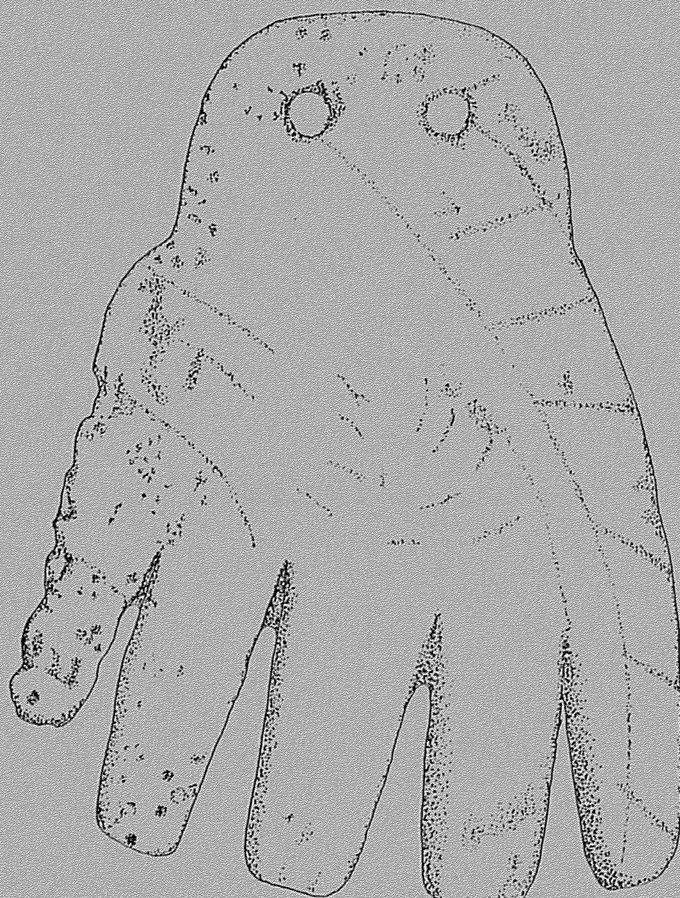
Bulletin of the TEXAS ARCHEOLOGICAL SOCIETY

Volume 62/1991



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TEXAS ARCHEOLOGICAL SOCIETY

The Society was organized and chartered in pursuit of a literary and scientific undertaking: the study of man's past in Texas and contiguous areas. The *Bulletin* offers an outlet for the publication of serious research on prehistory, archeological theory, and history. In line with the goals of the Society, it encourages the scientific collection, study, and publication of archeological data.

The *Bulletin* is published annually for distribution to the members of the Society. Opinions expressed herein are those of the writers and do not necessarily represent the views of the Society or its editorial staff.

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Membership in the Society is for calendar year. Dues (current 1994) are as follows: Individuals (includes societies and institutions), $25; Family, $30; Student, $12.50; Contributing, $50; Supporting, $100; Life, $600. All members of the Society receive the *Bulletin*, published annually, and *Texas Archeology*, a newsletter issued four times a year. A monograph series, *Special Publications*, also is published by the Society. Back issues of the *Bulletin* are available, and price lists can be obtained from the Secretary.

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Bulletin of the TEXAS ARCHEOLOGICAL SOCIETY

Volume 62/1991

Timothy K. Perttula, Editor
Nancy Reese, Associate Editor

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FOREWORD

With the publication of the 1991 *Bulletin of the Texas Archeological Society* (BTAS), the publications of the Texas Archeological Society are now back on schedule. I, as well as the previous BTAS Editor Jimmy L. Mitchell, greatly appreciate the patience of the membership, as well as the BTAS subscribers, libraries, and authors, who bore the long wait with good humor and grace. Hopefully, with the regular publication and distribution of the BTAS, we can better share with others what has been learned about the prehistory and history of Texas through professional and avocational archeological research, capture the imagination of more people who are interested in the archeology of Texas, and for the future, increase the membership and voice of the Texas Archeological Society in our efforts to preserve and protect Texas' archeological legacy.

With the 1994 receipt of the Deolece-Parmalee Award, the BTAS has recently been recognized by the Texas Historical Foundation for its long-term and continuing contributions to historical preservation research in Texas (Perttula 1994). I expect those contributions to continue well into the future.

To kick off the next 65 years of the *Bulletin of the Texas Archeological Society*, the 1995 BTAS, now in preparation, offers us a propitious opportunity to take stock of what we know (and do not know) about the archeology of Texas. As currently envisioned, this special volume will have forewords by eminent Texas archeologists, contain about 18-20 papers on the archeology of the different regions of Texas, along with discussions of trends in Texas archeology over the last 50 years or so. These papers will summarize the current state of knowledge for these areas, and communicate in a single volume our new learning about the archeological heritage of Texas to interested members of the public, Native Americans, and professional and avocational archeologists alike.

Timothy K. Perttula, Publications Editor
December 1994

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1994 TAS Receives Deolece-Parmalee Award. *Texas Archeology* (The Newsletter of the Texas Archeological Society)38(3):1, 20.

Excavations at the Blue Hole Site, Uvalde County, Texas, 1990

Henry E. Mueggenborg

ABSTRACT

The Blue Hole site (41UV159) was recorded by a University of Texas at Austin 1989 Summer Archaeological Field School survey team. Located in the upper Sabinal River Valley, about 13 km south of Utopia, Texas, the large alluvial terrace evidenced occupations dating from Early Archaic to Late Prehistoric periods. The site was excavated as a part of the Texas Archeological Society's 1990 Summer Field School. The goal of the excavation was to define the stratigraphy of the site in relation to the prehistory of the Sabinal Canyon. Excavations focused on 1 meter units along intersecting lines, which extended through a concentrated burned rock midden and into adjacent occupation areas. Artifacts recovered consisted primarily of lithics dating from the Late Prehistoric to the Middle Archaic period. Detailed information regarding burned rock, lithic debitage, land snails, and the general stratigraphy of the site have created a vivid visualization of cultural deposition at the site.

INTRODUCTION

The Blue Hole site (41UV159) is a prehistoric occupation site located on the Mary K. Kindred Ranch about 13 km south of Utopia, Texas, in northeastern Uvalde County (Figure 1). Here, the upper Sabinal Valley narrows and the Sabinal River leaves the Balcones Escarpment, the southernmost limit of the Edwards Plateau region. The alluvial terraces in this section of the valley contain numerous prehistoric remains, and the burned rock middens scattered in the area have long been a favorite source for local artifact collectors.

The University of Texas at Austin (UT) 1989 Summer Archaeological Field School, directed by Dr. Thomas R. Hester, included daily surface surveys of the upper Sabinal Valley area that were oriented toward site identification and recording. Local collections were documented and collectors were interviewed by Paul Maslyk (1993), who led the survey teams. One of the most popular collection areas was identified as the burned rock middens adjacent to the "Blue Hole," a deep, broad pool at a bend in the Sabinal River on the Kindred ranch. Maslyk obtained permission to survey the area and record the sites. Several days were spent on general reconnaissance, surface collecting, and recording the several sites on the ranch. Many sites were associated with burned rock middens,

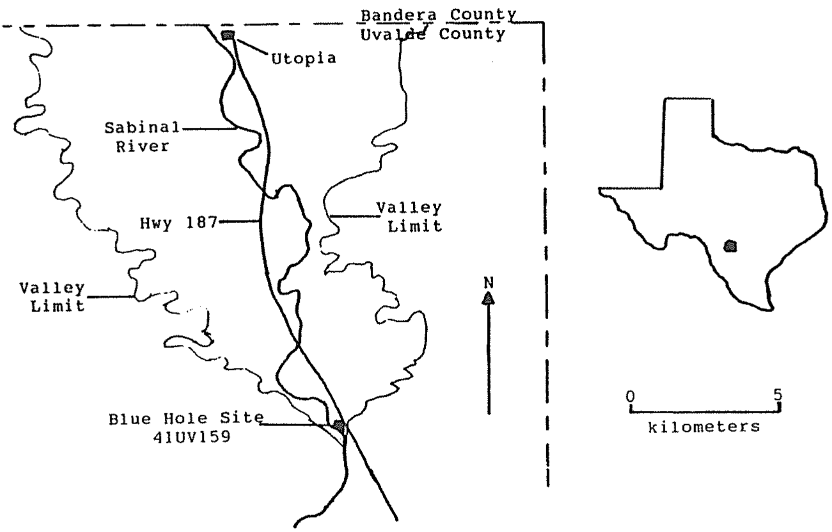

Figure 1. Map of the Blue Hole site locality. Inset shows the location of Uvalde County within the state. Valley limits are from Mear (1953).

and the artifacts collected included Early Archaic to Late Prehistoric period lithic projectile points.

The Blue Hole site was originally recorded as an individual burned rock midden on a deep alluvial terrace about 100 m east of the Blue Hole. Numerous collector potholes remained around the perimeter of the site and we later learned that the southern and western edges of the site had been mechanically (Bobcat loader and mechanical screen) excavated between 1986-1988.

When the upper Sabinal Valley was selected for the Texas Archeological Society (TAS) 1990 Summer Field School, Mary K. Kindred granted permission to excavate the Blue Hole site as a major focus of the field school. The main goal of the Blue Hole excavations was to define the temporal occupations of the midden itself, and the adjoining occupation areas, in an attempt to clarify the local chronology and to further examine the burned rock midden phenomenon in Central and South Texas archeology.

This paper will first set forth the physical environment at the site, discuss the archeological background of the general area, and give an account of the field and laboratory methods employed in the investigation. Since archeology reconstructs the accumulation of cultural deposits, the natural, geologic processes which contributed to the formation of the site are of particular interest.

These natural processes are then related to the artifacts recovered from the excavations to establish a relative site chronology consistent with that generally established for South and Central Texas. The artifacts, consisting primarily of lithics, are then described and the interrelationships between the burned rock accumulations, lithic artifacts, and molluscan remains are examined. Finally, the features are discussed and placed within the site's temporal framework.

ENVIRONMENT

Physical Setting

The upper Sabinal Valley follows the southerly flow of the Sabinal River through the Balcones Escarpment. The escarpment's position at the edge of the Edwards Plateau region places it between two of the grand physiographic divisions of North America, the Great Plains province to the west and the Coastal Plains to the east and south (Jordan et al. 1984). In Central Texas, this major physiographic break is denoted by the change from the Hill Country on the westward side of the escarpment to the Blackland Prairie on the east. With the Blue Hole site situated at the southern edge of the Balcones Escarpment, the South Texas Coastal Plain spreads immediately to the south, while the area to the north is in the Edwards Plateau.

Hydrology

The Sabinal River, because of its position with respect to other streams of the region (the Frio River to the west and the Medina to the east) and the positions of their head streams, obtains very little of its discharge from the limestone of the Edwards Plateau. Most of its water comes from rainfall runoff and seep springs in the Glen Rose formation. Consequently, the flow of the Sabinal River is relatively slight and is subject to rapid fluctuations. The relatively small flow of the river is further lost into fissures and fault planes near the Blue Hole where the Sabinal crosses the Balcones fault zone (Mear 1953). Thus, during the drier summer months, with the exception of unusual precipitation, the Sabinal River ceases to flow. However, it does maintain large quantities of water in the deeper entrenchments, such as the Blue Hole, that occur in the main river channel.

The Sabinal has many asymmetrical meanders which are separated by long straight portions of the river, and these meanders create rich alluvial terrace deposits with the sudden and short-lived floods characteristic of the river (Mear 1953). These terrace deposits result in an enriched environment with more productive floral species, but they would further have provided the prehistoric inhabitants with elevated habitation sites adjacent to a water source.

Geology

The Geologic Atlas of Texas depicts the entire upper Sabinal Valley as "Quaternary deposits undivided" including "slope wash, alluvial fan deposits, alluvium, colluvium, and locally older Quaternary deposits; mostly in the size range of cobbles to silt derived from Cretaceous limestone, dolomite, and chert" (Barnes 1983). The entire watershed is bounded by the Glen Rose Formation, consisting of about 122 m thick beds of "limestone, dolomite, and marl as alternating resistant and recessive beds forming stairstep topography." The Glen Rose formation, which extends several miles from the central valley region and a few hundred meters at the southern confluence, is then bounded by the Edwards Limestone, specifically Devil's River Limestone. Acording to Barnes (1983), this is a "limestone and dolomite, hard, miliolid, pellet, rudistid, shell fragment biosparite and lime mudstone; locally dolomitized, brecciated, and chert bearing; rudistid mounds more common in upper part; nodular limestone in basal part; thickness about 700 feet (213 meters)."

Selection of sites for early human habitation was at least partially influenced by a quality source of chert raw material for tools. Banks (1990) identified the Devil's River formation as one of the three principal chert-bearing units in the Edwards Group. In addition, the Uvalde gravel, composed of pebbles and cobbles of chert with some limestone in a calcareous mix, occurs naturally in the low rolling hills that outcrop below the Balcones Escarpment, but 61–91 m above modern stream levels (Mear 1953). However, it is generally accepted that the better quality chert was obtained from the upper Edwards areas or from Edwards gravels in the river bottom.

The general soil map from the Soil Survey of Uvalde County, Texas (Stevens and Richmond 1976:5), describes the floodplain of the upper Sabinal valley as "nearly level to gently sloping and undulating to hilly, very shallow to shallow and stony, clayey and loamy soils." The alluvial terrace which encases the Blue Hole Site consists entirely of "young but not recent Conalb loam, a fine-loamy, carbonatic, hyperthermic Inceptisol" (Stevens and Richmond 1976:97).

Flora and Fauna

Blair (1950) placed the upper Sabinal Valley at the southern limit of the Balconian, or Edwards Plateau, biotic province, with the Tamaulipan province immediately to the south. The most characteristic plant association in the Balconian is the scrub forest of Mexican cedar, Texas oak, and stunted live oak, interspersed with less numerous species. To the south, thorny brush, including mesquite and prickly pear, predominates in the Tamaulipan. The vertebrate fauna of the Balconian is an intermixture of species found generally to the north, west, and south of the province whereas the Tamaulipan species are more representative of provinces to the east of the Balconian. While both provinces contain vast floral and faunal resources, it is significant that the upper Sabinal Valley is located at a natural ecotone, or transitional zone; human populations are able to exploit the faunal and floral resources common to each respective province.

The floodplain of the present day upper Sabinal Valley characteristically has been cleared, and is either cultivated or improved grassland, or has been reclaimed by low mesquite and low shrubs, prickly pear cactus, and native grasses. The lower areas nearer the rivers and streams have concentrations of large pecan, oak, and elm trees while the rockier elevations support rather dense populations of live oak, mesquite, and cedar. The Blue Hole site itself sits upon a partially cleared alluvial terrace, with the lower slopes supporting numerous large native pecan, elm, and oak trees (Figure 2).

Climate

Uvalde County has a subtropical climate with dry winters and hot, humid summers. The present day upper Sabinal Valley receives an annual average of 59.6 cm of rainfall and enjoys a 255 day growing season (*Texas Almanac* 1989).

Figure 2. The Blue Hole site terrace prior to excavation, looking southeasterly toward end of terrace. TAS personnel are establishing the site grid.

During the Wisconsin glacial period (20,000-12,000 B.C.), the area "was considerably cooler and more humid than today" (Bryant and Holloway 1985:50), and was covered with grasslands, woodlands, and parklands including species of spruce and pine. Faunal records contain extinct species—such as the long nosed peccary and the mastodon— generally thought to inhabit cool, humid forests (Graham 1976). A slow climatic deterioration, with drier and warmer conditions, probably occurred between 12,000-8000 B.C., as the spruce and pine gradually gave way to grasslands (Black 1989:13). The Pleistocene and the accompanying Ice Age came to an end somewhere between 8000-7000 B.C.

Following what appears to have been a relatively long, gradual trend toward warmer temperatures and drier conditions (Bryant and Shafer 1977), the vegetation communities are believed to have become generally similar to those of today by about 550 B.C. By that time, the grasslands and oak savannas of South Central Texas had been established. Along with the plentiful food source of the acorn, bison proliferated in the region by around 1000 B.C. (Dillehay 1974). This gradual increase of floral and faunal resources, and the year-long reliability of the white-tailed deer and smaller game species as food sources, resulted in the growth of human populations and their expansion into more diverse geographical regions (Hester 1980).

ARCHEOLOGICAL BACKGROUND

South Central Texas Chronology

While the division of human prehistory into time frames, and the naming and calibration of these time frames, has caused considerable debate among archeologists, the basic periods as used in Texas are divided by changes in lifeways, subsistence patterns, settlement, and technology. Consequently, the division between these "periods" is most often transitional in one aspect (for instance, technology), while other aspects of culture appear to remain relatively constant. The commonly accepted periods or stages are listed below for South Central Texas (Turner and Hester 1985:47-53):

Historic	Present	-	A.D. 1600
Late Prehistoric	A.D. 1600	-	A.D. 700
Archaic:			
Transitional	A.D. 700	-	300 B.C.
Late	300 B.C.	-	1000 B.C.
Middle	1000 B.C.	-	2500 B.C.
Early	2500 B.C.	-	6000 B.C.
Paleoindian	6000 B.C.	-	9200 B.C.

When studying certain parameters of Central Texas archeology, particularly temporal assignments of site occupations, projectile points and other tools are common and reliable indicators. Consequently, any archeological investigation relies heavily upon established projectile point typologies for understanding chronology. While point typology is not necessarily indicative of cultural change, the ability to link projectile point types to a particular period and area, and their validation in this regard by absolute and relative dating methods, makes this chronology particularly useful. Toward this goal, Suhm et al. (1954) published a widely accepted taxonomy of Texas stone artifacts, which has been subsequently refined by Suhm and Jelks (1962), Weir (1976), Prewitt (1981), and Turner and Hester (1985). Continuing archeological investigations will help to more closely define the temporal and regional typological associations of projectile points (see Johnson and Goode 1994), especially with the collation of radiocarbon dates in association with these lithic artifacts (e.g., Prewitt 1985; Black and McGraw 1985:324). Consequently, this paper will generally follow the South Central Texas point typology in establishing the vertical stratigraphy of the site, and in comparing those occupational patterns with other relevant site excavation data.

Comparative Studies

Prior to the 1970s, little had been published pertinent to the archeology of Uvalde County and immediately adjacent counties. However, several reports have since appeared, and recent excavations have been undertaken, and these have helped clarify and define the prehistoric occupation of the general area. The Paleoindian period remains relatively undocumented, but Archaic cultural remains are much more common, as evidenced by the number of burned rock middens and terrace sites present in the proximity of the Blue Hole site itself. The burned rock midden phenomenon, discussed below, is a common Central Texas occurrence particular to the Middle and Late Archaic periods. The Late Prehistoric period is marked primarily by the introduction of the bow and arrow, and arrowpoints are extensively represented in area surface collections and stratigraphically above earlier Archaic occupations in excavated assemblages. The following excavations are representative of the recent studies from the area, and are thus of particular relevance in placing the Blue Hole site in its regional context.

Kincaid Rock Shelter

Generally, the earliest human occupation in the area is represented by occasional surface finds of Late Paleoindian projectile points. However, Collins et al. (1989) reported a stone pavement lens clearly associated with a Clovis occupation at the Kincaid rockshelter, about 24 km downstream from the Blue Hole site in Uvalde County. Collins (1990) further reported six distinct geological zones at the shelter which included some Late Prehistoric artifacts, the complete Archaic sequence, and both Folsom and Clovis Paleoindian occupations.

La Jita Site (41UV21)

About 8 km up the Sabinal River from Blue Hole, the burned rock middens and adjacent occupation areas of the La Jita site were excavated in 1967 (Hester 1971). Although occupations from the Early Archaic through the Late Prehistoric periods were represented, the Middle and Late Archaic occupations are of particular relevance to the Blue Hole site, because of geographic proximity, the artifact assemblages, and their relationships to the burned rock middens. Eighteen radiocarbon dates were obtained from the Late and Transitional Archaic through the Late Prehistoric period occupations. The most recent La Jita excavations (1989 UT Field School and 1990 TAS Field School) concentrated on the Late Prehistoric occupations, and recovered primarily Toyah phase Perdiz arrowpoints, beveled bifaces, and end scrapers, as well as an assortment of sherds from Leon Plain pottery in association with bison bone (Huebner 1990).

Smith Site (41UV132)

The 1989 excavations of the burned rock midden and adjacent occupation areas at the Smith site on the west bank of the Sabinal, about 1.5 km upstream from the La Jita site, revealed substantial Early Archaic occupations. Charcoal in association with an *in situ* hearth was radiocarbon dated and calibrated to 6307 ± 90 B.P. or 4357 ± 90 B.C. (Hester 1990; calibrated following Stuiver and Reimer [1986]), and a number of associated Early Archaic projectile points were found in the strata underlying the Middle Archaic occupations. A major Middle Archaic component was excavated in association with the burned rock midden, but the Late Archaic occupation was sparse and no Late Prehistoric artifacts were recovered. The 1990 TAS Field School excavations at the Smith site were directed at the deeper Early Archaic deposits and hearth complexes (Smith 1990).

Leona River Watershed, Four Sites in Uvalde County

Located about 40 km southwest of the Blue Hole site, the four sites included five burned rock middens and a quarry area (Lukowski 1987). Based on intersite comparisons of the five burned rock middens, and the associated radiocarbon dates, Lukowski proposed that the burned rock middens extended into much later temporal periods than was initially believed. Certain projectile point types similarly appeared to extend temporally beyond generally accepted time ranges.

Luce Middens (41UV20, 22, and 23)

These three burned rock middens, located in the northwestern corner of Uvalde County adjacent to the Nueces River, contained artifacts attributable to the Middle Archaic period. The zones above the burned rock deposits yielded Late and Transitional Archaic through Late Prehistoric period artifacts (Hester 1970). The sites had been heavily disturbed by collectors, and the zone strata and chronologies were established from the visual inspection of the sites, as well as from the collected artifacts and their reported approximate proveniences.

Salado Creek Watershed Site (41BX300)

Situated at the southeastern perimeter of the Balcones Escarpment, about 105 km due east of the Blue Hole site, 41BX300 was excavated in Bexar County in 1978 (Katz 1987). The excavations yielded diagnostic projectile points that clearly placed the burned rock midden in the Late Archaic period, with a substantial Transitional Archaic occupation in the strata above the burned rock midden. No conclusive absolute dates were obtained, however, to substantiate either the relative dating of the artifacts or the burned rock midden.

Panther Creek Springs Site (41BX228)

The 1979 excavations at Panther Creek Springs, located about 10 km southwest of 41BX300, indicated its intermittent occupation over at least 5,000 years, beginning in the Early Archaic period (Black and McGraw 1985). The deposits and artifacts were placed into an 11-phase local chronology, and radiocarbon dates were obtained from the Early, Middle, and Late Archaic periods, as well as from Late Prehistoric period deposits, to support the chronology.

The Burned Rock Midden

There is continued discussion regarding the origin of burned rock middens (BRMs) in Central Texas, although there is general consensus that they date primarily to the Middle and Late Archaic periods. These middens are large accumulations of fire-cracked and discolored limestone (Hester 1991). Early theories explained the BRM as an accumulation of abandoned hearths, but Hester (1971) reported that the accumulation at La Jita appeared to be a "rubble dump" where the broken-up hearth stones were cleared and dumped on a conveniently placed pile. It appears that prehistoric populations congregated repeatedly at favored locations to engage in a cooking process that used limestone which was then abandoned or discarded in piles.

Although Weir (1976) defined four types of BRM that occur in Central Texas, the excavations at the Blue Hole site involve a midden of Weir's *Type 1*, a dome-shaped accumulation from 0.45-2 m or more in maximum thickness. In addition, several other BRMs were recorded near the Blue Hole site but they were not excavated.

Artifacts and other cultural remains vary in BRMs from site to site. As with most of the BRMs in Central Texas, the acidic soils of the upper Sabinal Valley prohibit preservation of most of the associated food items, but the occurrence of charred acorns at 41BN63 (Thomas R. Hester, personal communication 1990), deer bones, mussel shells, and a variety of snail shells at other BRM sites support the "cooking location" theory. Projectile points and other lithic tools are sometimes found within the concentration of burned rocks and black soil matrix, whereas other middens produce only burned rock.

The most popular theory regarding the formation of the BRM revolves around utilization of acorns. Black (1989:19-20) discussed the positive distributional correlation of BRMs to that of the oak savannah (see also Creel 1991), and argues that the rock accumulations are a result of the processing of acorns (to remove the tannic acid and/or enhance preservation) by stone boiling or other cooking methods. Turner (1989) examined ethnohistoric data from aboriginal cultures in other areas of North America to propose that similar use of the acorn as a staple was likely common in Central Texas in Middle through Late Archaic times. Goode (1991) has demonstrated that BRMs are now known to have been used into the Late Prehistoric period.

Regardless of the specific or varied purpose of the BRM, their abundance in the upper Sabinal Valley, and the general Central Texas area, and their use over 1,500-3,000 years, substantiates the proliferation of human populations during the Middle through Late Archaic periods. It is this indication of increased population density that prods us to continue exploring the BRM for more definitive reconstructions of the cultures of these early inhabitants of the region.

FIELD METHODS

The 1989 UT Summer Field School survey teams recorded the Blue Hole site as a single BRM and adjacent occupational area perhaps 100 m wide (north to south) and 200 m long (east to west). While no shovel tests or test excavations were performed either in 1989, or in advance of the TAS Field School, the surface scatter of burned rocks, the partially exposed potholes, and the location of the artifacts that were recovered in 1989, gave us a relatively reliable definition of the horizontal and vertical limits of the site.

In 1990, a week prior to the commencement of the TAS Field School, a crew of eight graduate students from The University of Texas at Austin went to the Blue Hole site, and other sites selected for TAS excavations, to inspect, map, and prepare the sites for excavation. Heavy and consistent rains in March and April of 1990 created a dense grass and weed cover over the site. A tractor and shredder were hired to mow the site and perimeter; the site was cleared of brush, and low overhanging branches were removed. Permanent horizontal and vertical datums were established along with a site grid, and the entire terrace encompassing the site was mapped using a transit (Figure 3).

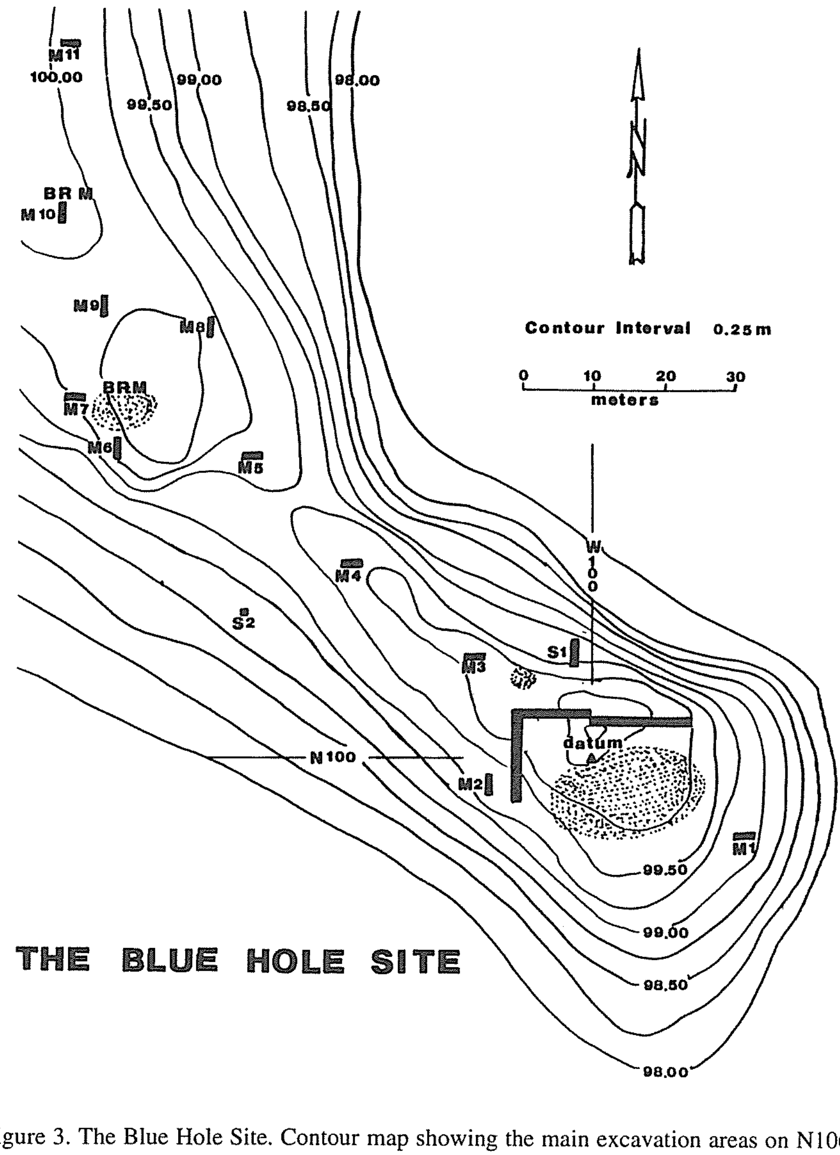

Figure 3. The Blue Hole Site. Contour map showing the main excavation areas on N106 and W110 lines, geomorphological shovel tests (S1 and S2) and backhoe tests (M1-M11), with the disturbed areas stippled. Two burned rock middens to the northwest of the main excavations are labelled BRM.

As our excavation plan, and eventual interpretation of the site, would rely heavily on geomorphological interpretations of the deposits themselves, a crew of UT students began a test unit at N113W102 (S1 in Figure 3), proceeding down the north slope of the terrace to N116W102, in 1 meter wide units. The excavation methods employed, and the findings of this and subsequent units excavated for geomorphological purposes, are addressed later in this paper.

Since the TAS Field School would involve excavations at four prehistoric sites, and a number of historic investigations, a detailed Technical Procedures Manual (Mueggenborg 1990) had been prepared for distribution to all field school participants upon arrival. While the excavation techniques varied somewhat from site to site depending on the excavation goals, uniform bagging, recording, and laboratory procedures were set forth to control the anticipated volume of data and artifact recovery. The discussion below describes the specific procedures used at the Blue Hole site.

The basic metric grid system was used at the site for horizontal control, with units progressing to the north and west from the primary datum (see Figure 3). Grid North was set at Magnetic North. Vertical measurements were stated as distances above or below the primary datum set arbitrarily at 100 m. Elevation reference stakes were designated for each unit, and string lines were used to measure vertical levels and the provenience of all significant artifacts and features. Crews were assigned to 1 m units and all 10 cm levels were dug to even 10 cm elevation readings (i.e., bottom of each level was 99.60 cm or 99.50 cm, for example). This uniformity is important when evaluating the computer-generated reconstructions of site deposition presented later in this paper.

Crews consisted generally of five individuals, one of whom was designated as the recorder for each level. Standard level forms insured consistency in information and format. All matrix was screened using a 1/4-inch screen, and artifacts (lithic debitage, land snails, bone, charcoal, mussel shell, etc.) were bagged by level. All projectile points or other particularly meaningful artifacts were provenienced and recorded and bagged separately. None of the typologically diagnostic projectile points were washed, either in the field or laboratory, to facilitate possible future residue analysis. Burned rocks were weighed, recorded, and discarded.

Crew Chiefs were supervised by four Area Supervisors, who monitored the overall progress and consistency of the excavations. The method of excavation varied somewhat with the circumstances and personnel involved but, generally, careful shoveling or trowelling was employed until particularly significant artifacts or concentrations were found in the screen, or features were identified, at which time more meticulous care was used. Two Site Secretaries issued and controlled all level bags and artifacts recovered.

TAS Site Directors Dr. E. Mott Davis and James H. Word met with the author and Dr. Hester on June 8, and we selected areas for excavation as well as general goals and strategies. Hester (1971:127) had suggested that the excavation of BRMs should concentrate not only on the BRM proper but also on peripheral areas outside the BRM. Black (1989:19-20) similarly suggested implementing more comprehensive research designs than the standard approaches of either mining the midden for large collections of artifacts, or scattering test pits within and around the midden. Toward this end, our main strategy was to excavate 2 m units along two intersecting lines that extended from beyond the perimeter of the midden accumulation into the midden proper. This broad view of the site deposits, as evidenced in the exposed profiles of the units, was to meet our primary objective: the reconstruction of the BRM cultural deposits.

Excavations commenced on June 9, 1990, at 7:30 A.M., by the approximately 150 individuals assigned to the Blue Hole site. It became obvious that there was a degree of disturbance in certain areas (based on the chronological intermixture of recovered projectile point types), but excavations continued since certain surficial disturbances had been anticipated at the site.

As work was finishing for the day, a local collector arrived who had mechanically excavated portions of the site. He indicated that certain units were within the confines of his previous excavations. Although the site had been subjected to pothunting, the heavy vegetation on the terrace had made it impossible to delineate the bounds of any disturbance other than the remaining potholes. The collector indicated that he had used a Bobcat loader to excavate portions of the site to depths of 3 m and that he had backfilled and smoothed the surface of the site over a year prior to the UT 1989 survey. He was very cooperative and interested in our scientific approach to the reconstruction of the site, and he detailed the horizontal confines and approximate depths of his excavations. The net result of the first work day was the misdirection of the entire excavation force. In retrospect, it was fortunate that the local collector defined the limits of his potholes when he did. Otherwise, controlled tests would have been needed to define the limits of the disturbed area before further TAS excavations could have continued.

The Site Directors met with Dr. Hester, and the excavation plan was adjusted to exclude the previously disturbed areas. Excavations commenced again, early on June 10, concentrating on 2 m wide units along north-south lines to intersect at grid coordinate N106W110. The N106 line was staggered at W100 to keep the excavations close to the perimeter of the terrace while maintaining its east-west orientation (Figure 4). The artifact recovery rate was intense as the excavations progressed through Monday, June 11. A tremendous amount of time was consumed in delays to log all bifacial lithic artifacts as "unique items," the designation for any artifact which required proveniencing and might become particularly relevant in later analysis. The Site Directors and Crew Chiefs met that Monday evening and decided on a "semi-unique" category for non-diagnostic projectile points and other artifacts which, in a less productive site, would rate a higher priority. We continued to provenience any "semi-unique" items found *in situ,* with the Area Supervisors approving the classifications as to "unique" or "semi-unique." The "semi-unique" items were then expediently bagged together by unit level. As the week progressed, the number of excavators decreased

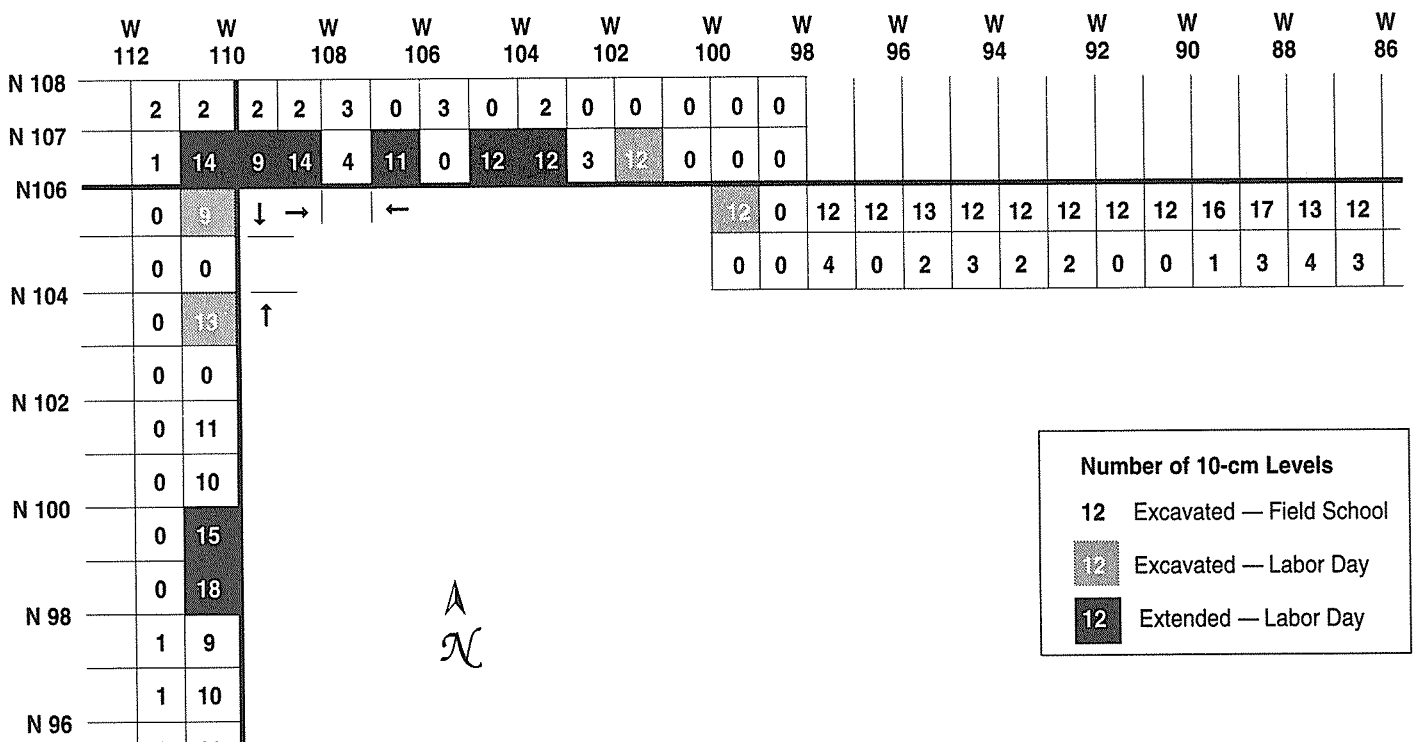

Figure 4. N106 and W110 Lines and Status of Excavations at Completion of Field School and Labor Day Excavations. The depths of the excavations completed over the TAS Field School are shown in the clear blocks; those units extended over Labor Day are partially stippled and completed depths shown; those units excavated entirely over Labor Day are darkly stippled with completed depths shown.

somewhat, and by Wednesday, June 13, all excavations were concentrated in 1 m wide lines at N106 and W110, eliminating the complementary 1 m units which had previously made up the 2 m wide excavation plan.

The excavations continued on the N106 and W110 lines through Saturday, June 16, the final day of the TAS Field School. Certain of the 1 m units had been completed to near-sterile depths while others were barely started (Figure 5). Plans had been made for a number of volunteers to return over the Labor Day weekend to continue excavations. Several crew members stayed over through Monday to complete wall profiles and photographs in the event of dis-

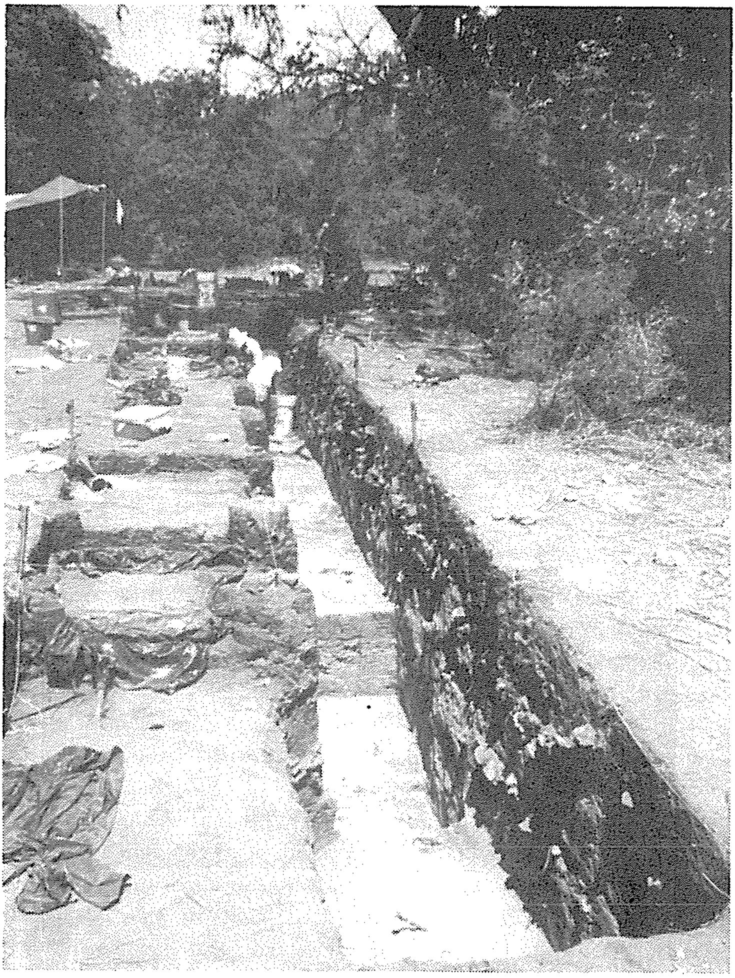

Figure 5. N106 Units at the Completion of the TAS Field School Excavations. Looking to the West.

turbance prior to our return; the units were covered and protected with tarps and plywood covering.

The TAS operated a field laboratory at the Utopia camp area, and the lab processed the unit bags, to the extent possible, including washing and counting the lithic debitage, counting the land snails, and confirming the field identifications of projectile point types. The daily feedback from lab personnel was invaluable in limiting and correcting inconsistencies in procedures, and for monitoring the progress of the excavations. The unit bags not completed at the TAS Field School were completed by UT students during the summer of 1990.

Mr. Bob Vernon, a TAS member who now resides in Massachusetts and who had excavated at the Blue Hole site throughout the field school, volunteered his computer expertise and services in plotting data charts for analysis and planning purposes. Prior to the Labor Day effort, his charts helped graphically reconstruct the field school excavations by showing concentrations of burned rock, land snails, and lithic debitage in cross-views of the units. These data, together with the location of features and other artifact concentrations, were the basis for the selection of units for further excavations over Labor Day.

Approximately 60 TAS members returned for Labor Day excavations between August 31-September 2. A great deal of additional progress was made during the three days but, as is commonly the case, not all excavation goals were met (Figure 6). Again, profiles were drawn and photographs of each unit wall were taken. Core samples were taken to 3 m below excavated levels in selected units for possible future analysis. Plastic liners were placed in the units and they were mechanically backfilled.

TERRACE GEOMORPHOLOGY

Methods

Since archeology relies on the physical location of artifacts and their spatial relationships to other cultural remains to establish their significance, it is paramount that any excavation be planned in relation to the site's geomorphological depositional framework. Proper interpretation of depositional processes, and the relative position and age of the site strata, independent of occupational debris, permits the formulation of more scientific excavation objectives and strategies.

The Upper Sabinal River Valley was the subject of Mear's (1953) master's thesis. He identified the alluvial terrace formations of the valley with numerical assignations as follows: Q0, Q1 and Q2 (Holocene alluvium); and Q3 and Q4 (Pleistocene gravel terraces). Describing the deposits by their composition and color, Mear noted that the alluvial deposits created a stair-step sequence down to the present river channel, with the higher terrace deposits generally being older. Using not only environmental data evident in the deposits, but also temporally

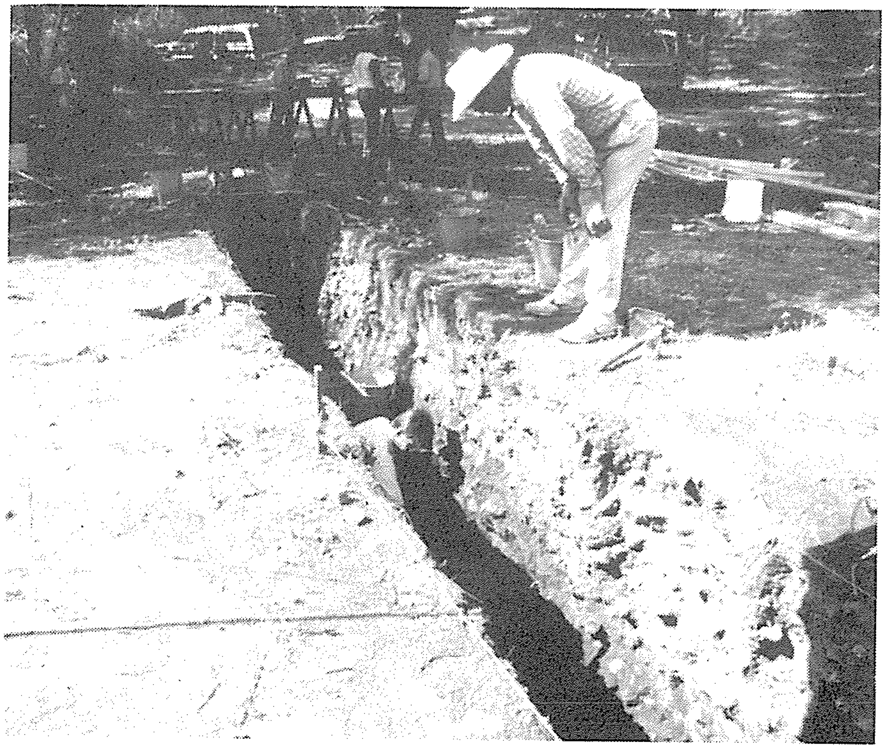

Figure 6. W110 Units Nearing the Completion of the Labor Day Excavations. Looking to the South.

diagnostic cultural artifacts found in association, the Q2 and Q1 deposits were thought to span the Middle and Late Archaic periods.

To improve the definition of these Holocene geologic strata, an initial geomorphological test was conducted at the Blue Hole Site in advance of the TAS Field School excavations. This test (S-1), proceeding in 1 m units down the north slope of the terrace at N113W102, was excavated in 50 cm levels using shovels. The matrix was screened using a 1/4-inch screen, and the artifacts recovered were bagged and logged using regular procedures.

Basic records were maintained regarding the general location of the burned rock concentrations and the recovered artifacts, but our primary goal was to expose the vertical profile of the test. In addition to the geomorphological profile, the preliminary evaluation of the artifacts recovered, and their relative location, helped define and clarify initial excavation strategies. The profile of this test unit (Figure 7) was:

0-10 cm	Organic soil horizon
10-20 cm	Dark soil formation with Q1 facies
20-100 cm	Q1 - Fine, medium to light alluvium with some soil development
100-? cm	Q2 - Fine, sandy, light yellow alluvium

The initial geomorphological interpretation of Unit S-1 was performed by Gene Mear, Dr. Michael B. Collins, and Michael D. Blum. They found the terrace deposits consistent with Mear's Q2 and Q1 depositional episodes, with the more recent Q0 lying on the lower terrace between the site and the Sabinal River.

Coincident with the TAS excavations on the N106 and W110 lines, additional geomorphological tests were excavated at N113W102 (S-1), at a 1 m unit (N120W148, S-2), and a 1x2 m unit (N233W244, S-3). These units were selected by the visiting geomorphologists to evaluate depositional variation across the terrace, but moving away from the river. The recovered artifacts and stratigraphic profiles of these test units confirmed the initial horizontal definition of the BRM proper, but, generally, no additional information was discovered to warrant any change in site excavation strategies. After the profiles were recorded and interpreted by the geomorphologists, tests S-2 and S-3 were backfilled at the completion of the regular TAS Field School.

To facilitate more complete geomorphological interpretations of the terrace, 11 backhoe trenches were excavated at the site on July 6th (see Figure 3). Each unit was dug as a narrow trench at least 50 cm into the Q2 alluvium. No screening or other artifact recovery methods were used since the goal was to expose the unit profiles for geomorphological interpretation (Table 1). On July 13, Blum returned to the site, reviewed the units, and recorded his geomorphological interpretations of the terrace (Blum 1990).

Interpretations

According to Blum (1990), the main body of the Blue Hole site sediments, which extend vertically at least 5 m below the surface, consists of the Q2 alluvium. This alluvium was deposited as a constructional floodplain surface during the Early to Middle Holocene period. Radiocarbon dates from other drainages of the Balcones Escarpment area of the Edwards Plateau indicate these Q2 deposits date from 10,000-5000 B.P. After deposition ended, the river downcut slightly and abandoned the floodplain and began to deposit the Q1 alluvium, which makes up the terrace nearer the present river channel to the south of the Blue Hole site. These Q1 deposits probably date from 4500-1000 B.P. Each of these two major stratigraphic units of the Holocene represent long periods of time when the river was migrating laterally and aggrading vertically, constructing the floodplain laterally from the channel.

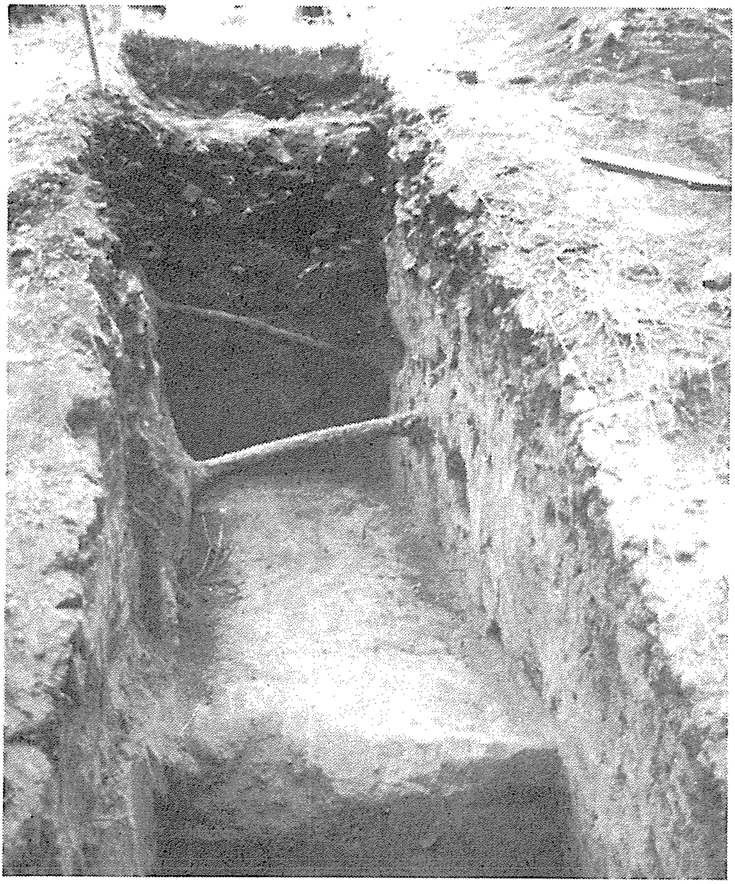

Figure 7. Geomorphological Test S1 at N113W102. The profile shows the burned rock accumulation of the main excavation area overlying the Q2 alluvium.

Due to the periods of time involved, each of these depositional units contains a wide variety of facies, or environmentally specific types of deposits. Depending on the duration and severity of flood episodes, older deposits were overtopped with thin veneers of alluvium from the latest episodes. Similarly, the older Q2 deposits were implaced with thin veneers of Q1. This more naturally occurs near valley confluences or constrictions, such as the Blue Hole location, where flood waters back up and attain a higher level than they would in an open valley.

The earliest archeological remains from sites in the Sabinal Valley are found, in terms of their geologic context, within Q2 deposits. Although

Table 1.

Depth of Alluvial Layers Below the Surface: Geomorphological Evaluations

Test	Surface Elevation[1]	Cm below Surface to Start of: Burned Rock	Ashen Soil Dev.	Q-2
S1	99.60	18	60	101
S2	98.99	N/A	45	70
S3	100.66	N/A	40	58
M1	99.15	N/A	57	150[2]
M2	99.13	98	158	198
M3	99.79	N/A	63	107
M4	99.63	N/A	40	96
M5	99.49	N/A	29	53
M6	99.80	47	56	76
M7	99.88	40	51	97
M8	99.77	N/A	31	71[3]
M9	99.90	N/A	43	95
M10	100.13	42	63	79
M11	99.96	N/A	60	100

[1]Relative to site's primary vertical datum at 100 meters.

[2]At 150 cm, more recent Q1 depositions were still evident.

[3]Gravel facies exposed at 90 cm.

Paleoindian habitation debris is occasionally recovered in the valley, the major floodplain accumulations from 10,000 to 5000 B.P. lessen the likelihood of identifying a discrete Paleoindian occupation. However, the Early Archaic peoples who visited or resided in the area did so on the still active floodplain. The record of their activities remains vertically segregated within these facies as the deposition of Q2 deposits gradually diminished in the Early Holocene.

The boundary between the Q2 and the Q1 terrace veneer facies is generally marked by a soil profile that developed in Q2 sediments during a period of landscape stability. It is this partially buried soil that was the surface upon which the BRMs accumulated at Blue Hole. During this period of stability, the Middle through Late Archaic, there was only minor sedimentation. The period of stability is marked by soil development, and this soil development is accelerated in the BRMs themselves, due to the anthropogenic nature of the matrix derived from processing plant foods and other such activities. Thus, the Q2 terrace at the Blue

Hole site became a reasonably discrete soil comprised of thin, periodic, veneer sediment deposits and the cultural debris of the inhabitants.

Of particular importance to the BRM atop the Q2 terrace is the Q1 terrace adjacent to, and below, the site toward the river. Gully exposures into this Q1 terrace indicate it contains major gravelly facies. Thus, the Middle Archaic peoples had a source for limestone cobbles about 40 m away.

After sorting through the discarded burned rock piles, we determined that all of the limestone cobbles used in the BRM were rounded and tumbled from flood deposition. The only angular edges on the discarded rocks appeared to be from heat fracture. This differs from many BRM sites in the Edwards Plateau where the prehistoric occupants appeared to favor proximity to bluffs with a good exposure of thin bedded limestone as the source material. The limestone in the bluffs to the east of the Blue Hole site is relatively thick bedded, and would need to be broken up prior to use to be suitable for campfires and hearths.

The earliest record of human occupation at the Blue Hole site, at depths that we were able to reach, is buried in the deeper facies of the Q2, where the Early Archaic campers sought the concentrated resources at the valley confluence. As the terrace land surface stabilized in the Middle Archaic, a BRM accumulated over a long period of time, with only occasional, thin alluvial deposits interrupting the anthropogenic soil development. As the river channel continued to aggrade, increased surface stability at Blue Hole compressed the Transitional Archaic and Late Prehistoric archeological record into a palimpsest, or very thin layer, atop the terrace surface.

SITE STRATIGRAPHY

Except for occasional instances of rodent or surficial disturbances, the projectile points recovered from Blue Hole are indicative of excellent temporal stratification, according to the generally accepted South Central Texas chronologies (cf. Black and McGraw 1985). Although no obvious stratigraphy or clearly defined occupation floors were evident, the burned rock concentrations, the geomorphological deposition, the recovery of diagnostic projectile points, and other temporally significant artifacts show a well defined vertical sequence from the Late Prehistoric through the Middle Archaic. Cultural material was still being recovered through the deepest excavated levels, but restrictions on the length of time we could pursue the excavations prevented continuing the excavations into possible earlier occupation periods. However, the core samples taken to 3 m below the floor of selected excavated units displayed no marked color changes within the Q2 alluvium. The radiocarbon date associated with the hearth in Feature 6 (discussed below) also substantiates the stratigraphic record.

To visually reconstruct site deposition patterns, the data regarding the burned rock, chert debitage, and Rabdotus (the predominant, large land snails) recovered from levels in units on the designated N106 and W110 lines were plotted by computer onto cross-sections of the units.[1] Concentrations of these artifacts in the units or levels which were not excavated (those not excavated are shaded in the plot of diagnostic artifacts in Figures 9, 11, and 13) were interpolated from the immediately adjacent units. In addition, the 268 diagnostic projectile points, and all of the "semi-unique" items, were plotted onto similar cross-sections to examine changes through time in each of the excavation areas by artifact type. The left column of the following plots designates the 10 cm levels measured relative to the site's primary vertical datum. The burned rock scattergrams (4 dots = 1 kg), and the unique item plots, are shown as follows: N106 - W86-W98 (Figures 8-9); N106 - W98-W110 (Figures 10–11); and W110 - N94-N106 (Figures 12–13). Table 2 indexes each of the diagnostic point types to the figures.

Based on the plotting onto the cross-sectional views of the diagnostic projectile points (see Figures 9, 11, and 13), the burned rock accumulations (see Figures 8, 10, and 12), and the soil color changes noted in the unit level records, lines were drawn onto the cross-views to segregate the undefined strata of the site into the following chronological/cultural levels:

> *Late Prehistoric* (after A.D. 700): this period is represented by the cultural materials extending downward from the ground surface to the first (uppermost) solid line (A) drawn across the profiles. No historic artifacts were recovered in the uppermost deposits of the site.
>
> *Late Archaic* (A.D. 700 through 1000 B.C.): this period is represented by the area between lines A and B. The Transitional Archaic (A.D. 700 through 300 B.C.) was not considered in establishing Line A since the predominant points attributed to the Transitional Archaic in this geographic area are the Frio/Ensor types, which are the focus of a separate analysis later in this paper. These Frio and Ensor types displayed much variation within the otherwise clear site stratigraphy.
>
> *Middle Archaic* (1000 B.C. through 2500 B.C.): this period is represented by the area below line B. A few Paleoindian and Early Archaic points were recovered in these Middle Archaic deposits.

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[1] Units on the designated lines N106 and W110 were subjected to in-depth laboratory and interpretational analysis since these units were the focus of the excavations. All other artifacts recovered from the first day's excavations of the disturbed areas, from units adjacent to the N106 and W110 units, or from the geomorphological units, were retained unprocessed and are stored at the Texas Archeological Research Laboratory for future research purposes.

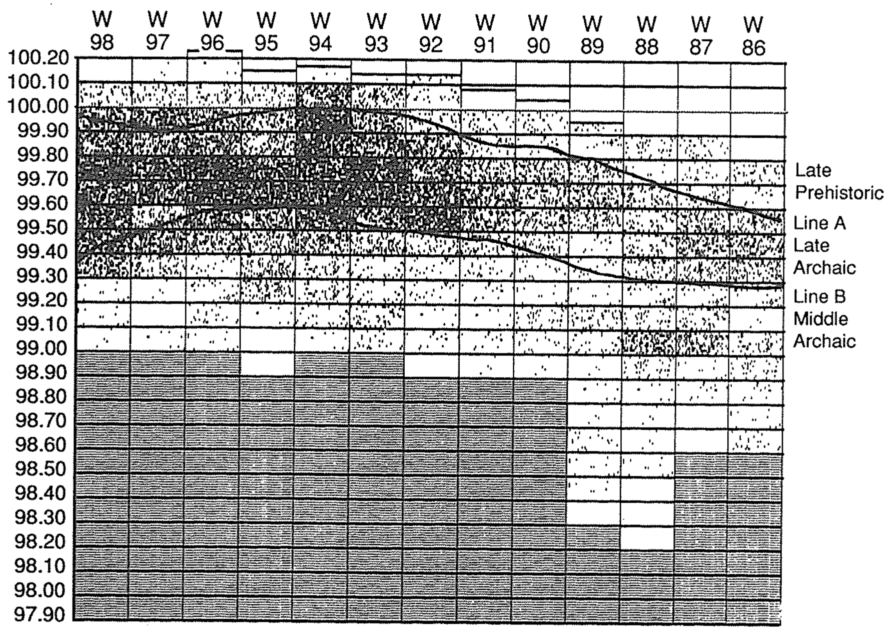

Figure 8. Burned Rock Weight (4 dots = 1 kg), N106 Line; W86-98.

To define lines A and B, paramount consideration was given to the diagnostic projectile points, since they most clearly define the temporal occupations. There is ambiguity in the placement of line A, because the primary Transitional Archaic markers (Ensor (E) and Frio (F) types) displayed temporal variation. Using transparencies of Figures 8, 10, and 12, the burned rock scattergrams were then superimposed over those of the diagnostic projectile points, and the lines were adjusted slightly at various places to distinguish:

- Lighter accumulations of burned rock in the Middle Archaic with occasional heavier concentrations due to hearth formations.
- The main burned rock accumulation in the Late Archaic, virtually uninterrupted by alluvial deposition.
- Some scattered burned rock in the Late Prehistoric period.

The lines, A and B, thus established were then compared to similar charts denoting the matrix color at the bottom of each unit level, and the hand drawn profiles of the unit walls (on file at TARL). Other than minor strata with light Q1 or Q0 facies deposition, or root or rodent disturbances, no additional differences were noted to warrant further adjustment of the A and B lines.

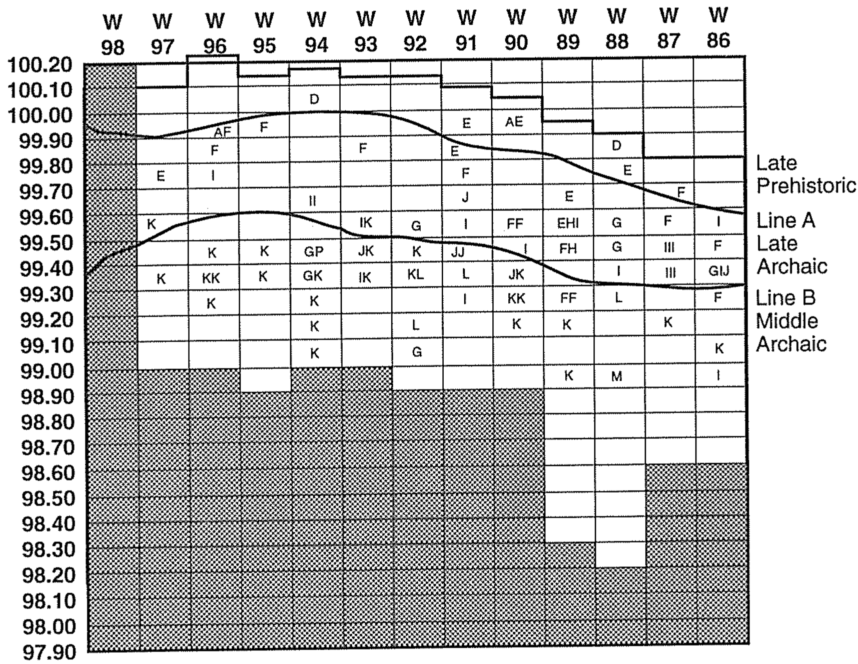

Figure 9. Diagnostic Projectile Points, N106 Line; W86-98. See legend for alphabetical index in Table 2.

There were a few anomalies noted in the otherwise consistent stratigraphy. In the N106 line at W106-108, three dart projectile points (Plainview (S), Nolan (O), and La Jita (N)) were recovered in Late Prehistoric deposits. The level notes indicate a high degree of rodent disturbance in this area and at depths that were characterized by very little burned rock and a fine loamy soil. Conversely, N106W106 yielded three Late Prehistoric projectile points from level 6 (99.40-99.30). The unit level records, however, clearly indicate two major animal burrows, with radii of approximately 15 cm, extending vertically through the unit, intermixing lighter Q2 matrix with Late Prehistoric deposits.

In the W110 line at N97-99, two Pedernales (K) and a Uvalde (Q) are clearly transposed into or near the Late Prehistoric strata. While the unit level records mention no major rodent disturbances at these levels, it is possible they were intermingled with the later strata by animals, or people, during later periods. The Perdiz (A) found in level 7 (99.10-99.00) of N98W110 was noted as "possibly from a cave-in of an adjacent unit" at the surface level. Root and rodent disturbances were noted in N96W110, level 10, which produced an Edwards (D) point. Based on the general stratigraphy established by the 268 diagnostic projectile points (see Figures 9, 11, and 13) and the other relative data, these anomalies do not detract from the overall reconstructed cultural stratigraphy at Blue Hole.

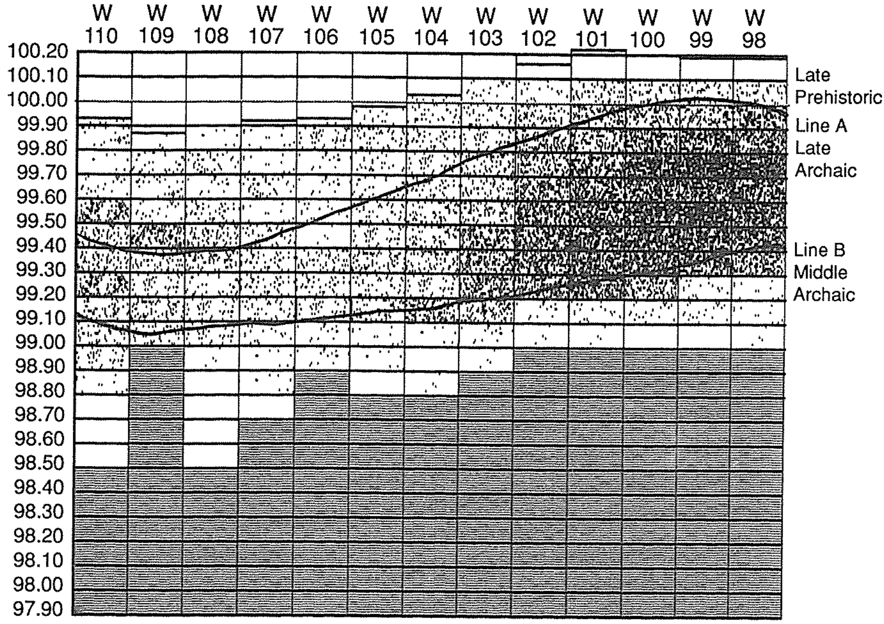

Figure 10. Burned Rock Weight (4 dots = 1 kg), N106 Line; W98-110.

THE ARTIFACTS

Artifacts recovered from the excavation of the units on the intersecting N106 and W110 lines were separated into the following broad categories: Chipped Stone Artifacts (including typologically diagnostic Projectile Points, Other Stone Tools, and Chert Debitage), and Other Artifacts. This section briefly describes the various classes of artifacts under each of these categories, in addition to the Molluscan remains recovered from the units.

Chipped Stone Artifacts

Projectile Points

The 268 typologically diagnostic projectile points recovered from the intersecting N106 and W110 trenches were generally sorted using Turner and Hester (1985). Those projectile points which were not clearly identifiable as a particular type were included as distal, proximal, or other bifacial fragments in plotting the "Semi-Unique" Items in "Other Stone Tools." Where specimens were incomplete, and it was possible to reasonably estimate the quantitative measurements but weight of the complete specimen, those estimations were made. Weights shown are in grams and are abbreviated as WT. All measurements are in mm

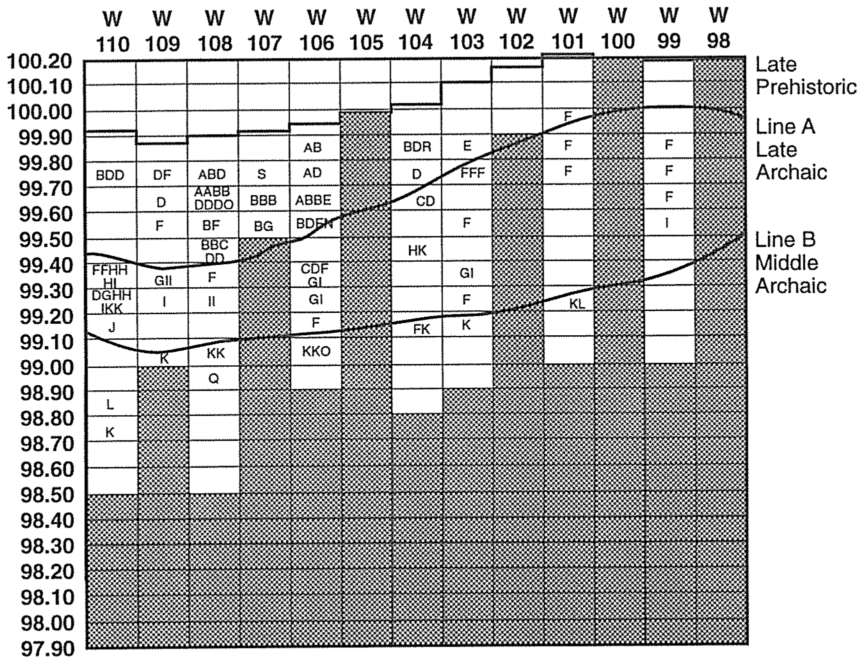

Figure 11. Diagnostic Projectile Points, N106 Line; W98-110. See legend for alphabetical index in Table 2.

with the following abbreviations: L: length; MW: maximum width; SW: stem width; and, MT: maximum thickness. References to "Unique Item" numbers exceed the 268 diagnostic items since a total of 514 artifacts were logged as "Unique Items," including those not from the main excavation units, and non-diagnostic artifacts which evidenced particularly meaningful relationships to other diagnostic artifacts and features.

Arrowpoints

Sixty-six arrowpoints were found, including Perdiz, Sabinal, Scallorn, and Edwards (Figure 14). The Late Prehistoric occupation at the Blue Hole site was generally compressed into surficial strata (see Figures 9, 11, and 13), and no major Late Prehistoric features or other meaningful cultural aggregations were discovered; thus, there was no clear separation between them as at the La Jita excavations (Hester 1971).

Perdiz (13 specimens). Perdiz points characteristically have barbed shoulders and sharply pointed, contracting stems. They vary considerably in size and shape and the specimen shown in Figure 14 has a broad stem and is considerably larger than the others. Most of these specimens were broken and

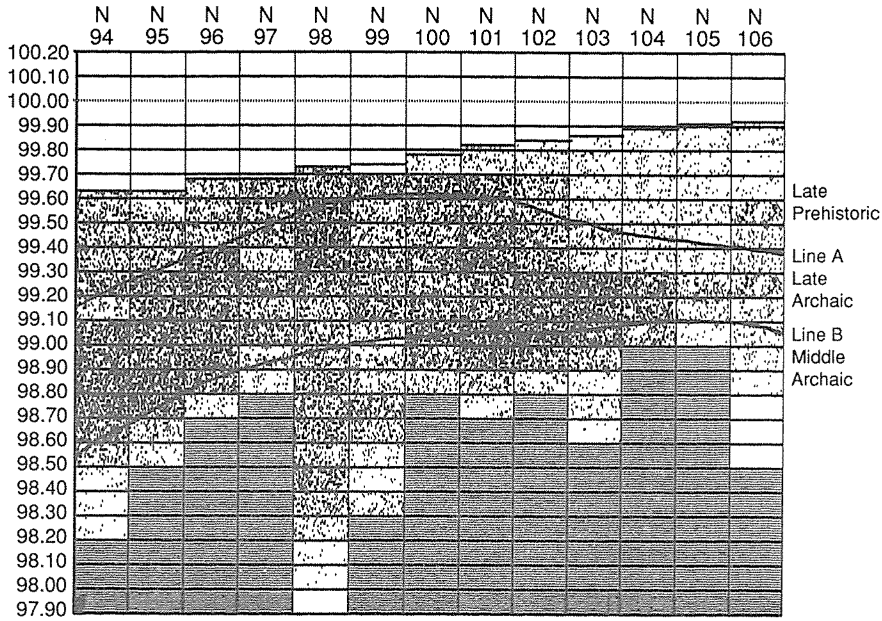

Figure 12. Burned Rock Weight, W110 Line, N94-106.

several were unifacial. They also exhibited a broad range of variation in workmanship. WT: 0.7-2.8; L: 19-46; MW: 10-20; SW: 4-8; MT: 2-4.

Sabinal (20 specimens). These long, narrow triangular points have stongly concave blade edges. The heavy barbs flare outward and often curve upward, as in U.I. #298. The slightly expanding stems have deep, rather wide basal notches. Extreme uniformity was exhibited in the maximum thickness of this type, as all but two of the specimens were 3 mm thick. WT: 0.5-3.2; L: 13-48; MW: 11-24; SW: 5-10; MT: 1-4.

Scallorn (6 specimens). These are corner or side-notched points with straight to slightly convex lateral edges and well-barbed shoulders. The expanding stem varies from a broad, wedge-shaped, convex base (U.I.s #486 and #357) to a narrower, concave base (U.I. #215). Three of the specimens were unifacial. WT: 0.9-1.5; L: 21-30; MW: 14-16; SW: 8-15; MT: 2-3.

Edwards (27 specimens). The Edwards points are sharply pointed and have straight lateral edges; some are serrated (see Figure 14: U.I. #147). The prominent shoulders are sharply pointed, and the stem is deeply divided and flares outward. Most of the specimens exhibited fine workmanship, from the straight triangular blades, deep corner notches, to the flaring stems. Their similarity to a scaled down version of the Frio dart point, noted by Sollberger (1967) and Hester (1971:67), supports the placement of this type as the earliest arrowpoints in the

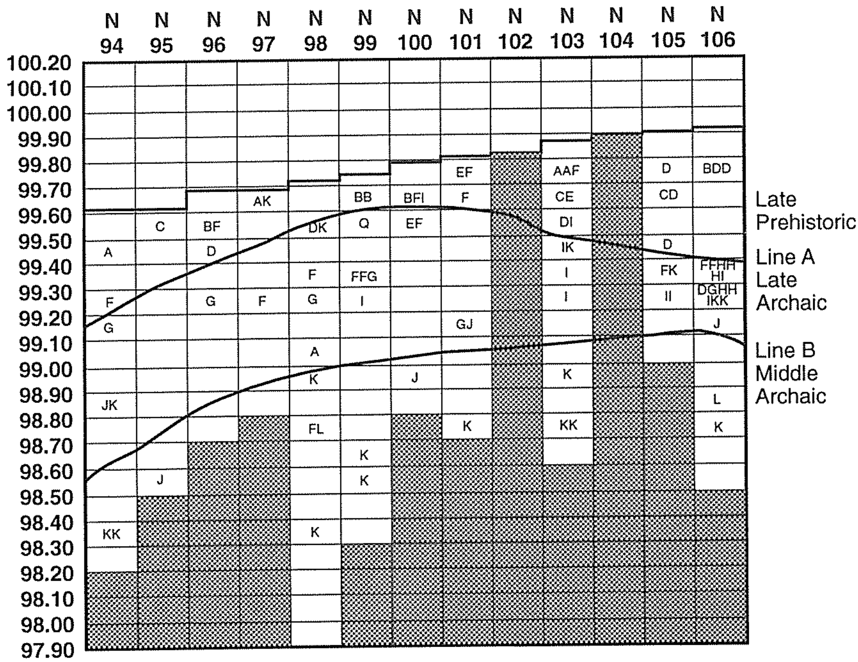

Figure 13. Diagnostic Projectile Points, W110 line; N94-106. See legend for alphabetical index in Table 2.

Late Prehistoric period along with the apparent continued use of the Transitional Archaic Frio and Ensor dart points. The most obvious modification in the Edwards form is the drastic narrowing of the neck width, apparently an adaptation for hafting to the more diminutive arrow shafts. WT: 0.7-3.6; L: 18-42; MW: 12-27; SW: 10-27; MT: 2-5.

Dart Points

Two hundred and two dart points were found and identified into the following typological categories, described in the order of their temporal progression (see Table 2).

Ensor (12 specimens). These points are addressed at length in the following Frio/Ensor Typology section of this paper. The measurement ranges are: WT: 3.2-14.0; L: 33-61; MW: 18-36; SW: 16-36; MT: 4-6.

Frio (47 specimens). These points are also addressed at length below. The measurement ranges are: WT: 4.5-17.0; L: 32-66; MW: 20-47; SW: 20-40; MT: 3-7.

Marcos (18 specimens). These are broad, triangular points with deep corner notches, expanding stems, and pointed to square barbs (Figure 15). The overall

Table 2.

Index to Diagnostic Project ile Points

Late Prehistoric:
- A) Perdiz
- B) Sabinal
- C) Scallorn
- D) Edwards

Transitional Archaic:
- E) Ensor
- F) Frio

Late Archaic:
- G) Marcos
- H) Castroville
- I) Montell

Middle Archaic:
- J) Marshall
- K) Pedernales
- L) Kinney
- M) Langtry

Early Archaic:
- N) La Jita
- O) Nolan
- P) Martindale
- Q) Uvalde
- R) Early Triangular

Paleoindian:
- S) Plainview

ranges in size were: WT: 7.8-37.0; L: 44-82; MW: 32-57; SW: 16-30; MT: 5-11. However, the Marcos type had the most uniform morphological characteristics of any point category, with all but a few falling within the following ranges: WT: 12-14; L: 60-66; MW: 36-40; SW: 23-27; MT: 6-7.

Castroville (8 specimens). They have extremely symmetrical, triangular bodies with long, basal-notched barbs, straight stems, and straight lateral edges. All of the specimens were characterized by extraordinarily fine workmanship and are exceptionally thin for their relative size. The Castroville points are sometimes associated with bison kills (Dibble and Lorrain 1968; Collins 1968). The overall ranges were: WT: 15.0-34.5; L: 66-116; MW: 42-52; SW: 21-28: MT: 5-8. The three Castroville points found in association with an apparently deliberate cache in Feature 7 are described below.

Montell (38 specimens). The Montell's from Blue Hole are triangular points with relatively short stems with V- or U-shaped basal notches. They have straight lateral edges and the strong shoulders are usually barbed, at least prior to reworking. Most of the Montell points conformed to a standard pattern and

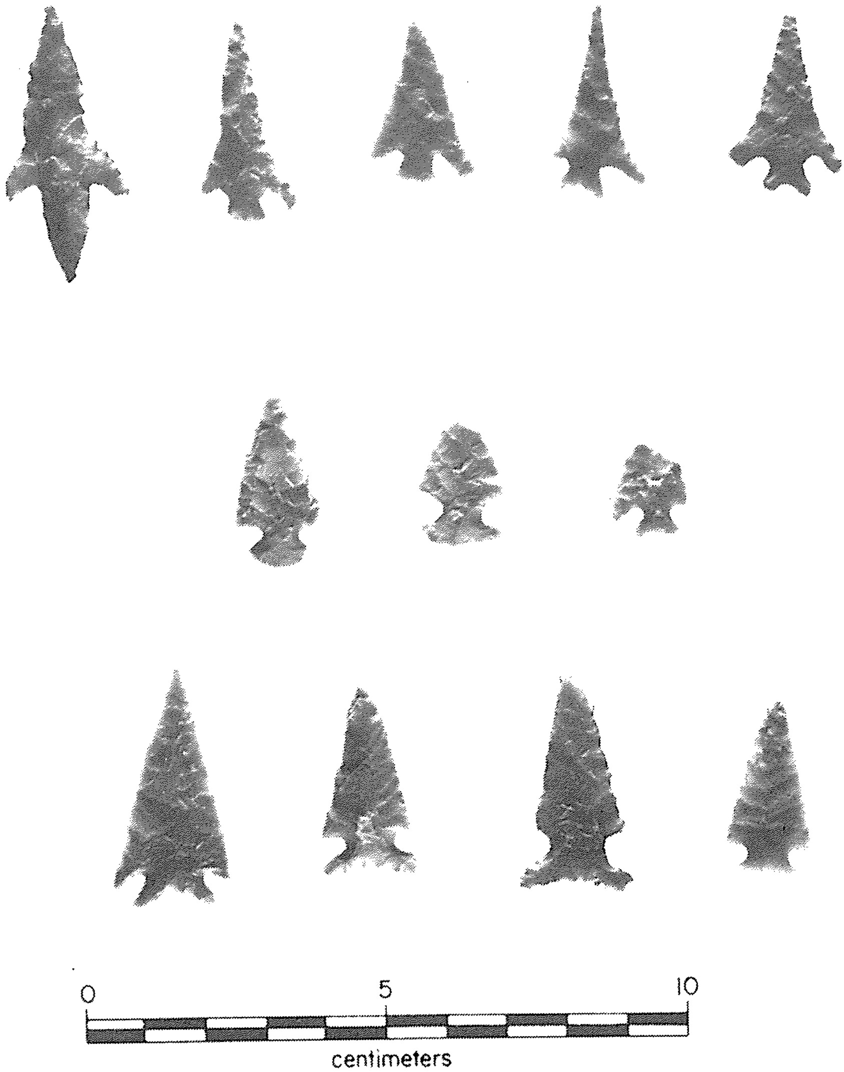

Figure 14. Late Prehistoric Arrowpoints (Unique Item numbers left to right). Top row: Perdiz #391; Sabinal #187, #269, #298, and #381; Middle row: Scallorn #486, #357, and #215; Bottom row: Edwards #147, #92, #406, and #71.

had finer workmanship than their temporal predecessor, the Pedernales. Almost all of the specimens were 6 mm thick, although two were 3 and 10 mm thick. Much like the Pedernales, some specimens exhibited a great deal of reworking (see Figure 15). WT: 8.0-28.0; L: 42-86; MW: 28-50; SW: 18-30; MT: 3-10.

Marshall (11 specimens). These broad triangular points have strongly convex to rounded lateral edges, and strong shoulders that are deeply barbed (Figure 16). The relatively short, expanding stems have slightly concave bases. Flute-like flakes were removed in stem thinning. WT: 8.8-26.0; L: 44-73; MW: 33-49; SW: 17-30; MT: 5-9.

Pedernales (52 specimens). These long points are characterized by a bifurcated stem with a deep basal concavity. This was the predominant point type at the Blue Hole site and was almost invariably found with the deeper and earliest concentrations of burned rock. They exhibited considerable variation from the broader, initial Pedernales product (U.I. #441 in Figure 17) to the narrower, or shorter, later stages of reworked Pedernales. Some of the specimens have strong barbs while others have almost rounded shoulders. The stem remains rather uniform throughout the type. Although none were found at the Blue Hole site, several reworked Pedernales drills or perforators were found at the Smith site (Smith 1990). WT: 5.7-36.0; L: 41-85; MW: 29-51; SW: 15-27; MT: 5-9.

Kinney (7 specimens). This elongated point has convex edges with a slightly to deeply concave base (see Figure 16). The basal corners vary from sharply pointed (U.I. #348) to rounded (U.I. #318). WT: 9.5-32.0; L: 57-90; MW: 26-34; SW: 23-27; MT: 6-9.

Langtry (1 specimen). This specimen is thin and has straight lateral edges and strong shoulders with a pointed stem (see Figure 16). It has been reworked and the stem varies from the Langtry's generally straight to concave base. WT: 10.4; L: 60; MW: 44; SW: 16; MT: 6.

La Jita (1 specimen). The La Jita point has an expanded stem with a slightly concave base; both the corners of the stem and the shoulders have been rounded (Figure 18). WT: 11.9; L: 56; MW: 32; SW: 26; MT: 7.

Nolan (2 specimens). These points have long lateral edges that are straight to convex, with tapered shoulders. One specimen has the steep, alternate beveling on the stem edges which is characteristic of this type. Respective quantitative measurements are: WT: 12.5 & 11.2; L: 65 & 63; MW: 25 & 24; SW: 20 & 15; MT: 7 & 7.

Martindale (1 specimen). With prominent shoulders and short barbs formed by corner-notching, this point's most distinguishing feature is its concave "fishtail" base (see Figure 18). WT: 7.8; L: 44; MW: 32; SW: 23; MT: 7.

Uvalde (2 specimens). The two specimens have triangular bodies with prominent shoulders or barbs. The stems vary from slightly expanding (U.I. #177) to flaring (U.I. #293), with concave bases (see Figure 18). Measurements are: WT: 3.9 & 10.4; L: 31 & 51; MW: 25 & 31; SW: 16 & 20; MT: 5 & 6.

Early Triangular (2 specimens). These triangular points have careful parallel-oblique flaking with straight to slightly concave bases and straight to convex, alternately-beveled lateral edges (see Figure 18). The measurements of #73 are: WT: 5.2; L: 36; MW: 35; SW: 35; MT: 5. The specimen from one of the geomorphological test units was not measured.

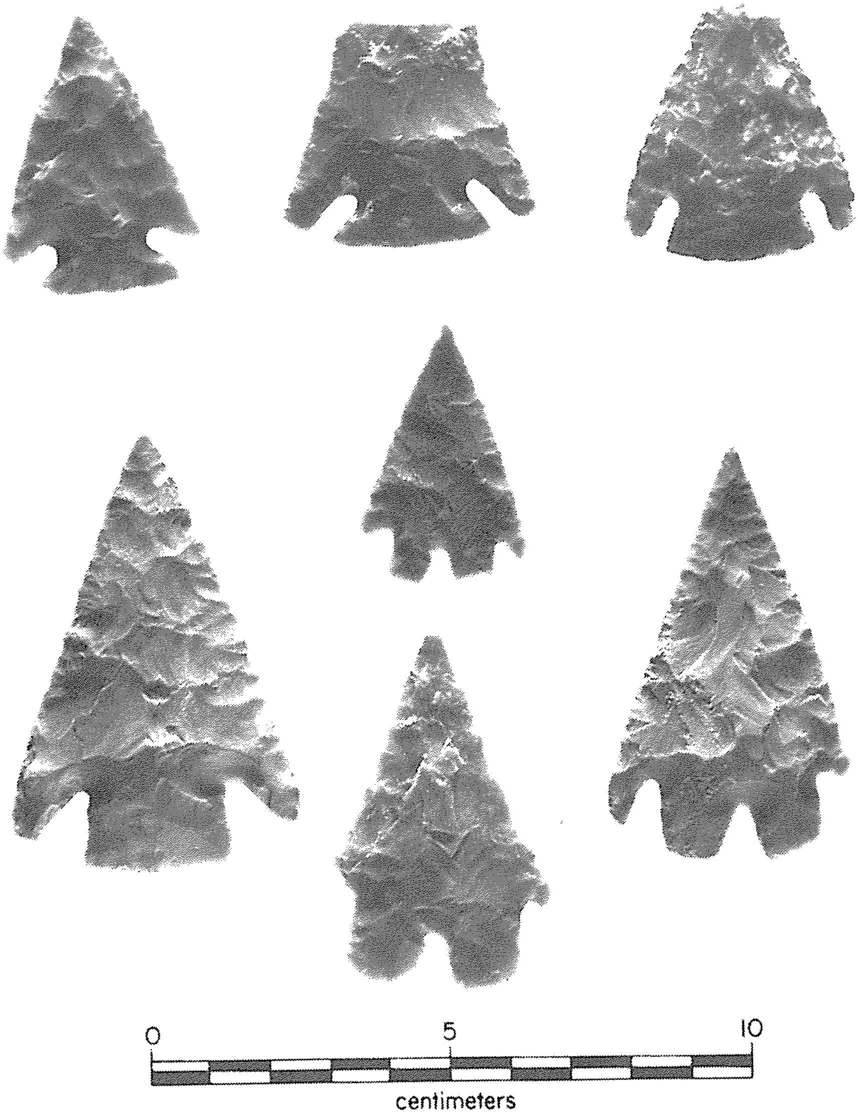

Figure 15. Late Archaic Dart Points (Unique Item numbers left to right). Top row: Marcos points #313, #245, and #484; Middle: Montell #225; Bottom row: Castroville #178, Montell #186, and #485.

Plainview (1 specimen). This specimen has a fragmented base but exhibited the parallel flaking and basal grinding characteristic of this Paleoindian type (see Figure 18). It was recovered out of context in the Late Prehistoric zones of the excavation. WT: 9.5; L: 62; MW: 17; SW: 17; MT: 7.

Frio/Ensor Typology

A major problem with South Central Texas projectile point chronologies is the broad temporal distribution of the Frio type points. Turner and Hester (1985:100) describe the Frio point's modal attributes as "a triangular body, often short and broad, with wide side or corner notches and a concaval basal indentation that ranges from shallow to a deep U-shaped notch" and place it in the "Transitional Archaic, ca. 200 B.C.-A.D. 600 (or later)." Similarly, they define the Ensor points as:

> varying considerably in all dimensions, but broad stems, shallow side notches and generally straight bases tend to identify the type. Specimens with a U-shaped basal notch are sometimes called Ensor-Frio. Typology is frequently difficult because there appears to be much gradation of basal forms from Frio to Ensor (Turner and Hester (1985:94).

Again, it is placed in the Transitional Archaic period.

The excavation at Blue Hole, however, produced points with these general stylistic characteristics at levels clearly attributable to periods ranging from the Late Prehistoric through the Middle Archaic. Thus, the value of these types as historical time markers requires refinement and redefinition of generally accepted lithic typologies when new excavations or different analytical methods enable such refinements. Redefining the temporal or geographic focus of a projectile point type must be evaluated on a progressive basis. Because of the broad temporal range of the Frio and Ensor types at the Blue Hole Site, further analyses were performed to determine if discrete groups of Frio and Ensor points could be defined that have specific temporal implications.

Stylistic Analysis

The 59 Frio/Ensor points recovered were segregated into four stylistic categories, based on their basal configuration (Figures 19-22) as follows:

Group 1 (4 specimens): A broad triangular point with moderate concave edges, a concave base, and long barbs formed by corner-notching.

Group 2 (12 specimens): Generally as long as wide, this traditional "Ensor" form evidences broad stems, shallow side notches, and generally straight bases.

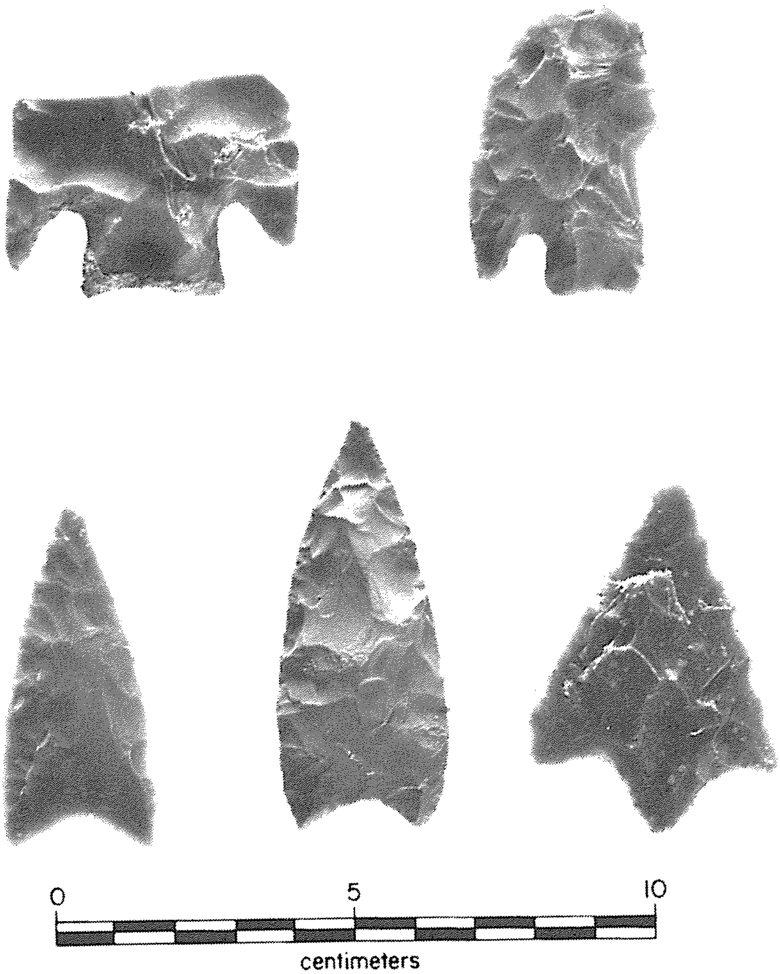

Figure 16. Middle Archaic Dart Points (Unique Item numbers left to right). Top row: Marshall #465 and #415; Bottom row: Kinney #348 and #318, and Langtry #273.

Group 3 (10 specimens): Morphologically very similar to Group 2, except for having deep U-shaped basal indentations.

Group 4 (33 specimens): Short and broad, with wide side or corner notches, and the swallow-tail concave basal indentation generally attributable to the Frio type.

In establishing the chronology of the Blue Hole site earlier, the Transitional Archaic was not segregated into distinct strata since no clear delineation could be made. Rather, all of the Frio and Ensor types, which are the main time marker

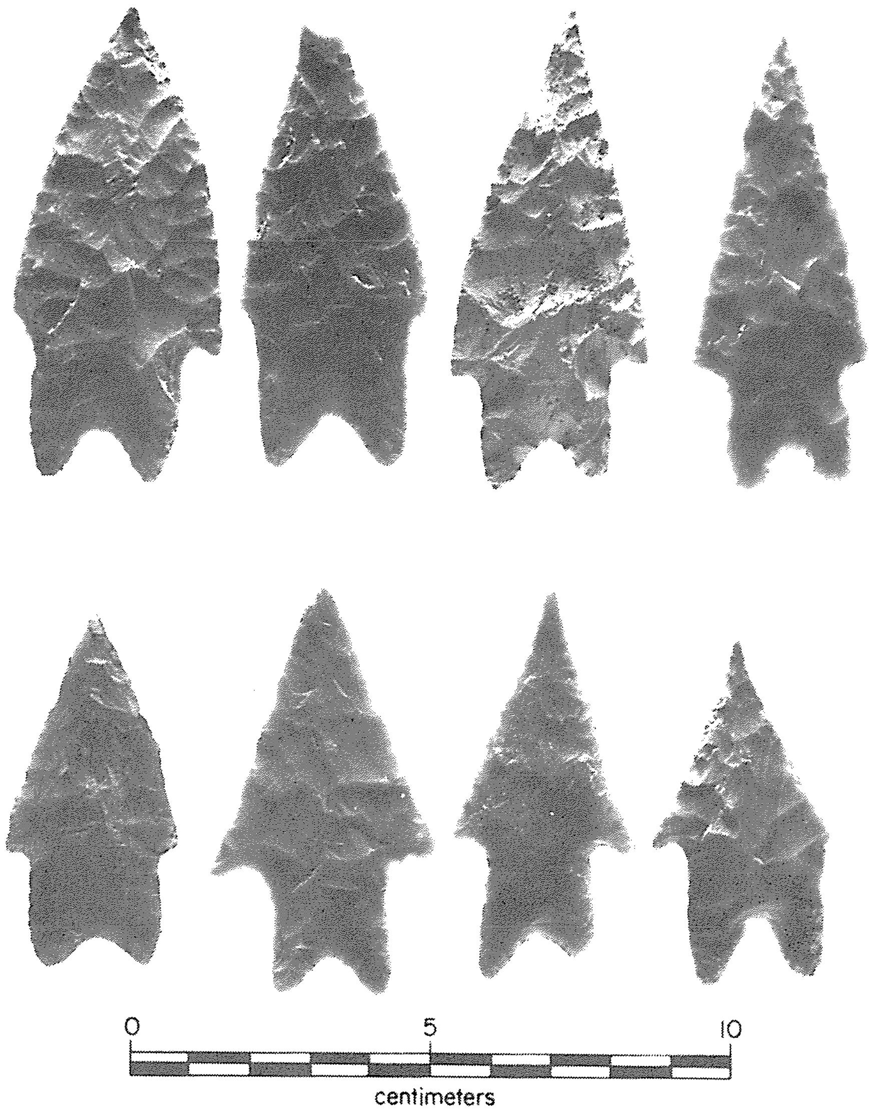

Figure 17. Middle Archaic Pedernales Dart Points (Unique Item numbers left to right). Top row: #441, #494, #350, and #400; Bottom row: #482, #397, #398, and #316.

for the Transitional Archaoic in South Central Texas, were disregarded in setting lines A and B. The plotting in Figures 23-25 tends to show that:

1) Group 1 belongs in the Late Archaic to Transitional Archaic periods. Its elongated barbs are stylistically similar to the deeply notched Castroville

and Marcos points. While the sample is not sufficient to predict contemporaneity, the points may represent the same functional adaptation (traditional hafting methods) as the more exotic, finely made

Figure 18. Early Archaic and Paleoindian Dart Points (Unique Item numbers left to right). Top row: La Jita #231, Nolan #457, and Martindale #267; Middle row: Uvalde #177 and #293; Bottom row: Early Triangular, #5 and #73, and Plainview, #243.

Castroville points. The Group 1 point in the W110 trench was also found in Level 6, consistent with the Marcos/Castroville strata (see Figures 24-25).

2) Group 2 occurs in the Transitional Archaic deposits. This Ensor type may be the successor to Group 3, which appears in earlier deposits at the Blue Hole site.

3) Groups 3 and 4 have a much broader temporal distribution than Groups 1 and 2. Group 3 is probably a Late Archaic diagnostic, but Group 4, the commonly accepted Frio type, appears to co-occur with Pedernales points at the Blue Hole site in the Middle Archaic deposits. Group 4 forms continue through the Transitional Archaic in numbers too substantial, and with a distribution too consistent, to attribute it to prehistoric "collecting" or "reuse."

Quantitative Analysis

As an alternative method to the stylistic groupings, the 59 Frio/Ensor points were also weighed (grams) and then measured (mm) along several parameters, such as length, width, thickness, stem length, stem width, stem thickness, and neck width (data on file at TARL). Measurements of the artifacts were estimated if the specimens were incomplete. Measurement ranges were then compared by group: Group 1 tended to be very large and heavy and Group 3 tended to be smaller and lighter in size. No correlations were derived from these measurements. The quantitative data base was then computer processed to search for correlations to support or negate the stylistic grouping, or to possibly suggest alternate groupings.

Pearson's R (Product-Moment correlation) on all 59 specimens revealed no strong correlations that were not previously evident in the data. The anticipated high positive correlations between such measurements as maximum thickness and weight, stem width and neck width, or length and weight, were confirmed for the entire class, but no less obvious correlations were revealed. Similar analyses were then performed for each stylistic group, 1 through 4, with specific results of the one-to-one measurement correlations as follows:

Group 1: Generally very high correlations, all of which were positive, except for neck width.

Group 2: Very high correlations to all variables. As a type, this traditional Ensor evidences the most consistent similarities and correlations.

Group 3: Wide variation due to fluctuations in size, length, and width. All correlations remained positive except for stem width.

Group 4: Wide variation similar to Group 3, due to size variation. But again, the stem width, length, and thickness scored high correlations and were very consistent; all correlations were positive.

The data were then subjected to multivariant discriminant analyses, which evaluates the characteristics of each group and places a quantitative correlation coefficient for the similarity of each individual artifact to the overall attributes of the groups. As with Pearson's R, the assignment of consistent values to each of the variables, where weight, length, and width tend to vary considerably within

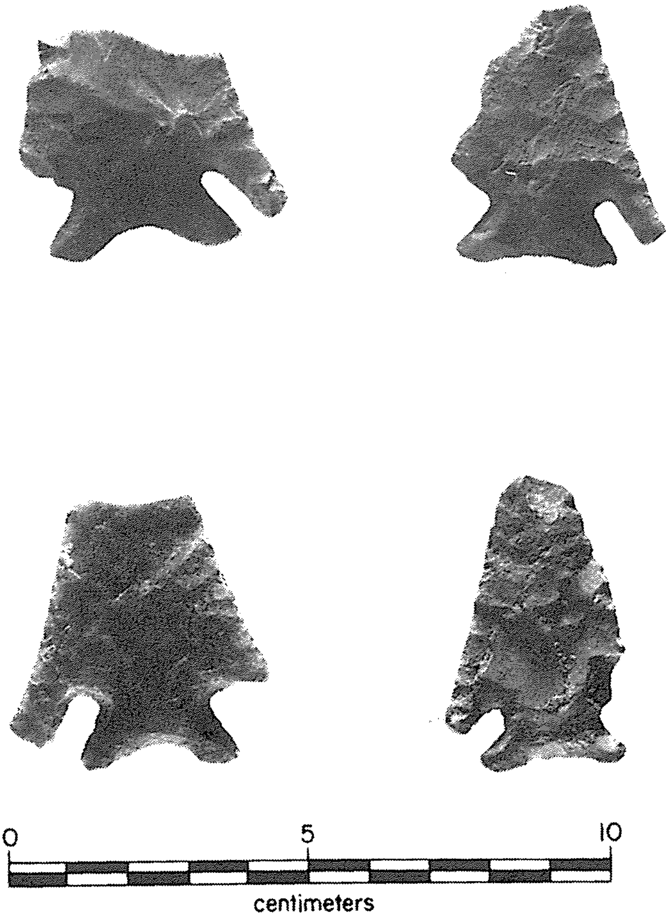

Figure 19. Group 1 Frio Points.

each of the four categories, would normally tend to skew the results so that no meaningful correlations are derived. Yet the statistical analyses yielded the following results:

> Group 1: All four artifacts were classed into Group 1 with a 1.0 correlation.

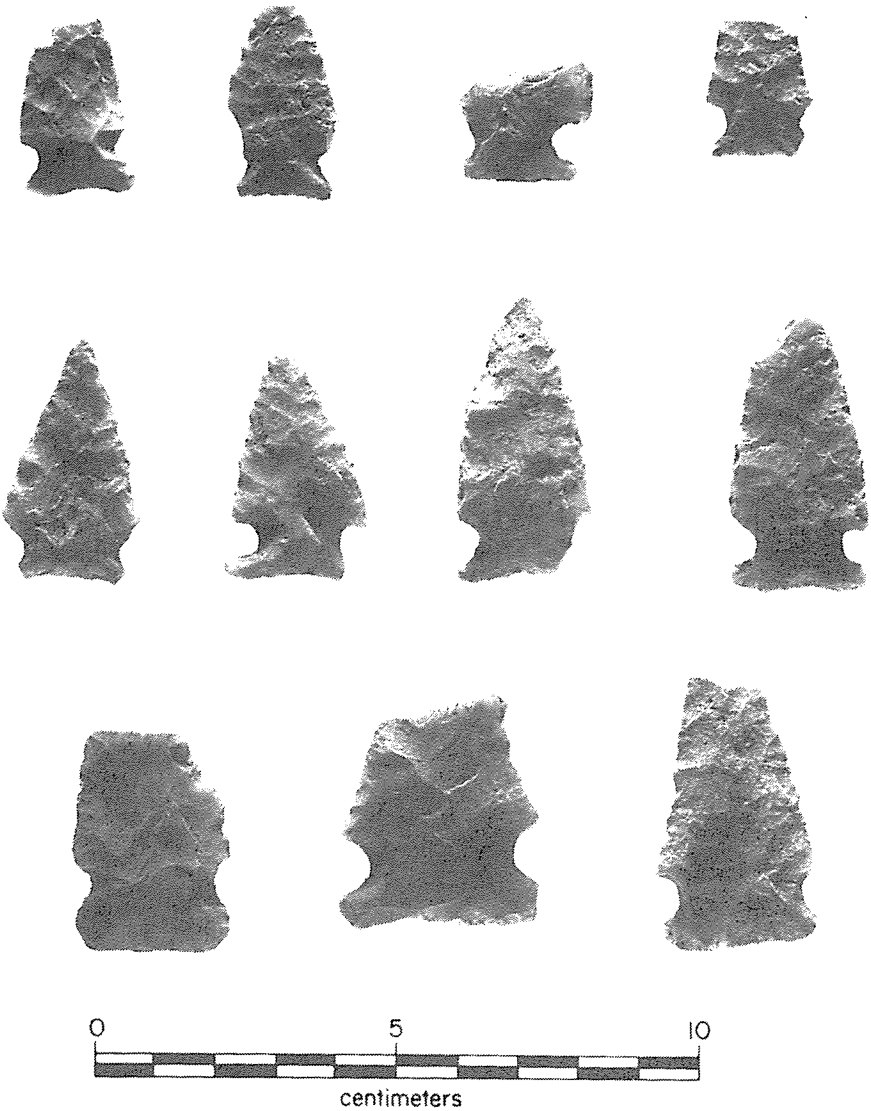

Figure 20. Group 2 Ensor Points.

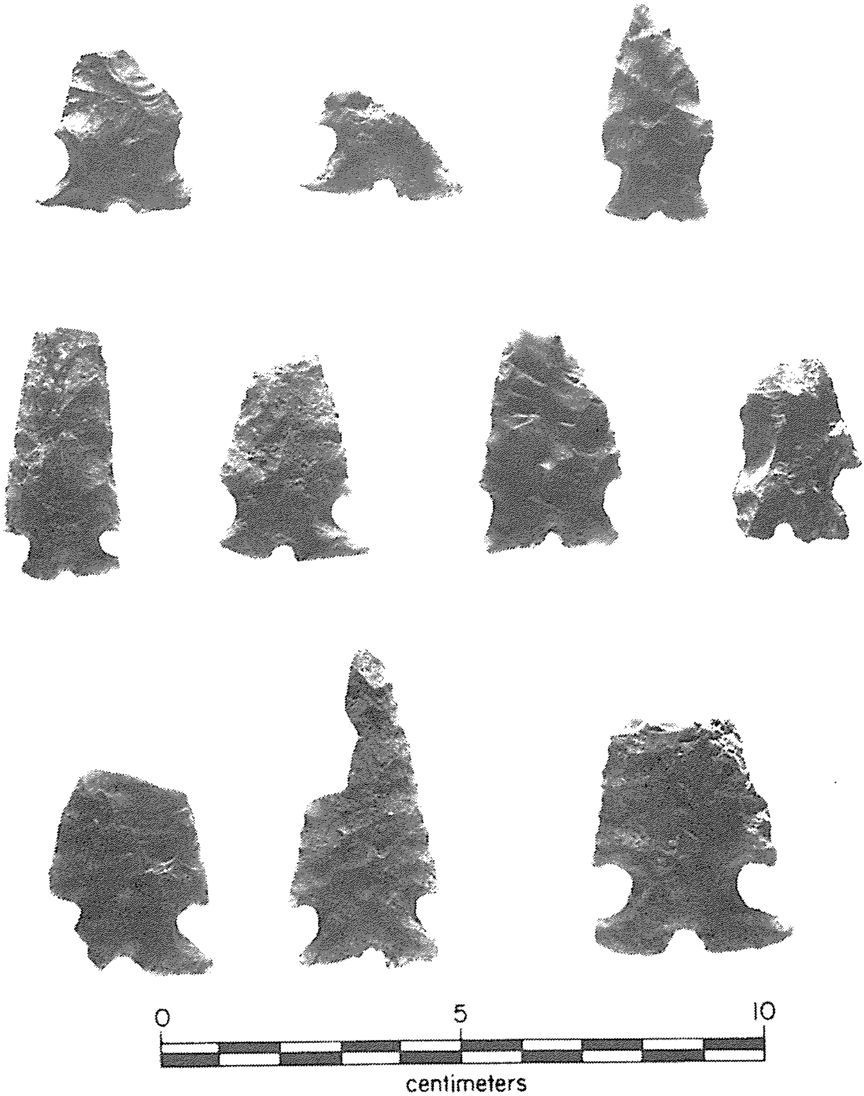

Figure 21. Group 3 Frio/Ensor Points.

Group 2: Ten of the 12 evidenced a preference of Group 2 attributes (higher correlation to Group 2 attributes than to Group 1, 3, or 4) with correlations ranging from .392 to .931 (average .607). Two marginally favored Group 3 but had Group 2 correlations of .406 and .440.

Group 3: Seven of the 10 showed the highest correlation to Group 3, with correlations ranging from .431 to .963 (average .660). The three

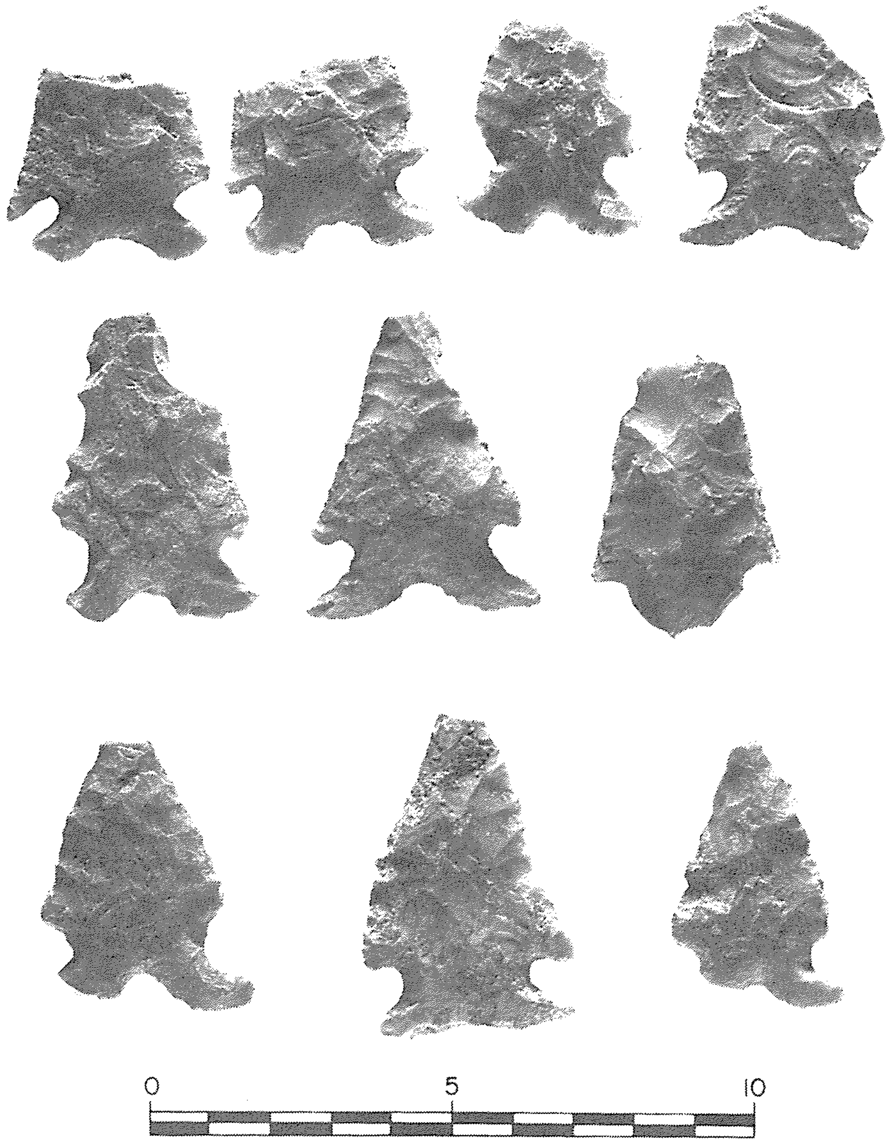

Figure 22. Group 4 Frio Points.

others had correlations ranging from .595 to .653 to Group 2.

Group 4: Of the 33 points, 25 correlated higher with Group 4 (correlations ranging from .447-.998), and had average correlations of .834. The other eight points favored Groups 2 and 3, due primarily to

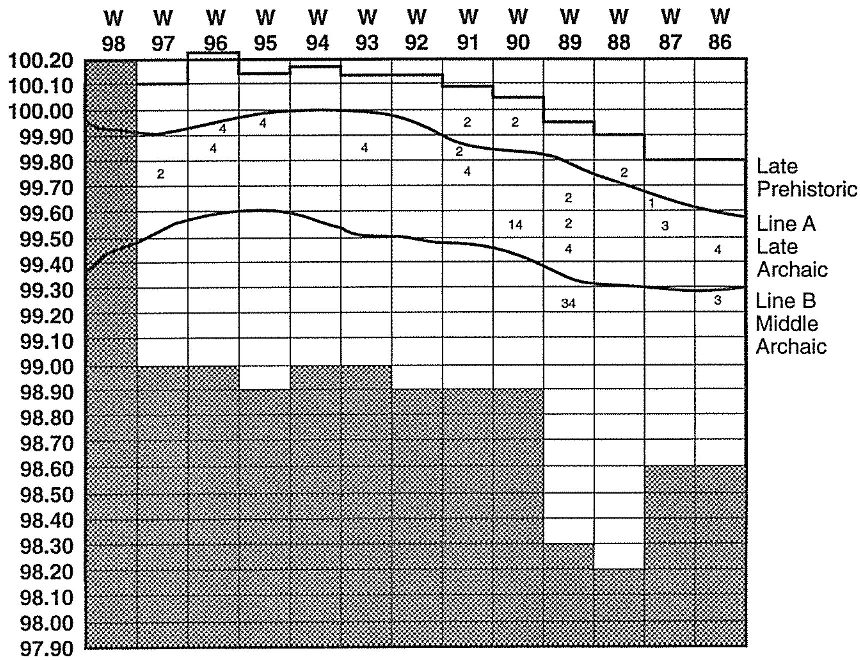

Figure 23. Frio/Ensor Groups 1-4 Plotted on N106 Line, W86-98.

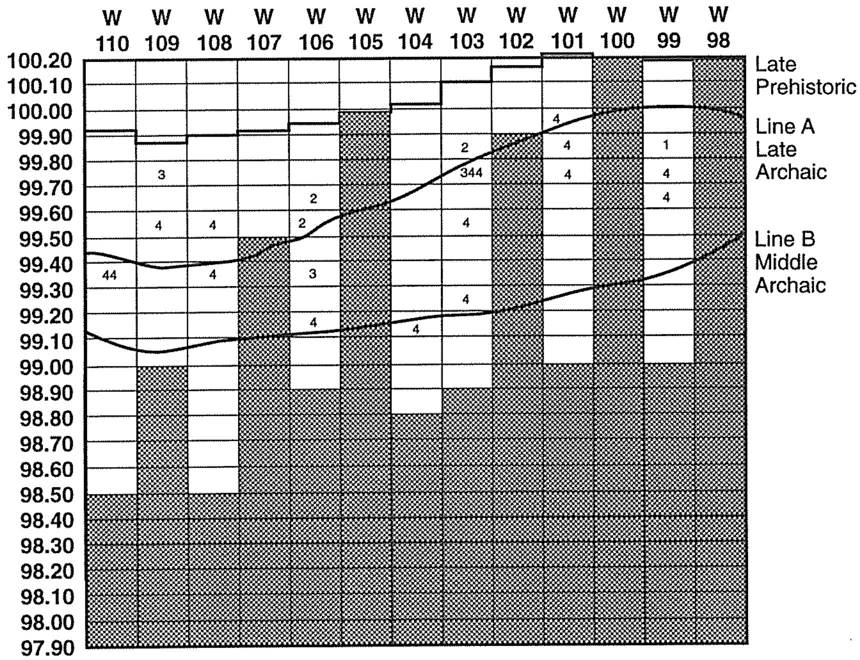

Figure 24. Frio/Ensor Groups 1-4 Plotted on N106 Line, W98-110.

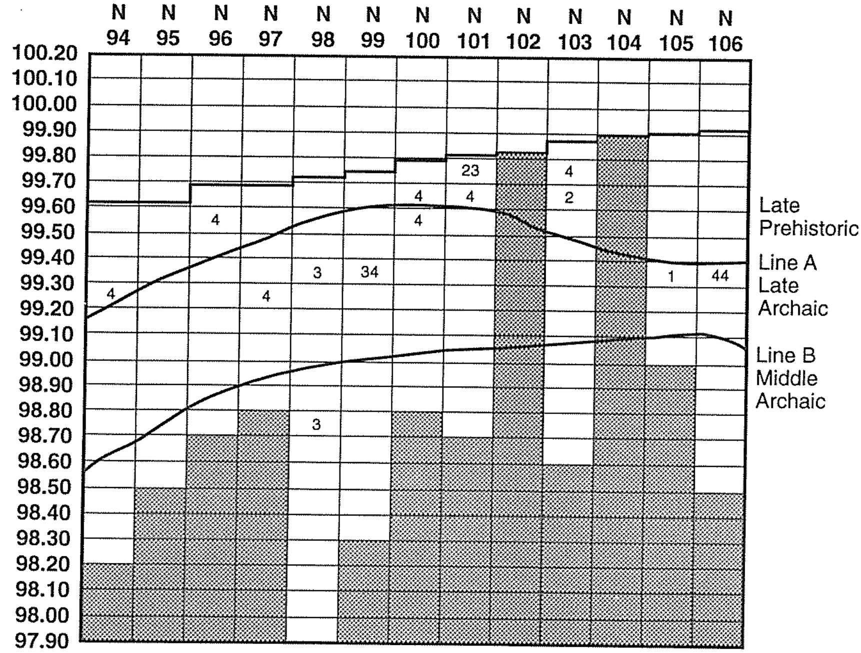

Figure 25. Frio/Ensor Groups 1-4 Plotted on W110 Line, N94-106.

larger than usual stem length and width in proportion to the rest of the projectile point.

While very strong correlations within the groups were not anticipated due to variation in the size and weight of points within the Frio/Ensor groups, the overall results were generally supportive of the stylistic form classification. Although the size and weight differentials were anticipated to skew the results somewhat, they were nevertheless included in the attribute analyses. Purposeful exclusion of unfavorable data would merely have resulted in "forcing" the correlations.

Relative Geographical Studies

The recognition of stylistic and temporal variation in the Frio/Ensor types is nothing new. Suhm and Jelks (1962) identified four stylistic variations, calling them Edgewood, Ensor, Fairland and Frio, dating them from as early as 3000 B.C. to A.D. 1000. Turner and Hester (1985) continue to recognize all four points as distinct types (partially due to their varied geographical distribution), but place them uniformly in the Transitional Archaic (200 B.C.-A.D. 600) or later.

Hester (1971) divided 28 specimens from the La Jita site into Edgewood, Ensor, and Frio types with six sub-varieties. Highley et al. (1978) split 19 Ensor types into six sub-varieties from the Scorpion Cave excavations. At Panther Springs Creek, Black and McGraw (1985) recovered 77 specimens identified as Edgewood, Ensor, Fairland, and Frio, along with several more unnamed classes of "side- and corner-notched triangular," and placed all of them in the Transitional Archaic period occupation of the site.

Lukowski (1987:217-220) identified 36 projectile points from four Uvalde County sites in the Leona River Watershed as Edgewood, Ensor (two varieties), Fairland, and Frio, and placed them chronologically in the Late through Transitional Archaic periods. Katz (1987:110-112) grouped the 39 Ellis, Ensor, Fairland, and Frio points from 41BX300 into local period 9, A.D. 200-600.

Hall et al. (1986), in the Choke Canyon project, recognized several unnamed specimens of "large expanding stem," in addition to the 17 points placed into the Ensor and Fairland types. Two of the points that Hall et al. (1986) called the Ensor type came from deposits radiocarbon dated to 100 B.C. and A.D. 590, quite consistent with the stratigraphic placement of Blue Hole Group 2 (traditional Ensor) in the Transitional Archaic (see Figures 23-25).

No other reports from the general area have as clear a stratigraphical record as the Blue Hole site in chronologically placing a broad range of projectile points. Heavy disturbance, consistent with caves, hampered dating of the Scorpion Cave archeological record and associated projectile points. Panther Springs Creek deposits, in addition to being heavily disturbed, were vertically compressed, thus rendering the separation of temporal zones difficult. The Choke Canyon sites were also generally compressed, and none of the single site excavations yielded the quantity and temporal diversity of diagnostic projectile points that have been successfully used to establish the relative chronology at the Blue Hole site.

Summary of the Frio/Ensor Analyses

These analyses have been presented to improve the definition of the Frio and Ensor projectile point types. Though they are far from conclusive, the group differentiation of temporal placement during the excavations, and the substantiation of modal similarities with the statistical studies, clearly warrant future classificatory attention when planning and performing excavations and lithic analysis in the South Central Texas area. The question of whether the variation between defined Groups 1-4 should be categorized as types, varieties, or related varieties, I will leave to the typologists who have spent years reviewing the temporal and geographical variation of the broad range of projectile points to understanding Texas prehistoric hunter-gatherers.

The goal and intent of this section has been merely to clarify the descriptive varieties of Frio/Ensor projectile points and their temporal significance. We must insure that the temporal and spatial placement of projectile points are as valid and up-to-date as possible. The purely descriptive analyses performed here, along with continued excavation and analyses of new sites and data, should help place the Frio and Ensor types more accurately in the South Central Texas chronological framework.

Other Stone Tools

"Semi-Unique" Items

The category of "semi-unique" items was designated for all non-diagnostic projectile points, bifacial fragments, and other worked stone from the Blue Hole site. All of the "semi-unique" items were reviewed in the laboratory and were grouped into the following categories: 1) Distal Projectile Point Fragments, 2) Proximal Projectile Point Fragments, 3) Other Bifacial Fragments, 4) Preforms, 5) Modified or Utilized Flakes, and 6) Cores.There were 469 semi-unique specimens. They were then plotted onto the cross-sections of the units, similar to the previous plots of the burned rock, and those of the diagnostic projectile points (Figures 26-28).

The general concentration of the "semi-unique" items was then compared in transparent overlays to the cross-sectional views of the burned rock and lithic debitage (see the following). A very direct correlation was evident between the "semi-unique" items and chert debitage. Conversely, burned rock concentrations bore a very indirect relationship with the "semi-unique" items and the debitage. This indirect relationship was even more pronounced than that between diagnostic projectile points and the burned rock. Again, lines A and B were drawn onto the cross-sectional profiles that establish the relative stratigraphy of the site.

Distal Projectile Point Fragments

There were 79 distal fragments recovered. They were not further distinguished as to general size, thickness, or representative portion of the original projectile point. The cross-sections indicate that most of the distal tips were recovered from the deepest Late Prehistoric strata (which overlies the concentrated burned rock midden on the W110 line and the westernmost five units of the N106 line). Only three distal tips were recovered from the Late Prehistoric strata in the 17 units to the east of W105 on the N106 line, whereas 32 were recovered from the 15 units proceeding westward to W110 and then south on the W110 line.

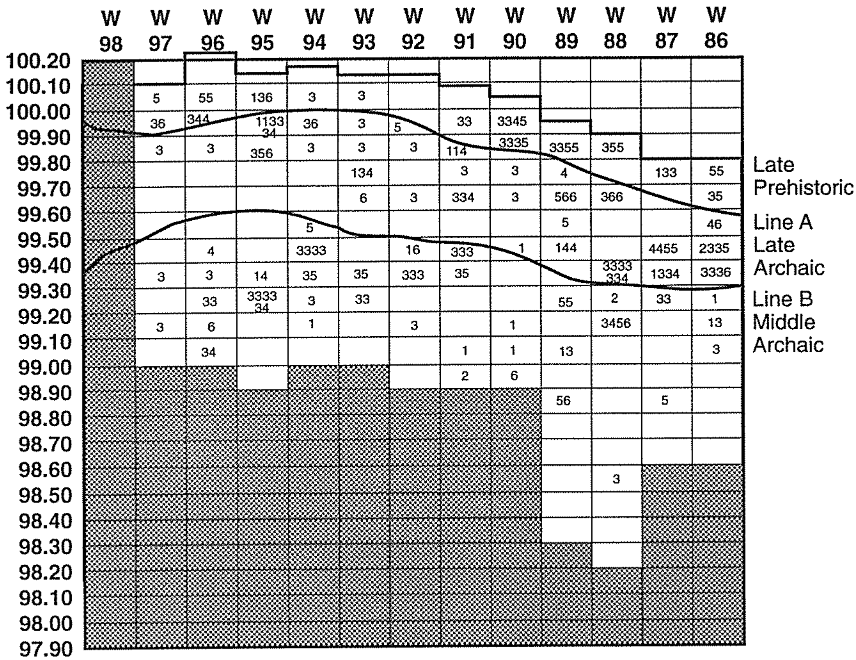

Figure 26. "Semi-Unique" Items (N106 Line; W86-98).

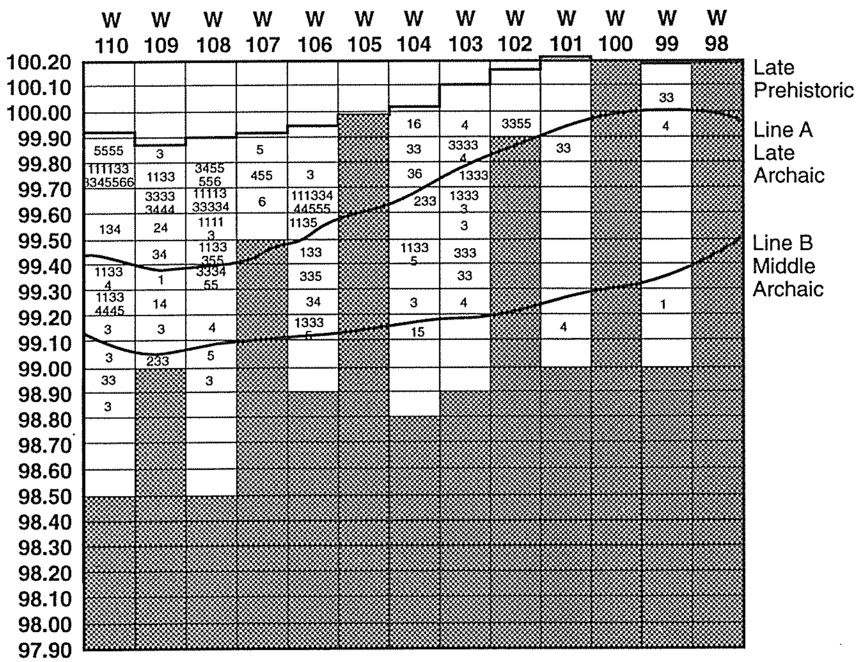

Figure 27. "Semi-Unique" Items (N106 Line; W98-110).

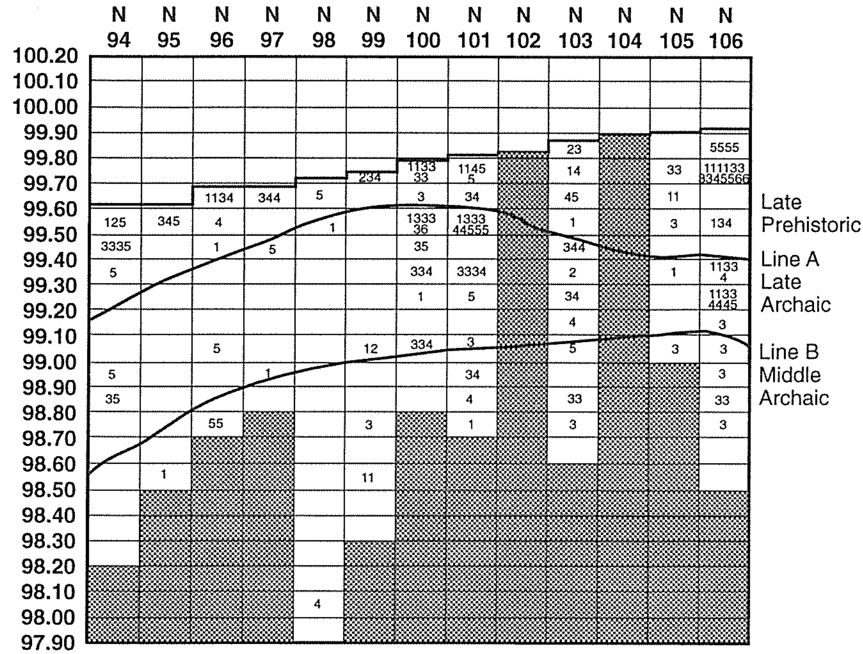

Figure 28. "Semi-Unique" Items (W110 Line; N94-106).

Proximal Projectile Point Fragments

Eleven proximal fragments were recovered that could not be placed into a specific typological classification. Since almost all of the 268 diagnostic projectile points were nearly complete, most broken proximal fragments were probably discarded at a hunting location and were seldom carried back to the site, which was possibly used as a food processing location.

Other Bifacial Fragments

There were 211 unclassified bifacial fragments, in varying stages of reduction, in the units. No obvious trends or concentrations were evident either within certain horizontal areas or in deposits of specific chronological periods. Since the Blue Hole site served at least partially as a food processing location, these fragments may have been either broken and discarded cutting or scraping tools, or by-products of lithic manufacture at the processing location.

Preforms

There were 67 preforms in various stages of reduction. Again, no obvious concentrations were evident. As with other bifacial fragments, most of these specimens were probably discarded at varying stages in the manufacturing process (Figures 29 and 30).

Modified or Utilized Flakes

There were 79 flakes which evidenced utilization or wear. Their distribution appears coincident to the heavier lithic scatters and to that of the diagnostic projectile points. As with other bifacial fragments, they may have been utilized as cutting or scraping tools. No in-depth microscopy or chemical analyses have yet been performed on the flakes to further determine their function.

Cores

Only 22 cores were recovered in the excavations. None was particularly large or diagnostic regarding manufacturing/reduction processes. The low number of cores indicates that the Blue Hole site probably served as a lithic finishing station: preliminary manufacture was being performed on the raw material at or near a lithic quarry, and the quarry blanks were generally brought to the site for further reduction.

Miscellaneous Other Tools (Figure 31)

Certain stone artifacts were found which, although not typologically diagnostic, were rather typical of certain stone implements described in Turner and Hester (1985). They include:

- Friday Biface (Turner and Hester 1985:214) from N105W110, level 2. This unstemmed, relatively thin, bifacially thinned knife has an approximately straight base that has been thinned by the removal of several broad, thin flakes. Its occurrence in the Late Prehistoric strata is consistent with its known temporal placement.
- Probable side fragment of a Corner-Tang Biface from N103W110, level 7. Although the specimen is incomplete, it appears to be the convex-edged, lateral portion of the tool. This type of tool is common to South Central Texas, and its placement in Late Archaic deposits at the Blue Hole site is consistent with its assumed age (Turner and Hester 1985:210-211).
- Perforator/Drill from N103W110, level 11. Characterized by a long and tapered bit that is diamond-shaped in cross-section, this bifacially flaked

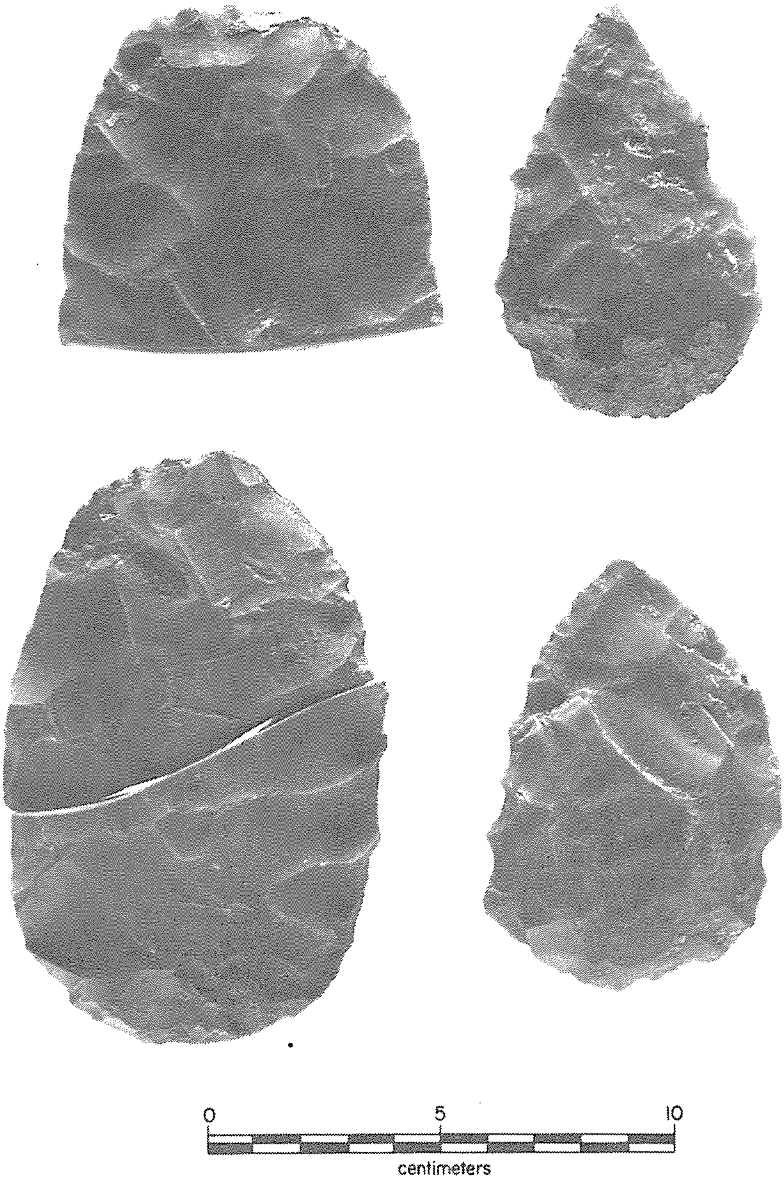

Figure 29. Quarry Blanks/Preforms in Varying Stages of Reduction.

Figure 30. Preforms and Partial Stem Modification.

tool was recovered in the deeper Middle Archaic deposits. Similarly large drills are commonly found in Texas Archaic deposits (Turner and Hester 1985:224-225).

- Hammerstones. A few elongated, cylindrical limestone hammerstone tools

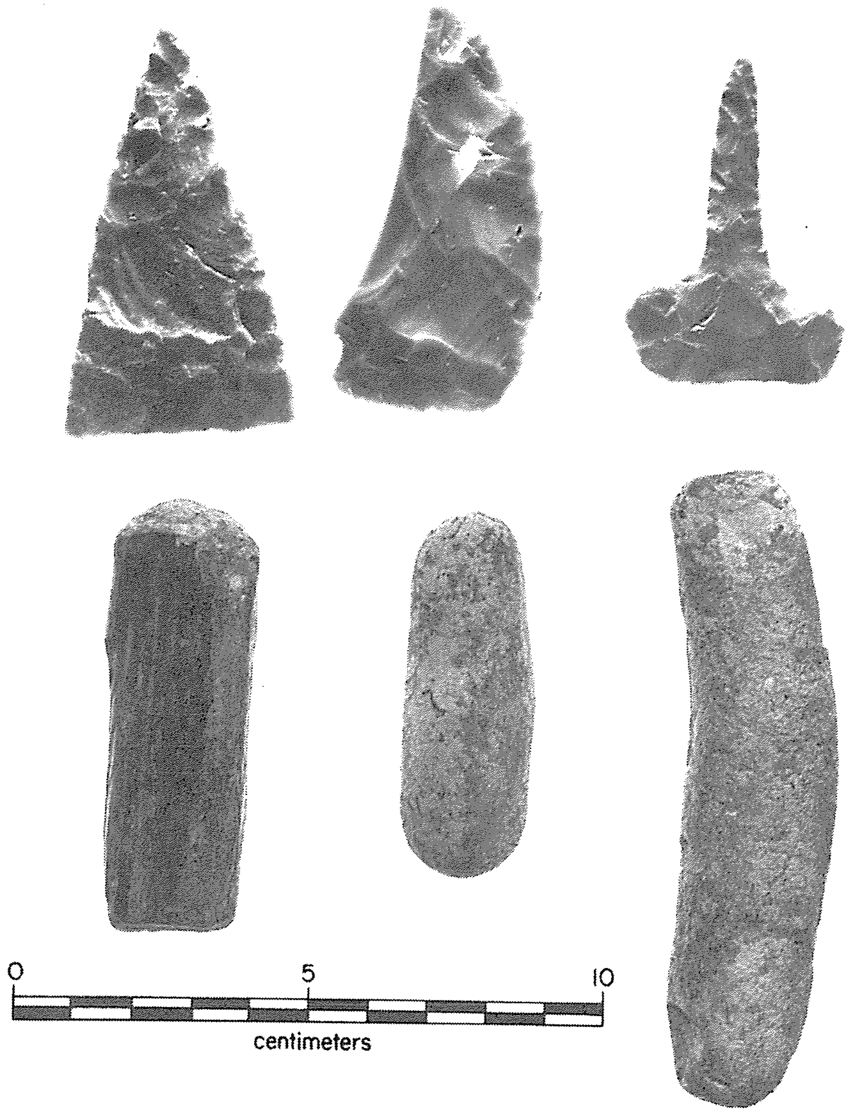

Figure 31. Other Stone Tools. Left to right, Top: Friday Biface; Corner-Tang Biface; Perforator. Bottom: Hammerstones; Petrified Wood (left) and Limestone (right two).

were found at the Blue Hole site. They were found in N105W95, level 10, N105W95, level 9, and N106W109, level 9 (see Figure 31, bottom row). Stratigraphically, this places all of the hammerstones in the Middle Archaic period deposits at the site.

Chert Debitage

Overall Plot

The number of flakes per unit was computer plotted onto the cross-sections of the units (Figures 32-34). As stated earlier, the plots bore a very direct relationship to that of the "semi-unique" items and a very indirect, or inverse, relationship to the burned rock. It is apparent, when comparing the burned rock densities with the debitage concentrations, that the activities which created the two artifact classes are basically mutually exclusive. It appears, returning to Hester's (1971) "rubble dump" concept, that during the Middle through Late Archaic, the Blue Hole site inhabitants periodically cleared the cooking area of all cracked rocks and other debris and deposited it on the slightly elevated mound of refuse 8-10 m away. This would account for the relatively minimal deposition of debitage and other lithic artifacts within the burned rock midden proper.

Detailed Debitage Analysis

Five 1 meter units were selected for more detailed analysis of the chert debitage: N105W86, N105W95, N106W104, N106W110, and N94W110. The purpose was to determine if the flake debris from varying areas of the excava-

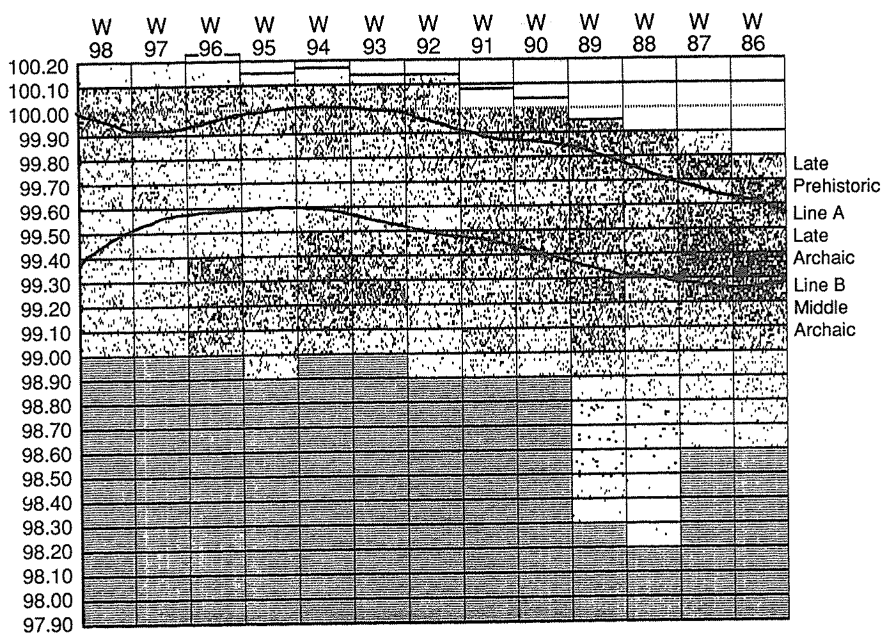

Figure 32. Debitage Count (1 dot = 4 flakes): N106 Line; W86-98.

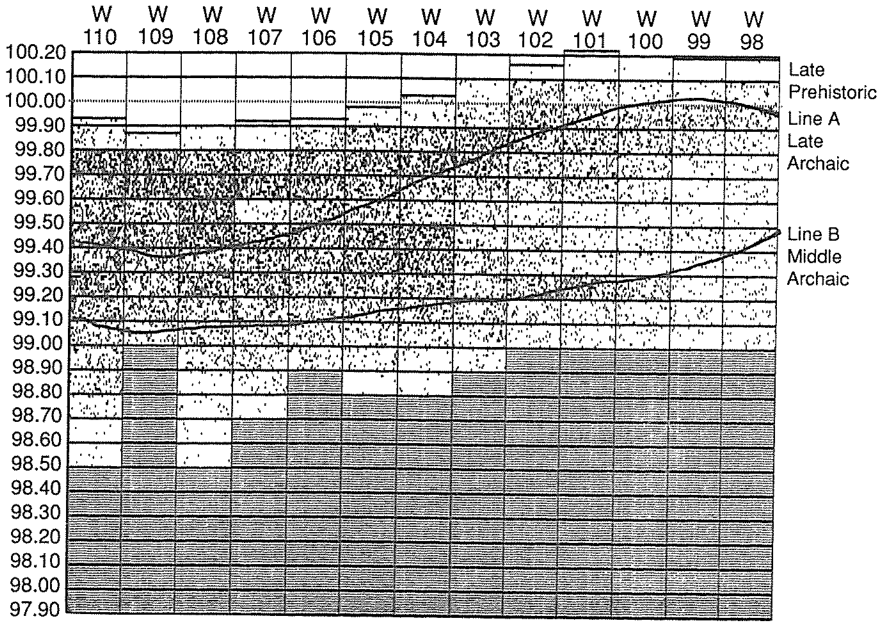

Figure 33. Debitage Count (1 dot = 4 flakes): N106 Line; W98-110.

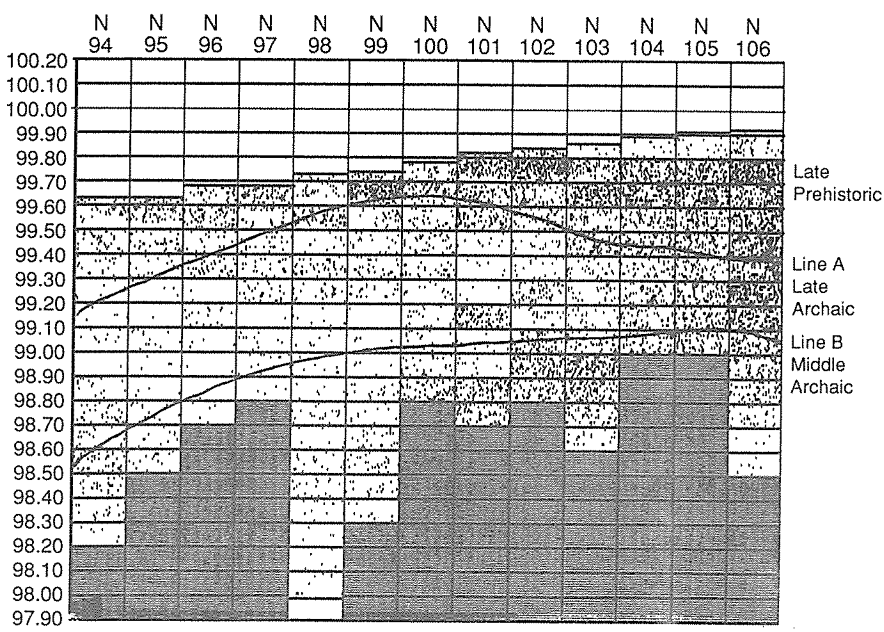

Figure 34. Debitage Count (1 dot = 4 flakes): W110 Line; N94-106.

tion units would indicate that different kinds of chert manufacturing/reduction activities occurred across the site, and, in the same light, if temporal changes could be noted.

The flakes were sorted, by 10 cm unit level, into the following categories:

1) Primary cortex (596 flakes): resulting from the removal of the cortex from the nodule. Generally 60-80 percent of the surface is covered with cortex.
2) Secondary cortex (1990 flakes): the dorsal face retains some cortex but also has one or more flake removals.
3) Interior or tertiary flakes (1540 flakes): no cortex on either surface as they have been removed from the interior of the core.
4) Biface thinning or lipped flakes (920 flakes): the result of biface thinning activities, these have an overlapping or lipped striking platform on a rather diffuse bulb of percussion.
5) Miscellaneous chips and fragments (14,185 flakes): any items which could not be placed in categories 1-4.

The flakes (N=19,231) were counted and weighed (in total by category) for each unit level. Of this number, only 5,046, or 26.3 percent were placed into categories 1-4 above. While part of the reason for the high frequency of Category 5 debitage is possibly due to reasonably inexperienced lab personnel, these results are not inconsistent with Hester's (1971:109) analysis of the debitage at La Jita: 32 percent of all flakes fell into into categories 1-4.

Further analysis of the debitage from these selected units, and all of the excavation units, may provide greater insight into the temporal and areal character of the lithic industry at the site. It should be noted, however, that the use of 1/4-inch screen during the excavations prevented the collection of possibly large amounts of micro-debitage. However, column samples were taken from each of the levels from the five selected units and these are also curated at TARL.

OTHER ARTIFACTS

A number of other interesting cultural items were found in the west end of the N106 trench. They include:

a) A marine gastropod shell bead found in association with the Castroville cache in N106W110, level 6 (Figure 35a). The shell has a perforation, apparently man-made, through the outer whorl near the aperture, presumably to facilitate stringing. It is identified as a *Prunuum (leptegouana) apicina*, and it originates on the Texas Gulf coast. Six similar beads were recovered from the Choke Canyon excavations (Highley 1986:75) in Archaic occupational zones. The Castroville cache at the Blue Hole site is within the Late Archaic deposits.

b) A small polished stone bead was found in N106W110, level 4 (Figure 35b). It was obviously a jewelry item, either in a simple necklace or as a bead in a more ornate arrangement. Highly polished, the bead had been drilled from both sides, and lateral grooves had further been filed into it. The bead was recovered from Late Prehistoric deposits.

c) A worked and cut bone bead came from N106W104, level 9 (Figure 35c). The tubular bead had a dull polish, probably from wear, and had been manufactured by the groove and snap technique. The species of animal for the bone was not identified. The specimen was recovered from the lowest Late Archaic strata.

d) A cut and decorated bone artifact fragment, probably of bison rib, with a symmetrical configuration of small, shallow pits drilled into it, was found in N106W101, level 4 (Figure 35d). Miller and Jelks (1952:185) reported two similar bone objects, although they were larger and with less decoration, associated with burials near the Belton Reservoir in Coryell County. Suhm (1957:49) recovered another somewhat similar and, again, much larger, bone object at the Smith Rockshelter in Travis County. None of these evidenced the intentional, symmetrical drilling as in this specimen. These three artifacts were attributed to Late Prehistoric period occupations, whereas the Blue Hole specimen was recovered from the most recent Late Archaic strata. The items may have some ritualistic significance, or may

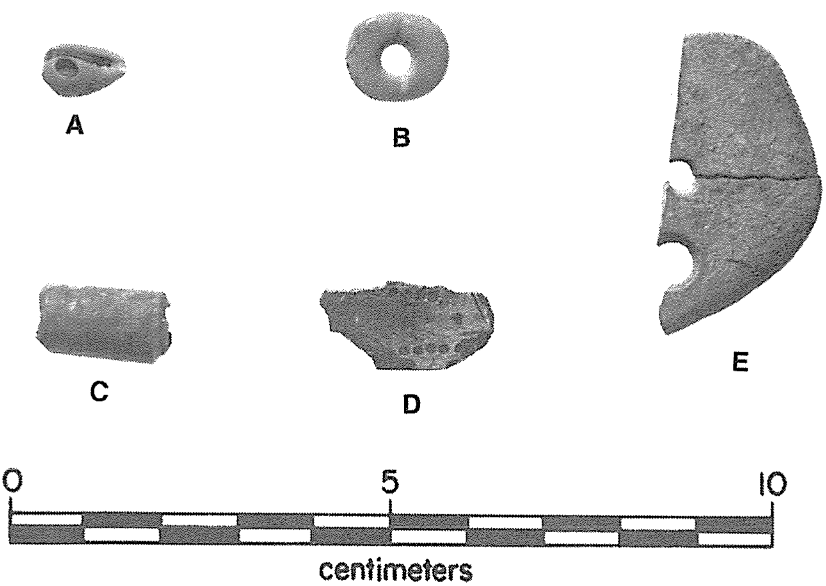

Figure 35. Decorative, Ritualistic or Gaming Artifacts. Top row: a, shell bead; b, stone bead. Bottom row: c, bone bead; d, decorated bone; e, stone pendant.

have been used as gaming pieces, but no conclusive interpretations are offered as to their function.

e) A broken stone pendant was recovered from N106W110, level 3, in Late Prehistoric strata. The unpolished flat stone appeared to have been ground on the sides and was biconically drilled in two places (Figure 35e).

FAUNAL AND MOLLUSCAN REMAINS

No significant vertebrate skeletal remains were recovered. Some occasional bison and deer bone were found in the Late Prehistoric deposits, especially in the upper three levels at the west end of the N106 trench. A large bison tooth was found in general association with the Castroville cache discussed below. No bone accumulations or spatial concentrations were identified which lent meaningful associations with features or artifacts recovered from the Blue Hole site.

Land snails were recovered, generally in high concentrations, throughout the Blue Hole excavations. The uppermost level or two of each unit generally produced very few snail shells whereas many unit levels contained nearly 1,000 of the shells (level 5 of N105W89 produced 1,100 Rabdotus shells; Figure 36). In all, 100,000 to 150,000 Rabdotus were recovered from the units. Rabdotus were the predominant land snails recovered in TAS excavations (over 95 percent

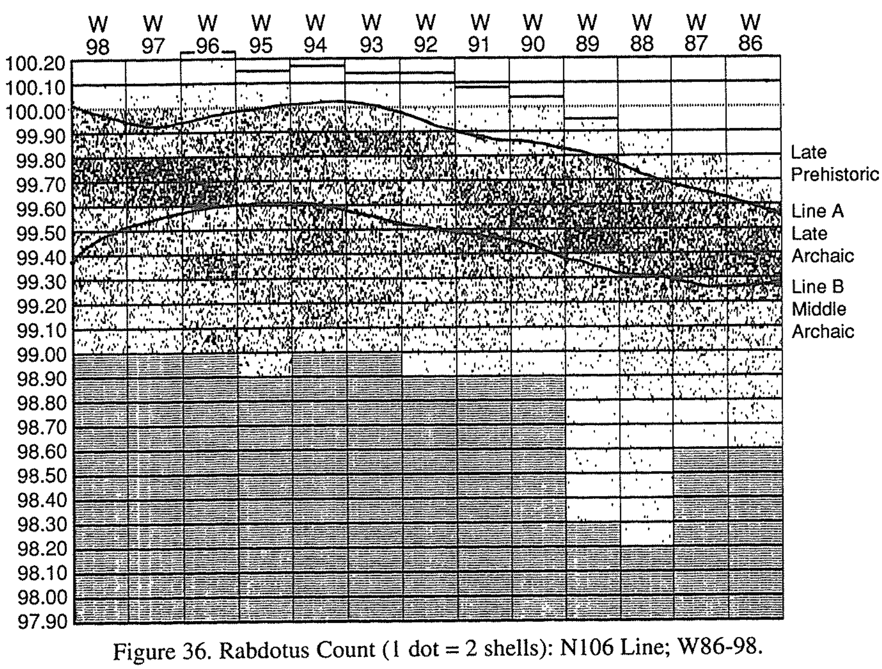

Figure 36. Rabdotus Count (1 dot = 2 shells): N106 Line; W86-98.

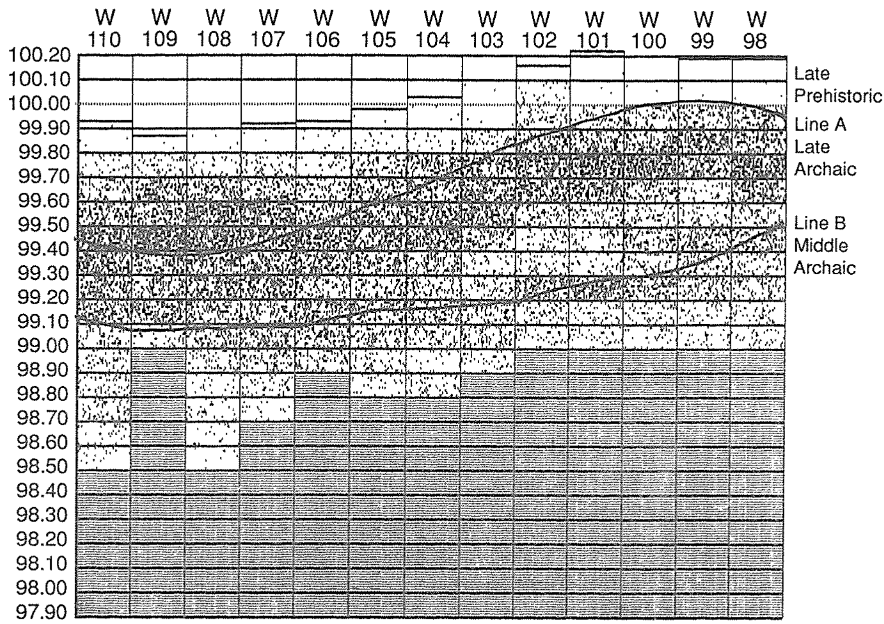

Figure 37. Rabdotus Count (1 dot = 2 shells): N106 Line; W98-110.

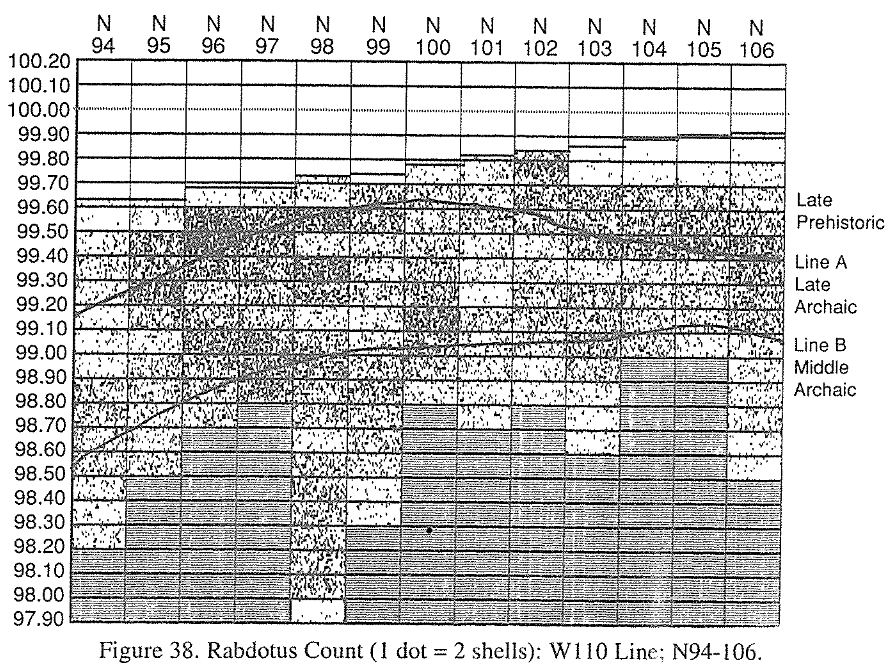

Figure 38. Rabdotus Count (1 dot = 2 shells): W110 Line; N94-106.

of total snail count), but use of the 1/4-inch screen suggests that the other smaller species (Helicina, *Rumina decollata*, Polygyra, and Helisoma) may have been overlooked. While the laboratory records reflect the counts of each species by unit level, only those of the Rabdotus were plotted on the cross-sections (Figures 36-38).

Due to the heavy concentrations of land snails in the matrix of most BRMs, it has been proposed that prehistoric hunter-gatherers collected and utilized these snails as a dietary supplement. Hall et al. (1982:470) support this hypothesis based on the very high protein count of the Rabdotus. Ethnohistoric accounts (Campbell and Campbell 1981:17) corroborate the consumption of land snails in the summer months by South Texas groups. Highley (1986:87-88) recounts that Rabdotus occur in concentrated colonies of up to an acre in size and that these nocturnal foragers seek cover from the daylight heat under rocks and logs, or by affixing themselves to plant stems.

The dietary supplement hypothesis is certainly supported by their ready availability, their high protein, and the ethnohistorical record. It would have been a relatively simple task to collect them and process them at an area where other types of food processing was already taking place. It is also possible that some of the land snails were simply drawn to the sites because of the rich floral and faunal debris, and the subsequent anthropogenic soil development, associated with a cooking site. While any long term experiment to evaluate the natural accumulation of land snails relative to cooking debris could never duplicate the span of 3,000 years or so that these sites accumulated, it would be interesting to test a plot over several seasons to determine the residual accumulation of the snail shells.

Regardless of the reason for the Rabdotus presence, the trench overlays show that the heavier concentrations of snails generally overlie the dense burned rock concentrations and are not coincident to them (see Figures 8, 10, and 12 and Figures 36-38). While the Rabdotus' relationship to the burned rock is not as strongly inverse as that of the debitage to the burned rock, there is no positive relationship. Thus, it would have been the case that the Rabdotus were not an integral part of the cooking process that created the burned rock concentrations. Furthermore, the co-occurrence of the Rabdotus in the BRM and non-midden deposits, both vertically and horizontally, seems to indicate the natural introduction of the snails to the occupation deposits.

In my opinion, an inordinate amount of time was spent in the laboratory counting the snails from the unit levels. Since the Rabdotus recovered from the Blue Hole site were rather uniform in size, the same meaningful comparisons could have been obtained by volumetrically measuring (e.g., 1 cup = 100 Rabdotus) the snails at the site and discarding them. Occasional tests to determine the accuracy of the estimates would insure that the data recorded remained within the 90-95 percent range of accuracy. A unit or two could then be selected for later, in-depth analysis.

FEATURES

Descriptions

Seven features, five hearths, a cache of Castroville dart points, and an unidentified "pavement lens," were identified in the Blue Hole excavations. It is possible that *in situ* hearths may have been unrecognized in the areas and levels of extremely dense burned rock, but the matrix and excavation methods in the other areas were such that any atypical rock concentrations should have been noted. The seven recorded features, briefly described below, are not plotted to the cross-views of the units, but reference to the burned rock and projectile point plots in Figures 8-13 will place the features within the established stratigraphy.

Feature 1, N98W110, levels 2-3.

This configuration of limestone rocks was about 50 cm in diameter and consisted mainly of larger rocks 8-15 cm in diameter. The matrix within 1 or 2 cm of the hearth was a slightly lighter, greyish soil and was harder than the general matrix of the unit, indicating probable heat alteration. There were no large pieces of charcoal in association with the hearth, but matrix samples were taken (not analyzed) for flotation and pollen analysis. An Edwards and a Pedernales point were found in the level above the hearth but were not in association with it. Stratigraphically, the hearth appears at the top of the dense burned rock concentration and, based on the cultural stratigraphy, can be placed at the top of the Late Archaic deposits.

Feature 2, N101W110, levels 10-11.

Only the westernmost part of this hearth was exposed, with the main body of the hearth apparently lying in unit N101W109 (unexcavated) to the east. It consisted of six large rocks 8-15 cm in diameter, and about 15 smaller rocks, and it was about 75 cm wide. No charcoal was present, and the matrix around the hearth was not different from that above or below the hearth. No special samples were taken. A Pedernales point was recovered from level 11, but was not in direct association with the hearth. This hearth occurs in the Middle Archaic deposits, part of the earliest occupations which contributed to the BRM.

Feature 3, N98W110, level 10.

Feature 3 was a dense "pavement lens" separating the black matrix of the BRM and the underlying lighter Q2 deposits. There was no charcoal associated with the feature. It consisted of several, unusually large, flat rocks, the two largest of which measured 25 x 22 x 10 cm and 29 x 32 x 4 cm, respectively. The intervals between the 15 or so larger flat rocks were almost completely filled in with smaller rocks 5-10 cm across. The yellow color of the Q2 alluvium was evident upon removal of this "pavement lens."

A Frio and a Kinney point were found directly on the upper surface of this lens. Samples were taken for flotation and pollen, but have not yet been analyzed. This feature dates to the Middle Archaic.

Unit N98W110 was selected for continued excavations over Labor Day, and it was taken 80 cm deeper. While the matrix continued to lighten through level 12, it then became gradually darker through level 15, when it resumed the natural lightening in color with depth. This suggests that an alluvial episode in the Middle Archaic interrupted the occupation of the site at about level 12. Occupation subsequent to the alluvial deposits then created the lens in Feature 3, as seasonal activities resumed at the site.

Feature 4, N106W110, level 4

This was a shallow, bowl-shaped hearth, consisting of 17-18 medium-sized rocks (5 x 10 cm) and four or five larger, flatter rocks (Figure 39). The central part of the hearth contained no rocks for about 15 cm across. Overall, the hearth would have been about 75-80 cm in diameter. The matrix at this level was a loose, sandy loam without baked or hardened clay. Some small associated char-

Figure 39. Feature 4, Hearth in N106W110, Level 4.

coal pieces were retrieved as samples, and soil samples were taken from the matrix immediately beneath the hearth. No diagnostic artifacts were found in association with this feature. The hearth is within the Late Prehistoric strata and is 20 cm above the Castroville cache (Feature 7).

Feature 5, N106W108, level 9.

This feature was a dark gray, circular anomaly, in the otherwise yellowish brown Q2. Measuring about 35 cm in diameter, it was associated with small bits of unburned bone and burned clay. Special samples were taken but have not been analyzed. There were no rocks around the perimeter, but there was a concentration (10 kg) of burned rock to the east of the feature. In the same level, two Pedernales points were recovered at approximately the same depth. This hearth falls within the Middle Archaic strata, but is below the main BRM.

Feature 6, N94W110, level 13

Perhaps the most distinctive hearth unearthed during our excavations, this slab-lined, basin-shaped burned limestone hearth was in the north half of the unit and extended into N95W110 (Figure 40). Based on the thermal fracturing of the stones, it appeared that the larger perimeter rocks had experienced horizontal

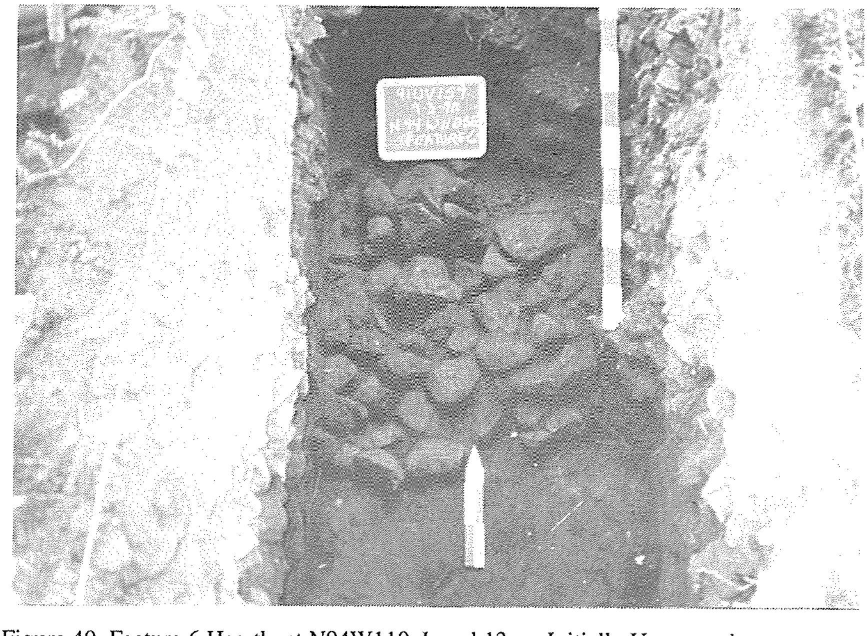

Figure 40. Feature 6 Hearth, at N94W110, Level 13, as Initially Uncovered.

displacement of less than 0.25 cm. Furthermore, there were piles of smaller, fist-sized, severely fractured rocks placed in two adjacent areas to the south of the hearth; these appeared to have been removed from the hearth and purposefully placed near it. The smaller groupings of rocks probably formed a cap over the hearth during the cooking process, and, severely heat fractured, were removed at completion. Two Pedernales points were found in direct association with the hearth, and several nodules of charcoal, one piece approximately 2 cm across, were retrieved.

Part of the larger piece of charcoal was submitted for radiocarbon assay at The University of Texas Radiocarbon Laboratory and an absolute date of 3840 ± 70 B.P. (TX-7057) was obtained. The calibrated date ranges (Stuiver and Reimer 1986) for the sample are 2468-2146 B.C. (4416-4096 B.P.). This is quite consistent with the stratigraphy, and the feature is attributed to the Middle Archaic. The date range obtained also supports the chronological placement of the Pedernales projectile point type at Blue Hole.

Feature 7, N106W110, level 6.

Two levels below the Late Prehistoric hearth (Feature 4), a Castroville point (U.I. #434) was discovered *in situ* in the southeastern quadrant of the unit. After it was removed and excavation continued, a rock concentration (Figure 41) was identified immediately below it, which contained two more Castroville points

Figure 41. Castroville Point *in situ* in Feature 7 at N106W110, Level 6: U.I. #439.

(U.I.s #437 and #439), a large preform (U.I. #444), and a marine shell. All of these specimens are shown in Figure 42. A large bison tooth was recovered in general association with the cache. To speculate on the significance of this accumulation of artifacts, it is quite certain that they were placed in that particular association by Late Archaic peoples; the cache may also have had ritual significance. All of the points evidenced extremely fine workmanship and may well have been manufactured by the same individual.

Archeomagnetic Sampling

The hearth identified as Feature 6 at N94W110, in addition to yielding the charcoal samples for the radiocarbon assay discussed previously, was also subjected to archeomagnetic testing. The hearth features at the Smith Site, also being excavated as a part of the TAS Field School, were a major focus of study, and highly specialized coring equipment was used to retrieve and record samples for laboratory testing. On the last day of the Labor Day excavations, a crew brought the equipment to the Blue Hole site and retrieved eight cores from the hearth limestone cobbles. The cores, approximately 2.5 cm in diameter, were removed from selected *in situ* hearth stones and recorded so that their exact physical orientation could be reconstructed in the laboratory.

While the location of magnetic north is near, over time, the location of rotation north, secular variation takes magnetic north on excursions with variations up to 20 percent. Paleomagnetism is the study and reconstruction of the history of the earth's magnetic field. Simply put, whenever a rock is heated to a certain point, it acquires a very stable permanent magnetism pointing in the direction of magnetic north at the time the rock was so heated. Likewise, the strength of the magnetism is proportional to the strength of the magnetic field. This remnent magnetism is referred to as thermo-remnent magnetism (TRM). All rocks which cool from high temperatures acquire a TRM and, provided this remnent magnetism is not subsequently altered, they will carry the memory of the magnetic field which caused the remnent magnetism (Strangway 1970).

The elements of the magnetic field which can be measured at any given location are declination, the direction of magnetic north; inclination, the angle of dip below the horizon; and intensity, total field strength. Archeomagnetism applies these premises of paleomagnetism to the past few thousand years in tracing the secular variations in the magnetic field. The application in archeology is twofold: first, in identifying the *in situ* status of hearths or kilns, and second, as an eventual alternative absolute dating method.

By reconstructing the orientation of the hearth stones in the laboratory, the declination, inclination, and intensity of each core can be extracted. If all cores exhibit nearly identical plots of the natural remnent magnetization (NRM), it is relatively certain that they were in fact heated simultaneously in either a single heating or cooking episode. Further testing involves thermally demagnetizing

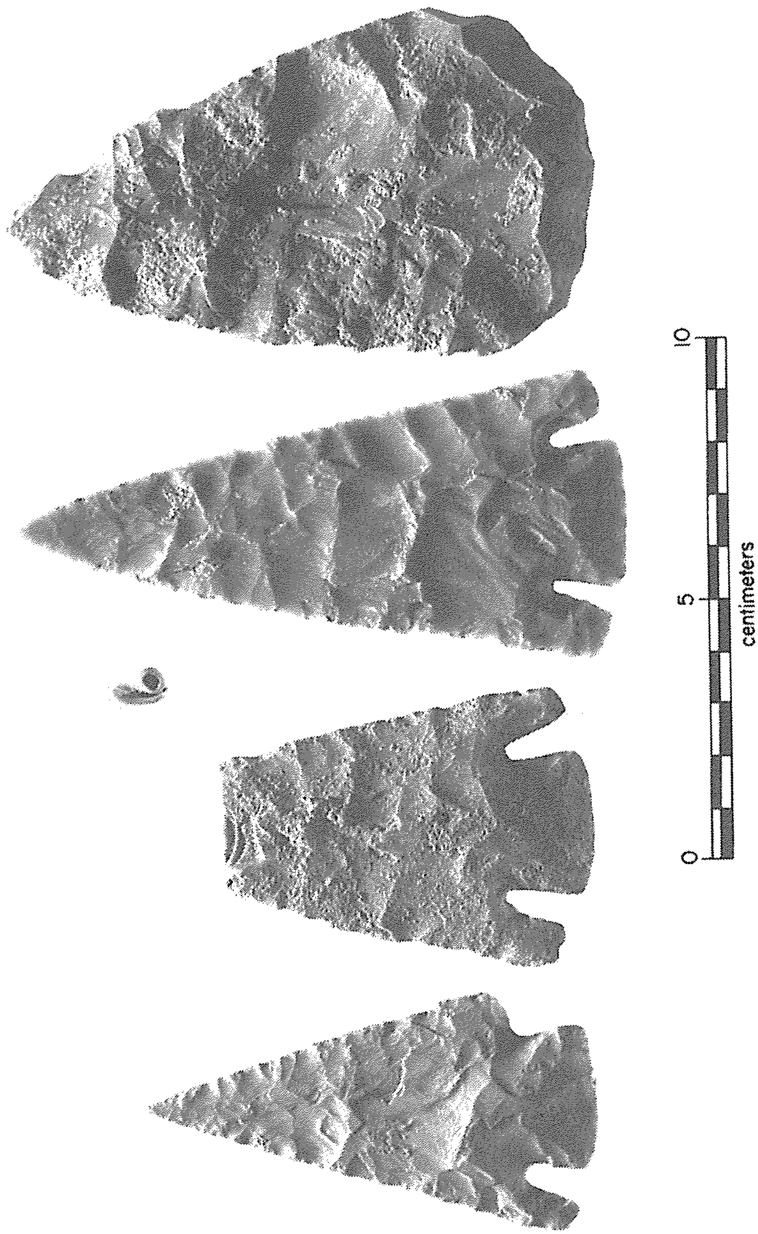

Figure 42. Castroville Points, Preform and Marine Bead from Feature 7 Cache. Left to right: U.I.s #437, #434, #442 (marine bead), #439, and #444 (preform).

Table 3.

Archeomagnetic Data from Feature 6.

Sample	Declination	Inclination	Intensity
1	8.8	47.0	2.63D-07
2	315.2	18.6	1.53D-05
3	18.8	33.1	1.23D-05
4	4.9	39.2	1.30D-05
6	10.1	43.9	1.89D-05
6A	309.8	25.6	1.89D-05
8	4.7	38.1	1.81D-05
9	0.5	44.1	2.26D-04

the samples by heating them in 50° C increments (in a controlled non-magnetic environment) until the samples reach a higher component of magnetization. At this higher temperature, a sample then assumes the magnetic properties of its orientation at some point in time prior to its alteration in the heating episode, or simply "reverts back" to what the NRM would have been if the sample had not been thermally altered. This further enables the researcher to define the temperature reached in the stones during the cooking episode.

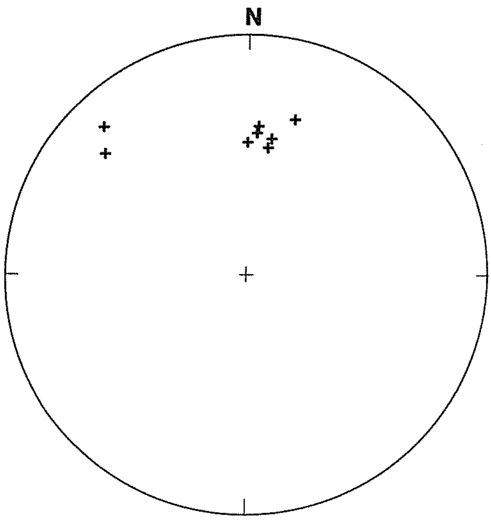

Figure 43. Pole positions for Archeomagnetic Samples from Feature 6.

By associating absolute dates, using radiocarbon dating or other methods, with a series of plots of NRMs for any given general geographic area, an archeomagnetic path can be established. This route can then be used to plot and date any future archeomagnetic sample, just as dendrochronology sequences are now used. While an area curve for the Edwards Plateau area has not yet been established, each of the samples that are dated will hopefully lead to an area curve that will enable the accurate dating of future archeomagnetic samples from the area.

The specific data obtained from the archeomagnetic samples from Feature 6 are provided in Table 3, and the plot of the NRMs is shown in Figure 43. The samples from Feature 6 were further demagnetized in 50° C increments to 450° C (The laboratory records are on file at the Paleomagnetic Laboratory of the Department of Geological Sciences at The University of Texas at Austin). Similar archeomagnetic analyses have been performed on hearthstones from the Camp Pearl Wheat site in Kerr County, Texas (Collins et al. 1990:69-78). The results from the tests at the Smith site (41UV132) are reported in Smith (1990).

Since the laboratory records were not available for review, it is impossible to collate the sample numbers assigned in the laboratory to the assignation of the hearth stones. But it is most apparent from the plot of the NRMs that six of the samples are in fact part of an *in situ* hearth with only very minimal subsequent settling or alteration.

SUMMARY

The Blue Hole site (41UV159) is a prehistoric site occupied by the ancient peoples of the Sabinal Valley over several thousand years. While the bulk of the cultural deposits at the site occurred in the Archaic, the Late Prehistoric is also represented along with one Late Paleoindian period artifact. The site is located on an alluvial terrace on the east bank of the Sabinal River, about 13 km south of Utopia, Texas, in Uvalde County. It was first recorded by the UT 1989 Summer Archaeological Field School survey crews, and was selected for excavation as a major part of the TAS 1990 Summer Field School.

The environment and resources near the Blue Hole site were major factors in the selection of the site by prehistoric peoples. The occupations took place on an elevated terrace within 100 m of the "Blue Hole," which was probably a deep, year-long source of water. The stream beds provided an unlimited source of stream-rolled limestone cobbles which were utilized in cooking tasks at the site. The site's location at the southern edge of the Balcones Escarpment placed the varied resources and habitats of both the Edwards Plateau and the South Texas Plains within reach of mobile prehistoric hunter-gatherers.

A major portion of the Blue Hole site consists of a burned rock midden, a Central Texas phenomenon which is usually a large accumulation of fire-cracked and discolored limestone. Though the specific origin of the burned rock midden continues to be debated among archeologists (Hester 1991), it appears that groups congregated repeatedly at favored locations to engage in a cooking process that used limestone which was then abandoned or discarded. Lithic artifacts are common in and adjacent to these burned rock middens. UT survey crews learned that the Blue Hole site had long been a favorite of local projectile point collectors, and we anticipated a high artifact recovery rate in the excavations.

The initial strategy at Blue Hole was to excavate 2 m units along intersecting lines from beyond the perimeter of the midden accumulation into the midden proper, thus giving a broad view of the burned rock concentrations as well as any adjacent occupation areas. We also excavated several test units in perimeter areas to provide visiting geomorphologists the opportunity to develop the alluvial chronology of the terrace. After determining that some of the initially selected units had previously been dug by an artifact collector, the excavation plan was shifted to avoid the disturbed areas, and resulted in two intersecting 1 m wide excavations.

The geomorphological interpretation of the terrace deposits suggests that the site terrace was an accumulation of alluvial episodes which occurred in the Early to Middle Holocene (10,000-5000 B.P.). The cultural deposits then formed upon this reasonably stable landscape surface. This temporal estimate enabled us to anticipate identifying cultural strata from the Middle Archaic, or possibly Early Archaic, period with little likelihood of identifying any Paleoindian occupation zones in the TAS excavations. Later cores taken to 3 m below the floors of selected units in the main excavation area confirmed the nature of the major Early to Middle Holocene alluvial deposits.

As the excavations proceeded vertically, it was apparent that the relative chronology of the Blue Hole site conformed closely to that established for South Central Texas. However, anthropogenic soil development had generally erased any natural stratification within the alluvial deposits, which might otherwise have separated occupational strata in the profiles. In order to define occupational strata, the 268 diagnostic projectile points recovered in the excavations of the 1 m intersecting lines were plotted onto unit cross-sections. Similar cross-sections of the units were plotted for: Burned rock weight; Lithic debitage; Rabdotus; "Semi-unique" items; and Frio/Ensor points. The computer plots of the burned rock weight, the number of debitage flakes, and Rabdotus shells enabled internal comparison of each of these remains with each other to evaluate the site stratigraphy.

Projectile points recovered from the uppermost deposits included four types of Late Prehistoric arrowpoints: Perdiz; Sabinal; Scallorn; and Edwards. Fifty-nine Frio and Ensor type points were recovered, which are generally attributed to the Transitional Archaic. However, because these types were unevenly dispersed in the deposits, no differentiation of the Transitional Archaic was made at Blue Hole. Separate analyses of the morphological attributes of the Frio and Ensor specimens suggest grounds for internal temporal differentiation. Late Archaic points included 64 Marcos, Castroville, and Montell projectile points, with

Montell the predominant marker for the Late Archaic period. Pedernales (52 specimens) was the primary type marking the Middle Archaic, along with an additional 19 Marshall, Kinney, and Langtry points. There were seven Early Archaic points (La Jita, Nolan, Martindale, Uvalde, and Early Triangular types). The only Paleoindian type recovered was a Plainview, found out of context in the Late Prehistoric deposits.

Other stone tools recovered from Blue Hole include a Friday Biface, a probable corner-tang biface fragment, a perforator, and three cylindrical hammerstones, one of petrified wood and two of limestone. Five decorative or ritualistic artifacts were obtained from various deposits at the site.

Rabdotus, the main land snail recovered in the excavations, was examined to determine their relationship to the artifacts. While no conclusive relationships were established to support or discredit their role as "dietary supplements," this data should help formulate further research designs regarding snails.

The Blue Hole site excavations identified seven distinct features: five hearths, an apparent cache of Castroville projectile points, and an unidentified "pavement lens." Of these features, the hearth (Feature 6), found in the deepest excavations near the perimeter of the burned rock midden proper, was radiocarbon dated to between 2468-2146 B.C. (calibrated). Two Middle Archaic Pedernales projectile points were in association. Archeomagnetic sampling of the feature stones showed that it was an *in situ* hearth complex. The Late Archaic Castroville cache (Feature 7) included a marine shell ornament.

The excavations at the Blue Hole site recovered an enormous amount of data relative to the Middle through Late and Transitional Archaic periods, and this analysis and future studies of the information should provide further insights on the burned rock midden phenomenon and the prehistoric settlement of the Sabinal Valley area. The cross-sectional analyses of the burned rock, lithic debitage, and land snail concentrations can be used for comparison with those of previous excavations in burned rock middens in South Central Texas, and, hopefully, as a guide to plan and analyze future excavations in the region.

A tremendous amount of hard work by TAS members during the 1990 Field School excavations contributed the data analyzed in this paper. The 60 members who returned to the Blue Hole site over Labor Day weekend to continue with the excavation objectives completed the area needed for this partial reconstruction of the site's cultural history. Their dedication and personal commitment at the Blue Hole site has added yet one more chapter to the reconstruction of the lifeways of the prehistoric inhabitants of the area.

A great number of prehistoric sites in the upper Sabinal Valley were documented and recorded by the surveys conducted as part of the 1990 TAS Field School. This area of Texas obviously contains some of the richest material records of these early inhabitants, particularly during the general period of 5000 B.C. to the birth of Christ. It is incumbent upon the professional and avocational archeologists to continue the investigation and documentation of the archeological record within this valley. It is similarly essential that the residents and landowners of this lovely valley protect the valuable cultural resources which are preserved there.

ACKNOWLEDGMENTS

The excavations at the Blue Hole Site were made possible by the hard work and dedication of the Texas Archeological Society, and my first "thank you" goes to the approximately 150 members who braved the June heat of 1990 in South Central Texas to excavate the site. Also, thanks to the 60 members who returned over Labor Day, thus filling in many of the parts of the puzzle. The organization and logistic preparation by the TAS Board of Directors and the Field School Committee enabled the excavations to progress efficiently.

I would like to thank Dr. Thomas R. Hester for his direction as the excavation's Principal Investigator, both in terms of technical expertise and moral support. Special thanks also to Dr. James A. Neely, who with Dr. Hester, assisted me on my thesis committee, and to Dr. Samuel M. Wilson, who assisted with the statistical analyses employed in the Frio/Ensor typology.

The property owner, Mary K. Kindred, was most gracious and cooperative, not only in granting us exclusive access to the site, but in tolerating our dusty daily arrivals and departures. I sincerely hope this report enhances her interest, along with that of sons Danny, Donny, and Douglas, in the archeology and prehistory of their beautiful ranch.

The strongest and most consistent effort in the completion of this report was made by TAS member Bob Vernon, who programmed and provided the computer reconstructions of the cultural deposition of the site, around which this paper is focused. Besides his time and expense in working with me, his feedback prior to the Labor Day session, and after the completion of the excavations, was greatly appreciated.

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Burial to Bronze: Excavation, Analysis, and Facial Reconstruction of a Burial From the Wilson-Leonard Site, Texas

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ABSTRACT

In 1983, the skeleton of a female human was found beneath Late Prehistoric, Archaic, and Late Paleoindian cultural components during excavation at the Wilson-Leonard Site (41WM235) on Brushy Creek north of Austin, Texas. One of the six most complete Paleoindian skeletons recovered in North America, the analysis revealed information about the biological nature and health of this early North American inhabitant. The skull was complete but crushed. Skull measurements and casts of skull fragments were used to rebuild the skull to a form as anatomically correct as possible for this individual. The rebuilt skull was used to sculpt the face in clay using tissue depths of bony landmarks. The end product, a collaboration between an anthropologist and a sculptor, is not an imaginative artistic work but reflects some of the individual anatomical features of this particular skull based on the underlying cranial architecture. The process of facial reconstruction was viewed by the public as part of a Houston Museum of Natural Science educational program on the biological evidence of the first Americans. A bronze was cast from the clay sculpture and is on display at the Houston Museum of Natural Science.

INTRODUCTION

Our interest in the human remains from the Wilson-Leonard site (41WM235) can be directly traced to an interest in the origins of our species, *Homo sapiens*, and its dispersal throughout the world. Current knowledge suggests that modern humans arose sometime between 500,000 and 200,000 years ago. We are uncertain whether our species first appeared in a specific locality (some say Africa, some say the Middle East) and recolonized the Old world, thus displacing the older species *Homo erectus,* or whether our species gradually arose from *Homo erectus* throughout Africa and Eurasia.

However we began, the last contingents to be colonized by humans were Australia and the Americas. Since these continents have been the most recently colonized, we are hoping our understanding of these peoples and their migration events will help us to understand better the earlier processes which led to the establishment of modern humankind and our dispersal throughout the world. The Wilson-Leonard site is particularly important in our quest for an understanding of the origins of the first Americans and the origins of all humankind because of the site's antiquity and the antiquity and completeness of the burial remains.

THE WILSON-LEONARD SITE

In 1983, the Texas State Department of Highways was excavating the Wilson-Leonard Site on Brushy Creek, approximately 30 km north of Austin, Texas, when the skeleton of a human female was found three m below the present ground surface and beneath excellent Late Prehistoric, Archaic, and Late Paleoindian cultural components; these cultural time periods span the last 12,000 years (Weir 1985). The burial pit was apparent in plan and section and the original depth of the grave was approximately 30 cm. Interred with her was a fossil shark's tooth found at the proximal end of the left humerus, a granitic sandstone chopper with pigment stains, and an angular fossiliferous limestone cobble under which were found several particles of charcoal. This charcoal was submitted to the University of Arizona for dating through their tandem accelerator. Reduced to only one mg of fine charcoal, a date (AA-171) of 13,000 ± 3,000 years before present (B.P.) was produced. Two other assays using standard radiocarbon dating methods and yielding smaller deviations were derived from the soil humates within the burial pit and are probably more accurate dates for the burial. These are 9,470 ± 170 (Tx-4787) and 9,650 ± 120 (Tx-4793) years B.P. Soil humate dates can be equal to, but are generally younger than, the actual time of deposition. The human bone was dated by the AMS technique, and yielded radiocarbon ages of between 1270 to 6700 B.P. (Stafford et al. 1987). These determinations can be accepted as minimum estimates only (Collins et al. 1993).

In 1992-1993, excavations at the Wilson-Leonard site were conducted by the staff of the Texas Archeological Research Laboratory, The University of Texas at Austin. The purpose was to obtain geological, radiocarbon, stable isotope, archeomagnetic, phytolith, diatom, and organic residue samples. These new samples are undergoing analysis (Collins et al. 1993).

The stratigraphy at the site clearly documents the provenance and antiquity of the interment pit. The two soil zones immediately above the burial strata contained traditional Paleoindian dart point forms including Midland, Plainview, Scottsbluff, and Angostura. Seven specimens of a thick and notched dart point form ("Wilson" points), and three lanceolate type specimens were found in the soil strata associated with the burial. Below the burial the oldest and most discrete evidence of human occupation of the site was found. This assemblage contained one very thin lanceolate projectile point associated with at least one butchered bison. At the time of interment the individual was placed in the burial pit on her right side in a semiflexed position facing west.

LABORATORY ANALYSIS OF THE BURIAL

With an estimated time of death approximately 9,500 years ago, the Wilson-Leonard burial represents one of the four oldest individuals recovered in Texas, and one of no more than 25 individuals of comparable age recovered in North America. When one considers the completeness of the remains, the Wilson-Leonard specimen represents one of the six most complete Paleoindian skeletons recovered from North America. It is on the basis of these few remains that we evaluate the biological nature and health of the first human populations to colonize the New World. Consequently, each of these individuals is of extreme importance to our understanding of the peoples of the Americas.

While the study of the biological remains of these Paleoindians has just begun, there are a few evaluations which can be made at this time. The adult female from the Wilson-Leonard site is represented by the major portion of the skeleton. She was in her mid-20s to mid-30s at the time of death, and there is no evidence for the cause of death. She was of modest height by today's standards with an estimated stature of 157.0 ± 6.0 cm (62 ± 2.5 inches), but her stature falls near the female mean for Archaic and Late Prehistoric hunters and gatherers from Central Texas. Her teeth were in remarkably good condition at the time of death, exhibiting very slight wear on the molars and moderate wear on the incisors. A much greater degree of wear is typically seen on burials of hunters and gatherers of the Archaic and Late Prehistoric cultural periods within the same geographic region. No cavities were apparent in the teeth, and only slight calculus was present.

It would be particularly satisfying to have a clear perspective of this individual's biological affinities, but rarely can one individual reflect the nature of the populations to which she or he belongs. The presence of shovel-shaped lateral upper incisors is certainly indicative of this individual's affinities with Mongoloid populations of northern Asia and later North American Indian populations. The central upper incisors, on the other hand, are not as markedly shoveled as is typical of most individuals in more recent northern Asian and North American Indian populations. Similarly, the slight prognathism of her upper palate is not the norm of later hunter and gatherer populations within the region. Since both of these latter characteristics occur in more recent populations, but in a minority of individuals, we are left with an unanswered question. Is the Wilson-Leonard individual representative of the norm of an earlier population which differs slightly from more recent hunters and gatherers, or does she represent an individual reflecting the normal range of variation which we see in more recent populations? In other words, were the first Americans a part of the same human population as later North American Indians, or did these earlier populations out of northern Asia represent a different population and a different migration event? Only with careful comparative analyses of rare finds like the Wilson-Leonard female will we ever be able to resolve these issues.

CASTING AND REBUILDING THE SKULL

The cranium of the Wilson-Leonard individual was crushed and fragile, inhibiting handling and analysis (Figure 1). An acrylic medium was used to make a cast of the skull which exactly reproduced the original shape as well as reflected the damage to each side of the skull and the distortion and displacement of the left side facial bones (Figure 2).

The original cast was preserved as a reference and a second cast was used to rebuild the skull to reflect as close as possible the correct anatomical shape of this particular individual. The second cast was altered by cutting it apart with a dental burr, so that the pieces could be reassembled in their correct positions. Working from the original cast, D. Gentry Steele estimated skull dimensions in millimeters: Maximum cranial width, 125 mm; Maximum cranial length, 175 mm; Bizygomatic arch, 122 mm; Palate width, 56-60 mm; Nasion-gnathion, 115 mm; Gonion-gonion, 94-95 mm; and Nasospinale-gnathion, 66 mm.

Much of the cranium was sculpted in clay to these overall dimensions. Casts of the temporal bones (including the external auditory meatus and mastoid process) were cut from the second cast and pressed into the clay cranium. The casts of the grontal bone, right orbit, right zygomatic arch, and entire maxilla had little distortion and were readily positioned into the clay. The left side of the facial bones was sculpted entirely of clay, using the opposite configuration and dimensions. The skull, rebuilt in clay incorporating the cast bone fragments and the rebuilt mandible, was ready for facial reconstruction (Figure 3).

FACIAL RECONSTRUCTION BACKGROUND

The facial reconstruction of the oldest known female American Indian from Texas was sculpted by Betty Pat. Gatliff in January, 1990, at the Houston Museum of Natural Science. The week-long process was viewed by the public as part of an educational program on Texas prehistory that included the importance of studying human biological remains.

The reliability of the facial reconstruction procedures developed and used by Ms. Gatliff has been tested in modern forensic cases (Gatliff 1984; Gatliff and Snow 1979). Unidentified remains, when facially reconstructed, have been identified by families and friends who were able to produce photographs of the deceased. Comparing clay reconstructions to photographs has supported the ability of the techniques used to accurately reconstruct individual facial features. Ms. Gatliff has sculpted 140 facial reconstructions on unidentified forensic

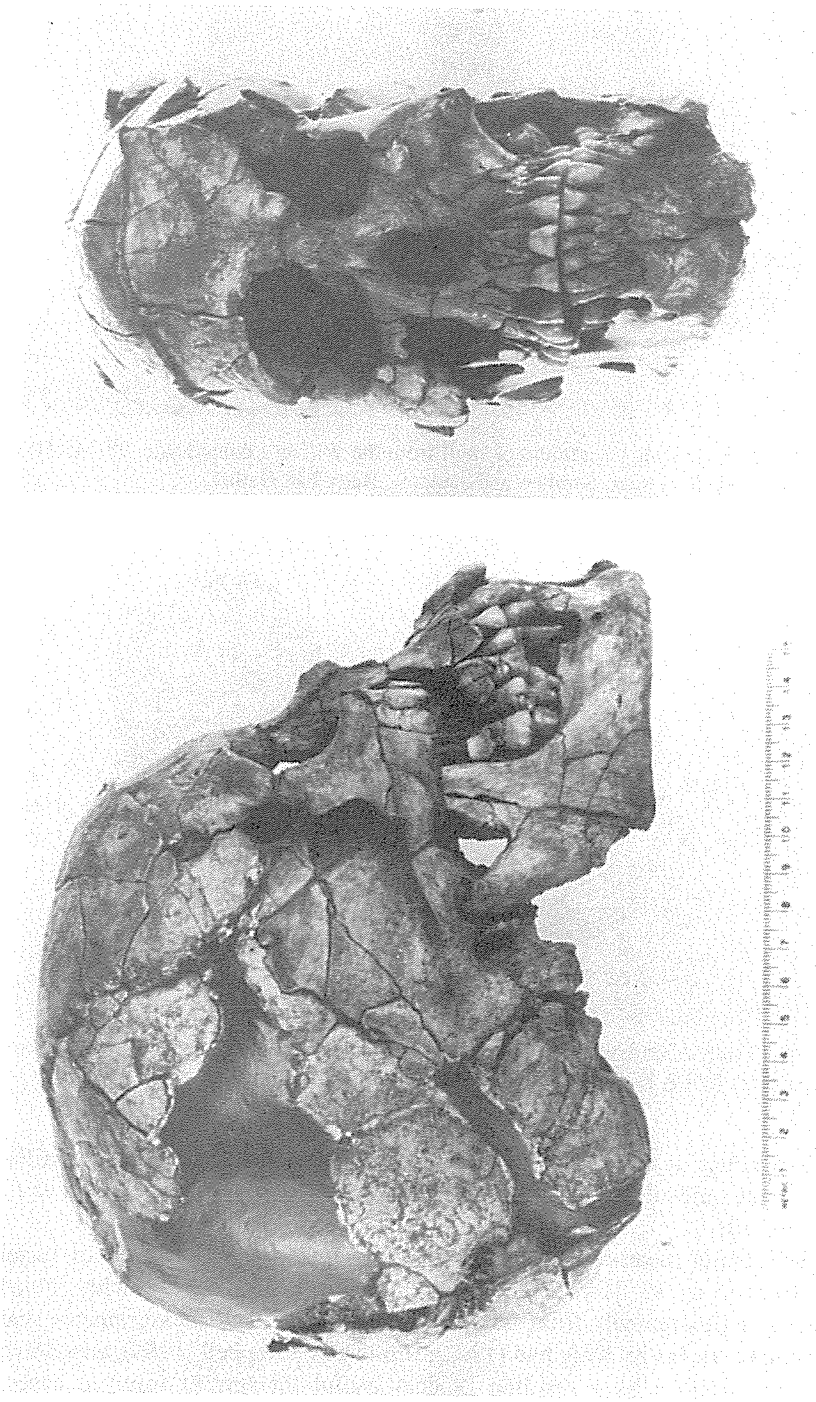

Figure 1. The female skull from the Wilson-Leonard Site.

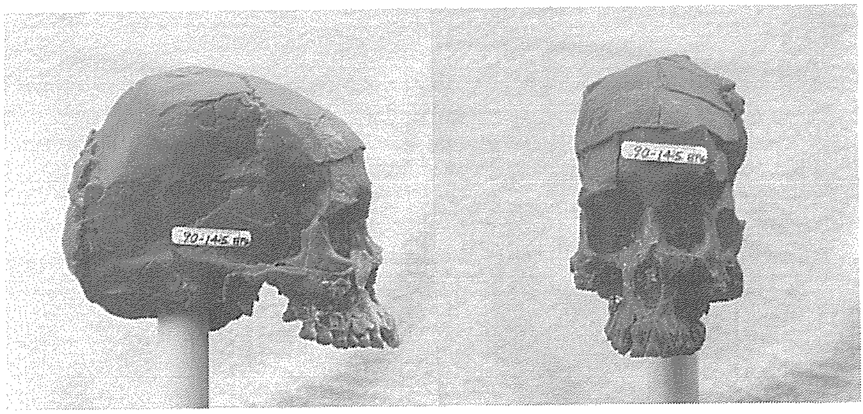

Figure 2. Acrylic casting of cranium of skull from the Wilson-Leonard Site. 90-145-BPG identifies this skull by year, number, and sculptor, Betty Pat. Gatliff.

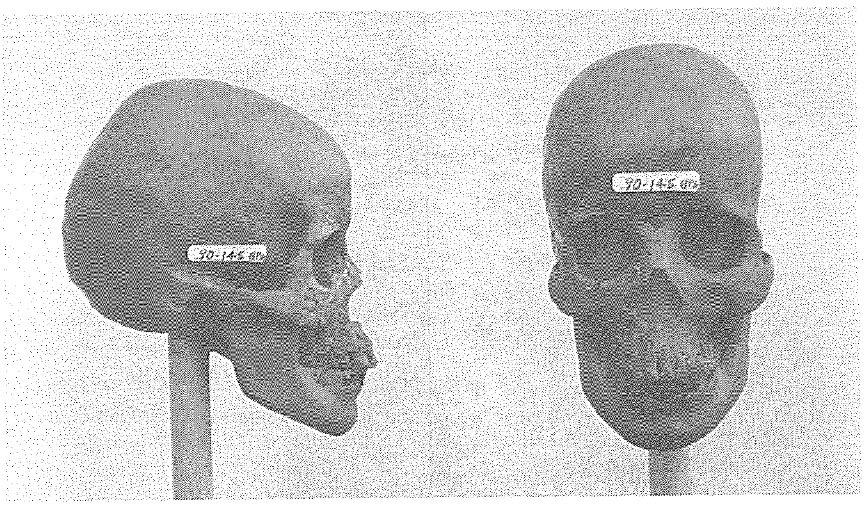

Figure 3. Skull reconstruction in clay using portions of the acrylic casting. Skull measurements by Dr. D. Gentry Steele.

cases, resulting in 105 identifications. Identification in forensic cases is difficult because unidentified mortalities are frequently criminal victims, runaways, and transients.

Skin depth measurements from 28 individuals were first used in facial reconstruction by W. His (1895). In 1898, J. Kollman and W. Buchly added additional measurements from 53 individuals. Skin depth measurements and comparative studies by Krogman (1962), Rhine and Campbell (1980), and Rhine and Moore (1982) have resulted in data useful on current forensic cases, particularly in America. It is helpful to have the tables divided by emaciated, normal, and obese, as well as by sex and race.

Each individual skull dictates the location, size, and/or form of all of the features: mouth, eyes, nose, and ears. The shape of the face is based on tissue thickness. A physical anthropologist examines the skull to determine the individual's sex, race, and age. Depths of the soft tissues of the face are different in males and females of the three major racial groups. The individual's age at death, as well as individual anatomical peculiarities, diseases, and injuries, influence the facial features of the person during life and must be considered during reconstruction. For example, tissue depth and muscle tone change over time, and to correctly reflect the individual must influence the reconstruction processes.

FACIAL RECONSTRUCTION: PROCESS

The process of facial reconstruction follows a set pattern of procedures with the individual skull measurements and determined tissue depths directing the sculpting process. To begin the process, the rebuilt clay and cast skull was mounted on a stand maintaining the Frankfort horizontal plane. Rubber cylinders were cut according to the appropriate tissue thickness for each of the 18 facial landmarks. Since there are no data for tissue thickness for prehistoric populations, for this reconstruction, Gatliff used the tissue thickness charts compiled by Kollmann and Buchly (1898) because the diet and physical lifeways of prehistoric Indians is closer to nineteenth century Europeans than to late twentieth century Americans (Figure 4). Tissue thickness includes in one measurement the size of the muscle, fatty tissue, and the skin thickness. The cut rubber cylinder markers were glued directly onto the rebuilt skull (Figure 5). The markers were connected using modeling clay, sometimes called plasteline. The open spaces were then filled in to form the shape of the face.

The mouth was formed by the shape of the front teeth. Three dimensions were used in this process: (1) the depth, tissue marker #7 (see Figure 4), of the upper lip margin; (2) the vertical thickness of the lips measured gumline to gumline on the teeth; and (3) the width of the mouth, which is approximately the distance between two lines radiating out from the junction of the canine and first premolar on each side. Basically, the lips cover the front six teeth.

The mouth barrel was bent around the teeth, and the parting line of the lips was creased horizontally along the halfway line and to each edge, to mark the width (or corners) of the mouth. Chin and cheek areas were connected to the mouth barrel. Lips were spread, rounded, and striated to give a life-like appearance and texture.

In facial reconstructions, the eye is a clay ball centered within the bony orbit. The iris and pupil are carved out to give the eye expression. It is important to construct the eyes to be anatomically correct, and thus the shaping of the eye

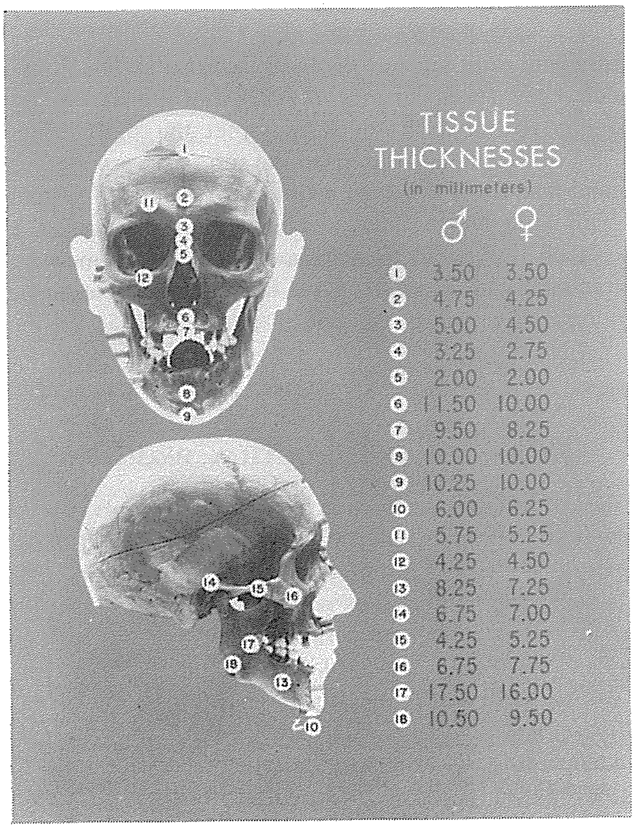

Figure 4. Average tissue thickness (adapted from Kollman and Buchly [1898]).

follows certain anatomical guidelines: (1) the apex of the cornea is approximately tangent to a centrally located line drawn from the superior and inferior margins of the orbit; (2) eyelids bend around the eyeballs, which give them the proper three-dimensional quality; (3) the lower lid comes up to the bottom of the iris; and (4) the pupil seems to hang from the upper lid.

There appears to be no relationship between the shape of the orbit and the shape of an individual's eyelids. A pleasant appearance can be given by closing the lids just slightly and forming a little puff under the eye, just as a person appears when starting to smile.

The human nose is based on two simple measurements: the width and the projection. The width is computed by measuring the bony nasal aperture at its widest points and increasing the dimension by 10 mm. The projection from sub-nasale to pro-nasale is three times the length of the nasal spine, which establishes the tip of the nose. The tip of the nose can then be connected with the bridge

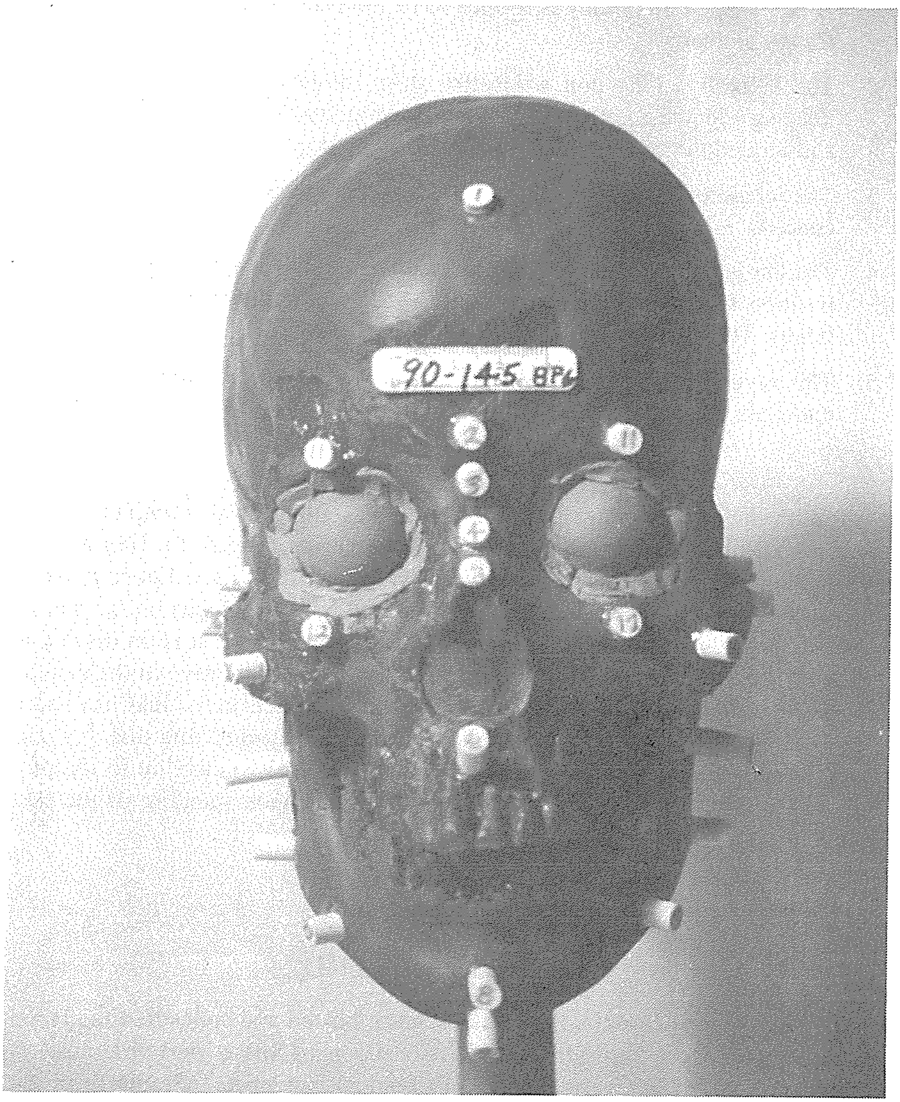

Figure 5. Tissue thickness markers glued on bony landmarks of the Wilson-Leonard skull.

and built out to the width measurement. To complete the process of forming the nose, the wings were rounded and the nares carved out to complete the nostrils.

The skull gives the location of the ear but no clues about their exact shape. A rule of thumb is that the ear and nose are approximately the same length. Ears are constructed in five steps:

1. A "C" shaped bit of clay is formed to be the concha, and spreads at the top for the antihelix.
2. The helix is a long thin worm-like strip, rolled and pointed at one end. Starting with the pointed end, it is curved around and fastened to the antihelix and around the concha.
3. The lobule is flattened and added to the lower portion of the ear, under the concha.
4. The ear is attached and the clay is smoothed into the side of the head. (To position the ear, the external auditory meatus should be at the top of the tragus. The ear is tipped back at about 15 degrees.)
5. The tragus is constructed and attached, and then smoothed into the cheek to complete the ear.

With the attachment of the ears, the facial sculpture was complete, as far as using all of the information that the skull revealed (Figure 6). Hair style is very difficult in prehistoric cases. It was decided for the Wilson-Leonard specimen to make the hair medium length, to fall below the earlobes on the sides.

The Wilson-Leonard clay sculpture was cast in bronze. It is on display at the Houston Museum of Natural Science, a respectful alternative to the display of human remains. From burial to bronze, this unnamed individual has had a singular effect on the public. Museum visitors are amazed to find that the Wilson-Leonard female looks much like them. This visual connection to the past humanizes our ancient ancestors and facilitates our understanding of the first Americans.

ACKNOWLEDGMENTS

The Houston Museum of Natural Science hosted and sponsored the facial reconstruction of the burial from the Wilson-Leonard Site as part of a museum program, "The First Americans: The Biological Evidence." Grants from the Texas Committee for the Humanities, a state program of the National Endowment for the Humanities, and the Anchorage Foundation made this project possible. Dr. Frank A. Weir and the Archaeological Studies, State Department of Highways and Public Transportation in Austin, loaned the cast of the Wilson-Leonard skull. Lewis Sadler, University of Texas Health Sciences Center in Dallas, provided the second acrylic casting and photographs of the original skull.

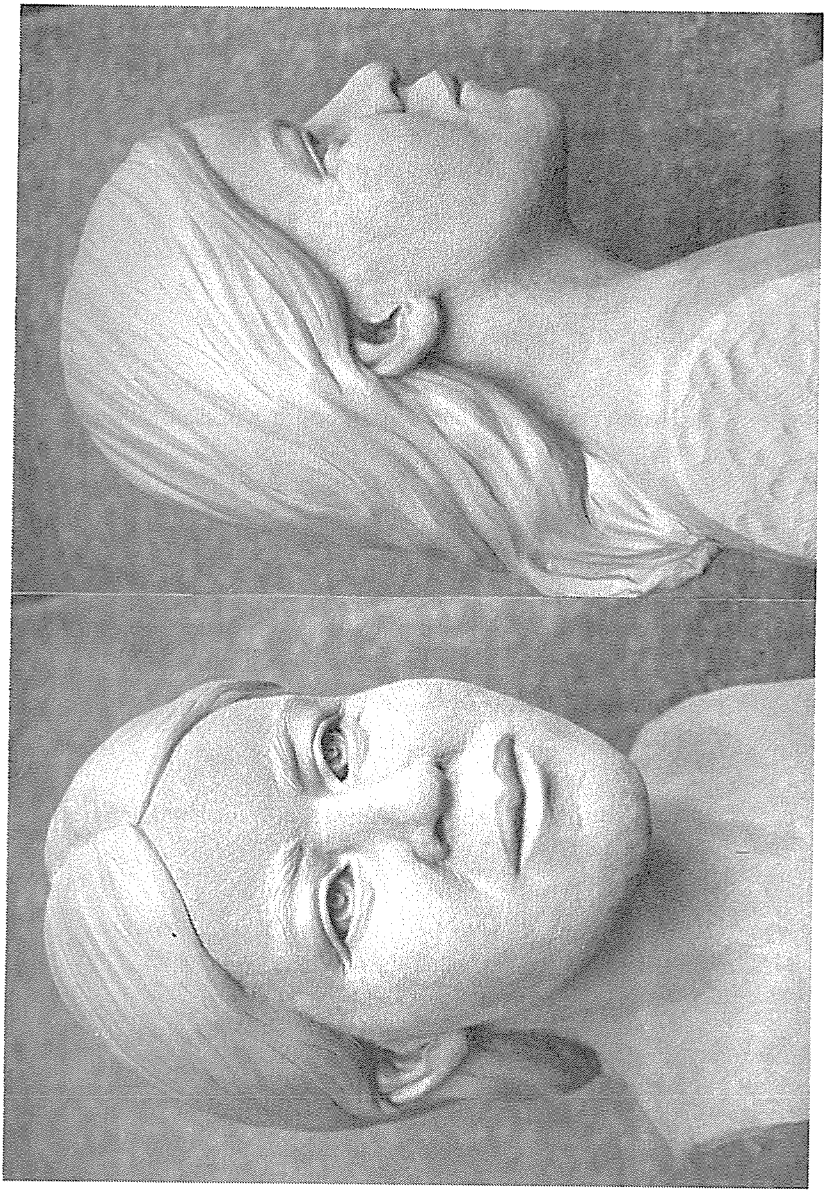

Figure 6. Completed sculpture of facial reconstruction, Wilson-Leonard skull.

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The Cunningham-Gray Collection from Austin County, Texas

Grant D. Hall

ABSTRACT

An assemblage of 82 artifact specimens collected from a site or sites along the Brazos River in Austin County is described. Dart points and arrow points present in the collection are diagnostic of the Late Paleoindian (Angostura) to Late Prehistoric periods, with a full Archaic sequence represented as well. Also present are conch shell pendants and two ground stone artifacts, a celt and an adze. The celt and adze are made of stones likely originating in the Ouachita Mountains of Arkansas. The presence of the shell ornaments and exotic ground stone artifacts is consistent with findings previously made at certain Late Archaic cemeteries in the lower reaches of the Brazos and Colorado rivers.

INTRODUCTION

The specimens in the collection described here were picked up over a period of years by a resident of Austin County as they eroded out of cattle trails cutting through a bluff face leading down to the floodplain of the Brazos River. The locations of sites yielding the artifacts are not published at the request of the property owner. The collection is now in the possession of individuals residing in Houston, Texas. Further details concerning the sites and collection are on file at the Texas Archeological Research Laboratory, The University of Texas at Austin.

The individual who collected these artifacts is now long-deceased. It was therefore not possible to obtain his direct account of the circumstances under which the finds were originally made. Members of the collector's family were, however, able to specify a short stretch of the Brazos River as the area where the artifacts were found. Several prehistoric sites are officially recorded for this general area and, in the absence of a thorough archeological survey, it is possible that some additional unrecorded sites are present. Alhough it is the impression of the relatives that the finds were all made on one site, it is more likely that the assemblage is an amalgam from several sites present in the vicinity. This conclusion is based on observations made by the author and Mr. Joe Hudgins during limited reconnaissance activities in the area.

ARTIFACT DESCRIPTIONS

All of the specimens in this collection are made of stone or shell. Four general descriptive categories are defined for the stone artifacts: Thick Bifaces, Thin Bifaces, Uniface, and Ground Stone (Table 1). Among the lithics, 66 of the 68 chipped stone specimens are made of chert. There is one piece of brown petrified wood and one of jasper (brown to light brown "moss agate"). A celt and an adze represent the ground stone category. The adze is made of a metamorphic slate or argillite and the celt is a very fine-grained igneous diorite.

The chert represented in the collection is generally of very good quality. It is fine-grained and has few imperfections. The most common colors present are light brown, tannish-cream, brown, and tannish-brown. Brown or white speckling is sometimes seen in these major color groups. Less common colors are tannish-gray, mottled tan-brown-gray, and mottled and/or banded gray to dark gray. Small numbers of the following make up the balance of the chert colors: light gray, dark gray, pinkish-gray with gray stripes and spots, dark brown and tan banded, and cream-white (a heavy patina).

The range of colors present among chert specimens in this collection indicates that most of the raw materials were procured locally. Today, there are extensive gravel bars along the active channel of the Brazos River in the area where the collection was made. Evidence provided by the specimens indicates that these same local resources were available in prehistoric times as well. However, there are six large bifaces in the collection that range in length from 10-16 cm. The size of these specimens is such that the chert used in their manufacture was probably not procured locally, as the chert cobbles now present in the Brazos River gravel bars are not big enough to yield bifaces this large. In one case (Specimen 7), Georgetown chert from Central Texas is unquestionably represented. For the remaining large biface specimens, a raw material resource area somewhere closer to Central Texas (i.e., to the west of Austin County) is suggested.

Twenty-six of the chipped stone tools are probably made of heat-treated chert. This observation is based on the presence of glossy or waxy sheens visible on the specimen surfaces and/or on atypical material colors such as pinkish-gray, reddish-brown or tan, tannish-orange, reddish-orange, or pinkish-tan.

Marine shell ornaments in this collection were modified to the extent that a positive species identification cannot be made. A substantial number of marine shell artifacts collected from several other sites in the region were made from the shells of a big conch called the lightning whelk, *Busycon contrarium*. Big conchs of this species occur along the Texas gulf coast, which would have been the closest source of the raw materials for specimens found in Austin County. For marine shell artifacts of this type showing up elsewhere in the region, Hall (1981:222, 306) has suggested that the artifacts were imported from Alabama or Florida. Steele (1988:238) has recently concurred with this view.

Table 1.

Types and Metric Attributes for Chipped Stone Artifacts

Type or Form	Specimen No.	Length[1]	Width	Thickness	Figure
Thick Biface	1	16.4	4.4	2.3	1
	2	12.5	5.2	2.3	1
	3	14.7	4.9	1.7	1
	4	15.1	5.3	2.5	1
	5	8.8	4.8	1.7	1
	6	7.7*	3.9	1.5	1
Thin Bifacial Knives	7	13.5	4.8	1.0	2
	8	10.4	4.3	0.8	2
Uniface	9	6.5	3.1	0.7	2
Angostura	10	8.9	2.9	0.7	2
Lerma	11	8.7	3.1	0.6	2
	12	11.0	3.2	0.8	2
	13	8.6	2.7	1.4	2
Lanceolate	14	8.4	2.9	0.9	2
Leaf-Shaped	15	10.4	2.8	0.8	2
Bell	16	4.4	3.0*	0.5	3
Bulverde	17	5.9	3.9	0.8	3
	18	4.1*	3.2*	0.6	3
Yarbrough	19	4.3	2.1	0.5	3
	20	4.8	2.0	0.5	3
	21	4.9	2.2	0.5	3
Morrill	22	4.8*	2.3	0.7	3
	23	4.2	2.5	0.9	3
	24	5.9	2.9	0.6	3
	25	5.4	2.5	0.9	3
Morhiss	26	7.5	2.5	0.7	3
	27	9.1*	3.2	0.9	3
	28	6.6*	3.4	0.7	3
Pontchartrain	29	9.5	2.6	0.8	3
Untyped Dart Point	30	8.9	3.1	0.8	3
Pedernales	31	6.2	3.6	0.7	4
	32	8.4	3.0	0.6	4
Kent	33	5.1	2.0	0.8	4
	34	6.3	2.7	0.6	4
Palmillas	35	6.0	2.5	0.7	4

Table 1 (Continued)

Type or Form	Specimen No.	Length[1]	Width	Thickness	Figure
Gary	36	4.3	2.3	0.6	4
	37	4.3	2.4	0.7	4
	38	4.2	2.2	0.5	4
	39	4.0	1.8	0.5	4
	40	3.9	2.2	0.5	4
	41	4.1	2.2	0.6	4
	42	5.4	1.9	0.7	4
	43	4.9	2.3	0.6	4
	44	4.6	2.0	0.8	4
	45	4.5	2.3	0.7	4
Marcos	46	3.6	2.6	0.7	4
Ensor	47	4.0	2.2	0.5	4
Ellis	48	4.4	2.6	0.5	5
Edgewood	49	3.8	1.8	0.7	5
Untyped Small	50	3.5	2.4	0.7	5
Dart Points	51	4.1	2.0	0.6	5
	52	6.5*	2.5	0.7	5
	53	5.3	2.2	0.6	5
	54	4.2	2.8	0.5	5
Scallorn	55	3.9	1.8*	0.4	5
	56	2.7	1.4*	0.3	5
	57	2.8	1.7	0.3	5
	58	2.5	1.7	0.3	5
	59	2.8	1.9*	0.3	5
	60	2.5	1.4*	0.3	5
	61	2.4*	1.5	0.3	5
Perdiz	62	3.5	2.0	0.6	5
	63	3.4	2.1	0.4	5
	64	3.8	2.3	0.3	5
	65	2.7	1.9	0.2	5
Untyped Arrows	66	3.6*	1.8	0.5	5
	67	3.0*	1.9	0.5	5
	68	3.3	1.4	0.3	5

1 All measurements in cm

* Indicates an incomplete specimen

CHIPPED STONE

Thick Bifaces (Specimens 1-6). There are six thick bifaces in the collection. All except Specimen 6 are complete (Figure 1). Four of the specimens retain patches of cortex on their faces or ends. Specimen 2 exhibits notching at one end which formed a short stem or spur. Specimen 6 has a heavy patina.

Thin Bifacial Knives (Specimens 7-8). Two specimens are classified as thin bifacial knives. Specimen 7 is a beveled knife made of mottled gray and dark gray Georgetown chert (Figure 2). The chert appears to have been heat-treated. Knives of this type are considered diagnostic of the Late Prehistoric period. Specimen 8 is a triangular blade of tannish-gray chert. It, too, was probably heat-treated.

Unifacial Scraper (Specimen 9). There is one unifacial side- and end scraper. It is made of dark brown and tan banded chert which was possibly heat-treated.

Angostura (Specimen 10). This point is made of banded brown and dark brown chert with speckles of patina; flaking is very fine. The chert appears to have been heat-treated. This type is diagnostic of the Late Paleoindian period from 6500 to 6000 B.C. (Turner and Hester 1985:66).

Lerma (Specimens 11-13). Specimen 11 is a finely flaked point made of cream-white chert, its color a result of heavy patination. The stem edges are heavily ground for a length of 3.2 cm up from the base. This artifact type is diagnostic of the Late Paleoindian and Early Archaic periods (Suhm and Jelks 1962:168; Turner and Hester 1985:116).

Specimens 12 and 13 may be of the Lerma type, but the flaking and symmetry are not as precise as exhibited in Specimen 11. Specimen 12 is made of brown chert which may have been heat-treated. No stem grinding is evident. Specimen 13 is of dark gray chert. It is crudely flaked and no stem grinding was detected.

Lanceolate (Specimen 14). Specimen 14 is a lanceolate-shaped thin biface. It is made of tannish-gray chert with patches of patina. Flaking is coarse.

Leaf-Shaped (Specimen 15). This thin biface is made of light brown chert. The blade edges are ground from the base upward for a length of 2.7 cm.

Bell (Specimen 16). This Bell dart point is made of light brown chert (Figure 3). One barb and shoulder are missing. The blade appears to have been reworked. There is one basal thinning flake scar. This type is diagnostic of the Early Archaic period, dating from 6000 to 3500 B.C. (Turner and Hester 1985:72).

Bulverde (Specimens 17-18). Two dart points are typed Bulverde. Specimen 17 is made of brown chert with tan mottling. Specimen 18 is of light brown chert. The distal tip and one barb are missing. This type is diagnostic of the period from 3000 to 2500 B.C. (Suhm and Jelks 1962:170; Turner and Hester 1985:73).

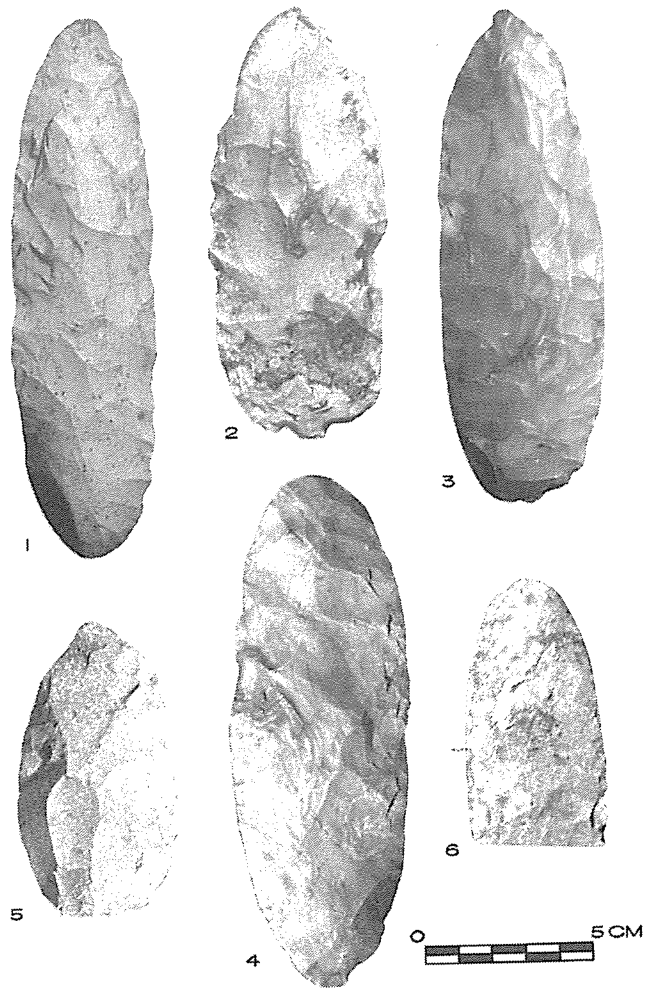

Figure 1. Specimens 1-6.

Yarbrough (Specimens 19-21). Specimen 19 is made of mottled tan and light brown chert. Specimen 20 is of brown heat-treated chert. Specimen 21 is tan heat-treated chert. The type is diagnostic of the Early Archaic period (Suhm and Jelks 1962:262; Turner and Hester 1985:160).

Morrill (Specimens 22-25). Four specimens correspond to the Morrill type, an Early and Middle Archaic period diagnostic (Suhm and Jelks 1962:224; Turner and Hester 1985:129). Chert colors represented include brown, light brown, and tan. Specimen 59 has a frosting of patina and the chert appears to have been heat-treated.

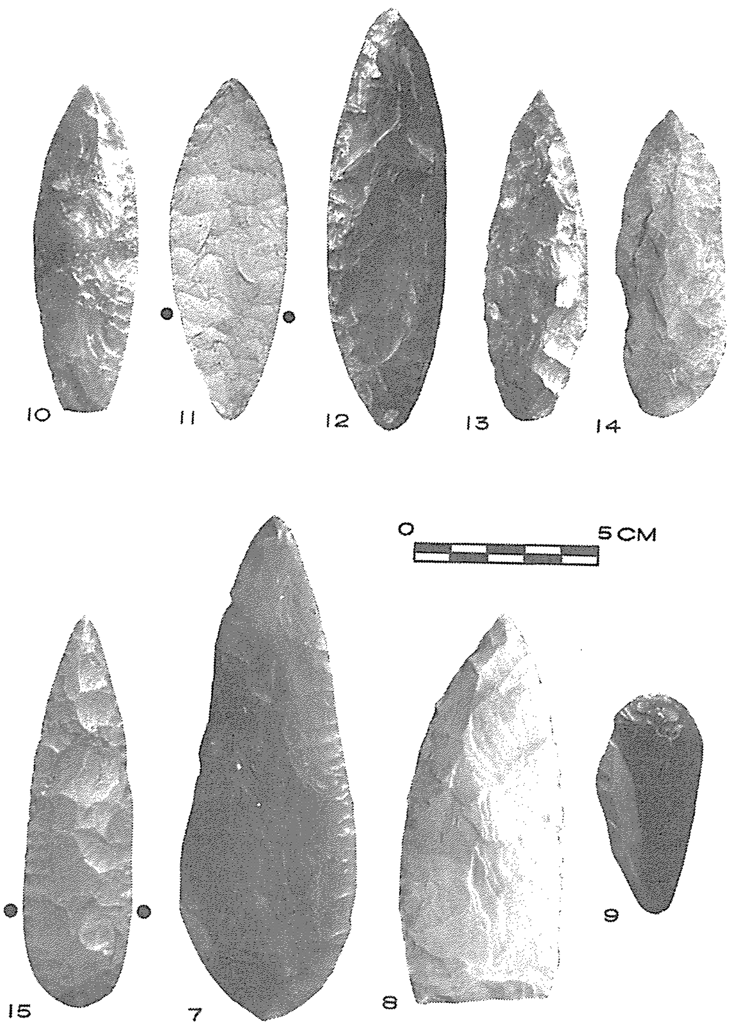

Figure 2. Specimens 7-15.

Morhiss (Specimens 26-28). Specimen 26 is made of tannish-cream heat-treated chert. It compares favorably with the Morhiss type, diagnostic of the Late Archaic period around 800 B.C. (Turner and Hester 1985:127-128). Specimens 27 and 28 lack stems, but have the size and blade outline characteristic of Morhiss. Specimen 27 is of pinkish-gray chert with a gray stripe and spot. This unusual color was probably imparted by heat-treating. Specimen 28 is made of tannish-brown chert with brown speckles. This point is similar to the Johnson type, an Early and Middle Archaic period diagnostic (Turner and Hester 1985:108-109).

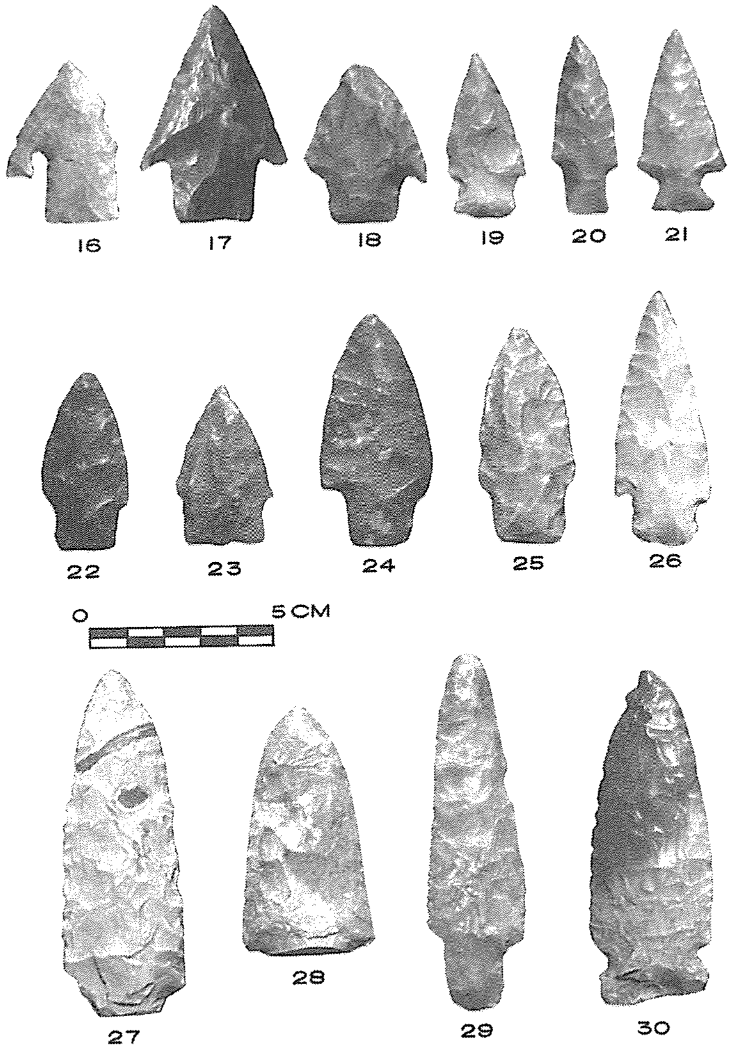

Figure 3. Specimens 16-30.

Pontchartrain (Specimen 29). This long, slender dart point has the distal tip broken off. The blade edges have been reworked, giving the blade a bevel. The specimen is made of mottled tan and light brown chert. The Pontchartrain type is diagnostic of the Middle to Transitional Archaic periods from 2000 B.C. to A.D. 500 (Turner and Hester 1985:143).

Untyped Dart Point (Specimen 30). Specimen 30 is a long, broad side-notched dart point. It is made of cream-gray chert which may be from the Georgetown area of Texas. The chert appears to have been heat-treated.

Pedernales (Specimens 31-32). Specimen 31 is made of tan-brown chert (Figure 4). There is a slight indentation in the base. It is quite well flaked.

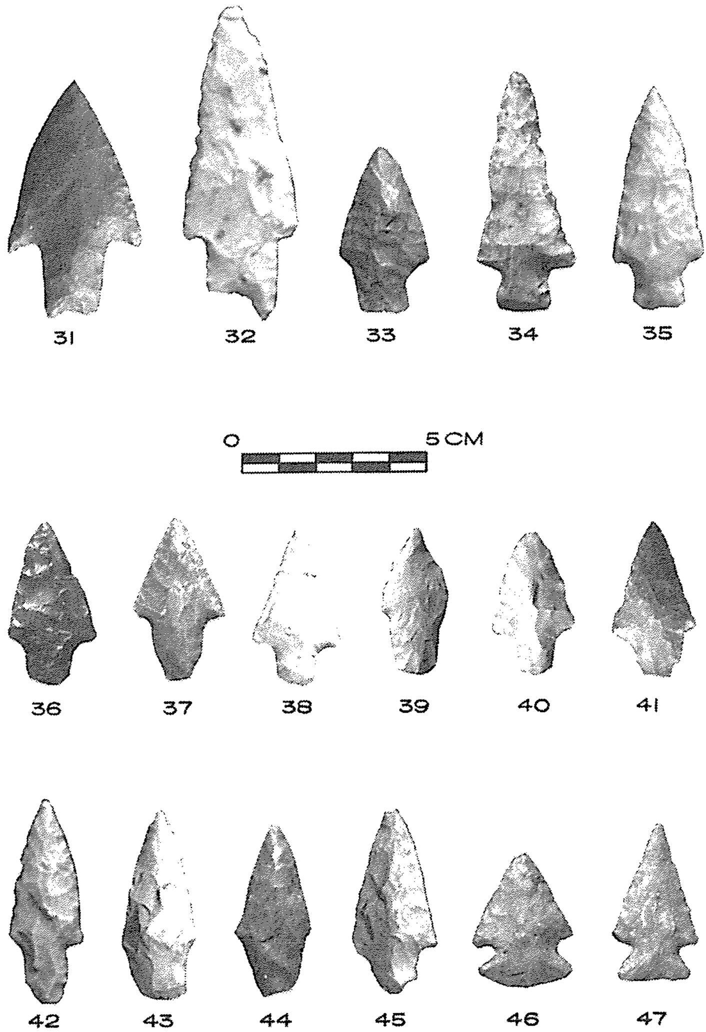

Figure 4. Specimens 31-47.

Specimen 32 is of cream-tan chert. The distal tip and one blade edge display impact fractures and one side of the stem is broken off. The Pedernales type is diagnostic of the Middle Archaic period, from 2000 to 1200 B.C. (Suhm and Jelks 1962:236-238; Turner and Hester 1985:139-140).

Kent (Specimens 33-34). Specimen 33 is made of light brown and reddish-orange chert. This color probably resulted from heat treatment. There is a patch of cortex on the base of the stem. Specimen 34 is of reddish-tan chert and was made on a long flake. The striking platform is preserved on the stem base, and there is a patch of cortex on one face. The blade edges are reworked and crooked. The Kent type dates from the Middle through Transitional Archaic periods from ca. 2000 B.C. to A.D. 500 (Suhm and Jelks 1962:200; Turner and Hester 1985:110).

Palmillas (Specimen 35). This dart point is made of light brown chert. The Palmillas type is diagnostic of the Middle and Late Archaic periods (Suhm and Jelks 1962:230; Turner and Hester 1985:134).

Gary (Specimens 36-45). Ten dart points are typed Gary, diagnostic of the Middle to Transitional Archaic periods from 2500 B.C. to A.D. 700 or 800 (Suhm and Jelks 1962:198; Turner and Hester 1985:101). Tan, brown, light brown, and gray cherts predominate. Four specimens appear to be made of heat-treated chert. Specimen 45 is made of brown petrified wood. It has a striking platform at the proximal end and possible asphaltum or other hafting cement on the stem.

Marcos (Specimen 46). This dart point is made of reddish-brown heat-treated chert. The Marcos type dates to the Late Archaic and Transitional Archaic periods from 600 B.C. to A.D. 200 (Turner and Hester 1985:117).

Ensor (Specimen 47). The specimen is made of light gray chert. The Ensor is characteristic of the Transitional Archaic period, from ca. 200 B.C. to A.D. 600 (Turner and Hester 1985:94).

Ellis (Specimen 48). Made of brown chert that appears to have been heat-treated, Specimen 48 is frosted with patina (Figure 5). The Ellis type is diagnostic of the Middle to Transitional Archaic periods from 2000 B.C. to A.D. 700 (Turner and Hester 1985:93).

Edgewood (Specimen 49). Specimen 49 is made of tannish-orange heat-treated chert. Edgewood is a Transitional Archaic type (Turner and Hester 1985:91).

Untyped Small Dart Points (Specimens 50-54). Specimen 50 is a stemmed dart point made of cream chert. The stem is rectangular, expanding slightly toward the straight base. The shoulders are pronounced, but not barbed. Blade edges are slightly convex.

Specimen 51 is a side-notched dart point made of light brown chert. Blade edges are straight to sightly convex.

Specimen 52 is an unusual bipointed thin biface. It is made of brown chert that appears to have been heat-treated. One tip has been broken off. This artifact may have functioned as a perforator or drill.

Specimen 53 is a stemmed dart point made of brown chert. The blade edges are pronouncedly convex. The stem has parallel sides and a slightly convex base, and the shoulders are weak.

Specimen 54 is a triangular thin biface made of gray chert. This artifact is probably an unfinished or discarded preform.

Scallorn (Specimens 55-61). Seven arrowpoints in the collection are typed as Scallorns. Such artifacts are diagnostic of the early part of the Late Prehistoric period, from A.D. 700 to 1200 (Turner and Hester 1985:189). These points are made of brown, light brown, tan-brown, cream-tan, or pinkish-tan cherts.

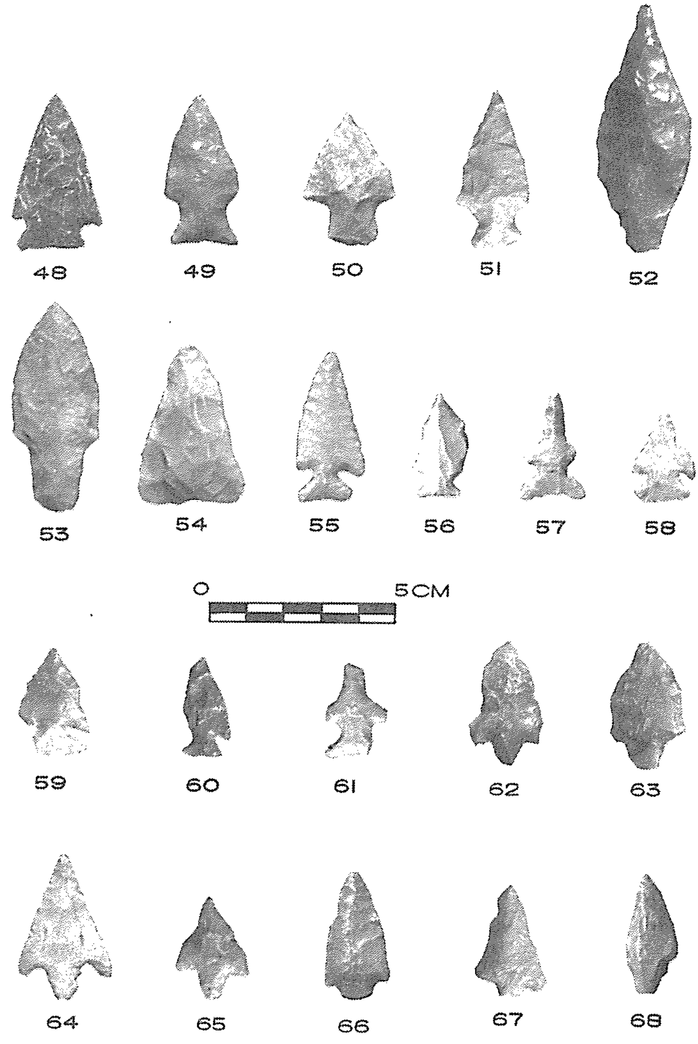

Figure 5. Specimens 48-68.

For two specimens, the chert appears to have been heat-treated. Specimen 57 was reworked into a stemmed drill or perforator. One blade edge of Specimen 58 was apparently broken and reworked.

Perdiz (Specimens 62-65). Four Perdiz arrowpoints occur in the collection. The type is diagnostic of the latter part of the Late Prehistoric period, from ca. A.D. 1200 to 1500+ (Turner and Hester 1985:187). These points are made of brown, light brown, or cream cherts. One specimen was made of heat-treated chert.

Untyped Arrow Points (Specimens 66-68). Specimen 66 is made of brown chert. The stem is broken off, so this artifact cannot be positively typed.

Specimen 67 is made of light brown chert. Its stem is missing.

Specimen 68 is made of reddish-brown chert. The color may be a result of burning or heat treating.

GROUND STONE

From a regional standpoint, the two most unusual specimens in the Cunningham-Gray collection are an adze and a celt. Both of these tools are made of ground stone (Figure 6).

Celt (Figure 6A). The celt is made of light greenish-gray very fine-grained diorite, an igneous rock. This material identification was made by Dr. Robert Folk of the Department of Geology, The University of Texas at Austin. The specimen has a length of 8 cm, a width of 4.7 cm, and a thickness of 2.5 cm.

Adze (Figure 6B). The adze is made of very dark gray slate or argillite, a metamorphic rock, as identified by Dr. Folk. This adze is subrectangular in outline shape, tapering slightly from a maximum width at the distal or bit end down to the narrower proximal end. It is 15.4 cm in length, 4.8 cm in width, and 1.0 cm thick. Centered on the specimen, and 4.1 cm from the proximal end, is a biconically drilled perforation having a diameter of 0.5 cm. Around this hole on one face of the adze is a patch of black substance suggestive of a hafting cement, perhaps asphaltum or aged tree sap. Embedded within this black substance are flecks of a material which, at low-power magnification, appear to be wood. If the black substance is indeed hafting cement, it is possible that it has preserved vestiges of a wooden handle once attached to the adze. On both faces of the piece, striations and scratches are visible, apparently resulting from the grinding originally done to work it into its present shape. The bit is very dull, actually having been flattened. The dulling seems to have been intentional, rather than the result of use.

Dr. Folk notes that the metamorphic slate or argillite and igneous diorite used to make the adze and celt are not found naturally anywhere in Texas east of the Big Bend. Given their characteristics, he suggests that the Ouachita Mountains of western Arkansas are the most likely source of the rocks.

MARINE SHELL ORNAMENTS

Twelve marine shell ornaments are present in the Cunningham-Gray collection (Figure 7). As mentioned above, the species of the shells cannot be positively identified, but it is believed to be the conch known as the lightning whelk, *B. contrarium*. Outline shapes vary from triangular, to oval, to subcircular, to rectangular and trapezoidal. Ten of the shells have single perforations. One has

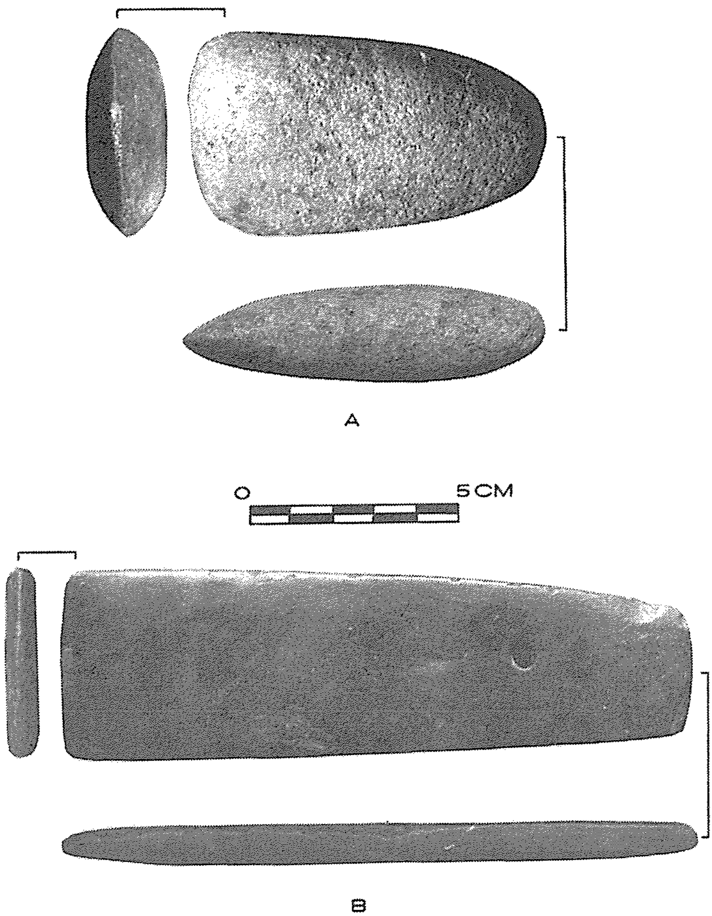

Figure 6. Ground stone tools.

two holes and another has three; both conical and biconical holes were drilled to make the perforations. Metric attributes for these shell ornaments are provided in Table 2.

Specimen 11 is unusual in that each face has a single groove running the length of the piece (see Figure 7). On one face the groove is centered over the perforation, while on the other side, the groove is offset to one edge. On Specimen 6 the edges of the perforation are smooth and highly polished, as if by the repeated action of a cord drawn through the hole.

Table 2.

Metric Attributes for Marine Shell Ornaments

Specimen Number	Length	Width	Thickness	Perforation Diameter
1	9.8*	5.3	0.3	0.4-0.9
2	7.3	5.9	0.3	0.3-0.7
3	5.9	4.2	0.3	0.5
4	5.9	5.2	0.3	0.3-0.5
5	4.7	5.1	-	0.4-0.6
6	4.4	5.2	-	0.6
7	4.5	3.8	-	0.7
8	3.2	4.1	-	0.5
9	4.6	4.1	-	1.2
10	3.6	2.1	-	0.3
11	3.7	3.8	-	0.6
12	2.9	2.1	-	0.5

* All measurements in cm

DISCUSSION

The Cunningham-Gray collection is noteworthy for the long sequence of prehistoric activity evidenced by the time-diagnostic artifacts present. In this respect, however, it is not atypical of the general region of Southeast Texas it represents. Patterson (1985, 1989) and Patterson et al. (1987) have shown that there are a number of sites in the region having similar lengthy sequences of occupation. Based on the available diagnostics, the sequence began 8,000 to 8,500 years ago as suggested by the presence of an Angostura point and a possibly related lanceolate thin biface with basal edge grinding. The Early, Middle, and Late Archaic periods are each represented by a variety of chipped stone types. Scallorn and Perdiz arrow points mark activity during the Late Prehistoric period from around A.D. 700 to perhaps as late as A.D. 1500. For all of the prehistoric periods represented in the Cunningham-Gray collection, the artifacts present are well within the range of types to be expected for this part of Texas.

Most of the chipped stone artifacts were probably made out of locally available cherts, the gravel bars of the nearby Brazos River being the most likely source of raw materials used. However, the large thick bifaces and thin bifacial knives are made from cores too large to have originated locally. Lithic resource

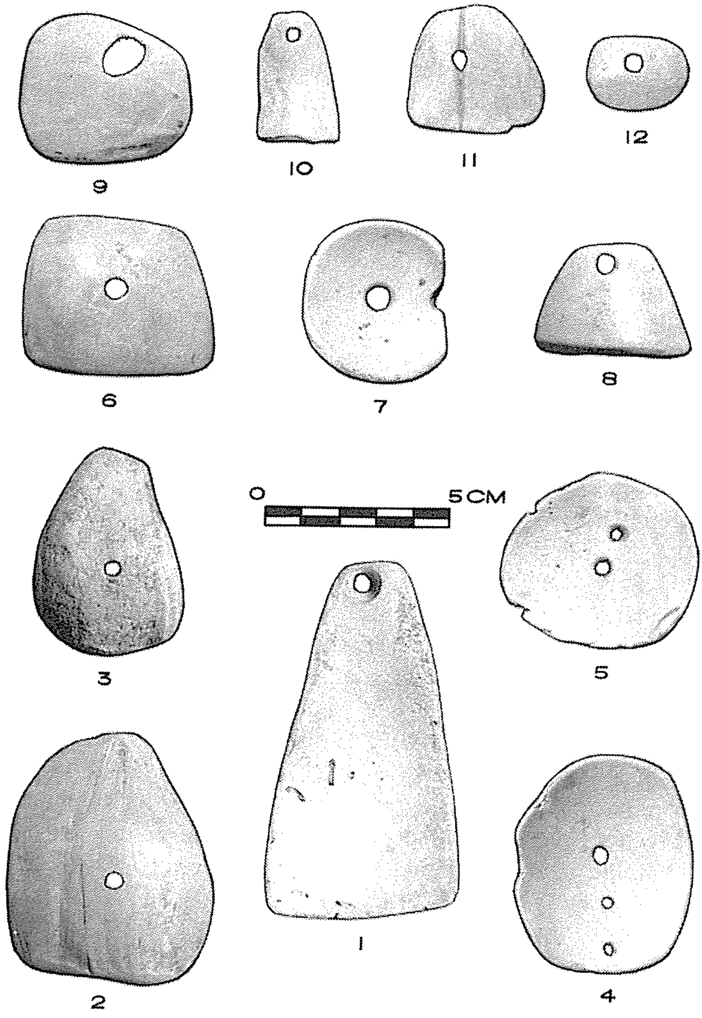

Figure 7. Shell Ornaments.

areas further west must have been utilized. In the case of one large beveled knife (Specimen 7), chert obviously originating in the Georgetown area along the Balcones Escarpment was used in its manufacture.

The presence of two ground stone artifacts and a number of marine shell ornaments in the Cunningham-Gray collection suggests that one or more human burials may have eroded out of the site(s) that were being collected. Area sites containing Middle or Late Archaic cemetery components, such as Albert George (Walley 1955), Ernest Witte (Hall 1981), and Ferguson (Patterson et al. 1993), have previously yielded ground stone artifacts and marine shell ornaments found as grave inclusions. Such specimens are rarely recovered from non-cemetery habitational contexts (Hall n.d.)

Most of the ground stone artifacts from the Albert George site (a boatstone), Ernest Witte (boatstones and a gorget), and Ferguson (tubular beads), are made of igneous and meta-sedimentary rocks originating in the Ouachita Mountains, perhaps near Little Rock, Arkansas. The celt and adze reported here are also made of lithic raw materials most likely derived from that same region. Thus, the raw material resource area for these ground stone specimens had been indicated by previous finds. However, the artifact types —celt and adze — are a rare occurrence in Southeast Texas. Their presence in the Cunningham-Gray collection permits expansion of the assemblage of ground stone artifacts derived from the Ouachita Mountains to include, most commonly, boatstones and beads, followed by single reports of a gorget, celt, and adze.

The presence of marine shell ornaments in the Cunningham-Gray collection is consistent with findings made at a number of other sites in the region, including Albert George (Walley 1955), Ernest Witte (Hall 1981), and Crestmont (Vernon 1989). Further afield are sites such as 41BX1 (Lukowski 1988) and the Texas West Indies Ranch site (Birmingham and Huebner 1991). In all of these cases, the shells were found as inclusions in Late Archaic graves. The outline shapes and patterns of perforations represented in the Cunningham-Gray specimens are most like specimens found at the Ernest Wite site (Hall 1981). As previously mentioned, a gulf coastal source in Alabama or Florida has been suggested for the marine shell ornaments showing up in the Late Archaic cemeteries of Southeast Texas (Hall 1981:222, 306; Steele 1988:238).

The Cunningham-Gray collection lends support to certain of the trends in the material culture previously recognized for the prehistory of Southeast Texas. It has chipped stone diagnostics indicating a long sequence of prehistoric cultural activity in the area. The ground stone adze and celt, and the marine shell ornaments, provide additional evidence of participation in an exchange network, probably most active during the Late Archaic period, that linked the prehistoric inhabitants of this region ultimately to distant raw material resource areas in Arkansas and perhaps even farther to the northeast in Alabama or Florida.

ACKNOWLEDGEMENTS

I thank the property owner and the individuals in possession of the artifact collection described here for their cooperation in permitting site survey activities and documentation of the specimens. The assistance that Joe Hudgins gave me in surveying the collection recovery area was greatly appreciated. I also thank Dr. Robert Folk for his identifications of the rock types used to make the ground stone artifacts.

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The Dillard Site: A Late Prehistoric Plains Village Site In Cooke County, Texas

Ernest R. Martin

ABSTRACT

Archeological investigations were conducted in 1985 in Cooke County, Texas, on an alluvial terrace where a prehistoric site had been discovered on the north side of Fish Creek near its junction with the Red River. The site was occupied between ca. A.D. 1100 and 1450 (the Late Prehistoric I and II periods). The village site was occupied by peoples who were possibly the precursors of some historic Wichita bands. Village occupants took part in a number of activities: hunting, gathering, fishing, horticulture, food storage, pottery manufacture, housing construction, basket-making, clothing production, making and maintaining weapons and tools, and trading with other villages.

INTRODUCTION

This article concerns archeological investigations at the Dillard site (41CO174), named after one of the landowners, Mr. Dutch Dillard. The site was discovered in 1985 on an alluvial terrace where Fish Creek once had emptied into Red River. Today's river channel lies 0.8 km east of the site. Another creek, Bearhead, also joins Fish Creek near this point and borders the west side of the site (Figure 1). The site is some 20 km northwest of Gainesville, Texas, and 2.4 km downstream from the Hubert H. Moss Lake dam. The site is accessible only via a private road through the Dillard-Monroe Ranch.

The labor involved in the investigation of this site was accomplished by the author, an avocational archeologist, with the help of friends, family, and other interested volunteers. Excavations at the Dillard site were undertaken to primarily recover information about, and also corroborate the existing data concerning, Late Prehistoric cultures in the Red River valley of North Central Texas.

NATURAL AND CULTURAL BACKGROUND

Regional Environment

The Dillard Site is on an alluvial terrace within a broad forested valley formed by the erosion of the Fish-Bearhead creek systems and the channel of

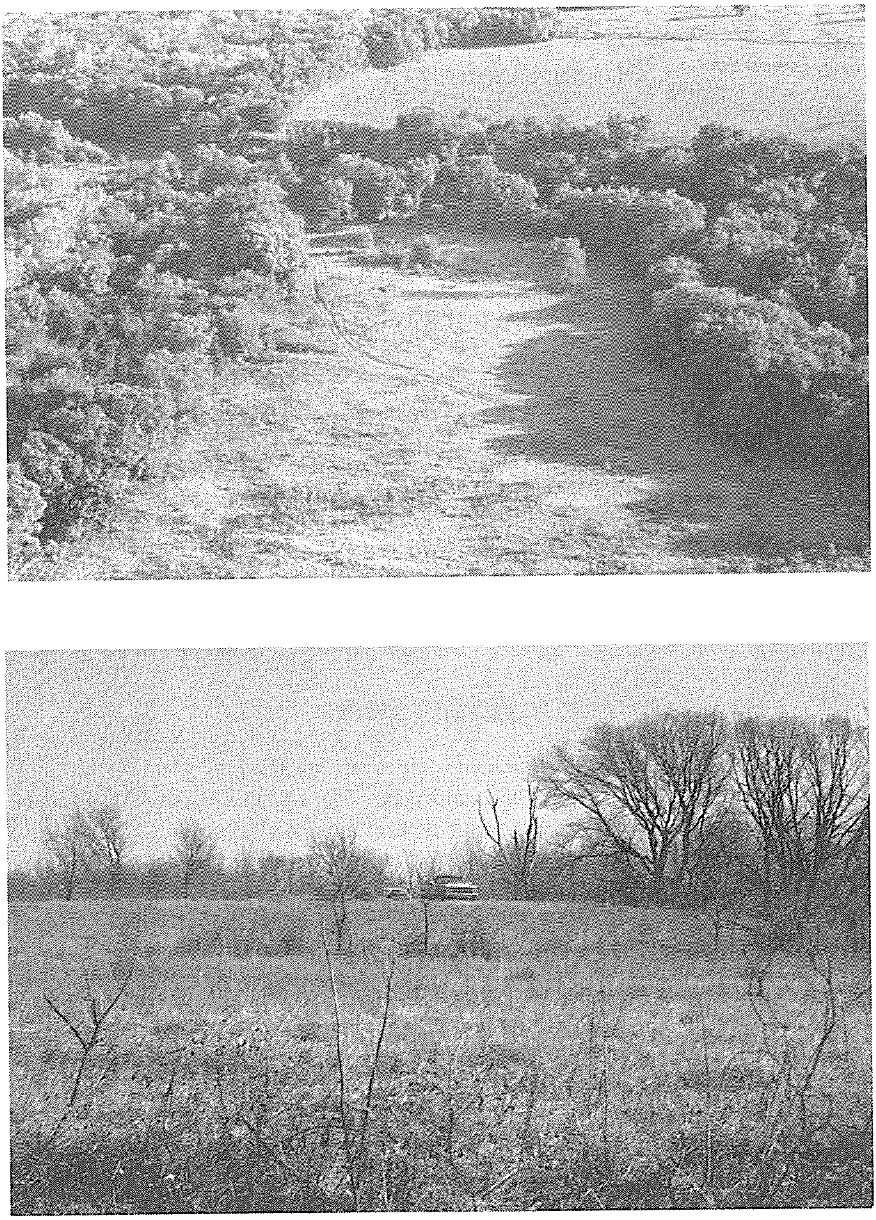

Figure 1. Top: Aerial view of the Dillard Site, looking south. Bearhead Creek is on the right, Fish Creek on the far side, and the former Red River channel is on the left; Bottom: A view of the site taken near the junction of Bearhead and Fish creeks.

Red River. Located in extreme North Central Texas, the site lies midway between the Eastern Cross Timbers and the Grand Prairie geographical regions. The unique micro-environmental setting of the Red River crosscuts these two larger geographic units: heavily wooded limestone hills and bluffs next to flat, sandy terraces at the river bends and where major streams enter.

The alluvial terrace was probably formed at the time of one of the three terrace-cutting episodes that have occurred regionally during the last 9000 years. The alluvial downcutting may have resulted from great amounts of runoff created by abundant local precipitation as well as spring snowmelt from the northwestern tributaries of Red River (Gilbert 1980:15).

The general shape of the deposits of deep sands above the terrace shelf suggests subsequent localized deposition by floods. During these later flood episodes, the river current by the site moved away from a high rocky bluff 300 m north of where the tributary waters of the Fish-Bearhead system enter the Red River. These backwater conditions resulted in the deposition of great amounts of fine river sand on the terrace, forming a high ridge along its length, ending with a promontory on the southeast end overlooking Fish Creek.

The soil type at the south end of the site is the Teller series, a deep well-drained loamy soil formed in alluvial deposits. As one approaches the hill on the north end of the site, the soil changes to the Venus series. This is also a deep, well-drained loamy soil, but it formed through erosion of thick beds of calcareous loamy sediments. The soil along the banks of Fish and Bearhead creeks is Frio clay loam, common to low terraces and floodplains in this area (USDA Soil Conservation Service 1979:60-62).

The surrounding bluffs are comprised of three primary geological layers. The lowest is a narrow band of Cretaceous (Comanche series) sandstone. This is overlaid with a narrow band of Goodland limestone, and the highest part of the bluffs is capped with a harder layer of Kiamichi limestone (Lorrain 1969:5). The valleys are wooded in most areas with deciduous oaks and hickories, walnut, and pecan, especially near the streams and hillsides. The upland plateau is sparsely wooded, but covered with many native grasses that once were common on the tall grass prairies of North Central Texas.

The local climate has probably not changed much over the past 800 years (see Collins and Bousman 1993). Current average low temperatures in January are 32° F, while the average high temperature for July is 96° (*Texas Almanac* 1988). The annual rainfall averages about 110 cm (*Gainesville Daily Register*, April 1992). This environment would lend itself very well then, as it does now, to dry land farming.

The variety and population of the fauna in the area is not as great as it was in the past when the site was occupied, but most of the native animals are still present. Animals indigenous in former times, but not present today include: American bison, pronghorn antelope, mountain lion, gray wolf, black bear, and the wapiti or elk (Kawecki and Wyckoff 1984:13). Among the animals still observed today are: whitetail deer, coyote, gray fox, opossum, skunk, mink, bobcat, beaver, ringtail cat, rodents (fox squirrel, cottontail rabbit, jackrabbit, ground squirrel, cotton rat, harvest mouse, white-footed mouse, mole, shrew), western box turtle, snakes (bullsnake, western diamondback rattlesnake, glossy snake, copperhead, cottonmouth water moccasin, diamondback watersnake, king snake, blue racer, chicken snake), bull frog, eastern fence lizard, glass lizard, salamanders, turkey, quail, and a host of migratory wild fowl.

The waters of both the creeks and rivers contained native fishes, reptiles, mollusks, and aquatic plants. Some fauna likely available during the Late Prehistoric period would include: alligator gar, catfish, shad, drum, buffalo, white bass, bream, sunfish, rock bass, paddlefish, alligator snapping turtle, soft shelled turtle, red eared turtle, freshwater mussels, and crayfish.

Major flora in the surrounding forests comprise post oak, pin oak, burr oak, red oak, blackjack oak, bois d'arc (osage orange), cottonwood, pecan, black walnut, hickory, hackberry, hawthorne, ash, juniper, elm, willow, poplar, sycamore, and salt cedar. Among the flora found at water's edge, or within the water, are cattails, arrowroot, duckweed, watercress, and wild grapes.

ARCHEOLOGICAL BACKGROUND

It has long been established that the Red River valley of North Central Texas was periodically occupied by prehistoric hunters and gatherers for many thousands of years. By about A.D. 700, farming groups began to settle in parts of the region, especially along the Red River (e.g., Brooks 1994a).

It was once a common notion that the development of farming societies in the Southern Plains was a product of new influences created when migrants from the eastern woodlands (i.e., East Texas) brought new technologies with them, forcing the existing inhabitants to move elsewhere. Current thinking suggests that settlement-subsistence changes were due more to an exchange of ideas with adjacent sedentary groups, ultimately resulting in population increases and social organizational changes (Story 1981:146). In either case, these cultural changes directly affected the lifestyles of prehistoric inhabitants in the North Central Texas region. Prikryl (1990:77) refers to this as the Late Prehistoric I period, and it lasted from about A.D. 700 to A.D. 1250. During this time, permanent and semi-permanent villages, both large and small, began to appear near springs and on large stream terraces in all major river valleys in North Texas and southern Oklahoma. In Cooke County, the sites concentrate on the Cross Timbers-Grand Prairie boundary in the Elm Fork drainage, and on terraces and stream valleys near the Red River.

The bow and arrow technology was introduced in the Late Prehistoric I period. It was a great improvement in weaponry over the dart-atlatl. Arrows had an improved accuracy and longer range than darts, thus increasing the hunter's success. Bow and arrow utilization spawned new hunting techniques since an arrow, unlike a dart, could be accurately launched from a crouched, hidden position, or from a tree, allowing the hunter to get a closer shot at his target. Such an improvement increased the chances of success when game was plentiful, and thereby decreased the need to move often to obtain enough meat for each community. The appearance of this new technology, coinciding with a resurgence of bison populations on the Southern Plains, significantly increased the available food supply. As a testament to their hunting successes, bison bones began to appear with greater frequency from village sites that were inhabited during this period (Lynott 1979).

Large herds of bison had been rare on the Southern Plains for several centuries, but around A.D. 1100, they began to appear in greater numbers (Hughes 1988:7). It has been proposed that bison herds pushed southward into Texas three times during the Holocene, between 10,000 to 6000 or 5000 B.C., between 2500 B.C. and A.D. 500, and between A.D. 1200 or A.D. 1300 to 1500 (Dillehay 1974). Bison herds, which required large amounts of fresh water to both drink and wallow in, would be more commonly found near the vicinity of the large streams and rivers during the drier months, when only these larger streams held sufficient water. Bison were more likely hunted and killed at ford areas when they sought out these streams, instead of by stalking the herds on the open tallgrass prairie and plains.

The introduction of horticulture probably had the greatest influence upon village populations and settlement locations than did any other major cultural changes that occurred during this period (Prikryl 1987:173). Farming, supplemented by more efficient hunting, supplied a larger population with not only its immediate needs, but produced enough surplus to allow the populace to place less emphasis on a seasonal-round subsistence pattern. Although hunting and gathering forays continued throughout the Late Prehistoric periods, the village remained as a permanent base camp and was unlikely to have been completely abandoned at any time (Lorrain 1969).

The technology involved in the manufacturing of ceramics may have been introduced to North Texas from two different areas. These areas included East Texas, where pottery crafting began about A.D. 200-300 (Story 1981), and the Plains, where crafting techniques were learned from Southwestern potters. Pottery vessels, being fragile and easily broken, were not as practical for highly nomadic cultures, and evidence for their manufacture and use is typically observed when a population became somewhat sedentary. This is one explanation for its increased use in agricultural societies on the Southern Plains, although the technology for pottery manufacture might have been available much earlier. The raw materials necessary for the production of pottery, red clay and pulverized mussel shells, were abundant along the Red River and its tributaries.

The establishment of villages on the banks of the large navigable streams increased the chances of contact with other contemporary Late Prehistoric cultures, and opportunities for trade (Brooks 1994a). Trade items originating considerable distances from North Texas have been found associated with Late Prehistoric cultures in the Red River valley, including: stone tool types and raw materials, Olivella and conch shell, and pottery from the Southwest and the Caddoan Area. The Red River was analogous to a natural highway that could be followed by pedestrians or navigated by dugout canoe (Albert 1984:1).

This indigenous population evolved an agriculturally-based Plains Village lifestyle, but increased their dependence upon bison hunting during the Late Prehistoric II period (Prikryl 1990), or what Krieger (1946) defined as the Henrietta Focus. These people may have been the forebears of some of those more northern groups of the Norteño Focus in North Texas, and along with the descendents of the nearby Washita River phase, are possibly part of the ancestral stock of the Wichita Indians (Duffield and Jelks 1961:73-75; Blaine 1990).

These innovations were well entrenched in Plains Village groups in North Central Texas. Sites of this period, from ca. A.D. 1250-1700 (Prikryl 1990:80), have tool assemblages that are characteristic of the Southern Plains Village cultural tradition (e.g., Brooks 1994a).

The artifact assemblage and recognizable features that were found at the Harrell Site, the type site for the Henrietta Focus, includes: arrowpoints of Fresno, Washita, Alba, Scallorn, Cliffton, and Young types; drills; scrapers (end, side, and oval); gravers; gouges; worked flakes of obsidian, quartz crystal, and Alibates dolomite; cores; sandstone abraders, manos, and metates; elbow pipes and fragments; bone awls and fish hooks; deer ulna and antler flaking tools; hoe blades of bison scapulae; unperforated shell hoes; Nocona Plain shell-tempered pottery; trade sherds from southeast New Mexico and the Frankston phase of East Texas; hammerstones; bifaces; four beveled and two beveled knives; spoke-shaves; tubular bone beads; Olivella beads; fossil crinoid beads; mussel shell beads; and pottery beads (Krieger 1946:103-119). Other important traits noted by Krieger (1946) were post molds on the site indicating permanent house structures, the placement of burials in the village midden, the absence of burial goods, the appearance of multiple burials with missing body parts, and a wide range in burial depths.

The artifact assemblage from sites labeled Henrietta Focus in the central Red River valley has characteristics of both the Southern Plains and eastern Caddo cultures. Artifacts recovered from the Dillard site and other Lake Texoma area sites that may have been traded or exchanged with Caddoan peoples are: deer jaw sickles, hide grainers, pottery, shell beads, Reeds Spring chert, novaculite, copper, and long-stemmed pottery pipes. Although these items only occasionally occur in Late Prehistoric II period sites in the upper Brazos and Trinity River drainages, they occur quite frequently in the middle Red River valley (Bell 1980; Albert 1984).

While most Late Prehistoric II village sites seem to be small, some sites appear to have covered several acres; most sites range between one and five acres in size (Krieger 1946:138). While the villages were the focal points of community life, nearby seasonal campsites and farmsteads were regularly maintained for the purposes of farming, hunting, and gathering. These associated sites were probably occupied only during the warmer times of the year. They were also more common in the earlier Late Prehistoric I period (e.g., Lorrain 1969:106). Five such suspected satellite sites have been discovered by surface surveys and test sondages surrounding the Dillard site.

Although historic Wichita villages were of similar size, they sometimes chose favored sites as gathering places, usually in the fall, where the people could have the opportunity to visit, trade, and hunt bison. The villages at these times could become quite large, extending more than a km along a river or stream bank (Smith 1959:526). This is a practice that might have commenced in the Late Prehistoric II period, because such activity would have allowed the villagers to have more regular encounters with other Plains Village groups, especially after the large bison herds appeared on the Southern Plains.

SITE SETTING AND DISCOVERY

No major archeological site had been previously reported near the immediate confluence of Fish Creek in northwestern Cooke County, Texas, and the Red River. One large site and some smaller associated sites were discovered and excavated upstream on Fish Creek in 1966 by Southern Methodist University before the completion of the Moss Lake dam (Lorrain 1969). The largest, the Chickenhouse site (X41CO6), was thought to be a permanent base village, while the smaller surrounding sites were used seasonally as camps for farming, hunting, and gathering. It was concluded that the occupation of the sites occurred around A.D. 850-1000.

Radiocarbon dates were obtained on charred corncobs from the Chickenhouse site. These dates were A.D. 1280, 1360, 1470, and 1630. These dates were considered too young for the anticipated age of this site (Lorrain 1969:111), and that the process of fractionation in carbon isotopes, which occurs in corn, was responsible for the false later dates. It is currently thought that radiocarbon dates from corn remains that have not been corrected for fractionation, consistently yield dates about 200 years too young (see Bowman 1990:20-21). This entire site, however, had been a farmhouse and chickenhouse complex for the previous 75 to 80 years. The increased amount of organic debris deposition, the application of fertilizers, and the regular tilling of the garden located there, may have increased a contaminant's filtration into the soil, thus affecting the tested sample while *in situ* (Joukowsky 1980:448).

The Chickenhouse site is 5.6 km upstream from the confluence of Fish Creek with the Red River. I suspected that if there was suitable terrain farther downstream, a similar significant Late Prehistoric site should be discovered there. The most probable location of such a site was thought to be near where Fish Creek merged with the Red River.

In May 1984, a terrace bench at the present confluence of Fish Creek and Red River was surveyed, but the area was too low in the floodplain to be suitable for sustained human occupation. The highest level of this terrace was

5.4 m above the present normal level of Red River. Fish Creek enters the river from the north at an acute angle with the west bank (Figure 2). The land between the creek and the river is a floodplain covered by small salt cedars interspersed with occasional groups of larger hardwood trees. The elevation of this area ranges between 2.4 to 3.6 m above the river level, and the terrain is prone to regular flooding. A decision was made to survey an area about 2.5 km upstream on Fish Creek, where a higher, flat, contour elevation was observed on a topographical map.

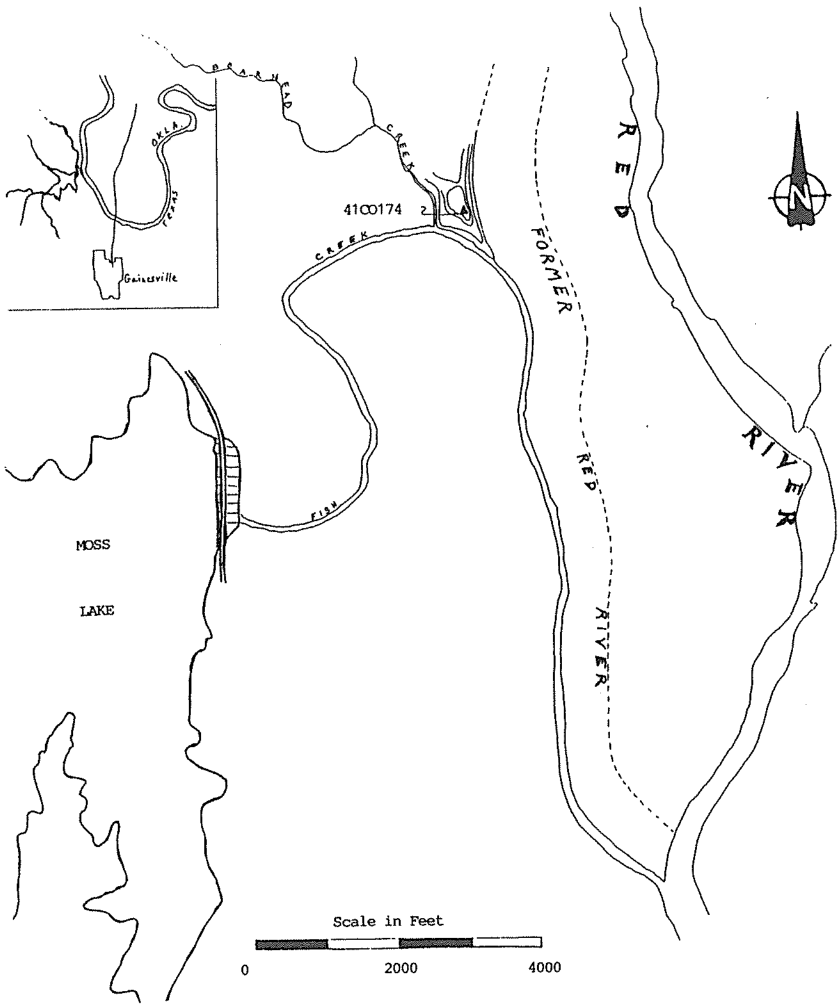

Figure 2. General Location of the Dillard Site (41CO174).

On May 31, 1985, after obtaining permission from the landowner, the site was located within an hour. While driving through a pasture on the north side of Fish Creek, a high, gently sloping alluvial terrace was observed running north-south on the eastern side of the pasture. The south end dropped off sharply about 60 m from Fish Creek. Another stream, Bearhead Creek, entered Fish Creek about 90 m southwest of the terrace. Later, after interviewing the landowner, it was learned that the previous owner had recounted that the river channel had run along the eastern edge of this terrace until around the 1890s, when increased soil erosion and resultant silting from area farming had presumably changed the river's course. Fish Creek now follows the west bank of the former river channel to its junction with the present river channel (see Figure 2).

The total area of the site is approximately five acres, of which about 50 percent has been previously cultivated. The southern end of the site was relatively undisturbed from cultivation. A small roadcut had been made running laterally away from the site on its eastern edge. This allowed vehicles to drive down from the terrace to the lower river bottoms. Most of the cultural deposits at the Dillard site had been covered with 30 to 35 cm of sterile sand that was either blown onto the site from the riverbank during dry periods, or deposited during post-occupation floods (see below). Although a part of the site had been under cultivation at one time, the plow zone rarely reached the occupied strata. In the unplowed areas of the site, original surface features—such as depressions and rises that were possibly formed during the prehistoric occupation—are still evident on the present surface.

Confirmation that the site had a prehistoric occupation was accomplished by excavating a small test pit on one of the higher points of the terrace. Lithic debris, mussel shell, charcoal, bone fragments, and one pottery sherd were recovered. Plans were made to begin excavation in the fall of 1985 after site mapping and surveys were completed.

The elevation of the site is 670.1 feet above mean sea level. This elevation places the site approximately 9 m above the normal present day level of Red River, making this an area well above normal flooding. However, a record flood did occur while the site was being excavated in June 1987. The water then reached an elevation of 675 feet, and was the greatest Red River flood in this area.

GOALS AND PURPOSE

The limited archeological investigations previously completed on sites along this part of Red River, although well done, have not provided a sufficient sample of material culture remains and features to be truly representative of the cultures that left them. Although a good general knowledge of the Late Prehistoric cultures in North Texas and southern Oklahoma has been attained, there are many details about these groups that have not been learned. While perhaps not as culturally complex as the Caddoan cultures of East Texas, Southern Plains villagers represented an era of high cultural achievement for the prehistoric Native Americans who lived in what is now Cooke County, Texas.

The Dillard site (41CO174) was apparently occupied continuously for a period perhaps as long as 400 years, but during only the Late Prehistoric I and II periods. This provides an excellent opportunity for comparative investigations of the nature of Late Prehistoric artifact assemblage changes through time along this part of Red River, and in this relatively unknown Southern Plains locale. The site is also unusually well preserved. The abundance of charcoal and other available carbon sources at this site provided good samples for radiocarbon dating. The site had no subsequent occupation after the Late Prehistoric II period, and the samples were expected to be free of organic contamination. Bone and plant remains were also preserved in quantity.

Several research problems concerning the Late Prehistoric period in North Central Texas were of interest in our investigations of the Dillard site. When beginning the excavations, it was hoped that new information could be obtained that would shed some light on the following questions:

- What were the social relationships between neighboring contemporary Plains village groups? By using archeological data obtained from previous excavations on Fish Creek (Lorrain 1969), periods of occupation of the two sites could be compared in several ways. Were these sites utilized before, during, or after the occupation of the Dillard site? If the periods of occupation did overlap, were there exchanges of food, raw materials, or finished items between the villages at this time?

- Are there discernible differences in the artifact assemblages between the Dillard site and other adjacent Late Prehistoric sites (whether in the Red River valley or not), and if such differences exist, what do they imply about cultural affiliation and variations in lifestyles?

- What types of raw materials and finished items were available through trade to the people of the Late Prehistoric era in this area? Where were the original sources of these trade items, and by what means did they arrive? Increased contact with other groups through trade likely would increase the chances of spreading new concepts from different cultural foci, and such cultural exchanges may have significantly affected the lifestyles of Late Prehistoric Plains Villagers during the time they changed from a semi-sedentary to a sedentary society.

- What was the nature of the burial customs that the Late Prehistoric groups of this area employed in their culture? Insights regarding the ceremonial practices of these people would be obtained with these investigations. Grave offerings are rare from burial sites in North Texas and southern Oklahoma, and when burial offerings are present, shell beads are the predominate items.

The Dillard site contains important archeological data. An obligation was recognized when work began to excavate and preserve on record a small part of this site before indiscriminate relic collecting, future agricultural operations, or possible gravel mining ventures damaged or destroyed it. By revealing the wealth of new, and significant, archeological information that can be recovered from this site, it is hoped that this will create a heightened awareness of its need for preservation for future generations to appreciate and learn from.

METHODS

Excavations at Dillard began on September 15, 1985. Two permanent datum points were established and a contour elevation map was plotted (Figure 3). Eleven sondages were excavated to roughly define the extent of the site, and to assess the density of cultural materials. These sondages were placed at wide intervals along the length of the terrace ridge, as well as near the bluff of the former river channel. Occupational debris extended 202.5 m along the terrace, but was concentrated mostly at the south end nearest the junction of Fish Creek with the old river channel.

The sterile orange-colored overburden was well defined, and was removed by hand using a sharpshooter. A square-ended shovel was employed to level unit floors at the top of the occupied zone, after which the soil was removed in 2-inch (5 cm) layers using a trowel or shovel. The soil was damp in the winter, which aided the identification of soil and cultural features. The dampness allowed the soil to be easily scraped, and it usually screened easily. The excavation was unencumbered by large tree roots or rocks. All dirt removed from the excavation was screened through either a 1/4-inch or 1/8-inch mesh screen. The screened soil was bagged and labeled by unit and level, then transported to the backyard lab and washed on 1/8-inch screens. The debris was cleaned of sticks and roots, and then dried and bagged for sorting.

Due to the depth of the cultural zone, 1.5 x 1.5 m units were used to allow for more working room within an individual unit. The depth of the excavations in the areas of the site used for dwellings varied between 0.95 and 1.05 m in depth. Cultural features and larger artifacts were plotted on overview maps; lithic flakes, small fragments of charcoal, small potsherds, hearthstone fragments less than 3 cm in size, and small bone fragments recovered through screening, were not plotted. However, all of the unplotted items were recovered by unit and level.

The plan for subsequent block excavations was based upon information gathered from the sondages. The accumulation of village debris increased from the center of the terrace to the southeast edge of the site. Based upon this information, it was decided to locate the major excavation on the end of the terrace as it began to slope downward toward the old river's edge. If there was a deep midden accumulation here as indicated by test sondages, a much larger sampling of artifacts could be obtained that would be best representative of the

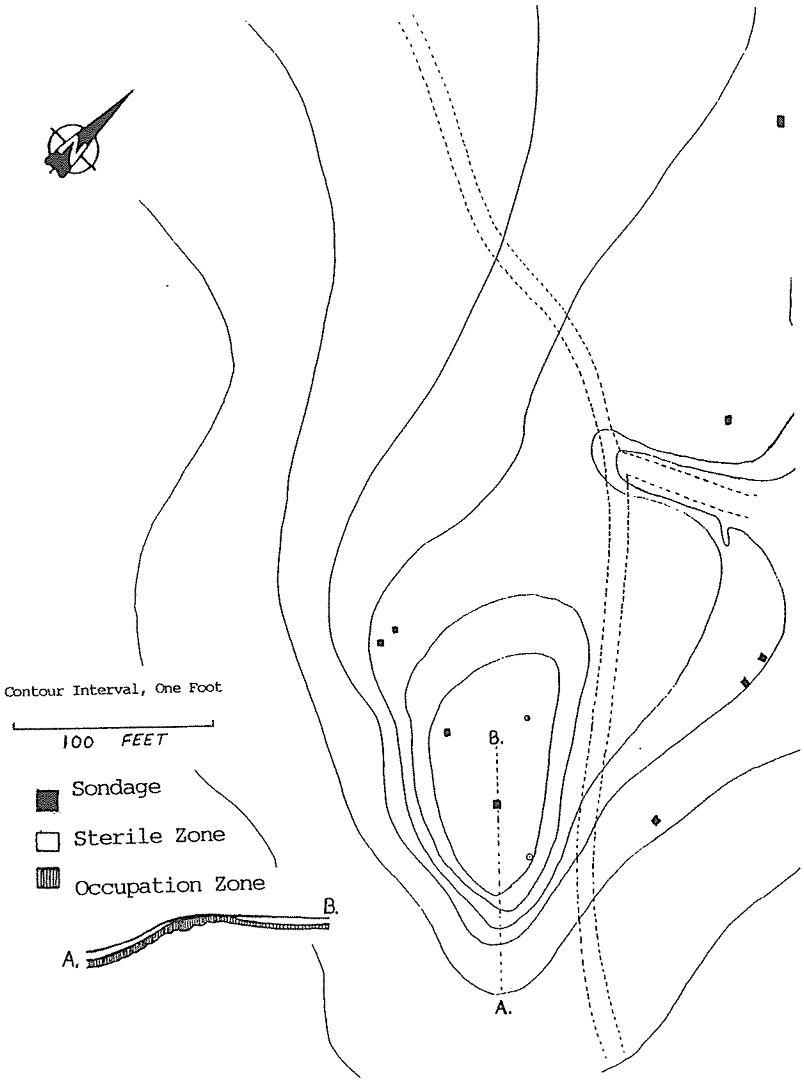

Figure 3. Initial excavations at the Dillard site.

lifestyles of these Plains Villagers, as opposed to a more restricted sample that could be gathered from a similar-sized excavation within the village proper.

Photographs of the floors of each excavated unit were made, and a mosaic of the entire block showing structural remains, etc., was assembled for future reference. Photographs of each block's stratigraphy, selected objects *in situ*, and the general progress of the excavations, were also taken.

STRATIGRAPHY

The sterile overburden covering the site ranged from 30-37 cm over most of the site area, with the exception of one area in Block 3 where it was almost nonexistent. The darkly stained soil of the occupation zone varied between 60 and 65 cm in thickness.

The overburden covering the site was mainly deposited during the dry summers, when prevailing south winds whipped loose sand from the river's edge. Additional deposition of this sterile layer came in the form of silt from post-occupation floods. In either case, the sand settled mainly on the more protected lower slopes on the ridge's northern side, and tended to settle less on the more exposed southern areas and prominent points.

No identifiable stratification could be discerned in the occupied zone except for a few widely scattered lenses of ash and lightly colored sand. Cultural features such as post molds and hearths were abundant. Clearly, the occupation zone had been disturbed by cultural activities, and in many places the primary deposits had been disrupted by house and hearth construction in addition to burial and refuse deposition. To keep records of vertical context, three 15 cm thick arbitrary stratigraphic levels were assigned, beginning at the top of the occupied zone, with level four including all materials more than 45 cm below the top of Level 1.

The soil present in the occupation zone at the Dillard site consisted of fine, moist sand infused with small bits of red clay and mussel shell, along with an abundance of charcoal, ashes, and organic humus. The normally tan-orange color of the sand was changed into a dark brown, almost black color by anthropogenic means, and in many areas had a slight gummy texture when damp.

FEATURES

Block 1

The first block was a linear trench measuring 1.5 x 9 m (Units F-1 to K-1). The block ran in a northwest/southeast direction to follow the orientation of the terrace ridge on the northeast edge of the site (Figure 4). The excavation of this block indicated that the area had been used for repeated housing; that is, an area where dwellings or other buildings were constructed, torn down, and rebuilt over a period of many years of continuous occupation. Scattered post molds were identified throughout this block, but they had no definable pattern to suggest the types or sizes of former structures (Figure 5). Expansion of this block would probably yield more information about the types and sizes of the structures, but the limited work force prohibited doing so at the time.

The post molds in Block 1 ranged in size from 5 to 20 cm in diameter. There was an abundance of fragmentary, burned hearthstones throughout the block,

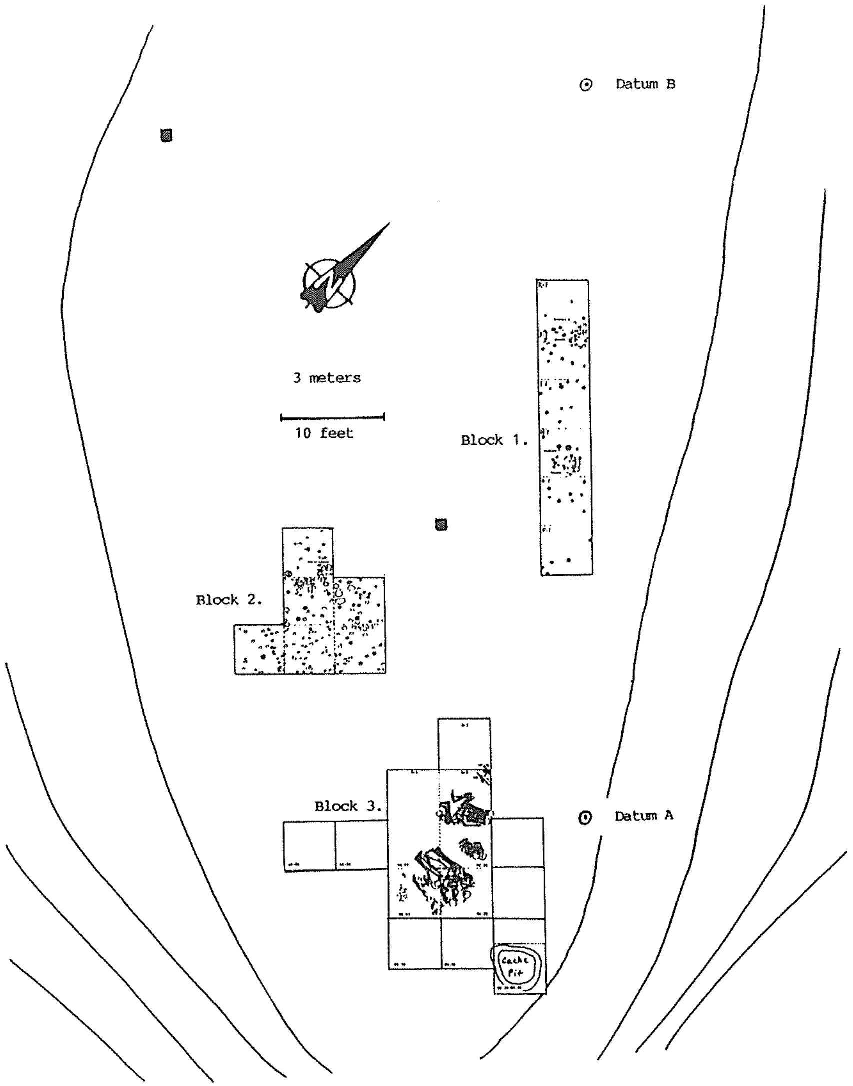

Figure 4. The relationship of the three blocks to each other.

with a noticeable concentration of larger fragments recovered from unit H-1 (see Figure 5). These pieces were accompanied by thousands of charcoal fragments and ash mixed with the soil. This suspected hearth area was next to one of the larger post molds, suggesting that it might have been near the center of a house.

Hundreds of fragments of animal bones were found scattered throughout the block. Tools made from animal bone were also recovered here, particularly

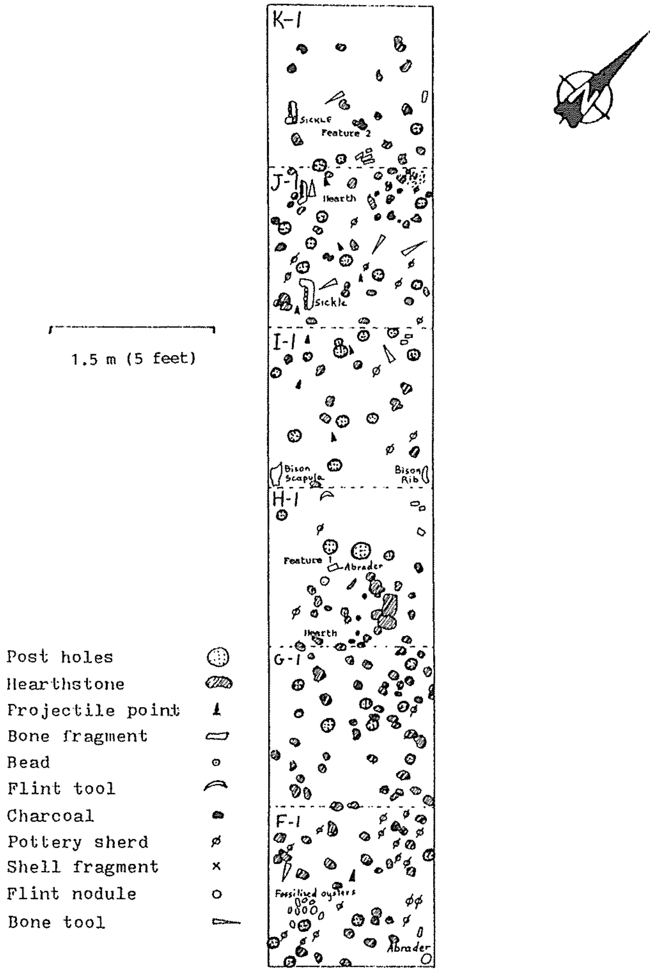

Figure 5. Block 1: Overview of structural remains.

in unit J-1 where two bone awls, two deer jaw sickles, and two deer ulna flaking tools were found (Figure 6). Four arrowpoints and an unusually large amount of lithic debris were also recovered from this grid, indicating that this was once an often-used work area. The broken bones of bison and deer were the most frequent faunal remains from Block 1. Fish, mussels, turtle, turkey, and rodent bones comprised the balance of the identifiable animal remains. Large numbers of small mammal and bird bones were also recovered from the block. Plant remains from Block 1 included charred walnut, hickory, pecan, and hackberry shells.

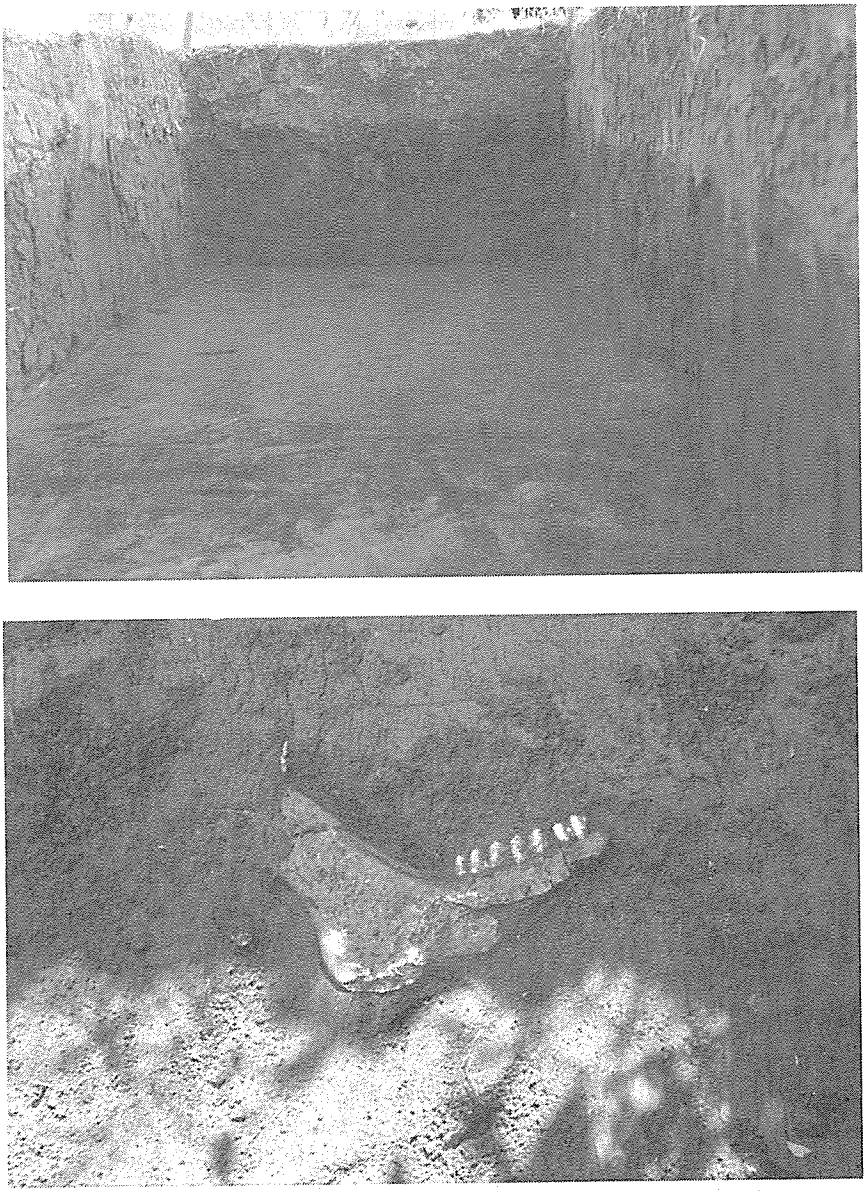

Figure 6. Top: The zone of occupation in Block 1 contrasted with the lighter colored overburden; Bottom: Deer jaw sickle *in situ*, Level 3, Unit J-1, Block 1.

An unusual cluster of fossilized oyster shells was recovered from a unit in Level 4 of Block 1. Their use, or significance, if any, has not been determined, but they are not naturally found in the sandy alluvium of the site. Their likely origin is the limestone deposits of the surrounding bluffs or the limestone gravel of Bearhead Creek.

Block 2

The excavation of Block 2 took place during the second season of work at the Dillard site, and began on September 26, 1986. This block was located some 4.5 m southwest of Block 1 on the opposite side of the terrace ridge (see Figure 4).

The excavation of this block had two purposes. One was to explore that part of the site nearer the point of the terrace, where cultural materials were shown by sondages to be more concentrated. The other goal was to uncover a wider area in an attempt to locate and delineate any structural remains that would be overlooked in trench excavations. Six 1.5 x 1.5 m units were eventually excavated in Block 2. More units were planned, but an interruption caused by a June 1987 flood damaged equipment and grid walls, while depositing a foot of muck in the floor of the excavation, delayed further work at the site for three months. All damage had to be repaired before the excavation of the block could continue.

In Units E-5, E-6, and F-6, a hearth was uncovered. Other large stones were scattered nearby (Figure 7). Small bits of charcoal were found in and around the stones, and the stones themselves had the characteristic gray color of burned limestone. One of the hearthstones was the broken half of a mano.

The dark occupation zone of Block 2 became thicker and sloped upward towards the present ground surface as the excavation approached the southwest end of the terrace. This thicker layer of cultural debris is characteristic of a midden or communal refuse heap. Cultural materials such as animal bones and lithic debris, pottery sherds, and hearthstones increased in numbers as the excavations progressed in this part of Block 2. The numerous post molds uncovered in all of the levels of Block 2 indicate that throughout the occupation of the site, several structures had been erected here, but only one possible house pattern could be identified. The intermittent dumping of trash at the end of the terrace may have begun when these first houses were constructed, and continued until the site was abandoned.

The occupation zone in Block 2 was similar in depth to that of Block 1, but generally the sterile overburden was shallower: the overburden ranged from 25-28 cm in depth. The shallowest overburden was present along the southeast edge of the block.

Block 2, like Block 1, also was an area where houses had been constructed successively over many years. Because of the limited area of the excavation, no complete outline of post molds was identified consistent with the size of a house's circumference (Figure 8). Although not entirely exposed, the linear curvature of some post molds suggests a structure with a diameter of approximately 6.6-7.5 m. A rock hearth (Feature 1) was located near the center of the post pattern (see Figure 7).

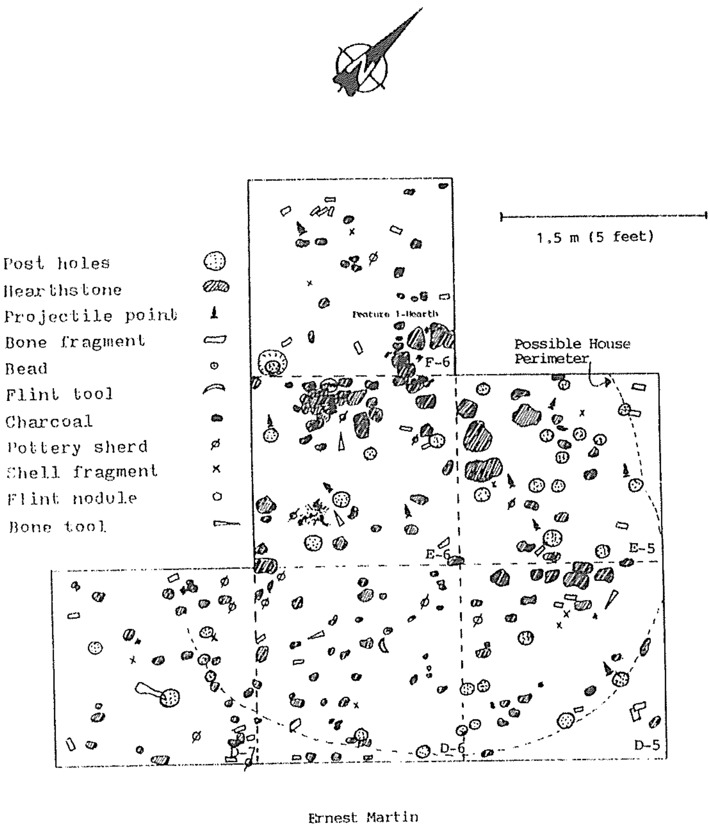

Figure 7. Block 2 plan map showing features, postmolds, and artifact locations.

An unusual soil feature was observed in Unit D-5: a long, dark, curved stain 2 x 87 cm in size. It is most likely the burned remains of a narrow piece of wood from the house superstructure, or alternatively a debris-filled animal burrow.

Figure 8. Top: Block 2 postmolds, view to the southwest; Bottom: postmolds in the wall and floor of Unit D-6.

The cultural zone in Block 2 was generally thicker than that found in Block 1: 65-70 cm. Animal bone fragments, charcoal, and small burned hearthstone fragments were greater in Block 2 than Block 1. Bison and deer again dominate the identifiable faunal remains. In the two lower levels, deer bones appear almost exclusively, with bison bones appearing more often in the higher, younger, levels of the cultural deposit. Other identifiable faunal remains included turtle, fish, mussel, turkey, snails, rabbit, rodent, and dog.

Plant remains from Block 2 included charred hulls of walnuts, hickory nuts, pecans, and chestnuts. In Unit E-6 at Level 4, adjacent to some larger hearth-stones, charred wood and five fragments of charred corncob were also recovered. This was the first positive evidence of horticulture at the site. The corn had at least six to eight rows of kernels per cob. One cob fragment appears to have seven rows, but examination of modern "Indian maize" also displays this scar near the end of the cob when two rows of kernels fail to develop.

The artifact assemblage from Block 2 comprised 10 arrowpoints of the following types: Washita, Scallorn, Bonham, and Fresno. One Washita point recovered from unit E-6 was made of obsidian. Other items recovered from Block 2 were: notches, a bison digging tip, bone awls, fossilized oyster shells, adzes, bifaces, scrapers, deer jaw sickles, abrading stones, unifaces, milling stone fragments, a mano, a flaking tool (deer ulna), and ochre stones from the local Woodbine Sand Formation.

Several large sherds of Nocona Plain ceramics were recovered from this block. Fragments of the rim and enough of the body were recovered to show that they were from a large vessel (35 cm in diameter) of local manufacture. Another pottery sherd was identified as part of a pipe bowl.

A fragment of reddish colored hematite was also found in Block 2. This piece contained a section of a drill hole and was ground and smoothed on the unbroken surface. The soft nature of the stone suggested that it had been heavily ground to obtain pigment.

Block 3

The excavation of Block 3 began on November 20, 1987. A decision had earlier been made to locate this block nearer the point of the terrace, southeast of the previous blocks (see Figure 4). This part of the site was considered a suitable area for a refuse dump as it is near the edge of the terrace, and would have been out of the way of most village activities. The first 1.5 x 1.5 m unit in Block 3 began in Unit A-3 (Figure 9). The block exposed a thick midden infused with faunal remains, pottery, lithic debris, and stone tools.

As excavations began, it was noted that the sand overburden was virtually absent. The dark soil of the occupation zone was encountered within 2 cm of the surface, and cultural debris was also recovered just beneath the surface. Shortly after the removal of this superficial layer had begun, the left anterior section of a human skull (Burial 1) was uncovered. The remaining surface sod in the unit was carefully removed and the burial was lightly exposed to determine its extent and position. The most superficial part of the skull was 23.75 cm below the present ground surface.

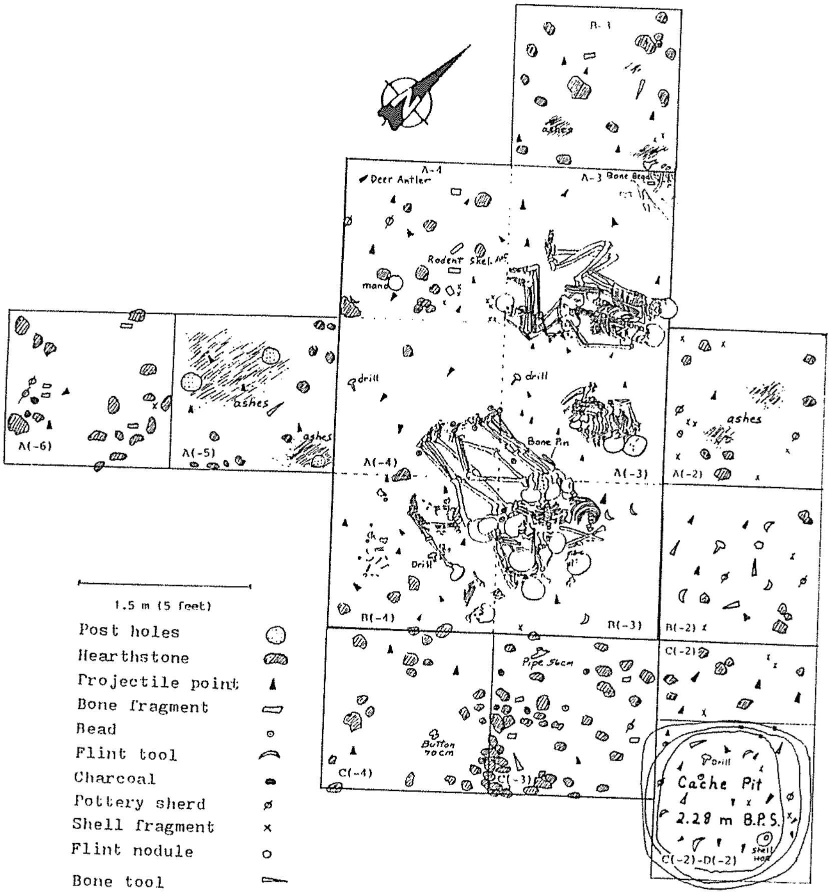

Figure 9. Block 3 plan map showing features, burials, postmolds, and artifact locations.

Burial 1

This burial contained the nearly complete skeleton of a 2.5-3.5 year old child. The body was flexed and lying on its right side (Figure 10). The burial was oriented with the head pointing east. The skull had apparently sustained fractures to the left temporal, left parietal, and right occipital areas (Albrecht, this volume, did not note fractures, however). This was not apparently due to ground weight compression as the skull retained its normal shape and form. The bones were well preserved, especially when considering the young age of the child and the shallow depth of the grave.

The fracture of the skull had displaced the position of the left temporo-mandibular joint, forcing the lower jaw forward and to the right. This position

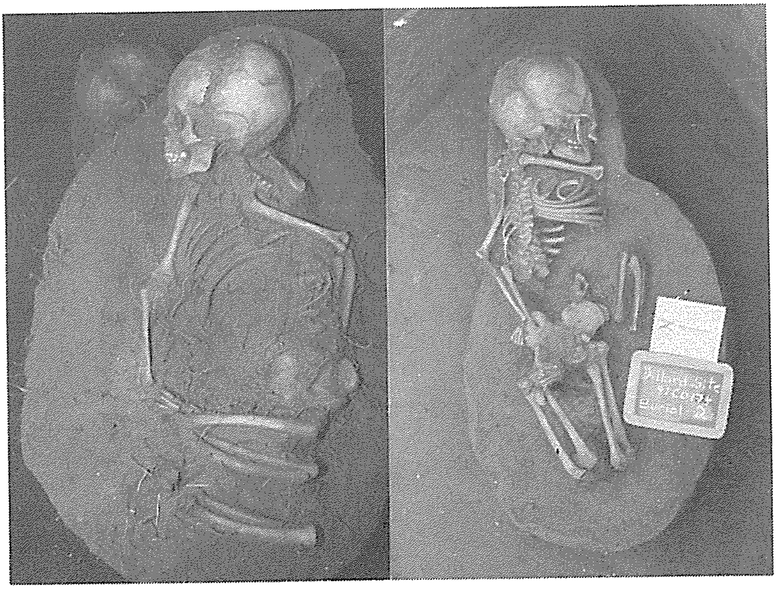

Figure 10. Left: Burial 1; Right: Burial 2.

forced the lower right lateral incisor into crossbite. The primary maxillary central incisors had been lost postmortem. Both root sockets were intact, showing that no root resorption had begun before the loss of these deciduous teeth. All but six of the ribs were missing, and five of those were on the right side. The bones of both hands were present, but the foot bones were missing. Due to the shallow position of this grave it is probable that it was disturbed by animals shortly after its placement.

Three roughly-finished arrowpoints of undetermined types were recovered near the right knee of Burial 1 (Figure 11). The points are on flakes worked only on the edge to outline their shape. Possibly made by the child, they may represent the remains of a toy bow and arrows placed with the child at the time of burial; these were the only possible funeral offerings found with this burial.

After the general extent and position of the burial had been determined, the entire 1.5 x 1.5 m unit was uniformly deepened, leaving the burial in place on a pedestal. When the excavation of the floor reached 48.75 cm bs, another burial was found directly below Burial 1.

Burial 2

Although Burial 2 was positioned almost directly below Burial 1, there was no intermixture of bones between the two (Figure 12). Both burials were confined to distinct burial pits separated by 10 to 12 cm of soil. Within this soil layer,

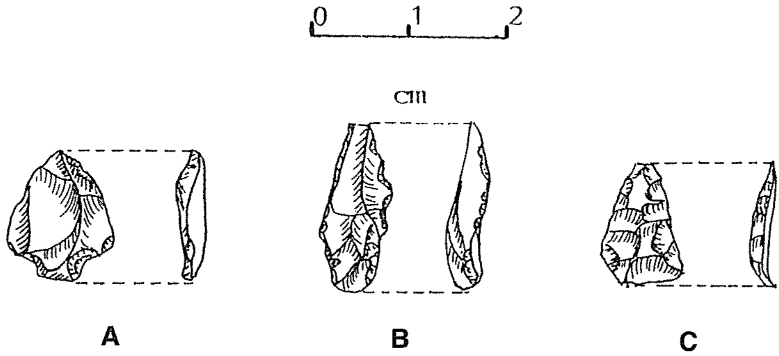

Figure 11. Three arrowpoints recovered near the knees of Burial 1.

a large piece of clean charcoal was recovered that was the first one submitted for dating (see below). It is likely that a part of Burial 2 was encountered during the excavation of the pit for Burial 1, as there is some evidence of minor disturbance of some bones (misplaced right humerus, left ulna, and fibulas).

Burial 2 was a 4.5-5.5 year old child. The sex could not be determined with certainty due to the age at death. The body had been placed in a prone position with the lower legs bent back toward the head. The toes of either foot were turned toward the other, and the feet were above the pelvic bones (Figure 13). This burial was also oriented to the east. Like the bones of the child above it, very little bone deterioration was observed on most bones of Burial 2, the exceptions being the ends of long bones, ribs, and pelvic bones. Generally, the remains are in a good state of preservation, and the dissolution noted is not unexpected due to the young age of the child.

Most of the ribs are present and in a normal anatomic relationship to the spine, also present and intact. The bones of the left arm and hand are undisturbed, except for the ulna, which had been moved from its original position. The left hand was folded back behind the body, over the left hip and near the feet. The distal end of the right humerus was lying over the right lower inferior border of the mandible, while the bones of the right forearm were 28 cm away from their normal articular surfaces with the humerus. The right radius and ulna were in anatomic relationship to each other, as well as being in proper relation to the bones of the right hand.

The position of the skull of Burial 2 was nearly face down. The cranial bones had settled, and the entire skull was flattened antero-posteriorly. This can be attributed to the ground weight on the incompletely ossified skull and/or to damage that occurred during the excavation of the pit for Burial 1. The maxillary anterior central incisors were both missing as a result of normal deciduous exfoliation.

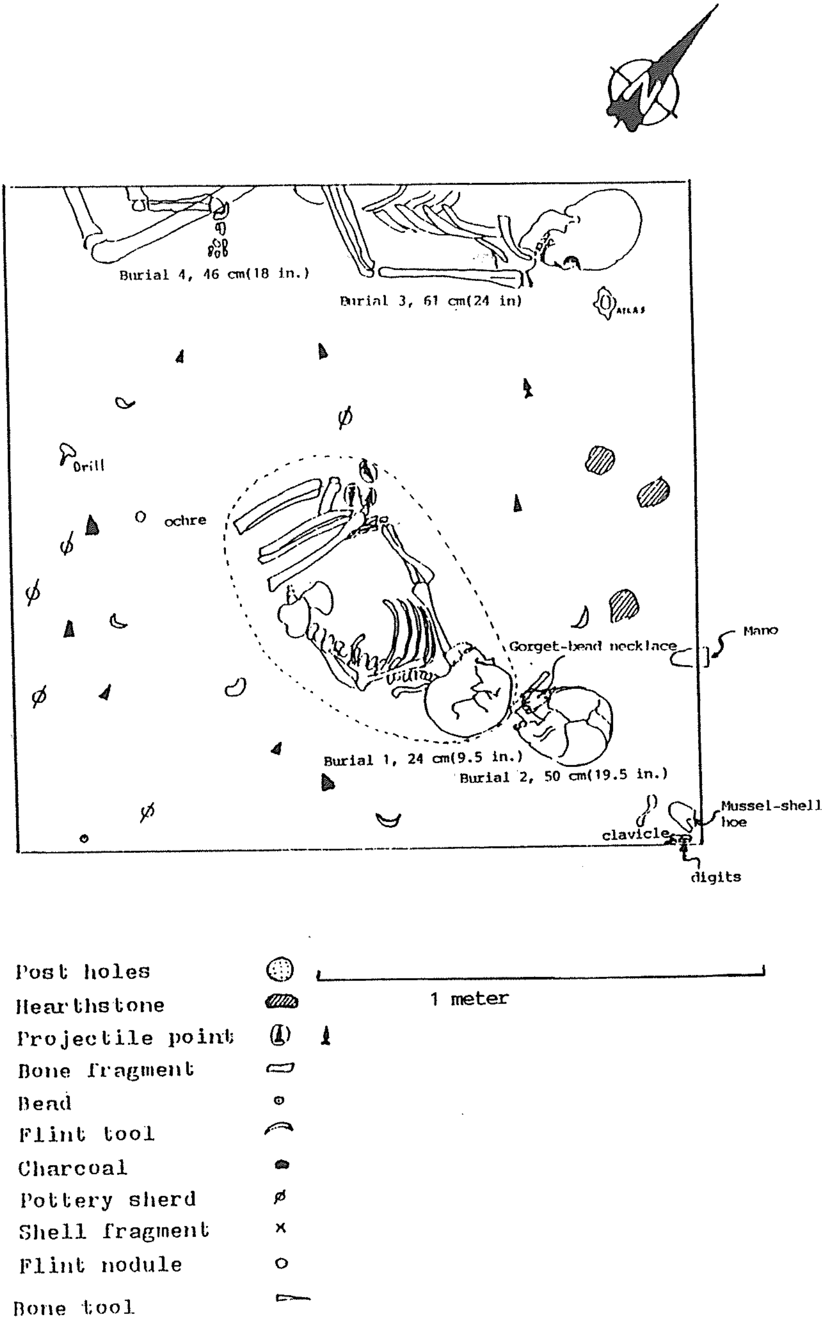

Figure 12. Plan map of Block 3, Unit A(-3).

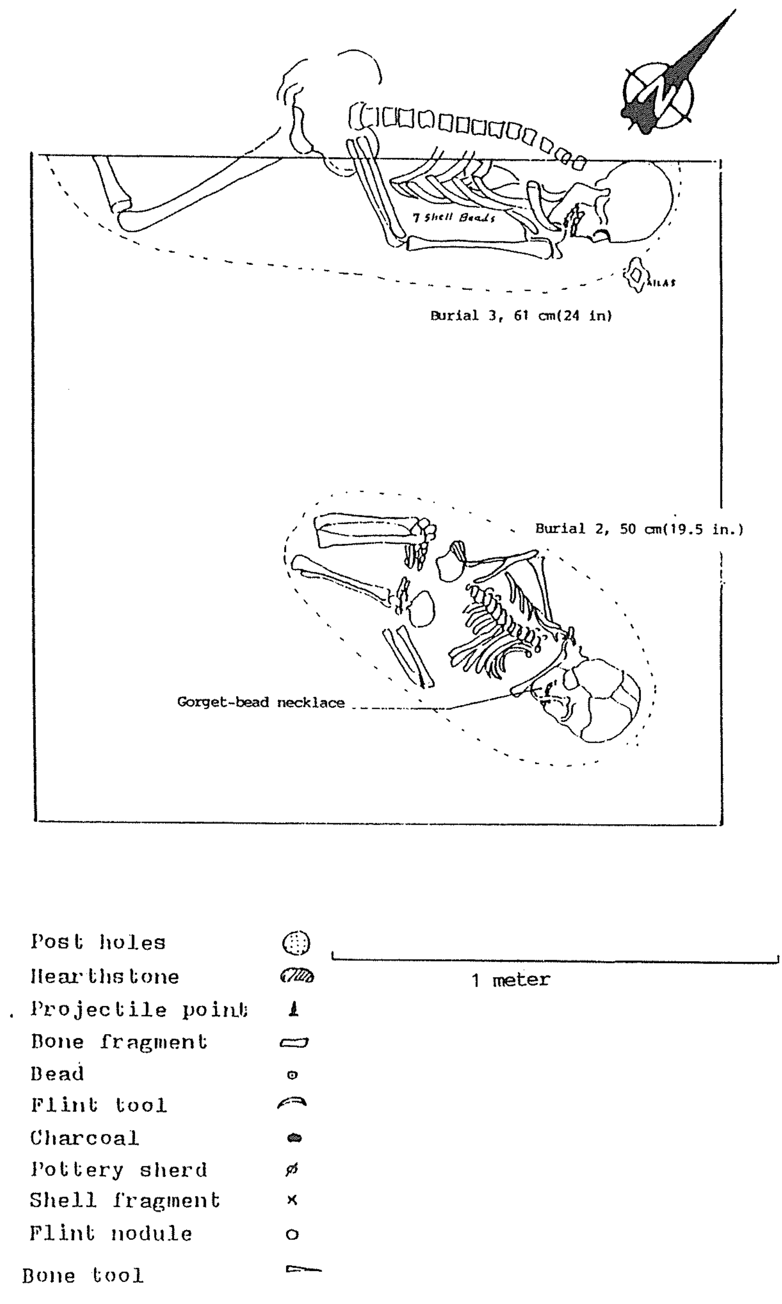

Figure 13. Burials 2 and 3, Unit A(-3).

The burial of this child was accompanied by grave goods of unusual rarity and beauty. Accompanied by a strand of small drilled disk beads was a double-drilled, engraved gorget made of a marine whelk shell. Their position around the neck of the child at the time of the burial implies that they were part of a shell necklace. The gorget was carved to represent an effigy of a human hand (Figure 14). During the process of excavating Unit A(-3) to allow for complete exposure of Burial 2, a third skull was encountered in the unit's north corner at 60 cm bs (see Figure 13).

Burial 3

Burial 3 was an adult male at least 55 years old. The body had been placed in a supine position with the head turned to face the left shoulder. The knees were slightly flexed and angled to the left. The left arm bones were lying across the lower part of the abdominal area, but the bones of the left hand and the distal sections of the left radius and ulna were missing (Figure 15). Some of the missing skeletal parts were recovered during excavation of the surrounding soil up to a meter away, suggesting rodent activity was responsible. The skull of this skeleton is remarkably well preserved and shows advanced ossification of the sutures; the other bones are exceptionally hard and well preserved, and on some surface areas the ivory color of fresh bone has been retained.

The right ascending ramus and genial area of the mandible had been fractured. Instead of being a simple crack through the bone, the ramus fracture was splintered halfway through. The zygomatic arch was cracked, and the appearance of it and the ramus fractures are consistent with those that could have occurred at or shortly after the time of death, although Albrecht (1994) considered the fractures healed.

The teeth are badly worn from mechanical abrasion, and exhibit dental decay. Wearing away of the dental enamel, and the softer dentin layer, exposed the pulp on no less than 11 teeth, rendering them non-vital and subject to periapical abscesses. The presence of a fistula scar on the right anterior maxilla represents the final stages of an infectious process that took many years to form after the associated tooth became non-vital. Evidence of two lost molars and subsequent healing are present. The effects of moderate generalized periodontal disease can be observed, and this is not unexpected in an individual of this age where carbohydrates (corn) are present in the diet, and oral hygiene is nonexistent.

Three *Olivella* shell beads and four small drilled columella beads were found with this burial. No arrowpoints or arrowpoint fragments were found in proximity to the burial.

Shortly after discovering Burial 3, the tibia, fibula, and the distal end of the femur of a very young child were exposed directly over and 20 cm above the lower legs of Burial 3. Designated Burial 4, the position of this skeleton prevented the complete exposure of Burial 3 until a later date (see Figure 15, left).

Figure 14. Top: Marine shell gorget *in situ*, showing its relationship to right humerus and skull of Burial 2; Bottom: View of gorget after removal of humerus.

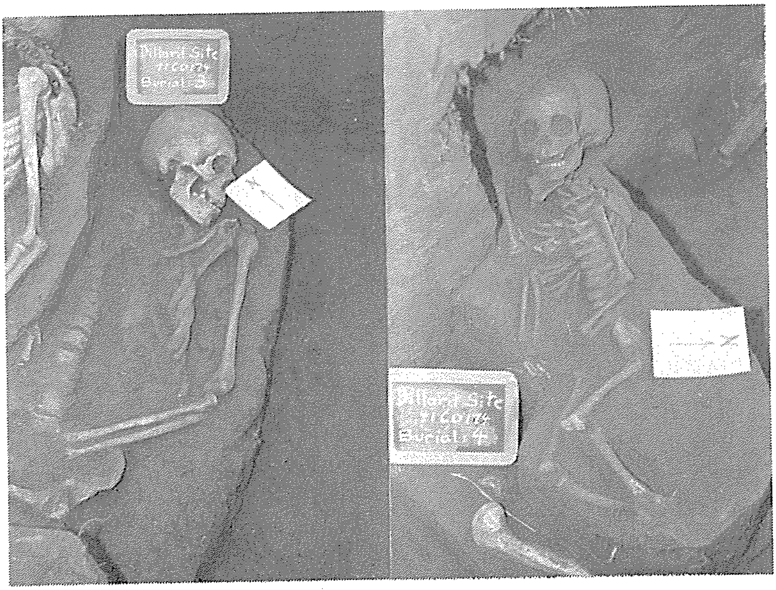

Figure 15. Left: Burial 3; Right: Burial 4.

The burials found up to this point had been encountered within the first 1.5 x 1.5 m unit. To complete the exposure of both burials 3 and 4, unit A-3 was excavated (see Figure 9).

Burial 4

Burial 4 was a very young child approximately 1.5-2.5 years of age. The long axis of the body was laying 10 degrees south of west and in a slightly flexed position. Most of the bones were present but were quite fragile due to incomplete ossification. The burial was undisturbed and was not associated with Burial 3. A distinct and separate burial pit was observed above the lower legs of Burial 3. The uppermost part of Burial 4 was 40 cm bs (see Figure 15, right).

As expected in the skeleton of a young child, the skull had settled from ground pressure, but generally it was intact. Most of the maxillary teeth were missing from other than natural causes, and they were not found during the initial exposure of the burial. As in Burial 3 however, some complete deciduous teeth were found in the soil surrounding Burial 4. Rodent activity is the most probable cause of their displacement.

A large necklace consisting of 405 small (4 mm in diameter), drilled, shell disk beads was found *in situ* around the neck of the remains of this child. The shell used to make beads was marine in origin, but the type of shell has not been determined; no other burial offerings were found with Burial 4.

Burial 5

Upon removing the uppermost layers of soil in the next unit, A-3, the fifth burial was encountered lying alongside and 10-12 cm higher in elevation than Burial 3. It was well separated from it (Figures 13 and 16).

Burial 5 contained the complete remains of an adult male about the same age as Burial 3. Despite their proximity to each other, Burial 3 and Burial 5 appear to represent separate interments. No grave offerings of any kind were found with this burial.

The skeleton of Burial 5 was flexed, oriented in a northeast direction, and lying on its right side. The lower legs were bent tightly against the thighs. The left arm bones were extended behind the body with the left hand positioned near the buttocks. The right arm was extended in front of the body with the right hand positioned between the thighs. The head was turned to the right, nearly face-down. Most of the bones of this skeleton were exceptionally dense and hard (Figure 17).

The dentition of Burial 5 was the worst encountered in any of the burials found at the Dillard site. All of the molars on the maxilla had been lost except one, the left first molar. This remaining molar was non-vital due to occlusal wear into the pulp, causing the development of a periapical abscess. Advanced periodontal disease was also observed. The area in which the other maxillary molars had been lost antemortem showed evidence of chronic bone infection. This was most likely due to the infection of residual root tips, preventing the bone from healing completely. The remaining maxillary teeth were severely worn, and their bone support was affected by moderate to severe periodontal disease.

This person had lost four teeth on the mandible while still living, with subsequent healing occurring. Of the remaining 12 mandibular teeth, nine of them had periapical abscesses either from decay or excessive wear. Based upon the physical evidence of extensive dental disease, this person was in an unusual amount of discomfort most of the time. The presence of dental caries in this individual is characteristic of a diet high in carbohydrates that provides the energy source for the growth of harmful bacteria (Morse 1978:40).

A very large post or small storage pit was found below Burial 5. It extended 1 m below the burial and was 25 to 36 cm in diameter.

Burial 6

Burial 6 was located in the northwest corner of Unit A-3. This burial seems to have been disturbed prehistorically and reinterred because of the disarticulated nature of the remains. Only a small part of this burial was located within this unit, so the excavation was expanded in unit B-3 to expose it. The exposed burial included only a radius, the second cervical vertebra, vertebral fragments, a skull fragment, one scapula, two calcaneus bones, two ribs, and five teeth (see Figure 17). A large tubular bone bead was recovered among the bones. The burial was

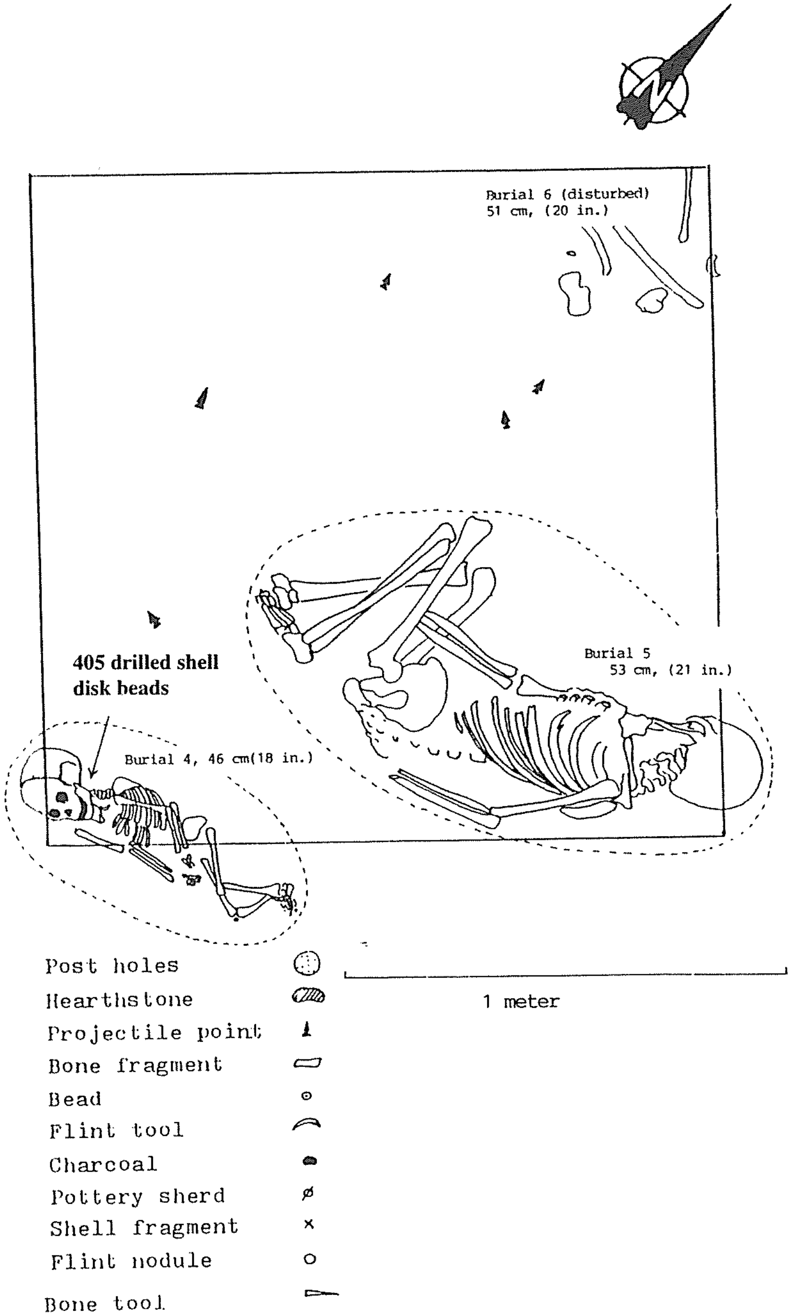

Figure 16. Burials 4-6, Unit A-3, Block 3.

Figure 17. Burial 5 (left) as it was found in Unit A-3, Block 3. The bones of the left hand were missing, possibly as a result of digging the grave for Burial 4. Burial 6 (right) was discovered in the north corner of Unit A-3. It is either a reburial or a case of a burial that had been disturbed by later prehistoric digging in the area.

photographed, its position recorded, and it was then covered with dirt until complete excavation and removal could be accomplished.

The excavation was now expanded on the southeast side nearer the point of the terrace ridge. This was in keeping with the original excavation plan, which would allow for the interim covering of the block with plywood and waterproof tarps. A shallow drainage ditch was dug around the excavation to channel off heavy rainwater.

When unit B(-3) was staked out, a distinct depression in the ground was noticed within the staked boundaries. This depression was about 75 cm wide and 15 cm deep. This had not been noticed before due to the tall grass, and the laying of the plywood covers over this area when working in the block. On closer inspection, three similar depressions were observed scattered across the point of the terrace.

Burial 7

An unusual amount of hearthstones were immediately encountered during the excavation of unit B(-3). In the area of the aforementioned depression, a solid layer of large hearthstones was uncovered. These stones were placed closely together with large amounts of charcoal and ashes interspersed between and beneath them (Figure 18). The layer of hearthstones was about 15 cm beneath the surface, and extended west into Unit A(-4). The large rocks exposed and removed during the excavation of the first unit of this block [A(-3)] were also associated with this rock layer.

A scapula, clavicle, and proximal third of a humerus were uncovered 60 cm bs along the southwest wall of unit B(-3). The bones had been obviously disturbed, and were that of a juvenile. The rest of the burial lay within the adjacent unit B(-4). Labeled Burial 7 (Burial 7A in Albrecht [1992, 1994]), the bones were left *in situ* on a pedestal against the wall until Unit B(-4) could be excavated.

A characteristic burial fill had been encountered from the rock layer to the depth of Burial 7, and it was initially assumed that this soil was associated with Burials 1, 2, and 7. However, mixed soil/burial fill continued below the level of Burial 7, and it was concluded that another burial probably lay deeper in the unit, and that Burial 7 had been previously disturbed by the digging of this subsequent, but yet unexplored grave. Unit B(-4) was excavated to expose the remainder of Burial 7.

Burial 7 was badly disturbed. The body had originally lain on its right side with the left leg fully extended and the right one slightly flexed. The left leg was complete, but only the lower part of the right leg remained. These bones represented the only undisturbed part of this burial. It was discovered later that the rest of the bones had been dislodged by prehistoric gravediggers, who had attempted to pile the loose bones back into the area of the original grave after digging a later one.

The burial was that of a child who died between the age of 6.5-7.5 years (see Albrecht, this volume). The burial was too badly disturbed to offer any clue as to the cause of death. The body had been originally oriented in an east-west direction with the head to the east. The skull, which had originally faced north, seems to have been moved nearer to the pelvis, and was positioned facing south when found (Figure 19). Other incidental bones (vertebrae, fingers, and ribs) had also been piled on the feet and legs of this burial. The left one-third of the mandible was found beneath the skull; the remaining two-thirds was missing. As with the other burials, artifacts were found mixed in the burial fill, but they were not considered intentional grave goods.

The Mass Burial (Burials 8-12)

Beginning about 75 cm bs, perforated Olivella shell beads were found in Unit B(-3). These seem to have increased as the excavations neared the skeletons, and they were most abundant in and around the bones themselves.

When the excavation of Unit B(-3) reached 87.5 cm, the occipital portion of an intact skull was encountered. Before the day was over, three other skulls had been located in this grave. The bones of two arms, articulated at the elbows, were

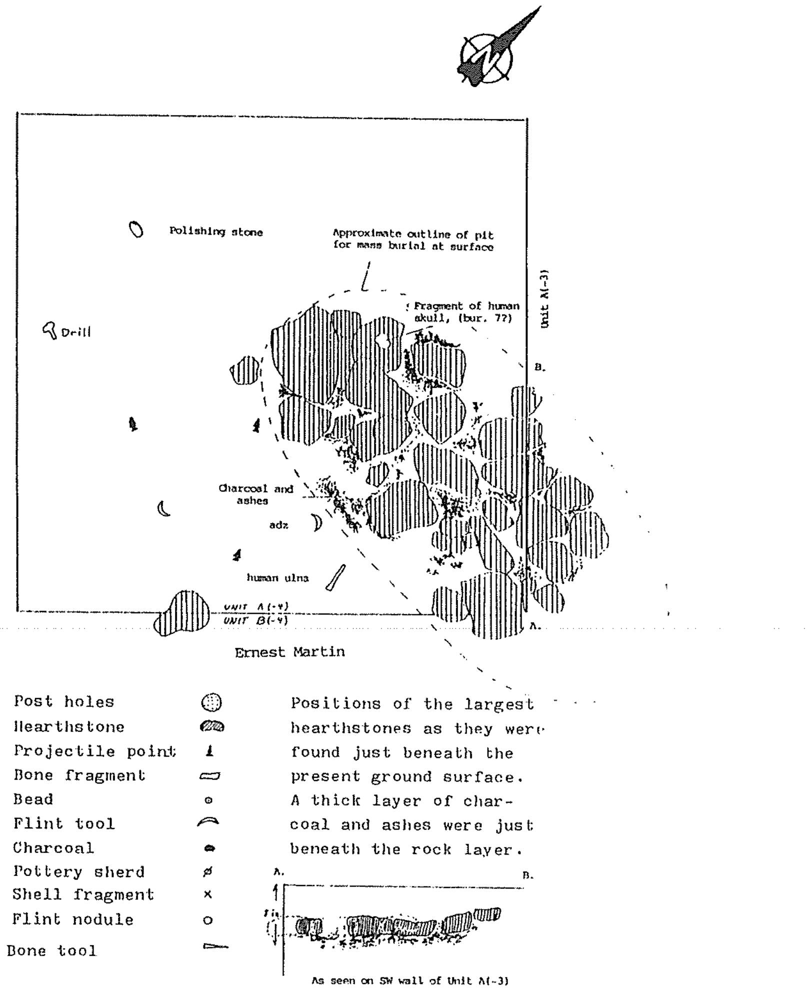

Figure 18. Plan of Unit A(-4), B(-4), and A(-3), and profile of SW wall of Unit A(-3).

found among the first two skulls. The next day, a fifth skull was discovered (Figure 20). The burial pit bottom was reached immediately below this last skull, at a depth of 1.35 m.

Clearing of the skulls revealed that five intact skeletons lay below them, but only two of these skulls were positioned in a normal anatomic relationship to the cervical spine. The others were well separated from the postcranial skeleton. The skeletons consisted of three females and two males (Albrecht 1994:Table 1).

It should be mentioned at this point that the individual remains found in this mass grave were labeled numerically in the order of appearance of their skulls.

Most of the other bones had settled within a 15-17.5 cm thick layer. Later, with additional dirt removal and exposure of more skeletal details, the skeletons were matched with the displaced skulls (Figure 21). The displaced skulls were matched to their respective skeletons by using the laws of deduction, observation of the undisturbed anatomic positions of the bones, and by identifying the sex of each skull and pelvis.

This detailed cleaning of the remaining dirt from the bones revealed evidence suggesting the perimortem decapitation of some of the five people.[1] Cervical vertebrae were found dislodged or missing. The skulls of three of the bodies had been displaced from 25 to 55 cm, and as much as 57 cm higher up in the burial fill from their respective postcranial counterparts, while most of the smaller, more easily disturbed bones, still remained in their proper anatomic positions (Figures 22-23).

Burial 8

The first two skulls discovered were labeled Burials 8 and 9. They were positioned high in the burial, 79 and 89 cm bs, respectively, and 48 and 58 cm from the floor of the gravepit. The disarticulated arms found associated with these skulls belonged to Burial 8, a 16-20 year old female lying extended on the north side of the mass grave (see Figure 21). Hers was the most disturbed of all the bodies, with only the torso and legs remaining intact, and she was positioned on the left side against the northwest wall of the gravepit. The fact that both the left and right arms were found articulated high in the burial fill suggests perimortem disturbance, rather than postmortem movement of the bones by animal or human disturbance. The mandible from this body was never found. Most of the digits of a dismembered hand thought to belong to this burial were found below the right femur of Burial 11. Around 40 *Olivella* shell beads were found scattered among the ribs and legs of Burial 8. There were no other offerings identified with this burial.

Burial 9

The displaced skull farthest from its respective skeleton was Burial 9. This skull was the second one encountered after the discovery of the mass grave, and its placement was the highest of any of the remains within the grave pit, but the skeleton was found in a prone position below Burials 8, 10, and 11. The mandible was intact and laying 25 cm away near the skull of

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[1] Albrecht's (1994) examination of Burials 8-12 did not uncover clear perimortem evidence of decapitation, but a few skeletons of Plains Village age have been found in the Southern Plains with evidence of traumatic death, including decapitation (Brooks 1994b; Bovee and Owsley 1994).

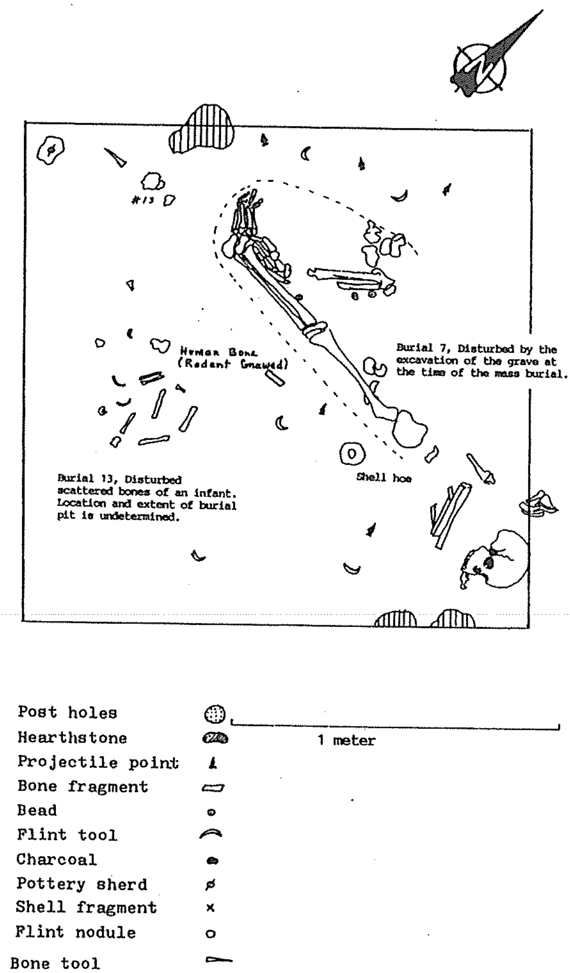


Figure 19. Plan of Burial 7 and 13, Unit B(-4), Block 3.

Burial 8 (see Figure 21). The arms were extended below the body. The most superior part of the skull was 57.5 cm above the floor of the burial pit, and it was lying on top of the arm bones of Burial 8 (see Figure 22).

The appearance of skull 9, with its prominent brow ridges, supraorbital foramina, and heavy jaw structure, was decidedly male. Positive proof of the correct matching of this skull to the remaining headless skeleton came when the pelvis was removed and definitely confirmed to be that of a male. The estimated age at the time of death is between 30 and 34 years.

Figure 20. Top: A view of the mass burial during its excavation. Bottom: A lateral view of the displaced skulls, seen at eye level looking south.

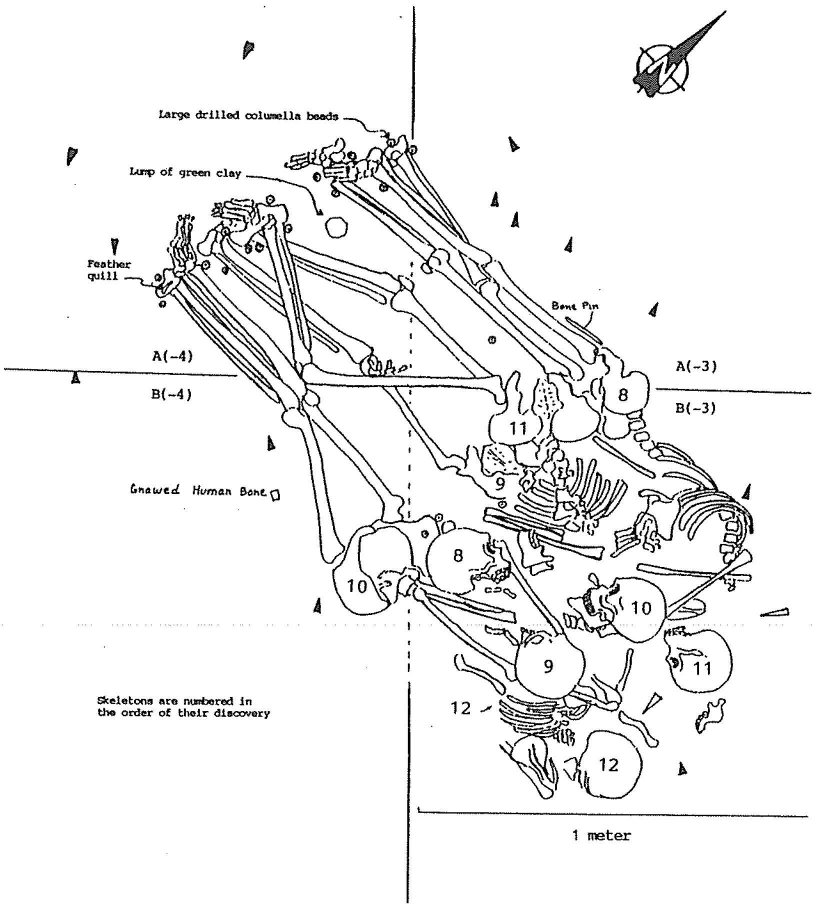


Figure 21. Overview of the mass burial matching the skulls to their respective bodies.

By measuring the remains *in situ* with the skull replaced in its approximate normal position, the height of this person was estimated to be around 1.6 m. The teeth that remained were in fair condition, and exhibited moderate wear; several had been avulsed at or after the time of death. *Olivella* beads were discovered among the bones of the upper torso, and conch beads were found near the feet.

Burial 10

The apparently intact skeleton, Burial 10, was that of a young male 27 to 34 years old. He appears to have been in perfect health with a complete and healthy dentition. Except for the aforementioned displaced body parts (the two arms and

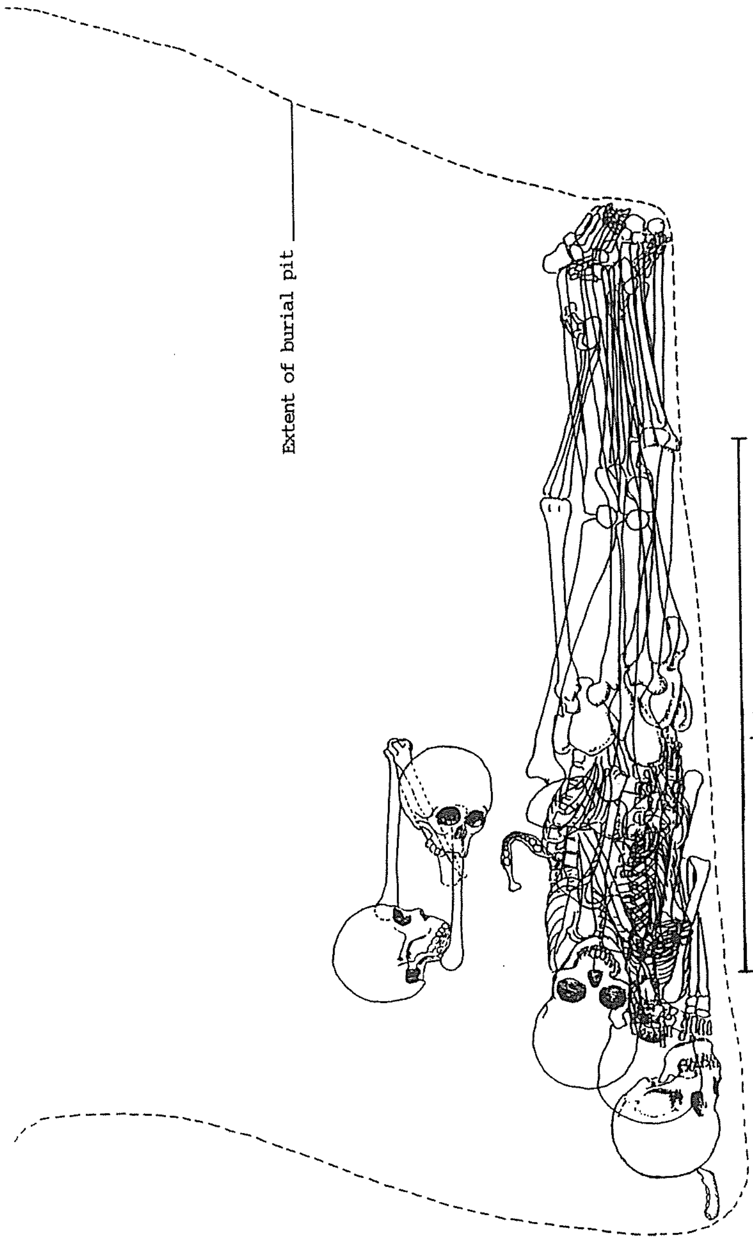


Figure 22. Profile of the human remains from the multiple burial as they were discovered. Viewed from northwest to southeast.

Figure 23. Left: A view of the mass burial as seen looking east; Bottom: A large drilled columella bead *in situ* near one of the skulls in the mass burial. Most of the beads were found near the feet of the five skeletons.

skulls of Burials 8 and 9), he was lying extended on the right side above all of the other bodies, with the superior part of the skull at 107 cm bs. The cause of death of this man is not evident from examination of the remains (Albrecht 1994). The skeleton appears to be complete, and unlike the four other skeletons placed below this one, all of the bones are in their proper positions. He was slightly larger in stature than the other male from this grave, with his height estimated to have been around 1.65 m. Two conch beads were found near the pelvis of this individual, and five were found near the feet (see Figure 23).

Burial 11

The skeletal remains of Burial 11, a female, were lying in a prone position atop Burials 8 and 9, but below that of Burial 10. The remains were 20 cm above the floor of the grave and 118 cm bs. The right leg was slightly extended with the knee bent.

Hundreds of *Olivella* shell beads were recovered near the neck and chest area of the skeleton, and the skull was displaced forward. The mandible was still in its normal position with the spine, while the cranial portion of the skull lay 30 cm away. This woman was small in stature, about 1.53 m tall, and from 17-21 years of age when she died. The arms were extended at her sides, and a bracelet containing 43 more *Olivella* beads was found around the bones of the left wrist. The missing part of the mandible from Burial 7 was found near the skull of Burial 11.

Burial 12

Burial 12 was that of a 35-44 year old female. Hers was the first body to be placed within the mass grave. Her burial posture was drastically different from the others placed around and above her, in that she was buried face down in a fully flexed position. The knees were drawn up to the shoulders, and the bones of the arms were at her sides with the hands under the chest (see Figure 21). Although she appeared to have been decapitated, the head had been placed next to the body, and very close to what would have been a normal anatomic position, although it had tipped forward during the subsequent placement or settling of the other bodies. The weight of the ground had flattened the skeletal remains (excepting the skull), and most were only 5 to 7.5 cm above the floor of the burial pit. The exact amount of separation of the skull from the cervical spine could not be measured because the first four cervical vertebrae were missing, and the remaining three may have been fractured. Blackened encrustations preserved on the skull of Burial 12 are very similar to those observed on the skulls of Burials 8-9, and 11.

Between the feet of the individuals in the mass grave was found an unusual lump of greenish-yellow clay, 5 x 7.5 cm in size. It resembles very closely the size and color of clay nodules occasionally found in Caddoan graves excavated in East Texas and Arkansas. This may have been a burial practice adopted by contact with the people from this area. It was noticed that smaller particles of this clay, caught in the screen during washing, produced a bright green paint when wet. Iron oxide-bearing ochre stones were also found close enough to the bones to be considered possible burial offerings.

An occasional small drilled columella bead was found in the mass grave. Fourteen were recovered scattered in the grave fill, and in association with the upper torso of Burials 9 and 11. Larger columella beads were found around the feet and legs of the five individuals, and in the surrounding grave fill. Twenty-eight of these were eventually found there, suggesting they were attached to anklets, the leather ties on footwear, or for decoration of the same.

Burial 13

The scattered bones of a child between 3.5-4.5 years of age were discovered while deepening the excavation of Unit B(-4). The bones were within a 60 cm area, which was 75 cm bs, and 50 cm southwest of the undisturbed leg of Burial 7 (see Figure 19). The bones were extremely small, but were well preserved, as were all of the other bones discovered at this site. As one might expect, no intact skull of this child was found, but several large, extremely thin fragments were recovered. The bones were not in normal anatomic relationship to each other, and they had been disturbed after the body had decomposed. This disturbance could have taken place during the digging of the grave for Burial 7, or during subsequent digging of a hole to deposit refuse. Rodent or other animal burrowing may also account for this disturbance.

The unusual preservation of the skeletal material was quite evident as each burial was discovered and excavated. When some of the skulls were cleaned and examined, even the tiny ossicles of the middle ear were found in perfect condition.

SUMMARY OF THE MASS GRAVE

When the damp earth was being dusted from the surface of the bones of the mass burial, they were coated with what appeared to be a thin layer of ashes. Upon seeing this, the first impression was that these people had been partially burned before their burial. However, there were no remnants of charred material associated with this ash coating, and the bones were of a uniform color and density when brushed off. This gray-white powder may represent the byproducts of a reaction of the decaying organic remains with minerals contained in the soil (Morse 1978).

The facial areas of the skulls had an intermittent black encrustation that did not firmly adhere to the bone. Many teeth, either loose or still in their sockets, had blackened root surfaces. These areas do more closely resemble charred remains. If these discolorations are a result of actual burning, it was not done to the point that the bone itself was charred. When the black crusty material is removed, the bone retains the same appearance as the surrounding unblackened areas. Whether this also represents some sort of reaction with the soil, or is evidence of burning prior to burial, requires further analysis. Neither the white ash-like coating, or blackened encrustations, appeared on any of the bones representing single interments.

The reason these five people died at the same time and were buried together is open to speculation. The most obvious observation to be made concerning this mass burial has to do with the possible mutilation by dismemberment and decapitation of most of the bodies. The positions of two skulls and two arms at such distances away from the postcrania suggest this, but visual examination of the remains showed no cut marks or other positive evidence of perimortem injury (Albrecht 1992, 1994).

If murder and mutilation were involved in the deaths of these people, it may be presumed to have been the result of actions by a group of marauding hostiles during a raid. If it can be assumed that the individuals interred in the mass burial did not die of natural causes, their burial postures suggest they were buried very soon following their deaths. The missing second, third, and fourth cervical vertebrae of three of the skeletons may explain why cut marks were not evident on the skulls if decapitation occurred through the neck. Evidence for perimortem decapitation is seen in other Late Prehistoric Plains Village burials (e.g., Brooks 1994b), and is rarely found in Caddoan cemeteries in the Great Bend area of Red River (as at the Crenshaw Site (3MI6) in Miller County, Arkansas [Durham and Davis 1975]). Other instances of this type of mutilation has been reported from Henrietta Focus sites (Krieger 1946; Lorrain 1969).

The absence of grave offerings such as pottery vessels and fine chert weapons and tools is characteristic of Plains Village burials. What is not characteristic is the presence at Dillard of so many marine shell beads with the mass grave. The positions of many of these beads suggests that they were in strands when the bodies were buried. At least three strands were identified *in situ* around the headless body of Burial 11. Around the left wrist of this body was a bracelet of *Olivella* beads. Other beads were not only found intimately associated with the skeletons, but were scattered within the burial fill, as if they had been thrown in as the bodies were being covered. Rodent activity probably accounts for some scattered beads being recovered beyond the perimeter of the burial. The only other items found in this grave that can possibly be identified as burial offerings were the ochre stones, a bone hairpin, and the lump of green clay. Although accidental occurrence of these items in the burial fill is possible, they were recovered intimately associated in the same layer with the bones.

The tragedy surrounding the death and subsequent burial of these five people was likely a very important and well-remembered event in the community. Whether their deaths were a result of a raid on the village proper, or upon a small group at an outlying camp away from the protection of the village, the incident was immediately known and the burial quickly accomplished. Since the bodies were carefully positioned within a small amount of space, with one in a fully flexed position, their burial may have taken place within a few hours of their deaths, before rigor mortis had occurred.

After the skeletal remains in Block 3 had been fully exposed, professional archeologists from several Texas universities and the Texas Historical Commission were invited to examine the remains *in situ*. Alternative ideas and different interpretations were discussed concerning the various burials and their possible causes of death. The confinement of the burials to such a small area is consistent with the burial patterns at the Harrell site (Figure 24). Intrusions by later burials at the Harrell site were common, and three mass burials were discovered. In these mass burials, skulls were missing and mandibles were either disarticulated or missing (Krieger 1946). They were all restricted to a small area in the center of what Krieger refered to as "the brow of the terrace," interpreted to mean an outward projection of the terrace itself.

After examination by the professional archeologists, and all pertinent measurements and photographs had been taken, the burials were removed and the bones individually wrapped and cataloged. They were transported to the National Museum of Natural History, Smithsonian Institution, where complete osteological analysis, including DNA recovery and sequencing, is being directed by Dr. Doug Owsley (see Albrecht 1992, 1994).

ADDITIONAL WORK IN BLOCK 3

Nine and one-half additional units were excavated in Block 3 (see Figure 9) after uncovering the mass grave. For the most part, these units were adjacent to those in which the burials were confined, and were excavated to further define the extent of the cemetery area. The sterile soil below the occupation zone in the remainder of Block 3 was encountered in most places from 91-106 cm bs.

No additional intact burials were discovered in these adjacent units, but some bones from the burials already discovered, and possibly from still undiscovered burials, were recovered (Albrecht 1992, 1994); four large columella beads were associated with them. A total of 176 additional human bones and teeth were recovered from these adjacent units. These bones had been transported from intact burial remains by rodent tunneling. Most of the bones were digits and teeth, but patellas, vertebrae, skull fragments, and rib fragments were also recovered. Many of these displayed rodent gnawing.

In the east corner of Unit C(-3), a dark soil stain mixed with charcoal, hearthstones, shell, clay, and bone fragments was noted. This continued through the sterile layer in the remainder of the unit (at 86 cm), and resembled burial fill. Further excavations in adjacent units C(-2) and D(-2) indicated that this

Figure 24. A view of the entire cemetery area in Block 3, looking northwest. Burial 7 is in the lower part of the picture and Burial 6 is at the top.

feature was a large storage pit measuring 1.37 x 1.52 m in diameter and 2.28 m deep. The storage pit was filled with the same types of cultural debris found elsewhere in the midden deposits of Block 3. The bottom third of the pit had been undercut, resembling the bell-shaped pits found at other Late Prehistoric

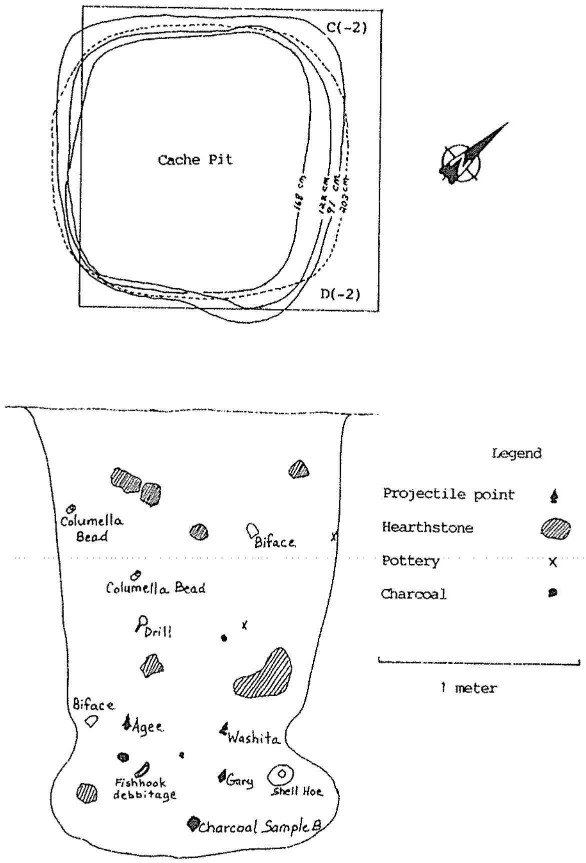


Figure 25. Plan and Profile of the Storage pit in Block 3.

Plains Village sites on the Southern Plains (Figure 25). A charcoal sample suitable for dating was recovered from the 203 cm level of this pit (see below).

ARTIFACT DESCRIPTIONS AND QUANTIFICATIONS

The discussion of the artifacts found at the Dillard site is divided into five main groups: chipped stone, ground stone, ceramic, shell, and bone. This includes consideration of the suspected provenance of the raw materials from which the artifacts have been made.

The artifact classifications and descriptions of the artifacts recovered at Dillard are based on information from three primary sources: (a) the identification of stone artifacts was based upon Turner and Hester (1985); (b) the bone tools and shell artifacts mainly from Bell (1980); and ceramic identifications from Suhm and Jelks (1962).

CHIPPED STONE TOOLS

The most common stone tool type at the Dillard site is the projectile point (N=101) (Tables 1-3). With one exception, all of the projectile points are arrowpoints; a Gary dart point was found at 188 cm bs in the storage pit in Block 3. The different age ranges of the recovered points suggest that this site was probably occupied by prehistoric groups from the Late Prehistoric I through the Late Prehistoric II periods (see Prikryl 1990). Dart points are infrequently found in deposits from Late Prehistoric I period sites on the Southern Plains. The absence of underlying Archaic deposits permits a clearer understanding of the associated tool assemblage for these periods.

The most common arrowpoint type is the Washita point (N=41) (Turner and Hester 1985). Many of these Washita points are of a serrated style (Figure 26) that is relatively common at sites on the Elm Fork of the Trinity River near Lake Lewisville (Daniel J. Prikryl, personal communication 1993). The Washita points averaged 1.9 cm in length and 1.25 cm in width.

The lithic materials used in the manufacture of the points originated from sources over a wide geographical area. Most of the artifacts were made of high-quality chert, but coarser-grained local quartzites or silicified sandstones, commonly called sugar quartz, were also used. Identifiable raw materials include green chert of the Reeds Spring Formation and novaculite from the Ouachita Mountains of western Arkansas and southeastern Oklahoma, Edwards Plateau chert, Alibates, Ogallala quartzite, agatized wood, and obsidian (Banks 1990). The most common source of obsidian in this area is from Obsidian Ridge in northern New Mexico (Hughes 1989:194).

The Fresno (N=26) was the next most prevalent point type (Turner and Hester 1985). This type was more common in the later part of the site's occupation, and technically they are generally crudely made compared to other arrowpoint forms. The Fresno points average 2 cm in length, while their width was 1.35 cm. The lithic types utilized for Fresno points were predominantly local quartzites and coarse-grained cherts.

The remaining arrowpoint types found were divided between the Bonham (N=5) and Scallorn (N=9) types, with one Agee, one Cliffton, and 11 unidentified examples also present (Turner and Hester 1985). The Scallorn and Bonham points typically occur in Late Prehistoric I period occupations, and/or the early

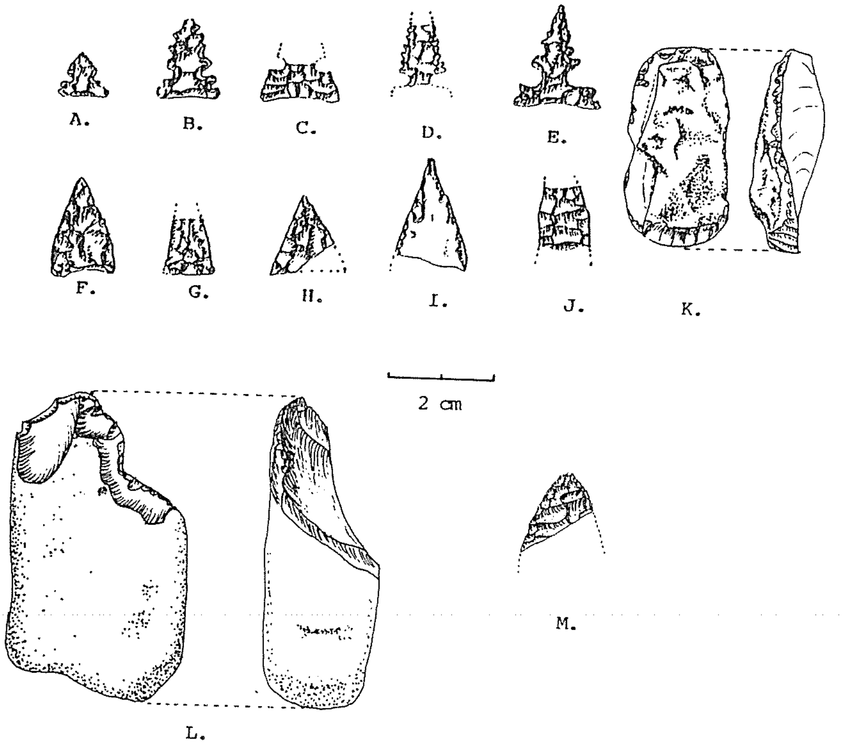


Figure 26. Chipped stone artifacts from Block 1 (see Table 1 for more information).

part of the Late Prehistoric II period. Agee points are rarely found this far west, and are most commonly found in the Great Bend area of the Red River near present day Texarkana.

Other stone artifacts recovered from the Dillard site included bifaces, uniface endscrapers, uniface sidescrapers, gravers, drills and spokeshaves (notches) (see Tables 1, 2, and 4). A utilized flake of quartz crystal was also found. These chipped stone tools are commonly found in prehistoric Plains Village sites on the Southern Plains. The appearance of wood and bone working tools (e.g., the uniface, graver, abrader, and notch) evidences bow and arrow and bone tool manufacture on this site. This type of assemblage would be expected in a village whose occupants relied heavily upon hunting not only for their own immediate sustenance, but for stockpiling a surplus to get them through lean times.

Flakes of lithic debris recovered from Block 1 totaled 1352 pieces, and these were mainly from deeper strata in units J-1 and K-1. Many of the projectile points recovered from this block also came from unit J-1 (see Table 1). Two bone

Table 1.

Chipped Stone Artifacts from Block 1

Type	Unit	Depth	Material	Figure 26
Washita	F-1	94 cm	Chert	A
Washita	I-1	86 cm	Edwards	B
Washita	I-1	79 cm	Reeds Spring	C
Washita	I-1	76 cm	Chert	D
Washita	J-1	86 cm	Edwards	E
Fresno	J-1	38 cm	Quartzite	F
Fresno	J-1	48 cm	Chert	G
Fresno	I-1	51 cm	Chert	H
Fresno	J-1	41 cm	Chert	I
UID*	J-1	66 cm	Chert	J
Uniface	H-1	72 cm	Ogallala qtz.	K
Uniface	F-1	77 cm	Chert	L
Biface	F-1	68 cm	Quartzite	M

*UID = unidentifiable arrowpoint

Table 2.

Chipped Stone Artifacts from Block 2

Type	Unit	Depth	Material	Figure 27
Washita	D-5	91 cm	Reeds Spring	A
Washita	E-6	96 cm	Quartzite	B
Washita	E-6	90 cm	Obsidian	C
Scallorn	E-6	101 cm	Chert	D
Bonham	E-5	66 cm	Quartzite	E
Fresno	E-5	46 cm	Quartzite	F
Fresno	E-6	43 cm	Chert	G
UID*	E-5	76 cm	Quartzite	H
Washita	F-6	71 cm	Chert	I
Washita	E-6	76 cm	Quartzite	J
Uniface	D-6	79 cm	Reeds Spring	K
Uniface	F-6	66 cm	Agatized wood	L
Uniface	F-6	70 cm	Chert	M
Uniface	F-6	54 cm	Chalcedony	N
Biface	E-6	60 cm	Red chert	O
Biface	D-6	64 cm	Reeds Spring	P

*UID = unidentifiable arrowpoint

pressure flakers were also found in this unit, suggesting that this part of the block was probably a work area at one time. The presence of many complete, apparently, usable artifacts is most likely the result of simple loss.

The artifact assemblage from Block 2 was very similar to that of Block 1, in that the predominant point type is the Washita, and there were few other tools besides arrowpoints (Table 2). Fresno, Scallorn, and Bonham arrowpoints comprise the remaining projectile point types recovered from Block 2 (Figure 27).

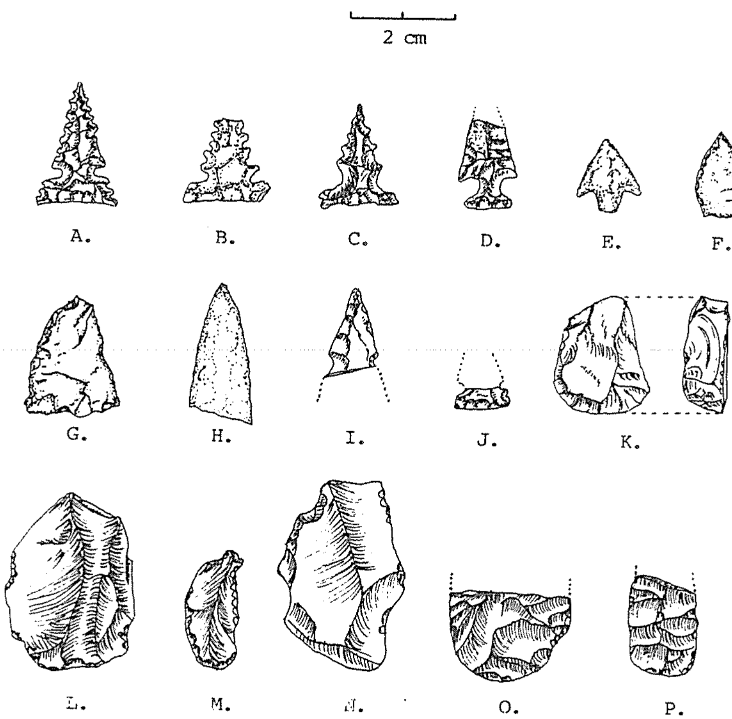


Figure 27. Chipped stone artifacts from Block 2 (see Table 2 for more information).

Because burials in Block 3 were placed in a dense midden, it was difficult to distinguish between artifacts placed with the burials and those that had been accidentally lost or thrown away. Cultural debris that had been deposited on the surface of the refuse heap, ended up deposited deep in the ground as burial fill when the graves were backfilled. Subsequent disturbance by rodent activity scattered some items further.

The numbers of chipped stone artifacts was much higher in Block 3 than in blocks 1 and 2 (Table 3). This artifact increase is probably related to the quantities of midden in Block 3, as more items were deposited. In other words, the items recovered from Block 3 were both accidentally dropped here during periods of intense occupation, but sometimes brought to this area of the site to be thrown away.

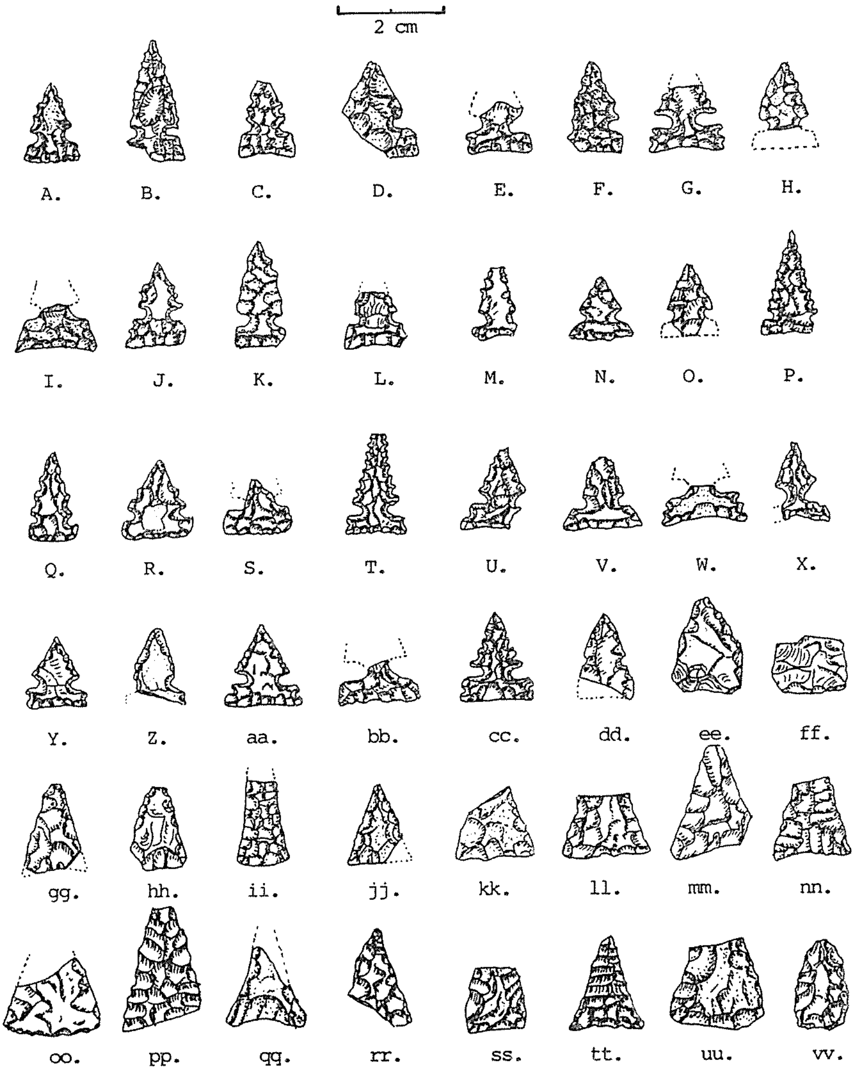


Figure 28. Arrowpoints from Block 3 (see Table 3 for more information).

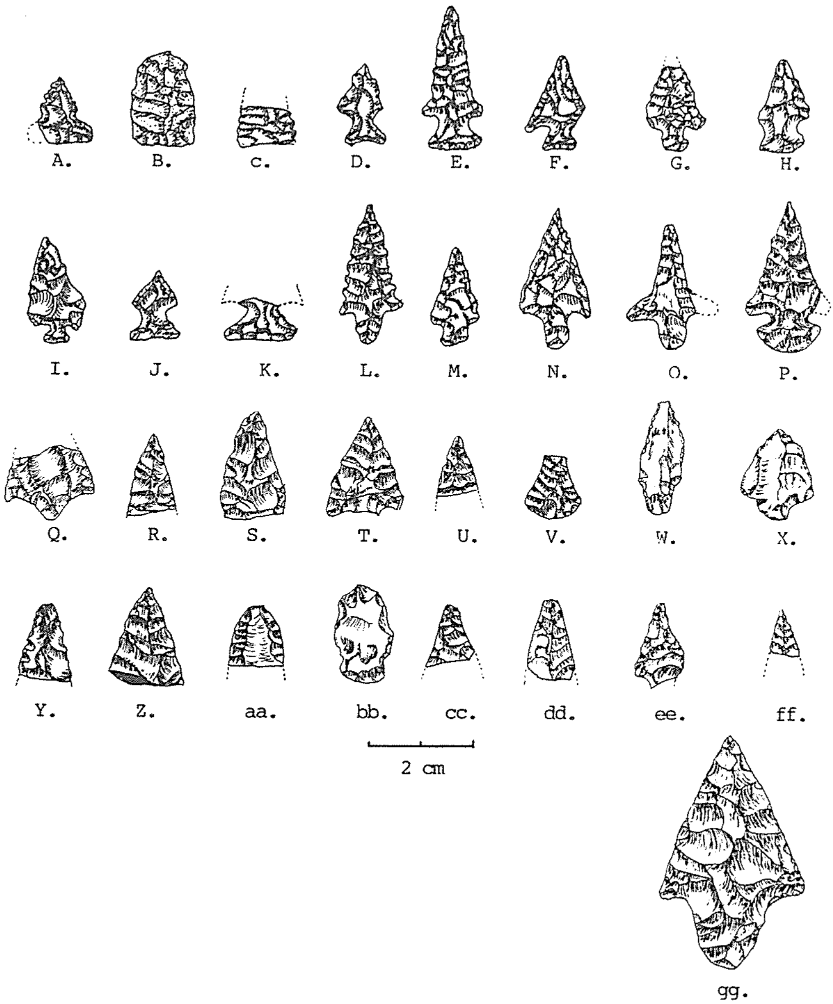


Figure 29. Projectile points from Block 3 (see Table 3 for more information).

Although many projectile points and tools were found in the area of the burials in Block 3, only three arrowpoints have been identified as burial offerings (see Figure 11). The rest were deposited or lost in the area, and some were interred in deeper deposits during excavation for trash dumping or burial placement. Since most of the points were broken, and generally recovered in shallower deposits than the human remains, it is unlikely that they were intentionally placed there as burial offerings. No projectile points were found in a context as to suggest that they were the cause of death of any of the individuals. When projectile points are found as grave goods in a burial, a common custom among

Table 3.

Projectile Points in Block 3

Type	Unit	Depth	Material	Illustration
Washita	A(-2)	81 cm	Chert	Fig. 28A
Washita	A(-3)	56 cm	Edwards	Fig. 28B
Washita	A(-3)	76 cm	Chert	Fig. 28C
Washita	A(-3)	99 cm	Quartzite	Fig. 28D
Washita	A(-3)	66 cm	Alibates	Fig. 28E
Washita	A(-5)	86 cm	Quartzite	Fig. 28F
Washita	A(-5)	69 cm	Alibates	Fig. 28G
Washita	A(-5)	71 cm	Quartzite	Fig. 28H
Washita	A(-5)	76 cm	Quartzite	Fig. 28I
Washita	A(-6)	61 cm	Reeds Spring	Fig. 28J
Washita	A(-6)	76 cm	Quartzite	Fig. 28K
Washita	A-3	102 cm	Chert	Fig. 28L
Washita	A-3	76 cm	Chert	Fig. 28M
Washita	A-3	76 cm	Quartzite	Fig. 28N
Washita	A-4	79 cm	Quartzite	Fig. 28O
Washita	B-3	74 cm	Novaculite	Fig. 28P
Washita	B-3	69 cm	Novaculite	Fig. 28Q
Washita	B-3	81 cm	Chert	Fig. 28R
Washita	B(-3)	58 cm	Quartzite	Fig. 28S
Washita	B(-4)	81 cm	Reeds Spring	Fig. 28T
Washita	B(-4)	127 cm	Edwards	Fig. 28U
Washita	C(-2)	76 cm	Chert	Fig. 28V
Washita	C(-2)	79 cm	Quartzite	Fig. 28W
Washita	C(-2)	102 cm	Quartzite	Fig. 28X
Washita	C(-2)	109 cm	Chert	Fig. 28Y
Washita	C(-2)	132 cm	Quartzite	Fig. 28Z
Washita	C(-4)	81 cm	Chert	Fig. 28aa
Washita	D(-2)	155 cm	Novaculite	Fig. 28bb
Washita	D(-2)	99 cm	Chert	Fig. 28cc
Washita	B(-4)	74 cm	Novaculite	Fig. 28dd
Washita	B(-2)	81 cm	Ogallala qtz.	Fig. 29A
Fresno	A(-3)	46 cm	Edwards	Fig. 28ee
Fresno	A(-3)	30 cm	Reeds Spring	Fig. 28ff
Fresno	A(-3)	51 cm	Chert	Fig. 28gg
Fresno	A(-3)	36 cm	Quartzite	Fig. 28hh
Fresno	A(-4)	41 cm	Chert	Fig. 28ii
Fresno	A(-4)	43 cm	Quartzite	Fig. 28jj

Table 3 (Continued).

Type	Unit	Depth	Material	Illustration
Fresno	A(-5)	46 cm	Quartzite	Fig. 28kk
Fresno	A-3	58 cm	Chert	Fig. 28ll
Fresno	A-4	53 cm	Novaculite	Fig. 28mm
Fresno	A-4	43 cm	Chert	Fig. 28nn
Fresno	A-4	50 cm	Chert	Fig. 28oo
Fresno	B-3	51 cm	Chert	Fig. 28pp
Fresno	B-3	53 cm	Quartzite	Fig. 28qq
Fresno	B(-4)	61 cm	Reeds Spring	Fig. 28rr
Fresno	C(-2)	56 cm	Chert	Fig. 28ss
Fresno	C(-2)	56 cm	Edwards	Fig. 28tt
Fresno	C(-2)	102 cm	Quartzite	Fig. 28uu
Fresno	C(-3)	53 cm	Chert	Fig. 28vv
Fresno	C(-4)	46 cm	Quartzite	Fig. 29B
Fresno	B(-2)	50 cm	Chert	Fig. 29C
Scallorn	C(-3)	86 cm	Brown Chert	Fig. 29D
Scallorn	B(-3)	125 cm	Novaculite	Fig. 29E
Scallorn	B(-4)	97 cm	Lt. Gray Chert	Fig. 29F
Scallorn	B(-4)	89 cm	Tan Chert	Fig. 29G
Scallorn	B(-4)	76 cm	Red Chert	Fig. 29H
Scallorn	A-4	78 cm	Gray Chert	Fig. 29I
Scallorn	A-4	81 cm	Tan Chert	Fig. 29J
Scallorn	A-4	91 cm	Lt. Gray Chert	Fig. 29K
Bonham	A-3	66 cm	Ogallala qtz,	Fig. 29L
Bonham	B(-4)	71 cm	Lt. Gray Chert	Fig. 29M
Bonham	B(-4)	79 cm	Tan Chert	Fig. 29N
Bonham	C(-4)	76 cm	Lt. Gray Chert	Fig. 29O
Agee	D(-2)	165 cm	Novaculite	Fig. 29P
Cliffton	A(-3)	76 cm	Quartzite	Fig. 29Q
Unident.	A-4	77 cm	Gray Chert	Fig. 29R
Unident.	A-4	83 cm	Lt. Gray Chert	Fig. 29S
Unident.	A(-5)	66 cm	Ogallala qtz.	Fig. 29T
Unident.	A(-4)	89 cm	Quartzite	Fig. 29U
Unident.	A(-3)	86 cm	Edwards Chert	Fig. 29V
Unident.	A(-3)	36 cm	Lt. Gray Chert	Fig. 29W
Unident.	A(-3)	36 cm	Pink Chert	Fig. 29X
Unident.	A(-3)	39 cm	Edwards Chert	Fig. 29Y
Unident.	B(-2)	84 cm	Red Chert	Fig. 29Z

Table 3 (Continued).

Type	Unit	Depth	Material	Illustration
Unident.	B(-2)	67 cm	Petrified Wood	Fig. 29aa
Unident.	C(-3)	56 cm	Quartzite	Fig. 29bb
Unident.	C(-2)	69 cm	Quartzite	Fig. 29cc
Unident.	D(-2)	147 cm	White Chert	Fig. 29dd
Unident.	D(-2)	177 cm	Edwards	Fig. 29ee
Unident.	A(-5)	74 cm	Tan Chert	Fig. 29ff
Gary Dart	D(-2)	188 cm	Ogallala qtz.	Fig. 29gg

Caddoan groups, they are usually in a cluster (probably a quiver) placed near the body. The only instance in which this occurred was with Burial 1, where three arrowpoints were found together near the knees.

Except for the Agee point, all of the stone artifacts recovered from the Dillard site are consistent with those from other Late Prehistoric Plains Village sites in North Central Texas and South Central Oklahoma (Krieger 1946; Lorrain 1969; Brooks et al. 1985). The frequency of the Washita type at this site is perhaps more common than at other Late Prehistoric sites in this area, but may simply be related to an increased intensity of hunting during the period when they were made. The different styles of points found at the site were produced at different periods by different artisans to comply with favored methods of mounting and lashing the point to the arrow shaft. The differences in size and shape of points of the same type probably had very little association with its intended use, but were more likely dictated by the size and workability of the stone blank. All would bring down a deer, bison, or man equally as well.

Almost all of the other chipped stone artifacts from the Dillard Site consisted of various tools used for working bone, shell, wood, and animal hides, or for food preparation (Figures 30 and 31). These types of tools were relatively common in each block (23-38 percent) (Table 4).

Simple, unworked flakes, freshly struck, were also used for miscellaneous tasks, attested to by the many small flakes along the tool edges that were evident under magnification. Uniface endscrapers and sidescrapers may have been for working either hides or wood. Bifaces were used for woodwork and food preparation. Wood was one of the most abundant natural resources available to the Native Americans, and they clearly took advantage of this resource. Stone tools from Dillard suggests the manufacture of several different wooden items that could have been produced by using these tools: the most obvious of these are arrow shafts and their bow counterparts.

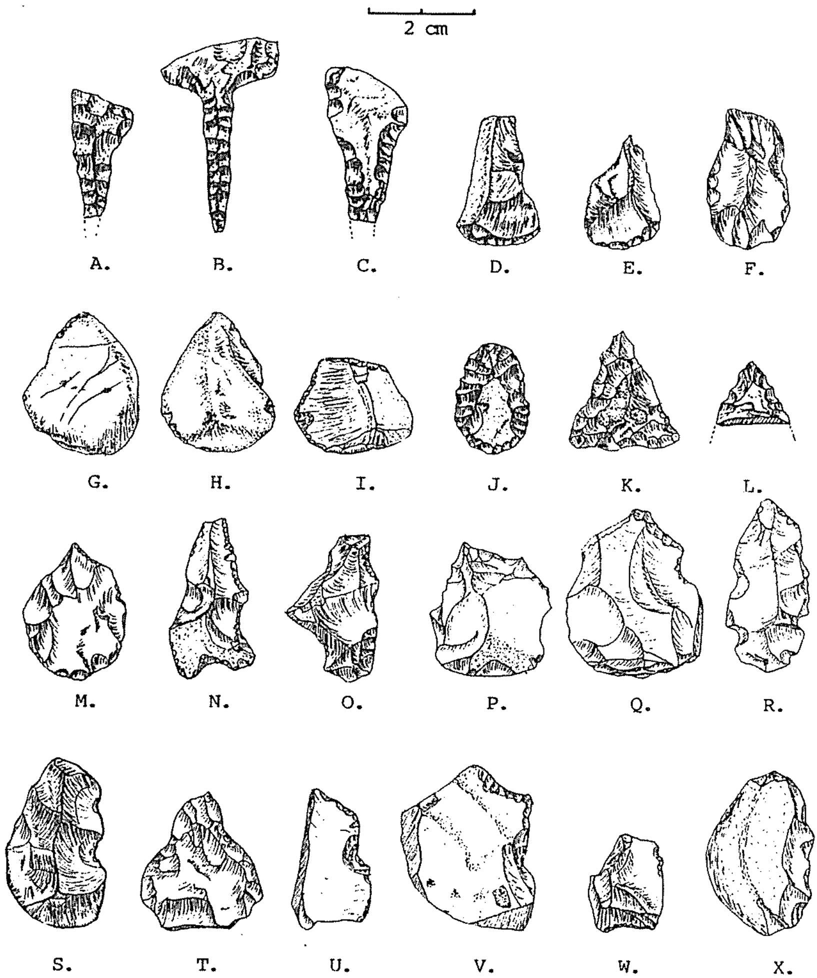


Figure 30. Chipped Stone Tools (see Table 4 for more information).

Pecked and Groundstone Artifacts

These artifacts were made primarily of native stone and produced by means other than percussion flaking (Table 5). Examples from the Dillard site included milling stones (metates) and the manos that were used to mill and process domestic and wild plants. Alhough no intact milling stones were recovered, the eight fragments found were thin and flat, and were made from dark sandstone and silicified sandstone. Eighteen whole or fragmented manos were found in all blocks, but were particularly common in Block 3. These

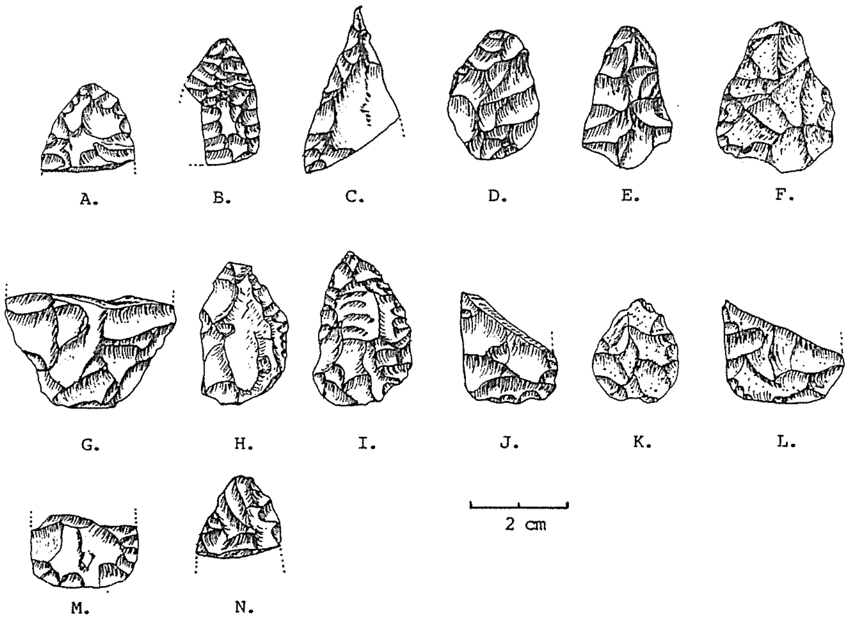


Figure 31. Bifaces (see Table 4 for more information).

Table 4.

Stone Tools from Block 3

Type	Unit	Depth (cm)	Material	Figure
Drill	B(-4)	76	Quartzite	30A
Drill	C(-2)	94	Quartzite	30B
Drill	B(-2)	68	Quartzite	30C
Endscraper	A(-3)	101	Lt. Gray chert	30D
Endscraper	A(-5)	73	Alibates	30E
Endscraper	B(-2)	79	Agate	30F
Endscraper	C(-4)	70	Chert	30G
Endscraper	C(-3)	61	Edwards	30H
Endscraper	A(-3)	78	Reeds Spring	30I
Endscraper	B(-4)	58	White chert	30J
Graver	B(-4)	61	Ogallala qtz.	30K
Graver	A(-3)	65	Dk. brown chert	30L
Graver	B(-2)	68	Ogallala qtz.	30M
Notch*	B(-4)	79	Black chert	30N
Notch*	A(-5)	63	Edwards	30O

Table 4 (Continued).

Type	Unit	Depth (cm)	Material	Figure
Notch*	A(-5)	55	Jasper	30P
Notch*	B(-4)	72	Chert	30Q
Notch**	A(-5)	58	Brown chert	30R
Notch**	C(-3)	79	Edwards	30S
Notch**	B(-3)	112	Ogallala qtz.	30T
Notch*	B(-4)	85	Quartzite	30U
Notch*	B(-4)	80	Novaculite	30V
Notch*	B(-4)	86	Reeds Spring	30W
Scraper	A-4	70	Reeds Spring	30X
Biface	A-3	67	Novaculite	31A
Biface	B-3	74	Chert	31B
Beveled Biface	A-4	82	Ogallala qtz.	31C
Biface	A-4	86	Chert	31D
Biface***	A-4	75	Chert	31E
Biface	A(-5)	90	Quartzite	31F
Biface	A(-5)	88	Chalcedony	31G
Biface	B(-4)	72	Edwards	31H
Biface	B(-3)	96	Reeds Spring	31I
Biface	B(-3)	88	Reeds Spring	31J
Biface	B(-2)	70	Quartzite	31K
Biface	D(-2)	140	Edwards	31L
Biface	D(-2)	110	Chert	31M
Biface	D(-2)	98	Chert	31N

* Unifacial **Bifacial ***Preform

Table 5.

Pecked and Groundstone Artifacts

Block	Mano	Milling Stone	Abrader	Ochre	Celt
Block 1	-	-	3	3	-
Block 2	3	2	4	5	-
Block 3	15	6	14	74	1

also were made of either sandstone or silicified sandstone. Other examples of milling stones were found at nearby Late Prehistoric satellite encampments.

Other artifacts in this category include sandstone and limestone abraders, used for smoothing wood, bone, or shell. One was made from a fossilized portion of mammoth or mastodon tusk, the remains of which are commonly found in the Fish Creek valley.

Cretaceous concretions containing cores of red or yellow ochre hematite were used as sources of pigment. They have also been mentioned as being one of many ritually significant burial offerings placed in Mississippian period graves (Spencer and Jennings 1965:76). Most of the examples were battered open and scraped with abrading stones to obtain the pigment. Although these were found in all of the blocks excavated, they were most numerous in the area of the burials; some were also present as burial offerings.

One fragment of a celt, made from an unidentified black stone, was found in Block 3. The ground surface is very flat and highly polished.

Large amounts of lithic debitage and fire-cracked hearthstones were recovered in the three blocks, with about 70-80 percent of these remains found in Block 3. The frequency of lithic debitage and burned hearthstones is presented by unit in Table 6.

CERAMIC ARTIFACTS

The ceramics from the Dillard site include small amounts of trade ware as well as locally manufactured wares. Most of the locally made ware has been identified as Nocona Plain, characterized by an abundant shell temper that was usually leached out, leaving a pitted and porous surface (Suhm and Jelks 1962). Also present in significant quantities were sherds similar in appearance to that of Nocona Plain, but with a temper made up of crushed limestone. The color and softness of these limestone fragments lead one to think that the source of the temper came from the abundant crumbling hearthstones that had deteriorated from the heat of cooking fires. In some examples, mixtures of both mussel shell and burned limestone were used as the tempering medium.

The exterior surfaces of the Nocona Plain type sherds vary in color from medium brown to dark gray. The interior surfaces are consistently darker, and sometimes a black carbonaceous deposit appears on the inner surface. There is no incising, engraving, applique, or any other type of decoration present on Nocona Plain. The surfaces are fairly smooth, but are not well polished. Many pits (from the leaching of the shell) can be observed on the surface of those sherds tempered only with mussel shell, while those samples tempered with both shell and limestone (or limestone only) have a smoother, less porous surface. The thickness of the sherds ranges from 4 to 9 mm, with an average thickness of 7 mm.

Several sherds of a cord-marked pottery were identified, principally from

Table 6.

Other Stone Artifacts

Block	Flakes	Hearthstone >3 cm Diameter
Block 1		
Unit F-1	174	27
Unit G-1	150	52
Unit H-1	130	39
Unit I-1	150	35
Unit J-1	491	37
Unit K-1	257	23
Totals	*1352*	*213*
Block 2		
Unit D-5	112	80
Unit D-6	124	114
Unit D-7	139	153
Unit E-5	134	186
Unit E-6	174	92
Unit F-6	134	115
Totals	*817*	*740*
Block 3		
Unit A(-2)	269	130
Unit A(-3)	301	538
Unit A-3	336	267
Unit A-4	445	396
Unit A(-4)	647	463
Unit A(-5)	413	292
Unit A(-6)	144	147
Unit B(-2)	264	171
Unit B-3	349	73
Unit B(-3)	863	496
Unit B(-4)	871	720
Unit C(-2)	203	94
Unit C(-3)	260	184
Unit C(-4)	270	62
Unit D(-2)	88	75
Totals	*5723*	*4108*

Block 3 (Table 7). The exterior surfaces of these sherds are buff in color and are decorated with many linear cord incisions and impressions having been pressed or stamped into the surfaces of the soft clay. The cordmarking generally runs in one direction on the vessel, but sometimes the pattern is quite random (Figure 32b). The sherd wall thickness of the cord-marked pottery ranged between 8-11 mm. The temper is grit and pulverized bone. The texture is coarse, but not crumbly. The cores are uniformly dark gray.

Of the total ceramic sample (N=759), 45 percent are Nocona Plain with shell temper. Over 30 percent of the total is Nocona Plain with shell and limestone temper, while 19.4 percent is tempered with just limestone. Nocona Plain rim sherds represent 3.4 percent of the total, and cord-marked pottery 1.4 percent. Five sherds from ceramic pipes from blocks 2 and 3 were also recovered (see Table 7).

Table 7.

Ceramic Artifacts

Block	Rim	Cord-marked	Nocona-shell	Nocona-limestone	Nocona-s/l*
Block 1	1	-	35	12	14
Block 2	4	1	68	7	28
Block 3	21	10	238	128	187

* s/l=shell/limestone temper

The cord-marked sherds are all from the body of globular jars. The other physical traits such as general thickness, temper, color, and surface treatment, fit the description of Lindsay Cordmarked. This is a typical ware found in Plains Village sites in South Central Oklahoma (Brooks 1994a:44), particularly the Washita River phase. The cord-marked sherds also have similarities to Borger Cordmarked, an Antelope Creek phase type. The time frame in which Borger Cordmarked was produced ranges from about A.D. 1100 to A.D. 1500 (Hughes and Hughes-Jones 1987:22). Cord-marked tradeware also appears in other Late Prehistoric sites on the Great Plains and Woodland areas of the United States and Canada (Suhm and Jelks 1962:15).

The method used to manufacture Nocona Plain type ceramics involved coil construction followed by hand-shaping and smoothing. Some specimens with rougher surfaces were possibly made using the paddle and anvil method. Sometimes a slip was applied. Although no complete or near complete vessels were recovered, enough sherds were retrieved to identify the sizes and

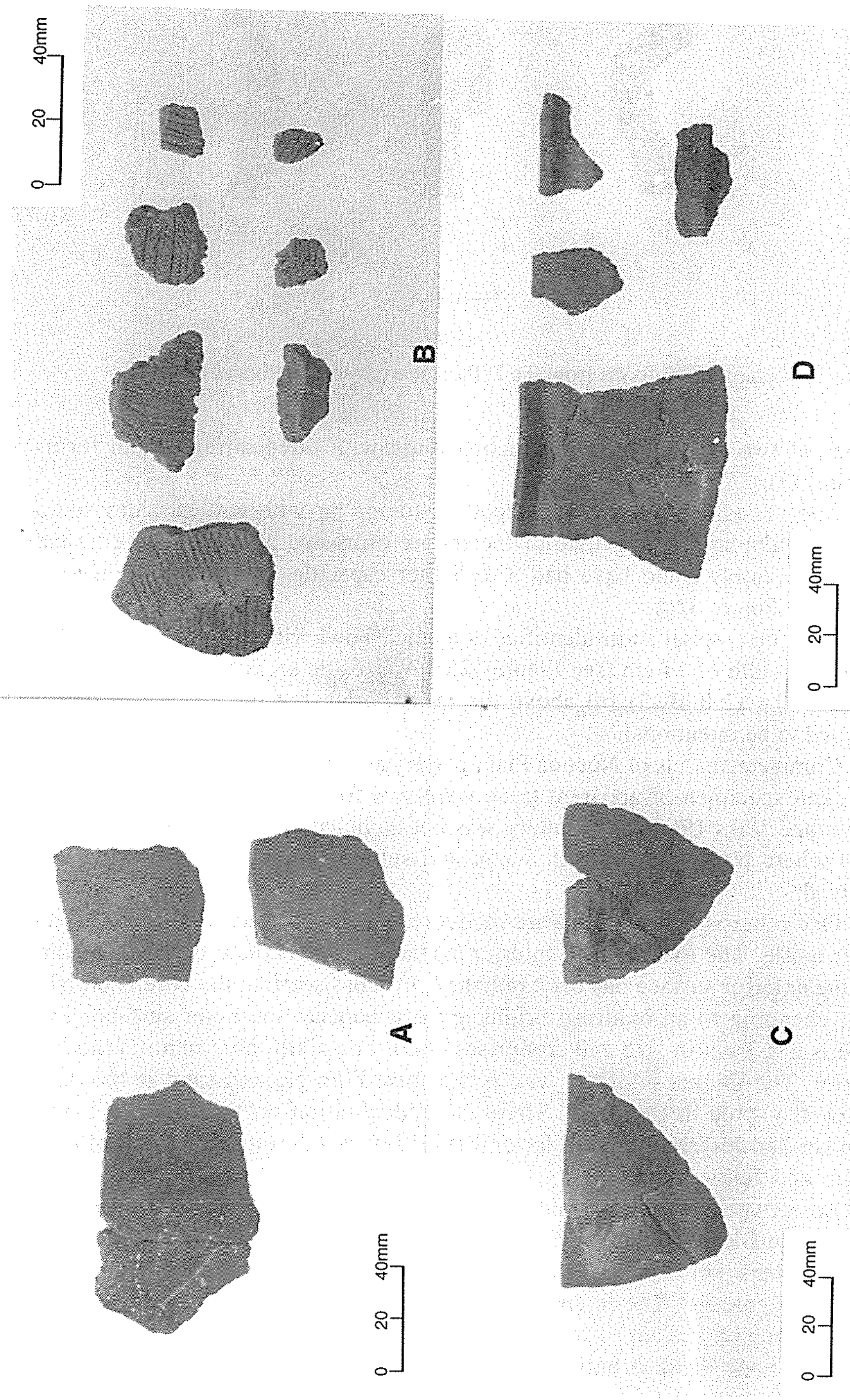


Figure 32. Pottery Sherds: A, Nocona Plain body sherds; B, Cordmarked sherds; C, D, Nocona Plain rims.

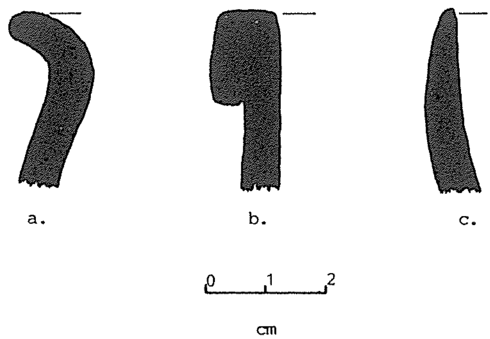


Figure 33. Ceramic Rim forms from the Dillard site; vessel interiors to the right.

shapes of two vessel forms of Nocona Plain with three different rim forms (Figure 33).

One vessel form is a cooking pot or storage jar with vertical sides and a rounded globular body. Orifice diameters are estimated at about 37.5 cm, and complete vessels could have had 3 to 5 liter capacities depending upon their depth (see Figure 32c).

The other vessel form identified is a small bowl with a depth of about 6.5 cm and a width of 14 cm (see Figure 32d). A sizeable section of one bowl was found in the Unit B(-3) fill above the mass burial, but the placement is not believed to be intentional.

Complete vessels of Nocona Plain pottery are practically unknown, but one unbroken specimen of apparent trade ware was found in Titus County, Texas (Suhm and Jelks 1962:115). Pottery was not included as burial offerings in the areas where Nocona Plain was made, and subsequently, few examples have survived.

One other sherd of tradeware recovered was a rim section of a Caddoan water bottle. The exterior and interior surfaces are chocolate brown in color, and the exterior surface has been polished. In cross section, the core is bluish-gray, changing to an oxidized bright red just beneath the outer surface. The piece is 2 x 3 cm in size and comprises about one-sixth the circumference of the rim. The thickness of the wall is 3.5 mm. Fine grained sand is the only inclusion visible in the paste. There is no decoration on the rim, but based upon similar descriptions, Wilder or Taylor Engraved bottles are possibilities (Suhm and Jelks 1962).

Besides pottery sherds, pipe sherds were also found at the Dillard site (two sherds from Block 2 and three from Block 3). Two fragments were pipe bowls, and the others were sections of the stem (14 mm in diameter) and stem/bowl junction (Figure 34). The ceramic pipe fragments were very hard and dense. The color is black on broken surfaces with evidently small amounts of shell temper showing on one sherd. A buff-colored slip had been applied to the surface.

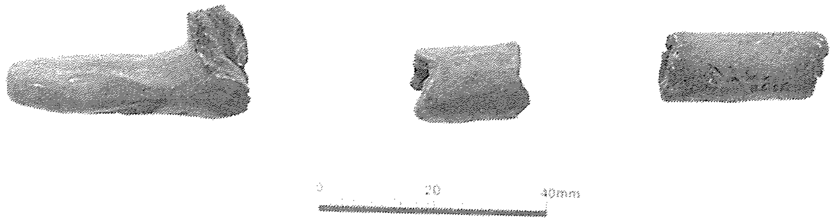


Figure 34. Ceramic pipe sherds.

In general, the pipe fragments do not resemble the pottery assumed to be locally made (Nocona Plain). Rather, the style is that of a type known as the Red River pipe (Bell 1980:99), although shell temper is usually not used with the Red River pipe. These types of Red River pipes were made from ca. A.D. 800-1400, and those from Dillard resemble later varieties (after ca. A.D. 1200).

SHELL ARTIFACTS

The shell artifacts from the Dillard site fall into two primary categories: local mussel shells of freshwater origin and land snails of the *Rabdotus* genus, and altered marine shells obtained through trade. None of the snail shells had been altered for utilitarian or decorative use. Although the occurrence of mussel shells and *Rabdotus* snail was frequent throughout the excavations, no lenses of either were noted.

Two different species of mussels were harvested from the creeks and Red River near the Dillard site. Both types were altered and utilized as digging tools; a hole was perforated near the center of the shell to facilitate hafting onto a handle. The unhafted shells may also have been used as gravedigging tools. Their use as hide scrapers is also possible, but this cannot be proven due to excessive deterioration of the edges.

Two complete hafted mussel shell hoes, and three fragments, were recovered in the Block 3 cemetery (Figure 35). Also, twelve unaltered examples showing evidence of wear were found. Many more shell fragments were found in the blocks (Block 1 = 25; Block 2 =11; Block 3 = 349) to indicate the degree to which they were harvested for food.

The discovery of 991 marine shell beads, and an engraved marine shell gorget in effigy of a human hand, evidences regular contact with Eastern cultures where these types of ornaments are commonly found. All of the marine shell artifacts recovered occurred as burial offerings or were part of the attire of those

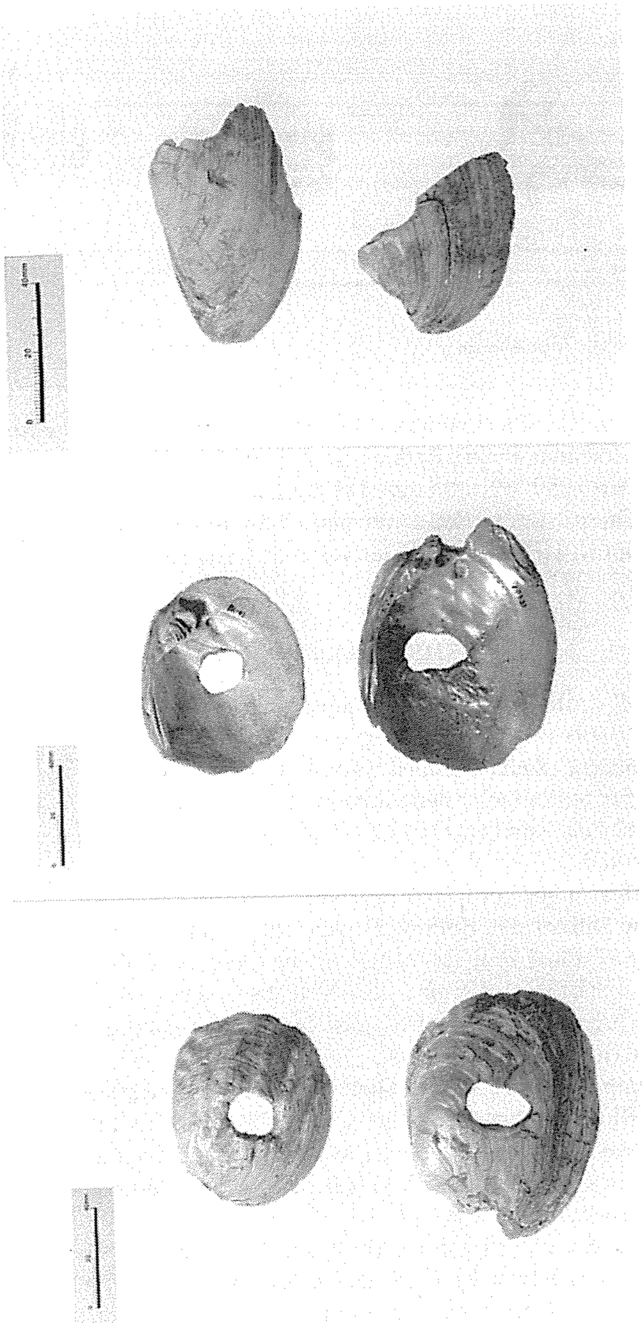


Figure 35. Mussel Shell hoes from the Block 3 burial area.

buried (Table 8). The likely origin of the identifiable shell types was in the waters around Florida, on both the Atlantic and Gulf sides. Artifacts of engraved shell appear in Mississippian period sites throughout the southeastern U.S. as far north as the Crable site in Illinois, and as far west as the Sanders and Valley Mills sites in Texas (Phillips and Brown 1978:xi). Shell beads have been found at other Late Prehistoric sites across eastern Texas and Oklahoma, and have been reported as far west as the Plains Village Edwards site in Beckham County, Oklahoma (Gilbert 1980:72).

The symbol of the hand has been linked to the "Southern Ceremonial Complex" (SECC) or "Southern Cult," terms that have been used to describe a common group of design elements and suspected religious practices prevalent throughout the Southeast during the Late Prehistoric period (Phillips and Brown 1978:169). It is uncertain if the hand gorget from the Dillard site represents a SECC artifact or association. This piece (Figure 36) does resemble four gorgets removed from the Craig Mound at the Spiro site, and other Southeastern ceremonial centers, but the motif lacks the eye symbol engraved on the palm as often occurs when associated with SECC burials (Hamilton 1952:206-208).

No refuse fragments of marine shell have been identified in the excavation debris from Dillard, indicating that the shell artifacts were not likely manufactured at the site. The presence of artifacts of marine origin supposedly associated with the SECC may merely represent the trade of such goods (originating somewhere in the Southeast), the motifs being the paraphenalia of Southeastern ceremonialism, instead of evidence suggesting the adoption of Southeastern religious practices on the Southern Plains.

The shell artifacts discovered at Dillard were probably traded in their finished state (cf. Brain 1988). The presence of bison hair textiles and robes from the Craig Mound at Spiro is suggestive that bison products among Mississippian groups may have been obtained by trading with Plains cultures (Hamilton 1952:265). Without regard to the original significance of the gorget, its presence does suggest that the people at the Dillard site did have contact with, and did carry on trade with, other contemporary societies from the Southeast.

The raw materials used for some of the marine shell artifacts discovered at Dillard were from two different shell species. These were a species of the *Olivella* genus, native to the southern Atlantic and Gulf coastal waters, and a species of the whelk shell, probably *Busycon perversum*, native to the southern Florida coast (Phillips and Brown 1978:27).

There are only two places along the Gulf of Mexico from which the shell for this artifact would have come. It came either from the western Gulf, near present Vera Cruz, Mexico, or from the eastern Gulf on the coast of Florida (Brain 1988). The total lack of evidence of the Mesoamerican connection lends more credence to a Florida-based trade network (Spencer and Jennings 1965:73).

The workmanship and attention to detail involved in the production of the gorget is excellent, and this is practically unknown for items from North Central

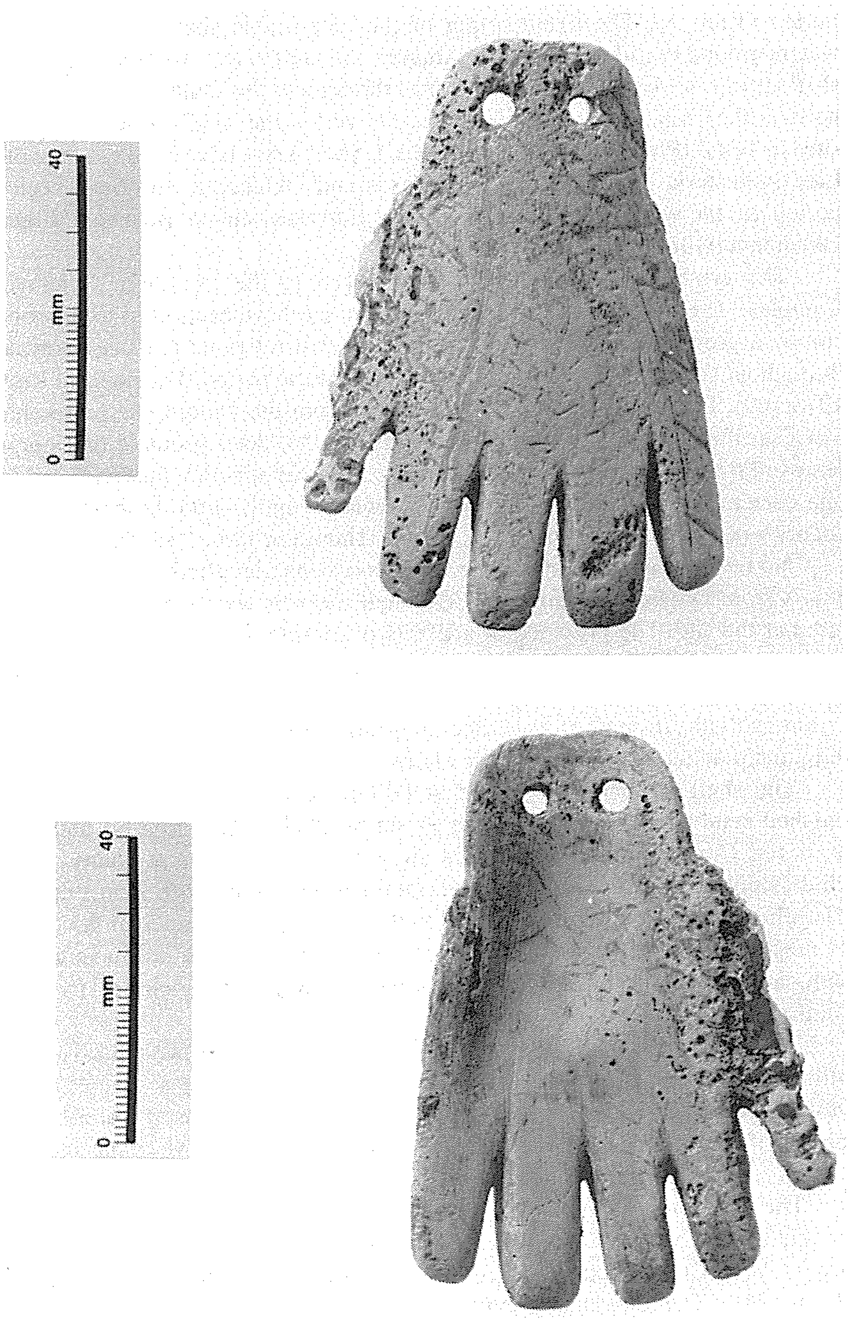


Figure 36. Top: Engraved Shell gorget from the front; Bottom: Engraved Shell gorget from the back. Note dissolution along one edge of the gorget.

Table 8.

Marine Shell Artifacts

Burial Association	2	3	4	Mass (8-12)	Sub-total
Small Disk Beads	68	-	405	-	473
Columella (Large)	-	-	-	28	28
Columella (Small)	-	4	-	13	17
Olivella Shells	-	3	-	470	473
Engraved Gorget	1	-	-	-	1
Total	69	7	405	511	992

Texas. Because of the geographical area in which this necklace was found, it is an important archeological find, but one should not discount the fact that it is also a beautiful example of prehistoric Native American art.

The piece was probably obtained in its finished form via a trade route up the Red River. Other engraved marine shell gorgets have been found in the Red River Valley in previous years, but none have been found as far west as Dillard. Since 1911, only 15 engraved shell gorgets, and 19 plain and engraved cups, have been reported from various Caddo sites along the Red River, ranging from the Belcher site in Caddo Parish, Louisiana, up river to the Sanders site in Lamar County, Texas (Phillips and Brown 1978:163-168).

The edges of the gorget are all rounded and well finished. On the convex surface are engraved abstract designs of unknown meaning or significance (see Figure 36). The dimensions of this piece are 5.5 x 7.5 cm. The average size of the 68 small drilled beads found accompanying the gorget was 1 x 5 mm.

The four different types of shell beads found with the burials at the Dillard site were small drilled disk beads, small drilled columella beads, larger columella beads, and beads made from the whole *Olivella* shell (Figures 37, 38). The disk beads were made from small fragments of drilled shell that were strung and wet-sanded on sandstone to round the edges. The columella beads were made from drilled sections of central spiral of a whelk shell (Figure 39).

The utilitarian nature of most objects that are placed in prehistoric graves usually is sufficiently straightforward to offer clues as to their intended use by the deceased in the afterlife. Such an intended specific use for the marine shell ornaments for the deceased can only be determined by learning about the social and religious importance these objects represented to the people while they were

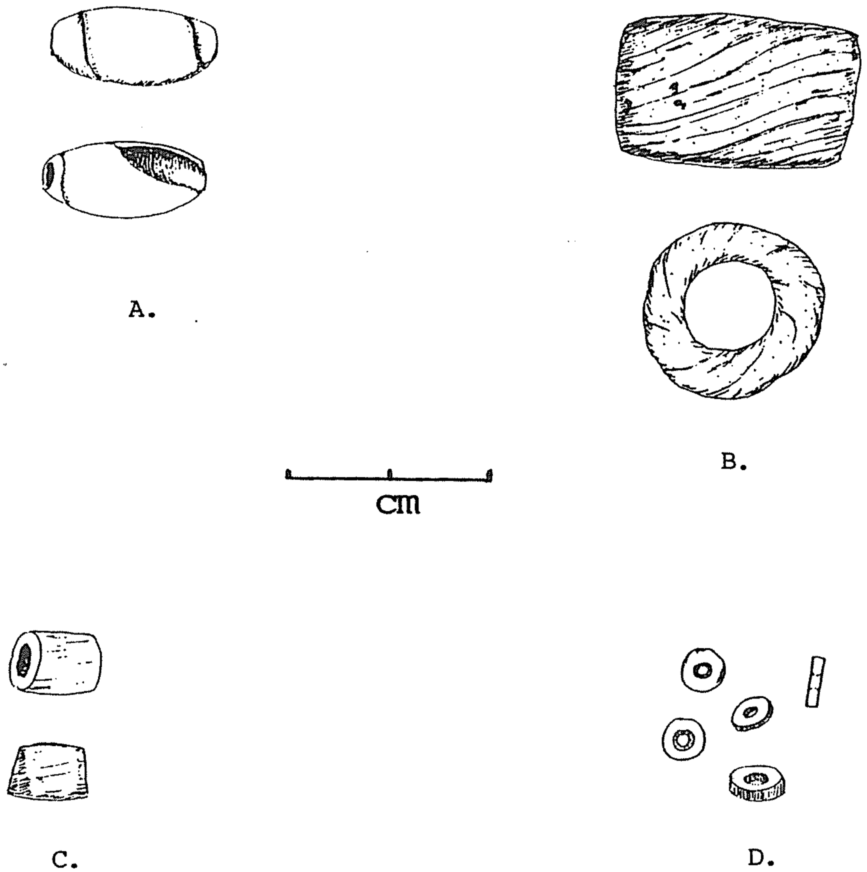


Figure 37. Shell Beads: A, *Olivella* shell bead; B, large drilled columella bead; C, small drilled columella bead; D, drilled shell disk beads.

living. While their presence in the burials may indicate nothing more than the simple act of burying property belonging to the deceased, the fact that exotic Gulf coast shell artifacts were included is connotative of the social position of some of the individuals at Dillard.

The importance the inhabitants of the Dillard site placed upon the possession of these beads is evident by the abundance of them when compared to contemporary burials from this area. This practice of including such items with human burials can be found among Caddoan groups throughout eastern Texas and Oklahoma, but has been found only infrequently to be associated with Late Prehistoric burials on the Southern Plains (Brooks et al. 1985:61; Brooks 1994a).

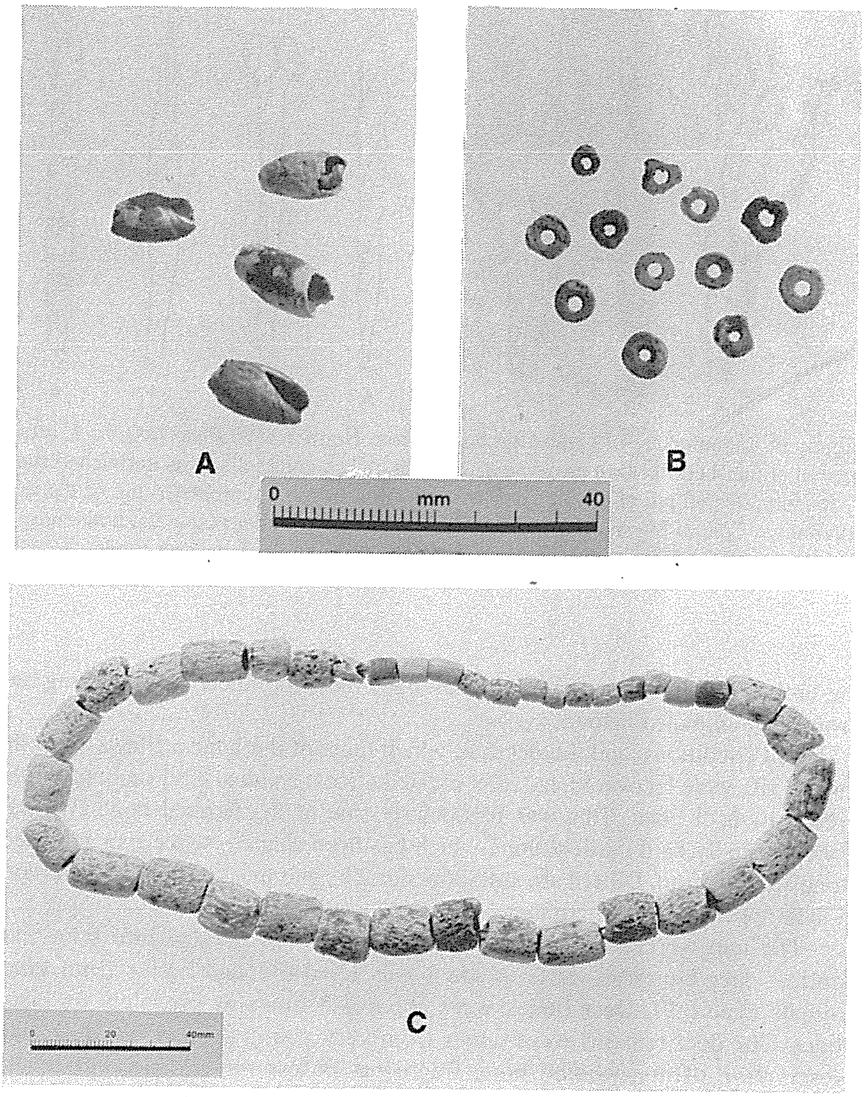
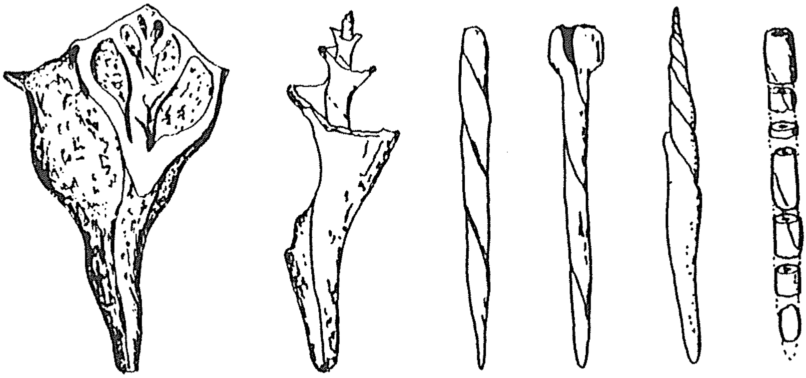


Figure 38. Marine Shell Beads from the Block 3 burials: A, *Olivella* shells; B, drilled disk beads; C, large and small drilled columella beads.

BONE ARTIFACTS

Two primary categories of bone artifacts, faunal remains and worked bone, will be discussed. Worked bones are those faunal remains that have been intentionally modified for tool use or ornamentation. Faunal remains comprise



1 2 3 4 5 6

Figure 39. Manufacture of Columella beads (from Holmes 1883:Plate XXIX): 1, cross-section of the shell *Busycon perversum*; 2, the extracted columella in its unfinished state; 3, roughly dressed pin of a type used on the Pacific Coast; 4, completed pin of the type common in Central Mississippi Valley sites; 5, finished cylinder pointed at both ends; 6, the manner of dividing the cylinder into sections for drilling and shaping beads.

the broken and unbroken animal bones from the byproducts of butchering and processing animals for food.

Soil conditions, and the depth at which most of the bone artifacts from the Dillard site were recovered, together created almost an ideal environment for the preservation of bone. This was particularly true of the worked bone. Worked bone is usually hard cortical bone which has been shaped, sanded, or polished. Bone artifacts from Dillard are still quite durable, and most resemble fresh ivory in their appearance and hardness.

The non-worked faunal remains (n=5241) were divided into three categories: deer bones (N=661), bison bones (N=146), and bones from other animals (Table 9). Deer bones were about 4-5 times as prevalent as bison bones. The deer remains were either from very young or very old deer. The preservation of non-worked bone fragments is less remarkable, but is still much better than is commonly seen in North Central Texas. The pits and fissures present in broken bone fragments probably allowed for greater moisture and plant root penetration, resulting in more decalcification from dissolved acids than that found on a smooth, polished surface (Klein and Cruz-Uribe 1984:7). Fat or oil was possibly rubbed into a bone tool's worked surfaces to enhance its flexibility.

Expert identification of a representative example of other faunal remains revealed a variety of animals used for food (Table 10). These remains were scattered over the different excavation areas, but were concentrated in the midden areas of Block 3.

Table 9.

Faunal Remains

Block	Deer	Bison	Other Animal	N
1	85	23	541	649
2	84	36	725	845
3	492	87	3168	3747
Percent	12.6	2.7	84.7	5241

Manufactured bone artifacts at this site were not abundant (N=33), but a representative sample was recovered to illustrate the various types of bone tools used by Plains Villagers during the Late Prehistoric period. The most common bone artifact recovered was the bone awl. Four complete specimens (mean length = 9.4 cm) and eight broken fragments were found (Table 11). One had an unusually hard and sharpened point (Figure 40b). These tools were most likely used to perforate hides in preparation for sewing into bags or garments. They also could have been used in the manufacture of baskets or matting (Bell 1980:61). Three of the awls from Dillard retained the joint end of the bone as a handle (Figure 40b-d), while all of the others were made from split sections of bone (Figure 40a, e-m).

A bone hairpin or fastener of clothing was recovered from the mass burial near the waist area, and between the skeletal remains of burials 8 and 9. It was 9.5 cm in length, and has been chipped and ground to shape, but was damaged by rodent gnawing. It is blunted on both ends, and undecorated (Figure 41a).

Three flaking tools, used in the production of stone projectile points and other tools, were found in association with an unusually large amount of lithic debris in Block 1. All three of these flaking tools had been made from deer ulnae. One had a long working point, while the other two had been shortened for more power and control (Figure 41b-d). Six fragments of deer antler were also found, and these were probably used for the same purpose (Figure 41e-j).

Three deer jaw sickles were recovered during the excavations, two of which were recovered intact in Block 2 (Figure 42a, b). These tools were used mainly for cutting grass, cane, and reeds to be used in basket weaving, matting, or house thatching. They could also have been used for harvesting both wild and domestic crops, as well as for shelling kernels of corn from the cobs. On each specimen the condyle had been removed from the mandible to simplify the fastening of a short handle to the ramus. The deer jaw sickle is commonly found in Plains Village

Table 10.

Identified Fauna from the Dillard Site

Mammals	
White-tailed Deer	*Odocoileus virginianus*
Bison	*Bison bison*
Raccoon	*Procyon lotor*
Fox Squirrel	*Sciurus niger*
Jackrabbit	*Lepus californicus*
Cottontail Rabbit	*Sylvilagus floridanus*
Cotton Rat	*Sigmodon hispidus*
Wood Rat	*Neotoma floridana*
Pocket Gopher	*Geomys cf. breviceps*
Swift Fox	*Vulpes vulpes*
Domestic Dog (shortface)	*Canis familiaris*
Birds	
Wild turkey	*Meleagris gallopavo*
Great blue heron	*Ardea herodias*
Black-crowned night heron	*Nycticorax nycticorax*
Reptiles	
Snake, two species	
Pond slider	*Trachemys scripta*
Box turtle	*Terrapene carolina*
Softshell turtle	*Trionyx sp.*
Amphibians	
Frog, two species	*Rana sp.*
Fish	
Gar	*Lepisosteus cf. osseus*
Bowfin	*Amia calva*
Buffalo	*Ictiobus* sp.
Catfish	*Ictalurus sp.*
Drum	*Aplodinotus grunniens*

Table 11.

Bone tools and ornaments

Type	Unit	Length	Figure
Awl	B(-3)	7.5 cm	40D
Awl	C(-3)	11.5 cm	40B
Awl	B(-4)	8.5 cm	40A
Awl	A(-5)	10.0 cm	40C
Awl (Fragment)	E-6	3.7 cm	40H
Awl (Fragment)	B-3	2.0 cm	40L
Awl (Fragment)	B(-3)	3.0 cm	40J
Awl (Fragment)	D-5	3.0 cm	40I
Awl (Fragment)	J-1	4.8 cm	40G
Awl (Fragment)	J-1	2.7 cm	40K
Awl (Fragment)	F-1	1.7 cm	40M
Awl (Fragment)	I-1	6.5 cm	40E
Hairpin	A(-3)	9.5 cm	41A
Bone flaker	K-1	8.5 cm	41C
Bone flaker	J-1	9.0 cm	41B
Bone flaker	J-1	8.0 cm	41D
Deer jaw sickle	K-1	12.0 cm	42A
Deer Jaw sickle	J-1	11.0 cm	42B
Antler tine	J-1	2.5 cm	41J
Antler tine	B(-2)	2.3 cm	41F
Antler tine	B(-2)	2.3 cm	41G
Antler tine	B-3	2.0 cm	41I
Antler tine	D(-2)	2.3 cm	41E
Antler tine	A-4	1.6 cm	41H
Hide grainer	H-1	6.5 x 6 cm	44A
Bison ulna tool	D-7	20.0 cm	44B
Bone bead	A-3	3.7 cm	43E
Bone bead	C(-4)	1.2 cm	43F
Fishhook blank	B(-4)	3.5 cm	43A
Fishhook blank	C(-2)	3.2 cm	43B
Fastener	C(-4)	1x1 cm	43D
Bone disk	B(-2)	0.8 cm dia.	43C
Unidentified	D(-2)	6.0 cm	40F

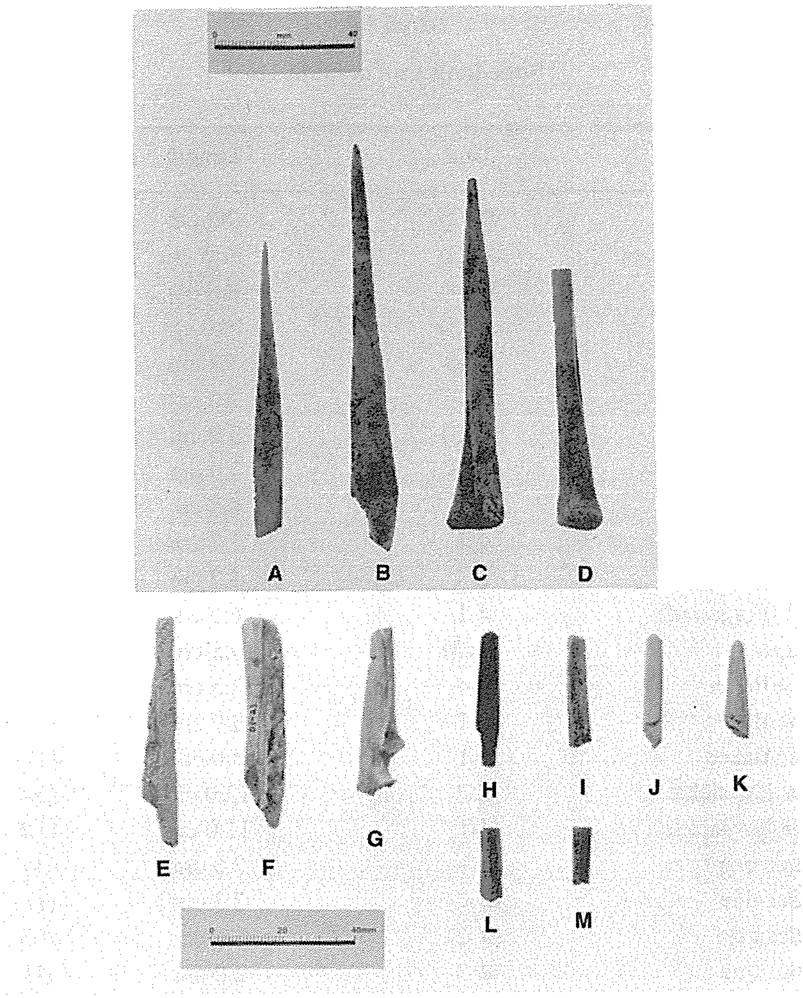


Figure 40. Deer Bone Tools: A-E, G-M, awls; F, Unidentified tool.

sites (such as the Washita River phase), as well as on Caddoan sites in Oklahoma and Texas (Bell 1980:71).

The production of fishhooks at Dillard provides some insight on the importance of fish in the Plains Village diet on the Red River. Fish could occasionally be obtained by capturing them in shallow pools, but the manufacture of handline tackle to catch them suggests that they were regular food items on the menu. The unfinished fishhook blank found intact at the Dillard site measured 11 x 33 mm with a 4.5 x 10 mm hole cut toward one end (Figure 43a). This artifact is extremely well preserved. The other fishhook fragment was found in the storage pit in Block 3.

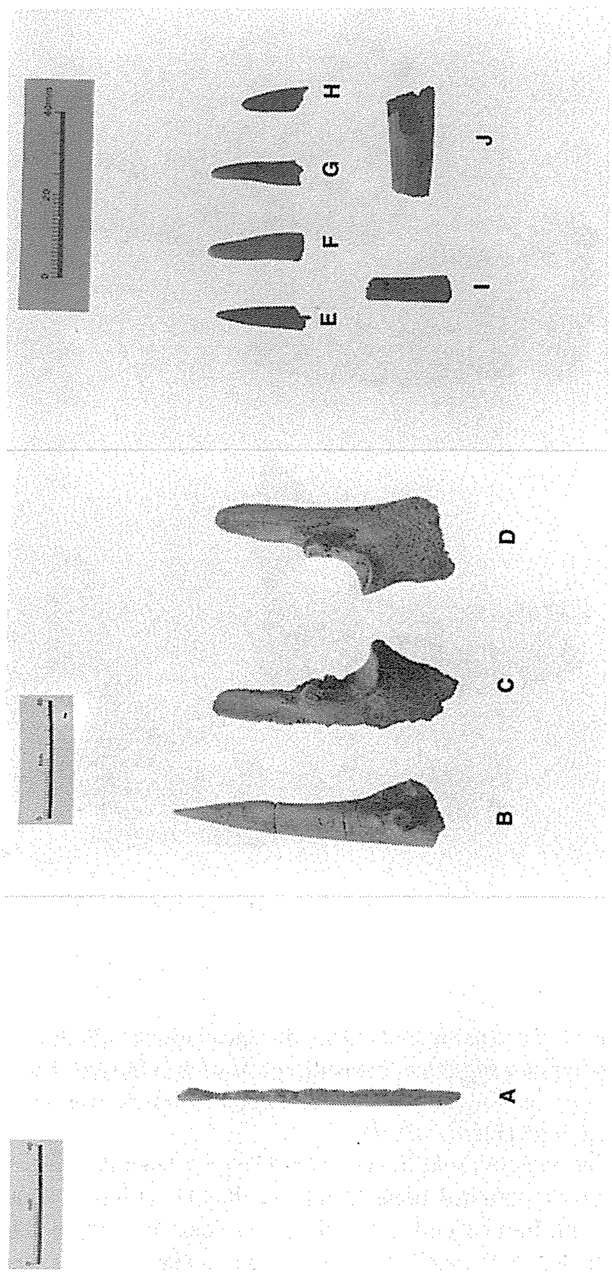


Figure 41. Bone Tools: A, hairpin; B-D, deer ulna flakers; E-J, antler tool fragments.

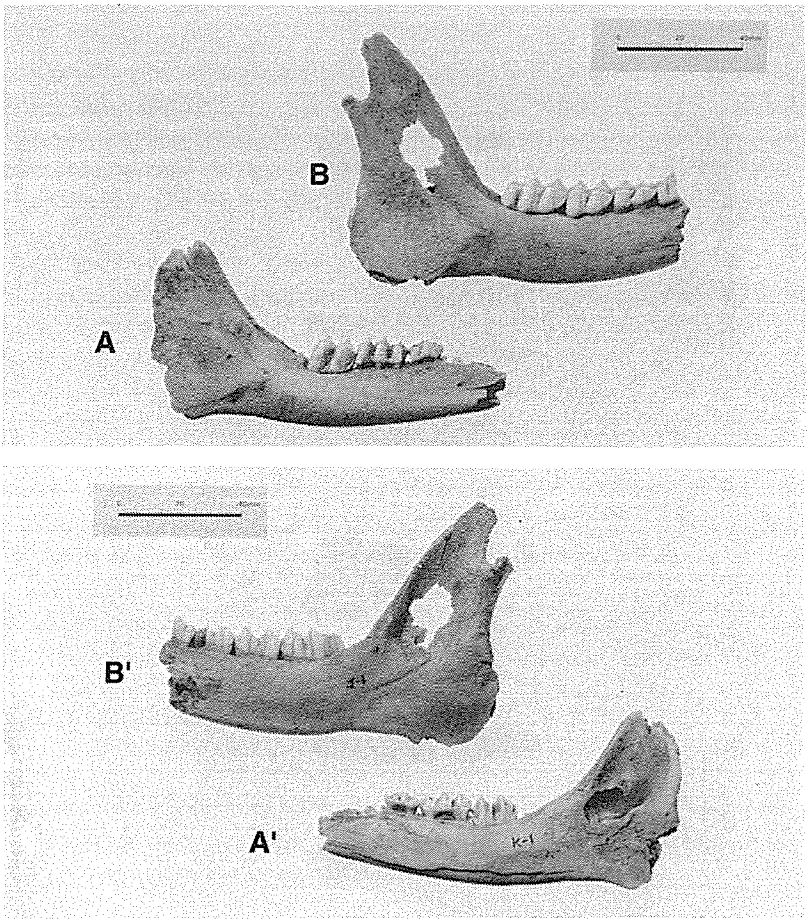


Figure 42. Deer Jaw Sickles showing front and back views of the modified ramus used for hafting.

Two bone beads were recovered during the excavations in Block 3. One was made from a bird leg or wing bone, measuring 5 x 13 mm in size. The other one (7 x 37 mm in size), associated with the disturbed Burial 6, was made from a small mammal leg bone (Figure 43e-f).

The use of the most unusual bone artifact has not been determined. It was cut from a section of flattened bone (2 mm in thickness) into a square shape roughly 10 x 10 mm. Into two opposing sides were cut two deep notches, 2.5 x 2.5 mm each. One face of the artifact has been scored several times with a stone tool (Figure 43d). My hypothesis is that it was used as a fastener, much like a button. A thong or sinew could be tied tightly around the "button," being held in place by the notches, with the knot against one of the flat sides. This in turn could

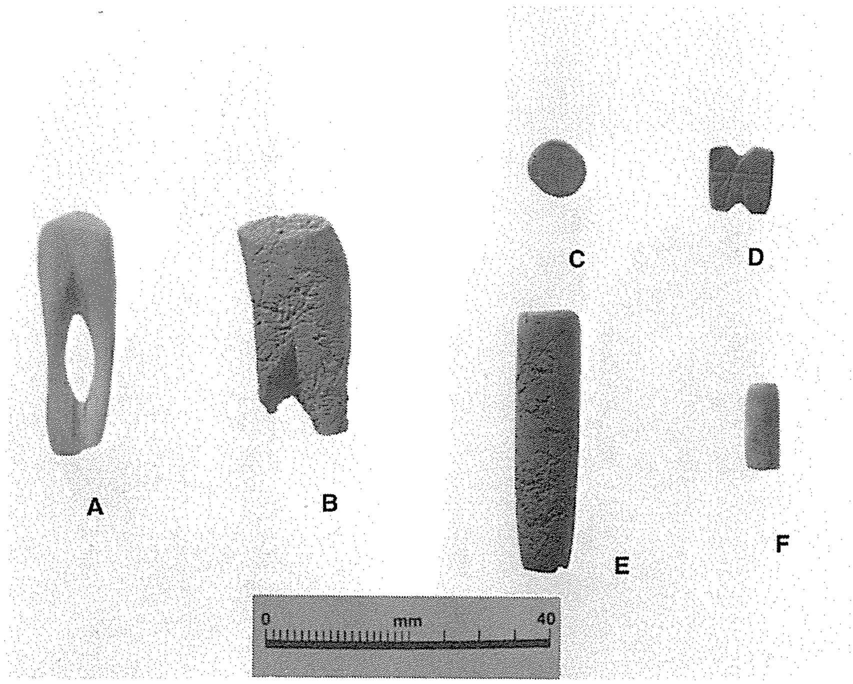


Figure 43. Miscellaneous bone tools and ornaments: A-B, fishhook blanks; C, unidentified disk; D, button or fastener; E-F, beads.

be tied onto clothing by passing the two ends through two holes and tying them from the reverse side.

A small, round disk of bone was found in Block 3. Less than a cm in diameter, it had been sanded and shaped on all surfaces. Its intended use is unknown (Figure 43c).

A flattened section of cancellous bone from a bison femur is identified as a hide grainer (Figure 44a). Fashioned from the end of the bone, the flat spongy surface was used like an abrader to smooth the surface of hides that were being prepared for bedding or clothing (Bell 1980). The artifact measured 56 x 65 x 37 mm. These bone tools have been found on protohistoric Wichita sites in Oklahoma.

A digging tip made from the ulna of a bison was found in Block 2. Marks on the tool as a result of hafting show that it was fastened to a handle and used like a shovel (Figure 44b). Bison tibia digging tips are common artifacts in Plains Village sites, especially in the Washita River phase (Bell 1980:75).

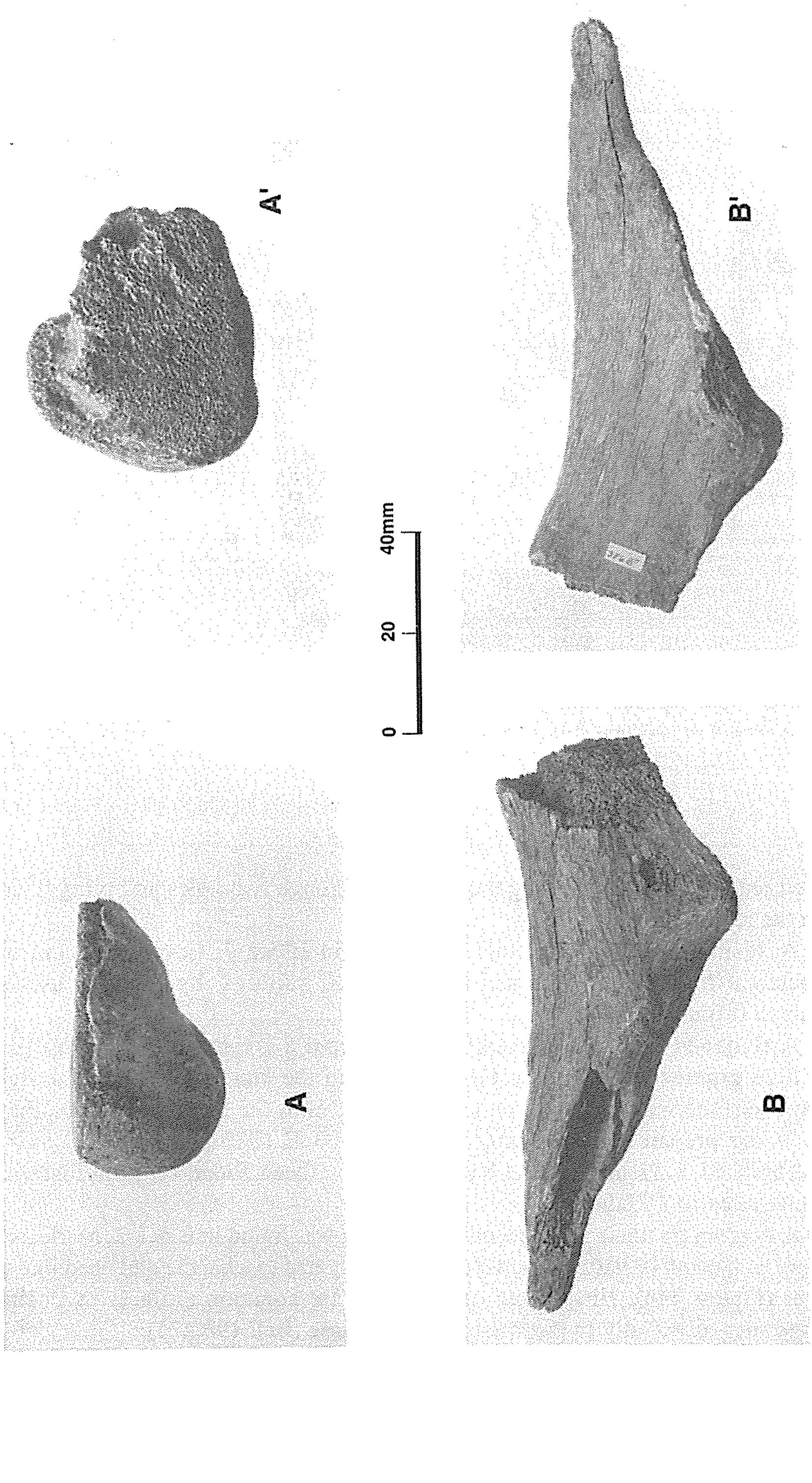


Figure 44. Bison Bone Tools: A-A', hide grainer of cancellous bone; B-B', ulna digging tip.

EVIDENCE OF COPPER

A fragment of human cranium recovered from Unit A(-4) was stained a bright blue color. This stain permeated the entire bone fragment (8 x 10 x 2 mm in size). It was suspected that this staining resulted from the presence of metallic copper, perhaps in the form of a bead, some of which had corroded on or near the surface of the bone fragment. As the original source of the suspected copper was not recovered or had corroded away, a simple chemical test was devised to confirm the presence of the copper ion.

Metallic copper oxidizes in the soil through corrosion. The resulting anhydrous copper sulfate is colorless, but in the presence of moisture changes to the characteristic blue color of the pentahydrate, represented by the following chemical equations:

$$\mathrm{Cu2 + H2SO4 = CuSO4 + H2}$$

$$\mathrm{CuSO4 + 5H2O = CuSO4.5H2O}$$

colorless blue

When the pentahydrate is dissolved in water, the cupric ion actually has the formula $\mathrm{[Cu(H2O)4]2}$. If excess chloride ions (from HCl or other very soluble chlorides) are dissolved in the solution, the color becomes green. The green color is attributed to an equilibrium mixture of blue and yellow ions, represented by the equation:

$$\mathrm{[Cu(H2O)4]2 + 4C1 = [CuC14]2 + 4H2O}$$

blue yellow

When the bone sample was tested under controlled conditions, the presence of copper ions was confirmed (Kennan and Wood 1966:517).

It is not a total surprise to find evidence of copper use in North Central Texas during this period. The availability of the metal at large prehistoric Caddoan trading centers, where other trade materials from Dillard probably originated, substantiates this.

MATERIAL ASSOCIATIONS AND DISTRIBUTIONS

The perception that the Dillard site was continuously occupied for several hundred years has a direct bearing upon the manner in which artifacts and remains were deposited. Although cultural debris was present throughout the occupation zone, it was most abundant in levels 2-3: lithic debris, pottery sherds, and broken animal bones were all consistently more numerous in these layers.

Burned and broken hearthstones were also more plentiful in levels 2-3, except in the center of the cemetery area where many large stones were concentrated near the surface.

Fresno arrow points are found generally in more recent deposits at the site, along with Washita points, and these points are diagnostic of the Late Prehistoric II period. Scallorn, Bonham, and Gary dart points are diagnostic of the Late Prehistoric I period. Thus, the arrowpoint distributions suggest the multi-component nature of the site.

The average thickness of the occupational deposits was 66 cm (Figures 45 and 46). This is unusually deep when compared to the the nearby Chickenhouse site and other Late Prehistoric sites in the area (Lorrain 1969). This evidence, coupled with the recovery of projectile points made over several hundred years, suggests that the site may have been consistently occupied for many generations (Figure 47). Profile layers displayed no sterile lenses or changes in soil color within the occupied zone. The only soil color changes noted were post molds, darker areas where ashes and charcoal were concentrated, and small intrusive areas of lighter soil introduced by burrowing rodents.

Many ochre stones of two primary colors were recovered throughout the excavation of the site, but they were most numerous in the areas of the burials. The stones originated in the Cretaceous formation of the Trinity and Woodbine Sands in which gas pockets from organic decay formed. These voids became filled with a soft brick red or yellow ochre hematite that can be scraped or ground into a powdered pigment. Ochre is found in abundance in both the Eastern and Western Cross Timbers of Cooke and Montague counties. The prevalence of these stones at this site suggests common use either for personal adornment (body painting), or for the coloring of pottery or clothing.

With the exception of Burial 1, there were no arrowpoints found directly associated with this or any of the other burials in the cemetery. The artifacts thought to be burial furniture, either as part of the person's attire or placed in a ceremonial context, included all of the marine shell beads (at least four necklaces and one bracelet), the shell gorget, ochre stones, a lump of green clay, the three roughly made arrowpoints, two bone beads, and a bone hairpin.

CHRONOLOGY AND RADIOCARBON DATES

Since the excavation of the Dillard Site was undertaken as a personally funded project, only two radiocarbon samples have been analyzed from the several collected samples. More samples will be analyzed as finances permit. In an attempt to obtain the most reliable results, the largest and cleanest of the samples collected were submitted to the University of Texas Radiocarbon Laboratory for analysis.

The samples tested were both charcoal, primarily still in lump form, and they were not affected by root contamination. Sample A came from a 13 cm

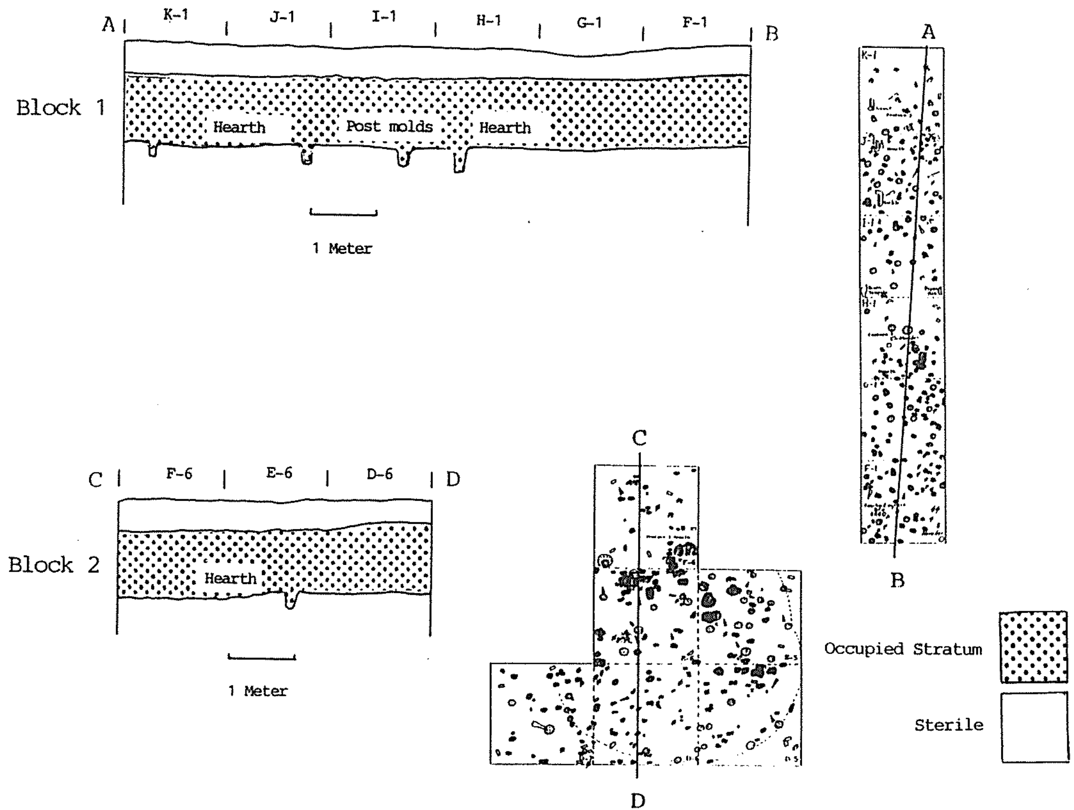


Figure 45. Plan and Profile of Occupation zone in Blocks 1 and 2.

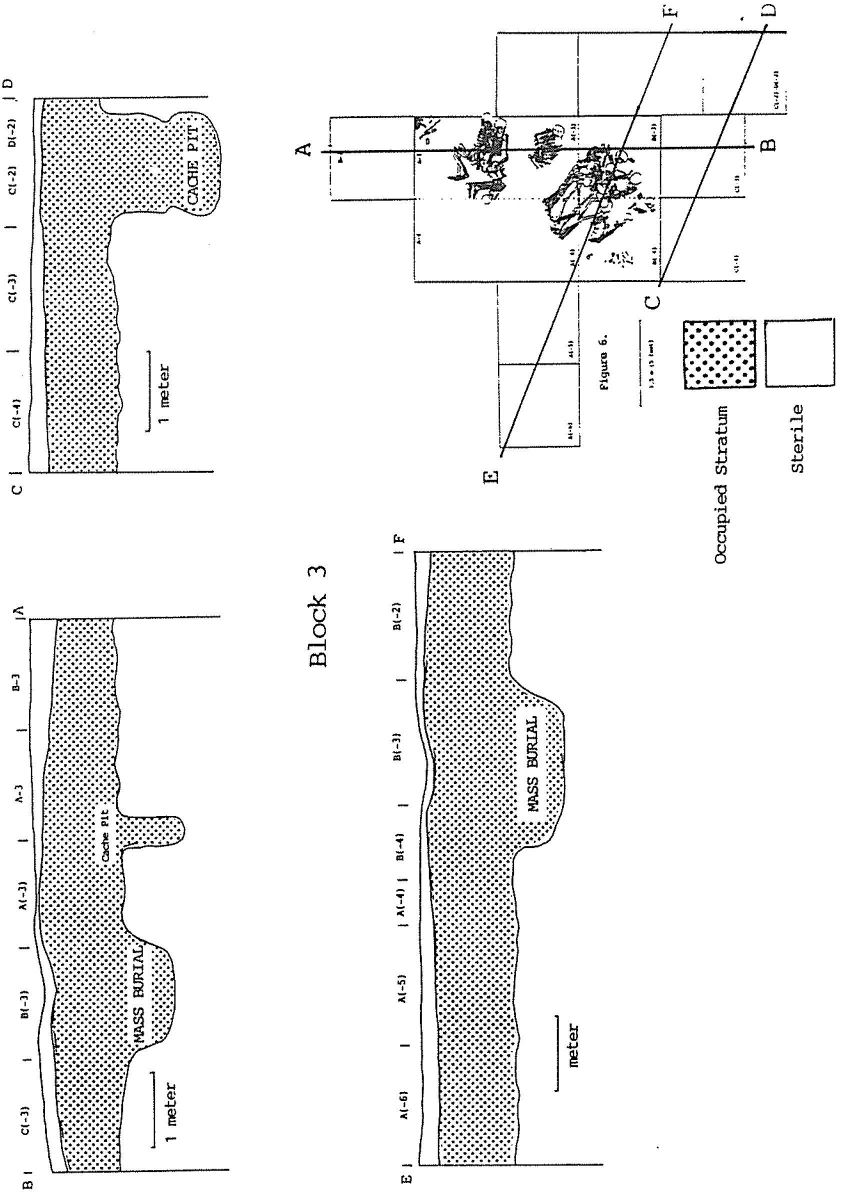


Figure 46. Plan and Profile of Occupation zone in Block 3.

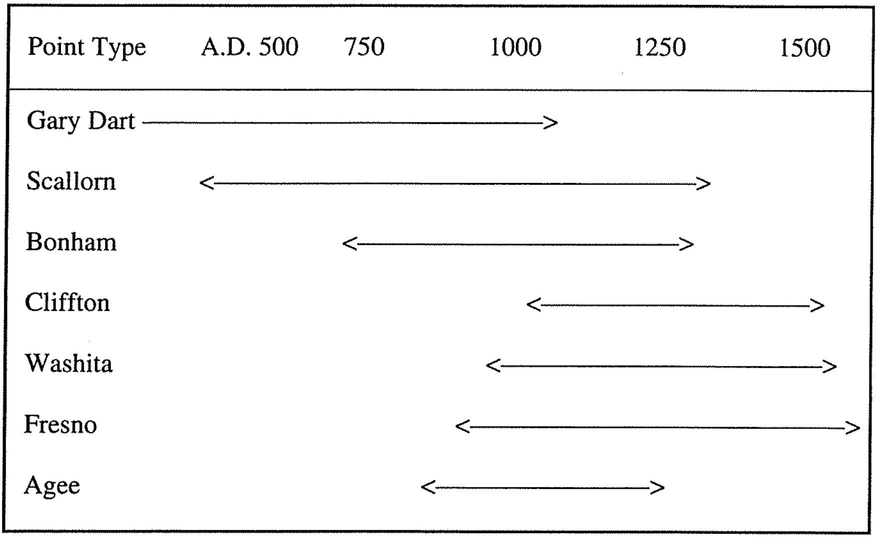


Figure 47. Age ranges of projectile points from the Dillard Site.

layer of soil separating Burial 1 and Burial 2 in Block 3, Unit A(-3). Burial 1 was directly above Burial 2. This position rules out disturbance or intrusion as a cause for the origin of the sample, and definitely associates the sample with at least one of the burials at the site. The sample was collected at 55 cm bs.

Sample B was recovered near the bottom of the large storage pit, 213.4 cm bs, in Units C(-2) and D(-2), Block 3. The age of this sample should help determine the time of pit abandonment and document the beginning of its use as a trash depository.

The isotope corrected date obtained for Sample A was 680 ± 110 years B.P. (Tx-6179), and Sample B was 622 ± 58 years B.P. (Tx-8022). These correspond well with my estimates of the age of the samples (A.D. 1150-1350) when they were submitted for analysis.

These dates were further analyzed by using a radiocarbon calibration computer program to make probability predictions of the ranges of occupation (Stuiver and Reimer 1993). The program calculates minimum and maximum age ranges (Method A), and their probability distributions (Method B) for the calibrated radiocarbon dates (Table 12).

Taking Sample B as an example, the values found by Method B can be interpreted as follows. With a one-sigma error range, 85 percent of the area under the probability distribution is within the combined age range Cal. A.D. 1300-1370 (or 85 percent of the error curve for one sigma). With a two-sigma error range of 95.4 percent, 100 percent of the area is within the age range A.D. 1290-1420 (Stuiver and Reimer 1993).

Table 12.

Radiocarbon Calibrations

Sample A, Corrected date, 680 ± 110 B.P.
Minimum of calibrated age ranges/Age intercepts/Maximum of calibrated age ranges

1*e* cal. AD 1260 (1290) 1407

2*e* cal. AD 1157 (1290) 1440

% area enclosed	Cal. A.D. age ranges	Relative area under probability distribution
68.3 (1*e*)	A.D. 1260-1410	1.00
95.4 (2*e*)	A.D. 1150-1450	0.97

Sample B, Corrected date, 622 ± 58 B.P.
Minimum of calibrated age ranges/Age Intercepts/Maximum of calibrated age ranges

1*e* cal. AD 1293 (1330, 1350, 1360, 1370, 1390) 1408

2*e* cal. AD 1281 (1330, 1350, 1360, 1370, 1390) 1430

% area enclosed	Cal. A.D. age ranges	Relative area under probability distribution
68.3 (1*e*)	A.D. 1300-1330	.42
	A.D. 1340-1370	.43
	A.D.1380-1390	.15
95.4 (2*e*)	A.D. 1290-1420	1.00

SUMMARY

The occupation of the Dillard Site occurred continuously over a period of 350 to 400 years, beginning around A.D. 1100. This encompasses part of both the Late Prehistoric I and Late Prehistoric II periods (Prikryl 1990). Prehistoric phases that existed during this time on the Southern Plains and western edges of the woodlands include: Sanders, Spiro, Haley, Henrietta, Frankston, Titus, Antelope Creek, Custer, Optima, and Washita River (Brooks et al. 1985; Brooks 1994a).

The prolonged occupation of the Dillard site, but the limited amount of work conducted there, prohibits estimating what the population was at any given period, but it may have been greater during the deposition of levels 2 and 3 since they contain the highest artifact densities. The longevity of the site as a permanent village may be attributed to its favorable location. Another village site with surface finds of artifacts comparable in age has recently been discovered in a field south of, and directly across, Fish Creek from the Dillard site. It is concentrated on a large terrace 665 to 675 feet in elevation, and extends south from the prehistoric mouth of the creek. It is conceivable that at times both terraces were occupied simultaneously as part of one village; thus the village population at the time of occupation could be much larger than originally thought.

Because of the geographic position of the Dillard site, and the site artifact assemblage, it is not considered a "classic" Henrietta Focus site. The origin of the Late Prehistoric inhabitants of North Central Texas, and of the Henrietta Focus, has never been firmly established, nor has a core area been described in which its distinctive cultural characteristics may have developed. The area encompassing the Henrietta Focus might best be described then as part of a cultural "buffer zone" between the wooded east and the prairie west. The cultural materials found at Dillard display some characteristics of both traditions.

The boundaries of this buffer zone extend from around Wichita Falls, Texas, in the west, to Bonham, Texas in the east, and from Denton, Texas to the south, northward to about Ardmore, Oklahoma; that is, the middle Red River Valley and areas 50-70 km either side of it, and the upper tributaries of the Trinity and Brazos rivers (Krieger 1946:87). Different villages within this area seemingly adopted many characteristics of neighboring cultures, dependent upon their geographic location. Those villages located in the eastern part of the zone display more eastern traits, while the opposite is true of those villages located on the plains further west (Wyckoff 1970:104). Subtle regional differences in artifact assemblages from these sites can be observed when collections from eastern and western Plains Village sites are compared (Brooks 1994a).

One example of this regional variability is the difference in the styles and numbers of milling stones found on Late Prehistoric Plains Village sites in North Central Texas. Those examples found on eastern sites are smaller and shallower than the more massive and deeper ones found on contemporary sites 60-80 km west of Dillard (Krieger 1946:108). Milling stones are less numerous on eastern sites when compared to those in the west, where hundreds of broken and complete examples have been observed scattered on site surfaces. One unrecorded site in Montague County also has dozens of milling holes pecked into the large stationary boulders at the edge of a bluff. A comparative decrease in the numbers of milling stones in the area of the Dillard site, can best be explained by a change to wooden mortars and pestles for processing grain. This change from stone to wooden implements was an idea that spread from the east and perhaps did not become well established in the western areas (Vehik 1989).

Another discernible difference at the Dillard site is related to the geographical terrain. This part of the Red River valley provided the populace with more available deer than bison to hunt. The forested hills and isolated valleys were not favorable terrain for large gregarious groups of bison, although their numbers had increased on the Southern Plains during the Late Prehistoric period. The large percentage of deer bones as compared to bison remains recovered from all levels of the Dillard site substantiates this. The tendency to rely more heavily on deer populations for meat is a characteristic of the more easterly situated Plains Village groups, who were agriculturally oriented while those to the west relied more strongly on bison (Brooks 1994a:43).

Another dissimilarity is with the types of lithic trade materials found on eastern Henrietta Focus sites with those from sites further west. Many eastern sites, particularly those around Lake Texoma, are dominated by lithics from eastern Oklahoma and Arkansas (Albert 1984). Lithic material originating at sources in West and Southwest Texas occurs most often on Late Prehistoric sites located west of western Cooke County. Geographical location would logically dictate this since the cherts, chalcedony, and jasper occasionally found at most of these sites originated as cobbles washed down from the western drainages into the Red River.

There are no ceremonial or burial mound complexes on the Red River west of the Caddoan Harling Site (41FN1) in Fannin County, Texas (Davis 1970:42-55). Temple and burial mounds are associated with the more important religious and social centers of the Caddo, but not all Caddoan groups built both temple or burial mounds. It makes sense that prosperous villages like the Dillard site, located on the western fringe of the moundbuilding areas and well outside the main sphere of Caddoan influence, would not have started this practice, even after some period of contact and interaction. Less affluence and more difficult environmental conditions would not easily allow a frontier society the wherewithal to invest energy in ceremonial activities such as mound building. Also, ceremonial mound centers are traditionally located in areas where mound building and associated religious practices evolved over a period of centuries (Albert 1984:15-17). Nevertheless, the absence of mounds at Late Prehistoric sites in North Central Texas does not preclude the possibility of the inhabitants possessing similar religious ceremonies and basic beliefs as those practiced in Caddoan societies (Albert 1984:15). Influential Late Prehistoric villages like Dillard are identifiable archeologically, as are non-moundbuilding Caddoan centers.

Given these observations, it is believed that the people of the Dillard site, and other nearby villages identified with the Henrietta Focus, were the progeny of the original Late Archaic inhabitants of North Central Texas. Contact with their surrounding neighbors, and their own adaptations, resulted in the development of sedentary villages, horticultural economies, and, to a lesser extent, bison hunting as a means to increase food production. This contact and influence increased as the dependence upon the eastern cultural centers became less important to those Caddoans living on the western frontier, and contacts with Plains inhabitants became more frequent. Thus, Plains Village groups in the eastern part of North Central Texas were different from more northern and western Plains Village farmers.

One of the original goals of the investigation concerned the amount of social contact and interaction that occurred with neighboring villages, such as the Chickenhouse site. Corrected dates from Chickenhouse (A.D. 1080, 1160, 1270, and 1430) indicate that occupations at both sites were largely contemporaneous. The artifacts from Chickenhouse are quite similar to those from Dillard in style and frequency: bone awls, fishhook debitage, whetstones, abraders, retouched flakes, scrapers, worked bison bones, knives, drills and bone beads. A variety of lithics were identified at both sites with non-local Edwards chert, quartz crystal, Alibates dolomite, and obsidian represented. Milling stones and manos were not abundant from either site. Cache pits, post molds, and hearths were much the same at both sites. The few clay pipe fragments from the two sites were nearly identical in size, material, and color, and were of a style and craftsmanship of Caddoan design (Bell 1980:98).

The only controlled excavation of a burial from Chickenhouse was of a middle-aged female buried in a semi-flexed position. The skull, left hand, and left wrist was missing and appeared to have been lacking these body parts when buried. The mandible was present. Two other burials were located by a dragline removing gravel after the excavations had terminated, but the bones were removed and given away before examination (Lorrain 1969). This one burial, however, shares with many of the Dillard site burials the fact that they also were missing some of their body parts.

The pottery from Chickenhouse was nearly all Nocona Plain. The rim forms were the same as most of those at Dillard, with large cooking vessels common at both sites. The thickness, temper, and method of manufacture were alike, but the body shapes of the vessels from Chickenhouse are more globular or olla-shaped. Some vessels from this site have massive flattened bases; no bases were found at the Dillard site. A few sherds of cord-marked ceramics were recovered at both sites. Limestone was sometimes used as temper in the pottery samples from both sites.

The types of projectile points differ at the two sites. Most notable is the greater percentage of Scallorn points, and the Eddy arrowpoint type, at Chickenhouse. Illustrated examples of the Eddy type appear to be a variety of the Alba type (Turner and Hester 1985). Several dart points were also found at Chickenhouse, and these together with the Scallorn and Eddy types, suggest that this site's occupation began before that of the Dillard site, where only one contracting stem dart point was found.

Based upon the comparison of the artifacts and radiocarbon dates, it can be reasonably assumed that the two sites were partly contemporaneous. Owing to the proximity of the sites, there was probably some contact between the two neighboring Late Prehistoric villages in the Fish Creek Valley. The relationship of the prehistoric villages with other neighboring settlements would not likely have been competitive or hostile, but raids by hostile groups probably did occur, particularly during times of drought when food supplies were decreased over wide areas.

No artifacts of marine shell were found during the Chickenhouse excavations, this being the only other major difference between the artifact assemblages of the two sites. Those from Dillard were found associated only with burials dating to the Late Prehistoric II period. The burial from Chickenhouse did not contain beads and other grave goods, but six bone beads were recovered during excavations elsewhere on the site (Lorrain 1969).

There is an abundance and variety of other trade items found at the Dillard site. Those obtained through eastern trade networks were probably channeled through locations near the Great Bend of the Red River and the middle Arkansas River, where lithic materials, pottery vessels, and marine shell ornaments were amassed at commercial centers like Spiro and Sanders (Schambach 1993). Sites like Dillard had greater access to trade goods from the east because of their proximity to the Red River. After exchanges were made at key trading points along the river, a wider dispersal of the trade goods was probably achieved through local barter with widely dispersed groups.

The Dillard site existed at a time when trade and commerce was at its height between Southeastern cultures. The large numbers of marine shell artifacts found at several civic-ceremonial sites suggests that beads, beaded clothing, and other shell items were important symbols of trade and exchange during this period (Kopper 1986:167). It is very possible that occupants of the Dillard site acted as intermediaries between traders traveling by river and groups living away from navigable streams. Its strategic location at the junction of Fish Creek and Red River, and the imposing view of the village itself, would provide an easily recognizable landmark for unfamiliar travelers going upriver in dugout canoes.

Probable trade materials at Dillard include stone, shell, pottery, and copper. The lithics identified in the debris included quartz crystal, novaculite, Zipper chert, and Bigfork chert from the Ouachita Mountains of Southeast Oklahoma, and both Keokuk and Reed Springs varieties of Boone chert from the Western Ozarks (Banks 1990; Albert 1984:73-75). Lithics from west or southwestern sources include Edwards chert from Central Texas, black translucent obsidian, probably from New Mexico, and Alibates dolomite from near Amarillo on the Canadian River; Alibates is also found in river gravels downstream from the quarries. Other items were copper from the Great Lakes area, marine shell beads and a gorget of whelk shell from the Gulf and Atlantic coasts, and cord-marked pottery from possibly the Washita River or Antelope Creek phases. The far-ranging extent of such a trade network is impressive, even in modern times, and emphasizes the generally accepted notion that Henrietta Focus peoples, and other Plains Village cultures, had adequate contacts and opportunities to obtain imported items and raw materials.

The suspected building outline of a structure in Block 2 of the Dillard site is similar to those described at Chickenhouse: the floor areas were circular or ovoid in shape and moderately sized, being approximately 6 to 6.5 m in diameter (Lorrain 1969). The outer framework of the structures at both sites was supported by an inner framework made of three or four large posts, 15 to 18 cm in diameter. Smaller post molds along the perimeter of the structures provided the foundation for thatching, and thus the structures would have resembled the dwellings of historic Wichita groups (Jelks 1967). Other interior posts may represent support poles for bedding frames and storage racks. Beginning at the bottom, bundles of cut cane or grass were vertically tied to this framework construction and were lashed in tiers until the entire house was thatched (Newcomb and Campbell 1982:34). These were very durable dwellings of surprising longevity. A 1956 reproduction of a similar dwelling at Indian City near Anadarko, Oklahoma, is still in good repair. Many structures were erected at the Dillard site, as evidenced by the numerous post molds exposed in the blocks. The most intense areas of house construction were concentrated on the highest parts of the terrace. Garden plots and outdoor work arbors probably surrounded the central living areas where the houses were located.

Milling stones, agricultural tools, and the remains of charred corncobs are conclusive evidence for the practice of maize agriculture at this site. Other crops were probably grown, such as beans, squash, sunflowers, or tobacco, but flotation analysis is needed to confirm this. Other plant food resources included walnuts, pecans, hickory nuts, and chestnuts; no acorns were found despite the thousands of oak trees of varying species in the surrounding forests. Wild edible or medicinal plants were probably also brought back to the village and tended to in the garden plots. However, foraging was still an important food source, particularly in the springtime when domestic surpluses were near depletion and the field crops were not ready for harvest.

Snares or nets were likely employed to capture small game animals and fowl, while the bow and arrow was reserved for the larger game. The bow and arrow is the predominate weapon to be positively identified as having been made and used at the Dillard site. The main projectile point type was the Washita, many a serrated variety. Also common was the Fresno type, and this point was generally recovered from the upper midden deposits.

The burials at the Dillard site were confined to a very small area on the southern point of the terrace, nearest the junction of the creek with Red River. This area contained deep midden deposits overlaying two abandoned storage pits. The storage pits eventually fell into disuse, and were filled with trash either before or about the same time as the burial interments. This area continued to be subsequently used as both a refuse dump and cemetery. So much refuse continued to be deposited here that the whole terrace point became elevated 30-60 cm higher than adjacent village areas. It was here, many years after the initial occupation of the site, that the last burials were placed in the highest elevation of the refuse heap.

The absence in the Henrietta Focus burials of pottery vessels and weapons as grave goods is significantly different from contemporary Caddoan phases further east (Perttula 1992). Although marine shell artifacts are often found in Caddoan burials, they are rarely seen in Plains Village burials. In almost all instances at the Dillard site, they were the primary burial offerings.

These objects either represented great wealth and importance to the survivors (important enough to lavish upon the dead), or the beads and ornaments were the possessions of the deceased. The *in situ* positions of most of the beads indicates they were worn as necklaces, anklets, and bracelets. The widespread dispersal of many of the *Olivella* beads suggests that some of them may have been sewn on to garments for decoration, but rodent disturbances may also account for this.

Personal adornment with exotic jewelry was a popular custom and probably a sign of social status among the inhabitants of the Dillard site. Almost 70 percent of the burials were adorned with some sort of bead ornamentation. The ages of those buried with such finery ranged from 2 to 60 years. The sex of the individuals apparently had no bearing on who wore the bead necklaces, but beads that appear to have been sewn to the clothing were found only on or near the remains of two women.

The body positions of the interments at Dillard were flexed, partially flexed, or extended, with the heads directed generally to the east or northeast. Most Caddoan burials are extended, but flexed and semiflexed burials also rarely occur (Turner 1978). The direction bodies are buried is not uniform among most burials on the Southern Plains, but most are placed in a flexed or semi-flexed position.

Two of the intact skulls from the Dillard site had fracture injuries confined to the facial areas, resulting in avulsed teeth, with associated fractures of the maxilla, mandible, and cranium. No cut marks were observed on the surfaces of the skulls in the areas of this trauma. Some additional fracturing may have occurred many years postmortem because of ground settling and movement. Besides the possible dismemberment of four of the five individuals in the mass burial, their skulls have blackened encrusted areas on the surfaces as if they had been partially burned or scorched. This may be related to the ectocranial porosis present on most of the skulls. Some burials had other missing body parts (such as a mandible and humerus) and they were removed without leaving any recognizable cut marks on the connecting bones.

CONCLUSION

The topographic location of the Dillard site fits the ideal prerequisites for a site existing during Late Prehistoric I and II periods: near a source of fresh water; a major, navigable stream was nearby; and the immediately surrounding terrain was heavily wooded. It is also situated above the normal floodplain on the second river terrace, and the soil is a fine, sandy loam that is fertile, drains well, and is easily tilled (cf. Albert 1984:132-133).

Certain archeological evidence from the Dillard site is suggestive of interaction with Caddoan groups. This includes maize agriculture, sedentary lifestyle, items obtained by trade from Mississippian cultures, housing that was similar to Caddoan construction, and Caddoan style tobacco pipes. Similar cultural traits are shared with the nearby Washita River phase, namely: maize agriculture, comparable arrowpoint assemblages, Nocona Plain and Lindsay Cord-marked pottery, sites situated on river terraces, more deer remains than bison, as well as the appearance of trade goods from both the Caddoan Area and from areas to the west and southwest (Kawecki and Wyckoff 1984; Brooks et al. 1985).

The archeological record from the Dillard site does resemble the Washita River phase more than any Caddoan tradition phase, but major differences are noted. Pipes from the Washita River phase are usually stone elbow pipes, a typical Plains Village style, and the houses instead of being circular in floor plan are rectangular (Brooks et al. 1985:18). No burial goods were found with Washita River phase burials, as is generally true of the Henrietta Focus and other Late Prehistoric burials on the Southern Plains.

The location of the Dillard Site in the riparian forests of the Red River, in reality, a western extension of the Eastern Cross Timbers, was an area geographically more suited to eastern than western cultural adaptations. The more abundant food resources in the area of the site led to the adoption of a more sedentary lifestyle, and its proximity to the river afforded the inhabitants easy access to traders from the east, and first chance at the available goods.

It is hoped that additional investigations of Late Prehistoric sites of North Central Texas and South Central Oklahoma will recover more evidence revealing the extent of Caddoan interaction in this area, and what effects this had on the lifestyles of indigenous occupants. Periodic contact with far-ranging traders may have helped to spread ideas as well as material goods, suggesting that other Plains Village sites may have had stronger ties with contemporary eastern groups than was once believed.

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Osteological Analysis of Human Skeletons from the Dillard Site (41CO174)

Fran Jaecques Albrecht

ABSTRACT

The skeletons of at least 12 individuals were excavated from the Dillard Site (41CO174), a Plains Village site in North Central Texas. Seven individuals were found in single interments, and five individuals were found in one mass grave. Osteological analysis of these skeletons was undertaken to obtain demographic, bone, and dental pathology information for inclusion in a larger data base being compiled by Dr. Douglas W. Owsley of the Smithsonian Institution that encompasses the entire Great Plains area. A second objective was to examine the osteological evidence for cause of death, with emphasis on the mass burial of five individuals. The initial archeological assessment that the mass burial represented a funerary rite of mutiliation and decapitation of four of the five people buried in the mass grave could not be confirmed by this analysis.

INTRODUCTION

The Dillard Site (41CO174) is a Late Prehistoric Plains Village occupation discovered, surveyed, and partially excavated by Dr. Ernest R. Martin in the mid-1980s (see Martin, this volume, for a description of the site excavations, burial context, and associated artifacts). Seven skeletons were found in individual graves at the site. These included five children and two adult males. Of the seven, five individuals were buried in partially or fully flexed positions. One was extended, and one was fragmentary and scattered such that the original burial position could not be determined.

Some of the interments had been disturbed before the present excavation. Martin (this volume) attributed the displacement of some of the bones of Burial 2 to the later excavation of the pit for Burial 1. Likewise, the badly disturbed Burial 7A seems to have been encountered prehistorically during the digging of a later grave (Burial 7B).

Five individuals were interred in a common grave. Two dissociated skulls, from Burials 8 and 9, were initially found, along with some arm bones, seemingly separate from other skeletal material. Soon three more skulls were found in rapid succession. These, too, gave the impression of isolation from postcrania.

Five relatively intact skeletons were found below the five skulls. The apparent separation of the skulls from postcranial skeletons, the presence of avulsed teeth and facial fractures that were perceived to be perimortem (at the time of death), and the shifting of bony elements (including missing cervical vertebra), as well as the multiple interment, suggested a catastrophic event that involved death and mutilation (decapitation) (Martin 1994). Four of the skeletons were fully extended and one, the deepest, was tightly flexed. The bones were found within a 15-17.5 cm thick layer. This dense commingling and shifting of skeletal material over the past 600-800 hundred years made the excavation complex and difficult. Martin (1994) reported only one skull, Burial 10, to be in normal anatomical relationship to the cervical spine.

OBJECTIVES OF THE STUDY

Other Late Prehistoric village sites along the Red River contemporaneous with this site are known to have produced mixed sex burials of decapitated skulls. Some of these have been interpreted as ritual burials of trophy skulls taken in warfare (Powell 1977), or as evidence of domestic funerary rites. The principal objectives of the osteological analysis of Dillard site skeletons were to determine age and sex, to inventory bones and teeth present (and missing), and to identify, document, and record dental and bone pathology for inclusion in the Great Plains data base (see Owsley and Jantz 1989, 1994). Additionally, an effort was made to identify cuts on bones (particularly on cervical vertebrae and the base of the skull), to identify evidence of blunt force perimortem trauma, and to identify dental and bony pathological conditions. Determination of when and why teeth were lost was important to confirm or deny the possibility of perimortem loss due to trauma. The presence of cuts, perimortem trauma, or other signs of mutilation would be strong positive evidence supporting the hypothesis of ritual, violent death for four of the five individuals found in the mass burial. Absence of this evidence leaves the cause of the death and reason for mass burial of these individuals open to further speculation.

METHODS AND MATERIALS

Criteria used for sex determination of the skeletons included skull, mandible and pelvic morphology, and long bone size and robustness. In general, male skulls possess larger, more rugged mastoid processes, supra-orbital ridges, and muscular attachment sites such as the nuchal notch on the occipital bone. Male mandibles are larger and heavier, they have square chins, and the gonial angle is typically obtuse. Females have sharper supra-orbital margins; their vaults are smaller, and more gracile than those of the male. The chin tends to be more rounded with a point at the midline (Bass 1987).

The female pelvis is wider and more shallow than the male. The female innominate has a wide, shallow sciatic notch, a long pubic bone, a ventral arc on the pubic bone, a wide subpubic angle and concavity, a preauricular sulcus, and an elevated auricular surface. The male sciatic notch is deep and narrow, as is the pelvis as a whole. It is heavier and larger than the female pelvis. The pelvis is the most reliable indicator of sex (Bass 1987; Ubelaker 1978).

Long bones are not as reliable as sex indicators but still contribute to the confirmation of an opinion. Male bones tend to be larger and more robust than female bones. Maximum diameters of the head of the femur and the humerus are larger in the male.

Dental development and eruption were the criteria used to make age determinations of the children when possible. Radiographs of the maxilla and mandible allowed accurate assessment of the stages of root development. The dental development stages for four of the five children in the sample are given in Table 1.

Long bone length and cranial vault suture closure were used when the dentition was not recovered. Closure and obliteration of long bone epiphyses, long bone length, dental attrition, cranial suture closure, palatal suture obliteration, spinal osteophytosis, other degenerative disease processes, and pubic symphysis and the sacroiliac auricular surface changes were used as criteria for aging adult skeletons (Bass 1987; Mann et al. 1987; Moorrees et al. 1963a, 1963b; McKern and Stewart 1957; Stewart 1979; Suchey et al. 1986).

Scoring of dental pathology included evaluation of the eruption status of teeth, the existence of enamel defects and hypoplasia, tooth loss and alveolar resorption, alveolar bone trauma (fracture), dental attrition (wear), pulp exposures, the existence and extent of caries, abscesses, and antemortem tooth loss. Bone pathology scoring included bone response to infections, wear, trauma, and nutritional distress such as ectocranial porosity, periostitis, cribra orbitalia, osteoarthritis, eburnations (polishing of bone due to wear against bone), remodeling, and healing of antemortem fractures.

Radiographs of the left femur and tibia were taken if possible; the right was substituted when the left was unavailable or unsuitable. Skull, maxilla, and mandible radiographs were taken as well. Trauma and pathology were documented radiographically and photographically.

OSTEOLOGICAL ANALYSIS OF BURIALS

Table 2 summarizes the results of the osteological analysis. A detailed discussion of each burial follows, beginning with the single burials (see Martin 1994 for additional details).

Table 1.

Tooth Formation Stages and Corresponding Dental Ages for Subadults in the Dillard Skeletal Sample.*

Tooth	Burial 1		Burial 2		Burial 4		Burial 7A		Burial 7B	
	Stage	Age	Stage	Age	Stage	Age	Stage	Age	Stage	Age
dc	$A_{1/2}$	2.5	A_c	3.0	$R_{3/4}$	1.8	A_c		No dentition Recovered	
dm_1	A_c	>1.8	A_c	>1.8	$A_{1/2}$	1.6	A_c			
dm_2	$A_{1/2}$	2.4	A_c	3.0	$R_{1/2}$	1.5	A_c			
I^1	Cr_c	5.0	R_{i+}	6.5	$Cr_{1/2}$		$R_{1/2}$	6.8		
I^2	$Cr_{3/4}$		C_{c-}	5.8	C_{oc+}		$R_{1/4}$	6.7		
I_1	R_i		$R_{1/4+}$	4.6	$C_{3/4}$		A_c	7.9		
I_2	Cr_{c+}		$R_{1/4}$	5.1	$C_{2/3}$		A_c	7.8		
C	Cr_{c-}	3.9	R_i	4.7	$C_{1/2}$	2.0	$R_{1/2+}$	7.5		
P_1	$Cr_{1/2}$	3.5	C_{c+}	5.1	C_{i+}	1.8	$R_{1/4}$	6.6		
P_2	C_{co}	3.5	$C_{3/4+}$	5.4			R_i	6.9		
M_1	R_i	2.9	$R_{1/4+}$	4.6	$Cr_{3/4+}$	1.6	$A_{1/2}$	7.0		
M_2	C_{co}	3.8	$Cr_{3/4}$	5.5			Cl_i	7.9		
M_3							C_{co}	9.9		
Age Range	2.5 to 3.5		4.5 to 5.5		1.5 to 2.5		6.5 to 7.5			

Legend: Teeth, Deciduous: dc, canine; dm_1, mandibular 1st molar; dm_2, mandibular 2nd molar; Permanent: I^1, maxillary central incisor; I^2, maxillary lateral incisor; I_1, mandibular central incisor; I_2, mandibular lateral incisor; C, canine; P_1, mandibular 1st premolar; P_2, mandibular 2nd premolar; M_1, 1st molar; M_2, 2nd molar; and M_3, 3rd molar.

Stage: Ci, initial cusp formation; C_{co}, coalescence of cusps; C_{oc}, cusp outline complete; $Cr_{1/2}$, crown 1/2 complete; $Cr_{3/4}$, crown 3/4 complete; Crc, crown complete; R_i, initial root formation; Cli, initial cleft formation; $R_{1/4}$, root length 1/4; $R_{1/2}$, root length 1/2; $R_{3/4}$, root length 3/4; R_c, root length complete; $A_{1/2}$, apex 1/2 closed; Ac, apical closure complete.

* After Moorrees et al. 1963a, 1963b

Table 2.

Demographic Data on Burials at the Dillard Site (41CO174)

Burial	Age	Sex	Single/Mass	Burial Position	Pathology
1	2.5-3.5	IND*	Single	Flexed at hips and knees; on right side	Enamel hypoplasia; slight cribra orbitalia; ectocranial porosis
2	4.5-5.5	IND	Single	Flexed at knees; prone	Deciduous interproximal root caries
3	55-59	M	Single	Extended, supine	Caries; dental attrition; abscesses; ectocranial porosis; extensive osteoarthritis; ante-mortem fractures (R scapula, clavicle, ribs, nasal bones, L Maxilla)
4	1.5-2.5	IND	Single	Flexed at hips and knees; on right side	—
5	>60	M	Single	Flexed at hips and knees; on right side	Caries; pulp exposure; antemortem tooth loss; abscesses; postmortem alveolus fracture; ectocranial porosis
7A	6.5-7.5	IND	Single	Extended, on right side; disturbed	Deciduous root caries; slight ectocranial porosis
7B	3.5-4.5	IND	Single	Fragmentary, disturbed	Postmortem rodent gnawing

Table 2. (Continued)

Burial	Age	Sex	Single/Mass	Burial Position	Pathology
8	16-20	F	Mass	Extended, on left side	Ectocranial porosis; rodent gnawing on R mandibular premolar
9	30-34	M	Mass	Extended, prone	Caries; L mandibular third molar impaction; healed depressed skull fracture; R femur rodent gnawing
10	27-34	M	Mass	Extended, on right side	Caries; peg-shaped lateral maxillary incisors; ectocranial porosis; R radius rodent gnawing
11	17-21	F	Mass	Extended, prone	Caries; osteoarthritis; ectocranial porosis
12	35-44	F	Mass	Flexed, prone	Caries; ectocranial porosis; osteoarthritis

* IND = Indeterminate; M = Male; F = Female.

SINGLE BURIALS

Burial 1 - Unit A

This is the skeleton of a 2.5-3.5 year old. Missing were the hyoid, sternum, left scapula, left clavicle, right innominate, sacrum, coccyx, both patellae, tali and calcanei, 10 left ribs and seven right ribs. Extrasutural bones were noted in the lambdoidal suture.

The deciduous dentition was present and mostly complete with only the maxillary central incisors having been lost postmortem. Both the maxilla and the mandible were present, and dental radiographs allowed comfortable assessment of the age of this child.

No sex determination could be made because of the child's young age. Slight cribra orbitalia, ectocranial porosis, and enamel hypoplasia of the left mandibular canine indicate some nutritional deficiency. No antemortem or perimortem trauma was evident.

Burial 2 - Unit A

This skeleton of a 4.5-5.5 year old was mostly complete. The right palatine, hyoid, sternum, coccyx, both patellae, right fibula, 11th and 12th right ribs, and third, fourth, and fifth lumbar vertebrae were missing.

Enough deciduous dentition was present to allow for age estimation, even though there was some postmortem tooth loss. All four permanent first molars were partially erupted, but none of the second molars had begun eruption.

Interproximal root caries was noted on five deciduous teeth. The deciduous teeth showed fairly heavy attrition. No trauma or pathology other than the dental caries was present.

No estimate of sex was attempted due to the skeleton's age.

Burial 3 - Unit A

This well-preserved male skeleton was judged to be 55-59 years of age at death. Most bones were present, and only the hyoid, manubrium, coccyx, both patellae, and first cervical vertebra were missing.

Age was determined by visual examination of the pelvis, long bones, and skull. The cranial vault sutures were partially obliterated. Dental attrition was severe and extensive. All epiphyses were closed. The ribs showed significant sternal end cupping, macroporosity was evident in the auricular area of the ilium, and thinning of the iliac was also noted. The condition of the pubic symphysis would suggest a younger age, but the overall condition of the skeleton is clearly that of an older individual (Suchey et al. 1986).

The skull was rugged, with clearly defined supraorbital ridges and muscle marking. Bone size and ruggedness, pelvis, skull, and mandibular morphology were all consistent with that of an older adult male.

Most permanent teeth were present. The maxillary third molar was lost antemortem and showed alveolar bone resorption. The maxillary left lateral incisor and right mandibular central incisor were lost postmortem. The remaining teeth were worn; five were without enamel. Three teeth showed carious lesions with more than one half of the crown surface destroyed. Nine teeth had alveolar abscesses, eight with pulp chamber exposure due to attrition. The left maxillary third molar had an enamel pearl.

The temporomandibular joints had been affected by osteophytes, porosity, and erosion. The vertebral column and right acetabulum, left scapula, left and right humeri, left radius, left ulna, left femur, left and right tibiae, and both calcanei displayed mild osteophytic pathology with some joint surface porosity.

The right scapula, right clavicle, and four ribs showed evidence of old healed fractures. The scapula and three ribs developed pseudoarthroses (healing without union), and the remaining rib healed normally. The nasal bone and left maxilla also displayed healed fractures. Rodent gnawing was seen on the right humerus and ulna. No evidence of perimortem trauma was found.

Burial 4 - Unit A

This skeleton is that of a child estimated to be between 1.5 and 2.5 years old. The presence of the complete skull and mandible facilitated aging by allowing examination of tooth calcification and eruption. The hyoid, sternum, both scapulae, both innominates, the sacrum, coccyx, both patellae, and calcanei are missing, as well as one right rib, the seventh, 11th, and 12th cervical vertebrae.

The right and left maxillary deciduous central and lateral incisors had been lost after death. All four deciduous second molars were unerupted as were the permanent first molars.

No sex determination was possible on this young child. No evidence of pathology or trauma was evident.

Burial 5 - Unit A

This is the virtually complete skeleton of a male estimated to be over 60 years of age. Only the hyoid and coccyx bones are missing.

This male's age was determined by visual examination of the skull, long bones, vertebra, and pelvis. All epiphyses are closed and obliterated. The ectocranial and endocranial vault sutures are closed with only traces of the coronal and sagittal sutures in evidence. The basilar synchondrosis is closed. There is thinning of the right parietal bone, which affirms an age estimate of over 60 years (Kerley 1970). Marginal lipping, macroporosity, and increased irregularity of the auricular area of the ilium are also seen.

The large, heavy skull has a well developed nuchal crest, heavy large mastoid processes, pronounced supraorbital ridges, and blunt supraorbital margins. The mandible has a squared symphysis and wide ascending rami. These features are all consistent with male morphology. The pelvis shows classic male features. It is large, narrow, and deep, and has a very narrow sciatic notch. The pubic bones did not survive, but other morphology is convincingly male.

Both parietals, the frontal, and the occipital bones are affected with ectocranial porosis. Vertebral lipping (osteophytes) is widespread, with the greatest involvement of the lower cervical vertebra (C4-C7) and lower thoracic (T9) inferiorly through the lumbars and the sacrum. There is periostitis on the visceral side of one left rib. The weight of the femur is very light, suggesting this individual suffered from osteoporosis.

Advanced dental attrition is evident with the crowns markedly worn. The maxilla is missing the right canine, which was lost postmortem. Both right and left second and third molar sockets show bone resorption, which indicates antemortem tooth loss. Both mandibular central incisors, the left first and second premolars, and the first permanent molar, were lost antemortem. The right lateral incisor, and the right and left canines, were lost postmortem. All other teeth were present in their sockets. Extensive caries affected three teeth, causing pulp exposure in two of them. Pulp exposure in three other teeth occurred because of marked attrition. All the maxillary molars had abscesses. They were probably responsible for the loss of all but the first molar. Mandibular abscesses were seen in both central incisors, the left second incisor, the left canine, the left second premolar, and the left first and second molars. Four of these teeth were missing because of the abscesses. No evidence of perimortem trauma was seen.

Burial 6

This skeleton was identified by Martin (1994) in the field, but it was not excavated.

Burial 7A - Unit B

This is the incomplete skeleton of a child estimated to be between 6.5 and 7.5 years old. No sex determination was attempted because of the young age of the child.

Missing elements of the skull include the left zygoma, left maxilla, left and right palatine, and the hyoid. Missing postcranial elements include the sternum, both scapulae, both clavicles, both patellae, the coccyx, left humerus, both radii, both ulnae, the right femur, 10 right and left ribs, first and seventh cervical vertebrae, the entire thoracic spine, and the third lumbar vertebra.

A separate bag of maxillary teeth found packed with the skeleton was determined to belong with Burial 7A, and they provided additional data with which to determine age. The deciduous central and lateral incisors of both the maxilla and mandible were exfoliated while the child was living. The maxillary deciduous left canine may also have been lost in this manner. The mandibular deciduous right canine and permanent central incisor were lost postmortem. The maxillary permanent central and lateral incisors had erupted, but all other maxillary permanent teeth were unerupted. The mandible retained the deciduous left canine, and both deciduous first and second molars. The permanent central and lateral incisors had erupted but the left central was lost postmortem.

Caries was found interproximally (between the teeth) and on the root of the deciduous right and left first molars. One occlusal pit caries was found on the mandibular permanent right first molar.

Very slight ectocranial porosis was found on the occipital bone, but was so insignificant that it was not coded for this study. No other pathology or trauma was detected for Burial 7A.

Burial 7B - Unit B

This is the skeleton of a child estimated to be between 3.5 and 4.5 years of age at death. It was found with burial 7A after the excavation of the mass burial of individuals 8-12 was completed. Since it was a single interment, it is included here (It is referred to as Burial 13 by Martin [1994]).

Postcrania present included the body of the sternum, part of the left scapula, parts of both radii, an ulnar fragment, a fragmentary right femur and an almost complete left femur, right and left tibiae, and the left fibula. No ribs, vertebrae, or sacrum were included.

Due to the fragmentary condition of this skeleton and absence of any facial material, the estimated age was based on estimated femur length (Ubelaker 1978). No estimation of sex was attempted. There was rodent gnawing on the left femur diaphysis. No other pathology or trauma was detected.

MASS BURIAL

Burial 8 - Unit B

The skull of this 16-20 year old female was the first encountered during the excavation of the mass burial. It was not found in anatomical position with the postcrania. The arms were positioned between this skull and that of Burial 9 and were among the first bones found. Packed with the carpals of this skeleton were also found the hand bones of at least two other individuals. These were those of an older male and of a younger child. A 6 to 10 year old sternal body and first metatarsal were also found commingled with this skeleton. A right mandibular second premolar was found as well, but it could not be positively identified as belonging to this individual. The mandible, hyoid, sternum, coccyx, and the first, second, and third cervical vertebrae for Burial 8 were not recovered.

Aging of this skeleton was determined both by dentition and epiphyseal state. The maxillary third molars were root complete, although not erupted. The proximal humeral head and ulnar epiphyses were in the terminal stages of closure, as was the iliac crest. Ischial epiphyses were nearly complete, except the anterior portion.

The determination of sex of Burial 8 was based mainly on the morphology of the pelvis and skull. The cranial vault was smooth, gracile, and consistent with that of a female. The pelvis was wide, shallow and possessed a wide sciatic notch.

There was slight, localized ectocranial porosis noted on the occipital bone, the parietals, and the frontal bone. No other pathology or trauma was evidenced, and no cuts were found on the crania or postcrania.

Anterior teeth were missing due to postmortem loss, not trauma. The right mandibular second premolar found with this skeleton had been gnawed on by rodents.

Burial 9 - Unit B

This is a male skeleton estimated to be 30-34 years of age at death. The skull was the second uncovered during the excavation and was the highest within the grave. The skeleton was, however, one of the last two exhumed because it was below Burials 8, 10, and 11. The hyoid, coccyx, three right and three left ribs, and the first cervical vertebra are missing for this individual.

Age estimation was based on the condition of epiphyseal closure and the pelvic bones. The sacrum is fused and there is no buildup in the postauricular area of the pelvis. The pubic symphysis suggests an age of 30 to 34 years.

Sex determination was based on skull and pelvic morphology. The skull displays prominent supraorbital ridges, nuchal notch and mastoids, and the mandible is large and heavy. The pelvis is typically male: large with a narrow sciatic notch and no buildup of the post-auricular area.

The maxillary central incisors, the mandibular central and lateral incisors, left canine, and left second premolar were lost postmortem. All other teeth are present and in good condition with the exception of a large carious lesion in the impacted mandibular left third molar. None of the teeth are abscessed, and enamel wear is not excessive for this group.

Slight osteoarthritis lipping is noted on both calcanei and tali, but otherwise no evidence is apparent that this individual had arthritis. A remnant of the metopic suture is present on the anterior and inferior aspect of the frontal bone.

There is a small circular (8 x 9 mm) healed depression fracture in the middle of the left parietal. No other trauma is seen, and with the exception of slight arthritis seen on the heel and ankle bones, no pathologies were noted. The acquisition of the V-shaped cleft in the left clavicle was determined not to be perimortem but rather postmortem in nature.

No cuts were found on this skeleton. Rodent gnawing was observed on the distal linea aspera of the right femur.

Burial 10 - Unit B

This skeleton of a 27 to 34 year old male was nearly complete. It was missing only the coccyx, one rib from each side, one thoracic vertebra, and the first and second cervical vertebrae. There were 14 thoracic vertebrae packed with this skeleton, two of which could not be articulated. Although the ribs were badly fragmented, the possibility of a 13th rib could not be ruled out. An extra right clavicle found packed with Burial 8 was determined to belong to this skeleton.

Burial 10's age was determined by recent epiphyseal fusing of the medial clavicle and iliac crest; the sacrum is also fused. The development of the symphysis pubis supports an estimate of 27-34 years of age.

Sex determination was based on skull and pelvic morphology and long bone size and ruggedness. The supraorbital ridges, mastoids, mandibular size and shape, and the nuchal notch, all confirm maleness. The pelvis had the classic male shape with a narrow sciatic notch.

Burial 10 retained all its permanent teeth. Caries were seen on the left maxillary third molar and both mandibular third molars. The lateral maxillary incisors were peg shaped (barrel). The third molars showed little attrition; no abscessing was seen.

There is no arthritis of the spine and the sacroiliac joint is smooth. Widespread active ectocranial porosis was seen on the frontal bone, both parietals, and the occiput. Osteochondritis dissecans (localized necrosis, followed by degenerative changes in the articular cartilage) was found on the medial condyle of the left distal femur (Loveland et al. 1984).

No cuts, no evidence of trauma, and no other pathology were seen on this skeleton.

Burial 11 - Unit B

This is a female skeleton judged to be 17-21 years of age at death. The hyoid, right scapula, coccyx, both patellae, left humerus, two left ribs and one right rib, and the second through sixth cervical vertebrae, were missing.

The age estimation was based on the development and condition of the teeth and the progression of epiphyseal closure. The third molars were root complete and the crowns show wear. The palatine incisive foramen is gone, the ilium is fusing, and the proximal femur is fused. The clavicular epiphysis is not fused and the proximal humerus has not reached final closure stage.

Sex determination was based on the small, gracile, smooth skull. The mastoids were small and delicate and there was no significant nuchal notch. The frontal bone had no supraorbital ridges. The pelvis did have a very deep narrow sciatic notch, but other postcrania were consistent with the female designation.

There was postmortem tooth loss of the maxillary right central and lateral incisors, right first and second premolars, the left canine, and both premolars. The symphyseal portion of the mandible was missing, but only the right central incisor, the left central and lateral incisors, the canine, and the first premolar were lost. Caries was present in the maxillary third molar, the mandibular right first molar, and all three left molars; no abscesses were found.

There is a slight localized ectocranial porosis on the occipital bone. Both tibiae show moderate but well-healed periostitis. X-rays demonstrated increased cortical thickness in these bones. The distal right humerus has a billowy, very slightly swollen quality that seems atypical. The atlas (first cervical vertebra) was discovered in the laboratory while cleaning the muddy clay of the burial pit from the skull. It was displaced forward of the foramen magnum. No cuts or evidence of trauma were found.

Burial 12 - Unit B

This skeleton of a 35 to 44 year old female was found in a flexed, prone position under the other four individuals in this grave (the others were all extended). The hyoid, coccyx, left clavicle, left innominate, left femur, the first, 11th and 12th ribs bilaterally, and the first through fifth cervical vertebrae, were all missing.

The age estimate was based on visual examination of the skeleton. All epiphyses were closed and obliterated. Dental attrition due to abrasion was significant. The symphysis pubis suggests an middle aged to older female.

Sex was determined by visual examination of the skull, pelvis, and long bones. The skull had no supraorbital ridges, small mastoids, sharp supraorbital margins, no nuchal notch, and the gonial angle of the mandible was pulled inwardly. This female had probably had children since there was a large preauricular sulcus on the pelvis and parturition pits on the dorsal surface of the pubis (Suchey et al. 1979). There was a ventral arc on the pubic bone, a wide shallow sciatic notch, and an elevated sacro-iliac articulation. The humeri had septal apertures which lend support to the determination of female gender (Trotter 1934).

With the exception of a congenitally missing right third molar, all mandibular teeth were present. Both maxillary central incisors were lost postmortem as was the right maxillary canine. Caries were evident on both maxillary first molars and the right second molar. On the mandible, only the right second molar was carious. The left maxillary first molar also suffered pulp exposure and alveolar abscess. The incisors were shovel shaped.

Porosity is seen on both temporal mandibular joint surfaces, and ectocranially on the parietals and occiput. Osteophytes and porosity are found on cervical, thoracic, and lumbar vertebra. One lumbar vertebra was found to be eburnated on an articular facet. Several of the vertebra had Schmorl's depressions. Distal femoral cortical excavation (Mann and Murphy 1990) is seen on the medial side of the posterior surface of the right femur.

No evidence of perimortem trauma was seen.

Included with the skeletons were bones that could not be assigned to any of the twelve analyzed individuals. Since space considerations prohibited laying out all the burials at once, it is conceivable that some matches exist that were not recognized. Some, however, are clearly not of the age groups represented in this sample from the Dillard site and some are duplicates of bones already inventoried. The extraneous bones are likely from disturbances of other interments in the cemetery at the site.

DISCUSSION

The seven single burials included two old adult males and five children. The two old males, Burials 3 and 5, suffered extensive dental disease and osteoarthritis. There is no evidence of perimortem trauma that would suggest a violent cause of death. More likely, they grew old, and died of natural causes.

Neither did the five children show signs of trauma that would suggest violent death. Rather, slight ectocranial porosis, cribra orbitalis, heavy dental attrition, caries, and enamel hypoplasia are seen, suggesting stress and possible nutritional deficiencies. It is likely that these children succumbed to childhood diseases.

In the mass burial, two men in their 30s, two very young women in their late teens or early 20s, and an older woman in her 40s were found together. Although the older woman had significant dental attrition, she had kept her teeth and had only one abscess. She had some arthritis, but it was not extensive or severe. A cortical excavation on her distal right femur was seen at a muscle insertion site. The older of the young women had evidence of healed periostitis. One of the men had a small healed depressed skull fracture. Osteochondritis dissecans was seen on the distal left femur of the younger male. This is often seen clinically, but rarely reported in bioarcheological literature (Loveland et al. 1984).

Six of the 12 skeletons showed mild ectocranial porosis. Eight of the 12 were found to have caries. Only one adult had none, and one individual (Burial 7B) had no dentition to examine. The old men had extremely worn, carious, abscessed teeth. This pattern reflects the diet of these people, and suggests a high carbohydrate intake as well as food processing techniques that introduced considerable grit into the diet.

Although the state of preservation of the bones was remarkable, an unexplainable loss of skeletal elements was common. This loss was seen in both the individual interments and in the group grave.

CONCLUSION

When decapitations and mutilations occur there usually is good osteological evidence of its occurrence. Cuts are found on the ascending ramus of the mandible, around the foramen magnum, and on the cervical vertebra, usually the first and second (Willey 1991). Dismemberment of the arms would be expected to leave some trace of the act on either the humeral head, around or in the glenoid cavity, and/or on the acromion or coracoid processes of the scapula. Turner (1983) believes that perimortem breakage, cutmarks, and burning are fundamental properties of bone altered by human intent. None of these properties were found in this sample from the Dillard site.

The fact that some skulls and arms were displaced so far from their normal anatomical position is not easy to explain. Perhaps the cause of the displacements and disturbances can be explained by natural postmortem taphonomic processes. Rodent gnawing was detected on four bones from three burials, and on one tooth from a different burial. Two of these burials were within the mass grave. This evidence that there was rodent activity within the mass grave, and with some of the individual graves, suggests animal transportation of the bones. Field tests have shown that buried bones do migrate underground when disturbances as slight as treading occur on the surface (Bielenstein 1990). Other taphonomic processes include: settling of the backfill of the burials as soft tissue decay progresses, migration of the bones due to surface disturbance, or differential bone attrition within the graves possibly due to variations in microclimate.

Of the 12 recognized burials, only three had complete cervical spines when examined. Of those three, only one was an adult, and all of them were interred in single burials. Not one individual in the mass burial had a complete cervical spine. Even Burial 10, ostensibly the unmutilated important person (Martin 1994), whose head was thought to have been articulated with his cervical spine, was missing both the first and second cervical vertebrae. The mandible from Burial 8 was never located. A portion of the mandible from Burial 7 was "found beneath the skull; the remaining two-thirds was missing" (Martin 1994:136).

Not surprisingly, no cocci were found in any of the graves and only one horn of one hyoid was found. Examples of other missing bones include 61 ribs (not counting the fragmentary child in Burial 7B), 10 patellae, and four clavicles. Evidence such as this could also suggest continuing disturbances of old graves as new burial pits were dug. The bones left over came from somewhere else within the cemetery. There was no evidence of any graves immediately above the mass grave. Burials 7A and 7B were close on one side and Burial 2 was close on the other, but the leftover bones could not be matched to any of these graves.

The age distribution of the skeletons in the graves excavated so far at the Dillard Site is skewed. The young and the old are represented in single grave burials. Those in the middle age range are found in the mass burial. That something catastrophic happened at the Dillard site long ago is possible. The circumstances that would cause a middle-aged woman, two very young women, and two men in the prime of their lives to die together and be buried together is open for further speculation. However, there is no osteological evidence that confirms either sacrifice, mutilation, or dismemberment.

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Oysters as Ecofacts

Kim A. Cox

ABSTRACT

The American Oyster, *Crassostrea virginica*, is offered as a substitute for artifacts, which are scarce in most coastal archeological deposits. Various methods of analysis of archeological oyster deposits are examined as they relate to human ecology on the macro- and micro-scales, and as they contribute to our understanding of Holocene environments. The focus of this article is the Archaic of the central Texas coast.

INTRODUCTION

Although archeological deposits from the Archaic are quite common along the Texas Gulf Coast, most are comprised of estuarine shell matrices that have produced few, if any, artifacts. Often as extensive and as difficult to excavate as burned rock middens, these shell deposits, with the exception of a handful of cultural resource management projects, have not drawn the wide attention of their Central Texas counterparts, principally because the dearth of artifacts has long been equated with a lack of discernible information.

Then, beginning in the late 1980s, innovations in shellfish analysis (e.g., Custer and Doms 1990; Kent 1988; Lawrence 1988, 1989) led to the emergence of the long ignored American Oyster (*Crassostrea virginica*) as a major archeological resource. Through these inventive approaches and techniques, the oyster became not only a worthy substitute for artifacts, in many cases it was to become vastly superior in the quantitative and qualitative production of archeological information. This new recognition of the importance of the oyster was, in many respects, to revolutionize coastal archeology.

Although still in their formative stages, the analyses and approaches discussed here are ones in which the oyster has already yielded meaningful information. The techniques and the significance of the inquiries are examined as they relate to human ecology on the macro- and micro-scales, and as they provide information for deciphering Holocene environments. The analyses rely heavily on intersite comparisons; the data from as many as 34 dated shell strata have been used in their formation.

HUMAN ADAPTATIONS AND COASTAL ECOLOGY

The coastal Archaic of the central Texas coast was originally defined by T. N. Campbell (1947). He characterized it as a pre-ceramic, hunting/gathering expression (called the Aransas Focus) with a homogeneous lifestyle, identified by crude stone dart points and a suite of shell tools, that supposedly persisted from some unspecified date until the advent of the Late Prehistoric period. Until recently, this was the extent of knowledge, more or less, of coastal Archaic adaptations (e.g., Prewitt et al. 1987; Shafer and Bond 1985; Steele and Mokry 1985). The demise of the Aransas Focus as a viable concept came when the radiocarbon dating of numerous well-stratified shell deposits led to the realignment of the coastal Archaic in terms of human ecology (see discussion in Ricklis 1990, 1993; Ricklis and Cox 1991).

RADIOCARBON DATES AND THE CHRONOLOGY OF HUMAN COASTAL ADAPTATION

Generally, archeological shell strata produce little datable material other than shells. However, the accuracy of the radiocarbon dating of estuarine shells, and the viability of certain correction factors and the irrelevance of others, have recently been demonstrated through the use of paired shell/charcoal dates (Ricklis and Cox 1991; Ricklis 1993). [1]

When properly adjusted and plotted chronologically, radiocarbon dates from sites on the central Texas coast with intensive use of estuarine resources show an unmistakable temporal clustering (Figure 1 and Table 1). Ricklis (1993) has theorized that this periodicity, supported by the presence or absence of certain time-diagnostic projectile point types in surface collections, indicates intensive human exploitation of estuarine resources only in times of sea level stability (see also Bloom 1983; Custer 1988; Reitz 1988; Widmer 1988).

Furthermore, the patterning of human coastal occupation, as Ricklis (1993) and Bernstein (1993) argue, has significant implications for the relative value of the estuary as an exploitable biomass, as well as for the microscopic phytoplanktons at the bottom end of its food chains. If people did not intensively use the estuaries during periods of rapid Holocene sea level rise, the food resources were most likely not as available to them during such times (Custer 1988). Assuming this to be true, one must look for ways in which a rapidly rising sea can adversely affect an estuarine biome (cf. Widmer 1988). Both Ricklis (1993) for the Texas Coast, and Bernstein (1993) for the southern New England coast, have suggested that this was the result of rising sea levels changing highly productive estuarine ecosystems into much less productive marine ecosystems

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[1] Much of the supporting documentation for these data is presented at length in Ricklis (1993).

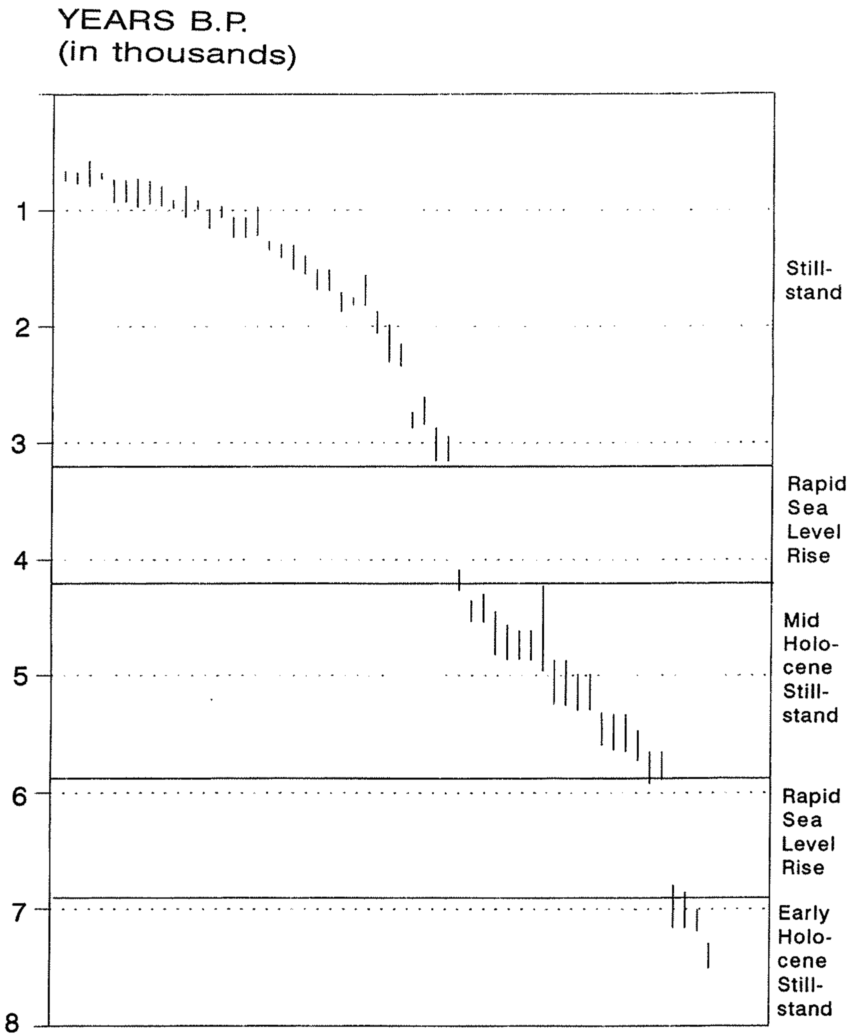

Figure 1. Radiocarbon dates from the central Texas coast (from Ricklis 1993).

(see Perlman [1980] for a discussion of contrasting levels of productivity of estuarine and marine ecosystems).

At the end of the last Ice Age, rapid sea level rise sent marine waters far up the deeply downcut Pleistocene river valleys, creating fjord-like estuaries quite different in appearance from the bay/lagoon estuaries of today. Initial evidence of estuarine adaptation in Texas comes from the end of the first major sea level stillstand, which occured between approximately 9000-7000 B.P. (see Figure 1). This was followed by major stillstands at ca. 5900-4200 B.P., and from ca. 3000 B.P. to present (see Brown et al. 1976; Frazier 1974; Prewitt and Paine 1988). As

Table 1.

Radiocarbon data, sites with intensive use of estuarine resources, central Texas coast

Site	Material*	^{14}C Age (BP)	Age with ^{13}C Correction	Age BP at one Sigma Error
41SP43	1	780 ± 40	—	725-680
41SP120	2	480 ± 70	910 ± 70	928-738
41SP120	3	510 ± 60	910 ± 60	926-741
41SP120	1	950 ± 110	—	970-730
41SP120	1	950 ± 80	—	943-751
41SP120	4	580 ± 70	980 ± 70	960-793
41SP120	3	630 ± 70	1020 ± 70	982-915
41SP120	1	1030 ± 130	—	1060-790
41SP120	2	610 ± 70	1030 ± 70	990-919
41SP120	5	760 ± 50	1160 ± 50	1161-996
41SP43	3	710 ± 40	1110 ± 40	1062-970
41SP43	3	820 ± 50	1220 ± 50	1235-1067
41SP43	3	820 ± 50	1220 ± 50	1235-1067
41SP120	4	770 ± 60	1180 ± 60	1217-974
41SP120	3	950 ± 60	1370 ± 60	1338-1270
41SP149	6	1060 ± 70	1440 ± 70	1407-1296
41CL70	6	1157 ± 85	1487 ± 85	1505-1303
41SP43	3	1180 ± 70	1580 ± 70	1546-1395
41SP43	2	1230 ± 60	1650 ± 60	1682-1514
41SP43	2	1260 ± 70	1660 ± 70	1689-1515
41SP43	2	1450 ± 70	1850 ± 70	1873-1711
41SP153	5	1400 ± 70	1760 ± 70	1816-1749
41CL2	5	1403 ± 88	1756 ± 88	1818-1559
41CL74	6	1599 ± 86	2006 ± 86	2060-1873
41CL59	5	1728 ± 86	2116 ± 86	2303-1991
41SP136	5	1880 ± 60	2230 ± 60	2340-2155
41AS3	2	2210 ± 60	2610 ± 60	2773-2740
41CL2	5	2244 ± 89	2611 ± 89	2837-2611
41SP177	5	2450 ± 60	2840 ± 60	3156-2873
41SP120	2	2445 ± 80	2890 ± 80	3157-2948
41SP148	5	3380 ± 60	3780 ± 60	4266-4086
41SP120	2	3560 ± 80	3970 ± 80	4533-4353
41CL70	5	3633 ± 95	3963 ± 95	4536-4300
41SP136	1	4090 ± 80	—	4822-4451
41SP153	3	3810 ± 80	4190 ± 80	4861-4568
41SP156	3	3770 ± 70	4210 ± 70	4859-4614

Table 1 (Continued).

Site	Material*	^{14}C Age (BP)	Age with ^{13}C Correction	Age BP at one Sigma Error
41CL70	5	3812 ± 92	4223 ± 92	4867-4614
41SP153	1	4090 ± 270	4080 ± 270	4962-4229
41SP148	5	4020 ± 70	4410 ± 70	5245-4871
41SP15	3	4030 ± 70	4430 ± 70	5257-4875
41SP153	5	4110 ± 70	4500 ± 70	5298-4991
41KL71	1	4204 ± 60	—	5295-4994
41SP156	5	4380 ± 90	4750 ± 90	5592-5325
41NU184	7	4390 ± 70	4790 ± 70	5633-5336
41NU221	7	4410 ± 90	4810 ± 90	5647-5336
41NU221	7	4450 ± 90	4850 ± 90	5724-5474
41NU221	7	4630 ± 90	5030 ± 90	5919-5654
41SP153	5	4610 ± 70	4990 ± 70	5888-5650
41SP136	5	5860 ± 110	6070 ± 110	7159-6798
41SP153	5	5700 ± 80	6110 ± 80	7161-6857
41SP153	5	5830 ± 90	6210 ± 90	7189-7010
41SP153	3	6180 ± 120	6550 ± 120	7509-7299

* 1=charcoal; 2=quahog; 3=scallop; 4=whelk; 5=oyster; 6=*R. cuneata*; 7=*R. flexuosa*

the continuing sedimentation process began to catch up with sea level during stillstand (see Dalrymple et al. 1992), highly photosynthetic shallows aided in turning the estuaries into rich areas of primary organic production, where the phytoplanktons and the salt grasses flourished.

The creation of highly productive estuarine biomes during periods of stillstand was probably facilitated in the Middle Holocene, and certainly in the Late Holocene, by the formation of barrier shoals and islands (see Ricklis 1993). These had the effect of trapping river-borne nutrients and sediments and reducing turbidity and salinity, turning the estuaries into some of the world's most highly productive ecosystems (Odum 1971; Whittaker 1975). By comparison, equal areas of the world's oceans are as much as 1000 times less productive (Valiela 1984).

With the advent of rapid sea level rise after the first two major stillstands, sea level increases of an estimated 100 cm/century (see Paine 1991:170) pulled away from much lower sedimentation rates (between 6-22 cm/century to approximately 38 cm/century [Shepard and Moore 1960; Widmer 1988]), inundating the estuaries' shallows and marshes, diluting their nutrients and increasing marine influences. The wide salinity gradient upon which highly productive estuaries depended (Bulger et al. 1993) was most likely compressed into the lower river systems, where fishing and shellfishing may have continued (see Weinstein 1994). Primary production, which thrived in the shallow, less turbid, and more brackish estuarine waters during stillstand, would likely have been greatly affected by the shift to heavy marine influence.

Because all subsequent levels on the estuarine food chain, including oysters, are either directly or indirectly dependent on primary production, periods of rising sea level probably had the effect of greatly reducing the density of oysters, and of turning what was perhaps never more than a marginal human food resource into one whose reduced abundance no longer justified its exploitation (see Perlman 1980). Thus, through a series of deductions supported by modern analogs, the radiocarbon dating of estuarine shells not only led to the complete realignment of the coastal Archaic in terms of human ecology, it also focused attention on the effects of environmental change on the exploitable estuarine biomass (Ricklis 1993).

SEASONALITY

It has long been known that most bivalves exhibit annual growth patterns on the exteriors of their shells (Lutz and Rhoads 1980). Over a decade ago, Lawrence Aten (1981) pioneered a method for the determination of seasonality through the examination of these annuli on *Rangia* from archeological shell middens on the upper Texas coast. Theoretically, the same could have been done for oysters, which are at least as prevalent as *Rangia* in coastal archeological sites, but they seem to have frustrated all attempts of accurately deciphering their outer shell growth rings (see Claassen 1986; Palmer and Carriker 1979).

Oysters, however, unlike other bivalves, also show growth annuli on the ligostracum of their umbos or hinges (Figure 2). As pointed out by Kent (1988), these annuli are far easier to read and are more reliable than those on the oyster's exterior surfaces. Previous attempts had been made to use these annuli to determine age and season of death (e.g., Sambol and Finks 1977; Waselkov 1982, 1987). But it was not until Kent (1988) and Lawrence (1988) published their results that the efficacy of the technique of examining oyster umbos for seasonality was firmly established.

This method was based on comparisons of monthly growth rates of umbo annuli on live oysters through their yearly cycle. Relying on these modern growth rates, Kent (1988), Lawrence (1988), and Custer and Doms (1990) have determined season of death on archeological samples by measuring the distance of growth past the last winter growth break, and comparing it to previous annuli on the same valve.

Kent's and Lawrence's pioneering method relies, however, on the ability of the oyster analyst to read winter growth breaks, and, to a lesser extent, on their knowledge of the growth rates of the archeological samples being analyzed (Claassen 1991). This has led to criticism by archeologists such as Russo

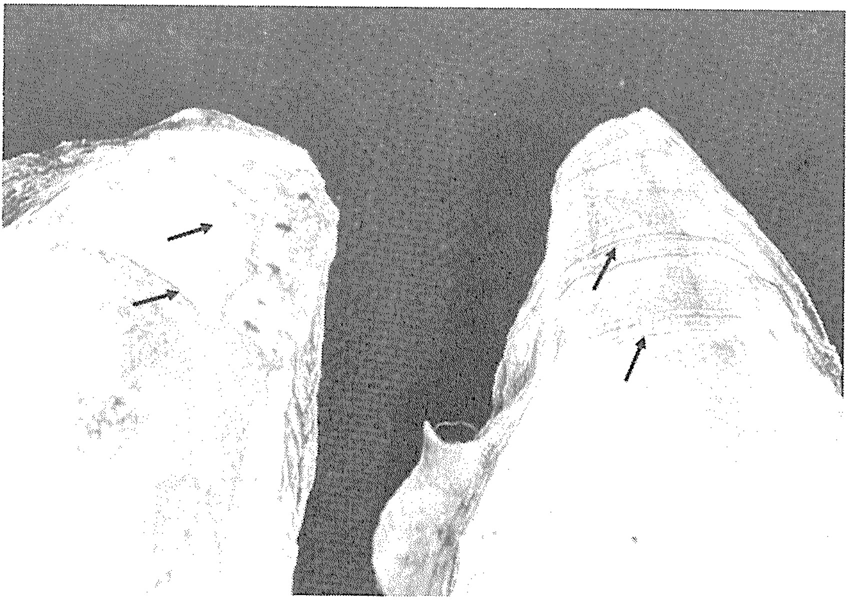

Figure 2. Winter/early spring growth annuli on lower umbos of *Crassostrea virginica*.

(1991a, 1991b), who found that oysters from "southern" waters do not produce distinctive winter growth breaks (a fact acknowledged by Kent [1988]).

While this may be true of the Florida oysters examined by Russo and Kent, it has not proven to be the case for oysters from the Texas coast today (Cox and Cox 1993; Ricklis 1990). Galtsoff (1964) has reported that the fastest growth rate of *Crassostrea virginica* is in water temperatures between 15-20° C, with growth virtually ceasing in the lower direction at 10° C and significantly declining in the upward direction at 25° C (cf. Austin et al. 1993; Haven and Morales-Alamo 1966). Hildebrand and King (1979), and recent unpublished data from the Texas Parks & Wildlife Department (Cox and Cox 1993:Figure 2), show that water temperatures in the Coastal Bend of Texas usually average between 10-15° C for the months of December and January, with actual temperatures sometimes falling below 10° C during those months. By contrast, information presented by Chestnut (1974) shows that winter water temperatures on the west coast of Florida average about 8° C warmer than those of the central Texas coast. This seems to explain the lack of distinctive winter growth breaks observed by Russo and Kent on Florida oysters, and why distinctive winter growth breaks do appear on Texas oysters.

The method suggested by Kent (1988) was recently applied to numerous oyster deposits from the White's Point archeological area on the north side of Nueces Bay (Cox and Cox 1993). A random sampling of 100 lower valves from modern oyster beds and reefs from upper and lower Nueces Bay indicated that oysters tend to die naturally in the summer (Figure 3). This is consistent with the findings of Gunter (1955) on mortality rates of *Crassostrea virginica* from the Texas Gulf Coast.

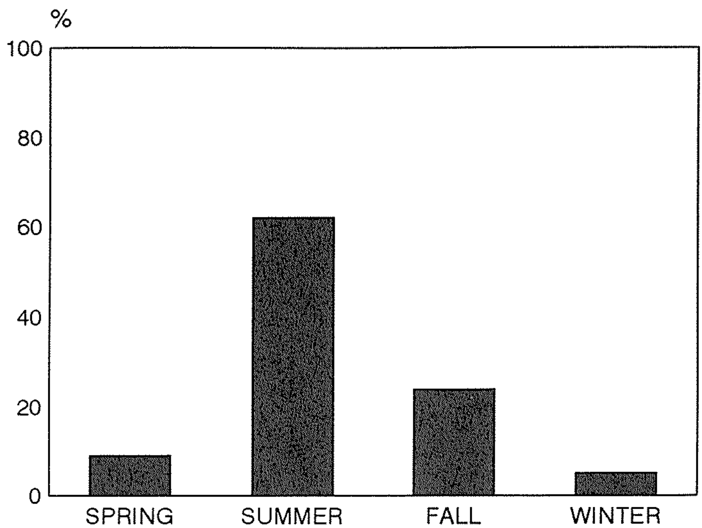

Figure 3. Seasonality of dead oysters from random oyster reefs in upper Nueces Bay.

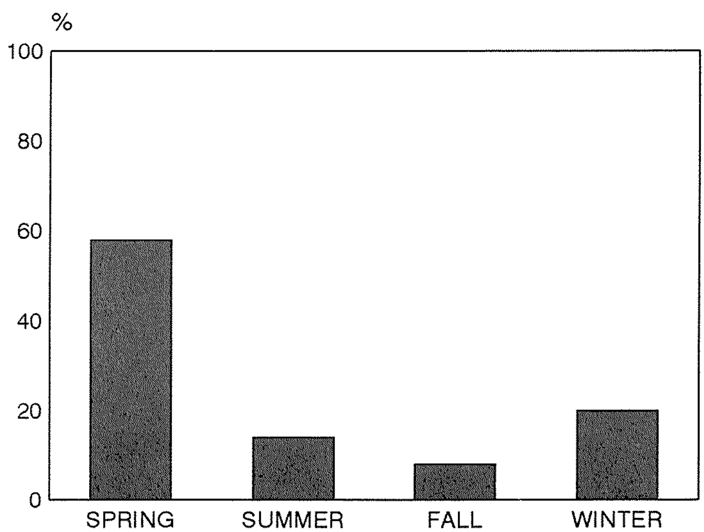

Figure 4. Composite seasonality of archeological oyster deposits from White's Point.

The aggregate graph of the oysters from White's Point (Figure 4), as well as those from the individual strata (see Cox and Cox 1993), however, exhibited a tendency toward a winter/early spring season of death. This is the time of year when their carbohydrate and glycogen contents were at their highest (Hopkins et al. 1954; Soniat and Ray 1985).

Ricklis (1988, 1990) had argued that the Late Prehistoric populations of the central Texas coast occupied the coast on a seasonal basis. The seasonality data from White's Point indicated that this pattern was at least 7500 years old (Ricklis 1993).

DENSITY AND CONTENT OF SHELL STRATA

At White's Point, all shell deposits were thin with low artifact densities. With the possible exception of Kent-Crane (41AS3) on Copano Bay, this is true for all Archaic shell deposits in the Coastal Bend area of Texas prior to approximately 1800 B.P. These shell deposits appear to be the results of single procurement episodes by small groups of people (cf. Lavin 1988; Stein 1992). The appearance of more extensive deposits after that time corresponds to a major shift in settlement and biotic procurement patterns beginning in the very Late Archaic and extending into the Late Prehistoric period (Ricklis 1990, 1993). These later shell deposits have higher artifact densities, evidencing much greater ranges of activity, and produce much more abundant fish remains (Ricklis 1990, 1993; Weinstein 1992, 1994).

Through the examination of the density and content of shell deposits, we can determine the relative value of the estuary to prehistoric populations (Waselkov 1987). By all indications, Late Prehistoric sites like 41SP120 on Corpus Christi Bay (Ricklis 1990, 1993) and 41CL2 on San Antonio Bay (Weinstein 1992) supported much larger populations than did their Early and Middle Holocene counterparts.

By converting the size of shellfish and fish otoliths to calories, a general idea can be obtained of calories being extracted from the estuarine biomass by time period (see Bernstein 1993). Unfortunately, an absolute comparison between time periods of total calories consumed at a site (and from there to population estimates) is difficult to determine because, among other things, bone from Early and Middle Holocene deposits does not often survive (see Ricklis 1988). Nevertheless, the relative value of estuarine resources is a subject that will continue to draw considerable attention, principally because of its implications for the Late Archaic aggregation of coastal populations (see Ricklis 1990), and the possible development of complex social organization in societies that never adopted agriculture (cf. Arnold 1992; Marquardt 1985; Russo 1988).

Waselkov (1987) and Henshilwood et al. (1994) have also suggested that the absence of artifacts in some shell middens is important. They argue that if women and children were principally responsible for the middens, one would not expect to see certain types of artifacts. This would also mean that these types of shell heaps are strictly related to a specific food procurement activity, with main residential sites usually located some distance away.

HUMAN PROCUREMENT STRATEGIES

Lower vs. Upper Shell Ratios

In trying to establish an absolute number of calories by strata, one factor that comes into play is determining the total number of oysters consumed. While the obvious approach of taking the total number of valves and dividing by two is logical, it is also probably inaccurate.

Oysters, like many bivalves, contain distinct upper (or right) and lower (or left) valves. The upper valve is usually flat with a concave umbo. The lower valve is more cupped and has a convex umbo (technically the "chondrophore"). When the oyster umbos from White's Point were separated in the field, the results showed a consistent weighting toward the lower valve (Table 2). This is a curious phenomenon that seems to be a regular feature in other archeological areas on the Texas coast (e.g., Weinstein 1994). Since even fragmented upper and lower umbos are easily identifiable, and since a meticulous attempt was made at White's Point to identify all umbos in the field (see discussion in Ricklis 1993), it is doubtful that the noted difference was a result of differential preservation between upper and lower umbos. Indeed, some deposits that contained very few fragmented shells, such as the upper level at 41SP177, produced some of the most striking disparities.

Therefore, as suggested by Bernstein (1993:65), in determining the minimum number of individuals, the number of lower umbos would have to be used. If, however, all oysters were being shucked at the site of procurement and were being brought "on the half shell," the actual number of individuals in the archeological deposits would be represented by the total number of valves and not merely lower ones. It should be pointed out that attempts were made at White's Point to pair larger valves but that they were never successful. Theoretically, if oysters were being shucked where the shells were being deposited, it should be fairly easy to match large, unique, upper and lower valves (see Koike 1979). To date, no one has demonstrated that this can be done for archeological oyster deposits. The tendency toward a prevalence of lower valves may also have its uses in determining whether certain shell strata are the results of human food procurement or the results of natural processes.

Evidence of Opening Techniques

Kent (1988) and Waselkov (1987) have reported archeological evidence of opening oysters appearing as fire scorching and shucking. This latter technique,

Table 2.

Percentages of lower valves to upper valves in dated shell strata from White's Point

Site and Shell Strata	Upper	Lower	% Lower
41SP136.2	274	401	59
41SP177.6	58	110	65
41SP177.7	62	88	59
41SP177.8	89	92	51
BHT 9	21	52	71
41SP136.4	44	72	62
41SP153 E	30	30	50
BHT6	138	278	67
41SP153.4	33	52	61
41SP153.6	365	496	58
41SP156	101	162	62

which involves opening the oysters without cooking the meat, includes fracturing, insertion of sharp objects to separate the valves, and hammering (stunning the valves open).

While scorching is rare on the White's Point oysters (with the exception of a hearth area at 41SP153), possibly intentional shell damage on many valves was documented during laboratory analyses. In some instances, this damage was apparently caused by the insertion of a strong, sharp object between the valves on the anterior side of the oyster slightly below the umbo, producing identifiable shell damage (Figure 5). Frequently, the distal end of the shell was also chipped, perhaps to break the airlock (Waselkov 1987), or perhaps to insert a long, thin object to slice the adductor muscle (Kent 1988).

In field experiments, hammering above the adductor muscle with a heavy object would sometimes cause the oyster to open enough to insert a sharp instrument to slice the adductor muscle; this was most easily done at its attachment on the upper valve. This technique left no noticeable damage on either valve.

While there was apparent evidence of shucking from many sites at White's Point, it was never universal, and greatly varied in percentages in deposits where it did occur. Several deposits produced few if any valves that evidenced shucking damage. None of the valves from a hearth area at 41SP153, for instance, showed shucking damage to their shells. These were the only valves that had been scorched in a fire, and were also the only valves in which there were equal numbers of upper and lower valves, implying a different opening technique.

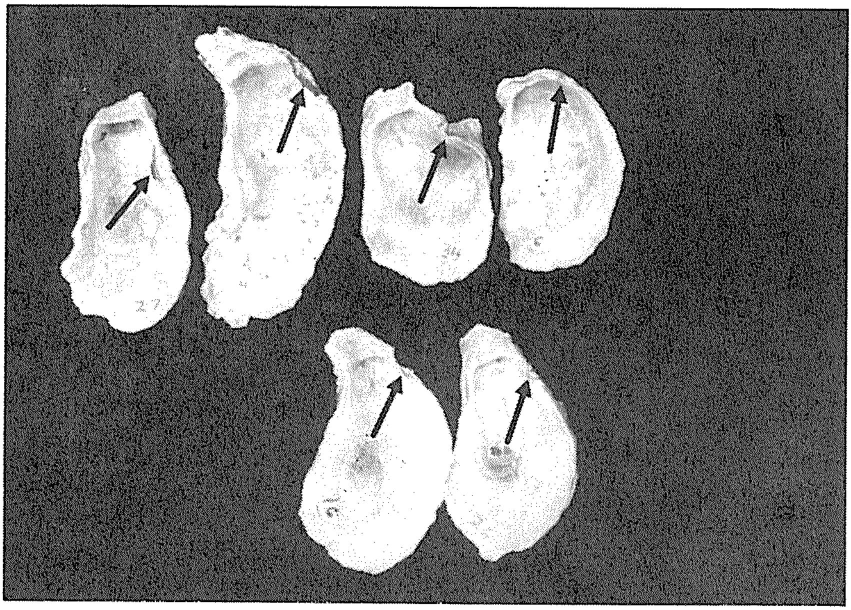

Figure 5. Shucking damage on lower oyster valves from 41SP177.

In their analysis of Late Holocene mussel shell "megamiddens" in South Africa, Henshilwood et al. (1994:104) suggested that "shells discarded as part of a processing strategy should be distinguishable from those discarded after in situ meat consumption according to the signature they leave in the archaeological record." Through experimentation, they concluded that the most efficient method of processing large quantities of mussels was to smoke or sun bake them in the half shell (cf. Kent 1988:55). The result is a light weight, highly nutritious food bulk that could be consumed without subsequent risk of food poisoning. Thus, they argued that the large Late Holocene middens were actually "localities where mussels were dried by work groups of hunter-gatherers prior to being transported and consumed inland" (Henshilwood et al. 1994:104).

No similar experiments have been undertaken with oysters, but such an activity could explain the prevalence of lower valves. As Waselkov (1987:103) pointed out, "since hand shucking is more time-consuming than roasting, there must be some incentive to avoid cooking the mollusc." The incentive could be for long-term meat preservation in the fashion described above. Since oysters can be easily smoked or dried for preservation, the possibility of mass extraction for future consumption has to be considered.

Height/Width Ratios

Based on studies of oysters procured from different environments, Kent (1988) proposed a method for analyzing their height/width ratios (H/W): the maximum dorsal-ventral measurement over the maximum anterior-posterior measurement (for purposes of clarity, the term "width" is used instead of the more scientifically accurate term "length"). These environments were identified as:

> H/W Ratio less than 1.3: beaches and bars of coarse, firmly packed sand.
>
> H/W Ratio between 1.3 and 2.0: mixed mud with sand, oysters occur either singly or in loose clusters.
>
> H/W Ratio greater than 2.0: soft mud bottoms, generally in deeper channels, that produce large oysters, or oyster reefs that produce small, elongated oysters.

In an examination of oysters from coastal Georgia, Crook (1992) found four basic types of intertidal oyster communities: (1) singles (including small clumps of not more than six oysters from soft mud along small tidal creeks), (2) clusters (usually 10-30 attached oysters from firm bottoms along larger tidal streams, or from softer muddy bottoms within tidal flats), (3) bank communities (usually more than 30 attached individuals found in large tidal streams on either firm or dead oyster substrates), and (4) reef communities (very dense and closely spaced clumps of 30 or more oysters living on a dead oyster substrate). In the sampled communities, Crook (1992) obtained measurements of average height, width, H/W ratios, and size index (the square root of H x W):

Measurements	Singles	Clusters	Banks	Reefs
Height (cm)	9.3	7.5	7.5, 8.0	10.7
Width (cm)	5.4	4.6	4.4, 4.4	3.4
H/W Ratio	1.73	1.67	1.74, 1.80	3.14
Size Index	70.83	58.13	57.51, 59.16	60.16

All of the oysters from White's Point from Early and Middle Holocene deposits fell in the fairly narrow H/W range of 1.63 to 1.76 (Table 3), at the upper end of Kent's scale for bed oysters and in line with Crook's communities of singles, clusters, and bank oysters. Average heights and widths approximate Crook's (1992) communities of clusters and banks. However, modern oysters from reefs and large bank communities in upper Nueces Bay, as well as commercially harvested oysters from Aransas and Matagorda bays, average 1.7, indicating that the Early and Middle Holocene oysters from White's Point were from communities similar to those existing today. The obvious differences with Kent's and Crook's reef oysters are most likely due to slight differences in method of height measurement (see Kent 1988:29; Cox and Cox [1993] simply took the longest dorsal-ventral measurement), and also perhaps due to different sampling techniques (most modern samples from Nueces Bay were legal size, 7.5 cm, or larger), and the different reef environments of the Texas coast vs. those of Maryland and Georgia. Overharvesting of reef oysters apparently was of no significance, since the reefs from upper Nueces Bay, where commercial harvesting has been off-limits for years, had similar H/W ratios to the heavily harvested reefs of Aransas and Matagorda bays.

Table 3.

Average heights and widths of oysters from White's Point

Sites/shell strata	Date (BP)	Av. Height	Av. Width	H/W Ratio
41SP153 s. s. 1	1782	10. 2	5. 1	2. 00
41SP136 s. s. 1	2252	10. 3	5. 2	1. 98
41SP177 60-70 cm	3014	8. 5	4. 5	1. 89
41SP177 70-80 cm	3362	7. 8	4. 5	1. 73
41SP177 80-90 cm	3738	7. 8	4. 8	1. 63
BHT 9	4176	7. 9	4. 5	1. 76
41SP136 s. s. 2	4636	8. 1	4. 7	1. 72
41SP153 s. s. 2	5058	6. 5	3. 7	1. 76
BHT 6	5144	7. 2	4. 3	1. 67
41SP156	5458	7. 4	4. 3	1. 72
41SP153 s. s. 3	7009	7. 4	4. 3	1. 72
Nueces Bay	Modern	8. 2	4. 8	1. 71

Since by far the densest biomass of oysters exists in large bank and reef communities (Chestnut 1974; Hedgpeth 1957), if we view human adaptation as a response to an exploitable biomass, then the focus of attention should be on the large, easily exploitable, oyster communities as food resources. Almost certainly, oysters have lived in Nueces Bay from its initial inundation (Gunter 1979). However, its dense communities of oysters would not have flourished in times of high salinities (Britton and Morton 1989; Claassen 1985), active wave action, or strong currents (Galtsoff 1964; MacKenzie 1981), all of which conditions most likely prevailed in times of marine influence during rapid sea level rise. Productive communities today are largest and most prevalent in the less turbid waters behind the barrier islands away from marine influenced areas (Britton and Morton 1989; Chestnut 1974).

The consistency in the H/W ratios from White's Point not only shows that oysters were gathered from similar environments over long periods of time, it also demonstrates the marginality of the oyster as a food resource. With the destruction of the dense oyster communities from rising sea level, the return for the human energy expended apparently did not justify the effort in exploiting other oyster habitats. During times of heavy marine influence, because of reduced densities, the oyster had declined in value relative to alternative terrestrial resources to the extent that human food procurement patterns were radically changed.

Ultimately, then, the virtual abandonment of the estuaries as a food resource area during times of rapid sea level rise was an indirect result of climatic changes. An understanding of these climatic changes and their effects would greatly facilitate an understanding of the intricate interplay between the relative values of terrestrial and estuarine resources. Several authors have recently dealt with the subject of human settlement patterns being a result of environmental conditions affecting terrestrial resources (e.g., Leonard and Reed 1993). However, the effect of a changing climate on estuarine resources is still not well understood. It is in this regard that the study of archeological oyster deposits will probably make its greatest contribution.

SALINITY DATA

Crassostrea virginica often appear in coastal environments encrusted with a myriad of organisms. As *Crassostrea virginica* is euryhaline, most of its encrusting organisms live in much narrower salinity ranges. Kent (1988) proposed a method for determining salinity of oyster environments based on evidence of the encrusting sponge of the phylum Porifera and genus *Cliona*. The different species of this sponge inhabit different salinity ranges in the estuaries and produce their own distinctive size of boreholes.

Based on studies by Hopkins (1956), Kent (1988) devised a system for determining salinity that relied on the relative percentages of small boreholes (incurrent 0.2-0.5 mm, excurrent 0.6-1.6 mm) and large boreholes (incurrent 0.8-2.5, excurrent 2.0-4.5 mm) on oyster valves. The system, as slightly modified by Cox and Cox (1993) and adapted to the central Texas coast, is as follows:

RELATIVE SALINITY REGIME	INDICATORS
0.5: salinity from 2 to 5 ppt a large portion of the year; rarely above 10 ppt	*Rangia cuneata*, no oysters
1: salinity from 5 to 10 ppt for a large portion of the year; rarely above 15	*Rangia cuneata*, oyster valves with very few sponge holes, prevalence of *Polydora* worm holes (Figure 6a)

2: salinity ranging from 10 to 15 ppt most of year, rarely above 20 for extended periods	Oyster valves with small sponge boreholes, no large ones, relatively few *Polydora* holes (Figure 6b)
3: salinity ranging from 15 to 20 ppt most of year, some fluctuation on both sides of this range	Oyster valves with small sponge boreholes more common than large holes; possible presence of bay scallop (Figure 6c)
4: salinity averaging 20 to 25 ppt, no extended fluctuations below this range	Oyster valves with large sponge boreholes more common than small holes (Figure 6d); possible presence of higher salinity marine species (Figure 6f)
5: salinity averaging 25 to 35 ppt, little time below 20 ppt	Oyster valves only with large sponge boreholes (Figure 6e); possible presence of higher salinity marine species

Cox and Cox (1993) identified the salinity ranges for the shell-boring polychaete *Polydora websteri* from data on file with the Texas Parks & Wildlife Department, Rockport, Texas (see Wargo and Ford [1993] for a detailed discussion of other environmental requirements of *Polydora* sp., and their effects on the condition of oysters). Salinity ranges of estuarine shellfish species are from Castagna and Chanley (1973) and Castagna (1992 personal communication).

This system of salinity regimes was applied to all oyster deposits at White's Point. The oyster shell strata (s. s.) dated, the median of the corrected and calibrated 1-sigma range, and the salinity regime are presented in the following chart:

Oyster Strata/Sites	*Date B.P.*	*Salinity Regime*
41SP149	1351	0.50
41SP153 (s. s. 1)	1782	1.13
41SP136 (s. s. 1)	2252	1.20
41SP177 (60-70 cm)	3014	1.38
41SP177 (70-80 cm)	3362	2.23
41SP177 (80-90 cm)	3738	2.18
41SP148 (BHT 9)	4176	1.38

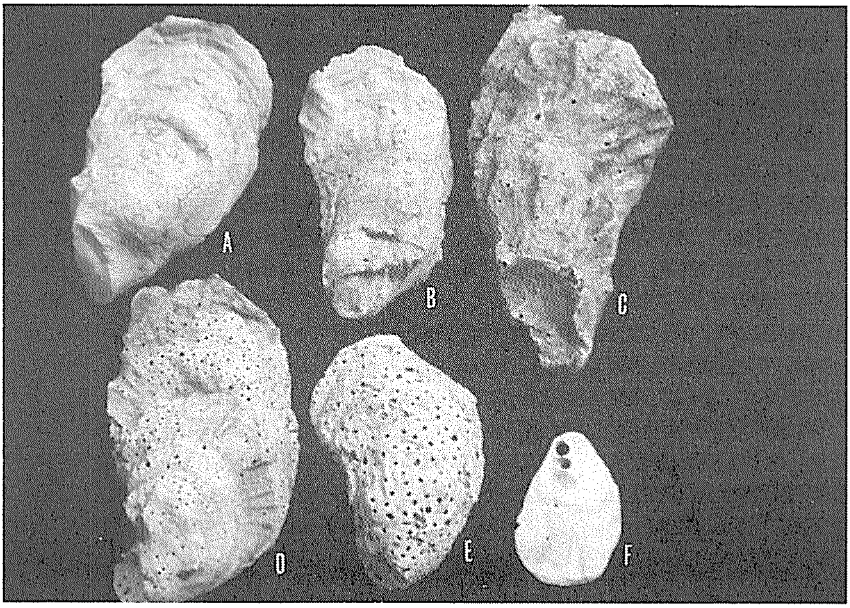

Figure 6. a, Valve containing only *Polydora* worm holes; b, valve containing small sponge boreholes and *Polydora* worm holes; c, valve containing small sponge boreholes more prevalent than large boreholes; d, valve containing large sponge boreholes more prevalent than small boreholes; e, valve containing only large sponge boreholes; and f, boring holes of the high salinity predatory snail *Polinices duplicatus*.

Oyster Strata/Sites	*Date B.P.*	*Salinity Regime*
41SP136 (s. s. 2)	4636	1. 90
41SP148 (BHT 6)	5058	2. 11
41SP153 (s. s. 2)	5144	1. 97
41SP156	5458	1. 77
41SP153 (s. s. 3)	7009	1. 76

These data are presented chronologically in Figure 7. The date for 41SP177 (70-80 cm) is an average of the actual radiocarbon dates that bracket it.

When compared to recently revised effective moisture ranges for Central Texas (Toomey et al. 1993), Figure 7 presents interesting parallels in two respects. First, the post-glacial minimum in effective moisture in Central Texas from ca. 5000-2500 B.P. (Toomey et al. 1993) roughly corresponds chronologically to higher salinity readings in Nueces Bay. And second, the return to more mesic conditions from ca. 2500-1000 B.P. (Aikens 1983; Toomey et al. 1993), with a peak between 1350-1250 B.P. (cf. Aikens 1983), approximately matches the significant decrease in salinity in Nueces Bay beginning around 3000 B.P. and extending until about 1300 B.P.

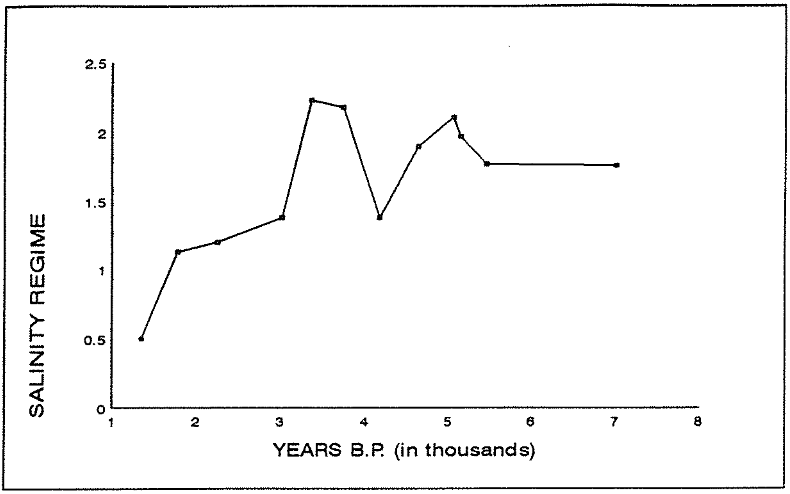

Figure 7. Salinity regimes of dated oyster strata from White's Point (from Cox and Cox 1993).

When xeric conditions once again prevailed at ca. 1000 B.P., White's Point quite possibly was no longer generally suitable for human occupation and had been abandoned. Perhaps this is because fishing had taken the place of shellfish gathering as the primary focus of estuarine exploitation (Ricklis 1993), and possibly also because the small streams that helped support human occupation there had quit flowing (cf. Hall 1990).

READABILITY

As discussed above, both Kent (1988) and Russo (1991a, 1991b) found difficulty in determining seasonality on oysters from southern waters due to a lack of distinctive winter growth breaks. However, when examining modern samples from the Texas Gulf Coast, Cox and Cox (1993) did not encounter similar problems. If Kent's and Russo's difficulties were in fact related to the difference in water temperatures between their comparative samples from the west coast of Florida and those from the more temperate waters of the Texas Gulf Coast, then temporal variations in water temperatures should be looked for in archeological samples.

As mentioned above, the applicability of Kent's (1988) seasonality technique depends on similar habitats, mostly in terms of winter water temperatures, between the archeological sample and the modern comparative sample. This, however, may not have always been the case, as Pielou (1991) points out that the range for *Crassostrea virginica* during certain parts of the Archaic period extended much farther north than it does today, indicating warmer estuarine waters during those times along the eastern United States coast. The lowering of the northern range for oyster began with the cooling of water temperatures in the Late Holocene, approximately 2500 years ago (Braun 1974; Yesner 1983).

Evidence of possible paleoclimatic shifts in water temperature was looked for in the various oyster samples from White's Point. Through examining modern oyster samples, it was discovered that the production of distinctive winter growth rings was to some extent related to winter water temperatures, with colder water producing more distinctive lines (Cox and Cox 1993). Presumably, the annuli of prehistoric oysters living in warmer waters would not be as distinct. If this is the case, it should be evidenced in the ability of the oyster analyst to read the umbos for seasonality.

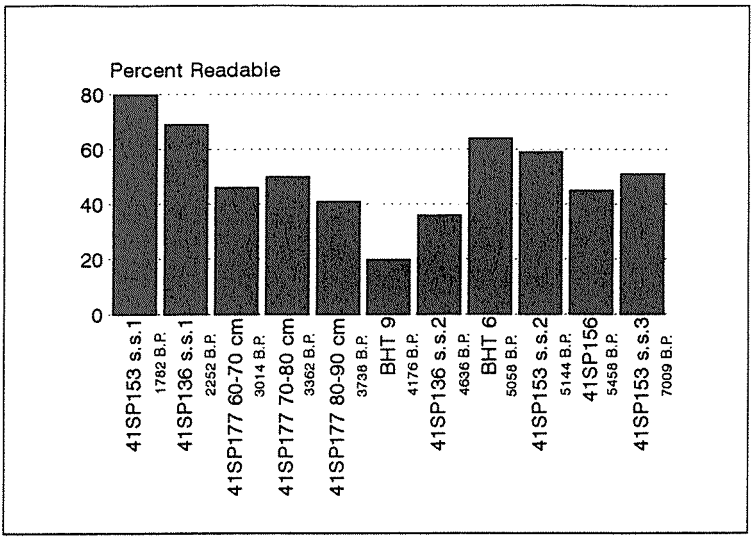

Figure 8. Seasonality determinations on oysters from White's Point by site and median date (from Cox and Cox 1993).

Readability of the oyster deposits from White's Point is presented in Figure 8. If differences in water temperature are responsible for the variations in the readability of these oysters, the data from White's Point would seem to indicate warmer winters in the Middle Holocene with cooler winters once again prevailing after 3000 B.P.

CHANGE IN AVERAGE HEIGHT

Oysters today along the Texas Gulf Coast reach their market size of 7.5 cm in approximately 1.5 years (J. D. Gray, Texas Department of Parks and Wildlife, personal communication, 1991; see also Hofstetter 1984). After that age, most oysters are infected by the extremely lethal protistan *Perkinsus marinus*, which flourishes in the warm coastal waters of the eastern United States (Fisher et al. 1992; Mackin et al. 1950).

Table 3 presents the average heights and widths of oyster deposits from White's Point. The appearance of high percentages of relatively long oysters from the upper levels of 41SP136 and 41SP153, some of which appeared to be in excess of 10 years of age, raises the issue of how these oysters managed to avoid the ravages of *Perkinsus* and similar diseases that have no effect on humans but are very deadly to oysters (see Galtsoff 1955).

A possible explanation of this phenomenon could be that oysters in this time period not only faced lower salinities but also perhaps lived in cooler winter habitats, both of which combined would be effective deterrents to *Perkinsus* and other diseases (Craig et al. 1989; Fisher et al. 1992; Ragone and Burreson 1993; Soniat 1985). Independent salinity analyses show that these oysters actually lived in more brackish environments (see Figure 7). The possibility of lower winter temperatures is also supported by the readability data discussed above.

A second possibility in accounting for changes in average height is overharvesting (Anderson 1981). This should be indicated by a progressive change in shellfish size in a rapidly deposited shellfish strata (cf. Botkin 1980). No changes were noted in the height of oysters from White's Point, but thinness of strata was always a limiting factor. It is at least possible that stress from overharvesting could be identified in denser strata.

In terms of human energy expenditure, a change in height will equate to an increase or decrease in the returns for the investment of a given amount of labor (Bernstein 1993). This in turn has obvious implications for the relative value of oysters to other food resources, as well as for the relative value of the estuary to terrestrial resources.

CHANGE IN HEIGHT/WIDTH RATIOS

As can be seen from Table 3, height/width ratios of the samples from White's Point remained constant for approximately 4000 years and then increased slightly beginning around 3000 B.P. If these oysters all came from similar habitats — the bed and reef communities of the White's Point cove area on Nueces Bay — the increase in height/width ratios suggests a changing environment. According to Gunter (1938) and Kent (1988), an increase in height/width ratios would reflect denser oyster reef populations forcing more elongated growth.

If true, then an increase would generally indicate a corresponding increase in the exploitable biomass. At White's Point, human populations after 3000 B.P. most likely encountered an increasingly abundant shellfish biomass, which may have helped precipitate a population increase. In any event, the return of humans to the coast was probably not coincidental. An understanding of the environmental correlates to the change in height/width ratios ca. 3000 B.P. would provide information on an intriguing time period in the prehistory of North America.

A MODEL OF HOLOCENE ENVIRONMENTS AND ESTUARINE ECOLOGY

For the time period from 5500-1300 B.P., the consistency of the oyster data from White's Point with the known environmental data supports a predictable model of estuarine ecology and human adaptation. Initially, with the onset of more xeric, and probably warmer, conditions in the Middle Holocene (see Pielou 1991; Toomey et al. 1993), salinity rose in the estuary, most likely due to reduced flow of fresh water. As barrier islands formed and the Nueces River delta prograded, salinity levels began to fall. Higher winter temperatures are reflected in reduced seasonality determinations on oysters toward the end of the Middle Holocene stillstand. Oyster communities flourished during this stillstand in the shallow, nutrient rich, brackish waters of Nueces Bay.

Human populations occupied the coast on a seasonal basis during periods of stillstand, most likely because oysters were a dependable food resource that could be gathered during winter months when other food resources were scarce. There are indications from the observed shucking techniques that the coastal populations may also have been preserving this food resource for later consumption.

With the onset of rapid sea level rise after ca. 4200 B.P., the highly productive estuarine biomass became subject to harmful marine influences. Oyster data during the time period of approximately 4000-3000 B.P. reflect a marked increase in salinity. The inundation of the barrier islands released trapped nutrients and increased average depth and turbidity of the estuary. While there may still have been continued human exploitation of the estuarine biomass, it was not with the intensity with which it occurred during stillstand.

As the climate turned more mesic and sea level reached its modern level around 3000 B.P., the river delta once again prograded, barrier islands formed, and salinities in the upper Nueces Bay area were progressively reduced. The increase in lengths and height/width ratios of oysters suggests more favorable environmental conditions. With lower salinities, much wider salinity gradients, cooler winters, and increased primary production, oysters lived longer, the exploitable biomass was much denser, and human procurement greatly intensified.

As salinity levels continued to fall during the Late Holocene, *Rangia* increasingly replaced oysters as the exploitable shellfish. Then, sometime toward the end of the Late Archaic, shellfish procurement sites along Nueces Bay were abandoned in favor of sites along the lower estuaries and tidal passes, perhaps, as suggested by Ricklis (1992, 1993), in response to the increased availability of fish in those areas.

The methods discussed here offer interdisciplinary insights into estuarine ecology throughout a large portion of the Holocene. The primary model of human coastal adaptations was principally formulated from inferences derived from the radiocarbon dating of estuarine shells. Other oyster analyses offer support for the ecological and geological constructs of the model. They are not offered as an exhaustive list, but rather as an insight into the enormous potential of estuarine ecofacts to the field of archeology. Much of the recent scholarship on shellfish utilization has focused on oysters, where researchers have only now managed to scratch the surface; there are many other types of estuarine species found in archeological middens about which very little in the archeological field has been written.

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Two Henrietta Focus Sites on the Brazos River in North Central Texas

R. E. Forrester

ABSTRACT

Two small excavated sites on opposite sides of the Clear Fork of the Brazos River in North Central Texas were occupied by Late Prehistoric Henrietta Focus people. The southern site had side-notched triangular projectile points and their Fresno preforms. The northern site also yielded bulbar-stemmed arrowpoints and their preforms, variants of the Cliffton "point." A small associated cemetery with poorly preserved flexed burials is also described.

INTRODUCTION

The purpose of this paper is *not* to address some abstruse Texas archeological problem and resolve it. Rather, it is to record activities performed, and specimens gathered, by my father and myself many years ago, prior to the recognition of the need to record and retain appropriate data recovered in excavations. At that time, we were merely artifact collectors, with no understanding of the need to keep records other than information on the county of origin of the artifacts. Nothing vicious was intended by our actions; we were only working with a lack of knowledge. Indeed, in those days, some professional Texas archeologists were performing little better than ourselves.

Now, more than half a century later, I present the archeological data recovered from two small excavated sites on opposite sides of the Clear Fork of the Brazos River. The information is presented in an informal manner, as that was the manner in which it was gathered.

Historical Background

In 1939, J.S. and J.W. Patterson, both of Moran in Shackelford County, Texas, were hired to remove the spines on prickly pear cacti by burning. This was an operation whereby a man carried a container of kerosene on his back with a rubber hose leading to an iron pipe. This pipe, about five feet long, had a handle with a trigger at the near end to control a blowtorch at the far end. The volume of flame was controlled by the trigger, and played over the prickly pear. The spines and glochids were burned away, leaving harmless pads.

During periods of drought at that time and place, the cacti were utilized as food for cattle. Their spines would be burned off over large areas, and the cattle could and would eat the nutritious pads. A second purpose was also served: that of destroying the pestiferous cacti. Unfortunately, if the cattle later found an area of unburned cacti, they would eat them too, having developed a taste for the pads, but not having been bred for intelligence. The spines would then become stuck in the nose, lips, tongue, mouth, throat, and stomachs of the cattle, causing serious damage.

These two "pear burners" were burning off spines on some pasturage then belonging to Mrs. George W. Elliot of Moran. The property lay on the south side of the Clear Fork of the Brazos River, north of Breckenridge, Texas. This was in extreme northern Stephens County, seven km northwest of Crystal Falls. During the course of their operations, they found arrowpoints on an exposed small, thin, sandy midden on the first terrace about 75 m from the south bank of the Brazos River. This was in the northwest corner of Mrs. Elliot's pasture, in the side of an old abandoned oil well slush pit. Creation of the slush pit had destroyed a large part of the midden.

The site was reported to their kinsman, Claude Patterson, also of Moran, and to his friend, R. E. Forrester, M.D., the writer's father. During the summer of 1939, and at odd times later, most of the remaining midden was excavated and screened through a 1/4-inch screen, using the first mechanically powered screen made by the Forresters. It was driven by the gasoline motor from Mrs. Claude Patterson's Maytag washing machine, and had to be returned to her after each use so she could do her laundry. The speed reduction pulley was a 21 inch wire spoke Model A Ford automobile wheel, minus the tire. The weight of this monstrous assembly must have approached 300 pounds, as it required a separate trailer to transport it, and at least three people to move it about. It was tremendously rugged, and could not be bogged down by two shovelers.

This site was given the catalog designation of F-O (later TARL designation 41SE19). Almost directly north of 41SE19, on the opposite side of the river on the first terrace, was found a similar site eroding directly into the river. This was designated Site F-R (41SE18) (Figure 1). This site was minimally excavated during the pre-World War II years, but was surface collected. Some additional excavations were performed by the author alone in 1964 and 1965. During these excavations, cultural materials were retained if evidence of modification was noted on any chert, shell, or bone, but debitage or bone scraps were not collected; drum fish otoliths were kept.

This was not the case with the artifacts obtained in 1939 from 41SE18 and 41SE19. Then, if a specimen was whole enough for display, it was catalogued. This involved placing a unique identifying number on the artifact, and a corresponding number in a catalog, thus permanently recording the object's

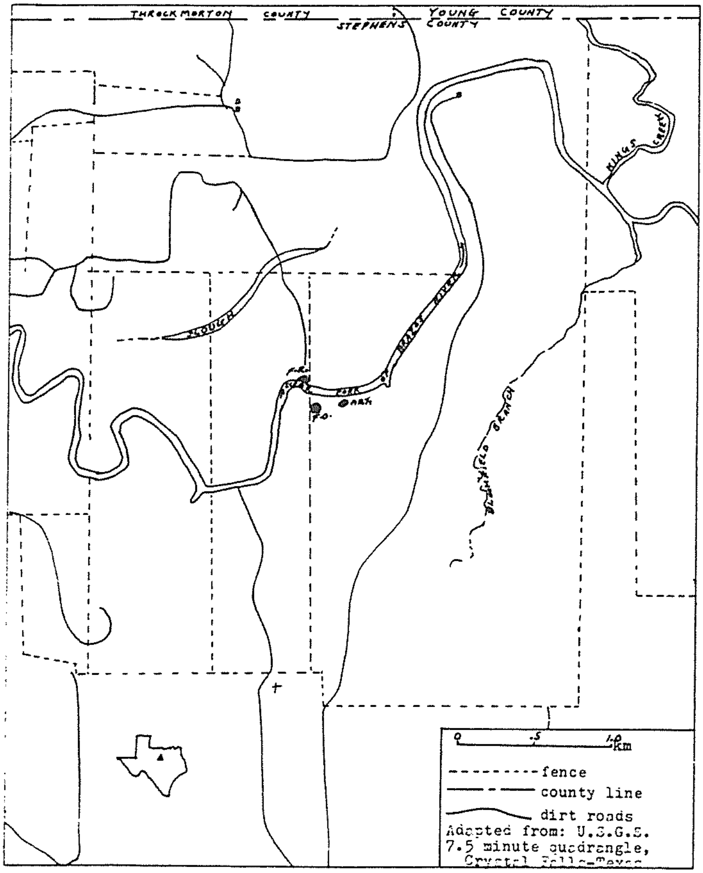

Figure 1. Location of sites 41SE18, 41SE19, and site ARX.

provenience. If not satisfactory for display, it was still retained but not identified or kept separate from other unrelated uncataloged materials.

ARTIFACTS FROM 41SE19

Only side-notched triangular points and triangular Fresno points (Bell 1958, 1960) were found at 41SE19. The Fresno points are considered to be preforms for the various side-notched triangular points (Figures 2 and 3).

A list of Henrietta Focus trait cultural materials (Krieger 1946; Poteet 1938; Suhm et al. 1954) found at 41SE19 is provided in Table 1, along with a list of expected Henrietta Focus traits that were not represented at the site. This combination of traits at 41SE19 indicates a brief Henrietta Focus occupation on the south bank of the river, although the full complement of artifactual traits was not found.

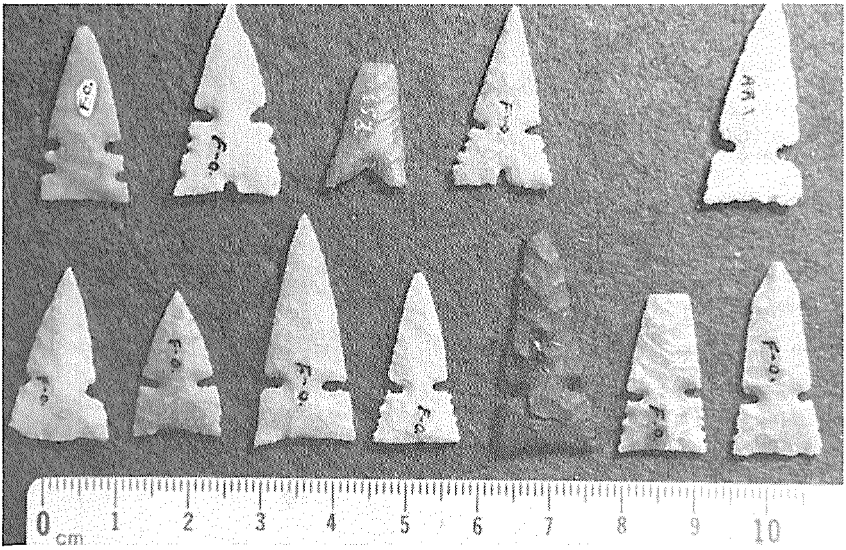

Figure 2. Arrowpoints from 41SE19: top row, left to right: Huffaker, Harrell, Garza, Harrell, and Washita from Burial 1 at site ARX; bottom row: Washita.

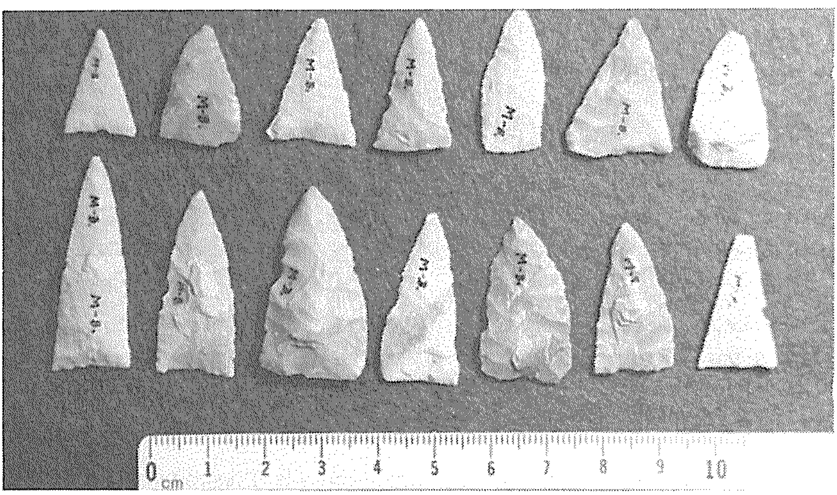

Figure 3. Fresno points from 41SE19.

Burials

In 1965 and 1966, three burials were excavated approximately 75 m east of 41SE19. These are catalogued as site ARX (no TARL trinomial designation has been obtained). Appendix 1 contains osteological data on these burials.

This cemetery was probably associated with one of the nearby midden sites. At least three more burials were located but were not excavated. The first of the

Table 1.

Presence and Absence of Henrietta Focus Artifacts at 41SE19, Stephens County, Texas

Found	Expected but Not Found
1. curved knife	1. 4-bevel knives (Harahey knives)
2. small polished hematite celt	2. snub-nosed scrapers, constricted heel end
3. elbow pipes, greenish-brown sandstone	3. small graver tips
4. side-scrapers from retouched spall edges	4. serrated flake saws
5. small snub-nosed scrapers	5. celts of Ouachita sandstone
6. well made oval scrapers	6. shaft smoother
7. spokeshave	7. sandstones hones
8. small flint drills	8. metates, milling stones, manos
9. pick-like flint objects	9. obsidian
10. bone awls, deer metapodial	10. mussel shell "saw"
11. bone fish hook blank	11. mussel shell scrapers
12. shell gorget fragment	12. bone/antler tools (other than awls, fish hooks)
13. potsherd gorget fragment	13. small perforated mussel shells
14. Fresno arrowpoints	14. *Olivella* shell beads
15. Washita arrowpoints	15. Cliffton arrowpoints, Type II
16. Harrell arrowpoints	
17. Huffaker arrowpoint	
18. dart point, reworked	

three burials produced a side-notched triangular Washita arrowpoint (see Figure 2). Whether it represented a burial offering, or was in the body at the time of death, is unknown. Damage from burrowing animals was severe in all three burials.

41SE18

A distinct arrowpoint type was found at 41SE18 that differed from any known to have come from 41SE19. This type has a stem which is bulbar or diamond-shaped, and has long, often out-flaring, barbs (Figure 4). It resembles the Hayes (Bell 1958, 1960) arrowpoint, although the latter is generally larger, and also usually shows a cut-in near the tip. For purposes of this discussion only, I will call this arrowpoint form "Lusk," in reference to a cross-road name a few miles west. At this point, I am not prepared to offer a new formal name, due to lack of sufficient numbers and little distributional data. Table 2 provides dimensional data on "Lusk" points.

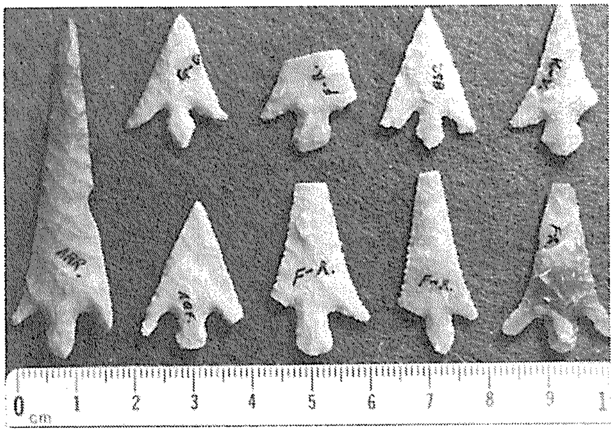

Figure 4. "Lusk" points from 41SE18, except two top right from 41SE17.

Table 2.

"Lusk" Arrowpoint Dimensional Data **

Catalog Number	Site	Serr-ated*	Thick-ness	Max Lth	Max Blade Width	Base Width	Haft Lth	Neck Width	Base Depth
K-V	S-Y	0	3	27	18	7	6	5	-2
859	S-Y	0	3	24	16	5	6	4	-2
G-C	F-R	0	3	23	18	5	7	4	-3
ARR	F-R	0	4	58	18	5	8	5	-2
AQF	F-R	0	3	25	18	5	6	4	-2
none-1	F-R	1	3	32	20	5	6	5	-2
none-2	F-R	1	3	39	20	6	7	5	-2
none-3	F-R	1	3	35	14	5	4	3	-4
none-4	F-R	0	2	29	19	7	6	5	-2
none-5	F-O/F-R	0	3	31	21	6	7	5	-2
Average		*0*	*3*	*32*	*18*	*5.6*	*6*	*4.5*	*-2*

* Serrated: 0 = absent; 1 = present; all other measurements in mm

** Data extracted from completed Artifact Quantification Coding forms (Prewitt & Associates, Austin, TX, Form 1-79)

Cliffton "arrowpoints" were found at 41SE18. By overlaying "Lusk" and Cliffton points, it seems reasonable to suggest that the Cliffton was clearly the preform for the "Lusk" point (Figure 5). This Cliffton variant is designated as Cliffton II herein, to separate it from the Cliffton used as a Perdiz preform (referred to as Cliffton I). Both Clifftons I and II have appeared in the literature under the Cliffton name (Turner and Hester 1993:208).

To assess the validity of separating the Cliffton preforms into Types I and II, I examined all the Clifftons recovered from Horn Shelter No. 2, which produced Perdiz points but no side-notched triangular, Fresno, or "Lusk" arrowpoints (Forrester n.d.), and compared them with the Clifftons from 41SE18. On inspecting the two Cliffton types, it is quite apparent that they differ: Cliffton I types are deeply concave on each side of what became the stem, and are rougher and more unfinished. On the other hand, Cliffton II specimens appear more finished, with fine retouching present. They are trapezoidal, with two basal edges commonly not indented, and range from 22-52 mm in length, 15-29 mm in width, and 3-6 mm in thickness. The impression is that only diagonal basal notches are needed to complete the "Lusk" points.

The visual differences between the two Cliffton types are so pronounced that in a blind test I was able to match the Cliffton I and II points with their proper areas in an excavated multicomponent site on a tributary of the Brazos River, a few miles upstream from Granbury, Hood County, Texas. The two site areas slightly overlap: one area bore a full Henrietta Focus set of attributes,

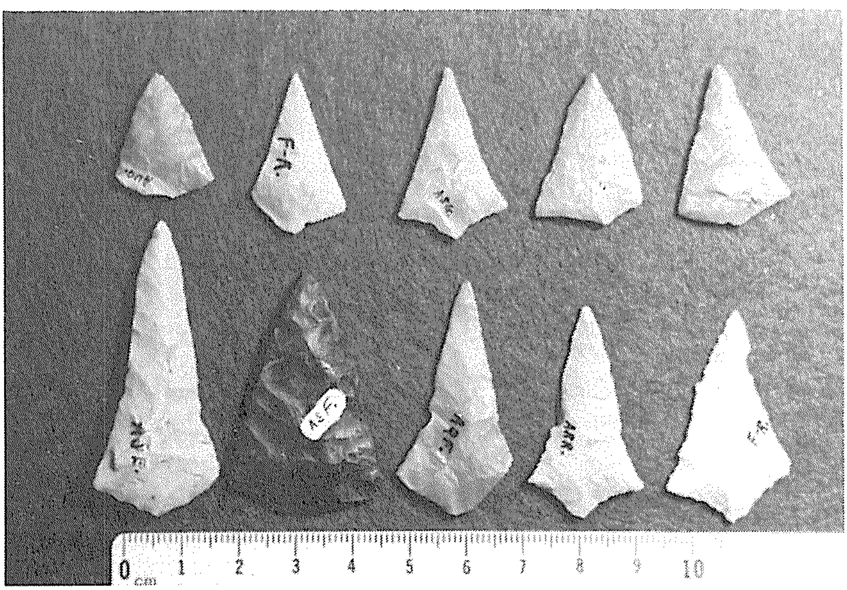

Figure 5. Cliffton points from 41SE18.

including the "Lusk" points; the other had none of these characteristics, but had Perdiz points. Thirty-one of the 32 Cliffton preforms were accurately assigned to areas with either Perdiz or side-notched triangular and "Lusk" points (Prentice Brown, personal communication, 1967).

I have found other "Lusk" points only on 41SE17, a large surface site in the southwestern part of Stephens County. Of 181 complete or near complete arrowpoints from that site, two were Type II Clifftons (No Type I Clifftons were present; and only one Perdiz) and two were "Lusk" arrowpoints. These were grouped with the Alba type in the site report (Forrester 1991). Side-notched triangular points were present in considerable numbers (33 specimens, plus 28 Fresno preforms). The dominant arrowpoint type there was the Scallorn (N=67, with 33 Granbury preforms).

Site Condition and Evaluation

The river is presently eroding 41SE18; the erosional destruction is a series of gullies, rather than vertical faces caving off into the river. This made the site difficult to excavate, and most of the excavation was done in the flat area behind the gullies. Some artifacts were gathered from the gully slopes after they had washed free from above; these were recorded as having been excavated.

The degree of destruction of the site by natural causes is difficult to assess; how far the river has proceeded to the north since the last occupation, and how far the site was originally located from the river edge, has not been determined. At last examination (1966), the occupation area appeared to be no more than 6-8 cm thick, with almost that much sterile soil on top. No attempt was made to test outlying areas to define the extent of the site. An area of roughly 3 x 3 m was excavated and screened through a 1/4-inch sieve. Little or no occupational debris is apparent in cross sections revealed by erosion of the river bank only a few meters in either direction from the excavated or eroded living area. No pits were detected. Occasional burned pieces of sandstone were encountered, but none appeared to form fireplaces or hearths.

41SE18 appears to have had multiple occupations based on the broad variety of arrowpoints found at the site (Figure 6). Few characteristic Henrietta Focus traits were recognized in the 41SE18 material culture assemblage as compared with 41SE19. No pipe or pipe fragments were found, nor any hematite celts or curved knives. Whether the Type II Clifftons and the "Lusk" points were left at the site by Henrietta Focus people, or by an unrelated group, is presently undetermined.

Flint Sources

To the author's knowledge, there are no outcroppings of siliceous stone satisfactory for knapping and tool manufacture within 60 km of these two sites.

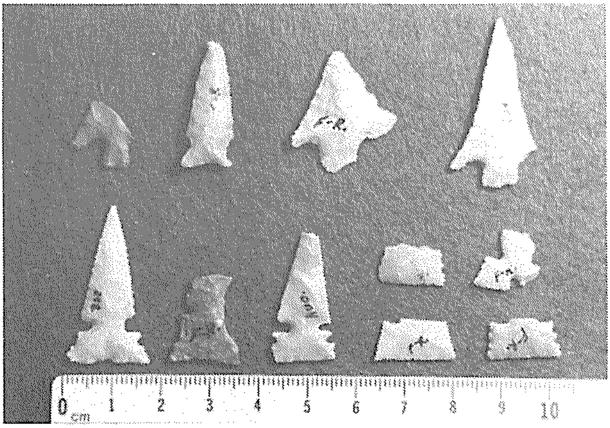

Figure 6. Arrowpoints from 41SE18: top row, unclassified arrowpoints; bottom row, side-notched triangular points.

All the stone artifacts found in these sites were examined in an attempt to determine the origin of the lithic material. The hematite celt from 41SE19 was probably made in the local area; that is, in the southwest part of Stephens County. Abundant hematite cobbles outcrop in that area and a large surface site on Big Sandy Creek has been identifed as a celt manufacturing center (Forrester 1991). Of 253 retained siliceous stone items from both sites (and the unprovenienced group), practically all, or possibly all, are from river gravels. The varieties are several, but in general they are foreign to the area and of a certain distinctive kind: commonly light tan or greyish-tan chert, occasionally of a very high quality bluish-grey flint.

Four possible exceptions to the river gravel chert group include: (a) the tip of a large blade (41SE18) of waxy brown chert, probably from the Edwards Plateau area; (b) another large blade (41SE18) of dark multi-colored chert, possibly from the Alibates quarries in the Texas Panhandle; (c) a Washita point (41SE19) made of brownish-black chert with fine white specks; and (d) another Washita type (41SE19) of waxy tan chert, veined with lighter tan. The source area(s) for the Washita arrowpoints is not known.

SUMMARY AND CONCLUSIONS

Available data indicate that 41SE19 on the south side of the river was a single component midden deposited by a small group of Late Prehistoric Henrietta Focus people (e.g., Krieger 1946). The only projectile point types present were three forms of the triangular side-notched arrowpoint and their Fresno preforms. Other Henrietta Focus material culture traits were also present, such as elbow pipes and a hematite celt. While not every trait of the Henrietta

Focus was found, those present are, as a group, considered diagnostic of that focus (Table 3).

Table 3.

Comparison of Artifacts From 41SE18 and 41SE19

Artifacts	41SE19 South Bank	41SE18 North Bank	Either 41SE18 or 41SE19	Total
Fresno	16	10	11	37
Washita	7	4	11	22
Harrell	2	1	1	4
Huffaker	1	1	0	2
Cliffton II preforms	0	37	6	43
"Lusk"	0	7	5	12
unnamed arrowpoints	0	4	0	4
arrowpoint blades	0	3	11	14
arrowpoint tips	0	18	2	20
Garza, square-tipped	1	0	0	1
Zephyr dart point	1	0	0	1
blades/blanks	15	40	0	55
scrapers	18	13	0	31
elbow pipe	2	0	0	2
hematite celt	1	0	0	1
graver (?)	1	0	0	1
unifacial awls	3	1	0	4
bifacial awls	0	1	0	1
bone needles	1	1	0	2
bone fish hook blank	1	0	0	1
bone arrowpoint (?)	1	0	0	1
mussel shell scrapers	0	4	0	4
mussel shell "saw"	0	1	0	1
shell gorget fragment	1	0	0	1
pottery gorget fragment	1	0	0	1
pottery sherd	0	1	0	1
hammerstone	1	0	0	1
antler drift	0	1	0	1
Totals	74	148	47	269

The cemetery, located about 75 m east of the midden at 41SE19, consisted of at least six burials, three of which were excavated. The one associated item with the burials was a Washita arrowpoint, suggesting that the burial was also probably made by the Henrietta Focus people residing at the midden site. All three excavated burials, and the visible portions of the other three unexcavated ones, were similar in character: they were flexed, shallow, had no obvious burial offerings, and were lined and covered with sandstone slabs, some of which were visible on the ground surface.

While questionable due to extreme deterioration of the skeletal elements, the three burials appear to have been two women in their 20s, and a man in his mid-30s. The Washita arrowpoint was found in the grave with the younger woman.

Site 41SE18, on the north bank of the river, was more temporally mixed than 41SE19 since it had triangular arrowpoints, a few stemmed arrowpoints, as well as the "Lusk" points. "Lusk" points and their preforms, Cliffton II points, have been found in at least four other sites, all of which also had side-notched triangular arrowpoints. One site was on Big Sandy Creek in Stephens County (41SE17); Big Sandy Creek is a tributary of the Brazos River. The other three sites (two surface, one rockshelter) were on the Brazos River or on a tributary near the river. The southernmost site is a rockshelter overlooking the Brazos River in northern Hill County, Texas. "Lusk" and Clifton II points become increasingly scarce as one progresses further downstream from Stephens County. I speculate that there is probably some cultural affiliation between Henrietta Focus peoples and "Lusk" arrowpoints and the Cliffton II preform; possibly those groups that manufactured the "Lusk" arrowpoints were a clan within the Henrietta Focus group (or groups).

Pottery was found on both sites in extremely limited amounts. A fragment of what was likely a circular gorget had been made from a potsherd at 41SE18. At 41SE19, a tiny sherd and a formed lump of fired clay were found. All three items had shell temper, and thus were probably examples of Nocona Plain (Krieger 1946).

Two elbow pipes of greenish sandstone were recovered, both from 41SE19 (Figure 7). Two fragments fit together to form part of a bowl of one pipe; the other pipe was represented by a slightly coarser variety of the stone. It had been broken and partially dressed down at the break so that it could be used again, probably with a stem inserted in place of the missing half. The greenish sandstone material is not found in the local vicinity.

Shell was utilized for scrapers and as a "saw" at the north bank site, and as a gorget in the southern site. Shells of fresh water mussel were fairly common in both sites, and possibly represent one local food resource.

Otoliths from the heads of drum fish were recovered from 41SE18; some showed discoloration from fire. These otoliths are most resistant to decomposition, and offer good evidence that the taking of fish was practiced.

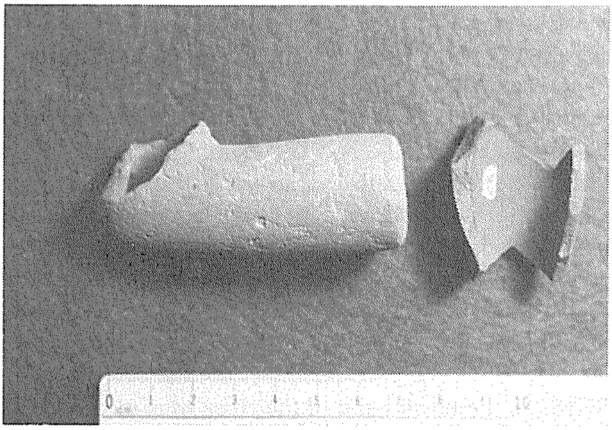

Figure 7. Elbow pipe pieces from 41SE19.

In summary, sites 41SE18 and 41SE19 on opposite sides of the Clear Fork of the Brazos were both Henrietta Focus middens that were probably occupied for relatively short periods. However, their association with a small cemetery suggests a longer occupation period than was indicated simply by the sparse recovered material remains. No evidence of agricultural pursuits was found at either site or in their artifact assemblage, nor were any permanent houses or bell-shaped storage pits observed in the excavations.

APPENDIX 1

This appendix describes the skeletal materials from three burials at site ARX, aproximately 75 m east of 41SE19. Only Burial 1 had artifacts in association: a side-notched triangular arrowpoint found in the area of the knees.

Osteological Report: Skeletal Material from Burial 1

The skeletal material shows considerable damage due to both natural decay of joints and spongy bone (probably minor), and attack by rodent activity (major damage). At the time of excavation (January 1, 1965) only both innominates, both femurs, the left tibia, and the left fibula were in place; the remaining bones appear to have been displaced to a greater or lesser degree (Figure 8).
The following is a complete list of the recovered skeletal material:

Innominates — right and left (both damaged)

Femurs — right and left (both damaged)

Tibia — left only (damaged); plus distal articular surface of tibia

Fibulae — portion of right; nearly complete left

Calcaneus — right only (damaged)

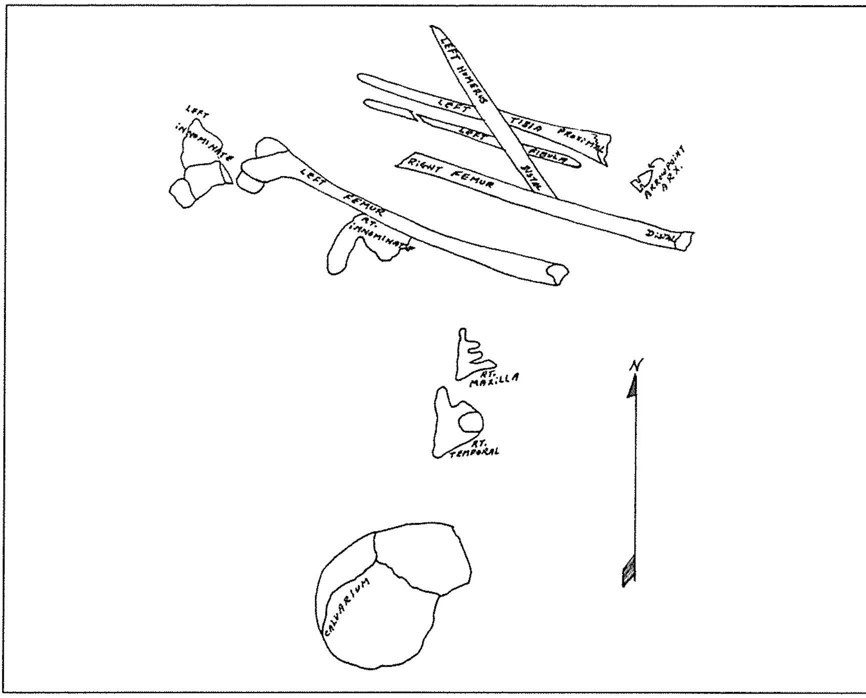

Figure 8. Site ARX: Burial 1. Sketch of burial as viewed from above, all major bones present *in situ.*

Ulna — left only; proximal end only
Humerus — left only; missing proximal end
Radius — left only; missing proximal end
Vertebra — neural arch of one thoracic or cervical vertebra
Phalange — distal half of one foot or hand phalange
Temporal — right temporal bone only (damaged)
Maxilla — right only; firmly fused to portion of right zygoma
Mandible — right half only
Calvarium — consists of frontal, parietals, occipital (all damaged)
Teeth — two loose teeth found; upper left incisor; third molar, left side
Fragments — six or eight very small fragments not positively identified.

Innominates: Right and left both present; sacrum noted absent. The iliac crests, pubic bones, sciatic tubers, and obturator foramina are missing from each innominate. No rodent gnawing is visible. Shape of the greater sciatic notches would indicate female status; general small size of remaining portions also indicates a female.

Femurs: Both present, neither broken. Each shows rodent gnawing which becomes progressively worse distally. Each is missing the distal end, from about the capsular line. The lesser trochanters are both missing, but by decay rather than by non-fusion. The greater trochanter is present on the right femur only. Both heads are present and fused (fuses in 19th year according to Shaeffer [1951]). Platymerism is not evident. Pilastering of linea aspera is present to a moderate degree. General appearance of the femorae indicates femininity.

Tibia: Left only is present , plus lower articular surface of the right tibia. In the tibia present, the proximal articular surface is missing. Its lower articular surface (distal end) is well fused. The separate lower articular surface from the missing right tibia is neatly separated at the epiphyseal line. (The upper extremity fuses about the 20th year; the lower at about 18 years.) It was impossible to establish if any of the missing surfaces are due to decay or to lack of fusion. If due to lack of fusion, then age would be about 19 years, based on tibiae alone. Only a minor amount of rodent gnawing is present.

Fibula: Left fibula almost complete; missing estimated 15 mm. Remaining portion is 313 mm. Missing end is the proximal. At least part of the damage is due to rodent gnawing. Shaft is badly gnawed by rodents. Mid-section only is present from right fibula; remainder was destroyed by rodent activity.

Calcaneus: From right foot. Lateral surface has been destroyed by decay. No rodent gnawing is visible. Epiphysis is fused.

Ulna: Proximal half of left ulna present; gnawed through by rodents. Olecranon is missing; coronoid process is present.

Humerus: Left humerus only; complete save for missing head, and the greater and lesser tubercles. Severely gnawed all over by rodents. A large supratrochlear foramen (septal aperture) exists at distal end.

Radius: Severely damaged distal end of left radius only. Fused epiphysis (fusion occurs at 18th to 20th year).

Vertebra: One neural arch from a probable cervical or thoracic vertebra; spinous process missing; arch is detached from body.

Phalange: Distal half of a phalange from either a hand or a foot.

Temporal Bone: Right temporal bone; squamous portion missing. Some other decay evident; no gnawed areas visible.

Maxilla: Right maxilla only; fused with right zygoma. Zygoma is gnawed by rodents; the frontal process of maxilla is destroyed by gnawing. Teeth are present in alvolar area.

All eight teeth (normal for maxilla) were present at death; the central incisor, canine, and first premolar are now missing. Of the remaining teeth: the third molar (wisdom) has a cavity in grinding surface and another at gum line next to second molar; there is a small "pearl" attached below the gum line to the lateral surface of the third molar. The second molar has a similar "pearl" on its lateral surface, plus another "pearl" at the base of a large cavity which faces backward toward the matching cavity in the third molar. The first molar is represented only by a stump sitting in its socket. This stump is mostly the root of the first molar with a small amount of enamel remaining. The remaining premolar (end premolar) is not diseased, nor is the remaining lateral incisor. Wear is quite evident, but not excessive considering the age and dietary habits of the individual.

Mandible: Slightly more than half of the right half of the mandible is present. The ramus is badly gnawed, as is the mental protuberance. The sockets exist for a total of 12 teeth; this is the entire right side plus the two left incisors, left canine and 1st premolar. Of these left four, only the lateral incisor is present. Apparently all teeth were present at death, although the sockets of the two central incisors, now missing, show a diseased condition. Of the normal eight teeth on the right side, all are present save the two incisors. There is only one cavity present in the existing teeth in the mandible section, it being in the grinding surface of the third molar (wisdom tooth). The general appearance of the mandible is feminine.

Calvarium: The calvarium consists of the entire frontal bone, most of the right and left parietals, and a small portion of the occipital, including the superior angle. A large Wormian bone (preinterparietal) exists at the junction of the two parietals and the occipital (lambda).

The occipital is gnawed almost entirely away; the right parietal is gnawed away at the mastoid angle, at sphenoid and temporal squama articulations. The frontal bone is gnawed on both supraorbital borders and both zygomatic processes, and on the left nasal part. The orbital plates are missing. The coronal suture closure has begun; the sagittal and sphenoidal sutures are in the process of closing. The remaining portions of the lambdoid suture are partly closed. Age would thus be estimated at around 25 years. The minimum frontal breadth is 87 mm; this seems markedly small for an adult, and so the skull appears when viewed from the front. The calvarium is not marked by heavy muscle attachment areas, indicating this is a female.

Teeth: Two loose teeth were found: the upper left incisor, and a third molar from the left side; neither showed cavities.

Fragments: Six or eight very small fragments of bone, not positively identified as to source.

Based on the skeletal evidence discussed above, Burial 1 is that of a woman, with slight build, about 22-25 years of age at death. Other than dental disease, no bone diseases were noted.

Osteological Report: Skeletal Material from Burial 2

The skeletal material from Burial 2 shows tremendous damage due to both natural decay of joints and spongy bone, and to attack by rodent activity. The vast majority of the skeleton was missing entirely. Excavation (February 7, 1965) exposed the major portion of the left femur and some of the left (?) tibia in its apparent burial position (fully flexed). The mandible, minus both rami, lay on the same level, with the maxilla directly over it, touching at the dental areas. In its appropriate anatomical position, the right temporal bone lay behind and to the right of the mandible and maxilla. A very few pieces of other bones were scattered at random in the pit fill (Figure 9).

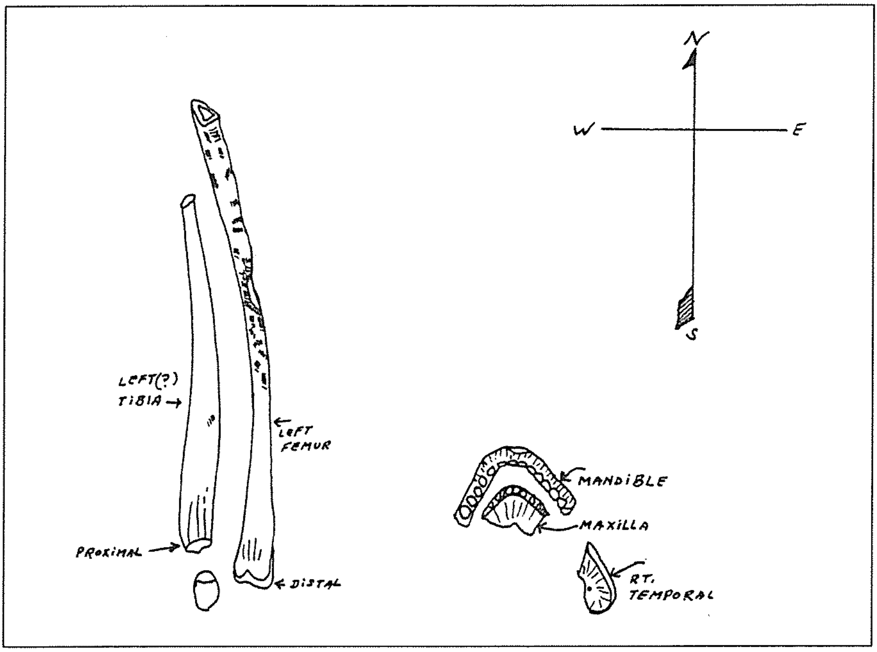

Figure 9. Site ARX: Burial 2. Sketch of Burial as seen from above, all major bones *in situ*.

The few bones remaining would indicate that the body was laid on the left side, fully flexed, with the head to the east. The skull as found must have been dislocated by rodents.

The long bones (tibia and femur) were too damaged to provide information other than that the individual was an adult. The mandible, missing its rami, offers the most useful data: the individual was fully adult, robust, and probably male. The teeth exhibit no cavities, but there are indications of alveolar disease, especially in the maxilla. All four wisdom teeth are present; the total wear on all grinding surfaces is consistent with an individual about 35 years old.

Osteological Report: Skeletal Material from Burial 3

This skeletal material shows marked damage due to natural decay of joints and spongy bone, and to attack by rodents. Most of the skeleton was missing entirely, but excavation (May 15, 1966) showed the tibiae and femorae to be in flexed position, left femur uppermost, thus indicating the body lay on its right side; the head was probably to the west. The cranium was west of the legs, but almost surely not in burial position. The burial was lined and covered with sandstone slabs. No long bone was complete enough for height estimations. All teeth were missing from the maxilla (postmortem loss); one tooth (lower right canine) was found loose in the grave fill (Figure 10).

Calvarium — complete except for loss of all teeth and some rodent-gnawed areas. Cephalic index: 184/137 x 10 = 74.3 (barely within dolichocephalic range). Calvarium is in good preservation, except for rodent-gnawing, and fairly recent temporal bone damage due to rock pressure.

Cranial sutures (beginning of closures noted):

sagittal	22 years	closed
sphenofrontal	22 years	open
coronal	22 years	open
lambdoid	26 years	closed
masto-occipital	26 years	closed
sphenoparietal	29 years	open
sphenotemporal	30 years	open
parietomastoid	37 years	open
squamous	37 years	open

The range of cranial closures indicate an age at death of about 28 years.The general impression of the cranium, including muscle attachments, indicates it was probably that of a female.

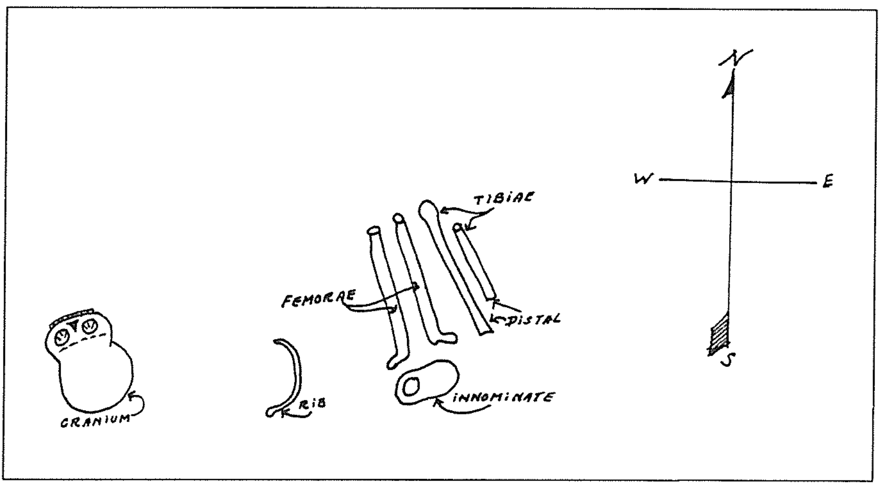

Figure 10. Site ARX: Burial 3. Sketch of Burial as seen from above, all major bones present *in situ*.

Right femur — destroyed at distal end; no measurements possible for length
Left femur — only mid-section remaining
Right tibia — destroyed at distal end; no measurement
Left Tibia — only mid-section remaining
Fibula — only 5 cm from center remaining
Left scapula — badly damaged, but appears small
Right innominate — badly damaged
Right rib — badly damaged
Vertebra — fragments from one only
Tooth — lower canine.

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Doña Ana Phase Ceramics and Cultural Evolution in the Southern Jornada Mogollon

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ABSTRACT

The Doña Ana phase (A.D. 1100-1200) in the southern Jornada Mogollon region, in the vicinity of El Paso, Texas, represents a transitional period linking a dominantly hunting and gathering adaptation with a more agrarian one; yet, it has remained enigmatic since its definition by Lehmer (1948). Problems identifying Doña Ana phase sites, and understanding the nature of the cultural adaptation they represent, have persisted due to the lack of systematically analyzed excavation data. An analysis of the ceramic assemblage excavated from the Hueco Tanks Doña Ana phase site (Kegley 1982), and comparisons with Mesilla and El Paso phase sites, indicate that vessel form and function were rapidly evolving in response to shifting adaptations. A frequency seriation of ceramic assemblages should aid in the recognition of Doña Ana phase sites on survey as well.

INTRODUCTION

In 1972 and 1973, George Kegley (1982) excavated site 41EP2 in Hueco Tanks State Park for the Texas Parks and Wildlife Department. The site represents one of the few Doña Ana phase (A.D. 1100-1200) occupations which have been excavated and published. Recent issues regarding this critical period have arisen which are addressed here by a reanalysis of the ceramic collections from the Hueco Tanks site.

Hueco Tanks State Park is located at the base of the Hueco Mountains about 50 km east of El Paso on the edge of the Hueco Bolson. The Hueco Tanks are a series of water-holding rock basins in an igneous formation that juts up from the desert floor (Figure 1). These sheltered rock basins were a critical source of water for both prehistoric and historic populations since moisture is held long after the rainy season ends. The hundreds of pictographs and numerous archeological sites in the park attest to the significance of the area for aboriginal populations.

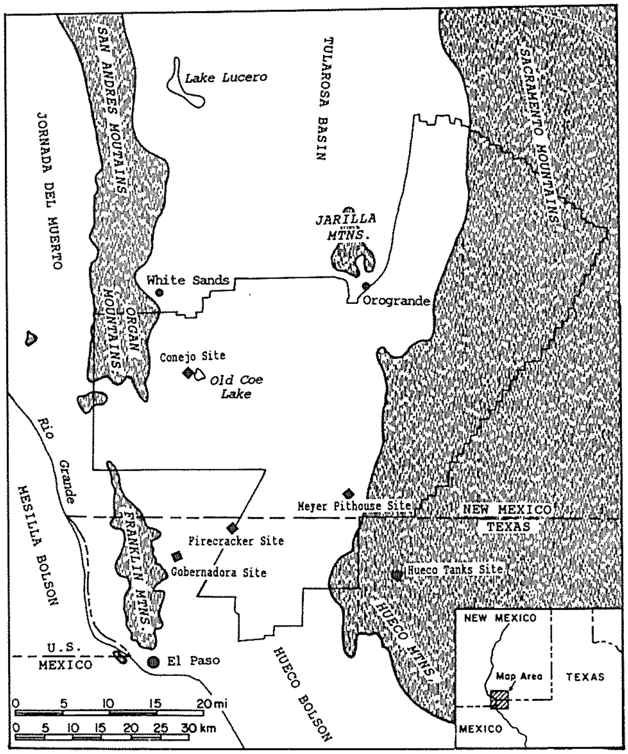

Figure 1. The El Paso area of Texas and New Mexico and sites and areas mentioned in the text.

Kegley's (1982) report describes the excavation of six rectangular pithouses, four interior trash-filled pits, and four burials and other associated features. Based on a single radiocarbon date (A.D. 1150 ± 50), the ceramic assemblage, and architectural style, Kegley suggested that the site represented a single component Doña Ana phase occupation.

During the Mesilla phase (A.D. 300-1100), El Paso Brown was the local pottery, and house forms included both huts and pithouses (Lehmer 1948; Whalen 1981a; Hard 1983a). The subsistence economy was primarily based upon hunting and gathering with a relatively minor use of maize (Whalen 1981a; Hard 1983b). Mesilla phase sites are found in a variety of ecological zones, and there is evidence for residential use of the desert basins, as well as the riverine and mountain foothill zones. Populations apparently engaged in a substantial amount of residential mobility (Whalen 1981a; Hard 1983b).

The Doña Ana phase developed from the Mesilla phase. Lehmer (1948) suggested, based upon limited data, that the ceramics for the phase consisted of about 50 percent El Paso Brown and 50 percent El Paso Polychrome. Doña Ana phase El Paso Polychrome rim treatments included direct thickened, direct unthickened, and everted forms. Whalen (1978, 1981b) formalized the recognition of variability within El Paso Polychrome and characterized early variant El Paso Polychrome rims as being slightly thickened with vertical necks and rims. Rim flattening was also common. Way (1979) and Whalen (1981b) dated early El Paso Polychrome ceramics from A.D. 1100-1250, roughly contemporaneous with the Doña Ana phase.

Doña Ana phase intrusive wares included: Mimbres Classic Black-on-white, San Francisco Red, Alma Plain, Mimbres Corrugated, Chupadero Black-on-white, Three Rivers Red-on-terracota, and St. Johns Polychrome. Both pithouses and surface structures were present (Lehmer 1948; Schaafsma 1990). The Doña Ana phase also linked the more mobile hunting and gathering adaptation of the Mesilla phase with the reduced residential mobility and increased use of maize in the El Paso phase.

During the El Paso phase (A.D. 1200-1400), a number of architectural forms were present, including huts, pithouses, individual detached surface rooms, adobe pueblos, and a large well (Batcho et al. 1985; Carmichael 1986; Thomas O'Laughlin, personal communication 1992; Scarborough 1988). Pueblos range in size from a few rooms to more than 100. Maize played a dominant role in the subsistence base, although wild foods remained important. El Paso phase residential sites cluster into core areas located at the toes of the alluvial fans in Tularosa Valley and the Hueco Bolson and are found along the Rio Grande as well. Residential mobility appears to have substantially decreased and populations increased (Whalen 1981b).

The local ceramic ware was El Paso Polychrome, and the unpainted El Paso Brown disappeared from the assemblage (Lehmer 1948). Lehmer (1948) noted that rims were everted, thickened, or everted and thickened. Whalen (1978, 1981b) described late variant El Paso Polychrome rims as having pronounced thickening and being flared outward about 20 degrees. The jars were constricted at the neck, rather than at the mouth. The late variant of El Paso Polychrome was widely used after A.D. 1250 (Way 1979; Whalen 1981b). The principal intrusive types included: Chupadero Black-on-white, Three Rivers Red-on-terracota, Lincoln Black-on-red, Ramos Polychrome, St. Johns Polychrome, and Playas Red Incised.

Since the temporal phases are defined on the basis of ceramic and architectural stylistic criteria, adaptational shifts within phases are not clearly detectable, but are probably present nonetheless. There appear to be clear adaptational differences between the phases that are useful to explore for various purposes. The nature of the adaptation during the Doña Ana phase has remained problematic, principally because few Doña Ana phase sites have been excavated, and simply recognizing Doña Ana phase sites during survey remains problematic.

With these problems in mind, we recently reanalyzed the Hueco Tanks ceramic collection. First, Kegley's chronological placement of 41EP2 in the Doña Ana phase is reexamined, followed by an analysis of the local rim sherds, and finally the results are placed within a larger regional context.

CHRONOLOGICAL PLACEMENT

Kegley (1982) reported a single uncorrected radiocarbon date of A.D. 1150 ± 50 from a piece of wood charcoal from House 1. The local ceramic types present were El Paso Brown, El Paso Bichrome, and El Paso Polychrome. The intrusive types included Chupadero Black-on-white, Mimbres Black-on-white, Playas Red, Wingate Black-on-red, St. Johns Polychrome, Three Rivers Red-on-terracota, Ramos Polychrome, and a corrugated ware.

Our reanalysis, using Scott's (1983:45-67) descriptions, indicated all of the Mimbres sherds were either Style II, III, indeterminate II/III, or unknown. Style II dates from before A.D. 950 until just after A.D. 1000. Style III begins in the early eleventh century and continues to the abandonment of the Mimbres Valley about A.D. 1150 (Scott 1983). Fifty-nine Mimbres sherds were examined: two were Style II, 25 were Style III, 10 were Style II/III, and 22 were unknown. This distribution supports an occupation of the Hueco Tanks site during Style III times.

A number of researchers have suggested that Mimbres Black-on-white continued to be manufactured in the Jornada area after the Mimbres Valley was abandoned. This brings into question the utility of the Mimbres Valley chronology for cross-dating Mimbres Black-on-white found in the Jornada area (Brody 1977; Rugge 1988; Wiseman 1982). Indeed, Rugge (1988) demonstrated with petrographic analyses that Mimbres ceramics found in the Tularosa Valley and the Hueco Bolson were produced outside of the Mimbres Valley, some probably in the Rio Grande Valley. However, data from a recently excavated pithouse site at Ft. Bliss suggests that the termination date of Mimbres Black-on-white in the southern Jornada area must be close to A.D. 1150. The Meyer Pithouse Village site was reliably dated to between A.D. 1150-1200 with a series of archeomagnetic and radiocarbon dates, yet the site contained no Mimbres ceramics among a collection of 13,000 sherds (Scarborough 1989). This site indicates that production of Mimbres ceramics in the area did not continue much beyond A.D. 1150.

The occurrence of Mimbres Black-on-white with Chupadero Black-on-white in the Jornada area raises a number of related issues since the ending date of Mimbres Black-on-white, as well as the beginning date of Chupadero, has been difficult to precisely define. Do such proveniences represent the late manufacture of Mimbres Black-on-white, multiple occupations, or twelfth century occupations?

Mimbres Black-on-white and Chupadero sherds were clearly associated at the Hueco Tanks site. Out of 52 proveniences with Mimbres Black-on-white sherds, 46 contained Chupadero, including at least one from a floor context. Chupadero Black-on-white and Mimbres Black-on-white have also been found in association in the Sacramento Mountains (Hayes 1981:71-72; Wiseman 1982:6), in the Mimbres Valley at the Swarts Ruin (Cosgrove and Cosgrove 1932), and in the Palomas drainage (Nelson 1992). Wiseman (1982) concludes that A.D. 1100 is a reasonable beginning date for Chupadero Black-on-white; apparently associations between Chupadero and Mimbres Black-on-white ceramics are valid, and represent early to mid-twelfth century occupations.

A small number of White Mountain Redware sherds was found at the Hueco Tanks site. Five sherds of Wingate Black-on-red and four sherds of St. Johns Polychrome were identified based on comparisons with Carlson (1970). Wingate Black-on-red dates between A.D. 1050-1200, with the greatest frequency occurring after A.D. 1100 (Carlson 1970). St. Johns Polychrome occurs between A.D. 1175-1300 (Carlson 1970:39-41). One sherd of St. Johns Polychrome was found in an excavated provenience with a Mimbres Style III sherd at the Hueco Tanks site. St. Johns Polychrome was found as well at the Swarts Ruin in the Mimbres Valley, indicating that this type may occur slightly earlier than Carlson's estimate. In fact, the Second Ceramic Conference at the Museum of Northern Arizona placed the beginning date for St. Johns Polychrome at A.D. 1150 (Hayes 1981:72).

Myles Miller (personal communication 1994) of the Ft. Bliss Archaeology Program submitted 14 radiocarbon samples to Beta Analytic Inc. from the Hueco Tanks site, including five normal wood samples and nine AMS samples of short-lived species. The tree-ring calibrated dates were distributed as follows: one in the ninth century, one in the tenth century, four in the eleventh century, seven in the twelfth century, and one in the thirteenth century.

The pooled mean, the variance of the pooled mean, and the T statistic for the 14 uncalibrated dates, were calculated using Wilson and Ward (1978) with the 50 year calibration error added to the laboratory counting error. The pooled mean date is A.D. 1000 ± 35 and T=5.5, with a chi-square value of 22.4 for 13 degrees of freedom. At the .05 significance level, the 14 dates appear to be statistically similar. The tree-ring calibrated mean date at one sigma is cal A.D. 1026 (1041, 1150) 1161, and at two sigma is cal A.D. 1015 (1041, 1150) 1180. The probability distributions at one sigma are cal A.D. 1030-1058 (p=.3), 1080-1124 (p=.47), and 1136-1157 (p=.23); at two sigma they are cal A.D. 1017-1170 (p=1.0) (Stuiver and Reimer 1993).

Taking all the ceramic and chronological data into account, the occupation of the Hueco Tanks site most likely between A.D. 1075-1150. The ceramic and radiocarbon data support one another, except there are several dates which fall outside of the expected range. The dates further suggest the occupation span may have extended to the late 1100's.

ANALYSIS

Our analysis of the Hueco Tanks pottery considers only the 448 rims of El Paso Brown, El Paso Bichrome, and El Paso Polychrome. The sample of rims consists of 21 percent El Paso Brown (unpainted), 26 percent El Paso

Bichrome (either a red or black paint on a brown paste), and 53 percent El Paso Polychrome (red and black on brown) (Stallings 1931; Lehmer 1948). This repesents one of the largest collections of brownware rims analyzed from a single excavated site in the region. The collection is particularly useful for verifying the seriation of local wares (Lehmer 1948; Whalen 1981b); for the consideration of vessel forms and functions; and for diachronic comparisons. The principal variables analyzed for each rim included: pottery type, vessel form, rim diameter, rim direction, and the rim sherd index (RSI)—a quantified measurement of rim finish.

Three vessel forms are present: tecomates, bowls, and necked jars; no ladles or miniature vessels were identified in this collection. The 448 rim sherds include 9 percent tecomates, 30 percent bowls, 51 percent jars, and 10 percent of unknown form.

Exterior rim diameter was only measured on sherds with a chord length (a straight line measured between the two ends of the rim) greater or equal to 1.5 cm; 313 rims met this requirement. The mean diameter of all rims is 20 cm. There is little difference in mean diameters among the three vessel forms: tecomates, 18.3 cm (sd=6.1 cm, n=32); bowls, 20.8 cm (sd=4.4 cm, n=95); and jars, 20.2 cm (sd=6.5 cm, n=186).

Rim direction categories used were inverted, direct, and everted (Figure 2). The most commonly observed rim direction was direct, comprising 90 percent of the sample. Everted rims accounted for 7 percent, inverted rims 1.5 percent, and 1.3 percent were of unknown rim direction. The high frequency of direct rims is characteristic of the early variant of El Paso Polychrome (Whalen 1981b).

The Rim Sherd Index, or RSI, was developed by West (1982) to quantify rim thickening. The RSI was determined by measuring wall thickness 2 mm below the lip and 15 mm below the lip. The lower measurement is then divided into the upper measurement. Rims with an RSI less than 1.0 are tapered, RSIs of approximately 1.0 are straight, and rims with values greater than 1.0 are wedged.

The mean RSI is 1.09 (sd=0.27) on a sample of 370 measureable rims, indicating that most rims are slightly wedged. The RSIs for each pottery type indicate that El Paso Brown has the smallest value at 0.97, El Paso Bichrome has an intermediate value of 1.06, and El Paso Polychrome has an RSI of 1.12. The early variant El Paso Polychrome shows the most thickening of the three brownwares in this assemblage.

A comparison of RSI by vessel form shows that both necked jars and bowls have similar RSIs of 1.12 and 1.09, respectively. Tecomates, however, have a mean RSI of 0.95, indicating they have more tapered rims than the other forms. Both direct and inverted rims have slight thickening based on their similar RSIs of 1.08 (n=312) and 1.09 (n=7), respectively. However, everted rims have more pronounced wedging since they have a mean RSI of 1.21 (n=25). Everted rims and pronounced wedging occur together as rim treatment patterns.

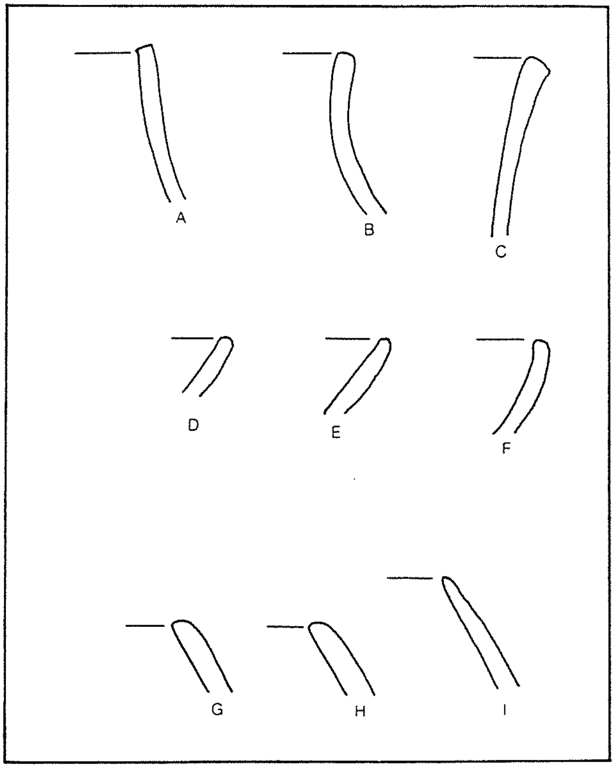

Figure 2. Rim Profiles. Top Row-Necked jars: A. El Paso Brown, B. El Paso Polychrome, C. El Paso Polychrome; Middle Row — Bowls: D. El Paso Brown, E. El Paso Polychrome, F. El Paso Bichrome; Bottom Row — Tecomates: G. El Paso Brown, H. El Paso Bichrome, I. El Paso Brown.

COMPARISONS

Our analyses are relevant to two issues: (1) the recognition of Doña Ana phase sites on surface survey, and (2) Doña Ana phase adaptations in comparison to earlier and later phases. Data from four other excavated sites are considered here, the Mesilla phase Conejo site (Hard 1988); the Doña Ana phase Meyer Pithouse Village (Scarborough 1989); the Doña Ana Godernadora site (Miller 1989); and the El Paso phase Firecracker Pueblo (O'Laughlin, personal communication 1992).

The Conejo site is located in the rainfall runoff zone nine km east of the Organ Mountains and one km west of the large Old Coe Lake playa in Doña Ana County, New Mexico, on Ft. Bliss. The radiocarbon dates primarily cluster in the ninth century A.D. Excavations identified four circular pithouses, an additional single large pithouse which may be a communal structure, an exterior trash midden, and numerous interior and exterior pits. The subsistence base included substantial reliance on wild plants, a heavy emphasis on lagomorphs, and minor use of maize and beans (Hard 1988).

The Meyer Pithouse Village is located on Meyers Range on Ft. Bliss in Otero County, New Mexico, about six km west of the Hueco Mountains in a rainfall runoff zone. Three quadrilateral pithouses (which averaged 6.4 m^2 in size) and a large (over 20 m^2), probable communal structure were excavated (Scarborough 1989). The site was well dated to A.D. 1150-1200. Substantial quantities of both wild and domesticated species of charred plant remains were recovered.

The Gobernadora site (41EP321) is located six km east of the Franklin Mountains, immediately north of the El Paso city limits, in a rainfall runoff zone. A series of 30 radiocarbon dates suggests that the site was occupied between A.D. 1050-1250, and it is considered to be a Doña Ana phase occupation (Miller 1989). Four quadrilateral pithouses, a midden, a burial, numerous exterior fire-cracked rock features, and pits were excavated at the site. Ethnobotanical samples recovered high frequencies of wild plant resources while the recovery of maize was remarkedly low.

Firecracker Pueblo is located in the Hueco Bolson approximately 10 km east of the Franklin Mountains in the rainfall runoff zone in El Paso County, Texas, just outside of Ft. Bliss. The chronometric dates indicate the occupation began about A.D. 1300 and continued to the mid-or late 1300s, all well within the El Paso phase (O'Laughlin, personal communication 1992). Sixteen or 17 pithouses, including a large, possible communal room, were overlaid by a pueblo. Eighteen to 20 pueblo rooms were present, along with over 400 extra-mural features. Numerous maize remains were recovered at the pueblo, as well as evidence for use of an array of wild resources.

COMPARISONS WITH OTHER DOÑA ANA PHASE SITES

Until recently, there had been insufficient excavated data available to conduct a frequency seriation of Doña Ana phase brownwares. The brownware rim frequencies from Hueco Tanks, Meyer Pithouse, and the Gobernadora site are listed in Table 1. The frequencies from the Hueco Tanks and Meyer Pithouse Village sites are similar, while the Gobernadora frequencies are lower in El Paso Bichrome and higher in El Paso Polychrome. However, Miller (1989) notes that some sherds which were originally classified as El Paso Bichrome, were reclassified as El Paso Polychrome with eroded red designs. This reclassification could account for the differences between Gobernadora and the other two Doña Ana phase sites. Whatever the case, there appears to be a pattern to the frequency seriation for the Doña Ana phase: El Paso Brown comprises 20-25 percent of the

Table 1.

Doña Ana Phase Type Frequencies

Type	Hueco Tanks		Meyer		Gobernadora	
	%	N	%	N	%	N
El Paso Brown	21	92	23	79	24	65
El Paso Bichrome	26	118	21	73	9	25
El Paso Polychrome	53	237	56	191	67	185
TOTALS	100	448	100	343	100	275

assemblage, El Paso Polychrome makes up about 50-70 percent, while El Paso Bichrome accounts for 10-25 percent.

The 216 rim sherds from the Gobernadora site have a mean RSI of 1.02 (Miller 1989), while the mean RSI on 370 sherds from Hueco Tanks is 1.08; the two collections have clearly similar RSI. The Doña Ana phase RSIs indicate that some rim wedging is present.

COMPARISONS AMONG MESILLA, DOÑA ANA, AND EL PASO PHASE SITES

Table 2 lists type frequencies for rims founds on the Conejo (Mesilla phase), Hueco Tanks (Doña Ana phase), and Firecracker Pueblo (El Paso phase) sites. At the Conejo site, El Paso Bichrome is rare and El Paso Polychrome is

Table 2.

Diachronic Type Frequencies

Phase	Site	El Paso Brown	El Paso Bichrome	El Paso Polychrome	Total
Mesilla	Conejo	206	3	0	209
Doña Ana	Hueco Tanks	92	118	238	448
El Paso	Firecracker	0	0	1037	1037

absent; by the Doña Ana phase, El Paso Polychrome dominates and El Paso Brown and Bichrome have roughly equal frequencies. By the El Paso phase, El Paso Brown and Bichrome have disappeared. Although O'Laughlin (personal communication, 1992) found three rim sherds of El Paso Brown at Firecracker, they are not associated with the El Paso phase occupation. These data quantify the conventionally accepted, although not well documented, seriation. Note particularly that El Paso Brown is completely absent by the 1300s in the El Paso phase (cf. Seaman and Mills 1988).

O'Laughlin (personal communication, 1992) calculated a mean RSI of 1.42 (sd=0.35) on a collection of 780 rims from Firecracker Pueblo. This is similar to a collection of 69 El Paso phase rims (RSI=1.35) from a surface survey at White Sands Missile Range (Seaman and Mills 1988). The RSI increases from slightly more than 1.0 on the early variant of El Paso Polychrome present during the twelfth century Doña Ana phase, to about 1.40 on the late variant El Paso Polychrome in the fourteenth century El Paso phase. Increasing RSI indicates substantially more pronounced wedging during the El Paso phase.

Changes in vessel form frequencies are evident across the three phases (Table 3). The proportion of necked jars steadily increases from less than 30 percent in the Mesilla phase to more than 75 percent in the El Paso phase. Bowls decline from almost 40 percent in the Mesilla phase to about 20 percent in the El Paso phase. Tecomates sharply decline, and by the El Paso phase they are nonexistent. The Firecracker Pueblo rim assemblage was similar to one small (n=69) surface collection of painted El Paso phase rims (Seaman and Mills 1988:Table 13.6): 23 percent bowls, 75 percent jars, and 1.4 percent tecomates. By the El Paso phase, necked jars had become the dominant form and had totally replaced tecomates in the assemblage.

Comparisons of mean rim diameters from the Conejo, Hueco Tanks, and Firecracker sites are presented in Table 4. Bowl diameters increased substantially between the Mesilla and Doña Ana phases, from 14.3 cm to 20.8 cm, but

Table 3.

Diachronic Vessel Form

Phase	Site	Bowls		Jars		Tecomate		Other	
		%	N	%	N	%	N	%	N
Mesilla	Conejo	39	35	29	26	30	27	2	2
Doña Ana	Hueco Tanks	30	132	51	230	9	40	10	46
El Paso	Firecracker	21	221	78	812	0	0	0.4	4

increased only slightly more in the following El Paso phase. Jars, however, increased only slightly between the Mesilla and Doña Ana phases, 18.4 cm to 20.2 cm, but increased to 27.6 cm in diameter in the El Paso phase. Whalen (1981b) noted a similar trend in a collection of 20 necked jar rims from the El Paso phase that had an average diameter of 25.8 cm. Tecomates slightly increased in size between the Mesilla and Doña Ana phases, and dropped out of ceramic assemblages by the El Paso phase.

Table 4.

Diachronic Rim Diameters

Phase	Site	Bowls		Jars		Tecomate		Totals
		cm	N	cm	N	cm	N	
Mesilla	Conejo	14.3	35	18.4	26	15.1	27	90
Doña Ana	Hueco Tanks	20.8	95	20.2	186	18.3	32	313
El Paso	Firecracker	21.3	209	27.6	697	-	0	906

In sum, jars dominated the assemblage and sharply increased in size by the time of the El Paso phase. The vessel assemblage was evolving as part of a technology responding to shifting adaptations. However, in order to understand these adaptations, improvements are still needed in our ability to recognize Doña Ana phase sites on archeological survey.

DISCUSSION

The identification of Doña Ana phase sites on surface survey has remained problematic. Many surveys have not attempted to identify Doña Ana phase sites (Seaman and Doleman 1988; Skelton et al. 1981; Whalen 1977, 1978). Other surveys identified Doña Ana phase sites based on the co-occurrence of a number of ceramic types (Beckes et al. 1977; Carmichael 1986). For example, Carmichael (1986:71-72) used the occurrence of El Paso Brown, El Paso Polychrome, Mimbres Black-on-white, and Chupadero Black-on-white together on surface survey to identify Doña Ana phase sites. However, multi-component sites with both Mesilla and El Paso phase occupations would produce similar ceramic assemblages.

Problems in phase identification have led to substantial differences in understanding long term cultural changes in the region. Whalen (1981a) proposed a gradualist model suggesting that the El Paso phase represented the peak in population density, aggregation, and agricultural dependence in the southern Jornada Mogollon. Carmichael (1986, 1990), on the other hand, proposed a cyclical model in which the Doña Ana phase represented a peak in population, followed by a decline, followed by either a continued decline or a second peak. The cyclic model is based upon the identification of a greater number of residential sites as belonging to the Doña Ana phase rather than the El Paso phase in the Tularosa Valley portions of Ft. Bliss.

Improved accuracy in the recognition of Doña Ana phase sites in the Hueco Bolson and southern Tularosa Valley during surface survey may now be possible with a rim frequency seriation. Based upon the ceramic analyses discussed above, Doña Ana phase sites should contain: 20-25 percent El Paso Brown, 10-25 percent El Paso Bichrome, and 50-70 percent El Paso Polychrome. Early rims of El Paso Polychrome (rims which are largely direct and with RSIs slightly greater than 1.0) should dominate.

An El Paso phase site assemblage overlying a Mesilla phase assemblage would not produce a similar ceramic pattern, since El Paso Bichrome is rare both during the ninth century portion of the Mesilla phase, and in the El Paso phase. In addition, the late variant El Paso Polychrome with everted and strongly wedged rim treatment should dominate on El Paso phase sites. The rims from Firecracker Pueblo indicate the late rim variant dominated by the 1300s. Way (1979) and Whalen (1981b) both suggested an ending date of A.D. 1250 for the early variant of El Paso Polychrome.

In the future, analyses of excavated assemblages from the later part of the Mesilla phase and early part of the El Paso phase may enable further refinement of this seriation. The occurrence of Style III Mimbres Black-on-white, in association with early variant El Paso Polychrome or Chupadero Black-on-white, is also a reliable indicator of the Doña Ana phase. However, the absence of Mimbres Black-on-white does not necessarily indicate that a site does not belong to the Doña Ana phase, as this intrusive ware only occurs in small amounts and it is apparently absent after the mid-twelfth century.

Identification of Doña Ana phase sites during surface survey is possible, but must depend upon both a reliable ceramic collection and sampling strategy, so that laboratory analyses and quantifiable results can be obtained on appropriate sample sizes. Sites with few rim sherds will remain problematic without samples for chronometric dating.

Our comparisons indicate that necked jars both increased in frequency and size in the Doña Ana phase and then further increased in the El Paso phase; necked jars had replaced tecomates by this time as well. What was the function or functions of these necked jars? The principal candidates are: water storage, cookpots, dry food storage, or multiple uses.

The necked jars are restricted in that the orifice diameter is less than the body diameter. The degree of vessel restriction reflects a tradeoff between accessibility and containment security. According to research by Mills (1989) and Smith (1985), water storage vessels tend to be characterized by small orifices which reduced spillage.

The orifice diameters on the Doña Ana and El Paso phase necked jars, on average, are too large to be effective water storage vessels. However, restricted vessels with orifice diameters in the range of the Hueco Tanks jars were commonly used to boil large quantities of food. Restricted vessels with medium to large orifices are suitable cookpots as they provide access, and reduce boil-over or spillage. Necked jars with medium to large orifices are, however, also used for dry food storage. Mills (1989) found that vessels in her archeological sample from the northern Anasazi area that were used as food storage were actually recycled cookpots. The senior author has observed a similar pattern among the Rarámuri (Tarahumara) in northern Chihuahua; vessels used to store seed corn, clothing, and pinole were frequently recycled cooking jars. The most likely function of most of the El Paso Brownware necked jars was as cookpots. There is one problem with this explanation—Mills (1989) reports that Anasazi cookpots are usually undecorated, since sooting would rapidly cover the decoration. The El Paso Polychrome decorations are, however, limited to the upper one-third of the vessel, which would tend to escape sooting.

If these necked jars were cookpots, what were they cooking? A number of independent lines of evidence suggest that maize consumption increased between the Mesilla and El Paso phases. Settlement pattern data indicate that El Paso phase residential sites are more clustered in the better watered areas in rainfall runoff zones than Mesilla phase residential sites (Whalen 1978, 1981a). Macrobotanical recovery of maize is usually high at El Paso phase residential sites but low on Mesilla phase sites (Whalen 1981a; Hard 1988; O'Laughlin, personal communication 1992). Mano length, a proxy index of the importance of maize, also increased between the Mesilla and El Paso phases (Hard 1990). Whalen (1981a) presented evidence that population increased between the Mesilla and El Paso phases as well.

One of the principal methods of preparing maize is steeping or boiling it for several hours in order to break down the complex starch (Braun 1983; Hard 1986). Some of the necked jars would likely have been used this way as their shape, size, and increased frequency are suggestive of a cooking pot function. Their increased frequency may be a result of either an actual increase in the number of pots in use in a household, and/or the high breakage rates that cooking pots suffer. Since Doña Ana phase jar size and frequency falls between the Mesilla and El Paso phases, it would suggest that the gradualist rather than the cyclical model is best supported by the ceramic assemblage data. Based on changes in ceramic vessel forms, it appears that the peak in agricultural production occurred during the El Paso, not the Doña Ana, phase in the southern Jornada Mogollon region.

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Excavations at the Meyer Pithouse Village and Conejo sites were conducted by the Ft. Bliss Environmental Management Office. This paper was initially read at the Mogollon Conference VII in Las Cruces, New Mexico.

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The Canyon Creek Site (41OC13): A Component of the Southern Plains Equestrian Nomad Archeological Complex

Harry J. Shafer, John E. Dockall, Douglas W. Owsley, and Thomas S. Ellzey

ABSTRACT

The Canyon Creek site is an historic Plains Indian child burial, with associated material items, discovered in a fissure cave in Ochiltree County, Texas. The burial contained the accoutrements of mid-nineteenth century horse nomad culture, placing it in the broader context of Native American equestrian cultures of the Southern Plains. Topics treated include determining tribal identity, dating, and defining the Southern Plains equestrian nomad archeological complex. This unique material complex was created through mutual interaction between Native Americans, and the Spanish, French, and Anglo-Americans.

INTRODUCTION

This paper describes a mid-nineteenth century equestrian nomad burial and associated artifacts excavated from a small solution cave (41OC13) on a tributary of Wolf Creek in Ochiltree County, Texas. A comparative study of like finds in the Southern Plains of Texas and Oklahoma shows that a distinctive Southern Plains Indian material complex grew out of the adoption of equestrian technology and European trade by many native groups (Kroeber 1963:76-80).

The archeology of Late Historic Native American culture (1800-1875) in the Southern High Plains consists of two complimentary assemblages: (1) isolated burials, and (2) artifacts, traces of houses, and mortuary remains from settled villages. The isolated burials are associated with equestrian nomads, and may relate to any one of several groups, including the Plains Apache, Kiowa, Comanche, southern Cheyenne, and southern Arapaho. The ancestral affiliation of the materials from prehistoric settled villages in the Texas Panhandle is unknown, but those in the South Plains, north central regions of Texas, and western Oklahoma, may relate to certain Plains Caddoan groups (Baugh 1991). Historically, Plains Caddoan sites in Texas are identified as occupied by Wichita-speaking groups, and they have been grouped under the heading of the Norteño focus (Duffield and Jelks 1961:71-72).

The Wichita adopted the horse by 1700 and played important roles in the acquisition and trade of horses to other Indian groups, Anglo-Americans, and Spanish, but they did not become nomadic wanderers. Instead, they maintained their agricultural fields and gardens up to the time they were removed to Indian Territory (Newcomb and Field 1967).

There has been no such archeological designation for the more nomadic groups that ranged into the Southern High Plains in the nineteenth century. These equestrian hunting/raiding nomadic groups in the Texas Panhandle and Southern High Plains, were mainly Comanche, Kiowa, Kiowa Apache, southern Cheyenne, and southern Arapaho, all of whom quickly adopted the horse by about 1700. These equestrian groups became so efficiently mobile that little material residue was left behind at their encampments to mark them for the archeological record. The tipi poles, covers, bedding, containers, and other everyday essentials were carried from camp to camp with the aid of horses. Not surprisingly, only two of these settlements have been identified archeologically, the Sand Pit and Sandstone Ledger sites, both in the Mackenzie Reservoir basin (Willey et al. 1978; Willey and Hughes 1978). The archeological presence of these equestrian nomads is, however, more frequently noted by an occasional human burial accompanied by personal adornments, horse trappings, and other belongings. The burial associations constitute a purely Indian expression even though the materials were acquired through trading among, or raiding against, Mexican, French, or Anglo-Americans.

The archeological identity of this historic Native American material complex comes almost exclusively from mortuary data. A limited number of Late Historic Plains Indian burials have been documented in the Southern Plains of Texas and western Oklahoma. Reported burials/sites in Texas include: Yellowhouse Canyon (Newcomb 1955), White (Suhm 1962), W. H. Watson (Ray and Jelks 1964), Cogdell (Word and Fox 1975), Morgan Jones (Parsons 1967), Merrell (or Long Hollow Burial) (A. J. Taylor, personal communication 1988), several finds near Ozona (Hester 1968), and the Canyon Creek burial reported herein. In Oklahoma, reported historic Plains Indian burials include the Rabbit Hill (Pearson 1978), Poafpybitty (McWilliams and Jones 1976), and Jared (Jackson 1972) sites. The location of these finds are shown in Figure 1. Unpublished records are available on about 10 additional burials in Texas mentioned in Word and Fox (1975); efforts are being made to thoroughly document some of these burial sites (A. J. Taylor, personal communication 1988).

PREVIOUS APPROACHES TO STUDYING HISTORIC PLAINS INDIAN BURIALS

Previous studies of Historic Plains Indian burials have tended to be site specific, with two rather limited goals beyond a basic description of the findings.

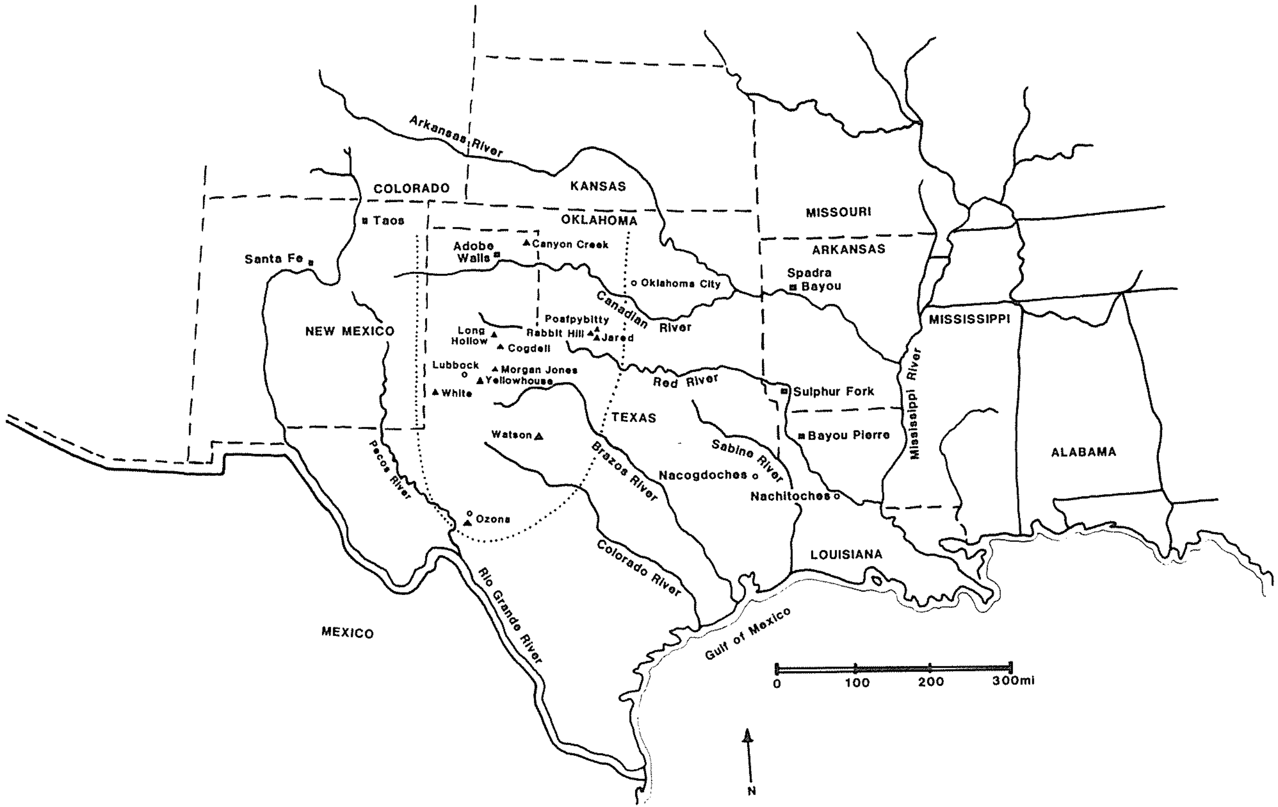


Figure 1. Map showing published nineteenth century Southern Plains Burials, the geographic extent of the Southern Plains Equestrian Nomad Archeological Complex, and proximity of early nineteenth century trading posts.

The first was to assess the date of the burial based on associated artifacts, and the second was to determine tribal affiliation.

Dating historic burials on the basis of associated artifacts is a standard archeological procedure utilizing associated European trade goods, buttons, weapons, hoes, knives, or other objects. All of the historic burials cited above date to the nineteenth century. We have employed the same method to date the Canyon Creek burial.

Determining tribal identity is a more difficult task. The double burial at the Poafpybitty site was identified as Kiowa based on a local Comanche informant and comparative studies; the Jared burial was identified as Comanche on the basis of literary and historic records (Jackson 1972), although it could be Kiowa. The Rabbit Hill burial was identified by Pearson (1978) as Kiowa Apache using archeological and photographic evidence. Yellowhouse Canyon, Cogdell, Morgan Jones, and White were probably Comanche, but there is no way of being certain of any of the Texas cases.

CANYON CREEK BURIAL (41OC13)

The Canyon Creek burial was discovered by Matthew Sell and a friend, Craig Gingerich, in the winter of 1987 while exploring the cave for evidence of prehistoric artifacts. Shafer, Ellzey, and Owsley visited the site in the summer of 1988 at the request of the landowner, and planned for future investigations.

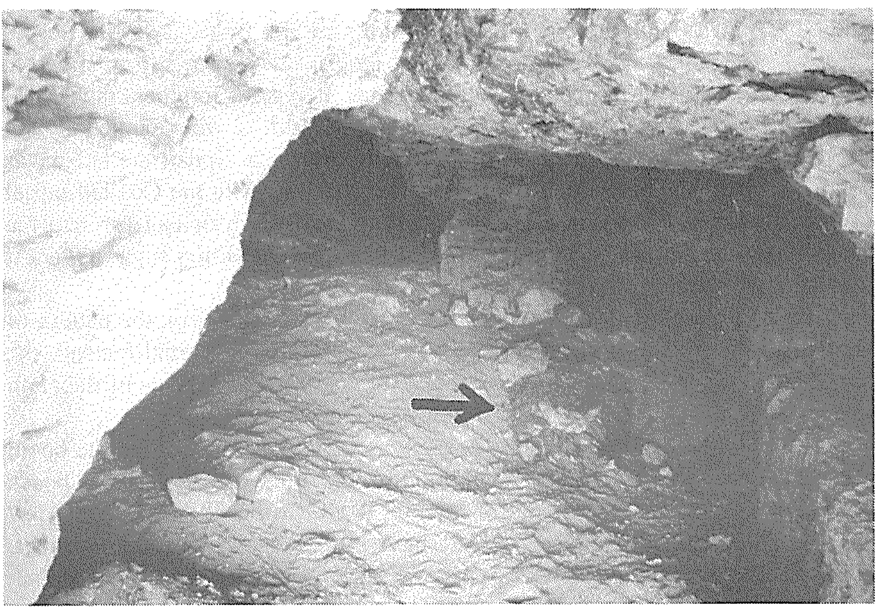
The site consists of two small horizontal fissure caves (Figure 2A) formed in the dolomite caprock. The burial was in the larger cave (Figure 2B). These small caves are vigorously defended during the warmer seasons by a rather large population of black widow spiders and rattlesnakes. Primarily for that reason, the burial was not excavated until November 1988 (during a blizzard) by Shafer, Ellzey, Owsley, Brian S. Shaffer, and David Tucker.

The floor of the burial cave contained a shallow fill with exposed bedrock along the west wall; a natural crevice in the floor on the east side was filled with fine wind-blown sediment. The burial was placed in the deepest deposit of fill in the cave. The floor sloped downward about 1 m toward the entrance from the place of the burial.

Excavation

Prior to excavation, Ellzey and David Tucker mapped the cave (Figure 3), and the burial area. Excavation focused on the burial itself, which was exposed, photographed, drawn, and removed for analysis. All fill was screened through a 1/16-inch mesh; approximately 11 kg of soil was collected and water or dry screened through 1/16-inch mesh at Texas A&M University to recover glass beads and microfaunal remains.

A



B

Figure 2. A, Canyon Creek caves (41OC13) showing burial site (arrow); B, Canyon Creek burial cave interior and burial location within the cave (arrow).

Copies of maps, drawings, notes, and photographs are on file at the Texas Archeological Research Laboratory, The University of Texas at Austin. The material culture items were returned to the landowner.

The Burial

The burial was that of a child approximately five years old. The body and associated items were covered with a mounded layer of dolomite cobbles (see Figure 2B). There is some evidence to suggest that the entrance of the cave was walled up, as a linear mound of dolomite cobbles lay across the entrance at the time the site was first visited by the authors in the summer of 1988 (see Figure 3)

A packrat nest had been constructed among the dolomite rocks covering the burial. This nest was extensively used as evidenced by packed fecal and other organic material among the rocks. Termites had badly damaged most of the wooden articles, and the percolating moisture undoubtedly contributed to severe deterioration of all organic material.

The body was placed in a shallow pit dug into the eolian fill along the south wall of the cave (see Figure 3), approximately 6 m from the entrance. The body was placed in a semi-flexed position on its left side with the head to the east and facing south (Figures 4, 5).

Numerous artifacts were placed with the body (see Figure 4), including a "killed" adult saddle frame, a complete child's saddle frame, a bridle (represented by the bits and fragments of leather straps), a wooden stirrup frame, a wooden ladle, a silver ring, and two copper rings. Items of adornment include 23 copper bracelets, of which 10 were on the right forearm, 12 were on the left, and another was against the right side of the skull near the occipital; the latter was probably worn as a hair ornament similar to that found with the Cogdell burial (Word and Fox 1975). A small red leather beaded pouch or bag (probably a tobacco pouch) was found in the chest area; the item's position suggests that it was suspended around the neck.

Textile impressions on one of the bracelets of the right arm, the pattern of bead distribution, and a concentration of fibrous organic material beneath the burial all suggest that the corpse was dressed in cloth. No remnants of the cloth remained, however, but three brass buttons were recovered.

A single string of white glass beads was found scattered about the head; presumably these were once threaded into the hair. White beads and blue beads were found along the south side of the burial pit, primarily between the left hand and the knees. These beads may have embellished a type of garment. The only other concentration of beads was around the beaded leather pouch noted above.

An iron bridle bit was placed over the chest area. Fragments of leather straps, presumably from the bridle reins, were also found near the bit and in front of the face.

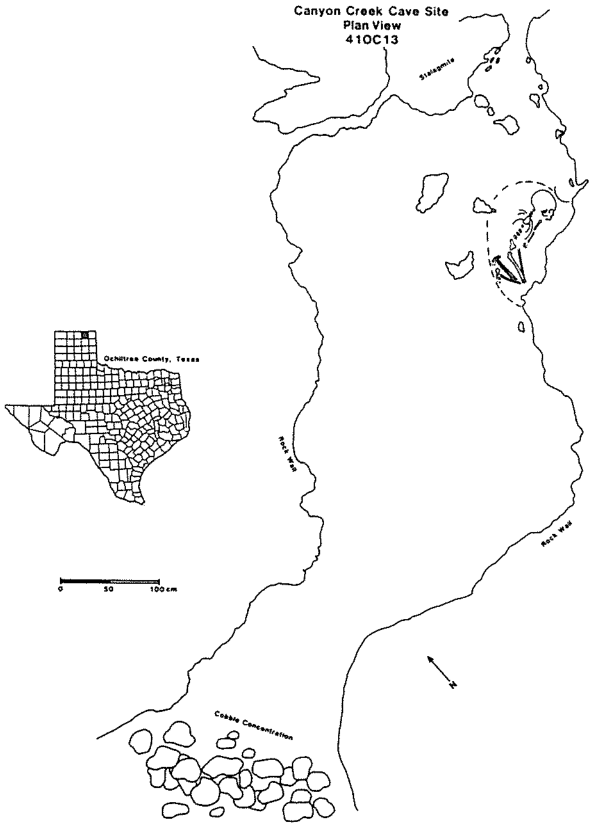


Figure 3. Location map and map of plan of burial cave showing location of burial. Note cobble concentration at entrance suggesting that the cave may have once been sealed.

An adult saddle frame was broken and scattered about the area over the legs. The breakage appeared to be deliberate as the pommel and cantle were both snapped at the fork.

A child-size saddle frame was placed intact along the north side of the grave against the skull. Inside the side boards of this saddle frame was a wooden ladle placed upside down. On the west side of the saddle was the wooden frame of a stirrup. Against the top of the stirrup was a copper ring.

Human Osteology

The inventory and analysis of the human remains from the Canyon Creek site was provided by Owsley at the Department of Anthropology, Smithsonian Institution, Washington, D. C.

Figure 4. Photographs of burial showing some of the associated artifacts.

Bone preservation is excellent, and the skeleton is nearly complete. The size of the skeletal elements, dentition (including the presence of deciduous teeth and unerupted permanent teeth), and open cranial sutures indicate that the skeleton is that of a five year old child. Age was determined using the dental calcification standards of Moorress et al. (1963a, 1963b). Lengths of the long bone diaphyses

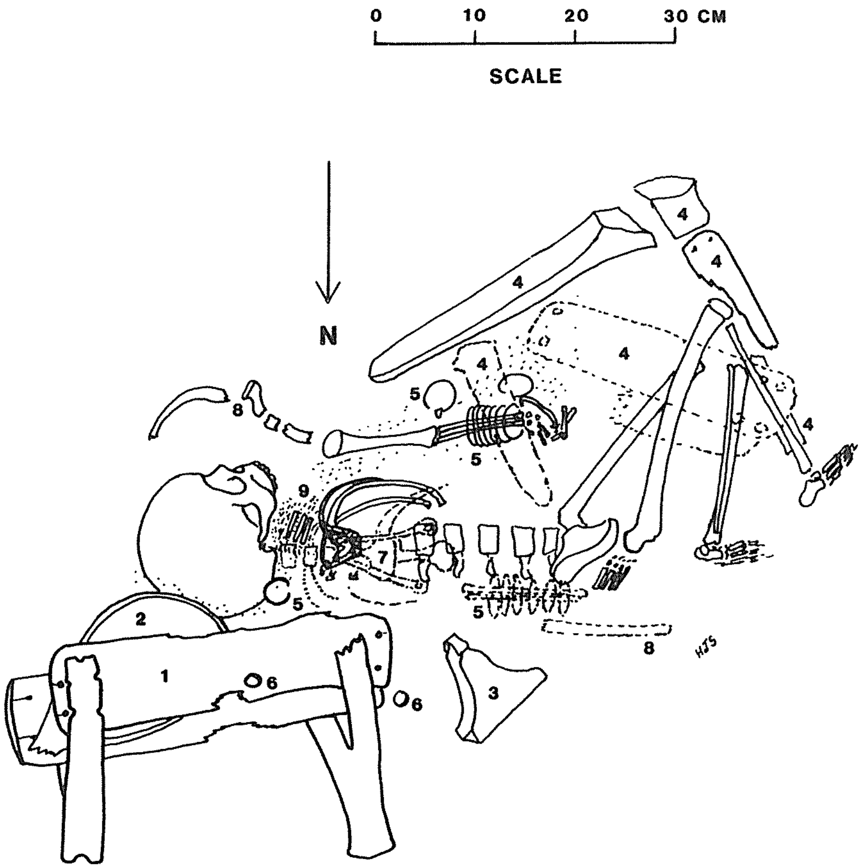


Figure 5. Diagram showing position of the body and placement of associated artifacts: 1, child's saddle; 2, wooden ladle; 3, stirrup; 4, adult saddle parts; 5, copper bracelets; 6, copper rings; 7, iron bit; 8, leather bridle/head stall fragments; and 9, beaded pouch.

(left side) were consistent with an age of 4.5-5.5 years (Ubelaker 1978) and were as follows: humerus (166 mm), radius (129 mm), ulna (143 mm), femur (233 mm), tibia (184 mm), and fibula (187 mm).

The mild wear on the deciduous teeth and the general craniofacial morphology (i.e., form of the zygomaxillary suture, shape of the nasal aperture, prominence and angle of the nasal bones, absence of a nasal sill, shape of eyes, and straightness of the palatine suture) are characteristic of Native Americans of the Plains. In addition, radiographs of the unerupted permanent maxillary incisors reveal the shovel shape that is a typical trait of Native Americans.

It is difficult to determine sex with certainty in a child so young. Characteristics of the pelvis (i.e., pubic symphysis and sciatic notch morphology) that enable sex determination of adults have an intermediate expression in this child, and thus have little diagnostic value. The mental eminence of the mandible, however, is squared and blunt, the gonial angle is acute (116 degrees), and the ascending ramus is relatively wide. These traits are characteristic of males.

The cranium is virtually complete, lacking only part of the right zygomatic process. Traces of rodent incisor marks are apparent on the orbits, zygomae, and right mandibular condyle. Such gnawing caused the missing and crumbling portions of the right zygoma and zygomatic process. The vault displays asymmetrical areas of thinning of the parietals, temporals, and occipitals (i.e., arachnoid granulations/pachyonian depressions). There is no evidence of cribra orbitalia or ectocranial porosis, and hence no indication of malnutrition, iron deficiency anemia, hookworm infestation, malaria, and other such causes of these conditions.

The maxillary deciduous canines and incisors are missing (postmortem loss), but the permanent teeth are visible in the gubernacular canals. Maxillary teeth present and erupted include the left and right deciduous first and second molars; the left permanent molars are present but unerupted. Mandibular deciduous teeth present and erupted include three incisors, both canines, and first and second molars (an unerupted permanent tooth is visible below the missing left first incisor). The left permanent first and second molars and the right second molar are present and unerupted; the right first molar is partially erupted. The deciduous teeth display minimal occlusal surface abrasions and only mild deposits of calculus. There is no evidence of caries or alveolar abscessing. The left mandibular first deciduous molar displays three roots, a rare occurrence.

Missing postcranial elements include the scapulae, clavicles, sternum, coccyx, patellae, right humerus, and a few ribs and vertebrae. Examination of the bones revealed no indication of congenital or developmental abnormality, nor of lesions resulting from disease or trauma. However, X-rays of the tibiae and femora show the presence of several faint transverse lines of arrested growth (Harris lines) (Garn et al. 1968). One corresponding set, which formed during infancy, is evident in the proximal and distal tibiae and the distal femora. These lines reflect an episode of disturbed long bone growth, followed by recovery, and probably were caused by an illness or a period of severe malnutrition. Green stains are apparent on the radii and ulnae, being more vivid on the left than the right (archeological data on the burial indicate that the bracelets on the arms are the cause of the stains on the arm bones).

In conclusion, examination of this burial indicates that the skeleton is that of a subadult, possibly a male, about five years of age. The child was in good health at the time of death, and the skeleton reveals nothing about the possible cause of death, as no lesions or abnormalities are present.

ARTIFACT DESCRIPTIONS

The artifacts recovered from 41OC13 are described, and examples illustrated, in this section of the article. Limited documentary research was conducted to provide a broader context of analysis and preliminary interpretations and inferences.

Horse Gear

Horse gear includes two Indian-made saddles, a wooden stirrup frame, an iron bridle bit, and fragments of a leather bridle or headstall.

Iron Bridle Bit

This specimen is a Spanish spade type bit that exhibits curation and repair (Figure 6). The bit is made of iron and is heavily rusted and pitted, but has been conserved by Dr. D. L. Hamilton and Georgia Fox at Texas A&M University. The roller on the spade is missing, but the crosspiece for the roller is still present. The curb chain is also missing but one hook for this chain is present. A piece of iron wire has been added to the spade part of the bit and connects and fastens both cheekpieces to the spade. This may indicate repair of an otherwise non-functional bit. The cheekpieces have a series of perforations that form two convex rows. The upper row is comprised of 11 holes and the inner row of four holes. The spade is scalloped along the edge and convex in cross section. The bit measures 32.6 cm between the cheekpieces.

Leather Bridle or Headstall Fragments (Figure 7; N=12)

There are five fragments of leather headstall or bridle fragments that are 2.5 cm in width. The remaining seven specimens are small non-diagnostic fragments. Two of the longer fragments have a series of small diagonal notches on one side. Presumably, this was to facilitate fastening the end of the strap into a buckle that is no longer present. There are four other specimens that have a series of stitching holes around their edges. Rivet or brad holes are present on two specimens. No buckles or rivets remain on any of the strap fragments.

Child's Saddle (Figures 8-10)

Pommel (Figure 9A)

The pommel was manufactured from the fork of a small tree or branch that resembles cottonwood. Remnants of bark still remain on the underside of the V. The top of the pommel is notched.

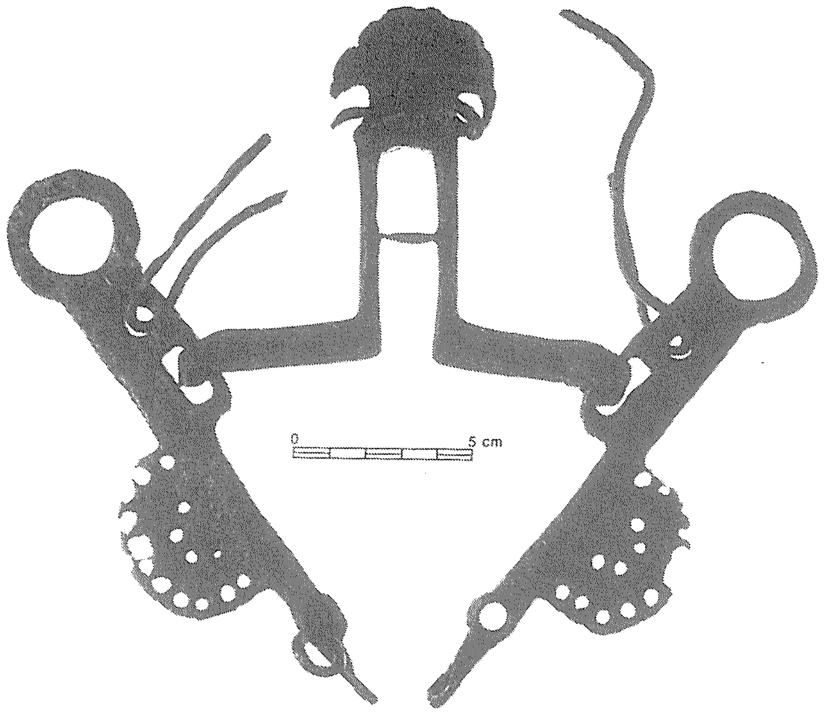


Figure 6. Spanish spade type iron bridle bit.

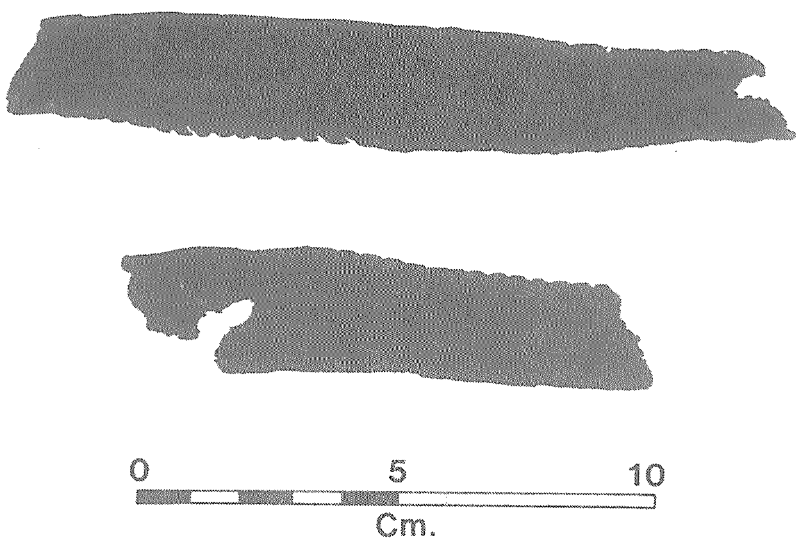


Figure 7. Leather bridle or head stall fragments.

At the ends of the forks on each side of the pommel are pairs of notches for lashing the pommel to the side boards of the saddle. One fork is incomplete and has only one set of notches. The complete fork had two notches. The first set is 12 cm from the top of the pommel, and the lower set of notches is 3.5 cm below the upper set. The upper pair of notches on the broken fork is 12.5 cm from the top of the pommel. Overall dimensions for the pommel are: height 12.5 cm, and 15 cm distance between the forks of the pommel.

Cantle (Figure 9B)

The cantle is manufactured of the same wood type as the pommel. The top of the cantle is carved flat and is spatulate in shape. As with the pommel, the cantle was also carved from the fork of a small tree or limb; bark is also present. The back surface of the cantle top is convex while the interior is slightly concave.

One fork is incomplete due to decay, while the other fork is complete. There are two pair of notches on the complete fork. The upper pair of notches is 13.5 cm from the top of the cantle. The lower pair of notches is 4 cm below the upper pair.

Binding impressions are present across the broad outer surface of the complete fork, between the notches. Microscopic examination revealed traces of decayed leather over part of the cantle.

Complete Side Board (Figure 10A)

This sideboard was constructed of cottonwood. This piece is concave/convex along the long axis, being probably hand-contoured. A series of binding holes were prepared at each end of the side board. The same hole pattern was used on both ends.

Microscopic analysis of the holes indicated they were made by burning (cf. Ewers 1980:Figure 52a). It is possible that the holes were first burned into the wood with a red-hot metal rod or awl and then reamed out to their present diameter. The holes were not produced biconically. Hole diameter ranges from 0.5-0.6 cm. A small bit of decayed leather is still present on one end of the side board, evidence that the saddle frame was once wrapped in rawhide. Linear binding impressions are still visible in this region. Rodent gnawing and decay have damaged much of this piece.

Dimensions for this side board are: Length, 30.7 cm; width of ends, 8.7 cm; width of middle, 7.8 cm; thickness: ends, 0.8 and 0.79 cm; middle, 0.63 cm.

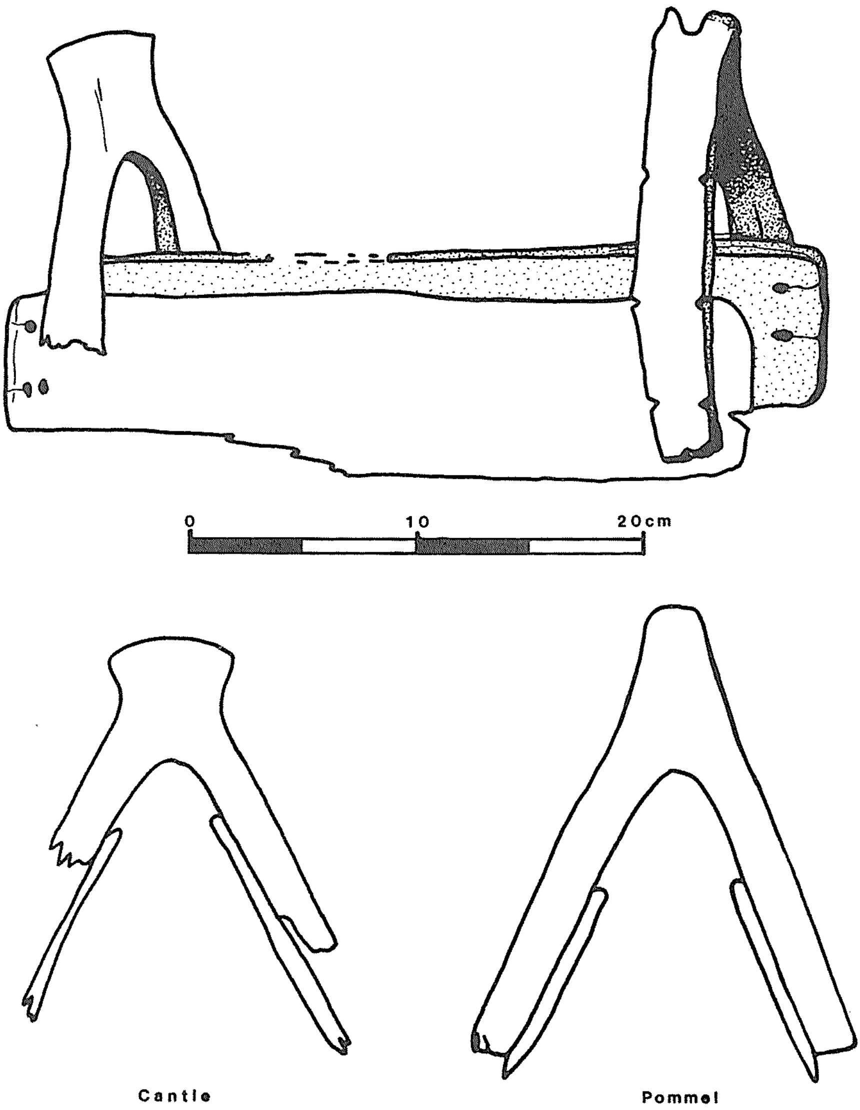


Figure 8. Drawing of child's saddle showing articulation of parts (pommel, cantle, and side boards).

Incomplete Side Board (Figure 10B)

This specimen was constructed of the same material as the complete side board and has the same binding hole pattern and method of hole manufacture. This piece is badly decayed.

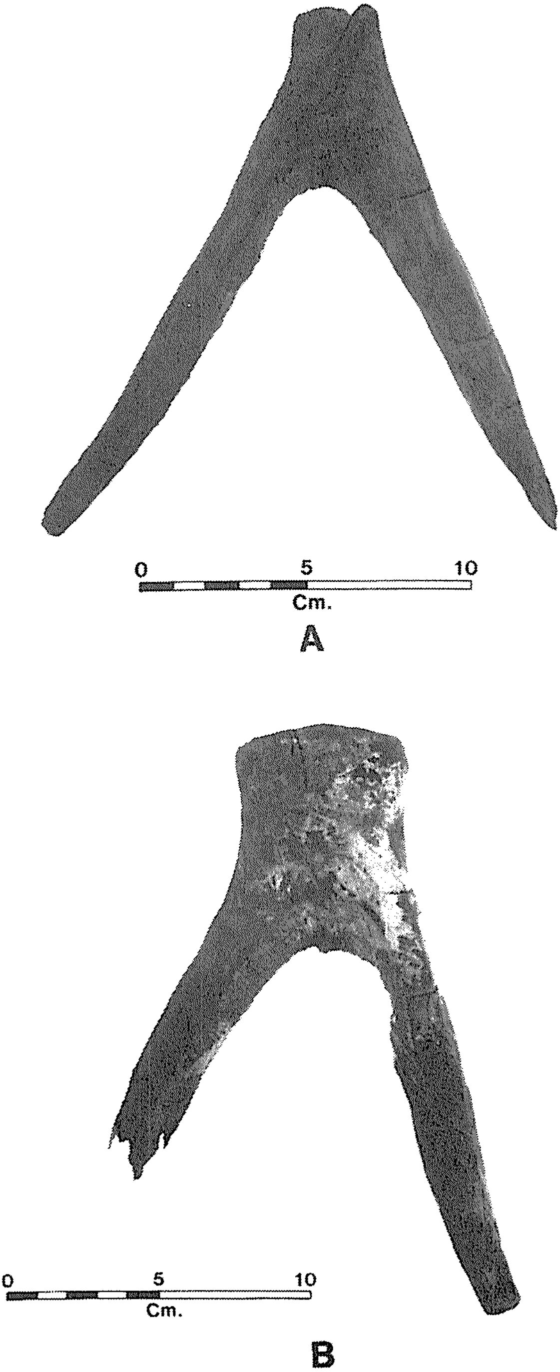


Figure 9. A, child's saddle pommel; B, child's saddle cantle.

Stirrup (Figure 10C)

The stirrup was manufactured of four separate pieces, all of cottonwood. There is one rectangular portion (stirrup tread), two sides of a bentwood construction, and a narrow strip (2 cm wide) across the top bridging both side pieces. The bottom portion is hand-shaped and measures 9.0 cm front to back and 8.7 cm side to side. It is 0.7 cm in thickness. Each side of this piece is beveled to accommodate the stirrup arch construction.

The sides of the stirrup were also cut and shaped by hand. The upper portion that forms the arch is bent and tapered to shape. The dimensions of the side parts of the stirrup are: Side part A: length, 8.1 cm; width, 8.0 cm; thickness, 0.6 cm; Side part B: length, 8.7 cm; width, 7.4 cm; thickness, 0.5 cm.

Adult Saddle

Structurally, the adult saddle is virtually identical to the child's saddle, only larger in scale. No components of the adult saddle are illustrated, but measurements and verbal descriptions are presented below.

Pommel

The pommel was probably manufactured from the fork of a small cottonwood tree. This specimen is in two pieces, and is incomplete, but there are traces of the original leather or hide cover in crevasses of the wood.

A series of two notches is present on the complete fork. The first pair is 22.3 cm from the top, and the second pair of notches is 4 cm below the first pair. The lower pair is actually a single large groove partially encircling the distal area of the fork. No binding impressions were present.

The length of the pommel is estimated to have been about 27.5 cm. Estimated width between the forks of the complete pommel is 25.5 cm.

Cantle

The cantle of the adult saddle was constructed of mesquite. It also was carved similarly to the cantle of the child's saddle described above. Both forks of the cantle are complete. A pair of grooves, carved with a metal tool, is present at the distal end of each fork. The upper groove is 22.5 cm from the top of the cantle. The second groove is 4 cm below the first groove. Much of the bark still remains on the surface of the cantle. The length of the cantle is 25.5 cm. Width between the forks is 24.5 cm.

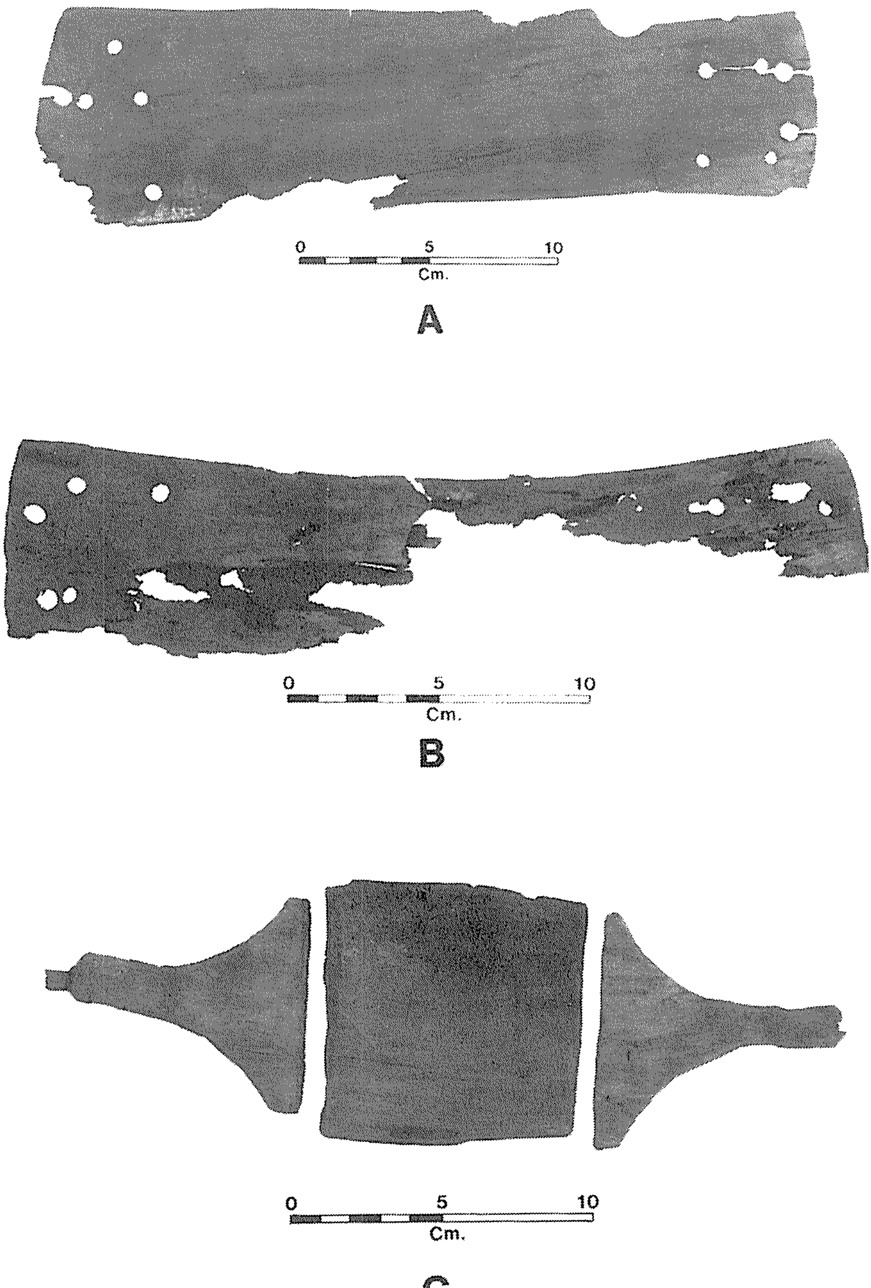


Figure 10. A, B, side boards to child's saddle; C, wooden stirrup frame from child's saddle.

Complete Side Board

This side board (probably of cottonwood) is mostly complete, but is severely warped and damaged by cracking and rodent gnawing. Traces of decayed leather covering still remain on the side board.

A set of seven binding holes are present on each end of this piece. Hole diameter ranges from 0.4-0.7 cm. Holes were created by burning with a red-hot metal rod or awl, and then by reaming the hole to its present shape. The hole pattern follows very closely that for the child's saddle. The estimated length of this specimen is about 44 cm.

DISCUSSION OF HORSE GEAR

The spade bit is not common in eighteenth and nineteenth century archeological collections from the Southern Plains (Jay C. Blaine, personal communication, 1993). According to Blaine, the spade bit is more common in Spanish colonial areas of Sonora and southern Arizona. The Canyon Creek specimen may have been acquired through trading with, or raiding among, Spanish/Mexican settlements in New Mexico or northern Mexico. Trading expeditions between the Southern Plains Indians and the New Mexico settlements and Comancheros are well documented (Berlandier 1969:120; Haley 1935; Kenner 1969; Levine 1991), but so was raiding in northern Mexico (Campbell and Field 1968:129). Kenner (1969:85) specifically mentions saddlery as one of the items of Comanchero trade.

Both of the Canyon Creek saddles are unquestionably of Indian origin. The style is comparable to that which the Blackfoot called "prairie chicken snare saddle" (Ewers 1980:81). According to Grinnell (1923, I:207, cited in Ewers 1980:92), this type of saddle was an invention of the Kiowa and was in common use in the middle decades of the nineteenth century.

According to Ewers (1980), there were basically three types of Indian saddles. The oldest form was the "pad saddle" made by stuffing soft skin pillows with animal hair. The pad saddle was mostly used by men. The second type of saddle was the woman's saddle, which consisted of forked pieces laced to two side boards. The pommel and cantle were each curved outward at the top, and were characteristically high relative to the third type of saddle, the prairie chicken snare saddle. The difference between the woman's saddle and the prairie chicken snare saddle is that the pommel and cantle are low rather than high on the latter. The sideboards and girting were much the same. The two saddle types are related, and Ewers (1980) believes the style was derived from Spanish pack saddles.

William Soule, a frontier photographer, photographed a saddle of the prairie chicken snare type on a southern Cheyenne horse sometime between 1868-1874 (Belous and Weinstein 1969:75). Another example taken from a Comanche raid on Corpus Christi is illustrated by Berlandier (1969:Figure 18). This raid must have taken place between 1827 and 1835 when Berlandier was in Texas, and suggests that the prairie chicken snare saddle dates as early as the first quarter of the nineteenth century.

Ewers (1980:80-81) states that saddle making was done by women. In making the Cheyenne prairie chicken snare saddle,

> a woman softened two sections of antler from fresh killed elk or blacktail deer in warm water to rend them pliable. The sections were then bent and cut to the desired shape, one for the pommel and the other for the cantle. Some women burned holes near each end of the section of antler for tying it to the wooden side boards; others made two horizontal grooves and passed the tie strong through these grooves and holes burned in the sideboards. The saddle was then covered with green rawhide and protected from warping while the rawhide was drying by the same methods used in making all-wood saddles.

While antler was used among the northern Cheyenne and other Northern Plains groups, wood was substituted in the Central and Southern Plains. The senior author, however, has observed a saddle of this type with antler used for the pommel and cantle in the Clarendon Museum in Clarendon, Texas. Also, an elk horn pommel and cantle attributed to mid-nineteenth century Comanche are in the Museum of the Great Plains collections in Lawton, Oklahoma (artifact numbers 61.119.4a and 4b; Joe S. Hays, personal communication, 1994).

The Canyon Creek Cave saddles were identical in construction to the Cheyenne saddle except that wood was used rather than antler. The types of woods (mesquite and cottonwood) would also place their manufacture in the Southern Plains. The prairie chicken snare saddles were all-purpose saddles used for riding and as pack saddles. The prairie chicken snare saddles also help to date this burial to the mid-nineteenth century (1825-1875). Excellent examples of women's saddles and a prairie chicken snare saddle are in the Panhandle Plains Historical Museum in Canyon, Texas.

Word and Fox (1975) list horse gear, second to glass beads, as the most common items found with historic Southern Plains Indian burials. Saddles, bits, bridles, and bridle trappings have been found singularly or together.

The inclusion of saddles as grave items was a known practice of the Comanche (Jackson 1972; Yarrow 1881); however, the trait was also well known among other Southern Plains groups, and thus does not provide a reliable means of identifying the tribal affiliation of any particular burial.

Adult-size prairie chicken snare saddles were found with adult males at the Merrell and Owens sites in Floyd County, Texas (Anna J. Taylor, personal communication, 1988; Tunnell 1984). These saddles constitute the only other examples of the prairie chicken snare saddle currently known from the archeological record.

Saddles of either Mexican or western American style with prominent rounded horns have been recovered from several nineteenth century Southern Plains burials. The nomenclature for these kinds of saddles varies according to the source. A "Santa Fe" style Spanish saddle was associated with the adult male burial from the Cogdell site in Floyd County (Word and Fox 1975). A saddle, identified by Word and Fox as a probable "Santa Fe" style saddle, was found with the White site burial in Yoakum County (Suhm 1962); another possible "Santa Fe" or western style saddle was found with the Jared site burial (Jackson 1972).

Utensil

Wooden Ladle or Drinking Vessel (Figure 11)

This artifact is of cottonwood or a similar species. The general shape of the ladle is oval and the handle is broken. The bottom of the cup is badly decayed from packrat urine. A hole was drilled into the handle at its juncture with the body. This hole is 0.7 cm in diameter. A small portion of the end of the handle is still present and the estimated handle length is 3.5 cm. Dimensions: Length, 22.5 cm; width, 12.6 cm; depth, 6 cm; thickness is highly variable.

Wooden utensils were not uncommon among the various Plains horse nomads. Markoe et al. (1986:115, 164) illustrate two examples of wooden containers identified as Sioux and Yanktonai Dakota, respectively.

Beaded Leather Pouch

A small beaded leather pouch was recovered from the upper chest area. The object appeared as a mass of beads covering and partially adhering to, two or more layers of very decomposed leather. Because of its deteriorated condition, it was not possible to determine if the leather was native-tanned. The interior side of the leather was dyed red.

The majority of the beads in the collection, except for the blue and white beads found along the left side of the body and the white beads around the head, came from this pouch. The specific bead pattern was not discernible, although a partial pattern was preserved that consisted of a block of red beads against a block of white beads. Partial patterns also can be seen in the X-ray photograph (Figure 12). The outer surface decoration included eight hair pipe beads and larger glass beads. The pouch was fringed with strings of beads; small iron tinklers tipped the ends of each fringe.

A small mass of a brown organic substance was between the layers of leather, presumably the contents of the pouch. Microscopically, this substance has the powdered consistency of snuff with small (ca. 1 mm) pieces of leafy

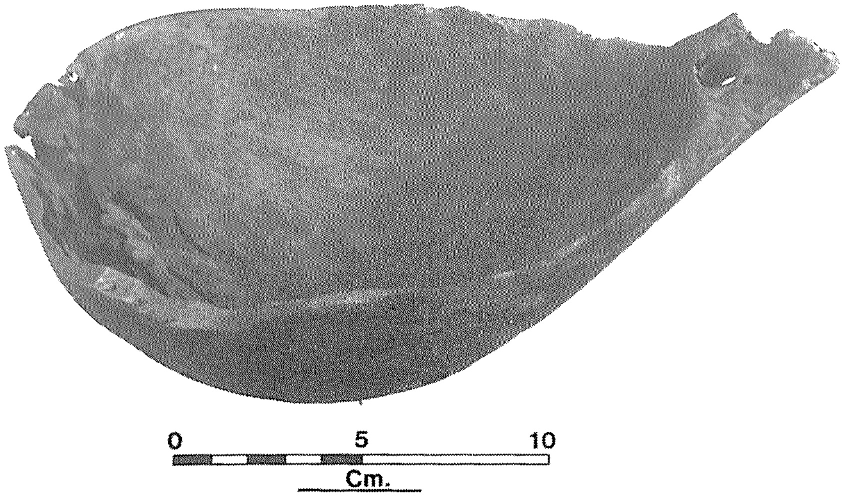


Figure 11. Wooden ladle.

structure. Samples of this material were collected for positive identification, although superficially the substance appears to be tobacco.

Discussion

An undecorated leather pouch, similar to that from Canyon Creek, was found at the White site that contained vermillion (Suhm 1962). Beaded pouches were common accoutrements carried by the nineteenth century Plains Indians, and were used to carry tobacco, medicines, strike-a-lights, and paint. Numerous examples of "tobacco," "medicine," or strike-a-light pouches are present in the ethnographic collections at the Panhandle Plains Historical Museum at Canyon, Texas. Figure 13 illustrates two of these ethnographic specimens from the Panhandle Plains Historical Museum collected in the late nineteenth century; one (see Figure 13A) was identified as Plains Apache. We cannot be certain that the Figure 13 examples are in fact pre-reservation specimens. In the latter part of the nineteenth century, Fort Sill Apaches (including Chiricahua) made such bags for Anglo-American traders (Joe S. Hays, personal communication, 1994). Hays feels that many of the bags labeled as "ethnographic specimens" in various museums today were produced by the Fort Sill Apaches. The bags from the Panhandle Plains Historical Museum are illustrated here simply to give the reader a general idea of the likely appearance of the Canyon Creek specimen.

A similar pouch (probably Dakota) is illustrated by Markoe et al. (1986:152). Will Soule photographed Comanche adorned with similar pouches (Belous and Weinstein 1969:105, 109).

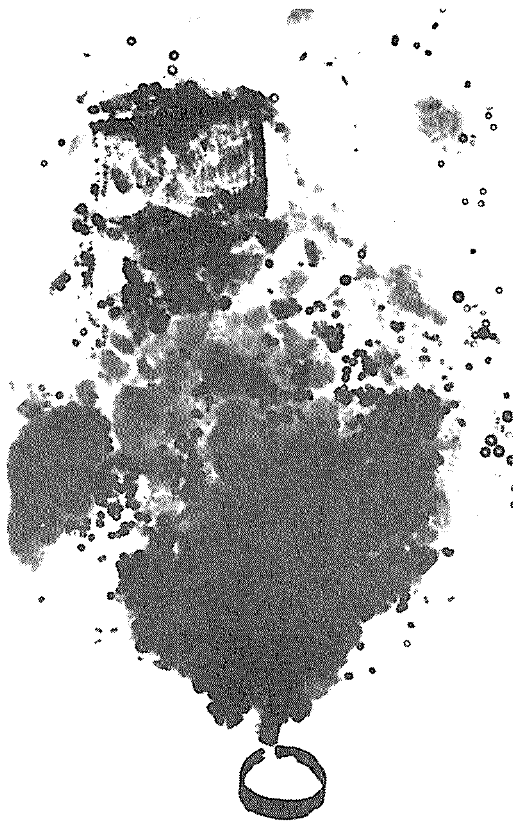


Figure 12. X-ray photograph of remnants of beaded leather pouch. Note mass of iron tinklers just above the ring.

Shell and Glass Beads

Tubular Shell Beads (N=8; Figure 14A)

Although the specimens have suffered from slight weathering, some retain traces of a high polish. Three of the eight specimens appear to be full length hair pipes, while five appear to be either reworked fragments or shorter examples.

Length of the full-sized specimens ranges from 4.6-5.5 cm. Outside diameters range from 0.69-0.8 cm. Inside diameter averages 0.2 cm. The length of the five short specimens ranges from 1.1-1.6 cm. Outside diameter ranges from 0.7-0.78 cm. Inside diameter also averages 0.2 cm. A remnant of a red string was found inside one of the larger hair pipes.

These specimens compare in both dimensions and appearance to similar artifacts from the White site (Suhm 1962:92-93). A breast plate made of hair

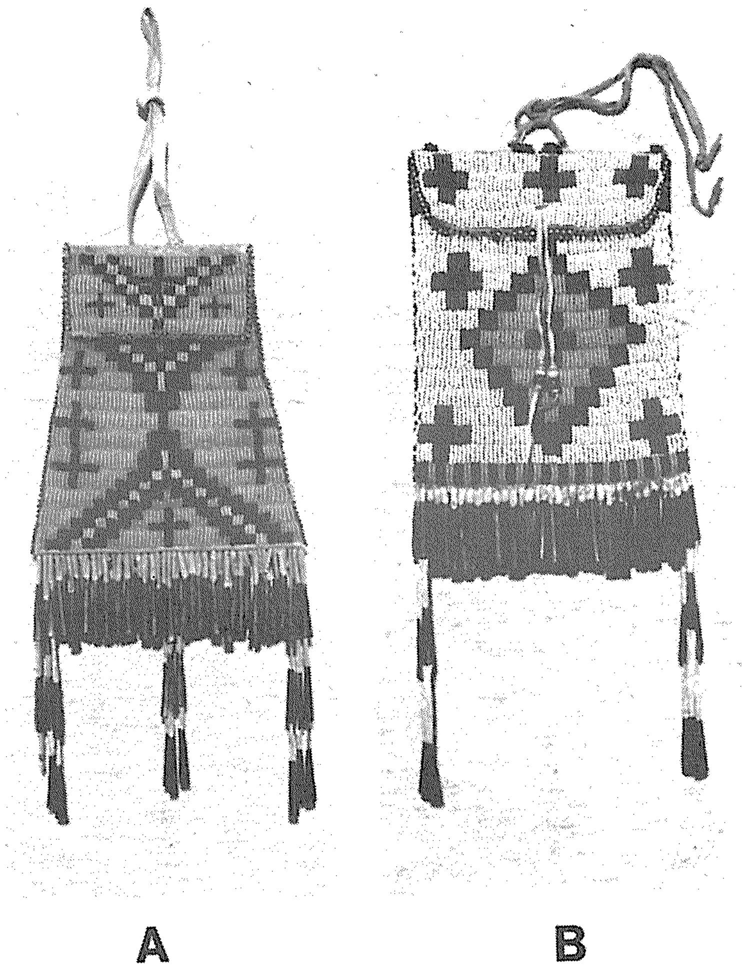


Figure 13. Two late Southern Plains Indian beaded leather pouches for tobacco and/or strike-a-lights: A, beaded pouch, ethnic identity unknown (length, 15.2 cm; width, 11.4 cm); B, Plains Apache beaded pouch (length, 14.0 cm; maximum width, 12.7 cm; width at top, 8.2 cm). Note the use of iron or silver tinklers on fringe of both specimens. Photographs courtesy of the Panhandle Plains Historical Museum.

pipe beads was recovered from the Yellowhouse Canyon Burial (Newcomb 1955); three hair pipe beads were associated with the Cogdell burial (Word and Fox 1975).

These shell beads or "hair pipes" were probably manufactured from the lip of *Strombus gigas* (cf. Ewers 1957:42). According to Ewers (1957:42), the manufacture of these artifacts began between 1776 and 1798. Manufacture was

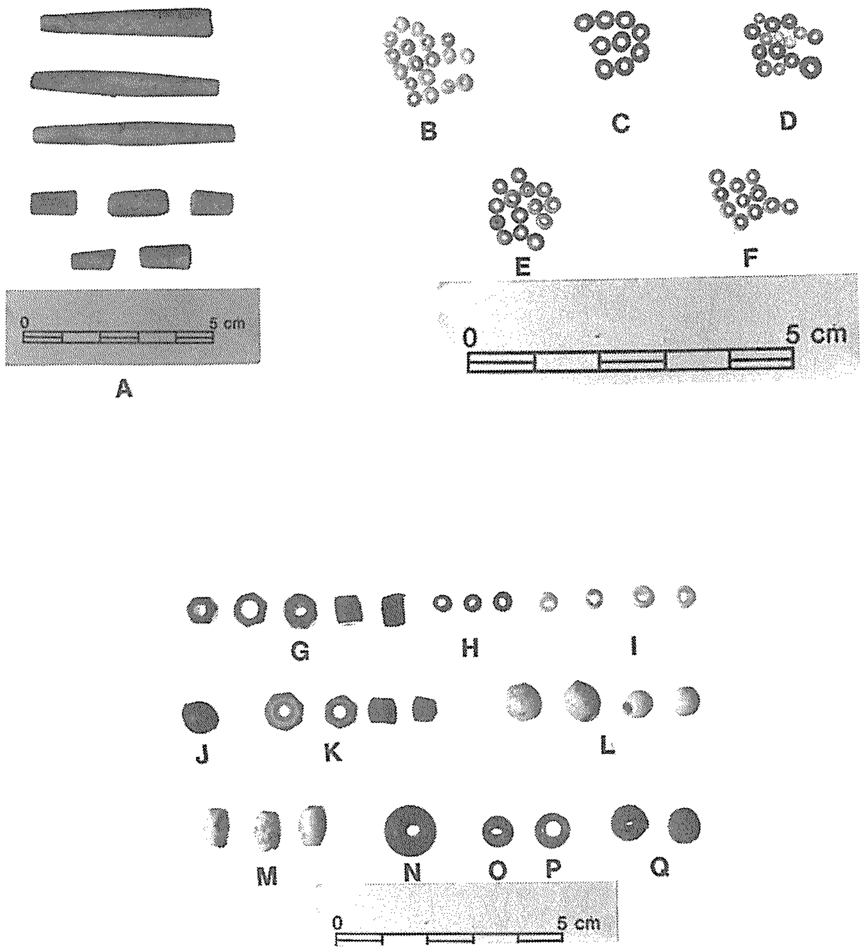


Figure 14. Shell beads and glass beads: A, tubular shell beads; B-Q, examples of glass beads. B, IVa13; C, D, IIa59; E, IVa9; F, IIa41; G, If1; H, IIa7; I, IIa14; J, WIb; K, IIIf2; L, WIb2; M, WIcl; N, WId; O, WIc11; P, WId; Q, unidentified green glass beads.

dominated by the family and descendants of William Campbell of Pascack (Park Ridge), Bergen County, New Jersey. Ewers (1957:74) states that the distribution of these artifacts to Plains Indians by U.S. Government agencies occurred prior to 1850. Shell hair pipes are also listed among the items traded to the Indians by the U. S. sponsored Indian trading factories (Peake 1954:45-81). The widespread use of these ornaments in breastplates followed their mechanized production in 1850.

Glass Beads (N=2500+)

The identification and classification of the glass beads associated with the burial follows that developed by Kidd and Kidd (1970). Although previous studies of beads from Historic Native American sites in Texas have used the bead classification developed by R. K. Harris and others, and systemized by Harris and Harris (1967) (for example, Suhm 1962; Word and Fox 1975; Harris et al. 1993), we chose to use Kidd and Kidd (1970) since it is a more recent study and provides more specific information on nineteenth century bead types. This classification system is based upon manufacture methods and physical attributes of the beads.

Prior to classification, all beads were separated according to manufacture. Two basic methods of manufacture were noted among the beads: tubular or drawn and wire wound (cf. Kidd and Kidd 1970; Harris and Harris 1967:134-138). Tubular beads are mass-produced whereas wire wound beads are individually hand-crafted.

The analyzed bead sample consists of those specimens found within the loose fill of the burial and during water screening of the burial fill (Table 1). An unknown number not included in this sample remain attached to a small beaded pouch (see Figure 12).

Tubular or Drawn Beads

If1 (N=7) (Figure 14G)

There are six blue beads and one black bead of this type. These are monochrome tubular beads whose surfaces have been faceted by grinding. The ends were broken irregularly and smoothed slightly. The blue beads were manufactured from clear glass while the black specimen is of an opaque glass. The beads are hexagonal in shape and range in size from 5.8-8 mm in diameter. The diameter of the hole ranges from about 1-3 mm.

IIa7 (N=4) (Figure 14H)

These are black beads; an opaque glass was used in the manufacture of these specimens. Bead diameter ranges from 4.4-4.9 mm, and hole diameters are about 1 mm.

IIa14 (N=1796) (Figure 14I)

This type is a white circular bead made from an opaque glass. There are two general sizes of this bead represented. The smallest size is represented by 1781 specimens. Bead diameter for this size ranges from 2.3-3 mm, and their

Table 1.

Glass Bead Attributes

Type	Shape*	Color	Technique	Exterior**	Interior**	Total	Percent
If1	F	Blue	Drawn	5.8-8.0	1.3	6	0.24
If1	F	Black	Drawn	5.8	1.3	1	0.04
IIa7	C	Black	Drawn	4.4-4.9	1.0	4	0.16
IIa14	C	White	Drawn	2.3-3.0	<1.0-1.0	1781	71.26
IIa14	C	White	Drawn	5.0-5.5	1.0-2.0	15	0.60
IIa41	C	Robin Egg Blue	Drawn	3.0-3.7	1.0	123	4.92
IIa59	C	Rose Wine Red	Drawn	2.0-4.0	<1.0-1.0	364	14.56
IIIf2	F	Blue/ Blue	Drawn	6.0-9.0	1.5-2.0	17	0.68
IVa9	C	Red/ White	Drawn	3.0	<1.0	101	4.04
IVa13	C	White/ Gray	Drawn	2.0-3.0	<1.0-1.0	44	1.76
WIb	R	Red	Wound	7.5	1.5	1	0.04
WIb2	R	White	Wound	6.0-7.0	1.5-2.0	13	0.52
WIb2	R	White	Wound	8.0-9.0	2.0	14	0.56
WIc1	O	White	Wound	6.0-7.0	1.5-2.0	10	0.40
WIc11	O	Ultra-marine Blue	Wound	7.4	1.5	1	0.04
WId	C	Robin Egg Blue	Wound	12.0	2.0	1	0.04
WId	C	Robin Egg Blue	Wound	8.5	2.0	1	0.04
UID	R	Green	Unknown	7.5-8.6	2.0	2	0.08

*F=faceted; C=circular; R=round; O=oval

** In mm

hole diameter is approximately 1 mm. The larger size group is represented by 15 specimens. Bead diameter for this group ranges from 5-5.5 mm and hole diameter ranges from 1-2 mm.

IIa41 (N=123) (Figure 14F)

This is a robin's egg blue circular bead type manufactured from an opaque glass. Bead diameter ranges from 3-3.7 mm and the hole diameter is 1 mm.

IIa59 (N=364) (Figure 14C, D)

Rose wine red is the color of this circular bead type; a clear glass was used in bead manufacture. Size variation is greatest among this group of circular beads than for any other bead group, as bead diameter ranges from 2-4 mm, and hole diameters are about 1 mm.

IIIf2 (N=17) (Figure 14K)

This type is a bichrome tubular bead that has had the surface facetted by grinding. The general appearance of this type is the same as that for type If1, the only difference being the use of two glass colors. The body of this type has a light blue or ultramarine color and was manufactured of clear glass. The core is a light aqua blue of translucent glass. The beads are hexagonal in shape and diameters range from 6-9 mm, with hole diameters from 1.5-2 mm.

IVa9 (N=101) (Figure 14E)

This is a bichrome circular bead type with a scarlet red exterior of clear glass and a white core of opaque glass. Bead diameters are 3 mm and hole diameters are about 1 mm.

IVa13 (N=44) (Figure 14B)

This is also a bichrome circular bead type with a white exterior of white translucent glass and a gray core of clear glass. Bead diameters range from 2-3 mm, and hole diameters range from less than 1 mm to 1 mm.

Wire-Wound Beads

WIb (N=1) (Figure 14J)

This is a clear, dark red, glass bead. The ends of this bead are slightly collared as a result of the manufacture process of winding glass upon a wire.

Bead diameter is 7.5 mm, and it has a hole diameter of 1.5 mm.

WIb2 (N=27) (Figure 14L)

This monochrome round bead type is represented by two basic size categories. The smallest group (N=13) is manufactured from an opaque white glass. Bead diameters range from 6-7 mm, and hole diameters range from 1.5-2 mm. The larger group (N=14) is also manufactured from a white colored glass. In two specimens, a translucent white glass was used; in all others a white opaque glass was used in manufacture. Bead diameter ranges are from 8-9 mm, with hole diameters of 2 mm. The ends of most of the beads are collared from the manufacture process but most of them have been reduced by grinding.

WIc1 (N=10) (Figure 14M)

This is a monochrome oval bead type manufactured from an opaque white glass. Bead diameter ranges are from 6-7 mm, and hole diameters range from 1.5-2 mm. The ends of these beads have been ground smooth and no collars are evident.

WIc11 (N=1) (Figure 14O)

This is a clear, ultramarine blue bead. It has a bead diameter of 7.4 mm, and a hole diameter of 1.5 mm. This specimen is broken and incomplete on one end. The opposite end is slightly collared but has been ground smooth.

WId (N=2) (Figure 14P)

This is a monochrome donut-shaped bead type. One specimen is manufactured from an opaque robin's egg blue glass. Bead diameter is 12 mm and hole diameter is 2 mm. The ends of this bead have been ground very smooth. The second specimen is manufactured from a clear, ultramarine blue glass. The ends of this bead are not as highly ground as the larger specimen. Bead diameter is 8.5 mm and hole diameter is 2 mm.

Miscellaneous Unidentified Beads (N=2) (Figure 14Q)

These specimens are round beads manufactured from a clear green glass. Both specimens are highly flawed by numerous internal fractures as if they had been subjected to decrepitation from heat or weathering. None of the other bead types exhibit this feature. These beads are very well shaped but could not be identified as being either the drawn or wire wound variety. Bead diameter ranges are from 7.5-8.6 mm, and hole diameters are 2 mm. One of the two beads is slightly collared at the ends.

Discussion

Glass trade beads are the most frequent item found in Historic Native American sites. The use of glass beads among Native Americans was predominately to embellish clothing, and items carried such as small pouches, parfleches, quivers, and body ornamentation. The manufacture and distribution of glass trade beads is well documented. Orchard (1929), Ewers (1957), Woodward (1965), and Schieber (1994) provide references to the study of glass beads in the Plains, while Duffield and Jelks (1961), Harris and Harris (1967), Word and Fox (1975), and Harris et al. (1993) are relevant glass bead studies from Texas sites.

In a recent analysis of the glass bead assemblage from the Pitchfork Rockshelter site (48PA42) in northwestern Wyoming, Schieber (1994) provides convincing evidence of the utility of beads as chronological indicators in historic Plains Indian burial sites. Pitchfork Rockshelter is a probable early nineteenth century Crow Indian double burial. The bead assemblage consisted of over 1,000 small tubular or drawn pony beads. There were also 21 monochrome necklace beads (Schieber 1994:37-38). Detailed measurements and statistical analysis of all complete beads (n=1034) has provided useful data that can be effectively drawn on to assess other Plains Indian burials with substantial bead assemblages. The Canyon Creek burial, with its large bead assemblage, provides an excellent comparative data set. Even though the level of detail in analysis differs between Canyon Creek and Pitchfork Rockshelter, it is felt that significant statements can be developed regarding the temporal span of the Canyon Creek bead assemblage from Schieber's (1994) information.

Schieber (1994:38) briefly discusses the "pony bead period" from about 1800 to 1840-1850 as a time when there was a distinct preference among native groups on the Northern Plains for larger embroidery or pony beads for design work. These beads are characterized by outside diameters of 3.0-5.0 mm. In the middle of the nineteenth century, there was a shift in preference for the smaller seed beads with outside diameters of 2.0 mm or less.

The more significant characteristics of the bead assemblage from Pitchfork Rockshelter include: a limited color range; larger bead sizes (interior and exterior diameters); and the presence of large monochrome necklace beads without polychrome bodies. The latter have been observed in Plains Indian burials dating after 1840-1850 (Schieber 1994:40). There was also a greater recorded variability in the dimensions of the various bead types.

The bead data from Canyon Creek can be compared to these temporal indicators to establish a general bead chronology for the site. Table 1 presents the bead data from Canyon Creek for comparison with Pitchfork Rockshelter and other Historic Indian assemblages.

Schieber (1994) reported that color variation among the small embroidery or pony beads at Pitchfork Rockshelter was limited to four main bead colors: white (67 percent), turquoise (21 percent), red with white centers (8 percent), and black (4 percent). The total number of pony beads in the analyzed sample at Canyon Creek is 2445 (97.8 percent of the total bead sample). Colors represented among the pony beads from the site include white (73.2 percent), red (14.9 percent), blue (5 percent), red with white centers (4.1 percent), and black (0.2 percent). All of these are drawn beads.

The larger wire-wound beads (n=41) correspond to Schieber's (1994:38-40) description of large monochrome necklace beads. This category represents only 1.6 percent of the Canyon Creek bead sample, with white beads predominant. Ultramarine blue and robin's egg blue beads were apparently used for contrast. Large monochrome necklace beads at Pitchfork Rockshelter represented about 2.1 percent of the assemblage.

Conclusions regarding the Canyon Creek beads are similar to those of Pitchfork Rockshelter, and can be summarized by the following: (1) there is a predominance of pony bead sizes with exterior diameters between 3.0-5.0 mm; (2) color variation is limited; (3) there is a range of variability in the sizes of the pony beads (see Table 1); and (4) large monochrome necklace beads are present to the exclusion of necklace beads with polychrome bodies. Based on these general similarities with Pitchfork Rockshelter, the Canyon Creek bead assemblage most probably represents the time period from 1800 to 1840-1850.

German Silver Finger Ring (N=1; Figure 15A)

This ring was manufactured from a single strap of German silver that is 5.6 mm in width and 0.9 mm in thickness. The ends of the ring do not meet, but taper towards each other. The interior and exterior of the ring are heavily pitted. Interior diameter is 12.3 mm. The ring was recovered in the proximity of the beaded pouch.

Copper Rings (N=2)

Two small copper rings (adult finger-size) were found in proximity to the child's saddle and stirrup. Unfortunately, these specimens were lost during the process of conservation, and were not available for description or precise measurement. Available information about the specimens indicates they were about 6 mm wide and bent into a circle about 14 mm in diameter.

Copper or Brass Jingle or Shoe Button (N=1; Figure 15B)

The specimen consists of two parts, a globose or spherical front and a disk-shaped back portion. The shank attached to the back is a small oval loop 0.46 cm in diameter, and is of a small gauge wire. No decoration is present on the dorsal surface of the jingle. Dimensions: diameter, 0.98 cm; height, 0 .72 cm.

This specimen compares favorably in size and appearance to similar artifacts from the White site (Suhm 1962:91 and Figure 1j). Shoe buttons commonly were used in the nineteenth century by Southern Plains Indians to adorn clothing, added to the ends of fringes similar to the metal tinklers, tied to the ends of thongs used to string hairpipe breastplates, or were used as components in breastplates (Joe S. Hays, personal communication 1994).

Copper Bead (N=1; Figure 15C)

The copper bead was found near the right hand of the burial. The bead consists of a small rolled rectangle of copper whose edges are not completely flush, resulting in a 0.28 cm gap. Dimensions: length, 0.73 cm; diameter, 0.58 cm; thickness, 0.15 cm.

Cone-shaped Iron Tinklers (N=48)(Figure 15D)

There were 48 whole and fragmentary iron tinklers associated with the small beaded pouch or bag. The condition of all specimens is very poor due to rust. The approximate length of these tinklers is 2 cm. The edges of the tinklers are flush and not overlapping. One specimen has a type WIb2 bead still articulated with the larger end, suggesting that these beads were strung below the iron tinklers on the same strands. There are various types of beads still encrusted onto the surfaces of some of the tinklers but they display no particular pattern.

Discussion

Iron tinklers frequently tip the fringes of beaded items, especially small beaded pouches or bags as can be seen in the specimens illustrated in Figure 13 from the Panhandle Plains Historical Museum. All of the eight pouches examined by the senior author in the Ethnographic Collections at the Panhandle Plains Historical Museum had tinklers tipping the fringe.

Small Brass or Copper Shank Buttons (N=3)

There were three small brass or copper dome-shaped buttons with stamped designs on the exterior surface of the dome. Designs on two buttons are characterized by a series of four stamped floral designs (Figure 15E-F). These designs are single flowers with stem and leaves that encircle the button. One button has a stamped line encircling the dome (Figure 15G). Beyond this line, at the edge of the button, are a series of connected diamonds encircling the

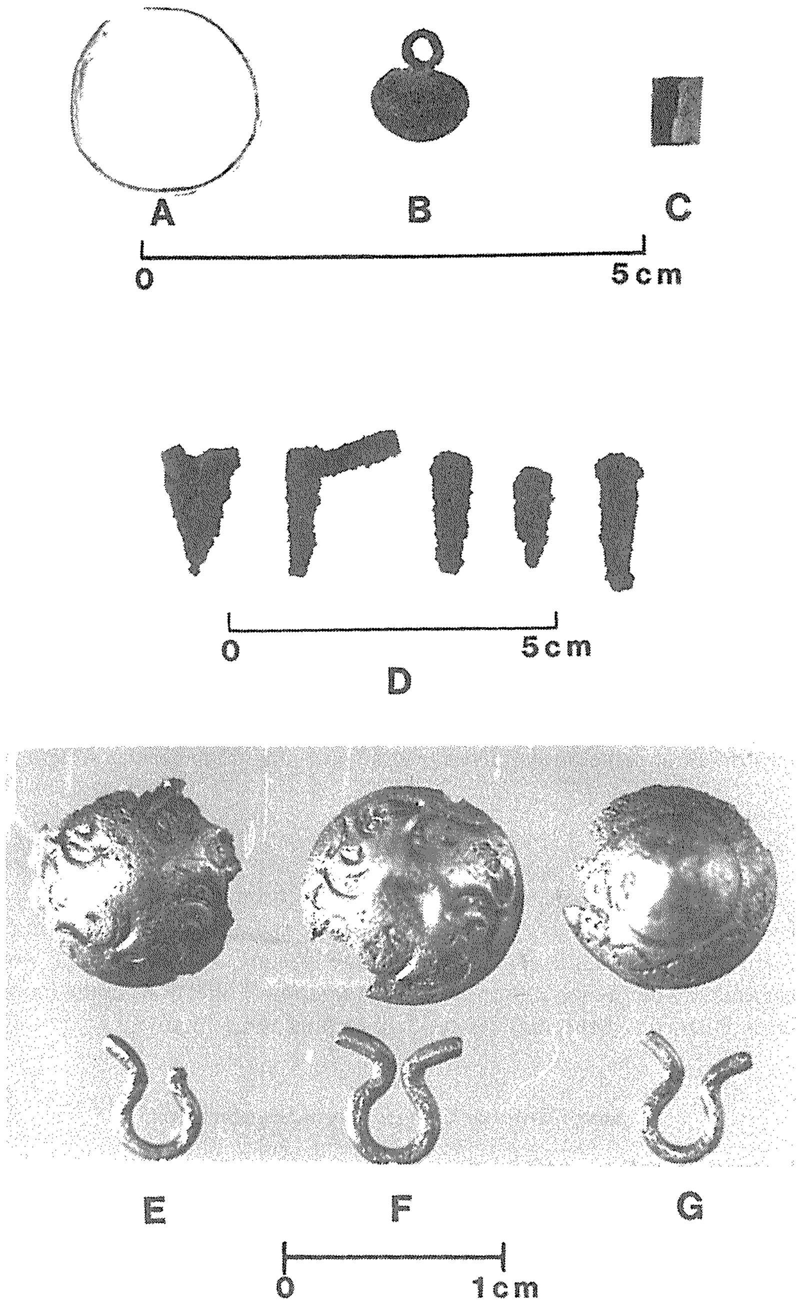


Figure 15. A, silver ring; B, brass jingle; C, rolled copper bead; D, iron tinklers that tipped the fringe on the beaded leather pouch; E-G, copper or brass shank buttons.

button. The button edge is rolled or crimped to create a shoulder. All designs were machine or die stamped.

The buttons are about 10.4 mm in diameter and about 3 mm in height. All shanks are of the same material as the buttons and are of a small gauge wire. They were not attached to the buttons. The three buttons compare closely with Olsen's (1963) type I button. He dates these buttons from 1830 to the present time.

Copper Wire Bracelets (N=23; Figures 16-17)

There were 23 pulled copper wire bracelets with the individual. Five of these had designs filed or chisel-cut into the outer surface (Figure 16B). Roll-out drawings of each decorated bracelet (identified by lot number) are shown in Figure 17. One bracelet has a central zone of *X's* bordered by a zone of deep perpendicular notches (41OC13-18). At the ends of this bracelet a diagonal or zig-zag line has been cut into the surface. Another decorated bracelet has a design at one end characterized only by alternating zones of diagonal cut lines and plain zones (41OC13-11). The design of the third bracelet is composed of alternating zones of perpendicular cut lines and dihedral flat hammered zones (41OC13-14); there are two zones of each. The fourth decorated bracelet has one zone of diagonal cut lines at one end (41OC13-10). The final bracelet has a continuous series of perpendicular filed notches or lines along the entire length (41OC13-9).

There are only three bracelets that do not exhibit evidence of cold hammering to flatten the round cross-section of the wire; none of these are decorated. The interior diameter of twenty-one complete bracelets ranges from 46.4 mm to 60 mm with an average of 56.5 mm. Wire diameters vary from 2.02 to 3.22 mm (Table 2).

Discussion

Word and Fox (1975) list copper bracelets behind horse gear as the third most common item of inclusion in Historic Plains Indian burials in Texas. Copper bracelets were standard dress items among the females in the latter half of the nineteenth century, as can be seen in Will Soule's 1868-1874 photographs of the Wichita, Comanche, Kiowa, Kiowa Apache, Cheyenne, and other Southern Plains groups (Belous and Weinstein 1969). The degree to which men and children were ornamented with these items is difficult to tell, but six were decorating the hair of the Cogdell site burial (Word and Fox 1975). If bracelets were used as hair ornaments only in males, then the single bracelet about the head of the Canyon Creek child may provide further confirmation to Owlsey's skeletal observations that it was a male. However, the use of copper wire bracelets for the sexual identification of nineteenth century Southern

Table 2.

Dimensions of Copper Bracelets

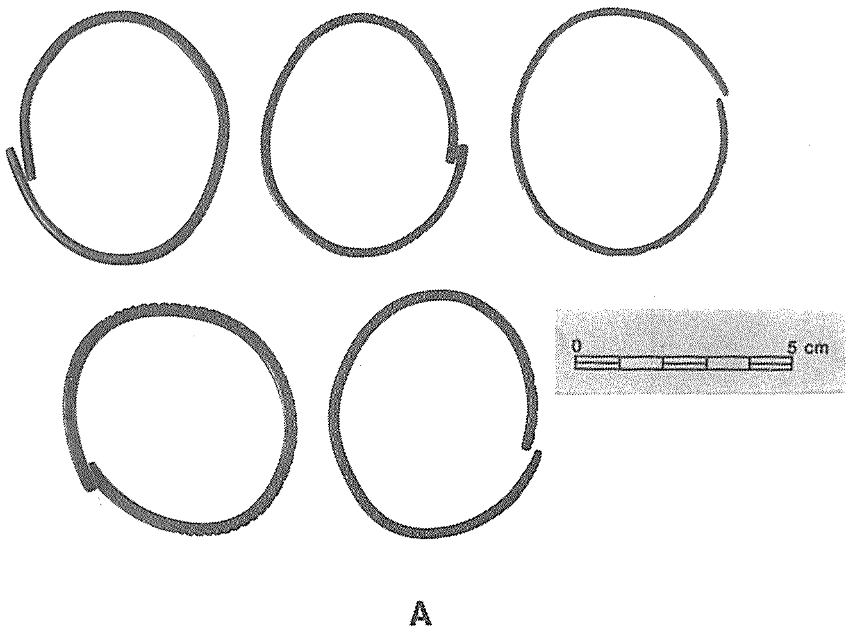
No.	Flattened	Width	Thickness	Diameter
1	yes	3.60-3.70	3.41-3.48	
2	yes	3.30-3.38	2.64-2.80	
3	yes	3.25	2.66-3.02	
4	yes	3.40-3.57	2.76-3.13	
5	yes	2.90-3.20	3.38-3.60	
6	no			2.31-3.22
7	yes	3.45-3.65	3.18-3.33	
8	no			2.59-2.73
9	yes	2.44-2.57	2.74-2.85	
10	yes	2.84-3.01	4.03-4.09	
11	yes	2.87-3.01	2.60-2.81	
12	yes	3.67-3.56	2.38-2.71	
13	yes	3.51-3.55	3.13-3.28	
14	yes	2.05-2.38	2.33-2.53	
15	no			2.02-2.18
16	yes	3.52-3.68	2.96-3.17	
17	yes	2.57-3.09	3.10-3.40	
18	yes	3.52-3.68	3.17-2.96	
19	no			2.69-2.88
20	yes	4.22-4.50	3.50-3.71	
21	yes	3.69-4.05	2.82-3.33	
22	yes	4.10-4.48	3.38-3.75	
23	no			2.57-2.98

NOTE: Measurements in mm.

Plains Indian burials is certainly inconclusive (Table 3), although the sample is admittedly small.

DATING THE CANYON CREEK SITE BURIAL

The time of burial was about 1830-1850 based on the associated artifacts. First, the native-made prairie chicken snare saddle is a style that was in vogue about the mid-nineteenth century according to Ewers (1980:92), and Berlandier (1969) documents Comanche use of this saddle type shortly after 1825. Second, the brass buttons are of a style that dates after 1830 (Olsen 1963). Third, the shell hair pipe beads are also consistent with an 1830s date. Finally, the



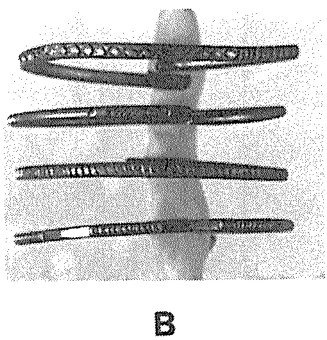


Figure 16. A, copper wire bracelets; B, decorated copper wire bracelets.

predominance of 3.0-5.0 mm diameter pony beads with a limited range of colors, and the absence of seed beads less than 2.0 mm in diameter, dates the burial from about 1800 to ca. 1840-1850. Given this information, and the fact that horse nomads were all removed to reservations by 1875, the favored date range for the Canyon Creek burial is from about 1830 to 1850.

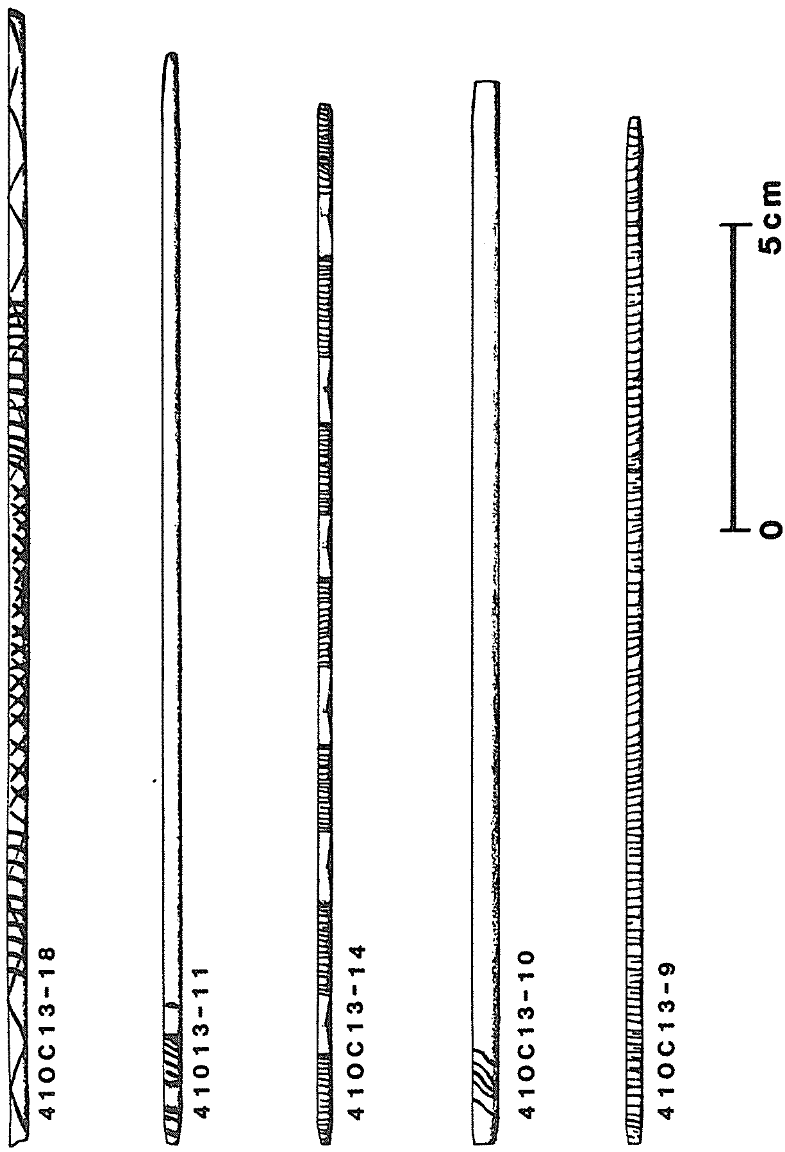


Figure 17. Roll-out designs on decorated copper wire bracelets.

Table 3.

Distribution of Copper-wire Bracelets in Southern Plains Burials

Site/Source	Sex/Age	No. of Bracelets
Canyon Creek (this paper)	Male?/Child	23
White (Suhm 1962)	?/Child	70
W. H. Owens (Tunnell 1984)	Female?/Child	260+
Yellowhouse Canyon (Newcomb 1955)	Male/Adult	0
Long Hollow (Taylor 1975)	Male/Adult	0
Cogdell (Word and Fox 1975)	Male/Adult	6
Morgan Jones (Parsons 1967)	Female/Adolescent	0
W. H. Watson (Ray and Jelks 1964)	Female/Adult	16

TRIBAL IDENTITY

Despite the tribal diversity among the Indians of the Southern Plains in the nineteenth century, the equestrian nomadism structured around buffalo hunting, raiding, and trading, resulted in the adoption of a common material culture. Efforts to define tribal identity on the basis of associated artifacts, dates for the burials, and locations have not been successful (Word and Fox 1975). One simply cannot be sure on the basis of associated artifacts. Such items as horse trappings (saddles, bits, and ornamentation), personal items (beads, buttons, tinklers, pendants, breastplates, copper bracelets, copper and silver rings, among others), implements (hoes, knives, and mirrors), weapons (guns, lances, and bows) were all essentially the same since they were derived from the same Spanish, French, and Anglo- American sources.

The inclusion of saddles as grave items was a known practice among the Comanche (Yarrow 1881; Jackson 1972). However, the trait was also well known among other Southern Plains groups, and thus saddle remains do not provide a reliable means of identifying the tribal affiliation of any particular burial.

Although specific groups ranged in loosely recognized geographic areas, these could hardly be defined as territories in the anthropological sense. The mobility made possible by the horses carried groups of raiders hundreds of miles from their residential locale (Campbell and Field 1968). Treaties between the Comanche and Wichita in the 1740s, and between the Comanche, Kiowa, and Kiowa Apache in 1790, allowed for mixed parties and common sharing of territorial ranges and resources after that time (Newcomb and Field 1967).

The location of the Canyon Creek site is in the general area of the Kiowa and Kiowa-Apache hunting range in the early and mid-nineteenth century. According to Wallace and Hoebel (1952:7), this area was also the domain of the Comanche. Newcomb (1961:Map 3), however, places the Kiowa and Kiowa Apache in the northern Texas Panhandle in the nineteenth century. Based on the general lack of success in assigning confident tribal identity to Historic Southern Plains Indian burials, we feel that it is more fruitful to examine the collective process of assimilation and change for these cultures using the burial complex as a means of documenting this process. For that reason, we prefer using the term equestrian nomads for the archeological remains of these various groups.

SOUTHERN PLAINS EQUESTRIAN NOMAD ARCHEOLOGICAL COMPLEX

The geographic distribution of the Southern Plains Equestrian Nomad Archeological Complex is based on the known distribution of isolated nineteenth century burials with equestrian accoutrements (see Figure 1). The range includes the Southern High Plains and the adjacent prairies to the east.

In comparing the Canyon Creek material assemblage with those documented from Historic Plains Indian burials (Word and Fox 1975), there is a notable similarity in the associated material culture. A comparative list is shown in Figure 18 (adapted after Word and Fox [1975] and Olive [1990]). Specific groups had ways of expressing their identity through material expression (dress, beadwork patterns, etc.), but whatever these stylistic ideosycracies were, they rarely can be identified archeologically.

This Southern Plains Indian material assemblage is clearly structured around equestrian technology and nomadism. It was on the basis of material culture that Wissler (1934) and Kroeber (1963) defined the Plains culture area. The material complex in these Southern Plains burials is distinctive enough to warrant archeological recognition beyond the point of simply determining the age of a burial, or attempting to determine its tribal affiliation. As noted previously, the equestrian nomad sites can also be distinguished from those of the seasonally nomadic horticultural groups such as the Wichita. The archeological assemblages of the latter has already been defined as the Norteño Focus (Duffield and Jelks 1961).

The incorporation of the horse and all of its associated material assemblage had an enormous effect on Plains Indian culture and value systems (Wissler 1914; Mishkin 1940). The horse transformed these cultures from hunter-gatherer band or tribal farming groups to mobile pastoralists with direct means of acquiring wealth and status.

An adaptation to horse nomadism resulted in profound changes in subsistence practices and economic systems, and radically altered warfare, raiding, trading, marriage patterns, and even the kinship system of these Southern Plains groups. Matrilineal agriculturally-oriented groups on the periphery of the Plains became patrilineal or bilateral to accommodate the changes in the economic system brought about by the introduction of the horse (Mishkin 1940:5-23).

Wealth among the Southern Plains Indians was measured by the numbers of horses individuals possessed (Mishkin 1940:5-23). Berlandier (1969:44), for example, stated that the poorest native owned six to eight horses, while the richest had 30 to 40 or more. One Comanche, Big Fall by Tripping, owned 15,000 horses and 300-400 mules. A person's acquired status was defined largely on the number of horses owned; women could own horses also, but they did not have the same freedom to acquire horses as did men.

Bride price was paid with horses (Wallace and Hoebel 1952:134); debts were paid with horses (Wallace and Hoebel 1952:226). Horses became a medium of exchange (Mishkin 1940:22; Wallace and Hoebel 1952:241), and killing another's favored horse was considered murder and treated as such (Wallace and Hoebel 1952:233).

The similarity in material culture was also brought about by the frequent mixing of the various tribal groups. For example, the Wichita and Comanche formed an alliance about 1740; the Kiowa and Comanche became close allies following the marriage of a Kiowa chief, El Roncon, to a Comanche woman (Berlandier 1969:108); the southern Arapaho became closely affiliated with the southern Cheyenne and Comanche in the early nineteenth century.

TRADE

Trade involving Southern Plains horse nomads has been discussed by Word and Fox (1975:52-56). Their discussion centers mainly on the trading relationships of the Comanche, Spanish, and New Mexicans, including the Comancheros. Perhaps the most active traders among the Native Americans of the prairie woodlands and Plains in the later part of the eighteenth and the first three quarters of the nineteenth century were Anglo-American traders.

Reference							Suhm 1962	Ray & Jelks 1964	Newcomb 1955	Parsons 1967		Word & Fox, 1975
Sites	Child	Collinsworth	Dean	McKaskle	Biddy	Caprock	White	Watson	Yellowhouse	Morgan Jones	Dawson	Cogdell
Position	Flexed	Unk	Flexed	Extended	Unk	Flexed	Unk	Extended	Flexed	Flexed	Extended	Extended
Place	Open	Niche	Open	Niche	Niche	Niche	Open	Niche	Niche	Niche	Niche	Niche
Burial Goods												
Horse Gear												
Bracelets												
Glass Beads												
Fabrics												
European Tools												
Indian Artifacts												
Finger Rings												
Conchas												
Hair Pipes												
Knives												
Food Offerings												
Leather Garments												
European Utensils												
Tinklers												
Buttons												
Bells												
Pigment												
Body Wrapped												
Shell Pendants												
Mirror												
Barrel-Keg												
Perf. claw-teeth												
Musical Instruments												
European Weapons												
Ceremonial Fire												
Metal Pendants												
Pipe												
Hair Ornament												

Figure 18. Associated Artifacts with Nineteenth Century Southern Plains equestrian nomad sites (adapted from Word and Fox 1975 and Olive 1990).

Reference	Bennett 1968	Woolsey 1936	Pearson 1978	Taylor 1975	Moorman & Jelks n.d.	Hughes & Willey 1978	This paper	Jackson 1972
Site	Bear Lamesa	"Graves"	Rabbit Hill	Long Hollow	41FP8	Sand Pit	Canyon Creek	Jared
Position	Extended	Unknown		Unknown		No Burial	Flexed	Flexed
Place	Niche	Niche		Unknown			Cave	Crevice/Niche
Burial Goods								
Horse Gear	■			■	■		■	■
Bracelets	■		■		■		■	■
Glass Beads		■	■		■	■	■	■
Fabrics							■	
European Tools	■			■				
Indian Artifacts	■	■		■		■	■	
Finger Rings							■	
Conchas			■	■				■
Hair Pipes			■				■	■
Metal Knives	■			■		■		
Food Offerings				■				
Leather Garments			■	■				
European Utensils	■			■		■		■
Tinklers						■	■	
Buttons					■		■	
Bells								
Pigment				■				
Body Wrapped							■	
Shell Pendants			■			■		
Mirror								
Barrel-Keg				■				
Perf.Claws/Teeth					■			
Musical Instruments								
European Weapons				■				
Ceremonial Fire								
Metal Pendants				■				
Pipe				■				
Hair Ornament			■				■	

Figure 18. Associated Artifacts with Nineteenth Century Southern Plains equestrian nomad sites (adapted from Word and Fox 1975 and Olive 1990).

Mutual trading between nomadic bison hunters and sedentary groups on both sides of the High Plains, which extended well back into prehistoric times, helped to set the stage for the evolution of the Southern Plains horse nomad complex (Baugh 1991; Creel 1991). Mutualism, as defined by Spielmann (1991:5), is "the exchange of material items or services to the benefit of all participants in the interaction." Spielmann (1991) goes on to say that such relationships create interdependence among the participating groups with regard to the goods and services each provides the other.

In the prehistoric Southern Plains, mutualism involved the trade of bison hides and meat to the Southwestern pueblos in exchange for agricultural products and less important material items such as pottery, cotton cloth, obsidian, and turquoise (Creel 1991); similar exchanges went eastward via the Plains Caddoan people. The adaptation to the Southern Plains ecology by Apache and Comanche groups was much the same with regards to resources used, and in relationships with the Pueblo people. The differences in extent of trade may have been defined by the degrees of mobility. Mutual trade between the pueblos and Apache, Comanche, and Plains groups continued, and indeed may have increased over that of the prehistoric groups. Apaches, and later Comanches, became extensively involved in trade first with the pueblos, and then later with the New Mexican Spanish/Mexican settlements (Levine 1991).

The material culture of these plains Indians was structured around the horse and designed for mobility. Because the Indians had a beast of burden larger than the dog, the amounts of material accumulations increased. So too was their ability to amass items within their enlarged sphere of exchange. Trade items provided by the Southern Plains Indians were animal hides (bison, deer, and antelope), smoked and dried meat, tallow, horses, and slaves for the Spanish. These commodities were highly sought by the Spanish, French, and Anglo-American traders, and formal trading industries were established by each to obtain these resources from the Native Americans (Peake 1954).

Hide traders had ventured out from the European settlements in Louisiana since the early eighteenth century, and trading fairs were established at French and Spanish settlements. Licensed American traders such as Philip Nolan and Anthony Glass trespassed into Texas territory in the late eighteenth-early nineteenth century to trade among the Wichita and Comanches for horses and hides (Flores 1985).

In exchange, the American traders supplied the Indians with: knives, hardware — wire, files, copper pails, weapons, powder, ammunition, alcohol, brown sugar, tobacco, hatchets, combs, corn, sword blades (for use as lance tips), cloth, cinnabar, glass beads, trinkets, and mirrors. These French, Spanish, and Anglo-American traders worked mostly among the Caddo and Wichita, but Comanche, Kiowa, and other groups were included in these frontier trading fairs and expeditions (Berlandier 1969:47-48; Flores 1985:30).

The U. S. Government established approximately 30 trading factories for the Indians from 1795-1822 (Peake 1954:1-25). Factories in close proximity to the Southern Plains who furnished licensed traders included: Natchitoches, Bayou Pierre, Sulphur Fork (all along the Red River), Arkansas Post, and Spadra Bayou (along the Arkansas), Marias de Cygne in western Missouri, and Fort Osage, Arrow Rock, and Belle Fontane on the Missouri River (see Figure 1). These trading factories furnished such items as: guns, whiskey, cloth, thread, blankets, jewelry, silver, brass rings, wire, plumes and ostrich feathers, rouge, vermilion, looking-glasses, brass kettles and pots, knives, pieces of copper and brass, tin pans, tin cups, jugs, crockery, glasses, mugs, forks, spoons, candle molds, bullet molds, bellows, sugar, salt, flour, raisins, tea, coffee, even spices which were used as otter and beaver bait, drugs, medicines, spectacles (green-glass spectacles mentioned), tobacco, pipes, tomahawk pipes, wampum of clam and conch shell, broaches, hair pipes, and animal traps, powder, powder horns, gunflints, shot, and blacksmith and carpenter tools. Special order guns and canes were manufactured for gifts to ranking Indians (Peake 1954:45-81).

In addition, a short-lived private trading post, the ruins of which were near the famous Adobe Walls, was established on the Canadian River in the Texas Panhandle by the Bent, St. Vrain and Company about 1840 (Baker and Harrison 1986:13-14). Its purpose was to trade with the Comanche, Kiowa, and Apaches, but it was forced to close due to the hostilities of some of the roving bands. The U. S. Government continued to supply the Comanche and Kiowa reservation groups through Indian Agency commissaries established in Indian Territory after 1869 (Crouch 1978).

SUMMARY

The Canyon Creek burial dates to about 1830-1850, and is identified as belonging to a Southern Plains equestrian nomad culture based on associated artifacts. The child was identified as a Native American about five years old at the time of death, and was probably a male. The skeletal analysis showed no abnormal physical characteristics.

The archeological materials associated with equestrian nomad burials in the Southern Plains constitute a distinctive archeological complex. The complex includes an array of items obtained through European interaction that were utilized as part of the horse pastoralism, and as tools, weapons, embellishments of material items, as well as dress decorations. This material expression is a uniquely Native American adaptation despite the dependence on European sources for the raw materials and manufactured items. Thus far, the archeology of this complex is derived exclusively from mortuary assemblages. Historic Plains Indians burials have been recorded intermittently throughout the Southern High Plains and in western Oklahoma.

Although the sources of material culture and uses of the horse are similar to that of the prairie Caddoan groups such as the Wichita (and previously defined archeologically as the Norteño focus in Texas), there are differences in the overall material expression resulting from different subsistence/settlement patterns between the two groups. For example, pottery, tobacco pipes, agricultural products, storage pits, fixed housing, and formal cemeteries with extended burials—generally oriented east-west with the head to the east (Schmitt 1952)— are found in the Norteño settlements (Bell and Bastian 1967; Duffield and Jelks 1961; Story 1985). These features are either absent or obscure among the highly mobile nomads. When one considers the larger scale economic system that involved the nomadic and seasonally sedentary groups on one hand, and the Europeans (Spanish, French, Mexican, and Anglo-Americans) on the other, the differences between the horse nomads and the Plains village farmers become less clear.

The economic foundation for the mutual trade between the Plains nomads and European traders was established in Late Prehistoric times. The exchange networks involved the pueblos in the Rio Grande Valley with bison hunters of the High Plains. Prairie Caddoan groups also became involved prehistorically with the Plains nomads, and through them, with the pueblo peoples.

The mutual exchange continued throughout the historic period. Formalized trade with the Indians became so important to the U. S. Government that considerable capital was invested in building an economic dependency with both the nomads and village farmers. By the late eighteenth and early nineteenth centuries, this mutualism expanded eastward as the Southern Plains Indians became the major suppliers of horses, hides, and tallow to the U. S. Government trading companies (Peake 1954). The U. S. Government furnished the goods necessary for the continuation, and eventual overexploitation, of the hide and tallow-yielding animals. While generating a market for the trade items, the U. S. and Mexican trade supplies also were directly responsible for creating a unique historic Native American Southern Plains culture that is represented archeologically as the Southern Plains equestrian nomad archeological complex.

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Reviews

New Light on Old Art: Recent Advances in Hunter-Gatherer Rock Art Research, edited by David S. Whitley and Lawrence L. Loendorf. Monograph 36. Institute of Archaeology, University of California, Los Angeles. 1994. 121 pages, figures and plates.

Reviewed by David G. Robinson, Texas Archeological Research Laboratory

The editors of this volume are overly modest. They claim that this collection of papers in UCLA's Institute of Archaeology Monograph series is an attempt to move rock art off the cover and into the book. By this they mean the treatment of rock art as the subject of serious study rather than as, literally, striking cover art for archeological reports within which the rock art receives no further treatment. Instead, these collected papers are an advance in archeological studies and concerns. Technological and theoretical changes have made this possible, in part because rock art is now directly datable by radiocarbon and cation ratio methods. In the arena of theory, the post-processual critique eschews the narrow adaptationalist approaches of the New Archeology and calls for the reintroduction of humanist research interests into archeology. As Earle (pp. vii-viii) puts it in the Preface, "No field offers better opportunities [given the new direct dating possibilities] than the systematic research on rock art."

Rock art studies are well poised to take advantage of these possibilities. With the test cases brought forward in this volume, they are rapidly contributing to the study and understanding of prehistoric ideology and socio-cultural organization, as well as specific issues such as gender studies and the identification and elucidation of shamanic complexes in hunter-gatherer societies. Wisely, the editors have organized the chapters into two parts: the technological analysis of rock art, primarily the new dating techniques; and the advanced cultural and humanistic interpretations of rock art styles.

It is in the technical analysis papers of Part I that *New Light on Old Art* represents a generational advance in rock art studies. The paper by Clottes is a summary which outlines a methodological approach, showing how parietal art can be tied into regional sequences, in this case southwestern France. There, rock art is a full partner in the construction of regional sequences, a happy circumstance not enjoyed by rock art in North America, where it languishes in second-class status. Clottes shows how the prospect of direct radiocarbon dating of the art may exalt it to leadership in refining regional cultural sequences. The chapter by Chaffee et al. is a clear explication of their technique for extracting organic carbon from minute pigment samples and gaining assays by accelerator mass spectrometry. Unlike many methodological contributions, theirs gets down to cases by presenting some of the initial results gained by the technique, from Utah and the Lower Pecos region of Texas. This article should be consulted by anyone contemplating dating rock art in this fashion.

The chapters by Dorn and Francis are related in that they both deal with cation ratio dating of rock art. Dorn's marvelously illustrated article is a compendium of virtually all North American studies of the various rock varnishes, crusts, and patinas which may form over petroglyphs. He goes on to chart all the techniques of age estimation which may be feasible once a coating appears on the art, ranging from relative thickness, to Potassium-Argon, and radiocarbon dating (varnishes cover and entrap organic matter on the rock surface beneath them), in addition to cation ratio dating (the cations of potassium and calcium decrease relative to those of titanium in varnishes over time). Francis' article is a copiously illustrated (although surely Figure 4.13 is a joke) case study of the application of cation ratio dating to a regional art style, and a good example of where one can go interpretively with a rock art sequence, once relative and absolute dates have been established. Her subject art style is the Dinwoody Tradition rock art of northwestern Wyoming, and her chapter is a smooth lead-in to the interpretive articles of Part II.

The interpretive chapters of *New Light on Old Art* commence with Ritter's exhaustive element analysis of scratched rock complexes in western Nevada. He arrives at interpretive conclusions by the testing of alternative hypotheses, ultimately prefering a neuropsychological model, wherein the artworks were executed while in, or depicting, the trance state. The article by Bass is a foray into gender issues in prehistoric art. Her thoughtful study shows how rock art can address current issues in social and critical anthropology, boldly ignoring North American archeology's general reluctance to do the same. Her de-gendering of the Pecos River style art, and the breadth of her conclusions, are puzzling, however. The Red Linear style of the same Lower Pecos region is full of gender representations: images of gender, sex, sexuality, and reproduction are frequent, central, often rampant. Here is the ground for gender studies of Lower Pecos rock art; I sense the beginnings of an overworked data set. Still, I applaud Bass's willingness to engage the big picture. Turpin's article establishes the were-cougar as a motif in Pecos River style art and in the ancient shamanic complex. The importance of the article is in seating the Pecos River style and its practitioners within the global system of shamanism as described ethnographically and ethnohistorically.

The interpretive chapters end with Whitley's and Loendorf's papers; their thorough scholarship efforts are clearly the show pieces of the volume. Whitley applies the neuropsychological model and entoptic phenomena, as expressed in California rock art, to linguistic groupings; the chapter is a virtual analytic *tour de force*. Loendorf's task is largely to show how rock art research can and should be incorporated into the conduct of general archeological analysis. He ranges over North American rock art to demonstrate with several test cases how the depiction and context of rock art can add to analytic findings in other data categories. Rock art can even suggest new research directions when compared to those findings.

Albeit a generational leap, this monograph is not without flaws. If the compendium has taken the next step in rock art research, then the next step after that is crediting one's illustrators. Although exceptionally well illustrated, the volume virtually ignores the researchers who worked to transfer the aboriginal imagery to the publishing format. The general acknowledgments credit Janet Lever, whose tracing became the cover art. Clottes gives gracious accreditations, along with the techniques used (tracings in his case). Otherwise, no credit is given for scores of photographs, drawings, and tracings. Ritter has a photograph (Figure 5.3) of the recording team in action at a site, but he does not name the person responsible for converting the scale drawings into the pen and ink drawings actually published. I found myself wanting to learn more about the CAD diagrams Dorn made from his photomicrographs of rock varnishes. Although credited, Bass's drawings are sketchy. Turpin receives a special note for her thoughtlessness.

This is not a trivial complaint. Noting the photographer, illustrator, and the techniques of recording, gives readers some indication of the integrity of an image in its many transformations and transmissions from the external environment to the published book. Is the imagery accurate? A brief statement about the rock art recording in captions, a la Clottes, is sufficient in most cases to answer this question.

This issue aside, or perhaps because of it, this volume should be read, studied, and enjoyed by as many readers as can order it from UCLA. *New Light on Old Art* in the future will be considered a monument and a milestone of rock art research.

Abandonment of Settlements and Regions: Ethnoarchaeological and Archaeological Approaches, edited by Catherine M. Cameron and Steve A. Tomka. Cambridge University Press, Cambridge. 1993. xv + 201 pp.

Reviewed by G. Lain Ellis, Texas Historical Commission

Catherine Cameron and Steve Tomka have assembled a suite of studies of interest to archeologists who study how people use landscapes. Most of the volume consists of ethnoarcheological and archeological symposium papers describing abandonment behavior. Building on research into site-formation, mobility, and curation (Schiffer and Binford are heavily cited), the contributors individually and collectively demonstrate that "abandonment" is a complex topic. A major strength of the volume is that it presents an array of different but complementary aspects of abandonment. As a result, the volume is a very useful conceptual guide in addition to being a compact resource for empirical observations about abandonment.

The largest part of the book contains ethnoarcheological papers about regional abandonment. As Cameron notes in her introduction, "regional abandonment" refers here to local abandonments occurring within a regional settlement system, and not to regional depopulation. Tomka's paper on Bolivian agro-pastoralists distinguishes between permanent abandonment (leaving a site with no intention to return) and episodic abandonment (planned departure with the intention to return when circumstances permit). With permanent abandonment, assemblages are small and heavily depleted, whereas episodic abandonment results in large assemblages with a wide range of usable goods. As the length of time to reoccupation increases, the site's owners return to retrieve cached goods for use at other locations. This form of delayed curation replenishes the inventory in use at current residences.

Martha Graham's chapter on the Raramuri (Tarahumara) identifies punctuated abandonment as a form of planned departure with anticipated return. The Raramuri are agro-pastoralists who maintain seasonally occupied main, winter, and agricultural residences. The content of the assemblage curated at abandonment depends largely on what already lies cached at the new residence, and on the intention to return. Since most moves involve an intent to return the next season, goods available at the next location are cached so they will be available when the site is reoccupied. When a site is permanently abandoned, all usable items may be curated, including the house itself.

Susan Kent's chapter on the Khutse area of Botswana is a study of Basarwa and Bakgalagadi foragers who seldom establish residences at previously occupied sites. Hence, all abandonments are permanent. The number of artifacts entering a destination site depends on how long the occupants intend to stay, and seems to be unaffected by the actual length of occupancy. The number of bones visible during occupation is relatively small, but increases as people relax their maintenance routines as abandonment nears. Since return is not anticipated, caching is rare, although scavenging at abandoned sites may be common.

Two ethnoarcheological chapters deal only indirectly with the archeological implications of regional abandonment. In comparisons of Kofya and Tiv (Nigeria) and German and Finnish farmers, Glenn Stone argues that cultural attitudes toward agricultural work can lead to highly divergent patterns of occupation and abandonment among groups living in the same environment, and even in the same places. Lee Horne's study of agro-pastoral villages in northern Iran shows that village occupation is highly dependent on the presence of individuals who are willing and able to coordinate irrigation network maintenance. Juxtaposing chapters dealing mostly with cultural and political-economic variables with other chapters dominated by subsistence behavior, rounds out a series of important contrasts.

The content of abandonment assemblages (the flip side of the curation coin) is conditioned by the anticipation of return or permanent abandonment. When return is anticipated, the primary influence on curation is the availability of cached goods at the destination sites. Permanent abandonment may leave few usable goods, and cached goods may be left behind inadvertently. In Kent's study, abandonment assemblages also are depleted partly because the assemblage used during occupation was small to begin with. The assemblage of a permanently abandoned site need not reflect the spatial distribution of actual activity areas. Reoccupation of an area need not result in reoccupation of sites, and abandoning a site need not involve abandoning the nearby landscape as a productive area. Abandonment by agriculturists need not be related to exhaustion of agricultural potential. Thus, a major theme in these chapters is that peoples' perceptions determine how they use and abandon sites and, hence, the content and distribution of things they leave behind. Another major theme is that people may abandon sites in complex ways. These themes appear in three archeological studies examining regional abandonment at different scales.

Relying on tree-ring analyses, Sarah Schlanger and Richard Wilhulsen reconstruct fine-grained cycles of Anasazi occupation and abandonment in the Dolores area of southwest Colorado. The authors correlate individual house construction events with climatic, and other, evidence. Although their use of "vv" dates may justify rejecting many of their construction dates and, hence, some of their empirical conclusions, the authors nonetheless argue persuasively that an analysis of regional abandonment is only as sound as the links established between the local details of abandonment and the variables one believes to be responsible for it. Moreover, they argue that differences between regional abandonment, as defined above, and depopulation may show up partly in the amount of usable goods remaining in abandoned houses since no one is around to engage in delayed curation after depopulation. Thus, depopulation is a special case of regional abandonment in which few destination sites are in the same region.

The destination component of abandonment is a major focus in a study of Classic Hohokam settlement in the northern Tucson basin by Suzanne Fish and Paul Fish. Preclassic settlements were fairly widely dispersed in communities centered around villages with ballcourts, although a trend toward aggregation was evident by A.D. 1100-1150. In the early Classic (A.D. 1150-1300), two communities in the northern basin coalesced into a single community (Marana), with evidence of high population (some from abandoned Preclassic settlements) and expansion of agriculture into sub-optimal niches. By A.D. 1350, the Marana community was completely abandoned, with populations aggregating to the north and south in extremely large late Classic communities that grew from already aggregated early Classic communities. Marana abandonment does not seem to result from agricultural failure, especially since the Marana area was exploited after abandonment. Late Classic "mega-aggregation" appears to be predicated on earlier aggregation-related development of social and economic structures capable of absorbing people abandoning Marana. Thus, the authors see Marana abandonment as a largely socially driven event made possible by social and economic developments in destination communities.

Katina Lillios' chapter on the Copper Age to Bronze Age transition in Portugal is an interesting, and appropriately broadly cast, application of theory and analogy to the issue of regional abandonment. Copper Age settlement conformed to a center-periphery pattern in which wealthier sites were concentrated along the Atlantic coast, and poorer sites were dispersed in the interior lowlands. Amphibolite, a raw material valued for tools and ritual objects, was closer to the periphery sites, but amphibolite artifacts were concentrated in the center sites. Lillios argues that amphibolite trade linked center and periphery, and that growing competition among center-based exchange alliances for access to periphery resources led to environmental degradation in both center and periphery, and to the breakdown of the exchange alliances. Given the operation of different processes in the center and periphery, results of Copper to Bronze Age abandonment were different, most notably with a shift from clustered to dispersed settlement in the center, but maintenance of dispersed settlement in the periphery.

Two ethnoarcheological chapters focus on abandonment within sites. One of these is an examination of Zuni farming villages by Nan Rothschild and others. The authors creatively characterize abandonment as a reversible multi-stage continuum. On this continuum, full-time use is the lowest abandonment value that can be assigned to a structure on a scale whose highest value is permanent abandonment. Casting abandonment this way is valuable because it conceptualizes the use of individual structures and occupation of settlements as a matter of degree rather than a binary condition. Between the extremes are other states which range from part-time use to no use other than a sign saying that others may not build here. The authors document cases of architectural deterioration (and renewal) and artifact distributions that go along with these states. Although the artifact discussions seem unfocused and weak, the discussion of architecture shows that their conceptualization of abandonment is realistic and viable.

Arthur Joyce and Sissel Johannessen examine a household abandoned by a family in La Concha, Oaxaca. The household consisted of a compound with four structures and outdoor activity areas. Each of the structures was treated differently on departure so that examining any single structure would lead to different conclusions about the nature of abandonment. One intact structure, a kitchen, appears to reflect unplanned departure. Another intact structure, a residence with a shrine, appears to represent planned departure, with caches implying an intention to return for reoccupation or to retrieve usable goods. Two other structures were dismantled and depleted of structural elements, and contained different amounts of abandonment refuse. Since abandonment was planned and gradual, the compound shows that abandonment of multi-structure households can yield complexly structured remains depending on intentions to return, security of cached goods, and the amount of time taken to move goods to the destination residence.

Three archeological chapters discuss household abandonment. Barbara Montgomery uses the Relative Room Abandonment Measure (RRAM) to study room abandonment at Chodistaas, a thirteenth century pueblo near Grasshopper Pueblo in Arizona. The RRAM uses the frequency of floor pots and the density of sherds in room fill as a regression-like index yielding relative dates for room abandonment. Montgomery modifies the RRAM into a matrix-analysis tool for performing the additional task of identifying abandonment processes. This adaptation provides a highly plausible basis for concluding that the Chodistaas RRAM results from intentionally burying rooms after abandonment. However, she may not see that her study radically alters the RRAM because she implicitly demonstrates that sequential room abandonment, like intentional burial, must be shown to account for RRAM before it can be used as a relative-dating index. This observation would reinforce her already sound recommendation that abandonment processes be analyzed on a case-by-case basis.

In a related vein, Ricky Lightfoot looks at abandonment of suites of rooms at the Duckfoot site in southwestern Colorado. On the basis of sherds in midden contexts, Lightfoot derives estimates of the numbers and types of vessels expected in systemic context. These estimates serve as an index against which to compare the content of ceramic assemblages recovered from room contexts. One architectural suite has an assemblage that is close to expected values, whereas another suite is heavily depleted in almost all vessel categories. A third suite falls between these extremes. Lightfoot concludes that this pattern, when interpreted along with other lines of evidence, reflects differential abandonment rates, with the most depleted suite being the most gradually abandoned.

Robert Brooks' chapter on household abandonment at Plains Village settlements focuses on criteria for determining whether a floor assemblage reflects a spatial patterning of activities. In five Washita River phase houses at a village in south central Oklahoma, four appear to reflect gradual, planned abandonment. The houses appear to have been dismantled, and their floor assemblages consist of relatively small artifacts (with few refits) distributed around the house edges or in internal postholes. In contrast, the fifth house was destroyed *in situ* by fire, and contained a relatively large floor assemblage (with many refit pieces) in which functionally related items are clustered near each other. Given the presence of a partial burial in the house, it is possible that the death of a child precipitated a hasty abandonment of this house. Brooks concludes that only the fifth house has sufficient assemblage integrity to use spatial clustering of artifacts to infer activity areas.

In the closing chapter, Tomka and Marc Stevenson note that the term "abandonment" in archeology typically means "permanent abandonment," and that this meaning belies the underlying complexity of how people stop using places. They also note that abandonment studies have a long way to go in terms of empirical studies and how we conceptualize the real differences between, say, curation, delayed curation, and scavenging, or residential mobility and sedentism. In effect, these papers vividly illustrate that sedentism is simply a very low value on the mobility scale, and even sedentism involves highly localized abandonment processes as activities and residences shift location within and around a settlement. Interestingly, although only one chapter covers hunter-gatherers, the papers show that concepts derived largely for hunter-gatherer studies have high interpretive value when applied creatively to groups with other subsistence bases.

To paraphrase Bertrand Russell, unexamined assumptions about abandonment are to archeology what theft is to hard work. This volume successfully demonstrates that failing to account explicitly for the details of abandonment is equivalent to assuming away the problematic relations between systemic and archeological contexts. It also demonstrates that identifying the conditions of abandonment is hard work that can be satisfying to analyst and reader alike. Abandonment begins at home, and making a case about the conditions of abandonment is a necessary foundation for well supported claims about other aspects of prehistory.

Book Notes

Timothy K. Perttula

The Meeting of Two Worlds: Europe and the Americas 1492-1650, edited by Warwick Bray. Published for the British Academy by Oxford University Press, Oxford. 1993. 336 pp.

Prepared from a one-day symposium held by the British Academy to commemorate the Columbian Quincentenary, this edited volume's main focus is the consequences of the European conquest of the New World, most especially on the native peoples of Latin America, during what Bray defines (p. 2) as the early colonial period (1492-1650). Thus, its thematic approach is on the conflicts and interactions between Europeans and Native Americans, and the "process of adaptation and syncretism" that created new *criollo* cultures that are distinctively American in character.

The Meeting of Two Worlds employs archeological, ethnohistorical, historical/documentary, geographic, and demographic research to form the tapestry of the text, and the scope and quality of the papers provides the reader with a real sense of how and why the process of contact between Native Americans and Europeans took the course it did. Given its focus on the "Columbian Exchange" (cf. Crosby 1972), there are obligatory papers by Brothwell ("On Biological Exchanges between the Two Worlds"), Newson ("The Demographic Collapse of Native Peoples of the Americas, 1492-1650), and Bray ("Crop Plants and Cannibals: Early European Impressions of the New World") that discuss the biological and cultural consequences of contact.

Other papers in the volume focus on particular aspects of contact and the character of Native American lifeways, principally in terms of native responses to conquest and settlement, but also in concert with an analysis (and appreciation) of the types of military, organizational, entrepreneurial, and diplomatic skills brought to bear by Europeans during colonial rule. As Newson (p. 247) suggests, Native American survival in the face of demographic collapse had much to do with "the more subtle demographic effects of changes to native economies, societies and beliefs . . . influenced by the different methods employed to exploit and convert the native population, . . . [and] the size and character of native societies at the time of contact and the demand for resources in the regions in which they lived."

Sacred Sites, Sacred Places, edited by David L. Carmichael, Jane Hubert, Brian Reeves, and Audhild Schanche. One World Archaeology 23. Routledge, London and New York. 1994. xxiv + 300 pp.

Some of the most difficult and demanding challenges for North American archeologists today, especially so in Texas, are to develop appropriate ways to effectively interact with Native Americans about the study, management, and protection of their cultural heritage, and to communicate and share information and concerns about the "kinds of places important to people of different cultures, and why" (p. 1). *Sacred Sites, Sacred Places* is thus a very timely and useful compendium, one organized around the theme of identifying, preserving, and interpreting sacred sites.

Sacred sites include much more than burial sites or human remains. Generally speaking, sacred sites are those places that have spiritual significance or power to the people who created them or imbued them with meaning, such as "transformer sites, spirit residences, ceremonial areas, traditional landmarks, questing sites, legendary and mythological places, burial sites and traditional resource areas" (pp. 4-5). Among the Mescalero Apache, for instance, Carmichael documents certain peaks, caves, springs, burials, and sweatlodges (including the Holy Lodge used in Girls' Puberty ceremonies) as sacred sites and places of power, few of much are marked by any physical remains. Among the Maori of New Zealand, sacred sites (*waahi tapu*) are places associated with death; altars; sources of water for healing and death rituals; sacred pathways for messengers; mountains, rivers, lakes, and springs; as well as certain stones and trees.

The papers in the volume address four main topics: (a) the nature of sacred places, (b) the question of ownership and management of sacred places and sacred geography/landscapes (i.e., sacred sites as part of a related set of powerful places that encompass broad landscapes), (c) the prospects for future progress in properly protecting sacred sites, and (d) how important it is for archeologists and native peoples to develop cooperative relationships "to protect sacred sites and to educate others about the importance of sacred places" (p. 7). There is much to ponder and consider in this volume, particularly in light of the poor record of North American archeology and many North American archeologists in understanding the sacred sites and places of Native Americans, and the lamentable lack of use of much of our historic preservation laws in protecting sacred sites when it is prudent and feasible to do so. I encourage archeologists in Texas to read and absorb *Sacred Sites, Sacred Places.*

El Rancho in South Texas: Continuity and Change from 1750, by Joe S. Graham. University of North Texas Press, Denton. 1994. x + 121 pp.

This is a wonderful and well-illustrated book. The architectural and structural photographs of nineteenth and twentieth century *jacals*, stone ranchhouses (*casa mayors*), wells, *corrals de lena*, ranching equipment, and roundups are worth the price of the book alone, and should be quite a useful reference to historic archeologists working in South Texas.

El Rancho is based on an exhibit, held in 1994 at the John E. Connor Museum in Kingsville, Texas, on the history of the private cattle ranch or *rancho* from 1750 to the present in South Texas. During the almost 250 years of private cattle ranching in the South Texas region, ranching as "the basis for civilization and culture" (p. ix) has been transformed from its roots in Spanish/Mexican cultural traditions (dating back centuries) in architecture, the *hacienda* social structure, cattle tending and water production, and the work roles and lifeways of the *vaquero*. Now, the modern Anglo-American cattle ranch is more than a traditional way of life, it is a profit-making and market-oriented business industry. Meanwhile, the *vaqueros* and cowboys, such a distinctive part of American culture, continue to work on the private cattle ranches (like the King Ranch, Randado's Ranch, and Alta Vista Ranch featured in the book) that are so characteristic a part of the history and settlement of South Texas.

Graham provides the context for understanding the history of the ranch in South Texas by first discussing the Spanish exploration and settlement of Texas, then examining the institution of ranching in Spain and Mexico, before *el rancho* moved north of the Rio Grande in 1750. As he makes clear, the ranch was the primary cultural tradition by which the South Texas border area was settled in colonial times. Graham then continues the story by discussing how the cattle ranches were modernized, and then after 1930 how they became incorporated in large agribusinesses. After 1848, Anglo-American settlement in South Texas greatly increased, and men such as Richard King and Charles Stillman married into landed families in the region, eventually helping to change the cattle ranch into a big business (with a community hierarchy resembling that of the Spanish and Mexican *hacendados*) with national markets. Fencing of the open range, new cattle breeds, windmills and drilling rigs, and the development of modern transportation facilities, the oil boom, paved roads, and vehicles complete the modernization and expansion of the private cattle ranch.

This book should greatly increase appreciation of the role Spanish/Mexican cattle ranching has played in forming the diverse cultural heritage of Texas. It is reasonably priced, and well worth the read.

Practices of Archaeological Stratigraphy, edited by Edward C. Harris, Marley R. Brown III, and Gregory J. Brown. Academic Press, London. 1993. viii + 296 pp.

The Harris Matrix concept, developed by Edward Harris (1979), represents a different and systematic way to diagram and interpret archeological stratigraphy, one that has found useful applications in a variety of prehistoric and historical archeological sites across the world, albeit not without controversy raised by some geoarcheologists and archeologists. This edited volume by Harris, Brown, and Brown has two main purposes: (1) to promote and advocate (somewhat stridently) the use of the Harris Matrix method for depicting archeological stratigraphy, and (2) to provide archeological research case studies from North America, Central America, and Europe that illustrate the interpretive potential of this type of method. Fortunately for the reader, the book's latter purpose is more successfully realized than the former; there is grist for the Texas' archeological stratigraphers mill here.

The Harris Matrix is a four-dimensional model (thickness, length, width, and time) of archeological stratigraphy that is presented diagrammatically. It is predicated on an important shift in perspective, from the vertical view of stratigraphy (the standing profile) to the "open-area" or horizontal excavation of a site. From this view, interfaces (that is, the area of the surface of a deposit, or features, or face of a wall) and single context plans (as in a stratigraphic unit of a particular character and size) can be viewed in a way more compatible with how a site "developed, i.e., by a topographical, superimposed, accretion of strata and interfaces, and mirrors the manner in which we should excavate them, not from the side (as in a sectional viewpoint), but from top to bottom, from late to early by the stratigraphic method of removing the later layers first" (p. 5).

Following an introductory paper by Marley Brown and Harris on interfaces in archeological stratigraphy, the remainder of the book is organized into sections on historical trends, analysis in excavation, phasing and structural analysis, post-excavation analysis, and future developments. Papers that best convey the merits of the Harris Matrix method, and seem to offer analogs for use in archeological sites in Texas, include: Stucki's on an assessment of activity areas within a shell midden; Gregory Brown and Muraca's on phasing stratigraphic sequences at Colonial Williamsburg; and papers by Gerrard and Triggs on interpreting the complex nature of stratigraphic sequences from Fort York and Fort Frontenac as well as evaluating the chronological character of historic ceramics from each site's artifact-bearing deposits.

Disease and Social Diversity: The European Impact on the Health of Non-Europeans, by Stephen J. Kunitz. Oxford University Press, New York. 1994. xi + 209 pp.

As archeologists, anthropologists, and others increasingly turn away from the idea that contact between Europeans and non-Europeans in the Americas and Oceania uniformly resulted in catastrophic population collapses following the introduction of new European diseases among the latter groups (for a forceful treatise on the subject, see Stannard [1992]), they would do well to consider the views and persuasive arguments regarding disease and social diversity put forth by Kunitz in this book. Basically, Kunitz examines from an epidemiological and socio-political perspective how diverse social institutions and cultural behaviors among Native Americans (particularly the Navajo and Hopi), and indigineous peoples of Oceania and Polynesia, have shaped patterns of death and disease in populations.

Kunitz builds his case by using historical records and modern health data for native populations from Australia, Canada, New Zealand, and the southwestern United States, then factoring in the effects on health and different types of European contact. From this perspective, then, he looks for concordance, or more significantly lack of concordance, between the overall disease experience and historical and current disease patterns of these indigineous peoples.

In the author's view, the impacts of European contact on the health of indigineous populations across the world has varied tremendously, depending upon the specific colonial, medical, and resettlement policies of European governments, as well as the cultural and social organization of the non-European groups. Like Young (see below), Kunitz argues forcefully that without understanding both the socio-political and cultural context (at local and national levels), as well as the biology and etiology of specific diseases, it is not possible to fully comprehend the morbidity and mortality of different infectious and chronic diseases among non-Europeans over time. In sum, he suggests that there was a range of responses to epidemic diseases, and that "in general the most devastating contact situations seem to have been associated with dispossession from the land. Not all natives dropped dead whenever they got down wind of a European" (p. 178). There is no simple truth here.

Skeletal Biology in the Great Plains: Migration, Warfare, Health, and Subsistence, edited by Douglas W. Owsley and Richard L. Jantz. Smithsonian Institution Press, Washington, D.C. 1994. xii + 415 pp.

This book, more than any other bioarcheological or archeological book that has been published in the last few years, is so much a product of the changes seen in these disciplines as a result of the repatriation and reburial of Native American skeletal remains and associated grave goods. The impetus for most of the research was the analysis of the William H. Over skeletal collection from the Central and Northern Plains shortly before it was due to be reburied.

Reading this scholarly volume, one sees and appreciates the tremendous amount of knowledge gained within the last decade about Native American demography and paleopathology, biological distance relationships, subsistence changes, and prehistoric warfare on the Great Plains from the study of skeletal biology. Thus, hopefully these words in the Preface by Owsley and Jantz (p. xii) can be heeded:

> We want to make clear that we understand the emotions and demands of those who call for prompt repatriation, but, as scientists, we ask for the understanding of Native Americans. It is our hope that research . . . will continue to contribute to an improved understanding of Native Americans and that it will benefit them and others in the human community as well.
>
> As scientists, we are aware that the loss of collections may hamper the continuation of research that we consider vital to the Native American community and to society at large. To prevent such a loss, it is our view that professional curation and study should precede the repatriation process. Otherwise, the education of future generations, full of questions, will be limited to our present store of knowledge and restricted by our inaccuracies and omissions.

This book is simply packed with interesting and enlightening papers on the archeology, burial archeology, and bioarcheology of the Native Americans who lived on the Great Plains of North America. The 32 chapters range over a multitude of issues and research problems regarding the region's skeletal biology and prehistory, with a special focus on the Northern and Central Plains. Of particular interest to this reviewer were: (a) the series of papers on stable isotope analysis of human bone for assessments of Native American subsistence and diet; (b) the papers considering evidence for plains warfare; and (c) the succinct overview of Great Plains human skeletal biology by Douglas H. Ubelaker that closes the book.

The only complaint I have with the book is that the archeological treatment of the Southern Plains, which focuses on the Plains Village and Protohistoric periods ("Southern Plains Cultural Complexes" by Robert L. Brooks) ignores most of the relevant archeological sites and remains from Texas other than those of the Antelope Creek phase in the Panhandle. This is a serious omission given the known Late Prehistoric archeological record of the upper Red River, the Llano Estacado, the Caprock Canyonlands, and the Rolling Plains (cf. Hofman et al. 1989; Johnson 1992; Boyd et al. 1993). Other than this, professional and avocational archeologists alike in Texas should find much of interest in this volume, from ideas to ponder to research agendas to develop, and I strongly recommend that the book become a mainstay in research libraries.

Turquoise Ridge and Late Prehistoric Residential Mobility in the Desert Mogollon Region, by Michael E. Whalen. University of Utah Press, Salt Lake City. 1994. xii + 160 pp.

This monograph presents the research results of Whalen's intensive excavations and feature/material culture analysis at the Turquoise Ridge site in the

Hueco Bolson of the Jornada Mogollon area. The Turquoise Ridge site, not far from the Hueco Mountains and about 30 km northeast of El Paso, is a large pithouse village occupied between ca. A.D. 500-1000, perhaps one of the largest "Formative" period sites (or Mesilla phase in local parlance) in the region. Given the limited number of published reports on excavations at Formative sites in western Texas and south-central New Mexico, Whalen's report is a welcome addition to the regional archeological literature.

Whalen's excavations and research perspectives focus on the role of residential mobility in determining the character of cultural adaptations in the Jornada Mogollon, as seen through the study of site occupational histories. His work at Turquoise Ridge suggests that hunting-gathering populations began to establish winter base camps along the upper edges of the intermontane desert basins (and along the Rio Grande) as populations began to increase regionally. Also, these groups were sustained by increased use of large-scale extramural storage pits filled with wild plant foods (and eventually with cultigens such as maize after ca. A.D. 750), and by the use of baking pits for the bulk processing of desert succulents. During the warm seasons, groups dispersed to forage through the Rio Grande valley and the drier desert basins.

At Turquoise Ridge, the populations lived as small family households in small pithouse villages; some 15-27 pithouses were identified at the site. One large non-residential or communal pithouse structure was constructed at the site after ca. A.D. 750, and this structure may be a reflection of the development of some sort of corporate or group-level social organization at that time. Whalen suggests that the pithouses were occupied for perhaps as long as three or four months at a time. That the occupations were intensive at Turquoise Ridge is apparent by the number and variety of house features, the storage facilities, and the numerous well-defined trash middens. Similar kinds of sites, although rare, are known in the Rio Grande valley (Los Tules, Hatch, and Rincon) and along the edges of the Tularosa Basin.

In addition to the engaging discussion of Jornada Mogollon residential mobility and cultural adaptations, the Turquoise Ridge monograph contains thorough discussions of: site dating/chronological concerns; structures, features, and use of site space; ceramic and lithic technology and function; and analyses of plant remains and animal bones. Of particular interest is Whalen's concise presentation of the close interval (2-4 m) bucket soil augering approach used at the site to successfully define the location of buried features, structures, and other subsurface remains.

The Health of Native Americans: Towards a Biocultural Epidemiology, by T. Kue Young. Oxford University Press, New York. 1994. ix + 275 pp.

Young's book examines the evolution and current patterns of health and disease among Native Americans, taking both an epidemiological and anthropological view of disease and health conditions in these populations. His basic point is that to understand long and short-term changes in health and population sizes among Native Americans, indeed among any group, it is important to consider and integrate the cultural context of disease (and its effects on populations), because "regional variation can be demonstrated in almost all diseases...reflecting the differences in genetic makeup, cultural background, ecological habits, and social circumstances" (p. 224). Focusing on both biological and cultural issues offers a broad and promising approach to the examination of disease causation among Native Americans.

Beginning with an overview of Native American population and health, the heart of the book deals principally with fairly recent trends (twentieth century) and conditions of disease and health in three categories: infectious diseases (such as tuberculosis, pneumonia, viral hepatitis, sexually transmitted diseases, etc.), chronic diseases (including cancer, hypertension, diabetes, and obesity), and injuries and the social pathologies (namely suicide, homicide, alcohol and substance abuse, etc.). As Young's comprehensive discussion makes plain, the overall health status of Native Americans in North America is poor compared to all-race national populations in Canada and the United States, particularly with respect to the rise of chronic, non-communicable diseases, accidents, violent deaths, and homicide, and because of the persistence of low levels of infectious diseases.

He attributes the current character of Native American health to rapid changes in lifestyles (especially dietary habits and levels of physical activity), and the wide gap between Native Americans and non-Native Americans in such socio-economic indicators as income levels, housing, social assistance, and children in care. Nevertheless, the health of Native Americans has seemingly improved over the last 40 years or so, which Young suggests has resulted from national public health intervention programs provided by centralized health service systems. While the benefits of these programs may be many, although slow in coming, it is clearly still the case that the deleterious effects of culture contact and interaction between Native Americans and European peoples remain pervasive and long-lasting.

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The *Bulletin of the Texas Archeological Society* (ISSN 0082-2930) publishes original papers in the field of American archeology. Emphasis is placed on Texas and adjoining areas in the United States and Mexico; papers on other areas are also considered. Articles concerning archeological theory, method, or technique are also accepted. Preference is given to members of the Society.

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