THE HIGHLAND CREEK SITE: MIDDLE TO LATE ARCHAIC WETLAND UTILIZATION IN WESTERN KENTUCKY

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CHAPTER 1:
INTRODUCTION

In May and June of 1999, test excavations were conducted at the Highland Creek site (15Un127) in Union County, Kentucky. The 1999 investigation of the site was conducted by archaeologists from the Kentucky Archaeological Survey at the request of the U. S. Army Corps of Engineers (Louisville District). The Highland Creek site is located on lands that are owned by the U.S. Army Corps of Engineers and managed by the Kentucky Department of Fish and Wildlife.

The Highland Creek site, which measures 75 m in diameter, is located on the crest of a low ridge in the Ohio River floodplain, approximately 200 m north of Highland Creek, from (Figure 1.1) and 2.6 km southeast of the Ohio River. The area surrounding the site is subject to periodic inundation from Ohio River floodwaters, although floodwater levels typically do not rise high enough to reach the site, except during the most extreme 100-year flood episodes. In general, the environment in which the Highland Creek site is located consists of a densely forested, lowland, backwater swampy wetland that is rich in plant and animal resources. The prehistoric environment is likely to have been similar in structure and distribution of available resources to that of the existing wetland environment due to the stabilization of the Ohio River during the Early Holocene (Shane et al. 2001).

The Highland Creek site was initially recorded in 1991 by archaeologists from the U. S. Army Corps of Engineers, Kentucky Heritage Council, University of Kentucky, and Indiana University. The original investigation was undertaken to document substantial looting that had occurred at the site (Figure 1.2). As a result of the 1991 investigations, more than 40 looter holes were documented and mapped. The documentation of the looter holes, along with the collection and preliminary analysis of artifacts from disturbed contexts, suggested that a thick, intact midden deposit at the site had been severely impacted and that the interments of at least 26 individuals had been disturbed (DiBlasi 1997). The original investigation also indicated that the site contained at least three components: a Late Archaic component, a Middle to Late Woodland component, and a late-nineteenth/early-twentieth century historic component (DiBlasi 1997:7).

Building on this earlier work, the 1999 investigations at the Highland Creek site were designed to: 1) define the boundaries of the site; 2) determine the nature and extent of intact subplowzone cultural deposits; 3) sample the intact cultural deposits to determine the age and nature of occupations at the site; and 4) more fully determine the extent of looter disturbance and damage to the site. In order to accomplish these four goals, four 1 x 2 m test units (Figure 1.2) and 36 auger probes (Figure 4.17) were excavated at the site. In addition to these excavations, four looter pits were opportunistically selected for cleaning and profiling to determine the depth of looter disturbance and to maximize the stratigraphic data recovered.

The 1999 excavations confirmed that the site contained three distinct components (late Middle Archaic/early Late Archaic, Late Woodland, and late-nineteenth/early-twentieth century). Radiocarbon determinations and diagnostic cultural materials indicate that deposition of a 60-70 cm thick midden occurred over a relatively short period of time (400-700 years), primarily during the late Middle Archaic/early Late Archaic period. It should be pointed out, however, that the Highland Creek site is not a shell midden, which is a common characteristic of Green River Archaic sites in western Kentucky. Rather, the Highland Creek midden consists of a dense accumulation of a broad spectrum of plant (particularly nutshell) and animal materials. It also contains a large amount

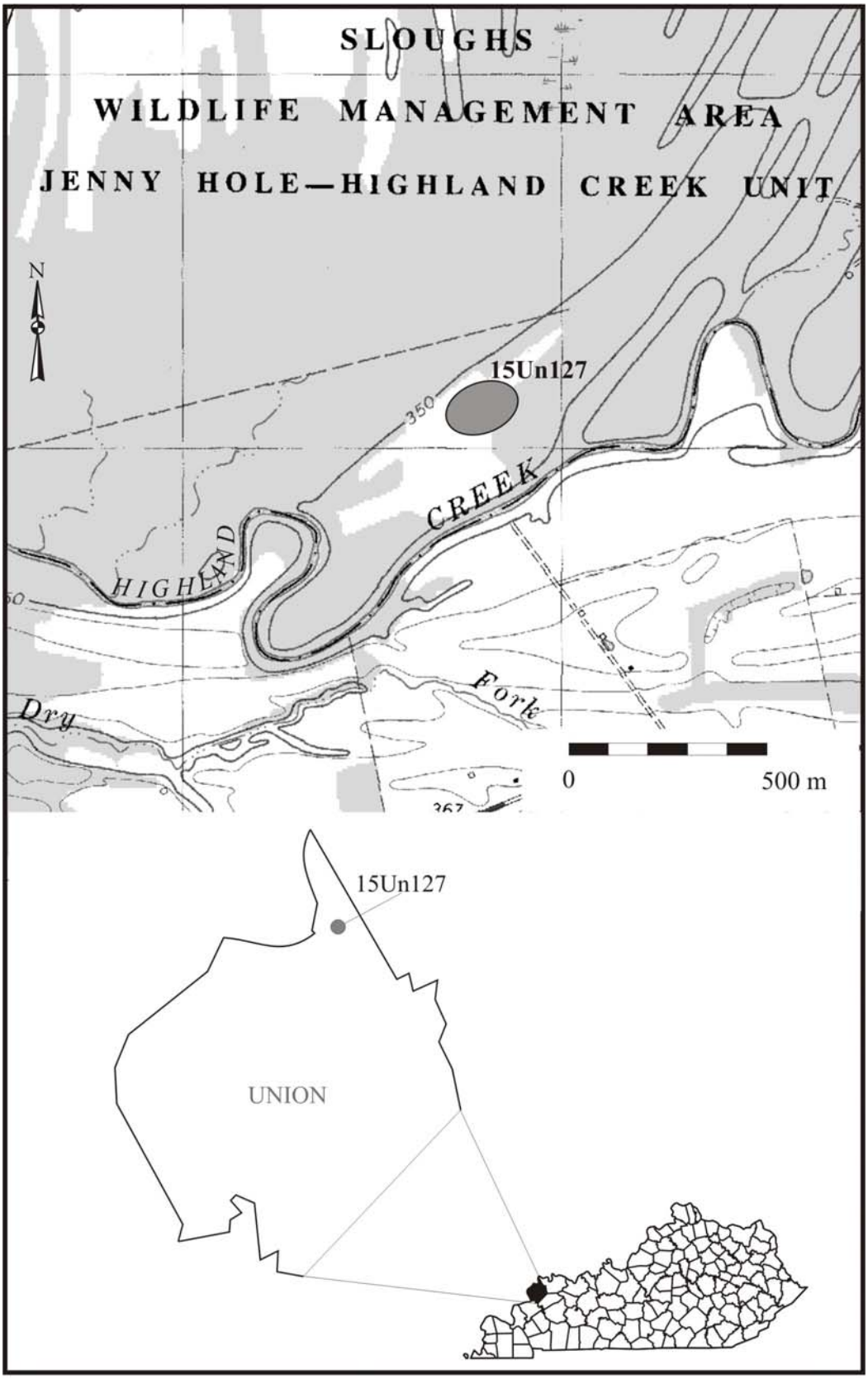

Figure 1.1. Location of Highland Creek Site (15Un127).

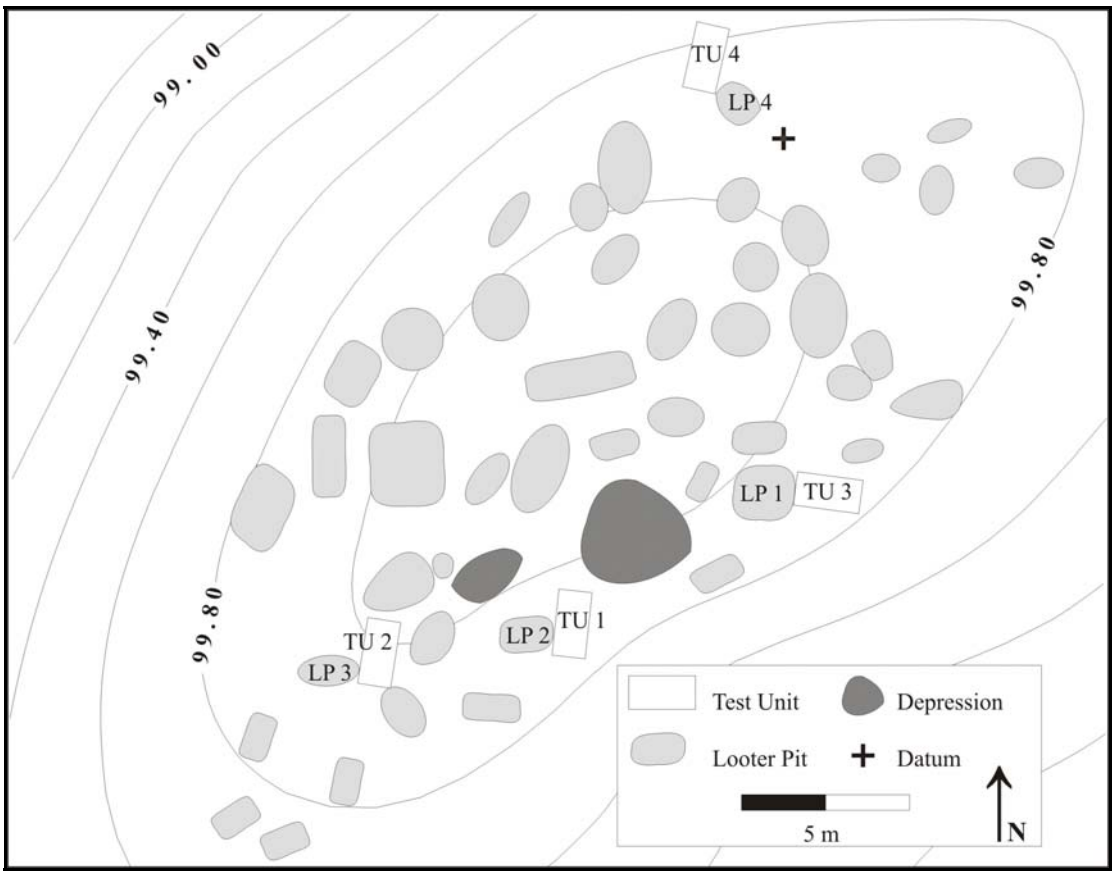

Figure 1.2. Map of the Highland Creek Site Showing the Location of Test Units and Looter Pits.

of burned clay. Within the thick midden deposits 16 features, including six human burials, were identified during the 1999 excavations. Other features consisted of hearths and large pits.

In addition to the substantial late Middle Archaic/early Late Archaic midden, a relatively ephemeral occupation of the site occurred during the Late Woodland period. A turn-of-the-century tenant or farmstead house was also constructed and occupied at the site. Both the Late Woodland and Historic components at the Highland Creek site were restricted to the plowzone.

The Highland Creek site late Middle Archaic/early Late Archaic component provides evidence of a localized adaptation to a highly productive wetland environment. Utilization of a diverse range of resources within this environment coupled with intensive exploitation of certain resources, such as nuts, points to an overall pattern of increasing economic intensification during the late Middle Archaic/early Late Archaic in the lower Ohio Valley. These findings correlate well with broad scale social processes that have been identified by other researchers (Jefferies 1990, 1996; Price and Brown 1985; Sassaman 1995) for this period. These processes include increased regionalization, a reduction in mobility, intensification of the economy, and increased social complexity.

Although the Highland Creek site has been severely damaged by looters, the 1999 investigation of this site documented that it still contains significant intact prehistoric remains that date to the late Middle Archaic/early Late Archaic. Based on the presence of these intact deposits,

the site appears to be eligible for listing in the National Register of Historic Places under Criterion D for its scientific data content. Additional research at the site has the potential to address Archaic period research questions identified in Kentucky's comprehensive state plan (Jefferies 1990: 220-228) and to contribute to the understanding of late Middle Archaic/early Late Archaic lifeways, and settlement and subsistence patterns in the Ohio Valley. Given the site's significance it is recommended that an effort be made to stabilize the Highland Creek site. This would involve filling the looters holes with sterile soil obtained from another location.

The remainder of this report details the 1999 investigations at the Highland Creek site and is organized as follows. Chapter 2 provides environmental and cultural background information for the Union County/Highland Creek area. It also provides a review of previous archaeological research in Union County. Field methods are discussed in Chapter 3, followed by a description of the Highland Creek site investigations in Chapter 4. Descriptions of the lithic materials and ceramics from the Highland Creek site are provided in Chapters 5 and 6 respectively. Historic artifacts found at the site are described in Chapter 7, botanical remains are presented in Chapter 8, faunal remains are discussed in Chapter 9 and human skeletal remains recovered from the site are described in Chapter 10. Finally, in Chapter 11, the results of the 1999 investigations are summarized.

CHAPTER 2:

BACKGROUND

ENVIRONMENTAL BACKGROUND

PHYSIOGRAPHY

Union County is located within the Western Kentucky Coalfield physiographic region. It is bordered on the north and west by the Ohio River, by Crittenden and Webster counties to the south, and Henderson County to the east. Topography within the county ranges from nearly level to steep. Elevation is highest in the central and southern portions of Union County, where rolling hills rise to 203 m amsl (Jacobs 1981). The lowest elevations (100 m amsl) occur in the southwestern part of the county. The major topographic features within Union County are the Ohio River and associated low floodplains, which can extend up to 3 km from the river's current location. Ridgelines that border the floodplains rise more than 60 m, creating a marked division between lowland and upland ecotones.

GEOLOGY/HYDROLOGY

Bedrock within the region is dominated by Pennsylvanian age sandstone, siltstone, and shale (Jacobs 1981). Soil overlying the bedrock consists primarily of alluvium on the floodplains and eolian loess deposits on the upland slopes. Watershed within Union County is typically a northward and westward flow, draining into the Ohio River. The Ohio River is deeply entrenched within its current drainage and alluvial deposits on the floodplain are composed of coarse materials derived from glacial outwash (Walker 1957). Finer deposits within the alluvium include lenses and beds of sand, gravel, silt, and clay.

SOILS

Melvin-Wheeling association soils are present throughout the lowland area surrounding the Highland Creek site. These soils are found on the low Ohio River floodplains of the northeastern portion of Union County. This area is characterized by long, narrow, wet swales separated by long, low ridges. Melvin soils are nearly level and poorly drained, consisting primarily of silty clay loam. Wheeling soils are nearly level to sloping, appearing on the long, low ridges within the area. They are characterized by a surface layer of silt loam, which grades downward into a silty clay loam and fine sandy loam. Melvin soils have good potential for wetland wildlife habitat and Wheeling soils have good potential for openland wildlife habitat (Jacobs 1981).

CLIMATE[1]

Northwestern Kentucky is currently characterized by relatively long, hot summers and mild winters. Brief periods of intense cold occur occasionally during the winter months. Mean annual temperature at nearby Evansville, Indiana is 56.9 degrees Fahrenheit, and temperature ranges between –23 and 108 degrees have been recorded (Ray 1965). The growing season, or period of frost free days, averages between 200 and 210 days a year, with extremes of 169 to 250 days (Elam 1967; Ray 1965). Mean annual precipitation is 18 cm and is fairly well distributed throughout the year (Elam 1967), although precipitation is slightly higher in the late winter and early spring months than in the fall months. The highest monthly total reported for Evansville, Indiana was for January 1937

[1] Climate and Flora and Fauna sections adapted from Sussenbach (1992:5-6).

when 6 cm of rain were recorded, and the lowest reported total was 0.04 mm of rainfall for March 1910 (Ray 1965). Snowfall averages around 4 cm per year (Elam 1967).

Past changes in the climate of the midcontinental United States have had pronounced affects on the lower Ohio Valley region. There is limited direct data from the immediate site area that can be used to reconstruct past climatic changes (Leach 1986; Wilkins et al. 1991). However, paleoclimatic evidence from elsewhere in the Midwest and Midsouth can be used as a proxy baseline for identifying the major changes in past climatic conditions (Delcourt and Delcourt 1981, 1985; King and Allen 1977; Wendland 1978; Wendland and Bryson 1974; Wright 1992).

The warming trend that marks the end of the Wisconsinan glacial episode began around 14,000 B.C. Between 14,000 and 19,000 B.C., the climate was generally cool (although warmer than the preceding glacial climate) and wet. From 9,000-8,000 B.C., climatic cooling and drying occurred as a result of the Younger Dryas oscillation (Wilkins et al. 1991; Wright 1989). By 8,000 B.C., environmental conditions began to approximate those of today in terms of annual temperature, seasonality, and precipitation levels (King and Allen 1977; Wilkins et al. 1991). After 7,500-7,000 B.C., the climate continued to warm during the Hysithermal interval (ca. 6,700-3,000 B.C.)(Davis 1983; Delcourt and Delcourt 1984; King and Allen 1977). During this period, mean annual temperatures exceeded those of today and precipitation and groundwater levels were depressed. The lowering of groundwater levels led to increased development of swamp and backwater habitats along major river courses and lowland floodplain settings (Davis 1983; Knox 1983; Wilkins et al. 1991). Maximum climatic warming occurred between 5,000-4,000 B.C., after which the climate began to ameliorate (Delcourt and Delcourt 1984; King 1973; King and Allen 1977; Wendland and Bryson 1974). The climate moderated after that time, and has remained relatively stable to the present.

FLORA AND FAUNA

Western Kentucky is included within the Western Mesophytic forest Region (Braun 1950). Depending upon the physiographic setting, the composition of local forest communities varies regionally. The loess-covered uplands are typically characterized by an oak-hickory forest, although higher ridge crest settings may include larger numbers of beech, yellow-poplar, and sugar maple, while lower slopes have greater frequencies of elm and sweet gum (Delcourt and Delcourt 1987; Ray 1965). On the terraces and floodplain of the Ohio River, slight differences in elevation greatly influence forest composition. Along the riverbanks, willow, cottonwood, and sycamore commonly occur. On slightly higher (and better drained) terrace soils, walnut, pecan, sugarberry, and poplar are more common. Lower, poorly drained, backwater (or slough) areas are dominated by water-tolerant species, especially bald cypress. Brushy undergrowth, succulent grasses, sedges, and reeds are also common in these areas (Delcourt and Delcourt 1987; King and Allen 1977; Ray 1965). Extensive stands of cane were once present in the area (along riverbanks and in sloughs), but evidence of their former extent is now limited to small, isolated localities. The wide scale clearing of uplands for agricultural purposes has also affected forest community composition. Abandonment of these cleared areas has resulted in the growth of a successional forest that includes significant quantities of sassafras, black locust, and sumac (Delcourt and Delcourt 1987; Delcourt et al. 1998; Ray 1965).

The modern floral communities described above represent the end result of long-term climatic changes that initiated during the Late Pleistocene period (Wright 1992: 129-134). For the past 4000-5000 years, however, little change in forest community composition has been detected–other than those induced by human action such as species selection, intentional fires, and industrial logging (Delcourt and Delcourt 1987; Delcourt et al. 1998) . Prior to that time, however, significant differences in vegetation were present throughout the region. During the height of the last

glacial maximum (LGM)(ca. 16,000-14,000 B.C.), boreal spruce and jack pine forests were present over much of the region (Delcourt and Delcourt 1987; King1981; King and Allen 1977; Leach 1986; Wilkins et al. 1991). Between 9,000-5,300 B.C., the boreal forests were replaced by a mesic deciduous forest, initially composed of oak and ash, and later (post 5,300 B.C.) included higher frequencies of elm, maple, and hickory (Wilkins et al. 1991: 228-233). Around 7,000-5,000 B.C., southern species, especially those adapted to lowland and floodplain settings (e.g. willow, cottonwood and sycamore), also began to appear throughout the region in greater frequencies (Delcourt and Delcourt 1987; King and Allen 1977; Wilkins et al. 1991). During the Hypsithermal interval, the drier conditions resulted in an increase in upland grassy areas, the development of lowland swamps as groundwater levels lowered, and an increase in oak and hickory frequencies in floodplain and terrace settings (King and Allen 1977: 319-320).

A wide range of animal species is currently present in the region. Common terrestrial species include white-tailed deer, raccoon, opossum, squirrel, turkey, quail, rabbit, coyote, skunk, box turtle, and woodchuck. Otter, beaver, and mink, along with numerous fish species, turtles, and shellfish, are, or were, found in the river valleys. Migratory water-fowl that frequent the area include ducks and geese. Early settlers also noted the presence of bison in the region.

During the Pleistocene period, a number of large animal species were present in the region. Stag moose, giant beaver, woodland muskox, mastodon, mammoth, peccaries, extinct bison, horse, short-faced bear, saber-toothed tigers, ground sloths, tapir and giant armadillo were likely present–in addition to many of the modern species. However, by 11,000 B.C., most, if not all, of the Pleistocene mega-fauna had become extinct (Leach 1986).

REGIONAL CULTURE HISTORY

PALEOINDIAN PERIOD (ca. 10,000 B.C. TO 8,000 B.C.)

It is currently unknown when the earliest occupation of North America occurred (Dillehay 2000; Dixon 2001; Lepper and Bonnichsen 2004; Madsen 2004; Meltzer 2002). The earliest documented human presence in the North American mid-continent, specifically the Eastern Woodlands, however, is believed to have occurred during the Early Paleoindian period (ca. 11,000-8000 B.C.). Few Paleoindian sites have been documented in western Kentucky (Freeman et al. 1996; Sanders 1990). As such, our knowledge of Paleoindian lifeways and adaptations is based largely on observations drawn from Paleoindian sites that have been studied in other regions. It is generally assumed that these early groups lived in small, nomadic bands that subsisted by hunting and gathering.

Tankersley (1996) divided the Paleoindian period into three subperiods based on changes in projectile point styles that, presumably, corresponded to changes in subsistence practices. Colonizing populations presumably entered Kentucky during the Early Paleoindian period (10,000-9000 B.C.) near the end of the Late Pleistocene, if not earlier. Sites associated with these early groups are generally identified by the presence of Clovis points, which are characterized by lanceolate forms and the presence of a fluted base formed by the removal of a long basal flake from either one or both sides of the tool (Sanders 1990). Some believe Early Paleoindian groups hunted primarily Pleistocene megafauna like mammoth and mastodon (Tankersly 1996:26). Other researchers, however, question how common this type of hunting would have persisted in the Eastern Woodlands, where megafauna may have been rare (Meltzer and Mead 1983). Associations of megafauna and Early Paleoindian cultual materials in the Midcontinent and Southeastern North America are rare (the Kimmswick site in Missouri is the best known example) and likely indicate

exploitation of a wider variety of smaller terrestrial plants and animals (Anderson 1996; Freeman et al. 1996; Graham et al. 1981). The relatively homogenous nature of the lithic assemblages from Early Paleoindian sites is believed to indicate a high degree of mobility resulting in large amounts of cultural interaction between small, nomadic groups.

By the Middle Paleoindian subperiod (9000-8500 B.C.), the subsistence strategies of Paleoindian groups were becoming increasingly more generalized (Tankersley 1996:32). Projectile points were more stylistically diverse in contrast to the Early Paleoindian subperiod. Though they were still characterized by fluted bases, there are distinct differences between northern Gainey points, which have deep, rounded basal concavities, and the more southerly Cumberland points, which have fluting scars running at least two-thirds the length of the point face. These stylistic differences may reflect the emergence of regionalized groups of Paleoindians, and a decrease in cultural interaction among these groups (Meltzer 2002).

By the Late Paleoindian subperiod (8500-8000 B.C.), fluted-base projectile points had disappeared and were replaced by increasingly more regionalized point styles, including the Dalton Beaver Lake, Quad, Greenbrier, Agate Basin, and Hardaway points (Justice 1987:33-44; Tankersley 1996:33). There is also broadening of the range of individual tool forms that comprise Late Paleoindian tool kits, compared with those of earlier Paleoindian groups (Freeman et al. 1996; Tankersley 1996). Additionally, Late Paleoindan subperiod tools demonstrate a greater reliance on regionally-available lithic raw materials for exploitation. Regional diversity in point styles, local raw material use, and a broader tool kit composition has been interpreted as indicating a more intensive exploitation of a wider range of food resources and more restricted regional settlement systems (Anderson 1996; Lepper and Bonnichsen 2004; Freeman et al. 1996; Tankersley 1996).

ARCHAIC PERIOD (8000 - 1000 B.C.)

The trend toward increased regionalization continued into the Archaic period (8000-1000 B.C.). Like their Paleoindian predecessors, Archaic groups were hunter-gatherers. However, over the course of this 7000 year period, the nature of their settlement and subsistence systems changed dramatically from relatively highly mobile generalists to the intensive exploitation of highly productive resources at seasonally occupied locations (Sassaman 1996). By the end of the Archaic, Native American populations had become semi-sedentary to seasonally-sedentary, with many sites evidencing more intensive use and occupation for longer periods of time. In general, a gradual trend of increasing social complexity has been documented for the Archaic period (Jefferies 1997).

These trends can, at least in part, be linked to changes in the natural environment. After the Pleistocene (from 7000 to 3000 B.C. during the early Holocene), Kentucky experienced a long period of warm, dry conditions referred to as the Hypsithermal climatic interval (Jefferies 1996:39). Fluctuations in the natural environment correspond to the increased use of diverse and regionally localized plant and animal resources. Also seen during this time are the first indications of plant domestication. Seasonal movements continued to be an important component of this subsistence strategy. Increases in the number of sites, tools, and storage facilities attest to more intensive site occupation. Larger numbers of sites imply that higher regional population densities existed throughout the Archaic period, which in turn suggests that as population grew, changes in social organization and settlement patterns changed as well (Jefferies 1982, 1996, 1997).

Like the Paleoindian period, the Archaic is traditionally divided into three subperiods. Cultural activities during the Early Archaic (8000-6000 B.C.) are more closely related to those of the Paleoindian period. This subperiod is seen as a time of cultural transition, as regional populations more fully adapted to the environmental conditions of the Early Holocene. Many, if not most, of the

modern animal and plant species native to Kentucky became established at this time. Game species included white-tail deer, elk, black bear, and turkey, while plant species included such nut bearing hardwood trees as oak, hickory, pecan, walnut and chestnut.

Throughout the Early Archaic, regional populations remained relatively highly mobile. Few Early Archaic sites have yielded evidence of midden development or substantial features that would indicate long-term occupation (Jefferies 1996:40). Early Archaic groups utilized lithic tool-kits similar to those of their Late Paleoindian ancestors. During the early portion of the Early Archaic, Kirk Corner Notched and Thebes Side Notched projectile points dominated site assemblages. Later, Early Archaic groups began using bifurcate base point types, such as Le Croy and Kanawha (Justice 1987:54-82, 91-97).

By the beginning of the Middle Archaic (6000-3000 B.C.), the more mobile settlement and subsistence strategies of Early Archaic peoples began to focus on more regionalized resource exploitation and settlement. Some sites appear to have been base camps used on a long-term, perhaps year-round, basis (Jefferies 1996; Nance 1987). The Middle Archaic also is characterized by an increase in regionally distinct projectile point types (Jefferies 1996; Justice 1987). In the Kentucky, Middle Archaic sites are typically identified by the presence of Morrow Mountain, Elk River, and Big Sandy points (Jefferies 1996; Justice 1987). These cultural changes may be closely related to the Hypsithermal, which began around 7000 B.C. Drier conditions may have restricted the distribution of subsistence resources and encouraged more intensive exploitation of local foodstuffs. This is indicated by the adoption of a variety of specialized foodstuffs available in smaller areas, and the use of specialized tools, such as stone axes, pitted anvils (for processing nuts), grinding stones, and pestles. Use of these tools allowed for the exploitation of a wider range of plant resources (Jefferies 1996:48). Ridgetops were occupied, but sites also were located in valleys and on bluffs, which suggests that Native Americans were exploiting a wide range of habitats (Jefferies 1982, 1990).

An emphasis on hunting and gathering continued into the Late Archaic (3000-1000 B.C.) with some important changes. People became more dispersed, and subsistence strategies included a greater reliance on fresh water mussels and starchy seeds. There also is evidence of small-scale cultivation of native plants, such as squash and gourd (Jefferies 1996; Watson 1969). An increase in social complexity has been inferred for this subperiod. In western Kentucky, individuals interred with grave goods, such as stone tools made from exotic chert or items made from Great Lakes copper could indicate the beginnings of status differentiation (Jefferies 1996; Webb 1946; Winters 1968).

Late Archaic groups extensively utilized both upland and lowland environments (Jefferies 1996:66). Large base camps are common in floodplain valleys, while rockshelters were utilized by hunting bands or by groups gathering nuts. These seasonal base camps may have served to socially integrate regional Late Archaic populations. Distinctive projectile points include Cogswell, McWhinney Stemmed, Merom-Trimble, Pickwick, Ledbetter, and Wade. Other artifacts include pestles, chipped stone choppers, chipped stone axes, metates, and nutting stones (Dunnell 1972; Jefferies 1990, 1996).

The appearance of cultigens in Late Archaic contexts has been interpreted as evidence of early plant domestication and use of these plants as subsistence resources. Evidence of early cultigens has been documented at several sites in or near Kentucky, such as Koster in central Illinois (Brown 1977:168) and at the Carlston Annis and Bowles sites along the Green River in western Kentucky (Marquardt and Watson 1977), as well as in eastern Kentucky at Cloudsplitter Rockshelter and Cold Oak Shelter (Cowan et al. 1981; Gremillion 1995, 1998). Gourd and squash have been

identified on Late Archaic sites, as well as goosefoot, sunflower, and marsh elder (Struever and Vickery 1973).

WOODLAND PERIOD (1000 B.C. - A.D. 1000)

The end of the Archaic period is defined by the introduction of pottery, some time around 1000 B.C. Many of the trends initiated in the Late Archaic, such as increased social complexity and a greater reliance on native cultigens, continued into the Woodland period. Technological, economic, and socio-political changes occurred during the Woodland period, with these trends culminating in the elaborate mortuary practices of the Adena and Hopewell traditions of the Early and Middle Woodland subperiods.

The Early Woodland (1000-200 B.C.) is distinguished from the Late Archaic by the manufacture of ceramics. Early Woodland ceramics often exhibit fabric-impressed, plain, or cordmarked surface treatments. Projectile points of this subperiod in the western Kentucky region include Adena Stemmed, Gary, Kramer, Saratoga, and Motley (Justice 1987; Lafferty 1981; Railey 1996).

Like Early Woodland groups elsewhere, Native Americans in western Kentucky were not just hunter-gatherers, but also engaged in the cultivation of domesticated plants (Railey 1996). The Early Woodland shows a growing reliance on horticulture. Botanical remains from Early Woodland sites indicate a greater use of several edible plants that make up the Eastern Agricultural Complex: squash and gourd, sunflower, maygrass, sumpweed, giant ragweed, and knotweed (Cowan 1985). Even with the introduction of these plants, nuts were still commonly consumed.

Early Woodland assemblages from western Kentucky are assignable to the Crab Orchard complex (Maxwell 1951). Large intensively occupied Crab Orchard sites have been documented in the lower Ohio Valley and some of these sites are located in Union County (Railey 1996:85). Many of these sites have thick midden deposits.

In the Middle Woodland subperiod (200 B.C. - A.D. 500), there is a continuation of hunting-gathering-gardening, with increased use of cultigens such as goosefoot and maygrass (Cowan et al. 1981; Watson 1969, 1985, 1989). The lithic tool kit changed in the Middle Woodland as well; Early Woodland Adena-like and other stemmed forms gave way to notched and expanding stemmed forms around or soon after A.D. 1. By the end of the Middle Woodland, point styles included weakly shouldered, expanding stem, or shallow side notched types, such as Stueben, Copena, Lowe (Justice 1987).

Middle Woodland ceramics include conoidal, barrel-shaped jars with flat, rounded, subconoidal, or pointed bases. At the beginning of the Middle Woodland, vessels tended to have cordmarked, cordwrapped dowel-impressed, or fabric-impressed exteriors. In addition, Southeastern stamped ceramics appear in low frequencies at many Middle Woodland sites in Kentucky. By the end of the Middle Woodland, the majority of vessels are subconoidal or subglobular jars, with recurved or direct rims. The flat-bottomed flower pot style ceramics become extremely rare, as do dowel-impressed vessels (Railey 1990).

Late Woodland sites in western Kentucky are located primarily along floodplains of major streams and creeks. Some early Late Woodland sites are similar to that of the Stone Fort Complex of southern Illinois (Pollack and Henderson 2000) and are associated with upland ridgetops. Ceramics are much thinner than those of the preceding Middle Woodland and projectile points are

characterized by Lowe Flared Base points. There also is an increased emphasis on the use of cultivated starchy and oily seeded plants.

One of the most important technological changes that took place in the Late Woodland was the introduction of the bow and arrow around A.D. 700-800 (Railey 1996:111). Stemless triangular arrow points are diagnostic of terminal Late Woodland site lithic assemblages (Railey 1996:119). Terminal Late Woodland sites along the Ohio River in Union County are assigned to the Yankeetown phase. Yankeetown components are characterized by distinctively decorated ceramics. Among the decorative elements found on Yankeetown ceramics are incising, bar stamping, finger nail impressions, and notched applied fillets (Pollack and Henderson 2000; Railey 1990, 1996; Sussenbach 1992). Maize becomes an important source of food during this phase and settlements tend to be occupied for longer periods of time.

LATE PREHISTORIC PERIOD (A.D. 1000-1750)

By A.D. 1000, Native American groups throughout western Kentucky had become increasingly sedentary, with long-term to permanent occupation of sites and the construction of corporate structures and facilities. They began to rely heavily on cultivated plants, maize in particular, to meet their subsistence needs. They also began to participate in the Mississippian cultural and religious traditions of the Southeast and Midwest and to create monumental architecture (Jennings 1989:262; Lewis 1996; Muller 1986).

Mississippian settlements were arranged in a hierarchical manner with a political system generally described as a chiefdom (Smith 1978; Muller 1986). The hierarchical nature of Mississippian settlements is usually assessed on the basis of site and population density, as well as the presence or absence of monumental architecture. Political, social, and ideological centers of Mississippian settlements were the towns. They had a central plaza surrounded by houses and earthen platform mounds (on which the homes for the chiefly lineages were built), and were associated with larger resident populations. Mississippian populations also lived in smaller associated villages, hamlets, and farmsteads (Green and Munson 1978; Lewis 1996:127; Muller 1986). Large multi-mound Mississippian sites, such as Jonathan Creek, Wickliffe, Angel, and Kincaid are present in western Kentucky and nearby regions (Black 1967; Green and Munson 1978; Muller 1978, 1986).

Basic technological changes in ceramic and lithic assemblages can be documented for this period. Mississippian ceramics are characterized by shell tempering, with a variety of vessel forms that include jars, bowls, bottles, plates, and pans. Lithic tool assemblages are dominated by triangular projectile points. The presence of marine shell and copper artifacts at Mississippian towns points to participation in long-distance exchange networks and interaction spheres.

Most Mississippian towns in western Kentucky were abandoned by A.D. 1400 with regional populations relocating to smaller more dispersed settlements (Muller 1986). An exception to this pattern is the Angel-Caborn-Welborn transition (Green and Munson 1978; Pollack 1998). Along the Ohio River in Henderson and Union counties and corresponding counties in Indiana and Illinois, following the collapse of the Angel chiefdom, during the subsequent Caborn-Welborn phase the regional Mississippian population continued to live in large villages and to maintain a settlement hierarchy. The largest Caborn-Welborn village is the Slack Farm site, which is located in Union County. In addition to large villages, Caborn-Welborn settlement patterns consisted of small villages, hamlets, farmsteads, and blufftop cemeteries (Green and Munson 1978; Pollack 1998). However, the Caborn-Welborn settlement system lacked a regional mound center.

The presence of objects manufactued from marine shell, copper, and catlinite at Caborn-Welborn phase sites points to continued participation in long distance exchange networks. The widespread distribution of these materials at all sites in the settlement system and the absence of regional mound center suggests that Caborn-Welborn sociopolitical organization was not as complex as that of earlier Mississippian groups. Historic trade goods, consisting of objects manufactured from European copper and brass and glass beads, have been recovered from Caborn-Welborn sites. Caborn-Welborn phase sites were abandoned prior to Euro-American exploration of the lower Ohio Valley during the mid- to late-eighteenth century.

PREVIOUS ARCHAEOLOGICAL RESEARCH

Although several archaeological investigations have taken place within Union County, the number is far less than in other counties of western Kentucky. The reasons for this are uncertain, but likely relate to the amount of development that has occurred in different areas. According the Kentucky Office of State Archaeology, 185 archaeological sites have been recorded in Union County.

The archaeological investigations that have occurred within Union County can be roughly divided into two broad eras (pre-1970s and post-1970s). The first of these encompasses the initial survey, documentation, and excavation of sites within the county. Lyon (1872), working with the Smithsonian Institution, reported the first surveys and excavations in the area. This early work focused on the recording of mounds and mound groups, along with the excavation of burials and the recovery of associated cultural materials. One of the sites that Lyon appears to have visited and documented was Slack Farm.

In the 1930s and 1940s, under the direction of William S. Webb, the Works Project Administration (WPA) sponsored several substantial excavations at mound centers and large midden sites in western Kentucky, such as Jonathan Creek (Webb 1952), Carlston Annis (Webb 1950), Indian Knoll (Webb 1946), and Chiggerville (Webb and Haag 1939). Additional, smaller WPA investigations were conducted in Union County. In their 1932 publication, Webb and Funkhouser (1932) describe the location of eight sites, primarily mounds or mound groups, within Union County.

A majority of the archaeological investigations that have been conducted in Union County since the 1970s fall under the rubric of cultural resource inventory and management projects. Most of these projects have been undertaken in response to the development of natural resources and mining activities (Carstens and Jenings 1978; Carstens et al. 1979; Schenian 1992; Turnbow and Gerard 1975; Webb 1984), or to urban expansion and highway construction (Stallings and Ross-Stallings 1995a).

Turnbow and Gerard (1975) conducted a Phase II testing of five sites that had been previously identified. The sites ranged in age from the Archaic to Historic periods. Testing consisted of two to three 1 x 1-m test units that were excavated at each site. These excavations suggested that the cultural material at all five sites was restricted to the plowzone and no additional work was recommended.

In 1978 and 1979, survey of the location for a proposed coal washing facility resulted in the recording of 21 sites (Carsten and Jenings 1978; Carsten et al. 1979). Testing was conducted at eight of these sites and consisted of a series of shovel probes and 1 x 1-m units at each location. Cultural

materials from the tested sites ranged in age from the Early Archaic to Late Woodland/Mississippian periods. None of the sites evidenced intact cultural deposits and no further work was recommended.

Paul Webb (1984) surveyed two tracts for airshaft/manshaft expansion by the Peabody Coal Company. This survey resulted in the identification of two prehistoric non-diagnostic lithic scatters and three mid-nineteenth to early-twentieth century historic sites. All of the sites were reported as heavily disturbed and no further work was recommended.

Schenian (1992) conducted a survey for the location of a proposed coal mining operation in the southern part of Union County. Five sites were recorded in her survey. These consisted of two light lithic scatters of non-diagnostic materials, two late-nineteenth/early-twentieth century historic sites, and a multicomponent Late Archaic-Early Woodland and Late Woodland-Mississippian site (15Un170), which was recommended for further testing.

Shovel testing of the site (15Un170) indicated high artifact densities within the plowzone and a lower, potential midden zone within the site deposits. Site 15Un170 is located on a low toespur overlooking a small floodplain, which would have been a wetland/marshy area for portions of the year, during the time of prehistoric occupation of the site (Schenian 1992). This site is of interest here because of the similarity in temporal affiliation and associated landform with the Highland Creek site.

In 1995, Stallings and Ross-Stallings (1995a) conducted Phase II testing of two sites (15Un175 and 15Un176) in response to the construction of a US 60 highway bypass. Eight 1 x 1-m test units were excavated at the site and mechanical equipment was used to remove the plowzone from three areas. Cultural materials recovered included a small amount of nondiagnostic lithic debris, nondiagnostic ceramics, and pieces of fire-cracked rock. No intact cultural deposits were discovered and no further work was recommended.

The 1987 looting of the Slack Farm site (15Un28) led to an intensive investigation in 1988 of this late Mississippian Caborn-Welborn phase village (Pollack 1998; Pollack et al. 1996). Slack Farm also contains a substantial Crab Orchard component. In the mid-1990s, Pollack (1998) documented and investigated several other Caborn-Welborn phase sites in Union County including Moore (15Un42), Blackburn (15Un57), and Hooper (15Un177). This research focused on Caborn-Welborn settlement patterns, exchange relationships, and sociopolitical organization.

Overall, the archaeological investigations that have been conducted to date within Union County have demonstrated the presence of sites ranging in age from Early Archaic through the mid-twentieth century. The presence of at least one other site (15Un170) that appears to be similar in age and physical location to that of the Highland Creek site suggests that during the Late Archaic period the Native American inhabitants of the region were positioning themselves on similar landforms (low ridges and spurs overlooking floodplains) and likely exploiting similar environmental niches (primarily wetland habitats).

CHAPTER 3:
FIELD METHODS

The field methods employed during the 1999 investigation of the Highland Creek site were designed to: 1) define the boundaries of the site; 2) determine the nature and extent of intact

subplowzone cultural deposits; 3) sample the intact cultural deposits; and 4) determine the extent of looter disturbance and damage to the site. Initial recording of this site was undertaken in 1991 by archaeologists from the U. S. Army Corps of Engineers, the Kentucky Heritage Council, the University of Kentucky, and Indiana University. The work was undertaken to document the severe looting of the site. The 1991 investigations resulted in the recovery and preliminary analysis of human remains from a minimum of 26 individuals (DiBlasi 1997). At that time, a sketch map was made of the more than 40 holes dug by the looters (looter pits). Building on this earlier work, the 1999 investigation began with the establishment of a datum and north-south/east-west baselines across the site.

To learn more about the site's stratigraphy, the slump and fill was removed from four looter pits. The four looter pits were opportunistically selected, based on their location, size, and depth. Upon completion of the removal of the slump/fill, each looter pit was photographed and profiled. The looter pits were then backfilled.

Four 1 x 2-m test units were excavated at the site. Each test unit was placed adjacent to one of the profiled looter pits to take advantage of what was known about the site's stratigraphy. Units were excavated in arbitrary levels divided into 1-m subunits. Sediment was removed in an arbitrary 20-cm level for the first level only, in order to remove the plowzone overburden. Following the first level, additional levels were excavated in 10-cm increments. Depth was measured in centimeters below surface (cm bs) from the southwest corner of each test unit. All excavated sediment was dry screened through 6.35 mm wire mesh. Each unit was excavated to sterile subsoil. The stratigraphy of each unit was documented with profile drawings and photographs. The test units were then backfilled.

A flotation column was taken from each of the four test units. A 20 x 20 x 10-cm area in the northeast corner of each test unit was taken as a flotation sample from each of level. Each flotation sample contained approximately 6-8 liters of soil. The depth below surface of each flotations sample was recorded.

Features documented during the course of this project were treated as follows: 1) feature limits were defined horizontally; 2) a planview map of the feature was drawn; 3) each feature was sectioned in half to determine its vertical limits; 4) the feature was then profiled and photographed; and 5) the remainder of the feature was excavated. Sediment from each feature was screened through 6.35 mm mesh. All recovered artifacts were collected, recorded, and bagged. Flotation samples were collected from all features and radiocarbon samples were collected when possible. Flotation sample size varied with the size of the individual feature and amount of fill they contained.

Although human burials were assigned feature numbers, they were excavated according to different procedures than non-burial features. Burials were excavated as follows: 1) upon discovery, the edges and orientation of the burial were determined; 2) the skeletal remains were exposed; 3) a planview map was drawn and photographs were taken; and 4) the skeletal remains were removed. All sediment fill in or around a burial was screened separately through 6.35 mm mesh. Flotation samples and radiocarbon samples were collected from burials whenever possible.

Auger probing of the site was undertaken in order to determine the extent of subsurface deposits and site boundaries. The location of auger probes followed the baseline grid system established for the site. No probes were placed within the area of the site that had been subjected to looting for two reasons: 1) to preserve as much as possible of the remaining intact deposits; and 2) to avoid disturbing burials. Auger probes were restricted to the site margins and off-site locations. Probes were placed at 10-m intervals on each of ten transects. Sediment removed from the probes

was screened through 6.35 mm mesh. The stratigraphy and depth of deposits, along with any cultural materials recovered, were recorded for each auger probe. A total of 36 auger probes were excavated.

Materials collected from the Highland Creek site were washed, labeled and catalogued at the University of Kentucky Archaeology Laboratory. After research and analysis was completed, all materials and records documenting these investigations were curated at the University of Kentucky's William S. Webb Museum of Anthropology in Lexington, Kentucky.

CHAPTER 4:
EXCAVATION AND STRATIGRAPHY

INTRODUCTION

Over the course of the four weeks of fieldwork, four looter pits were cleaned and profiled, and four 1 x 2-m test units and 36 auger probes were excavated. Only the four looter pits that were cleaned and profiled were assigned field identification numbers. All other looter pits were simply mapped. As a result of these investigations 15 subplowzone features were documented and the extensive midden deposits were sampled. In this chapter the stratigraphy associated with each documented looter pit and excavated test unit is described, as are associated features. The 36 auger probes excavated at the site are presented in a combined discussion that focuses on a description of site boundaries and the stratigraphy of the site outside the area that was impacted by the looters.

LOOTER PITS AND TEST UNITS

In this section, each of the four profiled looter pits is described in conjunction with its associated test unit. The stratigraphy of each looter pit and test unit is described, as are any associated features. Information is also presented on the types of artifacts recovered from each of the four profiled looter pits and test units. Representative stratigraphic profiles, feature planview maps, and artifact summaries are presented and described.

LOOTER PIT 1/TEST UNIT 3

Looter Pit 1

Looter Pit 1 (Figure 4.1) was located approximately 10 m south of the site datum (10S, 0E). The pit measured 1.7 m (north/south) x 1.6 m (east/west) and had a depth of approximately 50-60 cm below surface prior to cleaning. Slumping and filling had occurred and was removed by shovel and trowel to expose the full depth of the looter disturbance. Upon completion of cleaning, the depth was established to be 96-105 cm below surface across most of the pit, with a deeper area in the eastern side of the pit that extended to a maximum depth of 1.31 m below surface. Looter Pit 1 was the largest of the four looter pits examined.

A single feature (Feature 2) was discovered in the process of removing the fill from Looter Pit 1. It was located at the base of the pit (at approximately 1.11 m below surface) along its southeastern edge. The feature, a human burial, had been impacted by both looter and rodent disturbance. Excavation of the undisturbed deposits at the base of the looter pit revealed that a large portion of the burial was still intact. Removal of the intact portion of the burial resulted in a final pit depth of 1.31 m below surface.

Stratigraphy

The removal of slump/fill sediment revealed a stratigraphic profile of more than 1.3 m in depth (Figure 4.2). Five distinct stratigraphic zones were discerned, although the contact/transition between three of the zones were not clear. The uppermost stratigraphic zone (Zone Ia), which extended from the ground surface to approximately 13-17 cm below surface, was a dark brown

(10YR 3/3) silt loam mottled with a dark yellowish brown (10YR 4/4) silty clay. The sediment was moist and unconsolidated (lacking structure), and likely represents looter backdirt.

The contact of Zone Ia with Zone Ib was not clearly discernable. It was documented at 13-17 cm below surface (Figure 4.2). Zone Ib extended to a depth of 41-50 cm below surface. This zone did not evidence the mottling present in Zone Ia and was comprised entirely of a very dark grayish brown (10YR 3/1) silt loam. The sediment was dry and unconsolidated. Zone Ib represents the extent of the plowzone in Looter Pit 1.

The transition between Zone Ib and Zone II was very indistinct. Zone II, which was a dark grayish brown (10YR 4/2) silty clay, was documented at 41-50 cm below surface and extended to approximately 70-82 cm below surface (Figure 4.2). The sediment in this zone was moist and consolidated (blocky structure), containing a dense scatter of charcoal and burned clay fragments. Zone II represents a midden deposit characterized by a very dark, blocky sediment, densely mottled with nutshell charcoal and burned clay. Minor amounts of calcined bone and mussel shell fragments also were associated with this zone.

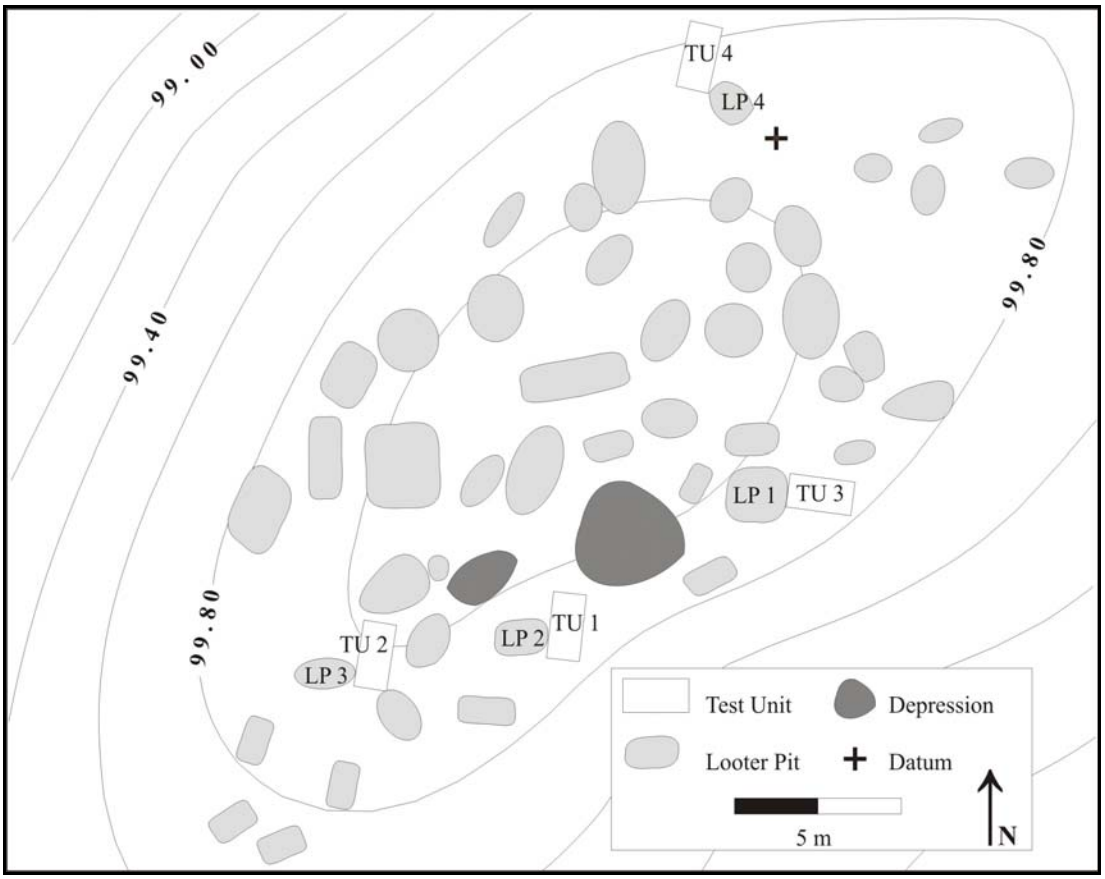

Figure 4.1. Location of Test Units and Looter Pits.

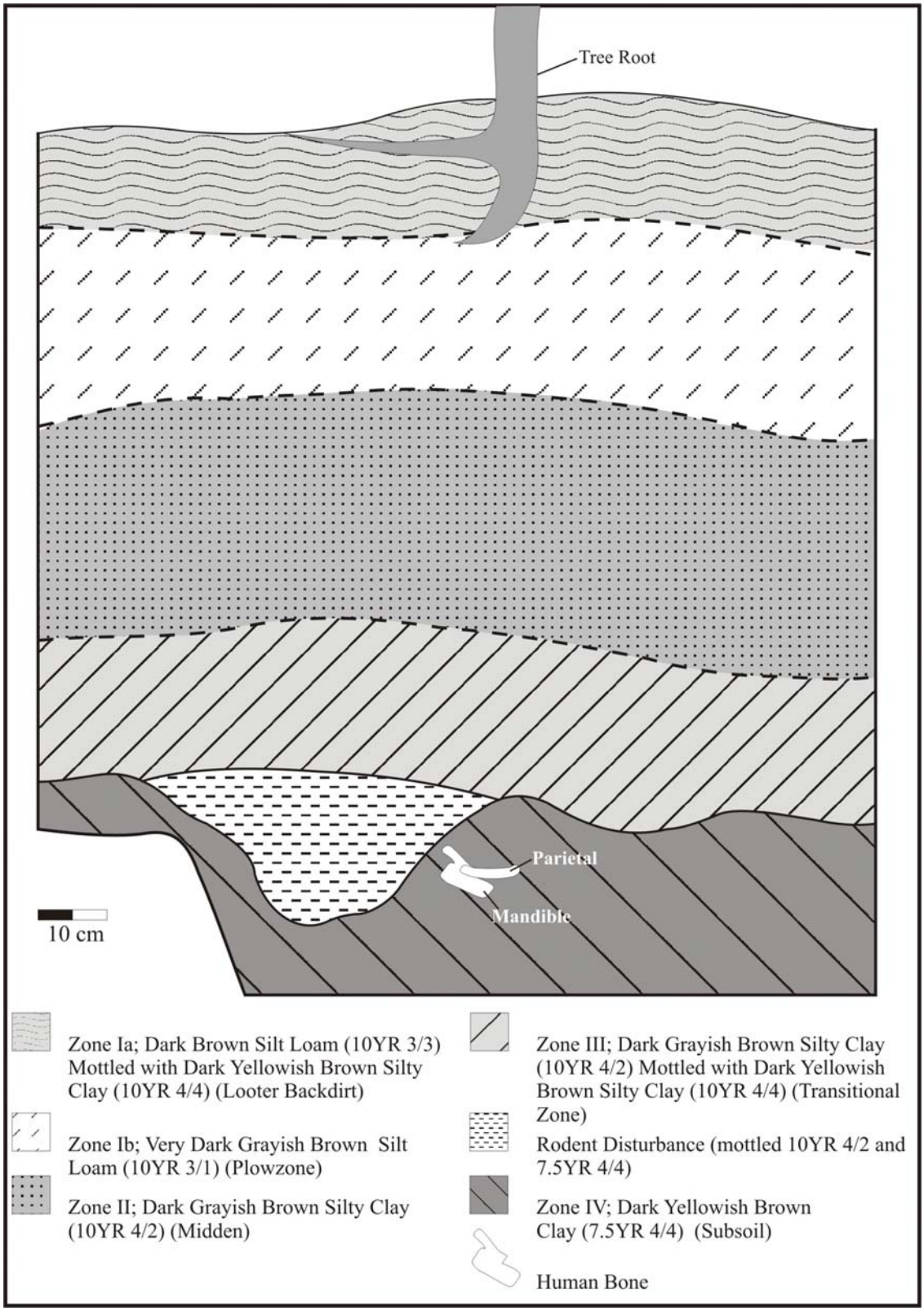

Figure 4.2. Stratigraphic Profile of East Wall of Looter Pit 1.

The contact between Zone II and Zone III was also nondistinct. Zone III appeared at approximately 70-82 cm below surface and extended to approximately 92-107 cm below surface (Figure 4.2). Zone III is characterized by a dark grayish brown (10YR 4/2) silty clay mottled with a dark yellowish brown (10YR 4/4) silty clay. It contained a scatter of charcoal and burned clay, which also characterized the Zone II midden zone. The sediment was moist and consolidated, and represents a transition between the midden deposits and the more clayey, sterile subsoil.

The contact between Zone III and Zone IV was clear and distinct, appearing at approximately 92-107 cm below surface (Figure 4.2). Zone IV was comprised of a very compact, moist, dark yellowish brown (7/5YR 4/4) silty clay. This zone represents sterile subsoil.

Feature 2, a human burial, was associated with Zone IV. No evidence of a burial pit was observed. The lack of a burial pit likely resulted from a combination of the looter disturbance and the large rodent disturbance in close proximity to the burial. However, Feature 2 appears to be intrusive into the Zone IV sediments. Other than Feature 2, no other cultural remains/materials were associated with the Zone IV sediments in this looter pit.

A rodent disturbance was situated near the contact between zones III and IV in the eastern edge of the looter pit (Figure 4.2). Sediment associated with the rodent disturbance mirrored the sediment in Zone III, being a mottled dark grayish brown (10YR 4/2) silty clay and a dark yellowish brown (7.5YR 4/4) silty clay mix that contained a light scatter of charcoal and burned clay. The sediment associated with this disturbance was loose and unconsolidated, lacking structure. The rodent disturbance appeared at approximately 92 cm below surface and extended to a maximum depth of 1.15 m below surface.

Features

Feature 2, a human burial, was documented near the base of Looter Pit 1 (Figure 4.3). First documented at a depth of approximately 1.11 m below surface, Feature 2 was represented by several disarticulated cranial fragments. After establishing the extent and depth of the looter pit, the remaining intact sediments were excavated to expose the feature. These excavations extended down to a depth of 1.31 m below surface, at which point the feature was completely pedestaled and exposed. The looters had impacted the burial in several locations. The burial also had been disturbed by rodents. These two processes resulted in the disturbance of the cranium and the left-side of the torso and pelvis, along with portions of the left arm and leg. However, approximately 70% of the skeleton remained intact.

Figure 4.3 illustrates the position of the burial in planview. Feature 2 is an adult male 35-45 years old at death (see Chapter 10, Individual 1). The burial was laid out in an extended position on his back. It was oriented roughly north-south, with the top of the cranium to the north. The left arm apparently was slightly flexed and drawn across the abdomen, while the right arm extended down across the pelvis. The position of the legs is indeterminable due to prior disturbance, however a large slate slab (27 x 29 cm), was located approximately 19 cm southeast of the pelvis and was positioned to cover the feet of the skeleton.

Other than the slate slab covering the feet, no objects or artifacts were associated with the burial. Analysis of the two flotation samples that were collected from Feature 2, one from sediment inside the rib cage and the other from sediment around the cranium, indicated the presence of a variety of nuts, including hickory (n=40), black walnut (n=9), and acorn (n=2). A fragment of gourd rind (n=1) was also identified (see Chapter 8).

During the cleaning and profiling of the east wall of Looter Pit 1, human bones were encountered and suggested the possibility of an intact burial. These bones, which are part of Feature 9, are detailed and discussed along with the results of the excavation of Test Unit 3.

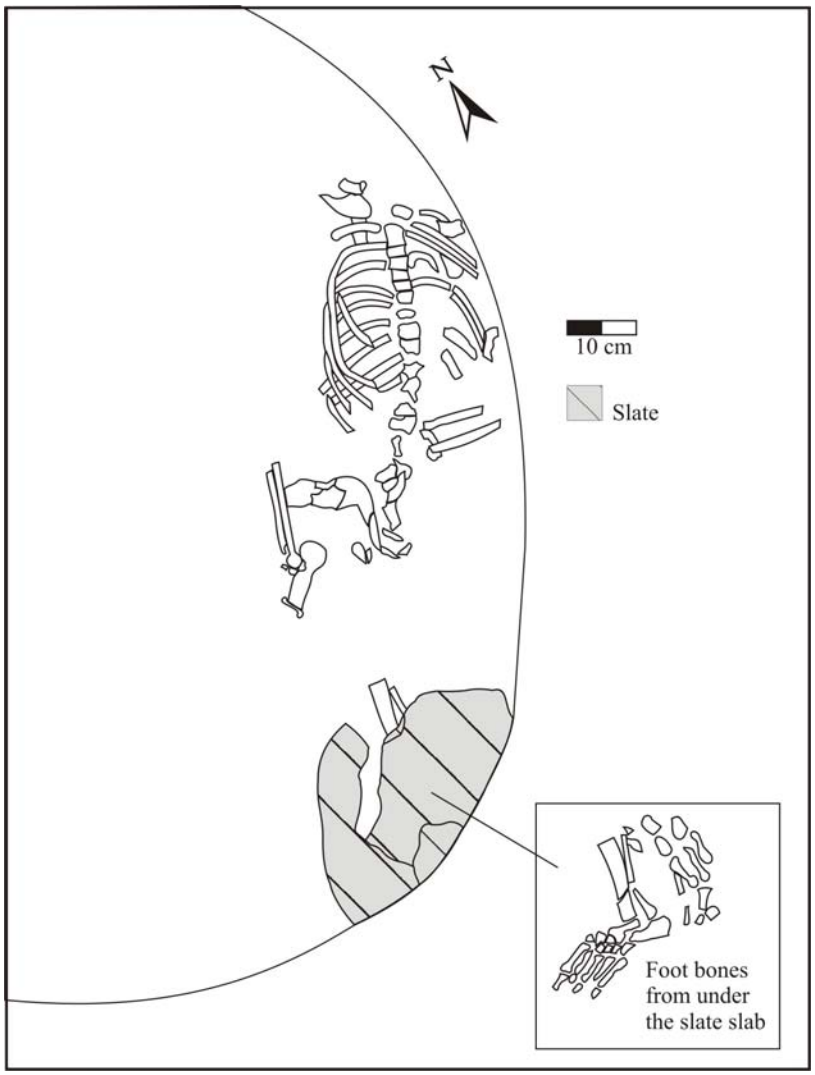

Figure 4.3. Planview of Feature 2 in Looter Pit 1.

Artifacts

Artifacts recovered from the removal of the mixed slump/fill of Looter Pit 1 included shell fragments, chipped stone debitage, and a groundstone fragment (Table 4.1). Botanical and faunal remains were also recovered, although in low frequencies. Human skeletal remains were also recovered.

Table 4.1. Looter Pit 1/Test Unit 3 Artifacts.

Artifact Type	Looter Pit 1	T.U. 3 - Zone I	T.U. 3 - Zone II	T.U. 3 - Zone III
Ceramics		6		
Fire-Cracked Rock		4	138	57
Botanical Remains	52	93	965	414
Faunal Remains	4	21	145	69
Shell	2			
Skeletal Remains	Present			Present
Historic		244		
Chipped Stone	2	248	179	32
Projectile Points		1	1	
Groundstone	1	1		3
Totals	61	618	1,428	575

Test Unit 3

During the process of excavating Feature 2, several bone fragments were discovered in the eastern wall of Looter Pit 1 near a rodent disturbance. Although these fragments likely represented disturbed remains from Feature 2, the possibility existed that the bone fragments were part of a second disturbed burial. In order to assess this possibility, a 1 x 2-m test unit was placed perpendicular to the eastern edge of Looter Pit 1 (Figure 4.1).

Test Unit 3 (T.U. 3) (10S, 0E to 10S, 2E) was excavated in 10-cm arbitrary levels, with the exception of Level 1, which was a 20-cm level (see Chapter 3). This unit was excavated to a depth of 1.14 m below surface. The ground surface associated with T.U. 3 was very uneven, with the western half of the unit having been raised, or "mounded," by the deposition of looter backdirt. Three features (features 6, 9, and 10) were recorded in T.U. 3. Of these, one was a human burial (Feature 9), one was a pit (Feature 10), and one was a rock concentration (Feature 6).

Stratigraphy

Upon completion of the unit, a stratigraphic profile was drawn of the north wall of T.U. 3 (Figure 4.4). Zone Ia, a dark brown (10YR 3/3) silt loam mottled with a dark yellowish brown (10YR 4/4) silty clay, was thickest in the western half of T.U. 3 and tapered off in the eastern half of the unit. The soil was dry and loose (unconsolidated). Zone Ia, which extended from the ground surface to 0-14 cm below surface represents looter backdirt deposited onto the previous ground surface of T.U. 3.

The contact of Zone Ia with Zone Ib was distinct. Appearing between 0-14 cm below surface across the unit, Zone Ib extended to a depth of 20-41 cm below surface (Figure 4.4). The relatively uneven measurements (20 cm and 41 cm below surface) for the depth of Zone Ib was a

product of the uneven distribution of looter backdirt across the surface of T.U. 3. Zone Ib did not contain the mottling present in Zone Ia and was comprised entirely of a dark brown (10YR 3/3) silt loam. The sediment was dry and unconsolidated. A light scatter of charcoal and burned clay was present throughout the zone. Zone Ib represents the extent of the plowzone in T.U. 3.

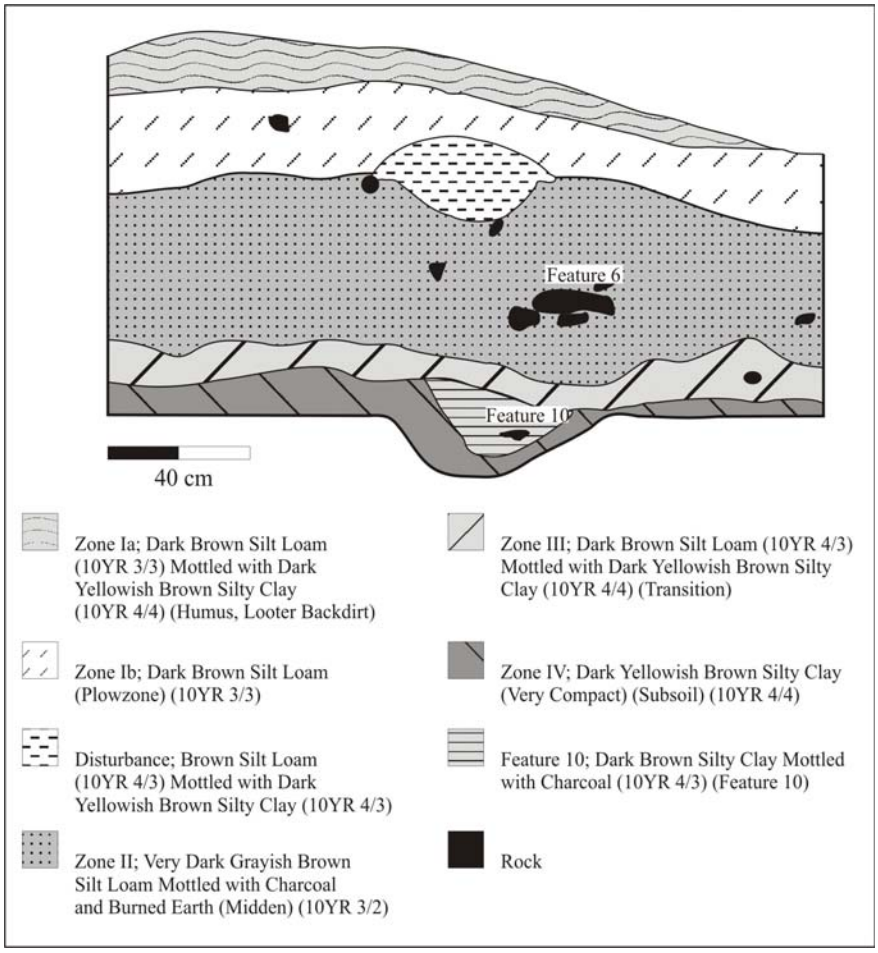

Figure 4.4. Stratigraphic Profile, North Wall of Test Unit 3.

During the excavation of T.U. 3 a large disturbance was documented near the center of the north wall at a depth of 22 cm below surface (Figure 4.4). The disturbance was characterized by a heavily mottled brown (10YR 4/3) silt loam with a dark yellowish brown (10YR 4/4) silty clay. The sediment was moist and unconsolidated (lacking structure). At its deepest point, the disturbance extended to a depth of 44 cm below surface.

Zone II appeared at approximately 41 cm below surface, except in the eastern-most quarter, where it appeared at a depth of 22 cm below surface (Figure 4.4). It extended to an average depth of 58-84 cm below surface. Zone II, a very dark grayish brown (10YR 3/2) silt loam, was densely mottled with charcoal and burned clay. Some calcined bone was associated with this zone. The sediment was dry and consolidated, having a blocky structure. This zone represents a midden deposit. A charcoal sample was collected at the base of Zone II (near the Zone II/III transition) at approximately 80 cm below surface. It yielded a calibrated radiocarbon date of 3370(3105)2905 B.C. (Beta-134231) (Table 4-2).

Table 4.2. Radiocarbon Dates from the Highland Creek Site.

Lab. No.	Provenience	B.P.	Calibrated (one sigma)	Material
Beta-134229	T.U. 1, Zone III, Fea-7	4580±80	3615(3355)3030 B.C.	Wood
Beta-134230	T.U. 2 Zone III, Fea-12	4380±70	3355(2935,2975,3005) 2885 B.C.	Nutshell
Beta-134231	T.U. 3 Zone II/III	4470±80	3370(3105)2905 B.C.	Nutshell
Beta-134232	T.U. 3 Zone II	4440±70	3355(3090)2900 B.C.	Nutshell
Beta-134233	T.U. 2, Zone II	4130±70	2875(2845,2820,2670) 2580 B.C.	Nutshell
Beta-134234	T.U. 4, Zone II	4310±70	3095(2905)2760 B.C.	Nutshell
Calibration provided by Beta Analytic, Inc.				

The transition/contact between Zone II and Zone III was clear and distinct, being characterized by increased mottling of the sediment that appeared between 58-84 cm below surface and extended to a depth of 68-96 cm below surface (Figure 4.4). Zone III was characterized by a dark brown (10YR 4/3) silt loam mottled with a dark yellowish brown (10YR 4/4) silty clay. The sediment was more moist and less consolidated than the Zone II midden deposits. However, the charcoal and burned clay observed in Zone II was also present in Zone III. Zone III most likely represents a transitional zone between the midden deposits of Zone II and the succeeding sterile subsoil.

The contact between Zone III and Zone IV was clear and distinct, occurring at 68-96 cm below surface (Figure 4.4). Zone IV was characterized by a moist and very compact dark yellowish brown (10YR 4/4) silty clay. Excavation of Zone IV terminated at 71-104 cm below surface throughout most of the unit, with a deeper area extending down to 1.14 m below surface around Feature 10. Zone IV represents sterile subsoil.

Features

Three features (Features 6, 9, and 10) were recorded in T.U. 3. The first of these, Feature 6, was a small concentration of burned sandstone and siltstone rocks documented at a depth of 56 cm below surface. Feature 6 measured 27 cm north-south and 52 cm east-west. Eight large (cobble-sized) rocks, each of which measured approximately 10-20 cm in length, were associated with this feature. A majority of the burned rocks associated with Feature 6, however, were small (pebble-sized) fragments that measured 5-10 cm in length. No other artifacts were associated with Feature 6.

The sediment surrounding the burned rock concentration was dark and ashy and contained a light scatter of charcoal fragments. Feature 6 extended to a maximum depth of 66 cm below surface. This feature has been interpreted as a hearth due to the concentration of burned rocks and their association with a scatter of ash and charcoal. The localized distribution of the rock concentration and the relatively thin, lens-like appearance of this feature in profile are also suggestive of a hearth (Figure 4.4). A charcoal sample collected from Feature 6 yielded a calibrated radiocarbon date of 3355(3090)2900 B.C. (Beta-134232) (Table 4.2).

Feature 9, a human burial (see Chapter 10, Individual 2), was initially documented during the cleaning of Looter Pit 1. Fragments of human bone were identified in the east wall of the looter pit and suggested the possibility of encountering an intact burial in T.U. 3. Documented at a depth of 82 cm below surface, the burial extended to a maximum depth of 90 cm below surface. The sediment surrounding the burial was a very dark grayish brown (10YR 3/2) silt loam mottled with a dark yellowish brown (10YR 4/4) silty clay. The sediment was moist and consolidated and represents the transition/contact zone (Zone III) between the midden and the sterile subsoil. No burial pit was discernable in the dark sediment and no artifacts were associated with this burial.

Feature 9 was an extended adult male (25-35 years old) oriented with the top of the cranium to the east (Figure 4.5). The burial was positioned flat on its back, with the head rotated slightly to the right. Arms were extended downward to the sides and across the upper abdomen. The hands were crossed on the lower abdomen, just above the pelvis. The rib cage and vertebrae were intact. Approximately 70% of the skeleton remained undisturbed.

Disturbance of Feature 9 had been caused by both rodent and looter activity. The latter had destroyed the portion of the burial that extended into Looter Pit 1, while rodent action had impacted

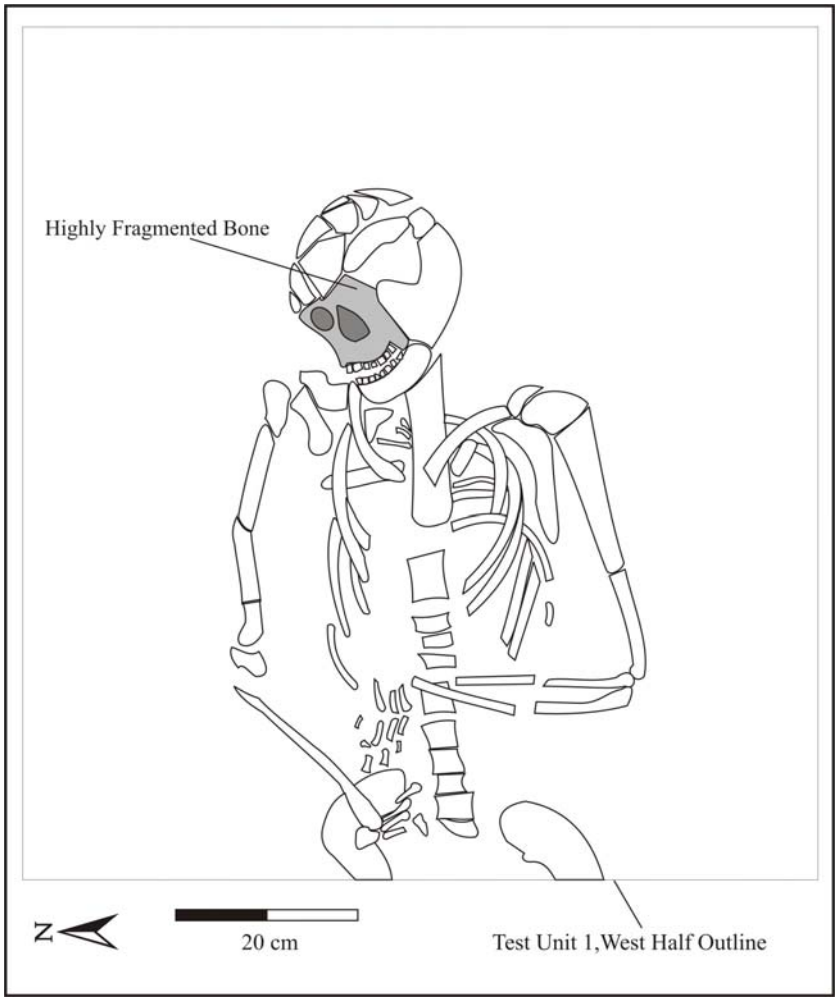

Figure 4.5. Planview of Feature 9 in Test Unit 3.

the lower portion of the pelvis. These activities resulted in the complete absence of the legs, feet, and a portion of the pelvis.

The third feature documented in T.U. 3 was Feature 10. This feature, which extended into the north wall of the test unit, was a large, shallow pit. It was associated with the transition/contact zone (Zone III) that was situated directly below the midden (Zone II) (Figure 4.4). Roughly circular in shape, the excavated portion of Feature 10 measured approximately 92 cm north-south x 90 cm east-west. Feature 10 was recorded at a depth of 88 cm below surface. It had a maximum depth of 1.08 m below surface.

The sediment associated with Feature 10 was a dark brown (10YR 4/3) silty clay that was heavily mottled with small charcoal fragments. The soil was moist and unconsolidated. Among the few artifacts recovered from this feature were two chert flakes, several small, calcined bone fragments, and three possible groundstone fragments. Analysis of the flotation sample that was collected from Feature 10 indicated the presence of hickory (n=183), black walnut (n=30), pecan (n=6), and acorn nuts/nut fragments (n=1) (see Chapter 8).

Artifacts

Artifacts recovered from T.U. 3 can be separated into their respective zones (Table 4.1). The Zone I plowzone and looter backdirt deposits contained several Late Woodland sherds, fire-cracked rock, chipped stone materials, a Late Archaic Pickwick projectile point, a groundstone fragment, and a large amount of late-nineteenth/early-twentieth century historic artifacts. The historic artifacts consisted primarily of container glass and white granite ceramics. Botanical and faunal remains, in relatively low quantities, were also recovered from Zone I.

The Zone II midden deposits contained fire-cracked rock, chipped stone materials, and a Late Archaic Pickwick projectile point (Table 4.1). No prehistoric ceramics or historic artifacts were recovered from Zone II. Botanical and faunal remains were much more numerous within Zone II than in Zone I.

The transitional Zone III deposits contained fire-cracked rock, chipped stone materials, and a few groundstone fragments (Table 4.1). Botanical and faunal remains recovered from Zone III were fewer in number than in the Zone II midden. A human burial (Feature 9) was associated with Zone III.

LOOTER PIT 2/TEST UNIT 1

Looter Pit 2

Looter Pit 2 was located near the southwestern edge of the extent of looter activity, approximately 8 m south and 12 m west (8S, 12W) of the datum point (Figure 4.1). The pit measured approximately 2 m (north/south) x 1 m (east/west) and had a depth of approximately 60-70 cm prior to cleaning. Slumping and filling had occurred, which was removed by shovel and trowel to expose the depth of looter disturbance. Only the eastern-half (roughly 1-m) of Looter Pit 2 was selected for cleaning, which was sufficient to establish both the depth of looter disturbance and the subsurface stratigraphy. Upon completion of the cleaning, the final depth of the eastern-half of Looter Pit 2 was 95 cm.

During the cleaning of Looter Pit 2, evidence of prior disturbance by looters of at least two features was documented. Fragments of human bone recovered from the fill of Looter Pit 2 (see

Chapter 10; Individual 8) suggest the disturbance of a burial. Identification of the recovered skeletal elements, which included a piece of a cancellous bone, a cervical vertebra fragment, femur and tibia shaft, a scapula fragment, and several long bone shaft fragments, indicate that the burial represented the remains of an adult burial. In addition to the burial, the westernmost section of Feature 7, a large pit documented in Test Unit 1 and Feature 16, a small pit, were impacted by looter activity. Extensive rodent and root disturbance at the contact with the sterile subsoil limited the precise determination of the extent and depth of looter disturbance in certain areas of Looter Pit 2, particularly along the north wall.

Stratigraphy

A section of the southern wall in the eastern-half of Looter Pit 2, approximately 80 cm wide and 86 cm in depth, was selected for profiling. The excavation, cleaning, and profiling of Looter Pit 2 resulted in the identification of four distinct stratigraphic zones and a large disturbance (Figure 4.6). The contact/transitions between stratigraphic zones in Looter Pit 2 were clear and easily discernable.

The uppermost stratigraphic zone (Zone Ia), which extended from ground surface to 15-19 cm below surface, was a very dark brown (10YR 2/2) clayey, silt loam (Figure 4.6). The sediment was moist and unconsolidated. This zone represents redeposited looter backdirt.

The contact between Zone Ia and Zone Ib was clear and distinct and was documented at a depth of 15-19 cm below surface (Figure 4.6). Zone Ib, which extended to a depth of 40-48 cm below surface, was a very dark brown (10YR 2/1) silty clay. The sediment was moist and unconsolidated. Zone Ib represents the plowzone at the site.

A large disturbance, which extended across the profiled wall section, was identified below Zone Ib. Documented at a depth of 40-48 cm below surface, this disturbance was a dark yellowish brown (10YR 4/4) silty clay heavily mottled with a very dark grayish brown (10YR 3/2) silty clay (Figure 4.6). The sediment associated with this disturbance was moist and unconsolidated, and extended to a depth of 59-66 cm below surface. The heavy mottling of dark grayish brown (10YR 3/2) silty clay with the dark yellowish brown (10YR 4/4) silty clay, which is characteristic of the site's sterile subsoil, was unusual at this depth and represented the westernmost edge of a large disturbance that is also evident in the west wall profile of Test Unit 1.

A clear contact between the large disturbance and Zone II occurred at a depth of 59-66 cm below surface (Figure 4.6). Zone II was comprised of a very dark grayish brown (10YR 3/2) silty clay. The sediment was moist and consolidated and extended to a depth of 84-87 cm below surface. Zone II was densely mottled with fragments of charcoal and contained several fragments of fire-cracked rock. Zone II represents the midden deposit of this site.

Zone III, the transitional zone between the midden deposits and sterile subsoil, was not present in Looter Pit 2. As a result, the base of the Zone II midden had a direct, clear contact with the Zone IV subsoil.

The contact between Zone II and Zone IV was distinct and occurred at a depth of 84-87 cm below surface (Figure 4.6). Zone IV sediment was comprised entirely of a dark yellowish brown (10YR 4/4) silty clay. The sediment associated with Zone IV was moist and very compact. Zone IV represents sterile subsoil.

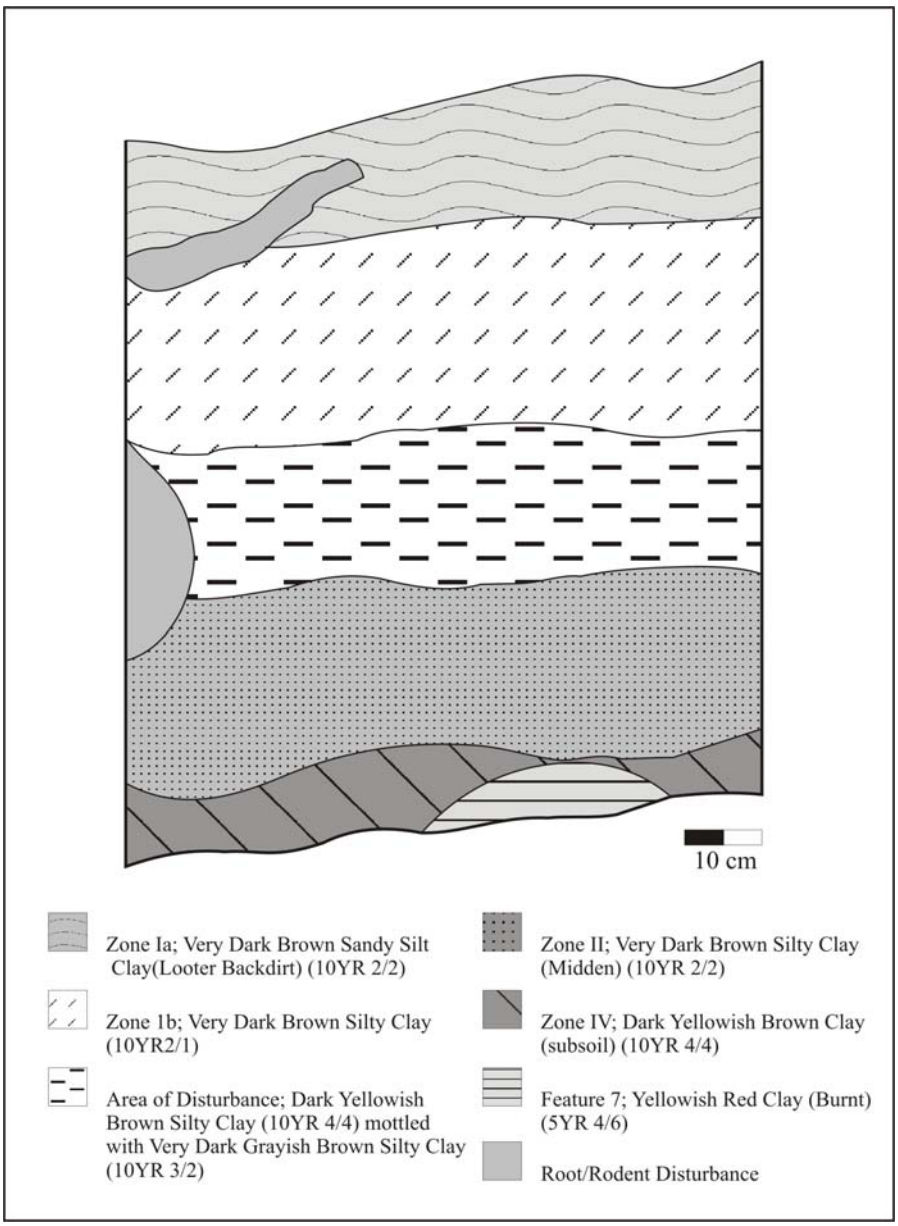

Figure 4.6. Stratigraphic Profile, South Wall of Looter Pit 2.

In addition to the natural large disturbance documented between Zone Ib and Zone II, two other natural disturbances were noted in the profile of Looter Pit 2 . One was a root disturbance that was present in Zones Ia and Ib. Documented at a depth of 8-10 cm (Zone Ia) below surface this disturbance extended to a depth of 24 cm (Zone Ib) below surface. The sediment associated with this disturbance was loose and unconsolidated. A second, later disturbance was intrusive into the previously described large disturbance. It appeared at depth of 40 cm below surface and extended into Zone II to a depth of 68 cm below surface. The sediment associated with this disturbance was also loose and unconsolidated. This disturbance most likely represents relatively recent rodent activity.

Features

As mentioned previously, evidence for looter disturbance of at least two features were documented within Looter Pit 2. Fragments of human bone discovered in the fill of Looter Pit 2 suggest the disturbance of at least one burial (Chapter 10, Individual 8).

The second feature (Feature 17) consisted of an area of burned clay that had been disturbed by looter activity (Figure 4.6). This area appeared at approximately 85 cm below surface and extended beyond the depth of the looter pit. Sediment associated with the burned area consisted of a yellowish red (5YR 4/6) clay. Feature 16 appears to be a pit that extended into the subsoil.

Feature 7, which was documented in during the excavation of Test Unit 1, also extended into this looter pit (see next section). Feature 7 was observed in the floor of the looter pit at a depth of approximately 85 cm below surface. The feature was recorded and mapped, but was not noted on the profile for Looter Pit 2.

Artifacts

Several fragments of human bone were recovered from the removal of the mixed slump/fill from Looter Pit 2 (Table 4.3). Although several pieces of fire-cracked rock were noted within Zone II, these were not collected. No other artifacts were recorded within Looter Pit 2.

Table 4.3. Looter Pit 2/Test Unit 1 Artifacts.

Artifact Type	Looter Pit 2	T.U. 1 - Zone I	T.U. 1 - Zone II
Ceramics		4	1
Fire-Cracked Rock	Not collected	53	218
Botanical Remains		392	2,304
Faunal Remains		41	38
Shell			75
Skeletal Remains	Present	Present	Present
Historic		108	29
Chipped Stone		118	118
Projectile Points		1	1
Groundstone			
Totals	0	717	3,129

Test Unit 1

Test Unit 1 (T.U.1), a 1 x 2-m unit, was located 7 m south and 11 m west (7S, 11W) of the datum (Figure 4.1). It was placed adjacent to the eastern edge of Looter Pit 2 and extended two meters to the north. Test Unit 1 was excavated in 10-cm arbitrary levels, with the exception of Level 1, which was a 20-cm level (see Chapter 3). Eight levels were excavated in T.U. 1 to a depth of 90 cm below surface. Excavation of a feature at the base of the unit resulted in a final depth of 1.4 m

below surface. Four features (Features 3, 5, 7, 8) were documented during the excavation of T.U. 1.

Stratigraphy

Upon completion of the excavation of this unit, a stratigraphic profile was drawn of the west wall of T.U. 1 (Figure 4.7). The surface depression in the south-half of the profile indicates where T.U. 1 bordered Looter Pit 2. Test Unit 1 had a stratigraphic profile that was very similar to that of the adjacent Looter Pit 2. Each of the four stratigraphic zones that were documented in Looter Pit 2 were also discernable in T.U. 1.

Zone Ia, the uppermost stratigraphic zone, extended from the ground surface to a depth of 15-18 cm below surface (Figure 4.7). The sediment of Zone Ia was a very dark brown (10YR 2/2) clayey, silt loam. The sediment of this zone was moist and unconsolidated. Zone Ia represents looter

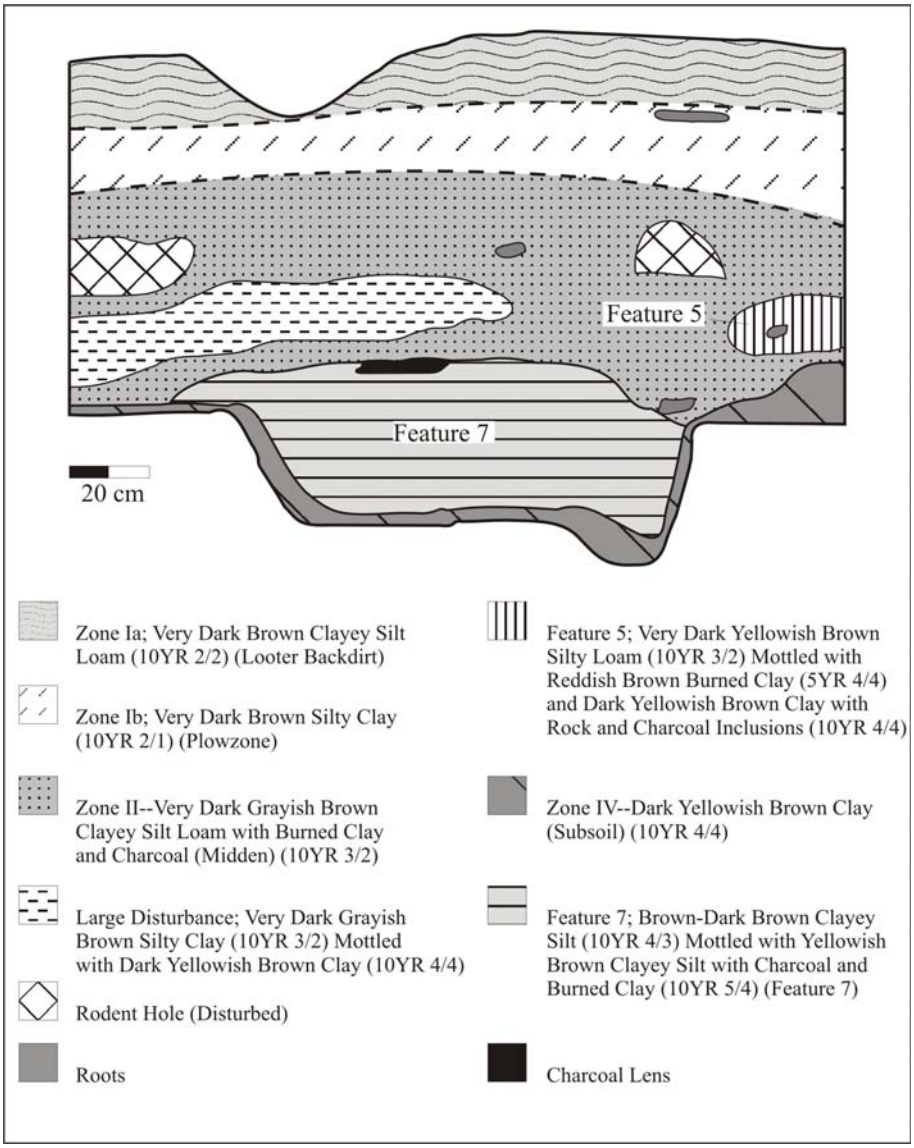

Figure 4.7. Stratigraphic Profile, West Wall of Test Unit 1.

backdirt.

The contact between Zone Ia and Zone Ib was clear and distinct, occurring at a depth of 15-18 cm below surface. Zone Ib extended to a depth of 35-41 cm below surface. The sediment associated with Zone Ib consisted of a very dark brown (10YR 2/1) silty clay. The sediment was moist and unconsolidated. Zone Ib represents the plowzone at the site.

The contact between Zone 1b and Zone II was less clear and not easily discernable. This may be a result of the fairly large amount of disturbances associated with Zone II. This zone was first identified at a depth of 35-41 cm below surface and extended to a maximum depth of 82-90 cm below surface. Zone II sediment consisted of a very dark grayish brown (10YR 3/2) silty clay. It was moist and consolidated and was densely mottled with fragments of charcoal and burned clay. Zone II represents midden deposits.

Similar to the Looter Pit 2 stratigraphy, the Zone III transitional zone was not present in T.U.1. As a result, the base of the Zone II midden had a direct, clear contact with the Zone IV subsoil.

The contact between Zone II and Zone IV was very distinct. It occurred between 82-90 cm below surface. Zone IV was characterized by a dark yellowish brown (10YR 4/4) clay that was moist and compact. Zone IV represents sterile subsoil.

Several disturbances were noted in the profile of T.U. 1 (Figure 4.7). Two root and two rodent disturbances were associated with the upper 60-65 cm of the unit (zones I and II). Sediment within each of these disturbances was loose and unconsolidated. In addition to these disturbances, a very large area of heavily mottled sediment was documented at a depth of 65-67 cm below surface. It extended to a depth of 75-85 cm below surface. The sediment associated with this disturbance was a very dark grayish brown (10YR 3/2) silty clay mottled with a dark yellowish brown (10YR 4/4) clay. This large disturbance extended to the west and was evident in the profile of Looter Pit 2 (Figure 4.6). Two smaller root disturbances were noted in the profile to the north of the large disturbance.

Features

Four features (Features 3, 5, 7, and 8) were documented during the excavation of T.U. 1. Feature 3, a hearth, appeared in the southeast corner of T.U. 1 at a depth of 63 cm below surface and extended to a maximum depth of 80 cm below surface. The sediment associated with Feature 3 was a very dark grayish brown (10YR 3/2) clayey silt mottled with a dark yellowish brown (10YR 4/4) clay. Small fire-cracked rocks (n=7), burned clay, and small charcoal fragments were scattered throughout the feature. Feature 3 measured 45 cm (north-south) x 55 cm (east-west). The flotation sample that was collected from Feature 3 indicated the presence of hickory (n=206), black walnut (n=10), pecan (n=8), and acorn nutshell/nutshell fragments (n=5) (see Chapter 8).

Feature 5, a hearth, was documented in the northwest corner of T.U. 1 at a depth of 64 cm below surface (Figure 4.7). It extended to a maximum depth of 79 cm below surface. Feature 5 was characterized as a very dark yellowish brown (10YR 3/2) silty loam mottled with a reddish brown (5YR 4/4) burned clay and a dark yellowish brown (10YR 4/4) clay. Burned clay fragments, small fragments of charcoal, and small rocks were scattered throughout the fill of this feature. Feature 5 measured 25 cm (north-south) x 26 cm (east-west). The flotation sample that was collected from Feature 5 resulted in the identification of three plant species: hickory nutshell (n=102), black walnut nutshell (n=24), and spurge (n=1) (see Chapter 8).

Feature 7 was a large, roughly circular pit that measured 1.3 m (north-south) x at least 1.0 m (east-west) (the pit extended beyond the west wall of the test unit) (Figure 4.8). Documented at a depth of 85 cm below surface, Feature 7 extended into the sterile subsoil to a maximum depth of 1.33 m below surface (Figure 4.7). The sediment associated with Feature 7 was a brown to dark brown(10YR 4/3) clayey silt mottled with a yellowish brown (10YR 5/4) clayey silt. The feature was very densely scattered with charcoal and fire-cracked rock (n=31). Minor inclusions included shell fragments, small bone and calcined bone fragments, and flakes (n=2). A bone awl was also recovered from the fill of Feature 7.

A dense concentration of burned clay and small, fire-cracked rocks in the northeast section of Feature 7 may represent a small hearth that is intrusive into this larger pit. A carbon sample collected from the charcoal associated with this concentration yielded a calibrated radiocarbon date of 3615(3355)3030 B.C. (Beta-1344229) (Table 4.1). The flotation samples collected from Feature

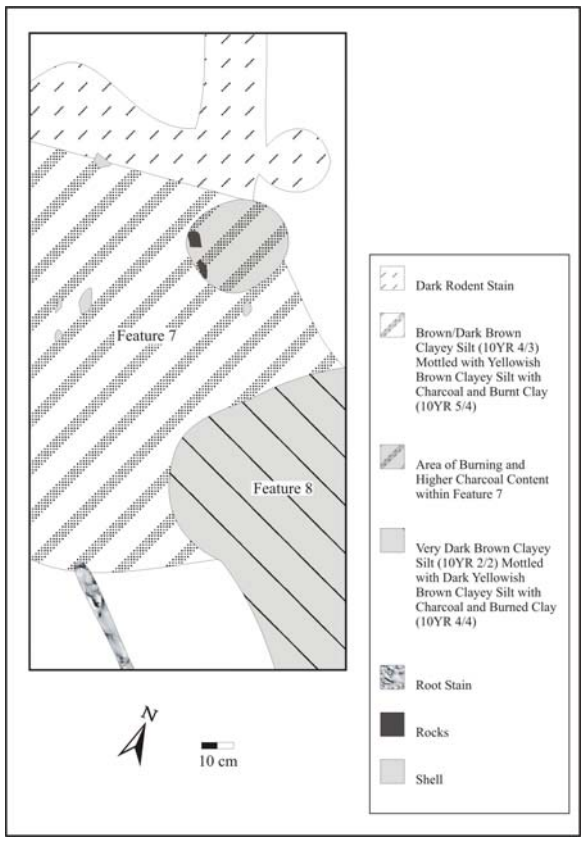

Figure 4.8. Planview of Features 7 and 8 in Test Unit 1.

7 yielded a substantial amount of plant remains, which were dominated by nut species (see Chapter 8). Hickory (n=626), pecan (n=31), and black walnut (n=22) were the most common, with acorn (n=14) and several other plant species also being represented (see Chapter 8).

Feature 8, also a large pit, extended outward from the southeast corner of T.U. 1 and intruded the southeastern portion of Feature 7 (Figure 4.8). Identified at a depth of 90 cm below surface, Feature 8 extended into the sterile subsoil to a maximum depth of 1.03 m below surface. The portion of the pit that was investigated (Feature 8 extended into the south and east walls of T.U. 1) measured 95 cm (north-south) x 61 cm (east-west). Feature 8 consisted of a very dark brown (10YR 2/2) clayey silt, charcoal, burned clay, fire-cracked rock (n=15), small shell and bone fragments, and a

single flake (n=1) were associated with the fill of this feature. The flotation sample that was collected from Feature 8, like that of Feature 7, was dominated by nut species, with hickory (n=177), acorn (n=6), black walnut (n=5), and pecan (n=3) represented (see Chapter 8).

Artifacts

The artifacts recovered from T.U. 1 can be separated into their respective zones (Table 4.3). The disturbed Zone I plowzone and looter backdirt deposits contained a small number of Late Woodland ceramics, fire-cracked rock, chipped stone materials, a Late Archaic Pickwick projectile point, and a large amount of late nineteenth-early twentieth century historic artifacts. The historic artifacts consisted primarily of container glass, white granite and whiteware ceramics, and nails. Faunal and botanical remains were also recovered from Zone I as were fragments of human skeletal elements (Chapter 10, Individual 5).

The Zone II midden deposits included fire-cracked rock, shell, chipped stone materials, a Late Archaic Saratoga Parallel stemmed projectile point (Figure 5.3, k), and a single Late Woodland sherd. Zone II was densely scattered with botanical and faunal remains. A small amount of late nineteenth-early twentieth century historic artifacts were recovered from the upper portion of the midden and relate to a relatively recent occupation/use of the site. The recovery of the prehistoric sherd and historic artifacts within the Zone II deposits, likely reflects downward movement of these materials from the plowzone through rodent or root disturbances. Fragments of human skeletal elements (Chapter 10: Individual 12) were also associated with the Zone II midden deposits. These materials represent the remains of a young adult (15-20 years old).

LOOTER PIT 3/TEST UNIT 2

Looter Pit 3

Looter Pit 3 was located near the southwestern edge of the extent of looter activity at the site, approximately 4 m south and 14 m west (4S, 14W) of the datum and about 3 m due west of Looter Pit 2 (Figure 4.1). The pit, which was roughly circular in appearance, measured approximately 1 m (north-south) x 1 m (east-west) and was approximately 70-80 cm deep prior to cleaning. Slumping and filling had occurred and was removed by shovel and trowel to expose the maximum depth of looter disturbance. Upon completion of the cleaning, it became apparent that the looters had severely undercut the southeastern wall of this pit. However, a portion of the northwest section of Looter Pit 3 was not disturbed by the looters. Cleaning of the pit removed only the sediment disturbed by the looters and avoided the undisturbed area. The final depth of Looter Pit 3 was established at 1.19 m below surface.

During the cleaning of Looter Pit 3, evidence of the disturbance by looters of two possible features was observed. Several fragments of human bone were recovered from the fill of Looter Pit 3, suggesting that the undercutting of the southeastern wall resulted from the disturbance of a burial. The human bones recovered suggest that burials of at least four adults were disturbed by this action (see Chapter 10: individuals 3, 4, 6, and 7). An area of burned clay (Feature 16) identified in the stratigraphic profile of the northeastern wall of Looter Pit 3, suggested that a hearth may have been disturbed as well (Figure 4.9).

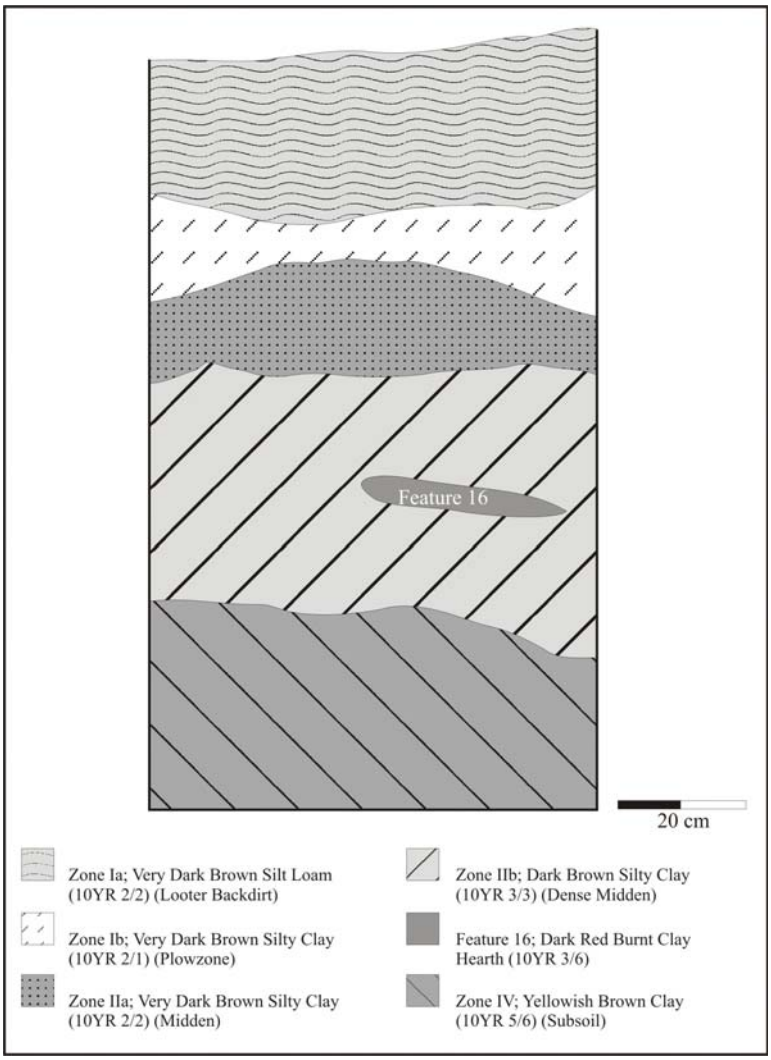

Figure 4.9. Stratigraphic Profile of Northeast Wall of Looter Pit 3.

Stratigraphy

A section of the northeast wall of Looter Pit 3, approximately 70 cm wide and 1.19 m in depth was selected for profiling. Five distinct stratigraphic zones (Figure 4.9) were identified in Looter Pit 3. The contact/transition between each of these zones was fairly well-defined and easily discernable.

Zone Ia extended from the ground surface to a depth of 21-26 cm below surface (Figure 4.9). It was characterized as a very dark brown (10YR 2/2) silt loam. The sediment was dry, loose, and unconsolidated. Zone Ia represents the backdirt from previous looter activity at the site.

The contact between Zone Ia and Zone Ib was clear and well-defined. It occurred at a depth of 21-26 cm below surface (Figure 4.9). Zone Ib extended to a maximum depth of 38-46 cm below surface. The sediment of Zone Ib was characterized as a dry, unconsolidated very dark brown (10YR 2/1) silty clay. Zone Ib represents the plowzone.

Zone IIa appeared at a depth of 38-46 cm below surface and extended to a depth of 51-54 cm below surface (Figure 4.9). It was characterized by a very dark brown (10YR 2/2) silty clay. Unlike the previous Zones Ia and Ib, Zone IIa was moist and consolidated. A light scatter of charcoal and burned clay was present throughout the zone. Zone IIa represents an upper midden deposit.

The contact between Zone IIa and Zone IIb was not as distinct as the upper zones, but was distinguishable (Figure 4.9). Zone IIb appeared at approximately 51-54 cm below surface. It extended to a depth of 85-99 cm below surface and was characterized by a dark brown (10YR 3/3) silty clay, which was moist and consolidated. A scatter of charcoal fragments and burned clay was present throughout the zone. Zone IIb represents a second, and lower, midden deposit in this location.

Zone III, the transitional zone between the Zone II midden and Zone IV subsoil, was not present in Looter Pit 3. The contact between Zone IIb and Zone IV was clear and very distinct, appearing between 85-99 cm below surface (Figure 4.9). The sediment of Zone IV was characterized as a yellowish brown (10YR 5/6) clay, which was moist and very compact. It represents the sterile clay subsoil.

Features

As mentioned previously, several features in this location appear to have been disturbed by the looters. Human bones recovered from the southeastern section of the looter pit, in the area of severe wall undercutting, suggest that a minimum of two, possibly four, burials were disturbed. The recovered skeletal elements have been identified as representing an adult female (40 to 50 years old) (Individual 3), a second adult female (over 30 years old) (Individual 6), an adult male (Individual 7), and an adult whose sex could not be determined (Individual 4) (see Chapter 10).

Feature 16, a diffuse lens of burned clay, located in the northeast wall (Figure 4.9) was discovered at a depth of 67-71 cm below surface. Consistent with the shape and content of other hearths documented at the site, the lens of burned clay likely represents a feature of this type that was also disturbed by the looters.

Artifacts

The artifacts recovered from the removal of the mixed slump/fill of Looter Pit 3 consisted of faunal remains and human skeletal remains (Table 4.4). No other cultural materials were recovered from Looter Pit 3.

Test Unit 2

The recovery of disturbed human remains, along with the documentation of a feature, during the cleaning and profiling of Looter Pit 3 suggested that the looters had impacted at least two subsurface features in this area. This evidence demonstrated that the likelihood of encountering similar, intact features was high in this portion of the site.

Test Unit 2 (T.U.2) was placed directly adjacent to Looter Pit 3 to sample the subsurface deposits in this area. Test Unit 2, a 1 x 2-m unit, was located 4 m south and 13 m west (4 S, 13 W) of the datum (Figure 4.1). Directly adjacent to the eastern edge of Looter Pit 3, T.U. 2 extended 2 m to the north. Test Unit 2 was excavated in 10-cm arbitrary levels, with the exception of Level 1, which was a 20-cm level (see Chapter 3). Nine levels were excavated in T.U. 2 to an ending depth of 1.0 m below surface. The excavation of a feature at the base of the unit resulted in a final

excavated depth of 1.25 m below surface. Four features (Features 4, 11, 12, and 13) were documented during the excavation of T.U. 2.

Table 4.4. Looter Pit 3/Test Unit 2 Artifacts.

Artifact Type	Looter Pit 3	T.U. 2 - Zone I	T.U. 2 - Zone II	T.U. 2 - Zone III
Ceramics		2		
Fire-Cracked Rock		22	125	4
Botanical Remains		283	906	947
Faunal Remains	2	97	216	43
Shell		1	17	14
Skeletal Remains	Present		Present	Present
Historic		78		
Chipped Stone		137	41	10
Projectile Points				
Groundstone		4	1	
Totals	2	624	1,306	1,018

Stratigraphy

Upon completion of the excavation of T.U. 2, a stratigraphic profile was drawn of the east wall of the unit (Figure 4.10). Examination of the profile of T.U. 2 resulted in the identification of five distinct stratigraphic zones within the subsurface deposits. The contact/transition between each of these zones was fairly well-defined and easily discernable.

Zone Ia extended from ground surface to a maximum depth of 13-16 cm below surface (Figure 4.10). The sediment associated with Zone Ia was a very dark gray (10YR 3/1) silty clay loam. The sediment was loose and unconsolidated. Zone Ia represents looter backdirt.

The contact between Zone Ia and Zone Ib was very distinct. Zone Ib appeared at a depth of 13-16 cm below surface and extended to a depth of 46-48 cm below surface (Figure 4.10). The sediment of Zone Ib was characterized as a dark brown (10YR 3/3) silty clay loam that was dry and compact. A light scatter of charcoal and burned clay was present throughout the layer. Zone Ib represents the plowzone.

The contact of Zone Ib and Zone II was irregular, but distinct. Zone II was documented at a depth of 46-48 cm below surface and extended to a depth of 84-95 cm below surface (Figure 4.10). Unlike the midden associated with Looter Pit 3, Zone II in T.U. 2 could not be subdivided into upper (Zone IIa) and lower (Zone IIb) components. As a result, the midden in T.U. 2 was treated as single zone (II). It consisted of a very dark brown (10YR 2/2) silty clay. The sediment associated with this zone was moist and compact. Scattered throughout Zone II were charcoal fragments and burned clay. Zone II represents midden deposits.

Zone III appeared at a depth of 84-95 cm below surface and extended to a depth of 95-105 cm below surface (Figure 4.10). This thin zone was characterized by a very dark brown (10YR 2/2) silty clay mottled with a yellowish brown (10YR 5/6) clay that contained a small amount of charcoal and burned clay. The sediment associated with this zone was moist and compact. Zone III represents

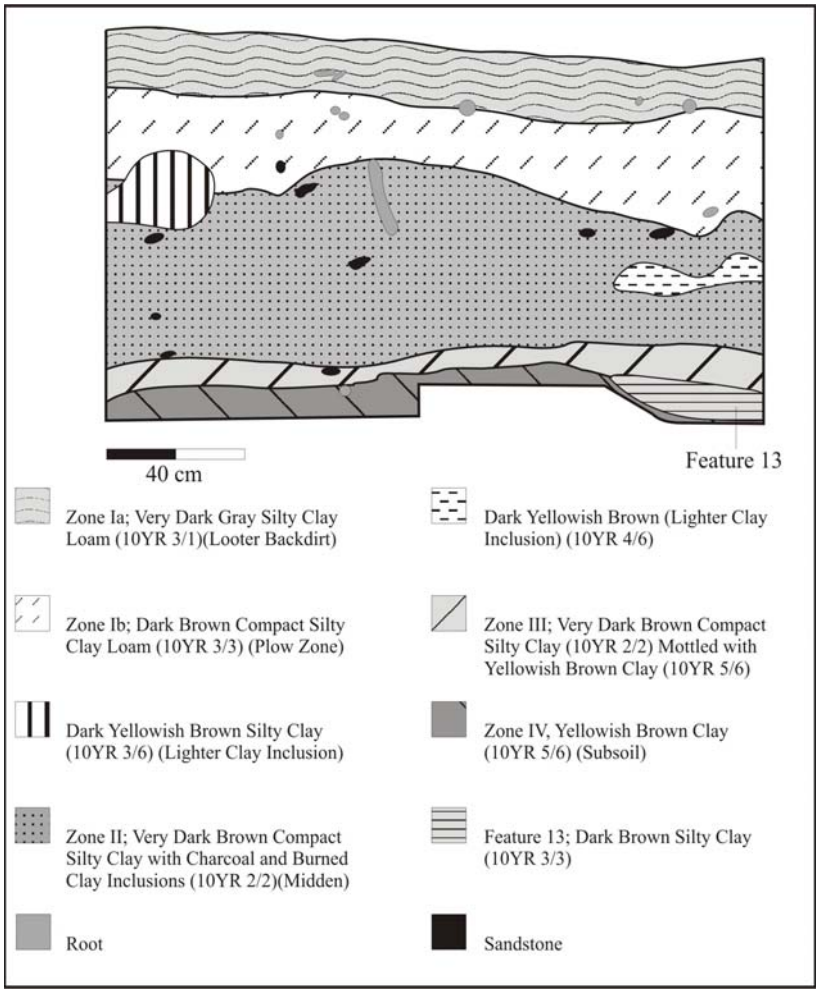

Figure 4.10. Stratigraphic Profile, East Wall of Test Unit 2.

a transition between the midden and clay subsoil.

Zone IV represents the sterile, clay subsoil. It appeared at a depth of 95-105 cm below surface (Figure 4.10). This zone was characterized by a yellowish brown (10YR 5/6) clay. Zone IV was moist and very compact.

Several small root disturbances were noted in the profile of this unit (Figure 4.10). In addition to these smaller disturbances, two larger areas of disturbance were documented. One was associated with Zones Ib and II. It was documented at a depth of 36 cm below surface and extended to a maximum depth of 58 cm below surface. This disturbance consisted of a dark yellowish brown (10YR 3/6) silty clay. A second disturbance was recorded below the contact between Zone Ib and Zone II at a depth of 55-58 cm below surface. It extended to a maximum depth of 62-67 cm below surface. It consisted of a dark yellowish brown (10YR 4/6) silty clay. The irregular nature of both of these areas suggests that they likely represent rodent or large root disturbances.

Features

Four features (Features 4, 11, 12, and 13) were documented in T.U. 2. Feature 4 was a very poorly preserved human burial (Figure 4.11). First recorded at a depth of 45 cm below surface, the feature extended to a maximum depth of 49 cm below surface. The burial was located at the contact between the Zone Ib plowzone and the Zone II midden. It did not appear to have been seriously impacted by plowing. However, the generally very poor state of preservation of the skeletal elements from this feature is likely a result of its location at the base of the plowzone.

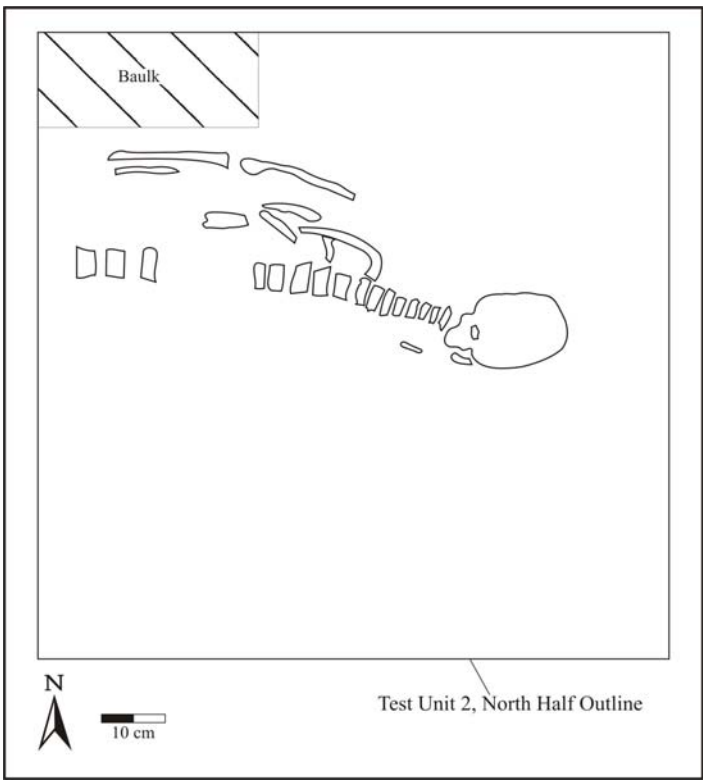

Figure 4.11. Planview of Feature 4 in Test Unit 2.

The sediment associated with Feature 4 was a very dark brown (10YR 2/2) silty clay mottled with a yellowish brown (10YR 5/8) silty clay. No evidence or outline of a burial pit was observed. The skeletal remains were in a very poor state of preservation and many of the skeletal elements consisted of trace stains in the surrounding sediment. Skeletal elements that were present included cranial fragments, mandibular fragments, three teeth, the right humerus, radius, and ulna, and fragments of three ribs. Given the poor state of preservation, precise identification of the skeletal materials was difficult, however, analysis of the teeth indicated that the Feature 4 burial represented a single individual, approximately 20-35 years old (Chapter 10, Individual 11). The burial was oriented with the top of the cranium toward the east. Given the state of preservation, it was impossible to determine the position of the skeleton (i.e., flexed or extended). Feature 4 was cleaned, photographed, mapped, and removed.

Feature 11 (Figure 4.12) was also a human burial. The general state of preservation for Feature 11 was somewhat better than that of Feature 4, with more of the skeletal elements being

present. Feature 11 appeared at a depth of 56 cm below surface and extended to a maximum depth of 60 cm below surface. The sediment associated with the burial, which is part of Zone II, was a dark brown (10YR 3/3) silt loam that was densely scattered with charcoal and burned clay fragments. No evidence of a burial pit was observed in the surrounding sediment.

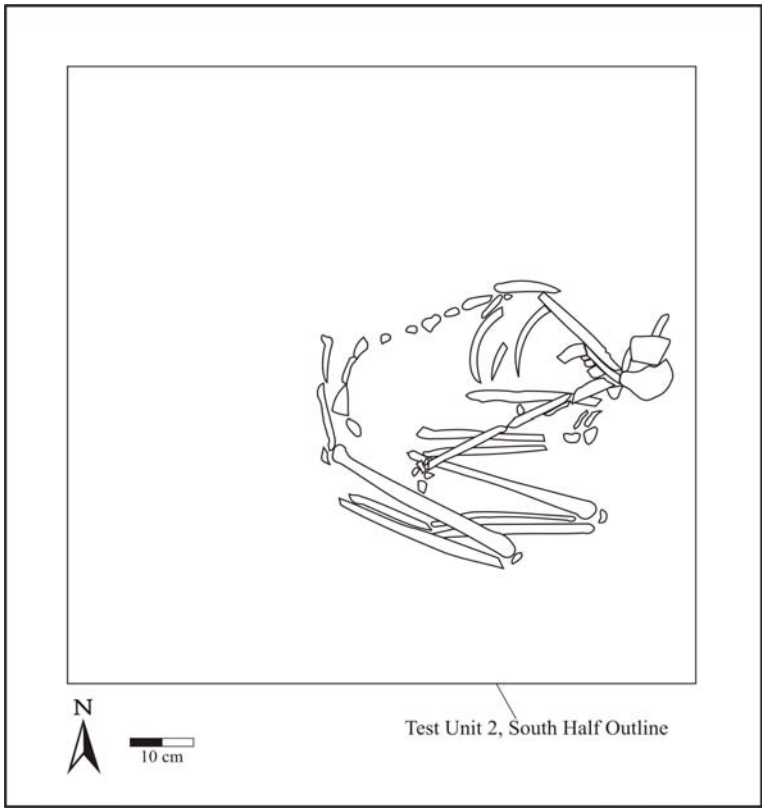

Figure 4.12. Planview of Feature 11 in Test Unit 12.

Skeletal elements that were identified and recovered during excavation included cranial fragments, right clavicle, right and left humerus, three right ribs, eight vertebrae, right innominate fragment, right and left radius and ulna, right and left femur, right patella, and the right and left fibula and tibia. Analysis of the skeletal elements, which was limited given the relatively poor state of preservation, suggests that the burial contained the remains of a single adult (Chapter 10, Individual 10). The burial was oriented with the top of the cranium to the east and had been placed on its left side in a tightly flexed position, with the legs drawn tightly against the torso and the arms folded across the chest. Feature 11 was cleaned, photographed, mapped, and removed.

A radiocarbon sample collected from the same level (Level 5) in the Zone II midden as Feature 11 yielded a calibrated date of 3095(2905)2760 B.C. Although no burial pit was observed with the feature, the burial was probably intrusive into the Level 5 deposits. This would suggest that the Feature 11 burial is younger than the date associated with Level 5.

Feature 12, a pit, was documented in the northwest corner of the unit at a depth of 1.0 m below surface (Figure 4.13). The maximum depth of Feature 12 was established at 1.22 m below surface. The pit measured 62 cm (north-south) x 48 cm (east-west). Feature 12 was characterized by a dark yellowish brown (10YR 4/4) silty clay densely mottled with burned clay, charcoal, and ash.

Some shell and bone fragments, along with a few fire-cracked rocks were noted. Feature 12 was roughly circular in appearance and extended into both the north and west walls of T.U. 2. The flotation sample that was collected from Feature 12 yielded three species of nuts, including hickory (n=544), black walnut (n=127), and acorn (n=9) (see Chapter 8). A radiocarbon sample taken from the Feature 12 material yielded a calibrated date of 3335(2935,2975,3005)2885 B.C. (Beta-134230) (Table 4.2).

Feature 13, a pit, was located at a depth of 91 cm below surface. Only a portion of the

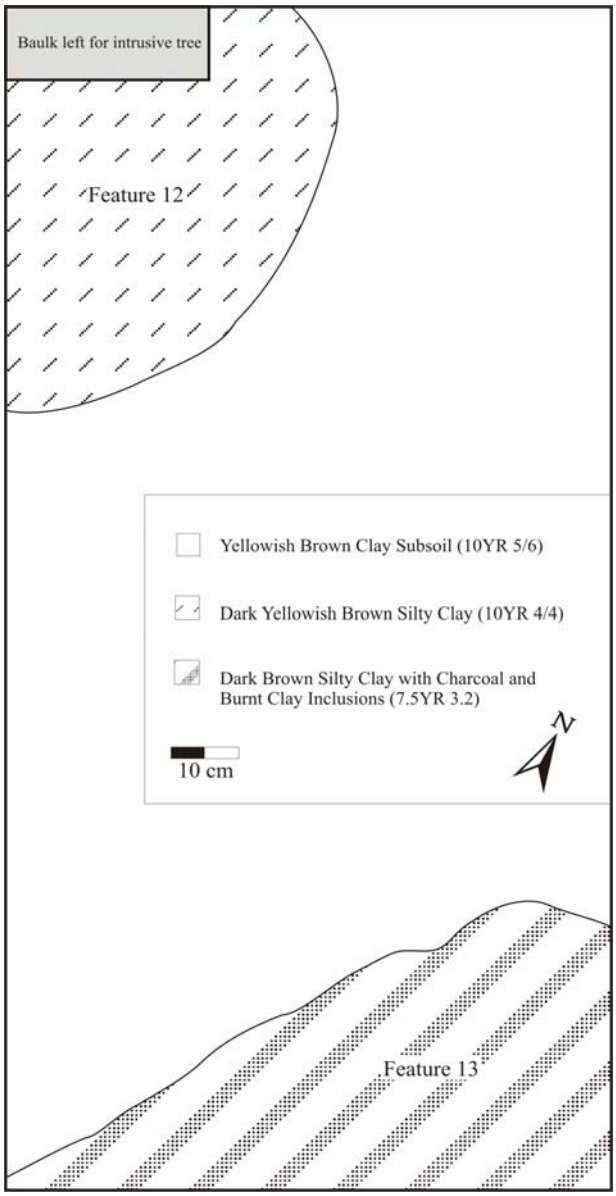

Figure 4.13. Planview of Features 12 and 13 in Test Unit 2.

feature was within the boundaries of the unit, as it extended into both the east and south walls (Figure 4.13). The pit outline was irregular, but roughly circular. The maximum depth of Feature 13 was 1.02 m below surface. Feature 13 consisted of a dark brown (7.5YR 3/2) silty clay densely mottled with charcoal and burned clay. Minor amounts of small shell and bone fragments, flakes (n=4), and

small fire-cracked rocks (n=4) were associated with the fill of this feature. Three cranial fragments (see Chapter 10: Individual 9) were also recovered from this pit. The lack of additional skeletal materials suggests these bones had been redeposited in this pit. The flotation sample collected from Feature 13 contained plant species that were similar to those associated with Feature 12, although in lesser frequencies. Four species of nuts were identified: hickory (n=209), black walnut (n=29), acorn (n=8), and pecan (n=3) (see Chapter 8).

Artifacts

Table 4.4 lists the artifacts recovered from T.U. 2 by zone. Artifacts recovered from the disturbed Zone I plowzone and looter backdirt included two Late Woodland ceramic sherds, fire-cracked rock, a piece of shell, chipped stone materials, groundstone, and late nineteenth-early twentieth century historic artifacts. The historic artifacts consisted of container glass, white granite and whiteware ceramics, and nails. Botanical and faunal remains were also recovered from Zone I.

Artifacts recovered from the Zone II midden included fire-cracked rock, shell, chipped stone materials, and groundstone (Table 4.4). No historic artifacts or prehistoric ceramics were recovered from this zone. The number of botanical and faunal remains increased substantially in Zone II over the amount recovered from Zone I. Within Zone II human skeletal remains were associated with Features 4 and 11. In addition, a modified bone (perhaps human) was also recovered from Zone II (see discussion in Chapter 10, Unit 2 Zone 2 Level 8).

The artifacts recovered from Zone III included fire-cracked rock, shell, and chipped stone materials (Table 4.4). Faunal remains decreased relative to Zone II. However, the amount of botanical remains recovered from Zone III was similar to that recovered from Zone II. Several fragments of human skeletal elements (Feature 13) were also associated with Zone III.

LOOTER PIT 4/TEST UNIT 4

Looter Pit 4

Looter Pit 4, an oval-shaped pit, was located approximately 1 m north and 2 m west (1N, 2W) of the datum, near the northern extent of looter disturbance at the site (Figure 4.1). The pit measured approximately 70 cm (north-south) x 180 cm (east-west). The depth of the pit ranged from approximately 30-50 cm below surface before cleaning. Slumping and filling had occurred and was removed by shovel and trowel to expose the depth of looter disturbance. Upon completion of the cleaning, Looter Pit 4 had a final depth of 1.22 m below surface.

A large, diffuse feature, Feature 1, was located in the northwest section of Looter Pit 4. A 1-m section of the Looter Pit, located in the northwest corner, was selected for profiling in order to document Feature 1 (Figure 4.14). A large rodent disturbance was recorded within this profile (Figure 4.14).

Stratigraphy

The excavation and cleaning of Looter Pit 4 resulted in the identification of five distinct zones (Figure 4.14). In general, the contact/transition between the sediment zones was distinct, however, the transition between the midden deposits was somewhat diffuse. Zone Ia represents looter backdirt, which was characterized as a dark brown (10YR 3/3) silt loam that was loose and unconsolidated. Zone Ia extended from ground surface to 13 cm below surface.

The contact between Zone Ia and Zone Ib was clear and distinct and was documented from 0-13 cm below surface. Zone Ib extended to a maximum depth of 24-34 cm below surface. This

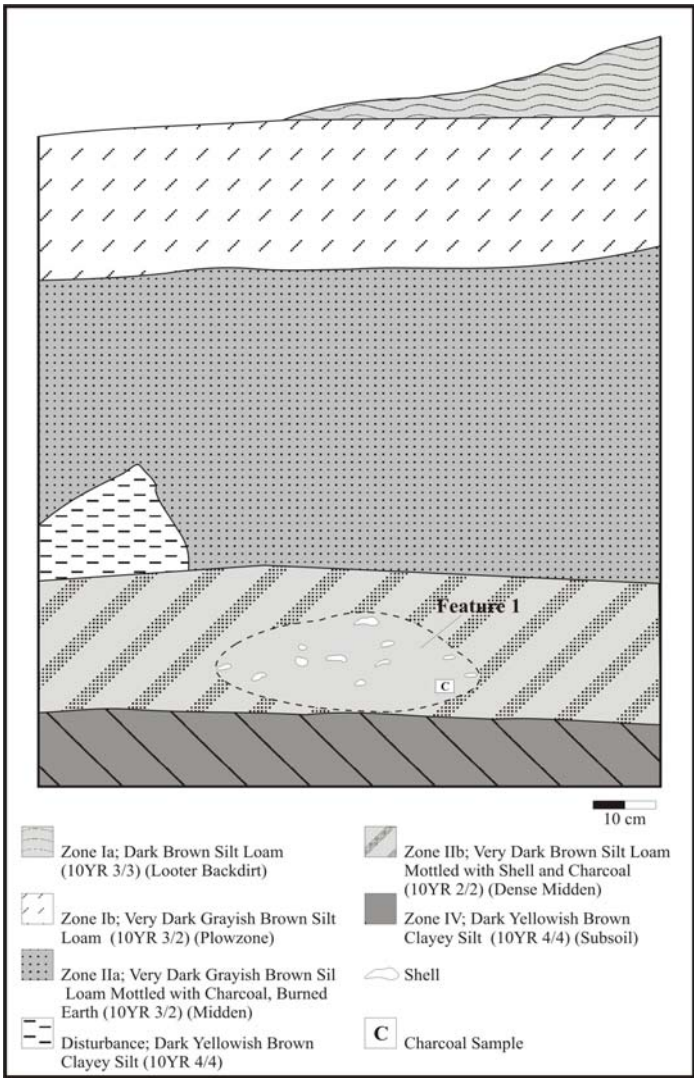

Figure 4.14. Stratigraphic Profile of the Northwest Wall of Looter Pit 4.

zone was characterized by a very dark grayish brown (10YR 3/2) silt loam that was moist and unconsolidated. Zone Ib represents the plowzone.

The contact between Zone Ib and Zone IIa was somewhat diffuse, occurring at an approximate depth of 24-34 cm below surface. Zone IIa was a relatively thick layer, which extended to a maximum depth of 74-92 cm below surface. The sediment of Zone IIa consisted of a very dark grayish brown (10YR 3/2) silt loam that was mottled with charcoal and burned clay. The sediment was moist and consolidated. Zone IIa represents an upper midden deposit.

The contact between Zone IIa and Zone IIb was also somewhat diffuse and occurred at a depth of 74-92 cm below surface. The sediment of Zone IIb consisted of a very dark brown (10YR 2/2) silt loam that was densely mottled with charcoal and shell. The sediment was dry and

consolidated and it extended to a maximum depth of 95-112 cm below surface. Zone IIb represents a lower, dense midden deposit.

Zone III, the transitional zone between the Zone II midden and Zone IV subsoil was not present in Looter Pit 4. As a result, the Zone IIb lower midden directly overlaid the Zone IV subsoil.

Zone IV is characterized by a dark yellowish brown (10YR 4/4) clayey silt subsoil. The contact between Zone IIb and Zone IV was distinct and occurred at a depth of 95-112 cm below surface. The sediment associated with Zone IV was moist and compact.

A large disturbance was noted in Looter Pit 4. Appearing along the western edge of the profile at a depth of 55 cm below surface, it extended to a maximum depth of 73-75 cm below surface (Figure 4.14). The sediment associated with the disturbance was a dark yellowish brown (10YR 4/4) clayey silt that was moist and unconsolidated. The sediment associated with this disturbance was the same as that of the subsoil and represents a large rodent disturbance that was intrusive into the upper midden deposit (Zone IIa).

Features

A single feature (Feature 1), a hearth, was documented in Looter Pit 4 (Figure 4.14). Feature 1 measured 41.5 cm (north-south) and 67 cm (east-west). The boundaries of the feature were diffuse and difficult to distinguish from the surrounding midden. Feature 1 appeared at a depth of 84 cm below surface and extended to a maximum depth of 1.0 m below surface. The sediment associated with the feature was a very dark brown (10YR 2/2) silt loam that was densely scattered with fragments of shell and charcoal. In addition, fragments of burned sandstone (n=10) were recorded within the feature. The flotation sample that was collected from Feature 1 yielded three species of nuts, including hickory (n=227), black walnut (n=29), and acorn (n=1) (see Chapter 8).

Artifacts

The artifacts recovered from Looter Pit 4 consisted of fire-cracked rock, shell, and a single chipped stone fragment (Table 4.5). Faunal and botanical artifacts were also recovered. No other artifacts were recovered from Looter Pit 4.

Test Unit 4

Test Unit 4 (T.U.4), a 1 x 2-m unit, was located 1 m north and 3 m west (1N, 3W) of the datum (Figure 4.1). Test Unit 4 was located directly adjacent to the western edge of Looter Pit 4 and extended 2 m to the north. Test Unit 4 was excavated in 10-cm arbitrary levels, with the exception of Level 1, which was a 20-cm level (see Chapter 3). Four stratigraphic zones were noted in the profile of T.U. 4.

Unlike Test Units 1, 2, and 3, only one-half of T.U. 4 was excavated to subsoil. This was done in order to pedestal Features 14 and 15 (human burials), which were documented in Zone IIa (40-50 cm below surface). Thus, Levels 1 through 4 represent excavation of the entire unit, while Levels 5 through 8 represent excavation of just the northern half of the unit.

Table 4.5. Looter Pit 4/Test Unit 4 Artifacts.

Artifact Types	Looter Pit 4	T.U. 4 - Zone I	T.U. 4 - Zone IIa	T.U. 4 - Zone IIb
Ceramics		1		
Fire-Cracked Rock	10	20	37	112
Botanical Remains	257	99	410	791
Faunal Remains	6	14	21	14
Shell	22			
Skeletal Remains			Present	
Historic		15	1	
Chipped Stone	1	29	14	33
Projectile Points			1	
Groundstone		1		2
Totals	296	179	484	954

Stratigraphy

Four distinct stratigraphic zones were recorded in T.U. 4. The ground surface of T.U. 4 was uneven and sloped steeply to the north (Figure 4.15). Zone Ia (looter backdirt) was not present in this portion of the site, and therefore, is not present on the T.U.4 profile. Zone Ib, a very dark grayish brown (10YR 3/2) silt loam, extended from ground surface to a maximum depth of 25-26 cm below surface. This sediment was moist and unconsolidated. Zone Ib represents the plowzone.

The contact between Zone Ib and Zone IIa was clear. Zone IIa was documented at a depth of 25-26 cm below surface and extended to a maximum depth of 40-53 cm below surface (Figure 4.15). Zone IIa consisted of a very dark grayish brown (10YR 3/2) silt loam that was mottled with charcoal and burned clay. The sediment was dry and consolidated. Zone IIa represents an upper midden deposit. A charcoal sample was collected from Zone IIa. It yielded a calibrated radiocarbon date of 3095(2905)2760 B.C. (Beta-134234) (Table 4-2).

The contact between Zone IIa and Zone IIb was clearly discernable in profile only. Zone IIb appeared between 40-53 cm below surface and extended to a maximum depth of 58-67 cm below surface (Figure 4.15). The sediment of Zone IIb consisted of a very dark brown (10YR 2/2) silt loam that was densely mottled with charcoal and burned clay. The sediment was dry and consolidated. Zone IIb represents a dense lower midden deposit.

Like the stratigraphy of Looter Pit 4, the transitional zone (Zone III) was not present in T.U. 4. As a result, the Zone IIb lower midden directly overlays the Zone IV subsoil. The contact between Zone IIb and Zone IV was clear and distinct. Zone IV appeared between 58-67 cm below surface (Figure 4.15). The sediment associated with Zone IV was a dark yellowish brown (10YR 4/4) clayey silt that was moist and compact. Zone IV represents the sterile subsoil.

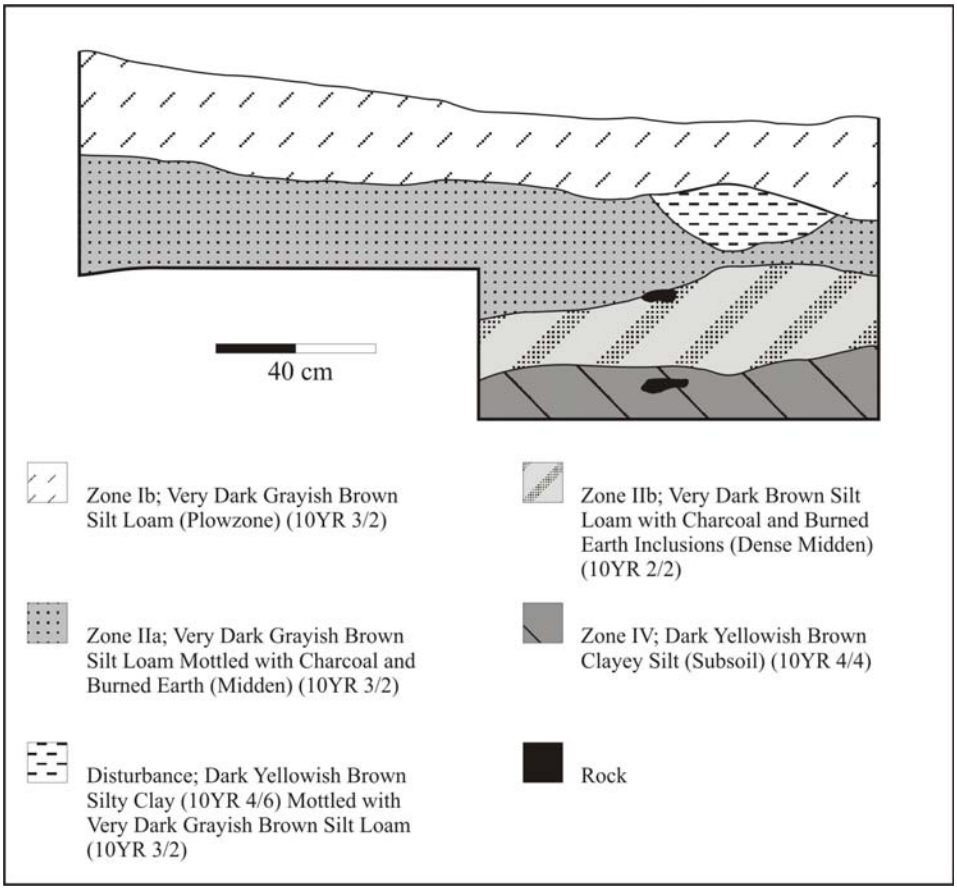

Figure 4.15. Stratigraphic Profile, West Wall of Test Unit 4.

A large disturbance was located in the northwestern corner of T.U. 4 (Figure 4.15). This disturbance appeared at a depth of 15 cm below surface and extended to a maximum depth of 32 cm below surface. The sediment associated with the disturbance was a dark yellowish brown (10YR 4/6) silty clay, mottled with a very dark grayish brown (10YR 3/2) silt loam. The sediment was moist and unconsolidated. It represents a large rodent or root disturbance.

Features

Two features (Features 14 and 15) were recorded during the excavation of T.U. 4 (Figure 4.16). Feature 14 was a poorly preserved primary inhumation (adult) that first appeared at a depth of 41 cm below surface and extended to a maximum depth of 54 cm below surface. The burial was oriented with the top of the cranium to the east. The skeleton was buried flat on its back in an extended position (Figure 4.16), with the left arm across the torso and the right arm paralleling the torso with the right hand across the pelvic area. The burial measured 84 cm along the east/west axis and 32 cm along the north/south. It extended into both the south and west walls of the unit. The sediment associated with Feature 14 consisted of a very dark grayish brown (10YR 3/2) silt loam mottled with charcoal and burned clay. No evidence or outline of a burial pit was observed.

The skeletal remains were in a poor state of preservation, with much of the skeleton evidencing only trace stains in the surrounding sediment. Skeletal elements present included the cranium, mandible, right clavicle, right humerus, sternum, eight ribs, innominate fragments, right radius and ulna, and the right femur. The age and sex of this individual could not be determined. Two pieces of weathered siltstone were located directly on top of the individual's sternum. These

two stones were unmodified and exhibited no regularized shape. However, they appear to have been purposefully interred with the burial. No other artifacts were associated with this burial. Feature 14 was cleaned, photographed, and mapped. Because the burial extended into both the east and west walls, it was not excavated and was covered and reburied, as such it was not analyzed or assigned an Individual number. In addition, both pieces of unmodified siltstone were repositioned and also reburied.

Feature 15, a second primary inhumation, was discovered in the same excavation level of

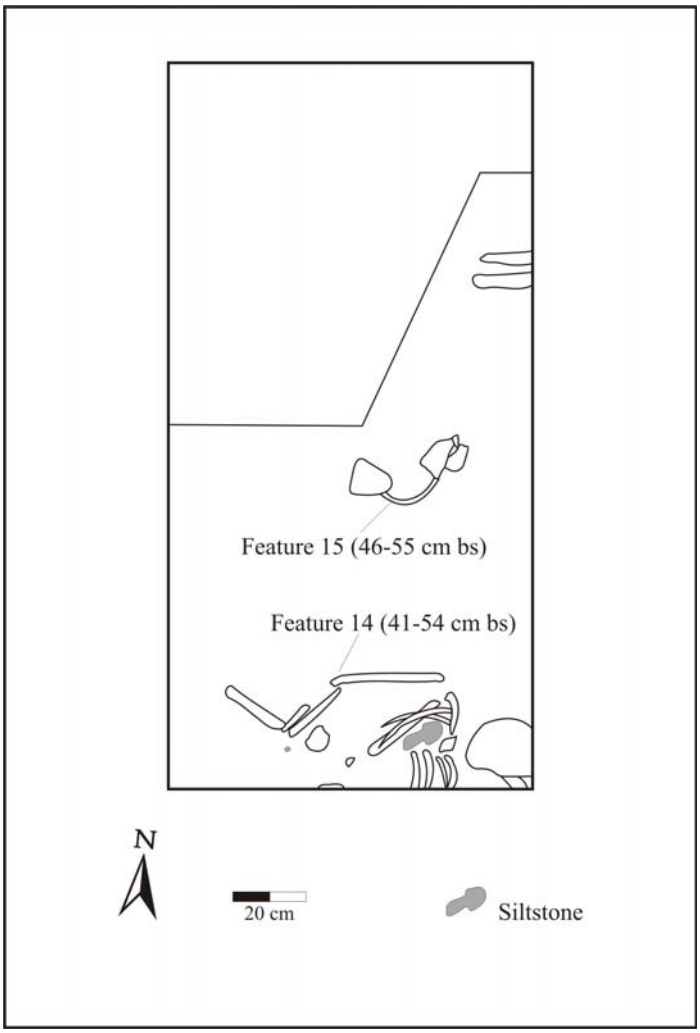

Figure 4.16. Planview of Features 14 and 15 in Test Unit 4.

T.U. 4 as Feature 14. Feature 15 was located approximately 48 cm to the north of Feature 14 and extended into the east wall of T.U. 4 (Figure 4.16). This burial was in an extremely poor state of preservation, having nearly completely decomposed to the point of trace stains. Feature 15 was documented at a depth of 46 cm below surface and extended to a maximum depth of 55 cm below surface. The burial was laying on its left side, in a flexed position, with the top of the cranium oriented to the southwest. Given the poor state of preservation, the position of the arms and hands could not be determined. The burial measured 76 cm along its north/south axis and 49 cm along the east/west axis. The sediment associated with Feature 15 consisted of a very dark grayish brown

(10YR 3/2) silt loam that was mottled with charcoal and burned clay. No artifacts were associated with the burial and no evidence of a burial pit was observed.

Skeletal elements of Feature 15 that were able to be identified at the time of excavation included several cranial fragments and fragments of both the right and left femurs. The age and sex of this individual could not be determined. Feature 15 was cleaned, mapped, and photographed. Although the preservation of Feature 15 was extremely poor, it appeared to extend into the unit wall. Because Feature 15 could not be completely removed, it was covered and reburied.

Artifacts

The artifacts recovered from T.U. 4 can be separated into their respective zones (Table 4.5). Artifacts recovered from Zone I consisted of a single Late Woodland sherd, fire-cracked rock, chipped stone materials, a groundstone fragment, and late nineteenth-early twentieth century historic artifacts (Table 4.5). The historic artifacts primarily consisted of container glass and white granite ceramics. Botanical and faunal remains were also recovered from Zone I.

The artifacts recovered from the Zone IIa upper midden deposit included fire-cracked rock, chipped stone materials, a Late Archaic Etley Corner Notched projectile point (Figure 5.3, j), and a single wire nail (Table 4.5). The presence of an historic artifact likely reflects the downward movement of materials from the plowzone through rodent or root disturbances. No prehistoric ceramics were recovered from Zone IIa. Botanical materials increased substantially in number over the Zone I amounts. In contrast, the amount of faunal materials remained similar to that of Zone I. Small fragments of human skeletal elements were also recovered from Features 14 and 15 (Chapter 10, Individual 13), however the burials were not removed.

The artifacts recovered from the Zone IIb lower midden deposits consisted of a relatively large quantity of fire-cracked rock, chipped stone materials, and two groundstone fragments (Table 4.5). Botanical remains recovered increased substantially in the lower midden relative to what was associated with the Zone IIa upper midden. However, the amount of faunal materials remained relatively constant, decreasing only slightly. No other artifacts were recovered from the lower midden.

AUGER PROBES

A total of 36 auger probes were excavated at the site to determine site boundaries and to provide information on the site's stratigraphy outside of the area sampled by the four test units (see Chapter 3). Of the 36 auger probes excavated, 18 contained cultural material and midden deposits (Figure 4.17). Based on the distribution of cultural material and midden, recovered from the auger probe testing, the site boundary appears roughly circular in form, with maximum dimensions of 74 m (north-south) x 77 m (east-west).

The auger probe testing data also indicates that the subsurface stratigraphy throughout the site is similar to that of the excavated test units and looter pits, with Zones I-IV being documented. A very dark brown (10YR 2/2) to dark grayish brown (10YR 4/2) unconsolidated silt loam extends from ground surface to an average depth of 35-45 cm below surface both within and outside the boundary of the site. This sediment represents the Zone Ib plowzone.

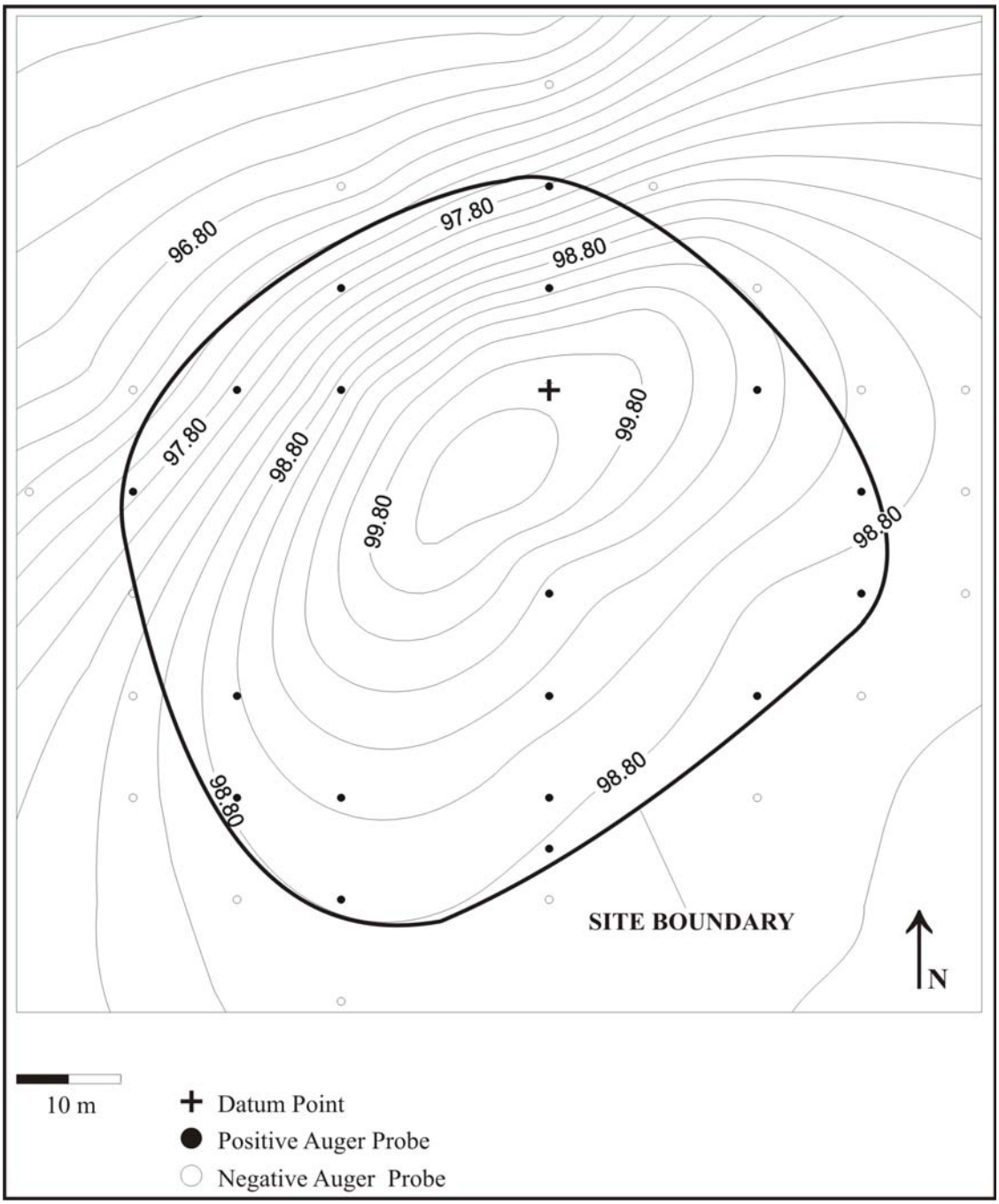

Figure 4.17. Positive and Negative Auger Probes.

Zone II midden deposits are represented within the boundary of the site and appear at an average depth of 35-45 cm below surface and extend` to an average depth of 75-90 cm below surface. The sediment of Zone II was characterized by a very dark brown (10YR 2/2) silt loam to a very dark grayish brown (10YR 3/2) silty clay. Fragments of charcoal, burned clay, and fire-cracked rock were noted within Zone II. Outside of the site boundary no midden was detected and the dark yellowish brown (10YR 4/4) clay subsoil tends to appear immediately below the plowzone.

The transitional zone, Zone III, which was observed in the profiles of some of excavated units was also documented in some of the auger probe profiles. It appeared at an average depth of 70-90 cm below surface and extended to an average maximum depth of 95-110 cm below surface across the site. The sediment associated with Zone III consisted of a very dark brown (10YR 3/2) silt loam to silty clay mottled with a dark yellowish brown (10YR 4/4) silty clay.

Within the boundary of the site, Zone IV subsoil appears at an average depth of 95-110 cm below surface. The sediment of this zone is characterized by a dark yellowish brown (10YR 4/4) silty clay to clay. As noted previously, outside of the boundary of the site the subsoil tends to appear immediately below the plowzone at an average depth of 35-45 cm below surface.

Features

No features were documented in the auger probes.

Artifacts

Chipped stone artifacts recovered from auger probes consisted of two unidentified biface fragments and 35 pieces of chipped stone debitage. In addition to these materials, eight fragments of animal bone were recovered.

DISCUSSION

The 40 holes dug by looters at Highland Creek have severely impacted the site's deposits. However, the results of this investigation suggest that a substantial amount of the site's subsurface deposits remain intact. Based on the data provided from four looter pits, four test units, and 36 auger probes, the boundaries of the Highland Creek site appear to be roughly circular, with the site having a diameter of approximately 75 m. Five stratigraphic zones, which extend to a maximum depth of 1.4 m below surface, were identified. These zones include Zone Ib (plowzone), Zone IIa (upper midden), Zone IIb (lower midden), Zone III (transition), and Zone IV (subsoil). Backdirt from looter activity was treated as a sixth zone (Zone Ia). All of the zones are not present across the entire site. For instance, the upper and lower middens were only clearly definable within the northernmost portion of the site. However, midden deposits do cover the entire site, having been noted in all locations tested within the site's boundaries. Zone III appears intermittently across the site, having been noted in roughly half of the profiled units.

The six radiocarbon dates from the site have midpoints that range from 3355 to 2670 B.C. These dates indicate that the Zone III transition and Zone II midden were primarily deposited during the Late Middle/Early Late Archaic. This is somewhat earlier than suggested by the few projectile points recovered from the site. While Etley Corner Notched points are thought to be diagnostic of the entire Late Archaic, Pickwick points tend to date to after 2500 B.C. and Saratoga Parallel Stemmed points generally date to after 2000 B.C. (see Chapter 5). If the dates from the Highland Creek site are correct, and there is no reason to believe that they are not, then these points types may have a longer period of use in the lower Ohio Valley than previously documented. Alternatively, the date ranges for the recovered projectile points may indicate a longer period of site use during the Late Archaic than is indicated by the radiocarbon dates.

Repeated use of the site over a nearly 400-1000 year period is suggested by the overlap of the radiocarbon dates and by the relatively thick accumulation of midden during this time. Based on

the recovered artifacts and the documented features (hearths, pits, and burials), this midden can be characterized as an extremely dense and thick accumulation of plant remains (primarily nutshell) and to a lesser extent animal remains. The association of large amounts of burned clay with this midden suggests that the processing of plants (likely cooking processed nutmeat) was an important activity of the Late Middle/Early Late Archaic residents of the Highland Creek site. The large pit features and burials indicate that during the Late Middle/Early Late Archaic the Highland Creek site may have served as a base camp.

In addition to a Late Middle/Early Late Archaic component, the Highland Creek site also contains a minor Late Woodland component and a late-nineteenth to early twentieth-century component. The Late Woodland component is represented by 14 ceramic sherds that were primarily recovered from Zone I (see Chapter 6). These materials point to short-term, or perhaps, sporadic use of the Highland Creek locality by Woodland groups. The late nineteenth to early twentieth century component also is restricted to the plowzone. These materials point to the presence of an historic house at this locality (see Chapter 7).

CHAPTER 5:
LITHIC MATERIALS

INTRODUCTION

This chapter describes the results of the analysis of the lithic assemblage (n=1,038) from the Highland Creek site. Chipped stone materials dominate the assemblage, and include tools and tool fragments (n=52), flakes and flake fragments (n=755), shatter (n=36), cores (n=1), and microdebitage (n=159). Non-chipped stone materials in the assemblage include groundstone (n=10) and hammerstones/pecking stones (n=5). Minerals (hematite and limonite) are present in the assemblage (n=6), along with quartzite, sandstone, limestone, and slate rock fragments (n=14). The results of the analysis of the lithic assemblage presented in this chapter are divided into separate discussions of the chipped stone materials, the groundstone materials, and other (mineral and rock) lithic materials. Each of these discussions focuses on three aspects of the Highland Creek assemblage: 1) describing the lithic materials; 2) characterizing the production and utilization of lithic material at the site; and 3) discussing the activities and behavior suggested by the assemblage.

CHIPPED STONE ASSEMBLAGE

METHODOLOGY

Chipped stone materials from the Highland Creek site comprise nearly 97% (n=1,005) of the lithic assemblage. A morphological analysis was conducted on the chipped stone materials to assess the variability present within the assemblage and to characterize the production and utilization of those materials at the site. This analysis involved a two-tailed typological classification of the site materials. The classification is considered two-tailed because it uses two different approaches to classify the data. One classificatory scheme focuses on the trajectory and stage of reduction of the chipped stone materials (Bradley 1975; Collins 1975). The other scheme focuses on specific tool types identified within the chipped stone assemblage.

Identification of the trajectory and stage of reduction involves the identification and classification of chipped stone debitage. For the purpose of this study, debitage was defined as chipped stone materials that are not formal or informal tools. The debitage typology consists of nine distinct categories, each of which is defined below.

Cores and Core Fragments

Cores are defined primarily on the presence of evidence for flake production. Artifacts classified as cores or core fragments exhibit multiple striking platforms, along with evidence of flake and cortex removal. These types of artifacts are representative of the initial stage of chipped stone reduction. Cores may also indicate the trajectory of reduction based on the preparation of striking platforms and direction of flake removal.

Primary Decortication Flakes

The identification of primary decortication flakes was based on the presence and amount of cortex on the dorsal surface of the flake. Artifacts classified as primary decortication flakes must have a bulb of percussion, a striking platform, and cortex on greater than 50% of the dorsal surface

of the flake. Primary decortication flakes are representative of the initial stages of chipped stone reduction.

Secondary Decortication Flakes

Secondary decortication flakes were also defined primarily on the presence and amount of cortex on the dorsal surface of the flake. Artifacts that were classified as secondary decortication flakes exhibited a bulb of percussion, a striking platform, and cortex on less than one-half (<50%) of the dorsal surface. Secondary decortication flakes are representative of the early to middle stages of material reduction.

Interior Flakes

The identification of interior flakes was based primarily on an arbitrary size grade and the absence of cortex on the dorsal surface of the flake. Artifacts classified as interior flakes were larger than 1 cm^2, exhibited a bulb of percussion and striking platform, and contained no cortex on the dorsal surface. The size grade was arbitrarily selected for this analysis in order to separate interior flakes from the smaller tertiary flakes. Interior flakes are representative of the middle to late stages of material reduction.

Tertiary Flakes

Tertiary flakes, like interior flakes, were identified primarily on an arbitrary size grade and the absence of cortex on the dorsal surface of the flake. Tertiary flakes are smaller than 1 cm^2 and larger than 0.5 cm^2, exhibited a bulb of percussion and striking platform, and contained no cortex on the dorsal surface. Tertiary flakes are representative of the late stages of material reduction, but can also be produced during tool resharpening.

Biface Thinning Flakes

Biface thinning flakes were identified by the absence of cortex on the dorsal surface and specific platform characteristics. Artifacts classified as biface thinning flakes exhibited a low-angle striking platform, which consisted of the previous edge of a flaked biface, exhibited a bulb of percussion, and contained no cortex on the dorsal surface (Ray and Lopinot 1998:69). Biface thinning flakes are indicative of the late stages of a biface production trajectory, along with the resharpening/rejuvenation of bifacial tool edges.

Flake Fragments

Several artifacts were classified as flake fragments. Due to the absence of a striking platform and/or bulb of percussion, these flakes could not be assigned to a specific flake category, although they were clearly cultural in origin.

Shatter

Chipped stone artifacts that were irregular, angular, or blocky (not clearly a flake) were classified as shatter. These artifacts also did not exhibit a striking platform or bulb of percussion.

Microdebitage

Microdebitage was classified based solely on an arbitrary size grade. Artifacts identified as microdebitage were smaller than 0.5 cm^2 in size. All microdebitage was counted and weighed.

DEBITAGE ANALYSIS

Each piece of debitage in the chipped stone assemblage was analyzed and classified. Size grades were measured on a horizontal surface using a template diagram of each size grade. Debitage classifications were recorded and weighed (in grams) for each test unit by level. Chipped stone debitage from features, auger probes, and looter pits were also recorded and weighed for the unit or feature as a whole. Additionally, all microdebitage was counted and weighed.

The process of lithic reduction is best conceived as a continuum of behavioral activities that begins with raw material acquisition, continues with manufacture (reduction and retouch) and use (retouch) and possible reuse (curation and/or recycling), eventually culminating with the final discard of an implement (Andrefsky 1998; Bradley 1975; Collins 1975; French 1998; Odell 2003). Deposition of lithic materials in the archaeological record may occur at any point along this continuum. Lithic debitage represents the by-products of the reduction process. At the Highland Creek site, debitage (n=952) was recovered from unit/level (n=894), feature (n=21), looter pit (n=2), and auger probe (n=35) contexts.

Spatial distributions of the debitage from unit/level and feature contexts are listed in Table 5.1. The debitage (n=915) was relatively evenly distributed among Test Units 1 and 2. However, T.U. 3 accounted for nearly half of the debitage. This unit contained about twice as much debitage as Test Units 1 and 2. Test Unit 4 contained less debitage than the other three units due to the fact that only one-half of this unit was excavated from Level 5 to Level 8.

Table 5.1. Distribution of Debitage by Test Unit.

Test Unit 1	Test Unit 2	Test Unit 3	Test Unit 4	Total
221 (78.8g)	185 (51.42g)	437 (142.22g)	72 (28.12g)	915 (300.56g)
24.2% (26.2%)	20.2% (17.1%)	47.8% (47.3%)	7.8% (9.4%)	100.0% (100.0%)

Table 5.2 presents the debitage by typological category for each test unit by stratigraphic zone. Debitage that was recovered from auger probes, looter pits, and the surface was not included in Table 5.2. Nor were the eight artifacts from test unit wall scrapings, due to the fact that they could not be assigned to a stratigraphic zone. All debitage categories selected for this analysis were represented in the site assemblage.

Table 5.2. Debitage Frequency and Weight by Test Unit and Zone.

T.U.	Zone	Primary Dec. Flake		Secondary Dec. Flake		Interior Flake		Biface Thinning Flake		Tertiary Flake		Flake Fragment		Shatter		Core		Micr-debitage		Total	
		freq	wt	freq	wt	freq	wt	freq	wt	freq	wt	freq	wt	freq	wt	freq	wt	freq	wt	freq	wt
1	I	2	1.86	4	8.08	21	15.71	7	1.25	16	1.58	30	7.91	7	12.38	1	7.75	23	0.3	111	56.82
	II			1	0.56	12	4.88	11	2.64	23	2.78	27	7.67	3	3			33	0.45	110	21.98
2	I	2	6.49	4	2.74	25	13.92	14	3.07	28	3.32	31	9.91	4	3.14			23	0.27	131	42.86
	II					5	1.23	8	0.58	12	1.23	6	3.51	2	0.67			12	0.13	45	7.35
	III							1	0.19	3	0.25	2	0.07							6	0.51
3	I	7	10.72	10	6.73	57	26.95	15	4.77	46	7.16	70	23.53	12	13.06			14	0.2	231	93.12
	II	2	3.61	2	0.67	36	16.55	11	2.64	36	4.11	57	14.53	2	0.69			24	0.35	170	43.15
	III			1	0.84	4	1.52	3	0.62	7	0.84	6	0.96					10	0.11	31	4.89
4	I	1	2.11	2	4.34	5	3.42			9	1.48	4	0.49	1	1.62			5	0.05	27	13.51
	II					5	5.23	1	0.11	17	1.86	3	0.63	4	6.61			15	0.17	45	14.61
Total		14	24.79	24	23.96	170	89.41	71	15.87	197	24.61	236	69.21	35	41.17	1	7.75	159	2.03	907	298.8

Flakes

Flakes (n=476) dominate the Highland Creek lithic assemblage. Tertiary and interior flakes are the largest flake categories, accounting for 41.4% and 35.7% of the total identified flakes, respectively. Biface thinning flakes comprise 15.0% of all flakes, while primary decortication and secondary decortication flakes account for 2.9% and 5.0%, respectively. The relatively high amounts of tertiary, interior, and biface thinning flakes would seem to indicate a lithic production sequence that was oriented toward bifacial reduction.

Cores

A single amorphous core fragment was recovered from the site. Recovered from T.U. 2 Zone I (Level 2), the fragment is manufactured from St. Louis formation (upper member) chert. The core fragment contains a thin limestone rind (cortex), which suggests, based on the raw material, that it was likely procured directly from a nearby locality.

Microdebitage

Microdebitage (n=159) was collected from flotation samples and it accounts for 17.5% of the total amount of debitage recovered from the site. Concentrations of microdebitage can be indicative of lithic production areas (Andrefsky 1998; Odell 2003). Based on the distribution of microdebitage by test unit, no concentrated areas of lithic production could be identified at the site. Among the four test units, the distribution of microdebitage was relatively uniform: T.U.1 = 35.2%, T.U.2 = 22.0%, T.U.3 = 30.2%, and T.U.4 = 12.6%. As previously noted the lower percentage from T.U. 4 is due to the fact that only one-half of this unit was excavated from Level 5 to Level 8 (see Chapter 4).

Stages of Reduction

Debitage categories that represent early to middle stages of lithic reduction (i.e., cores [n=1], primary decortication flakes [n=14], and secondary decortication flakes [n=24]), are present in the assemblage but account for only 4.3% of the total debitage (Table 5.2). In contrast, those categories that are representative of middle to late stage lithic reduction (i.e., interior flakes [n=170], tertiary flakes [n=197], and biface thinning flakes [n=71], comprise 48.3% of the total debitage. The presence of debitage representing all categories suggests that the full sequence of lithic reduction activities were being performed at the Highland Creek site. These percentages (4.3% compared with 48.3%) also suggest that at Highland Creek, lithic manufacture was primarily focused on middle to late stage early reduction.

Depending on the nature of the debitage, however, frequencies can be misleading. Debitage from later stages of reduction are typically much smaller in size than those from earlier stages, which can result in an overrepresentation if only the frequency data are examined. Examining the weight of the artifacts has been shown to be a useful method for clarifying trends that are evidenced in the debitage frequencies alone. In the Highland Creek site assemblage, debitage categories that are representative of the early to middle stages of lithic reduction (i.e., cores [7.75 g], primary decortication flakes [24.79 g], and secondary decortication flakes [23.96 g]), account for 18.9% of the total debitage by weight (Table 5.2). In contrast, debitage categories that are representative of middle to late stages of reduction (i.e., interior flakes [89.41 g], biface thinning flakes [15.87 g], and tertiary flakes [24.61 g]), account for 43.5% of the debitage by weight. The weight data for early and later stages of reduction (18.9% and 43.5%, respectively) are similar to those from the debitage

counts (4.3% and 48.3%, respectively). Together, these two lines of data provide a strong indicator that the focus of Highland Creek lithic manufacturing activities was on middle to late stage reduction.

One way to further understand this apparent emphasis on middle to late stage reduction is to examine the distribution of production activities (i.e., early and late stage production) (Table 5.3) by zone. As Table 5.3 demonstrates, late stage debitage dominates all three zones, with Zones II and III having slightly higher percentages of late state debitage than Zone I. In contrast, early stage debitage, which is nearly absent in the Zones II and III, accounts for 12.0% of the total Zone I debitage.

The stratigraphic distribution of lithic production activities suggest that early stage reduction is not a prominent part of the overall lithic production at the Highland Creek site. Late stage reduction appears to remain an important activity throughout the site occupation. In contrast, early stage reduction, which is represented by very low frequencies in Zones II (3.1%) and III (5.3%), show a relatively marked increase in Zone I (12.0%). The relative stability of the late stage reduction activities throughout the sequence, combined with the abrupt rise in early stage activities in Zone I, may indicate a change in the nature of lithic production during the later occupations of the site–possibly during the Late Woodland period. This change appears to represent a shift from lithic production that is focused almost exclusively on late stage activities (retouch and recycling) during the late Middle/early Late Archaic period, toward lithic production that is more representative of the entire reduction process (reduction, retouch, and recycling) during the Late Woodland period utilization of the site.

Table 5.3. Early and Late Stage Debitage by Excavation Level.

Zone	Early Stage Debitage	Late Stage Debitage	Total
Zone I	33 (12.0%)	243 (88.0%)	276 (100.0%)
Zone II	5 (3.1%)	154 (96.9%)	159 (100.0%)
Zone III	1 (5.3%)	18 (94.7%)	19 (100.0%)
Total	39 (8.6%)	415 (91.4%)	454 (100.0%)

Aside from the evidence for stage of reduction, Tables 5.2 and 5.3 also indicate a trend toward increased lithic production at the Highland Creek site through time. Both the size (weight) of the total debitage and the amount (count) of total debitage demonstrate a noticeable increase through time, from 37 (5.40 g) artifacts in Zone III to 500 (206.31 g) artifacts in Zone I. However, this trend may be misleading for two reasons. First, comparing the number of artifacts per zone assumes that the rate of sediment accumulation for each zone is the same. This is not a valid assumption because the rate of accumulation can vary through time and at different locations across the site. Second, it is difficult to directly compare Zone I with the other zones because it is partly comprised by a layer of looter backdirt (see Chapter 4) which, in all likelihood, may have resulted in the redeposition of artifacts from the lower Zones II and III within Zone I.

In spite of the potential for differential sedimentation rates and disturbance through looter activity, there does seem to be a general trend of increasing lithic production over time at the Highland Creek site. If lithic production at the site did increase over time, it would likely have resulted from two possible processes. First, population at the site may have increased over time, resulting in increased lithic production. Second, the duration of occupation or frequency of site

occupation may have increased, also resulting in increased (or more frequent) lithic production, or some combination of both processes. However, the ephemeral nature of the Late Woodland occupation (based on the relatively low number of ceramics that were recovered) suggests that the overall population at the site did not noticeably increase from the late Middle Archaic to Late Woodland. This would seem to indicate that any increase in lithic production was likely related to changes in the nature of the site occupation (i.e., frequency and/or duration). However, the importance of these processes in structuring the changes in lithic production at the site remain somewhat speculative, given the relatively small size of the lithic assemblage.

Cortex

An additional line of evidence for investigating lithic production and stage of reduction within the site assemblage is through the presence of cortex. The presence and type of cortex can be used to infer procurement practices and the presence of early stage lithic reduction (Andrefsky 1998; Odell 2003). Items with cortex are identified as having a rind or patina resulting from the chemical or physical weathering of the raw material during either natural deposition or transport. Two distinct types of cortex were recognized within the assemblage debitage: riverine (n=68) and residual (n=9).

Riverine cortex results from physical weathering of a raw material during water-transport. Typically, this type of cortex is reddish or brownish in color, water-smoothed or polished, and may appear battered or pitted. *Residual* cortex can result from either the chemical or physical weathering of a raw material that is bedded, or has eroded out of its original deposition. In contrast to riverine cortex, residual cortex typically consists of a sedimentary encasement around the raw material, which is often a chalk or limestone.

Artifacts displaying cortex account for only 8.5% of the total debitage. This figure correlates well with the stages of reduction represented by the debitage assemblage, and further suggests that early stage reduction was not a common activity at the Highland Creek site. In addition, the relatively high frequency of riverine cortex (88.3%) indicates that resource procurement activities probably focused on the exploitation of secondary deposits of raw materials (Church 1994). In this case, the nearby Ohio River gravels are the likely source of much of the lithic raw material. However, some direct procurement of lithic resources from primary sources also appears to have occurred, based on the minor presence of residual cortex (11.7%) within the debitage assemblage.

Raw Material

Raw material identification was conducted on all lithic debitage (n=952) with the exception of the microdebitage (n=160)–which was too small to be accurately identified–for a total of 792 artifacts. Figure 5.1 illustrates the frequency of raw material use in the debitage at the Highland Creek site. St. Louis Formation (upper member) cherts (52.3%) dominate the raw materials used at the site. Ft. Payne (18.3%) and St. Louis (undifferentiated) (8.4%) cherts are also relatively frequently represented in the assemblage, while Fredonia (2.9%), Vienna (1.3%), Clore (1.1%), St. Louis (lower member) (0.8%), St. Louis/Salem (0.4%), Kinkaid (0.3%), and Menard (0.1%) cherts are present only in minor amounts. Raw materials that were unable to be identified (e.g., too small of a fragment to be accurately typed or from an unknown source) account for 14.1% of the debitage (Figure 5.1).

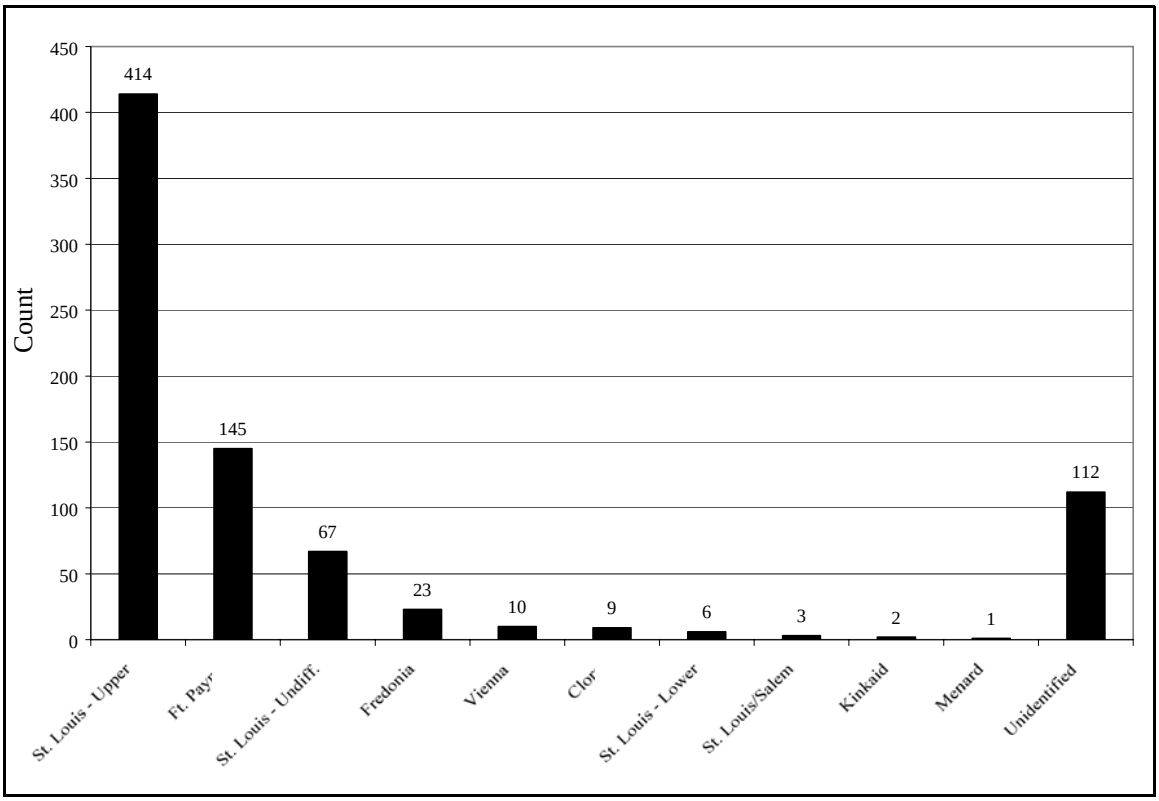

Figure 5.1. Debitage Raw Material Frequency.

All of the raw material types that were identified in the Highland Creek assemblage are known to outcrop near the site (Gatus 1979). However, based on the cortex data it appears that primary outcrop sources were not the major target of procurement activities. Instead, the bulk of the raw materials that were used at the Highland Creek site were apparently procured from secondary contexts, such as the nearby Ohio River gravels. What this suggests for the Highland Creek assemblage is a strong focus on common, locally occurring raw materials (such as the St. Louis and Ft. Payne formations) that can be relatively easily collected from stream gravel deposits in the vicinity of the site.

The relatively large amount of unidentified raw materials could also be a product of stream gravel procurement, with raw material types from far-upstream locations having been transported downstream. However, these unidentified material types could also represent non-local resources that were brought to the site by its prehistoric residents. Either of these possibilities appears likely, and in all probability, some of the unidentified raw materials probably represent both local and non-local cherts obtained from river gravels and primary sources.

TOOL ANALYSIS

The identification of formal and informal tools is useful in addressing questions involving the trajectory of reduction and the general activities undertaken by the prehistoric occupants of the Highland Creek site. *Formal tools* are defined as implements manufactured for a specific task, with a standardized morphology. They represent 4.1% of the lithic assemblage from the site. *Informal tools* are defined as those artifacts that were not necessarily manufactured for a specific task but show evidence of utilization (either intentional retouch for use or modification resulting from use). Informal tools represent 0.9% of the lithic assemblage from the site. The identification and classification of formal tools and utilized implements was based on macroscopic morphological

characteristics used to infer function (Andrefsky 1998; Bordes and Sonneville-Bordes 1970; Jelinek 1976; Odell 2003). Six categories of formal tools (n=43) were identified during the analysis of the chipped stone materials, including: projectile points/knives (n=5), projectile points/knife fragments (n=8), bifaces (n=2), biface fragments (n=19), adzes (n=1), drills (n=5), scrapers (n=2), and unifaces (n=1). Two categories of informal tools (n=9) were also identified and included: retouched flakes (n=1) and utilized flakes (n=8) . Formal tools (82.7%) dominate the assemblage, while informal tools account for only 17.3% of the tools (Figure 5.2).

Projectile Points/Knives and Fragments

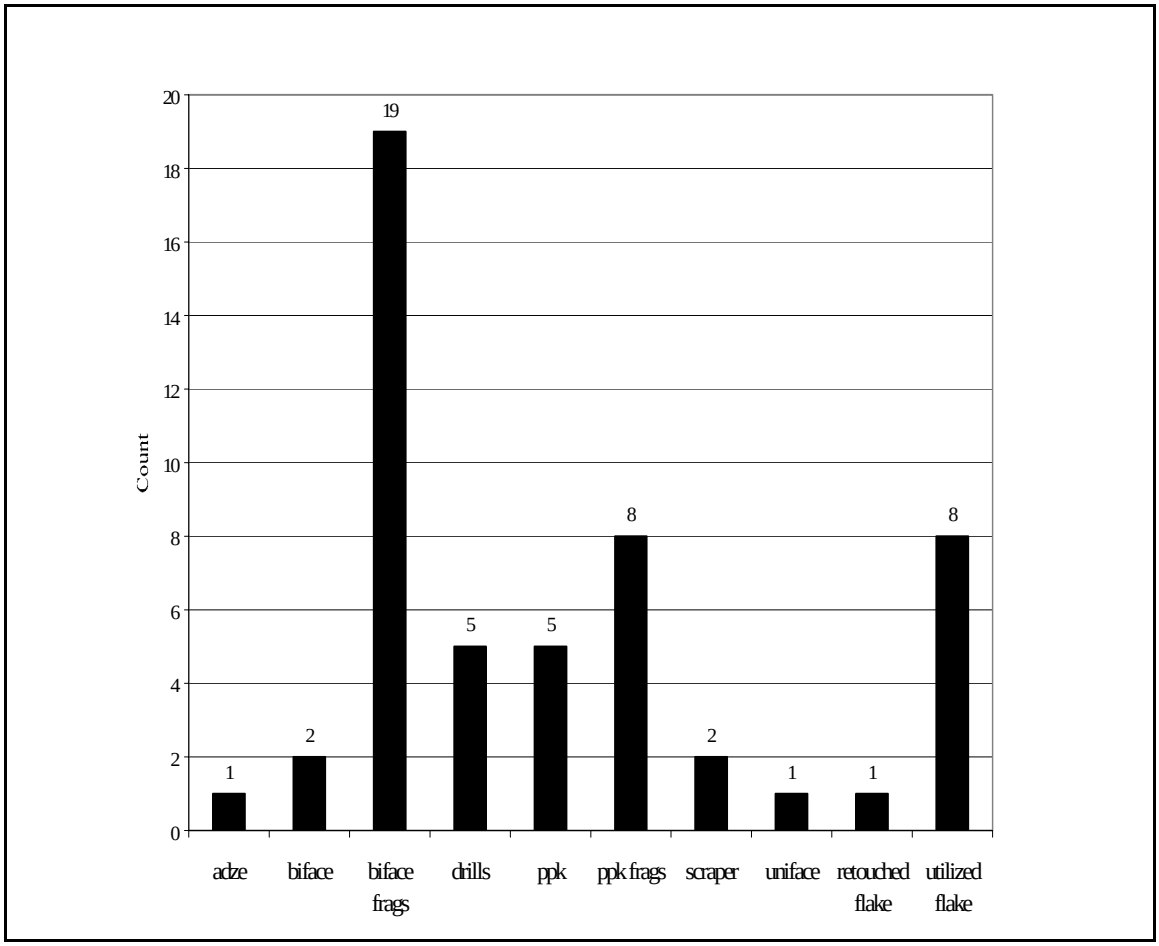

Figure 5.2 Frequency of Tool Types.

Five diagnostic projectile points/knives were recovered from the Highland Creek site. They have been identified as an Etley Corner Notched point (Figure 5.3a), three Pickwick points (Figure 5.3b-d), and a Saratoga Parallel Stemmed point (Figure 5.3e) (Justice1987:146-159; Stallings and Ross-Stallings 1995b:25-30). Each of these types will be discussed in this section.

Length, width, and thickness measurements (in millimeters) were taken for each projectile point (Table 5.4). Length measures reflect the maximum length along the long axis of the point. Width measures reflect the point of maximum width that is perpendicular to the long axis. Thickness measures reflect the point of maximum thickness on a plane that is perpendicular to that of the width.

Table 5.4. Projectile Point Measurements.

			Pickwick			
Measurements (mm)	**Etley**	**Saratoga**	**(b)**	**(c)**	**(d)**	**Mean**
Length	54.76	51.62	67.71	53.36	66.11	58.71
Width	32.56	28.59	31.86	25.75	29.49	29.65
Thickness	7.73	9.69	8.73	9.70	9.79	9.13

Etley Corner Notched: The Etley Corner Notched point (Figure 5.3j) was recovered from T.U. 4, Zone IIa (Level 3). The point is roughly triangular in form and exhibits a short expanding stem with a flat base. Corner notches are pronounced but the barbs appear weak, having been broken and/or reworked. Maximum width (Table 5.4) occurs at the barbs. Although triangular in form, both lateral edges have been heavily reworked, altering the original morphology. The point is manufactured from a medium-grained, dark gray, undifferentiated St. Louis chert.

Etley points are diagnostic of the Late Archaic period (3000-1000 B.C.), although the boundaries of this temporal range are not well-understood (Justice 1987:146-149). This point type is usually associated with the Middle Mississippi River Valley of eastern Missouri and southern Illinois (Justice 1987:146-149). Given the fact that point distributions are often poorly defined and

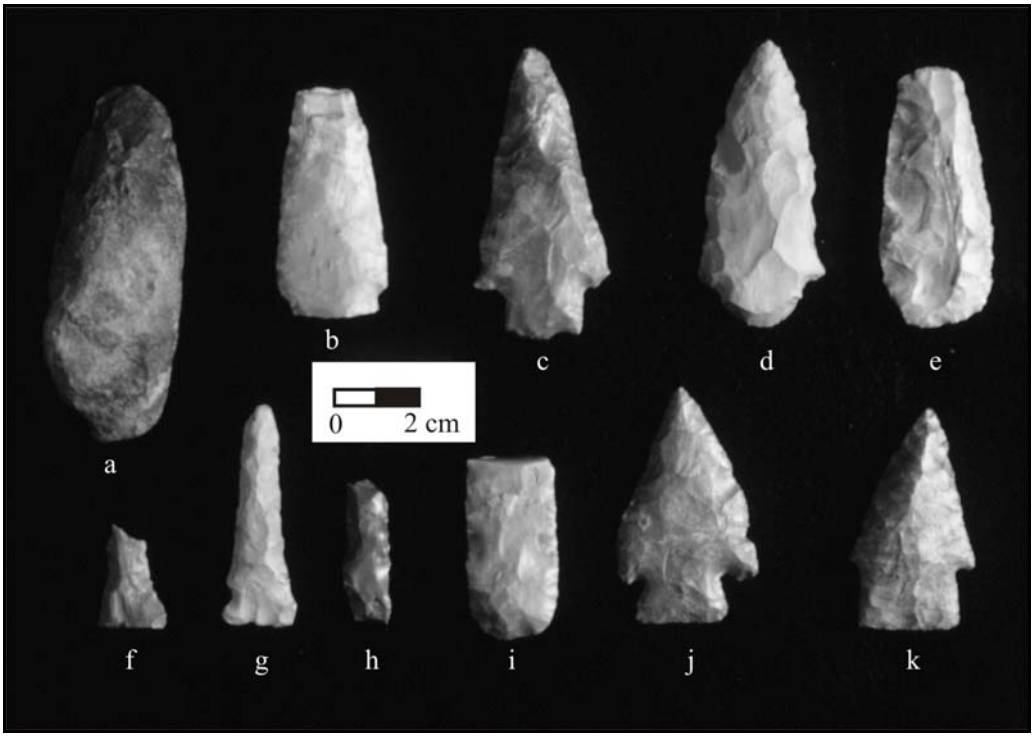

Figure 5.3. Bifacial Tools from the Highland Creek Site: a, adze; b-d, Pickwick projectile points; e, bifacial preform; f-h, drills; i, biface; j, Etley corner-notched projectile point; k, Saratoga parallel-stemmed projectile point.

that the Highland Creek locality is in relatively close geographical proximity to the Mississippi River Valley, the occurrence of an Etley point at the Highland Creek site is not completely unexpected. The radiocarbon dates from the Highland Creek site confirm an early Late Archaic temporal assignment for this point type (Table 4.2).

Pickwick: The three Pickwick points were recovered from T.U. 3, Zone II (Level 6) (Figure 5.3c), T.U. 3, Zone Ib (Level 1) (Figure 5.3b), and T.U. 1, Zone Ib (Level 2) (Figure 5.3d). The Pickwick point recovered from T.U.3, Zone II is roughly triangular with a short parallel-sided stem and a slightly convex base. Shoulder barbs are pronounced and represent the maximum width of the point (Table 5.4). Lateral edges are symmetrical and have been reworked. This point is manufactured from a medium to fine grained, dark brownish gray St. Louis (upper member) chert.

The Pickwick point recovered from T.U. 3, Zone Ib (Figure 5.3b) is also roughly triangular in form. Hinge fractures on both the distal end and proximate end resulted from the breaking of the tip and hafting element. Shoulder barbs are weak, with the maximum width occurring directly above the barbs (Table 5.4). Lateral edges are symmetrical and do not evidence any substantial reworking. This point is manufactured from a fine-grained, light gray to bluish-gray St. Louis (upper member) chert.

The Pickwick point recovered from T.U. 1, Zone 1b (Figure 5.3d) is roughly triangular in form, with a short, convex base. Shoulder barbs are pronounced and represent the maximum width of the blade (Table 5.4). Lateral edges appear symmetrical and are slightly recurvate. Only minor edge modification (reworking) has occurred. The point is manufactured from a medium grained, light grayish brown Fort Payne chert.

Pickwick points are diagnostic of the Late Archaic period, dating from roughly 2500-1000 B.C. (Justice 1987:152-153). Pickwick points are common in Late Archaic sites within the Tennessee River Valley (Justice 1987:.152-153), but are known to occur within the lower Ohio River Valley (Stallings and Ross-Stallings 1995b). The radiocarbon dates from the Highland Creek site suggest that the beginning date for the manufacture of this point type may have to be pushed back to ca. 3000 B.C. (Table 4.2).

Saratoga Parallel Stemmed: The Saratoga Parallel stemmed point (Figure 5.3k) was recovered from T.U. 1, Zone II (Level 5). The point evidences a broad, parallel-sided stem with a flattened, ground base. Shoulder barbs are somewhat pronounced and represent the maximum width of the blade (Table 5.4). Lateral edges are markedly asymmetrical due to heavy reworking of both edges. The point is manufactured from a medium grained, dark grayish-brown, banded St. Louis/Salem chert.

Although their temporal range is poorly understood, Saratoga points are generally thought to be diagnostic of the Late Archaic to Early Woodland periods, dating to periods after 2000 B.C. (Justice 1987:158). The radiocarbon dates from the Highland Creek site suggest that the beginning date for the manufacture of this point type may have to be pushed back to ca. 3000 B.C. (Table 4.2).

Projectile Point/Knife Fragments

Eight nondiagnostic projectile point/knife fragments were recovered from the site (Figure 5.2). Of these, four are manufactured from St. Louis Formation (upper member) chert, three from Fredonia chert, and one from Ft. Payne chert.

Bifaces and Biface Fragments

Two complete bifaces, one manufactured from St. Louis Formation (upper member) chert and one from an unidentified chert, were recovered from the site (Figure 5.2). Although nondistinct and nondiagnostic, both appear to be late stage bifacial preforms. In addition, to the complete bifaces, 19 biface fragments were found at the site. Of these,11 were manufactured from St. Louis Formation (upper member) chert, two each from Ft. Payne and Fredonia chert, one each from Undifferentiated St. Louis Formation and St. Louis Formation (lower member) chert, and two from unidentified cherts. None of the bifacial fragments could be further identified or assigned to a stage in the reduction sequence.

Adzes

A single bifacially-worked chert adze was recovered from the site (Figure 5.3a). It was manufactured from a coarse-grained, black Ft. Payne chert. Use-related polish was observed along the distal end of the adze. The morphology of the tool, along with the distal polish, suggests that it was likely used for woodworking/chopping and/or digging activities.

Drills

Five drills and drill fragments were identified in the assemblage. Of these, three consist of at least the proximal end, shoulders, and a portion of the bit (Figure 5.3f-h), and two are represented by medial sections of the bit only. Each of the drills appears to have been bifacially manufactured and were likely hafted, based on the hafting elements present on two of the specimens. Although no polish or use-alteration was macroscopically observable, these tools are likely representative of woodworking and/or hideworking activities. Three of the drills were manufactured from St. Louis Formation (upper member) chert and two from unidentified cherts.

Scrapers

Two bifacially manufactured scrapers were identified in the assemblage. One is a thumbnail-shaped end scraper manufactured from St. Louis (upper member) chert, and the second is a side-end scraper manufactured of Fredonia chert. The side-end scraper evidenced use-related polish on the flake scar ridges and edge of the distal end. These tools were likely used as scrapers, gravers, and cutters in hideworking/animal processing and/or woodworking activities (Andrefsky 1998; Odell 1981). No evidence for hafting was observed.

Unifaces

A single uniface fragment, manufactured from Ft. Payne chert, was identified in the assemblage. The tool was manufactured from an interior flake, pressure-flaked along the lateral edges into its approximate shape. It appears to have been retouched/modified during use. Due to the fact that only a fragment of the tool was recovered, morphology and function are difficult to infer.

Informal Tools

A total of nine informal tools, consisting of eight utilized flakes and one retouched flake, were identified in the lithic assemblage. The eight utilized flakes evidence use-alteration (edge damage, step fractures, and/or small flake scars) along sections of one or both lateral edges and the distal end of otherwise unmodified flakes. Of these, six were manufactured from St. Louis Formation (upper member) chert and one each from Ft. Payne and Fredonia cherts. In contrast, the single retouched flake, which was manufactured from Ft. Payne chert, exhibited the purposeful modification of a secondary decortication flake, through pressure flaking along the right lateral edge and distal end of

the flake. None of the informal tools evidenced macroscopically observable polish, however, based on the nature of use-alteration it is likely that these tools were used for a wide range of activities including cutting, scraping, and processing of plant and animal material (Andrefsky 1998; Odell 2003; Whittaker 1994).

Raw Materials

Table 5.5 illustrates the frequency of raw material usage among the different tool classes. Bifaces and biface fragments have been combined into a single category in this table, as have projectile points/knives and projectile point/knife fragments. Raw material usage in the manufacture of stone tools from the Highland Creek site mirrors the patterns observed in analysis of the debitage. Of the 52 formal and informal tools, 28 (53.8%) were manufactured from St. Louis Formation (upper member) chert, eight (15.4%) were manufactured from Ft. Payne chert, seven (13.5%) from Fredonia chert, two (3.9%) from Undifferentiated St. Louis Formation chert, one (1.9%) from St. Louis Formation (lower member), and one (1.9%) from St. Louis/Salem Formation chert. Five (9.6%) tools were manufactured from unidentified chert types (Table 5.4).

These frequencies suggest a heavy reliance on locally available raw materials and a selective preference for the finer-grained St. Louis Formation (upper member) cherts, followed by Ft. Payne and Fredonia cherts. Similar to the debitage raw materials, roughly 10% of the raw materials used for tool manufacture were unidentified. Again, the amount of unidentified raw materials is likely a by-product of the procurement of river gravels containing nonlocal materials or from the importation of nonlocal stone to the site by its prehistoric occupants.

At present, either of these possibilities appears likely and cannot be resolved given the small size of the tool sample. However, it is clear that a wide range of raw material types were used in the manufacture of the tools recovered from the Highland Creek site, and that those raw materials were primarily procured from locally available sources.

Summary of Tool Analysis

Although relatively few tools (n=52) were recovered from the Highland Creek site, some general patterns can be identified. Clearly, bifacially manufactured formal tools dominated the focus of lithic production throughout the occupation of the site. The relatively diverse array of bifacial tool types recovered suggests that a wide variety of activities, such as plant and animal processing, woodworking, and perhaps digging, were undertaken at the site. The informal, or expedient, tools found at the site were likely used in a similarly wide variety of activities, but apparently not as frequently as bifacially-manufactured tools.

Table 5.5 Raw Material Usage by Tool Type.

Raw Material	Adze		Bifaces/ Fragments		Drills		PPKs/ Fragments		Scrapers		Uniface		Retouched Flake		Utilized Flake		Total	
	freq	%	freq	%	freq	%	freq	%	freq	%	freq	%	freq	%	freq	%	freq	%
St. Louis (upper)	0		12	57.1	3	60.0	6	46.2	1	50.0	0		0		6	75.0	28	53.8
Ft. Payne	1	100.0	2	9.5	0		2	15.3	0		1	100.0	1	100.0	1	12.5	8	15.4
Fredonia	0		2	9.5	0		3	23.1	1	50.0	0		0		1	12.5	7	13.5
St. Louis (undiff.)	0		1	4.8	0		1	7.7	0		0		0		0		2	3.9
St. Louis (lower)	0		1	4.8	0		0		0		0		0		0		2	1.9
St. Louis/Salem	0		0		0		1	7.7	0		0		0		0		2	1.9
Unidentified	0		3	14.3	2	40.0	0		0		0		0		0		5	9.6
Total	1	100.0	21	100.0	5	100.0	13	100.0	2	100.0	1	100.0	1		8	100.0	52	100.0

NON-CHIPPED STONE ASSEMBLAGE

A total of 35 non-chipped stone lithics were recovered from the Highland Creek site. They include grinding stone fragments (n=10), hammerstone/pecking stone fragments (n=5), minerals (n=6), and rocks (n=14). The 10 grinding stone fragments were primarily manufactured from quartzite (n=9), with a single fragment having been manufactured from granite (n=1). These tool fragments were most likely used in the processing of plant materials at the site. The hammerstone/pecking stones (n=5) were also manufactured from quartzite (n=4) and granite (n=1). These tools were most likely used in both lithic reduction activities and the processing of hard-shell plant materials, such as nuts or seeds.

The presence of quartzite and granite, which are not local to the region, provides additional evidence for the likely procurement of lithic resources from the nearby Ohio River gravels, as was suggested by the chipped stone debitage and tools. Igneous and metamorphic rocks and cobbles have been documented in the channel deposits of the Ohio River (Walker 1957).

Several mineral fragments (n=6), which have been identified as hematite (n=4) and limonite (n=2), were also recovered from the site. The presence of these minerals on archaeological sites is not uncommon and they are often interpreted as having been used (in powdered form) for making pigments, paints, or dyes.

Unmodified rocks (n=14) that were recovered from the site include, quartzite (n=8), siltstone (n=2), chert (n=1), sandstone (n=1), granite (n=1), and a greenish-gray slate slab (n=1). Large rocks do not typically occur naturally on the low floodplain ridge that characterizes the Highland Creek site setting, indicating that these rocks were transported to the site (i.e., manuports). The two fragments of unmodified siltstone and the unmodified slate slab were recovered in association with human burials (see Chapter 4). In addition to these materials more than 800 fire-cracked rocks were counted in the field and discarded.

DISCUSSION

The five diagnostic tools recovered from the site suggest that the subplowzone midden deposits at the Highland Creek site date to the Late Archaic period. Analysis of the Highland Creek lithic materials led to the identification of three general trends related to Late Archaic lithic production, raw material acquisition, and use. First, based on the debitage data, the full sequence of lithic reduction took place at the site. However, the presence of predominantly middle to late stage reduction debris, combined with the presence of relatively few artifacts that display cortex, suggests that early stage lithic reduction, although present, was not commonly performed at the site. Based on the types of tools recovered from the Highland Creek site and the prevalence of bifacial thinning flakes, it appears that bifacial reduction was the primary reductive strategy employed. However, expedient tools, in the form of utilized and retouched flakes, were also manufactured and used by the site's inhabitants.

Second, the analysis and identification of raw material resources used in the manufacture of chipped stone tools suggests a procurement strategy that focused on the exploitation of locally available chert resources. Based on the cortex data, it appears that both primary and secondary source locations were targeted for procurement, with secondary river gravel sources being the most important locations for resource acquisition. Although a variety of local chert types were utilized, flint knappers at the Highland Creek site appear to have preferred St. Louis (upper member) and Ft. Payne cherts.

Approximately 10% of the raw material used to manufacture chipped stone tools could not be identified. There are at least two possible scenarios that could explain the patterns of raw material acquisition and relatively high amount of non-local raw materials in the Highland Creek assemblage. First, the prevalence of riverine cortex in assemblage may suggest that non-local raw materials were collected from the nearby river gravel deposits (along with local materials). In contrast, the non-local raw materials may have been transported to the site, which may be supported by the relative lack of early stage reduction material (suggesting that initial reduction took place in another location) and, overall, relatively few pieces with cortex. Both of these procurement strategies are, at least in part, supported by the available data. Given this fact, it is reasonable to assume that each procurement strategy probably operated at some point during the history of the site occupation, perhaps at the same time, and contributed to the raw material patterns observed in the Highland Creek lithic assemblage.

Third, the presence of a fairly diverse toolkit, consisting of bifacial, unifacial, and expedient flake tools, suggests that a wide range of activities, such as plant and animal processing, woodworking, and perhaps digging, were performed by the site occupants. In addition, based on the relatively even distribution of similar tools throughout the Late Archaic deposits, the focus and frequency of these activities does not appear to have substantially changed during the period of site occupation.

CHAPTER 6:
CERAMICS

INTRODUCTION

Only 14 ceramic sherds were recovered from the Highland Creek site. All of the sherds were greater than 1 cm^2 in size but most (n=10) were less than 4 cm^2. Four sherds were greater than 4 cm^2 in size. All sherds regardless of size were examined. Of the 14 sherds recovered from the site, one was tempered with limestone and 13 were tempered with grog. All have plain exterior surfaces and one grog tempered sherd is decorated. The sherds recovered from the Highland Creek site are described in this chapter by temper type. Because of the small size of the sample recovered from the site no attempt was made to assign the sherds to previously defined types or to assess vessel form and function.

LIMESTONE TEMPERED PLAIN

The one limestone tempered sherd recovered from the site has a thickness of 7.5 mm. It has a gray exterior surface color and a dark brown interior surface color. All of the temper has been leached out and the paste has quartz inclusions.

GROG TEMPERED PLAIN

Of the 13 grog tempered plain sherds recovered from the site, 11 are body sherds and two are rim sherds. The 11 body sherds have quartz inclusions in association with their paste. These sherds range in thickness from 4.7 to 10.4 mm and have a mean thickness of 6.9 mm. Exterior surface colors include light brown (n=8) and dark gray (n=3). Interior surface colors include light brown (n=2), dark brown (n=1), light gray (n=1), dark gray (n=3), and black (n=4).

As with the body sherds, both of the rims have quartz inclusions in their paste. One of the rims has a flat lip and a slight exterior protrusion. It has a thickness of 9.5 mm at the lip and a thickness of 7.3 mm approximately 1 cm below the lip. This rim has a light brown exterior surface color and a light gray interior surface color. It was too small to orient or determine vessel form.

The other rim has a rounded lip. It has a thickness of 7.3 mm at the lip and a thickness of 8.4 mm 1 cm below the lip. This rim has a light gray exterior surface color and a black interior surface color. It was too small to orient or determine vessel form. Decoration in the form of three incised lines or finger nail impressions are present 7.5 mm below the lip. The decoration is perpendicular to the lip. Unfortunately, the small size of the rim sherd precludes any attempt to determine how the design was executed.

DISCUSSION

All of the sherds recovered from the Highland Creek site have plain exterior surfaces and all but one were tempered with grog. Most of the sherds were recovered from Zone I (looter back dirt/plowzone). The one sherd that was recovered from Zone II is thought to be intrusive into the Late Middle Archaic/early Late Archaic deposits.

Based on the thinness of the body sherds (7.3 mm) and the absence of cordmarked exterior surfaces, the ceramics recovered from the Highland Creek site do not appear to be derived from an Early or Middle Woodland Crab Orchard (Clay 1963; Cole et al. 1951; Maxwell 1951) utilization of the site. Rather, they appear to be associated with a Late Woodland component. The presence of possible finger nail impressions below the lip lends support for this suggestion as this is a common trait on Late Woodland Yankeetown ceramics (Sussenbach 1992). In addition, in western Kentucky a decline in cordmarked exterior surface through time has been identified (Sussenbach 1992:73; Sussenbach and Lewis 1987). However, based on the small sample recovered from the site, assignment of the ceramics from the Highland Creek site to the Late Woodland period must be considered tenuous at best.

CHAPTER 7:
HISTORIC ARTIFACTS

By
M. Jay Stottman

INTRODUCTION

A total of 585 historic artifacts were recovered from the Highland Creek site. These materials were assigned to one of seven functional groups: activities, architecture, arms, clothing, furniture, kitchen, miscellaneous, and personal (Ball 1984; South 1977). Slightly more than two-thirds (n=408) of the historic-era artifacts were kitchen related and more than one-fifth (n=128) were assigned to the architecture group (Table 7.1). Other functional groups each accounted for less than 5% of the historic artifact assemblage. In this chapter, the historic artifacts recovered from the Highland Creek site are described by functional group.

FUNCTIONAL GROUPS

KITCHEN

The kitchen group consists primarily of glass artifacts (n=295), most of which were unidentified bottle or jar fragments (n=288) (Table 7.1). The identifiable glass vessel forms include two canning jars, two jugs, two lid liners for a canning jar, and a fragment of tumbler. From these identified vessels only three diagnostic manufacturing attributes were present, all of which are jar and bottle bases that exhibit Owen's scars (1903-1940) (Jones and Sullivan 1989). The kitchen glass consisted mostly of clear glass (n=193) **(**Table 7.2**)**. Other glass colors represented in the assemblage include amethyst (n=53), blue (n=3), brown (n=19), aqua (n=16), cobalt blue (n=6), green (n=3), green tinted (n=6), and white milk glass (n=6). Several of these are diagnostic. Clear glass suitable for bottle and jar manufacture was developed in 1875 and is still used today (Fike 1987). Amethyst colored glass (solarized glass) was manufactured from ca. 1880 to 1914 (Kendrick 1964, Newman 1970). Brown, cobalt blue, and white milk glass were all developed in the 1860s and are still used today (Fike 1987; Kendrick 1964).

The 110 historic ceramic artifacts recovered from the Highland Creek site account for 27% of the the materials assigned to the kitchen group (27%) (Table 7.1). Most of the ceramics consisted of white granite ware (n=71) (Table 7.2). Other ceramic types recovered include whiteware (n=16), buff stoneware (n=16), yellow ware (n=6), porcelain (n=1) and unidentified (n=1). Although most of the ceramic sherds could not be assigned to a specific vessel form, they were likely fragments of vessels that had a kitchen function, thus they have been included in the kitchen group. The sherds that could be classified as to vessel form are discussed with each ceramic type.

White granite ware, also known as ironstone, was developed in 1845 and is still produced today. However, it was most popular with consumers from the 1860s to the early 1900s (Miller 1991). Although most of the white granite ware was undecorated, two sherds exhibited a black transfer printed decoration (Table 7.2). White granite ware vessel forms that could be identified from the sherds recovered from the Highland Creek site included four bowls, seven plates, and a saucer.

Table 7.1. Historic Artifacts by Functional Group.

Functional Group	Artifact Type	Count
Kitchen (70.0%)	Ceramics	
	Bowl	5
	Cup	1
	Jug	1
	Plate	9
	Saucer	1
	Crock	8
	Unidentified vessel	85
	Glass	
	Unidentified Bottle/Jar	288
	Canning Jar	2
	Jug	2
	Lid Liner	2
	Tumbler	1
	Metal	
	Cookware	1
	Handle	1
	Lid	1
Architecture (22.0%)	Metal	
	Machine Cut Nail	7
	Wire Nail	32
	Unidentified Nail	18
	Glass	
	Window Glass	71
Arms (0.6%)	Metal	
	Shot Gun Shell Casing	4
Clothing (0.2%)	Bone	
	Unidentified Fastener	1
Furniture (2.0%)	Ceramic	
	Dish	1
	Glass	
	Lamp Globe	10
	Metal	
	Clock Part	1
Miscellaneous (5.0%)	Metal	
	Unidentified	12
	Synthetic	
	Styrofoam	17
	Unidentified Plastic	3
Personal (0.2%)	Plastic	
	Hair Comb	1
	Total	**586**

Table 7.2. Historic Artifacts by Provenience.

Artifact Type	Unit 1		Unit 2	Unit 3	Unit 4		Sur-face	LP1	LP3	LP4	Total
	ZI	ZII	ZI	ZI	ZI	ZII					
Buff Stoneware, Undecorated	1	0	1	11	0	0	0	3	0	0	**16**
Porcelain, Pattern Molded	0	0	1	0	0	0	0	0	0	0	**1**
Porcelain, Lustered	1	0	0	0	0	0	0	0	0	0	**1**
Porcelain, Undecorated	0	0	0	0	0	0	0	1	0	0	**1**
White Granite, Transfer Printed	0	0	0	2	0	0	0	0	0	0	**2**
White Granite, Undecorated	7	2	5	38	6	0	0	10	0	0	**67**
White Granite, Decal	0	0	0	0	0	0	0	1	0	0	**1**
Whiteware, Transfer Printed	3	0	0	0	0	0	0	0	0	0	**3**
Whiteware, Undecorated	4	0	2	0	0	0	0	0	0	0	**13**
Yellow Ware, Banded	1	0	0	1	0	0	0	0	0	0	**2**
Yellow Ware, Undecorated	1	0	1	0	0	0	0	1	0	0	**4**
Unidentified Ceramic	0	0	1	0	0	0	0	0	0	0	**1**
Amethyst glass	11	0	9	30	1	0	0	1	1	0	**53**
Aqua glass	1	0	3	10	2	0	0	0	0	0	**16**
Blue glass	3	0	0	0	0	0	0	0	0	0	**3**
Brown glass	4	1	2	11	0	0	0	1	0	0	**19**
Clear glass	39	8	13	123	5	0	1	4	0	1	**193**
Cobalt glass	5	0	1	0	0	0	0	0	0	0	**6**
Green glass	1	0	1	1	0	0	0	0	0	0	**3**
Green tinted glass	1	0	3	2	0	0	0	0	0	0	**6**
White milk glass	4	0	0	2	0	0	0	0	0	0	**6**
Window glass	28	4	7	32	0	0	0	0	0	0	**71**
Metal Lid	0	0	1	0	0	0	0	0	0	0	**1**
Cast Iron Cookware	0	0	0	1	0	0	0	0	0	0	**1**
Metal Handle	0	0	1	0	0	0	0	0	0	0	**1**
Machine Cut Nail	1	1	3	0	2	0	0	0	0	0	**7**
Wire Nail	6	0	18	7	0	0	0	1	0	0	**32**
Unidentified Nail	4	2	8	2	1	0	0	0	0	0	**18**
Shell Casing	0	1	0	1	2	0	0	0	0	0	**4**
Unidentified Metal	1	1	1	5	0	0	0	2	0	0	**10**
Metal Clock Part	0	0	2	0	0	0	0	0	0	0	**2**
Bone Fastener	1	0	0	0	0	0	0	0	0	0	**1**
Unidentified Plastic	0	2	1	0	0	0	0	0	0	0	**3**
Styrofoam	3	2	0	0	0	0	0	0	0	0	**17**
Plastic Hair Comb	0	0	0	0	0	0	0	0	0	0	**1**
Total	**134**	**32**	**85**	**277**	**17**	**2**	**1**	**25**	**1**	**1**	**586**

Whiteware was the earliest historic period ceramic found at the site. This ceramic type was manufactured from the 1830s to the 1870s (Smith 1983). Undecorated (n=8) as well as blue transfer printed (n=6) whiteware sherds were recovered from the site (Table 7.2). The two whiteware sherds that could be assigned to a vessel form were both fragments of plates.

One of the two porcelain sherds found was assigned to the kitchen group. It was a tea cup fragment. The other porcelain sherd is from a decorative dish that is discussed with the furniture group artifacts. Porcelain has been manufactured for hundreds of years and is generally not a good temporal indicator for nineteenth or twentieth century sites.

Buff stoneware was a common ware type used from the late-1800s to the mid-1900s for utilitarian vessels, like storage crocks. All of the buff stoneware sherds recovered were undecorated and consisted of a salt and slip glaze. Only nine of the buff stoneware sherds were identifiable for vessel type, with eight representing crocks and one representing a jug.

Yellow ware was manufactured primarily from the 1830s to the 1940s and was used in the production of food preparation vessels, like mixing bowls (Ketchum 1983). Most of the yellow ware found at the Highland Creek site was undecorated (n=4), but one sherd was decorated with a brown slip band (Table 7.2). Vessel form could be identified for only one of the yellow ware sherds. It was a bowl.

The remaining kitchen group artifacts consisted of a metal handle, a cast iron cookware fragment, and an unidentified metal lid. The handle may have been part of a cooking vessel. The cast iron cookware fragment may have been part of a kettle or frying pan (Table 7.1).

ARCHITECTURE

The architecture group consisted of nails (n=57) and window glass (n=71) (Table 7.1). The majority of the nails were made from wire (n=32). Wire nails were developed in the 1870s and are still used today (Nelson 1968). Machine cut nails (n=7), which were manufactured from ca. 1800 to 1880 (Nelson 1968), were also found. Due to their poor condition, 18 nails could not be assigned to a specific nail type.

ARMS

The arms group consisted of four brass heads to 12-gauge shotgun shells with head stamps (Table 7.1). Two of the shells were stamped with "WINCHESTER NEW RIVAL." These shells were paper walled and were manufactured from 1897 to 1920 (Ball 1997). The remaining shells were stamped with "REM UMC No. 7 12" and "WESTERN XPFHC." These shells were probably paper walled. A manufacturing date range was not available for these specimens.

FURNITURE

The furniture group consisted of 12 artifacts, the majority of which were glass lamp globe fragments (n=10) (Table 7.1). Other furniture group artifacts included a decorative pattern molded porcelain dish fragment and a metal clock part.

PERSONAL

Only one artifact was assigned to the personal group. It consisted of an early twentieth-century plastic hair comb (Table 7.1).

CLOTHING

Only one artifact, a bone fastener, was assigned to the clothing group (Table 7.1). Age range of this type of fastener is unknown.

MISCELLANEOUS

Several artifacts (n=32) were assigned to the miscellaneous group (Table 7.1). They consisted primarily of unidentified metal items that could not be assigned a particular function. Objects manufactured from styrofoam and plastic were also assigned to this group. These objects represent modern intrusions to the site.

DISCUSSION

Based on the high percentage of kitchen related artifacts (70%) and the presence of a large amount of materials assignable to the architecture group (n=128) (Table 7.1), the historic period artifact assemblage recovered from the Highland Creek site likely represents a house site (Ball 1984; South 1977). Kitchen related artifacts, such as tableware, cookware, and storage vessels, are indicative of a house site as these types of artifacts are not typically associated with agricultural buildings. The recovery of a large amount of window glass (n=71) (Table 7.1) also points to the building having been a house rather than an outbuilding or an agricultural building, as the former were less likely to have windows. The presence of both machine cut and wire nails, suggests that this house may have been constructed in the 1870s or 1880s, during the transition period of nail manufacturing technology. However, it is also possible that the presence of the two nail types represents the use of salvaged machine cut nails in a post-1880s building or the use of wire nails during a repair or remodeling episode.

Personal and clothing group artifacts are also commonly found in association with domestic dwellings. However, the low frequency of these types of artifacts coupled with the absence of entertainment and activities group artifacts in the Highland Creek assemblage, is unusual for a house site. Items, such as buttons, marbles, smoking pipes, and coins are commonly found on domestic sites, so their absence in the Highland Creek assemblage is somewhat conspicuous and puzzling. It is possible that the artifact assemblage is derived from a refuse area associated with a house, rather than the actual house site itself. Some architectural debris could have been deposited with household trash during a repair or remodeling episode, which would explain the presence of nails and window glass in the assemblage. That the remains of a foundation were not documented at the site lends support to this suggestion.

The diagnostic artifacts recovered from the site primarily date from the late-1800s to the mid-1900s. Some of the diagnostic artifacts (e.g., whiteware) have an earlier manufacturing date (i.e., mid-1800s), while other artifacts (e.g., styrofoam and plastic) date to the late-1900s. The earlier artifacts probably represent heirloom objects, while the later artifacts probably represent flood deposited debris.

CHAPTER 8:
ARCHAEOBOTANICAL REMAINS

By
Jack Rossen

INTRODUCTION

This chapter describes the plant remains recovered from 40 flotation samples (220 liters of soil) from the Highland Creek site. A substantial archaeobotanical collection was recovered, including nine species of wood charcoal, six species of nuts, squash and gourd rind, and the seeds of nine wild plants. The collection is heavily dominated by nutshell, but the recovered wild seeds indicate broad spectrum collecting of fleshy fruits and the seeds of both dryland annuals and wetlands plants (Tables 8.1 and 8.4). The presence of wild forms of marshelder and erect knotweed suggest the collection of plants that will later come under cultivation. In many respects, this assemblage is similar to the large Late Archaic collection from the Hedden site in nearby McCracken County (Rossen 2000a). Comparisons with selected sites are made in terms of densities per liter and ratios, and the consistency of regional Archaic period archaeobotanical collections is noted and discussed. A final discussion addresses some research issues regarding the Kentucky Archaic, including the importance of wetland plants, the foundations of seed plant horticulture, and the question of early gourd and squash cultivation.

Table 8.1. Frequencies, Gram Weights, and Ubiquities of General Categories of Plant Remains from the Highland Creek Site.

Category	Freq	Pct	Gm Wt	Pct	Ubiq*
Nutshell/nutmeat	7,906	91.2	120.5	93.8	1.00
Wood charcoal	712	8.2	7.7	6.0	0.95
Wild plant seeds**	16	0.2	0.2	0.2	0.25
Possible cultigens (squash and gourd)	5	0.1	---	---	0.10
Unidentified - general/seeds	29	0.3	---	---	
Total plant remains	8,668	100.0	128.4	100.0	---

**Ubiquity* represents the percentage of flotation samples (among all flotation samples [n=40]) that contained plant remains from each general category.
** includes two species (*Iva annua* and *Polygonum erectum)* that were later cultivated.

METHODS

Botanical remains are recovered from archaeological sites using a method known as water flotation. Soil samples are placed in a tank with agitated water, and the lighter charcoal and roots float to the surface and are collected in a nylon bag. Portions of the sample that sink are caught below in a fine screen. After drying the floated samples, they were passed through a 2 mm geological sieve, before sorting charcoal from uncarbonized contaminants such as roots. In open prehistoric sites like Highland Creek, only carbonized plant remains may be considered archaeological. Material such as wood and nutshell from the larger than 2 mm sample were identified, counted, and weighed. Sievings

smaller than 2 mm were scanned carefully for seeds. This procedure is followed because fragments of wood and nutshell smaller than 2 mm are difficult to reliably identify. Specimens greater than 2 mm in size, however, typically still represent small specimens, with the possible exceptions of acorn and squash rind (Asch and Asch 1975). Sieving thus saves considerable laboratory sorting time without a loss of information.

The samples were examined under a light microscope at magnifications of 10 to 30x. Identification of materials was aided by a comparative collection of both archaeological and modern specimens, along with standard catalogs (Delorit 1970; Martin and Barkley 1973; Panshin and deZeeuw 1970; U.S. Department of Agriculture 1948). When applicable, specimens were sorted by species, counted, and weighed to the nearest tenth of a gram. Macroscopic wood characteristics were observed from specimen cross-sections. Changes in the visibility of macroscopic characteristics that occur during carbonization were also accounted for, to insure maximum accuracy of identification (Rossen and Olson 1985). Very small wood specimens or specimens that were badly deformed during the carbonization process were classified as "unidentified." Similarly, nonwood specimens that were badly deformed were classified as "unidentified-general" and deformed or fragmented seeds were classified as "unidentified-seeds."

PRESERVATION

Archaeobotanical preservation varies greatly between sites for reasons that are only partially understood. The two factors that influence preservation are soil drainage and chemical composition of midden deposits (such as soil pH and ash content). The circumstances surrounding plant carbonization, including firing temperature and the amount of oxygen reduction present, also influence preservation. Soil particle size and inclusions affect whether or not carbonized plant remains are eroded or destroyed by mechanical grinding.

Preservation of carbonized plant material at Archaic sites like Highland Creek is almost never as good as preservation at more recent sites. Archaic sites are almost always dominated by hickory nutshells, which are very durable. All recovered remains in this collection are eroded as a result of mechanical soil grinding, and seed densities are typically low for this type of site. Despite this preservation problem, a variety of plant remains were recovered. Less durable economic plant seeds and rinds are underrepresented, and even low frequencies may represent plants that were substantially utilized.

WOOD CHARCOAL

Nine species of wood charcoal (n=712) were recovered (Table 8.2). In order of frequency, these are white oak group (*Quercus* sp.), hackberry (*Celtis* sp.), American chestnut *(Castanea dentata*), red oak group (*Quercus* sp.), black walnut (*Juglans nigra*), hickory (*Carya* sp.), sycamore (*Platanus occidentalis*), slippery elm (*Ulmus rubra*), and eastern redcedar (*Juniperus virginiana*). These trees are all native to western Kentucky. Most archaeological evidence suggests that the prehistoric forests of western Kentucky were mixed hardwood communities dominated by hickories and white oaks (Campbell 1985; Rossen 1991).

Table 8.2. Wood charcoal from Highland Creek.

Species	Freq	Pct	Gm Wt	Pct	Ubiq
white oak group (*Quercus* sp.)	68	25.8	.5	20.8	.23
hackberry (*Celtis* sp.)	52	19.7	.4	16.7	.30
American chestnut (*Castanea dentata*)	48	18.2	.8	33.3	.05
red oak group (*Quercus* sp.)	47	17.8	.4	16.7	.10
black walnut (*Juglans nigra*)	22	8.3	.2	8.3	.10
hickory (*Carya* sp.)	11	4.2	.0	---	.08
sycamore (*Platanus occidentalis*)	8	3.0	.1	4.2	.05
slippery elm (*Ulmus rubra*)	7	2.7	.0	---	.08
eastern redcedar (*Juniperus virginiana*)	1	0.4	.0	---	.03
Total identified wood charcoal	264	100.0	2.4	100.0	
Unidentified wood charcoal	448		5.2		
Total wood charcoal	712		7.6		

Wood frequencies are often very low at Archaic sites, compared with later Woodland and Late Prehistoric sites. In Kentucky and Illinois, for example, Archaic sites tend to have wood densities of less than 4 specimens per liter. With a wood density of 3.2 specimens per liter, the Highland Creek site conforms to this pattern. In comparison, later sites range from 20 to occasionally more than 110 specimens per liter (Table 8.3). Because of the low wood density at the Highland Creek site, the recovered wood probably does not adequately represent the inventory or relative importance of wood species in the environment surrounding this site (Rossen 1991). For example, at the Late Prehistoric and Woodland period Slack Farm site, also in Union County, an additional seven wood species were recovered: American elm (*Ulmus americana*), American holly (*Ilex opaca*), ash (*Fraxinus* sp.), black locust (*Robinia pseudoacacia*), honey locust (*Gleditsia triacanthos*), pine (*Pinus* sp.), and yellow poplar (*Liriodendron tulipifera*) (Rossen 1994). Another species that is conspicuously absent in the Highland Creek collection is cane (*Arundinaria gigantea*).

PLANT FOOD REMAINS

Prehistoric plant food remains from Highland Creek include nutshell from six species, wild seeds from nine species, and two possible cultigens (squash and gourd). These remains are described and discussed in this section.

NUTSHELL

Hickory (*Carya* sp.) and black walnut (*Juglans nigra*) nutshell are the most abundant food remains recovered (Table 8.4). Each was recovered from all but one sample. In Kentucky, throughout much of the Archaic and Woodland periods, hickory was a focal resource. Hickory nuts were valuable for their high protein and fat content, and relative ease of collection, preparation, and storage. Swanton (1946) reviewed at length the ethnographic data on hickory nut use by southeastern Native Americans. The most common use was in a “hickory nut soup,” prepared by cracking nuts and placing them into a pot of boiling water, where the nutshell would settle to the bottom leaving an oily white broth that was considered a delicacy. The large amounts of hickory

Table 8.3. Wood Frequencies per Liter of Floated Soil.

Site	Period	Freq Wood/liters
Petersburg (15Be6)	Middle/Late Fort Ancient	110.6
Guilfoil (15Fa167)	Middle Fort Ancient	85.2
Slack Farm (15Un28)	Late Mississippian component	70.7
Fox Farm (15Ms1)	Middle/Late Fort Ancient	62.3
Muir (15Js86)	Early Fort Ancient	56.1
Shelby Lake (15Sh17)	Late Woodland	47.0
Thompson (15Gp27)	Middle Fort Ancient	42.9
Slack Farm (15Un28)	Middle Woodland component	41.8
Chambers (15Ml109)	Mississippian	27.7
Hansen (15Gp14)	Late Woodland	20.0
Highland Creek (15Un127)	**Late Archaic**	**3.2**
Dyroff, Il.	**Late Archaic**	**1.8**
Missouri Pacific #2, Il,	**Late Archaic**	**1.7**
Watson (15Be249)	Late Woodland	1.6
Hedden (15McC81)	**Late Archaic**	**1.2**

Sources: Asch and Asch 1985; Johannessen 1983, 1984a, 1984b; Lopinot 1988; Rossen 1987a, 1987b, 1988, 1992, 1993, 1994, 1995, 2000, n.d.a.

Table 8.4. Plant Remains from Highland Creek.

Plant Type/species	Freq	Gm Wt	Ubiquity
Nutshell/nutmeat			
hickory (*Carya* sp.)	6832	86.7	.98
black walnut (*Juglans nigra*)	821	10.5	.98
acorn (*Quercus* sp.)	171	2.2	.83
pecan (*Carya illinoensis*)	78	1.0	.35
butternut (*Juglans cinerea*)	3	.1	.03
hazelnut (*Corylus* sp.)	1	.0	.03
Wild plant seeds			
grape (*Vitis* sp.)	6	---	.10
spurge (*Euphorbia* sp. cf. *corollata*)	2	---	.05
bedstraw (*Galium* sp.)	1	---	.03
chokeberry (*Aronia* sp.)	1	---	.03
erect knotweed (*Polygonum erectum*)	1	---	.03
hawthorn (*Crataegus rotundifolia*)	1	---	.03
marshelder (*Iva annua*)	1	---	.03
persimmon (*Diospyros virginiana*)	1	---	.03
pondweed (*Potamogeton* sp.)	1	---	.03
Possible cultigens			
gourd - rind (*Lagenaria* sp.)	4	.0	.08
squash - rind (*Cucurbita* sp.)	1	.0	.03
Miscellaneous			
unidentified - general	24	.0	
unidentified - seed fragments	5	---	

nutshell recovered from most Archaic sites raises the possibility that nutshell was deposited and archaeologically preserved due to specific use and deposition factors. One possibility is that thick-shelled hickory nutshell was used as fuel.

Black walnuts contain over three times more nutmeat (Styles 1981:82) and approximately 10% more protein and fat than hickory (Lopinot 1982:858-859). They may be more difficult to collect and utilize, however, because walnut trees do not grow in stands like hickories, and shelling and processing is more time-consuming.

Nuts recovered in lower frequencies are acorn (*Quercus* sp.), pecan (*Carya illinoensis*), butternut (*Juglans cinerea*), and hazelnut (*Corylus* sp.). A substantial quantity of acorn (*Quercus* sp.) (n=171) was recovered , considering that its shell is thin and fragile and that it is usually underrepresented archaeologically (Asch and Asch 1975). The importance of acorn at the Highland Creek site may also be inferred from its high ubiquity of .83 (appearance in 33 of 40 samples). It is probably the most abundant and reliable southeastern U.S. nut, producing consistent annual masts, while other species vary more in annual production. Acorns, however, require special processing to remove the astringent tannic acid of the nutmeat. Furthermore, acorns are nutritionally inferior to other nuts, with only half the protein and one-third the fat of hickory nuts. Despite this, acorn collection may be simpler than collection of other nuts, and nutmeat yields are high, so the net energy potential of acorn may be similar to that of other nuts (Lopinot 1982:726).

Pecan, a thin-shelled hickory (*Carya illinoensis*), was recovered from 14 samples, a ubiquity of .35. Pecans appear to have been prehistorically restricted to the westernmost areas of Kentucky and possibly along the Ohio River floodplain in northeastern Kentucky (Lopinot 1988:599); they do not appear in the many archaeobotanical collections from the central and eastern portions of the state.

Trace amounts of butternut (*Juglans cinerea*) and hazelnut (*Corylus* sp.) were recovered. These species were probably not as important as hickory, black walnut, acorn, and pecan. Butternut is widespread in the eastern U.S. archaeological record, but only in small amounts. Its nutritional content, processing and use is similar to that of black walnut. Butternut trees, however, only produce good harvests every two or three years, so butternut may not have fit into a seasonal collection strategy as well as other nut-bearing species that produce more consistent harvests (U.S. Department of Agriculture 1948:110, 202). The amount and availability of butternut in prehistoric Kentucky is difficult to assess because a blight has drastically reduced its numbers in recent years. Hazelnut (either *Corylus americana*, the American hazelnut or *Corylus cornuta*, the beaked hazelnut) is high in protein and is an easily stored nut (Krochmal and Krochmal 1982:6-8).

The nutshell from the Highland Creek site may be compared to other Kentucky sites within a broad diachronic scheme of frequency and gram weight density per soil liter, as they presumably reflect changes in prehistoric use through time. In this sense, nutshell density appears to be a predictable and stable temporal indicator (Table 8.5). In the case of the Highland Creek site, both frequency and weight per liter density measures are remarkably similar to values produced at other Kentucky Archaic sites, such as Hedden and the Archaic component of Withrow Creek (Davis et al. 1997:182; Rossen 2000a). These Archaic sites have more than double the nutshell densities of Woodland period sites. During the Late Prehistoric period, nutshell densities drop further at central and eastern Kentucky Fort Ancient sites, but not at western Kentucky Mississippian sites.

Another way of examining the relative importance of nuts in the economy is through wood to nut ratios. Kentucky Archaic sites couple their high nutshell densities with low wood charcoal

Table 8.5. Nutshell densities (frequencies and gram weights per liter of floated soil) at selected

Kentucky archaeological sites and site groupings, listed in approximate chronological order from top to bottom.

Site(s)/County or Region	Period	Freq/l	Gm/l
Withrow Creek (15Ne55) Nelson County	Late Archaic component	40.8	.53
Highland Creek (Un127) **Union County**	**Late Archaic**	**35.9**	**.55**
Hedden (15McC81) McCracken County	Late Archaic	35.3	.48
Slack Farm (15Un28) Union County	Middle Woodland	15.4	.22
Shelby Lake (15Sh17) Shelby County	Late Woodland	16.9	.28
Hansen (15Gp14) Greenup County	Late Woodland	10.5	.27
Withrow Creek (15Ne55) Nelson County	Late Woodland component	5.8	.13
Dreaming Creek (15Ma97) Madison County	Late Woodland	1.3	.02
Watson (15Be249)/Boone County	Terminal Late Woodland	2.9	.07
Kentucky *Fort Ancient* sites* (northeastern Kentucky - 3 sites)	Late Prehistoric	1.7	.04
Kentucky *Fort Ancient* sites** (northern Ky/southern Ohio - 3 sites)	Late Prehistoric	4.2	.06
Kentucky *Fort Ancient* sites*** (central Kentucky - 6 sites)	Late Prehistoric	3.2	.07
Kentucky *Mississippian* sites+ (western Kentucky - 6 sites)	Late Prehistoric	10.9	.23

References: Davis et al. 1997:182; Hockensmith et al. 1998; Lopinot 1988; Rossen 1992, 1993a, 1993b, 1994, 2000a, n.d.a.; Rossen and Hawkins 1995
* after Rossen 1992; ** after Cowan et al. 1990; Rossen 1993a
*** after Rossen 2000b; + after Edging 1995; Rossen and Edging 1987

frequencies, producing consistently low wood to nut ratios. The Highland Creek site produced a particularly low ratio, joining a group of Kentucky and Illinois sites with values under 0.1 (that is, sites with more than ten times more nutshell than wood charcoal by frequency) (Table 8.6).

Table 8.6. Wood to Nut Ratios of Selected Archaeological Sites.

Site	Period	Wood/nut Ratio
Petersburg (15Be6)	Middle/Late Fort Ancient	40.70
Thompson (15Gp27)	Middle Fort Ancient	28.50
Guilfoil (15Fa167)	Middle Fort Ancient	24.40
Watson (15Be249)	Late Woodland	24.30
Fox Farm (15Ms1)	Middle/Late Fort Ancient	23.00
Muir (15Js86)	Early Fort Ancient	12.60
Slack Farm (15Un28)	Late Mississippian component	11.00
Slack Farm (15Un28)	Late Woodland component	5.50
Shelby Lake (15Sh17)	Late Woodland	2.80
Slack Farm (15Un28)	Middle Woodland component	2.40
Campbell Hollow, Il.	**Late Archaic**	**1.90**
Hansen (15Gp14)	Late Woodland	1.50
Chambers (15Ml109)	Mississippian	1.50
Missouri Pacific #2, Il.	**Late Archaic**	**1.32**
Dyroff, Il. (11S463)	**Late Archaic**	**1.20**
Rosenberger (15Jf18)	**Late Archaic**	**1.05**
Longworth-Gick (Jf243)	Early Archaic	0.27
Villier (15Jf110)	**Late Archaic**	**0.21**
Highland Creek (15Un127)	**Late Archaic**	**0.09**
Spadie (15Jf14)	**Late Archaic**	**0.04**
Hedden (15McC81)	**Late Archaic**	0.03
Go-Kart North, Il.	**Late Archaic**	**0.02**

Sources: Asch and Asch 1985; Johannessen 1983, 1984a, 1984b; Lannie 1979; Lopinot 1988; Rossen 1987a, 1987b, 1992, 1993a, 1993b, 1994, 1995, 2000, n.d.a.

POSSIBLE CULTIGENS (GOURD AND SQUASH)

Trace amounts of squash and gourd rind were recovered. Four fragments of gourd (*Lagenaria* sp.) rind were recovered from three samples (Table 8.7). Gourd is a plant of Old World origin and its prehistoric introduction into the New World remains shrouded in mystery (Lathrap 1977; Stone 1984). It has been recently postulated that gourd arrived in the New World with its first aboriginal migrants (Erickson et al. 2005). Gourds were prehistorically used in Kentucky as containers and fishing floats, and their nutritious seeds were eaten (Hart et al. 2004; Hudson 2004) It is a fragile plant that is considered underrepresented in the archaeological record, and thus even its presence in a trace amount is significant. Despite this preservation issue, gourd has been recovered from numerous Kentucky sites ranging from the Archaic to Late Prehistoric periods.

One fragment of squash rind (*Cucurbita* sp.) was recovered (see Table 8.4). Prehistoric squashes in the southeastern U.S. were hard-shelled and probably used primarily for their edible seeds. Squash appears very early in the archaeological record, and has been found sporadically in Archaic period contexts (Cowan et al. 1981; Kay et al. 1980; Marquardt and Watson 1977). There is ongoing debate as to whether early squash specimens represent cultivated or wild plants, and if these plants are native to North America (see Fritz 1988; Heiser 1989; Smith 1987; Watson 1989 on this debate). Allozyme, morphology, and phytogeography studies are now convincing more scholars that squash was independently domesticated in the eastern U.S. from wild populations in Arkansas and Missouri (Decker-Walters 1990; see discussions in Crites 1994:G15-18 and Edging 1995:170).

Table 8.7. Nonwood Archaeobotanical Remains by Unit/Zone or Looter Pit and Feature.

Species						
Unit/Zone/Level	**Hickory**	**Black Walnut**	**Acorn**	**Pecan**	**Other**	**Liters**
1/I/2	128	28	5	2		5
1/I/3	196	30	2	1		5
1/II/4	160	29	16			5
1/II/5	156	3	3			5
1/II/6	186	18	4	1	1 erect knotweed	6
1/II/7	394	42	6			11
1/II/8		39	1			5
2/I/2	69	13	1			6
2/I/3	187	11	4	1		5
2/II/4	272	1	1			4
2/II/5	294	9	7	12	1 pondweed	5
2/II/7	107	9	1	1	1 hawthorn	4
2/II/8	161	28	1			5
2/II/9	18					4
3/I/3	74	18	1			6
3/II/4	97	33	2			6
3/II/5	198	35	5			6
3/II/6	268	9	28		1 marshelder 1 spurge	5
3/II/7	278	1	10		1 erect knotweed	6
3/III/8	66	10	3		1 chokeberry	5
3/III/9	81	27	6			6
4/I/2	75	23			1 grape	6
4/II/3	132	13			1 squash rind	6
4/II/4	224	31	4	2	2 gourd rind 1 grape	6
4/II/5	328	40	6			7
4/II/6	301	9			2 grape 1 butternut	7
4/II/7	51	16	7			5
4/II/8	19	10		1		6
Looter Pit/Feature						
LP-1/Fea-2	40	9	2		1 gourd	8
LP-4/Fea-1	227	29	1			3
Unit/Zone/Feature						
1/II/Fea-3	206	10	5	8	1 hickory nut meat	5
1/II/Fea-4	102	24			1 spurge	6
1/II/Fea-7	626	22	14	31	2 grape 1 hazelnut 1 bedstraw 1 gourd rind	17
1/II/Fea-8	177	5	6	3	1 persimmon	4
2/III/Fea-12	544	127	9			9
2/III/Fea-13	209	29	8	3		5
3/III/Fea-10	183	30	1	6		5

WILD PLANT SEEDS

Low frequencies of nine species of wild plants attest to the utilization of fleshy fruits and the seeds of both dryland annual and wetlands plants. The fleshy fruits recovered include grape (*Vitis* sp.), persimmon (*Diospyros virginiana*), and chokeberry (*Aronia* sp.) (tables 8.4 and 8.7). Wild grape (Feature 7; Unit 2, Zone I [Level 2]; and Unit 4, Zone II [levels 4 and 6]) was a commonly used food, either eaten fresh or fire-dried to make raisins for storage (Bartram 1955[1791]:321). Persimmon (Feature 8) is common in both dryer upland and wet bottomland forests, and its seeds are common at Archaic sites in southern Illinois (Lopinot 1982:762). Grape and persimmon (along with blackberry) were the most common fleshy fruit seeds at the Late Archaic Carlston Annis shellmound in Butler County (Wagner 1979). Chokeberry (Unit 3, Zone III [Level 8]) is generally a rapidly spreading wetland shrub, although a few species prefer better drained soils. Because of its high nutritional values in a range of vitamins and trace elements, chokeberry juice is now marketed as a healthier alternative to cranberry juice (King 2002). Wild fleshy fruits retained some importance throughout the Kentucky prehistoric sequence, although persimmon was relegated to more westerly areas of the state.

Two recovered species, marshelder (*Iva annua*) and erect knotweed (*Polygonum erectum*) came under cultivation sometime during the Late Archaic for their starchy and oily seeds (Smith 1987; Watson 1989). The "Eastern Agricultural Complex," really a low-level horticultural complex, has been archaeologically documented throughout much of the midwestern and southeastern U.S. stretching from Illinois to West Virginia. The Highland Creek specimens suggest the wild collection of these plants prior to their cultivation. Marshelder (*Iva annua*) is a plant with nutritious oily seeds that has a long history of utilization throughout the eastern U.S. Woodlands (Asch and Asch 1985; Yarnell 1978). This cultivation of this plant is indicated by gradual but large increases in achene length and its archaeological occurrence in large caches (Yarnell 1978). The specimen recovered from Unit 3, Zone II (Level 6), measures only 2.7 by 2.2 mm, comparable in size to the wild Middle and Late Archaic specimens that have been documented throughout Kentucky and Illinois (Yarnell 1978:294-5). During the Woodland and Late Prehistoric periods, achene lengths more than doubled as a result of selection and cultivation (Yarnell 1978:294-5). Erect knotweed (*Polygonum erectum*) is particularly common at Illinois sites (Johannessen 1984c), and was apparently a less important cultigen in Kentucky than other plants, such as maygrass and chenopod. Like the recovered marshelder specimen, the two erect knotweed specimens from the Highland Creek site probably reflect pre-cultivation use of this plant. One specimen was recovered from Unit 1, Zone II (Level 6) and the other from Unit 3, Zone II (Level 7).

Bedstraw (*Galium* sp.) was recovered from Feature 7 (Table 8.7). *Galium* is one of the largest and most diverse plant genera of North America. Some archaeobotanists consider the persistent presence of bedstraw in the archaeological record to represent accidental inclusions, because the seeds readily stick to clothing and hair (Asch et al. 1972). Bedstraw has been recovered in low frequencies at many Kentucky sites (cf. Rossen 1992:194). More notable are the high bedstraw frequencies at some sites, such as the multicomponent deposits at Site 15Sp26, Taylorsville Lake, Spencer County (Dunn 1984), Late Woodland contexts at Dreaming Creek, Madison County (Rossen 1993b), and Fort Ancient contexts at Capitol View, Franklin County (Henderson 1992). In the last case, bedstraw was recovered from specific areas within domestic structures (Rossen n.d.a.). As its archaeological occurrences proliferate, it is becoming evident that bedstraw was a prehistoric plant of considerable economic importance. As its name suggests, bedstraw could be used as bedding material, as suggested by its spatial distribution at Capitol View (Rossen n.d.a.). The plant may also be eaten in salads and used as a dye. In other regions of the U.S., the plant was used as a diuretic by the Ojibwa and a perfume among the Omaha and Ponca (Gilmore 1931:63).

Pondweed (*Potamogeton* sp.) was recovered from Unit 2, Zone II (Level 5) at Highland Creek. *Potamogeton* is a large genus of perennial herbs that live in a wide variety of aquatic habitats.

These plants may be either totally submerged or mostly submerged with floating leaves (Cook 1990:202). They are considered an important wildlife food source today for their leaves, stems and achenes, and the plant occurs occasionally in Kentucky and Illinois archaeological sites (Lopinot 1982:782; Rossen 1992:195-6). Pondweed was one of several edible wetland plants recovered from Archaic contexts at the Hedden site (Rossen 2000a).

Hawthorn (*Crataegus* sp.) was recovered from Unit 2, Zone II (Level 7). This is an understory shrub or small tree that prefers moist, poorly-drained or streamside locales. The thin pulps of the nutlets are considered only a minor or even a famine food (Asch et al. 1972:19; Gilmore 1931; Lopinot 1982:762).

Spurge (*Euphorbia* sp. cf. *corollata*), which was recovered from Unit 3, Zone II (Level 6) and from Feature 4, is a disturbed dryland weed that is present in several western Kentucky sites (Edging 1995:149-152). It is poisonous, and is sometimes used as a laxative in very small doses **(**Missouri Botanical Gardens 2006). Its potential prehistoric use is not known.

DISCUSSION

The Highland Creek site produced a substantial and varied collection of plant remains for a modest flotation effort (220 liters). The collection includes all the hallmarks of a typical Late Archaic assemblage: little wood charcoal, high nutshell density, low frequencies of various wild plant seeds, and trace amounts of possibly cultivated gourd and squash rind. The collection is similar in many ways to larger Archaic archaeobotanical collections, such as the one recovered from the Hedden site in nearby McCracken County (Rossen 2000a). As more Late Archaic archaeobotanical collections are recovered and analyzed several questions have been raised concerning Late Archaic plant use. Many of these questions focus on the use and abandonment of wetland plants, and when and why certain plants were cultivated. Questions that have been raised include: how important were wetland plants to the Archaic economy and why did those plants disappear from archaeological sites by the end of the Late Archaic period? Do the low frequencies of weedy annuals like marshelder and erect knotweed represent an early familiarity with plants that were later cultivated? Do the gourd and squash rind specimens that sporadically occur at Archaic sites throughout the eastern U.S. represent true plant cultivation? If so, why were these plants cultivated; why was this process so selectively applied?

THE IMPORTANCE OF WETLAND PLANTS

The Archaic importance of wetland plant resources becomes increasingly apparent with the analysis of new assemblages such as the one from Highland Creek. It takes only a few seeds from a site to call attention to the presence of a rich, diverse wetlands nearby and of collecting activities of people familiar with plant ecology and properties. In Kentucky, wetland plants that represent shorelines, wetlands edges, and relatively deep water environments were recovered from the Late Archaic Hedden site (Rossen 2000a). Wetlands also have been cited as important to the Archaic adaptation of the lower Illinois River Valley (Brown and Vierra 1983; Stafford 1991:218-219). In those case studies, wetlands were modeled as a resource-rich zone that reduced group mobility, focused exploitation on a narrower range of resources, and concentrated local populations (also see Munson 1980:674). Wetlands may have played a similar role in Kentucky during the Middle and Late Archaic.

Much of the author's personal familiarity with broad spectrum Archaic hunter-gatherers comes from research related to archaeobotanical and ethnobotanical collections from southern Chile. At sites such as Monte Verde (Ramirez 1989; Rossen and Ramirez 1997) and Pellines I (Andrea

Seelenfreund, personal communication 1995), wetland sedges, bulrushes, spikerushes, and pondweeds were an important dietary component. Their year-round availability allowed them to be exploited during times of the year when other plant sources were scarce, and they provided specific dietary aspects (such as trace elements and salt) and medicinal properties that were unavailable elsewhere (Rossen and Dillehay 1997). Although temporally and spatially removed, it is possible that the use of wetland plants by Archaic hunter-gatherers in Kentucky fulfilled similar dietary and economic roles.

Perhaps the most curious issue relating to wetland plants is their disappearance from archaeological sites towards the end of the Kentucky Late Archaic as the horticulture of starchy and oily-seeded plants took hold. What cultural and dietary considerations rendered these resources undesirable, and what factors conditioned the choice of the dryland annuals as possible domesticates? According to classic "dump heap" theories, it is the aggressive colonization of disturbed land that brought weedy annuals into closer contact with people and conditioned their co-evolutionary development (Anderson 1952; Fowler 1971; Rindos 1984). However, the archaeological record suggests a shift away from the exploitation of wetlands as dryland annuals came under cultivation. Archaic populations were in close contact with both wetland and dryland plants, and it can be argued that, of the two habitats, they were in closer contact with wetlands. The co-evolutionary theories do not satisfactorily explain how choices between different ecological resource foci are made, and how certain aspects of a broad plant collecting strategy move toward intensification and cultivation while others are abandoned.

FOUNDATIONS OF THE "EASTERN AGRICULTURAL COMPLEX"

The marshelder and erect knotweed seeds from the Highland Creek site, along with the chenopod (*Chenopodium* sp.) and sunflower (*Helianthus* sp.) specimens from the Hedden site, raise the issue of the foundations of the "eastern agricultural complex," which was really a low-level horticultural system. These two Kentucky Archaic collections alone contain four of the six recognized cultivated plants of the complex. At both sites, it is clear from radiocarbon dates, size, morphology, and low frequency of occurrence that these seeds represent wild plants. Prehistoric peoples certainly had a long-term familiarity with plants in their wild forms prior to bringing them under cultivation, and in the early stages of cultivation, plants do not display morphological changes. Besides the broad issue of plant choice discussed above, there are two immediate issues worthy of discussion: (1) the timing and (2) the nature of the development of starchy-oily seed horticulture. Do we (or can we) see the foundations of horticulture in these Archaic assemblages?

The timing of the transition to seed horticulture remains poorly understood. Some eastern Kentucky sites like the Cold Oak Shelter (Ison 1988; Gremillion 1998) in Lee County show clear-cut seed horticulture by 1500 B.C. The period just prior to this time is not well- represented in the archaeobotanical record of Kentucky, but each site like the Highland Creek site begins to narrow down the time range, that is, if there is one uniform regional time for the beginning of horticulture. Certainly the presence of cultivated plants in their earlier wild states lends optimism to the search for a threshold date for eastern U.S. horticulture.

Ultimately, the nature of the change to horticulture may be more elusive. Broader scale settlement pattern studies may be needed to see whether a shift away from wetlands zones was coordinated with the development of seed horticulture. Archaeologists will also want to know how intensive nut collecting, as reflected by archaeological nut densities, and other forms of wild plant gathering were affected by the development of horticulture.

GOURD AND SQUASH CULTIVATION?

Broad questions about the development of seed horticulture bring us to the specific question of the interpretation of Archaic specimens of gourd and squash. Can we simply assume that these were cultivated plants in the midst of a broad-spectrum hunting-gathering economy? Why were only these two plants cultivated, and does the weedy nature of both species require true cultivation at an incipient level of use?

Squash and gourd have been found in several Archaic period contexts, including the Carlston Annis site of western Kentucky (Cowan et al. 1981; Heiser 1989; Kay et al. 1980; Marquardt and Watson 1977; Wagner 1979). However, the absence of both plants from the Hedden site, where the largest Archaic flotation effort was conducted at a Kentucky Archaic site, is notable. The large Hedden collection could not confirm a systematic, widespread western Kentucky Archaic use of squash and gourd. Now both plants appear in trace amounts at the Highland Creek site. The Archaic use of gourd and squash may have been geographically sporadic and discontinuous. Illinois Late Archaic sites such as Go-Kart North, Koster, Dyroff, and Missouri Pacific #2 did not produce these plants despite notable water flotation efforts (Asch et al. 1972; Johannessen 1983, 1984a, 1984b). Another possibility is that these plants were of relatively little economic importance (hard-shelled varieties used for edible seeds) that would be archaeologically represented in only minor frequencies. But why would economically minor plants that are not systematically recovered archaeologically be the (only) objects of efforts to domesticate and cultivate plants?

The questions and issues outlined here result from an increasing understanding of the archaeobotanical record of Kentucky. The Highland Creek site reinforces and clarifies that record for the western Kentucky Late Archaic period, that is, the portion of the Late Archaic prior to the beginning of seed horticulture. This assemblage presents an image of a stable plant economy based on intensive nut collection and extensive, broad spectrum plant collecting from various ecozones. Late Archaic hunter-gatherers may have been experimenting with incipient horticulture, either hard-shelled cucurbits or starchy-oily seed plants, or they may have been “pure” hunter-gatherers who could not foresee how certain aspects of their plant economy would later be chosen for intensification and cultivation.

CHAPTER 9:
FAUNAL REMAINS

By
Emanuel Breitburg

Limited excavations at the Highland Creek site resulted in the recovery of a small sample of 1,319 specimens of shell and bone. Identification of the material was facilitated by use of a comparative collection of skeletons or shells of various species in the possession of the author. Each specimen was examined and identified to taxon or classified to the most specific taxon possible, and examined for signs of burning, butchering marks, and modification. The observed data were recorded in a database file by bag and field specimen number. The information presented here is based on the latter records, which are on file at the University of Kentucky, William S. Webb Museum of Anthropology. Because the faunal sample is small, only a limited amount of information can be gained specifying the nature of Late Archaic subsistence patterns that relate to faunal exploitation, modes of butchering animals, diet, and bone tool use.

The overall composition of non-human skeletal remains from the Highland Creek site (n=1319) consists of mammal (74.8%), bird (8.3%), reptile (3.8%), fish (less than 1%), and shell (12.7%). The identifiable portion of the sample is composed of 161 (11.9%) specimens that represent a minimum of 50 individual encompassing 20 taxa, including seven mammal, five bird, three reptile, two fish, and two mollusc taxa (Table 9.1). The taxonomic composition of the identifiable fraction of the sample consists of mammal (67.2%), bird (9.4%), reptile (7.8%), fish (1.6%), and shell (14.1%) taxa. The mammal taxa present include white-tailed deer, longtail weasel, gray squirrel, woodchuck, swamp rabbit, and opossum. Identifiable bird bones represent wild turkey, bobwhite quail, mallard duck, possibly teal, and an indeterminate species of goose. Reptile remains are identifiable to box turtle, spiny softshell turtle, and nonpoisonous snake family. The inventory of fishes present consists of freshwater drum and an indeterminate species of catfish. Mollusc consist of indeterminate *Pleurobema* species, Quadrula *pustulosa* or pimple-back, and specimens of freshwater snails of the genus *Pleurocera* and *Elimia*.

More than half (n=767) of the specimens show signs of contact with varying degrees of heat, and in many cases, the specimens are calcined. Two specimens exhibit cut marks, and 28 specimens display modification due to handling or as a product of tool use or manufacture. The two specimens displaying cut marks consist of one deer thoracic vertebra and one tibial tarsal or “ankle” bone. The thoracic process displays a cut mark along the spinous process implying that meat was removed along the back of the animal. The tibial tarsal exhibiting a cut across the anterior fossa implies that the lower leg of the animal was removed by cutting, in part, through the anterior ligaments and tendons.

Modified bone consists of 26 portions or pieces of tools and other indeterminate objects fashioned from deer, softshell turtle, and indeterminate bird and mammal bone. Modified white-tailed deer bone consists of one scored antler fragment, one antler beam portion that may have been used as a chert-working tool, a metapodial awl tip fragment, and one metapodial shaft that displays smoothing. At least six fragments of indeterminate mammal bone represent awl or possible awl fragments and six specimens display polish. Other modified indeterminate large mammal bone represents portions of a drilled needle or awl, one awl or bone pin, and one bone pin fragment. Five

Table 9.1. Faunal Remains from the Highland Creek Site.

Taxa	Count	MNI*	Burned	Cut	Modified
Mammals					
Odocoileus virginianus, White-tailed deer	52	2	18	2	4
Mustela cf. *frenata*, Longtail weasel	1	1			
Sciurus carolinesis, Gray squirrel	3	2	2		
Sciurus sp., Squirrel sp.	1				
Marmota monax, Woodchuck	19	3			
Sylvilagus aquaticus, Swamp rabbit	4	1	1		
Didelphis marsupialis, Opossum	6	1			
Large mammal fragments	715		548		15
Mammal fragments	169		94		
Small mammal fragments	17		10		
Totals	987	10	673	2	19
Birds					
Meleagris gallopavo, Wild turkey	1	1			
Colinus virginianus, Bobwhite	1	1			
Anas platyrhynchos, Mallard duck	8	2	1		
Anas spp, Teal size duck	1	1			
Anserinae, Goose sp.	1	1			
Bird fragments	97		45		6
Totals	109	6	46		6
Reptiles					
Terrapene carolina, Box turtle	3	1	1		
Trionyx spiniferus, Spiny softshell turtle	6	1	2		1
Colubridae, Nonpoisonous snake family	1	1	1		
Turtle fragments	40		37		
Totals	50	3	41		1
Fishes					
Aplodinotus grunniens, Freshwater drum	1	1			
Ictaluridae, Catfish family	1	1	1		
Totals	2	2	1		
Mollusc					
Pleurobema spp.	15	8			
Quadrula pustulosa, Pimple-back	3	2			
Freshwater bivalve fragments	139		1		
Aquatic snails	10	18			
Terrestrial snails	1	1			
Totals	168	2	1		
Other					
Undifferentiated remains	3		3		
Totals	3		3		
Grand Totals	1,319	50	765	2	26

* Minimum number of individuals

indeterminate bird bones exhibit polish and one indeterminate bird long bone shaft may have been used as an awl. Finally one softshell turtle plastron exhibiting polish may have functioned as a plate.

SUMMARY

In summary, the analysis of the small sample of faunal remains recovered from the site allows for a very limited number of statements that may be averred in regard to that part of the Late Archaic economies that involved the use of vertebrate and invertebrate animals. Deer and turkey, as has been demonstrated at numerous sites in eastern North America, probably were the most important animals taken, providing substantial amounts of meat to the diet and bones for tool manufacture. Small mammal exploitation at Late Archaic sites is usually well-developed, but at this site only a small number of species were identified (weasel, gray squirrel, woodchuck, swamp rabbit, and opossum). Although deer, turkey and small mammals may be taken at anytime of the year, these animals are in optimum condition in the late fall and winter months and were probably taken at that time. Likewise, bird exploitation patterns are generally well-developed, especially along major waterways such as the Ohio River. The presence of migratory mallard, possibly teal, and goose implies that the site was occupied in the late fall through early spring. The very limited sample of reptiles and fishes support a spring through summer occupation of the site, and the presence of mussel and aquatic snails probably represent late summer and fall collection periods by Late Archaic occupants. Thus, seasonal activity at the site appears to have occurred throughout the year.

CHAPTER 10:
HUMAN REMAINS

By
Nicholas P. Herrmann

INTRODUCTION

This report provides an elemental inventory and individual descriptions of the remains recovered from the Highland Creek site in 1999. Both *in situ* and disturbed skeletal remains were recovered from four looter pits and four test units. Disturbed material was recovered from four looter pits dug at the site prior to the 1999 field investigation (Figure 4.1, Looter Pits 1-4). The intact skeletal remains represent either partially disturbed burials at the margins of the looter pits or undisturbed burials identified in test units excavated adjacent to one of the four cleaned looter pits (Figure 4.1, Test Units 1-4).

The sample consists of approximately 2,033 human bone fragments representing a minimum of 371 skeletal elements. The minimum number of individuals (MNI) represented by the sample is 13 individuals. To establish the overall MNI, provenience information for each field specimen was utilized; therefore, the minimum number of individuals per provenience was calculated. All skeletal material is derived from adult individuals and no juvenile (less than 15 years) or infant remains are present in the sample. One individual represents a young adult, probably in his/her late teens.

METHODS

Skeletal material was inventoried and analyzed according to the methods described in the *Standards for Data Collection from Human Skeletal Remains* (Buikstra and Ubelaker 1994). In this analysis, the *Standard's* pathological and demographic codes were utilized, but Buikstra and Ubelaker (1994) do not provide a detailed system for analyzing fragmentary, commingled remains. To facilitate the analysis of the Highland Creek materials, a slightly modified coding system developed by Church and Burgett (1996) was employed for the skeletal inventory. This system utilizes a flexible tripartite coding structure allowing quick identification/classification of fragmentary remains. The simple coding structure also permits determinations to be made of the minimum number of individuals represented in the sample. Given the fragmentary nature of the remains, the skeletal inventory was performed after all elements were reconstructed. When possible, available skeletal measurements were taken on any completely intact or reconstructed elements.

Age estimates were based on all available skeletal indicators. Utilized age indicators include various pelvic features, dental development, and epiphyseal closure (Lovejoy et al. 1985a). Sex determinations were based on the examination and assessment of various morphological indicators of the pelvis and cranium as described by Phenice (1969) and Bass (1987). In addition, various quantitative techniques were used to supplement the morphological evidence and to increase the reliability of the sex estimate (Meindl et al. 1985). When available, permanent molar wear scores were utilized to estimate age by discriminant function analysis employing dental attrition scores from Indian Knoll (15Oh2) as a reference sample.

Given their context, the population affinity of the remains was determined to be prehistoric Native American. A majority of the material was far too fragmented to allow further analysis.

Skeletal and dental pathological lesions were noted during the inventory, then lesions were described and coded. Lesions were coded according to the methods detailed in the *Standards* (Buikstra and Ubelaker 1994). Dental remains were examined for caries, antemortem tooth loss, attrition rates, and linear enamel hypoplasia. Dental caries were scored according to location and severity. Dental attrition was evaluated according to Scott (1979) and Smith (1984). Linear enamel hypoplasias were assessed for age-at-insult with respect to developmental standards (Goodman and Rose 1990; Rose et al. 1985).

INVENTORY

A basic anatomical distribution of observed elements and fragments is provided in Table 10.1. Nearly all of the skeletal elements of the body are represented in the sample. In general, the skeletal material recovered from disturbed contexts is typically in better condition than the *in situ* material. Dental remains are limited, but these remains do provide general age information for the associated individuals.

Table 10.1. Breakdown of Elemental Distribution and the Degree of Fragmentation Observed.

Skeletal Area	Minimum Element Count	Approximate Fragment Count
Axial	107	509
Cranial	39	519
Dental	11	12
Appendicular	197	634
Indeterminate	17	359
Totals	371	2,033

Evidence of looting-related damage is ubiquitous in the human skeletal sample. Damage ranges from simple breakage to shovel marks to soil probe holes (Table 10.2). Fragmentation represents the most common damage with 80% of the sample displaying recent breaks. Only 18% of the sample lack evidence of recent damage, and these elements are typically small compact bones of the hands and feet. Often individual elements exhibit several types of damage.

SAMPLE DEMOGRAPHICS

The sample consists entirely of adults (over 15 years old). The demographic structure of the sample is provided in Table 10.3. One individual (No. 12) does represent a young adult, as evidenced by the active fusion of the proximal fibula. Due to the fragmentary nature of these remains, sex determinations were difficult. Estimates were based on metric assessments, cranial morphology, and pelvic indicators. Individuals 1, 2, and 3 represent a majority of the sample, comprising 79% (293 of 371) of the skeletal elements. The remaining individuals consist of loose material or extremely fragmentary *in situ* burials.

Table 10.2. Recent Damage Evident in the Highland Creek Sample.

Taphonomic Signature	Number of Elements	Percentage of Sample
No Damage	79	21.3
Minor Cut Marks/Slashes	21	5.7
Chop mark/Shovel Damage	14	3.8
Probe Damage	4	1.1
Fragmentation	282	76.0

Table 10.3. Demographic Summary of the Remains.

Individual	Age	Sex
1	Adult (35-45)	Male
2	Adult (25-35)	Male
3	Adult (40-50)	Female
4	Adult	Indeterminate
5	Adult	Indeterminate
6	Adult (Over 30)	Female
7	Adult	Male?
8	Adult	Indeterminate
9	Adult	Indeterminate
10	Adult	Indeterminate
11	Adult (20-35)	Indeterminate
12	Young Adult (15-20)	Indeterminate
13	Adult	Indeterminate

INDIVIDUAL DESCRIPTIONS

INDIVIDUAL 1

Individual 1 represents an adult interment. The individual consists of partially disturbed material from Looter Pit 1 and *in situ* remains from the bottom of this looter pit (Feature 2) (Figure 4.3). The partially flexed burial was positioned on its back with the head to the north. Looters had removed most of the lower limbs and anterior skeletal elements. A slate slab covered the feet and a portion of the distal tibiae and fibulae. This individual is represented by 148 identifiable elements and 374 fragments.

Based on an assessment of skeletal morphology and a discriminant function analysis of dental attrition, the individual was determined to be an adult male ranging in age from 35 to 45 years-old-at-death. Overall, the cranium is robust, the sciatic notch is quite narrow, and the auricular surface is flush with the retroauricular area. Stature is estimated to be 160.9±3.8 cm based on the femur length and Trotter's (1970) formula for Mexican males. The age of the individual is based on the auricular surface morphology and dental wear. Numerous secondary indicators, such as vertebral pathology and osteoarthritic activity, were also considered. The fragmentary nature of the remains limited the number of available primary age indicators.

Numerous pathological lesions were observed on this individual. Degenerative processes constitute the majority of the pathological conditions evident in the skeleton, but four healed traumatic injuries were identified. Slight marginal osteoarthritic lipping is evident in ulnae, distal humeri, left

scapula, distal radius, vertebral articulations of the ribs, articular facets of the vertebra (all sections), and proximal left femur. A small area of eburnation is evident on the second cervical superior articulation. Slight osteophytosis is present in the thoracic, lumbar, and sacral vertebrae. In addition, two thoracic centrums display small Schmorl's nodes. Bilateral squatting facets are evident on the distal tibia and superior talus.

The four traumatic pathologies may have occurred at the same time. The fractures include a compression fracture of the fourth and fifth lumbar vertebrae, a partially healed rib fracture, and a healed fracture of the sternal body. The pedicle of the fifth lumbar vertebra also exhibits a healed fracture. The left rib fracture was actively healing at the time of death, and a callus had formed. The fracture possibly formed a pseudoarthrosis, but the anterior section of the rib was not identifiable. The compression fracture of the vertebra has resulted in secondary degenerative changes. Although not a traumatic pathology, bilateral nonosseous tarsal coalition of the third metatarsal and third cuneiform are present (Regan et al. 1999). This pathology appears as correlated pits on the plantar margin of the tarsometatarsal joint (Figure 10.1).

The cranial fragments display slight porosity surrounding the sutures and are delimited by the temporal fascia. The lesions are a combination of healed and active coalesced pits that are restricted to the outer table. Sclerotic bone is evident in the area above the external auditory meatus. The left maxilla is edentulous, and evidence of sinusitis is visible in the sinus wall and base. Osseous changes

Figure 10.1. Nonosseous Tarsometatarsal Coalition of the Right Metatarsal and Cuneiform (Individual 1).

evident in the sinus include bony spicules, remodeled spicules, and general pitting (Boocock et al. 1995).

Recorded dental pathologies include caries, antemortem tooth loss, extreme attrition, periodontal disease, and slight calculus. The mandibular alveolus is complete with only slight

postmortem damage, but only the left half of the maxilla is present. All but one tooth in the maxillary series was lost antemortem, but only one mandibular tooth was lost antemortem. Two molars and a canine are present from the mandibular series. Periodontal disease is actively eroding the mandibular alveolus, specifically around the molars. The single maxillary tooth displays an occlusal carious lesion resulting from heavy attrition exposing the pulp chamber.

INDIVIDUAL 2

Individual 2 represents the remains of an adult male recovered primarily from T.U. 3, Feature 9 (Figure 4.5). This individual is represented by 81 elements and 926 fragments. Material from several associated field specimen numbers were grouped due to the proximity of the remains within Looter Pit 1 (LP1) and Test Unit 3 (T.U. 3). Two femoral fragments from LP1 were grouped with the burial because looters had disturbed the lower limbs of the burial. The color and general robustness was consistent between the locations. Two additional fragments, which were recovered from Test Unit 3, Levels 8 and 9, were grouped with this individual.

Based on an assessment of skeletal morphology and a discriminant function analysis of dental attrition, the individual was determined to be an adult male ranging in age from 20 to 35 years-old-at-death. Overall, the cranium is robust with a substantial external occipital protuberance, the sciatic notch is narrow, and the auricular surface is relatively flat. Stature could not be estimated for this individual. The auricular surface morphology classifies as a Phase 3, and the degree of dental attrition is typical of an individual 25 to 30 years old. The secondary age indicators are consistent with this assessment given that osteoarthritic activity is limited and no vertebral pathology was observed.

Pathological lesions in this individual include slight porotic hyperostosis, dental disease, and linear enamel hypoplasia. No osteoarthritic lipping or osteophytosis is evident on the available joint surfaces or in the vertebral column. The cranium exhibits slight porosity on the parietals and occipital. Remodeled surface porosity was evident between the external auditory meatus and the suprameatal crest. The dental remains are well represented but fragmented, which limited observations. Two carious lesions are present in the upper right first premolar (#5) and the upper left third molar (#16). The alveolar crest surrounding the root of the right first upper molar (#3) has eroded as a result of a periodontal infection or apical discharge from an infected tooth. Multiple linear enamel hypoplasias are present in the maxillary canines and the mandibular left canine. Table 10.4 provides a summary of each defect location and the correlated age-at-insult. These defects correlate to the period ranging from 2.5 to 4 years of age. The hypoplastic defect may relate to weaning stress or periodic malnutrition. The nonannual pattern of the defects appears to support a weaning stress hypothesis.

INDIVIDUAL 3

Individual 3 is an adult female ranging in age from 40 to 50 years old. All the skeletal material was recovered from Looter Pit 3 (Figure 4.1) and from the surface, and no *in situ* material was identified. The skeletal elements are in very good condition, and several bones are unbroken. Slight rodent gnawing is present on the ilium fragment found on the surface.

Table 10.4. Linear Enamel Hypoplasia Observed in Individual 2.

Tooth	Defect Distance from CEJ (in mm)	Correlated Age-at-Insult (in years)	Age-at-Insult Range
Right Maxillary Canine (#6)	4.55	3.4	3.0-3.5
	3.59	3.7	3.5-4.0
	2.88	4.2	4.0-4.5
Left Maxillary Canine (#11)	4.50	3.4	3.0-3.5
	3.60	3.7	3.5-4.0
Left Mandibular Canine (#22)	6.15	2.4	2.5-3.0
	4.93-3.53*	3.2-3.9	3.0-3.5/3.5-4.0
* Pitted disturbed zone			

The sex assessment is based on the overall skeletal size, pelvic morphology, and cranial characteristics. In this individual, the auricular surfaces are raised above the retroauricular area, and the pre-auricular sulcus on both sides is quite large. Stature is estimated to be 146.6±3.41 cm based on the femur length and Trotter's 1970 formula. Age determination of this individual is based on the morphology of the auricular surface, an evaluation of a series of secondary age indicators, and a discriminant analysis of the available molar wear scores. The auricular surfaces display pitted and irregular surfaces with small dense islands beginning to form. A majority of the left surface exhibits a course texture, which is indicative of individuals between 35 and 45 years old (Lovejoy et al. 1985a). The right surface is more dense and irregular, which is typical of individuals between 45 and 60 years old (Lovejoy et al. 1985b). Dental wear is quite heavy, as would be expected given that this sample probably represents Archaic period burials. The attrition scores are consistent with individuals 40 to 50 years old. Osteoarthritis and vertebral degeneration are marked in this individual, which support an older age estimate.

The observed skeletal pathology in this older individual is more extensive than in the other individuals. Pathological lesions recorded include a healed fracture, vertebral degeneration, dental disease, squatting facets, osteoarthritis, porotic hyperostosis, and a possible healed destructive lesion on the frontal bone. A fracture of the distal fibula, 60 mm from the distal end, has healed well with good alignment. As a result of the fracture, slight osteoarthritic activity developed along the proximal and distal joint surfaces. Additional, slight osteoarthritic changes were evident in the right wrist and left elbow. Although not degenerative, bilateral squatting facets were noted on the distal tibiae and superior articular surfaces of the tali. Extensive vertebral pathology was noted in this individual and all vertebral groups are involved. Cervical, thoracic and lumbar centrums display osteophytosis and osteoarthritic change. Schmorl's nodes, which are destructive lesions of the vertebral centrum, are present in two lumbar vertebrae (one example is shown in Figure 10.2). Finally, a large osteoarthritic ring has formed around the vertebral articulation of a lower left rib (Figure 10.2). Slight porotic hyperostosis is evident in the cranium with slight pitting near the sutures of the parietals and occipital. A small defect (10 mm in diameter) is evident on the midline of the frontal bone, directly above the superciliary arch. The lesion has healed, but an area of sclerotic bone (20 mm diameter) surrounds the defect. The frontal sinus, which would have been located directly below the defect, is absent and appears filled with new bone.

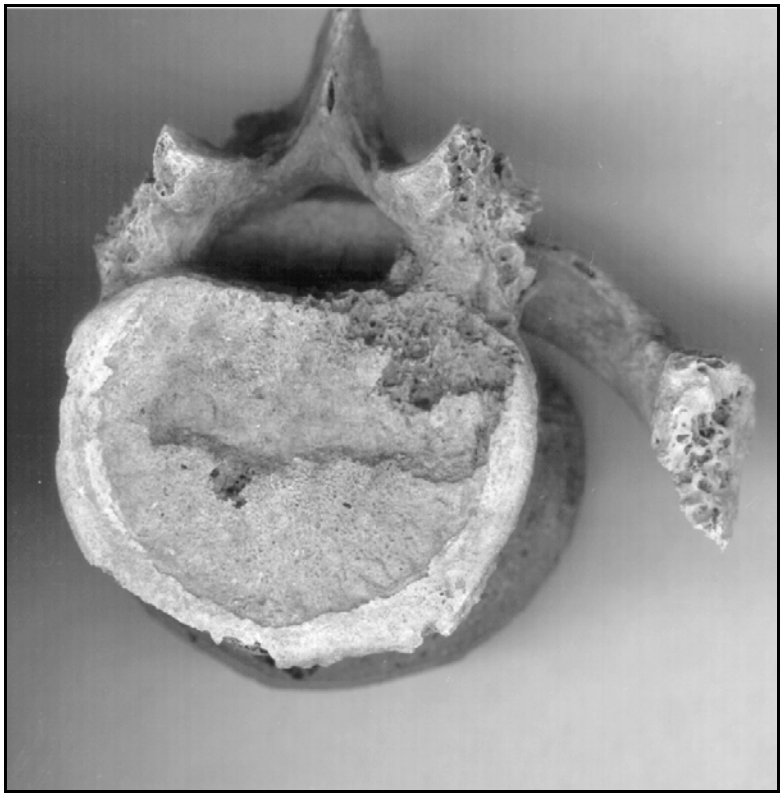

Figure 10.2. Vertebral Degeneration and Arthritic Rib Articulation from Individual 2.

INDIVIDUAL 4

A single bone, the squamous portion of an adult occipital, represents Individual 4. This individual was recovered from Looter Pit 3 (Figure 4.1). The external occipital protuberance is moderate, and the surface displays marked attachment sites for the nuchal muscles of the neck. These characteristics are typical of male individuals, but based on this limited data the sex of this individual is considered indeterminate. Slight porosity is evident near the lambdoidal suture and above the external protuberance.

INDIVIDUAL 5

Skeletal material recovered from Zone I (levels 1-3) of T.U. 1 were grouped together and identified as Individual 5 (Figure 4.1). The material includes cranial, post-cranial and dental remains. All the material is very fragmented, but the individual is definitely an adult. Clavicle shaft fragments associated with this individual are very gracile and small, which suggest a female individual. The dental remains are limited to a maxillary premolar crown. No pathology was noted in these remains, but the distal femur fragment displays a possible squatting facet on the posteriomedial surface, above the condyle.

INDIVIDUALS 6 AND 7

Skeletal material from Looter Pit 3 (Figure 4.1) represents Individuals 6 and 7. Bones collected from Looter Pit 3, include a right pubis, a scapula fragment, two proximal radius sections, two metatarsals, and one middle hand phalanx. The two proximal radii represented repeated elements, and the more robust element was considered Individual 7. All remaining elements were grouped as Individual 6.

Based on the morphology of the pubis, the sex of Individual 6 is female. The pubic symphysis is well preserved, and the symphyseal rim is complete with slight erosion on the ventral surface and lipping on the dorsal margin. These characteristics are typical of an adult over 35 years old (Todd 1920 [score = 8/9]; Gilbert and McKern 1973 [Component scores = 4/5/4]). Slight osteoarthritic lipping is evident on the glenoid fossa of the scapula.

INDIVIDUAL 8

Individual 8 is represented by a group of bones recovered from the disturbed fill of Looter Pit 2 (Figure 4.1). The skeletal inventory consists of a piece of cancellous bone, a cervical vertebra fragment, femur and tibia shaft, a scapula fragment, and several long bone shaft fragments. Based on the presence of two fragmentary femora, collected during the earlier 1991 investigation of the Highland Creek site, DiBlasi (1997:3) identified one individual from this location (also Individual 8). The 1999 skeletal material may be from the same individual. No pathological conditions were noted in these remains.

INDIVIDUAL 9

This individual is represented by three cranial bone fragments recovered from T.U. 2, Feature 13 (Figure 4.13). The feature is identified as a pit, but one that did not contain a burial. The lack of additional skeletal materials suggests that the bones were redeposited in the pit. Two fragments comprise the glenoid fossa of the right temporal bone and the third fragment is a midline frontal bone section. The area between the external auditory meatus and the suprameatal crest is porous, and sclerotic has been deposited on this surface. The material appears to be from an adult.

INDIVIDUAL 10

This individual was recovered *in situ* from T.U. 2 (Feature 11) (Figure 4.12). The skeletal material is extremely fragmented and identification was based primarily on field notes. The tibia and fibula shafts display slight remodeling with periosteal plaque deposition. Typically, these types of deposits are associated with an adult individual. Given the extremely poor preservation of these remains, no additional observations were possible.

INDIVIDUAL 11

This individual was recovered *in situ* from T.U. 2 (Feature 4) (Figure 4.11). The skeletal material is extremely fragmented, but identifications were possible. Three fully developed teeth with moderate occlusal wear were recovered, suggesting an adult individual. Based on a discriminate function analysis of the wear scores, this individual was between 20 to 35 years old. However, no other age indicators were available. Given the extremely poor preservation of these remains, no additional observations were possible.

INDIVIDUAL 12

Numerous bone fragments and teeth were recovered from T.U. 1, Zone II (levels 5 through 8)(Figure 4.1). The skeletal and dental age estimates are very close and these remains do not appear to represent multiple individuals. Therefore, these remains were grouped together as Individual 12. Identified elements include cervical vertebra, cranial fragments, femur shaft fragments, a proximal fibula section, a mandibular molar, a mandibular premolar, and series of vertebral and rib fragments. The mandibular molar is very lightly worn, typical of a young adult. The proximal fibula epiphysis is actively fusing, suggesting an individual from 15 to 20 years old. The ectocranial surface of a right parietal fragment displays slight porosity.

INDIVIDUAL 13

This individual is represented by a series of cranial fragments recovered from the Zone II (levels 3-4) of T.U. 4 and Feature 14 (Figure 4.16). The bone fragments are clearly cranial in origin, but specific identification is impossible. No pathological lesions were identified.

The cranial fragments that represent Individual 13 were recovered during the screening of T.U. 4 Levels 3 and 4. These fragments are likely associated with one, or both, of the two *in situ* burials that were recorded during the excavation of T.U. 4 (see Features 14 and 15 in Chapter 4). Because Features 14 and 15 were not removed from their primary context and were reburied, it is impossible to determine with which individual these cranial fragments are associated. Neither of the burials that were documented in T.U. 4 (Features 14 and 15) were further analyzed or assigned Individual numbers.

UNIT 2, ZONE II (LEVEL 8)

This bone represents a single modified cranial bone fragment (Figure 10.3). The fragment is broken along one side, but the unbroken side has been ground down forming a disc-shaped object. Parallel striations are visible on the surface, and these are aligned with the long axis of the bone. The author is not confident that the bone is human. However, the fragment does display a developed diploe layer, which is consistent with human cranial material.

DISCUSSION AND CONCLUSIONS

The skeletal material excavated and recovered from the Highland Creek site in 1999 represents a minimum of 13 individuals. Of this sample, sex estimates were possible for only five individuals of which two are probably female. One individual was a young adult, three were aged between 20 to 35 years old, and three were probably over 35 years old. The age of seven individuals could not be determined. Dental and skeletal pathological conditions are consistent with other prehistoric Archaic hunter-gatherer populations. The rate of dental attrition is high, the frequency of dental caries is low, and traumatic fractures are relatively common.

The analysis of the human remains collected from the site in 1991 resulted in the identification of 26 individuals (DiBlasi 1997). When the bones collected in 1999 are compared with the previously identified individuals, only the material from Looter Pit 2 could possibly be matched with the earlier collection. If this is the case, then portions of at least 38 individuals in total (from both 1991 and 1999) have been recovered from the Highland Creek site. Basic pathological and demographic data are consistent between the two samples, but comparisons of the data sets are limited by differing methodological approaches. From a demographic perspective, it is interesting that no

infants or juveniles under 10 years old were identified in either sample. Typically, individuals of these age groups would represent 20 to 30% of a burial sample.

Figure 10.3. Modified Cranial Fragment from Test Unit 2, Zone II (Level 8).

CHAPTER 11:
SUMMARY AND CONCLUSIONS

In May and June of 1999, limited excavations were conducted at the Highland Creek site (15Un127) in Union County, Kentucky. The site is located on the crest of a low ridge in the Ohio River floodplain. The area surrounding the site is subject to periodic inundation from Ohio River floodwaters, although floodwater levels typically do not rise high enough to reach the site except during the most extreme 100-year flood episodes. In general, the floodplain in the vicinity of the Highland Creek site consists of a densely forested, lowland backwater, wetland environment that is rich in a variety of terrestrial and aquatic plant and animal resources.

The purpose of this study was to: 1) define the boundaries of the Highland Creek site; 2) determine the nature and extent of intact subplowzone cultural deposits; 3) sample the intact cultural deposits to determine the age and nature of occupations at the site; and 4) determine the extent of looter disturbance and damage to the site. Based on data from the four looter pits, four units, and 36 auger probes excavated at the site, the Highland Creek site has a diameter of 75 m and contains intact cultural deposits that extend to a maximum depth of 1 m below ground surface (1.4 m below surface when the basal portions of features are considered). These deposits could be separated into five stratigraphic zones: Zone Ib (plowzone), Zone IIa (upper midden), Zone IIb (lower midden), Zone III (transition), and Zone IV (subsoil). Backdirt from the substantial looter activity was treated as a sixth zone (Zone Ia).

The midden, which has a maximum thickness of 60 to 70 cm, consists of a dense accumulation of plant and animal remains, and burned clay. Although Zone II midden deposits are present throughout the entire site, separation of the midden into clearly defined upper and lower zones was only possible in the northernmost portion of the site. In addition, the Zone III transition appeared intermittently across the site, having been noted in roughly half of the profiled test units. Within the Zone II and Zone III deposits, 17 features, including six human burials, were identified during the excavations. Other features consisted of hearths and large pits. The site's six radiocarbon dates have midpoints that range from 3355 to 2905 cal B.C., which indicates that the Zone III transition and Zone II midden were primarily deposited from the late Middle Archaic to early Late Archaic.

In addition to the late Middle/early Late Archaic midden, ephemeral prehistoric occupation and use of the site occurred during the Late Woodland period. This component, which is represented by 14 ceramic sherds, is restricted to the plowzone (Zone Ib). All of the sherds have plain exterior surfaces, all but one are grog tempered, and a single sherd is decorated with incised lines and/or fingernail impressions. Based on sherd thickness and the predominance of plain exterior surfaces, these materials appear to date to the Late Woodland period. Given the small sample of ceramic materials recovered from the site, however, this association cannot be completely supported.

The site also contains a late-nineteenth/early-twentieth century historic period component. As with the Late Woodland component, this component is restricted to the plowzone (Zone Ib). The historic period component likely represents the remains of a house site or farmstead. Of the 585 historic artifacts recovered, an overwhelming majority are associated with kitchen and domestic related activities. Diagnostic artifacts, such as whiteware, white granite ware, amethyst glass, cut nails, and wire nails indicate that the house was likely constructed sometime during the late nineteenth century (1870s or 1880s) and was occupied into the early-twentieth century.

Although the Highland Creek site has been severely damaged by looters, the 1999 investigation of the site documented significant intact prehistoric remains that date to the late Middle Archaic/early Late Archaic periods. Based on the presence of these intact deposits, the site appears to be eligible for listing in the National Register of Historic Places under Criterion D for its scientific data content. Additional research at the site has the potential to address Archaic period research questions identified in Kentucky's comprehensive state plan (Jefferies 1990) and to contribute to the understanding of late Middle Archaic/early Late Archaic period lifeways, and settlement and subsistence patterns in the Ohio Valley. Given the site's significance it is recommended that an effort be made to stablize the Highland Creek site. This would involve filling the looters holes with sterile soil obtained from another location.

In the remainder of this chapter the results of the investigation of the late Middle/early Late Archaic period component are summarized. This discussion is organized as follows: 1) plant and animal remains, 2) lithic materials, and 3) features and burials. Lastly an effort is made to place this component within the broader framework of late Middle/early Late Archaic developments in the Ohio Valley.

PLANT AND ANIMAL REMAINS

Data from the analysis of plant and animal remains recovered from the site's midden suggest a relatively intense occupation from the late Middle Archaic to early Late Archaic. Analysis of the animal and shell remains points to two trends related to the occupation and use of the site. The first is the exploitation of a fairly broad spectrum of animals, focused on both terrestrial and aquatic resources. The identified animal remains, several of which had been modified by humans, primarily consisted of mammals, dominated by white-tailed deer. Several small mammal species, including gray squirrel, woodchuck, and swamp rabbit, also were identified in the faunal collection. Others animals identified include several species of birds, including turkey, duck and goose, and fish, represented by freshwater drum and an indeterminate catfish species. At least two species of freshwater mussels also were identified in the faunal collection.

The second trend in the faunal data is related to the seasonality of the identified faunal species. A late fall to early spring occupation of the site is suggested by the presence of the migratory waterfowl, a spring through summer occupation can be inferred from the fish and reptile species recovered, and a late summer through fall occupation is indicated by the presence of mussel shell and aquatic snails. These seasonality indicators overlap and span all four seasons, suggesting that the site may have witnessed multi-seasonal or year-round occupations during the late Middle Archaic/early Late Archaic period.

Analysis of the botanical remains offers further insight into the nature of the occupation of the site. The botanical assemblage includes six species of nutshell, nine species of wild seeds, and two possible cultigens. Nutshell species were the overwhelmingly dominant plant material identified. Hickory and black walnut were the most prevalent, with acorn, pecan, butternut, and hazelnut also being represented. Wild seed plants include dryland and/or lowland species of grape, persimmon, marshelder, erect knotweed, bedstraw, and spurge, all of which occurred in relatively low frequencies, but demonstrate a relatively wide spectrum of plant exploitation. Use of aquatic and wetland plant resources is also indicated by the presence of pondweed, chokeberry, and hawthorn. Two possible cultigens (squash and gourd) also are present in low frequencies.

The identification and frequency of plant species suggest that the harvesting of nuts, predominantly hickory and black walnut, was the primary subsistence activity undertaken at the Highland Creek site. In addition to the harvesting of nuts, a broad spectrum of fleshy fruits and

wetland and dryland annuals was collected. The presence of possible early cultigens, along with two species (marshelder and erect knotweed) that eventually became part of the Eastern Agricultural Complex, suggest that the relatively wide exploitation of wild plant species also may have included some early experimentation with cultivable plants and/or early horticultural activity.

When considered together, the faunal and botanical data indicate that a diverse regime of subsistence resources was exploited by the occupants of the Highland Creek site. Nut collection appears to have been the dominant subsistence activity. Hunting and fishing of a variety of animal resources, along with the collection of several seed and fruit bearing plants, indicate that resources available in the wetland environment surrounding the site were important components of the local subsistence economy. The pattern that has emerged from the Highland Creek site materials is one intensive, broad spectrum use of the resources that were available within a highly localized environmental setting (i.e., wetlands).

Seasonality indicators from the identified plant and animal remains appear to suggest that the Highland Creek site was used throughout the year. However, year-round use does not necessarily indicate a sedentary settlement pattern. Rather than living at the site year-round, it seems more likely that late Middle Archaic/early Late Archaic inhabitants may have visited the Highland Creek site several times throughout the year during different seasons. It does appear likely, however, that these seasonal occupations may have lasted for extended periods of time given the diversity of plant and animal resources consumed at the site, the presence of large pit and hearth features, and the amount of midden development.

LITHIC MATERIALS

Analysis of the lithic artifacts suggests that the midden deposits at the site date to the Late Archaic period. This assignment is based on the presence of five diagnostic projectile points. The projectile points identified (Etley Corner-Notched, Pickwick, and Saratoga Parallel Stemmed) are typically thought to date somewhat later during the Late Archaic period than the site occupational date range of 3355 to 2905 cal B.C. (late Middle Archaic/early Late Archaic period) suggested by the midpoints of the radiocarbon dates. Given the fairly restricted temporal range indicated by the radiocarbon dates, these point types may have a longer period of use than has been previously thought.

Debitage and raw material analysis of the lithic artifacts indicate three trends related to Late Archaic lithic production, raw material acquisition, and use. First, based on the debitage and tool data, the full sequence of bifacial lithic reduction appears to have taken place at the site. However, the prevalence of middle to late stage reduction debris, combined with relatively few artifacts that display cortex, suggest that early stage lithic reduction, although present, was not common at the Highland Creek site. The relative lack of early stage reduction debris appears to indicate that the inhabitants of the Highland Creek site likely manufactured most of their tools (at least the formal tools) at another location and brought them in finished, or near finished (prepared cores and blanks), form to the site.

Secondly, the analysis and identification of raw material resources used in the manufacture of chipped stone tools suggests a procurement strategy that focused on the exploitation of locally available chert resources. It appears that both primary and secondary source locations were targeted for procurement, with secondary river gravel sources being the most important locations for resource acquisition. Although a variety of local chert types were utilized, flintknappers at the Highland Creek site appear to have had a selective preference for St. Louis and Ft. Payne raw materials.

Thirdly, the presence of a fairly diverse toolkit, consisting of bifacial, unifacial, and expedient flake tools, suggests that a wide range of activities, such as plant and animal processing,

woodworking, and perhaps digging, were performed by the site's occupants. The focus and frequency of the activities, as indicated by the distribution of tools throughout the late Middle Archaic/early Late Archaic deposits, does not appear to have substantially changed over the time span in which the site was occupied.

FEATURES AND BURIALS

Fifteen features, including six human burials, were identified at the Highland Creek site. Nonburial features included hearths and pits. Fire-cracked rock, burned clay, plant and animal remains, and artifacts were commonly found within, or associated with, hearths and pits. The hearths were probably used to process plant and animal remains, while the pits may have been used for storage. Evidence of burning and/or storage is not unexpected, since nut processing is thought to have been the primary late Middle Archaic/early Late Archaic subsistence activity undertaken at the site. Nut processing often involves intensive preparation and boiling/heating during preparation (Sassaman 1996). Stone-boiling techniques for nut processing, likely account for the presence of hearths, fire-cracked rock, and burned clay.

Six intact human burials were documented in the Highland Creek midden. Disarticulated or disturbed human bones also were recovered from looter pit and plowzone contexts. Analysis of these materials suggests that the 1999 collection contains a minimum of 13 individuals. When these numbers are combined with the 1991 collection, a minimum total of 38 individuals have been recovered from the Highland Creek site. The presence of at least 38 individuals at this relatively small (75 m in diameter) site points to a relatively high density of human burials. Dental and skeletal paleopathological conditions associated with the Highland Creek skeletal remains are consistent with other known prehistoric Archaic hunter-gatherer populations, although they do not display the violent injuries and/or dismemberments that have been noted at other Middle and Late Archaic sites (e.g., Indian Knoll and Ward) (Mensforth 2001; Webb 1946).

The burials from the Highland Creek site also do not contain similar types or quantities of grave goods that are sometimes associated with Late Archaic burials at Indian Knoll or the Ward site (Claassen 1992; Jefferies 1996; Webb 1946). With the exception of two pieces of unmodified siltstone and an unmodified slate slab, no grave goods were associated with the intact burials recorded at the Highland Creek site. In addition, no patterning of skeletal orientation or burial position was evident in the small sample excavated. The near absence of grave goods and lack of patterning in burial orientation and position, suggest that the status distinctions and/or incipient social differentiation that has been suggested for Green River Late Archaic groups, was minimal or non-existent in the Highland Creek region (Pedde and Prufer 2001; Rothschild 1979).

CONCLUSION

The Highland Creek midden was deposited during the late Middle to early Late Archaic period and represents a dense accumulation of plant and animal remains resulting from human subsistence activities that occurred over a period of 400-1000 years. Subsistence activities at the site appear to have centered on the collection and processing of various species of nuts, but also included the exploitation of a diverse range plant and animal resources that were available in the wetlands surrounding the site. Wild plants, seeds, and fruits, along with terrestrial animals, fish, and mussels were all targeted food resources.

The collection of wild plants and seeds at the Highland Creek site is particularly interesting given the presence of some plants (marshelder and erect knotweed) that are eventually domesticated

by later prehistoric peoples. In addition to these native plants, two possible cultigens–gourd and squash–also were present in the assemblage. The presence of possible cultigens and wild plants that later are domesticated point to a growing importance and intensified use of plant resources within Middle and Late Archaic period subsistence strategies, if not outright experimentation with plant manipulation and early horticulture.

Intensification of the economy at the Highland Creek site, however, is best evidenced by the relatively massive quantities of nutshell found in the site assemblage. Nuts, although only semi-predictable, are a high-yield resource. This fact, combined with the location of the site in a resource-rich zone provides a picture of the late Middle Archaic/early Late Archaic subsistence strategy at the Highland Creek site as one of intensified exploitation and increased knowledge of specific, local resources and seasonal schedules.

The growing importance of a variety of plants and broad-spectrum use of wetland resources that is evident in the site assemblage suggests that the late Middle Archaic/early Late Archaic economy was changing in ways that had not occurred, or been possible (for social or environmental reasons), earlier in the Archaic period. It appears that the occupants of the Highland Creek site were purposefully intensifying their exploitation of sets of resources that were tied to specific habitats or ecozones. In this case, the wetlands that surround the site provided a wide range of potential plant and animal resources that apparently became the near-total focus of subsistence activities.

The economic intensification that was occurring at the Highland Creek site is not unusual, however, and was a common trend during the late Middle Archaic/early Late Archaic period (Jefferies 1996; Sassaman 1995). The trend of intensification is part of the broader social trend of regionalization, or "settling in" that has been widely documented for the Middle and Late Archaic periods (Jefferies 1990, 1996, 1997; Price and Brown 1985; Sassaman 1995, 1996). Along with economic intensification, increased regionalization can encompass a reduction or restriction in mobility, increased territorialism, increased knowledge and use of local landscapes and ecological zones, the appearance of new technologies, and greater social connectivity (Dillehay 2000; Dixon 1999; Price and Brown 1985).

Evidence for economic intensification (increased focus on plant exploitation), greater knowledge of the local ecology (extensive use of wetland resources), and perhaps, technological changes (stone-boiling techniques for nut processing based on the large amount of fire-cracked rock in the midden) are, at least in part, supported by the Highland Creek archaeological record. Evidence for increased territorialism, reduced mobility, and changing social relations are much harder to identify. Some insight into these processes, however, may be found in the high density of human burials found at the Highland Creek site.

Human burial is a social action that can have many different, and culturally specific, meanings and functions. One potential function of burying individuals in specific places is to stake claim to or identify oneself with the that location (Charles and Buikstra 1983). It is possible that the high density of burials in the Highland Creek site midden could indicate some sort of territorial tie to this location. It is also possible that the number of burials in the midden simply reflects longer site occupations–which would require the internment of a greater number of deceased individuals in one location over time. Both of these possibilities–territorialism or reduced mobility (longer occupations) appear likely given the broad social trend of regionalization that is believed to have been occurring during the Middle and Late Archaic periods.

In sum, broad late Middle Archaic/early Late Archaic social trends that are reflected in the Highland Creek archaeological record appear to include regionalization and intensification of the economy with a focus on highly productive resource zones. The development of a dense midden

deposit through frequent and/or semi-permanent occupation of the site, coupled with a high density of human interments, appear to suggest that the site's occupants were becoming increasingly tethered (both socially and economically) to the wetland environment in the vicinity of the site. Late Middle Archaic/early Late Archaic groups may have visited the site several times during the course of a year, suggesting a less-mobile lifestyle and more restricted territory.

Overall, the picture we have of the late Middle Archaic/early Late Archaic occupation of the Highland Creek site is best understood when contextualized within the broader social processes that are believed to have been occurring at that time. Increasing regionalization and intensified exploitation of highly productive resource zones were the contexts within which horticulture, sedentary life, and greater social complexity eventually emerged. The Highland Creek site materials indicate the initiation of some of these early processes and provide an important window for understanding the specific local adaptations and contexts that fostered the broad social changes that occurred during the Middle and Late Archaic periods.

REFERENCES CITED

Anderson, Edgar
1952 *Plants, Man, and Life*. Little, Brown, and Company, Boston

Anderson, David G.
1996 Models of Paleoindian and Early Archaic Settlement in the Lower Southeast. In, *The Paleoindian and Early Archaic Southeast*, edited by David G. Anderson and Kenneth E. Sassaman, pp. 29-57. University of Alabama Press, Tuscaloosa.

Andrefsky, William, Jr.
1998 *Lithics: Macroscopic Approaches to Analysis*. Cambridge University Press, Cambridge.

Asch, David L., and Nancy B. Asch
1975 Appendix V: Plant Remains from the Zimmerman Site - Grid A: A Quantitative Perspective. In *The Zimmerman Si*te: *Further Excavations at the Grand Village of Kaskaskia*, edited by Margaret I. Brown. Report of Investigations No. 23. Illinois State Museum, Springfield, Il.

1985 Prehistoric Plant Cultivation in West-Central Illinois. In *Prehistoric Food Production in North America*, edited by Richard I. Ford, pp. 149-203. Anthropological Papers No. 75. Museum of Anthropology, University of Michigan, Ann Arbor.

Asch, Nancy B., Richard I. Ford, and David L. Asch
1972 *Paleoethnobotany of the Koster Site*. Report of Investigations No. 24. Illinois State Museum, Springfield.

Ball, Donald B.
1984 Historic Artifact Patterning in the Ohio Valley. *Proceedings of the Symposium on Ohio Valley Urban and Historic Archaeology*, edited by Donald B. Ball and Philip J. DiBlasi, 2:24-36. Archaeological Survey, University of Louisville, Kentucky.

1997 Types, Headstamps, and Chronology of Winchester Shotgun Shells, 1877-1973. *Ohio Valley Historical Archaeology, Journal of the Symposium on Ohio Valley Urban and Historic Archaeology* Vol. 12:130-140.

Bartram, William
1955 [1791] *Travels Through North and South Carolina, Georgia, East and West Florida.* Dover, New York.

Bass, W. M.
1987 *Human Osteology: A Laboratory and Field Manual*. 3rd ed. Missouri Archaeological Society, Columbia.

Black, Glenn A.
1967 *Angel Site: An Archaeological, Historical, and Ethnological Study*. 2 vols. Indiana Historical Society, Indianapolis.

Boocock, P., C. A. Roberts, and K. Manchester
1995 Maxillary Sinusitis in Medieval Chichester, England. *American Journal of Physical Anthropology* 98:483-95.

Bordes, F. and D. de Sonneville-Bordes
1970 The Significance of Variability in Paleolithic Assemblages. *World Archaeology* 2: 61-73.

Bradley, Bruce A.
1975 Lithic Reduction Sequences: A Glossary and Discussion. In, *Lithic Technology: Making and Using Stone Tools*, edited by E. Swanson, pp. 5-13. The Hague, Mouton.

Braun, E. Lucy
1950 *The Deciduous Forests of Eastern North America.* Blakiston, Philadelphia.

Brown, James A., and Robert K. Vierra
1983 What Happened During the Middle Archaic?: Introduction to an Ecological Approach to Koster Site Archaeology. In *Archaic Hunters and Gatherers in the American Midwest*, edited by James L. Philips and James A. Brown, pp. 165-195. Academic Press, New York.

Brown, W. R.
1977 A Re-Evaluation of Late Archaic Subsistence and Settlement Patterns in the Western Tennessee Valley. *Tennessee Anthropologist* 2(2):101-120.

Buikstra, Jane E., and D. H. Ubelaker (editors)
1994 *Standards for Data Collection from Human Skeletal Remains*. Research Series No. 44. Arkansas Archaeological Survey, Fayetteville.

Campbell, Julian J.N.
1985 The Land of Cane and Clover: Presettlement Vegetation in the So-called Bluegrass Region of Kentucky. Ms. on file, School of Biological Sciences, University of Kentucky, Lexington.

Carstens, Kenneth C., and Kandis K. Jenings
1978 *An Archaeological Survey and Testing of the Proposed Camp Breckenridge-Peabody Coal Company Coal Washing Plant, Priority Areas I and II, Union County, Kentucky*. Department of Sociology and Anthropology, Murray State University, Murray, Kentucky.

Carstens, Kenneth C., Kandis K. Jenings, and Roger Johnson
1979 *An Archaeological Survey and Testing of the Proposed Breckenridge-Peabody Coal Company Coal Washing Plant, Priority Area III, Union County, Kentucky*. Department of Sociology and Anthropology, Murray State University, Murray, Kentucky.

Charles, Douglas K. and Jane E. Buikstra
1983 Archaic Mortuary Sites in the Central Mississippi Drainage: Distribution, Structure, and Behavioral Implications. In, *Archaic Hunters and Gatherers in the American Midwest*, edited by James L. Phillips and James A. Brown, pp. 117-145. Academic Press, New York.

Church, M. S. and G. R. Burgett
1996 An Information Recording and Retrieval System for Use in Taphonomic and Forensic Investigations of Human Mortalities. *Proceedings of the American Academy of Forensic Sciences*. 2:167-168.

Church, Tim
1994 *Lithic Resource Studies: A Sourcebook for Archaeologists*. Department of Anthropology, Special Publications #3, University of Tulsa. Tulsa, Oklahoma.

Claassen, Cheryl
1992 Shell Mounds as Burial Mounds: A Revision of the Shell Mound Archaic. In, *Current Archaeological Research in Kentucky: Volume Two*, edited by David Pollack and A. Gwynn Henderson, pp. 1-11. Kentucky Heritage Council, Frankfort.

Clay, Berle R.
1963 *Ceramic Complexes of the Tennessee-Cumberland Region in Western Kentucky*. Master's thesis, Department of Anthropology, University of Kentucky, Lexington.

Cole, Fay-Cooper, Robert Bell, John Bennett, Joseph Caldwell, Norman Emerson, Richard MacNeish, Kenneth Orr, and Roger Wills
1951 *Kincaid: A Prehistoric Illinois Metropolis*. University of Chicago Press, Chicago

Collins, Michael B.
1975 Lithic Technology as a Means of Processual Inference. In, *Lithic Technology: Making and Using Stone Tools*, edited by E. Swanson, pp. 15-24. The Hauge, Mouton.

Cowan, C. Wesley
1978 The Prehistoric Use and Distribution of Maygrass in Eastern North America: Cultural and Phytoecological Implications. In *The Nature and Status of Ethnobotany*, edited by Richard I. Ford, pp. 263-288. Anthropological Reports No. 67. Museum of Anthropology, University of Michigan, Ann Arbor.

1985 *From Foraging to Incipient Food Production: Subsistence Change and Continuity on the Cumberland Plateau of Eastern Kentucky*. Ph.D. dissertation, Department of Anthropology, University of Michigan, Ann Arbor.

Cowan, C. Wesley, H.Edwin Jackson, Katherine Moore, Andrew Nichelhoff, and Tristine L. Smart
1981 The Cloudsplitter Shelter, Menifee County, Kentucky: A Preliminary Report. *Southeastern Archaeological Conference Bulletin* 24:60-76.

Cowan, C. Wesley, Dunavan, Sandra, Nass, Jr., John P. and Susan Scott
1990 The Schomaker Site, A Middle Fort Ancient Town on the Great Miami River, Hamilton County, Ohio. *West Virginia Archaeologist* 42(1): 11-35.

Crites, Gary D.
1994 Appendix G. Paleoethnobotany at the Main Site. In *Upper Cumberland Archaic And Woodland Period Archaeology At The Main Site (15BL35), Bell County, Kentucky, Volume 2*, by Steven D. Creasman, pp. G1-G78. Contract Publication Series 94-56. Cultural Resource Analysts, Lexington.

Davis, Daniel B., Leon Lane, Nancy O'Malley, and Jack Rossen
1997 *Phase II Testing and Phase III Mitigation of Three Sites in the Bardstown Industrial Park, Nelson County, Kentucky*. Archaeological Report No. 386. Program for Cultural Resource Assessment, University of Kentucky, Lexington.

Davis, Margaret B.

1983 Holocene Vegetational History of the Eastern United States. In, *Late Quaternary Environments of the United States, Part 2: The Holocene*, edited by H. E. Wright, Jr., pp. 166-181. University of Minnesota Press, Minneapolis.

Decker-Walters, Deena
1990 Evidence for Multiple Domestications of *Cucurbita pepo*. In *Biology and Utilization of the Cucurbitaceae*, edited by David M. Bates, Richard W. Robinson, and Charles Jeffrey, pp. 96-101. Cornell University Press, Ithaca, New York.

Delcourt, Paul A, and Hazel R. Delcourt
1981 Vegetation Maps for Eastern North America: 40,000 YR B.P. to the Present. In *Geobotany II*, edited by R. C. Romans, pp. 123-165. Plenum Publishing Corporation, New York.

1984 Late Quaternary Paleoclimates and Biotic Responses in Eastern North America and the Western North Atlantic Ocean. *Palaeogeography, Palaeoclimatology, Palaeoecology* 48: 263-284.

1985 Quaternary Polynology and Vegetational History of the Southeastern United States. In *Pollen Records of Late Quaternary North American Sediments*, edited by V. M. Bryant and R. G. Holloway, pp. 1-28. American Association of Stratigraphic Polynologists Foundation.

1987 *Long-Term Forest Dynamics of the Temperate Zone, Ecological Studies 63*. Springer-Verlag, New York.

Delcourt, Paul A., Delcourt, Hazel R., Ison, Cecil R., Sharp, William E. and Kristen J. Gremillon
1998 Prehistoric Human Use of Fire, the Eastern Agricultural Complex, and Applachian Oak-Chestnut Forests: Paleoecology of Cliff Palace Pond, Kentucky. *American Antiquity* 63(2): 263-278.

Delorit, R.J.
1970 *Illustrated Taxonomy Manual of Weed Seeds*. Agronomy Publications. River Falls, Wisconsin.

DiBlasi, Philip. J.
1997 Report of the Inventory, Analysis, and Curation of the Human Remains Recovered from 15UN127. Report Submitted to Department of the Army, Louisville District Corps of Engineers, Planning Division, Environmental Analysis Branch.

Dillehay, Tom D.
2000 *The Settlement of the Americas: A New Prehistory*. Basic Books, New York.

Dixon, James E.
1999 *Bones, Boats, and Bison: Archaeology and the First Colonization of Western North America*. University of New Mexico Press, Albuquerque.

Dunn, Mary E.
1984 Appendix A - Floral Analysis. In *The Archaeology of Taylorsville Lake: Archaeological Data Recovery and Synthesis*, edited by Boyce N. Driskell, pp. 297-308. Archaeological Report No. 85. Program for Cultural Resource Assessment, University of Kentucky, Lexington.

Dunnell, Robert C.
1972 *The Prehistory of Fishtrap, Kentucky*. Publications in Anthropology No. 75. Yale University, New Haven.

Edging, Richard B.
1995 *Living in a Cornfield: The Variation and Ecology of Late Prehistoric Agriculture in the Western Kentucky Confluence Region*. Unpublished Ph.D. dissertation, Department of Anthropology, University of Illinois, Urbana-Champaign.

Elam, A. B., Jr.
1967 Climate. In *Soil Survey of Henderson County, Kentucky*, by Henry T. Converse, Jr. and Frank R. Cox, Jr., pp. 104. United States Department of Agriculture, Soil Conservation Service, Washington, D.C.

Erickson, David L., B. D. Smith, A. C. Clarke, D. H. Sandweiss, and N. Tuross
2005 An Asian Origin for a 10,000-year-old Domesticated Plant in the Americas. *Proceedings of the National Academy of Sciences* 102(51): 18315-18320.

Fike, Richard E.
1987 *The Bottle Book: A Comprehensive Guide to Historic, Embossed Medicine Bottles*. Peregrine Smith Books, Salt Lake City.

Fowler, Melvin
1971 The Origin of Plant Cultivation in the Central Mississippi Valley: A Hypothesis. In *Prehistoric Agriculture*, edited by Stuart Struever, pp. 122-128. Natural History Press, Garden City, New York

Freeman, Andrea K. L., Smith, Jr., Edward E., and Kenneth B. Tankersely
1996 A Stone's Throw from Kimmswick: Clovis Period Research in Kentucky. In, *The Paleoindian and Early Archaic Southeast*, edited by David G. Anderson and Kenneth E. Sassaman, pp. 385-403. University of Alabama Press, Tuscaloosa.

French, Michael W.
1998 Lithic Technology: Chipped Stone and Ground Stone Artifacts. In, *Mississippian Adaptations Along the Barren River in South Central Kentucky*, by W. Lowthert, C. Shields, and D. Pollack, pp. 45-65, Kentucky Archaeological Survey, Research Report No. 1, Lexington, Kentucky.

Fritz, Gayle J.
1988 Crops Before Corn in the East: Regional Patterns of Early and Middle Woodland Period Paleoethnobotany. Paper presented at the 50th Annual Southeastern Archaeological Conference, New Orleans.

Gatus, Thomas W.
1979 The Occurrence and Distribution of Chert Bearing Deposits in the Land Between the Lakes Area of Western Kentucky. *Kentucky Archaeological Association Bulletin* 12: 24-42.

Gilbert, B. M. and T. W. McKern
1973 A Method for Aging the Female *Os pubis*. *American Journal of Physical Anthropology* 38:31-38.

Gilmore, Melvin R.

1931 *Uses of Plants by the Indians of the Missouri River*. University of Nebraska Press, Lincoln.

Goodman, A. H., and J. C. Rose
1990 Assessment of Systematic Physiological Perturbations from Dental Enamel Hypoplasias and Associated Structures. *Yearbook of Physical Anthropology* 33:59-110.

Graham, Russell W., C. Vance Haynes, D. Johnson and Marvin Kay
1981 Kimmswick: A Clovis-Mastodon Association in Eastern Missouri. *Science* 213: 1115-1117.

Green, Thomas J., and Cheryl Ann Munson
1978 Mississippian Settlement Patterns in Southwestern Indiana. In, *Mississippian Settlement Patterns*, edited by Bruce D. Smith, pp. 292-330. Academic Press, New York.

Gremillion, Kristen J.
1995 3,000 Years of Human Activity at the Cold Oak Shelter. Paper presented at the 12th Annual Kentucky Heritage Council Archaeological Conference, Richmond, Kentucky.

1998 3,000 Years of Human Activity at the Cold Oak Shelter. In *Current Archaeological Research in Kentucky, Volume Five*, edited by Charles Hockensmith, Kenneth Carstens, Charles Stout, and Sara Rivers, pp. 1-14. Kentucky Heritage Council, Frankfort.

Hart, John P., Robert A. Daniels, and Charles J. Sheviak
2004 Do *Cucurbita pepo* Gourds Float Fishnets? *American Antiquity* 69(1): 141-148.

Heiser, Charles B.
1989 Domestication of Cucurbitaceae: Cucurbita and Lagenaria. In *Foraging and Farming: The Evolution of Plant Exploitation*, edited by David R. Harris and Gordon C. Hillman, pp. 471-480. One World Archaeology, Volume 13, Unwin-Hyman, London.

Henderson, A. Gwynn
1992 The Capitol View Site: A Middle to Late Fort Ancient Community in Franklin County, Kentucky. In *Current Archaeological Research in Kentucky: Volume Two*, edited by David Pollack and A. Gwynn Henderson, pp. 223-240. Kentucky Heritage Council, Frankfort.

Hockensmith, Charles D., Pollack, David, Haskins, Valerie and Jack Rossen
1998 The Shelby Lake Site: A Late Woodland Upland Camp in Shelby County. In, *Current Archaeological Research in Kentucky, Volume Five*, edited by Charles D. Hockensmith, Kenneth C. Carstens, Charles Stout and Sarah J. Rivers, pp. 121-162. Kentucky Heritage Council, Frankfort.

Hudson, Jean L.
2004 Additional Evidence for Gourd Floats on Fishing Nets. *American Antiquity* 69(3): 586-587.

Ison, Cecil R.
1988 The Cold Oak Shelter: Providing a Better Understanding of the Terminal Archaic. In *Paleoindian and Archaic Research in Kentucky*, edited by Charles D. Hockensmith, David Pollack, and Thomas N. Sanders, pp. 205-220. Kentucky Heritage Council, Frankfort.

Jacobs, Eullas H.
1981 *Soil Survey of Union and Webster Counties, Kentucky*. United States Department of Agriculture, Soil Conservation Service, Washington, D.C.

Jefferies, Richard W.

1982 Archaeological Overview of the Carrier Mills District. In *The Carrier Mills Archaeological Project: Human Adaptation in the Saline Valley, Illinois*, edited by Richard W. Jefferies and Brian M. Butler, pp. 1461-1510. Research Paper No. 33. Center for Archaeological Investigations, Southern Illinois University, Carbondale.

1990 Archaic Period. In *The Archaeology of Kentucky: Past Accomplishments and Future Directions, Volume 1,* edited by David Pollack, pp. 143-246. Kentucky Heritage Council, Frankfort.

1996 Hunters and Gatherers After the Ice Age. In *Kentucky Archaeology*, edited by R. Barry Lewis, pp. 39-78. The University Press of Kentucky, Lexington.

1997 Middle Archaic Bone Pins: Evidence of Mid-Holocene Regional-Scale Social Groups in the Southern Midwest. *American Antiquity* 62(3): 464-487.

Jelinek, Arthur J.

1976 Form, Function, and Style in Lithic Artifacts. In, *Culture Change and Continuity*, edited by C. E. Cleland, pp. 19-33. Academic Press, New York.

Jennings, Jesse E.

1989 *Prehistory of North America* (Third Edition). Mayfield Publishing Company, Mountain View, California.

Johannessen, Sissel

1983 Plant Remains from the Missouri Pacific #2 Site. In *The Missouri Pacific #2 Site*, edited by Dale L. McElrath and Andrew C. Fortier, pp. 191-206. American Bottom Archaeology, FAI-270 Site Reports, Volume 9. Illinois Department of Transportation, University of Illinois Press, Urbana.

1984a Plant Remains. In *The Go-Kart North Site and the Dyroff and Levin Sites*, edited by Andrew C. Fortier and Thomas E. Emerson, pp. 166-178. American Bottom Archaeology, FAI-270 Site Reports, Volume 9. Illinois Department of Transportation, University of Illinois Press, Urbana.

1984b Floral Resources and Remains. In *The Go-Kart North Site and the Dyroff and Levin Sites*, edited by Andrew C. Fortier and Thomas E. Emerson, pp. 294-306. American Bottom Archaeology, FAI-270 Site Reports, Volume 9. Illinois Department of Transportation, University of Illinois Press, Urbana.

1984c Paleoethnobotany. In *American Bottom Archaeology: A Summary of the FAI-270 Project Contribution to the Culture History of the Mississippi River Valley*, edited by Charles J. Bareis and James W. Porter, pp. 197-224. University of Illinois Press, Urbana.

Jones, Olive and Catherine Sullivan with contributions

1989 *Parks Canada Glass Glossary*. Canadian Parks Service, Ottawa, Ontario.

Justice, Noel D.

1987 *Stone Age Spear Points and Arrow Points of the Midcontinental and Eastern United States*. Indiana University Press, Bloomington.

Kay, Marvin, Francis B. King, and Christine K. Robinson
1980 Cucurbits from Philips Spring: New Evidence and Interpetations. *American Antiquity* 45(4):802-822.

Kendrick, Grace
1964 *The Antique Bottle Collector*. Old Time Bottle Publishing Co., Salem, Oregon.

Ketchum, William C.
1983 *The Pottery and Porcelain Collector's Handbook*. Funk and Wagnalls, New York.

King, James E.
1973 Late Pleistocene palynology and biogeography of the western Missouri Ozarks. *Ecological Monographs* 43: 539-565.

1981 Late Quaternary Vegetational History of Illinois. *Ecological Monographs* 51: 43-62.

King, James E. and William H. Allen
1977 A Holocene Vegetation Record from the Mississippi River Valley, Southeastern Missouri. *Quaternary Research* 8: 307-323.

King, Jacqueline
2002 Washington State University, Mount Vernon Research and Extension Unit. Electronic document, http://mtvernon.wsu.edu/frt_hort/aronia01.htm.

Knox, J. C.
1983 Responses of River Systems to Holocene Climates. In, *Late Quaternary Environments of the United States, Part 2: The Holocene*, edited by H. E. Wright, Jr., pp. 26-41. University of Minnesota Press, Minneapolis.

Krochmal, Arnold, and Connie Krochmal
1982 *Uncultivated Nuts of the United States*. Agricultural Information Bulletin No. 450. U.S.D.A. Forest Service, General Printing Office, Washington.

Lafferty, Robert H., III
1981 *The Phipps Bend Archaeological Project.* Publication in Anthropology No. 26. Tennessee Valley Authority, Norris, Tennessee.

Lannie, Donna Dean
1979 Ethnobotanical Analysis. In *Excavations at Four Archaic Sites in the Lower Ohio Valley, Jefferson County, Kentucky*, edited by Michael B. Collins, pp. 978-1005. Occasional Papers in Anthropology No. 1, Department of Anthropology, University of Kentucky, Lexington.

Lathrap, Donald
1977 Our Father the Cayman, Our Mother the Gourd: Spinden Revisited, or a Unitary Model for the Emergence of Agriculture in the New World. In, *Origins of Agriculture*, edited by Charles A. Reed, pp. 713-751. Mouton, The Hague.

Leach, Elizabeth K.
1986 Environmental and Anthropological Studies of the Little River–Christian and Trigg Counties, Kentucky. Ms on file, Kentucky Heritage Council, Frankfort.

Lepper, Bradley T. and Robson Bonnichsen
2004 New Perspectives on the First Americans: Introductory Remarks. In, *New Perspectives on the First Americans*, edited by Bradley T. Lepper and Robson Bonnichsen, pp. 1-11. Center for the Study of the First Americans. Texas A&M University Press, College Station.

Lewis, R. Barry
1996 Mississippian Farmers. In *Kentucky Archaeology*, edited by R. Barry Lewis, pp. 127-160. University Press of Kentucky, Lexington.

Lopinot, Neal H.
1982 Plant Macroremains and Paleoethnobotanical Implications. In *The Carrier Mills Archaeological Project: Human Adaptation in the Saline Valley, Illinois*, Volume II, edited by Richard W. Jefferies and Brian M. Butler, pp. 671-860. Research Paper No. 33. Southern Illinois University, Center for Archaeological Investigations, Carbondale.

1988 Hansen Site (15Gp14) Archaeobotany. In *Excavations at the Hansen Site in Northeastern Kentucky*, edited by Steven R. Ahler, pp.571-624. Archaeological Report No. 173. Program for Cultural Resource Assessment, University of Kentucky, Lexington.

Lovejoy, C. O., R. S. Meindl, R. P. Mensforth, and T. J. Barton
1985a Multifactorial Determination of Skeletal Age at Death: A Method and Blind Test of Its Accuracy. *American Journal of Physical Anthropology* 68:1-14.

Lovejoy, C. O., R. S. Meindl, T. R. Pryzbeck, and R. P. Mensforth
1985b Chronological Metamorphosis of the Auricular Surface of the Ilium: a New Method for the Determination of Adult Skeletal Age at Death. *American Journal of Physical Anthropology* 68:15-28.

Lyon, Sidney S.
1872 Report of an Exploration of Ancient Mounds in Union County, Kentucky (Made by the request and at the expense of the Smithsonian Institution). *Annual Report of the Board of Regents of the Smithsonian Institution for 1870*, pp. 392-405. Washington, D.C.

Madsen, David B.
2004 Colonization of the Americas before the Last Glacial Maximum: Issues and Problems. In, *Entering America: Northeast Asia and Beringia before the Last Glacial Maximum*, edited by David B. Madsen, pp. 1-26. University of Utah Press, Salt Lake City.

Marquardt, William H., and Patty Jo Watson
1977 Excavation and Recovery of Biological Remains from Two Archaic Shell Middens in Western Kentucky. *Southeastern Archaeological Conference Bulletin* 20.

Martin, Alexander C., and William D. Barkley
1973 *Seed Identification Manual*. 2nd ed. University of California Press, Berkeley.

Maxwell, Moreau S.
1951 *The Woodland Cultures of Southern Illinois: Archaeological Excavation in the Carbondale Area*. Bulletin No. 7. Logan Museum Publications in Anthropology, Beloit College, Beloit, Wisconsin.

Meindl, R. S., C. O. Lovejoy, R. P. Mensforth, and L. Don Carlos
1985 Accuracy and Direction of Error in the Sexing of the Skeleton: Implications for Paleodemography. *American Journal of Physical Anthropology* 68:79-85.

Meltzer, David J.
2002 What Do You Do When No One's Been There Before? Thoughts on the Exploration and Colonization of New Lands. In, *The First Americans: The Pleistocene Colonization of the New World*, edited by Nina G. Jablonski, pp. 27-58. Memoirs of the California Academy of Sciences No. 27, San Francisco.

Meltzer, David J., and Jim I. Mead
1983 The Timing of Late Pleistocene Mammalian Extinctions in North America. *Quaternary Research* 19:130-35.

Mensforth, Robert P.
2001 Warfare and Trophy Taking in the Archaic Period. In, *Archaic Transitions in Ohio & Kentucky Prehistory*, edited by Olaf H. Prufer, Sara E. Peede and Richard S. Meindl, pp. 110-138. Kent State University Press, Kent, Ohio.

Miller, George L.
1991 A Revised Set of CC Index Values for Classification and Economic Scaling of English Ceramics from 1787 to 1880. *Historical Archaeology*. 25(1):1-25.

Missouri Botanical Gardens
2006 Missouri Botanical Gardens. Electronic document, http://www.mobot.org/mobot/missouri/genus.asp?GENUS=Euphorbia.,accessed September 2006.

Moorees, C. F. A., E. A. Fanning, and E. E. Hunt
1963 Age Formation by Stages for Ten Permanent Teeth. *Journal of Dental Research* 42:1490-1502.

Munson, Cheryl A.
1980 Comments on Subsistence and Settlement in the Upper Patoka Lake Valley. In *Archaeological Salvage Excavations at Patoka Lake, Indiana: Prehistoric Occupations of the Upper Patoka River Valley*, edited by Cheryl A. Munson, pp. 645-683. Research Reports No. 6. Glenn A. Black Laboratory of Archaeology, Indiana University, Bloomington.

Muller, Jon
1978 The Kincaid System: Mississippian Settlement in the Environs of a Large Site. In *Mississippian Settlement Patterns*, edited by Bruce D. Smith, pp. 269-292. Academic Press, New York.

1986 *Archaeology of the Lower Ohio River Valley*. Academic Press, New York.

Nance, Jack D.
1987 The Archaic Sequence in the Lower Tennessee-Cumberland-Ohio Region. *Southeastern Archaeology* 6:129-140.

Nelson, Lee H.
1968 Nail Chronology as an Aid to Dating Old Buildings. *Technical Leaflet 48.* American

Association for State and Local History, Nashville, Tennessee.

Newman, T. Stell
1970 A Dating Key for Post-Eighteenth Century Bottles. *Historical Archaeology*. 4:70-75.

Odell, George H.
1981 The Morphological Express at Function Junction: Searching for Meaning in Lithic Tool Types. *Journal of Anthropological Research* 37: 319-342.

Panshin, A.J., and Carl de Zeeuw
1970 *Textbook of Wood Technology*. 3rd ed. McGraw-Hill, New York.

Pedde, Sara E. and Olaf H. Prufer
2001 The Kentucky Green River Archaic as Seen from the Ward Site. In, *Archaic Transitions in Ohio & Kentucky Prehistory*, edited by Olaf H. Prufer, Sara E. Peede and Richard S. Meindl, pp. 59-86. Kent State University Press, Kent, Ohio.

Phenice, T. W.
1969 A Newly Developed Visual Method of Sexing the Os Pubis. *American Journal of Physical Anthropology* 30:297-301.

Pollack, David
1990 Introduction. *The Archaeology of Kentucky: Past Accomplishments and Future Directions, 2 Volumes*, edited by David Pollack, pp. 1-24. Kentucky Heritage Council, Frankfort

1998 *Intraregional and Intersocietal Relationships of the Late Mississippian Caborn Welborn Phase of the Lower Ohio River Valley*. Unpublished Ph.D. dissertation, Department of Anthropology, University of Kentucky, Lexington.

Pollack, David, and A. Gwynn Henderson
2000 Late Woodland Cultures in Kentucky. In *Late Woodland Societies: Tradition and Transformation Across the Midcontinent*, edited by Thomas Emerson, Dale McElrath, and Andrew Fortier. University of Nebraska Press, Lincoln.

Pollack, David, Cheryl Ann Munson, and A. Gwynn Henderson
1996 *Slack Farm and the Caborn-Welborn People.* Education Series Number One. Kentucly Archaeological Survey, Lexington.

Price, T. Douglas and James A. Brown
1985 *Prehistoric Hunter-Gatherers: The Emergence of Cultural Complexity*. Academic Press, New York.

Railey, Jimmy A.
1990 Woodland Period. In *The Archaeology of Kentucky: Past Accomplishments and Future Directions, Volume 1,* edited by David Pollack, pp. 247-374. Kentucky Heritage Council, Frankfort.

1996 Woodland Cultivators. In *Kentucky Archaeology*, edited by R. Barry Lewis, pp. 79-126. The University Press of Kentucky, Lexington.

Ramirez, Carlos
1989 Macrobotanical Remains. In *Monte Verde: A Late Pleistocene Settlement in Chile. Volume One: Paleoenvironment and Site Context*, edited by Tom D. Dillehay, pp. 147-170. Smithsonian Institution Press, Washington.

Ray, Jack H. and Neal H. Lopinot
1998 Field and Laboratory Methods. In, *The 1997 Excavations at the Big Eddy Site (23CE426) in Southwest Missouri*, edited by N. H. Lopinot, J. H. Ray, and M. D. Conner, pp. 62-73. Center for Archaeological Research, Special Publication No. 2. Southwest Missouri State University, Springfield, Missouri.

Ray, Louis
1965 *Geomorphology and Quaternary Geology of the Owensboro Quadrangle, Indiana and Kentucky*. Professional Paper No. 488. U.S. Geological Survey, Washington, D.C.

Regan, M. H., D. T. Case, and J. C. Brundige
1999 Articular Surface Defects in the Third Metatarsal and Third Cuneiform: Nonosseous Tarsal Coalition. *American Journal of Physical Anthropology* 109:53-65.

Rindos, David
1984 *The Origins of Agriculture: An Evolutionary Perspective*. Academic Press, New York.

Rose, J. C., K. W. Condon and A. H. Goodman
1985 Diet and Dentition: Developmental Disturbances. In *The Analysis of Prehistoric Diets* edited by R. I. Gilbert, Jr. and J. H. Mielke, pp. 281-306. Academic Press, Orlando.

Rossen, Jack
1991 Kentucky Landscapes: The Role of Environmental Reconstruction in Settlement Pattern Studies. In *The Human Landscape in Kentucky's Past: Site Structure and Settlement Patterns*, edited by Charles Stout and Christine K. Hensley, pp. 1-7. Kentucky Heritage Council, Frankfort.

1992 Botanical Remains. In *Fort Ancient Cultural Dynamics in the Middle Ohio Valley*, edited by A. Gwynn Henderson, pp. 189-208. Monographs in World Archaeology No. 8. Prehistory Press, Madison, Wisconsin.

1993a Botanical Remains. In, *Prehistoric Research at Petersburg, Boone County, Kentucky*, edited by A. Gwynn Henderson, pp. 72-80. Archaeological Report No. 289, Program for Cultural Resource Assessment, University of Kentucky, Lexington.

1993b Botanical Remains from the Dreaming Creek Site (15Ma97), Madison County, Kentucky. Report submitted to Wilbur Smith Associates, Lexington, Kentucky.

1994 The Archaeobotanical Record of the Late Mississippian Caborn-Welborn Culture. Paper presented at 54th annual meeting of the Southeastern Archaeological Conference, Lexington, Kentucky.

2000a Archaic Plant Utilization at the Hedden Site, McCracken County, Kentucky. In *Current Archaeological Research in Kentucky, Volume Six*, edited by David Pollack and Kristen J. Gremillion. Kentucky Heritage Council, Frankfort.

2000b Botanical Remains from the Dry Branch Creek Site (15Me62), a Fort Ancient Village in

Mercer County, Kentucky. Report submitted to Wilbur Smith Associates, Lexington, Kentucky.

n.d.a. Archaeobotanical Remains from the Capitol View Site (15FR101), Franklin County, Kentucky. Report submitted to the Program for Cultural Resource Assessment, University of Kentucky, Lexington.

Rossen, Jack and Tom D. Dillehay
1997 Modeling Ancient Plant Procurement and Use at Monte Verde (1st author, with Tom D. Dillehay). In *Monte Verde: A Late Pleistocene Settlement in Chile, Volume 2*, edited by Tom D. Dillehay, pp. 331-350. Smithsonian Institution Press, Washington.

Rossen, Jack and Richard Edging
1987 East Meets West: Patterns in Kentucky Late Prehistoric Subsistence. In *Current Archaeological Research in Kentucky, Volume One*, edited by David Pollack, pp. 225-238. Kentucky Heritage Council, Frankfort.

Rossen, Jack and Rebecca Hawkins
1995 The Plant Subsistence Tradition of A.D. 1000: The View from Boone County, Kentucky. Paper presented at the 12th Annual Kentucky Heritage Council Archaeological Conference. Richmond, Kentucky.

Rossen, Jack and James Olson
1985 The Controlled Carbonization and Archaeological Analysis of Southeastern U.S. Wood Charcoals. *Journal of Field Archaeology* 12:445-456.

Rossen, Jack and Carlos Ramirez
1997 Observations of the Present-Day (1983) Economic Plants in the Monte Verde Area and their Archaeological Implication. In, *Monte Verde: A Late Pleistocene Settlement in Chile, Volume 2*, edited by Tom D. Dillehay, pp. 307-329. Smithsonian Institution Press, Washington.

Rothschild, Nan A.
1979 Mortuary Behavior and Social Organization at Indian Knoll and Dickson Mounds. *American Antiquity* 44: 658-675.

Sanders, Thomas Nolan
1990 *Adams: The Manufacturing of Flaked Stone Tools at a Paleoindian Site in Western Kentucky*. Monographs in Archaeology. Persimmon Press, Buffalo.

Sassaman, Kenneth
1995 The Social Contradictions of Traditional and Innovative Cooking Technologies in the Prehistoric American Southeast. In,*The Emergence of Pottery: Technology and Innovation in Ancient Societies*, edited by W. Barnett and J. Hoopes, pp. 223-240. Smithsonian Institution Press, Washington, D.C.

1996 Early Archaic Settlement in the South Carolina Coastal Plain.. In, *The Paleoindian and Early Archaic Southeast*, edited by David G. Anderson and Kenneth E. Sassaman, pp. 58-83. University of Alabama Press, Tuscaloosa.

Schenian, Pamela A.
1992 *An Archaeological Reconnaissance of the Proposed 50 Acre Coal Mining Permit 913-0010*

Near Sturgis, Union County, Kentucky. Archaeological Service Center, Murray State University, Murray, Kentucky.

Scott, E.
1979 Dental Wear Scoring Technique. *American Journal of Physical Anthropology* 51:213-218.

Smith, Bruce D.
1978 Variation in Mississippian Settlement Patterns. In *Mississippian Settlement Patterns*, edited by Bruce D. Smith, pp. 479-502. Academic Press, New York.

1987 The Independent Domestication of Indigenous Seedbearing Plants in Eastern North America. In *Emergent Horticultural Economies of the Eastern Woodlands*, edited by William F. Keegan, pp. 3-47. Occasional Paper No. 7. Center for Archaeological Investigations, Southern Illinois University, Carbondale.

Smith, Samuel D.
1983 Excavation of a Mid-Nineteenth Century Trash Pit, Wynnewood State Historic Site, Sumner County, Tennessee. *Tennessee Anthropologist.* 8(2):133-181.

Smith, H. B.
1984 Patterns of Molar Wear in Hunter-gatherers and Agriculturalist. *American Journal of Physical Anthropology* 63:39-56.

South, Stanley
1977 *Method and Theory in Historical Archaeology*. Academic Press, New York.

Stafford, C. Russell
1991 Archaic Period Logistical Foraging Strategies in West-Central Illinois. *Midcontinental Journal of Archaeology* 16:212-246.

Stallings, Richard, and Nancy Ross-Stallings
1995a *A Phase I Survey of a Section of the US 60 Morganfield Bypass and Phase II Testing of 15Un175 and 15Un176, Morganfield, Union County, Kentucky*. Report No. 94-23. Cultural Horizons, Inc., Harrodsburg, Kentucky.

1995b *Analysis of the Lithic Material from the Hedden Site (15McC81), McCracken County, Kentucky*. Contract Publication Series 95-60. Cultural Resource Analysts, Inc., Lexington, Kentucky.

Struever, Stuart, and Kent D. Vickery
1973 The Beginnings of Cultivation in the Midwest Riverine Rise of the United States. *American Anthropologist* 75:1197-1220.

Stone, Doris
1984 *Precolumbian Plant Migration*. Papers of the Peabody Museum of Archaeology and Ethnology, Volume 76. Harvard University Press, Cambridge.

Styles, Bonnie W.
1981 *Faunal Exploitation and Resource Selection: Early/Late Woodland Subsistence in the Lower Illinois Valley*. Northwestern University Archaeological Program, Evanston, Illinois.

Sussenbach, Tom

1992 *Archaeological Investigations at the Proposed Scott Paper Plant in Daviess County, Kentucky*. Archaeological Report No. 238. Program for Cultural Resource Assessment, University of Kentucky, Lexington, Kentucky.

Sussenbach, Tom, and R. Barry Lewis
1987 *Archaeological Investigations in Carlisle, Hickman, and Fulton Counties, Kentucky: Site Survey and Excavations*. Western Kentucky Project Report No. 4. Department of Anthropology, University of Illinois, Urbana.

Swanton, John R.
1946 *The Indians of the Southeastern United States.* Bulletin 137. Bureau of American Ethnology, Washington, D.C.

Tankersley, Kenneth B.
1996 Paleoindian Period. In *Kentucky Archaeology*, edited by R. Barry Lewis, pp. 21-38. The University Press of Kentucky, Lexington.

Todd, T. W.
1920 Age Changes in the Pubic Bone, The Male White Pubis. *American Journal of Physical Anthropology* 3: 285-334.

Trotter, M.
1970 Estimation of Stature from Intact Long Bone Limbs. In, *Personal Identification in Mass Disasters*, edited by T. D. Stewart, pp. 71-83. National Museum of Natural History, Washington, D.C.

Turnbow, Christopher, and W. G. Gerard
1975 *Archaeological Testing of Five Sites in Union County Kentucky for the Texas Gas Transmission Corporation*. University of Kentucky, Lexington.

U.S. Department of Agriculture
1948 *Woody Plant and Seed Manual*. Miscellaneous Publication No. 654, Washington, D.C.

Vogel, Virgil J.
1982 *American Indian Medicine*. University of Oklahoma Press, Norman.

Wagner, Gail E.
1979 The Green River Archaic: A Botanical Reconstruction. Paper presented at the 39th annual meeting of the Southeastern Archaeological Conference, Atlanta.

Walker, Eugene H.
1957 The Deep Channel and Alluvial Deposits of the Ohio Valley in Kentucky. Geological Survey Water-Supply. Paper 1411, U.S. Deparment of the Interior, Washington.

Watson, Patty Jo
1969 *The Prehistory of Salts Cave, Kentucky*. Report of Investigation No. 16. Illinois State Museum, Springfield.

1985 The Impact of Early Horticulture in the Upland Drainages of the Midwest and Midsouth. In *Prehistoric Food Production in North America*, edited by Richard I. Ford, pp. 99-147. Anthropological Papers No. 75. Museum of Anthropology, University of Michigan, Ann Arbor.

1989 Early Plant Cultivation in the Eastern Woodlands of North America. In *Foraging and Farming: The Evolution of Plant Exploitation*, edited by David R. Harris and Gordon C. Hillman, pp. 555-571. One World Archaeology, Vol. 13. Unwin-Hyman, London.

Webb, Paul A.
1984 Archaeological Survey of the Peabody Coal Company Camp II Airshaft and Air/Manshaft Tracts, Union County, Kentucky. Center for Archaeological Investigations, Southern Illinois University, Carbondale.

Webb, William S.
1946 *Indian Knoll, Site Oh 2, Ohio County, Kentucky*. Reports in Anthropology and Archaeology 4(3), Part 1:113-365. University of Kentucky, Lexington.

1950 *The Carlson Annis Mound, Site 5, Butler County Kentucky*. Reports in Anthropology and Archaeology 7:267-354. University of Kentucky, Lexington.

1952 The Jonathan Creek Village. Reports in Anthropology and Archaeology 8:1. University of Kentucky, Lexington.

Webb, William S., and William D. Funkhouser
1932 *Archaeological Survey of Kentucky*. Reports in Anthropology and Archaeology 2. University of Kentucky, Lexington.

Webb, William S., and William G. Haag
1939 *The Chiggerville Site, Site 1, Ohio County, Kentucky*. Reports in Anthropology and Archaeology 4(1):1-62. University of Kentucky, Lexington.

Wendland, W. M.
1978 Holocene Man in North America: The Ecological Setting and Climatic Background. *Plains Anthropologist* 23:273:287.

Wendland, W. M., and R. A. Bryson
1974 Dating Climatic Episodes of the Holocene. *Quaternary Research* 4(1):9-24.

Whittaker, John C.
1994 *Flintknapping: Making and Understanding Stone Tools*. University of Texas Press, Austin.

Winters, Howard D.
1968 Value Systems and Trade Cycles of the Late Archaic in the Midwest. In, *New Perspectives in Archaeology*, edited by Sally R. Binford and Lewis R. Binford, pp. 175-221. Aldine, Chicago.

Wright, Jr., H. E.
1992 Patterns of Holocene Climatic Change in the Midwestern United States. *Quaternary Research* 38: 129-134.

Yarnell, Richard A.
1978 Domestication of Sunflower and Sumpweed in Eastern North America. In, *The Nature and Status of Ethnobotany*, edited by Richard I. Ford, pp. 289-299. Anthropological papers No. 67. Museum of Anthropology, University of Michigan, Ann Arbor.

1969 Contents of Paleofeces. In, *The Prehistory of Salts Cave, Kentucky*, edited by Patty Jo Watson, pp. 41-54. Reports of Investigation No. 16. Illinois State Museum, Springfield.