Archeology in Central Texas

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This chapter reviews the archeological record of Native Americans in the central Texas archeological region and considers selected aspects of the nature of the evidence and how archeologists have studied that evidence. Previous reviews have covered these same topics comprehensively (see D. Suhm 1960; D. Suhm et al. 1954) or selectively (e.g., Black 1989b; M. Collins 1995; Creel 1991a; G. Ellis 1994; M. Howard 1991; L. Johnson 1967; L. Johnson and Goode 1994; Lintz 1993; W. McKinney 1981; Prewett 1981, 1985; Weir 1976). "An Introductory Handbook of Texas Archeology" by Suhm et al. (1954) established a formal structure of archeological inquiry for the entire state, and the diverse data gathered over the first half of the twentieth century were organized and synthesized.

Although successive metamorphoses have rendered the particulars of the 1954 handbook virtually unrecognizable in current practice, each revision was built on what had gone before, so that much of what we know today rests on sturdy foundations laid a half century prior to this writing. Typologies of ceramics and projectile points published in the handbook have remained more intact than the other cultural constructs. In his introduction to the handbook, Alex D. Krieger (D. Suhm et al. 1954, 2–10) also established a number of the tenets of typology that continue to underlie some artifact classifications in the state.

The review published by Dee Ann Suhm in 1960 is the first metamorphosis, beginning by offering a smaller and less rigidly bounded delineation of "central Texas" (D. Suhm 1960, fig. 1). Among the lasting contributions of the review are good visual (D. Suhm 1960, figs. 2 and 3) and descriptive (D. Suhm 1960, 89–103) images of the nature of the central Texas archeological data base, particularly its key sites. Historic Indian groups in central Texas received greater treatment, and Suhm’s review also reflects the beginnings of the preoccupation with prehistoric chronology building that overwhelmed the research effort over the next twenty-five years and dominated subsequent reviews and syntheses. At the time Suhm actually wrote her review (in 1958), only one radiocarbon date was available for a central Texas site (D. Suhm 1960, 88), and analyses of stratified site excavations were too few to use as a basis for establishing a chronology.

Since 1960, the several reviews that have been written focused on topical, temporal, or theoretical issues of central Texas archeology. Some of these have been more influential than others, but as this chapter will show, none has adequately considered the nature of the region’s archeological record. The vast data base that now exists for central Texas cannot be adequately synthesized and presented in the space available. This essay attempts instead to

- critique aspects of the practice of archeology in central Texas,
- offer a brief summation of what we currently know, and
- consider some ways by which we might know significantly more (and have greater confidence in that knowledge) by the time the next review is written.

It is necessary to critique the manner of our work because archeology rarely answers questions that have not been asked and because the questions asked and the ways they are addressed in any archeological paradigm largely dictate the nature of the substantive findings. Over most of the second half of the twentieth century, archeological efforts in central Texas have excessively emphasized questions of chronology, have failed to identify and sustain a focus on but a few other issues of substance, and have not yielded adequate explanations for the nature of the archeological record.

Inexplicably, the preoccupation with chronology prevailed without the development of a very effective methodology for its pursuit. Specifically, although the sondage technique was adopted, the greatest effort has been expended on precisely the kinds of sites with the least potential
for yielding good chronological information, while sites having that potential languished with comparatively little attention. There have been many data generated but not much synthesis of those data.

It is encouraging to note that during the 1990s, four trends emerged that led me to believe that the prospect is good for significantly improved research in the archaeology of the region (see G. Ellis 1994). First, we have begun to better recognize the nature of the archaeological record and how it was formed, as well as the greater need for data quality over data quantity. Second, preoccupation with chronological issues has begun to give way to a greater focus on pattern with several questions of human adaptation. Third, research now reflects an awareness of great data potential that had long been overlooked, and the relevance of data to the questions asked is being scrutinized. Finally, archaeologists working in central Texas are noticeably less provincial than has long been the case (Perrotta 1995c). Thus, “The future of archaeological research in the Edwards Plateau and adjacent areas will be considerably less gloomy if the region can get the attention it deserves, and if its synthesis is addressed to a national or international audience that will be critical of any local misadventures” (L. Johnson 1991, 21–22).

Do not take what has just been said to mean that I do not consider chronology to be the backbone of archeological inquiry. Archaeology is a historical science, and constantly improving chronological control of the past must remain a primary objective, but only as the framework for ordering more substantive inquiries and findings. In this vein, much has been said about the validity and meaning of various temporal frameworks offered for central Texas prehistory. In spite of the use of terms such as phase, and the discussion of phases in ways suggesting they have ethnic meaning, the foremost purpose of such constructs has been temporal ordering of archeological material culture. These constructs are based largely on morphological (supposedly stylistic) trends in artifact forms and, as such, are archeological style periods, not unlike style periods (e.g., Victorian, Greek Revival, or Tudor) used by architects. Eileen Johnson (1987c, 1991) has suggested that some of our archeological style periods be called...

patterns, and I (M. Collins et al. 1990) have proposed the label intervals. Either of these is better suited than phase, to which we both object, but I continue to prefer interval, first because it emphasizes the main thrust—time—and, second, because pattern implies that we know more about the material cultural composition of some of the time slices than I believe we do. Whatever we call the segments of our temporal framework, their function is to order cultural change, which is the essential basis for understanding cultural processes.

Central Texas as an Archeological Area

Culture areas (Kroeber 1939) and their archeological counterparts (e.g., as used in G. Willey 1966) have long served to focus attention on regions of shared cultural traits. At any single moment in time, culture area boundaries often can be drawn relatively easily. Some boundaries persist for centuries or millennia, but others shift and blur over time. The longer the time period under consideration, the more arbitrary boundaries become. Much of North America might be considered a single culture area during Clovis times, but by A.D. 1000 scores of areas would be needed, with each embracing the same degree of material culture sameness seen in all of Clovisdom.

Any delineation of the central Texas archeological area is highly arbitrary. Conversely, to draw boundaries based on careful considerations of material cultural sameness would result in a sequence of perhaps a dozen central Texas areas of quite different sizes and shapes—an unmanageable array for the purposes of this essay. So, for the present discussion, Prewitt’s delineation (1981, 71, fig. 2) of the central Texas archeological area (Fig. 3.1) has been used as a descriptive framework, but its boundaries have not been adhered to rigidly as regards certain archeological and geological data that inform on key issues in the local record. Also, this delineation is selected with the proviso that, like any such arbitrary construct, it is more satisfactory for some parts of the prehistoric record than for others.

More importantly, as Clive Gamble

Fig. 3.1: The central Texas archeological area (after Prewitt 1981).
features in central Texas are massive, mounded accumulations of burned rocks or "burned rock middens" (Fig. 3.3a–c), because they have played such a large role in the archeology of central Texas (see G. Ellis 1994), burned rock middens are discussed separately, below.

The elements (artifacts and features) that make up or accompany camp sites sometimes occur apart from camps. These include caches, isolated artifacts, burials, bedrock mortars, and rock art (see Fig. 3.3d), all of which are known to occur in various settings (see Table 3.1).

![Fig. 3.2. Examples of common kinds of archeological sites in central Texas: a, open camp site; b, stratified open camp site; c, rockshelter; d, lithic quarry and workshop.](image-url)
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<td>Turkey Bend Ranch</td>
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<td>Waco Mammoth</td>
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Cemeteries, in and away from camps, are known to be prehistoric in the prehistoric record of central Texas and have been found in rockshelters (Watt 1936), open localities (Lowe-Fox, Frinch Ave!), and in vertical shaft caves (Hitzfelder, Mason Burial Cave).

Few animal kill sites have been documented in central Texas. The Late Prehistoric bison skeleton (Feature 66) at Lowe-Fox is one possible example (Pre-wit 1982, 73–79). Another is inferred from fossilized bison bones and Folsom points dislodged by treasure hunters from the floor of Kincaid Rockshelter, where it seems a bison died after it was wounded but was not retrieved by Folsom hunters (M. Collins 1990b).

Cerr has been the most important kind of toolstone throughout the prehistory of central Texas, and the area is rich in the quantity and quality of this raw material (Banks 1990). This wealth is reflected in numerous sites where chert was acquired (quarries), acquired and knapped (quarry/workshop see Fig. 3.2d), or just knapped (lithic scatters). Each of these kinds of sites has its own characteristic parameters. The diverse kinds of sites are not equally visible to the archaeologist; their interpretive potential varies greatly; they were never equally numerous; and they have survived the vagaries of nature at different rates. Efforts to interpret and compare patterns of land use over time, or to estimate such things as relative population sites, are heavily burdened with these sampling issues.

As a natural area, central Texas is diverse. Its single most significant feature is a prominent fault scarp, the Balcones Escarpment, that runs from northeast to...
southwest around the center of central Texas and breaks the area into two contrasting subareas (Fig. 3.4a). The larger subarea is north and west of the escarpment, on its upland. Most of this is dissected plateau land of resistant limestone and thin upland soils, but deeply eroded crystalline rocks—the Central Texas Mineral Region—are present as well. The prevailing vegetation is oak and juniper savanna. Of roughly half the size of the larger subarea is the smaller subarea, south and east of the escarpment. This is part of the coastal plain, a region of relatively soft bedrock and deep soils. Most of this subarea is prairie with deep clavy soils, but a narrow strip along its eastern margin is post oak forest standing on deep sandy soils.

Along the escarpment lies a great ecotone (see Fig. 3.4a) where natural conditions are transitional between the plateau to the west and north and the prairies to the east and south. Most importantly, it is beneficial for humans to occupy an ecotone because they can readily access contrasting resources in the adjacent biomes and capitalize on the resource diversity of the transitional zone.

Annual precipitation decreases from east to west across central Texas from near 100 cm to 55 cm. The primary water resources for pre-industrial peoples were streams and springs. Two river systems, the Brazos and the Colorado, drain approximately 75 percent of the central Texas area (see Fig. 3.4b); the remaining 25 percent is roughly equally divided into the catchments of the Nueces, San Antonio, and Guadalupe Rivers (see Fig. 3.4b). Generally, drainage is toward the southeast. Of the 281 springs documented for Texas, 139 (49 percent) are in the area, including both of the state’s very large springs (> 100 cubic feet per second), and 12 of the state’s 17 large (10 to 100 cubic feet per second) springs (Bruno 1975).

Change, as it is everywhere, is and always has been unsettling across the land of central Texas. Wind, water, and gravity move earth material from place to place; hills, streams, and springs flourish and fail; caves and rockshelters form, enlarge, degrade, and collapse. The delicate balances between soils, climates, plants, and animals are ceaselessly being adjusted.

Terra firma is but an illusion.

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**Fig. 3.3. Examples of the very common burned rock middens and the uncommon rock art panels of central Texas:**
- a (upper left), a pristine burned rock midden in Blaine County;
- b, burned rock midden and bazaar in the stratified Wiley Williams site, Travis County;
- c, typical structure of a burned rock midden (Burton County);
- d (lower right), pictographs at Flint Rock in Concho County.

**Fig. 3.4. Geographic aspects of central Texas:**
- a, physiography;
- b, major river basins;
- c, geology;
- d, soils (A = alfisols; M = mollisols; V = vertisols; f = fluvial valley fills, various soils).
Landscape Evolution from Earthquakes to Earthworms

Foremost among deficiencies in the methodology by which most of the central Texas archeological record has been built is an inadequate recognition of the dynamic nature of the physical environment. Landscape evolution has profound implications for archeological inquiry. Issues of long-term changes in climate (Bryant 1977; Bryant and Shafer 1977; Bryant and Holloway 1985) and biotic communities (e.g., Dilley 1974) have received considerable attention from archeologists, but these issues are like words without music when played against a static terrain. A few examples will illustrate the importance of integrating archeological inquiry with an understanding of landscape change—whether one is studying a region or a single site.

Most archeological surveys, until recent years, were conducted without the explicit objective of discovering buried sites (e.g., Shafer et al. 1964). Even though awareness of the need for subsurface reconnaissance has increased (e.g., J. W. Saunders et al., 1992), much of our archeological data base was generated without this awareness and is significantly biased as a result. Correlating in discovering buried sites is the recognition that in some areas landscape change has been sufficient to obliterate sites. The important point here is that geologic and pedogenic processes have eroded, altered, buried, and destroyed sites (e.g., Abbott 1995). Examples from different areas of central Texas are instructive.

Fluvial Systems

Simplified depictions of site distributions from archeological surveys in three reservoirs along the Colorado River clearly illustrate one aspect of this bias. In two of the three project areas (Figs. 3.5 and 3.6), virtually no sites were recorded on the inside of bends in the river (Jackson and Woolsey 1938; Shafer 1967). In the third area (Fig. 3.7), only a few sites, “ephemeral and not worthy of excavation” (M. Collins 1995, 368) were noted on the inside of bends (Texas Archeological Research Laboratory [TARL] files). Are we to infer that people almost never chose to live on the inside of river bends? No, I suggest we are to infer instead that the surveys failed to discover sites buried...
Fig. 27. Site distributions in the lower reaches of Marshall Ford (Lake Truval) basin: note that relatively few sites were mapped on the outside of river bends; sites 41TV20, 228, 240, 307, and 323 were tabulated in survey report as "prehistoric and not worthy of excavation" (M. Collins 1985).

at the interior of the river bends. Since streams almost invariably cut on the outside of their bends and deposit on the inside, a sequence of prograding deposits forms on the interior of bends. These are referred to as "point bars" and are often the ideal depositional environment for the formation of stratified sites. Such sites, however, are commonly invisible or decidedly meager in appearance as the upper reaches of small streams (Blum and Valenza 1989; M. Collins et al. 1990).

S. Alan Skinner (1974) found larger sites typically occurring along the main trunk of the Guadalupe River, with small sites being more characteristic of the tributaries. He interpreted this situation to reflect an Archaic settlement pattern with base camps on the large river linked to extractive sites in the smaller valleys. However, this conclusion cannot be valid because the archeological record formed differently along the main trunk and its tributaries. Exposed Early Archaic sites are extremely infrequent in the main Guadalupe valley, probably because most of them are deeply buried in Late Holocene alluvium, whereas in the upper reaches of tributaries, where little deposition has occurred since the Early Holocene, components dating throughout the Archaic are present, often mixed together in multi-component sites on long-stable surfaces (M. Collins et al. 1990, 13–15).

Finally, recent mapping and dating of allostratigraphic units in the valley of the Colorado River downstream from the Balcones Escarpment (Blum 1992) shows that major changes have taken place in a much shorter time frame than previously inferred (e.g., Baker and Pen TRADE-Orellana 1978). During the culturally relevant past (ca. 12,000 B.P. to the present), four periods of Colorado River valley geomorphic history can be recognized, based on Blum's findings (1992), as relevant to the formation of the archeological record in the eastern part of central Texas.

At approximately twelve thousand years ago, the river had downcut in its older valley fill and was cutting into bedrock. High surfaces of the older fill (the Eagle Lake Alluvial Formation that had built up during the period between 18,000 and 15,000 B.P.) were exposed as terraces along the river as possible localities for any very early sites to form. Significant portions of this landform were subsequently cut away, but scores of separate kilometers are still present in the central Texas stretch of the lower Colorado River valley. From then until about thirty-five hundred years ago, the valley floor aggraded, forming a unit mapped as Member 1 of the Columbus Bend Alluvial Formation. This unit dates from about eleven thousand to thirty-three hundred years ago and often exceeds 10 m in
thickness. Deeply stratified sites contain-
ing Pennsylvania to Late Archaic period-
ponents, such as the Vera Daniel site in
orin's Ziller Park (Riclidis et al.
1991), formed in this unit. This unit was
then partly cut by the river. Member 2 of
the same alluviation then aggraded
against, and partly over, Member 1 be-
tween about sixteen hundred and a thou-
sand years ago. Member 2 often exceeds
20 m in thickness and contains Late Ar-
chaic to early Late Prehistoric sites; these,
too, were present at the Vera Daniel site
(Tabac et al. 1992). These sites are strati-
gated square kilometers of Members 1 and
2 of the Columbus Bend Allu-
formation in central Texas, concealing an un-
told number of buried archaeological
components.
The river downcut again, approxi-
mately a thousand years ago, before de-
positing its most recent unit, Member 3 of
the Columbus Bend Alluviation, which
is set against the older Members 2 and 1.
Blum (1992, 1993) noted mod-
er artifcats (e.g., barbed wire) in this
member, but radiocarbon ages range to ca.
500 B.P. (Blum 1992, table 6.4) indicate
that some buried Late Prehistoric compo-
nents could be present. Accelerated depo-
sition over the last few thousand years (Blum
1992, 1993) is probably attributable to
disruption of the natural vegetation by
grafting and burning, and this activity
may have buried most late sites. For the archeologist, the horizontal ex-
tent of fluvial deposits may be im-
portant as their temporal coverage. Deposits of any particular age might occur
in extremely limited areas favorable for depo-
sition, might be massive and extensive,
or might be moderately widespread.
Knowledge of these conditions is essential to
discovering sites and to interpreting their
frequencies relative to other sites and by
time periods,

"Eocene" Sand Shale and the
Big Brushy Formation

Along the eastern transect of the cen-
tral Texas archeological area is a narrow
strip of deep sandy land (see Fig. 3.36c),
generally mapped as Eocene age on geo-
logic maps (Barnes 1981). As is much of
eastern Texas, prehistoric sites found in
this setting commonly are either buried
or exposed by some kind of land distur-
bance (see K. Brown 1986; A. Taylor
1987). Just outside the central Texas area,
but in the same sand belt, recent geo-
archaeological work has defined a Holo-
ene unit (the Big Brushy formation), a
widespread sand mantle of variable thick-
ness that in places contains buried arche-
ological remains (see Bianchi 1986; Bous-
man and Fields 1988; Peetradco et al. 1986).
This work sheds light on the kinds of for-
testing processes that might be expected
in the central Texas part of the sand belt.
Basically, in the words of C. Brit Bous-
man and Ross C. Fields regarding the Big
Brushy formation, "Sand stock-
viewed as having a direct bearing on the
preservation and interpretability of the
archaeological record, with thick sands
having the potential to contain intact,
stratified cultural deposits and thin sands
having a greater likelihood of contain-
ing eroded, displaced cultural materials"
(Bousman and Fields 1988, 196). Fur-
thermore, since the Big Brushy formation
is thought to have eolian and colluvial
facets, it has the potential of reflecting
changes in environmental conditions over
time.

Blackland Prairie

This broad of the coastal plain just east of
the Balcones Fault is known as the
Black Prairie or Blackland Prairie is an
area of deep soils ultrarich in clay, called
ultrarich soils. Sites formed in these soils
are subject to processes that might be expected
in soil processes (pedoturbation). Soil text-
books (e.g., Buol et al. 1989) even use
Houston Black Clay, the prevalent soil
series in the Blackland Prairie, as repre-
sentative of the adverse properties of ultra-
clay soils (see Fig. 3.4b). Extreme plas-
ticity when wet, deep vertical cracking
when dry (Duftield 1970b), and a pro-
pensity to roll like a slowly boiling thick
liquid (producing soil features called gil-
gai) are the factors that threaten site in-
tegrity. Gilga movement in soil is like
that in dough as it is kneaded. In deep
Houston Black Clay, the rolling motion
typically extends downward about 1.5 to
2 m and produces distinctive shea-
tures, called slickenlines, between masses
of soil that move past each other. I have
seen pieces of modern metal and glass
dragged to the bottom of gilga (a down-
ward distance of more than 1.5 m) by
this process, showing that the rolling time
of gilga is on the order of decades. If ex-
cavations encounter large slickenlines (of-
ten observable in irregular plates 25 to
50 cm or more across) in a site, that site,
in all likelihood, is badly disturbed.

Bluffs and Colluvial Slopes

Much of central Texas is dissected
limestone plateaus and, there are also areas
where hills of granite, sandstone, and
other rocks occur. These bluffs and
valley walls so all of these are subject to
degradation in the form of slope move-
ment, or colluviation. At least one site
61ML66 in McLennan County has been
documented as partially disrupted by a landslide (M. Collins and Holliday
1978). When overhangs (rocksheeters)
occur, these, too, degrade and collapse
over time (M. Collins 1991b). Sites on,
or at the toe of, slopes are subject to
movement or burial by colluviation. As rocksheeters degrade and collapse, sites
within them are buried in detritus. All of
these factors profoundly shape the arche-
ological record.

Ubiquitous Processes

Minor surface deformation events, as
well as overthrusts with magnitudes up
to 10 on the Richter scale, occur in the
area (Divis et al. 1989; Odom 1963). The
corollaries of seismic and tectonic
activity during the Late Quarternary (see
Collins 1982; Collins et al. 1980)
may have influenced broader disruption through
the archeological record of that history
in central Texas. Known consequences of
earthquakes include degradation of rock-
shelters and bluffs (M. Collins 1991b),
site liquefaction or ejection events, and
the alteration of stream courses (Rapp
1986; Schumm 1977; Talawi and Cox
1985). Pedoturbation occurs to some extent
in all soils. Common forms include the
action of tree roots, brush, and her-
biae vegetation; the burrowing of
animals; and the torrential action of earth-
worms. Dens of the social insects, particu-
larly ants, can also cause extensive dam-
age to sites.

As the landscape aggrades, soil forma-
tion and the disruptive forces that accom-
pny it are lessened proportionately to the
size of degradation. Conversely, cessation of
aggradation intensifies disturbance in the
soil zone. It also invives the mixing of
archaeological evidence from multiple
periods of occupation, called palimpsests (see Ferring 1960b). It is important to recog-
nize that any surface upon which ar-
chaeological materials rest was stable, at least briefly. If that surface is buried, ag-
gradation resumed after a time of stability. Not all buried surfaces are equal, since
the time of stability can vary from days to millennia before deposition reservoirs.
Archaeologists do not always discern the differences among buried archaeological
surfaces, placing too much emphasis on the fact of burial and not enough on the nature of the interval of stability (laxuna or hiatus) that preceded burial. 
Palimpsest sites can become buried and be just as mixed as their counterparts at the present surface. A particular pitfall is that of pre-
tecontemporaneity, or burial at the same time. At any moment, the land surface will be composed of surfaces that have been exposed for different lengths of time. If widespread deposition abruptly covers part of that land surface, the preceding interval of stability will have been of
greater duration in some areas than in others, but the overlying sediments will be of the same age. Any attempt by archaeologists to use the age of a deposi-
tional unit to estimate anything other than the minimum age of underlying archaeological materials is at risk.

Chronology and Other
Accomplishments

It has become fashionable to criticize efforts to build an archaeological chronol-
gen for central Texas, Wilson W. McKin
ney (1981); Duane Peter et al. (1982); Le-
Ray Johnson (1987, 1991); L. Johnson and
Goode (1994); Stephen L. Black (1989b);
Michael Collins (1994a; M. Collins et al.
1991); and G. Lain Ellis (1994), among
others, have all found fault with the lead-
ing chronological schemes proposed by
Frank Weir (1976) and by Elyon Prewitt (1981, 1985). There are significant flaws in both, but these are also two remarkable and significant contributions to the archae-
ology of the region, not so much as chrono-
logies but as attempts to integrate and generalize large amounts of archaeological
data. It is also important to remember
that Weir and Prewitt did not lack for
prototypes (notably those of L. Johnson
et al. 1962 and of Sorrow et al. 1967).

LeRoy Johnson et al. (1962) and Sor-
row et al. (1967) proposed local archeo-
ological chronologies, each on the basis of
a few sites. The data from the Foothill,
Oblate, and Wunderlich sites were not
robust chronologically, but an effort was
made to bring central Texas chronological
thought into closer agreement with that
being used in the eastern United States
(L. Johnson et al. 1962; L. Johnson and
Goode 1994). The Evoe Terrace and Landslide sites (Sorrow et al. 1967) af-
forded better chronological evidence, es-
pecially with the benefit of earlier find-
ings at the nearby Youngport site (Shaffer
1963). Sequencing of diagnostic chipped
stone tools, especially projectile points,
was emphasized in these efforts.

Weir (1976) and Prewitt (1981, 1985)
proceeded beyond chronologizing projec-
tile point types; sought to find temporal
patternning in site types, features within
sites, and assemblages of artifacts; and of-
erred suggestions to explain some of the
patterns they discerned. G. Lain Ellis
(1994) presents an insightful critique of
Weir’s and Prewitt’s efforts. It is a credit to Weir’s and Prewitt’s skills in the art of archaeological analysis that
such comprehensive schema could be deve-
developed when many of the data they
used were from sites with (a) mixed com-
ponents, (b) poor stratification, (c) un-
clear associations among artifacts and be-
tween artifacts and features, and (d) weak
associations between samples dated by ra-
diocarbon and the target archeological
manifestations. Weir (1976) relied on only
46 radiocarbon dates, the vast ma-
ajority of which were from sites outside of
central Texas; Prewitt (1985) had 147 ra-
diocarbon dates. Considerable use has been made of Weir’s and especially of Prewitt’s chrono-
logical schemes, and revisions have been
proposed (e.g., M. Collins et al. 1991;
L. Johnson and Goode 1994; Rickles and
Collins 1994). The work of verifying and
improving the regional archaeological
chronology will always remain unfinished.
Recent efforts, especially the more rigor-
ous use of absolute dating (see L. Johnson
and Goode 1994), show promise for sub-
stantial improvements. Importantly, the
caveat pointed by LeRoy Johnson (1987)
regarding Prewitt’s chronology must con-
tinue to be heeded.

Many sites in central Texas are deficient
or totally lacking in suitable organic ma-
terials for conventional radiocarbon dat-
ing. Use of AMS (accelerator mass spec-
trometry) in radiocarbon dating has en-
hanced the capability of the technique
and brings more sites within the scope of
radiocarbon dating.

Alternatives to radiocarbon dating and
application of radiocarbon techniques to
a wider array of materials are also impor-
tant developments. Archeomagnetic
(Eighmy 1993), optically stimulated lu-
minescent (Stokes 1992), thermolumi-
enescence (M. Collins 1994c, 495–501),
and in rare cases even obsidian hydration
(Stevenson 1992) procedures may hold
promise for dating certain recalcitrant
sites in the area. Dating of organic con-
stituents of bone, soil, sediments, small
shells, travertines, and other carbonate
rocks using radiocarbon techniques are
becoming more useful as the chemistry
of each becomes better known and the
problems associated with assaying these
materials become less serious.

Burned rock middens, because they
are numerous and conspicuous in central
Texas, have long received a large share of
archaeologists’ attention. After decades
of limited success in understanding what
these sites represent in human behavioral
trends, recent efforts employing more
thoughtful research strategies and im-
proved techniques for gathering and ana-
lizing data have begun to extract infor-
mation that promises to answer some
questions and frame others more clearly.
Perhaps the single most fundamental con-
ceptual advance in burned rock midden
research is recognition that burned rock
middens likely formed in several different
ways. The recovery of detailed data on
the structure, composition, content, and
context of middens in order to have data
on explicitly defined material expressions of
different aspects of human behavior is
the approach that has long been lacking
in burned rock midden research (Black
et al. 1997; M. Collins 1991a, 1994d;
Cree 1991a; Goode 1991; Hester 1991b;
M. Howard 1991; Prewitt 1991; Potter and
Black 1995; Potter et al. 1995).

Archaeology in central Texas has also
seen the development of sophisticated re-
search into the technology of stone tool
manufacture and use. A trend that began
in the late 1960s (e.g., Sorrow 1969) and
has become almost routine (e.g., Etras
and Mueller-Wille 1988) is the inclusion of technological findings in lithic artifact descriptions. This practice has included efforts as sourcing charts (e.g., Quigg and Peck 1995) and obliques (e.g., Hester et al. 1985) along with unexplained cross-references of how people acquired stone and worked it, as well as how they used, maintained, and recycled the resultant objects. What has not occurred is any regional synthesis of the diverse descriptive data that have been amassed. Debitage analysis, properly done on assemblages of high contextual quality, contributes otherwise unknowable information about prehistoric knapping behavior (see M. Collins 1994a; Ennor and Mueller-Wille 1988; Quigg and Peck 1995; Ricklis 1994b). Although ceramics are far less common than lithic artifacts in central Texas, concern with ceramic technology and the cultural implications of pottery-making behavior has recently emerged (e.g., L. Johnson 1994; Perttula et al. 1995b; Reese-Taylor et al. 1994). This development is an important one that, if sustained, will be an essential component in the prehistoric central Texas archeological record. Archeologists in central Texas have in creased their activity considerably over the past several years. For one thing, the data bases are becoming better known; for another, new sites are being found. Unfortunately, this perspective did not prevail in the region, and only recently has it become very common. Blocher (1982) notes that the archeological record can be viewed on three contrasting scales—micro, meso, and macro. Research at each scale has its own set of strengths and weaknesses. Archeological inquiry in central Texas has heavily emphasized the meso-scale, which usually encompasses a single site and in immediate setting. Unfortunately, archeological patterns are more vulnerable to disruption at the meso-scale than at either the microscopic or the macro-scale (M. Collins as al. 1991a). A few studies at the macro-scale, where archeological data patterns covering wide areas are sought, have been concluded, and they incorporate data from central Texas (Creez 1991a; Howard 1991; Larrain and Blanton 1980; Melzer 1987, 1988; Melzer and Beyer 1985), but considerable gain could be expected from more such studies. Historically, archeological excavations in central Texas have emphasized the vertical dimension, a direct outgrowth of the emphasis placed on the building of an archeological chronology. Growing interest in recovering evidence of human behavior has led to increasing use of wide-area excavations on "living surfaces" (e.g., at the Slab, Loewe-Fox, Haggins, Camp Pearl Wheat, Mustang Branch, Turkey Bend Ranch, Sleeper, and Rux sites, to name a few). These shifts in emphasis constitute one of the most positive developments in the regional paradigm, but much is yet to be done to bring this approach to full fruition. Principally, the first requirement is that any archeological array thought to have a "living surface" be assessed for length of exposure. The primary aim in excavations of this sort is to find horizonal patterning within a single component of short duration. Ideally, that is a surface lived upon by only one cultural group, who left material clues of the spatial organization of their activities where these patterns have not been altered or obscured by subsequent occupations of the same surface (see Ferring 1960b; L. John son 1987). Rapid burial of such surfaces is the surest process by which such conditions are produced, and comprehensive geologic evidence is the best indicator that burial was swift and sure. Good examples of these conditions having been met are for Late Prehistoric components at the Rux (Quigg and Peck 1995) and Mustang Branch (Ricklis 1994a, 1994b) sites. Obviously, "living surfaces" can be reused, as at the Slab site, where multiple components are clearly indicated at the same level in the site (Patterson 1987). Difficulty arises when it is unclear how long a surface remained exposed and how many episodes of use may be represented by the archeological materials on that surface (M. Collins 1994a). A great advantage of horizontal exposures in archeological sites is the opportunity to fully investigate entire features in their horizontal contexts. Thoughtful study of the component of burned rock features, and the behaviors responsible for their creation (Thom 1985) is burgeoning in central Texas (M. Collins 1991a; M. Collins 1990; L. Johnson 1991; Potter 1995). Explicit criteria for recognizing ovens, open hearths, rock Gypsum hearths and other functionally significant kinds of burned rock features are emerging, though consensus on these interpretations does not yet exist. The use of geomatics evidence to determine whether or not given burned rock has been moved since it was last heated and cooled is a new technique that holds promise in this area of inquiry (Gore 1994). The greater use of comparative ethnohistory and ethnographic analogy (Thorpe 1980) has also been a major benefit to this line of inquiry. It is too early to know what the potential of these investigations in this vein might be.
the cultural and natural forces that have operated on the assemblage (Mason and Holdeyer 1994). These views are essential to understanding the human behavior and adaptations behind the regional archaeological record, and thus they integrate closely with the investigation of living surfaces and burned rock features. Archaeologists in central Texas have been mindful of the need to understand the relationship between cultural history and prehistoric climatic conditions (Bryant and Holloway 1985; Bryant and Shafer 1977; Gunn and Mahula 1977). Integration of the two lines of evidence (see Bryant and Shafer 1977) has not been particularly successful, however, in part because the better environmental records have not been found in archaeological sites (Blum 1992) and because neither record has been consistent and precise. An almost complete vacuum exists between the prehistoric and ethnographic records of native peoples in central Texas. In the 1990s, considerable progress was made in explaining this gap and focusing on issues that are perhaps subject to meaningful investigation. No longer are the Jumanoans (J. Kelley 1947) or the Tonkawas (D. Suhm 1960) considered to be possible descendants of the authors of Toyah prehistoric manifesta-
tions; no serious scholar still considers Cabrego de Vaca's path to have crossed central Texas (Campbell and Campbell 1981). The present territory of central Texas was not the long-term ancestral homeland of any indigenous group for whom an ethnographic account exists. The ethnographically well-known Comanches, Apache, Wichita, Kiowa, and even the Tonkawas arrived in central Texas just before or during the early European contact period (Campbell 1988; Newcomb 1961. 1993). Historic records document the presence of numerous other groups during the first decades of European contact but provide very little information about them. Concentrated ethnohis-
worth work (see multiple listings by T. N. Campbell under Indian group names in Band 1976; Campbell 1988; Campbell and Campbell 1985; Newcomb 1993) has gleaned valuable but incomplete information on these peoples who mostly vanished from historical view by the early eighteenth century. Thus, we have an early part of the Historic period, essen-
tially a protohistoric period, consisting of historic glimpses of indigenous peoples, and a later Historic subperiod during which relocated, acculturated remnants of earlier groups as well as very recently ar-
ived groups are known from more complete historical records and, in some cases, later ethnographic studies. These facts greatly reduce but do not eliminate the usefulness of any direct historical ap-
proach to the prehistory of central Texas (M. Collins and Richlis 1994; Newcomb 1993).

The Gisement

Six features and 35 artifacts recovered in an excavation of the Camp Pearl Wheat site in Kerr County, Texas (M. Collins et al. 1990), tell us more about Archaic lifeways than the large burned rock mid-
edans and its 1,282 artifacts documented at the John Ischy site in Williamson County (Sorrow 1969). The difference is in data quality. At John Ischy, multiple compo-
nents were hopelessly mixed as they accu-
culated in a middens on a long-stable land surface, whereas at Camp Pearl Wheat the land surface was stable for only a brief time, during which people occupied the site once or a very few occasions and their leavings were buried before later cultural materials could be added. Sorrow could detect patterns in the distributions of certain artifact classes across the John Ischy site—for example, manos were more abundant just outside of the mid-
den than within or further away from it (Sorrow 1969, 50–51 and fig. 27)—but there was no way to know if this situation reflects behavior that continued through-
out the thirty-two hundred or so years (my estimate) of the site’s use or for only some portion of that time.

In contrast, all or part of a single, integ-

dated, functional artifact assemblage is probably represented at the Camp Pearl Wheat site in an isolable component. This artifact assemblage contributes to an emerging regional pattern of site types and distributions that reflect subsistence behavior during the Early Archaic (see discussion below).

Localties where low-energy natural deposition is active during or between episodes of human occupation afford the optimum conditions for the isolation of discrete assemblages of material cultural remains. Such localities become stratified archeological sites with one or more isolable archeological components sealed between strata of natural deposits. When archeological methods of investigating such sites are integrated with those from the earh sciences, the results are superior to any that derive from archeology alone. Europeans studying the prehistory of the Old World, especially in France, have long recognized and practiced this inte-
grated approach to site-specific as well as regional studies. (A good discussion as re-
gards rockshelters appears in Laville et al. 1980, and A. G. Brown [1997] addresses the issue for fluvial site settings.) A site with stratified archeological and geological layers is referred to in French as a gisement (plural, gisements) (both pro-
nounced “zee-zee-mahn,” with the “ge” as in “gee white”). Increasingly over the last forty years in Old World prehistory the methodology for excavating and inter-
preting gisements has emphasized the interdisciplinary approach, covering geol-
ogy, soil science, palaeontology, palynol-
ogy, archeology, and whatever other fields are appropriate. Had archeologists in cen-
tral Texas over the last forty years concen-
trated on the discovery and comprehen-
sive analysis of gisements even a small fraction as much as have their counter-
parts in Europe, the record at hand today would be more complete, chronology would have been much more easily con-
trolled, better constrained assemblages would exist for each time interval, and the regional archeological sequence would be integrated with a paleoenvironmental sequence. Data of this improved quality would have long ago fostered the kinds of substantive research just now begin-
ning to emerge in the region.

Gisements can form in caves, rock-
shelters, dunes, or any area of natural, low-energy deposition. As a practical matter to central Texas, most gisements have formed in the alluvium of stream valleys.

Gisements and Central Texas Archeology

Contrary to an appearance that gie-

ments might be scarce in central Texas or that none was known until recently, the problem has been that most archeologists have simply not appreciated the value of
the ones that have been found and have not rigorously sought others. Also, it is common for gisements in central Texas to have denser cultural deposits in the upper layers and sparser ones at depth (e.g., as at the Landslide and Wilson-Leonard sites). I have no doubt that countless times the excavators of such sites stopped digging either when artifact counts dropped off or when a sterile deposit was encountered (see the account of the previous testing of the Camp Pearl Wheat site [M. Collins et al. 1990]). In those cases, any deeper components went undetected.

Dirty stratified sites, with one, several, or many isolable cultural components, have been documented since at least the 1930s (for example, the Merrill Site, excavated in 1934 and 1935 [Campbell 1948] and Rob Roy, dug in 1938 and 1939 [A. Jackson 1939]), and a few have been important in the development of the local record (notably Youngpost, Landslide, Kyle, Smith, Loree-Fox, and Jett Court). Nonetheless, in spite of archeological work begun at least by 1918 (Peat 1932b: 48), only about thirty-one gisements with one or more accurately isolated archeological components have been reported in central Texas (Figs. 3.8 and 3.9a and b).

I have characterized the components at these sites as having either very high or moderately high integrity on arbitrary and somewhat subjective criteria. Components with high integrity (depicted in solid shading in Fig. 3.9a) show evidence of rapid burial, lack evidence for extensive postdepositional disturbance, and consist of a relatively homogeneous archeological assemblage (especially of diagnostically diagnostic artifact forms). Components of moderately high integrity (lightly shaded in Fig. 3.9a) are either slightly deficient in one or more of these criteria, the sample is too small for a high-confidence assessment, or there is not enough information to assess integrity fully.

Several aspects of the information in Fig. 3.9a require comment. Three main periods, Paleoindian, Archaic, and Late Prehistoric, are used approximately in the conventional sense to depict what have long been inferred to be significant shifts in adaptations; these inferences may not be entirely sound, but the periods are, nonetheless, useful in organizing the archeological record. Subdivisions of these periods into subperiods are also based on adaptive shifts thought to reflect changes in subsistence strategies. In this presentation, the subdivisions of the Archaic follow the recent revisions proposed by L. Johnson and Goody (1994). Early and late subperiods of the Paleoindian and Late Prehistoric periods are used in this presentation to reflect distinctive archeological patterns.

The finer subdivisions (type intervals) are dependent primarily on diagnostic projectile point styles ("types") that change for reasons not really understood at our present level of knowledge. These subdivisions, too, follow approximately the scheme offered by L. Johnson and Goody (1994) and derive from the syntheses of West (1976) and Pownis (1981, 1985). As already observed, some type intervals are better constrained than others—that called Toyah being probably the best, and that called Taylor, perhaps the poorest.

In Fig. 3.9b, absolute dating is portrayed in radiocarbon years before the
The Late Paleindian and Middle Archaic subperiods are represented by the fewest components (four and five, respectively); that means that 6.5 percent of the components are in the Late Paleindian subperiod, comprising 18 percent of the sequence, and that 8.2 percent are in the Middle Archaic subperiod—16.5 percent of the sequence.

Twelve geological, palynological, or paleoecological records (see Fig. 3.9b) in and near the central Texas archeological area reflect a consistent but generalized environmental sequence (see Table 3.2). Altering intervals of comparatively mesic or xeric conditions have been inferred by Boumaan in the pollen sequences from bogs in east-central Texas (M. Collins and Boumaan, 1993) and by Richard S. Toomey from the vertebrate faunal record of Hall's Cave (Toomey 1993; Toomey et al. 1993). The bog-pollen sequence is not well controlled chronologically; however, the available dates indicate relatively constant rates of sedimentation, from which Boumaan interpolated the depicted sequence. Boumaan's interpretation of the reported pollen data from Weakly and Boriack bogs considered the relative frequency of grass to arboreal pollens. In doing this, a climatically sensitive aspect of the pollen record emerges from the complete spectrum that otherwise contains numerous taxa, of which the abundances are more likely reflective of localized conditions around the bogs.

In Hall's Cave a deeply stratified, abundant, high-resolution sequence of small animal remains was found. Toomey excavated 3.7 m into the fill of Hall's Cave and recovered thousands of faunal specimens (more than twelve thousand had been cataloged in 1993, with many more remaining to be cataloged). Only the upper 2 m of the Hall's Cave sequence is considered here, and the climatic history depicted is based only on the relative proportions of the least shrew (Cryptotis sp. [which requires a relatively moist habitat]) to the desert shrew (Mobius sp. [found in more arid habitats]) following Toomey (1993) and Toomey et al. (1993). The Hall's Cave sequence I have used here is controlled by 41 radiocarbon dates on bone provided by Thomas Stafford (1995, 1997, personal communications; there are now almost 150 dates)
and by three charcoal dates (Townes 1993). Because of the large number of dates, the fact that the dates are almost perfectly stratigraphically consistent, and the generally high internal agreement between radiocarbon ages determined on different chemical fractions of the same bone, this sequence can be considered one of the best-dated and most environmentally sensitive records in North America. Concern expressed by L. Johnson and Goode (1994, 22) in regard to dates on the earthen fill of Hall’s Cave is clearly dispelled by the bone-organic chronology. When it is fully reported, the Hall’s Cave biostratigraphy will be a landmark contribution to Quaternary studies.

These pollen and faunal records both indicate an early xeric interval ending near 12,000 B.P. (closely correlating with the “Clovis Drought” noted in Haynes 1991) followed by a significant period of relatively mesic conditions. Each record then indicates a long Middle Holocene interval of relatively xeric conditions, which were slightly ameliorated at roughly its midpoint. That the two records are not synchronous probably results largely, if not entirely, from inaccuracy in the ages interpolated for the bog-pollen sequence. In general terms, the Middle Holocene xeric interval lasted approximately five thousand years—close to half of the local pedogenesis. The effects of Middle Holocene aridity are seen widely in central Texas, often in the form of stream incision, but precise dating is often difficult (see Abbott 1994).

Late Holocene conditions returned to being more mesic. The pollen and faunal indicators are inconsistent only in the latest Holocene, when a final swing toward xeric conditions appears in the Hall’s Cave fauna. Other than relatively small samples of the species (and, therefore, possible sampling error) on which Townes based his interpretations, the inconsistency is not readily understood. It is possible, of course, that contrasting conditions could exist because the pollen record is from the easternmost edge of the area and the faunal record is from more nearly the westernmost edge.

The relative abundance of bison in and near central Texas has been inferred from occurrences in archeological sites (Dillehay 1974; Prewitt 1981, 1985);
M. Collins et al. (1990). There is a general correlation between bison occurrences and comparatively hetic portions of the bog-pollen and Hall's Cave faunal records.

The geologic records are based on fluvial sequences where episodes of valley filling alternate with periods of erosion and/or stability and soil formation. Geologic sequences portrayed in Fig. 3.9b are based on data of varying completeness and precision (particularly as regards dating). Geologists working with Quaternary-age sequences vary widely in their application of the concept of soils (some emphasizing soil formation and reporting every minor soil, others emphasizing sedimentary process and reporting only major soils). Local conditions in each fluvial system differ, and circumstances determine the amount of radiocarbon dating that can be applied are unequal. Furthermore, investigators allocate their radiocarbon resources differently; some target dating soils, others preferring to date sediments. For these reasons, the depictions in Fig. 3.9b must be viewed only as indicating the general trends and are not to be taken to represent detailed, precisely dated alluvial sequences.

Consistently, the valleys of central Texas (and much of North America [Haynes 1991, 1992, and 1993]) were downcut and scoured of sediment in the Late Pleistocene, approximately fifteen thousand to twelve thousand years ago. Valley filling followed during the ensuing mesic interval, and it is in these sediments that a number of the important Early Paleoindian sites have been found. Erosion and stability (with soil formation) are more characteristic of the Middle Holocene, during the long xeric interval. This interval was first recognized in North America on the basis of extensive evidence for erosion and arroyo cutting in the southwestern United States, and this interval has been called the Alithermal (Anstis 1955). Whether or not the interval was significantly warmer, it does seem to have been drier, and the paleoenvironmental record of central Texas was clearly influenced by dry conditions. It is yet to be determined exactly what the consequences of this xeric interval were in terms of human ecology. It is abundantly clear that the archeological record has been significantly and adversely affected by the Middle Holocene xeric conditions.

Erosion undoubtedly destroyed many archeological sites, and many others, on stable surfaces, resulted in palimpsests of long duration. The approximately five thousand years of the Middle Holocene xeric interval—43 percent of the record—are represented by only about seventeen (22 percent) of the sixty-one components in Fig. 3.9c.

Downcutting of valleys occurred widely in the Middle Holocene, leaving former valley floors above the reach of most flooding and bringing deposition on these surfaces to a virtual halt. Major soils that formed on these long stable surfaces are documented over wide areas in the valleys of central Texas during the Middle Holocene, and many sites, especially burned rock middens, reside on these surfaces. It is from these numerous, highly visible, artifact-rich sites that much of the archeological record for the Middle Holocene has been derived. Returning to a moment for the poorly defined Taylor-style interval, the question to be answered by future research is whether in archeological scarcity reflects a cultural reality or results from gaps in the archeological record brought about by erosion and reduced deposition during the Middle Holocene. This poorly represented interval is left on Fig. 3.9a to underscore this aspect of the record and to provide a tempting target for sound archeological dismissal or verification.

Fortunately, all central Texas streams did not respond in exactly identical fashion to the Middle Holocene xeric interval, and neither erosion nor nondeposition are absolute in any fluvial system—there is always deposition somewhere. Deposits of Middle Holocene age are present but less abundant and less conspicuous than those of the Early and Late Holocene ages. Contrarily to this, there are undoubtedly sites of Middle Holocene age, in good geologic context, still waiting to be discovered. The search for them will need to be conducted using sampling designs based on geomorphology (see Blum andLintz1955;13;Mandel1992,79--;Nordt1992,68--;).

In the Late Holocene, valley filling prevailed, but one widespread episode of downcutting occurred ca. 1000 B.C. (S. Hall 1990). In part because the evidence is better preserved, the Late Holo-
for the absence of caudal vertebral mammal remains at the Waco Mammoth site (J. Fox et al. 1992), and for a "prehistoric" human form at Hitefeller Cave (Chase 1971). It is not clear whether these suggestions have been sustained with sufficient evidence for general acceptance. This is not to say that some future find might not prevail as a pre-Clovis site.

In addition to meeting the widely recognized criteria of stratigraphic integrity, unambiguous human evidence, and secure dating, two factors must be observed in any search for sites earlier than Clovis. The first is geographic. Most valleys in much of North America were scored to bedrock during the time immediately before Clovis, meaning that there is little chance of finding components stratigraphically beneath Clovis in fluvial contexts. Outside of alluvial valley settings, sites would either be on upland landforms or in rockshelters. Upland localities rarely produce good stratigraphic contexts, and rockshelters of pre-Clovis age may be highly degraded (M. Collins 1991b). The second is cultural. It is not known what constituted the pre-Clovis material cultural assemblages, and, lacking these criteria for its recognition, the evidence will almost certainly have to come from the unlikely context of strata underlying a Clovis archaeological component.

**Paleoindian**

Paleoindian sites and isolated artifacts are fairly common in central Texas. Concepts of Paleoindian lifeways in North America generally and in central Texas particularly are changing rapidly. The simple cultural sequence of big-game hunting "cultures"—Clovis, Folsom, Plainview, and Cody (Krieger 1947b; Sellards and Evans 1960; D. Suhm et al. 1954; Worthington 1957)—is no longer adequate to accommodate the diverse material cultural assemblages, projectile point styles, and indicated subsistence behaviors now documented during what has been traditionally recognized as the Paleoindian period, that is, earlier than ca. 8800 B.P.

It is necessary to draw upon some data from outside of central Texas to adequately portray these developments, but this is warranted because new results are emerging at a rapid tempo from Paleoamerican research in the Americas, there is no cultural manifestation during Paleoindian times confined to central Texas alone, and, although sites in central Texas are contributing evidence to the broader developments, there are important ideas emerging elsewhere with implications for our understanding of the local Paleoamerican evidence.

In this discussion, because the fundamental criteria for defining "Paleoindian" (best articulated in Worthington's proposed concept of a Paleoamerican Tradition [1957]) as nomadic big-game hunters are being challenged, the Paleoindian period is defined as a temporal span from ca. 11,500 to 8800 years B.P. This definition allows the issue of Paleoindian lifeways to be considered more objectively. As already noted, an Early and a Late subperiod of the Paleoindian period are proposed for central Texas (see Fig. 3.9a).

The Paleoindian period began as the Pleistocene waned, when now-extinct forms of large animals were among the prey taken by Early Paleoindian hunters. Projectile points in use during the Early Paleoindian subperiod were primarily, if not exclusively, of the lanceolate form and typically were fluted, Clovis and Folsom being the defined types.

Clovis is the earliest well-defined cultural horizon in central Texas. It is assumed on the basis of dating at sites elsewhere in North America that a Clovis culture existed in central Texas between approximately 11,200 and 10,900 B.P. (Haynes 1992). Kincaid Rockshelter, Wilson-Leonard, Gaul, Horn Shelter No. 2, Pavo Real, and Crockert Gardens are where the principal Clovis components have been documented in the area, and surface finds of distinctive Clovis points are reported from a number of other localities (Melzer 1987; Melzer and Bever 1995). Generally in North America, Clovis manifestations are the most diverse in the Paleoindian period, with types of sites including kill, quarry, stone-working, cache, camps, ritual, and burial. The artifact inventory includes chipped stone artifacts produced using bifacial, flake, and prismatic-blade techniques (Fig. 3.11), almost always on high-quality and often on exotic stones (M. Collins 1990b). Engraved stones (M. Collins et al. 1991, 1992), bone and ivory points,
a bone shaft straightener, stone bolas, and ochre are reported from Clovis contexts (Collins n.d.).

Subistence in Clovis times was based on diverse fauna (including large herbivores such as mammoth, bison, and horse as well as smaller animals such as water turtles, land tortoises, alligator, mice, badger, and raccoon). The diet presumably also included an array of plants (M. Collins et al. 1989b).

A paved floor at Kincaid Rockshelter reflects a greater investment of labor than nomadic hunters could afford on a fleeting habitation. (Enough stones, totaling more than two metric tons, were brought in from the nearby riverbed to cover 10 m² of the muddy shelter floor (M. Collins 1990b; M. Collins et al. 1989b).) Caches of Clovis artifacts (in Texas and elsewhere in North America (M. Collins n.d.)) are suggestive of hunting and gathering rounds that returned groups to the same places more reliably than is the case with nomadic hunters of big game.

Overall, the data indicate the Clovis lifeway to have been that of well-adapted, generalized hunter-gatherers with the technology to hunt big game (if not to rely exclusively on it). Either their travels or their contacts with other groups enabled them to acquire exotic stone from great distances. Ironically, more is known of these earliest Paleoindians than of those who came later.

In contrast to Clovis lifeways, subsistence in Folsom times seems to have been more reliant upon specialized hunting of big game (bison). Sites with Folsom-age components in central Texas include Horn Shelter No. 2, Pavo Real, Wilson-Leonard, and Kincaid, the latter two of which show evidence of bison hunting.

Camp, stone-working, and kill sites are all that have been documented, mostly in or near grassland habitats. These, along with a rodent trap of Folsom points, end scrapers, and large ultrathin bifaces, are the trapping of hunters (Fig. 3.12a, b, d, e). Diagnostic artifacts at Folsom sites are the large thin bifaces, fluted Folsom points, and thin unfluted (Midland) points.

Wilson-Leonard produced a thin, unfluted point (Fig. 3.12c) in association with bison bones and several bifaces baked in the masonry of Folsom bifaces. This point, and the Goshen assemblage of the Northern Plains (Frison et al. 1996), is part of a growing sample of point styles that do not adhere to the long-inferred sequence of Clovis—Folsom—Plainview.

An urgent problem in and beyond central Texas regards what constitutes "Plainview" and where that manifestation fits chronologically. Much that has been called Plainview—a plethora of unfluted, lanceolate dart point forms—fails to match the type-site points in chert and flaking technology (see, e.g., Chandler 1994; Hester 1990b; Redder 1985). A serious revisiting of existing typological and contextual evidence bearing on this problem is needed as are new and better data. I am beginning to suspect that true Plainviews (as at the Plainview site and some of the artifacts from Boise Bed 2 at Bonfire Shelter) are equally as old as Folsom (i.e., greater than 10,200 b.c., see Hayes 1993) and are absent from or extremely rare in central Texas. "Plainview" points at Horn Shelter No. 2 are thicker and
have more deeply concave bases than those at the Plainview site and come from zones dated ca. 8400 B.P. (Redder 1985). At Wilson-Leonard, the unfluted lanceolate points previously identified as Plainview (Weir 1985) are morphologically distinct from points at the Plainview type site and date to the interval between 9500 and 8000 B.P. These points from Wilson-Leonard are placed in the late Paleoindian subperiod and referred to as Golondrina (Fig. 3.12h), Barber (Fig. 3.12i), and St. Mary's Hall (Fig. 3.13a) (M. Collins 1998a; Masson and Collins 1995).

Also murky in central Texas and else-

where are the temporal position and cul-

tural significance of the few Dalton and

not-so-few San Patrice—like points (vari-
sely called San Patrice, Barros Fish-
tailed, and Rodgers Side-Hollowed) (see

Fig. 3.12f). The San Patrice—like points

occur at Wilson-Leonard and at Kincaid,

and both they and Daltons occur at Horn

Shelter No. 2 in central Texas. Daltons are

found in the middle Mississippi valley at
c. 10,500 to 9500 B.P. (Morse and Morse
1983) and are close to that age at

Horn Shelter No. 2 (ca. 9980–9500 B.P.
[Redder 1985]). San Patrice—like Rex

Rodgers points are associated with a Clo-

vis point and an unfluted lanceolate point in what appears to be a single-event bison kill site in the Texas Panhandle (Willey et al. 1978b). They occur in a deposit dated between 9700 and 9500 B.P. at Horn Shelter No. 2 (Redder 1985) but

remain undated at Kincaid (M. Collins
1990b). Everything about the fauna, as-
sociated artifacts, and features (including a double burial) found with San Patrice
(Brazos Fishetailed) and Dalton points at

Horn Shelter No. 2 suggest an Archai-

like, hunter-gatherer cultural manifesta-

tion (Redder 1985). For Fig. 3.9a it has

tentatively regarded this material as tran-

sitional, between Early and Late Paleo-

indian; future work or new finds will help

clarify the picture.

Three style intervals—Wilson, Golon-

drina-Barber, and St. Mary’s Hall—are

here proposed for the late subperiod in

the Paleoindian period (see Fig. 3.9a).

These style intervals are moderately well
defined at the Wilson-Leonard site

(M. Collins 1998a; Masson and Collins
1995). The Wilson component is the

better represented and is characterized as

having corner-notched, Archai-like Wilson
dart points (see Fig. 3.12g) (Masson
and Collins 1995; Weir 1985) in associa-

tion with features, a burial, artifacts, and

faunal remains more Archai than Pale-

oindian in appearance. Dates for this com-

ponent are ca. 10,000 to 9000 B.P. (Mas-

son and Collins 1995).

The Archai-like character continues for

the Golondrina-Barber and St. Mary’s Hall

components, dated between 9500 and

8000 B.P. All three of these compo-

nents (Wilson, Golondrina-Barber, and St.

Mary’s Hall) have burned rock fea-

tures, but the size of the features and the

amounts of rock present are decidedly

less than that in Archai features of yonder

ages. The subperiod here called Late

Paleoindian is in many ways archaeologi-

cally intermediate (or "transitional") be-

tween Early Paleoindian and the Archai

the question to be answered is how acu-

tely the material culture—based impres-

sion reflects their respective human adap-

tations. One suggestive indication of the

transitional nature of this cultural inter-

val is the continuity of the Angorastra dart

point (see Fig. 3.13b) and similar forms

(see Fig. 3.13c, d) from the Late Paleo-

indian into the Early Archai periods.

Two burials between ninety-five and
For more than seventy-five hundred years the basic Archaic mode of life prevailed in central Texas. There are distinct changes to be seen within the Archaic archeological record, but it is not clear how significant these changes really were at the times they occurred. It is clear, however, that in the broadest sense this long span represents a basic adaptation that was successful. A priority in the investigation of the Archaic record is to better understand the fundamentals of that adaptation and to determine the significance of the variations over time and across space. In briefly reviewing the Archaic of central Texas, the cultural chronological framework proposed by L. Johnson and Goode (1994) is adopted with minor adjustments.

The early part of the Archaic, from ca. 8800 to 6000 B.P., is here subdivided into the three projectile point style intervals: Angustura (see Fig. 3.13b), early split-stem (see Fig. 3.13c), and Martin-dale-Uvalde (see Fig. 3.13d) and similar late Archaic sites. Open camp sites (including Locue, Wilson-Leonard, Richard Beene, Sleepy, Jetta Court, Youngport, Camp Pearl Wheat, and Landslip) as well as a cave (Hall's Cave) occupied at the far reach of daylight contain noteworthy components of the Early Archaic. Numerous dart points and Guadalupe tools attributable to the Early Archaic also are present in Kincaid Rockshelter, but in mixed contexts. It is unclear if the distributional data are representative, but a number of authors have noted a concentration of Early Archaic components near the eastern and southern margins of the Edwards Plateau (Black 1989c; G. Ellis 1994; L. Johnson 1991; L. Johnson and Goode 1994; W. McKinney 1981). Large and varied burned rock features (at the Sleepy, Camp Pearl Wheat, Wilson-Leonard, Richard Beene sites), domestic structures (Turkey Bend Ranch), and caches (Lindner) are known from the Early Archaic. Grooved or notched stone variants are interpreted as net sinkers or bola stones (Boyd and Shafer 1997) appear in the Early Archaic (see Fig. 3.13e, m). Grooved and hammering stones. Clear Fork (see Fig. 3.13n) and Guadalupe bifaces (Fig. 3.14a) (both inferred to be specialized tools, probably for woodworking), along with a variety of unifacial and
bifacial chipped stone implements, are also reported from Early Archaic components. Subsistence data are sparse for the subperiod, but hunting of deer, exploitation of various small animals, including fish, and the cooking of bulbs in earth ovens are indicated.

If the currently known site distributional data reflect land use in the Early Archaic, then this was a time when people were living in the better-watered parts of the live-oak savanna habitats on the Edwards Plateau. Acorns, deer, and turkey are conspicuous among live-oak savanna resources, but geophytes (e.g., onions, prairie turnip), other nuts (e.g., pecan, walnut), berries (e.g., agawita and hawthorne), fruits (e.g., grapes, plums, persimmons), and grass seeds, along with a host of small terrestrial, amphibious, and aquatic animals, round out a diverse and reliable subsistence base.

Pollen and fluvial geologic evidence portrays an oscillation from mesic through extremely xeric and back to mildly xeric conditions during the Early Archaic (see Fig. 3.9b). Bison (and perhaps antelope) were evidently scarce or absent. What mix of other foods constituted the staple diet(s) during the Early Archaic is unknown at this time.

The appearance during the early splinter interval (as at Wilson-Leonard) of specialized cooking appliances that use quantities of stone as heating elements reflect a sophisticated technology for exploiting the oak-savanna resource base. These features almost certainly represent the technological antecedents of the larger burned rock middens that become a hallmark of later intervals in the Archaic of central Texas.

The middle subperiod of the Archaic, from ca. 6000 to 4000 B.C., is further subdivided into three style intervals: Bell-Andice-Calf Creek, Taylor, and Nolan-Travis (see Figs. 3.9a and 3.10b–c). The earlier two of these intervals reflect a shift in lithic technology from that which had prevailed earlier. Bell-Andice-Calf Creek and Taylor bifaces are thin, basically triangular bifaces with long thinning flakes emanating bifacially from the base; Taylor bifaces remain unnotched whereas Bell-Andice-Calf Creek bifaces are characterized by deep, narrow basal notches. All of these thin-bladed forms would serve equally well as knives or as tips of lances, spears, or darts. Impact fractures common on the Bell-Andice-Calf Creek forms attest to their use as weapon tips.

Climate during the earliest interval (Bell-Andice-Calf Creek) was somewhat mesic. It was a time when bison were hunted, leading L. Johnson and Goode (1994) to surmise, correctly, I think (M. Collins 1994a, 94), that these thin bifaces were part of a specialized bison-hunting weaponry, probably brought to the region by peoples moving southwestward from the prairie, prairie margin, and woodlands west of the Oракs (see Weydoff 1995). A tantalizing hint of functionally different sites is seen in this interval, with a greater diversity of tool forms occurring at the Landslide site than at the Barton site and Bell-Andice component. Notable at Landslide are more wood-and bone-working kinds of tools and especially milling equipment, which is absent from the Barton site. It seems apparent that more diverse tasks were undertaken at Landslide than at Barton. Large burned rock features—hearth as well as rock ovens—are inferred for the interval, pa-

Fig. 3.14. Selected Early a), Middle b–g), and Late h–j) Archaic artifact forms: a. Guadalupe Tool (Kinser Rockshelter), b. c. Andrews dart points (Goat site), d. Taylor or Early Triangular dart point (Higgins site), e. Texas dart point (Higgins site), f. g. Nolan dart points (Wilson-Leonard site), h. Bulverde dart point (Wilson-Leonard site), i. boron on a blade (Wilson-Leonard site), j. drill on a Maximil dart point (Wilson-Leonard site).
icularly at the Barton site. In a very sub-
jective sense, components of this interval
seem to me to show less intensive use than
that indicated at earlier interval compo-
nents, particularly those of the early splen-
num interval. Perhaps greater mobility as-
soiated with bison hunting is indicated.
By the later Middle Archaic Taylor and
Nolan-Travis intervals, bison have disap-
ppeared from the record and more xeric
climatic conditions have returned. In fact,
this transition culminates toward the end
of the Nolan-Travis interval in what ap-
ppears from the record to have been the
onset of the most xeric conditions ever
experienced by humans in central Texas.
Interestingly, Taylor and Nolan-Travis
components again have the appearance of
either long-term or intensive use, or both.
Burned rock middens debut (best seen at
the Wounded Eye site in Kerr County,
where Taylor bifaces dominate the assem-
blage recovered from a small burned rock
midden). Another technological shift is
seen in the production and morphology of
Nolan and Travis projectile points, as
they have comparatively thick and often
narrow blades (especially on Travis points)
with stems and shoulders; distinctive
beading of the stems is characteristic of
Nolan points.

L. Johnson and Goode (1994, 26)
suggest, as Premwit (n.d.) had earlier sug-
gested, that burned rock middens at this
time were more frequently used to
cook xenychs such as sorrel, which may
have thrived in central Texas as conditions
became drier. This practice does not nec-
ecessarily signal an end to extraction of the
more typical oak-savanna floral and fau-
nal resources; it could be merely a shift in
emphasis with concomitant adaptations in
subsistence technology, strategic plant-
ning, and scheduling (see Bousman
1993).

The Late Archaic, ca. 4000 to 1300 or
1200 B.C., began as effective moisture was
at its lowest in central Texas, but gradua-
ally the climate became substantially
more mesic (see Fig. 3.9b). Six style inter-
vals have been proposed for the Late Ar-
chaic (see Fig. 3.9a). The Late Archaic is
well represented by investigated sites, in-
cluding a number with components in
good stratified contexts, although well-
stratified components are almost com-
pletely unreported for the earliest Bul-
svale style (see Figure 3.14b) interval.

Middle Archaic subsistence technology
and the burned rock middens resulting
from a portion of it, continue well into the
Late Archaic. In fact, during the sec-
ond style interval (best known for its Pe-
ternales points), the growth of burned rock
middens was at its greatest, espe-
cially in the eastern parts of the area. It
appears, however, that xeric vegetation and
whatever reliance people placed upon it gradually disappeared from those parts
of central Texas between 3500 and 2500
B.C., and burned rock midden growth
slowly but did not cease. The xeric vege-
tation remained, and continues to re-
main, in the western reaches of the area
where its exploitation involved the regu-
lar use of communal earth ovens into
late Prehistoric times (Black et al. 1997;

Among distinctive material traits of the
Late Archaic in central Texas are di-
verse dart points styles (Fig. 3.15a–b
and Fig. 3.16a, b), “corner-tipped” knives
(see Fig. 3.15c), and cylindrical stone
pipes (see Fig. 3.15d). Marine shell orna-
ments occur, along with caches of large biface cores. Burned rock middens were in use throughout the Late Archaic.

L. Johnson and Goode (1994) have offered a succinct account of the main cultural aspects of the Late Archaic on the eastern Edwards Plateau. In so doing, they distinguished between early (Late Archaic 1) and late (Late Archaic 11) sub-periods. Their provocative ideas need not be repeated here other than to mention some highlights. Diverse and comparatively complex archaeological manifestations toward the end of the Late Archaic attest to the emergence of kinds of human conduct without precedent in the area. Among factors that have been cited as contributing to these developments are increasing population size (Prewitt 1981; Weir 1976) and stimuli from religious practices in the eastern part of the continent (L. Johnson and Goode 1994). Much remains to be learned about the hunter-gatherers of central Texas in Late Archaic times, and the questions prompted by the interpretations of L. Johnson and Goode (1994) will require thorough and comprehensive archaeological investigations using data of the highest possible integrity.

Late Prehistoric

Archaeologists working in central Texas have not been able to clearly interpret the extent and importance of the material cultural change that occurred in the region ca. 1200 B.C. This is the somewhat arbitrary break commonly made between the long Archaic period and its successor, the Late Prehistoric. Previously this was referred to as the “Neo-American Stage” (D. Suhm et al. 1954, 20) in the expectation that all three defining traits (pottery, bow and arrow, and agriculture) would eventually be recognized. It now appears that generally for central Texas, only the bow and arrow appeared initially, pottery was added later, and agriculture (at least, the possession of tropical crops) came last and was of quite minor importance.

Because basic hunting and gathering subsistence continued, what is now called the Late Prehistoric has also been labeled the “Neo-Archaic” (Prewitt 1981) or the “Post-Archaic” (L. Johnson and Goode 1994). Two subperiods, early and late (see Fig. 3.9), are here recognized in the Late Prehistoric (Jelks 1962); these correspond to the Austin and Toyah “phases” (I.) to continue to use the term “interval” of long-standing use in the local prehistory (Prewitt 1981). More than projectile point style change distinguishes Austin from Toyah manifestations, and the subperiod level of designation is intended to reflect the importance of these differences. I agree with L. Johnson and Goode (1994, 39–40) when they note that an equally satisfactory solution would be to place the break between the Archaic and the Late Prehistoric at ca. 1100 B.C., when Toyah replaces Austin as the prevailing archeological configuration. This distinction is, however, not as easily made for other regions of the state (see below).

The most apparent change seen at the beginning of the early Late Prehistoric (Austin interval) is a prevalence of dart points to that of arrow points, and, inferentially, from use of the atlatl and dart to that of the bow and arrow (see Fig. 3.16c). Evidence is seen of widespread hostilities in the form of what
thought to be numerous incidents of arrow-wound fatalities (Prewett 1974). Otherwise, comparatively little change is noted from terminal Late Archaic pat-
terns, particularly in subsistence behavior. Recent scrutiny has found evidence that in western central Texas burned rock middens continued to be produced in what may have been the cooking of sotol (Black et al. 1997; Google 1991).

The late subperiod of the Late Prehis-
toric is expressed as a single style interval, designated on Fig. 3.9.a by the Perdiz ar-
row point (see Fig. 3.165.g). However, it has long been recognized that in central Texas the Toyah archeological manifesta-
tion consists of a constellation of material culture traits (see Fig. 3.166.g). Notable among these traits are pottery (both local and imported from the Cadena area), large thin bifaces, Perdiz arrow points, and end scrapers and prismatic blades; the stone tool assemblage is associated with the hunting of bison as well as deer and antelope.

The occurrence of these distinctive traits on about the same time line across a wide area of the state distinguishes the Toyah as an archeological "horizon." A question that arises is whether such a horizon is the spread of a people across the landscape or the spread of ideas and their adoption by different peoples. LeRoy Johnson (1994) and Robert A. Ricklis (1994b) have recently brought forth dif-
fering views on Toyah lifeways. In keep-
ing with traditional interpretations, John-
son sees Toyah materials as the artifacts of particular followways—the products of a single ethnic group. Ricklis, in contrast, observes that the cultual materials that define Toyah represent tools and tech-
nologies that can be spread among differ-
ent groups rather easily—that is to say, Toyah is a technocomplex. The issue hinges on how similar lithic and ceramic objects and their technologies of produc-
tion have to be to represent the work of a single ethnic group. In the absence of lin-
guistic evidence (which is precluded by a general lack of identification of Toyah culture) or more robust archeological data, the is-
sue will not be resolved since the answer to the question just posed is too subjec-
tive. No time in the prehistory of central Texas is represented by more gisements, and the prospects for discovering more and better Toyah components are good.

The debate framed by Ricklis and John-
son is the kind of archeological issue that is so rare in the history of central Texas archeology. Because it is both in-
triguing and substantive, such a debate can be expected to continue, grow, and be refined, and perhaps in the future even resolved to some degree with robust new data.

Historic Period

Historic archeology differs from pre-
historic archeology in that past people, places, and events can be investigated from the vantages of written accounts as well as tangible archeological records. In the case of central Texas, the collision of multiple indigenous and European cul-
tures produced complex and rapidly-changing events that are chronicled spor-
tically in the early documents and seen spar-
ingly in the archeological record. With time, both the written and archeological records become fuller, but by the middle nineteenhtieth century, little but the Euro-
pean-derived cultures remained.

I consider three subphases in the Historic period of central Texas—early, middle, and late. In the first two, vestiges of both indigeneous and European peoples and cultures are represented; in the third, the indigenous peoples have virtually disappeared.

The early Historic, subperiod in central Texas begins in the late seventeenth cen-
tury with the first documented arrival of Europeans (Berlandier 1869; Bolton 1915; Newcomb 1961). Although there are documentary glimpses of the indige-
nous groups in and near central Texas, political consequences of the arrival of Europeans were already in motion, most notably the southern advance of mounted Apaches. For the indigenous peoples, little more than group names, locations, and limited descriptions exist. Concerned ethnographical research (see multiple en-
tries by T. N. Campbell under Indian group names in Brand 1976; Campbell 1988; Hester 1909a, 1909b; Newcomb 1961, 1993) has been used to piece to-
gether important yet incomplete accounts that reveal several distinctive features of native cultures in central Texas between ca. 1660 and 1720.

In these earliest historical accounts, numerous displaced groups are found in and near central Texas, some having gone northward to escape Spanish oppres-
sion, others having fled southward ahead of the Apache incursion. Their life-
ways had been affected substantially by the political accommodations to this new propinquity and possibly by social dis-
ruption brought about by the mortality of European-introduced diseases. The French and the Spanish vying for the territory that is now Texas often manipu-
lated the indigenous groups for their own political purposes. Also, native patterns of mobility had been altered by the acquisi-
tion of horses. It is obvious that these ac-
counts do not provide direct analogs to prehistoric patterns. Instead, they repre-
ten a time of drastic cultural change and political conflict to be investigated in its own right.

There may be some indigenous cul-
tural patterns that prevail through this time and thus afford insights into prehis-
toric lifeways of the aboriginal inhabitants of central Texas (M. Collins and Ricklis 1994). Small band-sized residential camps are indicated, but so are large, diffuse en-
campments composed of peoples with mixed ethnic affiliations. It is not clear whether the large, diffuse camps or politi-
cal amalgamations occurred prehistori-

cally, but to judge from the apparent ease and frequency of these occurrences his-
torically, it is possible that large camps shared by different ethnic groups had preceded in prehistory.

Hunting, particularly of bison but also of deer and antelope, is repeatedly noted in Spanish and French documents, as is the extensive use and exchange of bison products. Much of the mobility and hunting behavior of peoples was in re-
sponse to the movements and densities of bison populations. Through the histori-
cally observed behavior was affected by the use of horses, the same was probably true to some extent of peopling peoples whenever bison were present in the area.

Of particular importance to Late Prehis-
toric archeology are the many accounts of Hacienda Cabo traveling central Texas to hunt bison and at times camping with indigenous groups. The fairly com-
mon presence of Cadena ceramics and of local pottery with Cadena style deco-
rations in Toyah interval sites of central Texas (see discussion in Pettela et al. 1995b) suggests that this was a long-
standing pattern.
At a very general level, the early Historic subperiod informs prehistoric archeological inquiry on two topics. First, indigenous peoples clearly were more cosmopolitan than most archeologists seem to think. Second, large and dispersed encampments, exceeding the usual parameters of a "site," may have been fairly common.

The middle Historic subperiod, when much of the record on aboriginal peoples is in reference to remnants of native groups living in the Spanish missions, began in about 1730 and ended in about 1800 as the mission system was failing (Hester 1989a, 1989b). Central Texas lies mostly outside of the Spanish Colonial sphere, and the mission Indian subperiod is manifest primarily at the missions in Bexar County (Campbell and Campbell 1985). Interesting continuities from prehistoric times and new behavior resulting from acculturation are reflected in the material culture of the mission Indians (D. Fox 1979).

Shoshoni-speaking Comanches, who had become consummate equestrians by 1800, began to spread into northeastern Texas from the High Plains toward the end of the middle Historic subperiod (Wallace and Noelb 1952). Their presence in central Texas is documented mostly from the hostile view of Euro-American settlers.

The late Historic subperiod, extending into the twentieth century, encompasses minor numbers of mission Indians, far-flung nomadic native groups (primarily the Comanches) until the late nineteenth century, and a rich archeological record of the European-derived cultural presence (D. Fox 1983). As the Comanche presence in central Texas waned in the mid-to late nineteenth century, more than eleven millennia of Native American presence in the area came to an end.

Conclusions and Comments on Future Research

Central Texas was occupied by Native American hunter-gatherers more or less continuously for longer than eleven thousand years. During that time the net change in population was from zero to a pre-contact figure that may have been as high as 150,000 (based on a very approximate hemisphere-wide estimate of 2.1 persons per square kilometer [Doby 1966]). Whatever the actual ending figure, and however miniscule the rate of increase, it is an absolute certainty that over time more and more people lived in and around central Texas. Without doubt, population growth increasingly constrained subsistence and mobility options and may have fostered political conflict, but it also led to a cosmopolitan condition where more knowledge, commodities, words, and mates could be exchanged. Exchange in each of these domains of culture is likely to have comparatively low archeological visibility except when non-perishable commodities are exchanged or knowledge is transmitted that is reflected in durable items of material culture. The more exchange occurs, no matter its form, the more likely it is to have archeological visibility.

In the course of central Texas prehistory, archeological evidence for the exchange of ideas and exotic commodities becomes more visible in the later part of the Late Archaic and reaches its greatest expression in the Tiwah interval (assuming that exotic lithics in Paleoindian times were more often reflective of high mobility).

When Late Archaic sites in central Texas contain exotic obsidian and marine shells, and when there are interments influenced by Hopewelian burial ceremonialism, the indigenous population is not living in isolation. Unseen behind these tangibles are undoubtedly culture brokers, travelers, multi-linguistic interpreters, and diplomats—the prehistoric counterparts of the likes of Juan Sabeas, Sacagawea, and the Turk. To have reached sufficient levels for archeological expression in the Late Archaic, when did distant connections first develop? I doubt the natives of central Texas were ever isolated—a key element in my views of the local prehistory that follows.

Horticulture or agriculture had come to be practiced in all directions (Mexico, the Southwest, Southeast, and Plains) during what in central Texas was still the Late Archaic. Early European settlers found central Texas optimal for farming (Fehrenbacher 1968), and much of it is farmland today. A shift to horticulture or agriculture by natives of the region was not precluded by natural conditions of soil or climate. Nor was it precluded out of ignorance on the part of its inhabitants.

These conclusions argue for the alternative interpretation that efficient technologies for hunting and gathering prevailed and that the resource base was both rich and diverse. Central Texas was one of those places in the world where the labors and limitations of food production could be looked upon with disdain. What then are the ingredients of that technology and the characteristics of that resource base? The axiom that specialization is the path to extinction seems to be borne out in its corollary, namely eleven thousand years of successful, generalized exploitation of a diverse resource base in central Texas. The adaptability of hunter-gatherer subsistence in central Texas is underscored by the swings in climate (see Fig. 3.9b) from relatively moist (ca. 11,500 to 8800 or 8500 B.P.) to arid (ca. 8800 to 8500 or 3000 to 2800 B.P.) with a brief amelioration (ca. 6800 to 5500 B.P.), and back to moist again (ca. 2400 to 1000 B.P.), which was followed by a brief drying interval near 1000 B.P. Since ca. 1000 B.P., the climate seems to have been rather moderate compared with the more moist and more xeric periods of earlier times. From the earliest arrival of peoples into the area, which present evidence places near the middle of the seventh millennia B.P., until ca. 8800 B.P., conditions were relatively moist, and the archeological record reflects hunter-gatherers of moderately high mobility. Camp size of these Paleoindians usually have simple fireplaces with little or no use of rock. Dying out times, there may have been a substantial reliance on bison hunting, but otherwise Paleoindian subsistence seems to have been rather general. A small human population and reasonably abundant plant and animal resources would seem to best account for the evidence.

Beginning around eighty-eight hundred years ago, large fireplaces with quantities of burnt rocks appear and signal important changes in adaptations, ushering in what we refer to as the Archaic (Black et al. 1997). It is in the Archaic that we see the development and perseverance of archeological patterns distinctive to central Texas, a conspicuous element in that distinctiveness is the extensive use of rock in a variety of fireplaces. It is apparent that these rocks were used primarily for their heat-storage ca-
pacey in most cases, and this practice is central to the long history of Archaic adaptations (Black et al. 1997). There is a clear correlation between mesic climatic indicators and the archeological occurrence of bison remains.

There is less clear but suggestive evidence that burned rock features (middens and complexes of earth ovens) grew at faster rates in the more aridic intervals. In general, large hot-rock cooking appliances are needed for plant foods requiring long periods of cooking, whether baking or steaming. The labor and fuel required for efforts of this kind are efficient only if a large volume of food is cooked. It follows that the existence of the large hot-rock cooking appliances is prima facie evidence of bulk processing of starchy plants, be they sotol bulbs, prairie turnip roots, cat-tail roots, acorns, or wild onion bulbs.

But it is important to consider that once the effort is made to construct and fuel a hot-rock cooking appliance, it can be used to cook almost any kind of food—plant or animal—wherein lies the adaptability of those facilities.

As the abundance of various plant foods changes seasonally or in response to longer-term climatic shifts, rock ovens can go from bake to steam, as appropriate, the most available bulk staple augmented with anything from river mussels or turtle meat to hawthorn or persimmon fruits. It would appear, in this vein, that at those (mesic) times when bison were more abundant, somewhat less reliance was placed on the bulk processing of plant foods. One of these times was when Calf Creek, Bell, and Andice bifaces were in vogue, and another was when Marcos, Monstil, and Castroviejo points were current. John F. Goode (1994) after the suggestion that makers of Calf Creek and related point forms migrated into the region as bison ranges spread. Relative little use of hot-rock appliances is seen during the Bell-Andice-Calf Creek cycle interval, and possibly even during the interval identified by Marcos, Monstil, and Castroviejo forms, but this use is far less evident.

Central Texas environments are and have been far from uniform, and the foregoing generalizations will not apply equally over the region, and not at all in some places. Certainly such potentially important resources as desert succulents, bison, acorns, and riverine plants and animals have varied greatly in number over time, and archeological understanding of their importance will emerge locally, not regionally.

During the late (Toyah) interval of the Late Prehistoric, when bison hunting and mobility were evident at their highest levels since Folsom times, the ancient practice of using large hot-rock appliances came to an end. Once again, as in the Bell-Andice-Calf Creek interval, there is good evidence that the Toyah interval is the archeological expression of bison hunters who migrated into the area and neither depended very much on other local resources nor adopted the technology for their exploitation.

Such are a few general interpretations of the prehistory of central Texas. Should any of these be found worthy, they could guide future archeological investigations in a general sense, but as framed they are too general to be tested directly. Instead, archeological effort in the area needs to be directed toward more basic tasks that include accumulating specific evidence relevant to these generalizations.

First, a very small percentage of the archeological data base of central Texas derives from well-stratified contexts. To correct this deficiency, investigations need to be targeted as widely in space and as fully along the vertical vector as possible. Archeofaunal assemblages and paleoenvironmental data of high resolution derived from such contexts can provide the evidence needed to address most of our currently recognized archeological issues. As assemblages with greater integrity and higher data quality are investigated, more comprehensive data recovery and analytical techniques must be applied. First, the basics of archeological evidence must be better met, and second, the perspective of comparative ethnology should be used to structure inquiry.

The basics of archeological inquiry are relatively simple: obtaining well-documented, representative samples of archeological assemblages and controlling for the relative and absolute dating of those assemblages. An initial effort at this task has been made in central Texas. I suggest that a comparative-ethnological perspective is needed because in central Texas we have learned relatively little about the human lifeways that came and went in the region for nearly twelve thousand years. We need to have an organizational framework for our investigations that defines objectives and directs effort toward those objectives in the greatest need of attention. An obvious framework is comparative ethnology. The elements of culture that ethnologists compare cannot all be known from extinct cultural systems, but a subset of those that realistically can be at least partially reconstructed from archeological evidence is useful. A matrix table with cultural traits across the top and our archeological intervals arrayed up the left side would certainly remind us of our major data gaps. Within each cell of the matrix is a re-search objective that must be carefully considered in terms of what archeological evidence is needed and how that evidence would best be obtained. Traits from the general e.g., subsistence, settlement pattern, or transhumance) to the specific (e.g., burial practices, ornaments, and woodworking tools) need to be included. Obviously, the evidence required to satisfy a specific objective will not be found just because it is listed in the matrix. What is important is that research will proceed with that objective in mind, the essential evidence needed to satisfy the objective will have been thought out, and in the long run our efforts will be more productive by being allocated more appropriately.

A significant element in our lack of progress to date is redundancy. We keep digging up the same kinds of evidence using the same techniques. Targeting other aspects of the archeological record and using a greater array of procedures are priorities. Another impediment is how we conceive evidence. We see deer bones and dart points and infer that game was taken with weaponry that employed darts. We rarely consider alternative or complementary paraphernalia or strategies, such as the use of nets, spears, or dogs. We seldom ask, much less try to answer, questions like, "What was made using those tools we infer to be adzes or gouges? Were people making canoes, shelter, wooden mortars? If so, what were they doing with them?" Explicitly defined research objectives on the macro-, meso-, and microscales of investigation are starting points. Fuller use needs to be made of the more so-
phisticated techniques of dating and archaeometry—techniques that usually are not warranted unless applied to data from superior contexts. These suggestions carry a price. The costs of doing archeology, even mediocre archeology, continue to rise, and unless substantive new information is gained on nearly every attempt, those costs are not justified. Only by eliminating redundant efforts and targeting quality data with explicit research objectives and well-conceived plans for data recovery and analysis can we expect to make those substantive contributions. Because archeologists working in central Texas have begun to evaluate site data for their integrity, to eschew beyond the single-minded pursuit of chronology building, to give thought to data and analytical requirements for other research objectives, and to recognize important kinds of evidence previously ignored, conditions are right for making real progress in understanding the local prehistory.

**Acknowledgments**

Tim Perrula encouraged me to write this chapter and its predecessor essay, which appeared in volume 66 of the *Bull. of the Texas Archeological Society*, and his comments and editorial skills are greatly appreciated. The following individuals offered valuable and greatly appreciated information and counsel: Jan Gray Meoerick, Susan W. Díaz, C. Britz Bouman, Glenn T. Goode, Anne C. Ker, Thomas R. Hester, Stephen L. Black, Marilyn A. Mason, Darrell Creel, Linda Wootton Ellis, and Charles Frederick. At the Texas Archeological Research Laboratory, Lauren Sullivan assisted with research in the site files, Pamela J. Headrick drafted the figures and drew all of the artifacts except for Fig. 3.11a (drawn by Ellen Asha), Fig. 3.12d and e (drawn by the late Hal Story), and Fig. 3.15j (drawn by the author). Elizabeth Andrews printed the photographs, and Robin Benson assisted in the preparation of the artifact plates. Richard Toosney III and Tom Stafford graciously allowed me to use unpublished radiocarbon dates from Hall’s Cave, and Glenn T. Goode shared his unpublished data on the Anehon site. C. E. (Gene) Mear and Paul Goldberg granted me access to unpublished geologic data.

To all of these I extend my appreciation without any burden of responsibility for my errors.

**Note**

1. An alluvial stratigraphic unit is a sedimentary unit defined and mappable on the basis of its bounding discontinuities; each a unit itself does not have to be continuous (North American Commission on Stratigraphic Nomenclature 1983, 865–87).