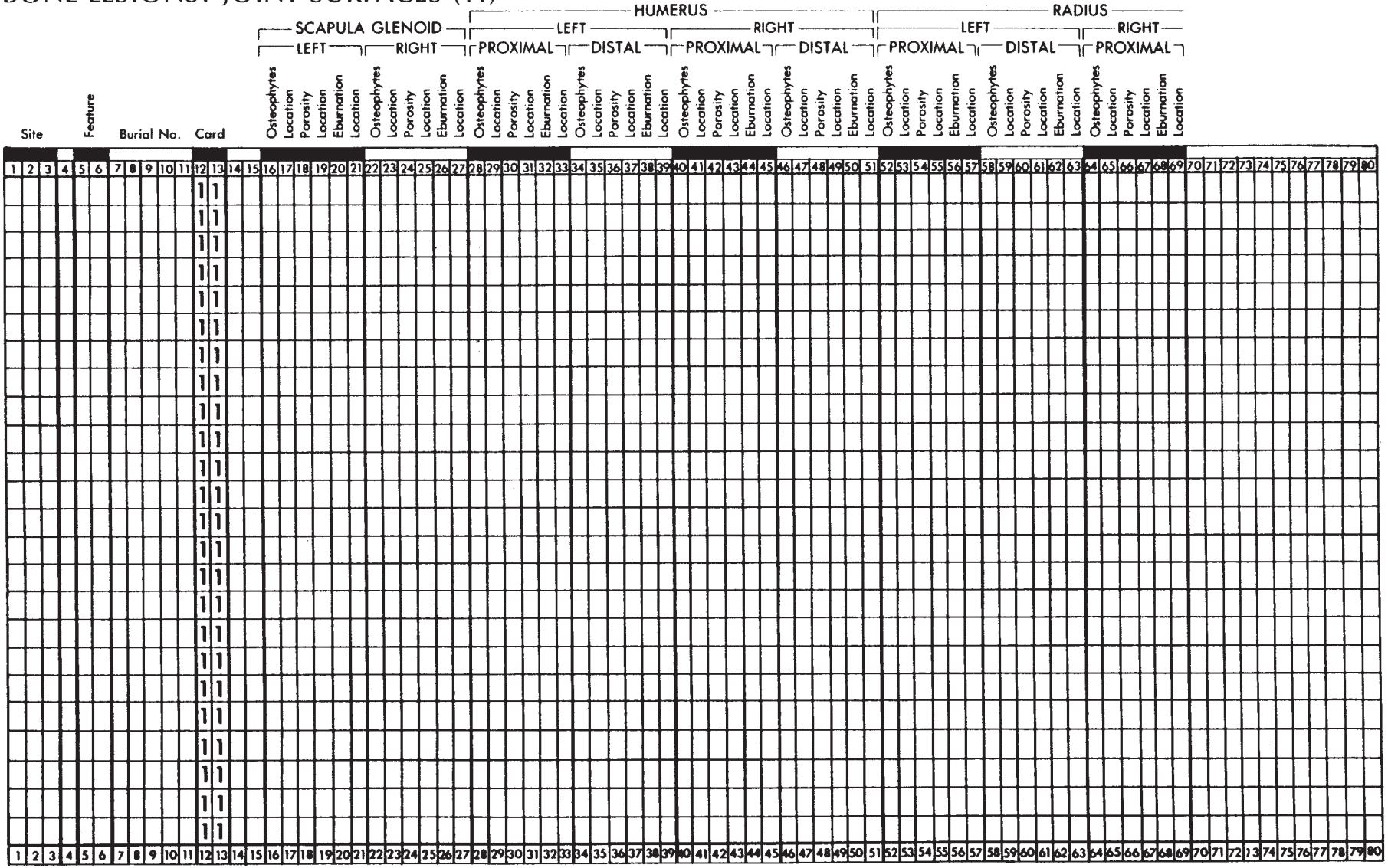
# BONE LESIONS: JOINT SURFACES (9)



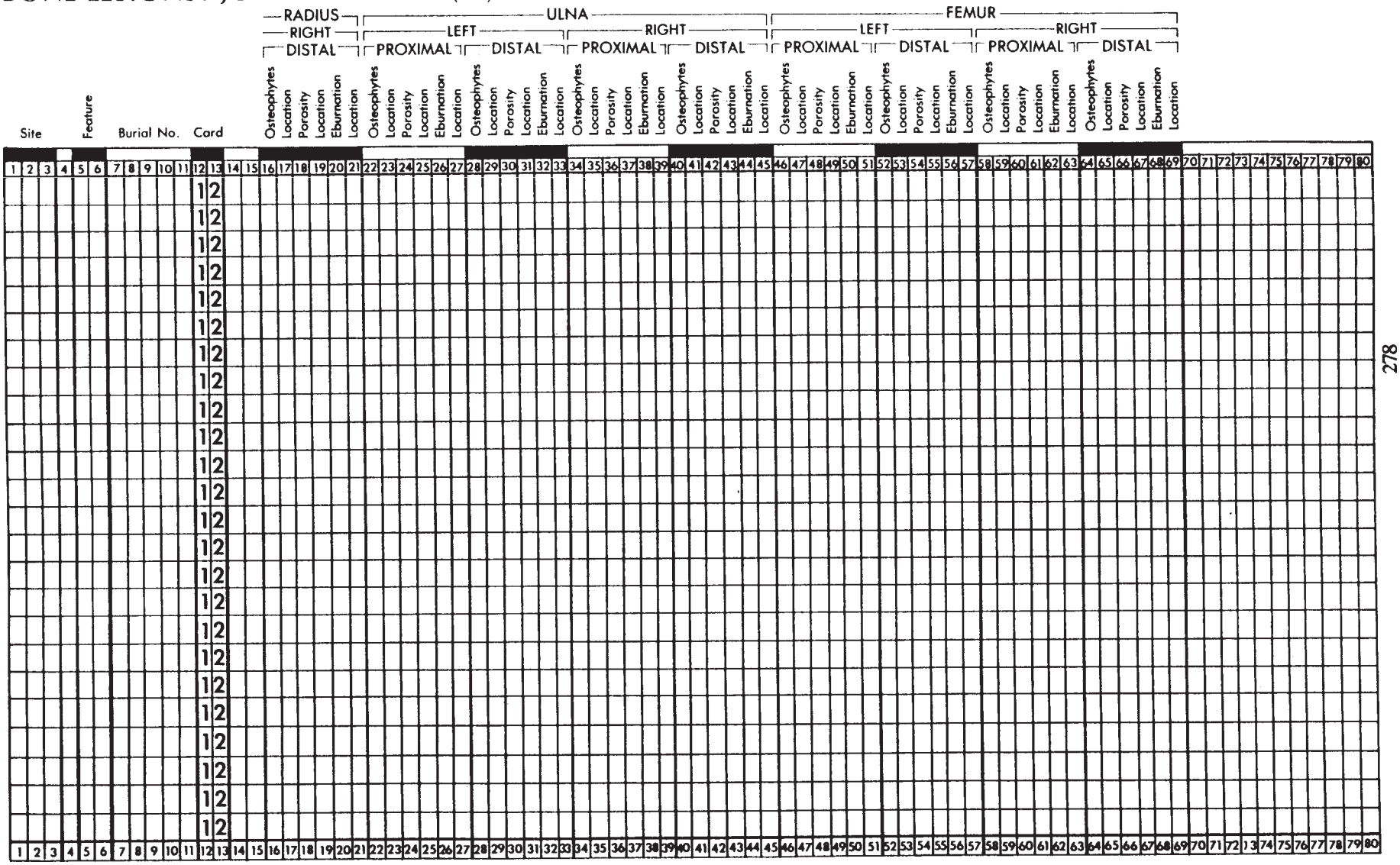
# BONE LESIONS: JOINT SURFACES (10)



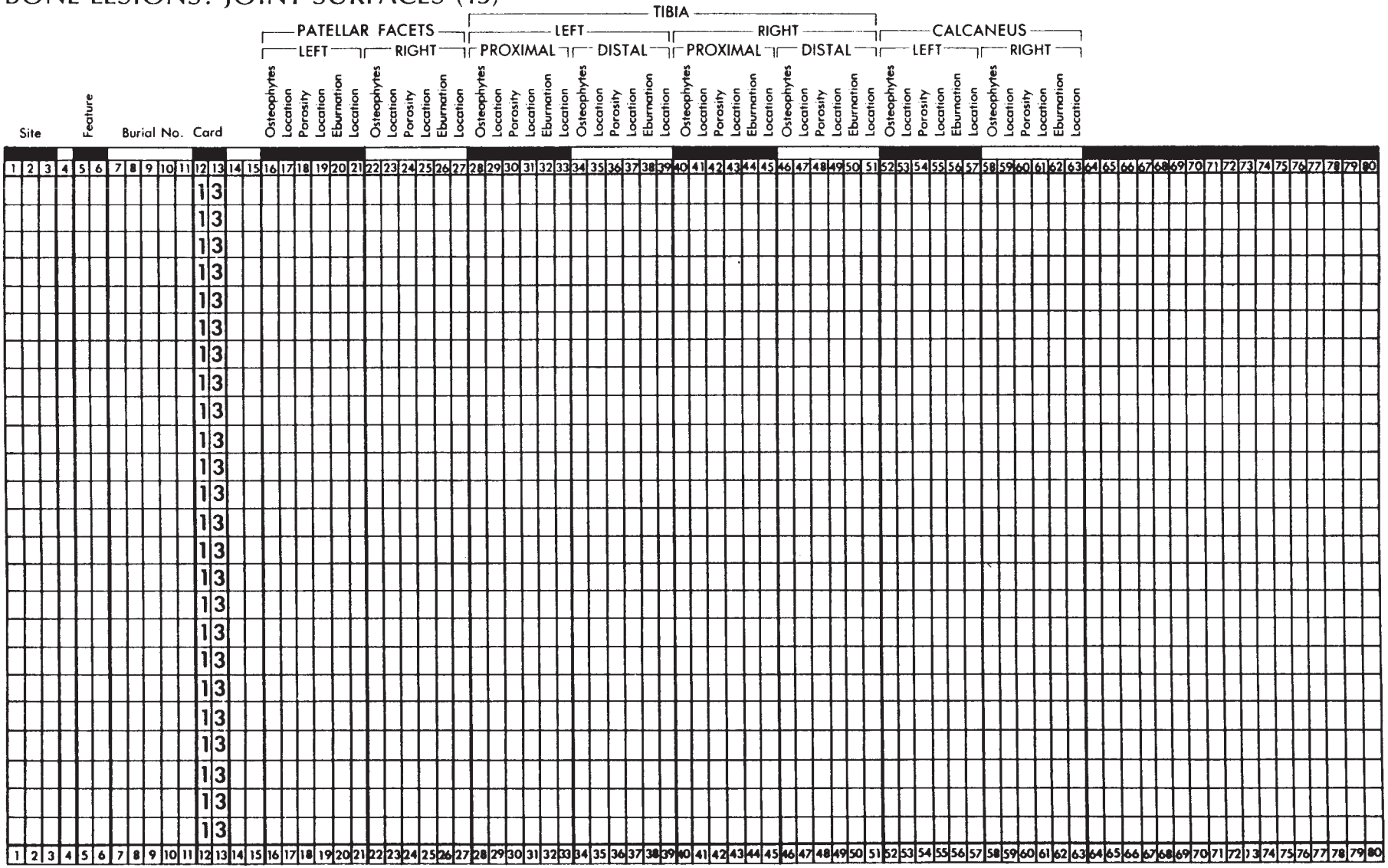
# BONE LESIONS: JOINT SURFACES (11)



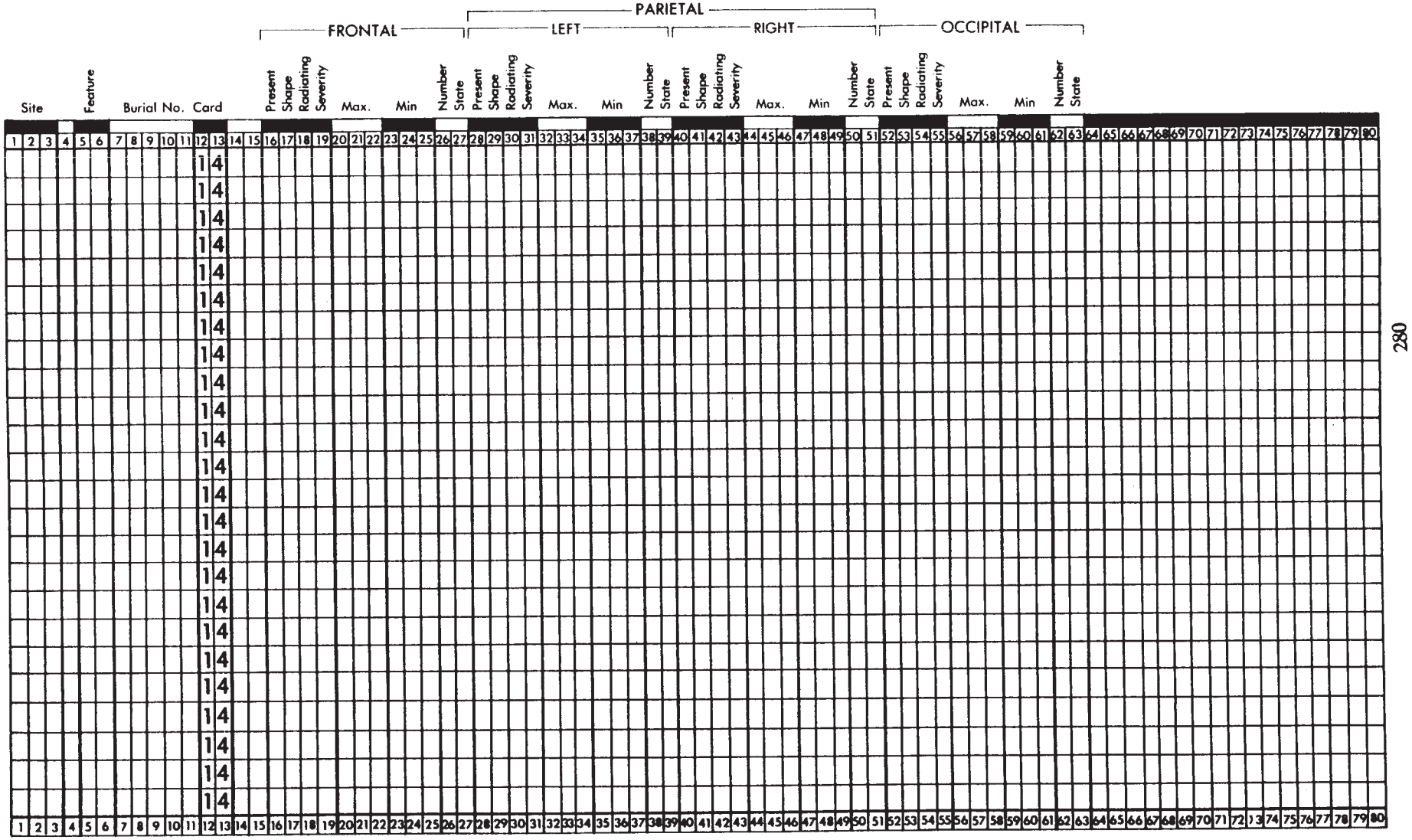
# BONE LESIONS: JOINT SURFACES (12)



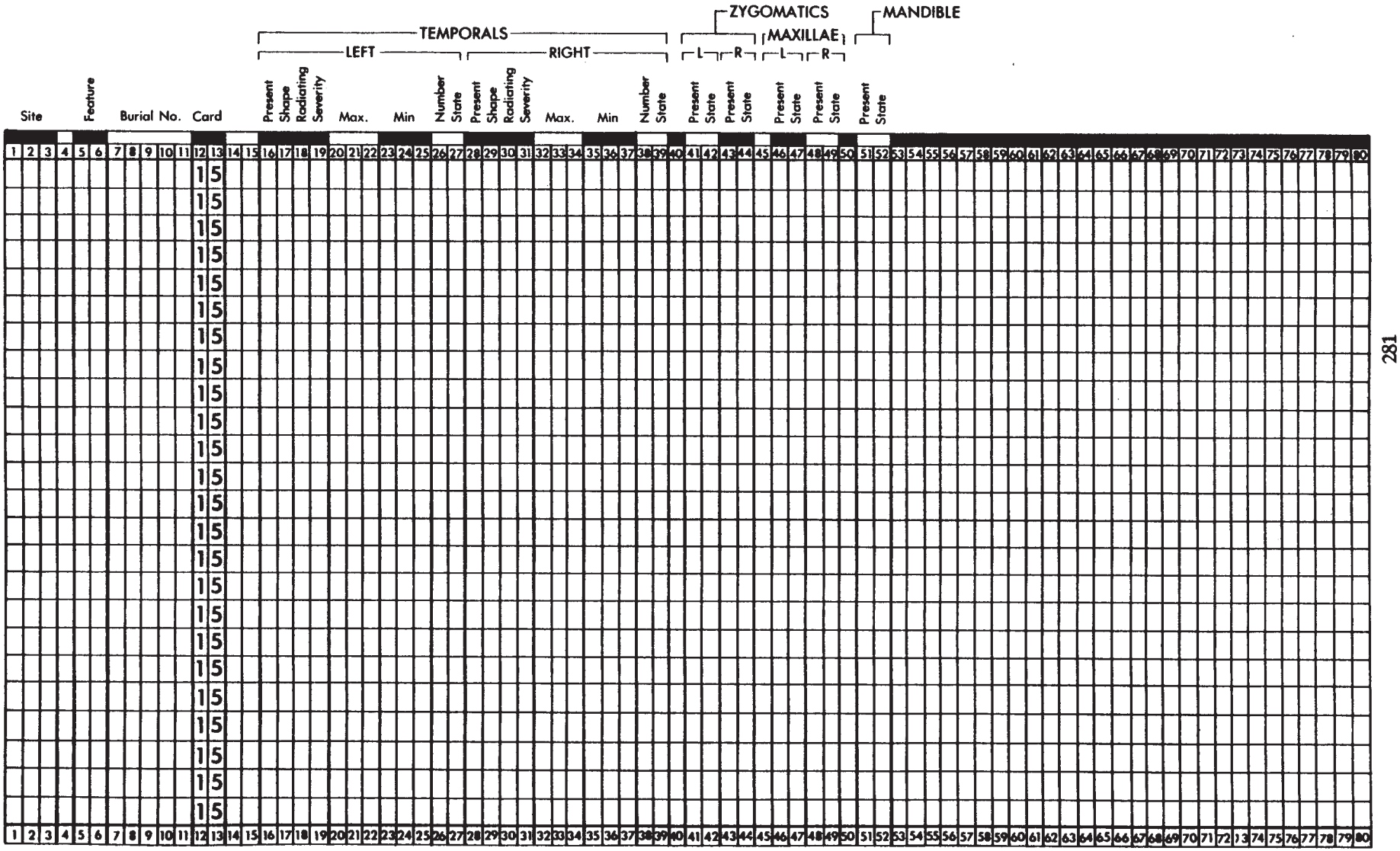
# BONE LESIONS: JOINT SURFACES (13)



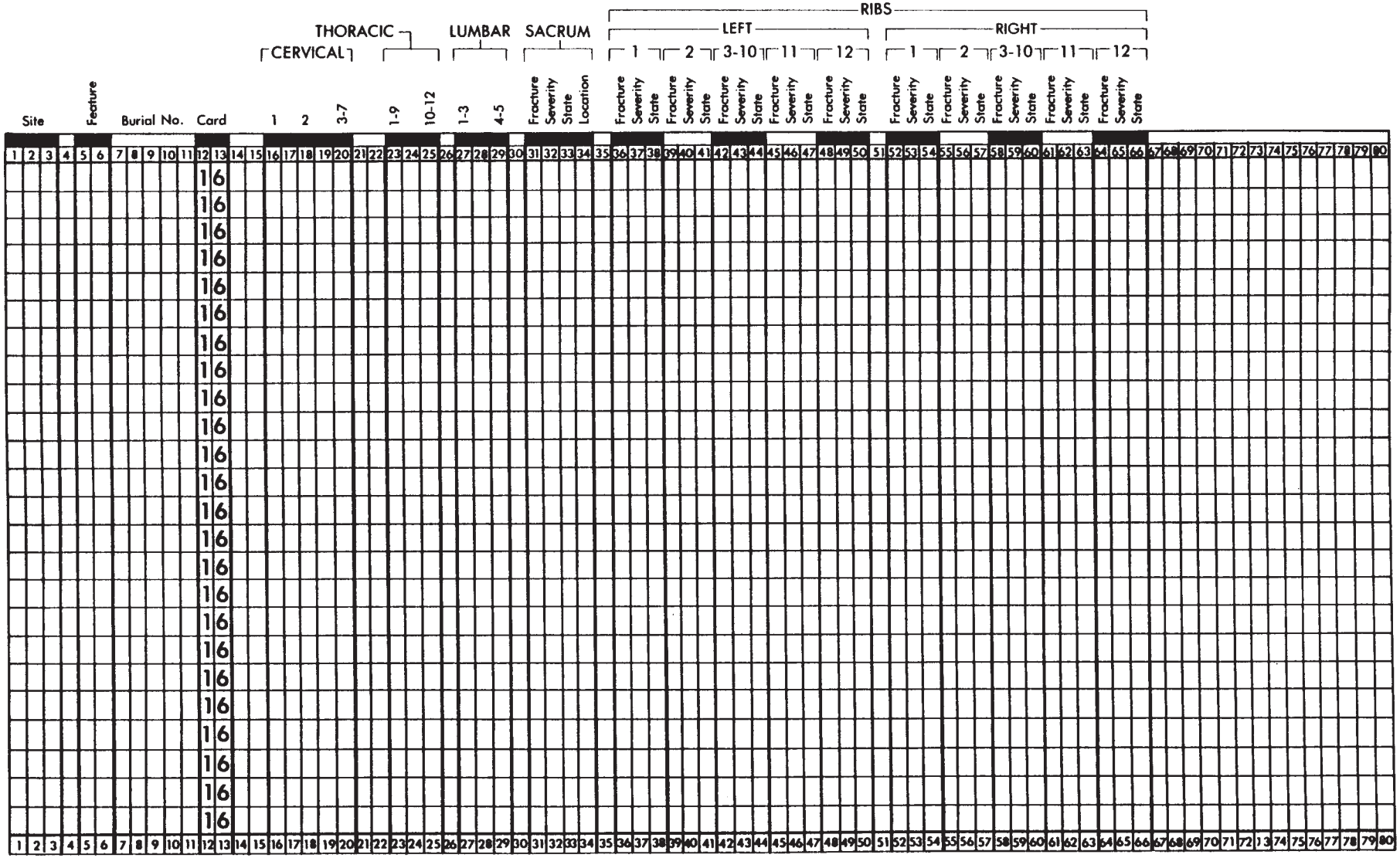
# BONE FRACTURES (14)



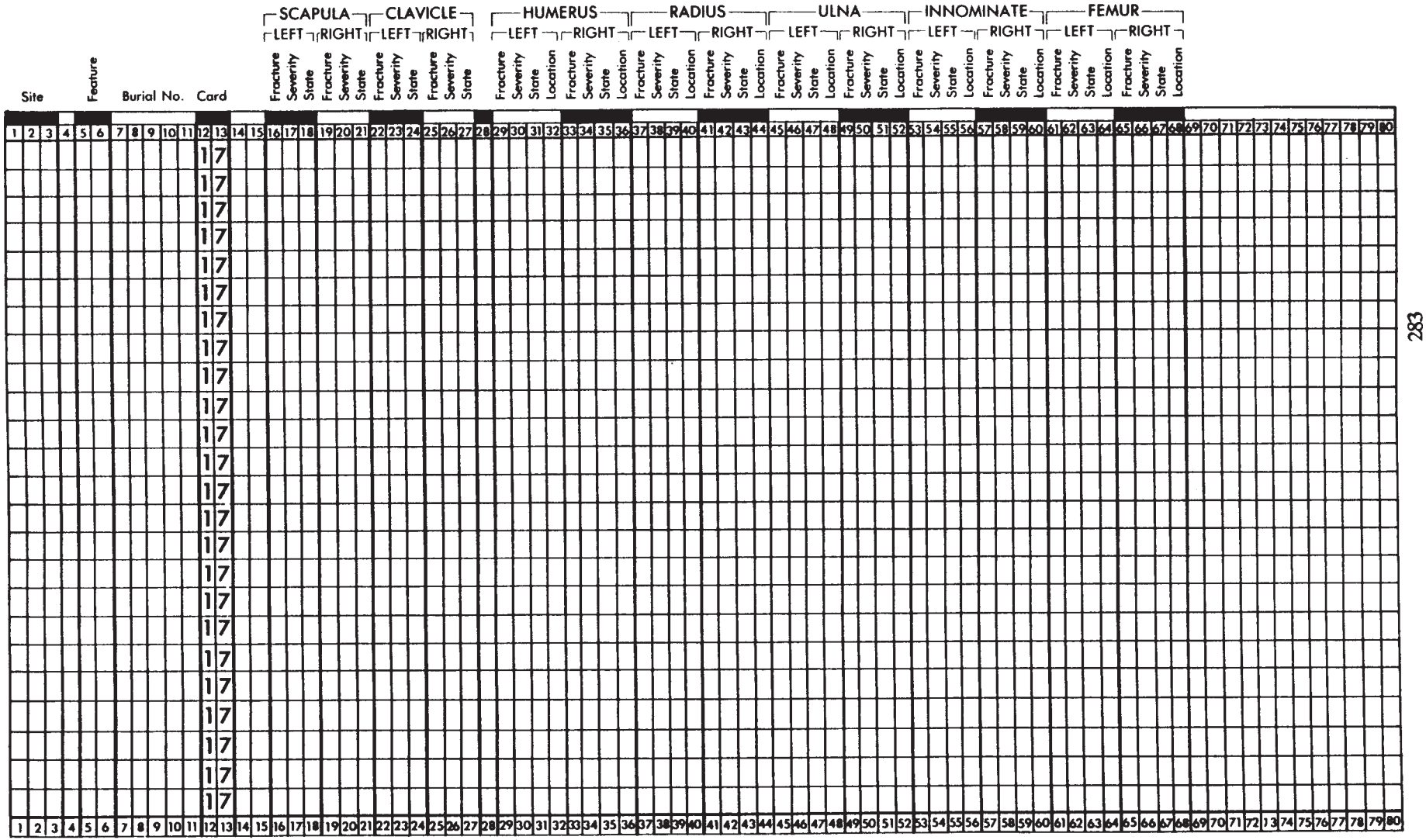
# BONE FRACTURES (15)



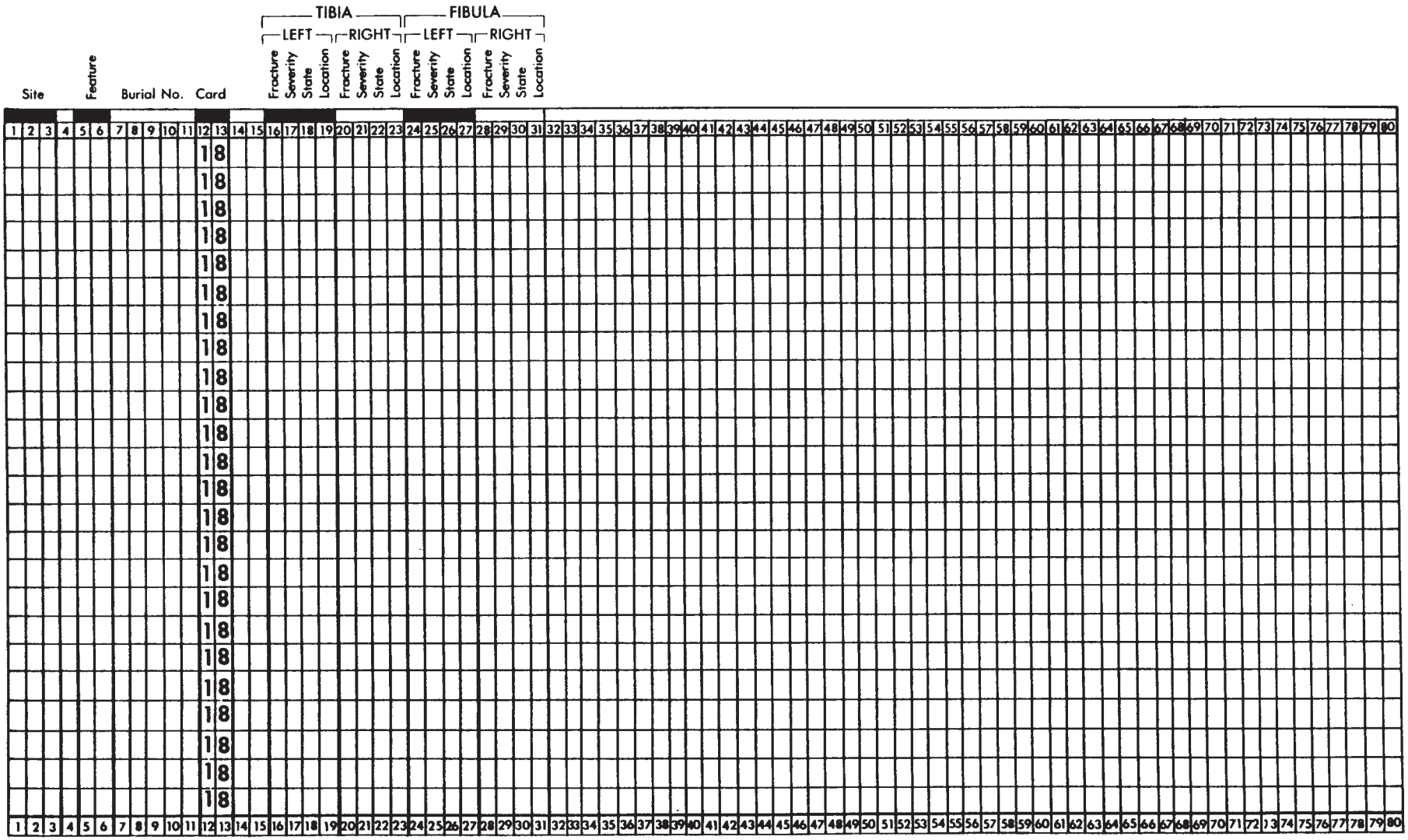
# BONE FRACTURES (16)



# BONE FRACTURES (17)



# BONE FRACTURES (18)



# Cranial and Postcranial Measurment Code Sheets

CRANIAL MEASUREMENTS

Collection_____

Site No._____

Sex_____ Age_____

Feature_____

Observer_____ Recorder_____

Burial No._____

Date_____ Photos_____

Notes_____

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Hinge. | 1 | Glab-occip 1 | __ __ __ | GOL | 33 | Malar 1, inf | __ __ | IML |
| | 2 | Nas-occip 1 | __ __ __ | NOL | 34 | Malar 1, max | __ __ | XML |
| | 3 | Basion-nasion 1 | __ __ __ | BNL | 35 | Malar subt | __ __ | MLS |
| | 4 | Basion-bregma | __ __ __ | BBH | 36 | Cheek ht, min | __ __ | WMH |
| | 5 | Max cranial br | __ __ __ | XCB | 37 | Supraorb proj | __ __ | SOS |
| | 6 | Max frontal br | __ __ __ | XFB | 38 | Glabella proj | __ __ | GLS |
| Slide. | 7 | Min frontal br | __ __ __ | WFB | 39 | Bistephanic br | __ __ __ | STB |
| | 8 | Bizygomatic br | __ __ __ | ZYB | 40 | Stephanic subt | __ __ | STS |
| | 9 | Biauricular br | __ __ __ | AUB | 41 | Frontal chrd | __ __ __ | FRC |
| | 10 | Min cranial br | __ __ __ | WCB | 42 | Frontal subt | __ __ | FRS |
| | 11 | Biasterion br | __ __ __ | ASB | 43 | Frontal fract | __ __ | FRF |
| | 12 | Bas-prosthion 1 | __ __ __ | BPL | 44 | Parietal chrd | __ __ __ | PAC |
| | 13 | Nas-prosthion | __ __ | NPH | 45 | Parietal subt | __ __ | PAS |
| | 14 | Nasal ht | __ __ | NHH | 46 | Parietal fract | __ __ | PAF |
| | 15 | Bijugal br | __ __ __ | JUB | 47 | Occipital chrd | __ __ __ | OCC |
| | 16 | Nasal br | __ __ | NLB | 48 | Occipital subt | __ __ | OCS |
| | 17 | Ext alveolar br | __ __ | MAB | 49 | Occipital fract | __ __ | OCF |
| | 18 | Ext alveolar l | __ __ | MAL | 50 | For magnum l | __ __ | FOL |
| | 19 | Mastoid ht | __ __ __ | MDH | 51 | For magnum br | __ __ | FOB |
| | 20 | Mastoid br | __ __ | MBD | 52 | Nasion rad | __ __ __ | NAR Radiom. |
| Dial. | 21 | Orbit ht, left | __ __ | OBH | 53 | Subspinale rad | __ __ __ | SSR |
| | 22 | Orbit br, left | __ __ | OBB | 54 | Prosthion rad | __ __ __ | PRR |
| | 23 | Interorbit br | __ __ | DKB | 55 | Dacryon rad | __ __ __ | DKR |
| | 24 | Nas-dacr subt | __ __ | NDS | 56 | Zygoorbit rad | __ __ __ | ZOR |
| | 25 | Simotic chrd | __ __ __ | WNB | 57 | Frontomalar rad | __ __ | FMR |
| | 26 | Simotic subt | __ __ __ | SIS | 58 | Ectoconch rad | __ __ | EKR |
| Coord. | 27 | Bimaxillary br | __ __ __ | ZMB | 59 | Zygomaxilla rad | __ __ | ZMR |
| | 28 | Zygo-max subt | __ __ | SSS | 60 | M1 alveolus rad | __ __ | AVR |
| | 29 | Bifrontal br | __ __ __ | FMB | 61 | Bregma rad | __ __ __ | BRR |
| | 30 | Nasio-frntl sub | __ __ | NAS | 62 | Vertex rad | __ __ __ | VRR |
| | 31 | Biorbital br | __ __ __ | EKB | 63 | Lambda rad | __ __ __ | LAR |
| | 32 | Dacryon subt | __ __ | DKS | 64 | Opisthion rad | __ __ | OPR |
| | | | | | 65 | Basion rad | __ __ | BAR |

POST-CRANIAL MEASUREMENTS

Site_____(1-3) Feature_____(5-6)

ID#_____(7-11) Sex_____(13) Age_____(15-16)

Date_____

Sex: 1=male 2=female 3= unknown

Side: 1=left 2=right

Side of Bone Used

1 Clavicle _____(18)
2 Scapula _____(19)
3 Humerus _____(20)
4 Radius _____(21)
5 Ulna _____(22)
6 Femur _____(23)
7 Tibia _____(24)
8 Fibula _____(25)

Remarks:

9 Humerus max l (HML)___ ___ ___(26-28)
10 Humerus epiph br (BUE) ___ ___(29-30)
11 Radius max l (RML)___ ___ ___(31-33)
12 Ulna max l (UML)___ ___ ___(34-36)
13 Femur max l (FML)___ ___ ___(37-39)
14 Femur oblique l (FOL)___ ___ ___(40-42)
15 Femur trochant l (FTL)___ ___ ___(43-45)
16 Tibia max l (TML)___ ___ ___(46-48)
17 Tibia prox epiph br (BPE)___ ___ ___(49-51)
18 Tibia dist epiph br (BDE) ___ ___(52-53)
19 Fibula max l (BML)___ ___ ___(54-56)
20 Clavicle max l (CML)___ ___ ___(57-59)
21 Humerus max midshaf (MDS) ___ ___(60-61)
22 Humerus min midshaf (MDM) ___ ___(62-63)
23 Humerus head dia (MDH) ___ ___(64-65)
24 Humerus epicond br (EBR) ___ ___(66-67)
25 Radius max head dia (RDH) ___ ___(68-69)
26 Ulna max olec pr br (BOP) ___ ___(70-71)
27 Ulna min olecr br (MBO) ___ ___(72-73)
28 Ulna max olecr wt (WOP) ___ ___(74-75)
29 Ulna olec-rad notch (ORL) ___ ___(76-77)
30 Ulna olecr-coron l (OCL) ___ ___(78-79)
31 Femur subtroch A-P (APD) ___ ___(18-19)
32 Femur subtroch M-L (MLD) ___ ___(20-21)
33 Femur A-P midshaft (APS) ___ ___(22-23)
34 Femur M-L midshaft (MLS) ___ ___(24-25)
35 Femur vert head dia (VHD) ___ ___(26-27)
36 Femur horiz head di (HHD) ___ ___(28-29)
37 Femur A-P lat cond (APL)___ ___ ___(30-32)
38 Femur A-P med cond (APM)___ ___ ___(33-35)
39 Tibia A-P dia @ for (APN) ___ ___(36-37)
40 Tibia M-L dia @ for (MLM) ___ ___(38-39)
41 Tibia nutr for pos (CLF)___ ___ ___(40-42)
42 Scapula max l (SML)___ ___ ___(43-45)
43 Scapula max br (SLB)___ ___ ___(46-48)
44 Scapula spine l (SLS)___ ___ ___(49-51)
45 Scapula S-spinous l (SSL)___ ___ ___(52-54)
46 Scapula I-spinous l (ISL)___ ___ ___(55-57)
47 Scapula glen cav br (GCB) ___ ___(58-59)
48 Scapula glen cav ht (GCH) ___ ___(60-61)
49 Scapula inf angle l (GIL)___ ___ ___(62-64)
50 Ulna physio l (UPL)___ ___ ___(65-67)
51 Femur epicond br (FEB)___ ___ ___(68-70)
52 Femur bicond br (BCB)___ ___ ___(71-73)
53 Humerus min shaft c (LCS) ___ ___(74-75)
54 Humerus max shaft c (MCS) ___ ___(76-77)
55 Ulna min shaft cir (ULC) ___ ___(78-79)
56 Femur min vert head (VDN) ___ ___(18-19)
57 Femur capito-coll l (CCL)___ ___ ___(20-22)
58 Femur neck angle (FNA)___ ___ ___(23-25)
59 Femur cond angle (FCA)___ ___ ___(26-28)