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THE EVOLUTION OF EXCHANGE IN SMALL-SCALE SOCIETIES OF THE SOUTHERN HIGH PLAINS

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THE EVOLUTION OF EXCHANGE IN SMALL-SCALE SOCIETIES

OF THE SOUTHERN HIGH PLAINS

A DISSERTATION

APPROVED FOR THE DEPARTMENT OF ANTHROPOLOGY

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ABSTRACT

The Southern High Plains is a vast semiarid environment characterized by erratic climate conditions and incongruent resources distributions. Prior to A.D. 1250 the region was inhabited by small groups of mobile foragers. Except for the transfer of some high quality tool stone, evidence for exchange between these societies is extremely meager suggesting that important resources were obtained through residential mobility. The onset of the Middle Ceramic period around A.D. 1250 was marked by the sudden appearance of Plains Village tradition societies who occupied permanent settlements and practiced subsistence economies based on foraging and horticulture. Settlements of the period vary from single family homesteads to villages containing 250 people. The large numbers of habitation sites documented for the period indicate that the region experienced a dramatic increase in human populations at this time. Coinciding with these significant cultural changes, the Middle Ceramic period also witnessed the emergence of widespread exchange networks. This study examines this development and its meaning in small-scale societies of the region.

Durable goods obtained through exchange can be described in a number of ways including the distances which items were traded and their function or meaning in society. In this study, utilitarian items, particularly chipped stone tools produced from high quality materials, are the most abundant exchange items documented. These objects were regularly traded over distances of 100 to 300 km. Nonutilitarian items, including jewelry produced from marine shell and precious stone, smoking pipes, and elaborately decorated ceramics were also obtained from communities located 350 to 550 km away. Given the distances involved, the latter objects are assumed to

represent status or prestige items. While nonlocal utilitarian items are widespread throughout the region, status items are notably concentrated at a few communities.

A political economic perspective, which envisions exchange as an activity embedded in broader social, economic, and political institutions, provides the theoretical foundation for understanding the alternative roles that exchange played in small-scale societies that inhabited the region. By necessity, a contextual perspective, which emphasizes both spatial and temporal parameters, is employed to investigate the interrelationships that existed between exchange and broader realms of social life.

This study concludes that initially exchange was regional in scope and provided access to utilitarian items among recently settled populations. Although temporal trends are not well understood, exchange was later elaborated by a few communities and involved the procurement of utilitarian and nonutilitarian objects through long-distance trading expeditions to settlements outside the region. Importantly, this expansion was also accompanied by the appearance of other key developments including land tenure systems, intensified economic production, and regional trade centers. Altogether, these trends are interpreted as evidence for increasing social complexity and the emergence of local leaders who encouraged and organized these activities. Support for this interpretation is derived from the ethnographic record which demonstrates that the subsistence economy and exchange frequently provide important avenues by which emergent leaders distinguish themselves above other members of society. In this study exchange is seen as serving a dual role that simultaneously brought prestige to local leaders and enhanced the status and well-being of the communities they represented.

CHAPTER ONE

Introduction

Exchange is a complex and multifaceted activity. While exchange plays a crucial role in initiating and sustaining interpersonal relationships, it is equally apparent that the obligatory rules underlying exchange are intricately interwoven into a much broader range of cultural norms, behaviors, and activities. The recognition that exchange is embedded in the fabric of social life stresses the fact that it is an activity that cannot be studied in isolation from the larger social context in which it takes place (see Dalton 1977; Earle 1982, 1994; Malinowski 1922; Mauss 1967; Polanyi 1957; Sahlins 1972). Given the numerous constraints imposed by the archaeological record, the significance of the contextual setting is especially important for the study of prehistoric exchange.

The primary goal of the present study is to understand the development of exchange between small-scale societies. Archaeologists are constrained by limitations in the material record for documenting and studying prehistoric exchange. This study is no different, and by necessity, the movement of durable objects serves as the primary evidence for investigating intersocietal interaction and exchange. Here, the Early and Middle Ceramic periods (A.D. 500-1500) of the Southern High Plains are investigated to document a situation where initially the transfer of material items among resident societies was extremely limited. Later, exchange expanded dramatically in a short period of time to include all societies of the region. As such, it may be more appropriate to assert that the florescence of exchange is the topic of this study.

Early Ceramic period (A.D. 500-1200) societies of the Southern High Plains are characterized by: a) settlement patterns consisting of dispersed family groups, b) subsistence economies dominated by broad spectrum foraging, c) material assemblages that indicate an emphasis on locally available resources, and d) a rarity or absence of trade items. While it is obvious that human societies are never entirely isolated, the above evidence provides the principal data to conclude that Early Ceramic societies of the region were largely economically autonomous.

Shortly thereafter, during the subsequent Middle Ceramic period (A.D. 1200-1500), the material evidence for exchange increased rapidly to astonishingly high levels and appears to have linked all communities within the region. Importantly, the emergence and florescence of exchange coincided with the appearance of a number of other equally significant cultural developments. Items involved in exchange at this time vary considerably from settlement to settlement, although subsistence related objects are by far most common. For example, while evidence for exchange is essentially nonexistent during the Early Ceramic period, following A.D. 1200 many Middle Ceramic settlements are characterized by chipped stone assemblages where 80 to 90% of all tool stone was imported from sources 100 to 300 km distant.

While items linked to subsistence were most widely traded, items used to display status were also obtained from communities 300 and 600 km away. In general, these objects occur at nearly all Southern High Plains settlements, but in extremely low frequencies (i.e., <10 items). In contrast, several thousand such exotics have been recovered at three settlements: Alibates Ruins, Chimney Rock Ruins 51, and Odessa Yates. Although understanding the social, economic, and political implications of those vast discrepancies in prestige item distributions are an important dimension of this study, it represents just one aspect of exchange that is explored.

Previously, exchange research on the Great Plains has concentrated almost exclusively on relationships described ethnohistorically between sedentary horticulturalists and nomadic bison hunters (see Baugh 1982, 1991; Ewers 1968; Lintz 1986a, 1991; Speth 1991; Spielmann 1982, 1983, 1991; Spielmann et al. 1990; Wood 1980). Central to these models are: a) interaction between societies with contrasting settlement patterns and subsistence economies, b) the central position that food products played in exchange, and c) the development of exchange as a risk reduction or buffering strategy. In the present study exchange between horticulturalists and horticulturalists as well as between horticulturalists and foragers are the topics of study. All of these societies are characterized by sedentary or semi-sedentary lifestyles. Although the transfer of food products undoubtedly occurred in some instances, for numerous reasons these items are seen as playing a minor role in the emergence and expansion of regional and interregional exchange relationships.

Overall, the archaeological record of the Early and Middle Ceramic periods of the Southern High Plains is of interest because it presents a situation where local and long-distance exchange expanded quickly and in dramatic fashion. For these reasons, it is proposed that from a methodological and theoretical standpoint the region presents an ideal case study for isolating those factors which led to the development or florescence of exchange among small-scale societies. However, the ability to document the movement of trade items does not in and of itself produce models of social interaction, this requires an interpretive framework to guide research and explanation (Schortman and Urban 1987:51).

Traditionally, political economy is associated with the study of state-level societies. However, as many have demonstrated, the interrelationship between political and economic institutions is also strongly developed in many nonstratified societies (see Cobb 1993; Earle 1982, 1991, 1994, 2002; Johnson and Earle 2000; Malinowski 1984; Mauss 1967; Polanyi 1957; Sahlins 1968, 1972). With this study's emphasis on the development of local and regional exchange networks, the subsistence economy, and sociopolitical organization, it is apparent that this work is heavily influenced by models developed and applied by political economists. Following a discussion of fundamental anthropological terms and concepts related to exchange, Chapter Two presents an evolutionary framework which examines the changing role of exchange in human societies of varying social, economic, and political scales (see Earle 1994; Johnson and Earle 2000). These discussions highlight the role of the economy, of which exchange is a part, in strategies to attain prestige, power, and authority.

Given the substantivist assumption that the economy is embedded in the larger social milieu of traditional societies, it is crucial that this study establish the contextual setting for the developments examined here. Considering that the purpose of the investigation is to examine the development and florescence of exchange, the contextual setting must include both temporal and spatial dimensions. Combined, Chapters Three and Four provide this information. Chapter Three introduces the natural environment of the study area. These discussions document a physical landscape where natural resources vary considerably in distribution and abundance across both space and time. The social context of the Southern High Plains is presented in Chapter Four. The primary emphasis of that chapter is on Middle Ceramic period (A.D. 1250-1500) societies of the region, although brief overviews are also presented for neighboring regions. To provide an evolutionary perspective to the development of exchange the preceding Early Ceramic period (A.D. 500-1200) groups are also examined. Generally speaking, this information is largely culture historical in scope, but introduces the reader to most of the major players involved in regional and extraregional exchange. Altogether, Chapters Three and Four establish the natural and social environment for the time periods of interest and provide the contextual information necessary for reconstructing the structure of local exchange systems that developed during this time.

As Earle (1982) has noted, the process of describing exchange involves three interrelated steps: a) to source trade items, b) to describe the spatial distribution of trade items, and c) to reconstruct the organization of exchange. The first of these steps is accomplished in Chapter Five. Here, major trade items documented for the region are presented and their source areas identified. The spatial patterning of these objects at settlements of the study area is presented in Chapter Six. Despite some limitations in existing data sets, the results of this analysis provide a thorough overview of the distribution and frequency of trade items among communities of the region.

Chapter Seven examines a number of topics frequently considered by political economists. Comparative analyses presented in this chapter provide evidence for competition, resource control, economic intensification, and redistribution of resources among settlements of the region. Examination of these subjects provides important insights into the relationship that existed between local subsistence economies and exchange. It is apparent that these trends are generally thought to occur under conditions of increasing social complexity.

Drawing on information provided by earlier chapters, Chapter Eight models the evolution of exchange among Middle Ceramic period societies of the Southern High Plains. Although some overlap is apparent, trade items of the region are discussed in terms of their relationship to either the subsistence or political spheres of the economy (see Bohannan 1955; Dalton 1977; Earle 1994; Johnson and Earle 2000). These discussions document exchange as an activity that expanded incrementally to procure objects at greater and greater distances. As exchange expanded, the goods obtained also reflect a shift in emphasis from the subsistence to political realms. It is argued that these trends are closely linked to the social and economic developments discussed in Chapter Seven and mark the appearance of local leaders who used these activities to establish and solidify their social standing. To illustrate the interrelationship between economic and political systems, a basic understanding of politics among small-scale societies is essential. This perspective is provided by contemporary societies documented in the ethnographic record and demonstrates that economic strategies play a crucial role in the political activities of emerging leaders.

This study documents the growth of political behavior in human societies. Previously, political economists have tended to concentrate their efforts on stratified societies (Cobb 1993). In these studies, coercion, ideological systems, and institutional control of the economy are often presented as primary pathways to power. However, given the numerous constraints that limit the development of marked social inequalities among small-scale societies, realistically, most of these strategies are seldom observed outside the context of complex chiefdoms or states. In the case study examined here, intensification of the subsistence economy and exchange offered viable and socially acceptable strategies to politically ambitious individuals. Thus, while every case is unique in its own right, it is suggested that these basic trends likely lay at the heart of emerging social complexity in all small-scale societies.

CHAPTER TWO

The Anthropology of Exchange

Generally, exchange denotes the transfer of goods or commodities between individuals. In this manner, exchange means much the same as trade, and the two are often used interchangeably. In a broader sense, however, exchange also has a wider meaning and refers to all interpersonal contacts. Here, all social behavior can be viewed as an exchange of both material and non-material goods. In this sense exchange also includes the exchange of information. In addition, even though trade often signifies the movement of goods between persons from different social units (i.e., external exchange), the fact that transactions also regularly occur among individuals within a given society should not be overlooked (i.e., internal exchange).

In the ensuing chapter a number of fundamental terms, concepts, and ideas related to the study of exchange are presented. After a brief introduction, traditional modes of exchange (i.e., reciprocity, redistribution, and market exchange) as identified by Polanyi (1957) and Sahlins (1972) are reviewed. Although important, these terms are less useful when examined in isolation. As such, the placement of exchange within an evolutionary perspective is necessary to emphasize the idea that the function and meaning of exchange can only be comprehended when viewed within a larger social context (i.e., Johnson and Earle 2000). These discussions highlight the idea that exchange among traditional societies can be split into two broad spheres: subsistence and political (Earle 1994). This simple dichotomy is useful for stressing the dynamic, and at times, contradictory role that exchange can play in the process of culture change. Overall, this chapter lays the groundwork for a study that examines intersocietal exchange in nonhierarchical societies and its role in the emergence of sociopolitical complexity.

Introduction to Exchange

Clearly, Marcel Mauss's (1967) *The Gift* has had one of the most profound and influential impacts on our understanding of exchange in traditional societies. Mauss (1967) recognized that in most societies lacking monetary systems, the fabric of social relations is bound together by a series of gift exchanges. In these societies, interpersonal relationships are typically initiated and underwritten by the giving of gifts. Indeed, "if friends make gifts, gifts make friends" (Sahlins 1972:186). In these transactions the gift does not represent a payment, but rather is a symbolic gesture that imposes an obligatory bond on each of the parties involved, especially on that of the recipient. For acceptance of the gift implies the obligation of repayment by another gift of equal or greater value at a later date.

Equally influential has been Bronislaw Malinowski's (1922) *Argonauts of the Western Pacific*. Here, Malinowski (1984) describes an exchange network known as the *Kula* among inhabitants of the Melanesian Islands. In this system, relationships among exchange partners are established and cemented by the exchange of valuable objects, most commonly shell. Although exchange among chiefly leaders focuses on ceremonial gift giving, the transfer of foodstuffs and utilitarian items also occurs. Overall, *Kula* exchange is subject to similar obligatory rules of gift giving as described by Mauss.

In the *Kula*, two different types of shell (i.e., beads and Abalone) are ceremonially exchanged between trade partners. Formal social rules dictate that beads are always traded for abalone. In *Kula* exchange, trade is regular, such that individual shells are not held in the possession of one person for very long before they are traded again. Another feature of interest is that some of the particularly exceptional shells develop reputations for their beauty and are highly prized and sought after by all. As a result, the acquisition of these shells through calculated exchange brings much prestige to the owners and their respective group. To better relate the social value of these items, Malinowski (1984:89-91) compares these particular shells to national treasures or heirlooms such as Britain's "Family Jewels," the "Hope Diamond," or Vincent Van Gogh's painting "Sunflowers."

In the examples presented above, it is emphasized that in many traditional societies the recipient of a gift is obligated to reciprocate by giving an item of equal or greater value. Equally important, however, is the idea that the giver or donor gains status and prestige both through their generosity and the scale of the gift. The significance of this side of exchange is amply demonstrated by the fact that in many societies gift giving often takes place in carefully orchestrated public displays that serve to accentuate the generosity of the donor. Perhaps the best-known examples of such displays are the lavish ceremonial gift exchanges of New Guinea societies (e.g., Feil 1984; Meggitt 1972, 1974) and potlatches of the Northwest Coast groups (e.g., Piddocke 1965; Suttles 1960). Indeed, in many societies positions of leadership are often achieved and reinforced by extravagant gift giving and by the incurring of debt on others (Hayden 1995).

Exchanges or gift giving, such as those outlined above, however, are closely related to a whole series of other social obligations and activities including friendship, alliances, providing marriage partners, feasting, and other communal activities. Although socially complex, extensive, and intertwined, the tie that binds all of these activities is the fact that they are subject to the same obligatory or reciprocal rules as gift giving. That exchange plays an important role in many, if not all, of these activities emphasizes the point that exchange is embedded in a much larger social realm and is not just an economic transaction.

Reciprocal Exchange

Reciprocity refers to a type of trade that takes place between individuals who are more or less social equals. Importantly and as noted in the examples above, reciprocal trade does not imply that repayment of a gift always occurs immediately upon acceptance of the gift, but may occur at some later date. This is especially true and necessary in extravagant giveaways where the underlying strategy is the establishment of social debt. Sahlins (1968, 1972) elaborates on these ideas and identifies three different types of reciprocity: generalized, balanced, negative. As Sahlins (1972) observes, these different forms of reciprocity may be envisioned as parts of a continuum defined by: 1. How closely related are those involved in the exchange transaction, and 2. How quickly and unselfishly obligations are reciprocated.

Generalized reciprocity takes places among the closest of kin and is characterized by giving without expectation of anything in return. In general, this form is synonymous with sharing and tends to govern exchanges between family members. Thus, these transactions are generally not strictly economic in nature; rather they are symbolic expressions of close personal relationships (e.g., gifts given to children by their parents). In many societies, generalized reciprocity or gift giving/sharing is so ingrained in the social fabric that it would be considered impolite for the recipient to express any sort of gratitude (see examples in Service 1966:16-17). Overall, generalized reciprocity is found in all societies from foragers to contemporary Western society (e.g., for examples among foragers see Bird-David 1992; Kent 1992).

Balanced reciprocity takes place among individuals that are more distantly related, such as affines or a trading partner from another village, and refers to direct exchange. In these exchanges the giver expects something in return. Although reciprocity in these instances may not occur immediately, the social relationship may be strained or ended if the obligation is not eventually met. For example, a wife may say to her husband "we have had the Simpson's over twice for dinner, lets not invite them over again until they have had us over." Generalized and balanced reciprocity are thought to characterize exchange transactions among egalitarian level societies (See Earle 1994; Johnson and Earle 2000; Sahlins 1972).

While generalized and balanced forms are based on trust and social ties, negative reciprocity involves the strategy of getting something for as little as possible. Such transactions typically characterize trade between strangers or those socially distant from one another. This form of reciprocity is often economically motivated and is most analogous to haggling, barter, or outright theft in modern society. Since these transactions are often wrought with ambiguity and distrust, immediate reciprocity is expected because of the fear of potential economic losses.

Redistribution and Market Exchange

Although rules of reciprocity characterize interpersonal relationships in many traditional societies, Karl Polanyi (1957) has identified two other modes of exchange that often characterize regional polities: redistribution and market exchange. Redistribution implies the operation of a central authority. Here, goods are moved to a central location, or are appropriated by it (i.e., a chiefly leader), and then are redistributed back outward. Although Service (1971) suggested that this type of exchange is dominant in more centrally organized societies, such as chiefdoms and states, this was later shown to not always be the case (see Earle 1977; Peebles and Kus 1977). Redistribution is generally envisioned to have developed as an organized strategy to overcome geographic settings in which resources are abundant and diverse, yet unequally distributed across the landscape. In this scenario, through the operation of a centralized authority a fisherman along the coast could obtain produce and an inland farmer could receive fish. Because redistribution works within the framework of a central political organization it is a form of internal exchange.

Market exchange is the type of trade that is dominant in capitalist economies. "Market exchange refers not only to the existence of market places (sites wherein buyers and sellers congregate), but more importantly, to the organizational process of purchase and sale at money price which is the mechanism of transacting material products, labor, and natural resources" (Dalton 1968:144). Markets imply a social setting where items are bought and sold, and bargaining occurs as a means to maximize profit and minimize cost. Polanyi (1957:139) argued that bargaining first became the basis of true market exchange in Tyre and Carthage, Greece, when coinage based on a well-defined monetary system was also developed. Often, markets are forms of internal trade, however, ports-of-trade represent an example of a market setting where individual traders from different cultural backgrounds can meet and bargain (i.e., external trade; see Arnold [1957] for an example of a port-of-trade).

As has been periodically noted in the preceding discussion, different modes of exchange tend to characterize trade in certain types of societies (e.g., reciprocity in foraging or egalitarian societies, redistribution in chiefdoms and states, market exchange in states and empires). Although this is generally true, it should not be forgotten that other forms of exchange might also regularly occur in a given society. For example, reciprocity is commonplace in a modern market economy. In addition, while different types of reciprocal exchanges typically occur within a society, as a rule the particular form employed in each instance is largely determined by rules of social distance.

Each of these points is important to consider when understanding the nature of exchange and the interpersonal relationships they signify. This is especially true when studying prehistoric societies. In contrast to the study of exchange in contemporary groups where researchers benefit from first hand observations, archaeologists must rely heavily on the movement of exchanged items to understand exchange among prehistoric societies. Taking into consideration that in most cases evidence for exchange in the archaeological record is vastly incomplete (i.e., much of what was exchanged is often not preserved), how may archaeologists determine the organization of exchange and how exchange may have functioned based on the distributions of materials observed in the archaeological record? For a general understanding this may be accomplished through the use of analogy and by placing exchange within an evolutionary perspective.

The Context of Exchange: An Evolutionary Perspective

Exchange is a social activity closely related to many parts of life. As such, the significance and function of exchange can only be understood when examined within the context of a local or regional cultural system. This idea that the economy, including exchange, is embedded in social relations is a key position of economists aligned to the substantivist school of thought (Dalton 1968; Polanyi 1957; Sahlins 1972; Wilk 1996). Of particular interest to substantivists is the evolutionary relationship identified between modes of exchange and levels of social complexity. Using an evolutionary framework (e.g., Earle 1994; Fried 1967; Johnson and Earle 2000; Service 1962), a contextual perspective of exchange is presented for three general types of groups relevant to the present research: family level, local groups, and certain regional polities (i.e., simple chiefdoms). Of course "these labels do not signify perfectly discrete levels or plateaus, to one or another of which all known cultures must be assigned; rather they designate stations along a continuum at which it is convenient to stop and make comparisons with previous stations" (Johnson and Earle 2000:245). Thus, it must be emphasized that an evolutionary perspective is used here simply as a framework from which to highlight various types of exchange and the social, political, and economic context in which they occur among different societies.

The following section is largely derived from Johnson and Earle (2000) and Earle (1994) and provides a general outline of exchange and its role in traditional societies. As many will recognize, this framework is similar to those presented earlier by Elman Service (1966, 1971) and Morton Fried (1967) and consists of designations based on the social and political organization of the economy. The decision to use this more recent framework is largely a matter of personal choice and often the earlier works mentioned above are frequently consulted to derive the following reviews. By necessity, the following reviews are kept to a minimum and are not intended to be an exhaustive discussion of each type of group. Therefore, the reader is encouraged to consult the original references, and others noted therein, for additional details and discussion (i.e., Earle 1994; Fried 1967; Johnson and Earle 2000; Service 1966, 1971).

Family-Level Groups

At its most basic level, the family group consists of a single nuclear or extended family of five to eight members and several families comprise a "band" (see Service 1966, 1971). Family groups are characterized by low population density (i.e., one person or two to 16 km) and are usually broad-spectrum foragers, although some incipient horticulturalists may also be included. Throughout the year individual families periodically move in and out of larger camps or hamlets (i.e., consisting of multiple families) of 25 to 50 members when resources are abundant or larger groups are necessary for particular subsistence activities (e.g., communal hunts). Thus, for part of the year individual family groups forage alone, while multiple family groups will aggregate for short periods of time. A division of labor along sex and age lines characterizes these societies and suprafamily leadership occurs only in situations requiring the cooperation of several families.

Given the close kin relationships that characterize these societies, exchange among family-level groups is dominated by general and balanced reciprocity and often involves the transfer of food (see Bahuchet 1990; Gould 1981; Kaplan et al. 1984; Lee 1979; Service 1966; Weissner 1996). That exchange often involves food among foragers is not surprising considering that the acquisition of plants and animals is often highly unpredictable from day to day, month to month, and year to year. Thus, exchange within family level societies usually serves to even out resource shortages over space and time. Because exchange among family-level groups often involves the transfer of crucial resources between closely-knit family members or an extended family, the term sharing is often used.

From an economic perspective, communal aggregations serve as a means to exploit seasonally concentrated resources in quantities not possible by individual family groups. While subsistence considerations clearly provide an underlying motive to gather together, aggregation was equally important for providing a context in which the exchange of goods and marriage partners and other important social activities could also occur. Given the organizational requirements of activities associated with aggregations, the formulation of short-term positions of group leadership was often necessary.

In general, although exchange among family-level groups often equates to sharing between closely related individuals (i.e., internal trade), the transfer of gifts, including food and status items, also occurs with neighboring groups. Here, relationships established through gift exchanges frequently serve as a buffer against economic shortfalls (see Wiessner 1982). In addition, although the creation of social networks is most often used by family groups to maintain reciprocal access to neighboring territories during times of resource shortage or periods of resource excess (i.e., economically oriented), the procurement and display of valuable wealth items probably also served as a strategy to show their attractiveness and value to potential mates and trade partners (Sahlins 1972).

Local Groups

Local groups consist of politically autonomous societies of 100 to 500 members. These groups can be coresidential as a village, dispersed into hamlets, or mobile depending on the nature of their social organization and economy. The subsistence economy is almost always based on domesticated species, although reliance on extremely abundant natural resources, particularly marine resources, may also occur (see Hayden 1995). Territorial defense is common among these societies and constituent groups may claim ownership of important resources, such as fertile land and valuable raw materials (see Earle 2000; Johnson and Earle 2000). Although the term local group is often considered synonymous with the term "tribe," the latter is more of an association of local groups or a regional collectivity of big men groups (see Hayden 1995; Sahlins 1968, 1972; Service 1962, 1971).

These societies are usually subdivided along kinship lines into corporate lineages or clans and form around a common interest, such as food production and storage or defense (see Sahlins 1968, 1972; Service 1971). The exact form and extent of group interests greatly influences the overall size of the society. Among smaller local groups, clan or lineage size segments of around 30 members may be dispersed into hamlets or several groups of hamlet size may aggregate into a single village.

These groups combine to form a ritually integrated political unit usually under the leadership of a village head or chief. In general, however, these integrated units are usually short-lived and periodically dissolve as internal disputes arise.

Because warfare is common among these societies intercommunity alliances are critically important for community well being. Among local groups, ceremonialism and exchange are very important for defining group membership, and for establishing and maintaining intercommunity relationships. Typically, intercommunity alliances are established along individual family lines.

Regional exchange networks headed by strong, charismatic leaders, commonly referred to as big men, integrate territorially defined local groups of 300 to 500 people (Hayden 1995; Sahlins 1963). Once again, settlement may consist of dispersed hamlets or an aggregated village within a well-defined territory. Because warfare between competing territorial groups is typically intense, big men are essential for negotiating intergroup alliances, feasts, trade, and maintaining group cohesion. These leaders also represent the group at important ceremonies that serve to establish and solidify intergroup relationships (see Bulmer 1960; Godelier 1986; Hayden 1995; Meggitt 1967; Sahlins 1963, 1972 for discussions of big men).

Overall, the underlying power of a big man is based on generosity with wealth accumulated in his lifetime (i.e., achieved status) and his ability to lead. Supporters, garnered through past favors and in anticipation of future rewards, recognize him as leader and accept his decisions. Therefore, while individual villages typically have leaders known as village heads, the big man has supporters from many villages. As a result, the big man is important for overseeing and influencing social, political, and economic activities in a much larger arena.

Although social alliances established through exchange may still continue to function as a buffer against resource failures, the political economy of local groups involves the steady transfer of primitive valuables. In these societies wealth goods are frequently used in ceremonies, as items of personal display, and as a means for creating status (see Rappaport 1968). Impressive intergroup ceremonies organized by big men are characterized by the exchange of wealth items and serve to bolster both the prestige of the big man and a groups' reputation as a potential friend and enemy.

Regional Polities

Chiefdoms represent a regional polity that contains some elements observed in the local group, and at times, elements observed only in more complex political units (i.e., states). Thus, the term "chiefdom" represents an *ideal type* along the continuum from tribes to states used by anthropologists to make social contrasts sharper than they really are (e.g., Earle 2002; Feinman and Neitzel 1984; Johnson and Earle 2000; Sahlins 1968; Service 1971). Of particular interest to the discussion here are simple chiefdoms: regional polities that range in size from the low thousands to tens of thousands.

Although considerable variability exists among simple chiefdoms (see Earle 1978, 1991, 1997, 2002; Feinman and Neitzel 1984; Peebles and Kus 1977; Steponaitis 1978, 1981, 1991; Upham et al. 1989; Welch 1991), several features serve to differentiate these societies from local groups. First and foremost, permanent leadership is organized beyond the village or local group level under the administration of a single individual or ruling council. Essentially, several local groups are integrated under the rule of a single political entity. For this to occur leadership becomes highly elaborated, institutionalized, and centralized. Typically, chiefdoms are characterized by systems of redistribution through which surplus goods are mobilized through staple and wealth finance to support the political ambitions of chiefly leaders (see Earle 1978, 1991, 2002; Peebles and Kus 1977). In other words, chiefs regulate the economy (i.e., the production, distribution, and consumption of goods) and political economies are formalized to finance or support the heightened institutional elaboration that emerges at this stage.

Like local groups, social relations in chiefdoms are based on kinship, marriage, descent, age, and gender. In some cases, all members of a chiefdom are thought to be descended from a single group of ancestors, and thus, are related to each other. Status in these societies is based on differential access to resources. With the appearance of chiefly leadership we also see the beginnings of truly monumental architecture (e.g., Pauketat 1994). These monuments serve as a testament to the emergence of a chiefly power over a large labor force and to the development of regional political and ceremonial centers (Earle 1991, 1997, 2002; Feinman and Neitzel 1984; Johnson and Earle 2000:265; Peebles and Kus 1977; Steponaitis 1978, 1981, 1991; Welch 1991).

The elite segment of society is differentiated from commoners in chiefdoms by privileged access to power, prestige, and wealth. This is typically accomplished through the display of wealth objects by the elite segment of chiefdom society. These items serve as unambiguous symbols of status differentiation. Overall, "the exchange of wealth goods is used to establish regional networks of political relationships and alliances that are important for the well-being of the group and the renown of its leader" (Earle 1994:430).

Discussion

Although very general in nature, the above review provides the context necessary for understanding the role of exchange among various types of societies. As seen here, although the function of exchange varies from group to group, there are clearly some broad trends that may be identified. Overall, it is very important to realize that the social scale associated with each of the evolutionary stages examined here has tremendous implications for the appearance, structure, and function of exchange.

Among family-level groups exchange typically serves as a risk reduction or buffering strategy to combat shortages of food resources. Although exchange still functions to provide security against risk among local groups, it is among these societies that we begin to see for the first time the emergence of wealth items obtained through exchange used as a means for creating status and prestige for individuals and the groups they represent. Here, public ceremonies, in which the display and exchange of valuables plays an extremely important role, are carefully arranged by aspiring leaders to establish intergroup alliances and to gain prestige. Among simple chiefdoms the public display of wealth items by the elite segment of society develops into a tangible means by which increasing differences in status and wealth are manifested. In general, the role of exchange within the context of the political economy is obvious, it functions to support and reinforce the political standing of individuals.

Spheres of Exchange

From the preceding section, two general classes of exchange may be identified; those associated with the subsistence sphere and those involved with the political sphere. Earle (1994, 2002) highlights the importance of these two major realms of exchange and, in general terms, their consequences for social complexity (see Dalton 1977). While exchange in subsistence goods in many areas may remain relatively unchanged over time and may represent a strategy to combat subsistence shortages (see Braun 1986; Braun and Plog 1982; Johnson and Earle 2000; Spielmann 1982, 1991), the increasing importance of wealth or prestige goods exchange signifies one avenue by which aspiring leaders seek to attain prestige and eventually monopolize power (e.g., Arnold 2000; Earle 1994, 2002; Friedman and Rowlands 1978; Hayden 1995; Peebles and Kus 1977). In the discussion that follows exchange within the subsistence and political economic spheres are briefly examined. This review is necessary because it serves to further clarify the major classes of goods exchanged and their role within the larger social arena.

In the subsistence sector of the economy the primary production unit is the household (see Sahlins 1968, 1972). In most traditional societies, households only minimally engage in exchange, rather, they seek to be relatively autonomous in that most of their economic needs are met, carried out, and controlled at the household level. Theoretically, exchange in the subsistence economy can involve the transfer of three major categories: food products, utilitarian items, and raw materials (Earle 1994). However, because the costs associated with moving food products any distance are extremely high, it is unlikely that any real economic interdependence can develop in the absence of markets or transport systems that can move food reliably and routinely. This proposition is supported by the fact that examples of organized and widespread food exchange documented outside these two contexts are exceedingly rare (see Arnold 1992, 1995; Baugh and Ericson 1994; Spielmann 1982, 1983 for discussions on the exchange of food products).

In contrast, the exchange of utilitarian items (e.g., tools and ceramics) and raw materials for their production is well documented throughout the world (see articles in Baugh and Ericson 1994 for examples from North America). The long-distance movement of stone tools is perhaps the most common example for many areas. These items are often produced from high quality materials, and are thought to have been highly valued in contexts where time, special raw materials, and mobility were restricted (see Andrefsky 1994; Binford 1979; Bleed 1986; Kelly and Todd 1988; Nelson 1991; Torrence 1989 for discussions on technological organization). Despite the numerous examples documented for the exchange of stone tools, Earle (1994:424) notes that like food products, large-scale trade in utilitarian items is generally quite rare. In most areas, the exchange of utilitarian items and raw materials becomes less important as restrictions on mobility increase. In general, as groups become more sedentary, the desire or need to acquire nonlocal high quality materials appears to become less important and groups tend to rely more on locally available materials (Parry and Kelly 1987).

This discussion is especially relevant within the context of decreasing mobility that affected much of the world's populations at one time or another. Under conditions of low human population, foraging groups over much of the world simply moved to areas of resource abundance to meet food requirements (see Binford 1980; Kelly 1995). However, as human populations increased and restrictions were placed on group mobility, people often elected to specialize and intensify food exploitation rather than rely extensively on others for crucial food resources (Earle 1994:422). This further emphasizes the reasons why exchange in technologies and raw materials are probably more important than the exchange of food in subsistence economies. Whereas food is difficult to transport over long distances, these other items are often much easier to move. An overview of exchange systems in North America (Baugh and Ericson 1994) supports these ideas.

The development of a political economy is often associated with the appearance of social institutions in complex societies that are supported by finance or tribute (Earle 1994). Here, the emphasis is on the production and distribution of surplus goods and services beyond the household level (see Arnold 2000; D'Altroy and Earle 1985; Earle 1991, 1994, 1997, 2002; Hayden 1995; Johnson and Earle 2000). In this politically charged arena, enterprising individuals emerge and seek to manage the production of a surplus for their own benefit (Arnold 2000; Hayden 1995; Peebles and Kus 1977). To accomplish this feat individuals must effectively control the means of production and distribution; in other words, to control the economy (see Arnold 2000; Earle 1997; Hayden 1995 among many others). Within the political economy two types of finance, staple and wealth, develop to support the political activities of an elite segment (see D'Altroy and Earle 1985; Earle 1991; Peebles and Kus 1977; Wright 1984 for discussions on finance systems).

Staple finance refers to the mobilization of food surpluses by leaders (Brumfiel and Earle 1987; D'Altroy and 1985, Earle 1991, 1994). Food surpluses are then redistributed back out to commoners for their support. Most often this control is obtained by chiefly ownership of horticultural land and its improved facilities (e.g., irrigated and terraced fields), although other strategies have also been identified (e.g., ownership of whaling boats, elaborate canoes, highly productive fishing areas, drying racks, and storehouses in some cases are equally important) (see Arnold 2000; D'Altroy and Earle 1985; Earle 1991, 1994, 2000; Hayden 1995). Cobb (1993, 2000) and Earle (1994) further suggest that control over access and use of utilitarian tools could have possibly provided an alternative means by which food production could be controlled and directed for staple finance.

Wealth finance is similar to staple finance, except instead of controlling food surpluses, leaders control the manufacturing and distribution of valuables to support their political maneuvering (e.g., Arnold 1992; Brumfiel and Earle 1987; Diehl 2000; D'Altroy and Earle 1985; Earle 1991, 1997, 2002; Feinman 1991; Hayden 1995; McGuire 1986). These items are often produced by craft specialists who may or may not be attached to elites (see Brumfiel and Earle 1987; Clark 1995; Clark and Parry 1990; Costin 1991 for discussions on craft specialization). Types of wealth finance are highly variable and include prestige-goods exchange (see Friedman and Rowlands 1978; Lightfoot and Feinman 1982; McGuire 1986; Steponaitus 1991:212 for examples). Importantly, within systems of wealth finance "the value of wealth is established in display and exchange, and wealth is given, received, and worn to represent status" (Earle 1994:427).

Often the nature of wealth, prestige, and status signifying goods may be broken down into two main primary categories: those produced from exotic nonlocal raw materials and those with high production costs. These two categories are not mutually exclusive, however, and may be combined as seen in the example of Mississippian Mill Creek chert hoes (see Cobb 2000).

The Role of Exchange in Traditional Societies

The discussions presented in this chapter have briefly touched upon a number of basic terms, concepts, and topics crucial for understanding exchange in various types of traditional societies. Although it may seem that I have gone to undue lengths to include additional information above and beyond exchange, it is this contextual information that is necessary for comprehending the variety of roles associated with exchange.

The above discussions have repeatedly highlighted the point that acts of exchange or gift giving play an important role in the establishment and maintenance of intersocietal alliances among traditional societies (see Blakeslee 1975, 1981 for another strategy). Equally important, however, are the many social, political, and economic incentives that lead to the development of these alliances in the first place. Notably, these incentives vary considerably depending on the context and scale of sociopolitical complexity. Oftentimes, alliances enable groups to maintain access to food, rare and valuable resources, marriage partners, and are also a source for allies in war. In other instances, exchange is a primary strategy by which aspiring leaders gain or enhance their status.

Typically, exchange organized around the subsistence sphere of the economy (i.e., as a means for maintaining access to food resources, raw materials, and marriage partners) tends to characterize most exchange transactions among family-level and local groups and often serves as a risk reduction strategy. While wealth exchange occurs among all types of societies (Earle 1994), this type of exchange is perhaps best known from examples provided by more "complex" societies. Here, wealth exchange is often viewed as a strategy by which individuals seek to establish and maintain institutions of social inequality.

As noted throughout these discussions, the acquisition of exotic wealth items are seen as important means by which local and regional leaders or elites may enhance their political careers. Mary Helms (1979, 1988, 1992) provides another dimension to our understanding of the nature and significance of exchange by placing these activities within a broader framework of political ideology. Here, Helms looks beyond long-distance interaction as simply a means by which nonlocal goods are obtained and focuses on the meanings often attributed or associated with goods and peoples from distant geographical areas. Typically, "geographically distant lands may be perceived as part of the extraordinary, supernaturally powerful other realm that surrounds the social or political heartland in all directions vertically and horizontally" (Helms 1992:159; with quotations removed). In addition, not only are goods and peoples given special status, but those who make the journey to remote lands and return are also held in high esteem.

Helms (1988, 1992) highlights a fascinating point of view held by many traditional societies; the farther one moves across the landscape from areas that are known and familiar, the more one is likely to encounter territories and peoples who are seen as markedly contrasting to yourself and the members of your social group. As such, contacts with such regions are regarded as exceptional activities reserved for only those individuals with special abilities. Helms (1992:159; with quotations removed) suggests that these long-distance travelers should be regarded as "political-ideological experts or heroes who contact cosmically distant realms and obtain politically or ideologically useful materials therefrom." As a result, these individuals are often given the status usually reserved for shamans or healers.

For many reasons highlighted here, the acquisition of wealth items through exchange is often examined within frameworks of political economy (Helms 1992:157). From this perspective, like substantivism, exchange is viewed as an essential ingredient for maintaining social relationships, providing essential resources, and establishing social inequality. Political economy as used here is broadly defined as "an analysis of social relations based on unequal access to wealth and power" (Roseberry 1989:44).

Political economists and their emphasis on inequality have highlighted the fact that enterprising individuals use intersocietal exchange and/or the economy as means to further their political careers as leaders. In other words, these strategies are used to manipulate social relations and create social inequality. Generally speaking, these leaders are successful in developing strategies that enable them to control the production or acquisition and distribution of wealth (see Appadurai 1986; Preucel and Hodder 1996:99-113 for discussions on value and wealth). While the vast majority of political economists have studied stratified societies (i.e., state level societies), the past

15 years or so have witnessed a significant increase in research that examines the political economy of nonhierarchical societies (e.g., Arnold 1996, 2000; Bender 1985; Cobb 1993, 2000; Hayden 1995; McGuire and Saitta 1996; Muller 1997; Peregrine 1992; Plog and Upham 1983; Saitta 1994; as well as chapters in Moore 1993 and Upham 1990).

In the case study presented here, Early and Middle Ceramic period (A.D. 500-1500) societies of the Southern High Plains of North America are investigated. The transition from the Early to Middle Ceramic period is characterized by considerable cultural change including trends toward sedentism and a reliance on food production and storage beginning around A.D. 1250. Coinciding with these changes is a dramatic expansion of exchange networks. Overall, the development and intensification of exchange is rapid and pervasive, and yet at the same time, is highly variable in terms of the types and frequencies of trade items that are distributed among resident communities.

This study seeks to understand the development of expanding exchange systems and the reasons underlying the spatial variability in status related items. Because the emergence of exchange coincided with a number of other significant changes in local cultural systems, it is understandably difficult to attribute this development to any one single cause. Nevertheless, previous studies of the region have proposed that food shortages resulting from a deteriorating climate were the primary factor stimulating exchange (Lintz 1986a, 1994; Spielmann 1982, 1983). As noted above, this study underscores the importance a contextual approach as crucial for understanding exchange. While the social setting strongly impacts the nature of exchange, it is also apparent that the environment and climate exert limitations that influence the basic structure of societies. As such, before the cultural context can be established a basic understanding of the ecological setting of the region is necessary.

CHAPTER THREE

Environmental Setting

Traditionally, archaeologists working on the Plains have viewed the environment as a major factor shaping the structure and appearance of cultural systems, including exchange. In particular, a highly variable climate and its effect on plant and animal resources has been emphasized. Although the climate of the Plains can be quite variable from day to day, month to month, year to year, and from area to area (a fact most residents take great pride in as they recommend that if you stick around for a while it will change), such a perspective tends to emphasize the extremes. While such a point of view is not limited to the Plains, the droughts of the 1930's and 1950's, coupled with more recent events (e.g., tornado outbreaks, ice storms, and heavy snowfalls), undoubtedly has much to do with the development and persistence of this environmental paradigm.

For many, the Plains environment is seen as an unrelenting force that dictates what people can or cannot do. Subscription to the above perspective implies that people of the region live a tenuous existence. In fact, prior to the advent of widespread irrigation in the 1950's, the Plains were commonly referred to as the "Great Desert" (see Eggan 1952:39-40; Ewers 1955:336-338; Kroeber 1939:76-88; Lowie 1955; Secoy 1953). Generally, the region was viewed as unsuitable to human occupation until the introduction of the horse by Europeans in the sixteenth century.

A preoccupation with the environment has resulted in a long history of Plains archaeological studies organized under some form of an ecological framework. Here, cultural systems, like other floral and faunal species, are viewed as adaptations to their environment and most day-to-day decisions are seen as largely determined by environmental conditions and biological factors (see Fawcett 1987:40-41). In addition, fluctuations in climate (i.e., especially wet to dry or dry to wet), and its bearing upon plant and animal resources, have been used as the principal explanation for many of the culture changes observed in the archaeological record.

While the use of environmentally based models is common for all areas and time periods of the region, they have been especially prevalent during the time period of interest here, the Early and Middle Ceramic periods (A.D. 500-1500). In these periods, environmentally based models have been used to explain many changes in human behavior, including immigration, emigration, mobility, subsistence economies, settlement, and exchange (e.g., Anderson 1987; Baerreis and Bryson 1965; Blakeslee 1975; Bryson 1980; Bryson and Baerreis 1968; Bryson and Murray 1977; Dillehay 1974; Duffield 1970; Duncan 2002; Henning 1969; Lintz 1986a, 1991; Spielmann 1982, 1983, among many others). In reality, however, paleoenvironmental conditions of the region are poorly known at this time and we do not have a good understanding on just how different or similar conditions may have been in the past compared to those observed today. Thus, models that rely heavily on hypothesized conditions should be subject to considerable scrutiny (see Lensink 1993 for an interesting discussion on these problems). While I would be the first to acknowledge that the environment certainly plays a role in shaping human societies, I would also argue that its perceived impact on the Plains has been overemphasized.

With these points in mind, the ensuing chapter presents an overview of the environmental setting of the Southern High Plains and provides the ecological context for the cultural systems examined in this study. The first section provides a description of modern conditions. This is followed by an overview of studies that have attempted to reconstruct past conditions during the last 2000 years. In the end, this information is summarized and sets the stage for an examination of the human societies that inhabited the region between A.D. 500 and A.D. 1500 in Chapter Four.

The Modern Setting

The Southern Plains is a large and ecologically diverse region. Traditionally, the region extends from the Arkansas River in the north to the Edwards and Comanche plateaus on the south. The Mescalero Escarpment defines the western boundary, while the eastern margin essentially follows the contact between the tallgrass prairie and the Ozark and Ouachita mountains. In all, the region includes parts of Kansas, Colorado, Oklahoma, Texas, and New Mexico (see Webb 1981). Generally, the Southern Plains is broken down into two main provinces: the Rolling or Osage Plains and the High Plains (Figure 3.1). Each of these provinces essentially corresponds to the distribution of the tall and mixed grass prairies and the short grass plains, respectively. The transition between these two provinces, often referred to as the Plains Border (Fenneman 1923:118), can either be abrupt or gradual depending largely on local topography, elevation, and other factors. Given that this study focuses primarily on prehistoric societies occupying the Southern High Plains, further discussion emphasizes this province.

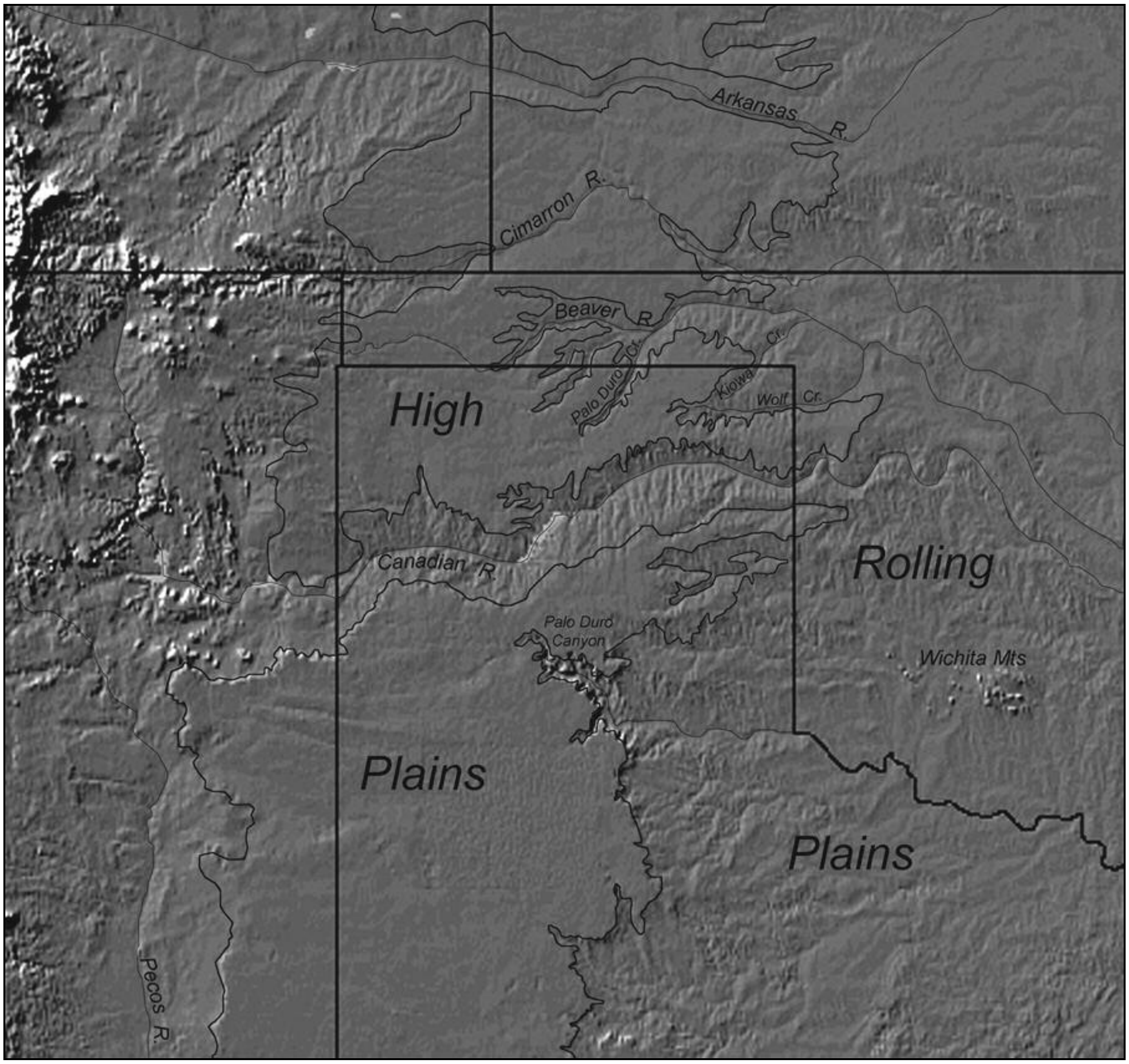


Figure 3.1 The Southern Plains of North America.

While the Southern High Plains is often portrayed as a vast featureless region, these images generally apply only to the flat and uneroded interior of the High Plains proper. Along the margins of the High Plains erosion has created topography that is rolling, broken, jagged, and scoured (see Fenneman 1923, 1931; Flores 1990). Here, escarpments between 50 to 200 m high are often present. These escarpments are nearly vertical in some areas, while in other places they have become irregular due to the extensive erosion of streams (Fenneman 1923:116). Several rivers traverse the Southern High Plains from west to east and have cut extensive valleys across the width of this level plain. Today, tributaries to these rivers continue to alter the shape of the landscape as they erode headward and make their slow encroachment on the High Plains. These Eroded Plains are frequently referred to as the "Breaks" and comprise approximately one-quarter of the region.

Although the flat surface of the High Plains tends to dominate much of the region, the High Plains and the Eroded Plains combine to create a landscape of remarkable contrast and beauty. Indeed, it is almost startling at times to come out of a deep valley or canyon to view the vast flatness that is the High Plains. Likewise, every time I drive off the High Plains and into the canyon country of the Canadian River I cannot help but be reminded of the words of Kurtis Blow (1994) "These are the Breaks!" These two basic subdivisions, the High Plains and Eroded Plains, provide a convenient framework from which to describe the physiography of the region.

Topography

The uneroded surface of the High Plains proper is an area characterized by little topographic relief. South of the Canadian River, in an area referred to as the Llano Estacado, vast expanses of this flat surface are present and remain essentially unbroken. North of the Canadian, this surface is much less expansive and has been eroded by the Beaver, Cimarron, and Arkansas rivers and their tributaries. Playas, sand dunes, and south of the Canadian River Valley, dry stream valleys known as draws, are the primary features that break up the uniformity of the High Plains landscape. Overall, the terrain, which represents a series of ancient overlapping alluvial fans derived from the Rocky Mountains, is covered by short grasses and gradually slopes from northwest to southeast at a rate of less than 2m/km (Fenneman 1931:11-12; Reeves 1976:214). Today, agriculture and ranching are the primary land uses on the High Plains.

For those unfamiliar with the region, Pedro de Castañeda, a member of Coronado's entrada in 1541, provides a brief, yet accurate description of the terrain and vegetation of the Southern High Plains as perceived by a newcomer:

> "…in traversing 250 leagues, the other mountain range was not seen, nor a hill nor hillock which was three times as high as a man. Several lakes were found at intervals; they were round as plates, a stone's throw or more across, some fresh and some salt. The grass grows tall near these lakes; away from them it is very short, a span or less. The country is like a bowl, so that when a man sits down, the horizon surrounds him all around at a distance of a musket shot. There are no groves of trees except at the rivers, which flow at the bottom of some ravines where the trees grow so thick that they were not noticed until one was right on the edge of them. They are of dead earth. There are paths down into these, made by the cows (i.e., bison) where they go to the water, which is essential throughout these plains." (Winship 1990:59).

The lakes described by Castañeda are known today as playas. Playas are internally drained basins of the High Plains that provide the only naturally impounded water in the region (see Gustavson et al. 1995; Holliday et al. 1996; Johnson 1901; Randall 1993; Reeves 1966; Wendorf 1975). Presently, playas usually contain water only seasonally (i.e., in the spring and early summer), although prior to modern farming and pump irrigation they probably held water on more of a permanent basis. These features are often small (<1.5 km^2), circular to oval shaped depressions that appear to have been formed by a number of processes, including deflation and dissolution (Randall 1993). Playas occur by the thousands on the High Plains, but their distribution is often variable. In some areas clusters of basins dot the landscape, while in other areas they are much less common.

In this province marked by a noticeable shortage of water, playas would have represented the only sources of potable water for much of the High Plains (Wendorf 1975:1). Although some basins contain brackish water, the importance of many playas as sources of water and other floral and faunal resources is demonstrated by repeated occupation of these locations throughout prehistory (see Brosowske and Bement 1998; Wendorf and Hester 1975). In fact, given the physiographic character of the High Plains, playas likely represented island oases to early occupants of the region.

Areas of sand dunes are present in many parts of the region. These occur as extensive dune fields along reentrant valleys near the western escarpment, on floodplains, and along the lee side of drainages and divides. Lunette dunes are small hummock-like accumulations of sand along the margins of playas that appear to represent the accumulation of deflated basin sediments (see Holiday 1995). In areas where playas are abundant, lunettes can provide considerable local topographic relief in the form of rolling sand hills or long linear ridges depending on the distribution of basins. Overall, the majority of dunes in the region appear to have formed since the end of the Pleistocene (i.e., 10,000 yrs B.P.), although some may have accreted episodically over the last 30,000 years (Holliday 1995).

In the area south of the Canadian River, draws traverse the region from northwest to southeast (Holliday 1995). Today these valleys contain no flowing water, but form the upper drainage basins of the Red, Brazos, and Colorado rivers that were pirated by the Pecos River. Although the exact importance of these dry valleys and the resources they provided to prehistoric occupants of the region is difficult to assess, high numbers of sites along these corridors suggest that they probably served to concentrate a number of valuable resources and provided natural routes across the Llano (see Hester and Grady 1977).

Although occupants of the region certainly frequented playas, sand hills, draws, and other areas of the High Plains, many of the major settlements are concentrated along rivers and tributaries in the Eroded Plains or breaks. These areas provide a variety of natural resources, including water, tool stone, and various plants and animals, as well as protection from the elements. The overall diversity of the Eroded Plains is extensive and is only examined summarily here. As such, the reader is encouraged to examine the many other sources that discuss various aspects of the Eroded Plains in greater detail (e.g., Brune 1981; Fenneman 1931; Flores 1990; Frye 1942; Green and Fairer 1995; Kindescher 1987; Latta 1948; Lintz 1986a; Marine and Schoff 1962; Nicholson 1960; Rathjen 1998; Reeves 1966, 1976; Schoff 1939; Smith 1940; Tharp 1939; Twenhofel 1924).

The headwaters of the four major river systems of the region, the Canadian, Beaver, Cimarron, and Arkansas rivers, are along the eastern flanks of the Rocky Mountains. These rivers crosscut the High Plains from west to east, and like draws, provide natural routes across the region. These valleys are 30 to 60 km wide and have been eroded to 50 to 200 m below the surface of the High Plains. Numerous north-south trending tributaries feed rivers of the region and have served to heavily dissect the slopes of valleys. In general, tributary valleys are roughly parallel to each other and are usually less than 35 km in length.

Steep erosional escarpments bound the eastern and western margins of the Southern High Plains and along the margins of some of the major rivers and tributaries. As noted earlier, these escarpments can vary from vertical cliffs 100-200 m high to more gradual slopes variously covered with rock, soil, and mixed vegetation. While the Mescalero escarpment on the west is essentially straight, several deep and picturesque canyons, such as Palo Duro, Tule, Quitaque, Blanco, and Yellow House, are present along the eastern margin south of the Canadian River. These canyons cut deep into the heart of the High Plains and create jagged and abrupt escarpments up to 200 m high.

North of the Canadian, Wolf Creek and the Washita, Beaver, and Cimarron rivers are present, but their valleys are much less dramatic than those to the south. Here, the transition from the High to Eroded Plains is gradual and rolling and often takes place over a distance of several kilometers. That deeply entrenched valleys of the region have served for millennia as natural traps for aeolian, colluvial, and alluvial borne sediments are aptly demonstrated by the thick sandy deposits they often contain. In addition, although most of the High Plains surface has been extensively dissected, remnants of this surface are frequently preserved as lone mesas or buttes and isolated ridges in many areas of the Eroded Plains. Today, the land of the Eroded Plains is primarily used as pasture for cattle ranching. Overall, although unique in and of themselves, portions of the Southern High Plains "Breaks," particularly along the

Canadian, are reminiscent of badland-type country located elsewhere, such as in North and South Dakota.

Geology

The oldest rocks of the region are represented by the Permian and Triassic red beds. The redbeds consist of red sandstone, siltstone, and shale, as well as beds of limestone, dolomite, and gypsum. Jurassic and Cretaceous limestones, shales, and sandstones overlie these rocks locally. Rocks of Paleozoic and Mesozoic age are only exposed along the margins of the High Plains and in some of the more deeply incised river valleys. Combined they form the basal foundation of the Southern Plains (Gustavson et al. 1990; Harbour 1975; Holliday 1995; Reeves 1976).

The famed Alibates silicified dolomite, the highest quality tool stone available in the region, is derived from the Alibates Formation (Bowers 1975). This formation consists of upper and lower dolomite members contained within Permian age deposits exposed in the Canadian River valley. Although varying amounts of calcification and chertification have occurred in both of these members, the best quality cherts are available from locations near the southwest end of present day Lake Meredith. Today, evidence for extensive prehistoric quarrying activities to obtain this highly prized stone are preserved within the confines of the Alibates Flint Quarries National Monument.

The Southern High Plains is constructed largely of extensive Cenozoic deposits that overlie the Paleozoic and Mesozoic bedrock. The Miocene-Pliocene aeolian and alluvial sediments of the Ogallala Formation comprise the bulk of these Cenozoic deposits. As noted earlier, it is these sediments that were originally derived from the mountains to the west. The top of the Ogallala is capped by a thick calcrete known as the "Caprock Caliche". The caprock is highly resistant to erosion and forms the upper unit exposed along escarpments.

Importantly, the Ogallala Formation contains gravels of various cherts, quartzites, and other materials suitable for stone tool production (see Banks 1990) and also houses the Ogallala aquifer, the principal source of groundwater for the region (see Hydrology below). Locally, the Pliocene age Blanco Formation represents a lacustrine deposit of dolomite and sand deposited in large basins eroded into the Ogallala. Like the Ogallala, a resistant calcrete caprock has also developed at the top of this formation. By definition, the Ogallala and Blanco formations are eroded away in the Eroded Plains exposing the underlying Paleozoic and Mesozoic bedrock.

The Ogallala, and where present, the Blanco Formation are overlain by the Blackwater Draw Formation (Reeves 1976). The Blackwater Draw, formerly called the "cover sands," consists of extensive aeolian deposits and intercalated buried soils laid down during the Pleistocene (see Frye and Leonard 1965; Holliday 1989; Reeves 1976). This formation represents the primary surficial deposit of the region and in all areas its surface is marked by a strongly developed soil (Holliday 1995; Reeves 1976:213).

Hydrology

Although a wide variety of water sources are available in the region, the best quality and most dependable sources are derived from springs emerging from semiconsolidated deposits of gravel, sand, silt, clay, and caliche of the Ogallala Formation (see Brune 1981:245, 293, 365, 345, 388; Marine and Schoff 1962:17).

Minor aquifers are also present in the Permian and Triassic formations; however, they generally provide only small amounts of poor quality water (Marine and Schoff 1962:5). In addition, although several major rivers of the region are present in the study area, they are often dry for extended periods of the year and generally contain water that is not suitable for human consumption. For example, the Canadian, Beaver, and Cimarron rivers contain amounts of chlorides, carbonates, and sodium that are often much higher than the recommended limits for drinking water (Brune 1981; Bureau of Reclamation 1979, cited in Lintz 1986a:59; Marine and Schoff 1962:Table 10).

Disregarding factors related to modern human activity, the overall quality of ground water depends on a number of factors, including pressure, temperature, the type of rock or soils through which the water has passed, and the length of contact (Marine and Schoff 1962:53). Water obtained from the Ogallala aquifer (i.e., also identified as undifferentiated Pliocene and Pleistocene deposits), although moderately hard, is suitable for human consumption. Prior to intensive agriculture and groundwater pumping, springs from these deposits were quite common in the Eroded Plains and it is likely that almost all of the springs important to prehistoric peoples in this area originated from this formation (see Brune 1981:245, 293, 365, 345, 388; Marine and Schoff 1962:17). Recharge to the Ogallala aquifer is gradual and is largely dependent upon precipitation (Baker et al. 1963:39-41; Gustavson et al. 1995).

Overall, “water obtained from the redbeds generally is very hard; it is also too high in sulfate and in some places is too in high chloride to be used for drinking” (Marine and Schoff 1962:57). That water obtained from the Permian redbeds usually far exceeds the recommended upper limit of sulfate concentration for drinking water (i.e., 250 ppm; Brune 1981:20) is well demonstrated by five wells from this source in Beaver County whose average concentration of sulfate was 1530 ppm (Marine and Schoff 1962:Table 9). The high concentrations of chloride in the redbeds noted above are due to the presence of salt (sodium chloride) layers. Lastly, water is also available in some alluvium of the region. However, the water quality in alluvium is quite variable from location to location and in some areas it is comparable to redbed sources, while in others it is more like that obtained from Pliocene and Pleistocene deposits.

In the study area tributaries to major rivers continue to erode at the margins of the High Plains and expose the base of the Ogallala Formation. It is at this contact of the Ogallala and the underlying resistant bedrock that many of the regions' springs and seeps are born. Overall, the amount of water flowing from springs and seeps greatly affects whether adjacent stream channels contain surface water or not. Since most drainages of the region contain abundant alluvium, at springs or seeps with low outputs, the water quickly sinks into the ground and the channel contains little flowing water except as runoff following thunderstorms (Redfield 1953:32). Likewise, springs with greater outputs serve to saturate the ground and water is more likely to flow perennially on the surface.

Overall, the drying up of springs as a result of a dropping water table from irrigation practices, as well as springs choked off by increased sedimentation brought about by historic farming practices are well documented throughout the region (see Brune 1981 for his discussion on springs in the Texas panhandle). In addition, prior to the modern era many playas of the region remained full for much of the year through seepage from a high water table. Although the saturated thickness of the Ogallala aquifer has increased since the 1980's, many of the springs and seeps in western and southern portions of the study area appear to be largely unaffected and streams continue to remain dry for the entire year (e.g., tributaries to the Canadian River and Goff, Coldwater, Frisco creeks in Texas County, Oklahoma). In contrast, although springs along major streams in the northeastern portion of the study area have not rebounded to earlier levels, many continue to remain perennial or at least contain pooled water (e.g., Ochiltree and Lipscomb counties, Texas, Beaver and Ellis counties, Oklahoma, and Meade, Clark, and Comanche counties, Kansas).

Climate

From the discussions provided above it should be apparent that water represents a valuable, and at times, a rare commodity on the Southern High Plains. Moisture is deficient throughout the region, although available moisture increases from west to east (Blair 1950:110). The bulk of this rainfall (i.e., approximately 70%) occurs during the months of April through September in the form of thunderstorms. In particular, unlike areas east of the High Plains where spring (March, April, and May) is the wettest season, the greatest amount of rain falls in the study area during the summer months of June, July, and August. Since the majority of rain falls during the growing season this rainfall pattern undoubtedly had important implications for prehistoric horticulturalists.

Western portions of the study area are classified as semiarid and the east as subhumid. On average, annual rainfall peaks at about 660 mm (26 inches) in the east and drops to 406 mm (16 inches) in the west (Figure 3.2). In the Oklahoma panhandle average annual precipitation sharply increases from west to east with 432 mm (17.0 inches) recorded at Goodwell, 541 mm (21.3 inches) at Beaver, and 623 mm (26.1 inches) at Buffalo (National Resource Conservation Service 2003). This is an increase in annual precipitation of 231 mm (9.1 inches) in about 185 km (115 mi) or about 254 mm (1 inch) every 21 km (13 mi).

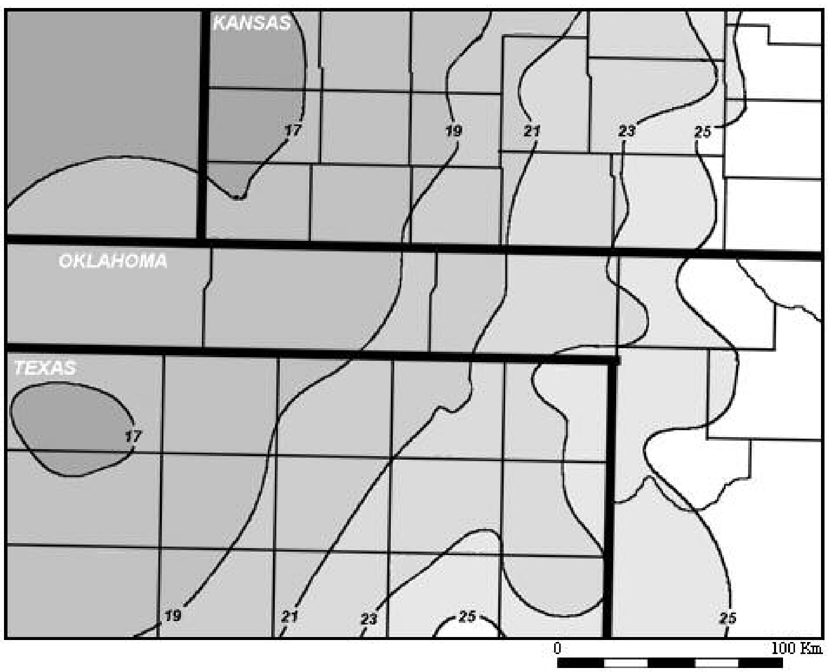


Figure 3.2 Annual Precipitation (Inches) for the Study Area.

To summarize annual precipitation for the Plains in terms of averages, however, is often very misleading for seldom does any location receive their "average". For inhabitants of the region it is common during the summer months to see it raining somewhere else or "smell the rain," but never receive a drop. Extreme variability in actual annual precipitation from one area to another is a major characteristic of rainfall patterns in the region. This variability is aptly demonstrated by examining actual precipitation amounts for a portion of the study area (Figure 3.3). The actual precipitation amounts for 2000 and 2001 little resembles the previous average precipitation map shown in Figure 3.2 and demonstrates that from year to year it is very common for a given location to receive well above or well below their “average”.

Also of importance is the fact that extreme variability in annual precipitation is often very evident over short distances. For example, in both 2000 and 2001 annual differences of 150 mm (6 inches) or more of rainfall frequently occurred in locations less than 64 km (40 mi) apart. In particular, compare the 2001 annual precipitation for the Garden City Airport and Experimental Stations (Table 3.1) (Kansas Library Network Board 2003). Although clearly an extreme example, a difference of 361 mm (14.21 inches) was measured at these two stations that are only about 13 km (8 mi) apart. These vast differences in rainfall over short distances are a result of fortuitous tracks of high precipitation thunderstorms. In terms of precipitation variability, similar observations have also been noted for other portions of the Plains (e.g., Blakeslee 1975; Wedel 1941). This phenomenon clearly has important implications for prehistoric inhabitants of the region and its potential consequences for economic strategies are examined in greater detail later in this study.

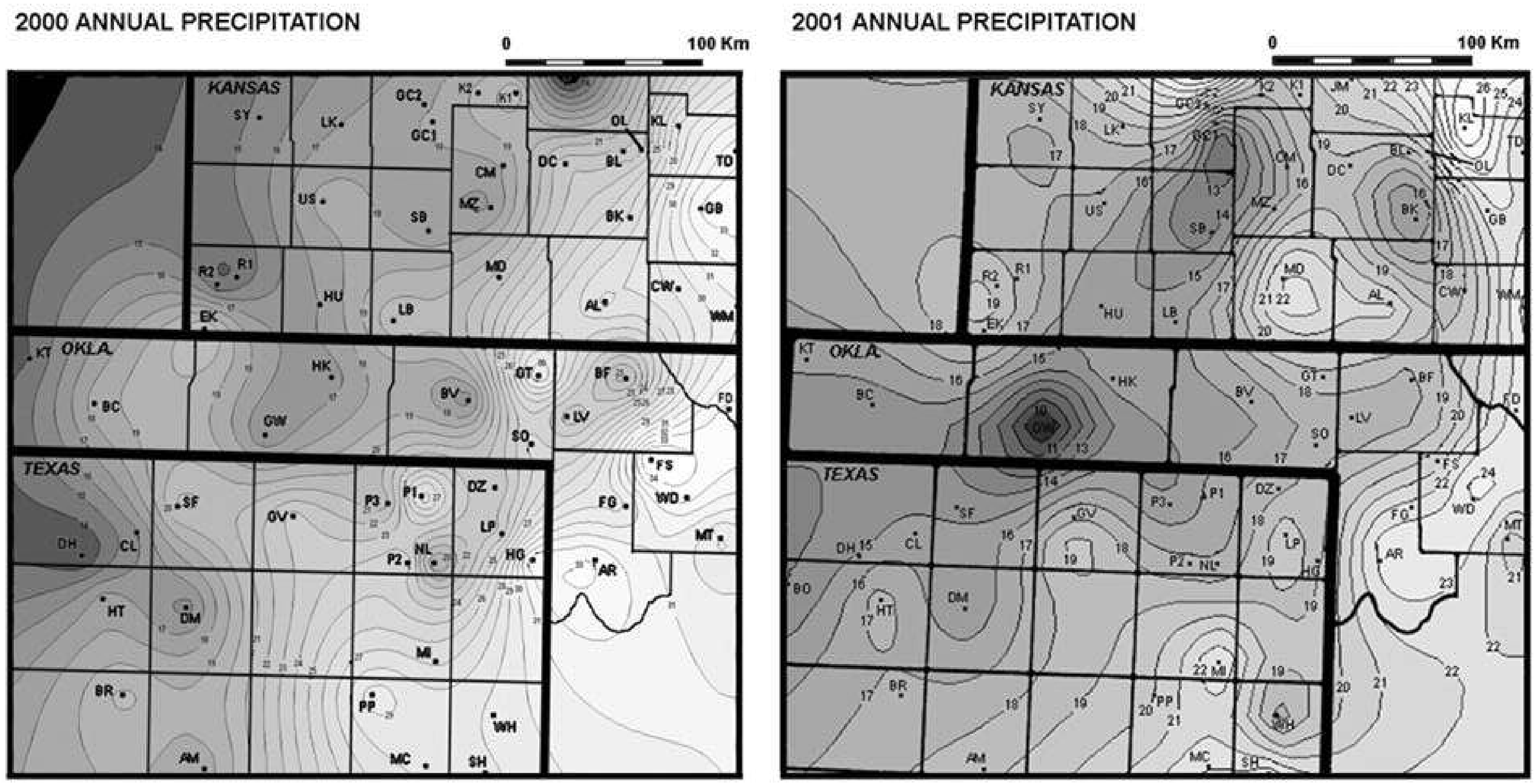


Figure 3.3 Annual Precipitation (Inches) in the Study Area during 2000 and 2001.

Table 3.1 2001 Annual Precipitation at Two Garden City, Kansas Weather Stations.

Location	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Total**
Station 1	.63	.48	.79	.61	2.0	2.8	2.67	1.36	.95	.03	.18	.01	12.51 in
Station 2	1.23	.71	1.16	1.49	7.82	3.02	8.72	1.31	1.11	0.0	.07	.08	26.72 in
Station 1	16.0	12.2	20.1	15.5	50.8	71.1	67.8	34.5	24.1	0.8	4.6	0.3	317.8 mm
Station 2	31.2	18.0	29.5	37.9	198.6	76.7	221.5	33.3	28.2	0.0	1.8	2.0	678.7 mm

Station 1 = Airport, Station 2 = Experimental Station

Similar to precipitation, temperatures of the study area also vary greatly from season to season and from location to location. In general, mean seasonal temperatures increase from west to east in northern portions of the region and from north to south in southern portions. Average mean high temperatures during July increase from about 33º C (91º F) in the northwest to 36º C (96º F) in the southeast (Bomar 1995:Table B-7; Rathjen 1998:12). Mean minimum temperatures in the region are less variable during the winter and average 10º C (50º F) in the northwest and 11º C (52º F) in the southeast during January. The growing season is less than 168 days in the northwest corner of the Oklahoma panhandle and about 217 days in southeast corner of the Texas panhandle (Johnson and Duchon 1995:Figure 3.11; Rathjen 1998:12).

The seasons of fall through spring on the Southern Plains are often subject to rapidly changing weather conditions. The highly variable climatic conditions occur because the area is subject to influence by a number of different air masses. These air masses include maritime polar, and tropical and continental polar, arctic, and tropical (Bomar 1995:31). The frequent convergence of fronts over the region from fall to spring may result in rapid changes in temperature often accompanied by the development of thunderstorms or snowstorms depending on the temperature. During warmer months afternoon heating coupled with unstable air masses frequently results in the development of high precipitation thunderstorms that may result in local rain totals of five to eight inches. Overall, fall represents a fairly rapid transition to the cooler conditions of winter, while the spring represents a transition to the hotter temperatures of summer.

Average annual snowfall totals for the region range from a high of 610 mm (24 inches) near Black Mesa, Oklahoma to a low of about 127 mm (5 inches) near Midland, Texas (Johnson and Duchon 1995:Tables 4.21, 4.39, 4.47; Bomar 1995:Table F-1). The region is also well known for its windy conditions. Average wind velocities range from 18-23 km/h (11-14 mph) and typically come from the south or southwest; making it one of the windiest places on the continent (Bomar 1995:Table F-2; Webb 1981:23). Although the above discussions emphasize climatic extremes, in general, rapid departures from normal conditions at any time of the year are usually short-lived events and typically last a few days at the most.

Drought is a weather phenomenon that is often difficult to define (see Bomar 1995:152-154). However, the effects of a drought are usually much easier to recognize and include stress on native plants and crops, decreasing spring or stream flow, and lower lake levels. Drought conditions are most often associated with a deficiency of rainfall, although higher than normal temperatures accompanied by increased wind velocities affect evapotranspiration rates and can certainly intensify and worsen already arid conditions. Although the region has been historically characterized as drought prone, it must be recognized that most definitions of drought or wetness reflect either a deficiency or abundance of moisture with modern agricultural and ranching needs in mind. As such, correlating present needs with those of the prehistoric past should be done cautiously. Nonetheless, a few general statements can be made.

As noted above, rainfall rates in the region vary a great deal between wet and dry and seldom does any one place receive its average. Using Palmer Index data (i.e., an indicator of drought duration and severity) it is apparent that dry versus wet conditions can also vary greatly from year to year in the region. For the period from 1951 to 1993 severe to extreme droughts are recorded on the High Plains of Texas in 29 of 168 yearly quarters (i.e., seasons) or about 17% of the time (Bomar 1995:Figure 88). Inversely, much or very much wetter than normal conditions occurred 11% of the time (19 out of 168 seasons) during this same period. Except for the period between 1951-1956 and 1963-1967, which represent periods of prolonged drought in the region, most droughts appear to be relatively short lived (i.e., a year or so) and are frequently preceded or followed by periods of greater than average rainfall (Bomar 1995:Figure 88). Conditions between moderately dry and moderately wet characterized the region in 120 out of 168 seasons or about 71% of the time.

Flora and Fauna

In general, the natural vegetation of the region has been severely altered by the historic Anglo activities. As such, floral composition drawn from modern surveys is undoubtedly far from perfectly known. Nonetheless, for purposes here these surveys are more than adequate to review the regions' flora. The short-grass Plains district characterizes almost all of the Southern High Plains (Blair 1950; Blair and Hubbell 1938). In this district buffalo grass (*Buchlöe dactyloides*) is the dominant constituent, although various species of grama grasses (e.g., blue and hairy gramma) are also common. These short grasses are well adapted to grazing by bison and provide a thick protective cover for underlying soils that are very susceptible to erosion. Areas around playa lakes and dune sands are characterized by a greater diversity of flora and include various species of beardgrass (*Andropogon* sp.), western wheat grass (*Agropyron smithii*), sand sage (*Artemisia filifolia*), and shin oak (*Quercus havardii* and other species). Prior to Historic times, natural stands of trees were essentially nonexistent on the Southern High Plains.

The Eroded Plains contain a highly variable mix of different species whose presence and abundance are dictated by local conditions. Recent surveys along the Canadian River have documented at least 487 species of native plants representing approximately 70 different families (Wright and Meador 1979; cited in Lintz 1986a:60). In general, however, important species include hairy gramma (*Bouteloua hirsute*), buffalo grass (*Buchlöe dactyloides*), purple (*Aristida purpurea*) and Roemer's three-awn (*Aristida wrightii*), tumble grass (*Schedonnardus paniculatus),* blue grama (*Bouteloua gracilis*), three-awn grama (*Bouteloua trifida*), tumble lovegrass (*Eragrostis sessilispica),* covered-spike drop-seed (*Sporobolus cryptandrus*), Plains three-awn (*Aristida oligantha*), curly mesquite (*Hilaria belanger*), sideoats grama (*Bouteloua curtipendula*), slim-spike windmill grass (*Chloris andropogonoides*), black grama (*Bouteloua eroipoda*), and sandbur (*Cenchrus longispinus*) to name a few (Tharp 1939:62-66).

The canyons and valley floors of the Eroded Plains support a number of different woody species whose abundance and distribution is largely dependant on soil type and available moisture. Well-drained sandy areas are dominant in this area and stands of juniper (*Juniperus monosperma* and *Juniperus pinchotii*), and mesquite (*Prosopis glandulosa*) are widespread. Better-watered valleys containing springs and seeps are marked by groves of cottonwood (*Populus deltoides*), hackberry (*Celtis occidentalis* and *Celtis reticulata*), mesquite (*Prosopis glandulosa*), wild chinaberry (*Sapindus drummondii*), willow (*Salix amygdaloides*, *Salix nigra*, and *Chilopsis linearis*), and chickasaw plum (*Prunus angustifolia*). Juniper, scrub oak (*Quercus mohriana*), grape (*Vitis rupestris*), and stretchberry (*Forestiera pubescens*) are found along the slopes and faces of valleys and escarpments (Rathjen 1998:15).

Lintz (1986a:Table 9) reviews the rich diversity of approximately 100 economically useful species for the Canadian River Breaks environs (i.e., for food, medicinal, or commercial uses). Similarly, an extensive list of floral species is also documented for the Dempsey Divide along the eastern margin of the Southern High Plains (Thurmond 2001). Here, more than 500 individual species were recently documented. Also of interest is the identification of the latter area as an important transition zone for numerous eastern and western species.

At least 59 species of mammalian fauna have been documented in the study area. These animals include bison (*Bison bison*), white-tailed deer (*Odocoileus virginianus*), mule deer (*Odocoileus hemionus*), pronghorn (*Antilocapra Americana*), elk (*Cervus elaphus*), several species of fox (*Vulpes vulpes*, *V. velox*, *Urocyon cinereoargenteus*), coyotes (*Canis latrans*), gray and red wolves (*Canis lupus*, *C. rufus*), cottontail rabbits (*Sylvilagus floridanus*), jackrabbits (*Lepus californicus*), striped and spotted skunks (*Mephitis mephitis*), weasels (*Mustela nigripes*, *M.*

frenata), mink (*Mustela vison*), muskrats (*Ondatra zibethicus),* beaver (*Castor canadensis*), raccoons (*Procyon lotor*), porcupines (*Erethizon dorsatum*), bobcats (*Felis rufus*), prairie dogs (*Cynomys ludovicianus*), gophers (*Geomys bursarius*), voles (*Microtus ochrogaster*), and several types of rats (*Dipodomys ordii*, *Neotoma floridana*, *Sigmodon hispidus*), and mice (*Perognathus spp.*, *Peromyscus leucopus*) (Blair 1950:111).

The ornate box turtle (*Terrapene* ornata) is the only land turtle native to the region, although several aquatic turtles (*Pseudemys scripta*, *Kinosternon flavescens*, *Chelydra serpentina*) are present in streams, rivers, and marsh areas. Other reptiles are well represented and include 14 types of lizards and 31 species of snakes (Blair 1950:111-112). Fourteen species of frogs and toads and one salamander (*Ambystoma tigrinum)* round out the amphibians found in the northern half of the Southern High Plains.

The variety of birds on the Southern High Plains is extensive, and once again, includes many eastern and western species. A total of 293 species of birds are documented for northern portions of the area (i.e, the Oklahoma panhandle; Shackford et al. n.d.). Undoubtedly this number would increase substantially if species for the rest of the region were included. For the Oklahoma panhandle portion of the study area, contexts containing a particularly high avian diversity include Black Mesa and wooded riparian and playa settings. Important taxa documented in the region include 28 species of waterfowl, 24 raptors, 30 shore or wading birds, and four native upland game birds (Shackford et al. n.d.).

Overall, many of the floral and faunal species listed here are not limited to the study area and may be found in adjacent regions. Also, river and stream valleys of the area often provide westward and eastward extensions of border regions and their associated plants and animals. In addition, while many of the above species are typically thought of as being limited to certain settings (e.g., the High Plains, Eroded Plains, short grass district, or riparian and marsh zones), a great deal of overlap exists and many species can be found in multiple environmental zones. This is at least partially a result of the fact that distinctly different habitat types may be in close proximity to each other and are often separated by little transition. For example, the short grass Plains surround playas and their distinct flora and fauna. Likewise, marshy areas and riparian zones of the Eroded Plains often exist within a stones throw of habitats that are almost desert-like. All of these factors serve to add to the ecological diversity documented for the region (see Lintz 1986a:44-62). Comparable biodiversity is documented for other regions (see Lundelius 1967) and presents challenges for archaeologists when conducting ecological catchment analyses and reconstructing past environments.

Paleoenvironmental Reconstructions

In general, past paleoenvironmental studies of the Southern Plains have primarily focused on the delineation of major, long-term climatic events over the last 20,000 years or so (e.g., Bryant and Holloway 1985; Bryant and Shaeffer 1977; Oldenfield and Schoenwetter 1964, 1975; Reeves 1965; Wendorf 1970). These studies have concluded that there have been no significant climatic changes during the last 4000 years. As we shall see, the paleoenvironment on the Southern High Plains for the late Holocene remains poorly understood because of the almost complete absence of crucial classes of data necessary for reconstructing past climates. Nonetheless, these incomplete reconstructions continue to be used as the basis for explaining several important cultural changes that occurred during the last 2000 years.

This research is interested in the human record for the last two millennia, and as such, the paleoenvironmental record for this period is examined here. In general, paleoenvironmental reconstructions for the region during this period are based largely on three primary sets of data: a) geoarchaeological information related to episodes of soil erosion, deposition, and stability, b) vertebrate remains recovered from archaeological sites, and c) pollen. Despite major limitations in the available data, most studies conclude that during the period from 2000 to 1000 years ago climatic conditions were significantly wetter than today (Hall 1988:203). Beginning sometime around 1000 years ago a shift toward modern conditions began (Hall 1984, 1988; Holliday 1985; Lintz 1986a; Lopez 1973; Speth 1983; Wilson 1980). During the latter period a short spike in aridity is thought to have occurred from about 600 to 400 years ago (Hall 1988:208; Lintz 1986a, 1991). In the discussion that follows the three above data sets are briefly reviewed.

Geoarchaeology and geomorphology contribute information regarding past environments through chronologically anchored studies of soil aggradation and degradation, fill genesis, and landform reconstruction. Overall, these studies in the region have focused almost entirely on alluvial settings (e.g., Artz and Reid 1984; Ferring 1986a, 1986b; Fredrick et al. 1993; Hall 1984, 1988; Hall and Lintz 1984).

Unfortunately, “direct evidence for paleoenvironments, such as pollen, snails, and plant macrofossils, is poorly preserved in alluvial sediments” (Ferring 1992:15). As such, the geoarchaeological record often serves as the primary record of past conditions with little correlative data from other sources. In addition, since floodplain stability or instability can be related to highly localized conditions, geomorphic controls for larger areas must be evaluated before data on soil formation can be attributed to climate change. With these points in mind, significant effort has been placed on identifying widespread correlations of soil deposition, erosion, and stability as a means for developing regional models of past environmental conditions for the Southern Plains (see Ruhe 1970, 1983 for discussions on regional modeling).

Previous studies in the region have been successful at identifying widespread floodplain stability and soil formation across much of the Rolling Plains of Oklahoma and Texas between about 2000 and 1000 years ago (Artz and Reid 1984; Ferring 1986b, 1992; Ferring and Hall 1987; Gustavson 1986; Hall 1977, 1982, 1988; Hall and Lintz 1984; Pheasant 1982). This stability is indicated by the development of soils named Copan, Caddo, West Fork, and Quitaque and suggests that wetter conditions accompanied by a high water table prevailed at this time (Hall 1988).

The alluvial record following the development of the above soils is widely considered to be representative of climatic conditions that were drier than those of the previous 1000 years or so (Hall 1982, 1988:208). In general, alluvial deposition in many valleys had resumed and it is thought that a drop in the water table may have accompanied these conditions. While there is little doubt that these alluvial conditions represent a return to drier conditions, the exact timing and magnitude of this event is not well understood and it is apparent that conditions may have varied considerably from area to area. Importantly, it is not well understood how these conditions may have compared to those observed today.

In southern portions of the region, moist conditions appear to have persisted at Lubbock Lake until about A.D. 1250-1400 when development of the Lubbock Lake soil ended and was subsequently buried by aeolian and colluvial sedimentation of Unit 5A (Holliday and Allen 1987:20). Similarly, Palo Duro Creek in the northern reaches of the Texas panhandle "incised and then shifted to more active fluvial sedimentation between 1400 and 600 years B.P. (i.e., A.D. 600 and A.D. 1400)" (Fredrick et al. 1993:435). In the latter area, however, long-term cyclical patterns of sedimentation have been identified which suggest that climate might not be the primary factor influencing sedimentation style (Fredrick et al. 1993:436). Lastly, a weakly developed paleosol dating to A.D. 1350-1600, termed the Delaware Creek paleosol, has been documented in west central Oklahoma (Ferring 1986b, 1986c; Hall 1977, 1982). This paleosol suggests a slowing of valley sedimentation and the establishment of stable floodplains in some areas (Hall 1988:208). Although unclear, the development of the Delaware Creek paleosol is interpreted to represent a peak in the regional drying period rather than a period characterized by wetter conditions.

An intensive radiocarbon dating program of dark organic stained soils dating to the last 2000 years appears to have documented 400-year rainfall cycles for the Southern Plains (Thurmond and Wyckoff 2002). In that study buried soils from 14 different exposures in Roger Mills County, Oklahoma were sampled. Dark organically stained soils (i.e., paleosols) thought to have formed during periods of higher rainfall (termed pluvials) are separated from one another by sediments that are not organically enriched. The latter are believed to have been laid down during periods of lowered precipitation known as interpluvials. Correlation in episodes of soil formation at several localities is interpreted as evidence for the existence of a cyclical pattern of wet and dry periods lasting on the average of 185 years for pluvials and 213 years for interpluvials (see Table 3.2). An examination of the 13C/12C ratios from organic rich soils from the proposed pluvials indicates considerable variation in the abundance of C_3 and C_4 plants contributing organic matter to soils (Thurmond and Wyckoff 2002:Table 2). Although problematical to interpret, this may suggest that stable surfaces conducive to soil formation occurred in both moist and dry settings.

Table 3.2 Dempsey Divide Late Holocene Climate Sequence.*

Climatic Interval	Calender Age	Subinterval Duration
Bean Creek Pluvial	A.D. 1900 to present	100+ years
Bean Creek Interpluvial	A.D. 1650-1900	250 years
Delaware Canyon Pluvial	A.D. 1450-1650	200 years
Delaware Canyon Interpluvial	A.D. 1300-1450	150 years
Brokenleg Canyon Pluvial	A.D. 1150-1300	150 years
Brokenleg Canyon Interpluvial	A.D. 1000-1150	150 years
Higgins Creek Pluvial	A.D. 775-1000	225 years
Higgins Creek Interpluvial	A.D. 600-775	175 years
Herring Creek Pluvial	A.D. 400-600	200 years
Herrring Creek Interpluvial	A.D. 100-400	300 years
Finch Canyon Pluvial	50 B.C.-A.D. 100	150 years
Finch Canyon Interpluvial	300B.C. – 50 B.C.	250 years

* adapted from Thurmond and Wyckoff 2002

Although processes of soil formation are useful for examining broad environmental trends, as the above review indicates, it appears as though under the best conditions this information is primarily useful for identifying patterns on the scale of hundreds or thousands of years (Ferring 1992:30). The development of Copan-

Caddo-West Fork-Quitaque soils in the region appears to indicate that regional climatic conditions between A.D. 0 and A.D. 1000 were moister than prior and subsequent periods (Ferring 1992). In contrast, although a shift to dryer conditions appears to have followed this period, the timing and magnitude of this event and how these compare to modern conditions is not well understood. Overall, given that considerable local variation in soil formation processes appears to be represented, short-term fluctuations in climate during the last 1000 years are much more difficult, if not impossible, to document in the alluvial record. As a result, we must look to other sources for this information.

Faunal remains from archaeological sites are frequently used to reconstruct past environmental conditions. For example, the presence of bison and jackrabbit remains at an archaeological site which today is outside the normal ranges of these species is often interpreted as evidence for xeric conditions (i.e., dry) at the time of occupation. Likewise, the same line of reasoning is often applied for the presence of mesic (i.e., wet) species. However, the use of macrofaunal materials from archaeological sites for paleoenvironmental reconstructions is known to be problematic and assumes that prey selection by human hunters is representative of local resource abundances, and by extension, climatic conditions. As such, microfauna (i.e., mice, shrews, and voles) are usually considered to be more useful for delineating local environmental conditions than macrofauna (i.e., bison, antelope, deer, and rabbits) because they are less likely to be affected by prehistoric cultural activities. However, because microfauna may be representative of highly localized conditions (e.g., an oasis in the middle of a desert), these forms of data should be correlated with other forms of evidence (Lundelius 1967).

Despite the cautions related above, the primary vertebrate evidence used as indicators of past climate on the Southern Plains during the last 2000 years has largely been limited to macrofaunal species, namely bison. Based on the frequency or presence of bison elements in archaeological sites, Dillehay (1974) and others (S. Baugh 1986; Huebner 1991; Lynott 1979) suggest that bison were abundant in the region prior to A.D. 500. Although few single component Early Ceramic sites dating between A.D. 500 and 1250 have been systematically investigated on the Southern High Plains (see Chapter Four), researchers suggest that bison populations in the region were greatly reduced at this time. Bison remains are common in the archaeological record following A.D. 1250 and the onset of the Middle Ceramic period. Under the assumption that human hunting strategies are correlated to climatic conditions and that bison are more abundant during drier periods and scarcer during wet periods, this information can be interpreted to mean that the climate was dry until about A.D. 500, wetter from A.D. 500-1250, and drier again after A.D. 1250.

Changes in the frequency of bison and deer through time in the archaeological record are also frequently used as evidence for perturbations in past climate. Here, bison and deer are equated with drier and wetter conditions, respectively. For example, Hall (1988:208) interprets the presence of bison, along with badger and Hispid pocket mouse, at the Wybark site (A.D. 1350-1600) in eastern Oklahoma as evidence for drier conditions for this area at that time. In contrast, Drass and Flynn (1990:Table 3) note that deer outnumber bison in seven of nine sites in central and western Oklahoma occupied between A.D. 1100 and A.D. 1500. These sites all lay west of the sites examined by Hall (1988) and following the logic used above would appear to suggest moist conditions for central and western Oklahoma at that time.

Overall, these examples serve to highlight the fact that a great deal of variability exists in the frequency and types of macrofaunal remains recovered at archaeological sites. Currently, there does not appear to any clear correlation between these remains and past climatic conditions (see Chapters Four and Seven; Drass and Flynn 1990). In addition, depending on which faunal assemblages one elects to consider dramatically different environmental scenarios can be proposed.

In general, although it is widely accepted that microfaunal remains are perhaps some of the best indicators of past climate (Graham and Lundelius 1984; Toomey 1989, 1993 Toomey et al. 1993), they are seldom used by archaeologists in the study area. Of all the microfaunal species available, the Prairie Vole (*Microtus ochrogastor*) has been most widely used (see Duffield 1970:231-232; Hall 1988:208; Johnson 1987:76, 87). Its presence in early and late Holocene contexts on the Southern High Plains is typically presented as evidence for higher precipitation and lower annual temperatures. A recent survey of playas in the Oklahoma panhandle, however, documented Prairie Vole remains in every modern hawk pellet (n=15) recovered at Eva playa in northwest Texas County (Brosowske and Bement 1998). Although unclear at this time, it appears as though their presence on the Southern High Plains is more widespread than previously thought. If so, their potential value as key paleoenvironmental indicators may not be as helpful as is generally considered.

Overall, the use of faunal remains recovered from archaeological sites as a tool for reconstructing past climates of the region is clearly wrought with a number of problems. Given the variable distribution of many species, coupled with the environmental diversity noted earlier and the bias introduced by human hunting strategies, it seems unlikely that these data by themselves can provide information regarding short-term climatic events sought by archaeologists to explain rapid cultural change. Therefore, while precise paleoenvironmental trends of wet versus dry may eventually be distinguished using multiple data sets, reliance on macrofaunal remains from a small sample of sites will probably always be tentative.

On the Southern High Plains pollen is often poorly, if at all, preserved in sample localities (Bryant and Larson 1968; Bryant and Schoenwetter 1987:39). For example, at Lubbock Lake, Bryant and Schoenwetter (1987:39) note that palynologists were either not able to find identifiable pollen or pollen was poorly preserved in sediment samples from this locality. Similar results have been obtained elsewhere in west Texas (see Bryant and Larson 1968). Unfortunately, there are many reasons why pollen may be poorly preserved at sites in the region and it is difficult to isolate or identify specific conditions that may be more conducive to its preservation at this time (see Holloway 1981; Bryant and Schoenwetter 1987:39; Hall 1995). On the bright side, playa basins may, however, represent a setting in which pollen records are preserved; unfortunately these contexts have yet to be extensively studied.

The extant pollen record currently available from the Southern Plains for the Late Holocene is extremely sparse, but appears to reflect a gradual succession from the dry arid grasslands of the Middle Holocene to the modern vegetational communities present today (see Bryant and Holloway 1985 for an overview). Perhaps the best pollen record for the region comes from over 300 km to the east of the Southern High Plains at Ferndale Bog in southeastern Oklahoma (Albert 1981). The record from this location indicates that a moist open forest characterized the area from 700 B.C. to A.D. 300. From A.D. 300 to about A.D. 1450 the forest became closed and consisted of an oak-hickory-pine forest. Fluctuations in arboreal taxa at Ferndale Bog from A.D. 1200-1300 and A.D. 1500-1600 were originally presented as evidence for climate instability (Albert 1981). More recently, however, these data have been reevaluated and are thought to be representative of a "series of secondary vegetational secessional patterns resulting from local forest fires" (Bryant and Holloway 1985:64). Overall, the pollen record from Ferndale Bog and other sample localities provides little evidence for any dramatic climate change during the last 2000 years and that an essentially modern plant community, and presumably climate, were established sometime around A.D. 800 (Albert 1981; Bryant and Holloway 1985; Hall 1982).

From the preceding paleoenvironmental review there are several points that need to be emphasized. First, and perhaps most importantly, there is little basis to support the existence of any extraordinary, long-term climatic fluctuations that equally effected all parts of the Southern Plains during the last 2000 years. At best, the current data may indicate moister conditions prior to A.D. 1000, followed by a gradual transition to modern climate and floral and faunal communities.

Second, it is apparent that the current paleoenvironmental record is sufficiently incomplete enough that either dry or wet conditions can be proposed depending on the types of data one elects to emphasize. Because there are numerous interpretational problems with individual data sets, as a rule, multiple sources of data should be used for delineating meaningful climatic patterns. Although broad trends on the scale of millennia may be discernable at present, clear evidence needed to demonstrate dramatic, short-term instability in climate, such as that provided by dendrochronology (see Rose et al. 1981), is currently not available for the region.

Third, there are numerous problems evident in using macrofaunal remains for reconstructing past climates of the region. Even though it is common knowledge that prey selection by people is subject to a number of different cultural processes, the frequency of bison, deer, and antelope and other macrofaunal remains from archaeological assemblages continue to be used to reconstruct past climates. A review of faunal assemblages from archaeological sites of the region display considerable diversity in the taxa represented (see Chapters Four and Eight; Drass and Flynn 1990). I suggest that these patterns are largely unrelated to climate and reflect variability in human hunting economies.

Lastly, a review of the major paleoenvironmental studies for the region suggests that previous reconstructions of climate have been strongly influenced by known events observed in the archaeological record (see Lensink 1993 for a similar scenario). While this has not been an exhaustive review of every source, these discussions do not support the conclusion that the Southern Plains experienced any striking climatic changes over the last 2000 years. As such, I would argue that we do not have a firm basis for supporting climate change as the primary explanation for the emergence of horticultural economies, shifts in hunting economies, or increases in regional exchange.

Overall, the points made here should not be construed to suggest that the structure of past climate is not important, for many fundamental issues regarding the ecological setting and its natural resources are certainly central to this research. Unfortunately, the current paleoenvironmental record does not enable us to precisely model how past conditions may have varied from those observed today. As a result, anthropologically based models are emphasized in this study as the primary means for explaining variability among prehistoric human societies.

Summary

The preceding review documents a modern grassland environment characterized by precipitation and temperature patterns that vary from day to day, season to season, and year to year. On a spatial scale, fairly dramatic variability is also documented for geology, topography, wet versus dry habitats, and the distribution and abundance of natural resources over short-distances. Undoubtedly, this variability has had profound effects on economic strategies of the region and our ability to reconstruct fine-scale models of paleoenvironmental conditions for the last 2000 years.

A review of paleoenvironmental reconstructions highlights numerous problems in the way existing data sets have been interpreted and argues that dramatic shifts between wet and dry conditions are not well supported by the current record. Instead, it is proposed that the best interpretation that can be made at this time is a fairly gradual transition from wetter to modern conditions or possibly a shift to more variable precipitation and temperature patterns during the last 2000 years. As such, although future studies may eventually provide more conclusive data, it is argued that it is premature to invoke climate change as the primary explanation for the variability observed in the archaeological record from A.D. 500-1500.

Despite the fact that past climates and environmental conditions of the region are poorly known, previous studies have long proposed that dramatic long-term climate change did occur during the last 2000 years and that people responded in dramatic fashion to these changes (i.e., they abandoned regions, colonized new areas, drastically altered subsistence strategies, and developed interdependent exchange relationships). It is interesting to note that many similar types of events and behaviors are also documented for the Historic period. However, because we have a much better handle on the details surrounding this time we know that many of these events were seldom the sole result of climate change, but were related to other factors, such as the adoption of new technologies, warfare, endemic diseases, and the movement of social groups.

At the risk of appearing to argue against the use of ecological or environmentally based models, I would propose we have placed too much of an emphasis on paleoenvironmental data that are very incomplete and subject to a number of interpretations. Although it is likely that models of cultural behavior derived from such data are flawed not only because we presume to know what climatic conditions were like, but also because we presume to know how various plant, animal, and human societies were affected by various climatic conditions.

In sum, this chapter has provided a description of the environmental setting of the study area. While past conditions are poorly understood, at the very least, there is little reason to doubt that the study area was not characterized by the climatic and environmental diversity observed today. This is not to say that conditions in the past were exactly like those of today, but rather that the Plains have always been variable. If this is true, one would expect that a given species, be it floral, faunal, or human, might develop adaptations that sought to minimize the impact of this ecological variability. In fact, this may be the case for a number of plant and animal species of the region, as Johnson (1987:161) notes that although the paleoenvironmental record of the last 1000 years appears to suggest short-term departures toward drought on the Southern High Plains, these perturbations "were apparently not severe enough to affect adversely the faunal and floral communities." If so, is seems possible that the same might be true for human societies of the region. Overall, while I do not propose to have the answers to many of the questions raised here, they do at least provide food for thought as we examine the nature of societies that inhabited the Southern High Plains and adjacent regions during the last 1500 years.

CHAPTER FOUR

The Contextual Setting of Exchange: The Southern High Plains (A.D. 400-1500)

This chapter seeks to establish a cultural context surrounding the development of exchange on the Southern High Plains. Two distinct perspectives, one diachronically oriented and the other spatial, are emphasized and provide the contextual information crucial for understanding the structure of exchange. Overall, the ensuing discussion lays the foundation for a basic understanding of the prehistoric cultural setting of the Southern High Plains between approximately A.D. 400 and A.D. 1500 and sets the stage for a study of regional exchange in Chapters Five and Six.

In order to provide both contextual and historical dimensions to this study, this overview examines Early and Middle Ceramic period entities that occupied the region from about A.D. 400 to A.D. 1500. Overall, each of the archaeologically defined entities examined here embody distinctive material characteristics which set them apart from other contemporaneous groups of the region and it is presumed that these similarities also equate to differences in other less tangible realms as well (e.g., economic, social, political, religious, etc.). While these discussions concentrate on populations occupying the Southern High Plains, other groups that influenced and interacted with local cultural groups, but which lived outside this area, are also briefly examined.

Previously, prehistoric cultural phenomena on the Southern High Plains between A.D. 400-1500 have been described using a number of different designations, including Plains Woodland, Neo-Archaic, Transitional Archaic, Late Prehistoric I (LP

I), Plains Village, Late Prehistoric, Neoindian, and Late Prehistoric II (LP II) among an assortment of others (Boyd 1997; Drass 1997; J. Hughes 1991). Because many of these terms have their origins in other regions and imply meanings that may not be entirely appropriate for the study area, this research elects to use the terms Early Ceramic and Middle Ceramic to denote societies that occupied the region from A.D. 400-1200 and A.D. 1200-1500, respectively. The following review of the region's culture history is presented in the traditional format of earliest to latest as is typical of most previous treatments. However, one must bear in mind that while these discussions are organized chronologically to provide a historical perspective to this study, evidence for long-term cultural continuity between Early and Middle Ceramic societies of the region remains in doubt and has yet to be satisfactorily demonstrated.

Lastly, it is not entirely appropriate to state that the following discussions are simply a review of earlier studies; otherwise a brief summary of previous work would suffice and the reader could be directed to important sources for detailed discussions. Generally speaking, most major studies of the Early and Middle Ceramic periods of the Southern High Plains have been concerned with constructing a regional cultural chronology (Boyd 1997; Campbell 1969; Krieger 1946; Lintz 1986a). Although the present research certainly relies to a great extent on this preceding work, the orientation of this research requires greater emphasis on topics, such as subsistence economies and settlement patterns, which have only been examined in a cursory fashion by earlier studies. As a result, because a basic understanding of these topics is essential to the present research, a great deal of space is devoted to establishing a baseline of information for these and other related topics using existing and newly acquired datasets.

Early Ceramic Period (A.D. 400-1200)

The term Early Ceramic (A.D. 400-1200) refers to a series of poorly known cultural complexes identified for the region that have previously been attributed to the Plains Woodland, NeoIndian, or LP I periods (Boyd 1997; J. Hughes 1991; Vehik 1984). These groups essentially represent a continuation of the foraging lifestyle documented for the preceding Archaic period with a few important changes (J. Hughes 1991; Thurmond 1991). As the name denotes, the Early Ceramic period on the Southern High Plains marks the earliest documented appearance of ceramics in the region. A second important development of the period is the bow and arrow. While evidence for food production is documented at a few sites (Carmichael 2004; McKay et al. 2004) it is apparent that horticulture was of limited importance to the diet until the subsequent Middle Ceramic period (see Adair 2003; Boyd 1997).

Fortunately, ceramics and arrowpoints produced at this time are fairly distinct from other time periods and coupled with information on settlement location and lithic raw material use often enables identification of sites belonging to this period. Although many sites undoubtedly remain undocumented, it is estimated that less than 80 Early Ceramic sites are currently recorded for this 800 year long period in the Texas and Oklahoma panhandles (Boyd 1997:Table 66; Carmichael personal communication 2004; Oklahoma Archeological Survey Site Files 2002; Texas Archeological Site Atlas 2003). Key cultural markers of the period are thick conoidal shaped ceramic vessels and corner and basally notched arrowpoints. The following provides a brief overview of Early Ceramic period societies of the Southern High Plains. Useful summaries for the period have been previously presented by Boyd (1997) and others (Cruse 1992; J. Hughes 1991; Hofman and Brooks 1991; Thurmond 1991; Vehik 1984) and the following is largely derived from these sources.

At present, two Early Ceramic cultural complexes have been identified in the study area. These include the Lake Creek and Palo Duro complexes (Figure 4.1). The Lake Creek complex was originally identified by Jack Hughes (1962) following test excavations at the type site in Hutchinson County, Texas in 1953 (Figure 4.1). Based on diagnostic artifact types, Hughes (1962:82) concluded that both Early and Middle Ceramic occupations were represented at the Lake Creek site. Unfortunately, no discrete features were identified and nearly all cultural debris from the site was from mixed or surface contexts. As a result, attributing individual artifacts to specific components is problematic at best.

While Hughes (1962) acknowledged the poor stratigraphic integrity at the Lake Creek site, it is also clear that he recognized corner notched projectile points and thick, coarse tempered conoidal ceramics as distinct from forms produced by later Middle Ceramic populations. In addition, while not noted in the 1962 article, it is likely that Hughes had observed similar types of projectile points and pottery forms during his many years of work with private collections and from survey and excavation at other sites in the Texas panhandle. Therefore, while delineation of specific details regarding these Early Ceramic populations was not possible at the time (Hughes 1962:83), the widespread co-occurrence of thick cordmarked ceramics and corner notched projectile points at numerous sites of the region justified the formal identification of an Early Ceramic complex known as Lake Creek. Unfortunately, subsequent work in the region has done little to further our understanding of these groups.

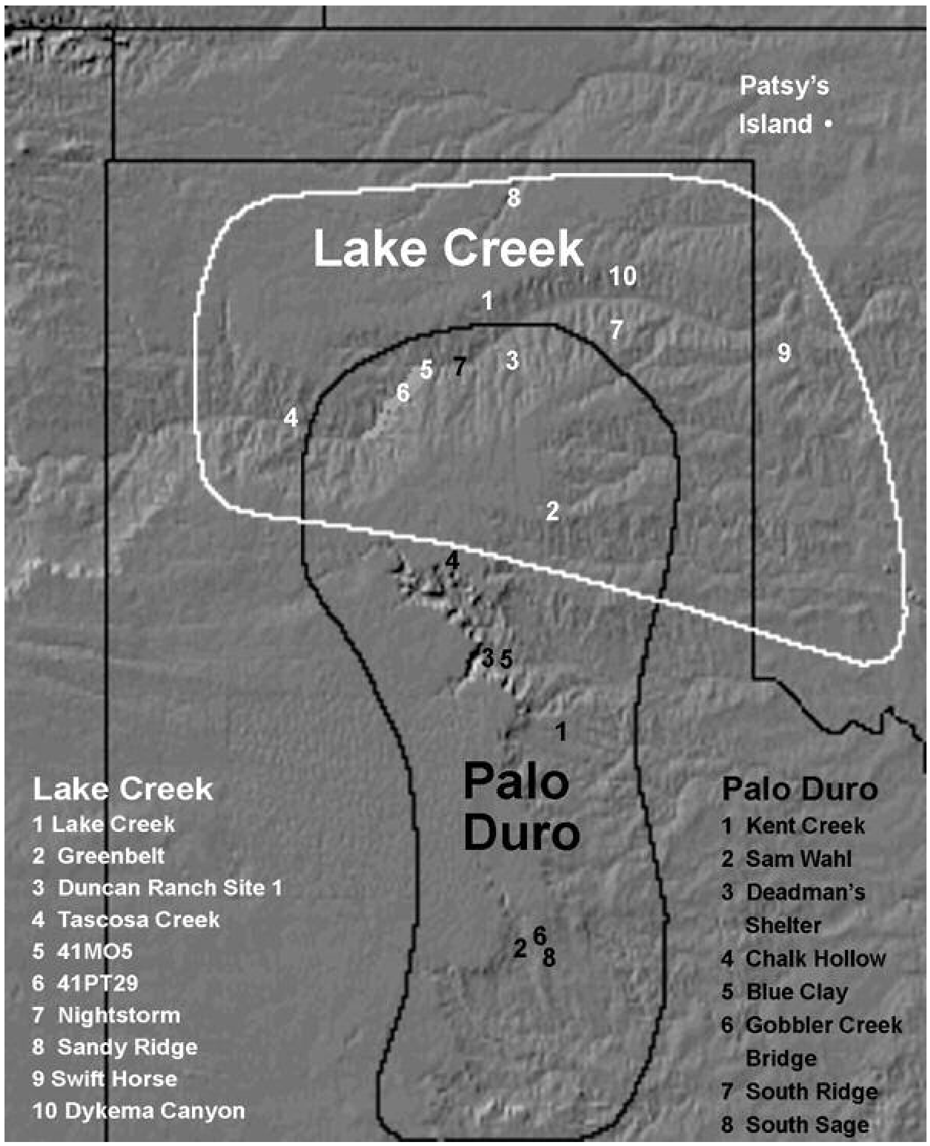


Figure 4.1 Early Ceramic Sites of the Southern High Plains.

A total of 13 Lake Creek complex sites have been recorded since 1962 and delineate a spatial distribution for the complex (Figure 4.1). These sites include Greenbelt (41DY17), Duncan Ranch Site 1 (41HC124), Tascosa Creek, 41MO5, 41PT29, Night Storm (41RB21), Sandy Ridge (41HP5), and possibly, Swift Horse (34RM501). Unfortunately, most, if not all, of these Lake Creek sites have multiple cultural components (Boyd 1997). Since later populations frequently reoccupied these same settings and significantly modified the landscape through the construction of residential facilities, it is often impossible to attribute specific artifacts and features to Early Ceramic occupations. Only four of the 13 Lake Creek sites listed by Boyd (1997:282-289), "have sufficient contextual integrity and quality of published data" to be used to define the Lake Creek complex. These sites include Lake Creek, 41PT29, Swift Horse, and Block A at Sandy Ridge. Currently, the Lake Creek complex is not well dated, but is thought to have begun sometime around A.D. 400. The few dates available are concentrated between A.D. 400 and A.D. 900, although the complex is assumed to have lasted until the appearance of Middle Ceramic populations around A.D. 1200 (Boyd 1997:Table 67).

Given the paucity of systematically excavated data, a very limited reconstruction of Lake Creek lifeways is possible at this time. Nevertheless, the available evidence indicates a mobile foraging lifestyle that included the exploitation of locally available plant and animal resources from short-term or possibly seasonally occupied campsites. Importantly, recent work by Carmichael (200 4) at the Patsy's Island site has demonstrated that some Early Ceramic groups along the northeastern margins of the region were experimenting with horticulture by A.D. 750. However, considering that residential structures and storage facilities have yet to be identified for any sites, this development appears to have had little impact on existing lifestyles. Overall, given the nature of available data sets, previous discussions have been limited to consideration of settlement mobility, the subsistence economy, and technological organization. As such, foraging models, such as those proposed by Binford (1980) and Kelly (1995), provide useful frameworks for describing these groups.

Concentrations of cultural materials have been documented at some Early Ceramic sites, which at first glance, appear to indicate fairly sizeable occupations of some length. However, it is more likely that these represent the archaeological signature produced by reoccupation of a general locale over several hundred years by small groups of foragers rather than large aggregations of groups (Thurmond 1991:129). Indeed, a recent examination of single component Early Ceramic sites suggests that sites or camps are generally quite small and suggest occupation by nuclear or extended families (see Bement and Brosowske 2001:31, 41, 61). That the settlement locations of Late Archaic and Early Ceramic sites remain virtually unchanged lends further support for considerable continuity between the two periods (J. Hughes 1991:26; Thurmond 1991:120).

Assemblages associated with Early Ceramic sites exhibit a number of similarities to those of the preceding Late Archaic period and suggest a persistence of a broad-spectrum foraging economy (Thurmond 1991). Like the preceding Late Archaic, bison are well represented at all Lake Creek sites, although a wide variety of other faunal resources are also typically recovered (see Boyd 1997). As discussed later, Early Ceramic sites in western and central Oklahoma exhibit increased frequencies of groundstone and fire cracked rock. Together these items suggest that a variety of floral resources were collected and processed. Although floral assemblages are essentially nonexistent from Lake Creek complex sites, it is likely acorns, prickly pear, plums, grapes, nuts, and other native plants were exploited (see discussion below of plant use among Palo Duro complex groups).

Overall, artifact assemblages, subsistence, and settlement suggest that little substantial change occurred between 500 B.C. and A.D. 1000 and that the Early Ceramic was simply an Archaic adaptation with the addition of bow and arrow, ceramics, and in some cases, limited food production. This suggests continuity in cultural tradition rather than the replacement of one group by another (Boyd 1997:282). Nonetheless, some relatively important changes can be observed between each of these periods.

First, the large communal bison kills well documented for the Late Archaic are not known for the Early Ceramic period (see Bement and Buehler 1994; Buehler 1997; Hughes 1977). The absence of large kills during the Early Ceramic has been interpreted to mean that bison were less abundant because the region was experiencing a wetter than usual climatic episode rather than other equally plausible explanations (see Boyd 1997; Dillehay 1974). In contrast, a similar environmental scenario is thought to result in an increase in communal bison hunting on the Northern Plains (see Reher 1978; Reher and Frison 1980). The idea that the abundance of bison kills may not be related to climate is suggested by the fact that kills are equally rare for the Middle Ceramic period; a time when we know that societies were actively hunting bison.

Secondly, the accumulation of midden deposits at several Early Ceramic sites (see Bement and Brosowske 2001; Boyd 1997; Carmichael personal communication 2003; Oklahoma Archeological Survey Site Files 2002) suggest that some sites were occupied for longer periods of time than before. Boyd (1997:294) has suggested that foods derived from plant resources become more important during Early Ceramic times. If correct, an intensification of existing plant resources may have effectively increased the density of food resources and allowed longer occupation at settlements. Despite potential trends toward economic intensification, the general paucity and size of sites suggests that these changes did not lead to noticeable increases in regional populations at this time.

To the south, the Palo Duro complex (A.D. 500-1100) has been identified for a series of Early Ceramic sites in west Texas and the southern panhandle region that contain corner notched and stemmed arrowpoints and brownware ceramics (Boyd 1995, 1997). Current reconstructions of the Palo Duro complex are based on research conducted at a few systematically excavated sites. These studies suggest a foraging lifestyle essentially the same as that described above for the Lake Creek complex. In particular, work at the Kent Creek (41HL66) and Sam Wahl (41GR291) sites have provided important details regarding Palo Duro architecture, subsistence, and technology (e.g., Boyd 1997; Boyd et al. 1994; Cruse 1992). Other notable sites include Deadman's Shelter, Chalk Hollow, Blue Clay, Gobbler Creek Bridge, South Ridge, and South Sage Creek (Boyd 1997).

A wide variety of site types have been recognized for the Palo Duro complex including seasonal habitations and hunting and plant processing campsites. The Kent

Creek and Sam Wahl sites have been interpreted as villages (Boyd 1997:300). However, occupation by more than one or two families has yet to be satisfactorily demonstrated and it seems unlikely that these sites are villages as they are generally defined. Excavated features at these two sites include hearths, roasting pits, burials, burned rock features, and three rectangular to oval houses (Boyd 1997:298, 321). In addition, there are several shallow pits approximately 50 to 80 cm deep at the Sam Wahl site that are interpreted as subterranean storage features. Plants and animals documented at the Kent Creek site include deer, antelope, bison, skunk, prairie dog, turtle, mussels, acorns (*Quercus*), pigweed (*Amaranthus*), goosefoot (*Chenopodium*), and purslane (*Portulaca*) (Cruse 1992:142 -145).

Overall, material assemblages from Early Ceramic period sites of the region suggest that these populations were mobile, broad-spectrum foragers. In particular, lithic assemblages are characterized by the use of local raw materials for tool production (Boyd 1997:292; Brosowske et al. 2000), although some nonlocal sources may be used at times for the production of projectile points. In addition, except for projectile points, there is little evidence for the production of specialized tool forms. In general, site assemblages are characterized by a wide variety of expedient tool forms.

Early Ceramic groups appear to have been scattered across the landscape in nuclear family or extended family groups. These populations probably occupied distinct territories and emphasized locally available raw materials and food resources. The absence of bison kills so prevalent in preceding periods and the abundance of small residential sites may suggest a decline in community organization above the family group at this time. It is possible that low population densities coupled with an increase in plant use may have enabled greater economic autonomy among resident groups. Although minimally discussed here, nonlocal trade items are rare. This suggests that intersocietal contact, beyond the need to insure access to important resources, was poorly organized and of little socioeconomic importance (see Chapter Six). Also of importance are numerous Early Ceramic burials that indicate that the period was characterized by "widespread violence" (Boyd 1997:508). These burials often contain diagnostic arrowpoints of the period embedded in bone and provide convincing evidence for conflict. Despite the apparent economic autonomy and low population densities, these data appear to indicate significant competition among local groups (see Boyd 1997; Wilkens 2001). While unclear at this time, local disputes over land-use may have arisen as formal claims to specific locations and their resources were made by groups (see Chapter Seven).

Lastly, Lake Creek and Palo Duro complex sites are still essentially identified by the presence of particular arrowpoint forms and thick coarse tempered ceramics. However, because additional cultural traits beyond a generalized foraging lifestyle have yet to be clearly defined for these complexes, essentially any settlement within the region containing these types of artifacts is attributed to one of these taxonomic entities. In Kansas, sites containing similar types of artifacts are attributed to the equally ambiguous Keith focus (Hofman and Brooks 1991; Kivett 1953; O'Brien 1984). Unfortunately, these artifacts do not appear to be diagnostic of any one Early Ceramic entity and may be representative of populations that occupied vast portions of the Central and Southern High Plains between A.D. 400 and A.D. 1200 (see Hofman and Brooks 1991; Kivett 1953; O'Brien 1984). As such, until systematic excavations geared toward the complete recovery of artifact assemblages are conducted at single component sites (or multi-component sites with good stratigraphic control), Early Ceramic entities, such as Lake Creek and Keith, will remain ambiguous.

The Middle Ceramic Period of the Southern High Plains (A.D. 1200-1500)

The Middle Ceramic period denotes horticultural groups that occupied the region from about A.D. 1200 to A.D. 1500. Elsewhere the terms Plains Village, Late Prehistoric, and LP II have been used to designate this time period (e.g., Boyd 1997; Drass 1997; Lintz 1986a). These populations are broadly described as sedentary to semi-sedentary groups who practiced a mixed economy of hunting, foraging, and horticulture. Although the Middle Ceramic is perhaps the best known of all prehistoric periods on the Southern High Plains, it is readily apparent that a great deal of very basic information about these societies still remains unknown.

Although highly variable among resident groups, the Middle Ceramic period of the Southern High Plains is marked by a number of important cultural developments including dependence on cultivated foods, storage, intersocietal exchange, rapid growth in regional populations, decreased mobility, changes in ceramic technology, the widespread appearance of permanent settlements, distinct forms of residential architecture, specialized tool economies, the control of crucial resources, and in some cases, the formation of villages and economic specialization. It is likely that each of these developments did not occur fortuitously, but in fact were all highly reinforcing events. Given the extent of these changes it is not surprising that the period was characterized by greater social complexity than earlier periods.

The Middle Ceramic period and all of its associated cultural changes appear very abruptly in archaeological record of the Southern High Plains region. That these developments appear very rapidly and that there is little evidence for *in situ* growth out of preceding cultural complexes suggests that these changes are set into motion by increased social interaction and/or the immigration of groups into the region following A.D. 1200. Overall, cultural migration as a primary explanation for the dramatic changes associated with the onset of the Middle Ceramic period has certainly not been popular among researchers of the region for the last 30 years or so and models invoking migration (e.g., Campbell 1969, 1976) have been met with severe criticism (e.g., Lintz 1978). Regrettably, rebuttals have focused largely on refuting models of migration and little actual research has been carried out to demonstrate that the observed cultural developments arose out of existing populations. Although I do not attempt to resolve this issue here, I think it is safe to conclude that at the *very least* the Middle Ceramic period of the Southern High Plains is characterized by the rapid adoption of ideas and technologies that are previously unknown in the region.

Whatever the case may be regarding the origins of various societies of the region, it is clear that the development and fluorescence of interdependent exchange was a Middle Ceramic event. Since exchange is extremely multifaceted and can serve a number of different purposes, all of which are tightly interwoven into the fabric of society, in order to understand this development it is essential to understand the contextual setting in which it emerges. In the case study to be examined, it is apparent that the emergence of exchange on the Southern High Plains coincides with a number of other significant cultural changes. Unfortunately, many of these developments remain minimally investigated at present. As a result, it is necessary to examine these in greater detail.

Middle Ceramic cultural complexes currently recognized for the Southern High Plains region include the Antelope Creek and Odessa phases. These two phases are the focus of this discussion, although other peripheral groups, such as those of the Red Bed Plains Variant and the eastern Pueblos, are also examined to a limited extent. These discussions rely on both previously published information and unpublished results provided by investigations conducted as a part of this research. Primary sources utilized in this section include Brosowske and Bevitt (n.d.), Cordell (1989), Drass (1997), Lintz (1986a), and Spielmann (1996). These discussions focus primarily on the spatial and temporal distribution, subsistence economy, architecture, settlement, and mortuary practices. Overall, because the material economies of Middle Ceramic groups of the Southern Plains are so similar, little attention is given to this area. As a result, the reader is encouraged to consult the sources listed above for more specific details on diagnostic artifact classes of the period. In addition, because evidence for involvement in intersocietal exchange as indicated by the presence of nonlocal trade items for each of the taxonomic entities considered here are the focus of Chapters Five and Six, little time is spent here discussing these data. Overall, these discussions serve only as a general overview of societies of the region as particularly important trends and developments are examined in greater detail in Chapters Seven and Eight.

The Antelope Creek Phase (A.D. 1250-1500)

The Antelope Creek phase and its highly distinctive stone architecture represents one of the most intensively studied and widely recognized Middle Ceramic period complexes found on the Southern Plains. Unfortunately, given that the vast majority of previous investigations at these sites were conducted many decades ago, it also represents one of the more enigmatic, and at times, most misunderstood cultural complex of the region. Overall, because most excavations were conducted prior to the advent of many modern sampling, documentation, and collection strategies now commonplace, reconstructions of the phase have been limited largely to issues related to chronology, architecture, and material assemblages (Brooks 2004). Regrettably, few investigations have been conducted in the last 30 years to supplement earlier studies.

Christopher Lintz's *Architecture and Community Variability within the Antelope Creek Phase of the Texas Panhandle* (1986a) published nearly 20 years ago still provides the most thorough overview of the phase currently available. Although no fieldwork was conducted as a part of his research, Lintz (1986a) pulled together a large number of important, and often rare, sources pertaining to the phase in an effort to understand the nature of Antelope Creek architectural variability. While the results of this research are largely cultural historical in nature (Brooks 2004), the immense volume of supplemental data contained within this study has proven extremely useful to Middle Ceramic researchers. All in all, Lintz's (1986a) work continues to serve as a landmark study for the region and is extensively relied upon here.

In the discussion that follows a much needed up-to-date overview of the Antelope Creek phase is presented. Since active field data collection at these sites essentially ended some 30 years ago (see Lintz 1986a:5-22 for a history of investigations prior to 1980) modern researchers have been forced to make do with extant data sets. During this period of inactivity numerous ideas regarding the phase have been proposed. Unfortunately in the absence of systematic field research, most of these ideas have not been sufficiently tested or are based on incomplete data. As such, they still remain hypotheses. Nonetheless, as is commonly the case, if read and quoted enough times, untested hypotheses seem to have a life of their own, and often, eventually become regarded as established facts. Therefore, with these limitations in mind, a major purpose of this discussion is to objectively as possible examine the Antelope Creek phase and determine what conclusions can or cannot be drawn at this time (see Brooks 2004). Characteristics of the phase as defined by Lintz (1986a) are used as a starting point from which to begin this review.

Distribution

The geographic distribution of the Antelope Creek phase as originally proposed by Lintz (1986a:Figure 1, 29-30) includes all of the Texas panhandle, the eastern two-thirds of the Oklahoma panhandle, the westernmost tier of counties in the main body of Oklahoma, and northeastern New Mexico. A review of site records and published sources, however, clearly indicates that two distinct concentrations of sites are localized within a much smaller area. These two clusters occur along the Canadian and Beaver rivers of the Texas and Oklahoma panhandles, respectively (Figure 4.2). In the following, the distribution of permanent habitation sites with residential architecture and material assemblages that can be firmly tied to the Antelope Creek phase are emphasized.

A northern cluster of sites occurs almost exclusively in Texas County, Oklahoma, along the Beaver River and its tributaries (see Bement and Brosowske 2000; Duncan 2002; Johnston 1934; Lintz 1976; Oklahoma Archeological Survey Site Files 2002; Schneider 1969; Watson 1950). Here, a total of 12 sites have been documented that contain or were likely to have contained habitation structures with stone foundations and can be characterized as permanent settlements of the Antelope Creek phase (see Appendix VI). Equally important, but rarely noted in the literature, are a number of sites in this area that almost surely represent seasonal camps or logistical resource procurement locales for groups of the phase (Oklahoma Archeological Survey Site Files 2002). These sites typically occur on playas or ephemeral drainages, lack permanent living structures, and contain abundant Borger or Stamper ceramics and diagnostic chipped stone tools of Middle Ceramic age produced almost exclusively from Alibates silicified dolomite (see White 1987).

The second concentration of Antelope Creek sites occurs on the Canadian River and its tributaries in the Texas panhandle. Sites within this cluster have received a great deal of research attention in the past and are among the best known of the phase (Baker and Baker 2000; Duffield 1964; Green 1986; Holden 1929, 1930, 1931, 1932; Keller 1975; Krieger 1946, Lintz 1986a, 1990; Moorehead 1931; Studer 1931a, 1931b, 1934, 1955). Twenty-eight sites found in and around the Lake Meredith area were the focus of Lintz's (1986:Figure 4) study. Additional sites with stone architecture are further documented in and around this area by others (e.g., Bousman

1974; Etchieson 1981; Keller 1975; Lintz 1990; Texas Archeological Site Atlas 2003). This dense concentration of sites is centered around the famed Alibates quarries and is often referred to as the core area of the Antelope Creek phase.

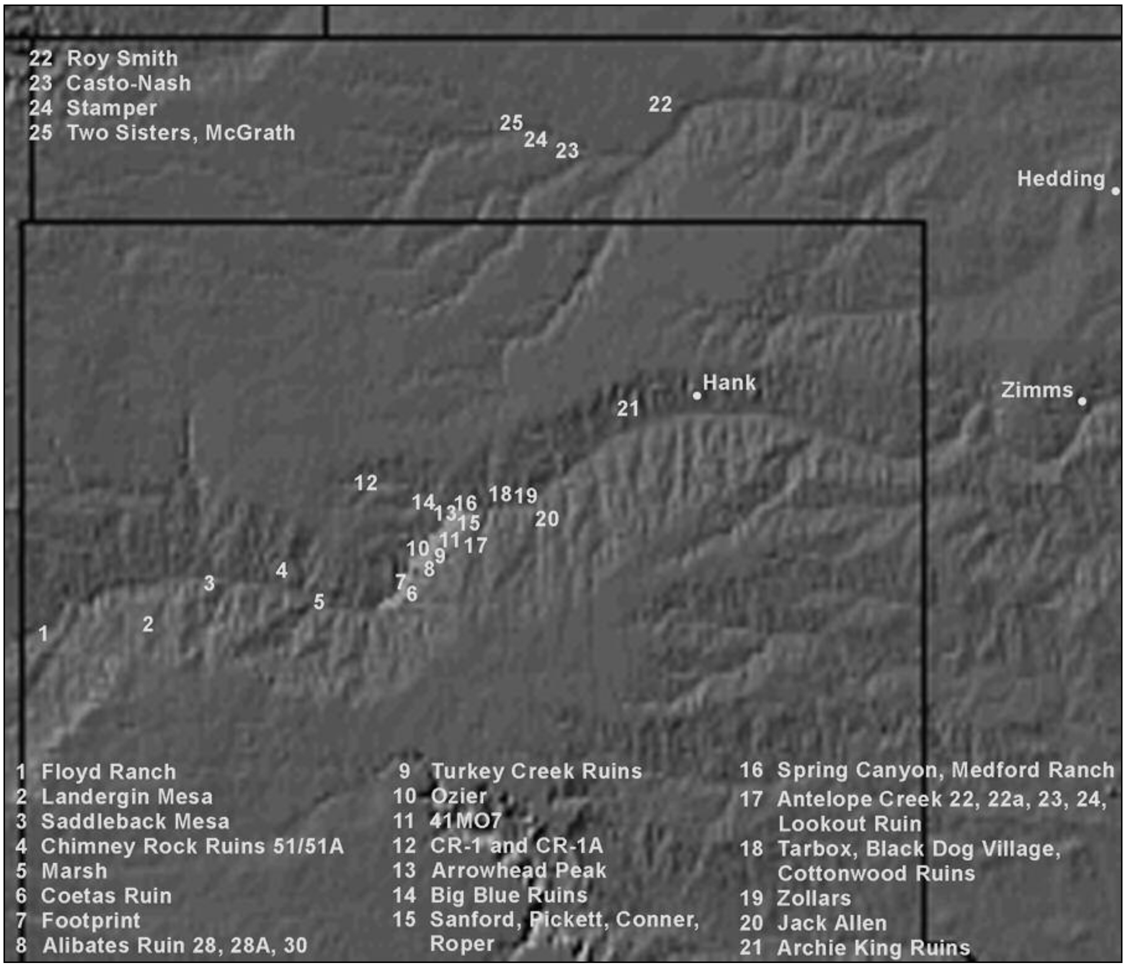


Figure 4.2 Antelope Creek Phase and Other Sites Discussed in Text.

To the west, south, and east of the core area the affiliation of Middle Ceramic sites is less definite. Lintz (1986a:30) “tentatively” places the western boundary of the phase near the western escarpment of the Llano Estacado, but notes that the cultural affiliation of sites this far west remains uncertain. As such, Landergin Mesa (see Lintz

1990), Saddleback Ruin (Holden 1933), and other sites in Oldham County, Texas, appear to represent the westernmost permanent habitation sites that can be securely attributed to the phase at this time.

South of the Canadian River valley, Lintz (1986a:30) suggests that the southern boundary extends as far south as Tule Canyon (see Hughes 1979). Although a review of site files for counties south of the Canadian River drainage basin seems to suggest that permanent habitation sites of the phase are not present in this area (Texas Archeological Site Atlas 2003), two Middle Ceramic age sites with stone architectural features are known for the upper reaches of Palo Duro Canyon. These sites, Currie and Palisades Shelter, are frequently mentioned in the literature largely because they have yielded radiocarbon dates (e.g., Baerreis and Bryson 1966:Table 2; Lintz 1986a:Table 3). Currie has yielded three dates (A.D. 1218, A.D. 1297, and A.D. 1434) and Palisades Shelter has four dates (A.D. 1304, 1367, 1385; A.D. 1327, 1346, 1393; A.D. 1438; and A.D. 1522, 1573, 1627). Unfortunately, besides these dates, all other details about these sites remain unpublished. As such, although Currie and Palisades are usually attributed to the Antelope Creek phase, since so little is known about these two outlying sites they are not further considered in the discussions that follow.

To the east of the core area the distribution of Antelope Creek sites remains poorly understood at this time. Recent pedestrian surveys conducted by Doug Wilkens, an archaeological steward of the Texas Historical Commission, has documented or relocated sites containing stone architecture and artifact assemblages typical of the phase as far east as Government Canyon in northwestern Roberts

County, Texas. East of this area sites which lack stone architecture, but contain house forms characteristic of the phase are documented (see Boyd and Wilkens 2001; Brosowske 2002a; Hughes et al. 1977; Wilkens personal communication 2002). Even though architectural forms found at some sites, such as Hank, Cantonment (Site A439), Zimms, and Hedding, are very similar to those of the Antelope Creek phase, various aspects of their material assemblages suggest that they may not be closely related to the phase (Boyd 2002; Brosowske 2002a; Flynn 1984; Shaeffer 1965; Wilkens personal communication 2002). Therefore, until additional work is completed these sites are not included in the Antelope Creek phase.

Generally, the 80 km expanse that separates the two concentrations of sites described here is included within the spatial distribution of the Antelope Creek phase (Figure 4.2). Much of this area is High Plains and is devoid of creeks, and previous surveys suggest that permanent habitation sites of the phase are absent (Bement and Brosowske 2001; Fredrick et al. 1993:466; Peterson 1988; Texas Archeological Site Atlas 2003; Wilkens personal communication 2002). As such, it is not apparent whether it is appropriate to assume that this area was under the territorial control of groups of the phase and was used during logistical foraging trips. Inclusion of this area within the phase effectively triples the distribution area of the phase and implies a much higher population than likely existed. As a result, this area is not included here as part of the Antelope Creek distribution.

In sum, a review of Antelope Creek site distributions suggest that settlements containing stone architecture that can be linked with some certainty to the phase occur in an area much smaller than that tentatively proposed by Lintz (1986a:29-30). It is concluded that the two concentrations of sites identified here most accurately reflects the spatial distribution of the phase.

Temporal Span

Chronological control for the phase is provided by 48 radiocarbon dates, four obsidian hydration samples, and three archaeomagnetic samples from 13 settlements (Baerreis and Bryson 1965; Duncan 2002; Keller 1975; Lintz 1986a:Table 3, 1990). These dates indicate a temporal span from A.D. 1250 to A.D. 1500 for the phase (Table 4.1). Also listed in Table 4.1 are the types of residential structures documented at each site. The term "freestanding" refers to isolated habitation structures and "both" refers to the presence of freestanding habitation structures and structures containing multiple residential rooms. These architectural types are later examined in greater detail under discussions of Antelope Creek architecture.

An additional seven radiocarbon dates have been obtained from two sites: Black Dog Village and Two Sisters (Table 4.2). Previous researchers, however, indicate that these dates are problematic and should be disregarded (Lintz 1986a:378-380; Duncan 2002:160). The four earliest of these dates span the period from about A.D. 900 to A.D. 1200. The earliest date from Black Dog Village (Tx-1498b) is a bone collagen date and is clearly in error. The remaining three assays are based on wood charcoal and have yielded calibrated dates that are 100 to 300 years earlier than others from these sites. For obvious reasons, these dates were considered erroneous. It is possible that the latter dates are related to problems frequently associated with dating juniper.

Table 4.1 Absolute Dates for the Antelope Creek Phase.

Site	Lab #	Radiocarbon Age	Calibrated Age[a]	Architectural Type
Coetas Ruin	WIS-95	800 ±75 B.P.	A.D. 1256	Both
Landergin Mesa	Beta-17195	780 ±70 B.P.	A.D. 1263	Both?
Alibates Ruin #28 Unit 1	WIS-129	770 ±75 B.P.	A.D. 1271	Both
Roy Smith	WIS-137	750 ±70 B.P.	A.D. 1278	Both
Roy Smith	WIS-121	730 ±75 B.P.	A.D. 1282	Both
Roy Smith	WIS-124	730 ±70 B.P.	A.D. 1282	Both
Roy Smith	WIS-148	730 ±65 B.P.	A.D. 1282	Both
Landergin Mesa	1987	Obsidian Hydration	A.D. 1286	Both?
Pickett Ruin (Site A116)	WIS-126	710 ±70 B.P.	A.D. 1287	Freestanding
Landergin Mesa	Beta-17197	700 ±80 B.P.	A.D. 1290	Both?
Roy Smith	WIS-145	700 ±50 B.P.	A.D. 1290	Both
Roy Smith	WIS-147	700 ±70 B.P.	A.D. 1290	Both
Sanford	Tx-255	700 ±90 B.P.	A.D. 1290	Freestanding
Coetas Ruin	WIS-92	690 ±60 B.P.	A.D. 1293	Both
Landergin Mesa	Beta-17196	660 ±60 B.P.	A.D. 1299, 1375, 1375	Both?
Footprint	WIS-122	660 ±70 B.P.	A.D. 1299, 1375, 1375	Freestanding
Stamper	WIS-83/WIS-84	650 ±70 B.P.	A.D. 1301, 1372, 1378	Freestanding
Roper (Site A62)	WIS-134	650 ±70 B.P.	A.D. 1301, 1372, 1378	Freestanding
Landergin Mesa	Beta-17201	630±70 B.P.	A.D. 1304, 1367, 1385	Both?
Alibates Ruin #28 Unit 1	WIS-116	630 ±70 B.P.	A.D. 1304, 1367, 1385	Both
Arrowhead Peak	WIS-118	620 ±70 B.P.	A.D. 1315, 1354, 1387	Both
Two Sisters	OU-888	Archaeomagnetic	A.D. 1320	Freestanding
Black Dog Village	Tx-1497	610 ±50 B.P.	A.D. 1323, 1350, 1390	Freestanding
Landergin Mesa	Beta-17199	600 ±90 B.P.	A.D. 1327, 1346, 1393	Both?
Alibates Ruin #28 Unit 2	WIS-101	600 ±70 B.P.	A.D. 1327, 1346, 1393	Freestanding
Alibates Ruin #28 Unit 1	WIS-114	600 ±75 B.P.	A.D. 1327, 1346, 1393	Both
Two Sisters	UGA-2509	600 ±50 B.P.	A.D. 1327, 1346, 1393	Freestanding
Black Dog Village	Tx-1496	590 ±60 B.P.	A.D. 1329, 1343, 1395	Freestanding
Roper (Site A62)	WIS-141	580 ±70 B.P	A.D. 1332, 1340, 1398	Freestanding
Landergin Mesa	1990	Obsidian Hydration	A.D. 1378	Both?
Two Sisters	OU-788	Archaeomagnetic	A.D. 1385	Freestanding
Landergin Mesa	1989	Obsidian Hydration	A.D. 1389	Both?
Spring Canyon	Tx-256	550 ±90 B.P.	A.D. 1406	Freestanding
Two Sisters	UGA-2508	545 ±55 B.P.	A.D. 1407	Freestanding
Footprint	WIS-102	530 ±70 B.P.	A.D. 1412	Freestanding
Coetas Ruin	WIS-89	520 ±70 B.P.	A.D. 1416	Both
Coetas Ruin	WIS-94A	520 ±85 B.P.	A.D. 1416	Both
Footprint	WIS-99B	520 ±80 B.P.	A.D. 1416	Freestanding
Two Sisters	OU-887	Archaeomagnetic	A.D. 1420	Freestanding
Black Dog Village	Tx-1489	510 ±60 B.P.	A.D. 1421	Freestanding
Two Sisters	Tx-3261	510 ±50 B.P.	A.D. 1421	Freestanding
Black Dog Village	Tx-1498A	500 ±70 B.P.	A.D. 1426	Freestanding
Landergin Mesa	Beta-17202	490 ±70 B.P.	A.D. 1430	Both?
Coetas Ruin	WIS-94B	490 ±70 B.P.	A.D. 1430	Both
Alibates Ruin#28 Unit 2	Tx-259	480 ±80 B.P.	A.D. 1434	Freestanding
Black Dog Village	Tx-1490	470 ±60 B.P.	A.D. 1437	Freestanding
Black Dog Village	Tx-1491	460 ±60 B.P.	A.D. 1439	Freestanding
Landergin Mesa	Beta-17200	450±70 B.P.	A.D. 1441	Both?
Coetas Ruin	Tx-258	430 ±80 B.P.	A.D. 1445	Both
Black Dog Village	Tx-1513	420 ±70 B.P.	A.D. 1448	Freestanding
Footprint	WIS-99A	420 ±80 B.P.	A.D. 1448	Freestanding
Landergin Mesa	1991	Obsidian Hydration	A.D. 1474	Both?
Black Dog Village	Tx-1488	390 ±50 B.P.	A.D. 1476	Freestanding

[a] University of Washington Quaternary Isotope Lab; Radiocarbon Calibration Program 4.3

Traditionally, the termination date for the phase has been regarded as A.D. 1500 (e.g., Boyd 1997:343; Brooks 1989:80; Drass 1998:415; Lintz 1986a). Three dates, all from Black Dog Village, yielded calibrated ages later than A.D. 1500. Lintz (1986a:378-380) concludes that these dates are either contaminated or document later components.

Table 4.2 Probable Erroneous Radiocarbon Dates for the Antelope Creek Phase.

Site	Lab #	Radiocarbon Age	Calibrated Age[a]	Architectural Type
Black Dog Village	Tx-1498B	1110 ±200 B.P.	A.D. 902, 917, 962	Freestanding
Black Dog Village	Tx-1512	980 ±170 B.P.	A.D. 1025	Freestanding
Two Sisters	Tx-3260	890 ±50 B.P.	A.D. 1161	Freestanding
Two Sisters	Beta-146586	830 ±50 B.P.	A.D. 1218	Freestanding
Black Dog Village	Tx-1499	350 ±90 B.P.	A.D. 1516, 1599, 1616	Freestanding
Black Dog Village	Tx-1495	300 ±50 B.P.	A.D. 1637	Freestanding
Black Dog Village	Tx-1493	280 ±150 B.P.	A.D. 1642	Freestanding

[a] University of Washington Quaternary Isotope Lab; Radiocarbon Calibration Program 4.3

Of the four large Antelope Creek settlements for which we have multiple radiocarbon dates there are two temporal trends that may be tentatively proposed (Table 4.3). First, it is apparent that two of the largest settlements in the “core area” of the phase, Alibates Ruin 28 and Coetas Creek, were occupied for considerable lengths of time (i.e., at least 163 and 189 years). Likewise, Landergin Mesa, a large settlement in a highly defensive setting along the western margins of the phase, appears to have been inhabited for about two centuries (i.e., at least 213 years). Although absolute dates are not available for many of the other large settlements along the Canadian River, overlapping residential structures, multiple occupation floors within structures, and middens of considerable depth (some nearly 3 m thick; see Holden 1933:46) all suggest that these sites were also inhabited for similar lengths of time (see Green 1986; Holden 1933; Lintz 1986a; Studer n.d.). In contrast, the length of occupation at Roy Smith, a small multiple family settlement along the northeastern periphery of the Antelope Creek phase world, may have been only a generation or so in length (Table 4.3; see Schneider 1969). The calibrated age intercepts for six radiocarbon dates available from this site span a period of only 12 years and only one of the habitation rooms has more than a single floor (i.e., Room A has two floors).

Table 4.3 Radiocarbon Dates for Large Antelope Creek Phase Settlements

Site	**# of Dates**	**Calibrated Age or Date Range**	**Occupation Length**
Coetas Creek	6	A.D. 1256 - A.D. 1445	189 years
Alibates Ruin 28	5	A.D. 1271 - A.D. 1434	163 years
Arrowhead Peak	1	A.D. 1315 - A.D. 1387[a]	-
Cottonwood Creek Ruins	0	Unknown	-
Stamper	2	A.D. 1301 - A.D. 1378 [a]	-
Antelope Creek 22	0	Unknown	-
Antelope Creek 24	0	Unknown	-
Landergin Mesa	10	A.D. 1263 - A.D. 1476	213 years
Zollars	0	Unknown	-
Saddleback Ruin	0	Unknown	-
Chimney Rock Ruin 51	0	Unknown	-
Roy Smith	6	A.D. 1278 – A.D. 1290 [b]	12 years

[a] Represents the age range for a single date that crosses the calibration curve in three places; note: the radiocarbon ages for the two dates from Stamper are 650 ±70 B.P. (WIS-83) and 650 ±75 B.P. (WIS-84).

[b] Does not include WIS-142 which Schneider (1969:177) notes may have come from a disturbed context and is noticeably later than the other six dates from Roy Smith.

Excluding sites such as Hank, Currie, and A439 for which the cultural affiliation is not entirely clear, there are currently 13 different Antelope Creek settlements that have yielded absolute dates using the radiocarbon, archaeomagnetic, and obsidian hydration methods (Table 4.1). These sites have yielded a total of 54 dates (note: the excluded sites have yielded eight dates). Using the dates available for the phase it is also possible to examine some fairly general trends regarding Antelope

Creek settlement through time and across space. Using calibrated ages, Table 4.4 provides the total number of dates for three arbitrary periods of time: A.D. 1250-1300, A.D. 1300-1400, and A.D. 1400-1475. Delineation of the middle period was derived by grouping all dates which cross the calibration curve in three places during the fourteenth century. This period is bounded by early and late periods. The onset of the early period (A.D. 1250) represents the earliest dates available for the Antelope Creek phase, while the termination of the late period (A.D. 1475) represents the latest dates available for the phase. It should be noted that these periods are not intended for any formal division of the phase, but are simply used here for discussion purposes. Use of these figures assumes that the dates currently available are at least broadly representative of general temporal trends for the phase as a whole, although it should be noted that this may not be the case for Antelope Creek settlements in the Oklahoma panhandle where only three sites are dated.

Table 4.4 Temporal Distribution of Absolute Dates for the Antelope Creek Phase

Period	**# of dates**	**# of dates** (Standardized)	**# of Sites**	**# of Sites** (Standardized)	**New Sites Established**
A.D. 1250-1300	14 (25.9%)	21 (37.3%)	6	9	6
A.D. 1300-1400	19 (35.2%)	14.3 (25.3%)	7[a]	5.3	6
A.D. 1400-1475	21 (38.9%)	21 (37.3%)	7	7	1
Totals	**54 (100%)**	**56.3 (99.9%)**	**20**	**21.3**	**13**

[a] Does not include WIS-142 from Roy Smith which Schneider (1969:177) notes may have come from a disturbed context.

In Table 4.4 the number of dates refers to the total number of dates available for each period. The number of sites dated refers to the total number different settlements that have yielded dates. Thus, for the period A.D. 1250-1300 there is a total of 14 dates from six different sites. Since each period of time differs in length, standardized figures are also presented for the number of dates and sites. These data are standardized to represent three periods 75 years in length (i.e., 14 dates in 50 years = 21 dates in 75 years). Combined, the total number of new sites established (N=13) refers to the number of different Antelope Creek settlements that have been absolute dated.

The distribution of dates within these three periods do not display any particularly striking trends, such as a dramatic shift in the number of new settlements established or occupied during the duration of the phase. The initial period, A.D. 1250-1300 witnessed the establishment of six different settlements that have yielded 14 dates. Except for Roy Smith, all these settlements are in the Canadian River valley. These six sites account for nearly half of the total number of different sites (N=13) for which we have dates. Standardizing these data to account for differences in the length of period, these dates comprise 37% of the entire sample of dates. Altogether, these data appear to suggest a fairly rapid establishment of Antelope Creek settlements in the region during the first 50 years of the phase. The middle period, A.D. 1300-1400, appears to have witnessed sustained growth as six new settlements were established, including Stamper and Two Sisters in Oklahoma. A total of eight different settlements were occupied at this time. The final period, A.D. 1400-1475, is marked by the establishment of only one new site (i.e., Spring Canyon), although six previously established sites continue to be occupied. As a whole, following the apparent rapid establishment of Antelope Creek sites between A.D. 1250 and A.D. 1300, settlement appears to have been relatively stable until the abandonment of sites sometime around A.D. 1475 or A.D. 1500.

Beyond establishing a time span for the phase and the trends presented above, more specific developments are essentially impossible to discern at this time given the paucity of dated sites and insufficient numbers of dates from larger settlements. In addition, although it is apparent the "core area" was certainly occupied throughout the duration of the phase and contained the highest density of settlements (see Settlement below), the nature of occupation for the Oklahoma portion of the distribution is not as clear.

Subsistence Economy

The subsistence economy of the Antelope Creek phase is described as a dual economy of horticulture and foraging. Unfortunately, few researchers have sought to systematically collect and analyze faunal and floral samples that would allow a detailed characterization of the economy (see Adair 2003; Brooks 2004; Habicht-Mauche et al. 1994:291). It should be noted that an earlier study by Duffield (1970) has for some time served as the primary source for characterizing that portion of the Antelope Creek diet provided by terrestrial, aquatic, and avian animal species. However, Lintz (1986a:243-244) and Spielmann (1982:288) have suggested that this study should be used with considerable caution since it relies on faunal samples from early excavations that were not systematically collected. Following these recommendations, the results presented by Duffield (1970) are not relied upon here to any great extent. With these limitations in mind the following description of the Antelope Creek subsistence economy is presented.

Even though extensive excavations have been conducted at dozens of Antelope Creek sites, comprehensive faunal analyses have only been completed for Landergin Mesa (DeMarcay 1986) and Two Sisters (Duncan 2002). These sites are along the western and northern peripheries of the phase, respectively. These studies utilize faunal samples from well-dated contexts and provide a starting point from which to characterize the importance of various species to the diet as well as information regarding hunting and processing strategies for the occupants of these sites. Later in Chapter Seven faunal data from these two settlements are examined in greater detail as part of a comparative analysis of regional hunting economies.

Several major points can be derived from the studies presented by DeMarcay (1986) and Duncan (2002, 2003). First, the diversity of faunal species represented indicates a fairly broad-based hunting economy in which virtually every animal available in the region was utilized at one time or another. For example, a total of 39 and 28 different taxa were identified at Two Sisters and Landergin Mesa, respectively, and indicate that all available environmental zones were utilized. Although bison remains are certainly more numerous than other species (DeMarcay 1986; Duncan 2002), the abundance of other species at these sites does not support the existence of a specialized hunting economy for the phase as has often been emphasized in the literature (see Chapter Seven).

Recovered bison elements at Landergin Mesa and Two Sisters suggest that meat packages transported back to settlements were stripped of meat and the remaining bone was intensively processed for marrow and bone grease extraction (DeMarcay 1986:99-113; Duncan 2002:259, 281). Similar conclusions have been suggested for other Antelope Creek sites (e.g., Duffield 1970; Lintz 1976:87). Overall, the systematic reduction of bones from bison, and other large mammals, into small splinters further emphasizes the need for detailed faunal studies as a means for identifying prey selection and transport and processing decisions. Seasonality studies using bison remains have the potential for providing several types of important information (see Bement 1999; Davis and Wilson 1978; Frison 1991; Frison and Todd 1987; Fuller 1959; Savage 1995; Speth 1983; Todd 1991; Todd et al. 1992), but remain vastly understudied from Antelope Creek phase sites at this time. As a result, it is not possible to determine the scheduling of bison hunts, seasonal variability in processing strategies, and at times, the length of occupation for most sites. In sum, because so few faunal studies have been carried out at Antelope Creek sites, we are not able to determine whether differences in the subsistence economy exist between sites or whether the above results are broadly applicable to all settlements of the phase.

Whereas even without a systematic faunal study some general ideas regarding the contribution of various animals to the diet may be gleaned by observations made during excavation, the importance of wild and domesticated plants to the diet is not as easy to determine without a detailed analysis of preserved botanical remains. Regrettably, previous studies of the botanical remains from Antelope Creek sites are virtually nonexistent and the use of native and domesticated plant species is largely unknown (see Dean 1986; Duncan 2002; Habicht-Mauche et al. 1994). Despite the dearth of studies that have systematically sought to recover plant remains, a few sites have yielded native and domesticated plant remains, including hackberry, mesquite, buckwheat, various grasses, cattail, sand plums, persimmons, prickly pear, Indian mallow, corn, squash, and beans (see Dean 1986; Duffield 1964; Green 1986; Holden 1933; Johnston n.d; Keller 1975; Lintz 1986a:33; Studer 1934). However, since the above list of plants is derived almost entirely from a single site (i.e., Black Dog Village), their abundance and ubiquity at other sites of the phase is not yet known.

Although charred corncobs, cupules, and kernels have been noted at several sites and suggest that maize was grown locally at some sites, numerous researchers suggest that horticulture may not have been a particularly important or reliable component of the diet for many Antelope Creek groups (Adair 2003:317-318; Duncan 2002, 2003; Habicht-Mauche et al. 1994:301; Hard 1990; Hard et al. 1996; Robinson 2001). This conclusion is based on several forms of evidence. Combined, the relatively rare occurrence of bison scapula hoes and tibia digging sticks, the sporadic nature of precipitation in the area, a lack of emphasis on settlement near soils favorable for horticulture, and characteristics of groundstone assemblages all suggest that farming was not likely emphasized to the same extent as observed among other Plains Village tradition groups (e.g., Washita River, Custer, and Odessa phases; and Little River and Lower Walnut foci). Although problematic in some respects, a recent use-wear analysis by Huhnke (2001) may also indicate a limited reliance on horticulture. This study suggests that many of the bone tools from Alibates Ruin #28 which have long been presumed to represent horticultural implements (i.e., bison scapula hoes) may not have been used solely for farming. Although conjectural at this time, the close proximity of this settlement to the Alibates outcrops may eventually indicate the use of some of these items in tool stone quarrying activities.

Lastly, although the cultural affiliation of Hank's site (41RB109) remains unclear at this time, it represents one of the few Middle Ceramic sites in the Canadian River valley for which plant remains have been systematically collected and studied (Dering 2002:Table 1). This permanent habitation site, along the eastern periphery of the Antelope Creek phase (see Figure 4.2), is marked by low ubiquity rates of domesticated plant species in floral assemblages from this site (i.e., 19% or 4 of 21 samples). Corn, the only domesticated species identified at the site, represented only 13% of all plant remains (Figure 4.3). Interestingly, wild sunflower accounts for nearly 80% of all botanical materials recovered at the Hank site (Dering 2002:Table 1). Overall, data from Hank may suggest that occupants of the Canadian River valley did not rely as extensively on horticulture as Plains Village societies elsewhere.

Combined, all of these data would appear to indicate that most Antelope Creek groups were primarily foragers whose diet consisted of wild plant and animal resources sporadically supplemented with domesticated species (Adair 2003:317-318; Duncan 2002). The conclusion that Antelope Creek groups were primarily foragers and practiced only limited amounts of horticulture goes against what has long been assumed to be the case for the phase. In the past, the sparse recovery of horticultural tools and charred corn has led researchers to readily conclude that these populations, like other Plains Village tradition groups, practiced an economy dependent on corn production. However, to presume that Antelope Creek phase groups were heavily dependent on horticulture cannot be supported from the multiple forms of evidence currently available. As such, it may be appropriate to interpret the C_4 signature noted by Habicht-Mauche et al. (1994) for Antelope Creek skeletal populations as resulting from of a diet high in wild plants and animals (i.e., cactus, amaranth, grasses, and bison) rather than corn.

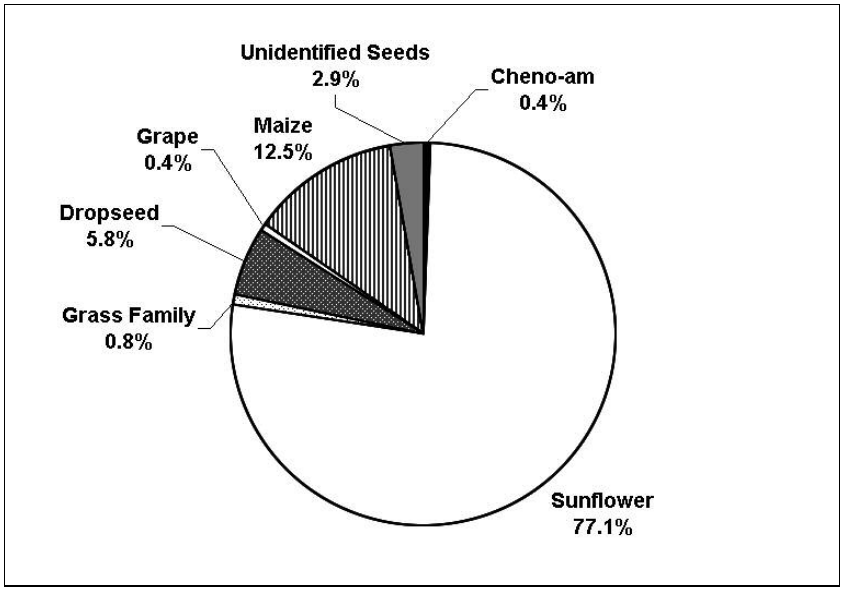


Figure 4.3 Edible Plant Remains Recovered at Hank's Site (Dering 2002:Table 1).

Accurately reconstructing the subsistence economy for the Antelope Creek phase is extremely important since the economy provides the basic foundation for traditional societies. As such, the manner in which we interpret the subsistence economy often has major consequences for how the rest of the cultural system is interpreted or perceived. For instance, whether a group practiced a foraging lifestyle or were horticulturalists certainly has important implications for reconstructions of settlement, mobility, population estimates, social and political organization, the nature of intersocietal interaction, and so on. In short, if our subsistence reconstructions are inaccurate, then it is likely that other reconstructions are also probably incorrect.

Architecture

Lintz (1986a) documented in great detail the stone and non-stone architectural features associated with the Antelope Creek phase. Using a sample of 223 architectural units from 28 sites in the core area, 11 different classes of architectural units and six room aggregate types were identified. Although Lintz (1986a:86-132) frequently notes the difficulty in ascribing specific functions to these features, generally speaking Unit types 1 and 2 are habitation structures, Unit types 4, 5, 8, and 9 probably represent sheltered activity areas or above ground storage areas, and Unit types 7, 10, and 11 are subterranean roasting pits or storage facilities. The function of Unit types 3 and 6 is less certain, but when they occur as the dominant architectural feature at sites and contain interior hearths it is likely that they also represent habitation structures. Although a wide range of architectural forms and configurations are documented by Lintz (1986a), Unit types 1 and 8 (Figure 4.4) are most common and comprise 63% (141 of 223) of the sample (N=47 and N=94, respectively).

The architectural taxonomic framework defined by Lintz (1986a) is certainly useful for explicitly defining and discussing Antelope Creek architecture, however, it is unwieldy for general overviews. As a result, only two broad functional classes are delimited and examined here: habitation structures and non-habitation rooms or storage facilities. Special attention is paid to the various types of habitation structures documented for the phase and sets the stage for later discussions of Antelope Creek settlement patterns. It should be noted that the terms residential and habitation structure and house are often used interchangeably here and refer to structures in which it is assumed that family groups slept. The assumption that these structures housed either nuclear or extended families is supported by floor sizes generally greater than 23 m^2 and the presence of tool classes presumed to be representative of male and female activities (see Flannery 1972). Overall, because this discussion provides only a cursory overview of Lintz's (1986a) original study, the reader is encouraged to consult this source for additional details.

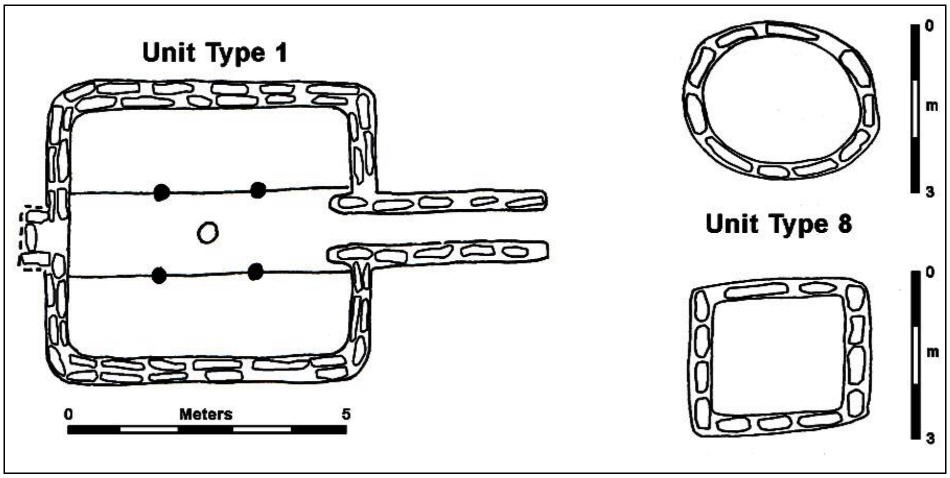


Figure 4.4 Primary Architectural Forms of the Antelope Creek Phase (adapted from Lintz 1986a:Figure 10).

Typically, most habitation structures of the Antelope Creek phase are rectangular to square shaped houses with eastern entryways (Figure 4.5). Often, these houses are roughly aligned to the cardinal directions, have stone foundations, and are essentially surface structures or are set in shallow depressions. These houses are usually between 23 m^2 and 30 m^2 in area and likely housed a single family. These structures often have central depressed floor channels, interior storage pits or bins, central hearths, and four central support posts. Although these descriptions tend to characterize most Antelope Creek houses, as noted above, many of the larger circular to oval structures that contain hearths, such as those at Sanford, Roper, Pickett, Zollars, Coetas, Conner, Spring Canyon, Turkey Creek, and Medford Ranch, also undoubtedly represent domestic habitation structures (i.e., some Unit types 3 and 6). These houses usually lack many of the architectural features that are heralded as "hallmarks" of the phase, such as central floor channels, four center support posts, raised benches, and extended entryways. Although seldom acknowledged, these houses are very similar to those documented for the Apishapa phase and Graneros focus in southeastern Colorado (see Campbell 1969, 1976). Overall, freestanding single-family houses are by far the most common form of residential architecture documented for the Antelope Creek phase (Lintz 1986a:145).

Large structures containing long, linear arrangements or blocks of adjoining habitation rooms are also documented for the phase (Figure 4.5). These structures housed between two and eight families and are often compared to the layout of pueblos of the American Southwest. These multi-family structures are frequently highlighted in the literature, but are actually quite rare when compared to the number of freestanding houses that are known. In fact, of the approximately 110 residential sites recorded for the phase (Oklahoma Archeological Survey Site Files 2002; Texas Archeological Sites Atlas 2003) there are only about 10 recorded localities with room blocks containing more than two adjoining habitation rooms (e.g., Coetas, Antelope Creek 22 and 24, Alibates Ruin 28, Saddleback Ruin, Arrowhead, Tarbox, Roy Smith, and possibly, Chimney Rock Ruins 51).

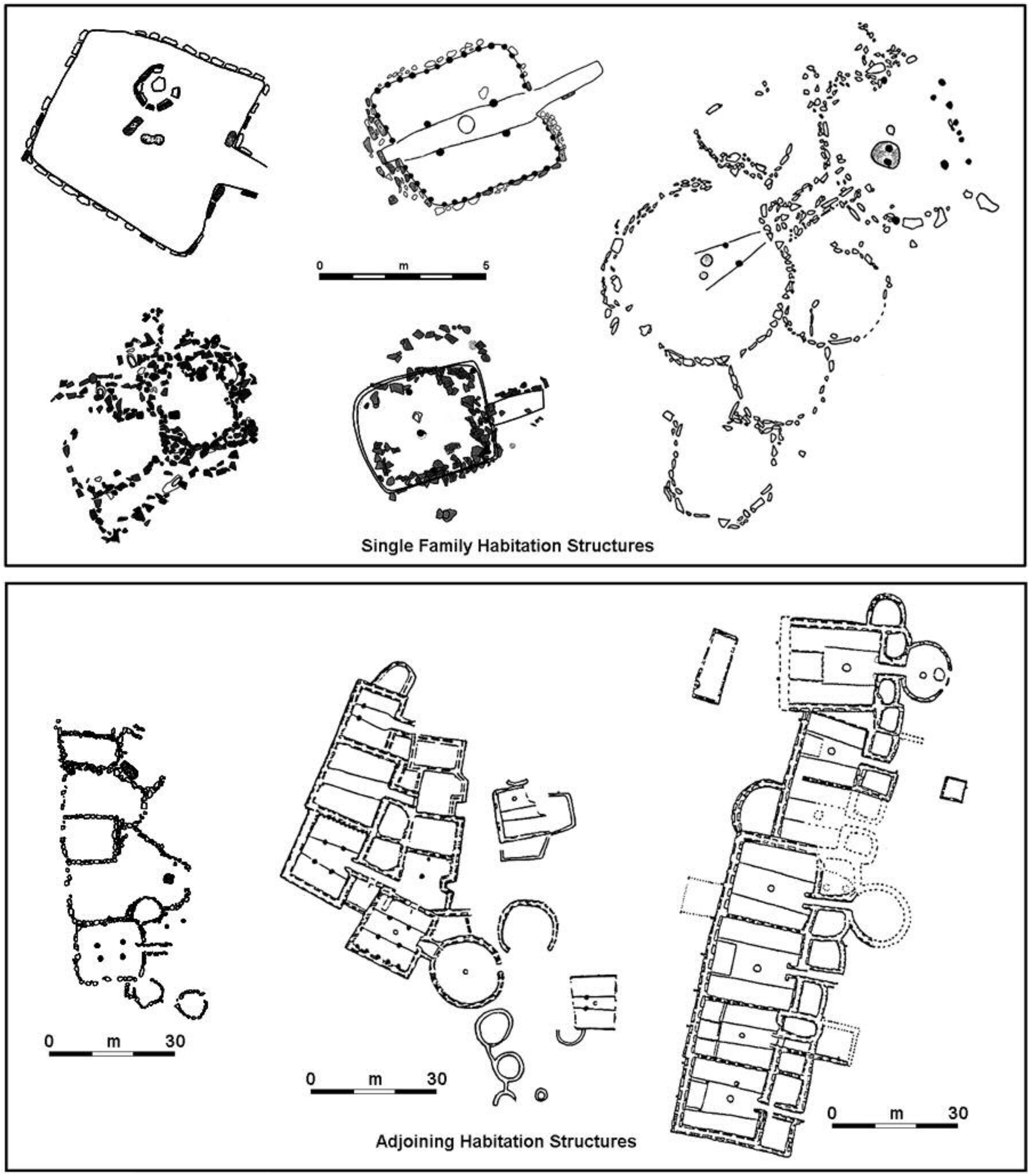


Figure 4.5 Antelope Creek Phase Habitation Structures (adapted from Duffield 1964:Figures 8 and 10; Green 1986:Figures 6 and 37; Lintz 1986a:Figures 38, 45, and 57; Schneider 1969:Figure 2).

As noted in Table 4.1, it is apparent that adjoining and freestanding residential structures are not mutually exclusive architectural forms. For example, while freestanding houses frequently occur as the only residential architectural form at many sites, they are also present at nearly every site where adjoining habitation structures are documented. Previously, it has been argued that the latter represent an early architectural style (Lintz 1986a, 1991), but it is clear that the existing chronological control for individual architectural forms is so poor that it is not possible to evaluate this hypothesis.

Among the many non-habitation Unit types described by Lintz (1986a), two distinct classes may be recognized. The first class includes surface Units types 4, 5, 8, and 9. These rooms or structures, depending on whether they are attached to houses or are freestanding, may be square, rectangular, circular, or oval. They are typically between two and four meters in diameter and usually lack internal hearths. Although it is often implied that these Unit types represent storage facilities or “cysts” for horticultural products, given their large size it is likely that these structures were used as sheltered activity areas or as storage for nonfood items (i.e., seasonal hunting and plant processing gear, ceramics, firewood, etc.). The second class (Unit Types 7, 10, and 11) may be distinguished from the first class in morphological and functional terms. These Unit types are usually about one meter in diameter, circular in shape, subterranean, and in some instances are lined with rocks. While the function of these features has not been examined, given their size and shape it is likely that they represent either subterranean roasting pits or storage facilities.

Despite the intensive study undertaken by Lintz (1986a), it is apparent that many functional, temporal, and spatial trends of Antelope Creek phase architecture still remain to be worked out. This is not a reflection on that study, but rather it highlights three main points. First, as Lintz’s (1986a) research aptly demonstrates, Antelope Creek architecture is highly variable through time and across space. Second, the lack of controlled excavations in the modern era has greatly limited our ability to understand the function of many architectural forms and the occupational history of many sites. Third, even though the Antelope Creek phase is certainly "one of the best dated cultural manifestations of the Southern Plains" (Lintz 1986a:30), the fact that only 13 of the approximately 110 sites currently documented have been dated only provides a basis for identifying the duration of the phase. Combined, these points greatly limit our ability to understand the spatial, temporal, and functional variability underlying Antelope Creek architecture at this time.

Settlement

In a most basic sense, human settlement patterns refer to the way in which people are dispersed across the landscape (Willey 1953:1). By themselves, these patterns are nothing more than descriptive accounts of site locations. On the other hand, to ask why settlements were located where they were forces us to examine the wide array of social and environmental factors that influence settlement. As a result, human settlement patterns are frequently used as a starting point from which to gain a better understanding of how people interacted with their cultural and physical surroundings (see Chang 1972).

Because previous work has focused largely on architectural or cultural historical issues, settlement patterns of the Antelope Creek phase have garnered little formal attention in the past. To date, the most thorough investigation of settlement has been presented by Lintz (1986a). Although that study specifically addressed architectural variability of the phase, a settlement analysis was also conducted.

Unfortunately, the sample selected by Lintz was restricted to a small number of previously excavated sites, which as a whole do not accurately reflect settlement for the phase. Organized under an ecological approach, that study concluded that the location of settlements functioned to place consumers near sources of potable water and areas where a wide variety of plants and animals could be found (see also Duncan 2002). A key assumption of Lintz's (1986a) study was that the environment deteriorated following A.D. 1300 and that this hypothesized event played a crucial role in shaping most aspects of Antelope Creek life (e.g., subsistence, settlement, exchange, and intergroup competition and warfare).

Although brief, the above discussion intends to impart the idea that previous research on Antelope Creek settlement has been extremely limited in scope. As such, considering the research interests of the present study, a more in-depth treatment of settlement is warranted. While previous studies are certainly of limited utility because they have not considered factors other than the distribution of basic subsistence resources as influencing settlement, an even more pressing concern is that many fundamental data regarding Antelope Creek settlement have yet to be assembled up to this point. For instance, even though several researchers have recently suggested that literally "hundreds" of Antelope Creek sites are present in the Texas panhandle (see Bell and Brooks 2002:213; Drass 1998:418; J. Hughes 1991:31), it is apparent that no one really knows "since the number, density, distribution, and kinds of sites…are largely unknown" (Lintz 1986a:193; see also Brooks 1994a:3). As a result, before a summary of Antelope Creek settlement can be presented, the number of known sites and their distribution must be determined.

As Lintz's (1986a) study of architecture has demonstrated, Antelope Creek settlements are characterized by a great deal of variability. As such, it is imperative that this study consider the range of settlement size and density represented. Although it is not feasible to examine each and every site here in detail, the following provides distributional data for nearly all of the Antelope Creek sites currently recorded in the Oklahoma and Texas panhandles. On a more specific level, the number of households that may have occupied settlements is also estimated using the number of habitation structures present at a sample of settlements. Although fairly general, settlement is described along a continuum of dispersal and aggregation.

A review of recorded sites in the Oklahoma and Texas panhandles in which Antelope Creek sites are found demonstrates that extensive pedestrian survey has been conducted in this area (Oklahoma Archeological Survey Site Files 2002; Texas Archeological Site Files Atlas 2003). This work has resulted in the recording of 1600 archaeological sites in the seven counties for which Antelope Creek sites are documented (Table 4.5). This is an average of 228 sites per county. Although an exhaustive study of Antelope Creek settlement patterns is not attempted here, it is clear that the data necessary to examine this topic in greater detail are available.

Table 4.5 Approximate Numbers of Recorded Archaeological Sites by County.

Beaver Co.	Texas Co.	Hutchinson Co.	Moore Co.	Roberts Co.	Potter Co.	Oldham Co.
180	180	220	239	110	364	306

In the Oklahoma panhandle only 12 permanent habitation sites are documented (Oklahoma Archaeological Survey Site Files 2002). Excluding Roy Smith, a noticeable outlier, sites in this cluster are contained within an area of about 1900 km^2 in size (55 x 35 km). Most of these sites are along the Beaver River and are dispersed at a fairly regular interval of about 6 km (Figure 4.6). In contrast, Roy Smith and the other four remaining sites are along tributary streams and are often more than 18 km from the nearest adjacent settlement. Although complete survey coverage is lacking, current data suggest that the latter sites represent isolated settlements or outposts of some kind. Overall, most of the sites in the Oklahoma panhandle represent single-family homesteads, although, based on the number of habitation structures present, Stamper, Casto-Nash, and Roy Smith are settlements that likely contained three to seven family groups (Schneider 1969; Watson 1950).

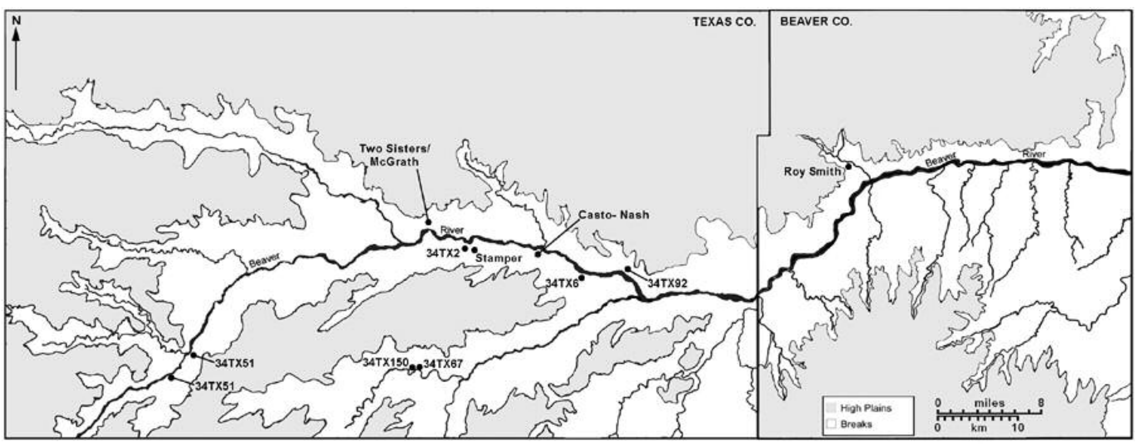


Figure 4.6 Antelope Creek Settlements in the Beaver River Drainage, Oklahoma.

As noted earlier, while Antelope Creek sites in the Texas panhandle have received a great deal of research attention in the past, basic information, such as total numbers of settlements and their distribution, is not known. Table 4.6 provides an overview of recorded sites for five counties in the Texas panhandle for which Antelope Creek sites are known (Texas Archeological Sites Atlas 2003). These records indicate that approximately 100 Antelope Creek permanent habitation sites containing stone architecture are currently recorded for Oldham, Potter, Moore, Hutchinson, and western Roberts County. The site files for neighboring counties were also examined, but they failed to contain any sites with stone architectural that could be firmly tied to the phase. Overall, these site distributions support the contention originally forwarded by Krieger (1946:50) that Antelope Creek settlements of the Texas panhandle are restricted to the Canadian River valley.

Table 4.6 Recorded Sites by Time Period for Select Counties in the Texas Panhandle*.

Cultural Period	HC Co.	PT Co.	MO Co.	OL Co.	RB Co.	Totals
Paleoindian	0	2	0	0	2	4
Archaic	14	16	10	17	4	61
Early Ceramic	4	9	5	9	2	29
Middle Ceramic [a]	42	44	26	42	14	168
Protohistoric	0	0	0	3	0	3
Historic Indian	0	2	2	1	0	5
Historic Anglo	16	36	12	41	0	105
Unknown Prehistoric	141	188	159	164	30	682
Site Forms not Available Online	10	75	31	49	63	228
Total Number of Components	226	372	245	326	115	1285
Site Totals	220	364	239	306	114	1243
A.C. Sites w/Stone Architecture	**29** [a]	**40**	**18**	**9**	**5** [a]	**101**

* Source: Texas Archaeological Site Atlas 2003; HC Co. = Hutchinson County; PT Co. = Potter County; MO Co. = Moore County; OL Co. = Oldham County; RB Co. = Roberts County; A.C. = Antelope Creek

[a] Includes six unrecorded stone architectural sites in Hutchinson (N = 2) and Roberts Counties, (N = 4)

These figures indicate that Antelope Creek sites along the Canadian River are eight times more numerous than those in the Oklahoma panhandle (101 versus 12) and certainly warrant designation of this area as the “Core Area” of the phase. Figure 4.7 shows the distribution of 93 Antelope Creek sites found in the Texas panhandle. Although sites along Canadian River valley are dispersed over an area from western Oldham County in the west to western Roberts County in the east (about 170 km in length), it is apparent that 93 or 92% of the settlements are densely concentrated in the Lake Meredith area. Excluding one or two outliers, these sites are contained within an area about 1600 km^2 (80 x 20 km) in size. This distribution indicates that Antelope Creek settlements are seven times more densely concentrated in the core area than along the Beaver River valley (i.e., 0.042 km^2 versus 0.006 km^2).

In the Texas panhandle, approximately 70% of the known settlements are within the Canadian River valley or along the valley rim (Figure 4.7). Given that the Canadian is a highly braided stream whose channel is subject to frequent lateral movement across a wide sandy floodplain, the nearest topographic landforms suitable for occupation are usually at some distance from the river. Thus, while in many instances settlements may not appear to be oriented to the river and its resources, site visits indicate that they are often as close to the river as is feasible, yet avoid the risk of flooding (see Holden 1933:41). As a whole, site distances to the river increase as you proceed downstream and the floodplain widens.

Notable exceptions to the above pattern, however, are clusters of sites, such as those along Antelope, Big Blue, Turkey, and Plum creeks and relatively isolated sites along Spring and Corral creeks and at the upper end of McBride Canyon. These sites are located between 4 and 8 km from the river and truly represent settlements that are oriented toward lateral tributaries and resources outside the Canadian River valley proper. Overall, considering that most sites are near the Canadian River suggests that there were advantages or benefits to settlement within the valley. Most obviously, the dense concentration of settlement observed near the Alibates quarries clearly indicates that populations were drawn to this important resource.

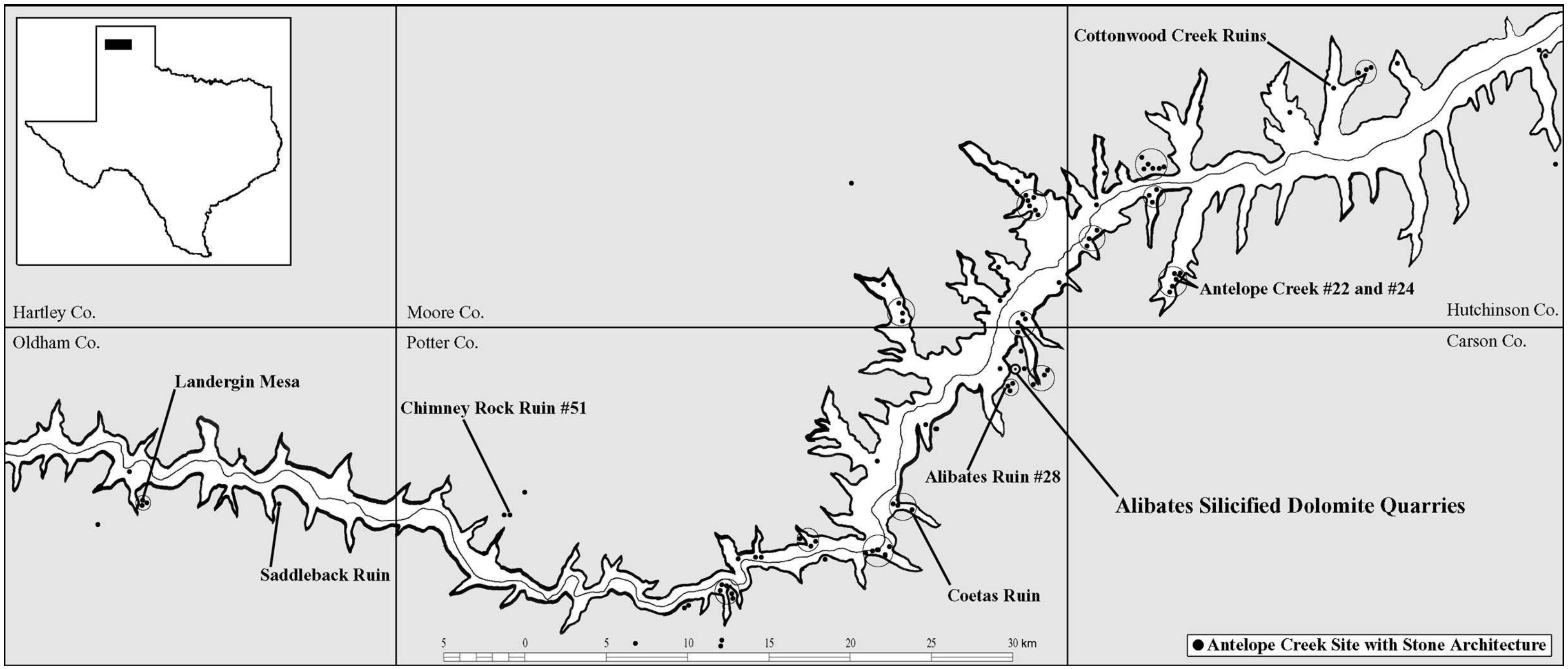


Figure 4.7 Antelope Creek Phase Settlements in the Canadian River Valley, Texas (Note: does not include eight outlying sites in Oldham Countv and western Roberts Countv).

Throughout the distribution shown in Figure 4.7, sites are densely concentrated, and for the reasons noted above, are almost always atop topographic rises of some kind. Accordingly, in the wide-open expanses of the Canadian valley several settlements are usually visible from each site location. Previously, Studer (1931c:13) and Kreiger (1946:42) have argued that many of the highly elevated Antelope Creek settlements were selected for their defensive qualities. Lintz (1986a:250) downplays this proposition and suggests "most settlement locations seem to have been chosen with little concern of the consequences from possible outside raiding." While this is undoubtedly the case for some sites, especially small homesteads situated low on the landscape, it is difficult to explain the location of several larger settlements on elevated promontories without invoking models of defense (see Brooks 1994b).

It is readily apparent that Antelope Creek settlements atop or adjacent to isolated mesas or along the Canadian valley rim were not selected solely for ecological reasons. In other words, it is unlikely that these locations facilitated access to water or food resources (e.g., Saddleback; Landergin; Lookout Ruin; Chimney Rock 51; Arrowhead Peak; Alibates Ruin 28, 28A, 30; Coetas Ruin; Antelope Creek 22; Cottonwood; Tarbox; Medford Ranch; Sanford; and many others). In general, these elevated or upland locations are exposed to the elements (particularly the wind), often require dangerous vertical descents of 20 to 100 m down steep rocky talus slopes to reach the valley floor, and are frequently several hundred meters from the nearest riparian or spring settings. Assuming that proximity to crucial resources and protection from the elements were important considerations, site visits demonstrate that locations better suited for occupation than the ones selected are often present in most of these areas.

Overall, it is difficult to envision elevated Antelope Creek phase settlements as beneficial for anything except defense. For example, it seems unlikely that elevated sites were selected to monitor herd movements. Lintz (1986a:250) cites the lack of evidence for fortifications (i.e., palisades, ditches, ramparts, and other defensive features) at sites as support for the idea that Antelope Creek groups were not overly concerned with defensive strategies. However, fortifications are generally quite rare except among complex tribes, chiefdoms, and states, and thus, are not to be expected in the study area (Keeley 1996:55-58; Table 3.2). Therefore, it is concluded that many of the Antelope Creek settlements incorporated defensive strategies into settlement decisions and that sites situated on promontories reflect a concern for intersocietal warfare. The numerous decapitated trophy skulls at the Footprint site in the Antelope Creek core area clearly demonstrates the gruesome reality of intergroup warfare and raiding during Middle Ceramic times on the Southern High Plains (see Brooks 1994b; Green 1986).

The above discussion of settlement provides a brief and fairly general description of the density and distribution of Antelope Creek phase settlements in the Oklahoma and Texas panhandles. What is apparent, however, is that the size of settlements can vary considerably (see Lintz 1986a). Using the total number of residential structures documented at a sample of sites, estimates for the maximum number of family groups that may have occupied Antelope Creek settlements is tabulated. Table 4.4 provides counts of isolated habitation structures or habitation rooms within adjoining room block structures at 31 Antelope Creek settlements for which we have fair to excellent information on site layout (see Lintz 1986a). It should be noted that in certain examples the number of structures at an individual site is adjusted to account for overlapping houses (e.g., Two Sisters, Black Dog Village, and Alibates Ruin #28).

The number of families occupying individual sites varies from single-family residences (e.g., Two Sisters, Lookout Ruin, Antelope Creek Ruin 22A and 23, Pickett, Marsh, and Spring Canyon) to settlements inhabited by four or more families (e.g., Antelope Creek 22 and 24, Alibates Ruin 28 Units I and II, Cottonwood Creek, Roy Smith, Chimney Rock, Stamper, and Coetas Creek). The figures presented here are obviously imperfect as it is unlikely that all residential structures were occupied simultaneously. Nevertheless, they do provide a general idea as to the maximum number of families that may have occupied individual settlements.

Although precise counts of residential structures in many instances cannot be reliably tabulated from the Texas and Oklahoma site forms for a number of different reasons, site records do indicate that most of the remaining 83 Antelope Creek sites not included in Table 4.7 probably represent residences of one or two families (Texas Archaeological Site Atlas 2003). A few larger sites were noted, however, and include Landergin Mesa and Saddleback Ruin in Texas and Casto-Nash in Oklahoma. As such, it is clear that many of the largest Antelope Creek sites are unequally represented in the sample shown in Table 4.7. This is not particularly surprising, considering that large settlements have traditionally attracted greater research attention.

Table 4.7 Estimated Number of Habitation Structures at a Sample of Settlements.

Site	# of Habitation Structures	Reference
Lookout Ruin	1	Lintz 1986a:304
Antelope Creek 23	1	Lintz 1986a:318
Chimney Rock Ruin 51A	1	Lintz 1986a:341-343
Sanford Ruin	1	Lintz 1986a:Figure 56
Antelope Creek 22A	1	Lintz 1986a:Figure 39
Pickett	1	Lintz 1986a:351
Marsh	1	Lintz 1986a:354
Jack Allen	1	Lintz 1986a:63
41MO7	1	Lintz 1986a:369
Two Sisters	1	Duncan 2002:Figure 5.2
Alibates Ruin 28A	1	Lintz 1986a:338
Tarbox	1.5 [a]	Lintz 1986a:301-303
Medford Ranch	1.5 [a]	Lintz 1986a:Figure 66
Turkey Creek	1.5 [a]	Lintz 1986a:371
Roper	2	Lintz 1986a:Figure 58
Conner	2	Lintz 1986a:Figure 65
Spring Canyon	2	Lintz 1986a:366
Black Dog Village	2	Lintz 1986a:Figure 73
Footprint	3	Lintz 1986a:Figure 71
Alibates Ruin 30	4	Lintz 1986a:338-341
Zollars	4	Lintz 1986a:359
Arrowhead Peak	4	Lintz 1986a:Figure 68
Antelope Creek 24	5	Lintz 1986a:320, 322-323
Roy Smith	5	Schneider 1969:Figure 2, 171
Alibates Ruin #28 Unit 1	6	Lintz 1986a:Figure 329
Antelope Creek 22	6.5[a]	Lintz 1986a:Figure 35
Stamper	7	Watson 1950:13
Chimney Rock Ruin 51	10	Lintz 1986a:341
Cottonwood Creek Ruins	10	Lintz 1986a:Figure 61
Alibates Ruin #28 Unit 2	12	Lintz 1986a:Figure 50
Coetas Creek	12-17?	Lintz 1986a:307-308

[a] Figures indicate that either one or two or six or seven residential structures are present

Based on site records, descriptions from published sources, and site visits by the author it is estimated that approximately 73% (N=83) of all Antelope Creek settlements were home to one or two families and only 16% (N=18) of the sites contained three or four families. Given the extensive pedestrian survey conducted in the area coupled with the increased visibility afforded by large sites, it is likely that most, if not all, of the largest settlements have been documented. Based on the number residential structures present, these settlements probably contained between five to 12 families. There are only about 12 known sites (11%) that fall into this largest settlement category.

Figure 4.7 shows that clusters of three to six individual settlements are present along many tributaries to the Canadian River. Bell and Brooks (2002:207) refer to these clusters as “settlement districts.” Generally, sites within clusters are separated by one hundred to several hundred meters and have been recorded as individual sites. If occupied contemporaneously, however, these sites could represent dispersed hamlets inhabited by several families.

While a paucity of radiocarbon dates generally precludes our ability to address issues of contemporaneity among sites within these clusters, to treat them as isolates could in some cases greatly underestimate the actual size of Antelope Creek phase settlements. In other words, to use the number of habitation structures present at individual sites as a final measure of settlement size may be misleading in some cases (e.g, Table 4.7). In particular, given their placement and close proximity to one another, it is likely that many of the sites along Antelope Creek and near the Alibates quarry were occupied contemporaneously (see Lintz 1986a, 1986b). Considered as single settlements, rather than clusters of temporally unrelated sites, the maximum number of families at each of these localities is approximately 14 families along Antelope Creek and 25 families in the Alibates Ruin cluster (Figure 4.8). If these assumptions are valid, then these are among the largest settlements currently documented for the phase.

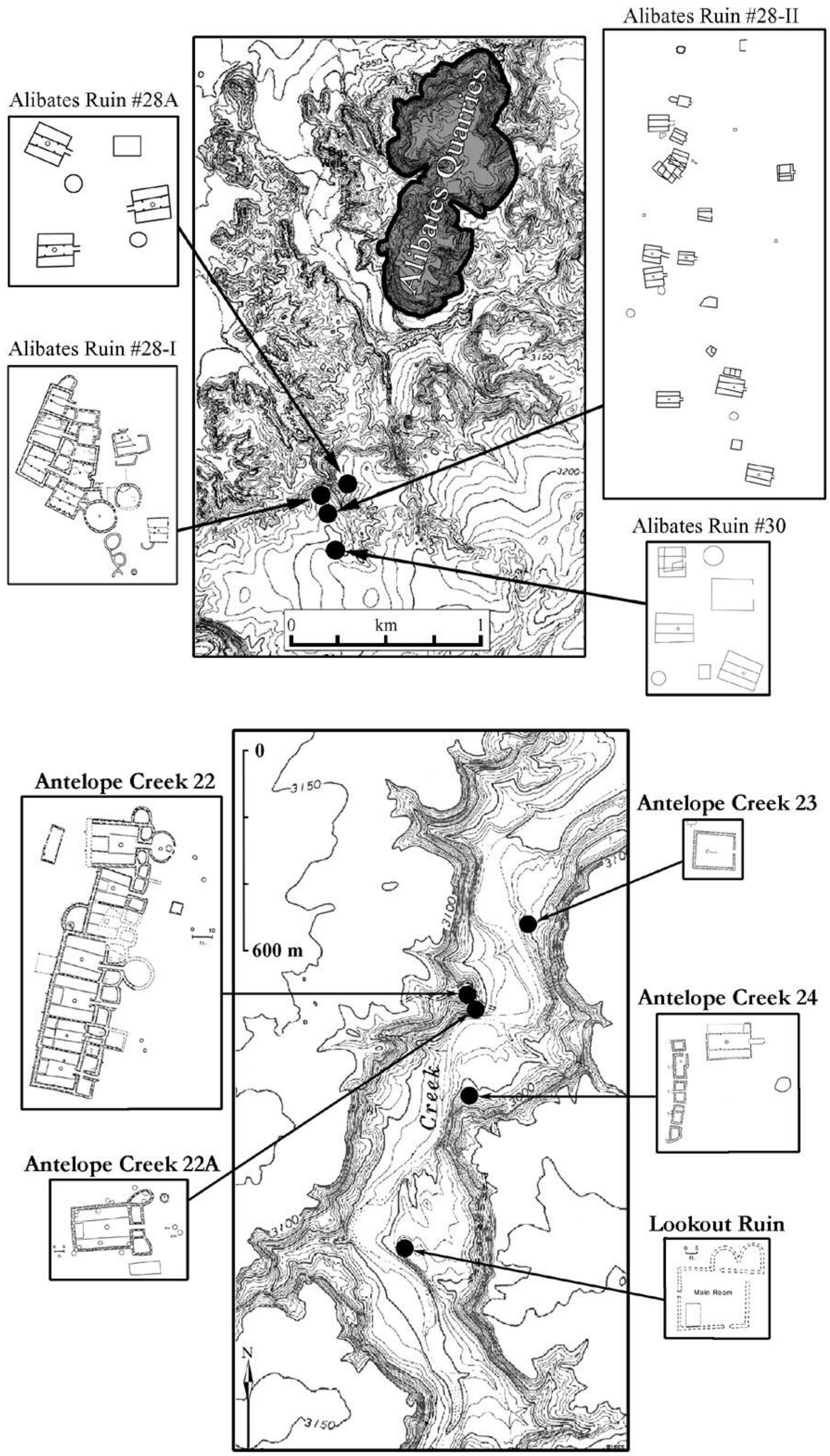


Figure 4.8 Alibates Ruins and Antelope Creek Settlements (adapted from Lintz 1986a:Figures 32, 38, 39, 40, 41, 45, 50, 52, and 53).

It is also important to note that the number of individual Antelope Creek family groups occupying dispersed settlements can be highly variable. For example, dispersed sites found in the study area can either represent single-family residences (e.g., Jack Allen) or an aggregation of households (e.g., Roy Smith and Saddleback). Likewise, in instances where several individually recorded sites are closely spaced along a single drainage, settlements may include single-family homesteads, multi-family settlements or a combination of both.

The Archie King Ruins along Couch Creek provides a typical example of Antelope Creek settlement in the Canadian River valley (Figure 4.9). These sites have recently been relocated by Doug Wilkens and represent a series of 14 permanent habitation structures with stone foundations scattered along a 5 km section of Couch Creek in Roberts County, Texas. These 14 structures are roughly clustered into four settlements separated from one another by 840 m, 3360 m, and 650 m. Each of these sites sits atop prominent knolls overlooking the valley bottom and contains two to four freestanding habitation structures. It should be noted that the position of structures as shown for each site in Figure 4.9 do not represent precise locations.

The Archie King Ruins are comparable in size and composition to many of the settlement clusters shown in Figure 4.7. These examples do not conform to a dual framework of dispersed and aggregated settlements and highlight another problem that often plagues settlement studies: determining the contemporaneity of residential structures and settlements. In many of the examples examined here, it is not possible to verify whether houses at an individual site or among adjacent sites should be treated as serially or contemporaneously occupied habitation structures. While there is currently no way of resolving this issue, it is not appropriate to broadly assume that either all settlements were occupied at the same time or that individual sites along a drainage are a result of short-distance residential moves by a single family or a group of families. It is likely that examples of both scenarios are represented.

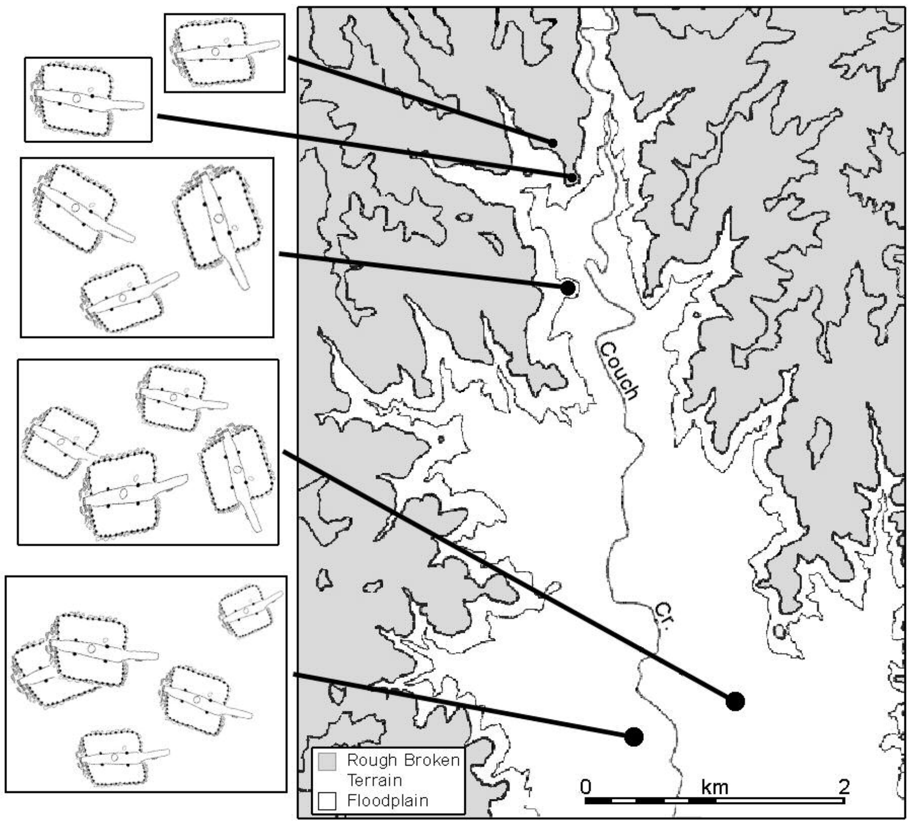


Figure 4.9 The Archie King Ruins.

The preceding examination of Antelope Creek settlement has been aided immensely by the high visibility afforded by the stone architectural features constructed by these groups. Unfortunately, this high visibility has also resulted in the widespread destruction of sites. Ultimately, these discussions have sought to identify the manner in which settlements and the households that occupied them were distributed across the landscape. As such, this study may be aptly described as a spatial or locational analysis.

When viewed as a whole, these results demonstrate that a great deal of variability exists in the way in which Antelope Creek family groups were dispersed across the landscape. Nearly three-quarters of the known settlements contained only one or two families. However, it is apparent that many of these sites are often loosely aggregated along a single drainage with several other households to form dispersed communities or hamlets. Larger isolated settlements or extended villages composed of several individually recorded sites are not very common (N=12). From a regional standpoint, these settlements were not particularly large and usually contained between five and 14 households. The Alibates Ruins, consisting of Alibates Ruin 28, 28a, and 30, is a notable exception to this pattern and may have contained as many 25 families. Considering the small size of most Antelope Creek sites, it is likely that the Alibates Ruins and other large settlements of the phase dominated the social landscape.

The reasons underlying Antelope Creek settlement variability are not well understood at this time. Nonetheless, the predominant pattern of dispersed households or loose clusters of family groups seems to fit well with reconstructions that suggest these groups were largely foragers who occupied fairly permanent residences. This settlement strategy would have enabled groups to effectively and efficiently exploit the regions' natural resources. Quite anomalous to this pattern, however, are larger settlements of the phase. Considering that water or food resources are often distantly located from these sites, it is apparent that the emergence of these settlements cannot be adequately explained using ecological models. In fact, like the previous work undertaken by Lintz (1986a), with the exception of the Alibates silicified dolomite quarries, this study also failed to identify any resource that was clearly associated with large settlements (e.g., arable land). It is concluded that settlement variability, particularly the presence of large settlements, is related to important differences in the way that individual communities were organized socially, economically, and politically. Support for the existence of inequalities among large and small settlements of the region is demonstrated by the distribution of exotic exchange items and the organization of economies (Chapters Six and Seven).

So what do settlement locations and their size tell us about the nature of conflict for this area? These data are somewhat contradictory and can be interpreted in a number of different ways. First, differences in settlement size and the degree of aggregation may indicate that the threat of conflict may have varied either through time or from one settlement to another. Unfortunately, chronological information currently available for the phase is not detailed enough at this time to model these changes through time. Nevertheless, instances where homesteads are dispersed along drainages certainly appear to suggest that warfare was not a major concern for the occupants of these sites. In contrast, larger settlements situated along the valley rim or atop high mesas and far from important resources seem to indicate that the threat of violence was very real. Indeed, these data as well as evidence for widespread burning of residential structures and skeletal remains with evidence for traumatic death suggest that warfare was prevalent.

Mortuary Practices

Burials of the Antelope Creek phase occur both on sites and on promontories overlooking sites (Baker and Baker 2000; Green 1986; Lintz 1986a; Watson 1950). Interments on sites occur in abandoned structures and midden deposits. Often burials were covered with a pavement of stone to form rock cairns approximately 1 x 1 m in size. These features were frequently placed on promontories or knolls overlooking sites, and in some instances, are marked by ceremonially "killed" cordmarked vessels.

Most burials represent single interments, although multiple grouped burials at some sites, such as Big Blue, Footprint, and Antelope Creek 22a suggest the development of cemeteries at some localities (see Couzzourt and Schmidt-Couzzourt 1996; Green 1986:75-82; Lintz 1986a:318, 375-376; Summers 1997). Overall, locations containing more than four to six individuals are rare. Generally, burials are semi-flexed and were not typically placed in any formal or patterned orientation. In addition, burials were usually not accompanied by grave goods, although a few examples contain utilitarian items or jewelry produced from exotic materials (Chapter Six). In general, the lack of associated grave items with most burials has led researchers to suggest that the phase was characterized by "little to no status differentiation" among individuals (Brooks 1994b; Lintz 1986a:32).

The Odessa Phase (A.D. 1250-1475)

In the discussion that follows a description of the Odessa phase is provided. Although much work remains to be completed with this recently defined Middle Ceramic entity, a fairly detailed description of the temporal and spatial distribution of sites, subsistence economy, site architecture and features, settlement patterns, and mortuary behavior is possible at this time (see Brosowske and Bevitt n.d.). Key characteristics of Odessa phase settlements include the occupation of circular to oval pithouses, settlement adjacent to highly fertile floodplain soils, high percentages of ceramics with distinctively decorated rims, chipped stone assemblages that contain a combination of Alibates silicified dolomite and Smoky Hill jasper, and almost always, nonlocal trade items derived from the Southwest. Although the origin of Odessa phase remains unclear at this time, the available data strongly suggests that these populations moved northeast following A.D. 1400 and formed a substantial part of the Little River focus of the Great Bend aspect (Brosowske 2002b; Brosowske and Bevitt n.d.).

Middle Ceramic sites at the Buried City locality are also included in the Odessa phase (Brosowske 2002b; Brosowske and Bevitt n.d.). This well-known locality represents a concentration of Middle Ceramic sites along an 8 km stretch of Wolf Creek in Ochiltree County, Texas. Previously, these sites have been attributed to the Antelope Creek focus of the Panhandle aspect (Krieger 1946), the Antelope Creek phase of the Upper Canark variant (Lintz 1986), and most recently, the Buried City complex (Hughes and Hughes-Jones 1987). In the latter formulation it is generally presumed that the Buried City complex is included in the Upper Canark variant (e.g., Brooks 1989:80; Drass 1997:418), although this relationship has never been formally clarified (see Hughes and Hughes-Jones 1987). Recent investigations have shed considerable light on the taxonomic relationship of Buried City to surrounding cultural complexes. These data indicate that the existing taxonomic scheme, which places the

Buried City sites in the Upper Canark variant, is in need of modification. Justification for placement of the Buried City sites in the Odessa phase is addressed here.

The Buried City sites were first formally investigated by T. L. Eyerly of the Canadian Academy, Canadian, Texas, in 1907 (see Hughes and Hughes-Jones 1987:7-23 for a review of investigations). Subsequent excavations at the locality were conducted in following decade by Jesse Fewkes, Fred H. Sterns, C. B. Franklin, and Warren K. Moorehead. The results of these investigations provided few important details beyond the existence of a sizeable Middle Ceramic period settlement containing square to rectangular structures with wall foundations comprised of unmodified caliche boulders and a Plains Village tradition cultural assemblage (Moorehead 1931:94-106).

Except for a brief investigation by Tom Ellzey (1966), no systematic investigations were conducted at Buried City from 1920 until 1985. Beginning in 1985, four field seasons of excavations were conducted under the direction of David Hughes (Hughes 1991; Hughes and Hughes-Jones 1987). These investigations also concentrated on the excavation of stone foundation houses and other related habitation features. Immediately following the second field season a new cultural unit known as the Buried City complex was defined for small number of sites along Wolf Creek (Hughes and Hughes-Jones 1987). Although key traits of Buried City complex, including architecture, settlement pattern, material culture, burial practices, chronology, and distribution, were defined, its taxonomic relationship to the Antelope Creek phase, was not explicitly addressed.

Overall, the differences between these two cultural units seem quite minor. Architecturally, the stone foundation houses present at Buried City were essentially identical to those of the Antelope Creek phase, except that they were noticeably larger (60-130 m^2 of floor space) and had wall foundations consisting of unmodified caliche boulders rather than cut stone placed on edge as is typical among Antelope Creek phase sites (see Hughes 1991:101; Moorehead 1931:102). A major difference was the high percentages of decorated ceramics at Buried City (decorated ceramics are rare at Antelope Creek phase sites). Hughes (Hughes and Hughes-Jones 1987:103, 105) suggested that additional sites might be eventually be attributed to the Buried City complex. Since that time, however, sites containing stone architecture, similar quantities and types of decorated ceramics, as well as presenting other key traits identified for the complex have not been documented. As such, the original distribution, an eight km stretch of Wolf Creek near Lake Fryer, still remains applicable.

To many, the differences between the Buried City complex and the Antelope Creek phase seem relatively slight; hence the inclusion of the Wolf Creek sites in the Upper Canark variant. Nevertheless, the act of formally defining the Buried City sites as a separate and distinct Middle Ceramic entity clearly indicates that D. Hughes viewed these sites as unique from those of the Antelope Creek phase. With additional fieldwork at related sites to the north and east and further work at Buried City since 1987 the nature and extent of variation between the two complexes has become much clearer. In particular, it is apparent that the presence of stone architecture as a key cultural trait of the Buried City complex is less important than previously thought.

These findings force us to alter many long-held ideas about this important locality and its taxonomic relationship to other sites in the region.

From 1989 to 1994 Drass and Turner (1989) and Brooks (1994a) reported on research conducted at Middle Ceramic sites in western Ellis and northern Beaver counties, Oklahoma. These site locations are about 80 km northeast and 75 km east of Buried City, respectively. Based largely on the types of decorated ceramics present, it was concluded that these localities were most closely related to the Buried City complex. However, since these sites lacked stone architecture, a key attribute of the complex, the cultural historical placement of these sites remained unclear.

Since 1998 considerable fieldwork and analysis of private collections has been conducted by author from the Arkansas River drainage in western Kansas to the Canadian River in the Texas panhandle. In particular, these investigations have focused on the geographic area between Buried City and the research areas examined by Drass (Drass and Turner 1989) and Brooks (1994). Similar to the findings of the latter researchers, these investigations also documented Middle Ceramic sites which lacked stone architecture, but had an abundance of decorated ceramics. Comparative analyses of these assemblages indicated that significant differences between these newly recorded sites and Antelope Creek phase sites in the Oklahoma panhandle (Brosowske 2000). These differences included the use of Alibates silicified dolomite and Smoky Hill jasper for chipped stone tool production, high percentages of decorated ceramics, and the common occurrence of Southwestern trade items at the new sites. Later, excavations at the Odessa Yates site documented ovate to circular semi-subterranean pithouses which bear no resemblance to the stone architectural structures of the Buried City complex or Antelope Creek phase. Discussions with other researchers and a review of site records indicated that pithouses were also present at other nearby related sites, but had remained unrecognized (see Bevitt 1999; Oklahoma Archeological Survey Site Files 2002).

Beginning in 2000 the author became actively engaged in field research at Buried City. To my surprise, an initial analysis of the Buried City cultural assemblage indicated that all aspects of these assemblages were nearly identical to the sites noted above (Note: I had not previously viewed these materials). Given these similarities it was hypothesized semi-subterranean structures were also present at Buried City, but for unknown reasons had remained undocumented. Subsequent discussions with D. Hughes did indeed indicate that while stone architectural features were the primary focus of his 1985 to 1991 investigations, several pithouses were recorded. For example,

> "Excavations in 1985 and 1986 showed a basic architectural sequence beginning with a small, roughly circular pit that may represent a pithouse with a central hearth, but no evidence of wall posts. This was overlain by the main Courson B house, which was about 8 meters square, inside the nearly 1-meter thick stone wall bases" (Hughes 1991:120).

A similar architectural sequence involving pithouses overlaid by stone structures also appears to be described much earlier by Moorhead (1931:101):

> "Our party extended a trench outside the west wall, full length of the building (a large stone foundation structure known as the Temple or Gould Ruin), finding near the center a large ash pit or fireplace, 5 or 6 feet in extent. It was long in use, being hard burned, and its base was some 5 feet below the present surface, and extended under the wall. With this discovery, we were led to the conclusion that a lodge site

> existed before the walls of the Gould ruin were erected. Indeed, 2 or 3 ruins presented similar conditions".

These findings appeared to support the initial hypothesis that pithouses were present at Buried City. Nonetheless, the abundance, distribution, and temporal relationship of these house forms to the more visible stone structures still remained poorly understood.

In 2000 and 2001 shallow, subsurface geophysical surveys were conducted at several locations at the Buried City locality in hopes of further clarifying an architectural sequence. These investigations identified numerous features thought to represent semi-subterranean pithouses. The presence of oval and circular pithouse forms were confirmed by subsequent excavations carried out in 2001 and 2003 (Brosowske et al. 2003). In sum, recent investigations suggest that semi-subterranean pithouses are the dominant house form at Buried City and may outnumber stone foundation houses by as many as ten-to-one (Brosowske et al. 2003; Brosowske and Maki 2002). Like the pithouses described above, the Buried City pithouses do not contain any of the distinct architectural features associated with stone foundation structures (e.g., extended entries, central floor channels, raised benches, etc.).

Analysis of cultural materials recovered from pithouses and stone foundation structures at Buried City clearly indicate occupation by a single population of Plains Villagers rather than the replacement of one group by another. Radiocarbon dating of architectural forms demonstrates that semi-subterranean pithouses predate the earliest stone foundation houses. Available radiocarbon dates demonstrate occupation of pithouses from about A.D. 1250 to perhaps as late as A.D. 1380. The earliest square stone foundation houses may have appeared as early A.D. 1330. The latest dates suggest that the Buried City locality was abandoned sometime around A.D. 1400. Altogether, these data indicate that pithouses were the original house form at Buried City and that the stone foundation structures were a later development. Overall, except for the appearance of stone structures later in the sequence, it is clear that all other aspects of the Buried City locality closely parallel those of Odessa phase settlements to the north and east.

For reasons presented here it is suggested that the existing taxonomic framework of the region be modified to include the Buried City sites in the Odessa phase. While it is recognized that the Buried City complex as defined by D. Hughes (Hughes and Hughes-Jones 1987) precedes the framework presented here, it is proposed that the Odessa phase be used instead. The idea that the Buried City complex could be elevated to the status of a phase and its key traits redefined to include other related Middle Ceramic sites to the north and east was also carefully considered. It is likely, however, that such a framework would always invoke an association between these sites and stone architecture, a situation that only occurs at the Buried City locality. In addition, given that the Buried City locality has long been viewed as closely related to the Antelope Creek phase, a situation that now seems less likely, it is probable that retention of the Buried City label would result in the persistence of these ideas. Current data suggests that a close ancestral relationship did not exist between Odessa and Antelope Creek phase societies.

As described in more detail below, the Odessa phase refers to a Middle Ceramic period population that occupied portions of southwest Kansas southward to the Wolf Creek valley from A.D. 1250 to about A.D. 1475. These horticultural societies produced ceramics that display a variety of decorations, used tool stone derived from the Southern and Central Plains, were actively involved in intersocietal exchange, and occupied permanent settlements containing ovate to circular pithouses. These cultural characteristics also clearly apply to the Buried City locality. What remains unclear, are the reasons why the Buried City locality was the only Odessa phase community that elected to emulate the architecture of neighboring populations after nearly 100 years of living in pithouses. Although this question may never be fully answered, the location of this settlement near the margins areas occupied by the Antelope Creek phase and other related populations is a likely place to witness such a development.

Distribution

Pedestrian survey, the recording of sites undertaken while documenting private collections, and excavation are used to identify the distribution of Odessa phase sites (e.g., Bement and Brosowske 1998, 2001; Bevitt 1999; Brooks 1994a; Brosowske 2002b; Brosowske and Bevitt n.d.; Brosowske et al. 2000; Drass and Turner 1989; D. Hughes 1991; Hughes and Hughes-Jones 1987). Sites occur in a north to south band along the High Plains border from southern Kansas into the Oklahoma and Texas panhandles (Figure 4.10). Sites are found in Meade County, Kansas, Beaver and Ellis counties in Oklahoma, and Ochiltree and Lipscomb counties in Texas. To the east, in Harper County, Oklahoma and Clark, and Comanche counties in Kansas, the cultural affiliation of Middle Ceramic age sites is less clear due to the paucity of investigations and/or the limited sizes of assemblages from these sites. Nonetheless, as additional work is completed some of these sites will eventually be included in the phase or some other closely related entity.

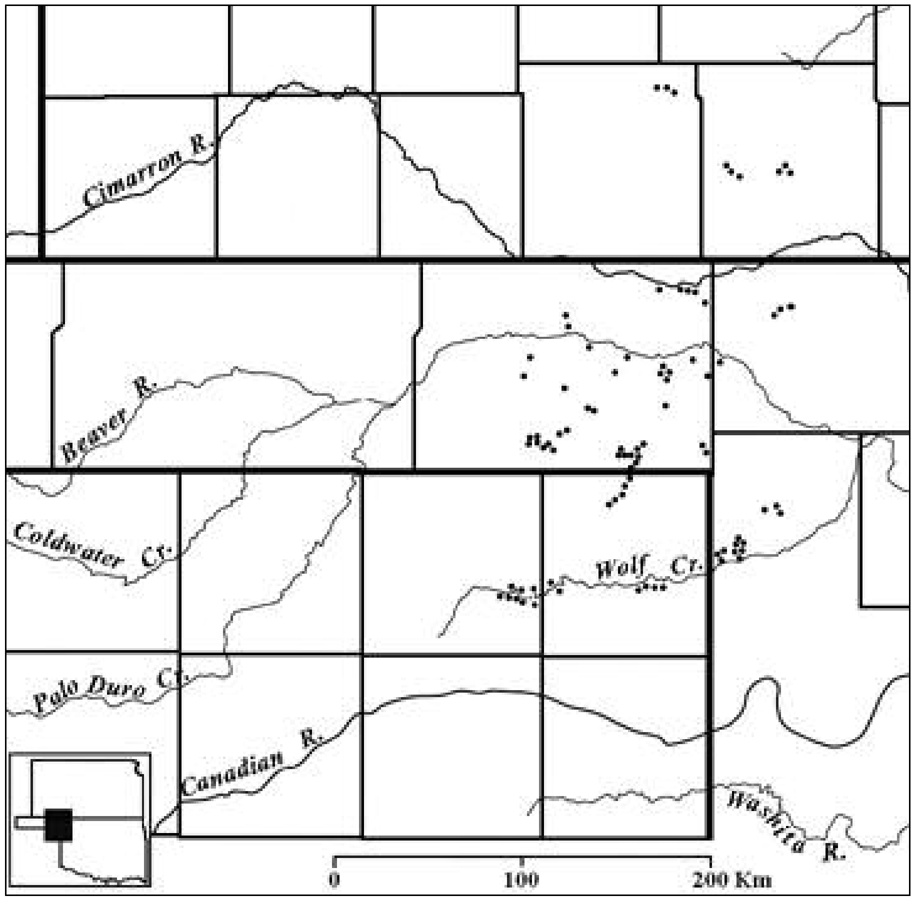


Figure 4.10 Distribution of Odessa Phase Settlements.

Currently, approximately 85 permanent habitation sites are documented and cover a geographical area of approximately 160 km north to south and 140 km east to west. Combined, these sites represent a sizeable Plains Village population. Key sites include Odessa Yates (34BV100), Lundeen (14MD306), Lonker (34BV4), Sprague (34BV99), Schwab (34BV130), Miller (34EL25), 34BV130, sites previously included in the Buried City complex, and Watson, one of several unrecorded settlements in Lipscomb County, Texas (see Bement and Brosowske 2001; Brosowske and Bevitt n.d.; Drass and Turner 1989; Ellzey 1966, 1985; Eyerly 1907a, 1907b, 1912; D. Hughes 1991; Hughes and Hughes-Jones 1987).

As seen in Figure 4.10, Odessa phase sites in southern Kansas do not seem to be very common. This pattern may be more apparent than real, as little of this portion of the distribution has received systematic survey. Presence of the Lundeen site and other related settlements along Crooked Creek, however, clearly indicates that Odessa populations occupied this portion of the region. Overall, sites presently included in this distribution are quite homogenous and clearly warrant their inclusion in the phase.

Temporal Span

Currently, there are a total of 34 dates from 10 different Odessa phase sites (Table 4.8) (Bevitt 1999; Brooks 1994a; Brosowske 2002b; Brosowske and Bevitt n.d.; Drass and Turner 1989; Hughes and Hughes-Jones 1987). Although the vast majority of known sites remain undated, dates are available from both small and large settlements across the entire distribution. Of these dates, only two are clearly in error or date a component later than the Middle Ceramic period (WIS-97, DIC-3280). A third date is also inaccurate (Beta 20277). The latter was obtained from the central hearth in the Kit Courson house. An additional date obtained from this same hearth (Beta-20871) coupled with additional dates from along Wolf Creek suggest that this house was occupied during the fourteenth century and that the earlier date is in error. Disregarding these three dates, which are all from the Buried City locality, the remaining dates indicate occupation of the region by Odessa phase societies from about A.D. 1250 to A.D. 1475, a period of 225 years (Brosowske 2002b; Brosowske and Bevitt n.d.).

Table 4.8 Absolute Dates for the Odessa Phase.

Site	Lab #	Provenience	Radiocarbon Age	Calibrated Age[a]
41OC43	Beta-20277	Central Hearth	840±100	A.D. 1216
41OC27	DIC-3300	Pit NW of House	800±55	A.D. 1256
41OC27	Beta-20276	Hearth in Pithouse	770±80	A.D. 1271
Lonker	Beta-4717	Pit (Feature #4)	750±40	A.D. 1278
41OC29	Beta-185069	Burned Pithouse	740±40	A.D. 1280
41OC1	WIS-90A	Unknown Midden	740±80	A.D. 1280
41OC1	DIC-3338	Pit near Franklin Ruin	740±60	A.D. 1280
41OC26	DIC-3281	Pithouse (Fea. #2)	740±50	A.D. 1280
Odessa Yates	Beta-145474	Tr. 5 E. Pithouse	720±40	A.D. 1280
Lonker	Beta-4716	Pit (Feature #3)	715±50	A.D. 1285
41OC27	DIC-3301	Pit South of House	710±50	A.D. 1287
41OC27	DIC-3228	Pit under House	710±50	A.D. 1287
41OC29	Beta-185071	Area A Pithouse	700±40	A.D. 1290
Odessa Yates	Beta-153243	2000-5 Pithouse	670±40	A.D. 1297
Lundeen	ISGS-4006	Pithouse #1	670±70	A.D. 1300
Odessa Yates	Beta-133579	Pasture Pithouse	670±60	A.D. 1300
41OC29	Beta-185072	Area A Pithouse	660±40	A.D. 1300
41OC1	WIS-90B	Midden	640±70	A.D. 1302, 1369, 1382
Lundeen	ISGS-4007	Pithouse #1	630±70	A.D. 1304, 1367, 1385
Lundeen	ISGS-4008	Pithouse#1	630±70	A.D. 1304, 1367, 1385
Miller	Beta-20398	Bell-Shaped Pit	630±60	A.D. 1304, 1367, 1385
Odessa Yates	Beta-153242	2000-4 Pithouse	630±40	A.D. 1304, 1367, 1385
41OC48	DIC-3302	Unknown	630±40	A.D. 1304, 1367, 1385
41OC29	Beta-185070	Area B Pithouse	630±40	A.D. 1310, 1370, 1380
41OC27	DIC-3327	Central Hearth	620±50	A.D. 1315, 1354, 1387
Lundeen	ISGS-4009	Pithouse #1	600±70	A.D. 1327, 1346, 1393
41OC1	DIC-3303	Unknown	590±45	A.D. 1329, 1343, 1393
41OC43	Beta-20871	Central Hearth	580±60	A.D. 1332, 1340, 1398
Miller	Beta-20399	Bell-Shaped Pit	540±50	A.D. 1407
Odessa Yates	Beta-153241	Tr. 5 W. Pithouse	480±50	A.D. 1434
Odessa Yates	Beta-169790	2000-1 House	390±40	A.D. 1476
Odessa Yates	Beta-169791	2000-3 Bell Pit	390±40	A.D. 1476
41OC1	WIS-97	Midden	360±75	A.D. 1491, 1603, 1609
41OC27	DIC-3280	Burial #1(Bone)	240±65	A.D. 1656

[a] University of Washington Quaternary Isotope Lab; Radiocarbon Calibration Program 4.3;
*Date from same hearth as Beta-20277

Excluding the three erroneous dates from Buried City, these data enable various temporal trends in Odessa phase settlement, the length of occupation for communities, and changes in residential architecture for the phase to be examined. Although the available dates are from 10 individual sites, six of these are part of the

Buried City locality (i.e., 41OC1, 41OC26, 41OC27, 41OC29, 41OC43, 41OC48) and should be considered as areas within a single large settlement. There are seven dates from the Clear Creek locality, but all of these are from an individual site (i.e., Odessa Yates). Thus, the available dates are actually derived from five different Odessa phase settlements. Two of these settlements represent large extended Odessa phase communities along Wolf and Clear creeks while the remaining three represent small settlements (i.e., Lonker, Lundeen, and Miller).

Currently, there are 16 dates from the Buried City locality (spanning A.D. 1256 to about A.D. 1400) and six dates from the Clear Creek locality (A.D. 1280 to A.D. 1476). These dates document the establishment and long-term occupation of pithouse villages of the Odessa phase. Assuming that these settlements were continuously occupied, the length of occupation of these communities (at least 144 and 196 years) is comparable to that noted above for the Antelope Creek phase. Despite the limited number of dates, using the same periods defined earlier for the Antelope Creek phase (see Table 4.4) it is possible to tentatively examine a few broad temporal trends in settlement for the phase (Table 4.9). These data are also standardized using the same methods applied above.

Table 4.9 Temporal Distribution of Absolute Dates for the Odessa Phase

Period	**# of dates**	**# of dates** (Standardized)	**# of Sites**	**# of Sites** (Standardized)	**New Sites Established**
A.D. 1250-1300	16 (51.6%)	24 (66.1%)	5	7.5 (60.0%)	5
A.D. 1300-1400	11 (35.5%)	8.3 (22.9%)	4	3 (24.0%)	1
A.D. 1400-1475	4 (12.9%)	4 (11%)	2	2 (16.0%)	0
Totals	**31 (100%)**	**36.3 (100%)**	**11**	**12.5 (100%)**	**6**

In contrast to the patterns noted above for the Antelope Creek phase, over half of the available dates for the Odessa phase appear to document occupation between A.D. 1250 and A.D. 1300. Although less meaningful since so few settlements have been dated, when these figures are standardized it is apparent that approximately 66% of all the Odessa phase dates are from this early period. These patterns also appear to indicate rapid settlement of the region by Odessa phase groups. Through time the number of dates declines fairly rapidly from an apparent peak during the first period. Examining the standardized figures, the number of dates decreases from 66%, to 23% in the middle period, and finally, to 11% during the last period. The available data indicate that four of the five dated settlements (80%) were established prior to A.D. 1300 (i.e., Buried City and Clear Creek localities, and Lonker and Lundeen). During the fourteenth century three of these settlements were still occupied (i.e., Buried City and Clear Creek localities, and Lundeen) and a fourth was established (i.e., Miller). Following A.D. 1400, only the Clear Creek locality and Miller appear to have been occupied. Whether or not these data indicate that Odessa phase populations were experiencing trends toward increasing aggregation at large settlements or a decline in population through time is not known. It is clear that many more dates from additional sites are needed for Odessa phase sites to help clarify temporal and spatial trends in settlement.

Subsistence Economy

Using multiple forms of evidence a fairly accurate reconstruction of the subsistence economy of Odessa phase populations is possible at this time. Faunal and floral remains have recently been recovered during systematic excavations at several sites (i.e., Odessa Yates, Lonker, Lundeen, Miller, and several sites along Wolf Creek) and provide excellent information on the subsistence economy for these groups (see Bevitt 1999; Brooks 1994; Brosowske 2002b; Brosowske and Bevitt n.d.; Brosowske et al. 2000, 2003; Drass and Turner 1987; D. Hughes 1991; Hughes and Hughes-Jones 1987). Additional support for economic reconstructions is derived from settlement patterns, storage features, and material assemblages. This information strongly supports the idea that Odessa groups practiced an economy of intensive horticulture, hunting, and foraging. Unfortunately, precise determinations of the contribution of each these strategies to the overall diet are difficult to assess. Current information, however, appears to suggest that all Odessa phase subsistence economies were heavily reliant on horticulture, but that hunting strategies may have varied among settlements.

Flotation analyses, tool types, abundant storage features, and settlement patterns all indicate that horticulture was an important component of the diet for all Odessa phase societies. Table 4.10 provides a list of cultivated and native plants recovered from Odessa phase sites. In general, corn is ubiquitous in all features at sites and represents the most commonly recovered plant species. Fragments of beans and squash have also been recovered, but their true importance to the diet is difficult to assess since they are seldom preserved. A wide variety of wild plant remains are also recovered and include goosefoot, sunflower, marshelder, various grass seeds, purslane, bulrush, prickly pear, and little barley. The size of marshelder and sunflower seeds at some sites suggests that Odessa populations were also cultivating these plants.

Table 4.10 Domesticated and Native Plant Species at Odessa Phase Sites.

Site	Archaeobotanical Remains	References
Lonker (34BV4)	C: maize cupules, kernels, embryo, and cob fragments, marshelder, and curcubita sp. rinds W: sunflower, goosefoot, purslane, Fabaceae, bulrush, knotweed, and prickly pear	Brooks 1994a; Drass 1997; Keener 1991
Miller (34EL25)	C: maize cupules, kernels, glume, embryo, and cob fragments W: sunflower, pigweed, cocklebur, carpetweed, and Poaceae	Bohrer 1987; Drass and Turner 1989
Odessa Yates (34BV100)	C: maize cupules, kernels, glume, and cob fragments, and common bean W: goosefoot, sunflower, purslane, bulrush, Poaceae, dropseed, marshelder, prickly pear, hackberry, mustard, wild bean, little barley, and ground-cherry	Brosowske et al. 2000
Lundeen (14MD306)	C: maize kernels, and cob fragments, squash, and possibly tobacco W: goosefoot, sunflower, hackberry, ground-cherry, plum, chokecherry, grape, pigweed, sedge, and grasses	Bevitt 1999
Buried City (41OC29)	C: maize cupules, kernels, and cob fragments, curcurbita sp. stems, sunflower, and common bean W: sunflower, dropseed, hackberry, bulrush, evening primrose, smartweed, grape, knotweed, johnny jump-up, purslane, poke, prickley poppy, and Argemene	Brosowske et al. 2003

C=Cultivated species; W=Wild plant species

The presence of deep storage pits (e.g., bell-shaped and straight-sided examples), coupled with abundant bison scapula hoes and tibia digging sticks and settlement on highly fertile soils all suggest a marked dependence on horticulture. Oftentimes, groundstone tools are relatively rare at many Odessa phase sites (Brooks 1994a:6; Brosowske and Bevitt n.d.). Although fragments of metates and a few one and two-handed manos ranging in size from 13 to 22 cm in length been recovered, the infrequency of groundstone suggests that Odessa phase groups used another method, such as wooden mortars and pestles, for processing domesticated and wild plant foods. The data presented above indicate that a variety of tropical cultigens and native plants provided an important contribution to the diet of these Plains Villagers. Overall, these groups appear to have engaged in a multicropping strategy, and in some cases it is likely that some settlements structured bison hunting around the demands of farming.

The faunal inventories recovered from Odessa phase sites suggest that two different types of hunting economies may have been practiced: broad-scale hunting and specialized bison hunting. Broad-scale hunting strategies appear represented at small, relatively isolated homesteads (Lundeen and Lonker) and some large villages (Buried City locality). At these sites, virtually every available terrestrial, aquatic, and avian animal species was hunted or collected (Bevitt 1999; Brooks 1994a; Brosowske et al. 2003). Also of interest is the fact that deer and antelope remains typically outnumber or equal that of bison.

These data suggest that broad-scale hunting strategies were more widespread at Middle Ceramic sites of the region than is usually recognized (see Chapter Seven). In general, even though minimum number of individuals (MNI) or number of identified specimens (NISP) indices may indicate that bison outnumber other large mammals at many sites of the region, it is probable that the importance of non-bison species to the diet have been underemphasized. In these cases, to broadly suggest that bison were the most important resource can be misleading and potentially ignores important differences in economic and social organization among sites.

The second hunting strategy represented at Odessa phase sites is an almost complete reliance on bison. Currently, this strategy is only documented at a single settlement, Odessa Yates. Bison comprise 93 to 99% of all faunal remains from excavated features at this site (see Chapter Seven; Appendix II). The season of kills determined from eruption and wear patterns of tooth rows and the presence of fetal or new born individuals at Odessa Yates also indicate that most kills took place from fall through spring (Table 4.11). These data suggest that spring kills were most common, although it is possible that the ease in which fetal or new born animals are identified (i.e., the porosity and small size of elements) may exaggerate the actual importance of these events. Whatever the case may be, the paucity of evidence for summer kills (MNI=2) suggest that bison hunting was organized around the demands of farming. While hunting was clearly important during the colder months of the year, the presence of animals killed during every season indicates that bison were locally available throughout the year.

Table 4.11 Seasonality Determinations for Bison Remains from Odessa Yates.

Feature	North	East	Level	Age	Season	Evidence type
2000-3	584	834	4	+/-6.4	Fall	M3
Pasture House	566	1027	8	0.5-0.6	Fall	Mandible
Trench 5	611/612	947	11	+/-7.6	Fall	P2 and P3
Trench 5	613	947	7	2.5	Fall	Dp4
Trench 5	607	948	4	6.5	Fall	Mandible
Trench 5	612	947	4	1.5-2.0	Fall to Spring	Mandibular Premolar
Pasture House	566	1026	8	4.8	Mid-Winter	Mandible
Pasture House	567	1025	7	4.8	Mid-Winter	Mandible
Trench 5	613	947	8	4.8	Mid-Winter	M3, Pm3
Trench 5	607	948	4	4.8	Mid-Winter	Mandible
2000-2	578	858	5	2.0	Spring	Maxilla fragment
2000-3	584	834	8	0.0	Spring	New Born Scapula, Radius, 2nd and 3rd Phalanges
2000-5	652	1301	6-7	-0.1-0.0	Spring	New Born Ribs, 1st and 2nd Phalanges, Occipital condyle
Pasture House	566	1025	8	2.0-2.2	Spring	Mandible
Trench 5	610	947	9	0.1-0.2	Spring	Deciduous Premolar
Trench 5	610	947	8	0.0	Spring	New Born Radius
Trench 5	612	947	8	0.0-0.1	Spring	New Born Humerus
Trench 5	608	951	3	0.0	Spring	New Born Metapodial
2000-1	580	884	3	0.0	Spring	New born Calcaneous
2000-4	848	735	12	6.2-6.3	Summer	Mandible
2000-5	652	1301	8	6.2-6.3	Summer	Mandible

Analyses of bison remains from Odessa Yates also indicate that kills took place close to the site. This is supported by the consistent presence of nearly all skeletal elements, including those of low utility from every excavated feature at the site (Figure 4.11; see Emerson 1993). If entire bison carcasses were typically transported back to villages for processing, it does not seem likely that kill sites will be found in the area. Once the meat was stripped, elements were smashed to remove marrow and boiled to extract bone grease. The intensiveness of processing is aptly demonstrated by the fact that nearly 97% of all bison bone recovered is less than 50 mm in maximum length (Table 4.12). The processing strategies resulted in few burned elements (see Appendix II).

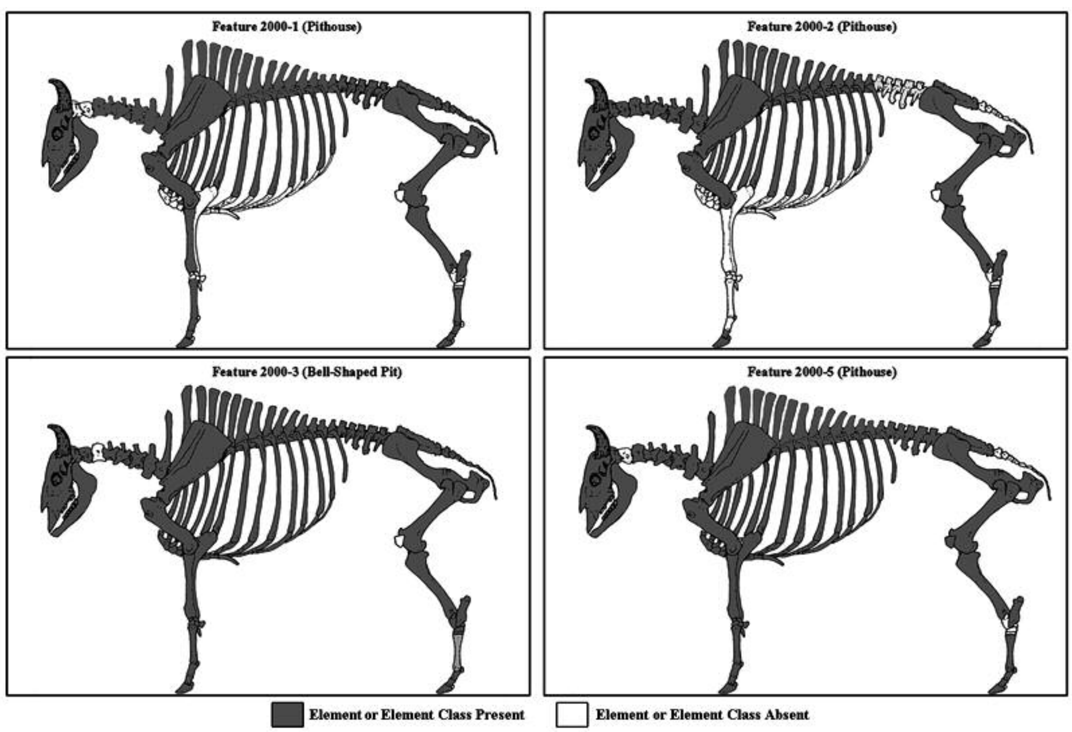


Figure 4.11 Bison Skeletal Elements Represented at Odessa Yates.

Table 4.12 Size Categories of Bison Skeletal Remains from Odessa Yates.

Feature	**Size 1** (0-25mm)	**Size 2** (25-50 mm)	**Size 3** (50-100mm)	**Size 4** (100-200mm)	**Size 5** (>200mm)	**Totals**
2000-1	2994	571	94	27	1	3687
2000-2	1575	111	33	14	0	1733
2000-3	4764	938	104	24	2	5832
2000-5	1930	468	65	14	1	2478
Tr. 5 House 1	577	177	23	7	0	784
Tr. 5 House 3	1161	293	99	29	0	1582
Tr. 5 House 4	1655	530	57	4	0	2246
Tr. 5 Other	1088	321	45	5	0	1459
Totals	15744	3409	520	124	4	19803

Architecture

Excavation at Odessa phase sites has documented two primary types of features: domestic habitation structures and storage facilities. Although many other types of features were undoubtedly present, historic agricultural activities at many sites appear to have destroyed most shallowly buried features. This appears to be case at sites, such as Odessa Yates, where most of the aboriginal ground surface has been plowed away and only cultural features excavated into the subsoil are preserved. Elsewhere, such as along Wolf and Kiowa creeks, many sites have not been plowed and may eventually provide a more complete picture of site features (see Bement and Brosowske 2001; Brosowske and Maki 2002; Brosowske et al. 2003).

The most common residential structure at Odessa phase sites is the semi-subterranean pithouse. Although their presence has been noted at several sites (e.g., Bement and Brosowske 2001; Bevitt 1999; Brosowske 2000; Brosowske and Maki 2002; Brosowske et al. 2003; D. Hughes 1991; Hughes-Jones 1987:96; Oklahoma Archeological Survey Site Files 2002), very few examples have been completely excavated. As a result, many of the specific architectural details of pithouse forms remain unknown. Excavated and cored examples indicate that circular to oval forms 4 to 8 m in diameter and whose floors were 0.8 to 1.8 m below the aboriginal surface are most common (Figure 4.12). Small closely spaced posts 5 to 10 cm in diameter are typically found around the perimeter, and within the pit itself. Single or pairs of larger central posts supported the roof. Internal features documented include shallow basin shaped hearths, small antechamber rooms, and shallow depressions of unknown function. Entry to houses is currently not known. Additional information regarding wall and roof construction remains an enigma as all of the houses investigated appear to have been dismantled and materials salvaged. After abandonment, pithouses were typically filled with trash debris. Although many details surrounding these pithouses are not known, it is readily apparent that these houses are in no way reminiscent of the square to rectangular shallow surface structures documented at Antelope Creek, Zimms, or other related sites.

A second house type has been documented at Odessa Yates and at several sites along Wolf Creek, including Courson A (41OC26), Courson B (41OC27), and Courson D (41OC29). These houses are also circular to oval, but are usually much smaller and shallower than the house forms discussed above (Figure 4.12). Of the four examples known, house forms are about 2.5 to 4.0 m in diameter and were only about 40 to 60 cm below aboriginal ground surface. Shallow basin hearths are typically found in the eastern half of these houses. Once again wall and roof construction remain unclear, although a small central post and wall posts are documented in two examples. Dates obtained for these structures suggest that they were used throughout the duration of the phase. This house form is identical to structures found at several Little River focus sites in central Kansas (e.g., 14PA307 and 14RC306).

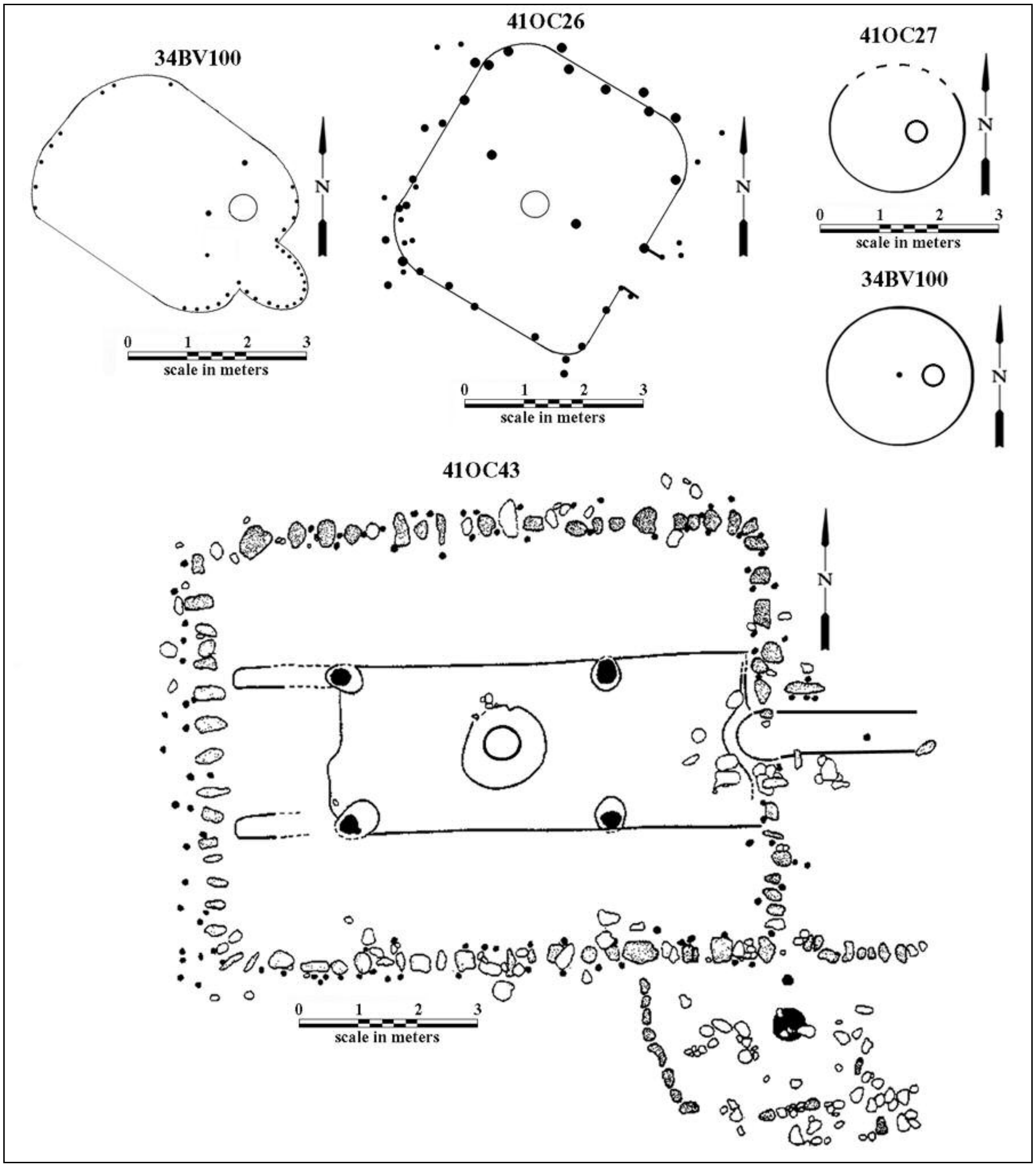


Figure 4.12 Odessa Phase House Forms (adapted from Hughes 1991:Figures 5, 7 and 21).

The last type of house documented for Odessa phase is the square to rectangular surface structure with stone foundations (see D. Hughes 1991; Hughes and Hughes-Jones 1987; Moorehead 1931:94-106). This form of residential architecture is virtually identical to those of the Antelope Creek phase, only much larger (Figure 4.12). These structures typically range between 60 and 130 m^2 in size (see Moorehead 1931) and are often characterized by central floor channels, four central posts, extended entryways, plastered hearths with collars, and adjoining external rooms. As noted earlier, these house forms are present only at the Buried City locality. Additional Odessa phase sites are documented approximately 10 to 15 km downstream from Buried City, but stone foundation structures are not present at these sites.

Pithouses and surface stone foundation houses are both well documented at the Buried City locality (see Brosowske and Maki 2002; Brosowske et al. 2003; D. Hughes 1991). Although the chronological relationship between these house forms is not entirely clear at this time, the available dates indicate that stone foundation house forms are a later development (Table 4.13). Presently, six dates are available for five pithouses along Wolf Creek. Five of these dates document pithouse construction from about A.D. 1270 to 1300 and the other dates to the fourteenth century. Cache pit features associated with a pithouse at 41OC27 that dated to A.D. 1271 also yielded dates before A.D. 1300 (i.e., DIC 3228; DIC 3300; DIC 3301). All of these features underlie and predate a later stone structure. Currently, there are only two acceptable dates that directly date large stone foundation structures at the Buried City locality. Each of these dates documents construction of these architectural forms during the fourteenth century (Table 4.13).

Table 4.13 Calibrated Ages for Pithouses and Stone Structures along Wolf Creek.

Site	Lab #	Architectural Form	Radiocarbon Age	Calibrated Age
41OC27	Beta-20276	Pithouse	770±80	A.D. 1271
41OC29	Beta-185069	Pithouse	740±40	A.D. 1280
41OC26	DIC-3281	Pithouse	740±50	A.D. 1280
41OC29	Beta-185071*	Pithouse	700±40	A.D. 1290
41OC29	Beta-185072*	Pithouse	660±40	A.D. 1300
41OC29	Beta-185070	Pithouse	630±40	A.D. 1310, 1370, 1380
41OC27	DIC-3327	Stone Structure	580±60	A.D. 1332, 1340, 1398
41OC43	Beta-20871	Stone Structure	580±60	A.D. 1332, 1340, 1398

* Both of these dates are from the Area A pithouse at 41OC29

As discussed earlier, the available evidence clearly indicates that semi-subterranean pithouses are the earliest house form along Wolf Creek and at other Odessa phase settlements. At present, the few available dates suggest that stone foundation houses are a later development and are first built in the fourteenth century. It is not known whether the latter totally replace pithouses or if the two forms continue to be used simultaneously until Middle Ceramic groups abandoned the Buried City locality sometime after A.D. 1400.

Storage facilities in the form of subterranean cache pits represent the most abundant cultural feature encountered at Odessa phase sites. Both bell-shaped and cylindrical varieties have been documented and excavated (see Bevitt 1999; Brooks 1994a; Brosowske et al. 2000; Brosowske et al. 2003; Drass and Turner 1987; Hughes and Hughes-Jones 1987). These features are usually at least one meter in diameter and at least that deep, although bell-shaped varieties tend to be larger (i.e., 1.5 m in diameter and depth) and often have caliche-plastered interiors. Presumably, these features only occur on permanent habitation sites and are associated with residential architecture. The abundance of subterranean storage facilities at sites is difficult to ascertain, but approximately 200 cache pits have been documented in a relatively small portion (i.e., about 20%) of the Odessa Yates site through the identification of positive crop marks, magnetic and resistance survey, and coring (Brosowske et al. 2000; Maki et al. 2003).

Settlement

Much of what is currently known about Odessa phase settlement patterns is derived from large-scale pedestrian survey projects and site recording undertaken in conjunction with the documentation of private collections (Bement and Brosowske 2001; Brosowske and Bement 1997, 1998; Brosowske et al. 2000). As noted above, while some portions of the study area have been extensively surveyed, other areas still remain virtually unknown. Therefore, while many sites undoubtedly remain unrecorded, the present information provides a reliable sample from which to characterize settlement patterns for the phase. In addition, it is clear that our knowledge of Odessa phase settlement is biased toward permanent habitation sites. However, if current reconstructions which suggest that Odessa phase settlements were permanently occupied throughout the year are accurate, then non-site locations used for short periods of time may be difficult to discern.

Permanent habitation sites for the Odessa phase include homesteads, hamlets, and villages 20 to 40 hectares in size (e.g., Odessa Yates, Dicky Yates, 41OC1, and 34BV130). Settlements are almost always on the second terrace of streams, but unlike other Middle Ceramic sites of the region, settlement locations are not documented atop high bluffs, mesas, or valley rims overlooking streams. As a result, the use of salient landforms as a guide for predicting or locating sites has yielded poor results. Initially, why one site location was selected over another was not readily apparent.

Nonetheless, over time it has become fairly obvious that two ecological factors influenced settlement locations: potable water and arable land. Although the importance of these resources have long been recognized by researchers of the Plains Village tradition, the abundance and quality of these resources in the study area is quite variable and appears to have influenced, and in some instances constrained, settlement (see Chapter Seven).

By and large, the majority of Odessa phase settlements are in the upper portions of spring fed tributaries. Selection of these locations was influenced by the local bedrock geology and the impact it has on water quality. In the study area, water may be obtained from the Permian age redbeds, Pliocene and Quaternary age deposits, and alluvium. Groundwater available from the redbeds occurs primarily as springs or seeps exposed in deeply incised streams of the study area. Water obtained from these sources "is too high in sulfate and in some places is too high in chlorides to be used for drinking" (Marine and Schoff 1962:57). Pliocene and Quaternary age deposits overlie the Permian age redbeds and water obtained from these deposits, although moderately hard, is suitable for human consumption. Lastly, alluvium is present in the channels, floodplain, and low terraces of major rivers (e.g., the Beaver and Cimarron Rivers) and the lower portions of some of the larger tributary streams (e.g., Clear, Crooked, Duck Pond, Kiowa, and Wolf creeks). The quality of water obtained from these locations is highly variable.

Odessa phase sites of all sizes are found primarily along drainages where the redbeds have not been exposed through valley dissection and the down cutting of streams. These settings most often occur in the upper portions of drainages that originate on or near the margins of High Plains. It is in these locations that the majority of Odessa phase sites are concentrated. There are, however, exceptions to this rule. A few small homesteads have been documented along streams with poor water quality. Each of these locations is adjacent to good springs and suggests that sufficient amounts of potable water were available at these locations to meet the needs of family sized groups. At this time it is unknown whether the latter settings were only used after other better-watered locations were already occupied. Although quality drinking water was clearly a crucial resource to these Plains Villagers, settlement was also influenced by the distribution of highly fertile soils.

The best soils available to prehistoric horticulturalists are generally assumed to have occurred along drainages (see Wedel 1986; Will and Hyde 1964). This is certainly true of the study area, although the perimeters of some upland playa basins and other upland settings may have also contained some fairly attractive soils. Nonetheless, given the semiarid climate of the region, when located far from permanent water sources it is unlikely that these areas would have been selected for settlement. Soils suitable for prehistoric horticulture may be identified using the capability classification system found in many county soil survey reports. This system ranks the suitability, limitations, and risks of various soils under most farming conditions (Allgood 1962:28). Other measures, such as range productivity or estimated yields per acre, are typically derived from yields of forage or crops whose requirements are much different than that of maize. As a result, these are less useful and are often misleading when presented as analogous measures for estimating prehistoric horticultural productivity potential.

Using the capability classification system, it is apparent that soils adjacent to Odessa phase settlements are consistently among the highest ranked in the region (i.e., Capability Class II soils). These soils (e.g., Spur, Bippus, or Canadian series soils) have few limitations and are usually characterized as deep, dark, friable, loamy floodplain soils that are easily worked, well drained, have a high moisture holding capacity, and are rarely flooded (Allgood 1962). Given that the annual precipitation in this portion of the Southern Plains is about 20 to 23 inches, bottomland soils with such qualities were probably crucial for consistent horticultural yields. Another important feature of these soils is that they tend to make up a very small percentage of all available soils. For example, in most counties of the area these soils comprise about 1% of the entire county.

In sum, the selection of settlement locations by Odessa phase populations appears to have been restricted largely to areas where both potable water and highly fertile soils were available. Because geological factors within the study area are such that locations containing both of these resources are fairly rare, settings fulfilling both these requirements probably represented valuable resources that were worth defending or fighting over (Chapter Seven). Settlement in the upper ends of tributaries is also attractive to horticulturalists because the risk of flooding is greatly diminished in these areas. Combined, each of these environmental factors has been used to predict the location of Odessa phase settlements with some degree of accuracy (see Bement and Brosowske 2001).

Thus far I have briefly mentioned that sites of varying sizes have been documented for the phase. In the northern half of the distribution sites are generally small and probably represent single-family homesteads. Lonker and Lundeen are two examples in this class that have received fairly substantial to extensive subsurface investigations (see Bevitt 1999; Brooks 1994a). Sites in this area are generally well dispersed, although site densities are higher in some settings and likely represent hamlets containing several families. In contrast, sites in the southern half of the distribution are much more densely clustered and often include very large individual settlements. Such settlement patterns appear to represent aggregated villages from 4 to 12 km in length. Villages are currently documented along Clear, Wolf, Coon, Kiowa, and possibly, Duck Pond, creeks (Figure 4.13). Occupation along these creeks is reminiscent of the villages described by Coronado on his visit to Quivira in 1541 (Bolton 1949:290-298). Although site contemporaneity is always difficult to demonstrate, multiple dates obtained from several sites in the Wolf Creek cluster suggest that at least some of these sites were occupied contemporaneously. Likewise, contemporaneous dates from the Buried City and Clear Creek localities indicate that at least some of these large villages were occupied at the same time.

Documentation of other site types is limited primarily to mortuary sites (see Mortuary Practices). A survey of playas has documented, albeit poorly, use of these settings by Odessa groups (see Brosowske and Bement 1998). Identification of these locations is based on the recovery of diagnostic materials and suggests short-term use possibly for the procurement of unknown native plant resources (Brosowske and Bement 1998).

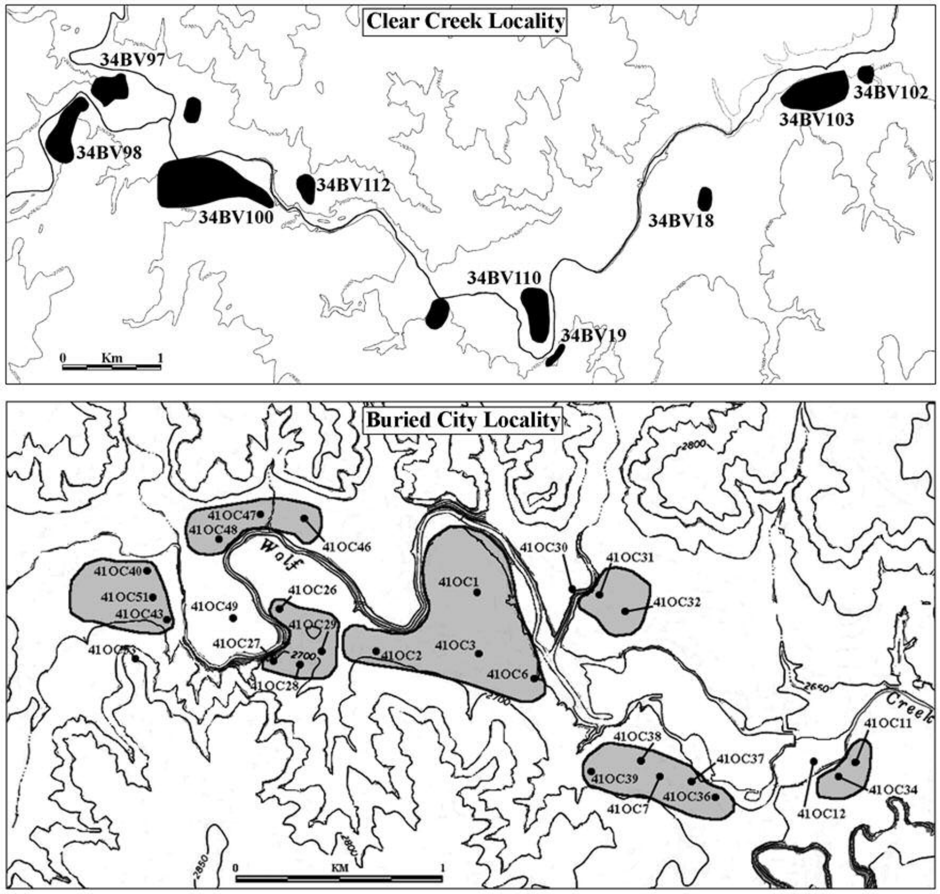


Figure 4.13 Odessa Phase Extended Villages.

As mentioned earlier, the nature of Odessa settlement, subsistence, and technological systems makes the identification of non-habitation sites particularly difficult. For example, an emphasis on high quality nonlocal lithic materials to produce tools makes the documentation of the use of local sources of poorer quality by these groups unlikely. In addition, while Odessa phase groups often relied heavily on bison to meet their subsistence needs, pedestrian surveys focusing on locations suitable for kills have failed to record any of these site types (see Buehler 1997). Lastly, and perhaps most importantly, current evidence suggests that Odessa phase peoples were sedentary horticulturalists who may have been effectively tethered to stored resources and cultivated fields at permanent habitation sites. Under these conditions it seems less likely that additional site types were frequently used and would be highly visible in the archaeological record.

Presently, the number of family groups occupying Odessa phase sites is poorly understood given the limited visibility afforded by semi-subterranean pithouses. As noted above, small sites, such as Lonker, Lundeen and others in the northern half of the distribution, however, are very likely to represent settlements of one or two families. In other cases, three or four households may be loosely clustered along a single drainage to form hamlets.

The number of family groups that occupied the large extended villages of the Odessa phase cannot be accurately determined at this time. As related above, these villages are 4 to 12 km in length and contain many individually recorded habitation sites that altogether frequently total one to several hundred hectares in size. Radiocarbon dates from several sites along Wolf Creek (N=16) clearly indicate that several of these individually recorded settlements were contemporaneously occupied (see Table 4.8). Likewise, at 41OC26, 41OC27, and 41OC29, several adjacent sites in the Buried City cluster, many residential structures have yielded dates that are statistically the same. A somewhat similar scenario is documented at Odessa Yates, a single large settlement within the Clear Creek locality. Of the small number of residential structures that have actually been radiocarbon dated at Odessa Yates (N=5) several suggest that at least some of these pithouses were inhabited at the same time (see Table 4.8).

Geophysical survey, mapping of positive crop marks, and excavation at Odessa Yates and the Buried City locality document comparable densities of residential structures at Odessa phase extended villages. The minimum density of houses derived from four different areas at the Odessa Yates site average about one residential structure per 2000 m^2 or five houses per hectare (Brosowske et al. 2000; Maki et al. 2003). At 41OC29, recent investigations have documented a minimum density of residential structures of one house per 1500 m^2 or about seven structures per hectare (Brosowske and Maki 2002; Brosowske et al. 2003; Maki et al. 2003). These results appear to indicate a slightly higher density of domestic structures along Wolf Creek than Clear Creek.

Barring complete excavation of settlements coupled with an exhaustive radiocarbon dating program, any means used to estimate the total number of family groups that may have occupied Odessa phase extended villages is obviously fraught with problems. Simply multiplying the number of residential structures per hectare by the size of a single settlement produces population estimates that seem too high. For example, at Odessa Yates, which is about 40 ha in size, the minimum density of figure of five houses per hectare would suggest that approximately 200 houses were present. It is possible, however, that these figures may represent portions of settlements that were most intensively occupied and that lower densities characterized other portions. Nonetheless, considering the residential structure density figures presented above and accounting for the fact that only a relatively small percentage of the total houses documented at a given site were occupied simultaneously, a conservative estimate for the number of family groups occupying these Odessa phase settlements is five family groups per linear kilometer of stream valley. Using this figure, estimates of between 20 and 60 families are suggested for each of the four currently documented Odessa phase villages. Although these figures seem entirely reasonable, it is admitted that many settlement variables still remain unknown at this time. Nonetheless, like the settlement estimates provided earlier for the Antelope Creek phase, these figures do provide some indication as to the probable size of settlements.

Mortuary Practices

Overall, the mortuary practices of Odessa phase remain poorly known. Although burials are documented from several sites, the vast majority of these are not well reported and are known primarily through discussions with avocationalists and landowners. To compound this situation, a few sites, such as those along Wolf Creek, are characterized by multiple occupations and some burials may actually represent use by later groups. This almost certainly appears to be the case for burials excavated from within the Courson B (41OC27) stone structure along Wolf Creek, which yielded a date on human bone of A.D. 1656 (DIC-3280).

Numerous bluff top burials are documented along Wolf and Clear creeks (i.e., 34BV19) and other drainages in Beaver County (Oklahoma Archeological Survey Site Files 2002). Although most of these burials are near Odessa phase sites and are probably associated with the phase, their age remains uncertain in the absence of diagnostic artifacts and dating. As a result, only those examples that are clearly associated with the phase are discussed here.

Burials associated with Odessa phase have been documented at several residential sites along Wolf, Coon, Clear, Sand, and Kiowa creeks (Bement and

Brosowske 2001:32; L. Bussard 2003, personal communication; Courson and Wilkens 2000, personal communication; Eyerly 1912; D. Hughes 1991; Hughes and Hughes-Jones 1987; Moorehead 1931; Oklahoma Archaeological Survey Site Files 2002). Eyerly (1907a, 1907b, 1912) and Moorehead (1931) encountered human burials in nearly every house structure they tested at the Buried City locality. All of these burials represent the interment of single individuals, however, as mentioned above, it is possible that some of these are related to later occupations. Other burials at Buried City which are definitely of Middle Ceramic age are interred in what may be abandoned storage pits. In several instances, burial pits containing females are capped with a pavement of stone and have ceramic vessels smashed on top of them (Brosowske 2002b; Brosowske and Maki 2002; Bussard 2003, personal communication; Wilkens 2000, personal communication). These features, commonly described as "pot drop" burials (see Figure 4.14), frequently contain bison tibia digging sticks, ceramic vessels, marine shell and exotic stone jewelry, and mussel shells as associated grave items. Burials of adult males are noticeably rare.

Despite the extremely limited number of well-excavated examples, evidence for violent death is represented by two burials. Eyerly (1912:2) notes an individual wtih an arrowpoint embedded in an unidentified bone at Buried City. A second burial found during the grading of a borrow ditch near 34BV103 also had a Washita arrowpoint embedded in the chest cavity (Kachel 1999, personal communication). Overall, although the frequency of intertribal violence is difficult to assess for the period, it is likely that warfare was much more common these societies than is generally thought (see Brooks 1994b; Green 1986; Keeley 1996; LeBlanc 1999).

Figure 4.14 Stone Capped Burial Cairn along Wolf Creek, Texas.

Assemblage Characteristics

In general, the material assemblages associated with Odessa phase sites contain many of the diagnostic artifacts that serve to identify the Plains Village tradition as a whole (see Lehmer 1971). These items include globular cordmarked ceramics, alternately beveled knives, triangular arrowpoints, distal endscrapers, drills, bison bone hoes, digging sticks, and rasps, and others (see Lehmer 1971; Lintz 1986a; Watson 1950 for lists of assemblage traits). However, because some features of Odessa phase artifact classes are quite distinct from other Plains Village populations of the region and because the phase has only been recently defined, the certain aspects of assemblages are briefly examined here (see Brosowske and Bevitt n.d. for additional discussion). In particular, these discussions focus on ceramics and lithic raw material use. Evidence for regular intersocietal exchange, a third important characteristic, is examined in Chapter Six.

Odessa phase ceramic assemblages are characterized by a great deal of variability. Sources of variability include the frequency and variety of decorated vessels, temper, and surface treatment. Decorations on ceramics occur almost exclusively on the rim and neck portions of vessels (Figure 4.15). A few examples of decorated shoulders are known, but these are relatively uncommon and usually consist of incised chevron designs (Bevitt n.d.; Brosowske et al. 2000; Hughes and Jones-Hughes 1987). At most sites, rims are decorated 50% and 100% of the time. This is in contrast with Antelope Creek sites where decorations on Borger cordmarked vessels are not common (Lintz 1986a), but may increase in frequency at sites in the Oklahoma panhandle. For example, the Stamper site has the highest frequency of decorated rims (i.e., nearly 25%) of any known Antelope Creek phase site (Brosowske 2002b).

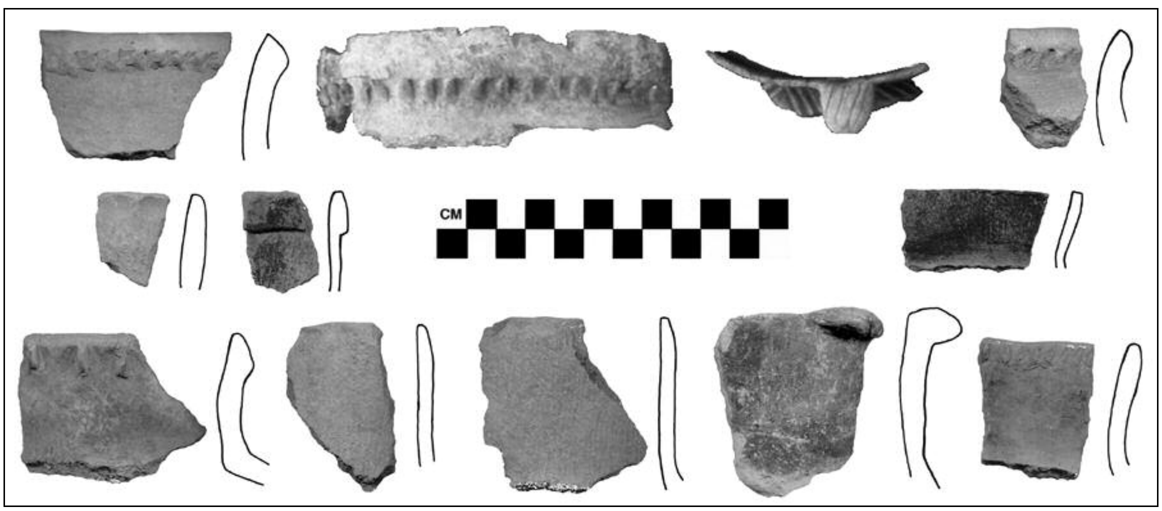


Figure 4.15 Odessa Phase Decorated Rim Sherds.

The types of rim decorations present at Odessa phase varies considerably, a fact that has been previously noted for the Buried City locality (Bevitt n.d.; D. Hughes

1991; Hughes and Hughes-Jones 1987), although pinching and impressed designs are most common. Single and multiple rows of pinching typically occur along the upper half of the rim. Common impressed designs include diagonal stick or tool impressions along the lip and shallow concave or cupped impressions at the lip/rim juncture. Strap handles and lip tabs occur at some sites and may or may not be decorated with incising. Other decorations include crenulated rims, appliqué, fillet, and punctations. In general, all of these decorative elements are usually thought to be much more common on the Central Plains rather than the Southern Plains.

The surface treatment of vessels is dominated by smoothed over cordmarks and plain examples. Unmodified cordmarks generally comprise less than 5% of samples (see Bevitt n.d.). The temper of vessels is most commonly sand or sand combined with bone or scoria. Sand as the sole temper agent often represents greater than 80% of samples from Odessa Yates and most other sites. The rim diameter of vessels is typically (i.e., roughly 50%) between 13 and 17 cm. Larger and smaller diameters round out samples and are about equally represented. It is also worth noting that although thick cordmarked sherds are commonly attributed to the Early Ceramic period, recent excavations at Buried City (i.e., 41OC29) document numerous vessels thicker than 15 mm from well-dated Middle Ceramic contexts (Brosowske et al. 2003).

Overall, considerable variability in decoration elements and surface treatment of ceramics among Odessa phase sites is well documented (Brosowske and Bevitt n.d.; D. Hughes 1991; Hughes and Hughes-Jones 1987). Currently, the source of this variability is not clear, and potential factors, such as intergroup exchange and post-marriage residence rules, remains unstudied. Differences between ceramics of the Odessa and Antelope Creek phases are limited primarily to the frequency of decorated rims and plain vessels. While these differences appear fairly obvious at times, designation of site affiliation should ideally be made using multiple forms of evidence.

Lithic raw materials used by Odessa phase populations are very distinctive, especially in comparison to other Plains Villagers of the area who primarily used Alibates silicified dolomite and/or locally available materials (see Chapter Six, Appendix IV). Antelope Creek phase lithic assemblages generally contain between 80% and 100% Alibates silicified dolomite from bedrock sources along the Canadian River in the Texas panhandle (Bandy 1976; Brosowske 2002c; Duncan 2002; Lintz 1976, 1986a). Redbed Plains variant groups most commonly utilized Frisco chert from south-central Oklahoma and quartzites and cherts from the expansive Ogallala formation (Drass 1997). In contrast, Odessa phase relied heavily on a combination of Alibates and Smoky Hill or Niobrara jasper whose nearest source area is in northwest Kansas (Brosowske and Bement 1997, 1998; Brosowske 1999, 2002b; Brosowske et al. 2000). In particular, use of the latter material is very distinct for the region and its frequency on Plains Village sites in or near the study area often denotes its affiliation with the phase. Typically, Alibates comprises between 50% and 80% of lithic assemblages and Smoky Hill about 20% to 35%. Other local and nonlocal lithic materials typically comprise less than 10% of assemblages.

Red Bed Plains Variant (A.D. 800-1450)

The following provides a brief overview of groups attributed to the Red Bed Plains variant (Figure 4.16). These groups are somewhat peripheral to the primary study area discussed above (i.e., the Texas and Oklahoma panhandles), and as such, the following represents only a general overview of basic cultural trends identified for the region. As a result, these groups are not examined as intensively as the preceding Antelope Creek and Odessa phases. These discussions are derived almost entirely from the work by Drass (1997) and the reader is encouraged to consult this excellent source for additional details.

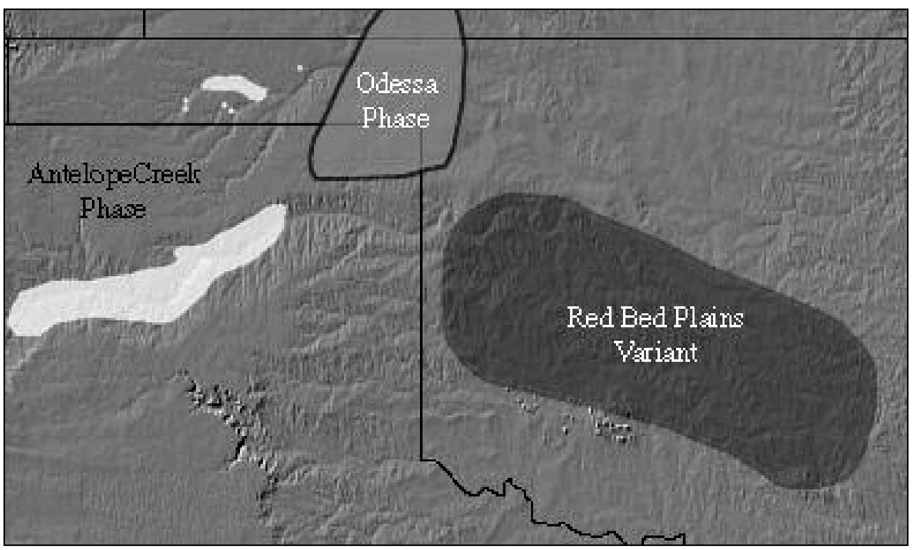


Figure 4.16 Distribution of Red Bed Plains Variant Societies.

The primary focus of this section is to summarize some of the more important temporal and spatial trends in the subsistence economies, material assemblages, and settlement patterns for groups of the Red Bed Plains variant. It should be noted that while cultural continuity from the Early to Middle Ceramic periods on the Southern High Plains is essentially nonexistent or has yet to be demonstrated in any meaningful way, it is readily apparent that very strong ties exist between Early and Middle Ceramic cultural traditions for the main body of Oklahoma (see Drass 1997). In fact, differentiating Early Ceramic from Middle Ceramic sites during pedestrian survey can sometimes be difficult because only subtle differences may exist in the material assemblages and settlement of groups representing these two periods. As such, while the Early and Middle Ceramic periods for the Southern High Plains were presented separately, these two periods are examined collectively, from earliest to latest for western and central Oklahoma.

The onset of the Red Bed Plains variant as recently defined by Drass (1997) denotes the appearance of horticultural groups in central and western Oklahoma (see discussion below for the appearance of horticulture in the area). This variant is divided into early (A.D. 800-1250) and late (A.D. 1250-145) periods and each of these temporal periods contain western and eastern components. Table 4.14 provides an overview of the four phases identified for the Red Bed Plains variant and their associated temporal spans.

Table 4.14 Identified Phases for the Red Bed Plains Variant.

Temporal Span	**Western Oklahoma**	**Central Oklahoma**
A.D. 800-1250	Custer phase	Paoli phase
A.D. 1250-1450	Turkey Creek phase	Washita River phase

As is typical for the entire region, the Early Ceramic period for western and central Oklahoma remains poorly understood. This is primarily a result of the fact that permanent sites, with substantial residential structures, middens, and subterranean storage facilities and the data they usually contain, are absent. Most sites contain relatively sparse concentrations of cultural materials and are interpreted as small hunting or base camps. Important sites include Roulston-Rogers, Barkheimer, Austin Sand Pit, Ayers, Rose-Fast, Thunderbird Dam, and components at Duncan-Wilson, Quillan, Spring Creek, 34CD257, and 34CD258 (Drass 1979, 1984a 1984b; Ferring 1982, 1986b; Hughes and Briscoe 1987, Lawton 1968; Mayo 1982; Moore 1988, Neel 1984). Identified Early Ceramic period site features are limited to those attributed to short-term food processing activities and include hearths and roasting pits.

Material culture also reflects a generalized lifestyle of hunting and gathering. Lithic assemblages are dominated by corner notched dart and arrowpoints and informal flake tools produced from locally available materials. Ceramics are almost always present in small numbers (i.e., less than 20 sherds) and represent thick conoidal shaped cordmarked vessels. Overall, the archaeological record for the Early Ceramic period of western and central Oklahoma suggests that mobile groups who relied on seasonally available plants and animals occupied the region. Although increased frequencies of groundstone are present at some sites and suggest that groups were using plant resources more intensively than during the preceding Late Archaic period, as a whole, it is apparent that lifestyle changes from the Archaic to Early Ceramic are relatively minimal compared to those that occurred later with the appearance of horticulture.

As noted above, the primary distinction used by Drass (1997) to differentiate the Early Ceramic from the beginning of the Middle Ceramic period in western and central Oklahoma is the appearance of corn horticulture. Importantly, the appearance of domesticated crops in the archaeological record of the area also coincides with the appearance of the first permanent villages. The fact that both these two events seem to arise at approximately the same time suggests that they were closely related and were mutually reinforcing developments. That groups became more sedentary at this time is further supported by substantial increases in the number of subterranean storage facilities and the accumulation of sizeable midden deposits at many settlements. In most cases, settlements were adjacent to floodplains and terraces with fertile soils. Although evidence for corn horticulture has been documented at all Paoli and some Custer phase sites, it should be emphasized that foraging was still very important, and the density of cultivated plant remains is much lower than that observed at sites of the following phases (Drass 1997:109-113).

The material assemblages at early Middle Ceramic sites (i.e., Custer and Paoli phase sites) contain many of the same chipped stone artifacts documented for the preceding Early Ceramic period and include corner notched dart and arrowpoints, scrapers, ovate knives, and drills. While notched and unnotched triangular arrowpoints do make their appearance at this time, and eventually become as common as corner notched forms, beveled knives are noticeably rare. Ceramics at the onset of the Middle Ceramic period show considerable continuity from the preceding period and include conical or globular cordmarked vessels with pointed, rounded, or flat bottoms. One important difference, however, is that ceramics are noticeably more abundant at these sites than during the Early Ceramic period. Bone hoes and digging sticks rarely occur, although they do become more common at sites dating to about A.D. 1200 or 1250.

Settlement for early Red Bed Plains variant groups is characterized by the occupation of hamlets or small villages during the growing season and frequent movement in and out of short-term habitation sites throughout the rest of the year (Drass 1997:13). Overall, it is thought that groups were essentially tethered to permanent villages and their associated horticultural fields during the growing season. These localities were abandoned in favor of hunting and gathering pursuits from late fall until early spring.

The late Middle Ceramic phases identified for the area include Turkey Creek and Washita River. Delineation of these phases is marked primarily by important changes in settlement, subsistence, and material economies. As a whole, these changes are thought to reflect organized strategies to increase economic production (Drass 1997). While bison were hunted by western Oklahoma groups throughout the Early Ceramic and Middle Ceramic, following A.D. 1250 bison remains became much more common at Washita River sites in central Oklahoma and suggests a shift away from a broad hunting economy to more of an emphasis on bison. Other important changes also noted for this time include dramatic increases in the frequency of alternately beveled knives, bison bone hoes and digging sticks, and as mentioned above, increases in the frequency of corn at sites.

It is suggested that full sedentism developed following A.D. 1250 as groups intensified farming and bison hunting activities (Drass 1997). While short-term habitation sites are documented for the Turkey Creek and Washita River phases, it is likely that these sites reflect logistical movement from permanent settlements. Although residential structures have been particularly difficult to identify within the entire distribution of the Red Bed Plains variant, an increase in settlement size is noted for the two late phases and is thought to reflect fairly dramatic increases in population during this time. In general, increases in human population are thought to be the primary factor that led to efforts to increase economic production (Drass 1997).

Because few residential structures have been excavated at Turkey Creek and Washita River phase sites, models of settlement are based largely on the distribution of sites. Nonetheless, identification and excavation of houses at a few sites, such as Arthur (Brooks 1987), suggest that late Red Bed Plains variant settlements may have contained anywhere from five to 20 family groups. More importantly, extensive survey of areas, particularly in central Oklahoma, provides useful information related to settlement of the region. Although it is unlikely that settlement density was the same for the entire area in which Red Bed Plains variant sites are found, it is apparent that settlements were most concentrated along the Washita River in central Oklahoma (see Drass 1997:Figure 43). In this area, settlements occur at one or two sites per linear km.

Although the earliest Red Bed Plains variant phases of western and central Oklahoma (i.e., Custer and Paoli phases) are noted as beginning around A.D. 800, it is apparent that domesticated plant remains (i.e., maize) are rare from contexts earlier than A.D. 1050, and more often occur after A.D. 1100 (see Drass 1997:Table 5; Figure 7). In fact, Drass (personal communication 2003; see Drass 2003:29) notes that an AMS date on corn of A.D. 1040 from 34CU306 represents the earliest date on corn for the area. This point is particularly crucial for the present research because western and central Oklahoma are often considered a likely point of origin from which horticulture and the Plains Village tradition lifestyle in general are thought to have spread to the Southern High Plains. The available information suggests that these developments were not widespread on the Rolling Plains until sometime following A.D. 1050.

Rio Grande and Pecos River Valleys (A.D. 600-A.D. 1600)

Social interaction and exchange between Plains groups and Puebloan populations of the Rio Grande and Pecos River valleys is a topic of long-standing interest among Southern Plains researchers (see Baugh 1982; Lintz 1986a:5-16, 1991; Mason 1929; Sayles 1932 [in Lintz 1986a:11]; Speth 1991; Spielmann 1982, 1983; Studer 1931a, 1939, 1963). Although the recovery of durable items, primarily obsidian, at Southern Plains sites demonstrates a long history of contact between these two culture areas (e.g., Bement and Brosowske 2001:109-112; Johnson et al. 1985), it is apparent that regular contact between groups of the Plains and Southwest is a relatively late development (i.e., post A.D. 1200) (see Baugh 1982; Lintz 1986a, 1991; Spielmann 1982, 1983).

The ensuing discussion provides a brief, and admittedly, generalized summary of cultural sequences for the Rio Grande and Pecos River valleys of New Mexico between A.D. 600 and A.D. 1600. For the archaeologist unfamiliar with the culture history of the American Southwest, sorting through the various chronological frameworks used to describe archaeological phenomena of the region can certainly be a daunting task (e.g., Cordell and Gumerman 1989; Glassow 1980; Kidder 1927;

Wendorf and Reed 1955; Wetherington 1968). In the area of interest here, most researchers have applied either the Pecos Classification (Kidder 1927) or a scheme proposed by Wendorf and Reed (1955).

The temporal span examined here closely correlates to the Pueblo I through Pueblo IV periods of the Pecos Classification scheme (Table 4.15). Particular emphasis is placed on the later periods following A.D. 1100 when regular exchange between the Plains and Southwest became more common. Previously, Cordell (1984, 1989), Kelley (1984), and Spielmann (1996) have presented overviews for this broad and culturally variable area and these studies are relied upon to a great extent here. Because there is considerable temporal and spatial variability across the region, previous overviews have grouped sites into archaeological districts to clarify broad trends and for comparative purposes (e.g., Cordell 1989; Spielmann 1996). For the same reasons, this review also makes use of the same districts (Figure 4.17). Overall, these discussions establish a cultural context for the eastern Pueblo area prior to and during the period in which interdependent exchange between the Plains and Southwest develops.

Table 4.15 Temporal Frameworks for the Rio Grande and Pecos River Valleys.

Pecos Classification (Kidder 1927)	**Wendorf and Reed Scheme (1955)**
Pueblo I (A.D. 750-900)	Early Developmental Period (A.D. 600-900)
Pueblo II (A.D. 900-1100)	Late Developmental Period (A.D. 900-1200)
Pueblo III (A.D. 1100-1300)	Coalition Period (A.D. 1200-1325)
Pueblo IV (A.D. 1300-1600)	Classic Period (A.D. 1325-1600)
Pueblo V (A.D. 1600-Present)	Historic Period (A.D. 1600-Present)

In contrast to many other portions of the American Southwest where agricultural economies first make their appearance before A.D. 300, researchers working in the Rio Grande and Pecos River valleys have repeatedly noted the paucity of farming settlements before A.D. 1000 (Cordell 1989; Dickson 1979; Glassow 1980; Spielmann 1996; Wendorf and Reed 1955). Currently, the two earliest horticultural sites in the region have been dated between A.D. 550 and A.D. 600 and are found in the upper Cimarron and Pecos drainages (Dickson 1979:30; Glassow 1980:113). In the centuries that follow additional evidence for the presence of horticultural groups in the region remains sparse and only a few sites in the Cimarron, Pecos, Albuquerque, and Sierra Blanca districts have been dated between A.D. 800 and 1000 (Cordell 1989:304; Kelley 1984; Spielmann 1996).

In general, sites are widely dispersed and are indicative of low population densities. Settlements typically contain one or a few circular pithouses and suggest occupation by one or possibly two families. The ephemeral appearance of sites and the lack of associated storage facilities suggest that these small settlements were occupied on a seasonal basis (Cordell 1989:305). It is also interesting to note that the earliest ceramics in the region coincide with the appearance of these early pithouse villages.

The period between A.D. 1000 and 1200 is characterized by a gradual increase in population across much of the entire region (Cordell 1989:308-309). While the period marks the first evidence for horticultural communities in the Taos and Gallinas areas, in other districts, such as Chama, Galisteo, and areas east of Santa Fe, there is still little or no evidence for resident farming populations (Cordell 1989:309; Lang 1977; Spielmann 1996:182). In the Cimarron district, which previously contained some of the earliest horticultural sites in the region, Glassow (1980:113) notes that this area experienced a decrease in population.

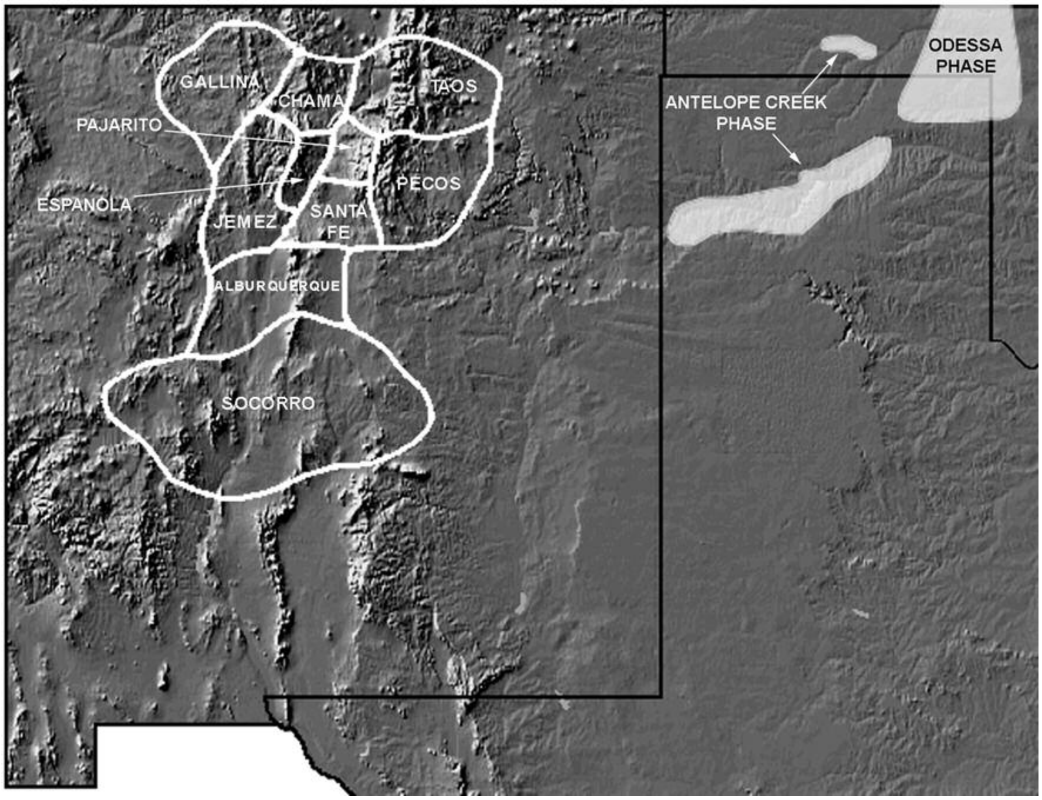


Figure 4.17 Archaeological Districts of Central and Northern New Mexico.

Although the period is noted as one of expansion, it is apparent that population densities remain low. Settlements are small, usually consisting of one or two pithouses, and possibly, a few jacal surface structures. Red Mesa Black-on-white is the "hallmark" ceramic type of the period, although corrugated gray utility wares are present and abundant at most sites (Cordell 1989:310). In general, the variability noted in the degree of sedentism, settlement, and subsistence orientation for the region at this time may reflect a period of "settling in" as groups practicing a mixed economy of foraging and horticulture expanded into previously unoccupied areas.

It is also during this period that the Chacoan system, based in the San Juan basin, reached its zenith. The potential impact that this burgeoning system may have had on populations in the Rio Grande and Pecos river basins remains unclear and is disputed among researchers (see Cordell 1984, 1989). Nonetheless, the evidence for population expansion and the widespread distribution of Red Mesa Black-on-white wares (a common type at Chacoan sites) at many sites are thought by some to be related to the developments occurring in the nearby San Juan basin (see Cordell 1989:310; Lang 1982).

Compared to earlier periods, most of the entire region is marked by significant transformations in demography, settlement, and architecture between A.D. 1200 and A.D. 1300. While a dramatic increase in the number of sites recorded is certainly a dominant trend for the period, distinct differences can be discerned in the way that populations and settlements were organized from area to area. For instance, in the Gallisteo and Santa Fe areas, population increases are reflected by the emergence of large numbers of moderate size pueblos containing 13 to 30 rooms (Cordell 1989; Spielmann 1996:181). In contrast, although population increases are also noted in the Taos and eastern Rio Abajo districts, rather than occupying numerous medium sized sites, groups are aggregated into fewer, but much larger villages (Cordell 1989; Spielmann 1996). Elsewhere, such as in the Chama and Galisteo areas, although the general pattern is one of relatively low numbers of medium sized settlements, individual large pueblos containing 100 to 150 rooms are also present in each of these districts (Cordell 1989; Spielmann 1996).

The above settlement patterns suggest that the rate of population increases and the concomitant organizational responses varied from district to district. Although the appearance of large settlements tends to dominate the literature, it should be stressed that most researchers note that moderate sized settlements consisting of pueblos with 13 to 30 rooms are still most common throughout the Rio Grande and Pecos region at this time (Cordell 1989:315). With this being said, except for the Cimarron district, which is essentially abandoned by A.D. 1300 (Glassow 1980:113), the fact that pueblos with more than 100 rooms are established in all parts of the eastern border between A.D. 1250 and 1300 (Spielmann 1996:183) is certainly a noteworthy development.

Coinciding with dramatic increases in population and the emergence of large aggregated communities is the widespread advent of surface pueblo architecture throughout the region. Although early masonry and adobe pueblos were previously built in the Rio Abajo and Cimarron districts as early as A.D. 1100, villages containing pithouses and jacals were the dominant architectural forms in all areas prior to A.D. 1200 (Spielmann 1996:Figure 12.4). While pueblos certainly became common following A.D. 1200, as a whole, architectural forms throughout the region remained diverse and still included pithouses and jacals (Spielmann 1996:183). In addition to new forms of architecture, the earliest water control features (i.e., check dams and grid alignment) also made their appearance at this time in the Española and Taos areas (Cordell 1989:317). Ceramic assemblages of this time are dominated by Santa Fe

Black-on-white wares or local Black-on-white variations, such as Chupadero, Taos, Wiyo, Pindi, and Poge (Cordell 1989:316).

The dramatic events described here for the latter half of the Pueblo III period coincided with the collapse of the Chacoan system. Although many of the demographic, architectural, and ceramic developments noted for the Rio Grande and Pecos areas at this time are often attributed to population influxes from the San Juan basin, large-scale migrations from the latter region have yet to be demonstrated (Cordell 1989).

The final period of interest here corresponds to the Pueblo IV period (A.D. 1300-1600). The initial trends of population aggregation and the emergence of large pueblos observed in the region between A.D. 1200 and 1300 continued and became even more pronounced following A.D. 1300. Cordell (1989:314) also notes that the period is characterized by the abandonment of high elevation settlements and the formation of large aggregated pueblos along major floodplains. Overall, large pueblo settlements are documented in the Chama, Taos, Upper Pecos, Albuquerque, Rio Abajo, Santa Fe, Galisteo, and Sierra Blanca districts (Cordell 1989; Spielmann 1996).

It is clear that aggregation into larger communities during the Pueblo IV period certainly would have required considerable modification of existing cultural systems. However, the available settlement and architectural evidence may also suggest that the pace of social, economic, political, and demographic change may have been even more rapid than in preceding periods, and that in many instances, the initial responses to these changes may not have provided viable long-term solutions. Cordell (1989) and Spielmann (1996) note that few of the large Puebloan communities established during Pueblo IV are occupied for any significant length of time. For example, Spielmann (1996:183) notes that only seven of the 19 large pueblos in the Salinas district established by A.D. 1300 continued to be occupied into the fifteenth century. Similar patterns are observed in the Galisteo and Sierra Blanca areas (Cordell 1979; Spielmann 1996:183). Overall, the regional trend of escalating aggregation is perhaps most clearly shown in the Upper Pecos area. Here, eight large pueblos (i.e., Arrowhead, Dick’s Ruin, Forked Lightning, CA 267, CA 680, Loma Lothrop, Pecos, and Rowe) were established between A.D. 1250 and 1325, but only Pecos Pueblo remained after A.D. 1450 (Cordell 1980:10; Spielmann 1996:183).

Of the pueblos that do persist after A.D. 1450, evidence suggests that substantial rebuilding projects were often carried out to accommodate additional populations attracted to these large settlements (Spielmann 1996:183). Although some pueblos have well-organized layouts, often consisting of multiple quadrangular room blocks organized around a plaza, others do not and suggest they experienced periods of unplanned population growth (Cordell 1989:322). The relocation of settlements from high to low elevations also suggests a shift to intensive horticulture. The fact that food production rates increased substantially over earlier periods, probably at surplus levels, is also supported by the construction of large storage facilities at most sites and the increased numbers of water control features documented for this period (see Cordell 1989:Table 10). Finally, the Pueblo IV period is marked by the appearance of Glaze wares. These ceramics are produced from the fourteenth to seventeenth centuries and early Glaze wares were traded widely.

Concluding Thoughts

The preceding reviews have established a cultural context for the Early and Middle periods for the Southern High Plains. These discussions have emphasized the two major Middle Ceramic entities: the Antelope Creek and Odessa phases. Contemporaneous groups in western and central Oklahoma and populations of the eastern border pueblos were also briefly examined. Even though evidence for cultural continuity from the Early to Middle Ceramic period is variable in each of these areas, discussions of preceding Early Ceramic groups provide an important historical dimension to this study.

These discussions demonstrate that the Southern High Plains was occupied by mobile foraging groups until about A.D. 1250. These populations, recognized as Lake Creek and Palo Duro complexes, were characterized by low population densities, use of local resources, and habitation of short-term camps occupied by family groups for a few days to as long as a season. Settlements were small and a mobile foraging lifestyle of frequent residential moves is supported by the rarity or absence of substantial features at most sites (i.e., houses and storage facilities). In general, population densities were quite low. Some sites do contain midden deposits and sizeable quantities of groundstone and burned rock which suggest that some sites were occupied for longer periods possibly to procure and process seasonally available plant resources. Overall, except for the addition of the bow-and-arrow and small amounts of ceramics, site assemblages and settlement suggest very little modification from Late Archaic times. Somewhat surprisingly, very similar trends are also indicated for western and central Oklahoma and the Rio Grande and Pecos River drainages at this time.

The onset of the Middle Ceramic period on the Southern High Plains is marked by a series of dramatic cultural events. These include major increases in regional population, the emergence of permanent settlements, the appearance of horticulturally based economies, distinct forms of residential architecture, a reliance on long-term subterranean food storage, use of specialized chipped stone and bone technologies, specialized subsistence economies, increased use of ceramics, and probably early examples of craft specialization and land tenure systems. All of these developments coincide with the development of interdependent exchange and appear very abruptly on the Southern High Plains around A.D. 1250. An overview of Middle Ceramic groups in western and central Oklahoma documents a similar sequence of evolutionary developments. One major difference, however, is that this transition appears less abrupt, occurring over a period of about two centuries.

In New Mexico, horticultural settlements do not appear to have become widespread in the Rio Grande and Pecos drainages until around A.D. 1000 or A.D. 1100. Following A.D. 1200 major trends of population aggregation are demonstrated by the appearance of medium and large villages. Following A.D. 1300, aggregation further intensified as many smaller settlements were abandoned and replaced by large pueblos containing hundreds of people. Some of these settlements were occupied into the Historic period and were described by early Spanish explorers.

On the Southern High Plains, the population distribution during the Middle Ceramic period is quite variable. Along the Canadian River valley, the vast majority of individual settlements were comprised of only one or two family groups. Although these sites appear fairly concentrated and some clustering was noted, they essentially represent a dispersed settlement of family groups across the landscape. For example, even though several homesteads were present along a single drainage, several hundred meters usually separated them. A few larger settlements clearly representing aggregations of family groups were also documented in this area. In general, however, most of these settlements were relatively small and probably contained about five to 10 families, although a handful of larger villages are also documented near the Alibates quarries and a few other areas (e.g., Chimney Rock Ruin 51 and Coetas, Cottonwood, and Antelope Creeks).

The subsistence economies of Antelope Creek phase groups are not particularly well understood at this time. However, the available evidence provided by floral, faunal, and tool assemblages coupled with settlement data strongly suggest that most of these groups were chiefly foragers and that corn horticulture played only a minor role. A fairly dispersed settlement pattern in which family groups were distributed along the Canadian and Beaver rivers and their tributaries probably enabled populations to efficiently exploit seasonally available plant and animal resources in these areas. In addition, the dispersed settlement strategy observed may also indicate that the carrying capacity of these environs effectively constrained the ability to aggregate into larger communities for any length of time. As such, the presence of a few larger settlements, which do not appear to have been horticulturally based, are obviously enigmatic (see Chapter Seven). Oftentimes, these villages are in defensible settings, and at least in the case of the Alibates quarries, some are near resources that were of obvious economic importance.

Along the northeast margins of the Southern High Plains were populations attributed to the Odessa phase. Among these societies settlement and subsistence economies appear much less variable than for Antelope Creek phase. Along the southwest and southern margins of their distribution, Odessa phase groups were aggregated into large extended villages containing 20 to 60 families. North and northeast of these large communities were smaller settlements consisting of one to four households. Settlement near fertile soils, abundant horticultural tools and subterranean storage facilities, and recovered floral assemblages all indicate a substantial commitment to horticulture by Odessa phase populations. A broad range hunting economy is suggested at smaller settlements, while a few larger villages placed an emphasis on specialized bison hunting.

Although specific details regarding the cultural sequence vary somewhat for each of the areas examined here, it is apparent that the general trend was much the same. In each of these regions permanent settlements, population increases, and the use of storage appear to be closely related to an increased reliance on cultivated foods. It is likely that these developments combined with other sociopolitical factors also resulted in the emergence of widespread systems of interdependent exchange involving crucial resources as well as prestige items. Evidence for the exchange of these items as indicated by their distribution and frequency among settlements of the Southern High Plains is the topic of the two ensuing chapters.

CHAPTER FIVE

Nonlocal Items and Their Source Areas

The preceding chapter established a cultural context for the two primary Middle Ceramic (A.D. 1200-1500) populations documented for the Southern High Plains as well as additional groups more peripheral to the area. This information is of key importance to the present study because as emphasized in Chapter Two, the social scale of societies has tremendous consequences for the nature and character of exchange. In this chapter we will begin to examine the intersocietal relationships that were established at this time. The basic foundation for demonstrating contact between these populations is provided by a study of nonlocal trade items recovered at settlements in the region. Of course, any study of prehistoric exchange is handicapped by the fact that only a small percentage of the items actually traded are preserved archaeologically. Nonetheless, the distribution, quantity, and types of durable items certainly provide an important basis for reconstructing the framework and function of exchange.

Source areas for durable items of nonlocal origin recovered at Middle Ceramic age (A.D. 1250-1500) sites of the Southern High Plains are the focus of these discussions. Chapter Six examines the distribution of these items among sites. The primary emphasis is on those commodities, which based on their quantity and distribution, suggest that they were most intensively traded. Other items occur less frequently, but are also highlighted because they may provide important insights into the nature and function of intersocietal relationships. The items examined here include tool stone, marine shell, turquoise, pipestone, and decorated ceramics. These discussions provide a necessary foundation for Chapter Six, which examines the distribution of these items among settlements of the Antelope Creek and Odessa phases. Altogether, these data facilitate the reconstruction of interaction networks that developed among resident societies of the region and between the Plains and Southwest following A.D. 1250 (see Chapter Eight).

Tool Stone Source Areas

The Southern High Plains has long been characterized, particularly by those studying early Holocene foragers (e.g., Hofman 1991, 1992), as a region where high quality lithic resources suitable for chipped stone tool production are incongruously distributed. As such, it is not surprising that, in terms of overall quantities, nonlocal lithic materials comprise the greatest portion of items proposed to have been traded throughout the region (see Vehik and Baugh 1994). In particular, however, it is readily apparent that exchange in high quality tool stones increased dramatically beginning around A.D. 1250. Since these resources factor prevalently into Middle Ceramic exchange, a brief discussion of source areas and descriptions for a few of the more important lithic materials is warranted.

Attributing source areas for most lithic materials recovered in the region is usually fairly straightforward and can be accomplished with the aid of a comparative collection and an ultraviolet light. There are, however, exceptions to this rule. For instance, various cherts and gravels obtained from secondary sources can be highly variable and can produce materials that are macroscopically similar to other better-known lithic materials (see Bement and Brosowske 1999:33; Hofman et al. 1991).

Also, some bedrock sources can produce varieties of tool stone that are nearly identical to that obtained at other sources. Nonetheless, at least 95% or more of the chipped stone materials present in most assemblages can typically be attributed to specific sources areas. These discussions focus on three primary lithic raw material types that were imported into settlements of the region during the Middle Ceramic period: Alibates silicified dolomite, Smoky Hill jasper, and obsidian. Other local and nonlocal tool stones are also briefly examined. Figure 5.1 identifies source locations for the tool stones described here.

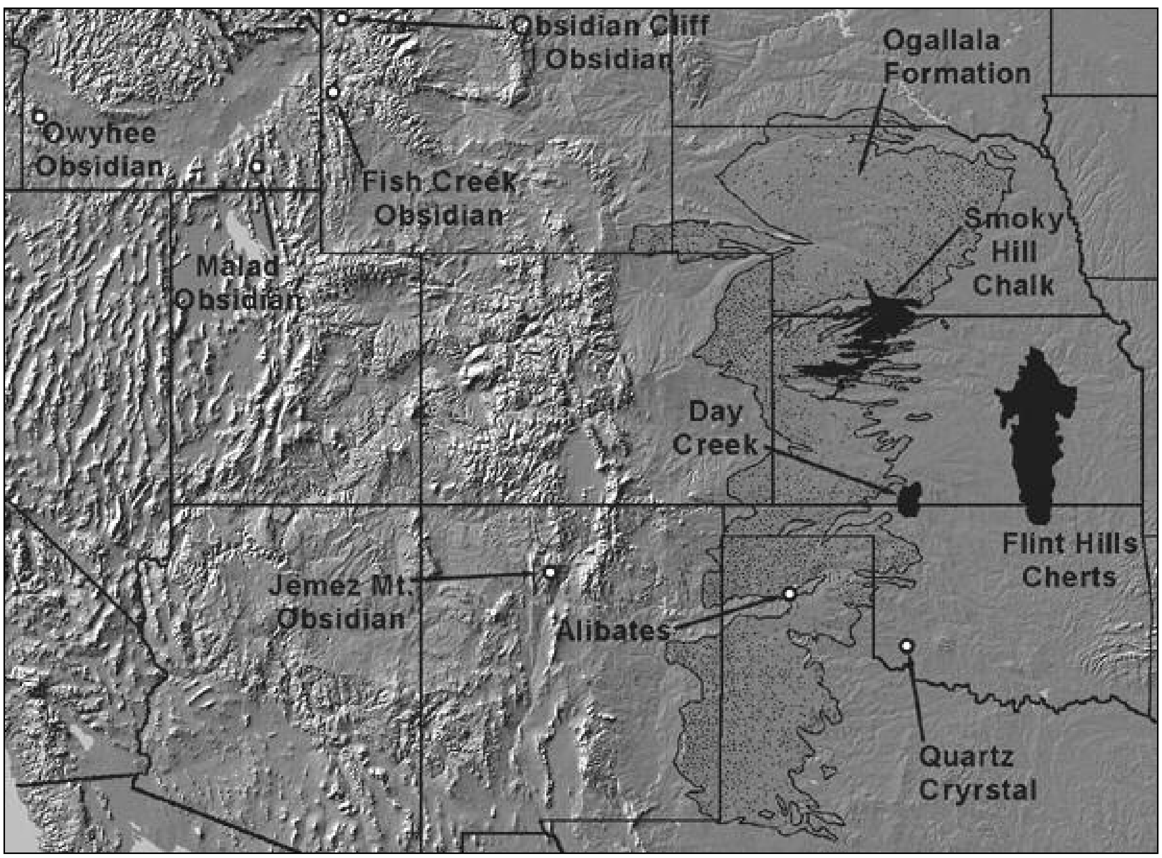


Figure 5.1 Tool Stone Source Areas Discussed in Text.

Without a doubt Alibates silicified dolomite is the most commonly recovered tool stone type in Middle Ceramic assemblages of the Southern High Plains. The appearance of Alibates is very distinct, but it can be red, gray, pink, white, maroon, or purple and specimens are frequently banded with a combination of two or three of these colors. The primary bedrock source for this material is along the Canadian River in the Texas panhandle (see Bandy 1976; Banks 1984, 1990; Bowers 1975; Shaeffer 1958; Studer 1931b). Hundreds of quarry pits and production debris middens approximately a meter thick aptly demonstrate extensive use of this resource. The main quarry areas are contained within the present boundaries of the Alibates Flint Quarries National Monument (see Chapter Seven) and are limited to a long, narrow horizontal outcrop approximately 1200 m long by 200 m wide between Turkey and Alibates creeks (see Shaeffer 1958:189-190). Additional outcrops of Alibates are also exposed in nearby areas to the north and east (e.g., along Plum Creek and Devil's Canyon), although these materials are "inferior to that of the Alibates quarry and there is much less evidence of working" (see Bowers 1975; Shaeffer 1958:190). The near absence of settlements in the vicinity of these secondary source areas suggests that they were of little importance.

Cobbles of Alibates are also available in the alluvium of several rivers of the region (Banks 1984; Wyckoff 1993). In particular, Alibates cobbles can be found at considerable distances downstream from the quarries in alluvium of the Canadian River. In general, however, the abundance, size, and quality of Alibates materials decrease with distance from the primary source (Banks 1984:91; Wyckoff 1993).

The Day Creek dolomite has a fairly widespread distribution across northwestern Oklahoma and adjacent areas of southern Kansas and is often thought to represent a lateral equivalent of Alibates (see Bailey 2000; Bowers 1975:17-19). Although a few small specimens of Day Creek can be indistinguishable both macroscopically and when examined under ultraviolet light from Alibates, as a whole, this material "is not comparable to the Alibates in quantity, quality, or size" (Banks 1990:92). From my experience, while researchers have often emphasized the potential problems in differentiating Day Creek from Alibates (e.g., Bailey 2000), this is not as serious a problem for the present research for two reasons. First, the amount of Day Creek that actually resembles Alibates in color and quality is generally quite low (i.e., less than 2%). Second, recent surveys suggest that Day Creek sources were used almost exclusively by local Archaic and Early Ceramic populations of the area and that later groups placed more of an emphasis on other high quality tool stones (e.g., Alibates, Smoky Hill, and Flint Hills cherts) (see Bailey 2000; Banks 1984:74; Bement and Brosowske 1999; Bement et al. 2002).

Smoky Hill jasper, also known as Niobrara, Graham, or Republican River jasper, is derived from the Smoky Hill Formation of the Central Plains. This formation outcrops over a fairly widespread area across Kansas, Nebraska, Colorado, and Wyoming, although the highest quality chert-bearing deposits are limited primarily to locations from west-central Kansas to southwest Nebraska (see Hattin 1982). Smoky Hill jasper is a highly siliceous material that varies in color from caramel to dark brown, tan, black, white, green, yellow, and red. These materials frequently occur as flat, tabular cobbles banded with several of the above colors.

Concentrations of quarries have been located in Graham, Trego, and Gove counties in Kansas (see Banks 1990:96; Stein 1997). In general, most of the known Smoky Hill quarries are attributed to members of the Upper Republican phase or variant, A.D. 1000-1350 (Stein 1997).

Previous studies have documented the use of obsidian for tool production by inhabitants of the Southern Plains (e.g., Baugh and Nelson 1987; Mitchell et al. 1980). Fortunately, several decades of geochemical studies have demonstrated that individual volcanic sources producing obsidian have distinct chemical signatures (Baugh and Nelson 1987; Glascock et al. 1999). As a result, it is usually possible to identify specific source areas for most obsidian artifacts recovered from the region.

Although several distinct sources are documented for northern New Mexico (Figure 5.2), geochemical studies suggest that the two most important source areas for obsidian recovered on the Southern Plains are the Cerro Toledo and Valle Grande calderas in the Jemez Mountains (Baugh and Nelson 1987; Brosowske 2004; Mitchell et al. 1980). Because Valle Grande obsidian never eroded outside the Valles Caldera proper, which is approximately 20 x 25 km in size, it can only be procured from this primary source area (Shackley 2000). In contrast, Cerro Toledo obsidian has a broader distribution and can be obtained from primary source areas just northeast and southeast of the Valle Grande Caldera rim as well as in the alluvium of the Rio Grande River. Generally, obsidians obtained from the Valle Grande Caldera are usually referred to as either Cerro del Medio or simply Valle Grande, while materials whose source of origin is the Cerro Toledo Caldera are identified as either Obsidian Ridge, Rabbit Mountain or Cerro Toledo Rhyolite (see Baugh and Nelson 1987; Glascock et al. 1999:863; Shackley 2004). A third obsidian source, El Rechuelos, is located north of the Valle Caldera and occurs in limited frequencies in the region.

In addition to the New Mexico sources, isolated specimens of obsidian have also been documented from more distant sources in Idaho, Wyoming, and Utah (Baugh and Nelson 1987:Table 3). The limited number of items originating from these sources suggests that contact (i.e., networks of interaction and exchange) between these two regions were not maintained on a regular basis.

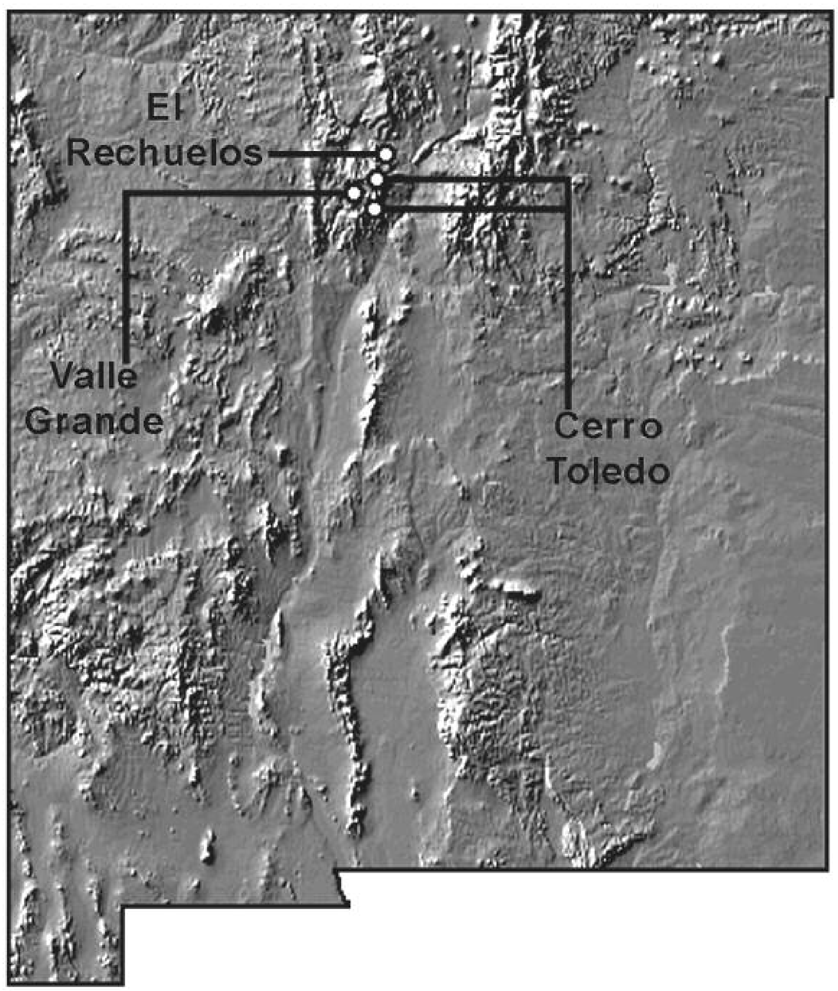


Figure 5.2 Obsidian Source Areas of the Jemez Mountains, New Mexico.

Although Alibates and Smoky Hill comprise the greatest percentage of tool stones at Middle Ceramic sites in the study area, other source areas are also represented. A few of these are briefly examined here in the approximate frequency in which they occur. Various colored orthoquartzites (e.g., yellow, gray, black, green, white, rust, maroon, brown, tan, and gold) are often observed in fairly low frequencies in Middle Ceramic assemblages (compared to either Alibates or Smoky Hill). These are usually identified as Ogallala, Dakota, or Tesesquite quartzites and are associated with the Ogallala, Dakota, and Morrison formations. The Ogallala formation is the surficial unit of the High Plains, and thus, quartzites, as well as petrified woods and a wide variety of cherts, obtained from this formation are widely available across the study area (Figure 5.1). These materials are from the lowermost portion of the formation (Banks 1984:71) and are usually exposed through the dissection of stream valleys. Quartzites derived from the Dakota and Morrison formations are also widespread on the plains, but are limited to areas generally northwest and north of the study area (i.e., they are essentially nonlocal sources). With this being said, Bevitt (1999:6) notes quartzites visually similar and identified as Dakota may be obtained from the Cheyenne sandstone in southern Kansas. Overall, tool stone derived from the Ogallala, Dakota, and Morrison formations are all of poorer quality than Alibates, Smoky Hill, and obsidian.

Banks (1984:71, 1990:95) and Peterson (1988:286) mention a material variously referred to as opalite, opaline, silicified caliche or Ogallala chert that occurs locally within the Ogallala Formation (see also Hughes 1976:29). This distinctive material is of poor quality, but is available along several stream valleys in the study area, particularly in Hansford, Ochiltree, and Lipscomb counties, Texas and Beaver and Texas counties, Oklahoma. This material is translucent to light brown in color, but becomes brittle and changes to cloudy translucent and eventually opaque white, as it weathers.

Various high quality cherts are derived from the Flint Hills region of central Kansas and north-central Oklahoma (Figure 5.1). These fossiliferous cherts include Wreford, Neva, Oologah, Foraker, although Florence A and Florence B or Kansas Gray Permian cherts are the best quality and were most widely used. Florence A cherts are limited to southern portions of the Flint Hills, while Gray Permian cherts are available in central and northern portions. Wedel (1959:476-480) and Vehik (1986, 1990) discuss localities in Cowley County, Kansas, and Kay County, Oklahoma, with evidence for extensive prehistoric quarrying of Florence A chert. This material benefits greatly from heat treatment and widespread exchange of this material occurred following A.D. 1400 (Vehik 1986:153). Florence chert is naturally tan, gray or white in color, but takes on a distinctive pinkish to reddish hue with some banding following heat-treating. Kansas Gray Permian chert is finer grained than Florence A and does not require heat-treatment. This material is blue to gray in color.

Knappable quality quartz crystal is frequently recovered in several portions of the study area. These materials are usually clear and can be virtually identical to clear glass. In addition, some smoky quartz crystal indistinguishable from obsidian (except by chemical studies) is also known to occur. Quartz crystal is found in many portions of the United States (e.g., the Rocky, Ouachita, and Wichita mountains), but remains poorly documented (see Reher and Frison 1991). The specific source area for quartz crystal recovered on the Southern High Plains is not entirely clear, although its fairly common occurrence at Protohistoric period (A.D. 1450-1700) sites in west-central Oklahoma may suggest procurement from the Wichita Mountains, particularly areas around Quartz Mountain (Figure 5.1).

These discussions have provided a brief description of source areas for some of the more important tool stones present in the study area during the Middle Ceramic period. Although tool stones certainly represent the largest portion of exchange items present in the region (see Chapter Six), a wide variety of other nonlocal goods are also documented. Here, a few of these items and their source areas are examined. Specific resources include marine shell, turquoise, pipestone, and ceramics. It should be noted that for some of the items mentioned here, a source of origin can refer to either a location where a raw material is procured (e.g., stone, shell, clay) or to a production locale (e.g., pottery, jewelry). In the case of marine shell jewelry, source areas and probable production locales can frequently be defined.

Marine Shell

Marine shell derived from the Gulf of California, Pacific Ocean, and the Gulf of Mexico was frequently imported into sites of the region. Although these locations represent the ultimate source areas for the particular species of molluscan fauna represented, given that each of these sources are over 1000 km away, it is probable that marine shell was not directly procured by local groups. As such, the following discussion first identifies the various species of molluscan shell recovered from settlements of the region and their likely sources areas. This is followed by a brief overview of settlements that are known to be production and distribution centers for marine shell jewelry recovered in the region.

At least five or six taxa of marine shell have been documented at Middle Ceramic settlements of the Southern High Plains. In their order of frequency, these include *Olivella* sp., *Conus* sp., *Oliva* sp., *Busycon* sp. or *Strombus* sp., and *Haliotis* sp. (Figure 5.3). Shell disk beads are also recovered from many sites of the region and may be produced from marine shell (e.g., *Laevicardium elatum* or *Glycymeris* sp.).

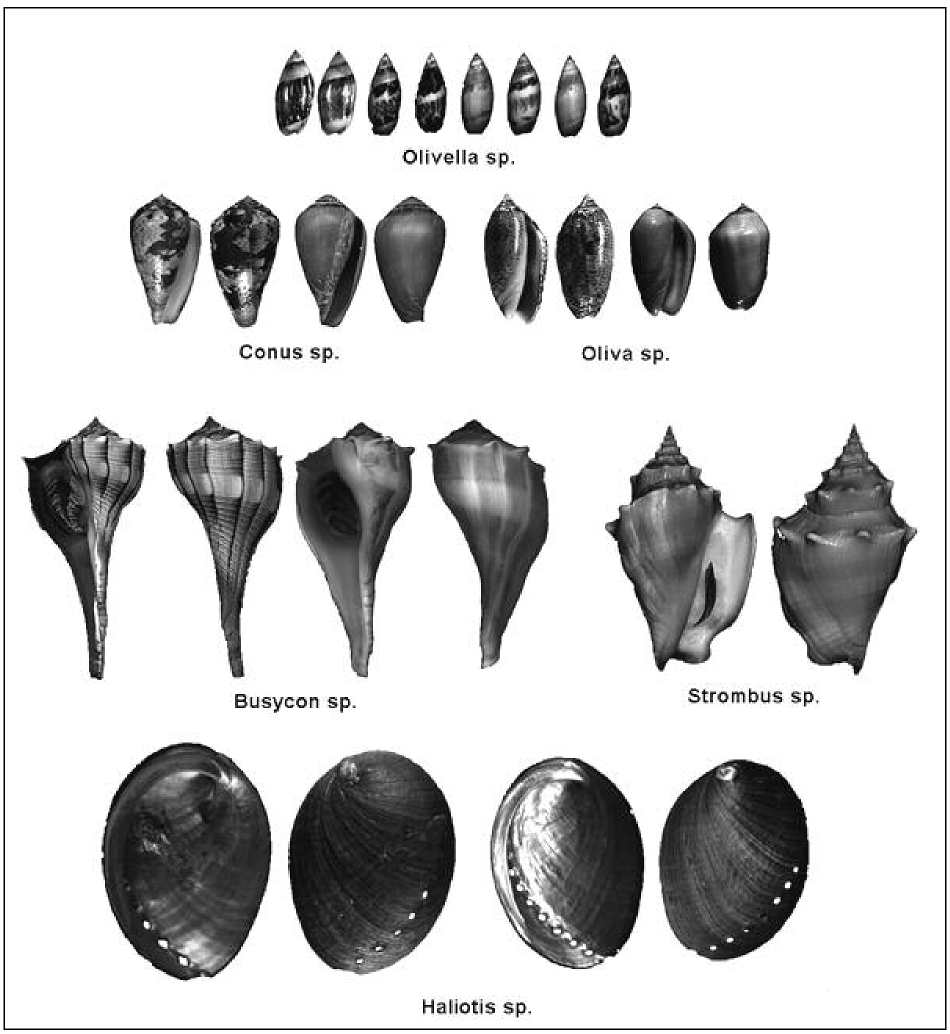


Figure 5.3 Marine Shell Taxa Discussed in Text (adapted from Handy 2004).

Spire-lopped beads produced from dwarf olive shells (genus *Olivella*) have a wide distribution throughout the Plains and adjacent regions (i.e., Southwest, Southeast, and Midwest United States). Shells of the genus *Olivella* can be obtained from the Pacific Ocean and Gulf of California (*Olivella biplicata, O. dama, O. baetica, and O. gracilis*) and the Atlantic Ocean and Gulf of Mexico (*Olivella nivea and Jaspidella jaspidea*). To my knowledge I am not aware of any study that has identified the species of *Olivella* shell recovered from sites of the Southern High Plains (see Howard and Brown 1973). Therefore, although the exact species, and thus, the ultimate source, for *Olivella* shell recovered from sites of the study area remain unknown, previous studies have identified source areas for marine shell found in adjacent regions.

In the American Southwest *Olivella* shell recovered from A.D. 0-1600 contexts has been identified as *Olivella dama* from the Panamic province (i.e., the central coast of Baja California southward through the Gulf of California down to northern Peru) or as *Olivella biplicata* or *Olivella baetica* from the California province (i.e., from the coast of Baja California northward along the coast of California) (Nelson 1991:15). At Pecos Pueblo, Bradley (1996) identified beads associated with a burial at Pecos as *Olivella dama.* At Arroyo Hondo, 175 *Olivella dama* shell beads were recovered (Venn 1981:Table 29). On a related note, Brand (1938:7) identified 90% of the marine shell from Pecos Pueblo, including *Olivella*, as originating from western sources. In general, it is apparent that *Olivella* shell beads recovered from southwestern settlements are derived primarily from the Gulf of California (i.e., the Panamic province) or the Pacific Ocean (i.e., the California province).

To the east, nearly 15,000 *Olivella* beads have been recovered from the Spiro site in eastern Oklahoma. Recently, Kozuch (2002) identified these beads as dwarf olive shells (*Olivella dama)* from the Gulf of California. Previously, they had been identified as West Indian dwarf olive from the Gulf of Mexico or the Atlantic Ocean. However, the fact that *Olivella* shell beads are more abundant at Spiro than Casas Grandes or any other site in the Southwest makes the identification of these *Olivella* shell beads as *O. dama* suspect (see Kozuch 2002:705). Other marine shell recovered from Spiro is derived from the Gulf of Mexico (see below). One would think that if Spiroans were indeed obtaining massive quantities of *Olvella* from the Southwest that additional exotics from this region would also be well represented. Except for the rare occurrence of a few items, this does not appear to be the case (see Brown 1996).

In south and central Texas dwarf olive shell beads are commonly recovered at sites dating as early as the Archaic period (Steele 1987). Given their proximity to the Gulf of Mexico, it is not surprising that these are identified as coming from this source (*Olivella dealbata*) (see Hall 1981). As a whole, however, *Olivella* shell, and marine shell in general, in Texas appears to drop off considerably with distance from the Gulf Coast. While marine shell species are fairly abundant within 150 km of the coast, these items are noticeably much rarer farther inland (see Steele 1987). In general, much of the marine shell from central Texas appears to be associated with Archaic contexts.

Although far from extensive, this brief overview suggests that except for examples along the Texas Gulf Coast, *Olivella* shell beads recovered from inland sites west, and possibly east, of the study area are derived from western sources and are identified as *Olivella dama*. Currently, there are no sites in central or north-central Texas that contain the frequencies of Gulf Coast marine shell that would suggest the existence of distribution, and certainly not production, centers in these areas (see Steele 1987). As a result, judging from the other nonlocal items present at sites of the region, which are clearly of southwestern origin, it is likely that *Olivella* shell beads recovered in the study area are *Olivella dama* and were obtained through exchange with groups along the eastern periphery of the Southwest. In addition, considering that sites in the study area are at least 1000 km from the Gulf Coast and less than half this distance from the nearest Puebloan sites, the latter settlements would have essentially represented a much closer source area for these and other marine shell items.

Assuming that the *Olivella* shells are derived from western sources, additional information regarding this species is warranted. First, this bead type is among the most common form of bead recovered at southwestern sites and Bradley (1999:Table 16) and Nelson (1991:58) document hundreds, if not thousands, of *Olivella* shell beads from settlements throughout the region. The distribution of raw shell and manufacturing tools and debris clearly suggest that the production of beads was concentrated in Hohokam and Casas Grandes areas. For instance, Kozuch (2002:705) notes that nearly 12,000 *Olivella dama* beads were recovered from Casas Grandes alone. Nelson (1991:58) notes that *Olivella* shell beads are about evenly dispersed between domestic and mortuary or offertory contexts. In regards to mortuary contexts, Kidder (1932:186) notes that these shell beads are most commonly associated with infants and children rather than adults at Pecos. Overall, the wide distribution of shell beads both among sites and within various site contexts suggests these marine shell beads were widely available to most members of southwestern society, but that they may have served a number of different non-utilitarian and ritual functions.

Like *Olivella* shell, *Conus* and *Oliva* shells recovered from sites in the study area have received little formal research attention (see Figure 5.3). Although species identifications have not been made for these items, it is assumed here that they also were derived from western sources and were obtained through exchange with the eastern Pueblos. The genus *Conus* is native to the Panamic (*Conus regularis, C. perplexus, C. ximenes, C. princeps, C. fergusoni*) and the California provinces (*C. purpurascens and C. Californicus*). The genus *Oliva* can be obtained from either the Gulf of California or the Atlantic Ocean (Kozuch 2002:702). *Oliva* obtained from southwestern contexts are usually identified as *Oliva incrassata.*

Conus shell is used to produce cone-shaped shell tinklers. Tinklers have been described as rattles, shaking instruments, or idiophones and are produced by removal of the spire at the point of maximum width (see Nelson 1991:55). Once again, *Conus* shell tinklers are concentrated at Hohokam sites and Casas Grandes, although the enormous quantities recovered from the latter site may suggest that this settlement was the primary distribution center for the entire Southwest (Nelson 1991:55).

Overall, although found at a number of sites, pendants produced from *Oliva* shell are generally quite scarce in the Southwest compared to other marine shell species (Nelson 1991:51). Interestingly, although rare at southwestern sites, Nelson (1991:52; see Kidder 1932:190-192) notes that *Oliva* pendants recovered from Pecos

Pueblo outnumber the total number of those recovered from all of the Hohokam sites combined. In general, these shells are similar in appearance to *Olivella*, but are significantly larger and have thicker shells (Kidder 1932:190; Kozuch 2002:702). Like *Olivella* shell beads, *Oliva* pendants are also produced by the removal of the spire tip by abrasion.

Large marine shell pendants or gorgets produced from the body whorl of the Conch (genus *Busycon*) have been recovered at a few sites on the Southern High Plains (Figure 5.3). These ornaments are much more common at sites to the east (e.g., Spiro) and to the south along the Texas coast. In both of these areas, these shells are identified as either *Busycon perversum* or *Busycon contrarium* (e.g., Hall 1981; Phillips and Brown 1978; Steele 1987). The source for these species is the Gulf of Mexico from the Florida Keys to the straits of the Yucatan (Phillips and Brown 1978:26). To the west, nearly identical pendants have been recovered at Pecos Pueblo, but here they are attributed to the genus *Strombus* (Kidder 1932:183, Figure 165a). Nelson (1991:Table 2.1) notes two species of *Strombus* (*S. galeatus* and *S. gracilior*) recovered from Hohokam sites. Both of these species are available only from the Panamic province (i.e., the Gulf of California).

In central and western Oklahoma marine shell, including a few large pendants produced from body whorls of genera such as *Busycon* or *Strombus* are documented. Generally, these items are thought to originate in the Southwest, although engraved gorgets with obvious Mississippian iconography are attributed to contact with groups to the east (see Drass and Peterson 1980; Hofman 1977). To the north, marine shell ornaments produced from large whelks (*Busycon* sp.) are also documented from

Kansas, Nebraska, Montana, and the Dakotas (Blakeslee 1997; Carlson 1997; Fosha 1997; Jaynes 1997; Lippincott 1997; Picha and Swenson 1997). Generally, these are thought to result from contact with eastern or southeastern groups.

Currently, the ultimate source for the large marine shell pendants recovered in the study area is not entirely clear. Considering that other marine shell ornaments and additional exotics obtained from the southwest are very common in the study area, it is possible that some of the large body whorl ornaments were obtained through exchange with Puebloan groups. However, even though other forms of evidence for contact with groups to the east is generally quite rare, the fact that these objects are clearly much more common to the east at Mississippian sites than at southwestern sites may suggest that they were derived from this area (see Nelson 1991; Phillips and Brown 1978).

Disk beads are also frequently recovered in the study area (see Chapter Six). Although the large "washer" type beads produced from freshwater mussels are fairly common at Early Ceramic sites of the region, the beads I am referring to here are much smaller, about 4 or 5 mm in diameter, and are usually associated with Middle or Late Ceramic period contexts. The intensive modification necessary to produce these beads often makes species identification, and thus, a source of origin difficult to determine. Although it would seem possible to produce these beads from freshwater mussels available in the study area, a review of the literature failed to identify any Middle Ceramic sites in the region with clear evidence for the production of disk beads (see Picha and Swenson 2000:106 and references therein for a discussion on Naiad disk bead production in the Missouri Trench). In addition, in several areas of the region many of the freshwater species available have shells that are too thin to produce these bead types. Therefore, considering this evidence coupled with the staggering quantities of disk beads recovered at southwestern sites it seems most likely that most of these beads were produced from marine shell and were obtained through exchange with groups to the west.

Disk beads are by far the most common type of bead recovered in the southwest (Nelson 1991:59). In fact, Nelson (1991:Tables 2.3 and 2.4) documents over 65,000 shell disk beads from 45 sites in southern Arizona. Large strings containing thousands of disk beads were also recovered at Pecos (Kidder 1932). In general, disk beads recovered from the study area are usually tan or white and may be *Laevicardium elatum* or *Glycymeris* sp. The former species is available from both the Californian and Panamic provinces and the latter is only found in the Panamic (Nelson 1991:Table 2.1). It is not known whether red, orange, and purple disk beads have been recovered in the research area, but in the Southwest, it is likely that the genera *Spondylus* or *Chama* were used to produce these beads (Nelson 1991:59). Saucer-shaped beads have found at Pecos and Casas Grandes in large quantities, however, to the best of my knowledge they have yet to be documented on the Southern Plains. These beads were produced by perforating sections of thin walled shells (e.g., *Vermetus*, *Olivella* or *Alectrion*) and smoothing the ends.

Lastly, a few cut shell pendants have been recovered from the study area, which, due to their size and thickness, are also likely derived from marine contexts. These pendants are typically flat, oval, triangular or rectangular in shape, and frequently have a hole drilled near the margin. Although ornaments produced from freshwater species indigenous to the region are fairly widespread, these are generally quite distinct from the shell items described here. The latter are often more than 2 mm thick and their overall size makes it unlikely that they are produced from locally available freshwater bivalves. Morphologically similar artifacts are documented for many areas of the Southwest (e.g., Kidder 1932; Nelson 1991; Venn 1981). Oftentimes, these ornaments have been extensively modified from original forms, but the genus *Haliotis* (abalone) is most commonly noted as the shell used for the production of these simple geometric pendants (e.g., Kidder 1932:190-194; Nelson 1991:54). Other genera are used for cut shell pendants in the Hohokam region (e.g., *Laevicardium elatum, Glycymeris, Spondylus, Pecten, Argopecten, Pteria*, and *Pinctada*), however, many of these are decorated with a wide variety of geometric or zoomorphic design motifs (Nelson 1991:54). The latter have yet to be documented in the study area and it seems most likely that the simple, undecorated forms recovered from the Plains may be *Haliotis* obtained from the Pacific Ocean. These simple forms were produced both in the Hohokam area and by various California groups and likely represent the primary source area for those items recovered on the Southern Plains (Nelson 1991:54).

With the exception of the large pendants probably produced from *Busycon* sp., all of the marine shell jewelry documented from the study area was almost surely obtained through contact with groups in the Southwest. From the discussions presented here it should be obvious that a great deal of research has been conducted regarding the production and distribution of marine shell artifacts in the Southwest (e.g., Bradley 1996, 1999; Brand 1938; Nelson 1991). As noted throughout these discussions, two primary areas of marine shell jewelry production have been identified for the prehistoric Southwest: the Hohokam area and Casas Grandes.

In general, Casas Grandes, a large complex community in northwestern Mexico and Hohokam sites of the Phoenix and Santa Cruz-Tucson basins and Gila Bend area of southern Arizona (e.g., Snaketown, Grewe, Casa Grande, and Pueblo Grande), contain by far the greatest concentrations of marine shell ornaments and debris and tools associated with the manufacture of these items (see Bradley 1996, 1999; Nelson 1991). The wide distribution of marine shell throughout the Southwest demonstrates widespread intersocietal contact between about A.D. 1250 and 1450 (locally the Medio and Classic Hohokam periods).

Recently, Bradley (1996, 1999) and Nelson (1991) have examined distributional patterns of marine shell in the Southwest. Their findings essentially lend support to the shell trade routes originally proposed by Brand (1938) (Figure 5.4). Of importance to these discussions are the linkages between the shell ornament production centers noted above and settlements in the Rio Grande and Pecos River valleys around A.D. 1250-1500. Brand (1938) and Bradley (1999:Figure 16.7) suggest that the latter settlements were connected to shell production centers by trade routes from the Zuni region to the west, the Mogollon area to the southwest, and from the south through the Alamogordo district. Support for existence of these connections is provided by the recovery of durable trade items, including shell, ceramics, and other items, at the eastern border Pueblos. As is discussed later in Chapter Six, many items from each of these areas also make their way out onto the Southern High Plains. It is also of interest to note, however, that the particularly ornate shell items (i.e., bracelets, rings, and effigy pendants) produced at Casas Grandes and the Hohokam areas are not known from the Southern Plains. Rather, fairly simple beads and pendants dominate the record. Venn (1981:245) also notes this general pattern at Arroyo Hondo and suggests that a western route which largely bypassed the major Hohokam communities of southern Arizona brought marine shell to the Eastern Pueblos.

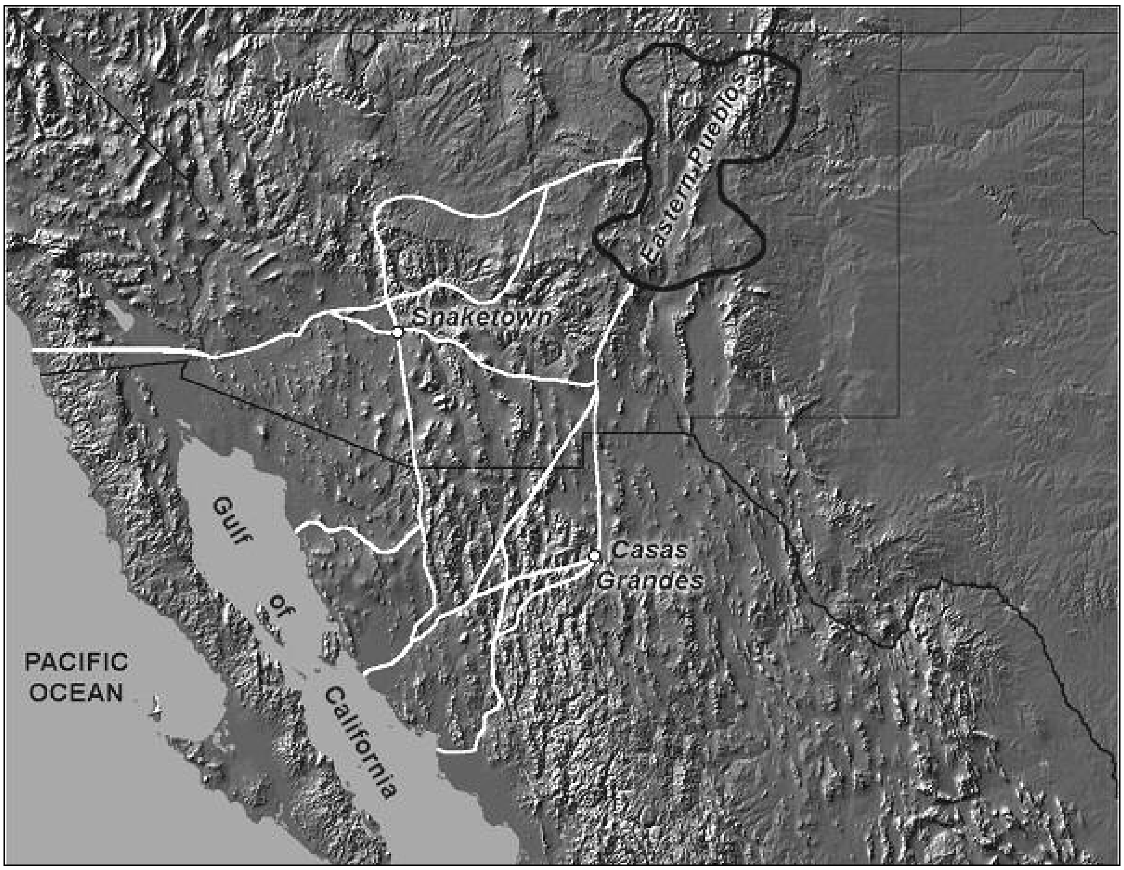


Figure 5.4 Southwestern Marine Shell Trade Routes (adapted from Brand 1938).

Turquoise

Compared to some portions of the Southwest, turquoise ornaments occur infrequently in prehistoric contexts in the study area. Generally, the term "turquoise" is used in two different manners (Weigand et al. 1977:16). Chemically, the term refers to a specific class of phosphates known as hydrated copper aluminum phosphate (i.e., chemical turquoise). At a more general level, the term is used to refer to a whole range of blue to blue-green stones, such as malachite, azurite, chrysocollas in addition to turquoise. In general, all of these materials are widely dispersed across New Mexico, Arizona, Nevada, Utah, California, and Mexico. Despite early claims which were highly optimistic about chemically differentiating turquoise obtained from discrete source areas (e.g., Weigand et al. 1977), recent studies have determined that considerable variability exists in the chemical composition of turquoise, both among and within individual source areas (Milford 1995). As such, it is not possible to determine specific source areas for turquoise recovered from the Southern Plains at this time.

The closest well known source of turquoise to the study area is the famed mines of the Cerrillos district (Figure 5.5). Within the Cerrillos district are 10 areas or mines with evidence for prehistoric mining activity (see Warren and Mathien 1985). The best known of these are Turquoise Hill, the Castillian, Mount Chalchihuitl, Tiffany Mine, O'Neil's Blue Bell, and the O'Neil Turquoise Mine site (Milford 1995). Several pueblo sites are in the general area of these sources, but San Marcos and La Cienega are clearly the closest (within 5 km). Currently, it is not known whether the quarries were open to all or if access was limited. Whatever the case, it is likely that one or both of these settlements played a key role in the mining, production, and distribution of turquoise beads and pendants.

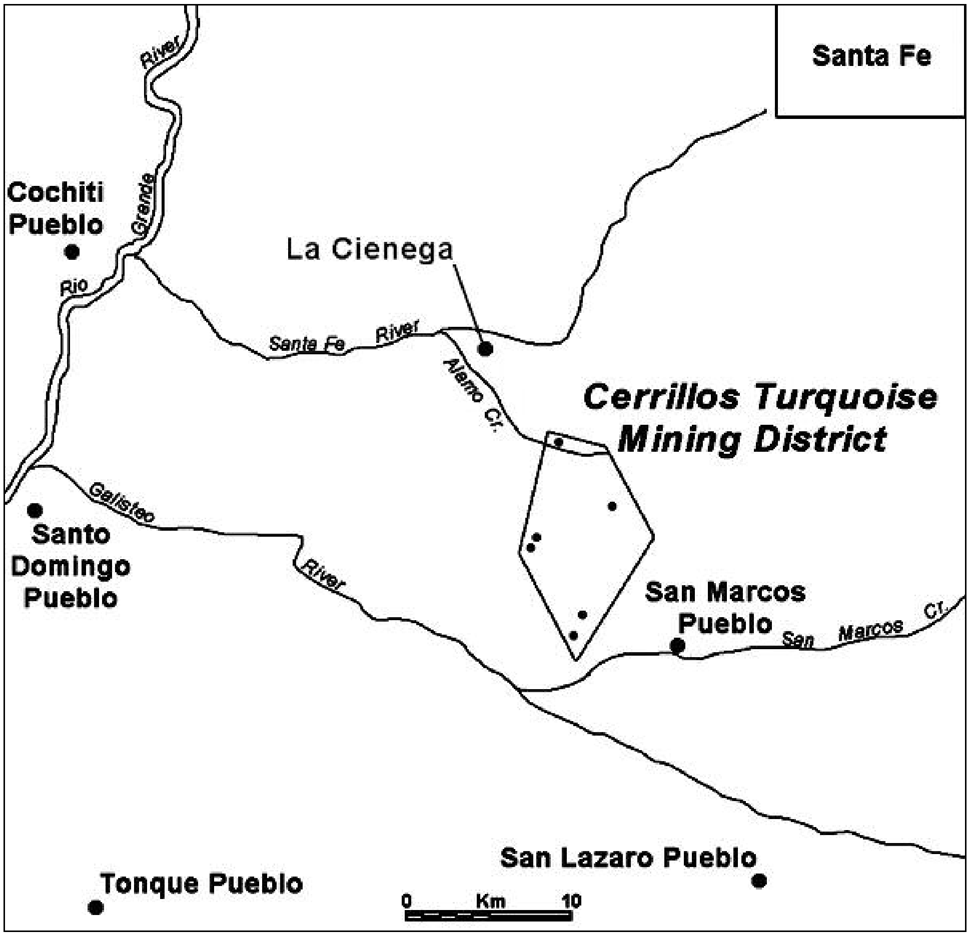


Figure 5.5 Cerrillos Turquoise District, New Mexico (adapted from Milford 1995).

Pipestone and Pipes

Pipes, generally elbow varieties, are a common artifact type recovered at Middle Ceramic sites of the Plains. In general, few researchers have sought to systematically identify discrete geologic source areas for the pipestones used to produce these items. Currently, the best-known variety of pipestone is a red argillite known as "Catlinite." This pipestone is obtained from the famed pipestone quarries of southwestern Minnesota (see Catlin 1996). Generally, red pipestone, no matter its find locality, is incorrectly identified as this material by most researchers (Gundersen

1988). Gundersen (1988, 1999) has determined that red argillites used for pipe manufacture may include four types of chemically distinct stone. These materials include true “Catlinite,” and South Dakota, Kansas, and Wisconsin pipestones. As the names imply, each of these materials are obtained from different source areas (Figure 5.6).

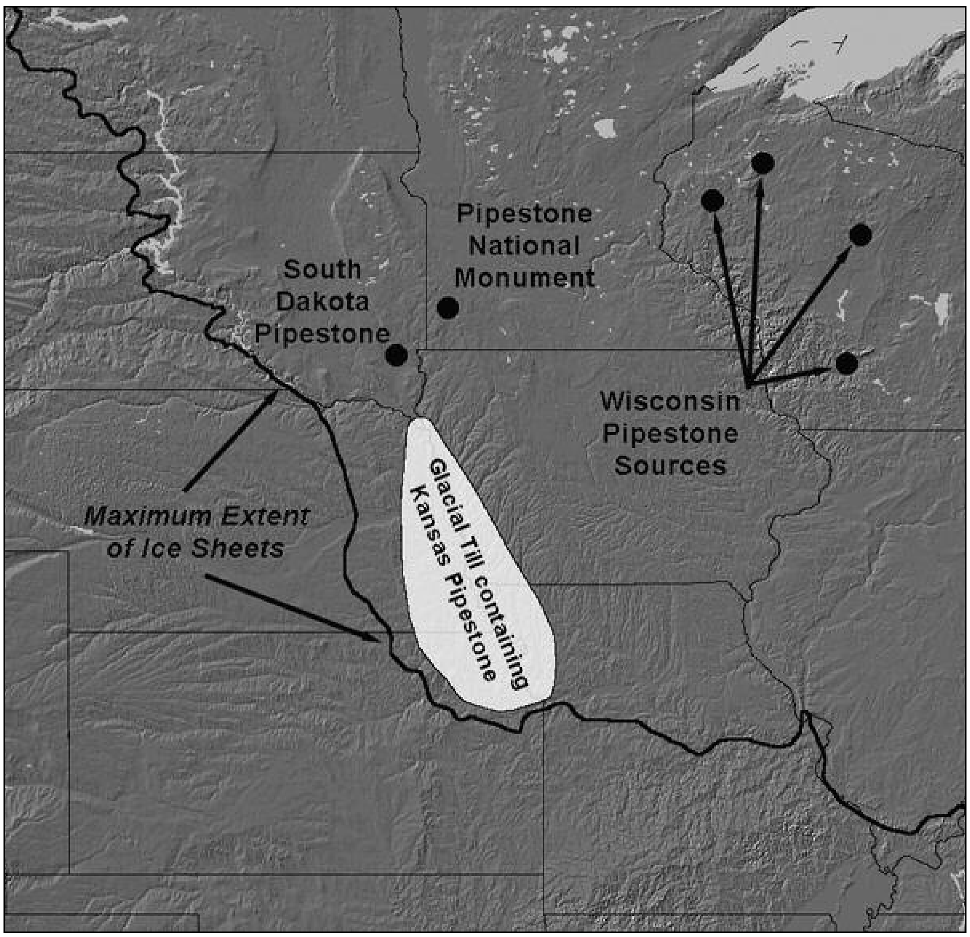


Figure 5.6 Pipestone Sources Discussed in Text.

Presently, it is not known whether access to any of these source areas was under the control of any known society during Middle Ceramic times, although

Kansas pipestone, which is most commonly recovered at settlements in the study area (Brosowske and Bement 1998), is widely distributed in glacial till deposits from southeastern South Dakota to northeastern Kansas. This broad distribution would seem to preclude social control of this resource. A wide variety of other pipestones are also documented in the study area. Generally, these are produced from fairly non-distinctive materials and may suggest that they are available from local bedrock and gravel sources. Lastly, stylistic elements may also indicate that pipes recovered from the Southern Plains were obtained from a nonlocal source. In particular, clay tubular or "Cloudblower" pipes were widely produced in the Southwest and are quite distinct from typical Plains elbow pipes (see Kidder 1932; Lintz 1991).

Southwestern Decorated Ceramics

Decorated sherds of southwestern origin have been recovered at a number of Middle Ceramic age settlements of the Southern High Plains. Previous researchers have identified specific types, ages, and general areas of production (e.g., central, eastern, western, and southern New Mexico) for many of these items (e.g., Crabb 1968; Lintz 1991). Although the general chronological framework for Anasazi ceramics has remained relatively unchanged over the last 40 years, the production districts for many of these types have become much better understood (see Habicht-Mauche 1993; Vint 1999). Using results recently presented by Vint (1999:Figure 7.7), ceramic production districts for the Rio Grande and Pecos River valleys of New Mexico are presented in Figure 5.7. Age ranges for most of the major decorated wares are provided in Table 5.1. Overall, these data are self-explanatory, and considering that the primary goal of these discussions is to identify source areas for these items, little supplementary information regarding these artifacts is presented here. Additional details regarding specific types and their production areas are provided as the distribution of these items at settlements in the study area is examined in Chapter Six.

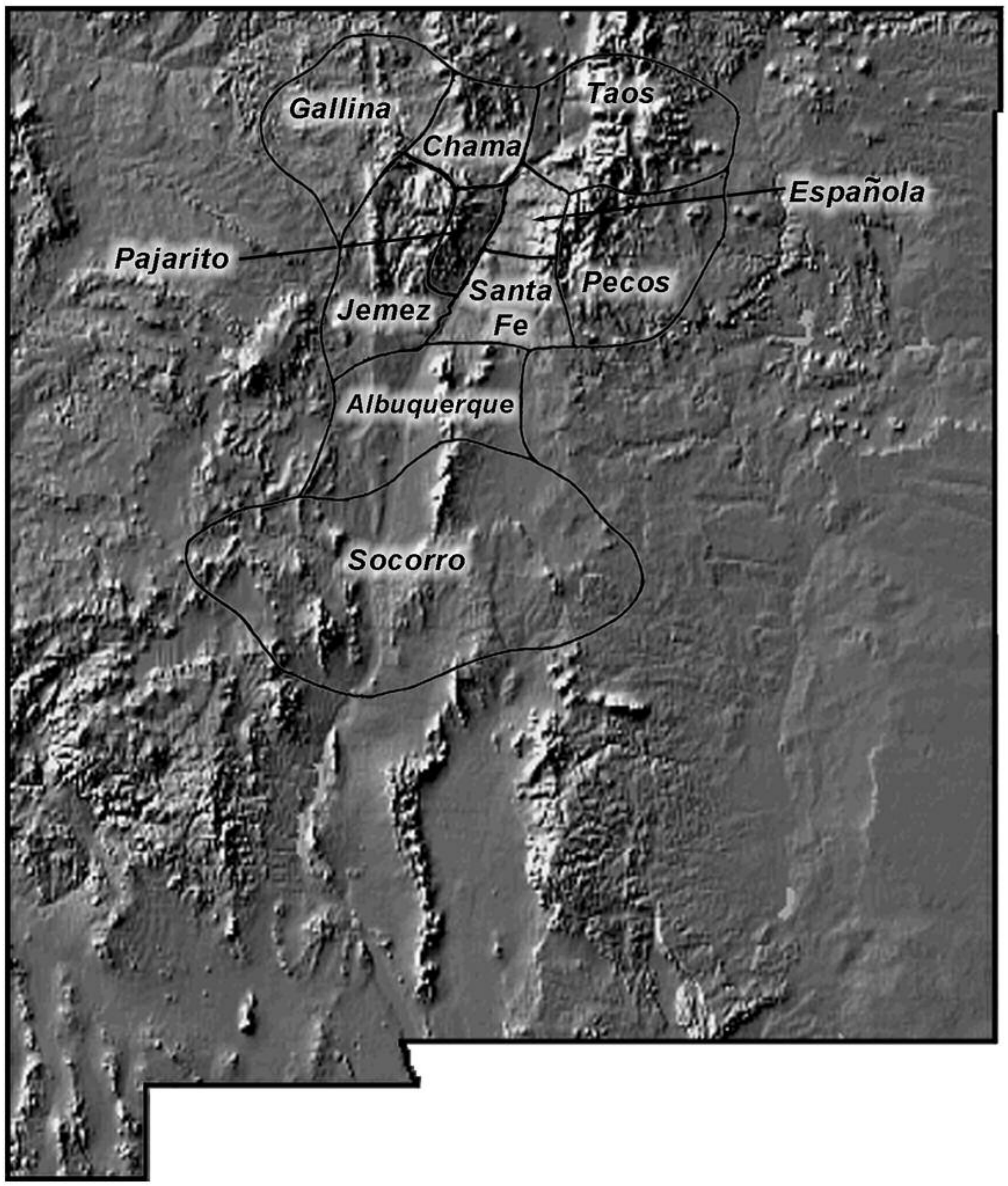


Figure 5.7 Ceramic Production Districts of Central and Northern New Mexico (adapted from Vint 1999:Figure 7.7).

Table 5.1 Dates and Production Districts for Southwestern Ceramic Types (after Vint 1999: Table 7.1 and 7.6).

Decorated Ceramic Type	Date Range	District of General Origin
Cibola White Ware		
Socorro Black-on-white	A.D. 1075-1250	Socorro, Albuquerque, and westward districts
Pajarito White Wares		
Kwahe'e Black-on-white	A.D. 1050-1250	Espanola, Chama, Pajarito, and probably Santa Fe, districts
Santa Fe Black-on-white	A.D. 1175-1425	Santa Fe, Pecos, Pajarito, Espanola, and Chama districts
Wiyo Black-on-white	A.D. 1300-1400	Espanola, Chama, and northern portions of Pajarito districts
Galisteo Black-on white	A.D. 1300-1400	Southern Santa Fe District, and limit production in Albuquerque and Pajarito districts
Jemez Black-on-white	A.D. 1300-1750	Jemez district
Abiquiu Black-on-gray (Biscuit A)	A.D. 1375-1450	Espanola and Chama districts
Biscuit B	A.D. 1400-1550	Espanola and Chama districts
Sankawi'I Black-on-cream	A.D. 1525-1650	Espanola and Chama districts
White Mountain Red Wares		
Puerco Black-on red	A.D. 1075-1200	East-central Arizona and west-central New Mexico
Wingate Black-on-red	A.D. 1100-1200	East-central Arizona to Zuni area
Wingate Polychrome	A.D. 1125-1200	East-central Arizona to Zuni area
St. Johns Black-on-red	A.D. 1175-1300	East-central Arizona to Zuni area
St. Johns Polychrome	A.D. 1175-1300	East-central Arizona to Zuni area
Heshotauthla Polychrome	A.D. 1300-1375	East-central Arizona to Zuni area
Rio Grande Glaze Wares		
Glaze A series		
Agua Fria Glaze-on-red	A.D. 1315-1425	Albuquerque, Santa Fe, and Pajarito districts
San Clemente Polychrome	A.D. 1315-1425	Northern Socorro district and rarely in Albuquerque, Santa Fe, and Pajarito districts
Cienguilla Glaze-on-yellow	A.D. 1325-1425	Southern Santa Fe district and rarely in Pajarito district
Cienguilla Polychrome	A.D. 1325-1425	Southern Santa Fe district and rarely in Pajarito district
Glaze B series		
Largo Polychrome	A.D. 1400-1450	Northern Albuquerque and southern Santa Fe districts
Largo Glaze-on-red	A.D. 1400-1450	Northern Albuquerque and southern Santa Fe districts
Largo Glaze-on-yellow	A.D. 1400-1450	Northern Albuquerque and southern Santa Fe districts
Glaze C series		
Espinoso Polychrome	A.D. 1425-1490	Albuquerque and southern Santa Fe districts
Glaze D series		
San Lazaro Polychrome	A.D. 1490-1515	Albuquerque and southern Santa Fe districts
Glaze E series		
Puaray Polychrome	A.D. 1515-1650	Southern Santa Fe, southeastern Jemez, and northern Albuquerque districts
Escondido Polychrome	After A.D. 1515	Southern Santa Fe and southeastern Jemez districts
Pecos Polychrome	A.D. 1515-1700	Southeastern Santa Fe and western Pecos districts

Summary

In closing, these discussions have concentrated on various nonlocal items which are relatively widespread across the study area and whose source areas are fairly well understood. These items include tool stone, marine shell, turquoise, pipestone, and Southwestern decorated ceramics. Additional items are also documented in the study area, but are discussed in the following chapter on an individual basis. Overall, these data provide the crucial baseline information needed for establishing the existence of intersocietal relationships between Middle Ceramic settlements of the Southern High Plains and other adjacent areas or societies. As such, these results are frequently referred to in the discussions that follow.

CHAPTER SIX

Nonlocal Trade Items of the Southern High Plains:

The Middle Ceramic Period Evidence

The process of describing prehistoric exchange involves three primary steps (Earle 1982:3). The first of these steps, to identify the source of exchange items, was accomplished in Chapter Five. The second step is to describe the spatial patterning of nonlocal trade goods across the landscape; this is the focus of this chapter. These data, combined with the contextual information presented in Chapter Four, lays the foundation necessary for examining the emergence and structure of intersocietal exchange.

The ensuing discussions document the distribution and frequency of nonlocal trade items at settlements of the Southern High Plains. In particular, emphasis is on items recovered at Antelope Creek and Odessa phase settlements, although a brief discussion on nonlocal trade goods recovered from Early Ceramic period sites is also presented to provide a historical perspective on the evolution of exchange in the region. For organizational reasons, the distribution of nonlocal trade items is examined separately for each of these archaeologically defined Middle Ceramic entities. Each section begins with an overview of the range of items associated with each phase. This is followed by a more detailed discussion of individual classes of trade goods recovered at settlements. Lastly, the chapter concludes with a discussion of the major trends noted in the spatial pattering of nonlocal trade items.

Early Ceramic Period (A.D. 500-1200)

Previously, Vehik and Baugh (1994) compiled information from a wide variety of sources to provide a broad overview of Plains exchange. In this study they conclude (1994:256-257) that the exchange of nonlocal items on the Southern High Plains was extremely limited during the Early Ceramic period. Similar conclusions are reached by others who have also examined the period in some detail (see Boyd 1997; Drass 1997; Hofman and Brooks 1989; J. Hughes 1991; Summers 1997; Thurmond 1991). Overall, most researchers agree that an emphasis on local resources seems to be a major characteristic of the period (see Boyd 1997; Drass 1997; Hofman and Brooks 1989; J. Hughes 1991; Thurmond 1991).

Trade items are only rarely noted among settlements of the period, although small percentages of projectile points produced from high quality, nonlocal tool stones (i.e., Alibates silicified dolomite, Edwards chert, and Smoky Hill jasper) are noted in most areas. Overall, the presence of high quality tool stone for the production of chipped stone tools is widely observed among mobile foraging societies of the Plains and adjacent regions, especially during the Early Holocene. Generally, these items are traditionally thought to have been obtained as part of an embedded procurement strategy rather than by exchange (see Binford 1980; Meltzer 1989).

Even though the procurement of nonlocal trade items through intersocietal exchange seems to have been a relatively rare event, there are a few isolated examples which provide evidence for the movement of some exotics over long-distances between about A.D. 0 and A.D. 1000. Bement and Brosowske (2001) have documented obsidian derived from northwestern Plains and Jemez sources in Archaic or Early Ceramic contexts of the Oklahoma panhandle (see Baugh and Nelson 1987). To the south, Boyd (1997:319) mentions several petrographic studies conducted on brownware ceramics recovered from Palo Duro complex sites in west Texas that attest to contact with Eastern Jornada groups that inhabited southern New Mexico and portions of west Texas.

Lastly, and perhaps the most widely cited evidence for intersocietal exchange at this time is provided by examples north of the study area in the Central Plains. Here, the presence of marine shell, copper, mica, and other exotic items recovered from mortuary or ossuary contexts in northwestern Kansas and western Nebraska document interaction with Hopewellian or other related groups in the Midwest (see Kivett 1953; Wedel 1986:86-91). The latter examples are outside the study area, but document participation in the far reaching exchange networks that developed in the American Midwest and adjacent Plains around A.D. 0-200. Evidence for similar developments is not observed on the Southern High Plains.

Except for the few isolated instances noted above, evidence for intersocietal exchange during the Early Ceramic period is sparse. As a whole, the vast majority of nonlocal items documented are limited primarily to chipped stone tools produced from high quality tool stone which may or may not have been obtained through trade. Finally, even during periods seemingly characterized by a paucity of evidence for intersocietal contact, one might expect mortuary contexts to contain at least some exotic items. Recent work by Summer (1997) and Boyd (1997), however, demonstrate that this is not the case as ornaments and utilitarian tools produced from local materials dominate Early Ceramic burial contexts.

Middle Ceramic Period (A.D. 1250-1500)

Even though exchange is generally thought to be pervasive among all societies (Earle 1994:420), it is surprising that evidence for intersocietal trade is as poorly represented in the Early Ceramic record of the Southern High Plains as it is. In general, exchange during the Archaic and Early Ceramic periods seems to have been erratic at best and evidence for contact is limited largely to the sporadic transfer of raw materials used for the production of basic utilitarian items. The Early Ceramic evidence stands in stark contrast to the exchange networks that emerged following A.D. 1250. Here, exchange involved the regular and organized transfer of what represent astounding quantities of utilitarian and exotic items compared to earlier periods. These socioeconomic networks developed rapidly and coincide with the appearance of highly distinctive Middle Ceramic period societies.

Antelope Creek Phase

Previous treatments of nonlocal trade items recovered at sites attributed to the Antelope Creek phase have concentrated on objects obtained from the Southwest U.S. Generally, these items have been much easier to identify than items obtained from other Plains societies for two primary reasons. First, in stylistic terms, southwestern trade items, such as ceramics and pipes, are generally quite distinct from traditional Plains forms. Second, these items are often highly visible because they are commonly produced from materials, such as obsidian or turquoise, which contrast markedly with the raw materials usually recovered at Plains sites. Although these two observations explain why trade goods from the Southwest are more visible and have garnered a great deal more research attention in the past, as the following discussion imparts, it is also apparent that durable trade items obtained from other Plains groups are not particularly well represented at Antelope Creek phase sites (see Lintz and Reese-Taylor 1997).

These discussions focus on five primary classes of trade items that have been recovered from Antelope Creek sites. These include ceramics, chipped stone, turquoise, marine shell (i.e, beads, tinklers, pendants, and gorgets), and Puebloan pipes (see Baker and Baker 2000; Couzzourt and Schmidt-Couzzourt 1996; Crabb 1968; Green 1986; Lintz 1986a:Table 31; 1991; Spielmann 1982; Watson 1950). Since identifiable ceramic types provide a great deal of information regarding sources of origin, particular emphasis is placed on this class of artifacts. Table 6.1 provides a listing by settlement for the quantity of each of these objects at all of the Antelope Creek sites for which this information is fairly well known and reported. It should be noted that many of these site totals are calculated from Lintz (1986a:Table 31). Underlined items in Table 6.1 refer to associated funerary objects.

Ceramics

A literature review documents approximately 339 southwestern sherds from Antelope Creek settlements in the Canadian and Beaver drainages (see Baker and Baker 2000; Couzzourt and Schmidt-Couzzourt 1996; Crabb 1968; Holden 1930, 1933; Lintz 1976, 1986a, 1991; Watson 1950). This total number is substantially lower than the “at least 465” figure suggested by Lintz (1991:94-95), but his total may include data from additional sites that remain unpublished and are unknown to this author.

Table 6.1 Select Trade Items Documented at Antelope Creek Phase Sites.

Site	Number of Residential Structures	Southwsetern Sherds	Turquoise	Olivella Shell Beads	Disc Beads	Conus Tinklers	Other Marine Shell	Southwetern Pipes	Obsidian	Total
Pickett	1	0	0	0	0	0	0	0	0	0
Antelope Creek 23	1	0	0	0	0	0	0	0	0	0
Antelope Creek 22A	1	0	5	22	1056	0	3	0	0	1087
41MO7	1	0	0	0	0	0	0	0	0	0
McGrath	1	1	0	0	1	0	0	0	11	13
Two Sisters	1	0	0	8	3	0	0	0	3	14
Turkey Creek	1.5	0	0	0	0	0	0	0	14	14
Medford Ranch	1.5	0	0	0	0	0	0	0	8	8
41MO36	2?	0	0	0	0	0	0	0	7	7
41MO37	2	0	0	0	0	0	0	0	0	0
Conner	2	0	0	0	0	0	0	0	0	0
Roper	2	0	0	0	0	0	0	0	0	0
Spring Canyon	2	0	0	0	0	0	0	0	0	0
Black Dog Village	2	0	0	0	0	0	0	0	0	0
Alibates Ruin 28A	3	16	0	0	0	0	0	0	128	144
Footprint	3	0	0	13	65	5	2	1	29	115
Zollars	4	0	0	3	0	0	0	0	19	22
Alibates Ruin 30	4	5	0	0	0	0	0	0	nd	5
Arrowhead Peak	4	1	0	0	0	0	0	0	6	7
Antelope Creek 24	5	13	1	1	0	0	0	0	43	58
Roy Smith	5	0	0	2	3	0	0	0	9	14
41MO35 (Big Blue I)	5+	16[a]	0	6	0	0	0	0	99	121
Saddleback Ruin	5+	24 [b]	nd	nd	nd	nd	nd	nd	nd	24
Alibates Ruin 28-I	6	11	0	10	0	0	0	?	14	35
Antelope Creek 22	6.5	8	0	0	1	0	1	0	nd	10
Stamper	7	4	2	10	5	0	0	0	2	23
Chimney Rock 51	10	43	1	72	0	1	0	9	2000[c]	2126
Alibates Ruin 28-II	12	177	12	0	33	1	0	?	4131	4354
Landergin Mesa	14?	20?	7	23	7	0	0	0	111	168
Big Blue Cemetery	0	0	0	0	0	0	0	0	0	0
Totals	**-**	**339**	**27**	**170**	**1174**	**7**	**6**	**10**	**6634**	**8367**

[a] Includes four from Crabb (1968) and 12 from Couzzourt and Schmidt-Couzzourt (1996)
[b] Holden (1933:49) notes that approximately 24 Puebloan sherds were recovered at Saddleback
[c] Studer (n.d.:4) notes that "thousands of obsidian chips" were recovered at Chimney Rock 51

Table 6.1 demonstrates that nearly all of the southwestern sherds are concentrated at the largest settlements documented for the phase (i.e., as indicated by the number of residential structures). In particular, the 188 Southwest sherds from

Alibates Ruin #28 (units I and II combined) near the Alibates Quarries clearly stands out in comparison to all other settlements. Other sites, such as Alibates Ruin 28a and 30, are relatively small settlements, but still have fairly abundant nonlocal sherds totals compared to other sites. Their proximity to Alibates Ruin #28 and the frequency of these and other nonlocal items lend further support to the idea that these settlements, along with Alibates Ruin #28, are part of a single large community (see Figure 4.8). If so, then this large settlement accounts for 209 (61.7%) of the 339 Puebloan trade sherds in the sample. It should be noted that compared to locally produced cordmarked wares, Southwest sherds make up a very small percentage of assemblages at all sites.

Overall, only two sherds in the entire sample were recovered from settlements that were probably home to four or fewer family groups (i.e., McGrath, Arrowhead Peak). These data indicate that nonlocal sherds are very rare at small settlements (Lintz 1991:95), which as discussed in Chapter Four, represent approximately 90% of all Antelope Creek settlements. The remaining 128 (37.8%) sherds are from other large communities (e.g., Chimney Rock 51, Saddleback, Landergin, 41MO35, and Antelope Creek 22 and 24).

Crabb (1968) and Lintz (1991) have previously presented information on the ceramic types, ages, and general source areas for 104 Puebloan sherds recovered from Antelope Creek settlements in the Texas and Oklahoma panhandles. These sherds represent 19 Puebloan ceramic types from 11 different settlements and two isolated find localities (Table 6.2). Of these sites, McGrath, Stamper, Saddleback Ruin, Alibates Ruin 28, Antelope Creek 22, Big Blue, and Landergin Mesa are fairly well documented in the literature. Little is known, however, about the other four remaining settlements (Chicken Creek, CR-1a, Ozier, and Floyd Ranch). Of these, CR-1a, Ozier, and Floyd Ranch contain a large percentage of the ceramics in the sample (N=69 or 66%) and 12 of the 19 identified ceramic types. The significance of these nonlocal items is difficult to assess since so little is known about these sites. Martha Crabb (1968, 2004, personal communication), a student of Jack Hughes, has provided about the only information available for these settlements and this information is worthy of brief mention here.

Of these sites, CR-1a produced the largest number of Puebloan sherds (N=49). This site and a related site immediately across the creek (CR-1) are on Running Water Creek about 12 km northwest of the Canadian River in Moore County, Texas. Given their proximity, it is likely that both of these sites combined to form a single settlement. This site has produced abundant artifacts of the Middle Ceramic age, but lacks stone architecture. Besides the nonlocal sherds, CR-1a has produced a number of unusual artifacts, including discoidal stones covered in red ochre, clay figurines, and eagle or hawk talons (Crabb 1968:84). Glasscock and Glasscock (1955) also note that approximately 1000 disk beads were associated with a burial at this site. Half of the cordmarked rim sherds from this site are collared and suggest substantial interaction with Odessa phase or unknown groups from the Central Plains (see Lintz and Reese-Taylor 1997). Both CR-1a and CR-1 were apparently destroyed as a result of investigations carried out by Glasscock (Martha Crabb 2004, personal communication; see Glasscock and Glasscock 1955).

Table 6.2 Southwest Ceramic Types Recovered from Antelope Creek Sites (adapted from Crabb 1968:Table 1; Lintz 1991:Table 6.1).

Site	Ceramic Type	Frequency
Alibates Ruin #28	Agua Fria Glaze-on-Red	No Data
	Cieneguilla Glaze Yellow	No Data
	St. Johns Polychrome	No Data
	Lincoln Black-on-red	No Data
Antelope Creek #22	Agua Fria Glaze-on-Red	No Data
	Cieneguilla Glaze Yellow	No Data
	St. Johns Polychrome	5
	Lincoln Black-on-red	No Data
	Little Colorado Glaze I	2
CR-1a	Santa Fe Black-on-white	9
	Wiyo Black-on-white	8
	Galisteo Black-on-white	13
	Rowe Black-on-white	19
Floyd Ranch	Santa Fe Black-on-white	1
	Wiyo Black-on-white	1
	Cieneguilla Glaze Yellow	1
	Heshotauthla Polychrome	7
	Chupadero Black-on-white	1
Ozier	Galisteo Black-on-white	2
	Cieneguilla Glaze Yellow	1
	San Clemente Glaze Polychrome	2
	Largo Glaze Yellow	1
	Largo Glaze Polychrome	1
	San Lazaro Glaze Polychrome	1
	Jeddito Yellow Ware	1
Saddleback Ruin	Abiqiu Black-on-gray	>2
	Agua Fria Glaze-on-Red	>4
	Cieneguilla Glaze Yellow	1
	Kuaua Glaze Polychrome	3
Landergin Mesa	Cieneguilla Glaze Yellow	No Data
	Largo Glaze Yellow	No Data
Big Blue I	Agua Fria Glaze-on-Red	2
	Cieneguilla Glaze Yellow	10
McGrath	Santa Fe Black-on-white	1
Stamper	Rowe Black-on-white	3
Chicken Creek	Agua Fria Glaze-on-Red	5
Isolated Find	Largo Glaze Yellow	1
Isolated Find	Kowina Black-on-white	1

Ozier Ranch Ruin (41MO96) is a sizeable settlement containing “numerous” stone structures on the north side of the Canadian River near the mouth of Evans Canyon (Texas Archeological Site Atlas 2003). This site is on a low bench adjacent to the river and has both Antelope Creek and later, possibly Apache, components (Crabb

1968:85). As such, some of the Puebloan sherd types (e.g., San Lazaro) found here might be associated with the later component.

The Floyd Ranch Ruin is on a high promontory along the south side of the Canadian River. This site is near the New Mexico border and has two adjoining rooms with flat laid stone masonry. Although diagnostic artifacts Antelope Creek phase have been recovered at this small site, its west location, unique architecture, and a relative abundance of Puebloan items, such as obsidian, a fibrolite stone axe, turquoise, and painted and utilitarian wares, may also indicate short-term occupation by Puebloan groups (Crabb 2004, personal communication).

Except for the San Lazaro Polychrome and Jeddito Yellow ware (a generic name that includes several sequent types) sherds at the Ozier site, which are likely related to a later component, all of the ceramic types recovered at Antelope Creek settlements were produced within the accepted temporal span for the phase (i.e., A.D. 1250-1500) (Figure 6.1). As such, they are almost surely related to occupation of these localities by Antelope Creek societies. Several of the types represented were first produced around A.D. 1300 and suggest that exchange relationships with the Puebloan groups were established about this time. However, both Santa Fe Black-on-white and St. Johns Polychrome were produced as early as A.D. 1175 and may indicate that contact began earlier. Although several types continued to be produced after A.D. 1400, only the Largo Glaze-on-yellow and Largo Polychrome were first produced after this date and clearly indicate that exchange between the two regions continued into the fifteenth century. Given the limited sample sizes and because many of the ceramic types were produced over 75 to 100 years, it is not possible to identify hiatuses in exchange or periods of increased interaction between the two regions. Instead these data only allow one to conclude that exchange relations were probably established by A.D. 1300 and continued throughout the duration of the phase.

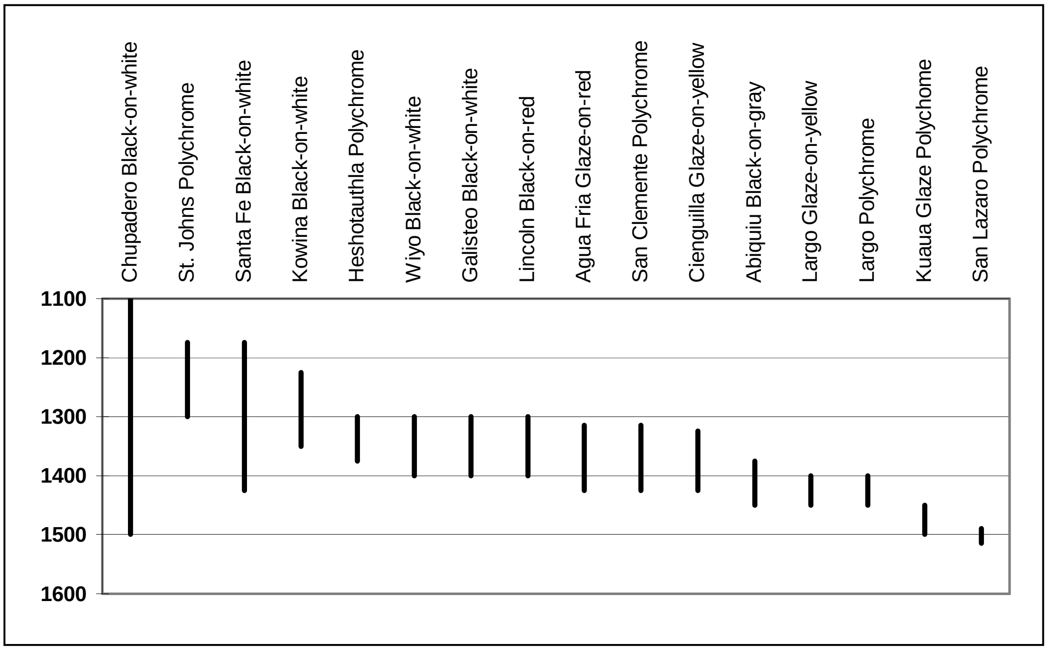


Figure 6.1 Date Profiles of SW Ceramic Types from Antelope Creek Settlements.

Using the information presented in Chapter Five, it is possible to identify probable production districts for the ceramic types recovered at Antelope Creek settlements. Even though all of the ceramic types identified here were produced in two or more districts (see Figure 5.7.), this information is certainly an improvement over earlier studies which provided general statements regarding sources of origin for these items (i.e., northern, western or southern Pueblos).

Cienguilla Glaze-on-yellow, Agua Fria Glaze-on-red, Largo Glaze-on-yellow, and Santa Fe Black-on-white wares are the most widespread ceramic types among settlements and occur at seven, five, three, and three sites, respectively (Tables 6.3). The other remaining types occur less frequently. Although previous studies have not specified whether the sherds recovered are from jars or bowls, the presence of Santa Fe and Wiyo Black-on-white wares and Abiquiu Black-on-gray suggest that bowls, in addition to jars, were obtained through exchange (see Honea 1973:79; Vint 1999:421).

Table 6.3 SW Ceramic Types Recovered at Antelope Creek Settlements.

Decorated Ceramic Type	Date Range	District of General Origin	N*
White Wares			
Chupadero Black-on white	A.D. 1050-1500	Eastern Socorro and Sierra Blanca districts	1
Santa Fe Black-on-white	A.D. 1175-1425	Santa Fe, Pecos, Pajarito, Espanola, and Chama districts	3
Kowina Black-on-white	A.D. 1225-1350	Western Albuquerque district (i.e., Acoma)	1
Wiyo Black-on-white	A.D. 1300-1400	Espanola, Chama, and northern portions of Pajarito districts	2
Galisteo Black-on white	A.D. 1300-1400	Southern Santa Fe District, and rarely in Albuquerque and Pajarito districts	2
Abiquiu Black-on-gray (Biscuit A)	A.D. 1375-1450	Espanola and Chama districts	1
Red Wares			
St. Johns Polychrome	A.D. 1175-1300	East-central Arizona to Zuni area	2
Heshotauthla Polychrome	A.D. 1300-1375	East-central Arizona to Zuni area	1
Jeddito Yellow Wares	A.D. 1350-1650	East-central to northeastern Arizona	1
Glaze Wares			
Glaze A series			
Agua Fria Glaze-on-red	A.D. 1315-1425	Albuquerque, Santa Fe, and Pajarito districts	5
San Clemente Polychrome	A.D. 1315-1425	Northern Socorro district and rarely in Albuquerque, Santa Fe, and Pajarito districts	1
Cienguilla Glaze-on-yellow	A.D. 1325-1425	Southern Santa Fe district and rarely in Pajarito district	7
Lincoln Black-on-red	A.D. 1300-1400	Sierra Blanca district	2
Glaze B series			
Largo Polychrome	A.D. 1400-1450	Northern Albuquerque and southern Santa Fe districts	1
Largo Glaze-on-yellow	A.D. 1400-1450	Northern Albuquerque and southern Santa Fe districts	3
Kuaua Glaze Polychrome	A.D. 1425-1500	Albuquerque and Socorro districts	1
Glaze D series			
San Lazaro Polychrome	A.D. 1490-1515	Albuquerque and southern Santa Fe districts	1

* Refers to number of settlements at which each ceramic type occurs; Data derived from Oppelt 1988; Vint 1999:Table 7.1 and 7.6; Wiseman 2004, personal communication

The ceramic production districts most frequently represented at Antelope Creek settlements are Santa Fe, Albuquerque, and Pajarito (Table 6.4). Española, Chama, Socorro, Pecos, and Sierra Blanca districts are represented by two or three types. Lastly, no ceramics in the sample were derived from the Taos (e.g., Vadito and Talpa Black-on-white types), Gallina (e.g, Gallina Black-on-gray), or Jemez districts (e.g., Jemez Black-on-white) and suggest no contact with settlements in these areas. The lack of ceramics from the latter two areas makes sense since the Gallina area appears to have been abandoned by A.D. 1300 and most pueblos in the Jemez district were not occupied until Glaze D times (ca. A.D. 1500) (Crown et al. 1996).

Table 6.4 SW Ceramic Production Districts Represented at Antelope Creek Sites.

Ceramic Type	**Production Districts**												**Sites**
	Sf	**Pj**	**Ab**	**Es**	**Ch**	**Sc**	**Sb**	**Pc**	**Ta**	**Jm**	**Gl**	**Wp**	
Cienguilla Glaze-on-yellow	x[s]	x[r]											7
Agua Fria Glaze-on-red	x	x	x										5
Santa Fe Black-on-white	x	x		x	x			x					3
Largo Glaze-on-yellow	x[s]		x[n]										3
Rowe Black-on-white	x							x					2
Galisteo Black-on-white	x[s]	x[r]	x[r]										2
Wiyo Black-on-white		x[n]		x	x								2
St. Johns Polychrome												x	2
Lincoln Black-on-red							x						2
Heshotauthla Polychrome												x	1
Kuaua Glaze Polychrome			x			x							1
Abiquiu Black-on-gray				x	x								1
San Clemente Polychrome	x[r]	x[r]	x[r]			x[n]							1
Little Colorado Glaze I (?)												x	1
Largo Polychrome	x[s]		x[n]										1
Kowina Black-on-white			x										1
Jeddito Yellow ware												x	1
Chupadero Black-on-white						x	x						1
Totals	**8**	**6**	**7**	**3**	**3**	**3**	**2**	**2**	**0**	**0**	**0**	**4**	

Abbreviations Sf=Santa Fe, Pj=Pajarito, Ab=Albuquerque, Es=Espanola, Ch=Chama, Sc=Socorro, Pc=Pecos, Gl=Gallina, Ta=Taos, Jm=Jemez, Sb=Sierra Blanca, Wp=Eastern Arizona to Zuñi

[n] = Production centered in northern portions of this district

[s] = Production centered in southern portions of this district

[r] = Rarely produced in this district

It is possible to further narrow down potential source areas for the ceramic types discussed here in two ways. First, one can consider only those areas identified in Table 6.4 as primary production districts and disregard those where individual types were rarely produced. Second, specific portions of districts which are recognized as probable centers of production can be emphasized and used (e.g., northern Albuquerque and southern Santa Fe for the Glaze B Largo wares). Of course it is recognized that each of these strategies is reasonable *only* if one assumes that Antelope Creek settlements obtained these ceramics directly from primary production districts and not through exchange networks with other pueblos.

It is apparent that the full range of ceramic types represented at Antelope Creek settlements could not have been obtained from a single pueblo. As such, it is likely that trade relationships with eastern pueblos were established and maintained by individual settlements. In addition, as the following demonstrates, it is also evident that settlements were not exclusively in contact with so called “gateway” communities on the eastern fringes of the Anasazi world, but also were in contact with settlements farther west.

So were the occupants of each individual settlement in contact with one or several Puebloan settlements? In other words, at settlements where several ceramic types have been recovered, would it have been possible to obtain all of these wares from a single settlement? The answer appears to be yes in some cases, but no in others. Except for the one Jeddito Yellow ware, all six types found at the Ozier Ranch site could have been produced at single settlement in the southern Santa Fe district.

Likewise, at CR-1a, which had four types represented, exchange with a single pueblo in the Pajarito district could have provided all the ceramics recovered here.

In contrast, at Alibates Ruin 28 and Antelope Creek 22 contact with at least one community in either the Santa Fe or Pajarito districts and another in either the Sierra Blanca or Socorro districts would have been minimally necessary to account for all of the ceramic types present. Also of note is the remarkable redundancy in types represented at these two settlements. Agua Fria Glaze-on-red, Cienguilla Glaze-on-yellow, St. Johns Polychrome, and Lincoln Black-on-red were all recovered at both of these sites. These parallels may indicate that close trade ties existed between these settlements and/or that both communities had established exchange relationships with Puebloan societies occupying the same districts, possibly even the same pueblos.

At Floyd Ranch it appears as though contact with settlements in the Santa Fe, Pajarito, and either the Sierra Blanca or eastern Socorro districts would have been necessary to obtain the types present. Similarly, at Saddleback it appears as though groups were in contact with communities in each of the following districts: either the Santa Fe or Pajarito districts, another in the Española or Chama districts, and finally another in either the Albuquerque or Socorro districts. In addition, several of the settlements mentioned here also contained wares that were derived from source areas in eastern Arizona or western New Mexico (i.e., St. Johns Polychrome, Heshotauthla Polychrome, and Jeddito Yellow ware) (Table 5.3). The type "Little Colorado Glaze I" listed by Lintz (1991:Table 6.1) from Antelope Creek 22 was probably also derived from this area, but does not equate to any known formal type (Wiseman 2004, personal communication). Presently, it is not clear whether these wares were obtained directly or through down-the-line contact with settlements in the Rio Grande and Pecos river valleys, although the latter seems most likely (compare with Figure 5.4).

Overall, given the enormous amount of past research that has focused on Anasazi decorated ceramics, it is clear that these items have the potential for providing detailed information regarding the structure of prehistoric interaction and exchange networks at present than perhaps any other class of artifacts (see for example Habicht-Mauche 1993; Vint 1999). While this has long been recognized in the Southwest, little sustained interest in Puebloan ceramics has been generated among Plains researchers. Currently, these data have little to offer regarding a detailed chronology of Plains-Pueblo exchange, but as demonstrated here, they can certainly provide fairly detailed information about potential Pueblo communities with which groups in the study area may have been in contact.

The preceding discussions have identified specific districts that served as sources for decorated ceramics recovered at Antelope Creek settlements. Most often these districts included Santa Fe, Pajarito, and Albuquerque, but contact with communities in the Española, Chama, Socorro, Sierra Blanca, and Pecos areas are also indicated. Table 6.5 provides a listing of a few of the larger settlements occupied between A.D. 1250-1500 in each of these areas (see Adler 1996:Appendix; Cordell 1989; Crown et al. 1996; Spielmann 1996). These sites represent some of the Puebloan communities where decorated ceramics may have been produced.

Table 6.5 Select Communities in Central and Northern New Mexico (see Adler 1996).

Santa Fe	**Pajarito**	**Albuquerque**	**Española**	**Pecos**
Pindi	Kuapa II	Kuaua	Cuyamunge	Pecos Pueblo
San Marcos	Pueblo Canada	Puaray	Nambe	Rowe Ruin
Arroyo Hondo	Kuapa I	San Antonio	Tesuque Pueblo	Forked Lightning
La Cienguilla	Cochiti Pueblo	Tijeras	LA835	Arrowhead
San Lazaro	LA12700D	Paa-ko		Dick's Ruin
Tonque	Otowi		**Chama**	Loma Lothrop
Pueblo Largo	Navawi	**Socorro/Salinas**	Tsiping	
Galisteo	LA351	Gran Quivera	Tsama	**Sierra Blanca**
Piedra Lumbre	Tshirege	Quarai	Te'ewi	Hiner
Pueblo Del Encierro	LA355	Abo	Sapawe	Robinson
La Bajada	Long House	LA1076	Yuque-Yunque	Phillips
Caja Del Rio South	Yapashi	LA1181	Ponsipa'akeri	Henderson
Chamisa Locita	LA3662	LA1075	Pose'uinge	
LA12579	LA9862	Pueblo Blanco	Ponyi Pakuen	

Obsidian

Whereas decorated sherds obtained through exchange with eastern Anasazi groups were clearly concentrated among the largest Antelope Creek settlements, the distribution of obsidian indicates that access to other items from the Southwest was much more widespread among sites. With this being said it is still apparent that obsidian is clearly much more abundant at large settlements. Although researchers working on Antelope Creek phase have long noted the presence of this exotic resource at settlements, little systematic analysis has been conducted to identify the specific source areas for obsidian from these sites. This problem has been somewhat amended by x-ray fluorescence (XRF) analyses conducted as a part of this research (see Appendix V). This discussion primarily identifies patterns in obsidian distribution among settlements, although the results of recent XRF analyses are also presented and provide information regarding sources of origin. Unfortunately, even though source areas have been determined for some of these artifacts, it is not possible at this time to identify specific settlements in New Mexico that may have ultimately supplied this resource to societies in the study area. Figure 6.2 shows examples of obsidian from a few select sites. All of these artifacts are unmodified flakes except for six projectile points from Chimney Rock Ruins 51.

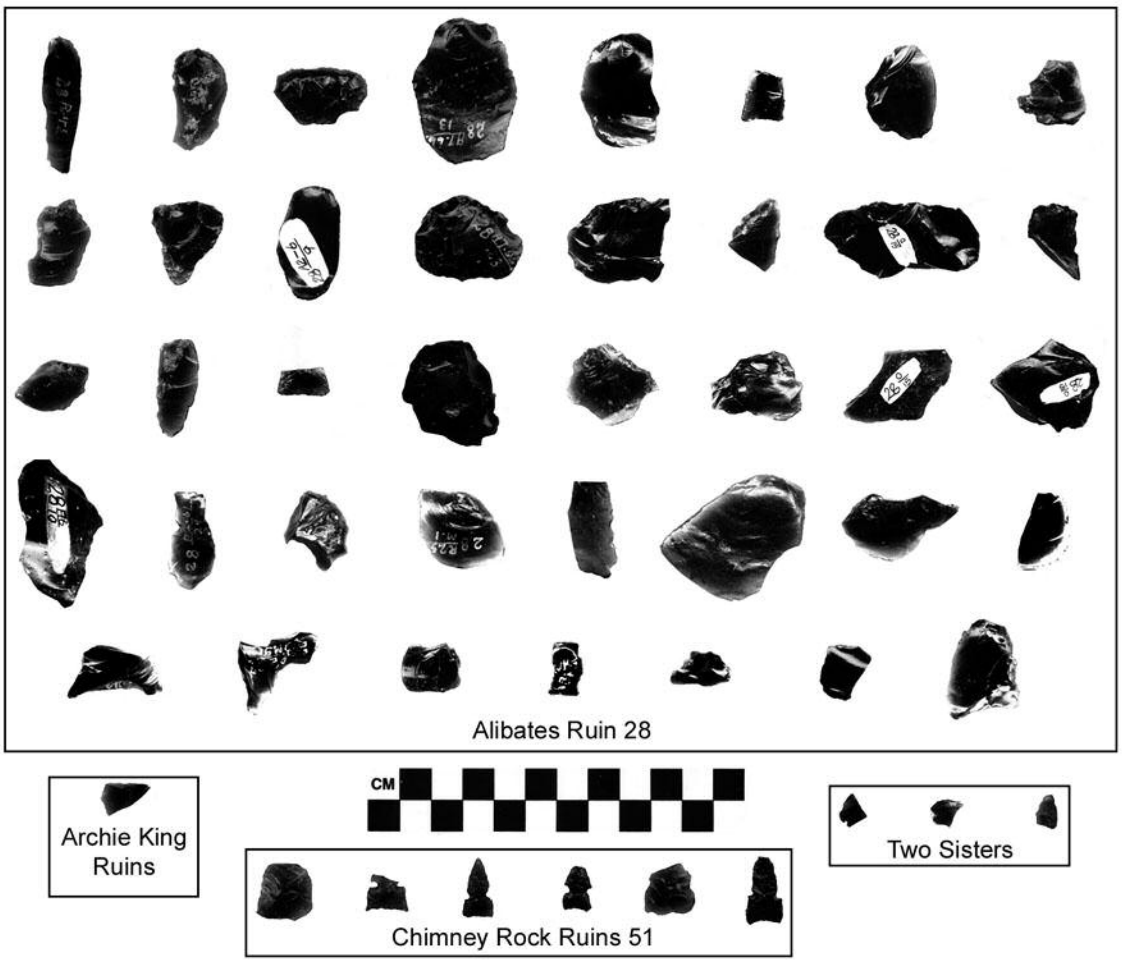


Figure 6.2 Obsidian from Select Antelope Creek Settlements.

Obsidian is present at 17 of 27 (63%) Antelope Creek settlements for which we have good data (Table 6.1). Additional sites such as Alibates Ruin 30, Saddleback Ruin, Coetas Creek Ruin, Tarbox Ruin, and Antelope Creek 22 also had obsidian, but specific frequencies from these sites remain unknown (Baker and Baker 2000; Holden 1933; Studer 1934). While obsidian is present at most sites, except for a few large sites, this resource is generally not very abundant at settlements of the phase. Of these sites, Chimney Rock 51 and sites within the cluster near the Alibates quarries (i.e., Alibates Ruins) clearly have the highest frequencies of this resource with quantities numbering in the thousands (Lintz 1986a:Table 31, 1990; Studer n.d.:4). Of the remaining sites, only 41MO35 and Landergin Mesa have what may be considered fairly sizeable quantities of obsidian (i.e., 99 and 111 pieces; Couzzourt and Schmidt-Couzzourt 1996; Lintz 1990, 1991). Each of the major source areas for obsidian used by Middle Ceramic populations of the Southern High Plains was presented in Chapter Five.

Currently, source data are available from eight different Antelope Creek settlements in the Texas and Oklahoma panhandles. Previously, trace element analysis (XRF) had only been conducted on nine pieces of obsidian from three sites (Lintz 1990; Mitchell et al. 1980). Six samples of obsidian from Landergin Mesa were all identified as Cerro Toledo Rhyolite (Obsidian Ridge). Originally, the samples from Tarbox Ruin (n=1) and the McGarraugh Ranch site (n=2) were tentatively identified as Valle Grande obsidian (Mitchell et al. 1980:304). However, further examination of the element abundances presented by Mitchell et al. (1980) indicates that these artifacts were definitely not derived from the Valles Caldera, but were probably obtained from Cerro Toledo sources (Shackley 2003, personal communication). This reinterpretation fits well with the recent XRF results from obsidian recovered at other Antelope Creek sites in the region (Table 6.6).

Table 6.6 Source Areas for Obsidian Recovered at Antelope Creek Settlements.

Site	**Cerro Toledo Rhyolite, N.M.**	**El Rechuelos, N.M.**	**Valle Grande, N.M.**	**Obsidian Cliff, Wy.**	**Owyhee, Id.**
Tarbox	1	-	-	-	-
McGarraugh Ranch	2	-	-	-	-
Landergin Mesa	6				
Alibates Ruin 28	41	1	-	-	-
Chimney Rock 51	6	-	-	-	-
Archie King Ruins	1	-	-	-	-
Roy Smith	4	-	1	1	-
Stamper	1	-	-	-	1
Totals (N=66)	62 (93.9%)	1 (1.5%)	1 (1.5%)	1 (1.5%)	1 (1.5%)

As a part of this research, obsidian source areas were identified for 57 samples of obsidian from Alibates Ruin #28 (units I and II), Chimney Rock Ruin 51, Roy Smith, Stamper, and the Archie King Ruins (see Figure 6.2). Sourced items included flake debris (i.e., primary, secondary, and tertiary flakes) and finished tools (i.e., projectile points). These results, combined with those from earlier studies, demonstrate that nearly all (i.e., 57 of 58 samples) of the obsidian obtained from six Antelope Creek settlements in the Canadian River valley of the Texas panhandle (i.e., Tarbox, McGarraugh Ranch, Landergin Mesa, Alibates Ruin 28, Chimney Rock 51, and the Archie King Ruins) were obtained from Cerro Toledo sources (Table 6.6). Additional analysis is required to determine if this same pattern holds true for other settlements in this portion of the distribution.

The sample from Antelope Creek sites in the Oklahoma panhandle is quite meager, but then again, obsidian is quite rare at sites in this area. The eight samples from Roy Smith and Stamper include materials from New Mexico (i.e., Cerro Toledo and Valle Grande), Wyoming, and Idaho (Table 6.6). The small sample available from these settlements certainly limits our ability to interpret these results, however, the presence of materials from Cerro Toledo and Valle Grande, as well as source areas in the northwestern Plains, is similar to that observed for the nearby Odessa phase. The three samples from Two Sisters shown in Figure 6.2 were also sent in for source analysis, but were too small for accurate measurement.

Obsidian recovered at Antelope Creek phase sites occurs almost exclusively as nonmodified flake debris, although a few projectile points, scrapers, and utilized flakes do occur at times. Primary and secondary flakes with cortex are fairly abundant and indicate procurement from both bedrock and gravel sources. The presence of early stage production debris at permanent habitation sites in the study area also indicates that these materials were transported to settlements in cobble form and not as finished objects. Although precise proveniences are almost entirely lacking for these items, it is apparent that they occur in general surface contexts and as midden debris. Obsidian is not documented from mortuary contexts.

In sum, although obsidian has been recovered at a variety of settlements, it is clearly most abundant at the largest communities of the phase (e.g., the Alibates Ruin Villages and Chimney Rock 51). Also of interest is the concentration of obsidian at some sites along the Canadian River and its rarity at settlements in the Oklahoma panhandle. A similar trend was noted in the distribution of southwestern ceramics.

All but a small percentage of obsidian was derived from sources of Cerro Toledo Rhyolite. These materials can be obtained both as gravels in the Rio Grande River and in landslide deposits resulting from the collapse of the Toledo Caldera (Shackley 2000). A review of the literature suggests that there is little evidence to support the proposition that any eastern Anasazi settlement controlled source areas and/or were actively involved in the mining, production, and exchange of obsidian prior to A.D. 1500 (see Head 1999:528-534). The presence of early and late stage obsidian production debris at sites in the study area also seems to support such a conclusion. In addition, the fact that Cerro Toledo Rhyolite obsidian is widely distributed (i.e., from primary source areas in the Jemez Mountains and in the alluvium of the Rio Grande River) also means that it would have represented a resource that would have been difficult for any one community to claim exclusive rights to access. This would not have been the case for obsidian obtained from the Valle Grande source since these materials are only available within the caldera proper. The latter source, however, is only represented by a single flake from the Roy Smith site.

Early stage production debris and the recovery of obsidian flakes containing cortical surfaces indicative of bedrock and gravel sources clearly suggest that these materials were obtained in cobble form and not as finished objects. These raw materials could have been obtained either by 1) direct procurement at the caldera or from alluvial contexts, 2) through exchange with settlements near the Toledo Caldera (e.g., Jemez and Pajarito districts) or 3) through exchange with settlements located farther downstream along the Rio Grande (e.g., eastern Santa Fe, Albuquerque, and Socorro districts). If indeed obsidian was obtained through exchange, then the ceramic data presented earlier would appear to suggest that contacts were with groups in the Pajarito and Santa Fe or Albuquerque districts.

Other Nonlocal Lithic Materials

Overall, evidence for exchange of other lithic materials used for chipped stone tool production at Antelope Creek settlements is fairly rare. This, however, is not particularly surprising considering that bedrock and gravel sources of Alibates silicified dolomite are readily available along the Canadian River and were used by groups throughout the distribution of the phase. In general, analysis of collections indicates that Alibates comprises over 95% of chipped stone assemblages for Antelope Creek sites in the Texas panhandle (Baker and Baker 2000:83; Bandy 1976; Brosowske unpublished data). The remainder consists primarily of Dakota or Ogallala quartzites. Smoky Hill or Niobrara jasper is rare (i.e., <0.1%) or absent from sites in this area.

The abundance of Alibates at Antelope Creek sites in the Oklahoma panhandle indicates that these groups developed and maintained exchange relationships with related populations near the Alibates quarries along the Canadian River (see Duncan 2002; Lintz 1976; Schneider 1969; Brosowske unpublished data). These settlements are at least 125 km from the Alibates Flint Quarries National monument, but still have lithic assemblages that usually contain of over 80% Alibates (Figure 6.3). Chipped stone items of Alibates at each of these settlements occur primarily as formal tools, large tertiary flakes, and retouch debris. Very few cores and little production debris are present. All of this suggests that this material entered the site as finished tools and large flake blanks suitable for the production of nonspecialized tools.

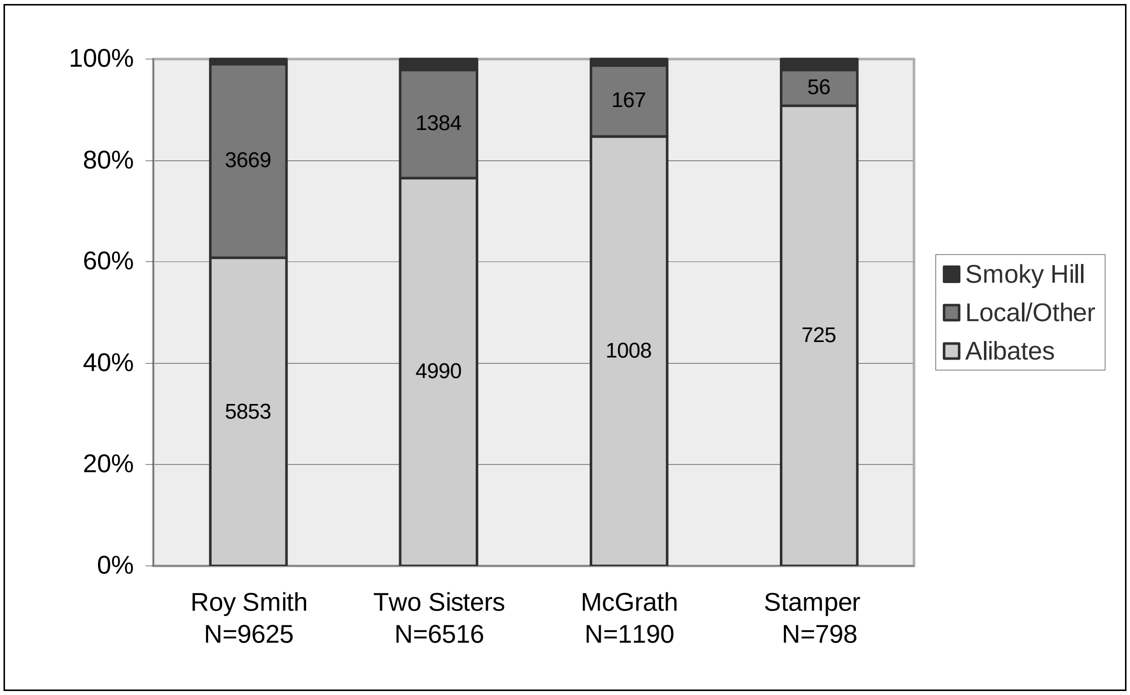


Figure 6.3 Lithic Raw Material Use at Antelope Creek Sites in Oklahoma.

Remaining portions of the chipped stone assemblage are primarily comprised of locally available quartzites and cherts obtained from exposures of the Ogallala formation. In terms of quality, these materials are inferior to Alibates. Nonetheless, these local materials frequently occur as debitage reflecting all stages of lithic production and some finished tools at many sites. In general, although these materials were used at times to produce projectile points, beveled knives, and scrapers, more often they are limited to informal tool types, such as utilized flakes and crude bifaces. As observed at sites along the Canadian River, Smoky Hill jasper occurs infrequently at Antelope Creek sites in the Oklahoma panhandle. Altogether, this material comprises 2% or less of all chipped stone items (see Duncan 2002; Lintz 1976; Schneider 1969).

Marine Shell

Marine shell artifacts at Antelope Creek settlements include disk (*Laevicardium elatum* or *Glycymeris*) and spire-lopped beads (likely *Olivella dama*), and rarely, tinklers (*Conus)*, gorgets and pendants (*Busycon* or *Strombus*, and possibly *Haliotis*). Table 6.1 shows the distribution of marine shell artifacts at settlements of the region.

Including the results presented by Glasscock and Glasscock (1955) and Lintz (1986a:Table 31) it is estimated that approximately 2174 disk beads were recovered from 10 different sites in the Texas and Oklahoma panhandles (Table 6.1). While these beads are certainly more numerous than other forms and appear to be widespread among settlements, it should be noted that nearly all of these were associated with a single burial at CR-1a and two burials at Antelope Creek 22A (N=2056 or 94.6%). At the latter, disk beads were associated with a young adult female (N=940) and a young child (N=116) in an abandoned habitation structure at the site (Lintz 1986a:Table 34; Summer 1997:Table 5.2). This house is the only habitation structure documented at this site and it contained a total of 16 interments. Lintz (1986a:317) suggests that following abandonment this structure was used as a formal cemetery by the occupants of the adjacent Antelope Creek 22 settlement. Glasscock and Glasscock (1955) notes that approximately 1000 disk beads were recovered from a burial context at CR-1a. Shell disk beads were also included with burials at Footprint (N=65) and Stamper (N=5) (Green 1986; Watson 1950) (see Figure 6.4). Small quantities of these beads (N=48) were also recovered in general settlement refuse at Alibates Ruin 28, Landergin Mesa, Antelope Creek 22, Roy Smith, Two Sisters, and McGrath.

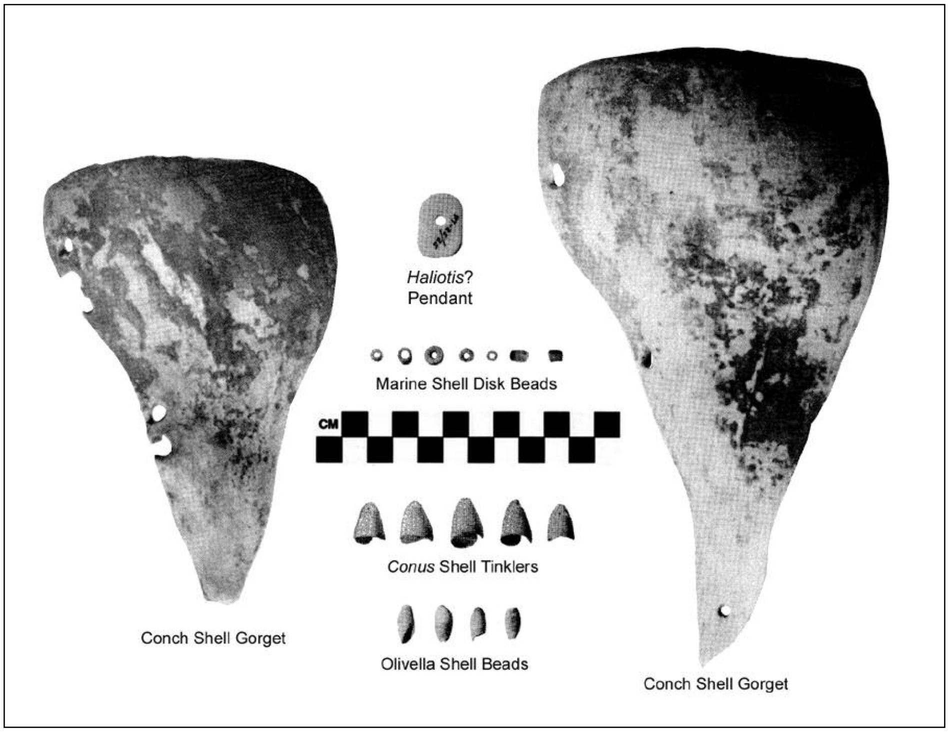


Figure 6.4 Marine Shell from Burial Pits A and B at Footprint (adapted from Green 1986).

Although shell disk beads can be found in small frequencies at both large and small settlements of the phase, it is clear that they are overwhelmingly associated with mortuary contexts (i.e., 97.8% of the time). In some cases, such as CR-1a and Antelope Creek 22A sizeable quantities (i.e., strings of several hundred marine shell beads) of these beads were interred with certain members of society, usually women and children. As such, the pattern noted earlier for southwestern ceramics and obsidian (i.e., dispersed among midden and general surface debris) is not observed for this class of nonlocal items. Overall, however, given the small size of these artifacts it is possible that unless fine screening of soil matrix was conducted during fieldwork, many of these items would not be recovered. The recovery of enormous quantities of disk beads at some settlements strongly supports the idea that these items were derived from the Southwest where they were mass produced at shell ornament production centers.

Approximately 170 *Olivella* shell beads are documented for 11 of the 30 (36.7%) Antelope Creek settlements shown in Table 6.1. An additional 56 *Olivella* beads were recovered from Coetas Ruin (Studer 1934:94) for a total of about 226 beads. Overall, these ornaments occur in both general site debris (125 or 55.3%) and in mortuary contexts (101 or 44.7%). Excluding the 128 *Olivella* beads recovered at Chimney Rock 51 and Coetas Ruin, it is apparent that these items are not particularly abundant at settlements of the phase; in fact, as a whole, they are less numerous than southwestern ceramic sherds. On a general level, however, *Olivella* beads do seem to be more common at larger sites (Table 6.1). This pattern especially holds true if one considers the fact that the 22 *Olivella* beads associated with female and child burials at Antelope Creek 22A were probably derived from occupants of Antelope Creek 22.

All of the beads from Coetas Ruin (N=56) and Alibates Ruin 28 (N=10) are from burial contexts for which we have fairly good information. At Coetas Ruin the *Olivella* beads were interred with a child of unknown age and at Alibates Ruin 28 they were recovered with a child approximately 10 years old (Baker and Baker 2000: 154). The association of these items with children is similar to that observed above for disk beads

Conus tinklers and other marine shell are quite rare at Antelope Creek settlements. A total of seven *Conus* tinklers are documented from three sites (Footprint, N=5; Chimney Rock 51, N=1; Alibates Ruin 28, N=1). The five tinklers from Footprint are all from burial pit A, which was in an abandoned habitation structure (i.e., Room I) (Figure 6.4). This feature contained the remains of two infants, one juvenile, and four adults (Green 1986:78). Unfortunately, it could not be determined with which burial or burials the shell tinklers were associated. The remaining two tinklers from Chimney Rock 51 and Alibates Ruin were apparently recovered within general midden deposits (see Baker and Baker 2000:246).

Other marine shell artifacts include conch shell gorgets, a conch shell pendant and one item simply identified as marine shell (Lintz 1986a:Table 34; Summers 1997:Table 5.2). Two conch shell gorgets (see Green 1986:Figure 45) were recovered from burial pit B at Footprint (Figure 6.4). This feature is also within Room I (see above description of burial pit A) and it contained the remains of one infant, two juveniles, and four adults (Green 1986:80). The third conch shell gorget was recovered from the adult female burial at Antelope Creek 22A that also contained the 940 disk beads and four *Olivella* beads (Lintz 1986a:Table 34). A conch pendant was also recovered with the two to four year old child mentioned above that contained 116 disk beads. This pendant was complete and also had a turquoise inlay (Lintz 1986a:173). The unknown marine shell ornament was recovered with an adult male at Antelope Creek 22A. In addition, Studer (1934:91) notes that besides *Olivella* shell, other Pacific coast shell was recovered from midden and burial contexts at Coetas Ruin. Unfortunately, these marine shell species and their quantities for this site are not known.

It is apparent that nearly all of the *Conus* and conch shell artifacts found at Antelope Creek settlements are recovered almost exclusively from mortuary contexts. Although the exact association of these items in burial pits A and B at Footprint is unclear, it is possible that all of these types of marine shell ornaments were included as grave items with either females or children. A similar pattern was noted above for disk and *Olivella* beads.

Turquoise

Turquoise and other types of blue-green stone (e.g., malachite, amazonite, azurite) derived from the Southwest are generally quite rare at Antelope Creek settlements (i.e., only 16.6% of the sites). Approximately 30 turquoise beads and pendants are documented at five settlements (Landergin Mesa, N=7; Alibates Ruin 28, N=12; Chimney Rock 51, N=>4; Stamper, N=2; Antelope Creek 24, N=1; and Antelope Creek 22A, N=5). These data indicate that turquoise jewelry is concentrated, albeit in small numbers, at the largest settlements of the phase. In contrast to other exotic items discussed above, these trade goods are not primarily associated with mortuary contexts, but seem to be dispersed among general site debris. With this being said, however, all of the turquoise items recovered at Antelope Creek 22A were associated with the two burials noted above (i.e., the adult female and child).

Pipes and Pipestone

Very little information is currently available regarding pipes and the raw materials used to produce these items at Antelope Creek sites. A few tubular or "Cloudblower" Puebloan pipes are documented in the literature from Footprint (N=1), Alibates Ruin 28 (N=5), Chimney Rock Ruin 51 (N=9), and Coetas (N=unknown) (see Baker and Baker 2000:309, 310, 312; Green 1986:93; Harrison n.d.; Studer 1934:94). Studer (1934:94) notes that several "Cloudblower" forms were recovered from Coetas Ruin, but does not provide specific information about their precise number or provenience. Lintz (1991:98-99) also notes that a stone "Pecos" pipe was recovered from the McGarraugh Ranch site and provides a drawing of another tubular (stone?) pipe from the Matthews Ranch Ruin. No additional information regarding the context of these artifacts is given by Lintz (1991). Overall, at least 16 tubular style Puebloan pipes of either clay or stone are documented from four different settlements. Precise details regarding the context of these trade items are not known. The remaining pipe forms represented at sites of the phase are typical Plains varieties (i.e., Elbow pipes) (see Figure 6.5).

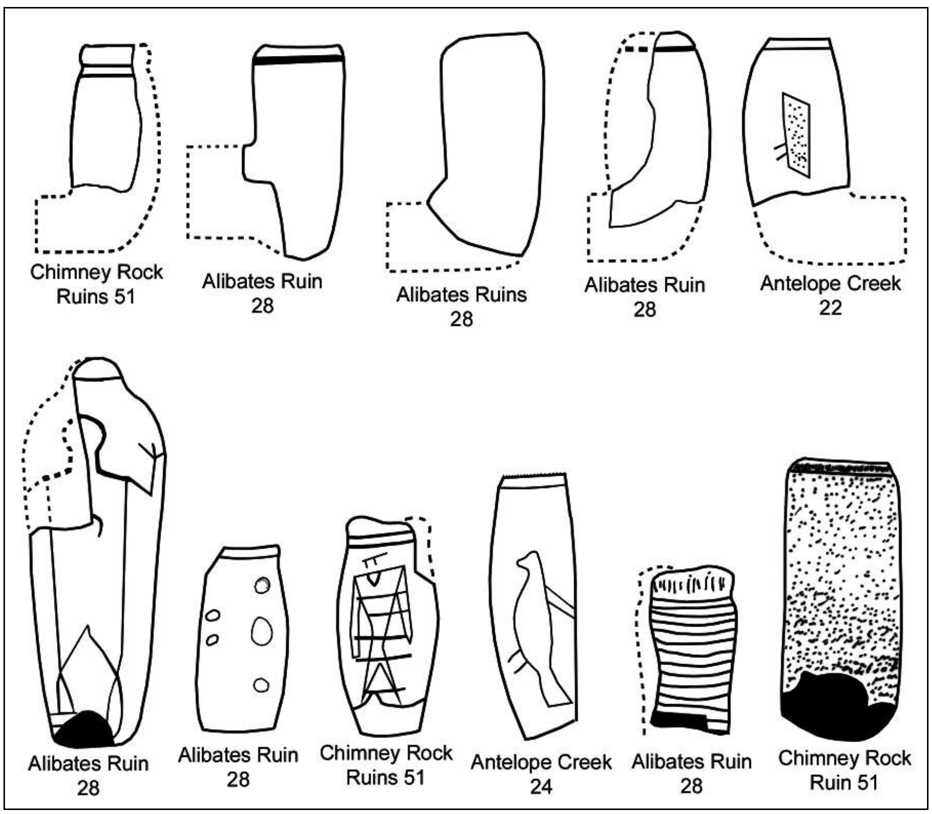


Figure 6.5 Select Pipes Recovered from Antelope Creek Sites (redrawn from Harrison n.d.).

Information regarding the raw materials used to produce pipes is equally poor. Harrison (n.d.) has provided limited details about raw materials for a sample of 25 pipes from Antelope Creek Ruin 22 and 24, Alibates Ruin 28, and Chimney Rock 51. All of these pipes were produced from either clay (N=12) or a red pipestone (N=13). A visual inspection of the latter at the Panhandle-Plains Museum in Canyon, Texas, suggests that many of these items may be Kansas pipestone from the glacial till in eastern Nebraska and Kansas. Of the 49 total pipes examined by the author from Alibates Ruin 28, only 9 (18.4%) were of red pipestone (Brosowske unpublished data). Although specific source areas for other raw materials represented are not known, it is probable that they are local in origin.

Summary

The preceding discussions have reviewed the major classes of nonlocal trade items recovered at Antelope Creek settlements of the Texas and Oklahoma panhandles. Additional items of nonlocal origin are also documented and include mica scraps, ground coal artifacts, soapstone and red stone beads, and one fibrolite axe (Lintz 1991). These items have not been previously discussed in detail elsewhere in print (see Baker and Baker 2000; Lintz 1986a, 1991; Spielmann 1982, 1983). This suggests that they are quite rare and represent isolated examples of items also derived from the eastern Pueblos. As such, these artifacts were not discussed here.

The distribution and frequency of exotic items presented here demonstrates that nonlocal trade goods, which were almost entirely derived from the Southwest, are concentrated at the largest communities of the Antelope Creek phase. The most abundant trade items were southwestern ceramic sherds, disk beads, and obsidian. Other items occurred less frequently, but were still associated with larger settlements.

Besides the association of the sizeable quantities of exotic items at large settlements, several other patterns were observed. First, nearly all of the artifacts documented here are items that are related to the political sphere of exchange (e.g., ceramics, marine shell jewelry, turquoise, and pipes). In addition, although obsidian was used to produce tools that are generally thought to be associated with subsistence activities, given the distances at which these materials were derived it could be argued that this class of artifacts is also related to the political realm. Other nonlocal lithics obtained through contact with other Plains groups were very rare (e.g., Smoky Hill jasper) and were limited primarily to settlements in the Oklahoma portion of the distribution. The latter were used and discarded in utilitarian contexts.

Of the trade items examined here it is obvious that the southwestern decorated sherds provide the greatest amount information regarding intersocietal trade relationships. As such, a great deal of time was spent discussing likely source areas and age ranges for these artifacts. Southwestern ceramics recovered at Antelope Creek sites indicate that decorated jars and bowls were obtained through exchange with several potential settlements in the Rio Grande and Pecos river valleys. These items suggest that contact with these communities could have begun as early A.D. 1250 and continued until the end of the phase (i.e., A.D. 1500). Previously, Lintz (1986a, 1991) has proposed that exchange with the eastern Pueblos increased dramatically following A.D. 1350, however, as discussed earlier, the current chronological control for the phase is so limited that it is not possible to support or refute such a proposition at this time.

Nonetheless, the ceramic data suggests that many of the largest Antelope Creek communities had established contact with one or more Puebloan settlements sometime following A.D. 1250. Most frequently these communities appear to have been in the Santa Fe, Pajarito, and Albuquerque districts, although contact with pueblos in the Española, Chama, Socorro, and Sierra Blanca districts were also noted. The location of these communities indicates that trade relations were not limited to the so called "Gateway" settlements frequently described in the literature (e.g., Taos, Pecos, Gran Quivira, etc.). Equally important was lack of evidence for contact with populations in the Taos, Gallina, and Jemez areas.

While the recovery of turquoise and obsidian do not provide precise information regarding specific pueblos which may have served as source areas, it is highly likely that these items would have been available at those same pueblos where the above ceramics were obtained (e.g., particularly in the Santa Fe, Galisteo Basin, Española, and Albuquerque areas). Hence, they serve to compliment the ceramic data.

In regards to marine shell at Antelope Creek settlements, it is apparent that nearly all of these items, except for some *Olivella* shell beads, were limited almost exclusively to mortuary contexts present at large settlements. For example, while marine shell beads were rare or absent from general site contexts, it was not uncommon to see hundreds of these artifacts interred with burials. In addition, it was also noted that these items were usually associated with the burials of some females and children. In general, there was little evidence for exotic items associated with adult male burials (see Lintz 1986a:Table 34; Summers 1997:Table 5.2).

Odessa Phase

In comparison to sites of the Antelope Creek phase, which have been extensively investigated through numerous, large-scale excavation projects over the last 80 years, settlements of the Odessa phase have for the most part received very little formal investigation. As a result, precise information regarding the distribution and frequency of nonlocal trade is limited and known for very few settlements (Table 6.7). In general, except for Odessa Yates, Lonker, Lundeen, and sites of the Buried City locality, which have all received some formal investigation in the past, many of the settlements discussed here are known only from small surface collections made by avocational archaeologists. Given the small sample sizes currently available, the abundance of nonlocal items at Odessa phase settlements is difficult to assess. Despite these problems it is apparent that nonlocal trade goods at Odessa phase settlements comprise a higher percentage of assemblages and have a broader distribution among sites than is documented above for Antelope Creek phase sites. In many instances, however, the frequency of these items is undoubtedly higher than is presented here.

In the ensuing discussion nonlocal trade items are presented for Odessa phase settlements that have been formally investigated or for which surface collections of more than 50 items are available (Table 6.7). Artifacts emphasized here include nonlocal chipped stone, ceramics, marine shell, turquoise, and Kansas pipestone. Additional items are also documented, but they occur in relatively few instances. As such, the latter are examined on a case by case basis throughout the following discussion. This information, although less abundant and detailed than what is available for the Antelope Creek phase, still provides key information regarding the role of intersocietal interaction and exchange among Odessa phase societies. Because many of the trade items examined here are known primarily from private collections, precise counts for many of these artifacts are often not possible. By necessity, many of the quantities presented in Table 6.7 simply represent conservative estimates. In other cases, it is only possible to note whether specific classes of items are present or absent at settlements. Figure 6.6 shows the general locations for Odessa phase settlements discussed here.

Table 6.7 Nonlocal Trade Items Documented at Odessa Phase Settlements.

Site	**Southwestern Sherds**	**Turquoise**	**Olivella Shell Beads**	**Disk Beads**	**Other Marine Shell**	**Kansas Pipestone**	**Tubular Pipes**	**Obsidian**	**Total**
Odessa Yates	10	10	±240	+	+	±10	-	>2000	2272
Buried City	10	+	±100	+	+	±10	-	200	323
Sprague	+	+	±45	-	-	±3	-	150	198
Watson	-	-	±25	-	-	2	1	200	228
Monty Cates	-	2	+	-	-	+	-	25	29
Lundeen	-	-	15	-	5	3	-	1	24
Miller	-	-	+	-	-	+	-	-	+
Lonker	-	-	-	-	-	-	-	-	0
Price	-	-	2	-	-	3	-	10	15
Skull Springs	12	-	±8	-	-	+	-	4	25
Totals	33	14	±436	+	7	33	1	>2586	3114

+ Present at settlement, but in unknown quantities

It should be emphasized that the greatest majority of nonlocal items recovered at Odessa phase settlements are from surface contexts. As such, it is reasonable to question whether these materials can be reliably attributed to Middle Ceramic occupations (A.D. 1250-1500). Except for perhaps some of the sites along Wolf Creek, all of the Odessa phase settlements that are discussed here represent, as best as can be determined, single component Middle Ceramic sites and lack diagnostic artifacts that would suggest occupation by later groups. In addition, the recovery of similar types of trade items, albeit in smaller frequencies, from excavated contexts which have been dated also strongly suggests that these items are of Middle Ceramic age.

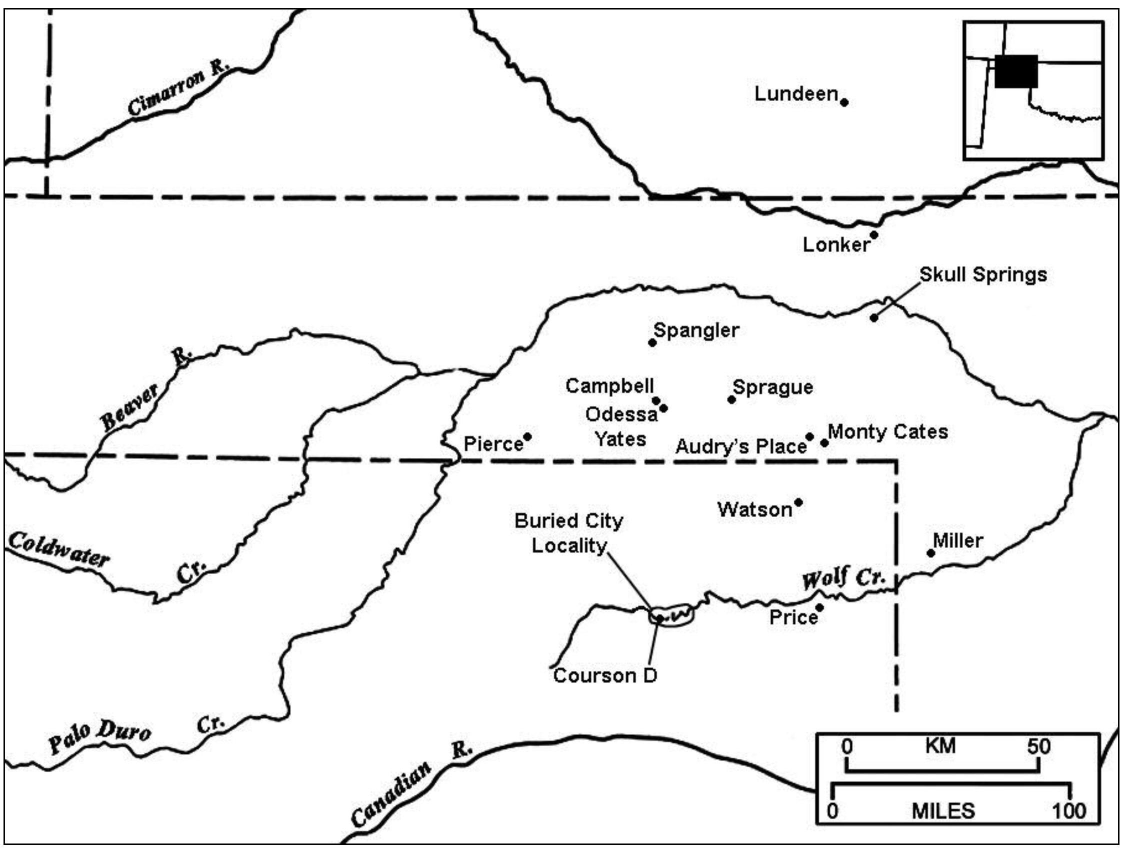


Figure 6.6 Odessa Phase Settlements discussed in Text.

Obsidian

Obsidian is commonly recovered at Odessa phase settlements of all sizes (i.e., extended villages and homesteads) (Figure 6.7). Of the 10 settlements presented in Table 6.7, obsidian is documented at eight or 80% of these sites. Even though this resource is present at most sites, and its complete absence at sites is fairly rare, there are notable differences in its frequency from settlement to settlement. In general, although exceptions exist, this variability appears to be largely related to settlement size. Of the sites presented in Table 6.7, all of the examples with high quantities of obsidian are large settlements.

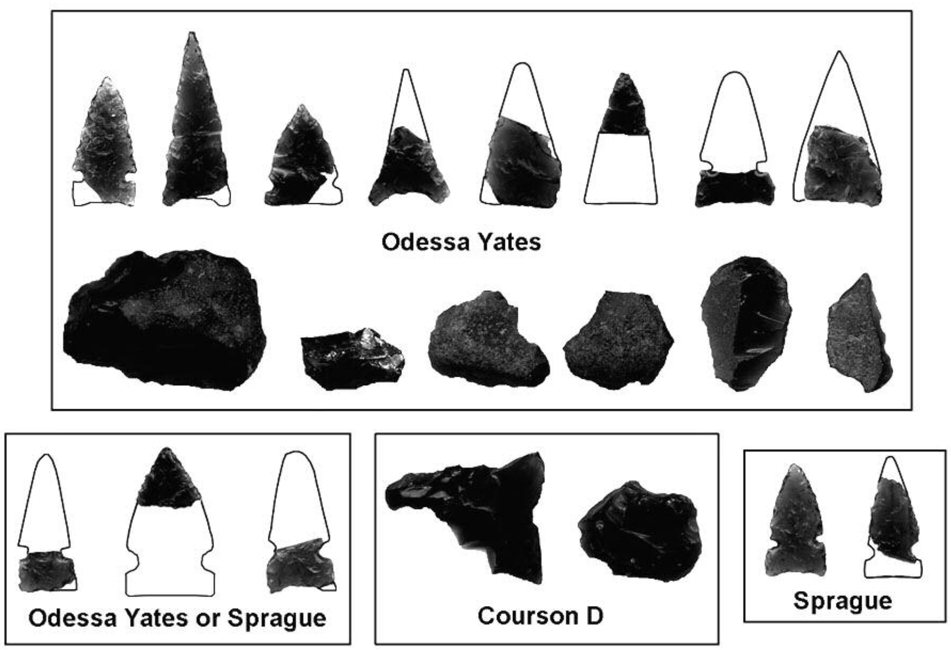


Figure 6.7 Obsidian from Select Odessa Phase Settlements.

As a whole, more obsidian has been recovered at Odessa Yates (34BV100) than at any other Odessa phase settlement or any other site in the state of Oklahoma.

Although precise counts are not available, at least 2000 obsidian flakes have been observed by the author in private collections from this site. Because countless people have intensively surface collected enormous quantities of artifacts, including obsidian, from this site over the last 100 years, it is clear that the overall amount is substantially higher than that reported in Table 6.7 (i.e., 2000).

The quantity of obsidian at other large Odessa phase sites is much less than what is observed at Odessa Yates. Obsidian is remarkably rare at settlements that comprise the large extended village along Wolf Creek known as the Buried City locality. Even though these sites form a settlement at least equal in size to the village on Clear Creek and is located only 48 km to the south, there are only about 200 obsidian artifacts known from private collections and formal excavations at Buried City (Brosowske et al. 2003; D. Hughes n.d.; D. Witt 2003, personal communication). Likewise, Sprague and Watson are two additional settlements that contain at least 150 obsidian artifacts. Both of these settlements also comprise portions of large villages along Duck Pond and Kiowa creeks. Lastly, the quantity of obsidian from small, single family homesteads (e.g., Lundeen, Lonker, Skull Springs, and Miller) seems to be quite small. Even though the amount of systematic research carried out at the latter settlements varies from small to relatively large-scale, the limited amount of obsidian and other nonlocal trade items recovered at these sites seems to be accurate.

A total of 65 obsidian artifacts from 10 Odessa phase settlements have been subjected to XRF analysis (Figure 6.7). At least five different obsidian source areas are documented for this sample (Table 6.8; see Appendix 2). The sample studied includes debitage (N=50) and projectile points (N=15). Although Cerro Toledo

Rhyolite does not dominate the sample to the extent observed among Antelope Creek settlements, it still comprises 80% of the obsidian examined in this study (i.e., 52 artifacts from nine settlements). Obsidian from the Valles Caldera is represented by seven artifacts (10.8%) from four settlements.

The remaining obsidian artifacts were sourced to Malad, Idaho (N=1); Fish Creek, Wyoming (N=1); and unknown sources (N=2). The latter exhibit a chemical composition with high strontium values similar to obsidian from the Yellowstone region; as such, it is likely that they were obtained from sources in this area whose elemental signatures remain uncharacterized (Shackley 1999). Each of these source areas document contacts with unknown populations in the Northwestern Plains.

Table 6.8 Source Areas for Obsidian Recovered at Odessa Phase Settlements.

Site	**Cerro Toledo, NM.**	**Valle Grande, NM.**	**Malad, ID.**	**Fish Creek, WY.**	**Unknown Source**	**Smoky Quartz**
Skull Springs (34BV55)	1	-	-	-	-	-
Campbell (34BV97)	1	2	-	-	-	-
Sprague (34BV99)	4	-	-	-	-	-
Odessa Yates (34BV100)	38	2	-	1	2	2
Spangler (34BV104)	-	-	1	-	-	-
Monty Cates (34BV116)	1	-	-	-	-	-
Audry's Place (34BV122)	1	-	-	-	-	-
Pierce (34BV172)	1	2	-	-	-	-
34BV99 or 34BV100	3	1	-	-	-	-
Courson D (41OC29)	2	-	-	-	-	-
Total	52 (80.0%)	7 (10.8%)	1 (1.5%)	1 (1.5%)	2 (3.1%)	2 (3.1%)

Also of interest are two artifacts that are visually identical (both macro and microscopically) to obsidian. These items are not obsidian, but appear to be some highly cryptocrystalline variety of smoky quartz. I am not aware of any other study on the Plains that has documented this material, but unless trace element analysis is conducted it is not likely to be recognized and would be simply identified as obsidian. Nonetheless, this material makes up a small percentage of the overall sample (3.5%) and was only recovered at Odessa Yates. Although the geological origin of this material is not entirely clear, the Wichita Mountain area of southwest Oklahoma may be the most likely source (see discussion below on quartz crystal).

As noted above, samples submitted for XRF analysis included both debitage and formal tools. As observed among the obsidian from Alibates Ruin 28, unmodified debris generally comprises greater than 95% of the obsidian observed at Odessa phase settlements. As a whole, debitage present at the latter sites are smaller than that recovered at Alibates Ruin 28 and suggests more intensive working. The flake debris present includes material indicative of all stages of production (i.e., primary, secondary, and tertiary flakes), although late stage production debris overwhelmingly dominates. Presently, the only formal tools of obsidian that I have observed are projectile points. These include primarily Washita and Fresno varieties, although a few corner notched projectile points are also represented. The presence of production debris indicates the procurement and transportation of obsidian nodules rather than finished items to Odessa phase villages. Although some obsidian is recovered from midden deposits in abandoned habitation structures and cache pits, the majority of this material appears to occur as general surface debris.

There are many observations regarding obsidian artifacts at Odessa phase settlements that were also noted earlier for the Antelope Creek phase. First, the production of obsidian tools occurred at Odessa phase villages and not at settlements near the source areas. As a whole, this material appears to have been used primarily for the manufacture of projectile points; other formal tools are rare to nonexistent. Second, production and resharpening debris comprises the greatest proportion of obsidian recovered from sites. Third, obsidian present at both phases was obtained from both bedrock and secondary sources. Fourth, most obsidian has been recovered from general surface or midden contexts.

In general, the high ratio of unmodified debitage to projectile points at both Odessa and Antelope Creek settlements is intriguing. This ratio is much higher than what is observed for other tool stones and is estimated to be at least 100 to 1. It is unclear why more finished items are not represented, but it is possible that obsidian artifacts are concentrated in contexts that remain poorly sampled at this time (e.g., bison kill sites).

The primary difference that may be noted between obsidian recovered at Odessa and Antelope Creek phase sites is its distribution among settlements. While obsidian was concentrated almost entirely at a few of the largest Antelope Creek settlements, it seems to consistently occur at both villages and homesteads of the Odessa phase. Similar distributional patterns are also noted for other highly exotic materials as well. Although this material is widely dispersed, albeit in small quantities, among all settlements, it is still apparent that it is most abundant in portions of large extended villages. This is most apparent at Odessa Yates where several thousand pieces of obsidian from several different source areas are documented.

Nearly 91% of the obsidian recovered from Odessa phase settlements was derived from the Cerro Toledo and Valle Grande sources in the Jemez Mountains of New Mexico. The former is represented by materials obtained from both bedrock and alluvial sources, while the latter is only available from primary source areas in the Valles Caldera. The presence of these materials suggests contact with Puebloan communities in Pajarito, Santa Fe, Albuquerque, and Salinas districts. These source areas are different than those documented for the Antelope Creek phase and may indicate separate, non-cooperative trading expeditions to the Southwest by settlements of each phase. Likewise, the presence of Northwestern Plains obsidian at the Odessa phase settlements further documents the existence of trade relationships that were apparently not established by villages of the Antelope Creek phase.

Other Nonlocal Tool Stone

Raw materials used for utilitarian chipped stone tools by the Odessa phase provide important information regarding intersocietal exchange. As noted in the preceding chapter, sources of high quality chipped stone are not locally available in the area occupied by the phase. Although the area is not devoid of knappable sources of stone, locally available material from the Ogallala Formation are of much poorer quality than either Alibates silicified dolomite or Smoky Hill jasper.

Whereas Antelope Creek chipped stone assemblages reflect an almost complete reliance on Alibates silicified dolomite, Odessa phase settlements almost always show a balance between several source areas (Figure 6.8). These sources usually include Alibates, Smoky Hill jasper, and other materials (see Figure 5.1). The latter consists largely of locally available materials (e.g., Ogallala quartzite and silicified caliche), although some additional exotic materials are also included (e.g., Flint Hills and Edwards cherts and quartz crystal).

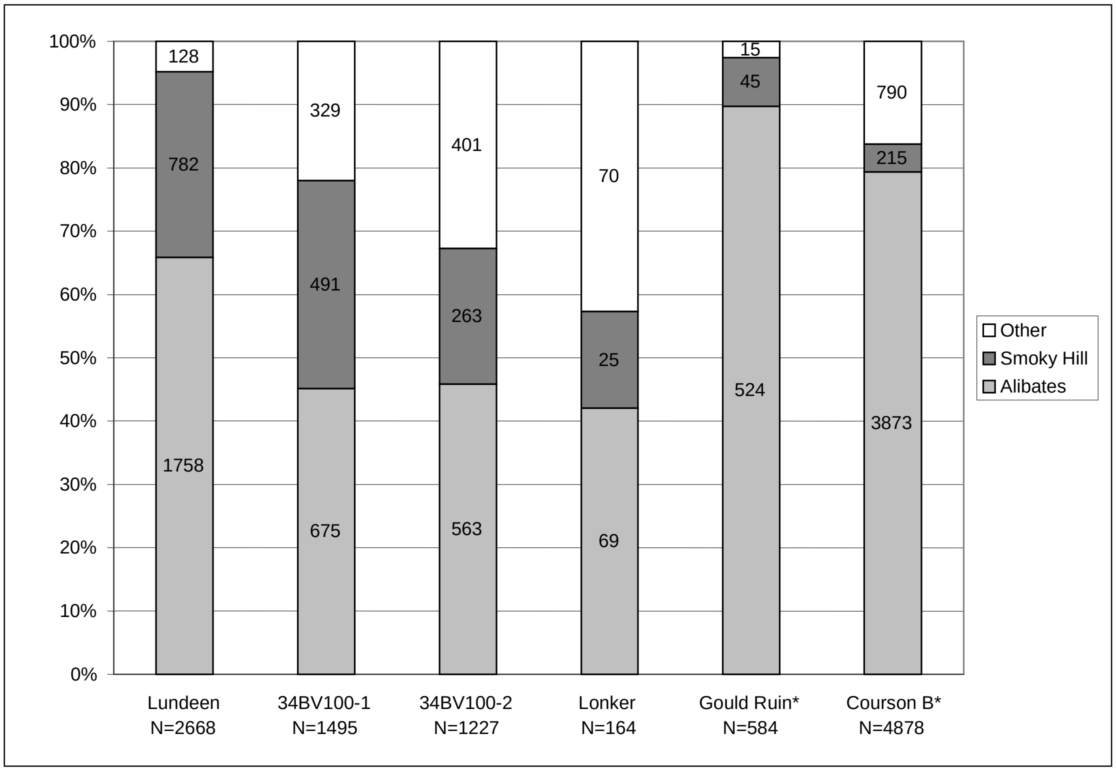


Figure 6.8 Lithic Raw Material Use at Select Odessa Phase Settlements.

In general, the most distinctive characteristic of Odessa phase chipped stone assemblages is the abundance of Smoky Hill jasper from northwest Kansas and southwest Nebraska. This material usually comprises between 15-30% of all chipped stone artifacts (i.e., debitage and finished tools) at settlements throughout the distribution, except for sites along Wolf Creek, such as the Gould Ruin and Courson B, where it usually comprises a lesser percentage (Bevitt 1999; Brosowske 2002b; D. Hughes n.d.). From the Odessa Yates site (34BV100), which is centrally located within the distribution, the nearest sources of Smoky Hill are about 250 km to the north. Debitage for this material shows up largely as late stage and resharpening debris, although some cortical debris does occur (Table 6.9). This suggests that Smoky Hill items arrive at sites primarily as late stage or finished tools.

Even though the relative abundance of Smoky Hill jasper serves as a key diagnostic marker of Odessa phase settlements, Alibates silicified dolomite is still the most common type of tool stone at these sites. This material usually comprises between 45% and 65% at most settlements, although it is often higher among some sites at the Buried City locality (e.g., Gould Ruin and Courson B). Flake debris is limited almost entirely to late stage production and resharpening debitage and suggests that little to no production of Alibates tools occurred at Odessa phase settlements (Table 6.9). In general, even though little cortical debris has been recovered at settlements it is likely that most of this material was ultimately derived from primary quarry locations. This conclusion is supported by the high quality of material present and the overall size of select tools, such as beveled knives, scrapers, and other flake tools, recovered at settlements. It is expected that poorer quality material and smaller tools would be represented if the Alibates present was derived largely from secondary alluvial sources along the Canadian River. This pattern is observed for Archaic and Early and Middle Ceramic sites in central and western Oklahoma (see Drass 1997).

Table 6.9 Cortical and Noncortical Debris for Select Odessa Phase Sites.

Site	Alibates Silicified Dolomite			Smoky Hill Jasper		
	Cortical	Noncortical	Total	Cortical	Noncortical	Total
Lundeen [a]	12	1071	1083	4	629	633
34BV100-1 [b]	17	612	629	29	440	469
34BV100-2 [b]	0	524	524	12	229	241
Total	29 (1.3%)	2207 (98.7%)	2236	45 (3.4%)	1298 (96.6%)	1343

[a] Totals include flake debris only
[b] Totals include both debitage and finished tools

Other important nonlocal lithic materials recovered at Odessa phase settlements include knappable quality quartz crystal and cherts derived from the Flint Hills region of Kansas. The quartz crystal recovered at Odessa phase settlements follows many of the patterns noted for obsidian. For example, this material occurs primarily as debitage and all stages of production debris are represented. Finished items, however, are even rarer than was noted for obsidian, but include projectile points and pendants. Quartz crystal occurs in both midden deposits and as site surface debris. In general, although found at most sites of the phase, abundant production debris has only been documented at Odessa Yates (R. Tibbetts 1998, personal communication). Overall, the similarities observed for obsidian and quartz crystal suggests that these two types of stone may have represented material equivalents.

On the Southern High Plains, quartz crystal is limited almost entirely to settlements of the Odessa phase. Outside of these sites, the author has observed only a few flakes of this material in two Antelope Creek assemblages in the Oklahoma panhandle (i.e., Roy Smith and Stamper). This material is, however, fairly abundant at some Protohistoric (A.D. 1500-1700) sites in west-central Oklahoma and lends support to the idea that it was derived from source areas in the Wichita Mountains.

Cherts derived from the Flint Hills of Kansas that are recovered at Odessa settlements are limited primarily to gray Permian varieties (i.e., Florence B). This tool stone seems to be most common at Odessa phase settlements along the eastern and northern margins of the distribution. For instance, at Price and other settlements in these areas (i.e., along the lower reaches of Wolf Creek and the headwaters of Kiowa Creek), gray Permian cherts may comprise 15% to 20% of chipped stone assemblages.

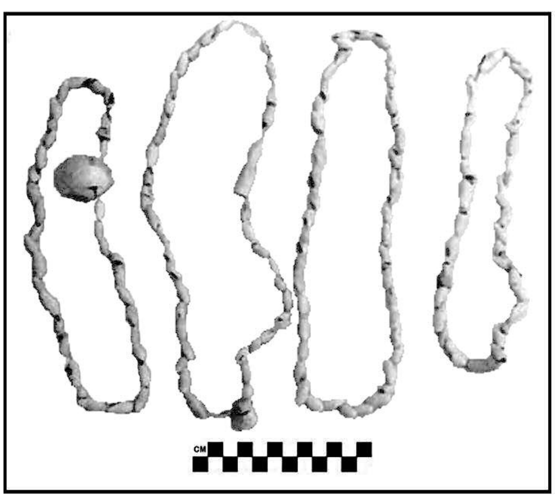
Elsewhere, finished tools of Florence B, usually beveled knives and scrapers, are present, but occur in low frequencies. It is interesting to note that Florence A is extremely rare at Odessa phase settlements. This is not surprising considering that most Odessa settlements appear to predate the occupation and control of the Florence A quarry areas (see Vehik 1986). Although Florence A chert artifacts are purported to come from some Odessa phase sites (e.g., Brooks 1994a; Hughes n.d.; Hughes and Hughes-Jones 1987), these items are usually Smoky Hill jasper or Laverne chert, another fossiliferous chert locally available in eastern Beaver County, Oklahoma. For example, a reanalysis of the material from the Lonker (34BV4) site indicates that a projectile point previously identified as Florence A is actually Smoky Hill jasper.

Other lithic raw materials documented in small quantities from Odessa phase settlements include Edwards chert from central Texas, Flattop chalcedony from northeastern Colorado, Tiger chert from southwest Wyoming, and others. The recovery of these materials, particularly those from the northwest, is not unexpected and parallels the occurrence of obsidian from this general area. However, while certainly documenting long-distance contact with the Northwestern Plains, their restricted occurrence suggests that intersocietal contact and exchange with societies in these areas was sporadic and of limited socioeconomic importance.

Marine Shell

The spatial distribution of marine shell at Odessa settlements is similar to that described previously for obsidian. Marine shell items documented include *Olivella* shell beads, disk beads, pendants likely produced from *Busycon* or *Strombus* and *Haliotis*, and large beads made from shell columella or *Conus*. Whereas the distribution of these items at Antelope Creek phase sites was limited primarily to mortuary contexts, marine shell is most commonly documented from midden and surface contexts at Odessa phase settlements.

Olivella shell beads are present at most Odessa phase settlements for which fairly sizeable samples of artifacts are available. These items are found at nine of the 10 (90%) sites (Table 6.7). In general, while these beads are widely distributed among sites, they are clearly most abundant at larger settlements (i.e., Odessa Yates and Buried City). Odessa Yates has the highest frequency of these artifacts with several hundred recovered from that portion of the Clear Creek extended village. It is estimated that approximately 100 *Olivella* shell beads have been recovered from sites at the Buried City locality (Witt 2004, personal communication). As a whole, these items are found as general surface debris and in trash filled cache pits and pithouses. While most *Olivella* beads are undecorated, a few examples with engraved designs are known from Odessa Yates and Watson (Figure 6.9).



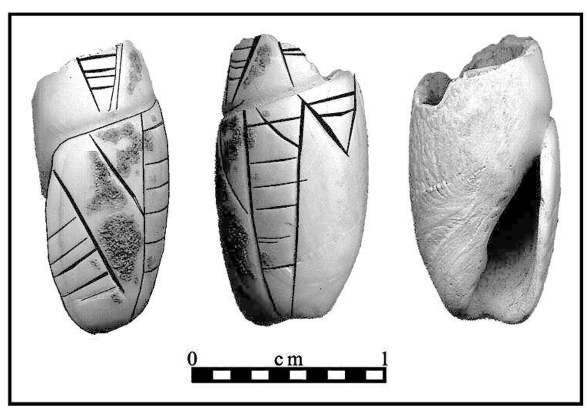


Figure 6.9 *Olivella* Shell Beads from Odessa Yates.

Although rarely recovered, disk beads are the second most abundant type of marine shell. As noted earlier, identification of these beads as a southwestern trade item, and hence, marine in origin, is based largely on their size (i.e., thickness), the evidence for mass production in the Southwest, and the lack of production debris at settlements on the Southern Plains. Generally, these items are recovered in low frequencies at all Odessa phase settlements (22.2%), although their small size makes it less likely that these beads would be found. On Wolf Creek, where water screening with fine mesh cloth has been employed, more of these small beads have been recovered and suggests that they may be more common than is currently thought. As a whole, the problems mentioned here make it difficult to assess the distribution and abundance of disk beads at Odessa phase settlements.

Other marine shell artifacts are poorly documented in the study area, but appear to occur only sporadically at both large and small settlements. These items occur primarily as pendants and beads. Pendants of either *Strombus* or *Busycon* and *Haliotis* are documented from Lundeen, Odessa Yates, and some of the settlements along Wolf Creek (Bevitt 1999:157; Brosowske 2002b; Hughes n.d.:104). Large circular beads produced from shell columella are documented at Lundeen and Buried City. A single *Conus* bead was recovered from 41OC27 in the Buried City locality (D. Hughes 2004, personal communication).

Southwestern Decorated Ceramics

Southwestern decorated sherds are noticeably rare at all Odessa phase settlements. Currently, these items are known only from Odessa Yates, Sprague, Millikan (34BV105), Skull Springs (34BV55), and Buried City (Brosowske and

Bement 1998; D. Hughes 2004, personal communication; Oklahoma Archeological Survey Site Files 2002; D. Wilkens 2004, personal communication; D. Witt 2004, personal communication). As observed at Antelope Creek settlements, all of these nonlocal sherds were recovered from either surface contexts or trash filled features. Currently, there is very little information available regarding these nonlocal sherds.

At least 10 southwestern sherds are documented from the Odessa Yates site. These include six decorated sherds and four sherds of corrugated gray utility ware. Two of the decorated sherds were analyzed for temper and provide information regarding likely production locales (Spielmann 2000). The first sherd is tempered with augite-latite and suggests production at San Marcos pueblo in the Santa Fe district. The second appears to be sherd tempered and may be derived from Quarai pueblo in the Salinas district. Currently, no additional information is available regarding the remaining decorated sherds from this site.

The gray utility wares recovered from Odessa Yates have not been analyzed, but Regge Wiseman (2000, personal communication) has viewed some of these items and suggests that these wares were common throughout the Upper Rio Grande and Pecos areas as late as A.D. 1350. Even though the difference between these and local cordmarked wares seems rather obvious, it is likely many additional nonlocal utility vessels are present at settlements of the region, but remain unrecognized. The presence of utility wares may indicate that these items were not the specific trade items themselves, but were simply vessels used for transporting other commodities.

Approximately 12 decorated sherds have been recovered from the Skull Springs site in Beaver County, Oklahoma (A. Laverty 2004, personal communication).

These include two Black-on-red glazeware sherds and 10 redware sherds. The temper, thickness, and style of all of these sherds suggest that they may be from a single untyped vessel (i.e., a jar). These sherds contain a hornblende-latite temper and were likely produced in Galisteo Basin or possibly the Tonque Valley (Warren 1973, 1982). This vessel appears to represent an intermediate glaze-polychrome ware and was probably produced between A.D. 1400 and 1500 (Warren 1982).

Southwestern decorated sherds appear to be about as common at Buried City as the two above sites and number between eight and 10 (D. Hughes 2004, personal communication; D. Wilkens 2004, personal communication; D. Witt 2004, personal communication). Unfortunately, specific types, and thus, potential source areas for these are not known at this time. As such, given the intensity of human occupation during subsequent periods along Wolf Creek, it is possible that some of these items could relate to later occupations. Additional decorated sherds are known from two other Odessa phase settlements. These items include unidentified Black-on-white sherds from the Millikan and Sprague sites (Oklahoma Archeological Survey Site Files 2002). As a whole, it is not known whether jar and bowl forms are both represented in the sample of decorated sherds from Odessa phase sites.

Turquoise

Jewelry produced from turquoise or other similar blue-green gem stones (i.e., amazonite, azurite, malachite) derived from the Southwest are about as rare as decorated ceramics at Odessa phase settlements. These items have only been recovered from Odessa Yates, Buried City, Sprague, and the Monty Cates site (Brosowske 2002b; D. Hughes 2004, personal communication; P. Terrell 2004, personal communication). Turquoise is generally represented by small pendants or pieces of inlay, although one small bead is also known (Figure 6.10). These items occur almost exclusively within midden deposits, although one pendant was associated with a burial at 41OC1 (D. Hughes 2004, personal communication).

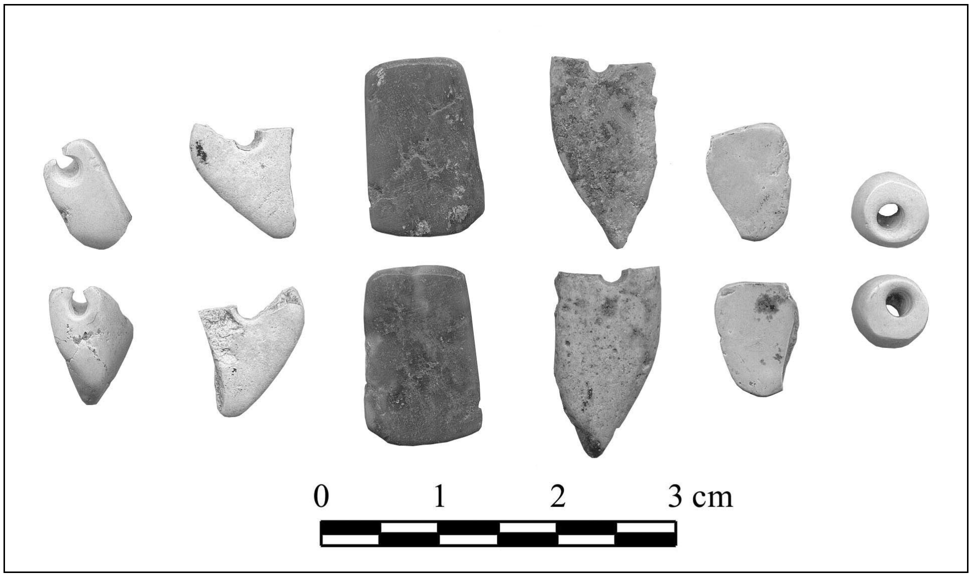


Figure 6.10 Turquoise and Other Blue Stone from Odessa Phase Settlements.

Pipes and Pipestone

As a whole, typical Plains elbow style pipes dominate assemblages from these sites and there is only a single southwestern style pipe documented from Odessa phase settlements. This example represents a stone tubular pipe recovered from the Watson site. Red argillites were most commonly utilized to manufacture elbow pipes used by Odessa phase populations. More than 40 red pipestone pipes or pipe fragments are documented from both large settlements and homesteads (Brosowske and Bement 1998; Drass and Turner 1989). A sample of Odessa phase pipes (N=9) representing the full range of pipestones was submitted to James Gundersen of Wichita State University for trace element analysis (Brosowske and Bement 1998) (Figure 6.11). All of the red argillite pipes (N=3) were identified as Kansas pipestone. A single white and red banded pipe that was broken and reworked into an ornament was identified as South Dakota pipestone. This material can be obtained from glacial tills around Sioux Falls, South Dakota. The nearest settlements containing this variety of pipestone are those attributed to Little River Focus villages of central Kansas (Gundersen and Blakeslee 2002). As such, this example appears to represent the farthest south occurrence of South Dakota pipestone currently documented (D. Blakeslee 2002, personal communication). The sample submitted for trace element analysis also includes a variety of other pipestones that were derived from unknown sources (N=5).

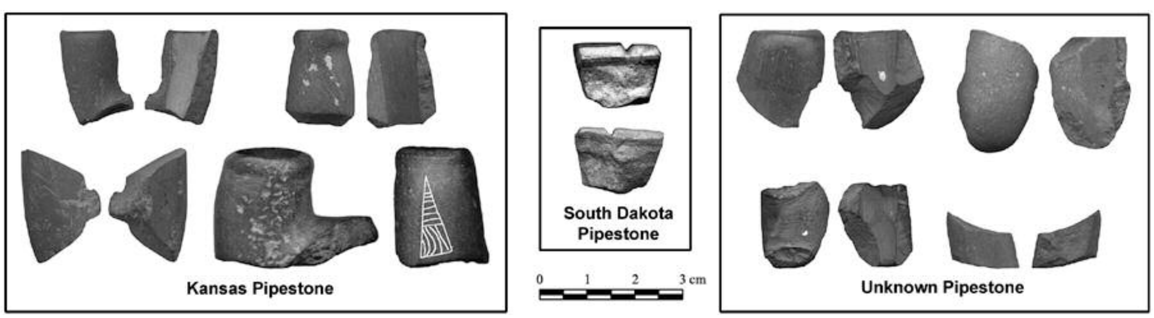


Figure 6.11 Pipe Fragments from Select Odessa Phase Settlements.

Although Kansas pipestone is recovered at most Odessa phase settlements, it appears to be most common at sites along the eastern margins of the distribution (see Drass and Turner 1989:Apendix A). The recovery of manufacturing debris and pipes broken during manufacture at Odessa Yates, Watson, and Price indicate that Kansas pipestone was obtained in cobble form and not as finished items. A high perceived value for this material is suggested by the fact that Kansas pipestone is frequently recycled into ornaments and other items after their use as smoking pipes.

Other Nonlocal Items

Other items of nonlocal origin recovered from Odessa phase settlements include greenstone celts, mica, and a Hohokam style lip plug. Celts documented represent typical Plains forms and may have been produced from either nonlocal or local materials. Greenstone celts seem to have been produced most often from nonlocal stone. Two of these celts in particular were manufactured out of a very distinctive type of greenstone native to the Gila River valley area of southwestern New Mexico. This stone is light green to jade in color and contains numerous gray to white circular inclusions. Both of these items were recovered from surface contexts at Odessa Yates and Gate Lake in Beaver County, Oklahoma. The latter was recovered from a prominent sandy knoll purported to have contained human remains near the lake margin. As such, this object may have been originally interred as a grave item. Other greenstone celts have been recovered from the Buried City locality along Wolf Creek. David Hughes (2004, personal communication) suggests that these items were produced from a greenstone derived from the Wichita Mountains of southwestern Oklahoma.

Small fragments of mica have been recovered from several excavated contexts at the Odessa Yates site. It is thought that this material was ultimately derived from the Southwest, although specific source areas remain unidentified. Another artifact of nonlocal origin is a lip plug also recovered from surface contexts at Odessa Yates

(Figure 6.12). This item is identical to lip plugs recovered from Hohokam settlements in southern Arizona and is produced from a translucent purple variety of fluorite containing light green bands.

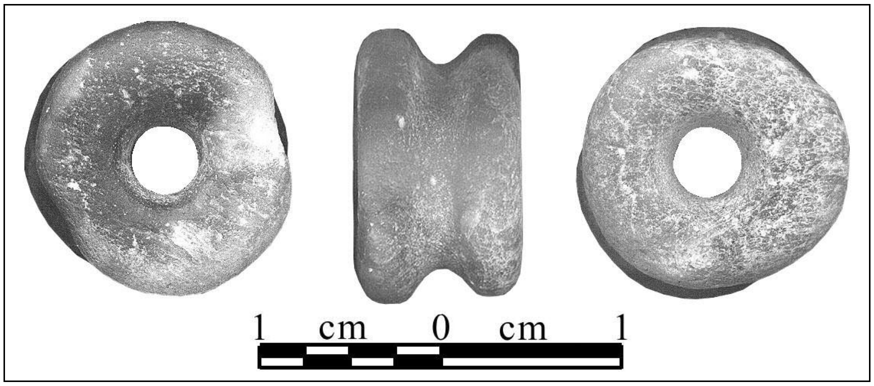


Figure 6.12 Hohokam Style Lip Plug from Odessa Yates.

Summary

This discussion has served to provide a description of the spatial distribution of various nonlocal items recovered from Odessa phase settlements. Although these sites remain only minimally investigated at this time, it is apparent that some trade goods are very common and are widely distributed among settlements, albeit in significantly different amounts. As a whole, while the trade goods documented here are dominated by items related to the subsistence sphere of the economy, a more restricted range and quantity of items related to the political spheres of exchange are also represented.

By far, the largest quantities of nonlocal items are chipped stone materials imported from the south (i.e., Alibates silicified dolomite) and north (i.e., Smoky Hills jasper). Other materials are also documented (i.e., Florence B and Edwards cherts), but occur much less frequently. Alibates and Smoky Hill represent sources of high quality lithic materials located approximately 145 and 300 km from the Odessa phase area. Although these materials were used to produce the full range of utilitarian tools used by these Plains Villagers, the rarity of production debris suggests that most of these items arrived at settlements as finished implements or late stage flake blanks.

Nonlocal tool stone recovered at Odessa phase settlements document intensive use and reworking (see Appendix IV). The thoroughly exhausted state of discarded tools, the high percentage of resharpening debris, the high incidence of recycling, and the general rarity of chipped stone at Odessa phase sites all suggest that stone were used as intensively as possible. These patterns are widespread among settlements and suggest that shortages of tool stone were pervasive among Odessa populations.

The remaining nonlocal trade items document the movement of goods related to the social/ritual/political sphere of exchange. These items include decorated pottery, turquoise and marine shell jewelry, and pipestone. Although obsidian and quartz crystal are generally considered items associated with the subsistence sphere, the distribution of these commodities is in many ways more similar to items of the political realm. The reasons for this apparent pattern are not clear. Similar to the distribution patterns observed for nonlocal chipped stone, it is apparent that all of these exotic items are widely dispersed among settlements. With this being said, however, it is readily evident the highest quantities of nonlocal trade items are concentrated at the largest settlements. While one would certainly expect to see higher quantities of exotics at large settlements, simply as a result of their size, the disparity in nonlocal items observed among the communities examined here suggests that settlement size is not the sole factor responsible for this pattern.

Unfortunately, southwestern ceramic wares are not commonly recovered at Odessa phase sites. As a result, it is not possible to identify in great detail potential settlements in the Southwest that may have served as source areas for these and other exotics. Two sherds recovered from Odessa Yates appear to have been produced at San Marcos pueblo in the Santa Fe district and Quarai in the Salinas district. Additional sherds from Skull Springs also document contact with Galisteo Basin or possibly the Tonque Valley. The vast majority of obsidian (90%) recovered also suggests contact with populations in these districts or the Española area. Marine shell jewelry is dominated by beads produced from *Olivella* sp. Undoubtedly these items must have been more abundant at some settlements in the Rio Grande and Pecos river valleys than others. Currently, however, it is not possible to identify specific settlements that have marine shell in sufficient quantities to suggest that they may have served as distribution centers. Other items, such as greenstone celts, mica, and a single Hohokam style lip plug, document the movement of exotic raw materials or finished goods from other portions of the Southwest.

Northwestern Plains obsidian and Kansas pipestone document contact and exchange with other Plains societies to the north. Although not known, it is likely that these items were obtained from the same society or societies that provided Odessa phase groups with Smoky Hill jasper. Previous archaeological work in western Kansas (Stein 1997) suggests that Smoky Hill jasper was intensively quarried and traded by Upper Republican variant groups. However, this variant ended around A.D.

1350 and yet Smoky Hill jasper continues to remain abundant at Odessa phase settlements after this date.

Discussion

This chapter has examined nonlocal trade items recovered at Middle Ceramic age Antelope Creek and Odessa phase settlements. These discussions serve to identify the distribution, quantity, and context of these items. Previously Middle Ceramic period exchange on the Southern High Plains has been characterized as a system with little socioeconomic importance (e.g., Spielmann 1982, 1983). However, from the data presented here it is readily apparent that nonlocal items of Plains origin were obtained in sizeable quantities. Exotics from the Southwest, although not as common, still number in the thousands and document regular and sustained contact with communities in this region. From the data examined here, it is clear that several fairly dramatic differences in quantities and types of exotics may be noted between the Antelope Creek and the Odessa phases and amongst individual settlements of each phase.

Excluding those Antelope Creek phase communities near the Alibates quarries, it is apparent that utilitarian tools produced from high quality tool stones were regularly traded over long-distances by groups in the study area. That Antelope Creek phase people in the Oklahoma portion of the distribution maintained exchange relationships with Antelope Creek phase communities in the Canadian River valley is aptly demonstrated by the quantity of Alibates recovered in the former setting. In contrast, lithic assemblages at Odessa phase settlements suggest that high quality tool stone was in short supply. Although Alibates represents the highest percentage of lithic raw materials recovered at Odessa phase sites, another high quality material (i.e., Smoky Hill jasper) was also imported. This material occurs in small amounts at Antelope Creek settlements in the Oklahoma panhandle and only rarely at Antelope Creek sites along the Canadian River.

The spatial distribution of exotics derived from the Southwest display different patterns among Antelope Creek and Odessa phase settlements. Although these items clearly occur in higher quantities at the largest settlements of both phases, several divergent trends are noted. First, southwestern exotics are not only associated with the largest settlements of the Odessa phase, but are also relatively frequent at small homesteads. Among the Antelope Creek phase, except for obsidian, southwestern trade items as a whole are only rarely noted at smaller settlements. A second pattern noted is that marine shell and turquoise jewelry among Antelope Creek sites are concentrated in mortuary contexts. In contrast, while turquoise is rarely recovered, marine shell was abundant in general surface and trash contexts at settlements of the Odessa phase. It is not possible to identify the frequency and variety of trade items present in Odessa phase mortuary contexts since very few burials have been excavated. Lastly, it is also apparent that the relative frequencies of various types of exotics vary greatly between each of these two phases. Although obsidian is well documented at sites of both phases, Southwest ceramics and disk beads are much more common at Antelope Creek settlements, but are rarely recovered at Odessa phase sites. In contrast, *Olivella* shell beads seem to be much more common at Odessa phase settlements.

Evidence for contact and exchange with groups in the Central Plains also varies considerably between the two phases. Kansas pipestone, in addition to Smoky Hill jasper, is abundant at Odessa phase settlements, but is much less common or rare among sites of the Antelope Creek phase. The complete absence of obsidian from Northwestern Plains source areas at Antelope Creek settlements further supports the conclusion that these groups had little or no contact with societies to the north.

In sum, this chapter has presented the spatial distribution of nonlocal trade items among settlements of the Antelope Creek and Odessa phases. The data presented here demonstrate that several significant differences exist between each of these societies. Overall, the distinctions noted here suggest that the organization and function of exchange within these societies was quite different. By themselves, however, these data are not self explanatory and simply document the distribution of these items. In the ensuing chapter the concept of an emerging political economy is used to interpret and explain the trends identified here. Organized under an economic perspective, the contextual setting of this development is emphasized and provides the key information necessary for reconstructing the institutional framework of Southern High Plains exchange during the Middle Ceramic period.

CHAPTER SEVEN

Trends toward Social Complexity:

Competition, Resource Control, Economic Intensification, and Redistribution

The preceding chapters have demonstrated the existence of considerable cultural variability among Middle Ceramic age settlements of the region. This variability is manifest by differences in settlement size and location, architecture, material culture, and the subsistence economy. These differences are evident both between cultural complexes and among sites that historically have been considered to be closely related (see Brosowske 2002a; Brosowske and Bevitt n.d.; Lintz 1986a). In particular, this study is interested in understanding why the communities of Chimney Rock Ruin 51, the Alibates Ruins, and Odessa Yates have vastly higher quantities of exotic items than other sites of the region. An examination of environmental settings, the timing or length of occupations, and changes in regional climate suggests that none of these factors provide suitable explanations for the dramatic disparities observed. Likewise, although these communities do represent some of the largest settlements in the region, the fact that other similarly sized communities do not have analogous frequencies of nonlocal trade goods suggests that settlement size was not the primary factor responsible for these patterns.

Besides having abundant exotics, it is apparent that these three settlements also differed in other significant ways, namely in the organization of their economies. Since ecological and temporal explanations are also insufficient for explaining the cultural variability documented among settlements, several topics traditionally examined by political economists are explored here. These are competition and resource control, economic specialization, and redistribution. As these topics suggest, the major emphasis of these discussions is the economy and how it was organized. While certainly a challenge to discuss within the confines of a single chapter, it should be apparent that these topics are interrelated. Equally significant, however, is the fact that increasing competition, resource control, economic specialization, and redistribution are all important developments that also clearly denote trends toward increasing social complexity within these small-scale societies.

Because virtually all details regarding the settlement of Chimney Rock Ruin 51 remain unknown, these discussions center primarily around the Alibates Ruins and Odessa Yates as case studies for investigating these issues. Within comparative frameworks, additional sites are used to further clarify particular points or trends. The topics examined here provide the foundation necessary for understanding how these economic strategies combined with other aspects of ecological and social systems to provide evidence for the emergence of political economies; that is the focus of Chapter Eight.

Competition and the Control of Valued Resources

At a basic level, the Southern High Plains is a region characterized by considerable environmental diversity (see Chapter Three). This variability stems from two primary sources. First, contrasting ecological and geological characteristics of the High and Eroded Plains result in fundamental differences in the types and frequencies of resources available from one area to the next. Second, an erratic climate brings about dramatic discrepancies in local rainfall patterns, often over short distances. These patterns also have a major influence on the distribution, abundance, and predictability of resources. As societies of the region became more sedentary and more densely populated with the transition from the Early to Middle Ceramic periods, by necessity, systems of resource use and rights of access also changed. These developments were closely tied to changes in subsistence economies that occurred around A.D. 1250 (i.e., more intensive foraging supplemented by horticulture among Antelope Creek groups and intensive horticulture by Odessa phase populations). Taken together, these developments dramatically altered traditional relationships between people and resources. Within the context of these social changes, competition over important resources must have undoubtedly increased substantially. Here, evidence for increasing competition over resources and its archaeological signature is examined.

From an evolutionary perspective, the appearance of the first permanent communities (i.e., sedentary to semi-sedentary populations) on the Southern High Plains around A.D. 1250 had numerous far reaching consequences for patterns of land and resource use. These consequences were probably even more substantial if the establishment of these communities was as rapid as it seems to have been (i.e., less than 50 years). Previously, the Southern High Plains was occupied during the Early Ceramic period by societies likely organized at the family level of political integration (Johnson and Earle 2000). These family groups appear to moved in an annual round to procure economically important resources. Sites or camps at this time were small and are indicative of short-term, probably seasonal, occupations. Nevertheless, access to various resources or preferred locations were probably constrained by human occupation during certain times of the year. As such, even though considerable residential mobility characterized cultural systems and regional populations were still relatively low at this time, it is likely that use rights to these resources or locations were maintained by a number of options.

As discussed in Chapter Two, strategies used by family level groups to maintain access to crucial resources included the establishment of intergroup alliances, reciprocal rights of access, and residential mobility patterns that included periods of group dispersal and aggregation (Johnson and Earle 2000). As a whole, current evidence seems to indicate that little substantial cultural differentiation characterized Early Ceramic foragers of the region (see Boyd 1997; Carmichael 2004; Cruse 1992 for a description of Lake Creek and Palo Duro complex groups). The existence of considerable social unity at a regional level may be interpreted to mean that the options listed above were indeed important strategies for local foraging societies.

That the above strategies were not always entirely successful for coping with problems related to land use and competition over important resources during the Early Ceramic period, however, is aptly demonstrated by the violent death documented in Dykema Canyon in Roberts County, Texas (Wilkens 2001, 2004). Here, the chest cavity of an adult male between the ages of 33 and 39 years of age contained eight arrowpoints, several of which were embedded in vertebra. This individual, dating to about A.D. 650, also exhibited additional perimortem injuries sustained by a blow to the chest with a blunt weapon, possibly a stone axe. Overall, “Dykema Man” does not represent an isolated example of Early Ceramic warfare as evidence for violence and conflict are fairly common for the Southern Plains during this period (see Boyd 1997; Brooks 1994b; Wilkens and Boyd 2000). These examples suggest that intersocietal competition, ultimately resulting from incongruent resource distributions, was prevalent even during periods when the region was sparsely inhabited by foraging societies.

Placed in this light, given the reduction in settlement mobility, the establishment of permanent settlements, and the rapid increases in the size and density of population observed during the Middle Ceramic period, suggests that social strategies employed by Early Ceramic period foragers to maintain access and limit competition over crucial resources would not have been sufficient after A.D. 1250. While the developments noted for the onset of the Middle Ceramic period certainly set the stage for increased conflict over important resources, they were also accompanied by significant shifts in perceptions regarding the economic importance of various natural resources. These trends are particularly evident in changes that occurred in regional settlement systems and patterns of tool stone use.

Pedestrian survey in the study area documents a significant shift in settlement patterns from the Early to Middle Ceramic periods. Previously, Early Ceramic sites were fairly well distributed across the landscape, but are most notably concentrated along ecotonal zones near the High Plains-Eroded Plains margin (Bement and Brosowske 2001; Brosowske 2002b; Thurmond 1991; Wilkens 2004, personal communication; see Epp 1984, 1986, 1988 for similar patterns of land use by foragers on the Northern Plains). Occupation of these settings is interpreted from an optimal foraging perspective to mean that family groups positioned themselves in locations where a variety of resources from each environmental zone could be effectively and efficiently exploited (Thurmond 1991).

Later in time, Odessa phase settlements exhibit a dramatic shift away from the High-Eroded Plains margins to stream valleys containing abundant fertile soils amenable to horticulture (Brosowske 2002b). As a result, stream valleys or portions of stream valleys that were previously unoccupied during the Early Ceramic period were preferentially selected for horticultural settlements following A.D. 1250. Since Odessa phase groups were much more dependent upon horticulture than their Antelope Creek neighbors, this shift is much more evident among these settlements. Elsewhere on the Southern Plains similar shifts in settlement are also noted for the Early to Middle Ceramic transition (see Drass 1997; Moore 1984, 1988; Thurmond 1991:138-140).

Another equally dramatic shift in resource use that indicates a change in the perceived value of resources during Middle Ceramic times is provided by tool stone use. As noted earlier in Chapters Four and Six, chert and quartzite gravels obtained from local outcrops of the Ogallala formation were extensively used by Archaic and Early Ceramic groups for the production of chipped stone tools. The onset of the Middle Ceramic period coincides with the appearance of several specialized tool forms, such as distal endscrapers, triangular arrowpoints, and diamond-shaped, alternately beveled knives. These tools were produced almost exclusively from Alibates silicified dolomite and Smoky Hill jasper during Middle Ceramic times. Traditionally, the use of high quality tool stone is thought to be related to the technological advantages provided by these materials (see Andrefsky 1994), Combined, decreasing residential mobility, the occupation of permanent settlements, dependence on cultivated foods and high quality tool stones, and escalating populations all likely resulted in increased competition over crucial resources during the Middle Ceramic period. Although competition over many types of resources likely occurred (e.g., bison, clay sources, potable water, trade routes, wood), the ensuing discussions focus on two in particular: bedrock sources of Alibates silicified dolomite and improved arable lands. An examination of changing settlement patterns through time as well as the distribution of Middle Ceramic period settlements across the landscape provide the primary evidence for the emergence of communities which claimed exclusive rights to access and use of valued resources. Before these case studies are presented, however, the concepts of property and resource control are briefly considered.

Property and Resource Control

Vehik (1986, 1990), Earle (2000), and others (see chapters in Hunt and Gilman 1998) have examined property and resource control among prehistoric societies. In foraging societies these same topics are often studied under evolutionary or ecological frameworks as territoriality studies (e.g., Dyson-Hudson and Smith 1978; Winterhalder and Smith 1981). Together, these and other related studies provide a theoretical framework for interpreting the interrelationship between resources, land-use, and settlement in the present study. In the ensuing discussion fundamental concepts regarding these issues are examined using the concept of property (see Earle 2000; Hunt and Gilman 1998). Of particular importance are landed property and resource characteristics that encourage or facilitate the development of social systems that incorporate exclusive rights of access and use of resources (i.e., property). A short review of archaeological techniques used to study property and resource control is also provided. These discussions enable the significance and use of the Alibates quarries and improved arable land to be assessed.

Property determines exclusive rights to things and refers to something that is possessed (Earle 2000:40). It also embodies a sense of ownership; that an owner or owners have the authority over the use of things. Importantly, whether envisioned as property or territory each of these concepts involves exclusive use of something by “means of repulsion through overt defense or advertisement” (Wilson 1975:256; quoted in Dyson-Hudson and Smith 1978:23). Arable land and the Alibates quarries represent examples of landed property. The definition of landed property is straightforward and refers to resources that are set in space. These differ from moveable property, such as chipped stone tools, cultivated food products, bison robes, and so on, which are all items that are extracted, manufactured or produced, and can be transferred from one person to another through exchange.

Dyson-Hudson and Smith (1978) and Vehik (1990) outline resource conditions that are involved in the decision to control or limit access and use of landed resources. These factors include whether or not a particular resource is: a) critical to survival, b) of high cultural value, c) geographically or seasonally restricted, and d) whose density and predictability are high. These researchers conclude that if a resource meets these conditions there is a high probability “that the costs of exclusive use and defense of an area are outweighed by the benefits gained from resource control” (Dyson-Hudson and Smith 1978:21). Although neither is seasonal, the Alibates quarries and improved arable land are clearly resources that meet each of the other requirements. Both of these resources are characterized by spatial distributions that are geographically restricted and whose distributions are highly concentrated and predictable. Assessing the criticalness or cultural value of these resources is more ambiguous, however, since these are largely social constructs. Nonetheless, the widespread use of Alibates for the production of utilitarian tools and the inclusion of caches of Alibates tools in mortuary contexts indicates considerable import of this resource to both the subsistence and political realms. Likewise, preferential settlement adjacent to fertile soils indicates the importance of arable land as a means for providing a reliable source of staple foods in a semiarid environment (see Netting 1993).

Techniques used to study property and identify the presence of exclusive rights to resources in archaeological contexts include settlement patterns, labor investment, visible markers of ownership, and warfare (Earle 2000:39; see Gilman 1998). By necessity, the appearance of permanent communities and the transition to intensive foraging and horticulture results in fundamental changes in existing land tenure and ownership systems (see Kim 2003). Because permanent communities are marked by numerous labor investments, such as habitation structures, agricultural fields, drying racks, and storage facilities containing food resources, exclusive rights of access and use must be established and maintained (Netting 1993:47). While exclusive property rights to land and its resources are obviously crucial for sedentary horticultural societies, examples from the Northwest Coast demonstrate that seasonally abundant and predictable food resources can be subject to the same rules among hunters-gatherers.

Given the incongruent resource distributions noted above for the region and the social changes that arose at the onset of the Middle Ceramic period, it is reasonable to presume that property rules maintained by force emerged at this time. Two case studies, bedrock outcrops of Alibates chert and arable land, are examined here in greater detail and lend support for this conclusion. In these examples, property rights ensured access to resources that not only were limited in their distribution, but also represented crucial resources that were superior to others in the region. In addition, labor investments made to the social landscape further reinforced these systems and served as visible claims of ownership. Overall, the case studies presented here provide convincing data for the strategic placement of communities as a means of controlling access to scarce and valued resources. Besides the general labor investments noted above, other evidence for asserting or communicating these rights is less apparent. For example, other visible markers of ownership, such as constructed mounds or burial cairns, although present in the study area are poorly understood at this time, and in some cases, are no longer preserved (see Lintz 1986b).

The Alibates Quarries

Geologically restricted to a small area along the Canadian River in the Texas panhandle, bedrock sources of Alibates silicified dolomite represent the primary source of high quality tool stone available to inhabitants of the Southern High Plains. As noted in Chapter Five, Alibates was also available from secondary sources along the Canadian River, but gravels obtained from these areas are relatively small in size, are of variable quality, and their spatial distribution is unpredictable (Hofman 1991; Katz and Katz 2004; Wyckoff 1993). As such, bedrock sources of Alibates represent a landed resource whose distribution was highly predictable and concentrated. Also important is the fact that Alibates obtained from quarry pits was higher in quality and was available in larger sizes than that from secondary deposits (Katz and Katz 2004). As noted earlier, all of these resource characteristics were important factors that determined whether or not access and use of a given resource was limited or controlled (see Dyson-Hudson and Smith 1978; Earle 2000; Vehik 1990).

Today, the primary bedrock sources of Alibates are preserved within the Alibates Flint Quarries National Monument. The main quarry areas are limited to a long narrow outcrop approximately 2.0 km in length (Katz and Katz 2004; Shaeffer 1958:189-190). More than 730 quarry pits and production debris a meter or more in thickness aptly demonstrate extensive use of this outcrop during the Middle Ceramic period (Katz and Katz 2004). Other bedrock sources are also known to the north and east of the monument (Bowers 1975; P. Katz, personal communication 2004), but as noted earlier, these locations generally contain materials that are poorer quality and show less evidence of quarrying activity (Shaeffer 1958:190). That bedrock sources in these areas were of little importance during the Middle Ceramic period is also supported by the absence of numerous or sizeable settlements of the Antelope Creek phase (Texas Archaeological Sites Atlas 2003).

Prior to the Middle Ceramic period access to bedrock sources of Alibates was unrestricted and procurement occurred as part of an embedded strategy by local foraging groups (Brosowske 2002c; Katz and Katz 2004). The idea that access to bedrock sources of Alibates was open or that settlement near the quarries was prohibited prior to A.D. 1250 is supported by the absence of habitation sites attributable to the Archaic and Early Ceramic periods on or near the Alibates Flint Quarries National Monument (Texas Archaeological Sites Atlas 2003). A review of site records for areas within 3 km of the quarries indicates large numbers of sites which lack diagnostic artifacts and whose age cannot be determined (Texas Archaeological Sites Atlas 2003). These sites represent procurement and early stage reduction locales where ledges and cobbles of Alibates were exposed through erosion (Katz and Katz 2004; Texas Archaeological Sites Atlas 2003). Although the precise age of these sites are not known, it is likely that they represent procurement activities by foraging groups from Paleoindian to Early Ceramic times.

The absence of camps containing substantial quantities of trash debris and tools reflecting a broad range of activities support an interpretation of short-term, task specific use by mobile foraging societies prior to the Middle Ceramic period. The fact that camps were not established prior to A.D. 1250 near the monument also suggests that other important resources may not have been sufficiently abundant enough near the quarries to support seasonal settlement by resident foragers. Indeed, except for the Canadian River which probably contained water of poor quality, an inspection of a 1 km area immediately surrounding the quarries indicates a noticeable lack of potable water and riparian settings containing important food resources.

In contrast to earlier patterns of land and resource use, beginning around A.D. 1250, numerous areas surrounding the primary outcrops of Alibates became inhabited by permanent settlements attributed to the Antelope Creek phase (Figure 7.1). The absence of earlier habitation sites, suggests that Middle Ceramic age settlements near the Alibates National Monument were established to facilitate access to tool stone.

Access to water and other important resources seem to have been of secondary importance. For instance, in reference to the Alibates Ruins, Lintz (1986a:323) notes that the nearest drainage is distantly located (i.e., approximately 1 km) from this, the largest settlement in the area. He (Lintz 1986a:323) further indicates that prior to modern irrigation practices seep springs may have been available in some locations near the settlement, but "that specialized collection devices were necessary to obtain and store water".

A total of seven permanent habitation settlements of the Antelope Creek phase are present within about 3 km of the Alibates quarries (Figure 7.1). Except for 41PT77, which I suspect is actually part of 41PT75, most of these settlements fall within the medium to large community range for the phase. Based on counts of habitation structures present at sites (see Table 7.1), a maximum of 40 to 50 households may have occupied a 3 km radius around the quarries (see Lintz 1986a; Texas Archaeological Sites Atlas 2003). Combined, these settlements would have represented the largest aggregation of Antelope Creek phase groups at this time. These sites essentially surround the Alibates quarries and offer unrestricted views in all directions. While additional settlements certainly would have increased the effectiveness of restricting access to the quarries, the populations present would have been more than sufficient to monitor, limit, and defend access to surface outcrops and quarry pits excavated to obtain this valuable tool stone. Given the paucity of water and other important resources near the quarries, it is possible that the carrying capacity of the area may have been strained by the number of families present. Lastly, while the frequent placement of Antelope Creek settlements in defensive settings certainly suggests the existence of competition among resident groups, sites in these locations also probably served to represent a visible claim to the Alibates quarries.

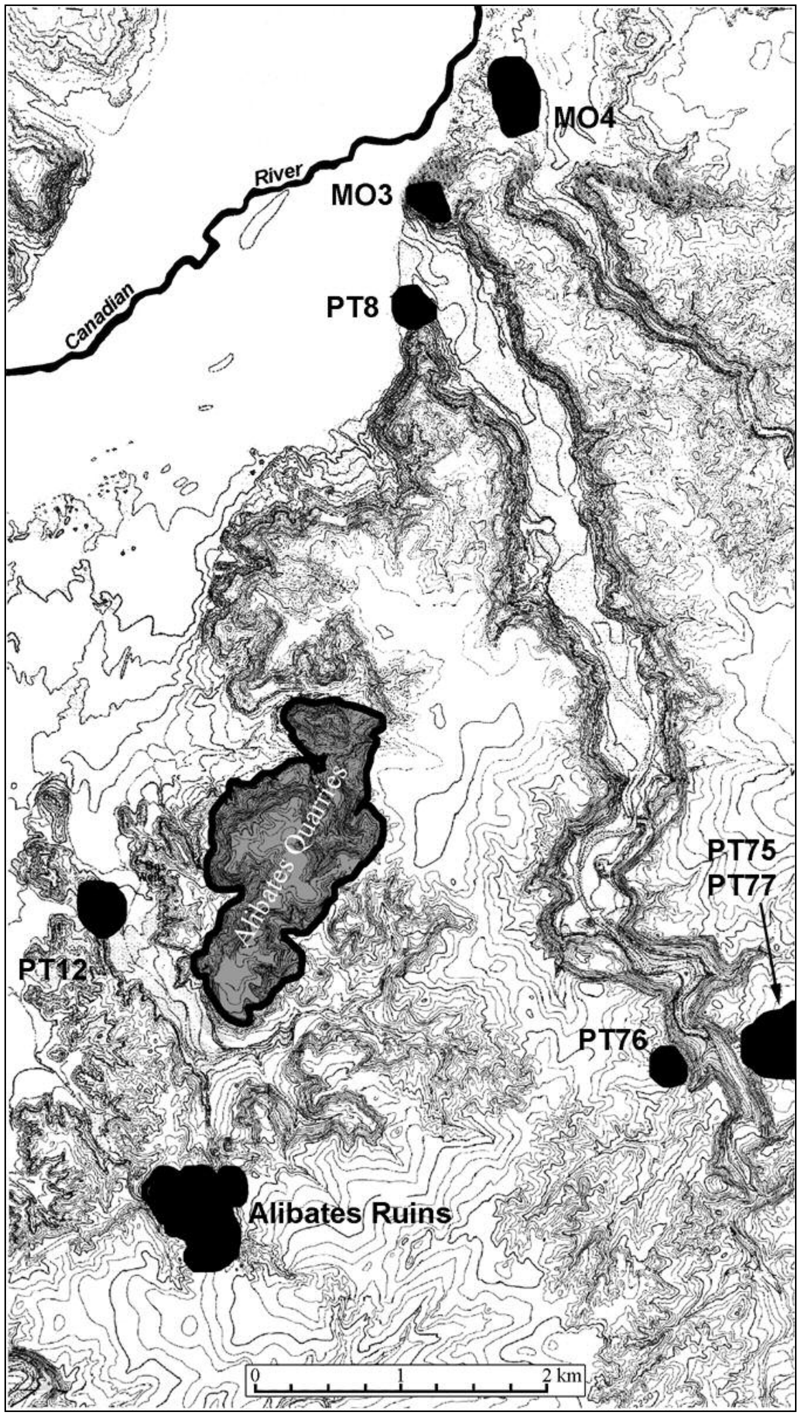


Figure 7.1 Antelope Creek Phase Settlements near the Alibates Quarries.

Table 7.1 A Description of Antelope Creek Settlements near the Alibates Quarries.

Site	# of Habitation Structures	Distance From Quarries	Site Size
41PT8	3	2.5 km	±0.405 ha.
Alibates Ruins	25	1.0 km	Several ha.
41PT12	Unknown; Multiple	0.5 km	±0.405 ha.
41PT75	8-10	3.0 km	0.500 ha.
41PT76	Unknown; Multiple	2.5 km	Unknown
41PT77	1?	3.0 km	Unknown
41MO3	Unknown	3.5 km	>0.405 ha.

Source: The Texas Archaeological Sites Atlas 2003

Coinciding with the establishment of settlements concentrated around the quarries after A.D. 1250 we also witness an enormous increase in Alibates use as evidenced by its spatial distribution throughout the Southern Plains and adjacent regions (Chapters Four and Six). Earlier it was noted that the quantity of Alibates in chipped stone assemblages of earlier periods is generally less than 10% or 20% and are often represented by highly formalized and curated tool forms, such as projectile points. Following A.D. 1250 use of this tool stone increased dramatically and over 95% of all chipped stone at settlements in the Texas panhandle and 50% to 90% at sites over 100 km to the north and northeast are of this material.

Previously, numerous researchers have suggested that Antelope Creek settlements near the quarries effectively controlled access to Alibates silicified dolomite and were extensively involved in the mining, production, and distribution of this important resource (see Bandy 1976; Baugh 1994:280; Boyd 1997:343; Brosowske 2002b; Drass 1998:421; Green 1986:54; J. Hughes 1991:31: Lintz 1991:98). Similar strategies involving economic control of high quality lithic resources are also observed for other portions of the Plains and adjacent areas during the Late Prehistoric period (Ray 2004; Vehik 1986, 1990). These examples also involve organized quarrying and surplus production of specialized forms of chipped stone tools for exchange. In general, however, the full extent, importance, and consequences of resource control, economic specialization, and export has yet to be systematically examined among Plains societies (Brosowske 2002b; Ray 2004; Vehik 1986, 1990). Although evidence for exclusive use of the Alibates quarries by Antelope Creek phase has been briefly examined here, production related topics, which are clearly tied to these developments are discussed in greater detail later in this chapter.

Horticulture and the Control of Arable Lands

Generalized patterns of settlement for Middle Ceramic groups of the Southern High Plains were presented in Chapter Four. In particular, these discussions noted that Odessa phase settlements were closely tied to highly fertile floodplain soils and sources of potable water. The existence of these patterns is not particularly surprising since both water and arable land are obviously crucial resources for horticultural societies. A closer examination of environmental characteristics of the region, however, suggests that when it came to establishing permanent settlements, Odessa phase populations were highly selective when discriminating among the various types of soils that were available. Once again, these patterns are not unexpected since these groups occupy a portion of the plains that receives about 510 to 590 mm (20 to 23 in.) of precipitation and has high evapotranspiration rates (Bomar 1995; Johnson and Duchon 1995). Because these conditions are generally considered marginal for corn horticulture (see Wedel 1986), it is likely that cultivation of highly fertile soils were necessary to provide reliable and consistent horticultural yields.

Given the climatic constraints of the area, the ideal soils for dryland horticulturalists using bison bone digging sticks and hoes are those that are sufficiently friable to be worked with these tools and yet have high moisture holding capabilities. As a whole, bottomland soils of the region are typically very sandy, excessively well-drained, and are not amenable to horticulture (e.g., Lincoln series soils). In addition, although some of these soils may be subirrigated, meaning they contain water within 600 mm (24 in.) of the ground surface, they are also not suitable for horticulture because the root systems of deeper rooted plants would have been susceptible to rotting (e.g., corn for example). The discussions presented in Chapter Four noted a strong correlation between Odessa phase settlements and the most fertile soils in the region (Brosowske 2002b; Brosowske and Bevitt n.d.). In nearly every case settlements were immediately adjacent to productive silt loam or clay loam soils (e.g., Spur or Canadian series). These soils represent rare resources and as a whole comprise less than 1% to 2% of all soils in the region (see Allgood 1962; Wheeler 1973; Williams 1975).

Figure 7.2 is a map of Beaver County, Oklahoma. The land area of this county is approximately 464,746 ha. (1,147,520 acres). This map shows the distribution of Odessa phase settlements that are currently known in this county and their spatial proximity to the fertile soils discussed above. This map is not well detailed and simply shows those sections of land (i.e., 259.1 ha. or 640 ac.) for which Spur and Canadian series soils are present. Generally, a single isolated section, shown in gray, contains less than 2 ha of fertile soils. Those areas along streams which contain many adjoining squares with these soils, however, represent areas with abundant arable land.

This map also shows those streams or portions of streams, shown in dark gray, that contain impurities which render the water unfit for human consumption. Although the entire county has not been completely investigated by systematic survey, those areas examined to date indicate that portions of streams where the water is potable and fertile soils are present almost always have Odessa phase horticultural settlements. Similar patterns are also noted for adjacent counties containing Odessa phase settlements (e.g., Meade County, Kansas; Ochiltree and Lipscomb counties, Texas; and Ellis County, Oklahoma).

Given the environmental constraints that today, and by extension, the past, adversely affect dryland horticulture on the Southern High Plains it is not unexpected that Odessa phase communities selected those soils that were most amenable to farming. Currently, irrigation is not documented for the region, suggesting that dryland horticulture was sufficient for producing crops. Since settings containing the critical combination of fertile soils and potable water are rare, these locations were undoubtedly regarded as highly valued resources and almost surely served as sources of intervillage competition and conflict. In addition to the land itself, improvements to the land, such as cleared horticultural fields, permanent habitation structures, and storage facilities, were labor investments that further strengthened claims to these locations. While certainly permitting permanent occupation, stored foods also represented a concentrated resource that likely served to further exacerbate intervillage raiding.

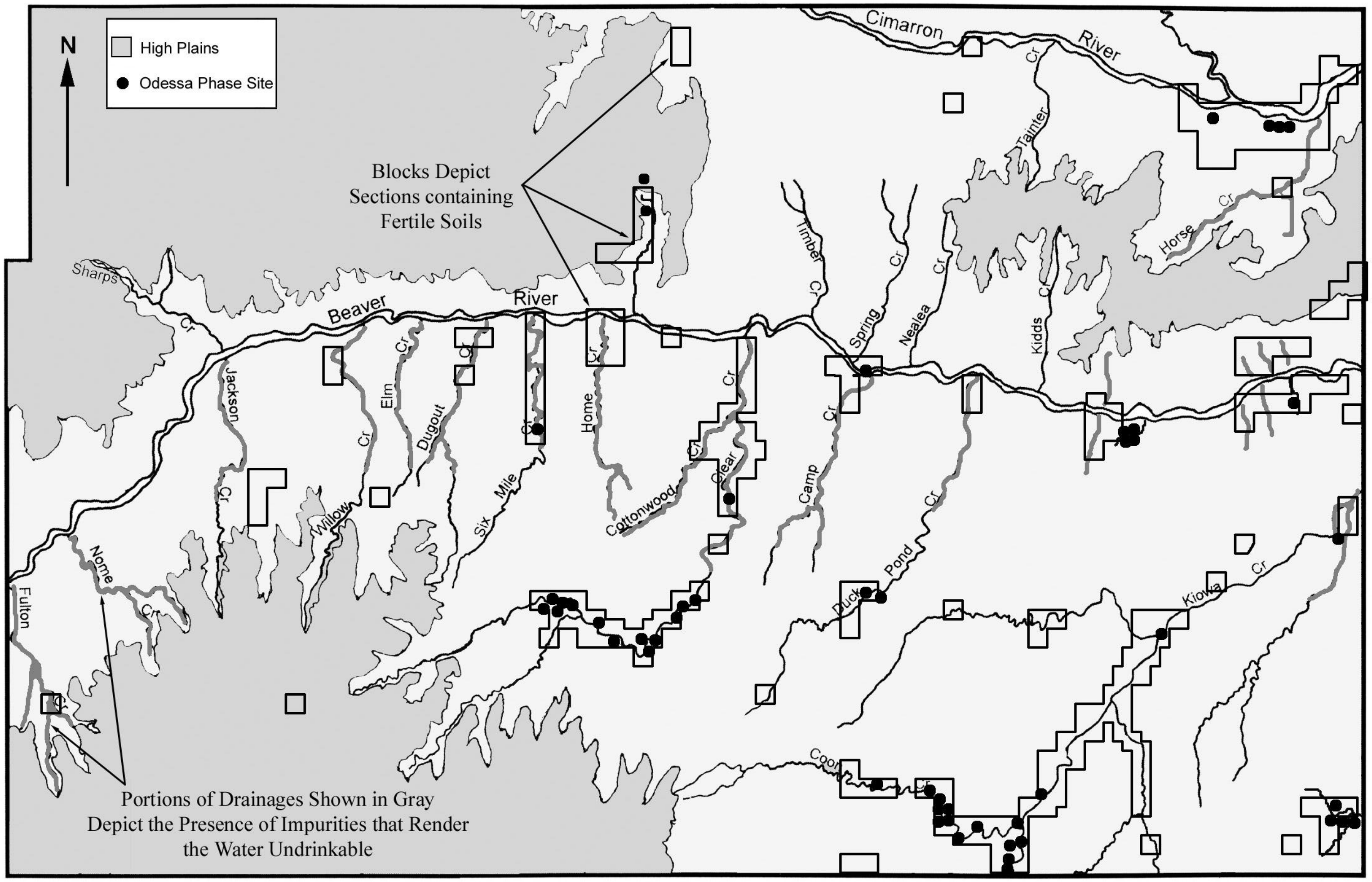


Figure 7.2 Relationship between Soils, Potable Water, and Odessa Phase Settlements.

The distribution of Odessa phase settlements (Figure 7.2) indicates that dense concentrations of settlements are associated with the largest patches of fertile soils. In Beaver County, Oklahoma, these large communities are found on Clear and Kiowa creeks. To the south and southeast in Ochiltree and Lipscomb counties, Texas, and Ellis County, Oklahoma, other large settlements are present in comparable settings along Wolf Creek and its tributaries (Brosowske 2002b; Bussard 2003, personal communication; D. Hughes 1991). Although absolute dates are somewhat limited, those currently available suggest long-term occupation of these large villages (i.e., 150 to 200 years; see Chapter Four).

A closer examination of the extended village along Clear Creek provides a more detailed picture of the relationship between settlement and soils (Figure 7.3). This figure depicts large patches of fertile soils concentrated in this valley and the strong association of Odessa phase settlements. Although the settlement map for Clear Creek is limited to only that portion of the valley that contains dense concentrations of Odessa phase sites, if the map was expanded to show areas immediately upstream and downstream of the settlement one would observe a pattern of interest: fertile soils and settlements are essentially absent both upstream and downstream from the Clear Creek locality. In other words, the length of this settlement nearly coincides exactly with the distribution of Spur and Canadian series soils. Similar patterns are observed for other Odessa phase sites including Buried City, a large Odessa phase village along Wolf Creek.

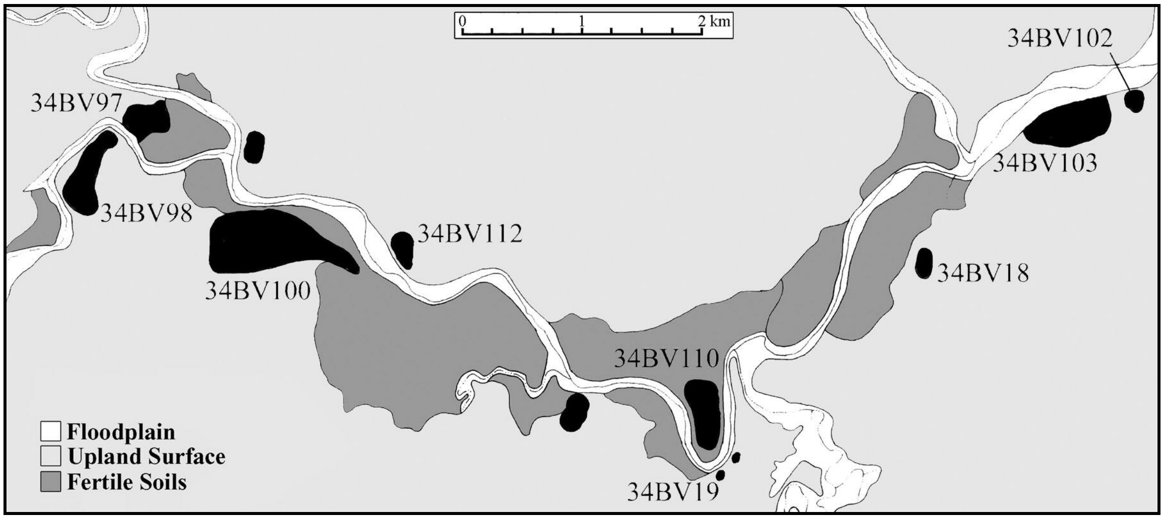


Figure 7.3 An Odessa Phase Village along Clear Creek, Beaver County, Oklahoma.

As noted in Chapter Four, large Odessa phase communities occur in the form of extended villages several km in length. While these settlements could have just as easily been organized into tightly aggregated villages, they are not and households or clusters of family groups are dispersed up and down the valley and mirror the distribution of arable land. Although difficult to fully demonstrate at this time without additional excavation and radiocarbon dates, I suspect that these are not fortuitous patterns of settlement, but rather represent planned strategies to effectively control and limit access to fertile soils through occupation. Unfortunately, the data needed to fully understand the evolution of these villages through time is currently not available.

Similar to earlier discussions of Antelope Creek settlements near the Alibates quarries, Odessa phase communities are distributed across the landscape in highly patterned ways that effectively enabled the control of highly valued resources that are limited in distribution and abundance. Likewise, given the size of these Odessa phase communities, it is likely that the population density represented at these settlements was in most cases sufficient to defend arable land and stored resources against intersocietal raiding. As noted earlier, Antelope Creek settlements in the Canadian River valley are frequently situated in highly elevated settings and suggest heightened conflict among resident groups over Alibates and other resources. In fact, based on archaeological and bioarchaeological evidence, Brooks (1994b:320) concludes that Antelope Creek populations participated in moderate to large-scale conflict. In contrast, Odessa phase settlements are not placed in defensive locations. Nonetheless, evidence for violent deaths is clearly demonstrated by two Odessa phase burials (Chapter Four).

Summary

In all likelihood, the widespread emergence of land tenure systems on the Southern Plains coincided with the appearance of the first permanent settlements of the Middle Ceramic period. Initially, exclusive claims to land probably arose from increased competition over resources as societies became more sedentary and the region became more densely populated. Under these conditions, the control of land and its resources is generally seen as a viable strategy to ensure that the basic subsistence needs of a group are met. Thus, while broadly applicable to all societies of the region in one way or another, evidence for competition and resource control were examined using the Alibates quarries and the proximity of Odessa phase settlements to arable land as examples. Although both of these resources represent examples of landed property, they were selected because they represent fundamentally different types of resources claimed by societies organized in significantly different ways. Despite these differences, the strategies used to establish and maintain exclusive rights of access to these resources were very much the same and involved the strategic placement of settlements. These two cases were also helpful for highlighting changes in the perceived value of key resources, such as tool stone and arable land, as the region underwent considerable social, economic, and political change.

From a historical perspective, the development of land tenure systems during the Middle Ceramic period was probably necessary to maintain social stability in a stochastic environment (i.e., ensured the procurement or production of staple foods necessary for survival). However, besides being two cases that were perhaps the most obvious and easiest to identify, they also highlight another important development. While claims to resources seem to be linked to economic systems characterized by production for personal consumption, notable differences in the organization and productivity of economies are evident at some settlements. In particular, the economies of both the Alibates Ruins and Odessa Yates exhibit unmistakable signs of intensified production.

Trends toward Intensification: Economic Specialization

Although somewhat circular in reasoning, the presence of unusually high quantities of trade items at the Alibates Ruins and Odessa Yates suggest that these communities were capable of producing a surplus of products for use in intersocietal exchange. Previous studies of exchange in the region have hypothesized that food products were the focus of regional exchange systems and that social transactions served as a risk reduction strategy against periodic shortages (e.g., Spielmann 1982, 1983; see Vehik 2002 for an alternative view). These studies emphasize exchange relationships between Plains and Southwest societies that were separated by 100 to 500 km (e.g., Baugh 1982; Lintz 1991; Spielmann 1982, 1983, 1991). However, the fact that clear evidence for trade in staple foods has yet to be demonstrated in these instances and that exchange in bulk goods, such as food, over long distances is unlikely without efficient transport systems, seriously weakens these arguments (see D'Altroy and Earle 1985; Earle 1994).

If the concentration of nonlocal exotic trade items at some settlements, such as Alibates Ruins and Odessa Yates, implies a surplus production of some class of items for exchange, then how were these economies organized and what items were being produced for export? Earlier chapters have suggested that considerable economic variability seems to have characterized settlements of the region (see Chapter Four; Drass and Flynn 1990; Speth 2004). Previously it has been argued that variation in Middle Ceramic economies of the region were largely related to differences in settlement size (Brosowske 2002b; Brosowske and Bevitt n.d.) The evidence presented in this research, however, suggests that it is not necessarily this straightforward. Considering the numerous potential sources of environmental, demographic, and cultural variability in the region, it should not be unexpected that economies also varied significantly. Along the same lines of reasoning, it should not be unexpected that potential strategies employed to produce a surplus of commodities for exchange may have also been equally variable.

In the following discussions evidence for the specialized production of highly valued commodities at Alibates Ruins and Odessa Yates are explored. In particular, it is proposed that chipped stone tools, along with bison hides and dried meat were produced at these communities for export. Before these case studies are presented, however, it is necessary to define the key concepts of economic production and specialization. Special emphasis is placed here on production strategies and behaviors frequently associated with craft specialization (see Arnold 1984, 1987; Brumfiel and Earle 1987; Clark and Parry 1990; Costin 1991; Muller 1984; 1987; Rice 1981; Torrence 1986).

Production and specialization

Production and specialization, although obviously related, are not the same thing. Production is a general concept and simply refers to manufacture of finished objects from raw materials. In contrast, specialization refers to the manner in which production is organized. While many definitions of specialized production have been presented, one of the more useful is: "a differentiated, regularized, permanent, and perhaps institutionalized production system in which producers depend on extra-household exchange relationships at least in part for their livelihood, and consumers depend on them for acquisition of goods they do not produce themselves" (Costin 1991:4). Brumfiel and Earle (1987:5) suggest that specialization may be envisioned as a continuum along which any economy can be measured. At one end of the scale is the Domestic Mode of Production (DMP) (Sahlins 1972). While all households are characterized by sharing and exchange among related kin, families practicing a DMP are essentially self-sufficient and produce most of the goods they use and consume. At the other end of the spectrum is the modern market economy. The latter is a highly specialized system where nearly all of the goods used and consumed by households are produced by others.

A key component of specialization is "differentiated" since the presence of variability in production serves as the primary means for identifying the existence of specialized production in the archaeological record. It follows that specialization is a relative state that can only be discerned through comparative analysis (Costin 1991:2). Thus, to suggest that a production system was specialized, but not to demonstrate how production varied along some scale of analysis is of little use. In addition, since a division of labor is known to exist along age and sex lines in all societies, differences in production along these lines does not in and of itself constitute specialization. Another important part of the definition is the idea that specialists do not produce all of the goods they consume. In other words, specialists obtain goods in return for items which they produce. This process is quite variable and includes reciprocal exchange, the use of currency, and all points in between.

The presence of specialized production, as demonstrated by differences in production activities, can be recognized by direct and indirect forms of evidence (see Costin 1991:18-43). Direct evidence includes facilities associated with production as well as variability in the distribution of raw and waste materials, tools, and finished items among some unit of analysis. The latter can be households, settlements, social classes, or time periods. Specialized production can also be inferred even when the exact location of manufacture cannot be identified. Referred to as indirect evidence, the presence of large numbers of items which are highly standardized or require a great deal of skill to manufacture can also indicate the presence of specialized production. Variation in the spatial distribution of objects with these characteristics is often used to infer, albeit indirectly, the presence of specialized systems.

Now that we have some idea as to what specialization entails, how does one go about describing specialized production? Because all economic systems consist of three primary components, production, distribution, and consumption, any attempt to describe specialized production must address each of these topics. Since earlier chapters have discussed distribution and consumption of items in some detail (see Chapter Six), the following emphasizes the production component. In the examples examined here, variability in economic production is examined at the level of the settlement. Specifically, evidence for specialized production of two classes of commodities is examined: chipped stone tools and bison products. It is proposed that specialized production of chipped stone tools was conducted by the occupants of the Alibates Ruins, while the inhabitants of Odessa Yates were heavily involved in the production of bison products. In both of these examples, it is suggested that a surplus was produced for trade. The existence of specialization is derived from comparative analyses of contemporaneous settlements and identifies differential quantities of production related debris (e.g., manufacturing implements, finished products, waste debris).

Specialized Chipped Stone Tool Production

As noted earlier in this chapter, numerous researchers have suggested that Antelope Creek groups were extensively involved in the mining, production, and distribution of Alibates silicified dolomite (see Bandy 1976; Baugh 1994:280; Boyd 1997:343; Brosowske 2002c; Drass 1998:421; Green 1986; J. Hughes 1991:31: Lintz

1991:98). These conclusions are based on a number of different types of evidence, including intensive occupation near the Alibates quarries, the excavation of hundreds of quarry pits to obtain this resource, astonishing quantities of lithic production debris, and finished and unfinished chipped stone implements at some sites. For example, Lintz (1991:98) notes that the Alibates Ruins "are within a one-kilometer radius of the Alibates agatized dolomite quarries, and the presence of sizeable biface caches in rooms, coupled with the staggering quantities of debitage at these sites, indicates that the Antelope Creek peoples were actively engaged in mining, shaping, and probably trading the locally available agate resource".

Although many researchers have stated, almost nonchalantly, that the occupants of the Alibates Ruins were heavily involved in the extraction, production, and exchange of Alibates, until recently the economic importance of these activities, at both the local and regional scales, had yet to be explored in any detail. Brosowske (2002b) has examined lithic materials recovered from Antelope Creek settlements in both Texas and Oklahoma and has concluded that the inhabitants of the Alibates Ruins and other communities near the quarries were part-time craft specialists producing chipped stone tools for export. This study identified differential distributions of waste debris, primarily manufacturing failures, tools associated with production (i.e., hammerstones and antler billets), and finished items, among a sample of Antelope Creek settlements. In the discussions that follow the results of this unpublished study are briefly summarized.

The Alibates Ruins consist of three individually recorded settlements: Alibates Ruin 28, 28A, and 30. Earlier it was argued that these settlements were contemporaneously occupied and should be considered a single community (Chapter Four). To review, it is estimated that approximately 19 residential structures were excavated at Alibates Ruin 28, four at Alibates Ruin 30, and one at Alibates Ruin 28A (Lintz 1986a:338, Figures 45, 50). It should be noted that at Alibates Ruin 28 two areas, Units I and II, contain distinct types of architectural features. Unit I is a large contiguous room structure containing six habitation rooms and Unit II consists of 13 freestanding habitation structures. These data suggest that as many as 24 families occupied the Alibates Ruins, although considering that this settlement was occupied for at least 200 years it is likely that the number of families at any given time was actually lower. Altogether as many as 40 to 50 families may have occupied communities that essentially surrounded the quarries. Earlier, it was argued that these communities represented a visible claim to this important resource and that they controlled access to the quarries. If these propositions are correct, then it should not be unexpected that these same communities may have also participated in specialized lithic production.

As Lintz (1986a) has pointed out, the Alibates Ruins and most of the other Antelope Creek settlements in the Canadian River valley were excavated many decades ago using excavation and sampling techniques that by today's standards are less than ideal. As a result, it is unfortunate that various analyses that rely on systematically collected samples and precise provenience information are seriously impeded. Therefore, with these limitations in mind the following analysis which seeks to identify the presence of specialized production of chipped stone tools at Antelope Creek phase communities near the Alibates quarries is presented.

Because "specialized production is a relative state" the material correlates of these activities can only be identified when multiple data sets are examined within a comparative framework (Costin 1991:2). Following Costin (1991) and others (e.g., Arnold 1985; Brumfiel and Earle 1987; Muller 1984; Rice 1981; Tosi 1984) this analysis examines evidence for differential participation in chipped stone tool production among a sample of Antelope Creek phase communities. This study is fairly coarse grained and primarily seeks only to demonstrate the existence of craft specialization not a thorough analysis of the entire production system. As such, although this study examines specialization at the settlement level, it is not suggested that production was comparable among all families within each community. The data used in this analysis are primarily derived from Lintz (1986a:Table 31) and Green (1986:Table 6), although additional supporting information was collected by the author at the Panhandle-Plains Historical Museum in Canyon, Texas, the primary curatorial facility for most of the assemblages examined here. Before the evidence for part-time lithic craft specialization is presented a brief description of the Antelope Creek lithic production system is presented.

Nearly three decades ago, Bandy (1976) provided a description of the lithic reduction sequence of Alibates silicified dolomite by Antelope Creek phase groups. His study was based on a sample of lithic waste debris recovered from the Turkey Creek site (41PT8), a small settlement approximately 1.5 km north of the Alibates quarries (see Figure 7.1; Green 1986). Even though only 44 m^2 were excavated at this site, an estimated total of 57,000 waste debris flakes were recovered during excavation (i.e., density = 1300 flakes per m^2). Based on its location and the density of chipped stone debris at the site, Bandy (1976:79) concluded that "the aboriginal occupants of 41PT8 without question acquired flint material from the nearby quarries, and biface cores were transported to 41PT8 where they were chipped into thin bifaces and other items for trade". The reduction process for the Turkey Creek site as described by Bandy (1976) is essentially identical to that identified by the author (2002c) for the nearby Alibates Ruins.

The production sequence began with the procurement of Alibates nodules from pits excavated at the quarries. Over 730 quarry pits representing five morphological types have been documented following the 1998 fire at the Alibates quarries (Katz and Katz 2004). Excavated quarry pits at the Alibates Flint Quarries National Monument are usually circular or oval in shape and contain sizeable debris rings around their perimeters. On average, quarry pits are about 3 m in diameter, although some nearly 10 m across are also documented (Katz and Katz 2004). Quarry pits were excavated through dolomite and caliche to obtain high quality nodules present at least 0.8 m below the ground surface. Katz and Katz (2004) note that gravels, nodules, boulders, and ledges of Alibates chert are available as surface exposures, but that weathering seriously reduces the quality of these material. Thus, quarried tool stone is more predictable in quality.

The reduction process began with the production of large bifacial cores often 20 to 30 cm in length from quarried nodules. The abundance of early stage flakes with weathered bedrock cortex at the quarries and their rarity at settlements indicate that the production of large bifacial cores occurred at the quarries (Bandy 1976:47, 79;

Brosowske 2002c; Katz and Katz 2004). These cores were transported to permanent settlements where they were further reduced.

The primary items produced during bifacial core reduction were large flakes blanks, scrapers, and bifaces (Bandy 1975; Brosowske 2002b). Initially, reduction involved the removal of large flakes from bifacial cores. These flakes included both flat and curved examples, each appropriate for specific types of tools. Flat flakes served as blanks for the manufacture of a variety of unifacial and bifacial tools (i.e., projectile points, drills, etc.), while curved flakes required little to no modification for use as end and side scrapers. Judging from the materials present at settlements, ovate knives and scrapers appear to have been the only formal tools manufactured. Evidence for the manufacture of other tools from flake blanks does not appear to be represented (Brosowske 2002b). That flake blanks were not reduced into finished implements for exchange is supported by the presence of sizeable caches of these objects at locations far from the quarries (see Bevitt 2001; Hurst 2002; Lintz n.d.b). Overall, the bifacial core technology described here is similar in many respects to that hypothesized for Southern Plains Folsom groups (ca. 10,900-10,200 B.P.) (see Boldurian et al. 1987; Hofman 1992; Stanford and Broilo 1981).

While the production of large flake blanks and scrapers was certainly important, knappers were simultaneously laboring to produce a large, thin ovate biface or knife from each bifacial core (Bandy 1976; Brosowske 2002c). These bifaces were traded widely throughout the region during the Middle Ceramic period, although most archaeologists are only familiar with these tools in their exhausted state: Harahey or diamond-shaped, alternately beveled knives. A distinct curvature to some ovate knives does indicate, however, that some specimens were also produced at times from flake blanks. Figure 7.4 shows examples of ovate knives, both prior to use and throughout various stages of the resharpening process. Initially, these tools were as large as 15 to 20 cm in length, 4 to 7 cm wide, and 0.5 to 1.0 cm in thickness. Given that Alibates gravels obtained from secondary sources are usually less than 10 cm in length, it is likely that these impressive tools could only be produced from tool stone procured from the quarries.

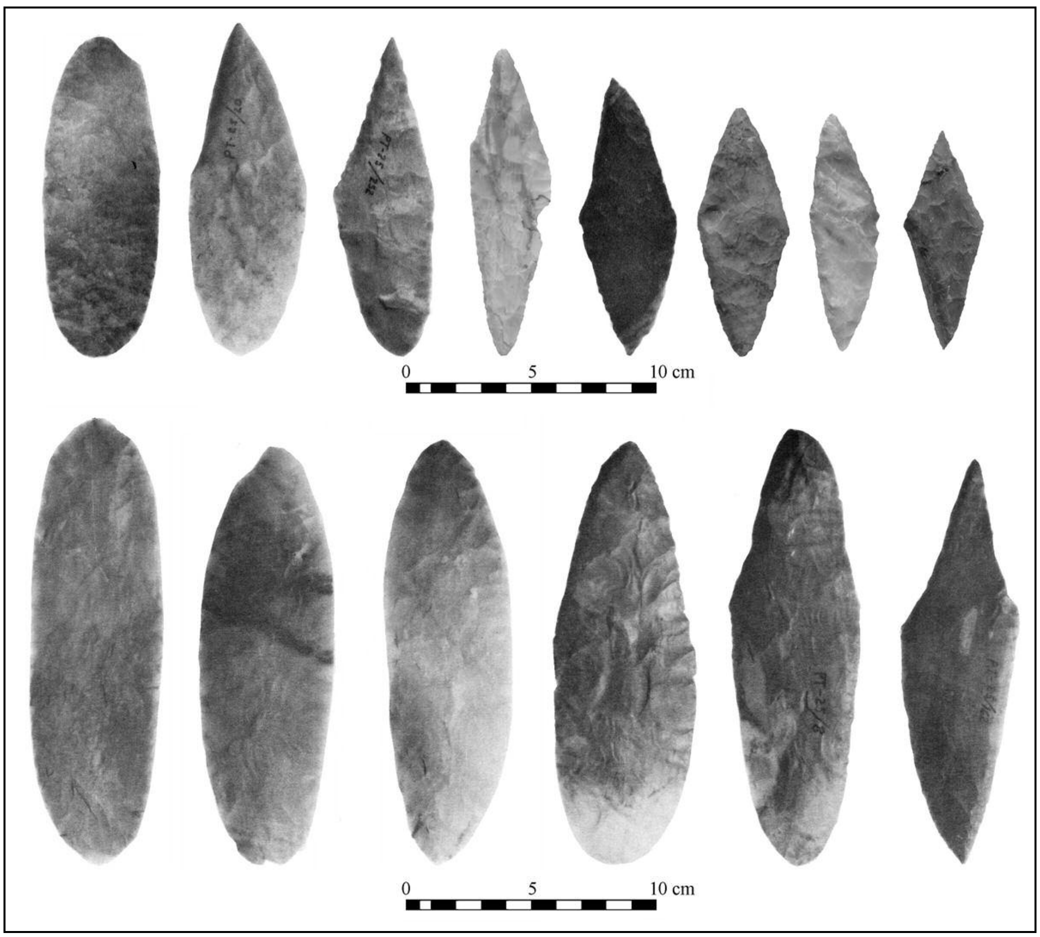


Figure 7.4 Ovate Knives with Various Amounts of Resharpening.

An additional stage that appears to be represented in the Alibates production process is heat treating. Currently, this step is poorly understood and only a single study has examined effects of heat treatment on Alibates (Joyce 1985). That study attempted to quantify alteration resulting from heat treatment, both in terms of visual changes and improvements in material quality. The results indicate that the optimal temperature for heat treating Alibates was 250° to 350° C. Samples heated within this range showed increased luster, red and pink colors became more prominent, and all specimens were much easier to work (Joyce 1985:37, 39). Lower temperatures showed little change in color or knappability, while higher temperatures produced material that was brittle, crazed, and/or potlidded (Joyce 1985:37). Overall, compared to other types of stone, Alibates requires a fairly low temperature range to obtain optimal results from heat treatment (see Luedtke 1992:Table 7.1 for a comparison with other materials). Experimentally heat treated specimens were compared to 200 Alibates artifacts recovered from Antelope Creek settlements and concluded that 70% of these artifacts were heat treated (Joyce 1985:38).

An examination of the chipped stone assemblages from sites, such as the Alibates Ruins, displays remarkable redundancy in reduction strategies (i.e., cores, bifaces, and flake forms. Although not formally investigated and based largely on qualitative assessments at this time, the materials present suggest a highly standardized and efficient system of production. These patterns are perhaps most evident when scraper forms are examined, although manufacturing failures associated with biface production and finished items also suggest that the manufacture of these items was highly standardized. Overall, despite the present limitations, the massive quantities of cores, hammerstones, and waste debris, including debitage and manufacturing failures at sites near the quarries are truly spectacular and appear to indicate production above and beyond normal household consumption.

While, the above summary is obviously quite limited in scope, it is sufficient for establishing a basic understanding of the Alibates production sequence. Key points of this system worth emphasizing are briefly mentioned here. It should be apparent that Alibates ovate knives represent an item that required a great deal of skill to manufacture. That these items were highly valued as utilitarian tools is visibly demonstrated by their abundance and wide distribution. The inclusion of ovate knives as associated grave objects in many instances also points toward their considerable value in the socio-political realm as well (see Green 1986:93; Summers 1997:Table 5.2). Standardization in the production sequence of Alibates, both in terms of reduction and the types of items manufactured (i.e., ovate knives, flake blanks, and scrapers) is also suggested, but remains largely uninvestigated at this time. Heat treatment of Alibates also appears to have been an important step in the production process. Interestingly, while this step does not appear to have been necessary since raw Alibates is generally considered a high quality material, it likely facilitated the reduction process and may have been seen as a means by which higher quality products were produced.

Overall, many of the characteristics identified here, including intensive quarrying, heat treatment, standardization in the production process, and the types of chipped stone items manufactured, as well as evidence for strategic settlement near the quarries, embody many of the traits typically exhibited with craft specialization (see

Arnold 1985, 1987; Brumfiel and Earle 1987; Clark and Parry 1990; Costin 1991; Muller 1984; 1987; Rice 1981; Torrence 1986). In the discussion that follows the idea that part-time lithic craft specialization was concentrated among a few Antelope Creek settlements near the quarries is examined. Using a comparative framework, evidence for differential distributions of production related items and finished objects are presented.

Considering the spatial relationship between some Antelope Creek settlements and the Alibates quarries it is expected that those settlements near the quarries should show evidence for involvement in the specialized production of chipped stone tools. The logic of this study is straightforward; to identify significant differences in the quantities of specific classes of artifacts associated with chipped stone tool production among Antelope Creek settlements. Artifact classes selected included production related objects (i.e., cores and hammerstones) and finished items (bifaces and scrapers). Because we are dealing with quantitative rather than qualitative data within a comparative framework, it is necessary to determine an objective method for measuring the frequency of artifacts at sites. Since settlements used in the sample were studied by different researchers using diverse excavation and sampling techniques, determining an objective calculation of artifact density is problematic. Ideally, a measure of frequency for some fixed unit of volume, such as quantity per m^3, would be best. However, since the m^3 excavated at most Antelope Creek sites is not known, frequencies per m^2 are used instead (see Green 1986:Table 6; Lintz 1986a:Table 31). Table 7.2 provides the frequencies for select artifact classes per m^2 for 18 Antelope Creek settlements. Artifact densities are multiplied by 100 to facilitate comparisons and the five highest densities for each artifact class are highlighted in bold font.

Table 7.2 The Density of Select Artifact Classes per M^2 for Antelope Creek Sites.

Site	Area Excavated	Cores		Bifaces		Scrapers	
		N	**Density per M^2 x 100**	**N**	**Density per M^2 x 100**	**N**	**Density per M^2 x 100**
Alibates Ruin 28A	381 m^2	5	1.3	29	7.6	149	39.1
Alibates Ruin 28-I	1516 m^2	294	**19.4**	261	17.2	1392	**91.8**
Alibates Ruin 28-II	4110 m^2	218	5.3	292	7.1	2318	56.4
Alibates Ruin 30	225 m^2	2	0.9	17	7.6	73	32.4
Turkey Creek	44 m^2	8	**18.2**	57	**129.5**	84	**190.9**
41MO7	109 m^2	6	**5.5**	45	**41.3**	135	**123.9**
Footprint	115 m^2	11	**9.6**	114	**99.1**	125	**108.7**
Arrowhead Peak	140 m^2	2	1.4	79	**56.4**	129	**92.1**
Antelope Creek 22A	299 m^2	4	1.3	17	5.7	6	2.0
Antelope Creek 22	1135 m^2	7	0.6	128	11.3	287	25.3
Antelope Creek 23	50 m^2	0	0	3	6.0	3	6.0
Conner	28 m^2	1	3.6	4	14.3	2	7.1
Roper	76 m^2	0	0	12	15.8	16	21.1
Pickett Ruin	26 m^2	3	**11.5**	9	34.6	0	0
Medford Ranch	113 m^2	0	0	44	**38.9**	26	23.0
Spring Canyon	81 m^2	0	0	25	30.9	69	85.2
Black Dog Village	180 m^2	0	0	14	7.8	24	13.3
Zollars	35 m^2	0	0	5	14.3	8	22.9

It should be noted that data from Antelope Creek 24, a well known Antelope Creek site, are not included in this analysis for two reasons. First, the size of the area excavated at this site is not known. Second, although an estimated five habitation structures are thought to have been present at Antelope Creek 24, these were destroyed by natural processes prior to excavation (i.e., they had eroded away), and thus, could not be sampled. In addition, since artifact counts and the total area excavated are known for specific areas within the Alibates Ruins (i.e., Alibates Ruin 28 Unit I and Unit II, 28A, and 30), these data are presented individually.

Settlements with the five highest density scores for cores, bifaces, and scrapers per excavated m^2 are shown in bold in Table 7.2. The settlements of Turkey Creek, 41MO7, and Footprint all rank in the top five for each of the three classes examined, Alibates Ruin 28 Unit I and Arrowhead Peak rank in the top five for two classes, and Pickett Ruin and Medford Ranch each rank in the top five for one class. Overall, these results are fairly ambiguous and difficult to interpret primarily because there does not appear to be any noticeable relationship between artifact density and settlement distribution or size, m^2 excavated, or as we shall see, distance to the Alibates quarries.

Although there are many possible explanations for the lack of patterning in the data, it is apparent that there is a relationship between artifact densities and the degree to which excavations at each site targeted cultural features (e.g., houses, middens, and storage facilities) and nonhabitation areas. For example, one would expect that the density of artifacts per m^2 to be higher at sites where excavations focused on cultural features containing abundant cultural materials, while exterior areas containing sparse habitation debris were only minimally examined. Likewise, it is anticipated that sites investigated using large open block excavations, which sampled both domestic features and large areas relatively devoid of habitation debris, should contain lower densities of artifacts per m^2. The relationship between each of these factors and their potential for biasing the data are shown in Table 7.3 as a measure of the total area excavated divided by the total number of residential structures excavated for a select number of sites. Lower indices indicate an emphasis on houses and middens, while higher scores reflect less of an emphasis on features containing high densities of artifacts. Here, artifact densities per m^2 are once again multiplied by 100 for comparative purposes.

Table 7.3 A Comparison of Artifact Densities and Areas Excavated at Select Sites.

Site	**Area Excavated**	**# of Houses**	**Area Excavated / # of Houses**	**Core Density x 100**	**Biface Density x 100**	**Scraper Density x 100**
Turkey Creek	44 m^2	1.5	29.3	18.2	129.5	190.9
Footprint	115 m^2	3	38.3	9.6	99.1	108.7
Alibates Ruin 30	225 m^2	4	56.3	0.9	7.6	32.4
Antelope Creek 22	1135 m^2	6.5	174.6	0.6	11.3	25.3
Alibates Ruin 28-II	4110 m^2	13	316.2	5.3	7.1	56.4

The figures presented in Table 7.3 suggest that in at least some cases there is a strong relationship between the excavation strategies employed at a given settlement and the densities of artifacts recovered. Those sites for which the area excavated divided by the number houses excavated is low tend to be sites which have high densities of the artifact classes selected. This trend is perhaps most evident at the Footprint site where three houses were excavated and all excavations were limited to house interiors or adjacent midden areas (see Green 1986:Figure 30). This settlement ranked in the top five for artifact densities for each of the three artifact classes examined (Table 7.2). The reverse trend is represented by settlements, such as Antelope Creek 22 and Alibates Ruin 28 Unit II, where large areas exterior to houses and middens were excavated and exhibit low densities of artifacts. As such, it is suggested that the frequency of artifacts recovered at the sites in the sample be calculated using an alternative means of measurement: density per excavated house. Tables 7.4 and 7.5 provide densities per house for cores and hammerstones (production related classes) and bifaces and scrapers (finished items) for the same sample of settlements. Once again, settlements with the five highest density scores for each of these artifact classes are shown in bold. Also included are the approximate straight-line distances to the Alibates quarries from each settlement.

Table 7.4 The Density of Production Related Tools per House for Study Sites.

Site	**Distance to Quarries**	**# of Houses**	**Cores**		**Hammerstones**	
			N	**Density**	**N**	**Density**
Alibates Ruin 28A	1.0 km	1	5	5.0	7	**7.0**
Alibates Ruin 28-I	1.2 km	6	294	**49.0**	27	**4.5**
Alibates Ruin 28-II	1.2 km	13	218	**16.8**	185	**14.2**
Alibates Ruin 30	2.0 km	4	2	0.5	0	0.0
Turkey Creek	2.5 km	1.5	8	**5.3**	4	2.7
41MO7	4.6 km	1	83	**83.0**	9	**9.0**
Footprint	11.2 km	3	63	**21.0**	2	0.7
Arrowhead Peak	12.0 km	5	15	3.0	0	0.0
Antelope Creek 22A	12.8 km	1	4	4.0	0	0.0
Antelope Creek 22	12.8 km	6.5	7	1.1	1	0.2
Antelope Creek 23	13.1 km	1	0	0	0	0.0
Conner	13.6 km	2	1	0.5	0	0.0
Roper	13.6 km	2	0	0	0	0.0
Pickett Ruin	16.0 km	1	3	3.0	1	1.0
Medford Ranch	16.8 km	1.5	0	0	2	1.3
Spring Canyon	16.8 km	2	0	0	10	**5.0**
Black Dog Village	25.6 km	2	0	0	23	**11.5**
Zollars	33.6 km	4	0	0	0	0.0

The data presented in Tables 7.4 and 7.5 exhibit a strong correlation between artifact densities per house and the proximity of settlements to the Alibates quarries. Of the six sites that are within five km of the quarries, all but Alibates Ruin 30 have high densities of the artifact classes examined. For each of the four classes of artifacts examined, Alibates Ruin 28 Units I and II, Turkey Creek (41PT8), and 41MO7 rank in top five 75% to 100% of the time. Alibates Ruin 28A, a portion of the Alibates Ruins that is about one km from the quarries, ranks in the top five only twice, but narrowly misses in the remaining two instances (i.e., it ranks sixth for both cores and bifaces).

Table 7.5 Density of Select Finished Artifact Classes per House for Study Sites.

Site	Quarries Distance	# of Houses	Bifaces		Scrapers	
			N	Density	N	Density
Alibates Ruin 28A	1.0 km	1	29	29.0	149	**149.0**
Alibates Ruin 28-I	1.2 km	6	261	**43.5**	1392	**232.0**
Alibates Ruin 28-II	1.2 km	13	292	22.5	2318	**178.3**
Alibates Ruin 30	2.0 km	4	17	4.3	73	18.3
Turkey Creek	2.5 km	1.5	57	**38.0**	84	**56.0**
41MO7	4.6 km	1	45	**45.0**	135	**135.0**
Footprint	11.2 km	3	114	**38.0**	125	41.7
Arrowhead Peak	12.0 km	5	79	15.8	130	26.0
Antelope Creek 22A	12.8 km	1	17	17.0	6	6.0
Antelope Creek 23	12.8 km	1	3	3.0	3	3.0
Antelope Creek 22	12.8 km	6.5	128	19.7	287	44.2
Conner	13.6 km	2	4	2.0	2	1.0
Roper	13.6 km	2	12	6.0	16	8.0
Pickett Ruin	16.0 km	1	9	9.0	0	0
Medford Ranch	16.8 km	1.5	44	**29.3**	26	17.3
Spring Canyon	16.8 km	2	25	12.5	69	34.5
Black Dog Village	25.6 km	2	14	7.0	24	12.0
Zollars	33.6 km	4	5	1.3	8	2.0

If one calculates the average density of each artifact class for settlements within 5 km of the quarries (N=6) and those at greater distances (N=12) the differences are fairly striking (Figure 7.5). For instance, the actual quantities of scrapers and cores are nearly eight to 10 times more numerous per house at settlements near the quarries (i.e., scrapers: 128.0 versus 16.3; cores: 25.7 versus 2.7). The densities of bifaces and hammerstones are less dramatic, but are still two to four times more common at settlements near the quarries than those more distant (bifaces 30.4 versus 13.4; hammerstones 6.2 versus 1.6).

Overall, the selection of cores and hammerstones for the preceding analysis are self explanatory since they are obviously classes of artifacts related to chipped stone tool production. The frequency of antler billets was also examined, but was not included in the analysis because it seemed possible that some of these items may actually represent handles or hafting elements for chipped stone tools rather than lithic percussors. Generally, artifacts listed as antler billets were absent from most settlements, however, one or more billets were recovered in each house at Alibates Ruin 28 Unit I (4.25) and Unit II (3.77), Alibates Ruin 28A (3.0), Antelope Creek 22 (2.71), 41MO7 (1.0), and Footprint (1.67). All but two of these settlements are near the quarries (i.e., Antelope Creek 22 and Footprint). Despite concerns regarding their function, the frequency of antler billets at sites appears to compliment the preceding data.

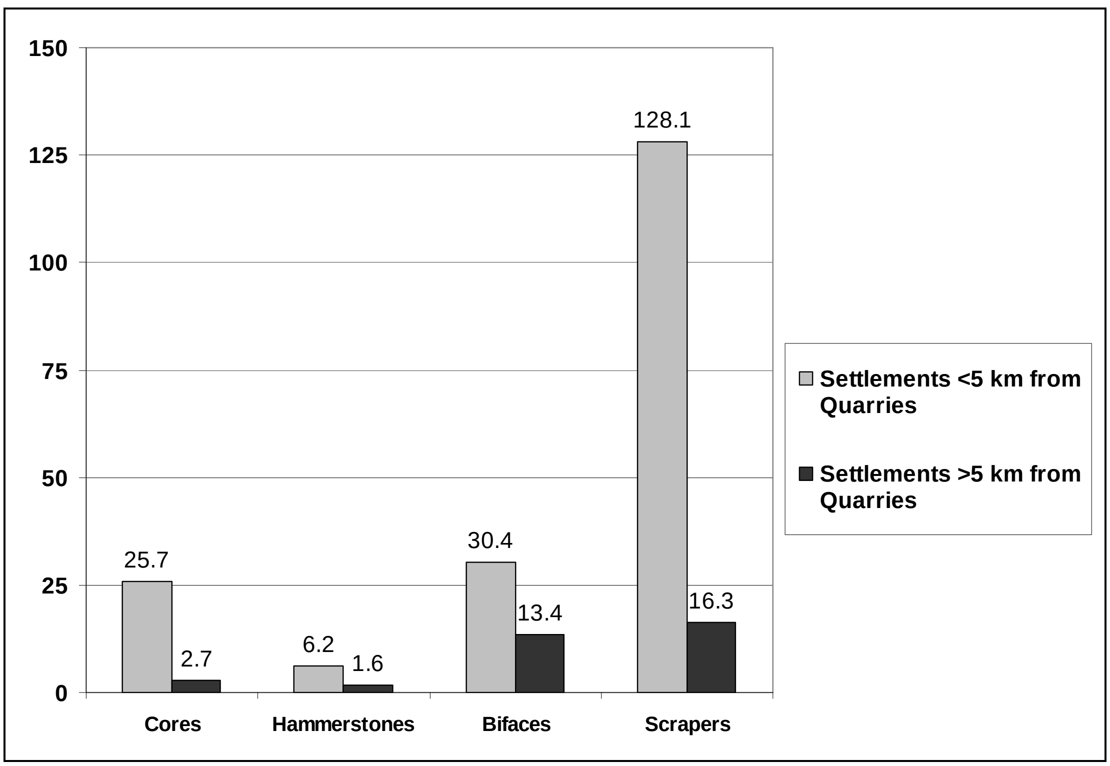


Figure 7.5 Artifact Densities per House and Proximity to the Alibates Quarries.

The reasoning underlying the selection of bifaces and scrapers for this analysis is slightly less obvious. As noted earlier, however, of all of the formal tool types that make their appearance during the Middle Ceramic period on the Southern High Plains, bifacial knives and scrapers are the only two tools that appear to have been produced for exchange. The only other items that appear to have been produced for exchange were flake blanks, however, since many researchers did not systematically collect unmodified debitage, the frequency of these items could not be tabulated. Other tools, such as projectile points and drills, do not appear to have been produced by specialists near the quarries, but rather seem to have been manufactured by consumers using flake blanks. Thus, since bifaces and scrapers were the primary tool classes produced by specialists, it was concluded that sites containing high frequencies of these objects were most likely to reflect locales of specialized production.

In sum, using artifact classes related to lithic production, artifact densities per excavated house were calculated for 18 different Antelope Creek sites. Six of the settlements are within 5 km of the Alibates quarries (33% or six of 18 in the total site sample), yet these sites ranked in the top five 76% of the time for the highest densities of the artifacts examined (i.e., 16 of 21). These data indicate substantial differences in the frequency of production related tools and finished items among Antelope Creek settlements. I suggest that these data, as relatively coarse grained as they are, provide fairly strong evidence for intensified production of chipped stone tools at several of the Antelope Creek settlements near the Alibates quarries. Overall, the quantities of items present at these sites are indicative of surplus production for exchange.

In the ensuing discussion additional evidence for economic intensification in the region at this time is examined. Here, intensification is manifested by the development of another specialized economy: bison hunting. Once again evidence for economic variability is identified through cross-cultural analysis. Despite their fundamental differences, these data also suggest that intensification represented an organized strategy to produce valued items slated for intersocietal exchange.

Specialized Bison Hunting and the Secondary Products Revolution

By A.D. 1250 large portions of the Great Plains were dominated by sedentary to semi-sedentary Plains Villagers who practiced a mixed economy of horticulture, hunting, and foraging. In many areas this settled way of life continued well into the historic period and is represented by societies such as the Mandan, Hidatsa, Arikara, Pawnee, and Wichita. Although these villagers are well documented, the media has long emphasized the nomadic societies that occupied this vast region. Unlike sedentary villagers, these nomadic groups followed transhumant cycles linked to the seasonal movements of bison herds, lived in portable bison skin tipis, and practiced economies which focused heavily on bison. Although this way of life is generally thought to apply only to equestrian hunters of the Historic period, accounts provided by early explorers firmly document the existence of similarly organized societies during the pre-horse era. The Coronado accounts describe two of these groups on the Southern High Plains during the sixteenth century:

> Two kinds of people travel around these plains with the cows; one is called Querechos and the other Teyas; they are very well built, and painted, and are enemies of each other. They have no other settlement or location than comes from traveling around with the cows. They kill all of these they wish, and tan the hides, with which they clothe themselves and make their tents, and they eat the flesh,

> sometimes even raw, and they also even drink the blood when thirsty. The tents they make are like field tents, and they set them up over some poles they have made for this purpose, which come together and are tied at the top, and when they go from one place to another they carry them on some dogs they have and other things, for the country is so level, and I have said, that they can make use of these, because they carry the poles dragging along on the ground. The sun is what they worship most. The skins for the tents is cured on both sides, without the hair, and they have the skins of deer and cows left over. They exchange some cloaks with the natives of the river for corn. [Hammond and Rey 1940:292-293]

The descriptions provided by this and other similar accounts document nomadic Protohistoric and Historic Plains societies that were specialized bison hunters *par excellence* (see Bolton 1949; Catlin 1996; Ewers 1955; Hammond and Rey 1940; Holder 1970; Jablow 1951; Lowie 1954; Swanton 1942). From an archaeological perspective, however, it is clear that these groups represent the final stages in a long evolutionary sequence of bison hunting on the Plains. For example, on the Northern Plains, kill sites containing Folsom, Goshen, Agate Basin, Hell Gap, Alberta, Cody, Hawken, McKean, Pelican Lake, Besant, Avonlea, and a variety of triangular shaped projectile points document 11,000 years of bison hunting (see Frison 1991; Reeves 1990). Since these societies are known almost exclusively from highly visible bison kill sites, they are also invariably described as "specialized bison hunters". Although kill sites are nowhere near as numerous on the Central and Southern Plains, similar trends are also presented for these regions (see Hofman 1996; Hofman and Graham 1998; Kay 1998). While the archaeological record is replete with societies that relied extensively on bison, technically speaking, can all of these societies be considered "specialized bison hunters"? This begs the question: What constitutes a specialized hunting economy?

Drawing on earlier studies which have investigated and characterized specialized economies (e.g., Brumfiel and Earle 1987; Costin 1991; Muller 1984; Rice 1981; Tosi 1984), a specialized bison hunting economy should involve a system in which hunters "depend on extra-household exchange relationships at least in part for their livelihood, and consumers depend on them for acquisition of goods they do not produce themselves" (Costin 1991:4). As such, key elements of specialized economies are surplus production and exchange. From this perspective, while it is apparent that numerous prehistoric Plains groups certainly focused on bison hunting, most of these societies probably cannot be considered "specialists" in a strict economic sense since they did not derive a large part of their livelihood from goods obtained through the exchange of bison products. Rather, bison hunting in most of these instances was conducted to meet basic subsistence needs (see Frison 1991; compare to the Domestic Mode of Production, Sahlins 1972).

Thus, an important distinction that can be drawn between specialized and non-specialized hunting economies is whether products from the hunt were procured for personal consumption or for exchange with a consumer population. On the Southern High Plains the earliest well documented bison hunting specialists are the Querechos and Teyas of the Protohistoric period (A.D. 1450-1750) mentioned above. Ethnohistorically these societies are known to have produced a surplus of bison hides, dried meat, and bone for tools and other items for trade with sedentary horticulturalists living to the west and east of the Plains (i.e., Puebloans and the Caddo). These groups correspond to the Tierra Blanca, Garza, Edwards, and Wheeler complexes documented in the archaeological record (see T. Baugh 1982, 1986; Habicht-Mauche 1992; Hofman 1984, 1989b).

Using the definition of specialized economies presented above, the following discussion examines the extent to which hunting economies during the Middle Ceramic period can be characterized as "specialized bison hunting economies". Here, the degree to which Southern High Plains hunting economies were specialized or generalized is measured through a comparative analysis of faunal remains. It is recognized that demonstrating the exchange of bison products in the distant past and differentiating between exchange and simple sharing among prehistoric societies presents a challenge. Fortunately, the ethnohistoric and archaeological records document Protohistoric societies that are known to have bartered in bison products for a significant portion of their livelihood. As such, the economies of these groups are used as a starting point from which to measure the extent of hunting specialization among Middle Ceramic communities.

As with other types of specialized economies (i.e., chipped stone, metallurgy, ceramics, textiles), the degree of specialization in hunting should be considered on a relative scale (Costin 1991). Thus, the extent of specialization is examined once again through comparative analysis. Relying on faunal inventories from permanent settlements of various Middle Ceramic complexes of the Southern Plains, hunting strategies are placed along a continuum from specialized bison hunting to broad spectrum hunting. Placement along this scale is based on faunal diversity and the total number or percentage of bison remains in each assemblage. Due to a number of problems with existing assemblages mentioned above, other types of data, such as specialized bison processing tools, are not considered. Within this framework, it is expected that bison hunting specialists should display faunal assemblages which contain a low diversity of faunal species and unusually high frequencies of bison remains. The Middle Ceramic settlements used in this analysis include two Antelope Creek phase sites (Two Sisters and Landergin Mesa), two Odessa phase sites (Lundeen and Odessa Yates), and one Turkey Creek phase site (Heerwald).

The faunal inventories from these settlements are compared to those from the Duncan (34WA2) and Edwards I (34BK2) sites. Both of these sites are well-known Edwards complex (A.D. 1450-1650) settlements in western Oklahoma. As Hofman (1989b:98) notes, "the economy of Edwards complex people was apparently heavily focused 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". As noted earlier, Edwards and other related complexes (i.e., Tierra Blanca, Garza, and Wheeler), are the archaeological manifestations of the nomadic bison hunting societies described by early visitors to the region (see Baugh 1982; Bell and Bastian 1967; Habicht-Mauche 1992; Hofman 1984, 1989b; Monk 1982; Savage 1995). As such, the faunal assemblages from Duncan and Edwards I are used as a baseline for weighing the degree of specialization in bison hunting for each of the study sites. Figure 7.6 shows the location of each of the settlements used in this analysis. Overall, each of the sites selected here represent some of the few faunal assemblages that have been systematically collected, subjected to rigorous analysis, and are well reported in the literature (see Appendix II; Bevitt 1999; Demarcay 1986; Duncan 2002; Monk 1982; Savage 1995).

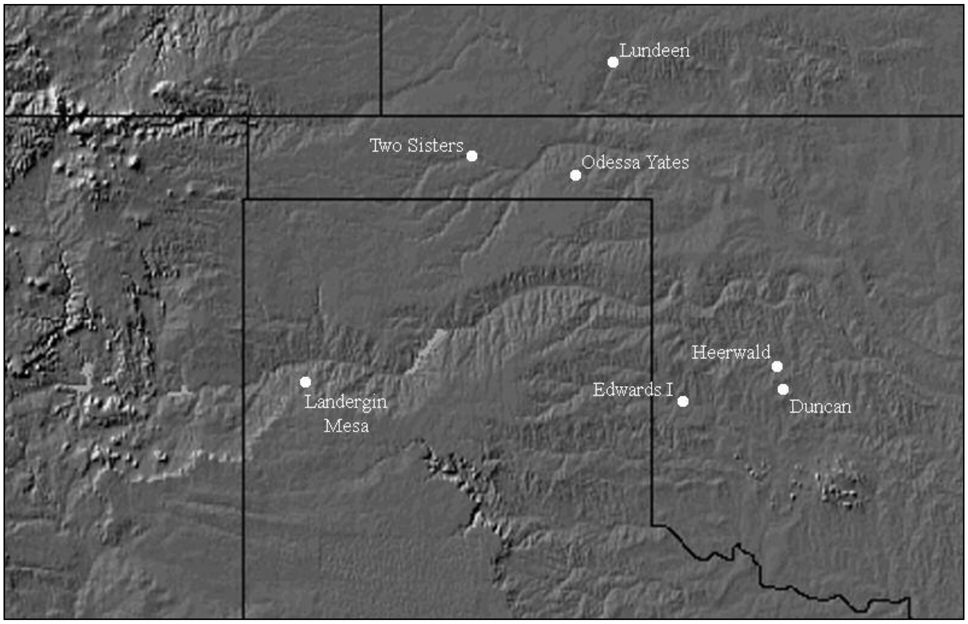


Figure 7.6 Location of Settlements Used in Faunal Diet Breadth Study.

Before this analysis is presented there are a number of potential difficulties that must be considered when comparing faunal assemblages from different sites. Often, these problems stem from differences in excavation and sampling techniques, preservation, variability among faunal analysts, and others. Although excavation techniques did vary among the study sites, the biases resulting from these differences appear to be negligible for the following reasons.

First, except for Odessa Yates where fine-screening with 3 mm mesh was employed, matrix from all of the study sites was dry screened through 6 mm mesh. Thus, while it is possible that smaller fauna may be underrepresented in the assemblages, since screening techniques were comparable among sites it is assumed that this bias should be roughly equivalent among sites. Second, since field techniques as a whole have improved over time, if there is a sampling bias against smaller fauna, one should expect higher frequencies of rodent, snake, fish, and amphibian remains recovered at settlements excavated more recently. This, however, does not seem to be a major problem since high frequencies of small fauna were recovered at most of the sites no matter their date of excavation (e.g., Two Sisters 1972 and 1973, Landergin Mesa 1984, and Lundeen 1998).

Overall, biases resulting from other factors appear to be minimal and sample sizes from each settlement are more than sufficient (i.e., NISP for each site are >1800). Lastly, the Antelope Creek phase faunal data presented by Duffield (1970) are not included here. These data are from excavations carried out at sites from about 1930 to 1961, and from an analytical perspective, are fraught with numerous problems (see Lintz 1986a:243-244; Spielmann 1982:288). As Lintz (1986a:244) has pointed out, the samples used by Duffield were derived from sites where screening was not systematically employed and only "identifiable" faunal specimens were collected.

Table 7.6 presents the faunal inventories for the Middle Ceramic settlements examined here. These data include the number of identified specimens (NISP) and minimum number of individuals (MNI) for all but Landergin Mesa (see Demarcay 1986). Freshwater molluscan fauna are excluded from these data. It should be noted that several closely related taxa are lumped for ease of data presentation. Thus, aquatic turtles, snakes and lizards, amphibians, fish, mice, ground squirrels, woodrats, and cottontails are not differentiated as to species, but are combined into individual classes. Likewise, deer and pronghorn are joined into a single class. Later, faunal diversity is examined in greater detail and specific information regarding the number of species identified at each site is presented at that time.

Table 7.6 Faunal Inventories for Select Southern Plains Middle Ceramic Settlements.

	Two Sisters			Landergin Mesa			Lundeen			Odessa Yates			Heerwald		
Mammals	**NISP**	**%**	**MNI**	**NISP**	**%**	**MNI**	**NISP**	**%**	**MNI**	**NISP**	**%**	**MNI**	**NISP**	**%**	**MNI**
Bison	344	47.2	8	752	59.9	-	668	30.8	10	2036	84.3	18	3285	88.6	39
Deer/Antelope	184	25.3	15	332	26.5	-	498	22.9	23	121	5.0	8	220	5.9	8
Artiodactyls	-	-	-	76	6.1	-	-	-	-	-	-	-	-	-	-
Fox	0	0.0	0	0	0.0	-	7	0.3	2	6	0.2	4	0	0.0	0
Coyote/Dog	10	1.4	2	2	0.2	-	19	0.9	3	29	1.2	8	19	0.5	3
Badger	4	0.6	1	1	0.1	-	22	1.0	3	0	0.0	0	1	0.03	1
Black-tailed Jack Rabbit	26	3.6	4	6	0.5	-	40	1.8	4	23	1.0	7	26	0.7	3
Cottontail Rabbit	16	2.2	4	15	1.2	-	35	1.6	5	10	0.4	2	66	1.8	10
Black-tailed Prairie Dog	35	4.8	6	28	2.2	-	831	38.6	49	0	0.0	0	0	0.0	0
Plains Pocket Gopher	80	11.0	10	12	1.0	-	8	0.4	2	64	2.7	6	12	0.3	3
Ord's Kangaroo Rat	17	2.3	6	1	0.1	-	3	0.1	1	118	4.9	9	67	1.8	14
Hispid Cotton Rat	6	0.8	3	2	0.2	-	1	0.04	1	5	0.2	3	0	0.0	0
Woodrat sp.	5	0.7	1	10	0.8	-	1	0.04	1	0	0.0	0	0	0.0	0
Ground Squirrel sp.	1	0.1	1	10	0.8	-	1	0.04	1	2	0.1	2	3	0.08	1
Mouse sp.	0	0.0	0	2	0.2	-	1	0.04	1	0	0.0	0	0	0.0	0
Striped Skunk	0	0.0	0	0	0.0	-	1	0.04	1	0	0.0	0	0	0.0	0
Beaver	0	0.0	0	2	0.2	-	0	0.0	0	0	0.0	0	1	0.03	1
Muskrat	0	0.0	0	4	0.3	-	17	0.8	4	0	0.0	0	1	0.03	1
Raccoon	0	0.0	0	0	0.0	-	18	0.8	2	0	0.0	0	6	0.2	2
Totals	**728**	**100**	**61**	**1255**	**100.3**	**-**	**2171**	**99.9**	**113**	**2414**	**100**	**67**	**3707**	**99.97**	**86**
Unid. Large Mammals	6845	72.7	-	-	-	-	-	-	-	17767	94.8	-	1858	66.3	-
Unid. Medium Mammals	2337	24.8	-	-	-	-	-	-	-	693	3.7	-	810	28.9	-
Unid. Small Mammals	237	2.5	-	-	-	-	-	-	-	290	1.5	-	134	4.8	-
Totals	**9419**	**100**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**18750**	**100**	**-**	**2802**	**100**	**-**
Turtles	1086	78.5	38	591	98.7	-	380	9.9	50	1151	94.0	24	2101	86.0	39
Snakes and Lizards	48	3.5	7	4	0.7	-	44	1.2	2	8	0.7	6	0	0.0	0
Amphibians	45	3.3	13	0	0.0	-	0	0.0	0	11	0.9	5	0	0.0	0
Fish	104	7.5	8	0	0.0	-	2996	78.5	22	27	2.2	5	99	4.1	1
Birds	101	7.3	16	4	0.7	-	397	10.4	56	27	2.2	4	244	9.9	16
Totals	**1384**	**100.1**	**82**	**599**	**100.1**	**-**	**3817**	**100**	**130**	**1224**	**100**	**44**	**2444**	**100**	**56**

Faunal inventories for the Protohistoric period Edwards complex sites selected for analysis (i.e., Duncan and Edwards I) are presented in Table 7.7. Once again, similar lumping techniques were employed to produce a manageably sized table. Whereas, the Middle Ceramic site assemblages did not appear to display any major sampling biases, Duncan has low quantities of small mammals, birds, and fish. For instance, small mammals represent only 0.5% of all mammals at this site. It is likely that these patterns reflect a sampling bias against small animals. Sampling appears to be less of a problem at Edwards I where small mammals are represented by a number of different species, and as a whole, comprise nearly 2% of all mammals.

Table 7.7 Faunal Inventories for Edwards Complex (A.D. 1500-1650) Settlements.

	Duncan			**Edwards I**		
Mammals	**NISP**	**%**	**MNI**	**NISP**	**%**	**MNI**
Bison	804	85.5	15	1076	86.6	23
Deer/Pronghorn	47	5	4	99	8	8
Coyote/Dog	7	0.7	1	45	3.6	5
Black-tailed Jack Rabbit	0	0	0	1	0.08	1
Eastern Cottontail	2	0.2	1	3	0.2	1
Black-tailed Prairie Dog	0	0	0	7	0.6	2
Plains Pocket Gopher	3	0.3	1	5	0.4	3
Hispid Cotton Rat	0	0	0	1	0.08	1
Thirteen-lined Ground Squirrel	0	0	0	3	0.2	1
Striped Skunk	0	0	0	1	0.08	1
Raccoon	77	8.2	1	1	0.08	1
Totals	**940**	**99.9**	**23**	**1242**	**99.92**	**47**
Unidentified Large Mammals	10491	30.3	**-**	**-**	**-**	**-**
Unidentified Medium Mammals	24083	69.6	-	-	-	-
Unidentified Small Mammals	21	0.1	-	-	-	-
Totals	**34595**	**100**	**-**	**-**	**-**	**-**
Turtles	7120	99.8	40	1072	98.0	205
Snakes and Lizards	7	0.1	2	8	0.7	-
Amphibians	0	0	0	3	0.3	3
Fish	2	0.02	1	0	0.0	0
Birds	8	0.1	1	11	1.0	8
Totals	**7137**	**100.02**	**44**	**1094**	**100**	**216**

The two primary faunal indices used here to measure the degree of hunting specialization among the study sites are faunal diversity and the overall abundance of bison in each assemblage (Figure 7.7). Faunal diversity equates to the total number of terrestrial, avian, and aquatic species (excluding freshwater mussels). To account for differences among faunal analysts some taxa are joined into single classes. In particular, aquatic turtles and fish were not consistently differentiated to species, so they are combined here. Likewise, because it is often not possible to differentiate between deer and pronghorn elements in highly fragmented assemblages, these ungulates are joined into one class. Other than these minor changes, all identified species are included in these figures. Determining the abundance of bison at each settlement is straightforward and was calculated based on the percentage of identified bison elements relative to the total number of identified mammal elements. For comparative purposes, two hypothetical sites are also included in Figure 7.7. These sites are labeled “specialist” and “generalist” and represent two conceptual extremes of the hunting spectrum.

The results of this comparison show some very interesting trends. It is readily apparent that two of the Middle Ceramic sites, Odessa Yates and Heerwald, compare very closely, both in terms of faunal diversity and the abundance of bison, to the two specialized bison hunting economies of Duncan and Edwards I. Overall, faunal diversity among the study sites varies from a low of 12 different species at Duncan to a high of 52 at Lundeen. As noted earlier, the unusually low faunal diversity index at Duncan is probably related to a sampling bias against small mammals, birds, and fish.

As such, it is likely that the number of species represented at this site is actually higher than is indicated here (i.e., >15 species). Odessa Yates has the next lowest number of species identified (N=18). Because all soil matrix from this site was subjected to fine screening it seems less likely that this low figure reflects a sampling bias against small fauna.

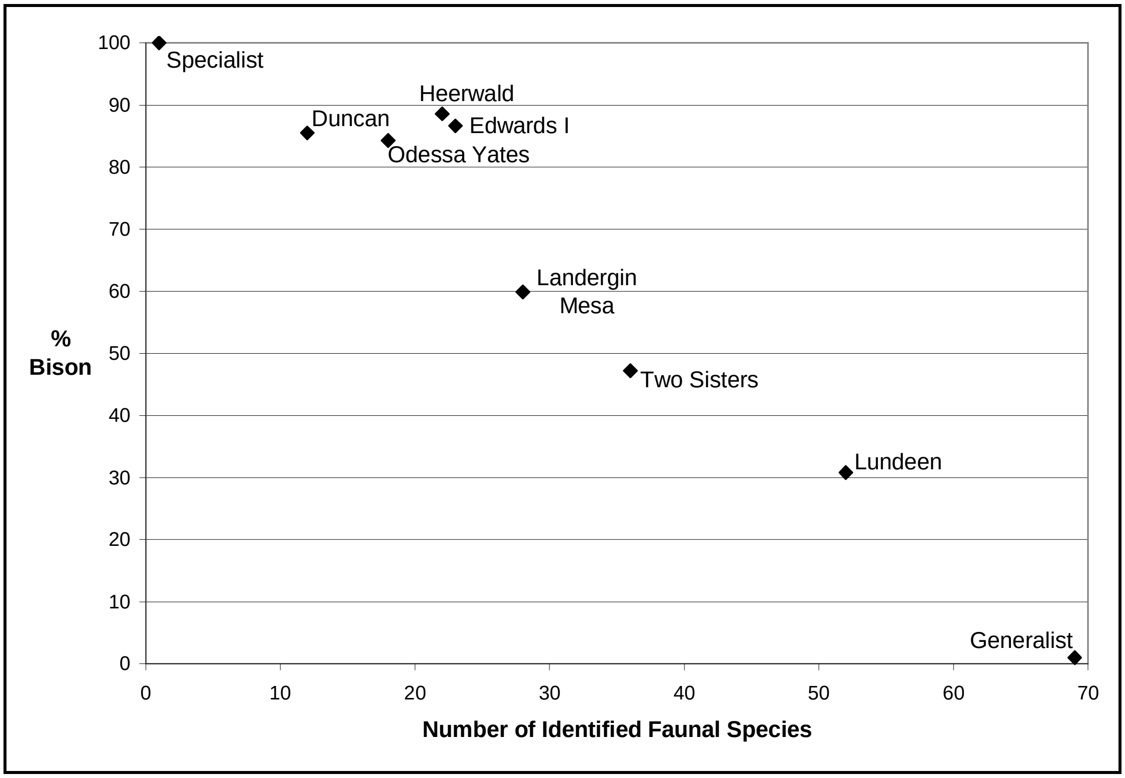


Figure 7.7 Faunal Diversity and the Abundance of Bison at the Study Sites.

Besides indicating the range of animals hunted or collected, it is possible that the diversity of species identified can also be a reflection of the environmental setting immediately surrounding each settlement. The sites used here (see Figure 7.6) are dispersed over a large area of western Oklahoma (Heerwald, Duncan, and Edwards I), north across the Oklahoma panhandle (Two Sisters and Odessa Yates) to southern Kansas (Lundeen). Landergin Mesa is to the west near the Texas-New Mexico line. Annual precipitation varies considerably from about 736 mm (29 in) at Duncan, to about 508 mm (20 in) at Odessa Yates, and 457 mm (18 in) at Two Sisters and Landergin Mesa. All of the settlements are along spring fed tributary streams, except the Two Sisters site, which is adjacent to the Beaver River.

Of all the sites, the potential impact that a productive environment may have on faunal assemblage diversity is best reflected by the Lundeen site. Bevitt (1999:20) notes that the Crooked Creek valley surrounding Lundeen contains numerous large sloughs or lakes that historically often held water for several years. Thus, the large numbers of waterfowl, aquatic turtles, and fish recovered at this settlement probably reflect seasonal hunting, gathering, and fishing at these locales (Bevitt 2004, personal communication). As a result, the diversity of species recovered likely reflects the abundance of wetlands near the site. Nonetheless, even when the diversity index at Lundeen is adjusted to account for the large numbers of birds (note: this index is already adjusted for fish and aquatic turtles), a fairly generalized hunting strategy is still indicated. Besides Lundeen, no other sites present assemblages that would indicate occupation of unusually productive settings.

Conversely, there were no settlements in which a low diversity of faunal species could be attributed to occupation of a particularly unproductive environment. For instance both Two Sisters and Landergin Mesa are in the most arid portions of the study area, but both still have some of the highest faunal diversity indices. Overall, except for Lundeen, the range and abundance of various fauna within a 5 km catchment zone around each settlement appears to have been roughly equivalent. In addition, the species represented at each site also indicate that all environmental zones around settlements were used (i.e., riparian, breaks, and uplands). As a result, it is concluded that the diversity of species presented for each site is a fair measure of diet breadth and not settlement in settings that are unusually rich or poor in resources.

The abundance of bison at each of the settlements varies from 84% to 89% at Odessa Yates, Duncan, Edwards I, and Heerwald to 31% at Lundeen. As noted earlier, the frequency of bison represents the total number of bison elements relative to the total number of mammal elements. As such, this variable is useful because it represents a measurement that is largely independent of the faunal diversity index. Whereas the total number of faunal species seems to be a reasonable reflection of the range of animals hunted or gathered in most cases, the overall quantity of bison elements recovered at a permanent settlement can be subject to a large number of social processes. For example, the proximity of bison kills to residential settlements, transport and processing strategies, and the length and season of occupation are all variables that can greatly affect the amount of bison bone in an assemblage. Since there are considerable disparities in the abundance of bison among the study sites, it is worthwhile to explore how some of these dynamics could have affected the frequency of bison elements compared to other mammals.

The location of bison kills and their proximity to settlements has obvious potential for influencing the amount and types of bison elements represented in the faunal assemblages of residential sites (see Binford 1978, 1984). The average dressed weights for bull and cow bison are about 246 and 212 kg (541 and 467 lbs), respectively (derived from Halloran 1961:Tables I and II). Given the large body size of bison and the limitations associated with Middle Ceramic and Protohistoric transport technology (i.e., human and dog transport), bison hunters were faced with a number of logistical problems related to transporting animals from kills to residential sites. As the distance between bison kill locations and settlements increases the costs of transporting animals also increases.

Previous research has examined the relationship between transport and butchering/processing strategies among various types of societies (Binford 1978, 1984; Bunn 1983; Bunn et al. 1988; Metcalfe and Jones 1988; Speth 1983, 2004). Beyond the logistical problems associated with transporting animals back to settlements, processing strategies are also influenced by a number of factors, including the number of animals killed, demands for meat, marrow, bone grease, and bone tools; the food utility of various body parts (i.e., meat, marrow, bone grease, fat utility), and the size, age, and nutritional status of animals (see Binford 1978, 1984; Emerson 1993; Speth 1983).

In general, these issues are less of a problem with other fauna of the region since these animals are characterized by smaller body sizes. For instance, the average dressed weights of adult male and female pronghorn are about 30 and 26 kg (66 and 57 lbs), respectively (Mitchell 1971; Miracle 2004). Other constraints aside, one of these animals could easily be transported over fairly long distances by a single hunter. Thus, except for perhaps deer, other non-bison faunal resources hunted by the occupants of the region were more likely to be transported to settlements with little field processing. As a result, it might be expected that all skeletal portions of these animals stand a greater chance of being recovered at settlements.

With these points in mind, it is worth considering the possibility that each of the settlements examined here may have emphasized bison hunting equally, but that the amount of bison remains in each assemblage varied because the distance between kills and settlements also varied (i.e., the transport and processing strategies differed). Of particular concern, is the likelihood that the comparatively low frequencies of identified bison elements at settlements, such as Lundeen and Two Sisters, resulted because the occupants of these sites conducted bison hunts far from home, while those settlements containing high frequencies of bison remains represent cases where bison kills occurred close to settlements.

Weighing the utility of various anatomical parts and the costs associated with transporting these items, the types and frequencies of bison elements represented in assemblages can provide an approximate measure of the distance between kill sites and settlements. Generally, as transport costs increase bulky portions of animals of low utility (e.g., cranium, innominate/sacrum) are more likely to be abandoned at kills, while anatomical segments of high utility (e.g., femur, tibia, humerus, radius) are more frequently transported back to settlements (see Emerson 1993 for bison utility indices). Thus, assemblages that contain bulky, low utility elements are usually interpreted to mean that kills occurred close to the settlement and transport costs were low. In contrast, in systems where kills were typically conducted far from home, assemblages should contain fewer low utility elements and larger numbers of high utility elements.

From this perspective, it is possible to determine whether the reliance on bison at Lundeen and Two Sisters was equal to that of Edwards I, Duncan, Odessa Yates, and Heerwald, but because bison were killed far from settlements, low utility elements may have been processed and discarded at kill locales, and thus, are underrepresented in these assemblages. Even though these issues are less of a concern for Edwards I, Duncan, Odessa Yates, and Heerwald, since all of these sites have high frequencies of bison bone in their assemblages, the distance between kills and settlements is also considered for these sites.

Using the types of bison skeletal elements transported to the study sites, it is possible to determine the general proximity of settlements to bison kills (e.g., close, moderate, and distant). If sites containing relatively low frequencies of bison remains also primarily contain bison elements of high utility, then it may be concluded that transport and processing decisions may have influenced the composition of faunal assemblages causing bison elements to be underrepresented at these settlements (i.e., underestimating the importance of this resource to the economy). If kills were conducted close to settlements, then it is expected that transport and processing decisions did not greatly impact the composition of faunal assemblages and all types of elements, regardless of their utility, should be represented. In many instances this issue has been already been explicitly addressed by previous researchers and is not reviewed here (see Appendix II; Bevitt 1999; Duncan 2002; Savage 1995). In two cases, Landergin Mesa and Edwards I, this issue has not been formally examined, but elemental frequencies are available (Demarcay 1986:Appendix; Monk 1982:Table 12). Using these previously published data the projected distance to kills, along with the seasonality of occupation and the timing of bison kills, if available, are presented in Table 7.8.

Table 7.8 Seasonality of Occupation and the Timing and Proximity of Kills to Sites.

Site	**Seasonality of Occupation**	**Seasonality of Bison Kills**	**Estimated Distance to Kills**
Two Sisters	Year Round	Spring	Close
Landergin Mesa	Spring to Fall?	Spring or Early Summer	Close
Lundeen	Year Round	Unknown	Close to Moderate
Odessa Yates	Year Round	Fall to Spring	Close
Heerwald	Year Round	Fall, Spring to Early Summer	Close to Moderate
Duncan	Fall	Fall	Close to Moderate
Edwards I	Warm Season	Unknown	Close to Moderate

The projected distance to kills based on the recovery of portions of skeletons with contrasting utility indices suggest that bison kills were regularly conducted at relatively close or at moderate distances to each of the settlements. Although not equally represented, both high and low utility portions of animals are present at all of the sites (Appendix II; Bevitt 1999:Table 30; Demarcay 1986:Appendix; Duncan 2002, personal communication 2004; Monk 1982:Table 12; Savage 1995:Tables 5.8, 5.9). This pattern is perhaps most evident at Odessa Yates (see Figure 4.11). Similar patterns are observed at Landergin Mesa and Two Sisters (Demarcay 1986:Appendix; Duncan personal communication 2004). Based on these patterns it is concluded that kills occurred close to all three of these settlements. Settlements listed as having kills at close to moderate distances contained both high and low utility elements, but researchers observed lower frequencies of certain anatomical segments, namely axial elements (see Bevitt 1999:147-148; Savage 1995:149). Lower frequencies of these elements suggest that some kills were far enough away from settlements that particular portions of animals were processed and left at kill locales (see Speth 2004 for a discussion of intervillage trade in axial elements). Nonetheless, the fact that three of these four settlements (i.e., Heerwald, Duncan, and Edwards I) contain abundant quantities of bison bone suggests that in these instances the proximity of kill locales did not adversely affect our perceptions of the importance of bison to these economies.

Since faunal analyses typically emphasize identifiable specimens, the processing of bison bone for marrow and bone grease also has the potential to affect the apparent quantity of bison elements in assemblages. Although these activities typically rendered most elements into small fragments, they do not appear to have caused bison bone to be underrepresented in any of the assemblages because intensive processing appears to be equally well represented among each of the study sites (Bevitt 1999; Brosowske unpublished data; Demarcay 1986; Duncan 2002, personal communication 2004; Monk 1982; Savage 1995). As a result, it is anticipated that a failure to identify bison remains should be roughly equivalent among each of the study settlements.

The final factor that must be investigated is to determine whether the quantity of bison remains at any of the sites was influenced by the duration or season of occupation. This issue is important because it is possible that bison hunting was a seasonal activity for the occupants of some sites. If so, it is feasible that some settlements were occupied during times of the year when bison were not hunted, thus, potentially underestimating the importance of this resource. In most cases, this factor does not appear to have influenced the composition of assemblages since nearly all of the Middle Ceramic settlements appear to have been occupied throughout the year (i.e., four of five sites). As such, it is assumed that the faunal remains recovered at these sites are representative of hunting strategies throughout the year.

The only Middle Ceramic settlement for which the reconstructed length of occupation is less than year round is Landergin Mesa. The seasonality data available from this site are extremely meager and consist of the remains of a fetal or new born pronghorn and turtle elements. These data suggest occupation during the warm season (i.e., spring to fall). Generally, evidence for winter occupation at settlements of the region is often derived from either mammal dentitions or migratory waterfowl remains. However, since both of these forms of evidence are relatively rare at most sites of the region, it is not surprising that they were not recovered at Landergin Mesa. Therefore, even though data indicative of a winter occupation were not recovered at this settlement does not necessarily imply that people were not here during this time of the year. Overall, the fact that seasonality data is lacking at this site is somewhat of a mute point because bison remains are abundant at this site.

Seasonal reconstructions for the two Edwards complex sites appear to suggest relatively short-term occupations, possibly seasonal in nature. A fall occupation is indicated by bison dentitions at the Duncan site (Savage 1995:146). Dentitions were apparently absent from Edwards I and the presence of turtle remains in the assemblage provides minimal evidence for occupation during the warm season (Monk 1982). The seasonal nature of these Protohistoric settlements is not surprising as previous reconstructions suggest that these societies were seasonally mobile (see T. Baugh 1982, 1986; Drass and Savage 1992; Hofman 1978, 1984, 1989b). These conclusions are based largely on the absence or rarity of subterranean storage facilities, permanent residential structures, and evidence for horticulture. Because both Duncan and Edwards I represent seasonal encampments, and since we have little evidence for organization of their economies for the rest of the year, it is only possible to characterize their hunting strategies based on the data available from these two sites. Therefore, it is possible that the emphasis on bison hunting by Edwards complex societies, as represented by Duncan and Edwards I, may have been seasonal, possibly a fall activity. Nonetheless, even though these sites represent seasonal occupations, the low diversity of faunal remains and the high frequency of bison elements at each of these settlements provide excellent examples of what the faunal assemblages of specialized bison hunters should look like. It should be noted that both of these sites only somewhat approach the patterns expected at the hypothetical "specialized" site shown in Figure 7.7. However, since the composition of the faunal assemblage presented for this hypothetical site is based on the patterns observed at bison kill sites (i.e., species diversity equals one, bison comprise 100% of the assemblage), it is not surprising that even the faunal assemblages recovered from fairly permanent settlements of specialized bison hunters fall short of these expectations.

Overall, the comparative analysis of faunal assemblages from five Middle Ceramic period settlements of the Southern Plains demonstrates considerable variation in the organization of regional hunting strategies. Since all of these settlements were occupied from A.D. 1250 to A.D. 1500, this variation does not appear to be related to differences in regional climate across space or through time. Rather, these data document fundamental differences in the organization of subsistence economies. These trends are perhaps most evident for the settlements of Two Sisters, Lundeen, and Odessa Yates, which are all geographically close to one another. Similar patterns are also observed for western Oklahoma, but space and time constraints limited the number of Middle Ceramic sites, beyond Heerwald, that could be formally examined (see Drass and Flynn 1990). Likewise, variation in the setting of sites, distance to kills, and transport and processing strategies were also examined, but they do not appear to have greatly influenced the patterns observed in assemblages. As such, the results presented in Figure 7.7 are interpreted to represent examples of hunting strategies along various points of a continuum from specialized bison hunting to broad spectrum hunting. The two Edwards complex sites have provided a means by which to gauge the importance of bison in Middle Ceramic economies.

The results indicate that two settlements, Odessa Yates and Heerwald, have faunal assemblages that closely match the assemblages from the Protohistoric period specialized bison hunting sites of Duncan and Edwards I (i.e., low diversity of fauna and high frequencies of bison). Given these notable similarities, it is proposed that the emphasis on bison hunting observed at Odessa Yates and Heerwald approximated that of Duncan and Edwards I. Since Protohistoric societies associated with Duncan and Edwards I were known to have produced a surplus of bison products for exchange, it seems likely that the occupants of these two Middle Ceramic settlements did so as well. Compared to the above sites, the faunal assemblages from Landergin Mesa, Two Sisters, and Lundeen indicate more of an emphasis on broad spectrum hunting. I would suggest that the patterns presented by these assemblages likely reflect bison procurement for local consumption.

Lastly, the differences between specialized bison hunting and broad spectrum strategies proposed here are only further clarified when additional data are examined. For example, the contribution of different classes of mammals at each site is shown in Figure 7.8. Among Two Sisters, Landergin Mesa, and Lundeen, the latter site is certainly most similar to the hypothetical "generalized" site shown in Figure 7.7. Even without considering the importance of birds, fish, and reptiles to the diet, this site still displays a fairly equal representation of each of the four mammal classes. Once again the importance of bison to the Odessa Yates, Heerwald, Duncan, and Edwards I economies is aptly demonstrated by these data. As noted earlier, bison represent >84% of all mammals at each of these settlements. These quantities are nearly 20% higher than at any other site.

Intermediate to Lundeen and the proposed specialized bison economies are Two Sisters and Landergin Mesa. It is worth noting that bison are the most numerous of all mammal classes at both of these sites (i.e., Two Sisters 47.2%; Landergin Mesa 64.8%). As such, the assemblages from these two settlements present a pattern commonly observed for many portions of the Plains. Generally, these results are interpreted to mean that bison hunting dominated the hunting economy. Oftentimes, these interpretations are further bolstered using MNI's and information regarding the amount of usable meat provided by each faunal resource (e.g., bison, deer, jackrabbits, prairie dogs, etc.). While certainly accurate to some extent, to conclude that the occupants of these sites were specialized bison hunters is misleading. It is suggested that these propositions are not particularly meaningful when presented outside a comparative framework.

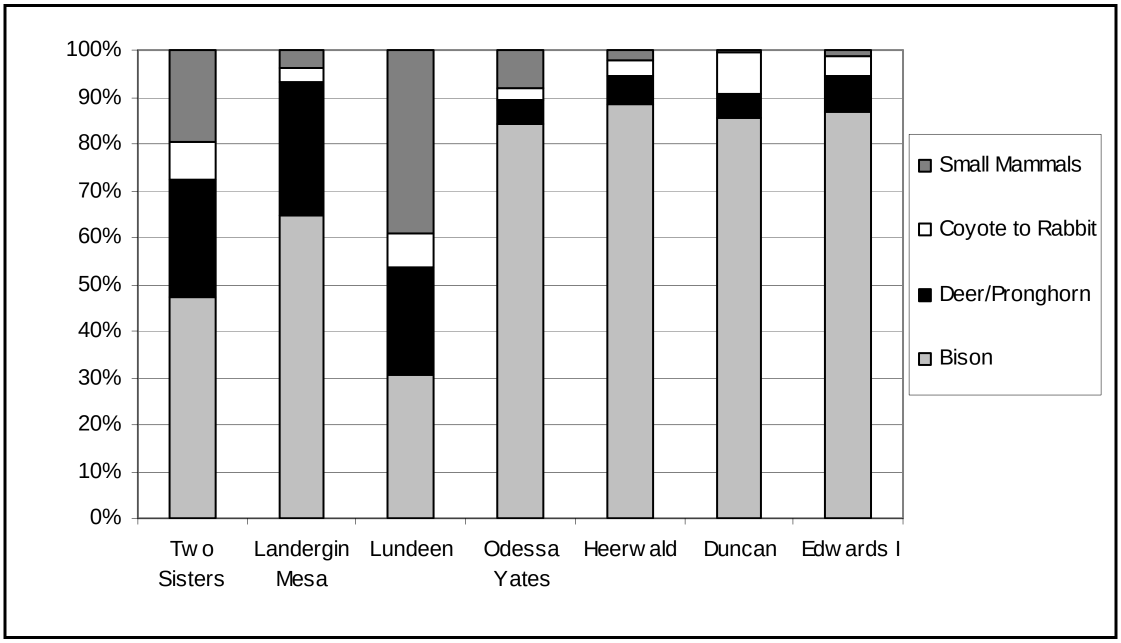


Figure 7.8 Mammal Classes and their Contribution to Diet at the Study Settlements.

Previous studies have also emphasized the relative importance of bison to deer and/or pronghorn in regional subsistence economies (e.g., Boyd 1997; Dillehay 1974; Drass and Flynn 1990; Duffield 1970). Generally, these studies interpret differences in the ratios of these large mammals among settlements as reflecting environmental changes through time or across space (e.g., bison increased in abundance following A.D. 1300 or bison were more common in western Oklahoma than in central Oklahoma).

The ratio of bison to deer and antelope (derived from NISP data) among the study sites presents some fairly dramatic trends (Figure 7.9). It is very apparent that bison considerably outnumber the combined class of deer and antelope at Odessa Yates and Heerwald (i.e., the average ratio is nearly 16 to 1). These results compare quite nicely with specialized bison hunting sites of Duncan and Edwards I where the average ratio is 14 to 1. These ratios are much higher than those observed for Two

Sisters, Landergin Mesa, and Lundeen (i.e., the average ratio is about 2 to 1). The latter ratios are more indicative of generalized hunting economies. As noted above, the variability in hunting strategies among societies of the region are typically attributed to environmental variability. However, since each of the Middle Ceramic period sites examined are roughly contemporaneous and are distributed throughout much of the region, it is proposed that an ecological explanation for the data presented here is not particularly helpful. Rather, it is proposed that these results reflect fundamental differences in the orientation and organization of hunting economies by the occupants of these sites.

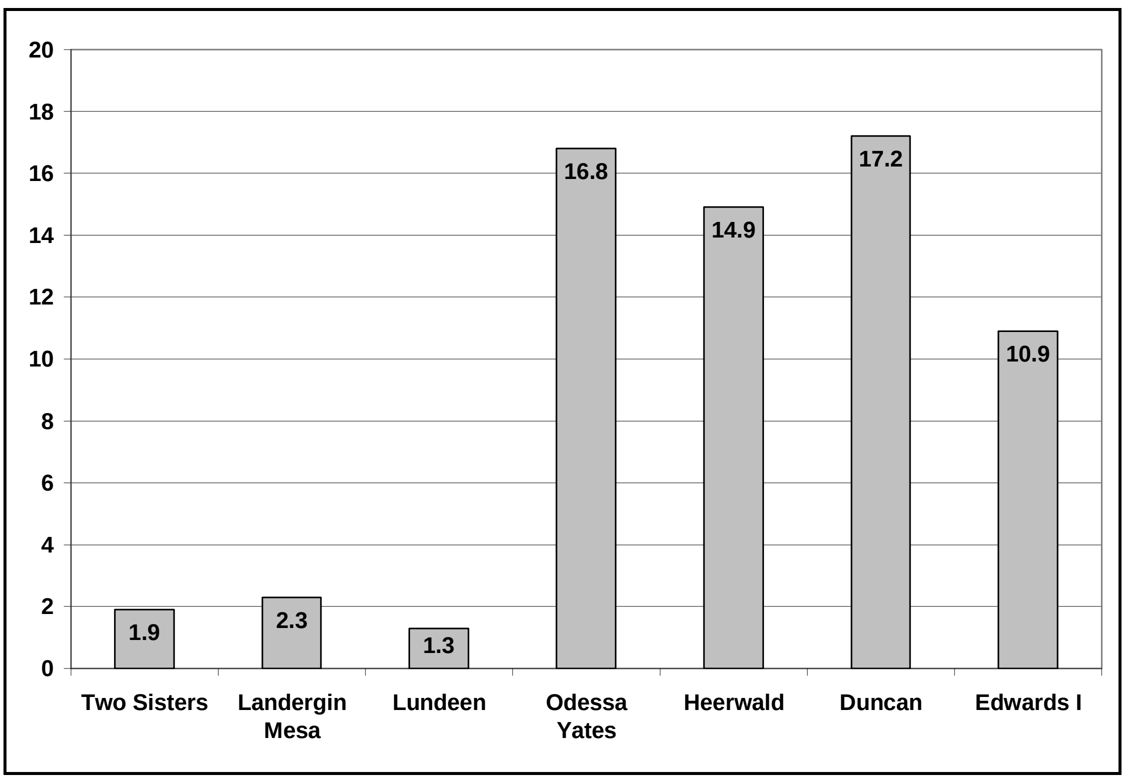


Figure 7.9 Bison to Deer/Antelope Ratios at the Study Settlements.

Summary

Case studies that examine the intensification of subsistence economies have oftentimes focused on horticulture and the role of irrigation in agricultural production. Given the lack of precise temporal control and the paucity of botanical data, our ability to document variability in horticultural productivity of the region is currently out of reach. Nevertheless, evidence for intensification is indicated for other segments of the economy, namely chipped stone tool production and bison hunting. Even though chipped stone production and hunting are fundamentally different segments of the economy, intensification of these two activities was most effectively discussed and described using the concept of specialization. The results of these analyses indicate that economic behavior varied considerably from one settlement to another. Importantly, this variability was discernable through cross-cultural analysis and the adoption of a comparative approach and enabled human behavior to be measured along a relative scale. In this instance, the value of this approach was further enhanced by holding spatial and temporal parameters among settlements roughly uniform.

Considering the high frequencies of nonlocal items recovered at the Alibates Ruins and Odessa Yates, it is suggested that the driving force behind the economic intensification documented here was to produce a surplus of items for regional and interregional exchange. Previous studies of regional exchange have emphasized relationships that developed between societies of the Southern High Plains and the eastern Pueblos. Although this research has much to offer to that discussion, the last section of this chapter examines the organization of exchange among resident communities of the Southern High Plains. In particular, whether trade items present at settlements of the region were acquired through direct or indirect exchange and how these items were distributed among communities.

Redistribution on the Southern High Plains: The Emergence of Regional Centers

As noted in Chapter Five, previous research at Middle Ceramic age (A.D. 1250-1500) sites of the Southern High Plains has documented a wide variety of durable trade items whose sources of origin are the eastern Pueblos of New Mexico. These items include decorated ceramics, pipes, turquoise, marine shell, obsidian, and others (e.g., Baker and Baker 2000; Brosowske and Bement 1998; Crabb 1968; Harrison n.d.; Kreiger 1946; Lintz 1986a, 1991). The presence of these items attests to the development of exchange between societies of the Plains and Southwest at this time. However, the ability to demonstrate contact through the documentation of nonlocal trade items does not by itself result in models of social interaction. The process of describing exchange involves three interrelated steps: a) identification of source areas for these items, b) description of the spatial patterning of nonlocal items, and c) the reconstruction of the organization of exchange (Earle 1982:3-4). The last of these steps involves the interpretation of data under the guidance of an explanatory framework.

Previously, steps one and two were examined in Chapters Five and Six. Combined, these discussions and those presented in the ensuing chapter represent the final step toward reconstructing the organization of Middle Ceramic period exchange on the Southern High Plains. Although some aspects of Plains-Southwest trade are briefly considered, the primary emphasis of this study is on interaction and exchange between resident communities of the Southern High Plains. In particular, this study relies on the spatial distribution of obsidian artifacts from Middle Ceramic sites, in relation to their source areas, as a means for understanding the organization of regional exchange. The data for this investigation is provided by X-ray fluorescence (XRF) analysis of 139 obsidian artifacts from 21 Middle Ceramic period settlements of the Southern High Plains (see Appendix V; Baugh and Nelson 1987; Bement and Brosowske 2001; Brosowske 2004; Brosowske and Bement 1997; Lintz 1990; Mitchell et al. 1980). The results provide information regarding the procurement and distribution of obsidian, and by extension, other exotic items. Figure 7.10 shows the location of the settlements used in this analysis.

While nonlocal trade items of southwestern origin are documented at many settlements of the region, it is readily apparent that there is considerable variation in the frequency of these items from site to site (see Chapter Six). For instance, even though Southwest trade goods are documented at many Antelope Creek phase settlements, it is clear that many more of these items have been recovered at Alibates Ruin 28 and Chimney Rock Ruin 51 than all of the other sites of the phase combined (Chapter Six; see also Lintz 1986a, 1991; Studer n.d.). Similarly, Odessa Yates, an Odessa phase settlement in Beaver County, Oklahoma, also contained much higher quantities of southwestern exotics than did other related sites (Brosowske and Bement 1997; see Chapter Six and Appendix V).

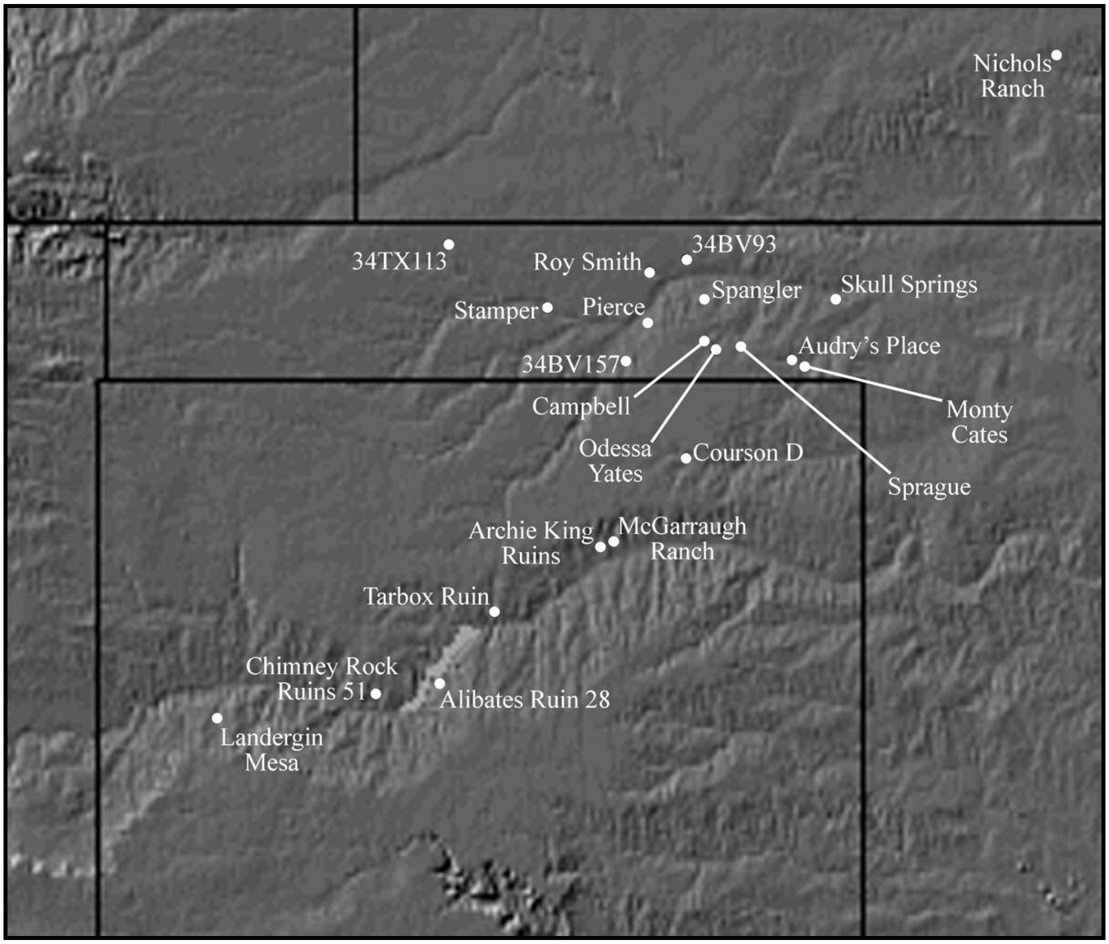


Figure 7.10 Distribution of Settlements Used in Obsidian Study.

Overall, the quantities of Southwest trade items rarely surpass 50 items at most Middle Ceramic settlements of the region, although 100 to 300 exotics are known from a handful of sites (Tables 6.1 and 6.7). As such, the several thousand Southwest exotics documented at Alibates Ruin 28, Chimney Rock Ruin 51, and Odessa Yates stand in marked contrast to other settlements. The quantities of southwestern trade items at Alibates Ruin 28, Chimney Rock Ruin 51, and Odessa Yates sites mark these settlements as likely candidates for regional trade centers that participated in direct exchange with Puebloan communities. However, given that Alibates Ruin 28 and

Chimney Rock Ruin 51 are much closer to the eastern Pueblos than Odessa Yates, it is possible that exotics found at Odessa Yates were obtained through down-the-line exchange with the occupants of one or both of these two communities. Assessment of this hypothesis is examined here through a trace element analysis of obsidian from these settlements. If Odessa Yates obtained this resource from Alibates Ruin 28 or Chimney Rock Ruin 51, then it is expected that the obsidian source areas documented at Odessa Yates should mirror those of these two communities. On the other hand, if the obsidian source areas at Odessa Yates do not correspond with these communities, then it is concluded that the inhabitants of this settlement established independent trade relations with communities of the Southwest.

X-ray fluorescence analysis and the correlation of obsidian with source areas are both topics that have been thoroughly described elsewhere. As a result, these topics are not examined here (see Anderson et al. 1986; Nelson 1984, 1985). Rather, the objective of this discussion is to briefly describe the obsidian samples that were studied as a part of this investigation and to present the results of XRF analyses. All trace element analyses were performed under the direction of Steven Shackley at the Archaeological XRF Laboratory at Berkeley, California. A total of 45 obsidian artifacts from Alibates Ruin 28 (N=39) and Chimney Rock Ruin 51 (N=6) were analyzed as a part of this study. Items from Alibates Ruin 28 were recovered from rooms 23, 25, and 45, areas 1, 2, 3, 6, 7, 8, 16, and 22, and surface contexts. Artifacts from Chimney Rock Ruin 51 are from areas 1 and 2, the two main areas excavated at this site. Artifacts sampled included projectile points (N=5), flake debris or shatter (N=35), bifaces (N=2), and amorphous cores (N=3). Visually, these artifacts represent the full range of obsidian present in these assemblages and include translucent, opaque, banded, and other varieties. Likewise, a total of 45 obsidian artifacts from Odessa Yates were also subjected to XRF analysis. This sample contains a similar range of artifact types and obsidian varieties described above and includes items from residential structures and surface contexts. Appendix V provides the trace element information for all of the artifacts used in this analysis.

Table 7.9 provides source provenance information for obsidian artifacts from Alibates Ruin 28 and Chimney Rock Ruin 51. Except for one flake from Alibates Ruin 28 that was derived from the El Rechuelos (Polvadera Peak) source in north-central New Mexico, all of the artifacts from Alibates Ruin 28 and Chimney Rock Ruin 51 are manufactured from Cerro Toledo Rhyolite obsidian. Primary sources for this material are the Jemez Mountains and include Obsidian Ridge, Rabbit Mountain, and Cerro Toledo localities (see Figure 5.2). Since obsidian from each of these sources are chemically indistinguishable from one another and are ultimately derived from the Cerro Toledo Rhyolite eruptions, following Baugh and Nelson (1987) the correct term for these materials is Cerro Toledo Rhyolite (see Shackley 2004). Small cobbles of Cerro Toledo obsidian are also documented in the alluvium of the Rio Grande River (Church 2000).

The source provenance for obsidian recovered from Odessa Yates indicates that these items were derived from source areas in the Jemez Mountains and the Northwestern Plains (Table 7.9). Jemez Mountain sources include Cerro Toledo Rhyolite and Valle Grande (Cerro del Medio) (Figure 5.2). Northwestern Plains sources include Fish Creek, Wyoming and one unknown source (Figure 5.1). The latter exhibit a chemical composition with high strontium values and indicate that they were also derived from the Yellowstone region (Shackley personal communication 2003). Lastly, two artifacts were visually identical to obsidian, but XRF analysis indicates that these items are not obsidian. These artifacts appear to be some knappable variety of smoky quartz. A specific source area for this material is not known at this time.

Table 7.9 Obsidian Source Areas for Alibates Ruin 28, Chimney Rock Ruin 51, and Odessa Yates.

Site	**Cerro Toledo, N.M.**	**El Rechuelos, N.M.**	**Valle Grande, N.M.**	**Fish Creek, Wy.**	**Unid.**	**Smoky Quartz**
Antelope Creek Phase						
Alibates Ruin 28	38	1	-	-	-	-
Chimney Rock Ruin 51	6	-	-	-	-	-
Totals (N=45)	**44 (97.8%)**	**1 (2.2%)**	**0 (0%)**	**0 (0%)**	**0 (0%)**	**0 (0%)**
Odessa Phase						
Odessa Yates	38	-	2	1	2	2
Totals (N=45)	**38 (84.4%)**	**0 (0%)**	**2 (4.4%)**	**1 (2.2%)**	**2 (4.4%)**	**2 (4.4%)**

The results of these XRF analyses allow us to assess the likelihood that obsidian artifacts present at Odessa Yates were obtained through down-the-line exchange with Alibates Ruin 28 or Chimney Rock Ruin 51 (see Brosowske 2004). First of all, it is apparent that obsidian artifacts from the Antelope Creek settlements along the Canadian River were almost entirely produced from Cerro Toledo Rhyolite, while obsidian from Odessa Yates was derived from multiple sources in New Mexico and the Northwestern Plains. The absence of Northwestern Plains obsidian at Alibates Ruin 28 and Chimney Rock Ruin 51 strongly suggests that Northwestern Plains obsidian was not obtained by the occupants of Odessa Yates through down-the-line exchange with Alibates Ruin 28 or Chimney Rock Ruin 51.

Regarding the Jemez Mountain sources, each of the obsidian samples examined here are dominated by Cerro Toledo obsidian (i.e., Alibates Ruin 28, 97.4%; Chimney Rock Ruin 51, 100%; Odessa Yates 84.4%). As such, it is entirely possible that Odessa Yates could have obtained this variety of obsidian through down-the-line exchange with the occupants of Alibates Ruin 28 or Chimney Rock Ruin 51. If this was the case, however, one would expect that at least some Valle Grande obsidian would also be represented at one of the Antelope Creek phase settlements. Since XRF analysis did not document any obsidian from this source, it seems unlikely that the Cerro Toledo Rhyolite and Valle Grande obsidian from Odessa Yates was obtained from Alibates Ruin 28 or Chimney Rock. In addition, even though the El Rechuelos source is represented by only a single artifact from Alibates Ruin 28, it is not documented in the sample from Odessa Yates.

Ideally, the results obtained by these analyses would have been one of the following: a) all of the obsidian from each of the three study sites was derived from the same source or b) that all of the obsidian from Alibates Ruin 28, Chimney Rock Ruin 51, and Odessa Yates was derived from different sources. The explanation of such results might be relatively straightforward and unambiguous. Nonetheless, the lack of congruence for obsidian source areas represented at the study sites suggest that most, if not all, of the obsidian from Odessa Yates was probably not obtained through down-the-line exchange with either Alibates Ruin 28 or Chimney Rock Ruin 51. This interpretation is further supported by an analysis of a broader range of nonlocal trade items presented in Chapter Six. These items appear to suggest that little direct social interaction occurred between the occupants of Odessa Yates and large Antelope Creek phase communities along the Canadian River. These data include substantial disparities in the quantity of southwestern ceramics, Alibates silicified dolomite, *Olivella* shell beads, Smoky Hill jasper, and decorated cordmarked ceramics.

The above results support the idea that the inhabitants of Alibates Ruin 28, Chimney Rock Ruin 51, and Odessa Yates had each established independent trade relationships with Puebloan settlements, particularly those in the Santa Fe, Pajarito, Albuquerque, and Española districts (see Chapter Six). The possibility that each of these three communities did not obtain Southwest exotics through direct exchange with the eastern Pueblos, but through some other means, seems unlikely for two primary reasons. First, there are no settlements that have been identified between the eastern Pueblos and the study sites that contain significant quantities of the nonlocal goods. Second, previous research indicates that nomadic groups that could have acted as intermediaries between Alibates Ruins, Chimney Rock Ruin 51, and Odessa Yates and the Southwest were absent during the Middle Ceramic period. For these reasons, it is concluded that southwestern exotics items present at these settlements could only have been obtained through direct trade with the Pueblos.

Overall, the archaeological signature of down-the-line exchange (i.e., goods fall-off with distance) is not observed among sites of the region. Rather distinct concentrations of nonlocal trade items occur at Alibates Ruin 28, Chimney Rock Ruin 51, and Odessa Yates. In addition, it should be emphasized that while nonlocal goods do appear to be more common at larger settlements, the fact that other communities of comparable size, occupational history, and sample sizes do not have equivalent numbers of exotics suggest that the frequency of these items at settlements is not solely a result of site size or temporal factors. Given the observed trends it is proposed that each of these communities could have served as regional distribution centers for obsidian and other southwestern exotics.

Using the same rationale applied above, a preliminary attempt to delineate the geographic area served by each of these trade centers is explored here. Although it is not possible to differentiate whether obsidian recovered at sites of the region was obtained from either Alibates Ruin 28 or Chimney Rock Ruin 51 since they are both dominated by Cerro Toledo Rhyolite, it should be feasible to determine if obsidian from a given site was obtained through down-the-line exchange (i.e., redistribution) with either of these two settlements or Odessa Yates. If so, then it is expected that the obsidian sources represented at other Middle Ceramic sites of the region should emulate those represented at the trade center where they obtained this resource.

Currently, our ability to assess whether Alibates Ruin 28, Chimney Rock Ruin 51, or Odessa Yates served as redistribution centers is limited because so little obsidian from Middle Ceramic sites of the region have been subjected to XRF analysis. In fact, prior to 1998, of the thousands of obsidian artifacts known for the region (see Baugh 1982; Lintz 1986a, 1991; Spielmann 1982), only 11 items from four Middle Ceramic sites of the Southern High Plains had been subjected to source analysis (i.e., Tarbox Ruin, McGarraugh Ranch, Skull Springs, and Landergin Mesa; see Baugh and Nelson 1987; Lintz 1990; Mitchell et al. 1980). Despite additional studies conducted by the author, sample sizes still remain small for most sites.

Nonetheless, they still enable some tentative statements regarding the potential role of these settlements as trade centers. Tables 7.10 and 7.11 present the results of trace element analyses for 49 obsidian artifacts from 18 Middle Ceramic age sites in the Texas and Oklahoma panhandles (Figure 7.10).

Table 7.10 Source Areas for Antelope Creek Phase Obsidian.

Site	**Cerro Toledo, N.M.**	**Valle Grande, N.M.**	**Obsidian Cliff, Wy.**	**Owyhee, Id.**
Texas				
Tarbox Ruin	1	-	-	-
McGarraugh Ranch	7	-	-	-
Landergin Mesa	2	-	-	-
Archie King Ruins	1	-	-	-
Total	**11 (100%)**	**0 (0%)**	**0 (0%)**	**0 (0%)**
Oklahoma				
Stamper	1	-	-	1
Roy Smith	4	1	1	-
Total	**5 (62.5%)**	**1 (12.5%)**	**1 (12.5%)**	**1 (12.5%)**

Even though source provenance data for obsidian from Antelope Creek sites still remain meager, it is apparent that significant variation in the obsidian source areas are represented at sites in the Texas and Oklahoma panhandles (Table 7.10). All of the obsidian from sites in the Canadian River valley of the Texas panhandle are derived from Cerro Toledo source areas. The dominance of this obsidian source at these settlements is essentially identical to what is observed at Alibates Ruin 28 and Chimney Rock Ruin 51. As such, considering that thousands of obsidian artifacts have been recovered at Alibates Ruin 28 and Chimney Rock Ruin 51, it is proposed that the obsidian present at these smaller settlements were derived through contact with one of these two settlements.

In contrast, Antelope Creek phase sites along Beaver River in the Oklahoma panhandle display a variety of sources from both New Mexico and the Northwestern

Plains (Table 7.10). The New Mexico sources include Cerro Toledo and Valle Grande. Northwestern Plains obsidian is documented at both Roy Smith and Stamper and includes Obsidian Cliff, Wyoming and Owyhee, Idaho. Excluding Cerro Toledo Rhyolite, the remaining sources are not represented at either Alibates Ruin 28 or Chimney Rock Ruin 51. This suggests that these two settlements were not the source for obsidian recovered at Roy Smith or Stamper. Although Obsidian Cliff, Wyoming and Owyhee, Idaho sources are not specifically documented at Odessa Yates, the combination of Cerro Toledo, Valle Grande, and Northwestern Plains sources mirrors the patterns presented earlier for this large Odessa phase settlement. As a result, it seems more likely that these materials were obtained from Odessa Yates or elsewhere rather than the more distant Antelope Creek phase communities along the Canadian River.

Combined, the source provenance information for 30 artifacts from eight Odessa phase and six unaffiliated settlements present very similar trends (Table 7.11). Obsidian from Cerro Toledo and Valle Grande sources in the Jemez Mountains and the Malad, Idaho source are documented at these sites. As a whole, the source areas documented at these sites appear most similar to what is observed at Odessa Yates than either Alibates Ruin 28 or Chimney Rock Ruin 51. Therefore, although it is certainly possible that some of the sites containing only Cerro Toledo Rhyolite could have received these items from Alibates Ruin 28 or Chimney Rock Ruin 51, given the spatial proximity of Odessa Yates to these sites, it seems more plausible that the obsidian recovered at these settlements was obtained from this settlement or elsewhere.

Table 7.11 Source Areas for Obsidian from Odessa Phase and Unaffiliated Settlements.

Site	Cerro Toledo, N.M.	Valle Grande, N.M.	Malad, Id.
Odessa Phase			
Skull Springs (34BV55)	1	-	-
Campbell (34BV97)	1	2	-
Sprague (34BV99)	4	-	-
Spangler (34BV104)	-	-	1
Monty Cates (34BV116)	1	-	-
Audry's Place (34BV122)	1	-	-
Sprague or Odessa Yates[a]	3	2	
Courson D (41OC29)	2	-	-
Totals	**13 (72.2%)**	**4 (22.2%)**	**1 (5.6%)**
Unaffiliated Sites			
Pierce (34BV172)	1	2	-
34BV93	1	-	1
34BV157	2	-	-
Nichols Ranch (14KW311)	3	-	-
34TX113	-	1	-
Totals	**7 (63.6%)**	**3 (27.3%)**	**1 (9.1%)**

[a] These items refer to five obsidian artifacts in a private collection which the individual was not certain whether the provenience was the Sprague or Odessa Yates site so they are combined here

Summary

This analysis has concentrated on the spatial distribution of obsidian as a means for reconstructing the structure of Middle Ceramic period exchange networks on the Southern High Plains. Although it is recognized that this investigation is limited at times by inadequacies in the available data sets (i.e., primarily sample sizes), dealing with a class of artifacts for which precise elemental signatures can be determined enables these items to be traced across the social landscape. The first step in this research was to identify the spatial distribution of obsidian at settlements of the region (Chapter Six). From a regional perspective, it was obvious that the settlements of Alibates Ruin 28, Chimney Rock Ruin 51, and Odessa Yates contained much higher frequencies of this resource than any other settlements of the region. Based on this distribution it was hypothesized that these communities served as regional trade centers.

Given the geographic proximity of each of these communities to obsidian sources in New Mexico, however, it was possible that Odessa Yates may have obtained obsidian through exchange with either Alibates Ruin 28 or Chimney Rock Ruin 51. This idea was examined through a trace element analysis of 90 obsidian artifacts from these three settlements. The lack of congruence of obsidian sources documented suggests that it was unlikely that Odessa Yates obtained obsidian through down-the-line exchange networks with either of these two large Antelope Creek settlements along the Canadian River.

In turn, the proposition that each of these three sites may have acted as regional distribution centers was tentatively supported by XRF source analysis results for 49 artifacts from 18 Middle Ceramic settlements. The results seem to indicate that Alibates Ruin 28 and Chimney Rock Ruin 51 supplied obsidian to other settlements of the Canadian River valley. While it is certainly possible that these centers also traded some obsidian to sites within the Beaver River drainage system, given their location and the obsidian sources represented, it seems more plausible that they received this resource through contact with the occupants of Odessa Yates or elsewhere. The presence of cordmarked ceramics with decorated rims and higher frequencies of Smoky Hill jasper at Antelope Creek sites in this area supports the idea of contact with the community of Odessa Yates (see Schneider 1969; Watson 1950).

Given the distances involved in traveling to the eastern Pueblos (i.e., between 300 and 500 km to the nearest Pueblos from each of these settlements), the number of people that likely comprised trading parties, the food required to feed the trading party to and from distant communities, and the ability for home settlements to remain economically viable while the expedition was gone, it is likely that only those communities in the region that were socially, economically, and politically the most complex could have organized and conducted such activities. Thus, it is not surprising that only some of the largest communities in the region contain evidence for participation in these expeditions.

Lastly, it may be noted that the terms distribution center and redistribution center were used interchangeably here when referring to the communities of Alibates Ruins, Chimney Rock 51, and Odessa Yates. This is not to suggest that these terms are synonymous, for indeed entirely different social, economic, and political arrangements characterize these two types of settlements. Rather, the problem lies in determining which of these two terms is most appropriate for describing these settlements. Of particular importance to this issue is the character of social relationships between these and other outlying settlements of the region. An analysis of obsidian source areas represented at these and other outlying settlements certainly seems to indicate that items obtained from the eastern Pueblos passed through these regional centers to other settlements. As such, the description of these settlements as either distribution or redistribution centers each has some merit. However, our ability to discern whether true hierarchical relationships characterized social systems at this time is limited by the data currently available.

Conclusions

An overriding point of interest in this study has been why exotic trade items are disproportionately represented at the Alibates Ruins, Chimney Rock Ruin 51, and

Odessa Yates compared to other settlements of the region. In preceding chapters many of the traditional explanations used by existing models to explain exchange relationships between societies of the Southern Plains and Southwest were explored (e.g., Lintz 1991; Spielmann 1982, 1983). These frameworks, however, were inadequate for explaining the patterns observed. For example, spatial and temporal factors, such as climate change or environmental variability, do not appear responsible for the discrepancies observed among settlements. Other potential explanations, such as disparities in settlement size, length of occupation, and proximity to exotic source areas were also examined, but they also held little power for explaining these differences.

Since the above explanations provided little assistance for understanding the dramatic differences in the distribution and frequency of exotics at Middle Ceramic settlements alternative explanations were explored. Theoretically speaking, an economic perspective was immediately attractive because of its long association with studies of exchange. In these studies exchange is envisioned as embedded in the larger social realm and exchange data is often used for understanding the evolution of human societies. Emphasis on the economy has directed this research to explore topics which previously have attracted little attention from researchers of the region. It is clear that this path has uncovered many significant correlations between communities, economies, and involvement in exchange. Although this chapter has covered a great deal of ground and a seemingly wide array of subjects, it should be apparent that all of these topics are closely related and represent steps toward economic intensification and emerging social complexity.

Examined from a historical perspective, the Early to Middle Ceramic transition on the Southern High Plains represented a period of intense social change. Although the timing and specific nature of these developments are poorly understood at present, key changes included increasing regional population size and density, decreases in settlement mobility, a reliance on food storage, changes in architecture and bone, chipped stone, and ceramic technologies, and at times, shifts in settlement size and location. In combination, it is obvious that these general trends have been played out many times the world over and are often linked to the emergence or expansion of food production. Among Odessa phase populations this certainly seems to be the case. Although current subsistence data are fairly poor for Antelope Creek phase, these societies appear to have practiced a subsistence economy based largely on foraging supplemented by cultivation. Nonetheless, these societies also embody many of the developments noted above. Thus, while changes in regional subsistence economies were undoubtedly important to some extent, it does not seem to be the primary stimulus leading to these changes. A more significant factor, however, seems to have been increasing competition over crucial resources which were highly variable in distribution and abundance.

Currently, available data indicates that the Southern High Plains was sparsely inhabited by small groups of mobile foragers during the Early Ceramic period. Although subsistence related data reflect a reliance on seasonally available plants and animals, recent studies indicates that horticulture was not unknown to these societies (Carmichael 2004). Even though regional populations were low and seem to have been dispersed at this time, evidence for violent conflict suggests that competition over key resources was a recurrent problem (Boyd 1997; Wilkens and Boyd 2000).

With the striking increases in population that mark the region with the onset of the Middle Ceramic period (A.D. 1250) it is not surprising that evidence for hostilities also rose dramatically. In fact, Brooks (1994b:320) interprets the available data as indicative of “moderate to large-scale conflict”. It is proposed that increasing intersocietal competition over important resources was at least initially a major factor that led to heightened conflict at this time. Evidence for increased competition over resources also resulted in the claiming of resources by resident societies and insured access to crucial resources as populations rose. Although the emergence of property rights in the context of increasing population is somewhat intuitive, the fact that the first permanent settlements also make their appearance at this time is perfectly logical. These settlements were placed adjacent to these resources and represented visible claims to important resources by both horticulturalists and foragers. In some cases, the placement of some communities in elevated locations appears to suggest selection of these settings for defensive reasons, however, settlement in these locations could also have served as visible markers of ownership.

Although difficult to demonstrate, it is likely that once some communities began to lay claim to important resources through the establishment of permanent settlements that others by necessity followed suit. From this perspective, it is easy to envision the development of land tenure systems as coinciding with the appearance of the first horticulturally based settlements in the region. Since sedentary communities are represented throughout the Southern High Plains, it is assumed that this development occurred on a region wide scale. Therefore, even though the establishment of permanent settlements and exclusive rights to resources was probably widespread, these developments are perhaps most apparent by the examples highlighted here: Antelope Creek communities near the Alibates quarries and the proximity of large Odessa phase villages to arable land. Both of these examples represent landed resources that were predictable, concentrated, limited in distribution, and were highly valued. As such, it is not surprising that they were subject to exclusive rights of use and access. These two cases are of interest because even though they represent fundamentally different types of resources, they are also types of resources whose production can be intensified.

If some communities were heavily involved in intersocietal exchange, then it is logical that they must be producing a surplus of some resource for export. In the two cases examined here, the Alibates Ruins and Odessa Yates, chipped stone tools and horticultural products would seem to be the most obvious choices for surplus production. Although much work remains to be done, it is clear that many of the households near the Alibates quarries were producing chipped stone implements far above and beyond normal consumption needs. Intensive quarrying, concentrated production at Alibates Ruin, standardized reduction techniques combined with the widespread distribution of finished Alibates items at contemporaneous settlements throughout the region further supports the hypothesis of intensified production by part-time craft specialists.

Arguably, besides Alibates silicified dolomite there are really no other obvious natural resources available in the region, such as clay, shell, salt, crystals or other types of tool stone, that readily apply themselves to claims of exclusive rights of access, intensified production, and exchange (i.e., are naturally abundant, predictable and limited in distribution, of high cultural value, etc.). As noted above, arable land is one possible exception to this claim, however, given the problems associated with current data sets, our ability to distinguish between differing levels of horticultural production is limited. Therefore, while a surplus of cultivated foods certainly could have been produced at Odessa Yates and other large Odessa phase settlements, an examination of the material assemblage from the community of Odessa Yates indicated another resource amenable to intensified production: bison products.

A comparative analysis of the faunal remains from several sites of the region indicates that the occupants of Odessa Yates developed a hunting economy that was organized similar to those of Protohistoric period societies. The latter are known ethnohistorically to have produced a surplus of bison products for exchange. The assemblage of Odessa Yates was quite aberrant compared to those from other Middle Ceramic age settlements and indicates that a limited variety of faunal species were exploited, of which, bison were far and away the dominant resource. It is suggested that the hunting economy of Odessa Yates is best described as a specialist system.

The faunal assemblage from Courson D (41OC29), a settlement at the Buried City locality, was not included in this analysis, but provides additional support for intensified bison procurement at Odessa Yates. Although the analysis of faunal materials from this site is not entirely complete, it represents an ideal case study for comparison with Odessa Yates because: a) both of these sites represent portions of similarly sized Odessa phase extended villages, b) both settlements are contemporaneous (A.D. 1250-1500), c) both of the economies are horticulturally based, d) in both instances bison kills occurred close to settlements, and e) these villages are only separated by approximately 42 km. While the assemblage from Odessa Yates indicates intensified bison procurement, the faunal assemblage from Courson D is quite different and indicates a generalized hunting economy more similar to that documented at Two Sisters or Landergin Mesa. Here, the ratio of bison to deer/antelope is approximately 3:1. The abundance of small mammals and aquatic resources, particularly fish, is similar to that observed at Lundeen. Considering the marked cultural similarities between Odessa Yates and Courson D, why are there such dramatic differences in the hunting economies of these two settlements? I would suggest that these differences relate to the extent of their involvement in long-distance exchange with the eastern Pueblos. This proposition seems to be supported by the quantities of southwestern exotics recovered from each of these villages.

While the exchange of food items is typically quite difficult to demonstrate archaeologically, the idea that the community of Odessa Yates was involved in intensified production of bison products for exchange is logical for the following reason. The primary source of exotic prestige items on the Southern High Plains are the eastern Pueblos (i.e., obsidian, marine shell, turquoise, decorated ceramics, etc.). Since these societies are known to have been intensive horticulturalists it seems improbable that Odessa Yates could have been exporting cultivated foods, such as corn, to these groups. In addition, as mentioned elsewhere, in the absence of transport systems capable of moving bulk staple foods, it also is unlikely that horticultural products could have been efficiently transported over the 450 km that separates Odessa Yates from the eastern Pueblos.

Table 7.12 Faunal Inventories for 41OC29 at the Buried City Locality.

	Area A House			Area B House		
Mammals	**NISP**	**%**	**MNI**	**NISP**	**%**	**MNI**
Bison	124	40.9	4	17	28.8	1
Deer/Pronghorn	37	12.2	2	9	15.3	1
Coyote	2	0.7	1	2	3.4	2
Badger	10	3.3	1	-	0.0	-
Black-tailed Jack Rabbit	2	0.7	1	-	0.0	-
Eastern Cottontail	21	6.9	2	-	0.0	-
Black-tailed Prairie Dog	9	3.0	3	10	17.0	3
Plains Pocket Gopher	56	18.5	7	12	20.3	2
Hispid Cotton Rat	12	4.0	7	6	10.2	2
Southern Plains Woodrat	27	8.9	5	3	5.1	1
Prairie Vole	3	1.0	2	-	0.0	-
Totals	**303**	**100.1**	**35**	**59**	**100.1**	**12**
Unidentified Large Mammals	2012	88.3	-	337	76.1	-
Unidentified Medium Mammals	154	6.8	-	37	8.4	-
Unidentified Small Mammals	113	5.0	-	69	15.6	-
Totals	**2279**	**100.1**	**-**	**443**	**100.1**	**-**
Turtles	56	7.4	5	35	16.0	2
Snakes and Lizards	21	2.8	1	9	4.1	1
Amphibians	12	1.6	3	8	3.7	2
Fish	626	82.6	19	159	72.6	4
Birds	43	5.7	6	8	3.7	2
Totals	**758**	**100.1**	**34**	**219**	**100.1**	**11**

The idea that societies of the Southern High Plains were exporting bison hides to southwestern communities is not a new development and has been previously proposed by numerous researchers (see T. Baugh 1982, 1986; Creel 1991; Habicht-Mauche 1992, 2002; Hofman 1984, 1989b; Spielmann 1982, 1983). The exact reasons underlying the demand for bison hides and meat by southwestern communities, however, has attracted little systematic research (see Spielmann 1982). As noted earlier, ethnohistoric accounts document the existence of specialized bison hunters on the Southern High Plains by A.D. 1540 (see Bolton 1949; Hammond and Rey 1940). Minimally, this suggests that the need for bison products at the Pueblos could have been present as early as the Middle Ceramic.

Recently, LeBlanc (1999) has proposed that a dramatic increase in the need for bison hides in the Southwest occurred following A.D. 1300 (see also Creel 1991). This increase in demand is attributed to the need for durable shields used in warfare following the appearance of sinew backed recurved bows. These shields were produced from the hump portion of bison hides (i.e., the toughest portion of the hide). Generally, the hump portion of one or two hides provided only enough material to produce a single shield (LeBlanc 1999). If indeed every male of fighting age in the Southwest required at least one shield, one can imagine that consumption rates of bison hides may have doubled or even tripled at this time. It is likely that this increase in demand provided more than enough incentive for some Plains societies to intensify bison procurement and hide production for exchange.

Although the exact character of products obtained from Plains societies still remains largely unexplored, the available data suggests that bison hides, sinew, robes, and possibly, dried meat, were the most likely items produced for export. Whatever the case may be it is apparent that there was a substantial increase in interaction and exchange between the two regions beginning during the Middle Ceramic period. Given the distances involved and the logistics associated with long-distance exchange, it is likely that very few communities of the Southern High Plains were capable of organizing and conducting trading expeditions to the Southwest. Of all of the Middle Ceramic settlements known, the high frequencies of southwestern exotics recovered at the Alibates Ruins, Chimney Rock Ruin 51, and Odessa Yates suggest that these three communities were involved in direct exchange with the eastern Pueblos. Although little information is currently available concerning Chimney Rock Ruin 51, all of the data examined here from the Alibates Ruins and Odessa Yates support this proposition.

Considering that the communities mentioned here are not particularly unique in terms of their size or other aspects, it is intriguing that Alibates Ruins, Chimney Rock Ruin 51, and Odessa Yates intensified economic production to produce a surplus of items for interregional exchange while other communities did not. The examples provided here suggest that multiple strategies for producing a surplus of products for exchange existed. For instance, the Alibates Ruins manufactured an abundance of chipped stone implements and Odessa Yates produced bison products. Unfortunately, the economic system of the Chimney Rock Ruin 51 is not known, but could provide a third strategy. While there are no indications which suggest that other similarly sized settlements of the region were not equally capable of incorporating these strategies to intensify production, the question remains why communities, such as Buried City, Coetas Creek, and settlements along Antelope Creek, did not.

If indeed the Alibates Ruins, Chimney Rock Ruin 51, and Odessa Yates were the primary communities in the region involved in direct contact and exchange with Southwest, it is very likely that these societies occupied positions of considerable sociopolitical power. From a regional standpoint, it is probable that these communities were already considered quite powerful due to their large size and their ability to produce a surplus of food and utilitarian items. However, their ability to establish and maintain ties with distant and largely unknown settlements almost certainly increased the regional standing of leaders in these communities to a different realm.

The final chapter of this study examines the potential role that local leaders could have played in the patterns highlighted here. It is proposed that enterprising leaders emerged at Alibates Ruins, Chimney Rock Ruin 51, and Odessa Yates and encouraged intensified economic production to produce a surplus for intersocietal exchange. Although similar leaders were undoubtedly present at other settlements, it is proposed that important differences in the aspirations of leaders existed. Considering that the Southern High Plains is marked by significant environmental uncertainly from year to year and season to season, it is likely that the surplus production revolved around basic food items which were used to establish debts among neighboring communities that could be called upon during subsequent times of need. While such strategies likely characterized most settlements of the region and certainly required leadership, I think the crucial turning point in social systems occurred when particularly ambitious leaders expanded their attention from the subsistence to the political realm of the economy. This transition coincided with the development of interaction and exchange with distant communities.

CHAPTER EIGHT

Alternative Roles of Exchange in Small-Scale Societies

Using the Middle Ceramic period of the Southern High Plains as a case study, the preceding chapters have presented a wide array of information surrounding the development and florescence of exchange. Although quite extensive in scope, this information provides the contextual foundation needed for understanding the various roles that exchange played in these societies. For numerous reasons, however, given that exchange is an activity that can have social, economic, and political components, an attempt to model its development through time is certainly a daunting, if not presumptuous, task. Thus, while it may be tempting to divorce exchange from the larger social context to isolate a specific function, such a strategy can diminish exchange to something much less than it actually was. With these cautions in mind, a general framework which seeks to explain the changing role of exchange in small, kin-based societies is presented. While never entirely separate or unrelated, the evolution of exchange in this study is interpreted as reflecting a shift in emphasis from concerns that are primarily subsistence related to those associated with the political side of life (see Bohannan 1955; Earle 1994, 2002).

Correlations between Types of Exchange and the Social Scale

Generally, the types of nonlocal objects recovered at settlements, the distances at which they were procured, and their context within sites provide the primary evidence for interpreting the meaning of exchange (see Earle 1982). As described in

Chapter Two, nonlocal items obtained through exchange are traditionally seen as related to one of two broad realms, the subsistence or political (e.g., Bohannan 1955; Earle 1994, 2002; Friedman and Rowlands 1978). The exchange of food, raw materials, and tools are typically attributed to the subsistence economy and are seen as strategies to buffer against economic shortfalls, even out resource distributions, and maintain access to neighboring territories (Braun and Plog 1982; Cobb 1993; Earle 1994). On the other hand, the transfer of nonutilitarian objects manufactured from shell, copper, galena, special stone, mica, and other exotics are frequently interpreted as status, wealth, or prestige objects and are linked to political activities (Earle 1994:427; Friedman and Rowlands 1978). These items may be obtained from distant settlements, time intensive to produce, and at times, convey socio-religious or ideological meanings.

Unfortunately, the meaning of exchange can be more problematic to interpret in some instances than others. The primary reason for this is that the nature of exchange can vary considerably depending on the social scale of the societies involved. For example, attributing the exchange of utilitarian items between family-level groups to the subsistence realm or associating the transfer of exotics between regional polities with the political realm is fairly straightforward (see Chapter Two). These two examples illustrate well the strong correlation that generally exists between social scale and various types of exchange. For obvious reasons, however, exchange among societies that span the evolutionary continuum between family-level groups and regional polities can be much more difficult to infer. This point is particularly germane for cases in the prehistoric record, including the present study.

Settlements documented for the region vary considerably from relatively isolated, single family residences to larger extended villages containing 100 to perhaps 250 people. To encompass the full range of social variability present in the area the term small-scale society has been used to describe these kin-based groups. It is apparent, however, that much of this study has been concerned with the largest settlements of the region, such as Alibates Ruin, Chimney Rock Ruin 51, Odessa Yates, and Buried City. Judging from their size, degree of permanence, and nature of subsistence economies, these sedentary settlements are analogous to the local groups described earlier in Chapter Two (see Johnson and Earle 2000). The terms tribal, nonstratified, middle-range, nonhierarchical, or transegalitarian have been used by others to describe similar types of societies found elsewhere (see Bender 1985; Cobb 1993, 2000; Dalton 1977; Feinman and Neitzel 1994; Hayden 1995, 1998; Mills 2000; Plog and Upham 1983; Upham 1990).

As Chapter Six has related, some of these communities contain high frequencies of nonlocal items, while others do not. Importantly, those settlements with large quantities of nonlocal objects also exhibit unmistakable signs of emergent social complexity (see Chapter Seven), yet they also lack many of the traits traditionally linked to institutionalized social inequality, namely monumental architecture and concentrations of wealth associated with certain burials or households. The absence of clear markers of status differentiation among these societies is not entirely surprising, however, since the ethnographic and archaeological records are replete with examples which demonstrate that social inequality is frequently manifested along a number of other dimensions in nonhierarchical societies

(Arnold 1996, 2000; Bender 1985; Cobb 1993, 2000; Dalton 1977; Feinman and Neitzel 1994; Godelier 1982; Hayden 1995, 1998; Malinowski 1984; Mauss 1967; McGuire and Saitta 1995; Mills 2000; Moore 1993; Muller 1997; Peregrine 1992; Plop and Upham 1983; Rappaport 1967; Sahlins 1963, 1968, 1972; Saitta 1994; Service 1966, 1971; Strathern 1973; Upham 1990).

Numerous studies demonstrate that wealth items or primitive valuables used to create and validate status first make their appearance among societies at this scale (Dalton 1977; Earle 1994:428-429; Johnson and Earle 2000:136). In contrast to traditional views of social inequality, the ethnographic record indicates that an inverse relationship often exists between wealth and power in these societies (Barnes 1988; Dalton 1977; Godelier 1977, 1982; Mann 1986; Meillassoux 1981; Sahlins 1958, 1963, 1972; Trigger 1990:135-136). Indeed, that "individuals may be forced to distribute worldly goods rather than to accumulate them" to build prestige and status in these societies has long been recognized (Cobb 1993:51-52). Therefore, considering that many of the most obvious signs of inequality may be absent in middle-range societies, a key question is how are social distinctions between individuals, interest groups, or communities identified? Although multiple approaches are available, this study has adopted a regional perspective involving intercommunity analyses along a number of interrelated topics and scales.

This study has documented nonlocal items, which given that they occur at sedentary settlements and originate from sources greater than 100 km away, are concluded to have been obtained through intersocietal exchange. Most frequently these objects include raw materials, utilitarian tools, decorated ceramics, pipes, jewelry, and other various exotics. While frameworks for describing exchange among egalitarian or hierarchical societies are well established, coherent theoretical explanations are not well developed for the types of societies examined in this study. In particular, items that have characteristics of both the subsistence and political realms are particularly difficult to interpret since clear markers of social inequality are absent. On the other hand, the social and economic patterns observed among groups in this study also indicate that these societies were not strongly egalitarian either. Here, an interpretation of Middle Ceramic period exchange for the Southern High Plains is presented. The assignment of exchange items to either the subsistence or political segments of society are based primarily on the function and use contexts of objects and the distance that items were procured. Other objects which display characteristics of both realms are also identified. The latter include utilitarian tools produced from high-quality materials that were derived from sources approximately 300 km away. These items are assessed using other contextual information and examples provided by the ethnographic record.

Exchange and the Subsistence Economy

The initial development of widespread exchange on the Southern High Plains coincided with the onset of the Middle Ceramic period. Earlier chapters have demonstrated that the extent of cultural change coinciding with this development was extensive and far-reaching. These changes impacted virtually all areas of life and included a shift to a reliance on horticulture or intensive foraging and long-term storage, substantial reductions in residential mobility, the appearance of permanent settlements, increases in regional population density, modifications in chipped stone, ceramic, and bone technologies, the claiming of crucial resources, and in some cases, the aggregation of population and specialized production. Together, these traits represent the earliest manifestation of the Plains Village tradition in the region (Lehmer 1971). Given the extensive nature of these changes and the apparent rapidity at which they spread, it is difficult to envision these developments as occurring without the intrusion of at least one social group from outside the region.

Considering the intensive cultural change documented at this time, there are a large number factors which potentially could have led to the intensification of intersocietal exchange. From an ecological perspective, increasing population and a transition to a sedentary horticultural lifestyle are frequently seen as primary factors leading to numerous developments, including exchange. From this view, exchange is often visualized as a strategy to offset periodic economic shortfalls and to maintain access to crucial resources (Braun 1986; Earle 1994; Johnson and Earle 2000; Spielmann 1982). Depending on the scale of societies involved such exchange can vary from reciprocal exchange of food and raw materials among family groups of foragers to redistributive networks among complex regional polities (Earle 1994; Johnson and Earle 2000). The latter, often seen as a strategy to even out environmental disparities, required the existence of a central authority and often resulted in considerable economic interdependence among participants (see Earle 1977; Sahlins 1958; Service 1962).

Traditionally, the Southern High Plains has been viewed as marginal for horticulture, and during some periods, even foraging (e.g., the middle Holocene). As such, it is not surprising that many previous studies have envisioned the environment as a major force that essentially dictated the structure of resident subsistence economies. Until recently, however, there has been little to no data collected from which to evaluate the economic productivity of regional farming and foraging systems. As described in Chapter Three, the distribution and abundance of important resources on the Southern High Plains can vary considerably across both space and time. Rainfall is seen as deficient throughout much of the region and resource conditions are in many ways linked to the amount of precipitation areas within the region receive. Annual precipitation varies from about 585 mm (23 in.) along the Eastern margins of the study area to about 430 mm (17 in.) in the west.

To some extent, precipitation rates across the region do seem to have constrained what types of subsistence strategies were economically feasible. Better watered areas with annual rainfall rates that surpass 490 mm (19 in) were occupied by societies in which horticultural products represented a major component of the diet (i.e., Odessa phase). Although important, rainfall was not the sole factor that constrained horticultural systems. Soils with high fertility rates and high moisture holding capabilities also appear to have been necessary for successful cultivation. Elsewhere, areas receiving less than 490 mm of precipitation and containing extensively drained sandy soils appear to have been prohibitive to farming. These areas appear to have been occupied by groups that were primarily broad-spectrum foragers (i.e., Antelope Creek phase). The recovery of cultivated plants and horticultural implements at some sites, however, do suggest that some farming was also practiced by these groups.

In cases where the productivity of food resources may have fluctuated considerably from year to year or season to season, ecological models have often been proposed for explaining for the development of exchange among prehistoric Plains societies (e.g., Blakeslee 1975; Lintz 1986a, 1991; Spielmann 1982, 1983). Under these conditions the establishment and maintenance of reciprocal trade relationships over broad areas are frequently hypothesized to have been important strategies to combat economic shortfalls. Although such relationships may have developed in the study area, considering the constraints imposed by local transport systems and the prohibitive costs of moving staple products over long distances (Earle 1994:422), a threshold must have existed where it was not feasible to trade for food with communities located more than a certain distance away. Although this actual distance is not known, it might be expected that it was not very great, possibly less than 20 or 30 km. It should also be stressed that while lower than average harvests must have occurred from time to time, there is nothing to indicate that subsistence economies were not well adapted to local climatic and environmental regimes. In addition, while periodic shortages could probably be expected at times, it seems unlikely that permanent settlements, especially large villages, would have been established and occupied for any length of time if basic subsistence yields were not consistently met in most years (see Chapter Four).

While each of the above points suggests that it is unlikely any real economic interdependence based on food existed among widely dispersed settlements, it is possible that some degree of interdependence may have developed within or among closely spaced communities of the region (see Duffield 1970:254). For this to occur one might expect family groups to have worked cooperatively with each emphasizing or specializing in particular components of the economy. Nevertheless, the data needed to explore the idea that mutualistic networks may have existed among some local communities, such as those near the Alibates quarries, is currently not available.

The costs of transporting raw materials and technology are generally much less than those associated with staple foods (see examples in Baugh and Ericson 1994). This is aptly demonstrated by the vast distances that utilitarian items were transported in the study area during the Middle Ceramic period. This trend stands in marked contrast to the preceding Early Ceramic period (A.D. 500-1200) where assemblages reflect an emphasis on locally available raw materials for the production of tools. This pattern is most apparent in chipped stone tools. Although variable, local quartzites and cherts from the Ogallala Formation were the primary tool stone used for the production of chipped stone implements for most of the region during the Early Ceramic period. This pattern was modified in the Canadian River valley where Alibates silicified dolomite from both primary and secondary sources was used alongside local quartzites and cherts. Overall, these trends of tool stone use persisted throughout the Archaic and Early Ceramic periods (i.e., 6000 B.C. to A.D. 1200). Around A.D. 1250 Middle Ceramic societies greatly reduced their reliance on locally available tool stone in favor of high quality nonlocal materials. Although the reasons underlying this development are not self evident, the most obvious explanation would be that specialized tool forms that made their appearance at this time required production using high quality stone. As we shall see, however, even this explanation is problematic.

As many have noted, the abundance and quality of lithic raw materials factor prevalently into the organization of stone tool technology (e.g., Andrefsky 1994; see Bamforth 1986, 1990; Kelly 1988; Parry and Kelly 1987). When high-quality tool stone occurs in low abundance it is often the preferred material to produce formal tool designs. In contexts where only poor-quality material is available informal tools tend to predominate. Typically, formal curated tools manufactured from high-quality stone are usually associated with mobile foragers, while informal or expedient tools produced from poorer quality materials are thought to characterize sedentary systems (Henry 1989; Kelly and Todd 1988; Parry and Kelly 1987). In contrast to earlier studies, Andrefsky (1994) has argued that levels of residential mobility or sedentism had little effect on the organization and design of chipped stone tools.

To briefly summarize general trends for chipped stone economies of the study area, Early Ceramic assemblages of the Southern High Plains are marked by few formal tools and the use of poor-quality materials of local origin. In contrast, the onset of the Middle Ceramic coincides with the appearance of several specialized tool forms which were almost always produced from high-quality tool stone. Logically, one might conclude that since the geological distribution and quality of tool stone in the region did not change through time that the dramatic changes observed in raw material use (i.e., a shift from poor to high quality) and an increased emphasis on formal tool designs were related to a shift toward decreasing residential mobility. If so, given the prevailing thoughts regarding the organization of technology among mobile and sedentary societies, then the trends observed here are essentially the opposite of what many researchers have noted for other areas (compare Andrefsky 1994:27-28, 30-31).

So why did many Middle Ceramic societies of the Southern High Plains elect to use nonlocal high-quality tool stone when suitable, but poorer quality material, was locally available? What had changed? Overall, the solutions to these questions are complex and likely varied among societies of the region (i.e., Antelope Creek and Odessa phases). Nevertheless, they are key for understanding several aspects of exchange.

Given the large quantities of subsistence items obtained through exchange during the Middle Ceramic period and the vast distances at which these objects were procured, the research area certainly presents a unique case study. Faced with these trends, it should not be surprising that it is difficult to determine at what procurement distance objects should be considered nonlocal or exotic. While it is apparent that classes of utilitarian goods, especially Alibates tools, were regularly traded at distances up to 150 km, whether these items were obtained through direct or indirect exchange has obvious implications for understanding the organization of exchange.

In the ensuing discussion the acquisition of raw materials and utilitarian objects associated with the subsistence side of the economy is examined. Of these items, information regarding the distribution and frequency of nonlocal tool stone among settlements of the region are by far most abundant and are summarized here. These data are examined separately for Antelope Creek and Odessa phase communities and highlight contrasting archaeological signatures associated with down-the-line exchange systems and items procured through direct, long-distance trading expeditions.

Despite current limitations of existing data sets, the ubiquitous presence of Alibates tools at settlements throughout the region suggests that these items moved steadily through a series of direct and down-the-line reciprocal exchange transactions (see Chapter Six for quantities of Alibates at various sites of the region). In fact, it may be possible to discern a pattern of fall-off with distance from the Alibates quarries for these items. For example, the quantity of Alibates in assemblages near source areas in the Canadian River valley average between 95% and 100%. Frequencies at Antelope Creek settlements 125 km north in the Oklahoma panhandle and the Buried City locality 110 km to the northeast drop to between 80% and 90%. These high frequencies seem to indicate direct exchange with inhabitants at the quarries.

Alibates comprises only 50% to 70% of assemblages at other Odessa phase settlements 150 km to the northeast in the Oklahoma panhandle and beyond (e.g., Odessa Yates, Lonker, and Lundeen). These lower frequencies suggest that Alibates at these settlements was obtained through down-the-line exchange rather than direct trade with settlements near the quarries. Other trade items also suggest there was little direct interaction between Antelope Creek settlements near the Alibates quarries and these Odessa phase communities (Chapters Six and Seven). Alibates is abundant at Antelope Creek settlements, such as Stamper, Two Sisters, Casto-Nash, to the west and represent likely sources for this material. Considering the apparent shortages of chipped stone observed at the Buried City locality (Brosowske et al. 2003; Hughes and Hughes-Jones 1987:103), it is unlikely that Alibates was obtained from this settlement.

Currently, temporal data from the region are insufficient for a precise understanding of the development of Alibates production and exchange. Nonetheless, the moderate to high frequencies of Alibates at settlements over 100 km from the quarries certainly demonstrates that the mining, production, and exchange of this tool stone by Antelope Creek groups was well established by the end of the thirteenth century. Previously, Lintz (1986a) has suggested that the relatively low frequencies of this tool stone at the Roy Smith site (61%), the easternmost Antelope Creek site known in the Oklahoma panhandle, may indicate that the mining, production, and exchange of Alibates by groups near the quarries had not yet begun. This site has yielded multiple calibrated dates that range from about A.D. 1275 to 1300 (Chapter Four). However, the quantity of Alibates at this multi-family settlement is comparable to that of other nearby, and apparently contemporaneous, Odessa phase sites in Beaver County, Oklahoma. As such, these relatively low frequencies may also reflect fall-off associated with down-the-line exchange.

As noted recently in Chapter Seven, formal tools present in Middle Ceramic assemblages included alternately beveled diamond shaped knives, small triangular projectile points, distal endscrapers, and drills. Of these tools, it is almost certain that high quality tool stone was necessary for the production of the large ovate bifaces, which through use and resharpening became alternately beveled knives (i.e., Harahey knives). The same limitations or constraints, however, do not apply for the other formal tools present, yet they were still produced from nonlocal tool stone. Why was local material not used to manufacture these items?

These observations are particularly noteworthy when one considers the shortages of lithic materials that seem to have characterized some Odessa phase settlements (Brosowske et al. 2003; Hughes and Hughes-Jones 1987:103). These communities are about 110-150 km from the nearest source of high quality tool stone.

If these societies were indeed plagued by shortages of chipped stone materials, logically one would expect that they would make greater use of local materials. This strategy, however, is not represented at these sites. Instead, while these societies did rely heavily on Alibates (i.e., about 50% to 70% of all chipped stone is this material), they also established and participated in long-distance exchange to obtain either Smoky Hill jasper from northwestern Kansas or Gray Permian cherts from south-central Kansas. The nearest sources for these high-quality materials are both about 250 km to 300 km away (Figure 5.1).

The frequency of Smoky Hill and Gray Permian cherts varies considerably among Odessa phase settlements. For instance, although never absent from any sites, Smoky Hill jasper is most abundant at communities in Beaver County, Oklahoma, and Meade County, Kansas (i.e., comprising 20% to 35% of chipped stone assemblages). Likewise, although not completely quantified at this time, Gray Permian cherts are most common at settlements in Lipscomb County, Texas, and Ellis County, Oklahoma (i.e., about 20% of chipped stone assemblages). It is also worth noting that Florence A or Kay County chert from north-central Oklahoma is about the same distance from the area as Gray Permian cherts, but was not used in the area at this time. This suggests that exchange of Florence A described by Vehik (1986, 1990) did not extend this far west prior to A.D. 1400.

The Middle Ceramic cultural complexes of Kansas and the nonlocal trade items associated with these societies were not examined in preceding chapters. Nevertheless, given the abundance of Smoky Hill jasper and Gray Permian cherts recovered at Odessa phase sites it is useful to briefly consider the frequency of items derived from the Southern High Plains in this area as a means of understanding exchange relationships that developed between the two areas. To date no one has systematically examined these data so this information is admittedly incomplete. Nevertheless, enough information is documented to propose a few tentative trends.

Beyond the sporadic occurrence of Alibates at numerous sites, comparable data regarding objects of Southern Plains origin at Central Plains Tradition settlements are not well understood at this time. Roper (1988) has documented malachite and turquoise at Upper Republican phase settlements in south-central Nebraska. Similar items are also documented among White Rock and Oneota phase settlements of the region (Ritterbush 2002a, 2002b). Originally, it was suggested that these societies obtained southwestern exotics through down-the-line exchange with the Antelope Creek phase. Considering that nonlocal items derived from the Central Plains are almost completely absent at Antelope Creek sites, but very abundant at Odessa phase sites, suggests that these objects were almost surely obtained via exchange with the latter societies.

The profusion of Smoky Hill jasper, Gray Permian cherts, and Kansas pipestone throughout the period certainly demonstrates regular and sustained contact between the Central Plains and Odessa phase groups. In fact, the abundance of these items at Odessa phase settlements along with the similarities noted in ceramics, architectural forms, and subsistence economies may indicate that additional relationships beyond exchange existed between these societies and the Central Plains tradition. Nevertheless, given the paucity of detailed information regarding nonlocal items from the Southern High Plains in Kansas, specific Central Plains communities that may have been in contact with Odessa phase communities are not known at this time. As such, Upper Republican variant, and Solomon River, Smoky Hill, White Rock, and Oneota phase settlements are all regarded as potential trading partners.

Despite the current limitations in the data sets, is it possible to determine whether only Odessa phase trading expeditions visited the Central Plains or if expeditions from the latter also visited the Southern High Plains? This is certainly a difficult question to answer at present considering that the Middle Ceramic period for most of western Kansas and northwestern Oklahoma is poorly known. Nevertheless, it is an issue that is of obvious importance to understanding the nature and structure of exchange.

The fact that distinct concentrations of Smoky Hill and Gray Permian cherts can be readily identified for specific portions of the Odessa phase distribution suggests that a community or communities in each of these areas had established independent exchange relationships with societies presiding near the source areas of these materials. If trading expeditions from the Central Plains visited the region and traded equally among settlements, one might expect that the distribution of these two types of tool stone would be fairly ubiquitous among local communities. This pattern, however, is not observed.

Overall, previous studies have not identified any Central Plains societies, except perhaps Oneota or White Rock phase groups, which were as heavily involved in long-distance exchange as Odessa phase. Thus, although the total numbers of trade items derived from the Southern High Plains have not been formally quantified for Central Plains Tradition settlements, I suspect that they are not nearly as abundant as objects documented at Odessa phase sites that were derived from the Central Plains. As such, while not entirely clear at this time, I suspect that Smoky Hill jasper, Gray Permian cherts, and Kansas pipestone were acquired primarily by Odessa phase trading expeditions to the Central Plains and not supplied by Central Plains groups traveling to Southern Plains settlements.

As these data demonstrate, understanding the meaning and function of exchange for items related to the subsistence realm can be quite complex and require robust data sets. In spite of these problems the transfer of food, utilitarian implements, raw materials, and technology over short distances within the study area seems fairly straightforward. The movement of these items suggest that faced with unequal resource distributions and abundances, exchange at the outset of the Middle Ceramic period (A.D. 1250) likely functioned as a strategy by which recently settled people maintained access to crucial resources associated with the subsistence realm. Since "exchange is widespread, if not universal among human societies" (Earle 1994:420), this is probably a reasonable assumption.

Transfers at the local level probably revolved around the reciprocal exchange of food, raw materials, and technology among neighboring settlements. Previously, procurement of subsistence related items was embedded in annual mobility rounds. Tethered to the landscape, however, by permanent settlements, stored resources, claims to resources, and improvements to land, exchange was likely the only avenue in which sedentary to semi-sedentary groups were able to procure many basic resources that were unequally distributed across the landscape. The widespread distribution of cordmarked ceramics, chipped stone and bone tool forms, and certain raw materials, such as Alibates, indicate that most, if not all, settlements of the region were linked through a broad web of reciprocal exchange relationships (see Fortes 1949). Depending on the exact social distances involved, it can be expected that general or balanced forms of reciprocity characterized exchange among individuals and families, while negative forms probably occurred between strangers and distant kin. Simultaneously, these material transactions not only served to initiate and solidify interpersonal relationships within and between neighboring communities, but they also imposed an obligatory bond that ensured repayment at a later date.

From a functionalist perspective, the regional exchange of subsistence related objects as an organized strategy to maintain access to crucial resources unequally distributed across the landscape is a reasonable interpretation for the items discussed above. In contrast, the long-distance acquisition of utilitarian tools produced from Smoky Hill jasper or Gray Permian cherts by Odessa phase societies is not as easily explained. As noted above, the nearest source areas for these items are about twice as distant as the Alibates quarries (i.e., 300 km versus 150 km). The question remains why these objects were obtained when another equal quality tool stone, Alibates appears to have been more readily available through down-the-line networks. Since Odessa phase societies were sedentary horticultural villagers and that bison kills were made close to settlements (Chapter Four and Seven), suggests that it is unlikely that these materials were obtained through direct procurement while conducting other activities.

In sum, it is concluded that models of technological organization and optimal foraging hold little explanatory power for understanding the acquisition of utilitarian tools manufactured from exotic tool stone. As such, considering each of the patterns noted here, even though chipped stone tools produced from Smoky Hill and Gray Permian cherts are obviously associated with the subsistence realm, it may be profitable to consider them as something more than just simple utilitarian items. Therefore, it is proposed that these objects span the continuum that exists between the subsistence and political spheres of the economy. In fact, given the distance at which these two types of exotic tool stone were procured, it is probable that the social value attributed to these objects were in many ways analogous to obsidian obtained from north-central New Mexico.

Obviously, the basis for this conclusion is poorly formulated at this point in the discussion. Nevertheless, the potential meaning and symbolic importance of these items as trade goods associated with sociopolitical activities necessitates a brief review of politics among small-scale societies. The ensuing discussion relates the types of leaders present in these societies and the various strategies that they use to establish, validate, and maintain positions of leadership. These data are derived from the ethnographic record and emphasize the key role that the economy and exchange play in the politics of these societies.

The Rise of Politics in Small-Scale Societies

In this study it is proposed that many of social and economic developments described for the Middle Ceramic period of the Southern High Plains mark the emergence of communities characterized by greater social complexity than preceding periods. This is obvious considering that the appearance of larger settlements, increasing sedentism, claims to important resources, economic intensification, and long-distance exchange are all developments that would have required substantial changes to previously existing forms of leadership and social organization. Of particular interest is the role that nonlocal items and the economy frequently play in the social and political activities of these and other small-scale societies. As noted earlier, these societies have been referred to as middle-range, transegalitarian, or intermediate societies. These entities usually lack the overt forms of inequality observed in hierarchical societies, but display varying levels of inequality along a number of other different dimensions (e.g., Cobb 1993; Hayden 1995; Mills 2000).

As many have noted, objects obtained through exchange frequently provide an avenue that enables leaders to gain followers and build prestige (e.g., Cobb 1993; Earle 1994, 2002; Friedman and Rowlands 1978; Hayden 1995; Johnson and Earle 2000; Sahlins 1972). However, simply proposing the emergence of prominent leaders as an explanation for the patterns observed versus understanding how these individuals rose to prominence and maintained these positions are two entirely different things. Given the trends noted here, insights into the politics and social life of contemporary small-scale societies are helpful for explaining and interpreting long-distance exchange in the present study.

As noted earlier, culture change associated with the transition from the Early to Middle Ceramic period on the Southern High Plains was substantial. Although the degree of change was generally quite intensive, some continuity was noted for some communities of the region. For instance, throughout the preceding Early Ceramic period populations were dispersed across the landscape into family sized groups.

Likewise, even though aggregated settlements of various sizes do make their appearance during the Middle Ceramic period, some communities, especially among the Antelope Creek phase, still represented dispersed single family settlements. Current data suggest that these homesteads were largely autonomous and self-sufficient. In these instances, it is probable that these settlements were organized by a domestic mode of production (DMP). As Sahlins (1972) has observed, the DMP is characterized by economic underproduction and families generally produce only enough to meet their immediate needs. Under these conditions, political leaders of any consequence are not to be expected.

By necessity, the transition from dispersed homesteads to cohabitation in villages often brings about many substantial changes in the organization of human societies. Even though most of life's daily activities may still continue to be organized around the family, it is at this level that we witness the emergence of broader, more formalized kinship networks. The formation of clans and lineages serve to define group membership and interpersonal relationships, integrate the community, and often, signal the appearance of corporate groups. These developments in social organization are frequently accompanied by heightened ceremonial activity, the claiming of resources, economic intensification, and warfare (see Johnson and Earle 2000; Keeley 1996; Sahlins 1968, 1972). Under these conditions the basic elements necessary for the appearance of more complex sociopolitical systems are present (i.e., emergent political economies).

In contrast to societies characterized by a DMP, emerging political economies are marked by systems of production and distribution above and beyond the household level (Cobb 1993; Earle 1994, 2002; Hayden 1995; Sahlins 1972). Critical components of these social systems are ambitious leaders who organized and manipulated the economy of a larger group as a basis to support their political activities. Following Leach (1954) and others (Earle 1997:2; Hayden 1995:20, 1998; Sahlins 1958:1), I assume that all societies contain at least a few individuals that seek political advantage at the expense of others. With this being said, it is important to emphasize the social limitations that often hinder marked social inequalities among small-scale societies. Since members of these societies are unlikely to tolerate blatant self-serving behavior, leaders' intent on attaining fame, status, and prestige must also be generous, hard working, and seen as acting in the best interests of the community they represent.

Leaders in small-scale societies are variously termed petty chieftains, great men, headmen, center-men, village heads, lineage or clan heads, rich men, chiefs, big men, men of renown, and aggrandizers (see Bulmer 1960; Dalton 1977; Godelier 1982; Hayden 1995; Johnson and Earle 2000; Malinowski 1984; Mauss 1967; Rappaport 1967; Sahlins 1963, 1968, 1972; Service 1966, 1971; Strathern 1971). Importantly, the degree of power and authority wielded by these individuals varies considerably depending on the number of persons over which they hold influence and can direct. For comparative purposes, a few of these leaders and the roles they play in the politics of small-scale societies are briefly reviewed here. Although somewhat arbitrary, the positions of leadership examined here are intended to relate how power and authority vary in scale among these societies (see Hayden 1995 and Sahlins 1963).

Positions of leadership among family level foragers are typically short-lived and informal (see Chapter Two). Because daily activities are organized and carried out by autonomous families, suprafamily leadership is ephemeral and required primarily when the coordination of several families is needed for the procurement of seasonally abundant foods (Johnson and Earle 2000). In these societies, where all individuals are considered equally capable of leading, temporary positions of leadership can be filled by a number of eligible persons.

As defined by Sahlins (1968:21) a petty chieftain refers to a "duly constituted authority" of a village or local descent group. Petty chieftains are the first among equals and are leaders in name only. This official position is often obtained not through any exceptional skill or ability, but by group membership, customary rules, and consensus. In other words, this position may be acquired simply by virtue of being the oldest living man in the group or by being the eldest son of an existing leader if determined by descent. Politically, beyond the title of "chief" this position carries little social distinction and authority. For instance, although petty chieftains are frequently called upon to give some direction regarding internal disputes, in the end, village members are not obligated to follow their advice.

Like the petty chieftain, the village head represents a leadership position found in small-scale societies organized into villages. Although most activities are still organized at the family level, political integration among these groups is strongly defined by ceremony and leadership (Johnson and Earle 2000:125). As with petty chieftains, the power and authority of village heads is limited and they lack the ability to issue direct orders. Nonetheless, because social sanctions underlie all reciprocal relations, members of these integrated societies often feel obligated to respect decisions made by leaders.

Village heads are usually well known for gaining prominence and followers through persuasiveness, generosity, strength of personality, and their reputation as renowned hunters, warriors, orators, mediators, and diplomats. However, since power and authority are not institutionalized in these societies, if the village head wishes to have something done he must lead by example or persuade others to do his bidding. The primary means by which these individuals operate and expand their sphere of influence is through the accumulation of loyal followers that willingly back his political career with labor and resources (Earle 1994, 1997; Hayden 1995; Sahlins 1963, 1972).

Supporters are amassed by village heads who demonstrate their effectiveness in sponsoring public feasts, resolving internal and intergroup disputes, implementing public policy, paying death and bride compensations, attracting mates, allies, and exchange partners, organizing ceremonial exchanges, and being a generous provider of food and resources (Godelier 1982; Hayden 1995; Sahlins 1963, 1972). All of these activities are seen as beneficial to the general well-being and reputation of the group. Although there is considerable overlap, it is the expansion of political activities that generally serves to separate a village head from petty chieftains.

Similar to the village head, the "big man" makes himself leader by virtue of possessing extraordinary abilities to marshal followers (Godelier 1982; Sahlins 1963, 1972). While these leaders still hold no official position or ascribed power, "big men" do hold considerable influence over others. Once again, reciprocal debt relationships established through the strategic use of surplus resources and labor provide an economic basis for political activities. Generally speaking, "big men" are simply an elaborate version of village heads whose authority and influence has extended beyond the local village (Sahlins 1963:163).

Although highly simplified, it should be apparent that the leadership positions reviewed here may be envisioned as existing along a continuum. Importantly, the elaboration of power and authority in small-scale societies is directly tied to the number of followers that an individual leader can amass and rely upon for support in his political endeavors. For instance, a petty chieftain may have influence over a few families, while the village head may hold sway over entire lineages and clans. In its most advanced form, the "big man" also has followers outside his village.

In contrast to the paramount leaders of chiefdoms who come into power (see Earle 1997; Sahlins 1963), none of the positions described here represent institutionalized offices. Rather, individuals in these societies attain power by elevating themselves over others through personal acts of generosity and deeds which promote the status, well-being, and welfare of the community. Because social status is not ascribed or determined by birth, and theoretically, all individuals were equally capable of leading, it is not surprising that the politics of small-scale societies are characterized by considerable competition over positions of leadership (Dalton 1977; Godelier 1982; Hayden 1995; Johnson and Earle 2000; Rappaport 1967; Sahlins 1972; Strathern 1971). Under these circumstances, leaders are often compelled to perform increasingly elaborate deeds that serve the dual role of validating their authority and providing benefits to supporters. Failure in these activities meant a loss of prestige to both the leader and his followers, and at times, a loss of supporters to rival head men.

In nonstratified societies there are numerous strategies by which enterprising individuals seek and attain political influence and power (Barnes 1988; Carneiro 1981; Earle 1987, 1994, 1997; Friedman and Rowlands 1978; Gilman 1981; Godelier 1977, 1982; Hayden 1995; Mann 1986; McGuire 1992; Meillassoux 1981; Sahlins 1972). These include the manipulation of social relationships, ideological systems, coercion, and control of the economy (see Earle 1997). Given the numerous constraints that often characterize small, kin-based societies, coercion and the manipulation of ideological systems tend to be uncommon among these groups. Accordingly, Sahlins (1963, 1972) and many others (e.g., Earle 1997, 2002; Hayden 1995; Johnson and Earle 2000) have emphasized the key position that the economy occupies in establishing, maintaining, and expanding a base of power and authority in these societies. Indeed, labor and resources always play a crucial role in important activities, such as attracting and pacifying supporters, death and bride wealth payments, feasting, and ceremonial exchange.

Therefore, if ambitious leaders intend to become major players in the politics of small-scale societies they must intensify economic production to sponsor important political activities. Initially, ambitious leaders may cultivate larger gardens or enlarge their domestic work force through polygyny as a basis for launching their political careers. However, if their scale of involvement is to expand leaders must eventually attract supporters beyond their household that can be convinced to work harder to produce surplus resources. So how is this accomplished? As noted above, the ethnographic record repeatedly demonstrates that positions of leadership were won by those capable of enhancing the well-being, security, and status of the community. In New Guinea, for example, successful "big men" gained loyal followers by demonstrating "their effectiveness in entrepreneurial roles: the planner of public policy, the settler of private disputes, the peace-maker in war, the arranger of death compensations, the generous provider of food, the leader who secures strong allies in war and pays for their services with valuables, the organizer of moka ceremonial exchanges" (Dalton 1977:196).

Altogether, this discussion of politics in small-scale societies provides a basis for understanding the evolution of exchange in the present study. In the subsequent discussion the elaboration of exchange is seen as an archaeological signature that marks the emergence of ambitious leaders. Contact with distant communities brought prestige and renown to local leaders that organized trading expeditions. Supporters also benefited through their association with these activities and by obtaining rare items used to display their value as potential trading partners, allies, and mates. An important element of long-distance exchange is its elaboration within a competitive arena. Here, the continued expansion of long-distance exchange is seen as arising from rivalry among local leaders for enhanced personal status, prestige, and the accumulation of loyal supporters.

Long-Distance Exchange and the Emergence of Political Economies

In addition to the subsistence related items discussed earlier in this chapter, a number of truly exotic objects obtained through long-distance exchange are also frequently recovered from settlements of the region. It is readily apparent that many of these objects were not associated with the subsistence realm of the economy. Exotics include marine shell, decorated ceramics, obsidian, quartz crystal, turquoise, Puebloan pipes, Kansas and South Dakota pipestone pipes, greenstone celts, mica, and other unique objects (see Chapter Five and Six). Most exotics were acquired from the Eastern Pueblos of the Rio Grande and Pecos River valleys, although a few items were also derived from the Central, Northern, and Northwestern Plains. Goods derived from contemporaneous Mississippian communities to the east have not been recovered at settlements of the Southern High Plains. Given that the listed objects were materially and/or stylistically quite distinctive from locally available items, it is probable that all inhabitants of the region were well aware that these items were obtained through long-distance exchange with remote communities.

As described in Chapters Six and Seven, even though one or two exotic items have been recovered at most settlements of the region, prestige items are notably concentrated at Alibates Ruins, Chimney Rock Ruins 51, and Odessa Yates. Nonlocal items number in the thousands at these three settlements. Distributions and source analysis indicate that the occupants of these settlements conducted trading expeditions to the Eastern Pueblos. The low frequencies of exotics at other settlements of the region and source provenance analyses also suggest that the communities of Chimney Rock Ruins 51, Alibates Ruins, and Odessa Yates functioned as regional trade centers that redistributed exotics obtained during long-distance trading expeditions.

As noted above, demonstrating that trading expeditions from the Southwest or elsewhere visited the region is difficult to confirm (see Howard and Brown 1973).

Nonetheless, if trading emissaries from other regions visited the Southern High Plains one might anticipate that exotics would have a much broader distribution among settlements of the Plains than is observed. On the other hand, it is possible that traders did travel to the region, but the distribution of nonlocal items suggests that they only visited a select number of important communities.

Treated in isolation, any body of data is subject to a number of equally plausible alternative explanations. Nonetheless, even in isolation, it is readily apparent that risk reduction models or down-the-line exchange networks are insufficient for elucidating the distributional patterns of trade items observed here. Given that exchange is an activity that is embedded in broader social institutions, an understanding of the social and environmental context in which exchange occurs is crucial for understanding the meaning of this material act. Thus, that the communities of Alibates Ruin, Odessa Yates, and likely, Chimney Rock Ruins 51 also made exclusive claims to important resources and exhibit trends toward economic intensification are additional cultural patterns that support the emerging social complexity. Overall, while the Southern High Plains were never home to hierarchical societies during the prehistoric era, at the same time, it is also evident that the trends observed here are not typical of societies normally characterized as “egalitarian.”

As demonstrated above, economic intensification and long-distance exchange are often two complimentary strategies used by emergent political leaders to attain status and renown. In contrast to other communities of the region, the settlements of Alibates Ruins and Odessa Yates display intensified economic production to levels beyond normal consumption. At the Alibates Ruins inhabitants were involved in mining, production, and exchange of Alibates tools for exchange. Alternatively, the faunal inventory at Odessa Yates indicates that the occupants of this settlement developed a bison hunting economy that is best described as “specialized”. In each of these contexts one must ask: under what conditions would families elect to work harder to produce a surplus?

Judging from the data represented, however, I would suggest that risk reduction strategies were not the ultimate factor influencing the economic patterns observed here. In fact, rather than periodic shortages, I visualize these developments as only occurring within a context where resources were reliable and abundant (see Hayden 1995, 1998). As the ethnographic record demonstrates, an expansion of political activities, such as long-distance exchange and the accumulation of loyal supporters, relies extensively on the ability to generate surpluses. As such, I would suggest that intensified production observed at Alibates Ruins and Odessa Yates represents a strategy initiated by local leaders to finance political activities, including long-distance exchange. Likewise, even though many of the details surrounding Chimney Rock Ruins 51 remain unknown, the same can probably also be said for this settlement. Drawing on examples provided by the ethnographic record, the various trends observed for the region are cautiously interpreted here.

Earlier it was proposed that the emergence of regular exchange among Middle Ceramic settlements of the Southern High Plains developed as an organized strategy to obtain crucial resources related to the subsistence realm. While many of these items were likely obtained through reciprocal exchange with relatives or extended kin in neighboring settlements, as social and geographic distances increased more formal social arrangements undoubtedly must have been required to initiate and maintain exchange relationships. The ethnographic record demonstrates that intervillage exchange was an activity often orchestrated by group leaders and that success in exchange often brought considerable status and renown to head men and the communities they represented.

Considering that the items obtained through local and regional exchange (i.e., food, raw materials, and technology) represent crucial objects associated with the subsistence realm, it is easy to envision that initially community members were easily persuaded to produce a surplus to obtain these objects. The broad distribution of Alibates tools, which are by far the most widespread trade item found in the region, indicates that all members of society benefited from intervillage exchange. Trade in other subsistence items are admittedly difficult to document in the archaeological record at this time (see Lintz and Reese-Taylor 1997), however, given regional environmental and climatic conditions that result in marked disparities in many important resources, it seems reasonable to assume that other objects must have also been exchanged (see Ford 1972).

For Odessa phase societies the expansion of exchange to obtain utilitarian chipped stone tools produced from high quality, nonlocal tool stone, such as Smoky Hill Jasper and Gray Permian cherts, seems to mark an important step in the evolution of exchange and resident sociopolitical systems. It is likely that the success garnered from local and regional exchange of subsistence objects was recognized by leaders as an activity that could be manipulated for personal gain. In fact, in many ways the expansion of exchange to procure these nonlocal items simply represented an elaboration of existing strategies already proven successful and deemed acceptable by local community members. Once again, success in long-distance exchange to obtain these items brought prestige to local leaders and community members also benefited by acquiring high quality utilitarian items that were obtained by these leaders from distant communities. However, given the distances involved, added prestige must have been gained from these activities. In fact, enhanced status and prestige garnered by long-distance traders appears to be universal among small-scale societies around the world (see Helm 1979, 1988, 1992).

Smoky Hill Jasper and Gray Permian chert tools were not as widely distributed throughout the Southern High Plains as Alibates. Although low frequencies of these items, usually exhausted Harahey knives and distal endscrapers, are often observed at most Odessa phase settlements, each of these materials is notably concentrated at specific communities. These patterns suggest that only certain Odessa phase communities conducted trading expeditions to certain portions of the Central Plains. The regional distribution of exotics from the Southwest indicates that an even smaller number of settlements participated in exchange with the Eastern Pueblos.

The recovery of Smoky Hill and Gray Permian chipped stone tools in residential and midden contexts supports their use in subsistence related tasks, especially those related bison hunting, processing, and hide preparation. However, it seems highly unlikely that the sole purpose of trading expeditions to communities 300 km away was to procure items whose value was limited to the subsistence realm. These trends are especially enigmatic when one realizes that Alibates, another high quality tool stone was available at half this distance. Considering that procurement costs for these objects were extremely high, but yet they were used on a regular basis for subsistence activities suggests that this trend was not coincidental. The ethnographic studies discussed earlier indicate that nonlocal items obtained through long-distance exchange were often extensively used by community members to display their value as potential trading partners, allies in times of war, as mates, or as enemies to be feared. As such, even though these nonlocal items are associated with the subsistence realm, the patterns observed suggest that these utilitarian items may have also served as indicators of wealth, status, and power for community members (see Hayden 1998). Materially, these items demonstrated the ability of a leader and his followers to produce reliable surpluses, which out of a number of potential options, were used to obtain luxury items from distant communities.

It is also worth noting that at settlements, such as Alibates Ruins and Odessa Yates, where exotics are abundant, these items were not concentrated in particular portions of these settlements, but appear to have been distributed throughout the community. This distribution pattern is not unexpected, however, as the ethnographic record indicates that the stockpiling of prestige items by leaders is not likely to be tolerated. Indeed, leaders in many of these societies are well-known for their generosity and often give away all they have (see Dalton 1977; Sahlins 1963; Trigger 1990:135-136 among many others). As such, it is likely that it was in the best interest of leaders' who organized trading expeditions to strategically redistribute nonlocal items. These transactions served as repayment for supporters or could be used to indebt additional people to them.

The fact that exotics are not observed in large quantities in burial contexts is also not to be expected in the study area. Considering that the primary value of items obtained through long-distance exchange was their use in displaying status, inclusion in mortuary contexts would have effectively removed them from circulation. Nonetheless, the small quantities of marine shell jewelry associated with burials supports the interpretation that these items represented personal belongings worn for display.

In Chapter Seven it was argued that the settlement of Odessa Yates intensified production of bison hides for long-distance exchange with the eastern Pueblos. Earle (1994:427) has raised the question of whether exchange in nonlocal tools could have provided a strategy by which local leaders could manipulate or control the subsistence economy. While the patterns are not entirely clear, the co-occurrence of specialized bison hunting economies and long-distance exchange to procure high quality chipped stone tools used in bison hunting, processing, and hide production is interesting.

If indeed developments of specialized bison hunting and the acquisition of chipped stone tools manufactured from high quality stone were contemporaneous and interrelated developments, then it seems possible that the development of exchange with the Southwest may have also been a related event. Earlier it was suggested that the primary trade item exported to Puebloan communities was bison hides (Chapter Seven). The distribution of exotics obtained from the Southwest suggests that only a small number of communities in the region conducted trading expeditions to the Eastern Pueblos. These items are clearly most abundant at Alibates Ruins, Chimney Rock Ruins 51, and Odessa Yates. However, specialized bison hunting has only been demonstrated at the latter settlement. While a lack of data from Chimney Rock Ruins 51 precludes further discussion of this site, the available information from Alibates Ruins provides a basis for some tentative thoughts regarding long-distance exchange by the occupants of this settlement.

Current evidence indicates that the occupants of Alibates Ruins were heavily involved in the mining, production, and exchange of Alibates tools (see Chapter Seven). The distribution of Alibates tools throughout the region and beyond demonstrates the key economic position that this community occupied. The abundant exotics from the Southwest at this settlement also indicate that regular trading expeditions to the west were conducted. While the occupants of Odessa Yates appear to have produced bison hides for exchange, what items the occupants of Alibates Ruins traded with Puebloans is not entirely clear at this time. At first glance, Alibates tools seem to be the most logical commodity to be traded to the Pueblos, and indeed, these objects have been recovered at many of these settlements (Lintz 1991; Spielmann 1982). Unfortunately, the abundance of these items in contexts dating between A.D. 1250 and A.D. 1500 at the Eastern Pueblos are not well documented.

Despite these limitations, I suspect that Alibates silicified dolomite was not the primary item traded to the Southwest by the inhabitants of Alibates Ruins. This conclusion is based largely on the observation that Puebloan populations generally seem to have shown little interest in chipped stone technology. Indeed, these groups did not emphasize high quality tool stone or formal tool designs to the degree observed among neighboring Plains tradition societies. Equally telling is the fact that obsidian frequencies at Alibates Ruins, Chimney Rock Ruins 51, and Odessa Yates likely outnumber obsidian recovered at most Puebloan communities of comparable size. Thus, if Puebloan societies exhibited little interest in obtaining obsidian, a local higher quality tool stone, then it seems unlikely that Alibates would have generated interest as a trade item among these groups. Currently, it is not known whether Alibates tools occur in contexts at the Eastern Pueblos that would suggest their use as status markers. Thus, even though much supporting data needed are largely lacking, I would speculate that bison products were probably the main items traded to the Southwest by Alibates Ruins. Indeed, much basic information regarding the economy of this settlement remains unknown.

The distances to the Eastern Pueblos are highly variable for Southern High Plains societies. Eastern Pueblos are only about 350 km from the settlements of Chimney Rock Ruin 51 and Alibates Ruins, while the nearest pueblos are about 550 km from Odessa Yates. In contrast to Odessa phase communities, it is apparent that none of the Antelope Creek settlements were involved in direct exchange with any Central Plains societies. Overall, I suspect that the development of exchange with Central Plains tradition groups and the Eastern Pueblos simply represent trends toward increasing elaboration. Given the lack of other plausible explanations, the ethnographic record would appear to suggest that the primary motivation underlying this elaboration was competition among local leaders for prestige, nonlocal items, and followers. Although precise temporal data is lacking, the interpretation that long-distance exchange was an activity that grew incrementally seems most plausible and was an outcome of competition among local leaders.

As presented above, the importance of ambitious leaders in the emergence of social complexity obviously has a long history in anthropological studies (see Blanton et al. 1996; Earle 1997; Hayden 1995; Sahlins 1972). Recently, however, researchers have questioned the traditional view of social hierarchy as a monolithic process involving ambitious leaders with centralized authority (e.g., Blanton et al. 1996; Feinman 2000a, 2000b; Hayden 1995; Mills 2000). Grounded in political economy, these studies contrast social systems where political organization is exclusionary and individual-centered (network) with others that are more group-oriented (corporate). Together, network and corporate modes are linked under the heading of dual-processual theory and represent alternative strategies to establish and maintain political-economic power in societies of varying complexity and scale (Blanton et al. 1996; Hayden 1995).

Arguably, the societies examined in this study employed strategies that contain characteristics of both network and corporate modes (see Blanton et al. 1996; Feinman 2000a, 2000b; Hayden 1995). Here, emerging leaders are envisioned as encouraging and organizing the intensification of local economies and the elaboration long-distance exchange (i.e., network mode). However, it is also apparent that social constraints greatly limited the ability of leaders to manipulate these activities for personal gain (i.e., corporate mode). In addition, while the absence of concentrations of wealth and elite residences are certainly characteristic of corporate systems, evidence for other key traits of this mode are noticeably lacking. For example, even though items obtained through exchange do appear to have been distributed throughout each community, other major integrating mechanisms used to create and maintain group equality and solidarity, including ritual and ceremony, non-competitive feasting, and large communal construction projects are not observed (see Blanton et al. 1996; Feinman 2000a, 2000b; Hayden 1995; Mills 2000).

Conclusions

This research has examined the origin and evolution of exchange among small-scale societies of the Southern High Plains. The results of this study indicate that the development and expansion of exchange on the Southern High Plains was rapid and in step with other important events associated with the appearance of Plains Village tradition societies in the region. On a general level, the nonlocal items observed can be envisioned as being broadly related to either the subsistence or political realms (Earle 1994, 2002; Johnson and Earle 2000). As this study has demonstrated, however, the assignment of items to one of these two realms can be problematic for a number of different reasons. As a result, it is apparent that this investigation has benefited greatly by the adoption of a contextual perspective that considers both temporal and spatial parameters. This study concludes that exchange and the acquisition of nonlocal items served a number of different purposes in Middle Ceramic society.

Previously, researchers have hypothesized that climate conditions during the Middle Ceramic period fluctuated greatly from year-to-year and caused considerable economic uncertainty and stress among resident populations (see Lintz 1991; Spielmann 1982, 1983). Considering the prohibitive costs of transporting staple products over long distances coupled with evidence for long-term occupation of settlements and local subsistence economies that were productive and reliable, this study concludes that it is unlikely that the primary function of Middle Ceramic exchange was to buffer against economic shortfalls. Instead, the types, quantities, and source areas of nonlocal items present suggest that exchange systems developed for other socioeconomic reasons.

An examination of Archaic and Early Ceramic period assemblages of the region indicates that evidence for the organized transfer of nonlocal items among resident mobile foraging societies was extremely limited. This suggests that intersocietal exchange was of little socioeconomic importance to groups at that time. In contrast, widespread exchange involving large quantities of nonlocal objects appears to have developed rapidly at the onset of the Middle Ceramic period around A.D. 1250. In particular, evidence for the exchange of utilitarian items, especially chipped stone tools manufactured from high quality nonlocal tool stone, are extremely abundant at settlements throughout the region. These objects were often obtained from sources over 100 km away and comprise 70% to 90% of assemblages. That this development coincided with the appearance with sedentism and the first permanent settlements suggest that the initial function of exchange was to provide access to resources that earlier were obtained through residential mobility.

The distances at which nonlocal objects were obtained and their distribution among settlements provide additional information regarding the structure of regional exchange networks. For example, even though chipped stone tools produced from Alibates silicified dolomite are abundant at all communities of the region, it is clear that the quantity of these items decrease with increasing social and geographic distance from communities controlling the distribution of this important resource. These patterns suggest that these utilitarian objects passed through down-the-line, reciprocal exchange networks established and maintained between individuals and families in neighboring settlements. If correct, it is probable that these exchange relationships closely corresponded to extended kin networks that existed between communities.

Given the disparities noted in the distribution of local resources, the initial development of exchange to obtain subsistence related objects at the regional level seems perfectly logical. However, the appearance of utilitarian and status items whose primary cultural value seems to lay in the fact that they were obtained from distant sources or communities makes little sense from technological, ecological or economic perspectives. This is especially apparent if one considers the Smoky Hill jasper and Gray Permian chert stone tools obtained by Odessa phase societies. These objects were procured through long-distance exchange with communities 250 km to 300 km away, yet were equivalent in quality to Alibates tools available through local down-the-line networks. Considering the costs involved in procuring these items it is suggested that it is useful to consider these objects as something more than mere utilitarian goods, perhaps as luxury items or primitive valuables.

Whereas the exchange discussed above centered around the acquisition of items linked to the subsistence economy, trading expeditions to Puebloan communities 300 to 600 km away focused on the procurement of nonutilitarian items, including painted ceramics, pipes, and jewelry produced from marine shell and precious stone. Since most these items essentially had no local equivalents and were clearly not associated with the subsistence realm, it is assumed that these objects were worn to display and validate social status. The frequent recovery of pipes and jewelry in burial contexts supports this contention.

These nonlocal status items are noticeably concentrated at a small number of settlements, such as Alibates Ruin 28, Chimney Rock Ruin 51, and Odessa Yates. Analyses also indicate that these settlements laid claim to important resources, intensified economic strategies to produce surpluses, and served as important regional trade centers. These patterns suggest that only the largest and most complex communities in the region were capable of participating in long-distance trading expeditions to settlements more than 300 km away.

Overall, although the exact timing is not well understood, it is proposed that the material and economic evidence documented in this case study reflect trends toward increasing social complexity among Middle Ceramic societies of the Southern High Plains. In particular, it is suggested that these data along with the exchange patterns observed above indicate that intersocietal exchange provided a major avenue by which enterprising leaders sought to create and sustain status, power, and respect. The interpretation that these events were incremental in nature seems reasonable considering the scale of societies and distances involved, the types of objects exchanged, and the nature and extent of regional involvement.

The ethnographic record repeatedly demonstrates that as social distances increase individuals with exceptional social skills are likely required for initiating, negotiating, and maintaining the exchange relationships with communities consisting of nonkin. As in any context, the process of distinguishing oneself among other potentially capable individuals undoubtedly was a process played out on a competitive stage. Therefore, as an official representative of a larger social group (i.e., clans or lineages), these individuals must have demonstrated their skill and ability as emerging local leaders through their generosity, organizational skills, implementing public policy, as peace-makers, etc. Like these other stepping stones, success in long-distance exchange must also have had the two-fold effect of providing status and prestige for leaders and well-being and security of community members. In this light, the increasing distances at which nonlocal items were procured may reflect some degree of competition among local leaders for status and supporters.

It is proposed that the social and economic trends documented here required forms of leadership that for numerous reasons were not necessary for small groups of economically autonomous families. Although it is concluded that these trends mark the emergence of important community leaders, it is apparent these were individuals whose power and authority was socially restricted. Given the proposed relationship between exchange and increasing social complexity, a basic understanding of the politics of small-scale societies has provided an important basis for understanding how and why these developments occurred. Here, the steady movement of subsistence related objects among settlements throughout the region is seen as a strategy by which recently sedentary populations maintained access to crucial resources. Developing from these beginnings were the skills required to organize long-distance trading expeditions to distant communities. Importantly, these developments provided the leverage needed to manipulate local economic, social, and ideological systems. Altogether, these are key developments that mark emergent political economies.

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APPENDIX I

Odessa Yates: The 1998 to 2000 Field Seasons

Odessa Yates (34BV100) is a large Middle Ceramic settlement in Beaver County, Oklahoma. Three field seasons of archaeological investigations were conducted at this site as a part of this research. Fieldwork included large-scale shallow subsurface geophysical survey, testing, and open block excavation. Figure I.1 provides a plan map of the site and the location of investigated areas. In addition to these investigations several private collections from Odessa Yates were also documented (see Brosowske and Bement 1998). This appendix briefly relates the results of fieldwork conducted at Odessa Yates from 1998 to 2000. Subsequent appendices present the results of various analyses completed on cultural materials recovered.

Odessa Yates is one of the largest prehistoric settlement sites known for the region. Although the site has been known and collected by the local community for perhaps more than a century, professional archaeologists did not become aware of its existence until it was recorded in the spring of 1998. Odessa Yates is approximately 40.5 ha (100 acres) in size and is situated along the south side of Clear Creek. The site is part of a much larger extended village that stretches for several kilometers (see Figure 4.13). Extensive private collections indicate that Odessa Yates contained a single Middle Ceramic period (A.D. 1200-1500) component. Subsequent fieldwork and absolute dating completed since 1998 supports this interpretation.

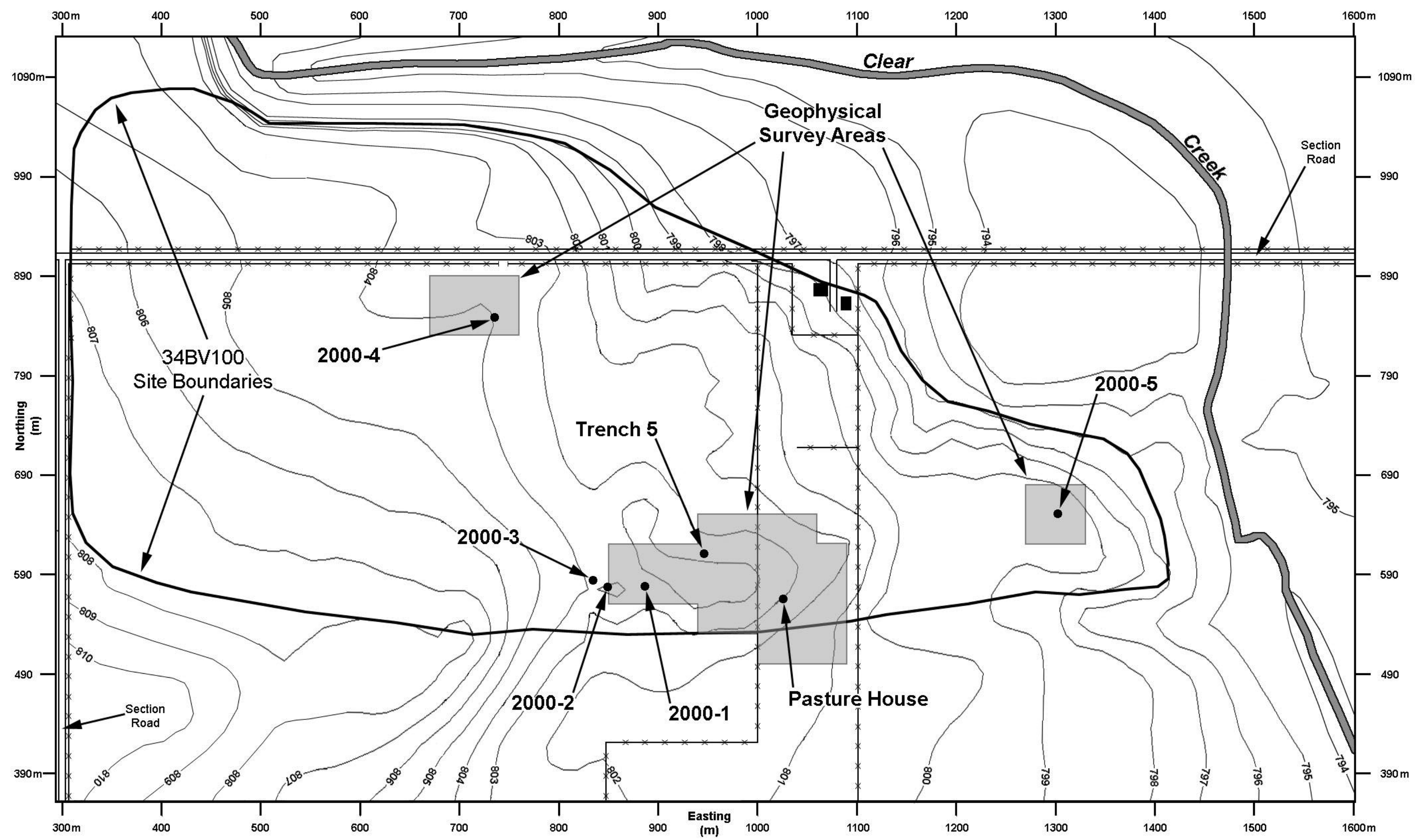

Figure I.1 Plan Map of 34BV100

Currently, about 50% of Odessa Yates is actively cultivated, although it appears that most of the site was farmed until the 1940's. In June of 1998 geophysical survey using a Geoscan RM 15 resistance meter and a Geoscan FM 35 gradiometer was conducted in a fenced portion of the site that has been in pasture for nearly 60 years (Maki and Jones 1998). The resistance survey covered 6300 m^2 and the magnetic survey included 4500 m^2 (Figure I.1). This geophysical survey, representing the first completed in the region using modern equipment (see Hughes and Hughes-Jones 1987:121-130), successfully identified numerous anomalies thought to be cultural in origin.

The survey area was separated from a wheat field on the west by a barbed wire fence. At the time of the survey wheat in this field was mature and about ready to be harvested. During the evening, under the low light conditions, several hundred positive cropmarks were visible in this field. These cropmarks were circular in shape and varied in size from one to six meters in diameter. These anomalies were clearly visible as discrete areas containing taller and thicker vegetation. Closer inspection of these areas showed charcoal stained soils and concentrations of cultural debris. Although it was apparent that these cropmarks were associated with buried cultural features, further investigation of these features was not possible until January of 2000.

Shortly after the geophysical survey was completed, a sample of resistance and magnetic anomalies were selected for systematic ground truthing or testing in July of 1998. Testing determined that all of the most salient anomalies could be attributed to differences in topography or local variation in soils and bedrock geology. In other words, these anomalies were not cultural in origin. However, there were also numerous, much more subtle anomalies that did represent cultural features. These features showed up in both the resistance and magnetic data and could be split into two main categories: 1) large basin shaped features approximately four to six meters in diameter and 2) smaller features about 1 m in diameter. Once located, both types of features were easily differentiated from surrounding matrix by coring because they contained dark, greasy soil filled charcoal, bone, and other cultural debris. Based on testing it was concluded that the largest features likely represented domestic structures and the smaller ones were cache pits. Both types of features extended to depths of about 100 to 150 cm below the modern ground surface.

In June and July of 1999 a six week long archaeological field school was conducted at Odessa Yates by the University of Oklahoma (Brosowske 1999). Fieldwork completed during this field season focused on block excavation at one of the large basin shaped features identified and tested in 1998. Additional geophysical survey extended the block examined in 1998 and also completed areas immediately to the west in the wheat field which was not cultivated at that time. A total of 18,900 m^2 was surveyed with a resistance meter and 18,000 m^2 was examined with a gradiometer during this field season (Figure I.1).

Excavation of the large basin shaped feature uncovered an oval shaped pithouse approximately 5.5 x 3.5 m in size (Figure I.2). This structure, called the Pasture House, was excavated to a depth of about 100 cm below aboriginal surface. It had two central support posts, and smaller posts about 8 cm in diameter around the perimeter. The house was oriented from northwest to southeast. No discernable entry was identified, although a 1 m diameter vestibule adjoined the structure on the southeast corner and was separated from the rest of the house by a raised sill. Although unclear, entry to the structure may have been gained through this vestibule.

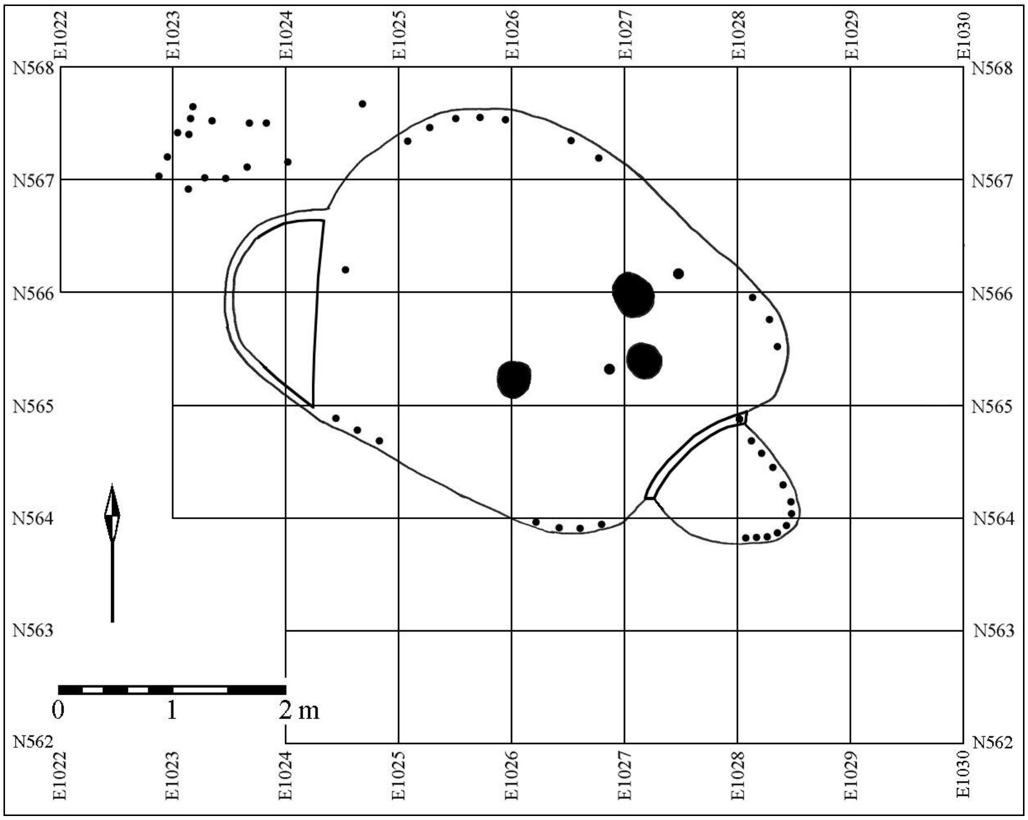

Figure I.2 Floor Plan of the Pasture House at 34BV100

Fill within this structure lacked evidence for the remnants of a superstructure indicating that the house was dismantled and usable materials were salvaged. Following abandonment the house basin was filled with a mixture of midden debris and aeolian and colluvial sediments. A north to south profile across this structure shows a series of strata sloping downward from the margins of the feature to the center of the basin (Figure I.3). In general the pasture house contained a level floor, although a shallow basin shaped depression was observed along the west wall. This basin was roughly oval in shape and approximately 1 x 2 m in size and 0.2 m deep. Outside and immediately upslope from the house (i.e., along the northwest side) a series 14 small posts were identified. Each of these posts was about 8 cm in diameter and did not present any obvious patterning. One wood charcoal sample from the floor of the Pasture House was submitted for a standard radiocarbon date. This sample yielded a calibrated age of A.D. 1296 (Beta 133579).

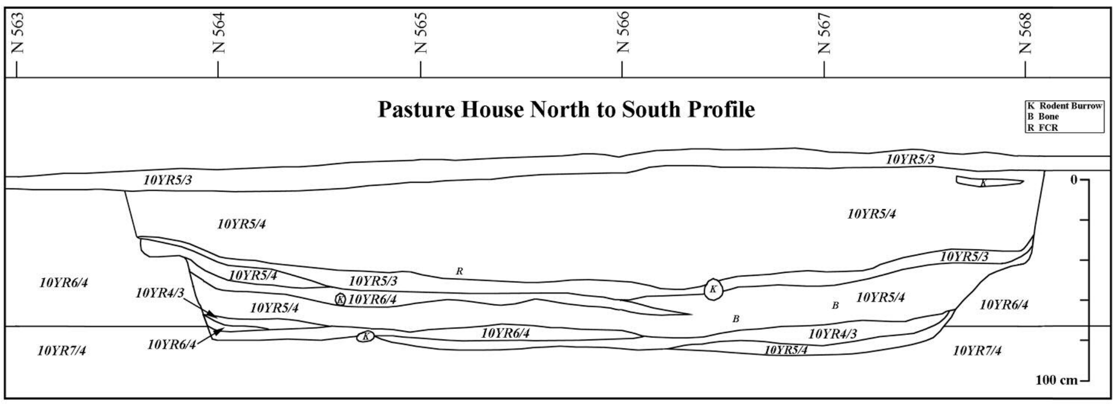

Figure I.3 Soil Profile from the Pasture House, 34BV100

Geophysical survey conducted in the fallow wheat field identified numerous anomalies which were thought to be cultural features. Following the survey a sample of these anomalies was subjected to ground truthing or testing to determine if indeed they represented cultural features. Small anomalies less than 2 m in diameter were systematically cored using a truck mounted “bull-probe” and Oakfield coring instruments. Larger anomalies were examined using a small backhoe with a 30 cm (12 in.) wide bucket. Trench #5 examined one such anomaly. Trenching of this area began to the west of a large high amplitude bipolar magnetic anomaly and proceeded slowly to the east with several individuals monitoring excavation. This trench was excavated to a length of 4 m when the edge of a semi-subterranean habitation structure was encountered. At this point, trenching of this anomaly was terminated and the trench was profiled and photographed.

To gain a better understanding of the architectural details of pithouses at Odessa Yates, Trench 5 was extended to the east through excavation of a series of 1 x 1 m test units until the eastern wall of this feature was encountered (Figure I.4). Upon completion the total length of this west to east trending trench, including both mechanical and hand excavated portions, was 11 m. The profile afforded by this trench indicated the presence of not one, but three overlapping pithouses (Figure I.5). From west to east these structures are labeled #2, #1, and #4. Two additional 1 x 1 m units (N 608/E949 and N608/E951) were also excavated to the north along the eastern end of the trench to gather additional architectural information regarding the shallow, easternmost structure (#4). This also aided in determining the diameter of the feature.

Work at Trench 5 continued with the excavation of a second trench (Figure I.4). Seven additional 1 x 1 m units were consecutively excavated northward from the original trench until the northern margin of structure #1 was encountered. The profile provided by this trench suggested that the structure was about 8 m long. Given the size of other pithouses present at the site, which are generally much smaller, it was thought that more than one feature might be present, but that could not be demonstrated at the time.

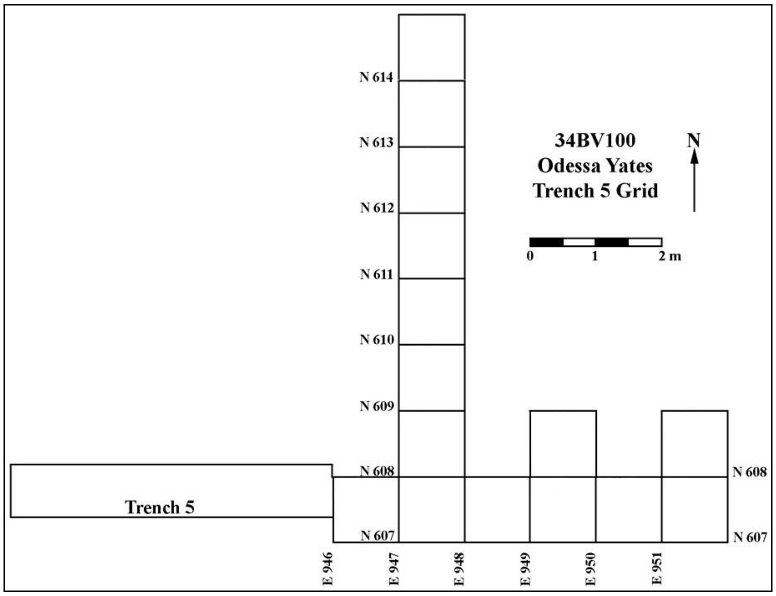

Figure I.4 Trench 5 Grid Layout at 34BV100

Determining the occupation sequence for the three structures identified at Trench 5 was, in some instances, quite apparent in soil profiles (Figure I.5). For example, in the west to east profile it was clear that the westernmost structure (#2) truncated an earlier house immediately to the east (#1). As noted above, the profile provided by the north to south trench suggested that structure #1 was about 8 m in diameter, but this seemed too large. In hopes of clarifying this issue two samples were submitted for absolute dating. The first sample submitted for Accelerator Mass Spectrometry (AMS) dating was from level 6 (55-65 cm below ground surface or BGS) of unit N 608/E949. The material dated was maize and was derived from midden fill deposited into structure #1 after it was abandoned. The provenience of this sample was northwest and below the floor of structure #4 and was associated with fill containing an obsidian Washita projectile point. This sample yielded a calibrated date of A.D. 1284 (Beta 145474) and indicated that both structures #2 and #4 post-date A.D. 1284.

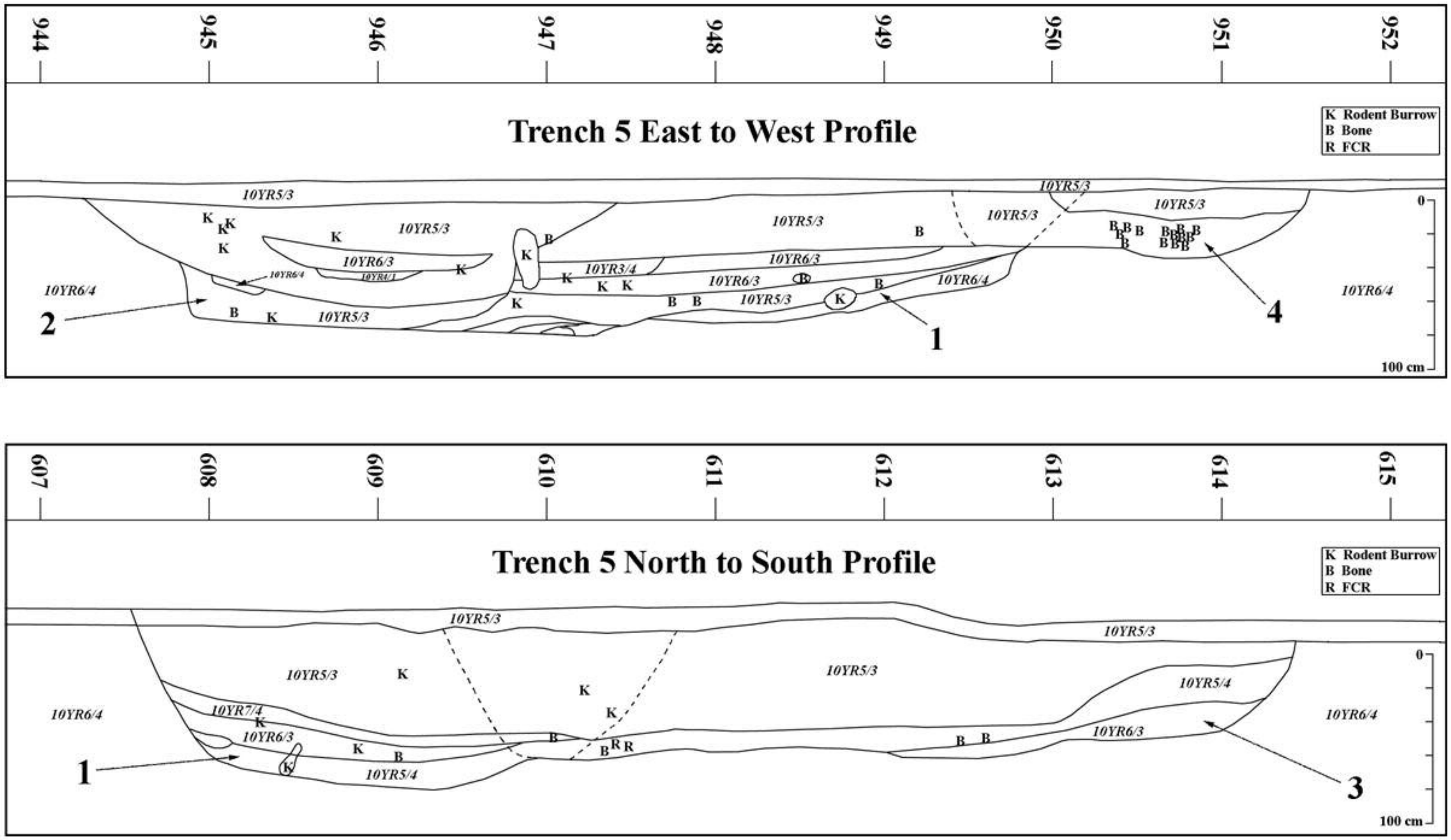

Figure I.5 Trench 5 Profiles

A second sample from Trench 5 was also submitted for AMS dating. This sample was from level 10 (95-105 cm BGS) of N612/E947. The material dated once again was maize. If this unit was part of structure #1 and this structure was indeed nearly 8 m in diameter, then the date obtained from this sample should have yielded a date relatively close to A.D. 1284. This sample yielded a calibrated AMS date of A.D. 1434 (Beta 153241). Since no other intrusive features, such as cache pits, were observed during the excavation of this section of Trench 5, based on radiometric data it is concluded that two structures, rather than one, are present in the N-S trench. Overall, profiles, superposition, and absolute dates provide a chronometric sequence for the features exposed in Trench 5. The approximate dates for structures 1 through 4 are shown in Figure I.6. Until samples for dating are submitted for structures 2 and 4, it is only possible to state that these features date sometime after A.D. 1284. In addition, it should be stressed that it is not possible to precisely identify the northern limits of structure #1 (or the southern limits of structure #3) in the N-S trench. As such, these boundaries as shown assume some degree of symmetry.

Given that numerous features, which overlap and are not contemporaneous, were identified at Trench 5 presents several analytical problems. As noted above, it was generally not possible to visually distinguish between the fill of overlapping features until excavation was complete and a profile was available. As a result, it is not possible to reliably separate cultural materials from each respective structure in instances where features overlapped, or likely overlapped, within a single 1 x 1 m excavation unit.

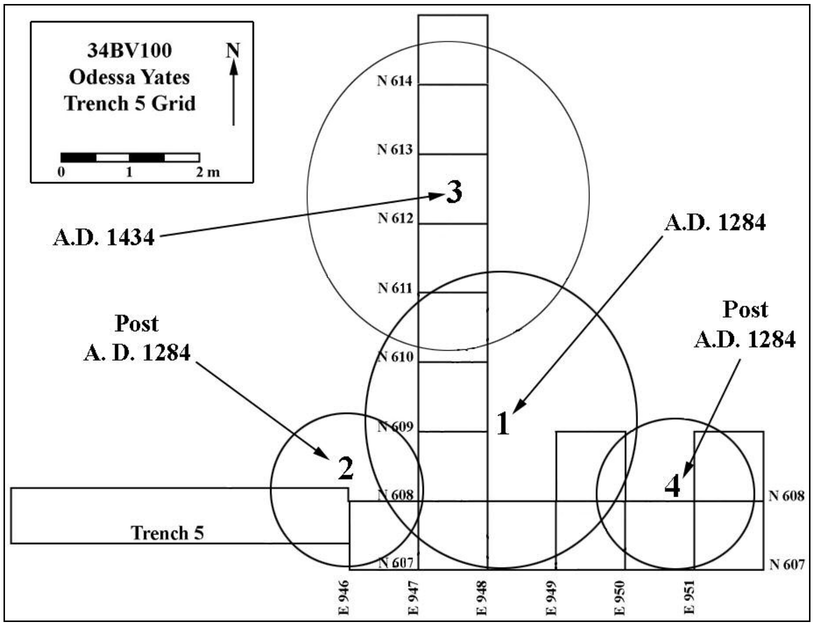

Figure I.6 Habitation Structures Identified at Trench 5, 34BV100

As mentioned earlier, a large number of positive cropmarks, which were thought to mark buried cultural features, were observed in the cultivated wheat field at Odessa Yates during the summer of 1998. This field was not planted again until August of 1999. The site was monitored throughout the fall and early winter of 1999 for the presence of cropmarks. In December the wheat sprouted and shortly thereafter cropmarks were observed along several low ridges and knolls throughout the field. Later, additional cropmarks were noted in some of the lower elevation areas.

In January of 2000 several days were spent mapping and coring some these features. Aerial photography was also undertaken as a means to further document these anomalies. A total 108 cropmarks approximately 1 m in diameter (probable cache pits) were mapped. Twelve cropmarks were noticeably larger and ranged in size from three to seven meters in diameter. These probably mark the location of semi-subterranean domestic structures. A 20% sample of these features was subjected to coring. Results indicate that these cropmarks do indeed represent buried cultural features. In addition, the provenience data for cropmarks were overlaid onto maps depicting the results of resistance and magnetic survey. This helped clarify the interpretation of small, subtle anomalies present in the geophysical data.

A second summer field school was held at Odessa Yates during August of 2000. This field school was only three weeks long, but completed testing at five different areas of the site. Three of the features examined had been previously located through geophysical survey (i.e., 2000-1) or were marked by positive cropmarks (2000-2, and 2000-3). Two additional features (2000-4 and 2000-5), were identified by geophysical survey conducted as a part of the field school. Altogether, 2000-1, 2000-2, and 2000-3 are located near the center of the site, while the other two are along the northern (2000-4) and eastern margins (2000-5) of 34BV100 (Figure I.1).

The primary goal of these investigations was to collect a sample of cultural materials from several different portions of the settlement. Testing consisted of the excavation of a 1 x 2 m unit from the ground surface to the bottom of each feature. Features 2000-2, 2000-4, and 2000-5 all represent semi-subterranean pithouses that were between four and five meters in diameter. Excavation units in each of these three areas were all placed in the approximate center of these structures as indicated by coring conducted with a truck mounted “bull probe”. As such, beyond determining the diameter of these features through coring, these units provided no information regarding the architecture of domestic structures at the site. Features 2000-2 and 2000-5 both contained abundant midden debris deposited into houses after abandonment. Feature 2000-4 contained very little cultural material throughout all levels, except on the floor where the butchered remains from a summer bison kill event were documented. Accelerator mass spectrometry dates from 2000-4 and 2000-5 suggest these structures were abandoned during the fourteenth century (Beta 153242) and around A.D. 1300 (Beta 153243), respectively.

Feature 2000-1 is a small, shallow structure 2.5 m in diameter (Figure I.7). This floor of this feature was only about 50 cm below the ground surface, but contained extensive midden debris. The conclusion that this feature was a habitation structure is supported by the presence of a central support post, a basin shaped hearth, and a small stepped entryway to the east. Its small size and the absence of substantial walls, however, may indicate that the occupation of this structure was limited to the warmer months. An AMS date on maize from this structure indicates that it was abandoned around A.D. 1476 (Beta 169790).

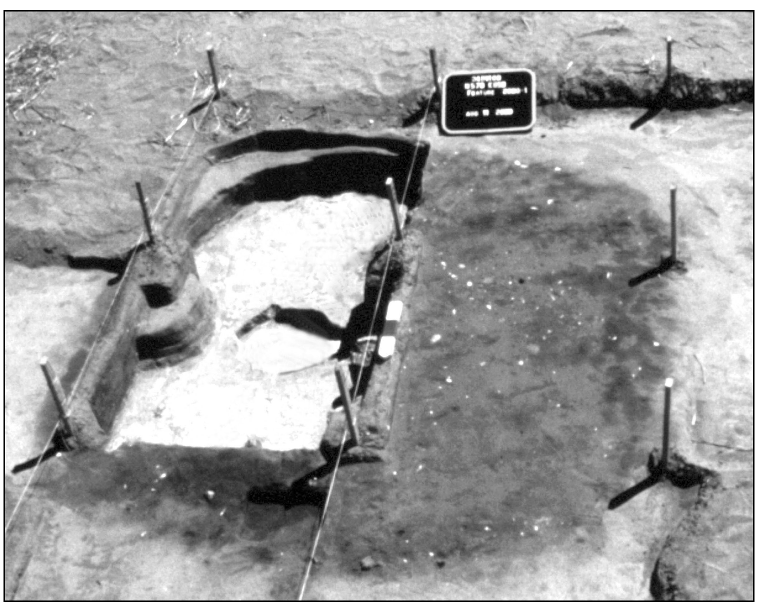

Figure I.7 Seasonal Habitation Structure (Feature 2000-1) at Odessa Yates

The remaining feature examined in 2000, 2000-3, is a large bell-shaped cache pit (Figure I.8). Investigations examined only the southern half of this feature. This cache pit extended to a depth of 150 cm, was about 140 cm at its widest point, and had an orifice diameter of approximately 95 cm. Interestingly, a caliche plaster 5 cm thick was applied to the interior walls of this pit. After abandonment this feature was completely backfilled with trash debris. Notable artifacts recovered from 2000-1 included numerous bison scapula and tibia bone tools and abundant charred corn remains. An AMS date on maize from the bottom of the feature yielded a calibrated age of A.D. 1476 (Beta 169791). Table I.1 presents dates from 34BV100.

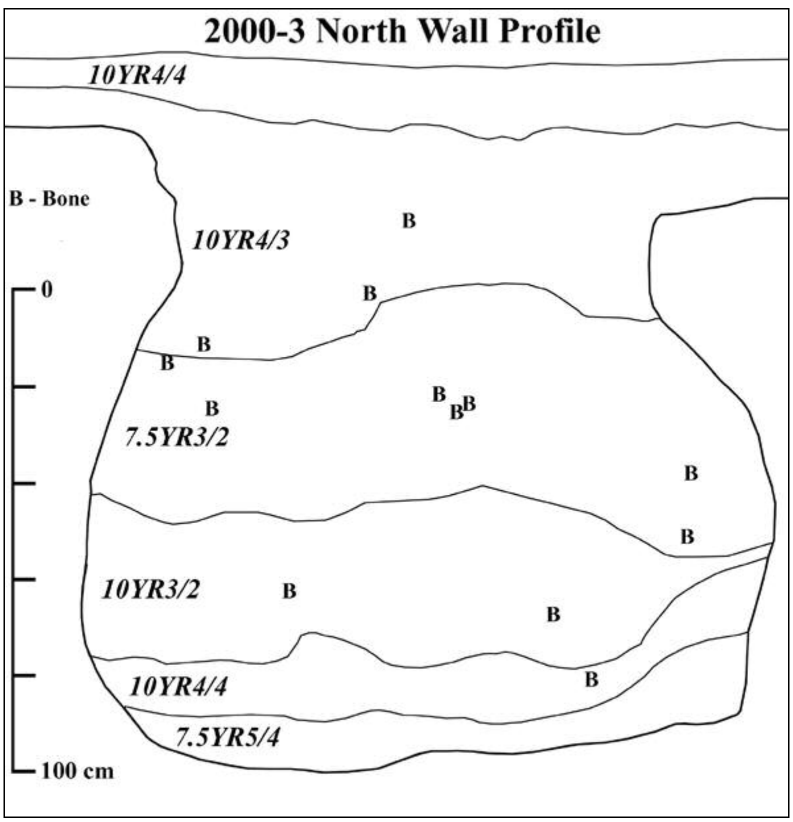

Figure I.8 Bell-Shaped Cache Pit (Feature 2000-3) at Odessa Yates

Table I.1 Radiocarbon Dates from Odessa Yates (34BV100)*

Feature	North	East	Level	Lab #	Conventional Radiocarbon Age	Material	13C/12C Ratio	Calibrated Age	1 Sigma Range (Probability Distrib.)
Pasture House	566	1027	9	Beta 133579	680 ± 60 BP	Wood	-25.6 o/oo	A.D. 1296	A.D. 1279-1321 (.529) A.D. 1351-1389 (.471)
2000-1	579	885	4	Beta 169790	390 ± 40 BP	Maize	-10.3 o/oo	A.D. 1476	A.D. 1444-1516 (.809) A.D. 1598-1617 (.191)
2000-3	584	834	14	Beta 169791	390 ± 40 BP	Maize	-10.3 o/oo	A.D. 1476	A.D. 1444-1516 (.809) A.D. 1598-1617 (.191)
Tr. 5 Structure 1	608	949	6	Beta 145474	720 ± 40 BP	Maize	-9.7 o/oo	A.D. 1284	A.D. 1261-1300 (.961) A.D. 1373-1377 (.039)
Tr. 5 Structure 4	612	947	10	Beta 153241	480 ± 50 BP	Maize	-11.4 o/oo	A.D. 1434	A.D. 1404-1455 (.982) A.D. 1456-1458 (.018)
2000-4	848	735	12	Beta 153242	630 ± 40 BP	Maize	-10.1 o/oo	A.D. 1304, 1367, 1385	A.D. 1300-1326 (.395) A.D. 1348-1373 (.381) A.D. 1377-1391 (.224)
2000-5	653	1031	10	Beta 153243	670 ± 40 BP	Wood	-25.7 o/oo	A.D. 1297	A.D. 1284-1310 (.460) A.D. 1354-1387 (.540)

*All dates are AMS dates except Beta 133579 which was a standard radiometric date
Radiocarbon Calibration Program Revised 4.3; Stuiver, M. and Reimer, P. J., 1993

These discussions have provided a brief summary of the investigations conducted at 34BV100 from 1998 to 2000. This work resulted in the investigation of 10 separate cultural features. All of these features represent domestic structures except 2000-3 which was a storage facility. In addition to excavation, 34,200 m^2 or 3.42 ha were surveyed using geophysical instruments. Radiocarbon dates were obtained for seven of the features examined and demonstrate occupation of Odessa Yates from about A.D. 1275 to A.D. 1475. In subsequent appendices the results of analyses conducted on faunal, chipped stone, and botanical remains, from these features are presented. As such, these discussions provide basic information regarding the provenience of cultural materials analyzed.

APPENDIX II

Odessa Yates (34BV100): The Faunal Remains

This appendix presents the results of analyses conducted on faunal remains from the Odessa Yates site. These materials were recovered during two summer field schools conducted at the site by the University of Oklahoma in 1999 and 2000. Here, faunal remains recovered from six areas investigated during these field seasons are reported. These areas include 2000-1, 2000-2, 2000-3, and 2000-5, Trench 5, and the Pasture House. Feature 2000-4, a domestic structure along the northern margins of Odessa Yates, was nearly devoid of trash debris. As such, the total number of faunal remains from this feature did not constitute a large sample and was not analyzed. Figure I.1 shows the locaion of each of the areas investigated at the site.

Except for faunal remains from the Pasture House, all of the analysis results presented here were completed by the author from 1999 to 2002. These studies were conducted at the Oklahoma Archeological Survey in Norman and made use of the extensive comparative faunal collection housed there. As noted in Appendix I, all but Feature 2000-3 (a trash filled cache pit) represent abandoned domestic structures filled with trash debris. The total amount of trash debris deposited in these features, especially faunal remains, was generally extensive. As a result, a sample of faunal materials from each feature was selected for analysis. In most cases, samples consisted of all faunal remains recovered from a single 1 x 1 m excavation unit. The sample from Trench 5, which tested four overlapping domestic structures, is derived from 10, 1 x 1 m units. Sample sizes for each discrete feature ranged from about 1900 to 6400 individual specimens. Combined, all of the samples total nearly 26,500 specimens. Except for some of the upper levels, which were excavated with shovels, all excavation at Odessa Yates was conducted using trowels and bamboo tools. Soil was dry screened through 3 mm mesh.

The analytical procedures and data classes used in these analyses focused on collecting information needed for reconstructing diet breadth and butchering and transport decisions by the occupants of Odessa Yates. Attributes used to determine skeletal element frequencies for each taxon included the portion, segment, and side of an element. Anatomical landmarks were also recorded for several elements. Efforts were generally made to identify the taxon represented for all specimens, although given the fragmentary condition of the assemblage some general classes were utilized (e.g., deer/antelope, fish, and aquatic turtles). Fish remains were not identified to taxa or element; they were simply recorded as "unidentified fish".

Specimens too fragmentary for species identification were assigned to classes, such as unidentified mammal, bird, and so on. Unidentified mammal bones were further divided into three categories based upon the animal's size. These categories included 1) large mammals (e.g., bison, elk, and bear), 2) medium mammals (e.g., mule deer, white-tailed deer, pronghorn, wolf, domestic dog, and coyote), and 3) small mammals (e.g., foxes, rabbits, hares, rats, and mice). When possible generalized element designations, such as long bone, rib, and vertebra along with size class information were also recorded for all unidentified specimens. Since no identifiable elements of any large mammals other than bison were observed, it is concluded that all unidentifiable large mammals remains probably represent bison. Overall, the frequencies of each category of unidentifiable mammals are similar to the results provided by identifiable specimens. The only inconsistency observed is from Feature 2000-5 where higher numbers of deer to jackrabbit sized mammals were observed. These remains were intensively processed into small unidentifiable fragments and were often burned.

Element size and whether a specimen was burned were recorded for insight into butchering strategies. The maximum length of all specimens was recorded using an arbitrary size class system. These classes are as follows: Class 1 (0-25 mm), Class 2 (25-50 mm), Class 3 (50-100 mm), Class 4 (100-200 mm), and Class 5 (>200 mm). Size information was recorded for all specimens. These data are only presented for bison and deer/pronghorn since the elements of other species generally fell into Classes 1 or 2. Bone breakage caused by excavation appears to be minimal and element sizes observed are assumed to have resulted largely from aboriginal processing. This conclusion is reasonable considering that faunal remains from the site are characterized by green bone breaks and exhibit little surface weathering. Evidence for burning was simply recorded as present or absent. Weights were recorded by all specimens, but are reported only for species other than bison and deer/pronghorn.

The results of faunal analyses are presented here in tabular form by feature. Minimum number of individuals (MNI) information is also provided. Earlier a combined summary of faunal data from Odessa Yates was presented in Chapter Seven (Table 7.6). The interpretation that the occupants of this settlement practiced an economy largely dependent on bison is supported by the data presented here.

FEATURE 2000-1 FAUNAL REMAINS (N=4240)

Bison	Comp.	Prox.	Distal	Shaft	Other	N	MNI
Unidentified Large Mammal	-	-	-	-	3180	3180	-
Long Bone Fragments	-	-	-	-	153	153	-
Cranium	-	-	-	-	3	3	1
Mandible (Right)	-	-	-	-	-	-	-
Mandible (Left)	-	-	-	-	1	1	1
Mandible (Unknown)	-	-	-	-	-	-	-
Tooth Fragments	-	-	-	-	1	1	1
Hyoid (Right)	-	-	-	-	-	-	-
Hyoid (Left)	-	-	-	-	-	-	-
Atlas	-	-	-	-	-	-	-
Axis	-	-	-	-	-	-	-
Cervical 3-7	-	-	-	-	-	-	-
Thoracic 1-14	-	-	-	-	-	-	-
Lumbar 1-5	-	-	-	-	1	1	1
Caudal	3	-	-	-	-	3	1
Unidentified Vertebra	-	-	-	-	25	25	-
Vertebra (Ant. Epiphysis)	1	-	-	-	1	2	-
Vertebra (Post. Epiphysis)	-	-	-	-	-	-	-
Sacrum	-	-	-	-	1	1	1
Rib (Right)	-	-	-	-	1	1	-
Rib (Left)	-	-	-	-	1	1	-
Rib (Unknown)	-	-	-	-	220	220	-
Sternal elements	-	-	-	-	-	-	-
Scapula (Right)	-	1	-	-	3	4	1
Scapula (Left)	-	-	-	-	6	6	1
Scapula (Fragments)	-	-	-	-	29	29	-
Humerus (Right)	-	-	-	1	-	1	1
Humerus (Left)	-	-	1	-	-	1	1
Humerus (Unknown)	-	-	-	-	-	-	-
Radius (Right)	-	-	-	-	-	-	-
Radius (Left)	-	-	-	1	-	1	1
Radius (Unknown)	-	-	-	-	-	-	-
Ulna (Right)	-	-	-	-	-	-	-
Ulna (Left)	-	-	-	-	-	-	-
Metacarpal (Right)	-	-	-	-	-	-	-
Metacarpal (Left)	-	-	-	-	-	-	-
Metacarpal (Unknown)	-	-	-	-	-	-	-
Unidentified Carpal	-	-	-	-	-	-	-
Ulnar Carpal	-	-	-	-	-	-	-
Intermediate Carpal	-	-	-	-	-	-	-
Radial Carpal	-	-	-	-	-	-	-
2nd & 3rd Carpal (Right)	-	-	-	-	1	1	1
2nd & 3rd Carpal (Left)	-	-	-	-	-	-	-
Fourth Carpal	-	-	-	-	-	-	-
Accessory Carpal	-	-	-	-	-	-	-
Innominate (Right)	-	-	-	-	-	-	-
Innominate (Left)	-	-	-	-	1	1	1
Innominate (Unknown)	-	-	-	-	-	-	-
Femur (Right)	-	-	-	1	-	1	1
Femur (Left)	-	1	-	-	-	1	1
Femur (Unknown)	-	-	-	2	-	2	1
Tibia (Right)	-	-	1	2	-	3	1

Bison	Comp.	Prox.	Distal	Shaft	Other	N	MNI
Tibia (Left)	-	-	1	1	-	2	1
Tibia (Unknown)	-	-	-	2	-	2	1
Patella (Right)	-	-	-	-	-	-	-
Patella (Left)	-	-	-	-	-	-	-
Astragalus (Right)	-	-	-	-	-	-	-
Astragalus (Left)	-	-	-	-	1	1	1
Calcaneus (Right)	-	-	-	-	-	-	-
Calcaneus (Left)	1	-	-	-	-	1	1
Calcaneus (Unknown)	-	-	1	-	-	1	1
Lateral Malleolus (Right)	1	-	-	-	-	1	1
Lateral Malleolus (Left)	-	-	-	-	-	-	-
Central & 4th Tarsal (Right)	-	-	-	-	1	1	1
Central & 4th Tarsal (Left)	-	-	-	-	-	-	-
Metatarsal (Right)	-	1	-	1	-	2	1
Metatarsal (Left)	-	-	-	-	-	-	-
Metatarsal (Unknown)	-	-	-	1	-	1	1
Metapodial	-	1	3	1	-	5	2
1st Phalanx (Right)	1	3	2	1	-	7	1
1st Phalanx (Left)	1	1	1	-	-	3	1
2nd Phalanx (Right)	1	-	-	-	-	1	1
2nd Phalanx (Left)	2		3	-	-	5	2
2nd Phalanx (Unknown)	-	-	-	-	-	-	-
3rd Phalanx (Right)	-	-	-	-	1	1	1
3rd Phalanx (Left)	-	1	-	-	1	2	1
3rd Phalanx (Unknown)	-	-	-	-	1	1	1
Unidentified Phalanx	-	-	-	-	1	1	1
Proximal Sesamoid (Right)	3	-	-	-	1	4	1
Proximal Sesamoid (Left)	1	-	-	-	-	1	1
Distal Sesamoid (Right)	1	-	-	-	-	1	1
Distal Sesamoid (Left)	-	-	-	-	-	-	-
Totals						**3687**	**2**

Deer/Pronghorn	Comp.	Prox.	Distal	Shaft	Other	N	MNI
Unident. Medium Mammal	-	-	-	-	1	1	-
Long Bone Fragments	-	-	-	-	-	-	-
Cranium (Antler)	-	-	-	-	1	1	1
Mandible (Right)	-	-	-	-	-	-	-
Mandible (Left)	-	-	-	-	1	1	1
Mandible (Unknown)	-	-	-	-	-	-	-
Tooth Fragments	-	-	-	-	-	-	-
Hyoid (Right)	-	-	-	-	-	-	-
Hyoid (Left)	-	-	-	-	-	-	-
Atlas	-	-	-	-	-	-	-
Axis	-	-	-	-	1	1	1
Cervical 3-7	-	-	-	-	-	-	-
Thoracic 1-14	-	-	-	-	-	-	-
Lumbar 1-5	-	-	-	-	-	-	-
Caudal	-	-	-	-	-	-	-
Unidentified Vertebra	-	-	-	-	-	-	-
Vertebra (Ant. Epiphysis)	-	-	-	-	-	-	-
Vertebra (Post. Epiphysis)	-	-	-	-	-	-	-
Sacrum	-	-	-	-	-	-	-

Deer/Pronghorn	Comp.	Prox.	Distal	Shaft	Other	N	MNI
Rib (Right)	-	-	-	-	-	-	-
Rib (Left)	-	-	-	-	-	-	-
Rib (Unknown)	-	-	-	-	1	1	-
Sternal elements	-	-	-	-	-	-	-
Scapula (Right)	-	-	-	-	-	-	-
Scapula (Left)	-	-	-	-	-	-	-
Scapula (Unknown)	-	-	-	-	1	1	1
Humerus (Right)	-	-	-	-	-	-	-
Humerus (Left)	-	-	-	-	-	-	-
Humerus (Unknown)	-	-	-	-	-	-	-
Radius (Right)	-	-	-	-	-	-	-
Radius (Left)	-	-	-	-	-	-	-
Radius (Unknown)	-	-	-	-	-	-	-
Ulna (Right)	-		-		-	-	-
Ulna (Left)	-	-	-	-	-	-	-
Metacarpal (Right)	-			-	-	-	-
Metacarpal (Left)	-	-		-	-	-	-
Metacarpal (Unknown)	-	-	-	-	-	-	-
Unidentified Carpal	-	-	-	-	-	-	-
Ulnar Carpal	-	-	-	-	-	-	-
Intermediate Carpal	-	-	-	-	-	-	-
Radial Carpal (Right)	-	-	-	-	-	-	-
Radial Carpal (Left)	-	-	-	-	-	-	-
2nd & 3rd Carpal (Right)	-	-	-	-	-	-	-
2nd & 3rd Carpal (Left)	1	-	-	-	-	1	1
Fourth Carpal	-	-	-	-	-	-	-
Accessory Carpal (Right)	-	-	-	-	-	-	-
Accessory Carpal (Left)	-	-	-	-	-	-	-
Innominate (Right)	-	-	-	-	-	-	-
Innominate (Left)	-	-	-	-	-	-	-
Innominate (Unknown)	-	-	-	-	-	-	-
Femur (Right)	-	-	-	-	-	-	-
Femur (Left)	-	-	-	-	-	-	-
Femur (Unknown)	-	-	-	-	-	-	-
Femur/Humerus	-	-	-	-	-	-	-
Tibia (Right)	-	-		-	-	-	-
Tibia (Left)	-	-	-	-	-	-	-
Tibia (Unknown)	-	-	-	-	-	-	-
Patella (Right)	-	-	-	-	-	-	-
Patella (Left)		-	-	-	-		-
Astragalus (Right)	-	-	-	-	-	-	-
Astragalus (Left)	-	-	-	-	-	-	-
Calcaneus (Right)	-	-	-	-	-	-	-
Calcaneus (Left)		-	-	-	-		-
Calcaneus (Unknown)	-	-	-	-	-	-	-
Lateral Malleolus (Right)	-	-	-	-	-	-	-
Lateral Malleolus (Left)	-	-	-	-	-	-	-
Central & 4th Tarsal (Right)	-	-	-	-	1	1	1
Central & 4th Tarsal (Left)	-	-	-	-	-	-	-
Metatarsal (Right)	-	-	-	-	-	-	-
Metatarsal (Left)	-	-	-	-	-	-	-

Deer/Pronghorn	Comp.	Prox.	Distal	Shaft	Other	N	MNI
Metatarsal (Unknown)	-	-	-	-	-	-	-
Metapodial	-	-	-	-	-	-	-
1st Phalanx (Right)	-	-	-	-	-	-	-
1st Phalanx (Left)	-	-	-	-	-	-	-
1st Phalanx (Unknown)	-	-	-	-	-	-	-
2nd Phalanx (Right)	-	-	-	-	-	-	-
2nd Phalanx (Left)	-	-	-	-	-	-	-
3rd Phalanx (Right)	-	-	-	-	-	-	-
3rd Phalanx (Left)	-	-	-	-	-	-	-
3rd Phalanx (Unknown)	-	-	-	-	-	-	-
Unidentified Phalanx	-	-	-	-	-	-	-
Proximal Sesamoid (Right)	-	-	-	-	-	-	-
Proximal Sesamoid (Left)	-	-	-	-	-	-	-
Distal Sesamoid (Right)	-	-	-	-	-	-	-
Distal Sesamoid (Left)	-	-	-	-	-	-	-
Totals						**8**	**1**

Other Mammals	NISP	%	MNI	WT (g)
Black-Tailed Jackrabbit	7	24.1	1	3
Plains Pocket Gopher	4	13.8	1	0.2
Prairie Dog	5	17.2	1	1.3
Eastern Wood Rat	1	3.5	1	0.1
Coyote/Dog	3	10.3	1	0.7
Fox	2	6.9	1	0.2
Mouse	1	3.5	1	0
Unident. Small Mammal	6	20.7	-	0.4
Total	**29**	**100**	**8**	**5.5**

Mussel (U. tetralasmus)	NISP	WT (g)	MNI
Umbo (Rt)	6	4.4	6
Umbo (Lt)	5	3.2	5
Unidentified Fragment	124	21.3	-
Total	**135**	**28.9**	**6**

Western Box Turtle	NISP	WT (g)	MNI
Carapace/Plastron	357	187.2	2
Humerus (Lt)	2	0.4	2
Scapula (Lt)	2	0.1	2
Vertebra	1	0	1
Innominate	2	0.1	1
Total	**364**	**187.8**	**2**

Unidentified Aquatic Turtle	NISP	WT (g)	MNI
Carapace/Plastron	12	6	2
Total	**12**	**6**	**2**

Unidentified Fish	NISP	WT (g)	MNI
Unidentified Element	2	0.2	1
Total	**2**	**0.2**	**1**

Unidentified Snake	NISP	WT (g)	MNI
Vertebra (Nonvenomous)	1	0.1	1
Vertebra (Venomous)	1	0	1
Total	**2**	**0.1**	**2**

Tiger Salamander	NISP	WT (g)	MNI
Femur	1	0	1
Total	**1**	**0**	**1**

FEATURE 2000-2 FAUNAL REMAINS (N=1921)

Bison	Comp.	Prox.	Distal	Shaft	Other	N	MNI
Unidentified Large Mammal	-	-	-	-	1544	1544	-
Long Bone Fragments	-	-	-	-	4	4	-
Cranium	-	-	-	-	4	4	-
Mandible (Right)	-	-	-	-	-	-	-
Mandible (Left)	-	-	-	-	1	1	1
Mandible (Unknown)	-	-	-	-	-	-	-
Tooth Fragments	-	-	-	-	15	15	-
Hyoid (Right)	-	-	-	-	-	-	-
Hyoid (Left)	-	-	-	-	-	-	-
Atlas	-	-	-	-	-	-	-
Axis	-	-	-	-	-	-	-
Cervical 3-7	-	1	-	-	1	2	1
Thoracic 1-14	-	-	-	-	9	9	1
Lumbar 1-5	-	-	-	-	-	-	-
Unidentified Vertebra	-	-	-	-	10	10	1
Vertebra (Ant. Epiphysis)	-	-	-	-	-	-	-
Vertebra (Post. Epiphysis)	-	-	-	-	-	-	-
Sacrum	-	-	-	-	1	1	1
Rib (Right)	-	-	-	-	1	1	-
Rib (Left)	-	-	-	-	4	4	-
Rib (Unknown)	-	-	-	-	107	107	-
Sternal elements	-	-	-	-	-	-	-
Scapula (Right)	-	-	-	-	-	-	-
Scapula (Left)	-	-	-	-	-	-	-
Scapula (Unknown)	-	-	-	-	1	1	1
Humerus (Right)	-	-	-	-	-	-	-
Humerus (Left)	-	-	-	1	-	1	1
Humerus (Unknown)	-	-	-	-	-	-	-
Radius (Right)	-	-	-	-	-	-	-
Radius (Left)	-	-	-	-	-	-	-
Radius (Unknown)	-	-	-	-	-	-	-
Ulna (Right)	-	-	-	-	-	-	-
Ulna (Left)	-	-	-	-	-	-	-
Metacarpal (Right)	-	-	-	-	-	-	-
Metacarpal (Left)	-	-	-	-	-	-	-
Metacarpal (Unknown)	-	-	-	-	-	-	-
Unidentified Carpal	-	-	-	-	-	-	-
Ulnar Carpal	-	-	-	-	-	-	-

Bison	Comp.	Prox.	Distal	Shaft	Other	N	MNI
Intermediate Carpal	-	-	-	-	-	-	-
Radial Carpal	-	-	-	-	-	-	-
2nd & 3rd Carpal	-	-	-	-	-	-	-
Fourth Carpal	-	-	-	-	-	-	-
Accessory Carpal	-	-	-	-	-	-	-
Innominate (Right)	-	-	-	-	-	-	-
Innominate (Left)	-	-	-	-	1	1	1
Innominate (Unknown)	-	-	-	-	13	13	-
Femur (Right)	-	-	-	-	-	-	-
Femur (Left)	-	-	-	1	-	1	1
Femur (Unknown)	-	-	-	1	-	1	-
Tibia (Right)	-	-	2	3	-	5	2
Tibia (Left)	-	-	-	-	-	-	-
Tibia (Unknown)	-	-	-	-	-	-	-
Patella	-	-	-	-	-	-	-
Astragalus	-	-	-	-	-	-	-
Calcaneus (Right)	-	-	-	-	-	-	-
Calcaneus (Left)	1	-	-	-	-	1	1
Calcaneus (Unknown)	-	-	-	-	-	-	-
Lateral Malleolus	-	-	-	-	-	-	-
Central & 4th Tarsal	-	-	-	-	-	-	-
Metatarsal (Right)	-	-	-	-	-	-	-
Metatarsal (Left)	-	-	-	1	-	1	1
Metatarsal (Unknown)	-	-	-	-	-	-	-
Metapodial	-	-	-	-	-	-	-
1st Phalanx (Right)	-	-	-	-	-	-	-
1st Phalanx (Left)	-	-	-	-	-	-	-
2nd Phalanx (Right)	1	1	-	-	-	2	1
2nd Phalanx (Left)	1	-	-	-	-	1	1
3rd Phalanx (Right)	-	1	-	-	-	1	1
3rd Phalanx (Left)	-	-	-	-	-	-	-
Proximal Sesamoid (Right)	1	-	-	-	-	1	1
Proximal Sesamoid (Left)	1	-	-	-	-	1	1
Distal Sesamoid (Right)	-	-	-	-	-	-	-
Distal Sesamoid (Left)	-	-	-	-	-	-	-
Totals						**1733**	**2**

Deer/Pronghorn	Comp.	Prox.	Distal	Shaft	Other	N	MNI
Unident. Medium Mammal	-	-	-	-	-	-	-
Long Bone Fragments	-	-	-	2	-	2	-
Cranium	-	-	-	-	-	-	-
Mandible (Right)	-	-	-	-	-	-	-
Mandible (Left)	-	-	-	-	-	-	-
Mandible (Unknown)	-	-	-	-	-	-	-
Tooth Fragments	-	-	-	-	-	-	-
Hyoid (Right)	-	-	-	-	-	-	-
Hyoid (Left)	-	-	-	-	-	-	-
Atlas	-	-	-	-	-	-	-
Axis	-	-	-	-	-	-	-
Cervical 3-7	-	-	-	-	-	-	-

Deer/Pronghorn	Comp.	Prox.	Distal	Shaft	Other	N	MNI
Thoracic 1-14	-	-	-	-	-	-	-
Lumbar 1-5	-	-	-	-	-	-	-
Unidentified Vertebra	-	-	-	-	-	-	-
Vertebra (Ant. Epiphysis)	-	-	-	-	-	-	-
Vertebra (Post. Epiphysis)	-	-	-	-	-	-	-
Sacrum	-	-	-	-	-	-	-
Rib (Right)	-	-	-	-	-	-	-
Rib (Left)	-	-	-	-	-	-	-
Rib (Unknown)	-	-	-	-	-	-	-
Sternal elements	-	-	-	-	-	-	-
Scapula (Right)	-	-	-	-	-	-	-
Scapula (Left)	-	-	-	-	-	-	-
Scapula (Unknown)	-	-	-	-	-	-	-
Humerus (Right)	-	-	1	-	-	1	1
Humerus (Left)	-	-	-	-	-	-	-
Humerus (Unknown)	-	-	-	-	-	-	-
Radius (Right)	-	-	-	-	-	-	-
Radius (Left)	-	-	-	-	-	-	-
Radius (Unknown)	-	-	-	-	-	-	-
Ulna (Right)	1	-	-	-	-	1	1
Ulna (Left)	-	-	-	-	-	-	-
Metacarpal (Right)	-	-	-	-	-	-	-
Metacarpal (Left)	-	-	-	-	-	-	-
Metacarpal (Unknown)	-	-	-	-	-	-	-
Unidentified Carpal	-	-	-	-	-	-	-
Ulnar Carpal	-	-	-	-	-	-	-
Intermediate Carpal	-	-	-	-	-	-	-
Radial Carpal	-	-	-	-	-	-	-
2nd & 3rd Carpal	-	-	-	-	-	-	-
Fourth Carpal	-	-	-	-	-	-	-
Accessory Carpal	-	-	-	-	-	-	-
Innominate (Right)	-	-	-	-	-	-	-
Innominate (Left)	-	-	-	-	-	-	-
Innominate (Unknown)	-	-	-	-	-	-	-
Femur (Right)	-	-	-	-	-	-	-
Femur (Left)	-	-	-	-	-	-	-
Femur (Unknown)	-	-	-	-	-	-	-
Tibia (Right)	-	-	-	-	-	-	-
Tibia (Left)	-	-	-	-	-	-	-
Tibia (Unknown)	-	-	-	-	-	-	-
Patella	-	-	-	-	-	-	-
Astragalus	-	-	-	-	-	-	-
Calcaneus (Right)	-	-	-	-	-	-	-
Calcaneus (Left)	-	-	-	-	-	-	-
Calcaneus (Unknown)	-	-	-	-	-	-	-
Lateral Malleolus	-	-	-	-	-	-	-
Central & 4th Tarsal	-	-	-	-	-	-	-
Metatarsal (Right)	-	-	-	-	-	-	-
Metatarsal (Left)	-	-	-	-	-	-	-
Metatarsal (Unknown)	-	-	-	-	-	-	-
Metapodial	-	-	-	-	-	-	-

Deer/Pronghorn	Comp.	Prox.	Distal	Shaft	Other	N	MNI
1st Phalanx (Right)	-	-	-	-	-	-	-
1st Phalanx (Left)	-	-	-	-	-	-	-
2nd Phalanx (Right)	-	-	-	-	-	-	-
2nd Phalanx (Left)	-	-	-	-	-	-	-
3rd Phalanx (Right)	-	-	-	-	-	-	-
3rd Phalanx (Left)	-	-	-	-	-	-	-
Proximal Sesamoid (Right)	-	-	-	-	-	-	-
Proximal Sesamoid (Left)	-	-	-	-	-	-	-
Distal Sesamoid (Right)	-	-	-	-	-	-	-
Distal Sesamoid (Left)	-	-	-	-	-	-	-
Totals	**-**	**-**	**-**	**-**	**-**	**4**	**1**

Other Mammals	NISP	%	MNI	WT (g)
Black-Tailed Jackrabbit	2	2.2	1	0.3
Plains Pocket Gopher	26	28.6	1	0.9
Prairie Dog	22	24.2	1	1.4
Kangaroo Rat/Mouse	3	3.3	1	0.1
Unident. Small Mammal	38	41.8	-	1.6
Totals	**91**	**100.1**	**4**	**4.3**

Mussel (U. tetralasmus)	NISP	WT (g)	MNI
Umbo (Rt)	1	0.8	1
Umbo (Lt)	-	-	-
Unidentified Fragment	21	2.0	-
Total	**22**	**2.8**	**1**

Western Box Turtle	NISP	WT (g)	MNI
Carapace/Plastron	52	13.7	-
Scapula (Lt)	1	0.1	1
Vertebra	2	0.1	1
Innominate (Lt)	2	0.1	2
Total	**57**	**14.0**	**2**

Unidentified Aquatic Turtle	NISP	WT (g)	MNI
Carapace/Plastron	4	0.8	-
Innominate (Rt)	1	0.1	1
Total	**5**	**0.9**	**1**

Unidentified Fish	NISP	WT (g)	MNI
Unidentified Element	8	0.2	1
Total	**8**	**0.2**	**1**

Unidentified Snake	NISP	WT (g)	MNI
Vertebra (Nonvenomous)	1	0.1	1
Total	**1**	**0.1**	**1**

FEATURE 2000-3 FAUNAL REMAINS (N=6373)

Bison	Comp.	Prox.	Distal	Shaft	Other	N	MNI
Unidentified Large Mammal	-	-	-	-	4974	4974	-
Long Bone Fragments	-	-	-	-	156	156	-
Cranium	-	-	-	-	18	18	-
Mandible (Right)	-	-	-	-	2	2	1
Mandible (Left)	-	-	-	-	-	-	-
Mandible (Unknown)	-	-	-	-	2	2	1
Tooth Fragments	-	-	-	-	55	55	-
Hyoid (Right)	-	-	-	-	1	1	1
Hyoid (Left)	-	-	-	-	-	-	-
Atlas	2	-	-	-	1	3	3
Axis	-	-	-	-	-	-	-
Cervical 3-7	5				3	8	-
Thoracic 1-14	-	-	-	-	5	5	-
Lumbar 1-5	-	-	-	-	2	2	-
Caudal	2	-	-	-	-	2	-
Unidentified Vertebra	-	-	-	-	126	126	-
Vertebra (Ant. Epiphysis)	-	-	-	-	-	-	-
Vertebra (Post. Epiphysis)	-	-	-	-	-	-	-
Sacrum	-	-	-	-	1	1	1
Rib (Right)	-	-	-	-	5	5	-
Rib (Left)	-	-	-	-	1	1	-
Rib (Unknown)	-	-	-	-	359	359	-
Sternal elements	-	-	-	-	2	2	-
Scapula (Right)	1	1	-	-	3	5	2
Scapula (Left)	-	3	-	-	1	4	3
Scapula (Fragments)	-		-	-	20	20	-
Humerus (Right)	-	1	1	-	-	2	1
Humerus (Left)	-	1	-	1	-	2	1
Humerus (Unknown)	-	-	-	1	-	1	1
Radius (Right)	-	1	-	-	-	1	1
Radius (Left)	-	2	-	2	-	4	2
Radius (Unknown)	-	-	-	-	-	-	-
Ulna (Right)	-	-	-	-	2	2	2
Ulna (Left)	-	-	-	-	-	-	-
Metacarpal (Right)	-	-	-	-	-	-	-
Metacarpal (Left)	-	1	-	-	-	1	1
Metacarpal (Unknown)	-	-	-	-	-	-	-
Unidentified Carpal	-	-	-	-	-	-	-
Ulnar Carpal	-	-	-	-	-	-	-
Intermediate Carpal	-	-	-	-	-	-	-
Radial Carpal (Right)	1	-	-	-	-	1	1
Radial Carpal (Left)	-	-	-	-	-	-	-
2nd & 3rd Carpal (Right)	-	-	-	-	-	-	-
2nd & 3rd Carpal (Left)	-	-	-	-	-	-	-
Fourth Carpal	-	-	-	-	-	-	-
Accessory Carpal (Right)	-	-	-	-	-	-	-
Accessory Carpal (Left)	1	-	-	-	-	1	1
Innominate (Right)	-	-	-	-	-	-	-

Bison	Comp.	Prox.	Distal	Shaft	Other	N	MNI
Innominate (Left)	-	-	-	-	1	1	1
Innominate (Unknown)	-	-	-	-	1	1	-
Femur (Right)	-	4		1	-	5	3
Femur (Left)	-	1	1	1	-	3	1
Femur (Unknown)	-	-	-	1	-	1	-
Femur/Humerus	-	-	1	-	-	1	-
Tibia (Right)	-	-	1	1	-	2	1
Tibia (Left)	-	-	4	1	-	5	4
Tibia (Unknown)	-	-	-	5	-	5	-
Patella (Right)	-	-	-	-	-	-	-
Patella (Left)	-	-	-	-	-	-	-
Astragalus (Right)	-	-	1	-	-	1	1
Astragalus (Left)	-	1	-	-	-	1	1
Calcaneus (Right)	-	-	-	-	-	-	
Calcaneus (Left)	-	-	-	-	2	2	1
Calcaneus (Unknown)	-	-	-	-	-	-	-
Lateral Malleolus (Right)	-	-	-	-	-	-	-
Lateral Malleolus (Left)	1	-	-	-	-	1	1
Central & 4th Tarsal (Right)	-	-	-	-	-	-	-
Central & 4th Tarsal (Left)	-	-	-	-	-	-	-
Metatarsal (Right)	-	-	-	-	-	-	-
Metatarsal (Left)	-	-	-	-	-	-	-
Metatarsal (Unknown)	-	-	-	-	-	-	-
Metapodial	-	-	-	2	-	2	1
1st Phalanx (Right)	-	2	2	-	-	4	1
1st Phalanx (Left)	3	4	1	-	-	8	2
2nd Phalanx (Right)	2	-	-	-	1	3	1
2nd Phalanx (Left)	1	-	-	-	-	1	1
3rd Phalanx (Right)	2	2	-	-		4	2
3rd Phalanx (Left)	-	4	-	-	4	8	1
3rd Phalanx (Unknown)	-	-	-	-	5	5	-
Unidentified Phalanx	-	-	-	-	-	-	-
Proximal Sesamoid (Right)	2	-	-	-	-	2	1
Proximal Sesamoid (Left)	-	-	-	-	-	-	-
Distal Sesamoid (Right)	-	-	-	-	-	-	-
Distal Sesamoid (Left)	-	-	-	-	-	-	-
Total						**5832**	**4**

Deer/Pronghorn	Comp.	Prox.	Distal	Shaft	Other	N	MNI
Unident. Medium Mammal	-	-	-	-	107	107	-
Long Bone Fragments	-	-	-	-	7	7	-
Cranium (Antler)	-	-	-	-	-	-	-
Mandible (Right)	-	-	-	-	-	-	-
Mandible (Left)	-	-	-	-	1	1	1
Mandible (Unknown)	-	-	-	-	-	-	-
Tooth Fragments	-	-	-	-	-	-	-
Hyoid (Right)	-	-	-	-	-	-	-
Hyoid (Left)	-	-	-	-	-	-	-
Atlas	-	-	-	-	-	-	-
Axis	-	-	-	-	-	-	-

Deer/Pronghorn	Comp.	Prox.	Distal	Shaft	Other	N	MNI
Cervical 3-7	-	-	-	-	-	-	-
Thoracic 1-14	-	-	-	-	-	-	-
Lumbar 1-5	-	-	-	-	-	-	-
Caudal	-	-	-	-	-	-	-
Unidentified Vertebra	-	-	-	-	2	2	-
Vertebra (Ant. Epiphysis)	-	-	-	-	-	-	-
Vertebra (Post. Epiphysis)	-	-	-	-	-	-	-
Sacrum	-	-	-	-	-	-	-
Rib (Right)	-	-	-	-	-	-	-
Rib (Left)	-	-	-	-	-	-	-
Rib (Unknown)	-	-	5	-	-	5	-
Sternal elements	-	-	-	-	-	-	-
Scapula (Right)	-	-	-	-	-	-	-
Scapula (Left)	-	-	-	-	-	-	-
Scapula (Unknown)	-	-	-	-	1	1	1
Humerus (Right)	-	-	-	-	-	-	-
Humerus (Left)	-	-	2	-	-	2	1
Humerus (Unknown)	-	-	-	-	-	-	-
Radius (Right)	-	-	-	-	-	-	-
Radius (Left)	-	-	-	-	-	-	-
Radius (Unknown)	-	-	-	-	-	-	-
Ulna (Right)	-	-	-		-	-	-
Ulna (Left)	-	-	-	-	-	-	-
Metacarpal (Right)	-	-	-	-	-	-	-
Metacarpal (Left)	-	-	-	-	-	-	-
Metacarpal (Unknown)	-	-	-	-	-	-	-
Unidentified Carpal	-	-	-	-	-	-	-
Ulnar Carpal	-	-	-	-	-	-	-
Intermediate Carpal	-	-	-	-	-	-	-
Radial Carpal (Right)	-	-	-	-	-	-	-
Radial Carpal (Left)	-	-	-	-	-	-	-
2nd & 3rd Carpal (Right)	-	-	-	-	-	-	-
2nd & 3rd Carpal (Left)	-	-	-	-	-	-	-
Fourth Carpal	-	-	-	-	-	-	-
Accessory Carpal (Right)	-	-	-	-	-	-	-
Accessory Carpal (Left)	-	-	-	-	-	-	-
Innominate (Right)	-	-	-	-	-	-	-
Innominate (Left)	-	-	-	-	-	-	-
Innominate (Unknown)	-	-	-	-	-	-	-
Femur (Right)	-	-	-	-	-	-	-
Femur (Left)	-	-	-	-	-	-	-
Femur (Unknown)	-	-	-	-	-	-	-
Femur/Humerus	-	-	-	-	-	-	-
Tibia (Right)	-	-	-	-	-	-	-
Tibia (Left)	-	-	-	-	-	-	-
Tibia (Unknown)	-	-	-	-	-	-	-
Patella (Right)	-	-	-	-	-	-	-
Patella (Left)		-	-	-	-		-
Astragalus (Right)	-	-	-	-	-	-	-
Astragalus (Left)	-	-	-	-	-	-	-
Calcaneus (Right)	-	-	-	-	-	-	-

Deer/Pronghorn	Comp.	Prox.	Distal	Shaft	Other	N	MNI
Calcaneus (Left)		-	-	-	-		-
Calcaneus (Unknown)	-	-	-	-	-	-	-
Lateral Malleolus (Right)	-	-	-	-	-	-	-
Lateral Malleolus (Left)	-	-	-	-	-	-	-
Central & 4th Tarsal (Right)	-	-	-	-	-	-	-
Central & 4th Tarsal (Left)	-	-	-	-	-	-	-
Metatarsal (Right)	-	-	-	-	-	-	-
Metatarsal (Left)	-	-	-	-	-	-	-
Metatarsal (Unknown)	-	-	-	-	-	-	-
Metapodial	-	-	-	-	-	-	-
1st Phalanx (Right)	-	-	-	-	-	-	-
1st Phalanx (Left)	-	-	-	-	-	-	-
1st Phalanx (Unknown)	-	-	-	-	-	-	-
2nd Phalanx (Right)	-	-	-	-	-	-	-
2nd Phalanx (Left)	-	-	-	-	-	-	-
3rd Phalanx (Right)	-	-	-	-	-	-	-
3rd Phalanx (Left)	-	-	-	-	-	-	-
Unidentified Phalanx	-	-	-	-	-	-	-
Proximal Sesamoid (Right)	-	-	-	-	-	-	-
Proximal Sesamoid (Left)	-	-	-	-	-	-	-
Distal Sesamoid (Right)	-	-	-	-	-	-	-
Distal Sesamoid (Left)	-	-	-	-	-	-	-
Totals						**125**	**1**

Other Mammals	NISP	%	MNI	WT (g)
Black-Tailed Jackrabbit	1	0.5	1	0.2
Plains Pocket Gopher	14	6.7	1	0.5
Prairie Dog	15	7.1	1	0.9
Eastern Wood Rat	1	0.5	1	0
Coyote/Dog	3	1.4	2	1.1
Fox	1	0.5	1	0
Kangaroo Rat/Mouse	1	0.5	1	0
Unknown Sm. Mammal	174	82.9	-	14.5
Total	**210**	**100.1**	**8**	**17.2**

Mussel (U. tetralasmus)	NISP	WT (g)	MNI
Umbo (Rt)	3	4.8	3
Umbo (Lt)	1	3	1
Unidentified Fragment	82	9.9	-
Total	**86**	**17.7**	**3**

Western Box Turtle	NISP	WT (g)	MNI
Carapace/Plastron	190	134.3	-
Humerus (Rt)	2	0.4	2
Humerus (Lt)	2	0.4	1
Scapula (Rt)	4	0.1	4
Scapula (Lt)	4	0.2	4
Tibia (Rt)	1	1	1
Femur (Rt)	1	0.2	1
Femur (Lt)	1	0.2	1

Western Box Turtle	NISP	WT (g)	MNI
Vertebra	1	0	1
Innominate (Rt)	2	0.1	2
Metacarpal (Rt)	1	0	1
Total	**209**	**136.9**	**4**

Unidentified Aquatic Turtle	NISP	WT (g)	MNI
Carapace/Plastron	18	9.6	2
Total	**18**	**9.6**	**2**

Unidentified Fish	NISP	WT (g)	MNI
Unidentified Element	11	0.7	1
Total	**11**	**0.7**	**1**

Unidentified Snake	NISP	WT (g)	MNI
Vertebra (Nonvenomous)	1	0.1	1
Vertebra (Venomous)	1	0	1
Total	**2**	**0.1**	**2**

Bullfrog	NISP	WT (g)	MNI
Vertebra	2	0.0	1
Innominate (Rt)	1	0.0	1
Phalanx (Unknown)	2	0.0	1
Total	**5**	**0.0**	**1**

FEATURE 2000-5 FAUNAL REMAINS (N=3408)

Bison	Comp.	Prox.	Distal	Shaft	Other	N	MNI
Unidentified Large Mammal	-	-	-	-	2089	2089	-
Long Bone Fragments	-	-	-	-	121	121	-
Cranium	-	-	-	-	32	32	2
Mandible (Right)	-	-	-	-	-	-	-
Mandible (Left)	-	-	-	-	-	-	-
Mandible (Unknown)	-	-	-	-	-	-	-
Tooth Fragments	-	-	-	-	23	23	-
Hyoid (Right)	-	-	-	-	-	-	-
Hyoid (Left)	-	-	-	-	-	-	-
Atlas	-	-	-	-	-	-	-
Axis	-	-	-	-	1	1	1
Cervical 3-7	-	-	-	-	1	1	1
Thoracic 1-14	-	-	-	-	-	-	-
Lumbar 1-5	-	-	-	-	-	-	-
Caudal	-	-	-	-	-	-	-
Unidentified Vertebra	-	-	-	-	15	15	-
Vertebra (Ant. Epiphysis)	-	-	-	-	-	-	-
Vertebra (Post. Epiphysis)	-	-	-	-	-	-	-
Sacrum	-	-	-	-	-	-	-
Rib (Right)	-	-	-	-	2	2	-
Rib (Left)	-	-	-	-	2	2	-

Bison	Comp.	Prox.	Distal	Shaft	Other	N	MNI
Rib (Unknown)	-	-	-	-	96	96	-
Sternal elements	-	-	-	-	4	4	-
Scapula (Right)	-	-	-	-	1	1	1
Scapula (Left)	-	-	-	-	2	2	2
Scapula (Fragments)	-	-	-	-	17	17	-
Humerus (Right)	-	-	-	1	-	1	1
Humerus (Left)	-	-	1	1	-	2	1
Humerus (Unknown)	-	-	1		-	1	1
Radius (Right)	-	-	-	1	-	1	1
Radius (Left)	-	-	-	1	-	1	1
Radius (Unknown)	-	-	-	-	-	-	-
Ulna (Right)	-	2	-	1	-	3	2
Ulna (Left)	-	-	-	-	-	-	-
Metacarpal (Right)	-	1	1	-	-	2	1
Metacarpal (Left)	-	-	1	-	-	1	1
Metacarpal (Unknown)	-	-	-	-	-	-	-
Unidentified Carpal	-	-	-	-	-	-	-
Ulnar Carpal	-	-	-	-	-	-	-
Intermediate Carpal	-	-	-	-	1	1	1
Radial Carpal (Right)	-	-	-	-	1	1	1
Radial Carpal (Left)	-	-	-	-	-	-	-
2nd & 3rd Carpal (Right)	-	-	-	-	1	1	1
2nd & 3rd Carpal (Left)	-	-	-	-	1	1	1
Fourth Carpal	-	-	-	-	-	-	-
Accessory Carpal (Right)	-	-	-	-	-	-	-
Accessory Carpal (Left)	-	-	-	-	-	-	-
Innominate (Right)	-	-	-	-	-	-	-
Innominate (Left)	-	-	-	-	-	-	-
Innominate (Unknown)	-	-	-	-	6	6	-
Femur (Right)	-	-	-	1	-	1	-
Femur (Left)	-	-	-	2	-	2	1
Femur (Unknown)	-	-	-	-	-	-	-
Femur/Humerus	-	-	-	-	-	-	-
Tibia (Right)	-	-	1	-	-	1	1
Tibia (Left)	-	-	-	2	-	2	2
Tibia (Unknown)	-	-	-	6	-	6	-
Patella (Right)	-	-	-	-	-	-	
Patella (Left)	3	-	-	-	-	3	2
Astragalus (Right)	-	-	-	-	-	-	-
Astragalus (Left)	-	-	-	-	-	-	-
Calcaneus (Right)	-	-	-	-	-	-	-
Calcaneus (Left)	1	-	-	-	-	1	1
Calcaneus (Unknown)	-	-	-	-	-	-	-
Lateral Malleolus (Right)	-	-	-	-	-	-	-
Lateral Malleolus (Left)	-	-	-	-	-	-	-
Central & 4th Tarsal (Right)	-	-	-	-	-	-	-
Central & 4th Tarsal (Left)	-	-	-	-	-	-	-
Metatarsal (Right)			1	1	-	2	1
Metatarsal (Left)	-	-	-	-	-	-	-
Metatarsal (Unknown)	-	-	-	-	-	-	-
Metapodial	-	-	6	-	-	6	-

Bison	Comp.	Prox.	Distal	Shaft	Other	N	MNI
1st Phalanx (Right)	1	-	-	-	2	3	1
1st Phalanx (Left)	-	2	-	-	-	2	1
1st Phalanx (Unknown)	-	1	-	-	-	1	1
2nd Phalanx (Right)	4	-	-	-	-	4	1
2nd Phalanx (Left)	2	1	-	-	1	4	1
3rd Phalanx (Right)	-	4	-	-	1	5	1
3rd Phalanx (Left)	2	-	-	-	-	2	1
3rd Phalanx (Unknown)	-	-	-	-	-	-	-
Unidentified Phalanx	-	-	-	-	-	-	-
Proximal Sesamoid (Right)	2	-	-	-	-	2	1
Proximal Sesamoid (Left)	1	-	-	-	-	1	1
Distal Sesamoid (Right)	-	-	-	-	2	2	1
Distal Sesamoid (Left)	-	-	-	-	-	-	-
Total						**2478**	**2**

Deer/Pronghorn	Comp.	Prox.	Distal	Shaft	Other	N	MNI
Unident. Medium Mammal	-	-	-	-	-	-	-
Long Bone Fragments	-	-	-	8	-	8	-
Cranium (Antler)	-	-	-	-	-	-	-
Mandible (Right)	-	-	-	-	-	-	-
Mandible (Left)	-	-	-	-	-	-	-
Mandible (Unknown)	-	-	-	-	-	-	-
Tooth Fragments	-	-	-	-	4	4	-
Hyoid (Right)	-	-	-	-	-	-	-
Hyoid (Left)	-	-	-	-	-	-	-
Atlas	-	-	-	-	-	-	-
Axis	-	-	-	-	-	-	-
Cervical 3-7	-	-	-	-	-	-	-
Thoracic 1-14	-	2	-	-	-	2	-
Lumbar 1-5	-	-	-	-	-	-	-
Caudal	-	-	-	-	-	-	-
Unidentified Vertebra	-	-	-	-	-	-	-
Vertebra (Ant. Epiphysis)	-	-	-	-	-	-	-
Vertebra (Post. Epiphysis)	-	-	-	-	-	-	-
Sacrum	-	-	-	-	-	-	-
Rib (Right)	-	-	-	-	-	-	-
Rib (Left)	-	-	-	-	1	2	-
Rib (Unknown)	-	-	-	-	1	3	-
Sternal elements	-	-	-	-	-	-	-
Scapula (Right)	-	-	-	-	-	-	-
Scapula (Left)	-	-	-	-	-	-	-
Scapula (Unknown)	-	-	-	-	-	-	-
Humerus (Right)	-	-	-	-	-	-	-
Humerus (Left)	-	-	-	-	-	-	-
Humerus (Unknown)	-	-	-	-	-	-	-
Radius (Right)	-	-	-	-	-	-	-
Radius (Left)	-	-	-	-	-	-	-
Radius (Unknown)	-	-	-	-	-	-	-
Ulna (Right)	-		-		-	-	-
Ulna (Left)	-	-	-	-	-	-	-

Deer/Pronghorn	Comp.	Prox.	Distal	Shaft	Other	N	MNI
Metacarpal (Right)	-			-	-	-	-
Metacarpal (Left)	-	-		-	-	-	-
Metacarpal (Unknown)	-	-	-	-	-	-	-
Unidentified Carpal	-	-	-	-	-	-	-
Ulnar Carpal	-	-	-	-	-	-	-
Intermediate Carpal	-	-	-	-	1	1	1
Radial Carpal (Right)	-	-	-	-	-	-	-
Radial Carpal (Left)	-	-	-	-	-	-	-
2nd & 3rd Carpal (Right)	-	-	-	-	-	-	-
2nd & 3rd Carpal (Left)	-	-	-	-	-	-	-
Fourth Carpal	-	-	-	-	-	-	-
Accessory Carpal (Right)	-	-	-	-	-	-	-
Accessory Carpal (Left)	1	-	-	-	-	1	1
Innominate (Right)	-	-	-	-	-	-	-
Innominate (Left)	-	-	-	-	-	-	-
Innominate (Unknown)	-	-	-	-	-	-	-
Femur (Right)	-	-	-	-	-	-	-
Femur (Left)	-	-	-	-	-	-	-
Femur (Unknown)	-	-	-	-	-	-	-
Femur/Humerus	-	-	-	-	-	-	-
Tibia (Right)	-	-	1	-	-	1	1
Tibia (Left)	-	-	-	-	-	-	-
Tibia (Unknown)	-	-	-	-	-	-	-
Patella (Right)	-	-	-	-	-	-	-
Patella (Left)	-	-	-	-	-		-
Astragalus (Right)	-	-	-	-	-	-	-
Astragalus (Left)	-	-	-	-	-	-	-
Calcaneus (Right)	-	-	-	-	-	-	-
Calcaneus (Left)	-	-	1	-	-	1	1
Calcaneus (Unknown)	-	-	-	-	-	-	-
Lateral Malleolus (Right)	-	-	-	-	-	-	-
Lateral Malleolus (Left)	-	-	-	-	-	-	-
Central & 4th Tarsal (Right)	-	-	-	-	-	-	-
Central & 4th Tarsal (Left)	-	-	-	-	-	-	-
Metatarsal (Right)	-	-	-	-	-	-	-
Metatarsal (Left)	-	-	-	-	-	-	-
Metatarsal (Unknown)	-	-	-	-	-	-	-
Metapodial	-	-	1	-	-	1	1
1st Phalanx (Right)	-	-	-	-	-	-	-
1st Phalanx (Left)	-	1	-	-	-	1	1
1st Phalanx (Unknown)	-	-	-	-	-	-	-
2nd Phalanx (Right)	1	1	-	-	-	2	1
2nd Phalanx (Left)	1	-	-	-	-	1	1
3rd Phalanx (Right)	-	-	-	-	-	-	-
3rd Phalanx (Left)	-	1	-	-	-	1	1
Unidentified Phalanx	-	-	-	-	-	-	-
Proximal Sesamoid (Right)	-	-	-	-	-	-	-
Proximal Sesamoid (Left)	-	-	-	-	-	-	-
Distal Sesamoid (Right)	-	-	-	-	-	-	-
Distal Sesamoid (Left)	-	-	-	-	-	-	-
Totals						**31**	**1**

Unid. Small to Med. Mammal*	NISP	%	MNI	WT (g)
Radius	1	7.5	1	0.1
Ribs	4	5.2	1	0.6
Cranium Fragments	4	49.3	1	2.4
Long Bone Fragments	1	14.9	1	10.5
Tooth Fragment	1	8.2	1	0.1
Unidentified Fragments	560	14.9	-	50.9
Total	**571**	**100.0**	**1**	**64.6**

* This feature had an unusual amount of highly fragmented and burned faunal remains which may include deer to jackrabbit size taxon.

Other Mammals	NISP	%	MNI	WT (g)
Black-Tailed Jackrabbit	10	7.5	2	1.3
Cottontail Rabbit	7	5.2	1	2.1
Plains Pocket Gopher	66	49.3	3	5.7
Prairie Dog	20	14.9	1	1.6
Coyote/Dog	11	8.2	2	3.3
Unknown Sm. Mammal*	20	14.9	-	2.1
Total	**134**	**100.0**	**9**	**16.1**

* Includes jackrabbits and smaller taxon

Mussel (U. tetralasmus)	NISP	WT (g)	MNI
Umbo (Rt)	2	1.3	2
Umbo (Lt)	2	5	2
Unidentified Fragment	78	11.1	-
Total	**82**	**17.4**	**2**

Western Box Turtle	NISP	WT (g)	MNI
Carapace/Plastron	96	63.7	-
Humerus (Rt)	1	0.2	1
Scapula (Lt)	1	0.4	1
Tibia (Lt)	1	0.1	1
Femur (Rt)	1	0.2	1
Innominate (Rt)	1	0.3	1
Total	**101**	**64.9**	**1**

Unidentified Fish	NISP	WT (g)	MNI
Unidentified Element	4	0	1
Total	**4**	**0**	**1**

Unidentified Snake	NISP	WT (g)	MNI
Vertebra (Nonvenomous)	2	0.1	1
Total	**2**	**0.1**	**1**

Bullfrog	NISP	WT (g)	MNI
Humerus (Lt)	1	0.0	1
Metacarpal (Lt)	2	0.1	2
Total	**3**	**0.1**	**2**

Teal?	NISP	WT (g)	MNI
Long Bone Fragment	2	0	2
Total	**2**	**0**	**2**

Bison Element Class Sizes from 2000 Field Season

Feature	Size 1	Size 2	Size 3	Size 4	Size 5	N
2000-1	2994	571	94	27	1	3687
	81.2%	15.5%	2.6%	0.7%	0%	100%
2000-2	1575	111	33	14	0	1733
	90.9%	6.4%	1.9%	0.8%	0%	100%
2000-3	4764	938	104	24	2	5832
	81.7%	16.1%	1.8%	0.4%	0.03%	100.03%
2000-5	1930	468	65	14	1	2478
	77.9%	18.9%	2.6%	0.6%	0.0%	100%
Totals	11263	2088	296	79	4	13730
	82.0%	15.2%	2.2%	0.6%	0.0%	100%

Burned and Unburned Bison Elements from 2000 Field Season

Feature	Burned	Unburned	N
2000-1	413	3274	3687
	11.2%	88.8%	100%
2000-2	150	1583	1733
	8.7%	91.3%	100%
2000-3	367	5465	5832
	6.3%	93.7%	100%
2000-5	236	2242	2478
	9.5%	90.5%	100%
Totals	1166	12564	13730
	8.5%	91.5%	100%

Deer/Pronghorn Element Class Sizes from 2000 Field Season

Feature	Size 1	Size 2	Size 3	Size 4	Size 5	N
2000-1	2	6	0	0	0	8
	25.0%	75.0%	0	0	0	100%
2000-2	0	2	2	0	0	4
	0	50.0%	50.0%	0	0	100%
2000-3	110	12	3	0	0	125
	88.0%	9.6%	2.4%	0	0	100%
2000-5	12	14	4	1	0	31
	38.7%	45.2%	12.9	3.2	0	100%
Totals	124	34	9	1	0	168
	73.8%	20.2%	5.4%	0.6^	0.0%	100%

Burned and Unburned Deer/Pronghorn Elements from 2000 Field Season

Feature	Burned	Unburned	N
2000-1	1	7	8
	12.5%	87.5%	100%
2000-2	0	4	4
	0%	100%	100%
2000-3	75	50	125
	60.0%	40.0%	100%
2000-5	2	29	31
	6.5%	93.5%	100%
Totals	78	90	168
	46.4%	53.6%	100%

TRENCH 5 FAUNAL REMAINS (N=6909)

A total of 10 units were sampled for faunal analysis from Trench 5 (see Figure I-4). As noted in Appendix I, Trench 5 exposed portions of four overlapping semi-subterranean domestic structures. Radiocarbon dates were obtained from two of these features and suggest that Structure #1 and #3 were abandoned sometime around A.D. 1284 and A.D. 1434, respectively. Structure #1 is represented by remains from a single unit (N 609/E 947). Faunal material was not numerous from N 607/E 946, the only unit that clearly contained fill from structure #2. Thus, due to a small sample size from this unit no faunal debris from this structure was analyzed. Structure #3 is represented by specimens from four units (N 611/E 947, N 612/E 947, N 613/E 947, and N 613/E 947). Structure #4 is represented by faunal material from three units (N 607/E 950, N 607/E 951, and N 608/E 951). Faunal elements from N 607/E 949 and N 610/E 947 likely represent mixed contexts. These data are presented in tabular form for all units combined and by each individual habitation structure. Information presented here include number of individual specimens (NISP), weight, and minimum number of individuals (MNI).

Trench 5 All Units Combined (N=6909)

Identified Mammals	NISP	WT (g)	MNI
Bison	529	7244.3	8
Deer/Antelope	23	177.1	4
Black-Tailed Jackrabbit	3	0.4	2
Cottontail Rabbit	2	0.2	1
Plains Pocket Gopher	8	0.6	3
Prairie Dog	2	0.7	2
Coyote/Dog	12	13.6	3
Fox	3	0.5	2
Total	**582**	**7437.4**	**25**
Unidentified Mammals			
Large Mammal	5542	4200.2	-
Medium Mammal	52	14.7	-
Small Mammal	52	8	-
Total	**5646**	**4222.9**	**-**
Reptiles			
Box Turtle	358	174.5	7
Aquatic Turtle	27	28.3	3
Snake (Venomous)	1	0.1	1
Total	**386**	**202.9**	**11**
Other Taxa			
Mussel (U. tetralasmus)	287	105.6	18
Unidentified Bird	5	1.3	3
Unidentified Fish	2	0.4	1
Unidentified Toad	1	0.1	1
Total	**295**	**107.4**	**23**
Total All Fauna	**6909**	**11970.7**	**59**

Structure #1 (N=1023)

Mammals	NISP	WT (g)	MNI
Bison	82	1154.3	2
Deer/Antelope	2	7.2	1
Black-Tailed Jackrabbit	1	0.1	1
Cottontail Rabbit	1	0.1	1
Large Mammal	702	534.4	-
Medium Mammal	39	12.1	-
Small Mammal	9	1.2	-
Total	**836**	**1709.4**	**5**
Other Taxa			
Mussel Shell	115	41.2	5
Box Turtle	65	27.1	1
Aquatic Turtle	3	7.7	1
Unidentified Fish	2	0.4	1
Unidentified Toad	1	0.1	1
Unidentified Bird	1	0.2	1
Total	**187**	**76.7**	**10**
Total All Fauna	**1023**	**1786.1**	**15**

Structure #3 (N=1864)

Mammals	**NISP**	**WT (g)**	**MNI**
Bison	262	4305.8	3
Deer/Antelope	12	117.6	1
Black-Tailed Jackrabbit	2	0.3	1
Cottontail Rabbit	2	0.2	1
Plains Pocket Gopher	2	0.2	1
Prairie Dog	1	0.1	1
Coyote/Dog	11	11.5	2
Fox	2	0.4	1
Large Mammal	1320	948.2	-
Medium Mammal	-	-	-
Small Mammal	20	2.6	-
Total	**1634**	**5386.9**	**11**
Other Taxa			
Mussel Shell	83	34.6	5
Box Turtle	121	57.3	2
Aquatic Turtle	24	20.6	2
Snake (Venomous)	1	0.1	1
Bird	1	0	1
Total	**230**	**112.6**	**11**
Total All Fauna	**1864**	**5499.5**	**22**

Structure #4 (N=2367)

Mammals	**NISP**	**WT (g)**	**MNI**
Bison	94	555.1	1
Plains Pocket Gopher	3	0.2	1
Coyote/Dog	1	2.1	1
Kit/Swift Fox	1	0.1	1
Deer/Antelope	8	33.4	1
Large Mammal	2152	1552.7	-
Medium Mammal	13	2.6	-
Small Mammal	7	1.2	-
Total	**2279**	**2147.4**	**5**
Other Taxa			
Mussel Shell	56	19.0	2
Box Turtle	30	12.7	1
Bird	2	0.2	1
Total	**88**	**31.9**	**4**
Total All Fauna	**2367**	**2179.3**	**9**

Unit N607/E949 (N=1214)

Mammals	NISP	WT (g)	MNI
Bison	40	515.6	1
Plains Pocket Gopher	3	0.2	1
Prairie Dog	1	0.6	1
Large Mammal	1054	870.8	-
Medium Mammal	-	-	-
Small Mammal	10	2.4	-
Total	**1108**	**1389.6**	**3**
Other Taxa			
Mussel Shell	12	5.8	5
Box Turtle	93	52.1	1
Bird	1	0.9	1
Total	**106**	**58.8**	**7**
Total All Fauna	**1214**	**1448.4**	**10**

N610/E947

Mammals	NISP	WT (g)	MNI
Bison	51	713.5	1
Deer/Antelope	1	18.9	1
Large Mammal	314	292.2	-
Medium Mammal	-	-	-
Small Mammal	6	0.6	-
Total	**372**	**1025.2**	**2**
Other Taxa			
Mussel Shell	21	5	1
Box Turtle	49	25.3	2
Total	**70**	**30.3**	**3**
Total All Fauna	**442**	**1055.5**	**5**

Trench 5 Bison Element Size Categories by Structure*

Feature or Unit	Size 1	Size 2	Size 3	Size 4	Size 5	Total
Structure #1	577	177	23	7	0	784
	73.6%	22.6%	2.9%	0.9%	0.0%	100%
Structure #3	1161	293	99	29	0	1582
	73.4%	18.5%	6.3%	1.8%	0.0%	100%
Structure #4	1655	530	57	4	0	2246
	73.7%	23.6%	2.5%	0.2%	0.0%	100%
N607 E949	841	235	15	3	0	1094
	76.9%	21.5%	1.4%	0.3%	0.0%	100.1%
N610 E947	247	86	30	2	0	365
	67.7%	23.6%	8.2%	0.6%	0.0%	100.1%
Totals	4481	1321	224	45	0	6071
	73.80%	21.80%	3.70%	0.70%	0%	100%

* Figures include unidentified large mammal elements

Burned and Unburned Bison Elements from Trench 5*

Feature or Unit	Burned	Unburned	N
Structure #1	40	744	784
	5.1%	94.9%	100%
Structure #3	76	1506	1582
	4.8%	95.2%	100%
Structure #4	224	2022	2246
	10.0%	90.0%	100%
N607 E949	108	986	1094
	9.9%	90.1%	100%
N610 E947	22	343	365
	6.0%	94.0%	100%
Totals	470	5601	6071
	7.70%	92.30%	100%

* Figures include unidentified large mammal elements

PASTURE HOUSE (N=3633)

Faunal analyses were also completed for two, adjacent 1 x 1 m units (N566 E1026 and N566 E1027) from a domestic structure referred to as the Pasture House. These analyses were not conducted by the author and the methods used and attributes measured by the analysts vary considerably from those presented above. Nonetheless, the results are important and are reported here. The primary information available from these analyses includes the number of individual specimens for each taxon. Weights of specimens were measured for only one unit (N566 E1027), and thus, cannot be presented for both units. MNI figures and the data they are based upon were only calculated for N566 E1026. These MNI results are presented, but it must be recognized that these figures are in some cases probably too low. For example, a total of 278 deer/pronghorn elements were identified from these two units. Thus, an MNI of one for this combined class seems too low. It should also be noted that unidentified mammal categories, such as large, medium, and small, were not utilized by either analyst. Instead, all unidentified large mammal remains were assumed to represent bison and all unidentified medium-sized mammals were attributed to deer/pronghorn. Given the trends observed for faunal remains from other features at the site these appear to be reasonable assumptions. Figure II.1 shows bison elements or element classes (e.g., ribs, thoracic or lumbar vertebra) present in this sample. These data suggest that all portions of bison were transported back to the settlement (compare to Figure 4.11).

Pasture House (N=3633)

Mammals	Combined	WT (g)*	MNI
Bison	3147	-	4
Deer/Pronghorn	278	-	1
Coyote/Dog	5	-	1
Unid. Mammal	3	-	-
Total	**3433**	**-**	**6**
Other Taxa			
Western Box Turtle	105	-	1
Mussel	95	-	3
Total	**200**	**-**	**4**
Total All Fauna	**3633**	**-**	**10**

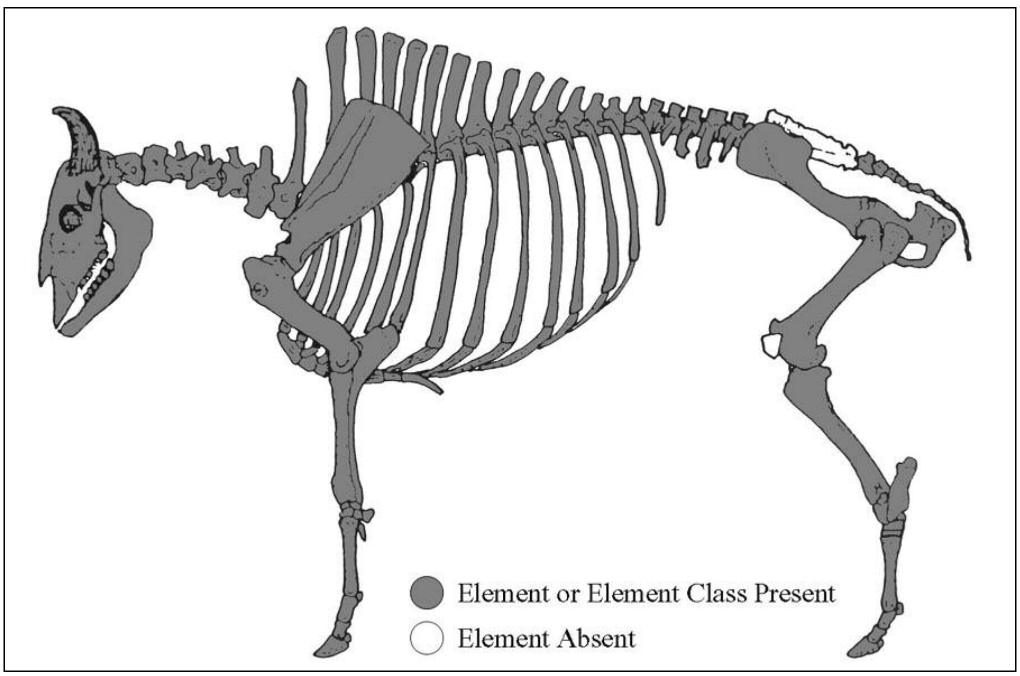

Figure II.1 Bison Elements Present in Pasture House Sample.

APPENDIX III

Archaeobotanical Remains from Odessa Yates (34BV100)

Sediment samples containing archaeobotanical remains were collected from nearly every level of every excavation unit during the 1999 and 2000 field seasons at Odessa Yates. Except for a few samples curated for future studies, all of these sediment samples have been processed to remove preserved plant remains. Limited funding has enabled only a small portion of these remains to be analyzed. To date, analysis of plant remains has been completed for several of the features excavated at the site (Table III.1).

Table III.1 Archaeobotanical Samples from 34BV100

Feature or Area	Sample #	Size	Unit	Level	Feature Age[a]
Trench 5 Structure #1	#1	2.5 L	N608-E949	6	A.D. 1434
Trench 5 Structure #1	#2	7.5 L	N608-E949	6	A.D. 1434
Trench 5 Structure #3	#3	7.0 L	N612-E947	10	A.D. 1284
2000-4	#4	4.0 L	N848-E734	12	A.D. 1304, 1367, 1385
2000-5	#5	4.0 L	N653-E1301	10	A.D. 1297
Pasture House	#6	14.0 L	N566-E1027	9	A.D. 1296
2000-3	#7	4.0 L	N584 E834	14	A.D. 1476

[a] Calibrated age (see Table I.1)

All archaeobotanical analyses of plant remains from Odessa Yates were conducted by Dr. Richard R. Drass of the Oklahoma Archeological Survey, Norman from 1999 to 2002. Sediment samples were dried and processed to collect heavy and light fraction remains. A flotation system consisting of 5 gal buckets with an overflow spout to collect light fraction debris was used. Heavy fraction debris was collected from the bottom of these buckets after their separation from sediments. After drying, all samples were sorted in the laboratory through nested screens of 2 mm, 1 mm, 0.5 mm, and 0.25 mm for light fractions and 2 mm and 1 mm for heavy fractions. Generally, both heavy and light fractions were scanned for seeds and other plant remains. The results are presented here in tabular form and include both charred and uncharred remains (Tables III.2 and III.3). Even though most samples were collected from relatively deep contexts at the site (i.e., 0.8 to 1.5 m below ground surface), it is likely that uncharred remains represent recent intrusions, probably the result of rodent activity.

Table III.2 Macrobotanical Remains from 34BV100

	Sample # (Sample Size in Liters)			
Charred Plant Seeds	**#1** (2.5L)[a]	**#2** (7.5L)[a]	**#3** (7L)	**#4** (4L)[b]
Zea mays Corn cupules	25, 15f	29, 27f	28, 95f	4, 6f
Zea mays Corn Cob Fragments	-	5	4	-
Zea mays Corn kernels	3f	-	1cf	-
Zea mays Corn glumes	1, 2f	-	5, 1cf	-
Helianthus sp. Sunflower	1f	-	1, 4f	-
Cheno-Ams Goosefoot	-	2	5, 2f	18, 6f
Deervetch?	-	-	1f	-
Physalis sp. Ground Cherry	-	-	-	1cf
Poaceae Grass Seeds	-	-	6cf	-
Leguminoseae Common Bean	-	-	1cf	-
Lupinus perennis Wild Bean	1	-	-	-
Scirpus sp. Bulrush/Smartweed?	-	1	-	1cf
Sporobolus sp. Dropseed	1cf	-	-	-
Hordeum pusillum Little Barley	-	-	-	1cf
Celtis sp. Hackberry	1	-	-	-
Portulaca sp. Purslane	-	-	5	2
Unidentified Seeds	5f	1, 3f	1, 1f	2
Total	**55**	**68**	**161**	**41**
Uncharred Plant Seeds	**#1** (2.5L)[a]	**#2** (7.5L)[a]	**#3** (7L)	**#4** (4L)[b]
Mollugo sp. Carpetweed	-	-	1	1
Cheno-Ams Goosefoot	-	-	-	6, 2f
Copperleaf?	-	-	-	4cf
Unidentified Seeds	-	-	-	6
Total	**0**	**0**	**1**	**19**

Key: L –Liter, f-fragment, cf-similar to; [a] Includes only 1 and 2 mm sorts of light fraction. [b] Light fraction only.

Table III.3 Macrobotanical Remains from 34BV100

	Sample # (Sample Size in Liters)			
Charred Plant Seeds	**#5** (4L) [a]	**#6** (14L) [b]	**#7** (4L)	**Total** (43L)
Zea mays Corn cupules	2, 2f	12, 11f	19, 33f	119, 189f
Zea mays Corn Cob Frags.	-	-	3	12
Zea mays Corn kernels	-	-	1, 3f	1, 6f, 1cf
Zea mays Corn glumes	-	-	1	7, 2f, 1cf
Helianthus sp. Sunflower	-	3, 1cf	13, 13f, 2cf	17, 18f, 3cf
Cheno-Ams Goosefoot	10	5, 4f	306	346, 12f
Chenopodium sp. Goosefoot	-	-	2	2
Deervetch?	-	-	-	1f
Physalis sp. Ground Cherry	-	-	-	1cf
Poaceae Grass Seeds	-	1	1	2, 6cf
Leguminoseae Common Bean	-	-	4	4, 1cf
Lupinus perennis Wild Bean	-	1cf	-	1, 1cf
Portulaca sp.Purslane	-	-	2	2,
Scirpus sp. Bulrush/Smartweed?	-	1cf	-	1, 2cf
Sporobolus sp. Dropseed	-	1cf	-	2cf
Hordeum pusillum Little Barley	2, 7cf	-	-	2, 8cf
Sporobolus sp. Dropseed	1cf	-	-	1cf
Iva annua Marshelder	-	1cf	-	1cf
Mammillaria cf. Cactus?	-	2cf	-	2cf
Celtis sp. Hackberry	-	1	-	2
Cruciferae cf. Mustard?		-	3cf	3cf
Portulaca sp. Purslane	1	-	-	8
Unident. Round Seed	-	-	-	1
Unident. Small Seeds	3	-	-	4, 2f
Unident. Large Seeds	-	-	10f	10f
Unident. Seeds	8f	2, 8f	4, 30f	8, 53f
Total	**36**	**54**	**450**	**539, 293f, 33cf**
Uncharred Plant Seeds	**#5** (4L) [a]	**#6** (14L) [b]	**#7** (4L)	**Total** (43L)
Mollugo sp. Carpetweed	1	-	22	25
Amaranthus sp. Pigweed	1	-	-	1
Cheno-Ams Goosefoot	-	2, 1f	-	8, 3f
Copperleaf?	-	-	-	4cf
Grass Seeds	-	7, 1f	-	7, 1f
Unidentified Seeds	-	-	-	6
Total	**2**	**11**	**22**	**55**

Key: L –Liter, f-fragment, cf-similar to; [a] Light fraction only. [b] 7 of 14 liters are light fraction only

APPENDIX IV

Chipped Stone Artifacts from Odessa Yates

The chipped stone assemblage from Odessa Yates is typical of sites attributed to the Plains Village tradition. Diagnostic items include triangular projectile points, distal endscrapers, and Harahey knives. Other aspects of the assemblage, however, are quite unique compared to other Middle Ceramic sites of the region. For example, the types of tool stone used by these groups, which include a combination of Central and Southern Plains types, are particularly notable. Another key characteristic, but more difficult to quantify, is the heavily curated appearance of the chipped stone assemblages. The latter suggest that the occupants of this village may have suffered from shortages of chipped stone. A similar trend is also observed at the Buried City locality (Hughes and Hughes-Jones 1987:103). Here, chipped stone from five features at Odessa Yates are used to document these trends (Table IV.1). These assemblages were recovered along with other trash debris in abandoned habitation or storage features. Two other features, 2000-4 and 2000-5, were also excavated, but chipped stone from these areas were not analyzed due to time and budgetary constraints.

Table IV.1 Chipped Stone Assemblages from Odessa Yates.

Feature	**Area Excavated**	**Total Chipped Stone**	**Density per m^3**	**Total Faunal**	**Density per m^3**
Pasture House	24.3 m^3	1495	61.5	17,051	701.7
Trench 5	12.3 m^3	1227	99.8	10,841	881.4
2000-1	2.6 m^3	141	54.2	7493	2881.9
2000-2	3.3 m^3	278	84.2	3474	1052.7
2000-3	1.5 m^3	115	76.7	7470	4980.0
Total or Average	**44.0 m^3**	**3256**	**74.0**	**46,329**	**2099.5**

Table IV.1 presents basic information regarding the chipped stone assemblages used here. Included are the total volumes of matrix excavated at each feature and the total number of all chipped stone items recovered from these areas. The density of chipped stone per m^3 ranges from about 54 to nearly 100 items per m^3. By themselves these data might suggest that cultural materials were sparse in these features. To demonstrate that this is certainly not the case, the quantities of faunal remains and their respective densities for each of these of features are also presented in Table IV.1. Faunal densities are very high and range from 700 to nearly 5000 individual faunal specimens per m^3. A comparison of average chipped stone and faunal densities for each of the features indicates a chipped stone to faunal debris ratio of 1.0 to 28.4.

Not only is the total quantity of chipped stone unusually low at this settlement, but the overall size of chipped stone items is also surprisingly small. Figure IV.1 presents the maximum length for the sample analyzed. Although there is some variation in the frequency of chipped stone artifact size classes among features, 81.5% or 2652 of all specimens, including tools, are 20.0 mm or less in length. Debitage in this size range are likely associated with the refurbishing and/or late stage production of chipped stone tools. This, coupled with low frequencies of primary and secondary flakes, supports the interpretation that tools entered the site as finished items or in the late stages of production (see Chapter Six; Table 6.9). It should be noted, however, that 23 cores were recovered. The average maximum length of all cores is only 40.3 mm, indicating these items were essentially exhausted of usable stone. Of these items, Alibates and Smoky Hill jasper, the two primary types of stone used for tool production, are represented by only six examples.

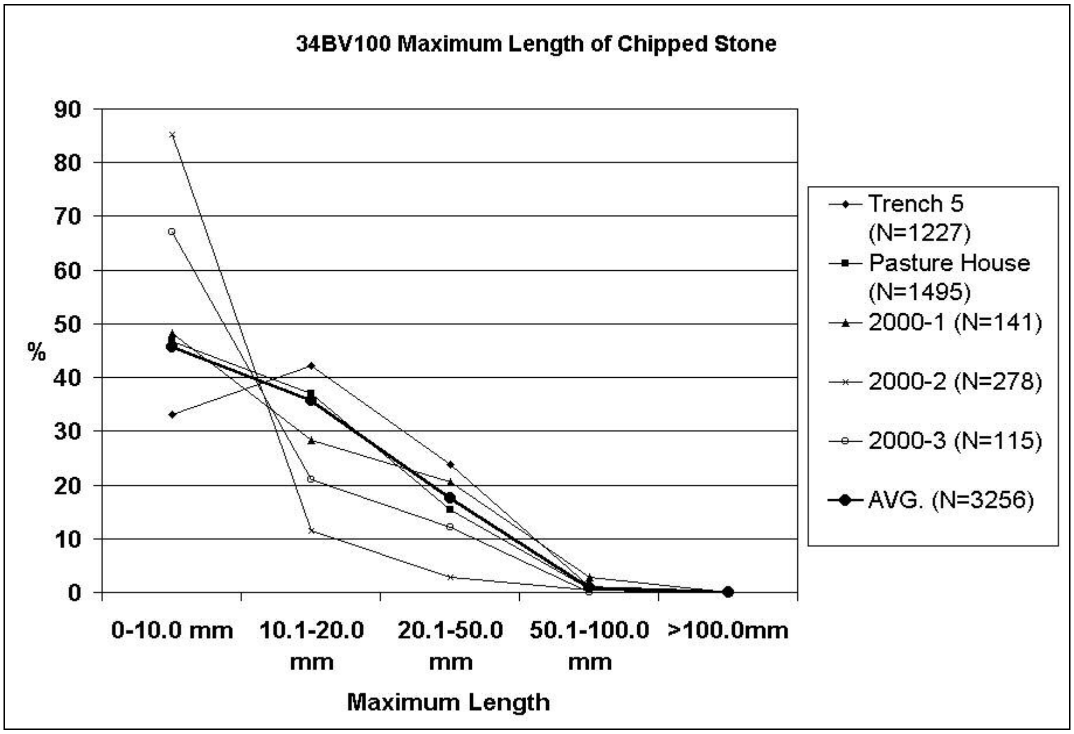

Figure IV.1 Maximum Length of Chipped Stone at 34BV100.

Chipped stone tools recovered at Odessa Yates are represented almost entirely by formal designs produced from either Alibates or Smoky Hill jasper. These include projectile points, distal endscrapers, alternately beveled diamond shaped knives, and drills (Table IV.2). Modified flake tools, referring to flakes exhibiting one or more resharpening episodes, were rarely observed. Except for projectile points, most of the formal tools present are broken or exhausted. This is particularly evident among distal endscrapers and alternately beveled diamond shaped knives (i.e., Harahey knives). These tool forms are designed for long-term use and employ resharpening techniques that facilitate economical use of tool stone. A total of 15 bifaces were also recovered. These items are generally small and crude and may represent attempts to recycle tools.

Table IV.2 Chipped Stone Classes and their abundance at 34BV100.

Description	P. House		Trench 5		2000-1		2000-2		2000-3		Total	
	N	**M^3**	**N**	**M^3**	**N**	**M^3**	**N**	**M^3**	**N**	**M^3**	**N**	**M^3**
Proj. Points	30	1.24	28	2.28	5	1.92	1	0.30	1	0.67	65	1.48
Scrapers	16	0.66	10	0.81	2	0.77	0	0.0	0	0.0	28	0.64
Knives[a]	7	0.29	11	0.89	3	1.15	3	0.91	0	0.0	24	0.55
Bifaces	6	0.25	7	0.57	1	0.39	1	0.30	0	0.0	15	0.34
Drills	5	0.21	8	0.65	0	0.00	0	0.0	0	0.0	13	0.30
Debitage	1415	58.2	1157	94.1	130	50.0	272	82.4	114	76.0	3088	70.2
Cores[b]	16	0.66	6	0.49	0	0.00	1	0.30	0	0.0	23	0.52
Totals	**1495**	**61.5**	**1227**	**99.8**	**141**	**54.2**	**278**	**84.2**	**115**	**76.7**	**3256**	**74.0**

[a] Harahey knives. [b] All are amorphous cores, some of which may represent recycled tools.

A total of 65 arrowpoints were recovered from excavated contexts at Odessa Yates. Varieties represented include Washita (33 or 60.0%), Fresno (20 or 36.4%), and unidentified corner-notched types (2 or 3.6%). Ten arrowpoints fragments were also recovered and could not be identified to type. Except for lower quantities of corner-notched points from excavated features, these frequencies closely resemble a much larger sample recovered from surface contexts at the site (N=346) (Figure IV.2).

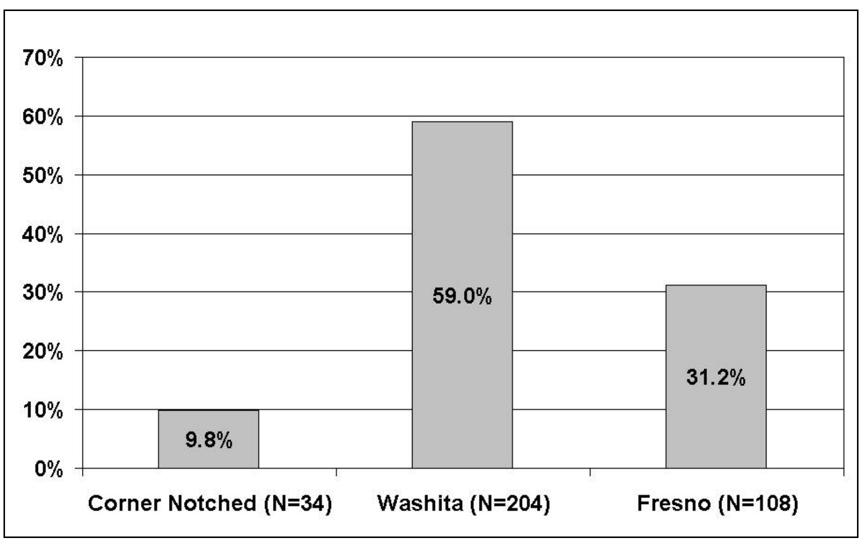

Figure IV.2 Arrowpoint Types from Surface Contexts at 34BV100.

The chipped stone recovered at Odessa Yates (see Figures IV.3 and Table IV.3) are dominated by two main types: Alibates silicified dolomite (48.1% or 1566) and Smoky Hill jasper (26% or 848). The remainder includes a variety of local and nonlocal materials. Of these Dakota quartzite (9.5% or 310), quartz crystal (7.6% or 247), and silicified caliche (2.9% or 94) are most common. Only 25 (0.8%) obsidian artifacts were recovered during excavations. Overall, similar trends of tool stone use are observed at the Lundeen site (Bevitt 1999).

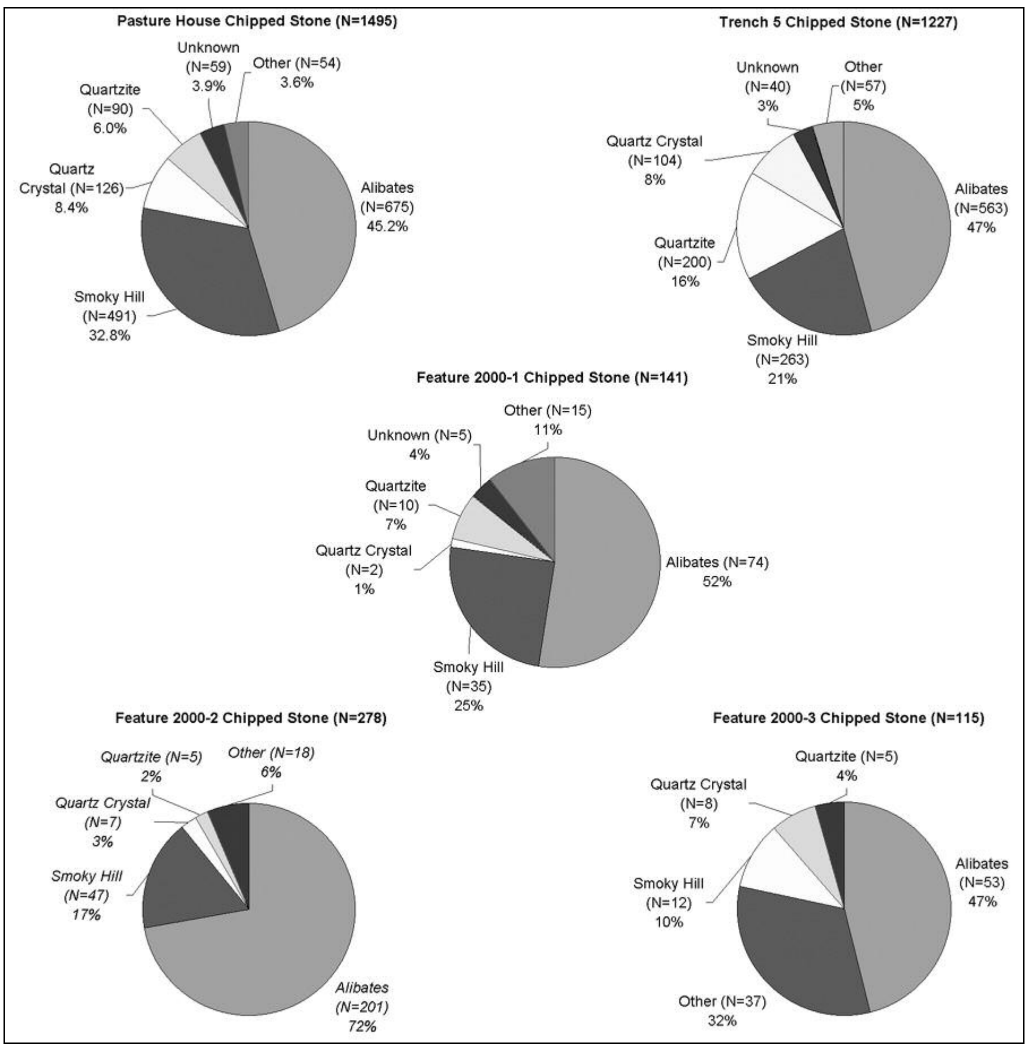

Figure IV.3 Tool Stone Use by Feature at Odessa Yates.

Table IV.3 Tool Frequencies by Raw Material for Each Feature at 34BV100.

Pasture House	**Alibates**	**Smoky Hill**	**Quartzite**	**Unknown**	**Other**[a]	**Total**
Washita	9	5	-	-	-	14
Fresno	6	3	-	-	-	9
Corner Notched	1	-	-	-	-	1
Unknown Pt.	3	3	-	-	-	6
Scraper	14	2	-	-	-	16
Beveled Knife	5	2	-	-	-	7
Biface	2	2	1	-	1	6
Drill	4	1	-	-	-	5
Core	2	4	3	1	6	16
Trench 5	**Alibates**	**Smoky Hill**	**Quartzite**	**Unknown**	**Other**	**Total**
Washita	7	8	-	-	1	16
Fresno	5	3	-	-	-	8
Unknown Pt.	4	-	-	-	-	4
Scraper	9	1	-	-	-	10
Beveled Knife	7	4	-	-	-	11
Biface	1	5	1	-	-	7
Drill	6	1	-	-	1	8
Core	-	-	2	1	3	6
2000-1	**Alibates**	**Smoky Hill**	**Quartzite**	**Unknown**	**Other**	**Total**
Washita	3	-	-	-	-	3
Unknown Pt.	2	-	-	-	-	2
Scraper	2	-	-	-	-	2
Beveled Knife	1	-	-	-	2	3
Biface	1	-	-	-	-	1
2000-2	**Alibates**	**Smoky Hill**	**Quartzite**	**Unknown**	**Other**	**Total**
Corner Notched	1	-	-	-	-	1
Beveled Knife	-	3	-	-	-	3
Biface	-	-	-	-	1	1
Core	-	-	1	-	-	1
2000-3	**Alibates**	**Smoky Hill**	**Quartzite**	**Unknown**	**Other**	**Total**
Fresno	1	-	-	-	-	1

[a] Includes silicified caliche, obsidian, Florence A, and Edwards and Laverne cherts.

In summary, chipped stone tool forms recovered at Odessa Yates represent items diagnostic of the Plains Village tradition. Two unique characteristics of the assemblage include the types of tool stone used and the overall rarity of chipped stone. Combined, Alibates silicified dolomite and Smoky Hill jasper comprise nearly 75% of all chipped stone. The abundance of these materials in features dating from A.D. 1284 to A.D. 1476 demonstrates sustained exchange contacts with both Southern and Central Plains societies.

The rarity of chipped stone is apparent both in terms of the low quantities recovered and the small size of items. While the high frequencies of small debitage are clearly related to the fact that sediment from the site was screened through 3 mm mesh, it should be noted that even smaller quantities of chipped stone would have been recovered if 6 mm mesh had been used. Thus, the paucity of tool stone recovered seems to be quite real. These trends are interpreted as evidence for limited tool production at the site and probable shortages of chipped stone for the occupants of Odessa Yates.

APPENDIX V

Results of Obsidian X-Ray Florescence Analyses

Introduction

Given the emphasis of this research on intersocietal exchange determining the source of origin for nonlocal items obtained through trade has been of obvious importance. Here, the results of X-Ray Florescence (XRF) source analyses of obsidian artifacts undertaken as a part of this research are presented. Source areas for 130 artifacts from 19 different Middle Ceramic period (A.D. 1200-1500) sites are reported. All of the XRF analyses results presented here were conducted by the Berkeley Archaeological XRF Laboratory, Phoebe Hearst Museum of Anthropology, University of California at Berkeley under the direction of Steven Shackley. These analyses were conducted between May 1998 and November of 2003.

By taxonomic unit, 63 artifacts were recovered from Odessa phase settlements, 59 were from Antelope Creek settlements, and eight are from Middle Ceramic period sites for which the cultural affiliation is not yet clear. Odessa phase settlements included in these analyses are Campbell, Sprague, Odessa Yates, Spangler, Huddleston, 34BV122, and Courson D. Additional obsidian artifacts attributed to this phase include those from 34BV93 and one Washita projectile point. The latter item is from the collection of Ross and Clifford Goodner. Although the specific site where this artifact was recovered is not known, Ross and Clifford are known to have collected extensively at Odessa Yates, Sprague, and other Odessa phase sites in Beaver County, Oklahoma (Brosowske and Bement 1999:49; Karber 2000, personal communication). It does not appear as though they ever collected from any of the Antelope Creek phase sites located 75 km to the west. As such, it is concluded that this artifact was recovered from an Odessa phase site, likely Odessa Yates or Sprague. Three flakes, all which were thought to be obsidian were analyzed from 34BV93. Two are obsidian and the other is a black chert. This site, which contains a Middle Ceramic period component, is situated on a playa lake in northwestern Beaver County, Oklahoma. The source area for one flake is Malad, Idaho and is remarkably similar in elemental composition to another from Spangler, an Odessa phase site about 22 km to the southeast. Given these similarities and the site's location it is concluded that the obsidian flakes from 34BV93 are associated with an Odessa phase occupation of the site.

Antelope Creek phase settlements examined in this analyses include Alibates Ruin 28, Chimney Rock Ruin 51, Archie King Ruins, Stamper, Roy Smith, and Clawson. An additional site included with this group, 34TX113, is an ephemeral site on a playa lake in north-central Texas County, Oklahoma. This site has a Middle Ceramic period component and is near permanent settlements of the Antelope Creek phase. As such, it is concluded that 34TX113 was likely used by these groups. Another playa site in this area, 34TX112, also appears to have used by groups of the phase. One flake, thought to be obsidian, was analyzed from this site. This item is not obsidian, but is also included in the results presented here.

Eight additional obsidian artifacts were also sourced from three Middle Ceramic period sites for which the cultural affiliation is not known. These sites include 34BV172, 34BV157, and 14KW311. The latter site, known as Nichols Ranch, is a permanent habitation site along the upper reaches of Medicine Lodge Creek in Kiowa County, Kansas. Very little is known about Nichols Ranch, although the three obsidian artifacts analyzed were recovered from uncontrolled excavation of Middle Ceramic age midden deposits at the site. The other two sites, 34BV157 and 34BV172, are in southwestern Beaver County, Oklahoma and are along Fulton and Bull creeks, respectively. These sites have yet to receive any formal investigations and the cultural affiliation remains unknown. Each of these sites is situated between known Odessa and Antelope Creek phase settlements.

Provenience of Obsidian Samples Analyzed

The provenience of artifacts presented here includes items from excavated and surface contexts. Of the Odessa phase obsidian artifacts, only 13 (20.6%) were recovered during excavations. All of these artifacts were recovered from Trench 5 and document items from Cerro Toledo and Valle Grande from New Mexico, an unknown source in the northwestern Plains, and a knappable quality variety of smoky quartz whose source is not known (Table V.1). The latter is visually identical to obsidian. Many of these items found on site surfaces represent projectile points diagnostic of the period (i.e., Washita and Fresno varieties) and document similar source areas as those from excavations. Given these trends, and the fact that later components have not been documented at these sites, it is reasonable to conclude that the obsidian from these sites can be attributed to Middle Ceramic period occupation by Odessa phase societies.

The context of obsidian from the Antelope Creek sites is not entirely clear in all cases. The artifacts from 34TX113, Archie King Ruins, and Clawson are all from surface deposits. A total of nine obsidian artifacts are reported for the Roy Smith site (Schneider 1969:Table V). A site catalog for the collection, however, documents 10 obsidian flakes from the site (Table V.2). These include seven flakes from the main structure, and three flakes from other test units (one from Test C and D, one from Test E, and one from the Corral). Of the ten cataloged obsidian artifacts, only six are curated with the collection at the Sam Noble Museum of Natural History in Norman, Oklahoma. All six of these items were subjected to source analysis. Unfortunately, none of these artifacts were marked with catalog numbers. As such, it is not possible to determine where each of the artifacts subjected to source analysis were recovered.

Table V.1 Provenience Data for Obsidian Artifacts from Trench 5 at 34BV100

Sample #	**Cat #**	**Unit**	**Level**	**Description**	**N**
TR 5-1	369	N609 E947	1	Flake	1
TR 5-2	372	N609 E947	4	Flake	1
TR 5-3	343	N607 E951	1	Flake	1
TR 5-4	332	N607 E949	3	Flake	1
TR 5-5	343	N607 E951	1	Flake	1
TR 5-6	333	N607 E949	4	Core?	1
TR 5-7	337	N607 E948	2	Flake	1
TR 5-8	371	N609 E947	3	Flake	1
TR 5-9	360	N608 E949	5	Projectile Point (Washita)	1
TR 5-10	348	N608 E947	4	Flake	1
TR 5-11	346	N608 E947	2	Flake	1
TR 5-12	366	N608 E951	2	Flake	1
TR 5-13	382	N610 E947	1	Flake	1

Three flakes from the Stamper site were submitted for source analysis. The results indicate that two items are obsidian and one is an opaque variety of black chert. These represent all of the obsidian artifacts present in collections from the site. Provenience information is not available any for these items. Thus, it is not known whether they were recovered from surface or excavated contexts.

Table V.2 Provenience Data for Obsidian Artifacts from Roy Smith (34BV14)

Catalog #	Area	Unit	Level	N
111	Main Structure	N26 R5	1	1
154	Main Structure	N27 R4	3	1
288	Main Structure	N30 R2	1	1
340	Main Structure	N31 R6	1	2
341	Main Structure	N31 R6	2	1
425	Main Structure	N35 R5	Unknown	1
498	Test C and D	N14 R19	1	1
511	Corral	N4 L5	2	1
561	Test E	N4 R13	3	1

A short site report was written on the investigations at Chimney Rock Ruin 51 indicates that "thousands" of obsidian artifacts were recovered here (Studer n.d.:4). Studer (n.d.:4) also notes that southwestern trade items were more numerous here than any of the other Antelope Creek site investigated along the Canadian River, including Alibates Ruins. Unfortunately, the debitage from the site, including obsidian, was apparently not collected (i.e., they are not curated with the collection). All of the obsidian artifacts present in the collection are bifaces. Of the items analyzed, four are Washita projectile points and two are biface fragments. Five of these items have catalog numbers and indicate that three are from Area 1 and two are from Area 2 (Table V.3). The catalog number on the remaining item was not entirely legible and the area where it was recovered is not known. The catalog numbers used for Chimney Rock Ruin 51 records site (i.e., **51** A1-16/11), area number (i.e., 51 **A1-**16/11), section number (i.e., 51 A1-**16**/11), and specimen number (i.e., 51 A-16/**11**).

Table V.3 Provenience Data for Obsidian Artifacts from Chimney Rock Ruins 51

Sample #	Catalog #	Description	N
CR 51-1	51 A1-16/11	Washita point	1
CR 51-2	51 A1-22/9	Washita point	1
CR 51-5	51 A1-15/6	Biface fragment	1
CR 51-3	51 A2-21/111	Washita point base	1
CR 51-4	51 A2-21/105	Biface fragment	1
CR 51-6	51 A?-20/27	Washita point	1

Alibates Ruin 28 was excavated by the Workers Progress Administration (WPA) from 1938 to 1941 (Lintz 1986:328). This site was split into two main areas of excavation: Units I and II. Excavation Unit I is along the northern perimeter of the site and overlooks the Canadian River valley and the Alibates quarries to the north. Unit I contained a large pueblo-like structure that included numerous contiguous habitation and non-habitation rooms. Unit I was subdivided into four areas (Areas 1-4) and a total of 1515 m^2 were excavated here (Lintz 1986:335). Excavation Unit II adjoins Unit I on the south and is also subdivided into four areas (Areas 5-8). A total of 4110 m^2 were excavated at Unit II and exposed numerous freestanding habitation and non-habitation features (Lintz 1986:335). Several thousand obsidian artifacts were recovered during excavations (Lintz 1986, 1991; Spielmann 1982; see Figure V.1). Nearly all of these items are unworked and represent debitage from all stages of tool manufacture. In contrast to Chimney Rock Ruin 51, all of the obsidian artifacts recovered at Alibates Ruin 28 appear to have been collected and are now housed at the Panhandle-Plains Museum in Canyon, Texas.

Determining the provenience of obsidian recovered at Alibates Ruin 28 is of key importance because the frequency of obsidian and other Southwest exotics has been used, sometimes in the absence of radiocarbon dates, as a means for relative dating of

Antelope Creek phase sites. Lintz (1986a, 1986b, 1991) has argued that exchange between Southern High Plains and Puebloan societies increased dramatically following A.D. 1350 (i.e., during the late subphase [A.D. 1350-1500] of the Antelope Creek phase). Thus, sites with few southwestern exotics are thought to date to A.D. 1250-1350, while settlements containing an abundance of trade items are thought to date after A.D. 1350 (see Lintz 1986:184-191, 1991:93). These ideas are based entirely on the data derived from Alibates Ruin 28.

Figure V.1 Obsidian Artifacts from Alibates Ruin 28

Citing several short, unpublished reports written by Ele and Jewel Baker (Baker 1940a:51, 1940b:44; Baker and Baker 1940:20), Lintz (1986a:335, 1986b:117; 1991:101) has suggested that only 13 obsidian artifacts were recovered from Unit I, while at least 4132 were recovered from Unit II. To account for these vast differences, Lintz (1986b:117, 1991:101) proposed that Unit I represents an earlier component of the site (i.e., pre-A.D. 1350) a period when exchange with southwestern societies was minimal. The higher frequencies of obsidian at Unit II were thought to represent a later period of occupation (i.e., post-A.D. 1350) when intersocietal relations with the Southwest had increased significantly (Lintz 1991:101).

Only five radiocarbon dates are available from Alibates Ruin 28 (Table 4.1). Three of these dates are from Rooms 1 (N=1) and 19 (N=2) at Unit I and two are from Room 24 at Unit II. The dates from Unit I range from about A.D. 1270 until A.D. 1400 and the dates from Unit II suggest occupation from about A.D. 1325 until A.D. 1430. Give the large number of habitation structures at this settlement (see Table 4.4) and the limited number of dates from the site I would suggest that the occupational history of this site is not well understood at this time (see Lintz 1986b).

Previous analyses of artifacts from Alibates Ruin 28 have not documented the quantities of obsidian recovered from various excavation areas of the site (see Baker and Baker 2000). As of May 2003, nearly all of the several thousand obsidian artifacts from Alibates Ruins 28 were permanently curated in six cigar boxes and two paper bags (three additional boxes held another 46 items). In most cases, these boxes and bags were labeled with provenience data or contained slips of paper with this information. A small number of obsidian artifacts within each box or bag were also usually labeled with provenience information. The two paper bags containing obsidian represent original bags used by WPA archaeologists. These bags were sealed shut in such a manner that suggests that they have not opened since the 1940's. At the request of the museum curator, these items were rebagged into plastic bags (the original paper bags were retained with the artifacts). Due to time constraints, the total number of obsidian was tabulated for only one box of artifacts (i.e., Cigar Box 2). This box contained a total of 879 obsidian artifacts weighing 1751.2 g (1.99 g per flake). Counts for the remaining boxes and bags were estimated based on the quantities contained in this box. It is estimated that approximately 6000 obsidian artifacts weighing approximately 11,954 g are present in the collection. Table V.4 provides provenience information and estimates or counts for each box and bag of obsidian artifacts from Alibates Ruin 28.

Table V.4 shows there are instances where provenience information written on bags, boxes, slips of paper, and artifacts do not match. For example, items in Cigar Box 3 could be from either Area 4 of Unit I or Area 8 of Unit II. Similar problems are noted for Cigar Boxes 4 and 5. Artifacts in Cigar Box 4 appear to be from Areas 1 and 4 of Unit I. This box is also labeled "Site 24 Area 2 Section 46". The "Site 24" label may refer to Antelope Creek 24 and may indicate that this box was recycled by WPA analysts. In addition, since only 43 obsidian artifacts were recovered from Antelope Creek 24 (Lintz 1986:Table 31), the approximately 900 artifacts in this box are almost surely from Alibates Ruin 28. Cigar Box 5 is labeled "Area 5 7" and an inside tag reads "Ruin 28 Area 7". None of the artifacts within this box are labeled. These items appear to be from Unit II, although it is not known whether they are from

Area 5 and/or Area 7. A small box containing four items (Small Box 3) contains a tag that reads "Ruin 28 Area 7". Two of the artifacts inside this box, however, are labeled as coming from Unit I (Area 4 Sections 1 and 7). The provenience data on the remaining boxes and bags correspond with information written on artifacts and it is concluded that these data are correct. In addition, many boxes contain artifacts labeled with an area designation of "0". It is likely that these represent items recovered from surface contexts at each area (Shaller 2003, personal communication).

Table V.4 Provenience information for Alibates Ruin 28 Obsidian

Box/Bag #	N	Provenience Written on Box/Bag	Provenience Written on Artifacts
Alibates Ruin 28: Unit I			
Cigar Box 1	900 [a]	Area 1, Section 20	Area 1, Section 20 (N=3)
Cigar Box 2	879	Area 2, Section 6	Area 2, Section 6 (N=3)
Small Box 1	36	No label	Area 2, Section 6 (N=15); Area 0[b] (N=21)
Small Box 2	6	No label	Area 4, rest of label unreadable (N=1)
Alibates Ruin 28: Unit I Unknown Provenience			
Cigar Box 4	900 [a]	Area 4, Sections 1 to 20; Box also labeled "24, Area 2, Section 46"	Area 1, Section 20 (N=7); Area 0[b] (N=4)
Alibates Ruin 28: Unit II			
Bag 1	900[a]	Area 6	Area 6 (N=8)
Bag 2	900[a]	Area 6	None labeled
Cigar Box 6	600[a]	Paper inside labeled "Ruin 28 Area 8"	None labeled
Alibates Ruin 28: Unit II Unknown Provenience			
Cigar Box 5	300 [a]	"Area 5 7"; Inside paper labeled "Ruin 28 Area 7"	None labeled
Alibates Ruin 28: Unknown Provenience			
Cigar Box 3	600 [a]	Area 3 and Area 5; Paper inside labeled "Ruin 28 Area 8"	None labeled
Small Box 3	4	Paper inside labeled "Ruin 28 Area 7"	Area 4, Section 7 (N=1); Area 4, Section 1 (N=1); Labels not readable (N=2)

[a] Count represents a visual estimate; [b] Items labeled "Area 0" likely represent items recovered from surface contexts.

Although provenience information is suspect in a couple of instances, it is apparent that large quantities of obsidian were recovered from nearly all of the areas investigated at Alibates Ruin 28. The provenience data presented here suggest that approximately 2721 obsidian artifacts were recovered from Unit I (Areas 1 to 4). This figure includes the items from Cigar Box 4. It is estimated that approximately 2704 obsidian artifacts were recovered from Unit II (Areas 6, 7, and 8). The items in Cigar Box 3, which is estimated to contain a total of 600 artifacts, could be from either Area 3 of Unit I and/or from Area 8 of Unit II.

It is apparent that the obsidian frequencies presented here for Alibates Ruin 28 is dramatically different than those reported by the Bakers (Baker 1940a:51, 1940b:44; Baker and Baker 1940:20) and Lintz (1986a, 1986b, 1991). These findings are important for a number of reasons. First, they do not lend support to the idea that dramatically different quantities of obsidian were recovered from Units I and II. As such, these data cannot support the proposition that temporally distinct components were present at Alibates Ruin 28. Thus, the proposition that exchange relations with southwestern societies were essentially nonexistent from A.D. 1250 to A.D. 1350 and then rapidly developed thereafter is also difficult, if not impossible, to support with the quantities and spatial distribution of obsidian from Alibates Ruin 28.

Turning to the obsidian artifacts from Alibates Ruin 28 selected for XRF analysis, Table V.5 presents provenience, descriptive, and metric information for these items. The sample selected includes the full range of artifact and flake types and obsidian varieties present in the collection. Items included in the analysis are 22 artifacts from Unit I and 15 items from Unit II. Two items are labeled as being from areas not known to have been excavated at the site (i.e., Area 16 and Area 22). The 22 artifacts from Unit I are from Area 1 (N=2), Area 2 (N=18), and Area 3 (N=2). Two of the items from Area 2 (i.e., from Cigar Box 2) had no labels and eight were labeled as coming from surface contexts (e.g., 28 0/15). The artifacts from Unit II include five from Area 6 (including 4 with no catalog numbers), two from Area 7, and two from Area 8. Five obsidian artifacts came from room contexts (Rooms 23, 25, and 45) in Unit II. Of note are the four specimens from Room 25. This domestic structure is overlain by several other habitation and storage features (see Baker and Baker 2000:215, 218, 223) and suggests that it is an early house at the site.

The cataloging system used by WPA archaeologists is essentially the same as that discussed earlier for Chimney Rock Ruin 51. Items from non-room or “refuse” contexts incorporate site, area, section, and specimen designations as noted above (see Baker and Baker 2000:131). In contrast, items from habitation and non-habitation rooms are designated with room numbers (e.g., 28 **R23**/4). Some artifacts from rooms have individual specimen numbers as noted above, but others have an “M” or “A” preceding the last number. The meaning of this code is not known.

The elemental concentrations for all of the obsidian specimens included in this analysis are presented at the end of this appendix (Table V.6). Here, all measurements are presented in parts per million (ppm). Elemental concentrations for artifacts from four other Middle Ceramic sites of the region (i.e., Tarbox Ruin, McGarraugh Ranch, Landergin Mesa, and Skull Springs) have been previously presented by others (see Baugh and Nelson 1987; Lintz 1990; Mitchell et al. 1980). These items are not included here.

Table V.5 Obsidian Artifacts Analyzed from Alibates Ruin 28

Sample #	Catalog #	Artifact Description	L (mm)	W (mm)	Th (mm)	W (g)
AR 28-40	28 A1-20/4	Tertiary flake (distal; point base?)	16.2*	13.6	3.5	0.7
AR 28-41	28 A1-20/6	Tertiary flake (midsection)	22.6*	16.3	4.5	1.5
AR 28-10	28 A2-6/9	Tertiary flake (utilized)	30.0	18.6	5.5	3.5
AR 28-11	28 A2-6/9	Secondary flake (bedrock cortex)	36.3	21.1	6.5	5.1
AR 28-14	28 A2-6/7	Tertiary flake (distal; utilized)	27.1*	22.6	5.9	3.1
AR 28-17	28 A2-61/M52	Tertiary flake	28.7	18.6	2.7	1.4
AR 28-18	28 A2-66/M22	Tertiary flake (heavily patinated)	17.2	22.8	5.1	1.5
AR 28-21	28 A2/?	Tertiary flake (midsection)	18.0*	16.6	3.2	0.8
AR 28-24	28 A2-27/M9	Tertiary flake	28.8	22.4	4.3	1.5
AR 28-27	28 A2-61/29	Tertiary flake	31.5	15.1	3.9	1.5
AR 28-12	28 0/2	Triangular point base	9.1*	16.1	2.5	0.4
AR 28-13	28 0/10	Tertiary flake	32.2	17.7	5.7	3.0
AR 28-36	28 0/15	Tertiary flake (proximal)	27.7*	32.4	13.1	10.2
AR 28-37	28 0/15	Tertiary flake (distal?)	30.0*	22.7	8.8	4.9
AR 28-38	28 0/15	Exhausted core (no cortex)	51.2	25.0	13.3	17.1
AR 28-39	28 0/15	Tertiary flake (distal)	23.5*	32.0	8.0	5.5
AR 28-42	28 0/15	Shatter (no cortex)	29.9	23.2	7.8	3.6
AR 28-43	28 0/15	Tertiary flake	36.5	25.3	5.8	4.4
AR 28-44	No #	Shatter (exhausted core?)	28.4	32.3	10.7	8.7
AR 28-45	No #	Tertiary flake	26.7	29.1	4.8	3.2
AR 28-22	28 A3-82/M	Tertiary flake	25.7	14.8*	4.7	1.3
AR 28-29	28 A3/15?	Tertiary flake (blade-like)	17.1	10.3	3.1	0.5
AR 28-31	28 A6/10	Shatter (exhausted core?)	51.2	25.7	15.1	13.0
AR 28-32	28 Area 6 No #	Secondary flake (bedrock cortex)	30.7	23.7	9.6	5.2
AR 28-33	28 Area 6 No #	Tertiary flake (distal; patinated)	31.5*	14.9*	4.4	2.1
AR 28-34	28 Area 6 No #	Shatter (no cortex)	21.3	22.5	5.4	1.9
AR 28-35	28 Area 6 No #	Tertiary flake (proximal)	24.4*	24.2	5.4	2.0
AR 28-7	28 A7-66/13	Primary flake (stream cortex)	26.5	34.9	11.8	10.0
AR 28-8	28 A7-66/28	Tertiary flake	45.9	35.0	7.5	9.0
AR 28-15	28 A8-24/7	Tertiary flake (utilized)	31.2	13.9	3.9	1.6
AR 28-30	28 A8-9/1	Tertiary flake (weathered)	45.5	35.6	8.6	11.8
AR 28-9	28 R23/4	Primary flake (stream cortex)	35.3	32.8	15.7	14.6
AR 28-19	28 R25/M-1	Tertiary flake	24.2	34.0	4.2	2.9
AR 28-20	28 R25/M3	Tertiary flake (distal)	15.9*	20.3	5.8	1.9
AR 28-23	28 R25/A20?	Shatter (bedrock cortex)	22.4	22.1	8.5	3.4
AR 28-26	28 R25/M21	Tertiary flake	27.0	36.4	7.3	4.1
AR 28-16	28 R-45/1	Tertiary flake (blade)	43.4	12.0	5.8	2.3
AR 28-28	28 A16-?/M40	Tertiary flake (distal)	23.8*	30.5	6.8	2.2
AR 28-25	28 A-2?/M?	Tertiary flake	11.0	18.0	4.2	0.7

Discussion

As noted in Chapter Six, Cerro Toledo Rhyolite obsidian from the Jemez Mountains of north-central New Mexico dominates the current sample of sourced obsidian artifacts from Middle Ceramic contexts of the Southern High Plains.

Combining all items in the sample (N=129), 108 (83.7%) are from Cerro Toledo, nine (7.0%) are from Valle Grande, and 12 (9.3%) are from various other sources. These trends are quite different than those observed for the Protohistoric period (A.D. 1450-1700) (see Figure V.2).

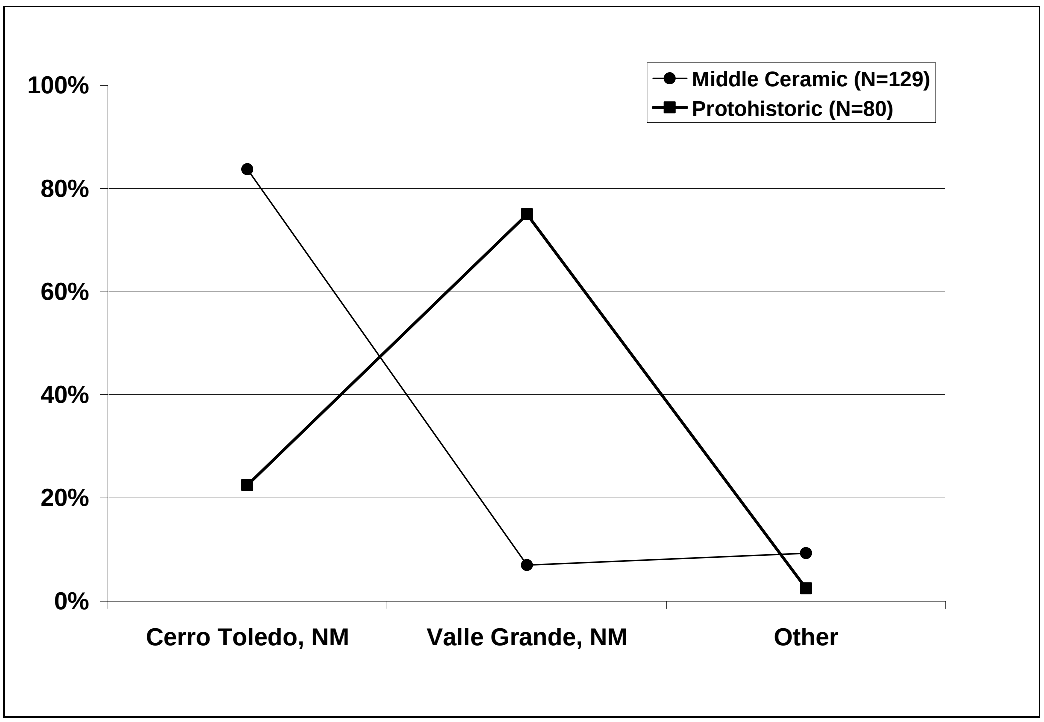

Figure V.2 Obsidian Source Areas by Time Period for Southern Plains Sites

Baugh and Nelson (1987) present XRF sourcing results for 80 obsidian artifacts of Protohistoric age from the Southern Plains. These items were recovered from Duncan (N=7), Goodwin-Baker (N=17), Taylor (N=6), Edwards I (N=31), Bridwell (N=7), Montgomery (N=8), and Country Club (N=4). Previously, Baugh and Nelson (1987:Table 3) also included one obsidian flake from Skull Springs (34BV55) to this list. Recent analysis of materials from this site by the author, however, indicates that this site is Middle Ceramic in age. Of this sample (N=80), 60 (75%) are from Valle Grande, New Mexico, 18 (22.5%) are from Cerro Toledo, and 2 (2.5%) are from other sources (El Rechuelos, New Mexico and Malad, Idaho).

Figure V.2 documents a major shift from the use of Cerro Toledo obsidian during the Middle Ceramic period to Valle Grande obsidian during the Protohistoric period. Although the reasons for this shift are not yet understood, this cultural transition is traditionally thought to be marked by the abandonment of the region by at least some Middle Ceramic period societies and their replacement by Athapaskan or other Caddoan speaking groups (for a review see Hofman 1989). Even though Cerro Toledo and Valle Grande sources are geologically close to one another, this dramatic shift in resource use may signify the emergence of new exchange alliances and possibly the control of obsidian sources (i.e., Valle Grande) by resident Puebloan groups. Hopefully, future research will shed additional light on the structure of obsidian exchange on the Southern Plains and adjacent areas of New Mexico.

Table V.6 Elemental Concentrations for Obsidian Specimens Examined in this Study (all in ppm)

Odessa Phase Site	Sample #	Description	Rb	Sr	Y	Zr	Nb	Ba	Ti	Mn	Key	Source
Campbell (34BV97)	Cambell-1	Flake	204.1	0	64.4	176.6	90.2	-	835.8	477.4	A	Cerro Toledo, N. M.
Campbell (34BV97)	Cambell-2	Flake	164.1	5.3	44.5	162.9	48.7	-	715.4	327.7	A	Valle Grande, N. M.
Campbell (34BV97)	Cambell-3	Flake	157.4	5.8	37.8	158.9	48.9	-	782.0	338.2	A	Valle Grande, N. M.
Sprague (34BV99)	Sprague-1	Flake	181	2.4	58.5	162.3	88.9	-	724.1	381.6	A	Cerro Toledo, N. M.
Sprague (34BV99)	Sprague-2	Flake	211.2	1.2	65.9	183.5	92.6	-	803.7	497.3	A	Cerro Toledo, N. M.
Sprague (34BV99)	BV99-10	Washita	205	10	63	181	96	184	-	-	D	Cerro Toledo, N. M.
Sprague (34BV99)	BV99-11	Washita	195	7	59	172	92	24	-	-	D	Cerro Toledo, N. M.
34BV99 or 34BV100	BV100/99-13	Washita	192	7	60	176	91	11	-	-	D	Cerro Toledo, N. M.
34BV99 or 34BV100	BV100/99-14	Washita	177	7	55	160	85	46	-	-	D	Cerro Toledo, N. M.
34BV99 or 34BV100	BV100/99-15	Point Tip	196	6	59	174	91	0	-	-	D	Cerro Toledo, N. M.
Odessa Yates (34BV100)	Odessa-1	Flake	214.2	1.7	62.7	178.6	94.9	-	726.9	488.9	A	Cerro Toledo, N. M.
Odessa Yates (34BV100)	Odessa-2	Flake	217.1	1.7	66.5	183.4	89.7	-	960.7	578.6	A	Cerro Toledo, N. M.
Odessa Yates (34BV100)	Odessa-3	Flake	195.4	3.1	60.1	168.6	90.9	-	788.1	438.5	A	Cerro Toledo, N. M.
Odessa Yates (34BV100)	Odessa-4	Flake	205.4	1.2	58.4	178.7	91.8	-	836.8	506.0	A	Cerro Toledo, N. M.
Odessa Yates (34BV100)	Odessa-5	Flake	202.3	3.2	61.8	173.4	87.9	-	782.9	437.4	A	Cerro Toledo, N. M.
Odessa Yates (34BV100)	Odessa-6	Flake	198.3	2.2	57.2	171.1	91	-	803.7	495.8	A	Cerro Toledo, N. M.
Odessa Yates (34BV100)	TR 5-2	Flake	200	4	62	173	94	26	-	-	F	Cerro Toledo, N. M.
Odessa Yates (34BV100)	TR 5-5	Flake	195	5	56	166	90	34	-	-	F	Cerro Toledo, N. M.
Odessa Yates (34BV100)	TR 5-7	Flake	221	4	60	176	93	78	-	-	F	Cerro Toledo, N. M.
Odessa Yates (34BV100)	TR 5-8	Flake	175	4	54	153	85	50	-	-	F	Cerro Toledo, N. M.
Odessa Yates (34BV100)	TR 5-10	Flake	181	4	49	157	76	58	-	-	F	Cerro Toledo, N. M.
Odessa Yates (34BV100)	TR 5-11	Flake	203	7	52	149	82	178	-	-	F	Cerro Toledo, N. M.
Odessa Yates (34BV100)	TR 5-12	Flake	197	5	57	171	90	38	-	-	F	Cerro Toledo, N. M.
Odessa Yates (34BV100)	TR 5-13	Flake	201	6	57	170	92	120	-	-	F	Cerro Toledo, N. M.
Odessa Yates (34BV100)	WF-14	Flake	202	4	61	180	96	36	-	-	F	Cerro Toledo, N. M.
Odessa Yates (34BV100)	WF-15	Flake	194	5	59	172	90	78	-	-	F	Cerro Toledo, N. M.
Odessa Yates (34BV100)	WF-16	Flake	207	4	62	180	98	42	-	-	F	Cerro Toledo, N. M.
Odessa Yates (34BV100)	WF-17	Flake	199	4	61	177	95	22	-	-	F	Cerro Toledo, N. M.
Odessa Yates (34BV100)	WF-18	Flake	203	5	61	180	96	47	-	-	F	Cerro Toledo, N. M.

Odessa Phase Site	Sample #	Description	Rb	Sr	Y	Zr	Nb	Ba	Ti	Mn	Key	Source
Odessa Yates (34BV100)	WF-19	Flake	205	4	61	183	97	37	-	-	F	Cerro Toledo, N. M.
Odessa Yates (34BV100)	WF-20	Flake	222	4	66	182	98	-6	-	-	F	Cerro Toledo, N. M.
Odessa Yates (34BV100)	WF-21	Flake	197	4	61	178	94	30	-	-	F	Cerro Toledo, N. M.
Odessa Yates (34BV100)	WF-22	Flake	193	4	60	172	93	28	-	-	F	Cerro Toledo, N. M.
Odessa Yates (34BV100)	WF-23	Flake	191	4	59	170	91	48	-	-	F	Cerro Toledo, N. M.
Odessa Yates (34BV100)	WF-24	Flake	187	3	58	169	90	15	-	-	F	Cerro Toledo, N. M.
Odessa Yates (34BV100)	WF-25	Flake	208	4	62	178	95	25	-	-	F	Cerro Toledo, N. M.
Odessa Yates (34BV100)	WF-26	Flake	191	4	56	175	92	18	-	-	F	Cerro Toledo, N. M.
Odessa Yates (34BV100)	BV100-3	Washita	203	7	62	180	95	28	-	-	D	Cerro Toledo, N. M.
Odessa Yates (34BV100)	BV100-4	Washita	198	6	60	180	90	45	-	-	D	Cerro Toledo, N. M.
Odessa Yates (34BV100)	BV100-5	Point Tip	202	6	59	172	92	12	-	-	D	Cerro Toledo, N. M.
Odessa Yates (34BV100)	BV100-6A	Fresno	195	7	61	178	92	0	-	-	D	Cerro Toledo, N. M.
Odessa Yates (34BV100)	BV100-6B	Fresno	196	7	62	176	94	0	-	-	D	Cerro Toledo, N. M.
Odessa Yates (34BV100)	BV100-7	Fresno	204	7	63	176	95	26	-	-	D	Cerro Toledo, N. M.
Odessa Yates (34BV100)	BV100-8	Fresno	204	6	63	182	96	12	-	-	D	Cerro Toledo, N. M.
Odessa Yates (34BV100)	BV100-17	Flake	199	6	62	180	96	23	-	-	D	Cerro Toledo, N. M.
Odessa Yates (34BV100)	BV100-18	Flake	202	7	63	183	97	37	-	-	D	Cerro Toledo, N. M.
Odessa Yates (34BV100)	BV100-19	Flake	207	7	64	182	98	5	-	-	D	Cerro Toledo, N. M.
Odessa Yates (34BV100)	BV100-20	Flake	203	7	62	182	97	23	-	-	D	Cerro Toledo, N. M.
Odessa Yates (34BV100)	BV100-16	Flake	115	125	21	135	28	983	-	-	D	Fish Creek, Wy.
Odessa Yates (34BV100)	TR 5-4	Flake	1	3	1	21	2	21	-	-	F	Quartz Crystal
Odessa Yates (34BV100)	TR 5-6	Flake	2	5	4	22	1	56	-	-	F	Quartz Crystal
Odessa Yates (34BV100)	TR 5-1	Flake	120	122	18	133	28	1136	-	-	F	Unknown NW Plains
Odessa Yates (34BV100)	TR 5-3	Flake	96	57	24	75	13	1056	-	-	F	Unknown NW Plains
Odessa Yates (34BV100)	TR 5-9	Washita	154	9	42	160	53	64	-	-	F	Valle Grande, N. M.
Odessa Yates (34BV100)	BV100-9	Washita	160	11	43	174	55	46	-	-	D	Valle Grande, N. M.
Spangler (34BV104)	Spangler-1	Flake	123.3	68.1	31.3	87.8	10.7	-	-	-	A	Malad, Id.
Huddleston (34BV116)	BV116-1	Flake	208	7	63	181	97	11	-	-	B	Cerro Toledo, N. M.
34BV122	BV122-1	Flake	200	5	5	178	111	-	865	594	E	Cerro Toledo, N. M.
Courson D (41OC29)	Courson-1	Flake	205	7	63	185	99	30	-	-	D	Cerro Toledo, N. M.

Odessa Phase Site	Sample #	Description	Rb	Sr	Y	Zr	Nb	Ba	Ti	Mn	Key	Source
Courson D (41OC29)	Courson-2	Flake	200	7	62	184	97	16	-	-	D	Cerro Toledo, N. M.
34BV93	BV93-1	Flake	187	0.8	55.6	171.5	87.1	-	696.8	430.5	A	Cerro Toledo, N. M.
34BV93	BV93-3	Flake	194.2	3.1	60.1	160.7	76.9	-	729.4	471.8	A	Cerro Toledo, N. M.
34BV93	BV93-2	Flake	123.3	71.9	29.1	86.6	13.5	-	816.4	188.7	A	Malad, Id.
Unknown Odessa Phase	Goodner-3	Washita	160	10	43	164	54	189	-	-	B	Valle Grande, N. M.

Antelope Creek Phase Site	Sample #	Description	Rb	Sr	Y	Zr	Nb	Ti	Mn	Fe	Key	Source
Archie King	AK46	Shatter	180	5	5	170	102	861	550	8021	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-7	Flake	189	7	7	174	91	924	576	8887	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-8	Flake	202	9	9	173	97	995	584	8605	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-9	Flake	206	5	5	187	108	914	546	9224	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-10	Flake	208	5	5	177	103	885	575	9259	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-11	Flake	204	5	5	187	102	923	612	9449	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-12	Point Frag	186	12	12	172	87	976	586	8296	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-13	Flake	193	32	32	162	94	1087	541	8079	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-14	Flake	209	5	5	187	104	843	620	9384	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-15	Flake	204	8	8	178	93	914	672	9175	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-16	Flake	160	8	8	161	89	861	510	7590	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-17	Flake	191	5	5	170	101	872	521	8246	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-18	Flake	168	5	5	155	84	814	406	7196	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-19	Flake	194	9	9	175	92	773	470	8790	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-20	Flake	195	7	7	178	105	969	572	8818	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-21	Flake	204	8	8	173	97	891	563	8759	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-22	Flake	183	5	5	172	98	768	543	8226	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-23	Shatter	192	5	5	167	93	859	517	8153	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-24	Flake	187	12	12	151	87	871	496	8179	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-25	Flake	172	6	6	147	92	716	448	7355	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-26	Flake	209	5	5	173	102	877	596	9037	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-27	Flake	199	8	8	165	102	864	499	8641	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-28	Flake	184	7	7	166	101	914	514	7994	E	Cerro Toledo, N. M.

Antelope CreekPhase Site	Sample #	Description	Rb	Sr	Y	Zr	Nb	Ti	Mn	Fe	Key	Source
Alibates Ruin 28	AR 28-29	Flake	209	7	7	181	98	847	641	9131	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-31	Shatter	185	11	11	174	108	881	559	8588	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-32	Flake	194	7	7	179	105	972	555	8749	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-33	Flake	196	21	21	167	97	862	578	8510	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-34	Shatter	197	12	12	168	93	886	584	8728	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-35	Flake	203	8	8	183	103	938	589	9119	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-36	Flake	209	8	8	180	100	941	638	9392	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-37	Flake	195	5	5	180	94	836	571	8668	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-38	Shatter	199	8	8	172	96	893	568	9080	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-39	Flake	199	8	8	176	100	837	561	8743	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-40	Flake	212	5	5	177	97	933	575	9023	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-41	Flake	190	5	5	174	101	881	559	8265	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-42	Core	195	9	9	180	103	918	598	8863	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-43	Flake	180	5	58	170	102	861	550	8021	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-44	Shatter	209	5	67	174	109	878	672	9393	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-45	Flake	203	7	61	173	107	876	583	8826	E	Cerro Toledo, N. M.
Alibates Ruin 28	AR 28-30	Flake	151	10	10	78	51	889	447	5483	E	El Rechuelos, N. M.
Chimney Rock	CR 51-1	Washita	205	8	8	163	99	1079	608	9200	E	Cerro Toledo, N. M.
Chimney Rock	CR 51-2	Washita	158	6	6	138	70	962	340	6565	E	Cerro Toledo, N. M.
Chimney Rock	CR 51-3	Washita	207	5	5	179	97	1017	576	9057	E	Cerro Toledo, N. M.
Chimney Rock	CR 51-4	Biface	216	5	5	192	92	884	709	9956	E	Cerro Toledo, N. M.
Chimney Rock	CR 51-5	Biface	207	5	5	179	102	936	624	9398	E	Cerro Toledo, N. M.
Chimney Rock	CR 51-6	Washita	180	8	8	165	93	857	497	8103	E	Cerro Toledo, N. M.
Roy Smith (34BV14)	BV14-21	Flake	213	7	65	186	99	-	-	-	D	Cerro Toledo, N. M.
Roy Smith (34BV14)	BV14-22	Flake	195	8	60	171	90	-	-	-	D	Cerro Toledo, N. M.
Roy Smith (34BV14)	BV14-23	Flake	196	7	62	177	96	-	-	-	D	Cerro Toledo, N. M.
Roy Smith (34BV14)	BV14-24	Flake	190	6	61	172	93	-	-	-	D	Cerro Toledo, N. M.
Roy Smith (34BV14)	BV14-25	Flake	251	10	77	178	47	-	-	-	D	Obsidian Cliff, Wy.
Roy Smith (34BV14)	BV14-26	Flake	158	11	44	181	55	-	-	-	D	Valle Grande, N. M.
Stamper (34TX1)	TX1-28	Flake	199	7	62	178	95	-	-	-	D	Cerro Toledo, N. M.

Antelope Creek Phase Site	Sample #	Description	Rb	Sr	Y	Zr	Nb	Ti	Mn	Fe	Key	Source
Stamper (34TX1)	TX1-27	Flake	5	49	8	26	1	-	-	-	D	Black Chert
Stamper (34TX1)	TX1-29	Flake	192	49	23	119	25	-	-	-	D	Owyhee, Id.
34TX112	TX112-1	Flake	8.9	15	8.3	16.5	4.7	582.1	29.3	7511.1	A	Black Chert
34TX113	TX113-1	Flake	153.6	4.2	39	163	52	775.9	336.4	9688.2	A	Valle Grande, N. M.
Clawson (34TX34)	1	Flake	193	42	21	117	24	-	-	-	C	Unknown

Unaffiliated Sites	Sample #	Description	Rb	Sr	Y	Zr	Nb	Ti	Mn	Fe	Key	Source
14KW311	KW#47	Flake	210	7	65	169	101	881	610	9027	E	Cerro Toledo, N. M.
14KW311	KW#48	Shatter	210	7	60	176	97	850	552	8886	E	Cerro Toledo, N. M.
14KW311	KW#49	Flake	217	6	64	175	94	943	678	9734	E	Cerro Toledo, N. M.
34BV157	K-1	Flake	163	10	45	171	56	-	-	-	B	Valle Grande, N. M.
34BV157	K-2	Flake	158	10	43	168	55	-	-	-	B	Valle Grande, N. M.
Pierce (34BV172)	Pierce-2	Flake	206	3.4	56.8	174.4	91	767.8	507.7	10779	A	Cerro Toledo, N. M.
Pierce (34BV172)	Pierce-1	Flake	164	4.2	44.9	168.1	53.6	801.8	377.2	10158	A	Valle Grande, N. M.
Pierce (34BV172)	Pierce-3	Flake	168.8	5.3	48.2	168.8	56.1	1010	403.3	11046	A	Valle Grande, N. M.

Key	Sample Standard	Rb	Sr	Y	Zr	Nb	Ba	Ti	Mn	Fe	Date of Study
A	USGS Rhyolite Standard	152	108	24	226	10	-	1516	259	13991	18 May 1998
B	USGS Rhyolite Standard	144.6	102.2	24	216.4	8.8	806.4	-	-	-	20 February 2001
C	USGS Rhyolite Standard	146	102	24	217	9	806	-	-	-	16 April 2001
D	USGS Rhyolite Standard	145	102	24	218	9	807	-	-	-	4 December 2001
E	USGS Rhyolite Standard	150	113	24	220	9	-	1741	14254	14254	4 November 2003
F	USGS Rhyolite Standard	145	100	24	216	9	736	-	-	-	17 September 1999

APPENDIX VI

Database of Recorded Antelope Creek Phase Settlements

In Chapter Four a study of Antelope Creek phase settlement patterns was presented. This study focused on the distribution of permanent habitation sites of the phase in Texas and Oklahoma. Permanent settlements, as opposed to special activity, resource procurement, and other non-habitation sites, were identified in existing site files by the presence of domestic architecture. Data used for this study were derived almost exclusively from the Texas Archeological Site Atlas (2003) and site files housed at the Oklahoma Archeological Survey in Norman (2002).

This site database represents a listing of all permanent habitation sites of the phase that were recorded as of January 2003. It should be noted that additional habitation sites, particularly in the Texas panhandle, are known, but remain unrecorded. For instance, there are two sites in Hutchinson County and four sites in Roberts County, which the author has visited. Although these sites have never been recorded, they are included here. There are undoubtedly other similar cases along the Canadian River and its tributaries of which I am not aware. In addition, since significant portions of the Texas and Oklahoma panhandles remain uninvestigated, it goes without saying that additional sites surely remain to be documented.

These data are presented by county for each state. As noted in Chapter Four, site records for surrounding counties were also examined, but failed to document additional sites that could be firmly attributed to the phase as it is defined by Lintz (1986a).

Table VI-1 Permanent Habitation Sites of the Antelope Creek Phase

Hutchinson Co., Tx.[a]	**Moore Co., Tx.**	**Potter Co., Tx.**	**Potter Co., Tx.**
41HC2	41MO3	41PT2	41PT174
41HC3	41MO7	41PT8	41PT253
41HC6	41MO26	41PT11	41PT254
41HC7	41MO35	41PT12	41PT257
41HC10	41MO36	41PT13	41PT283
41HC13	41MO37	41PT14	41PT342[b]
41HC19	41MO40	41PT17	41PT343[b]
41HC20	41MO41	41PT18	41PT345[b]
41HC21	41MO42	41PT21	41PT346[b]
41HC23	41MO96	41PT22	41PT349[b]
41HC24	41MO100	41PT24	
41HC26	41MO105	41PT25	**Texas Co., Ok.**
41HC27	41MO110	41PT34	34TX1
41HC29	41MO117	41PT40	34TX2
41HC30	41MO120	41PT45	34TX6
41HC34	41MO127	41PT47	34TX31
41HC35	41MO160	41PT50	34TX32
41HC36	41MO180	41PT51	34TX34
41HC45		41PT57	34TX51
41HC96	**Oldham Co., Tx.**	41PT67	34TX52
41HC99	41OL1	41PT75	34TX67
41HC108	41OL2	41PT76	34TX92
41HC113	41OL8	41PT77	34TX150
41HC114	41OL25	41PT93	
41HC141	41OL48	41PT96	**Beaver Co., Ok.**
41HC154	41OL188	41PT109	34BV14
41HC202	41OL200	41PT111	
	41OL281	41PT112	
Roberts Co., Tx.[a]	41OL282	41PT132	
41RB2		41PT133	

[a] Does not include six known, but unrecorded sites in Hutchinson Co. (N=2) and Roberts Co. (N=4)
[b] These may represent previously recorded sites of the phase that have already been assigned site numbers (i.e., these sites may have two different site numbers).