EASTERN AGRICULTURAL COMPLEX TRADITIONS IN SMALL FORT ANCIENT COMMUNITIES—THE WILDCAT EXAMPLE

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By

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ABSTRACT

This archaeobotanical investigation tests a hypothesis associated with Fort Ancient subsistence activities and settlement attributes. I compare small Middle Fort Ancient (1200-1400 CE) communities in the Great Miami River Valley of western Ohio to larger, more centralized Middle Fort Ancient settlements, using the Wildcat (33MY499) and SunWatch (formerly Incinerator, 33MY57) villages as case examples. I hypothesize that small communities had less incentive to focus on maize agriculture than large villages and would therefore favor stable indigenous traditions. This hypothesis relies on the assumption that village size, permanence of occupations, and landscape location can all affect any given group's access to plant taxa, food preferences, or environmental impacts. Differences in these settlement attributes contribute to the apparent persistence of Eastern Agricultural Complex plants at Wildcat, which runs counter to the conventional belief that this Woodland suite of cultigens largely disappears from the archaeological record in favor of maize agriculture after about 1000 CE.

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CHAPTER 1

INTRODUCTION

My investigation contrasts Eastern Agricultural Complex (EAC) traditions at small communities with the maize agriculture characteristic of larger, more centralized villages in the Great Miami River Valley of southwestern Ohio during the Late Prehistoric period. I compare aggregate paleoethnobotanical data between two Middle Fort Ancient (1200-1400 CE) villages in Montgomery County, Ohio, the Wildcat (33MY499) and SunWatch (formerly Incinerator) (33MY57) sites. These data contribute to the current body of knowledge regarding Fort Ancient subsistence and provide an example counter to the conventional belief that Eastern Agricultural Complex plants, which are native to North America, largely disappear from the archaeological record after about 1000 CE, when maize achieved a central economic role.

Important settlement attributes that can affect access to plant resources, food preferences, or environmental impacts include village size, permanence of occupations, and position in the landscape. The goal of this research is to test the hypothesis that small Fort Ancient communities had less incentive to focus on maize agriculture than conventionally-held due to the impact of these settlement attributes on communities' subsistence strategies. I made the following three predictions to test this hypothesis.

1. If small communities had less incentive to focus on maize agriculture due to lower population densities, differential access to maize, or greater availability of wild game and plant resources, then EAC plants will be present in a higher proportions (to food taxa) at the Wildcat site than at SunWatch, indicating a persistence of older Woodland subsistence traditions at the smaller, more remote site.
2. If small communities were largely self-sufficient (Nass 1987:37), then Wildcat feature contexts will show evidence of year-round occupation, rather than evidence of short-term occupation associated with seasonal hunting and gathering activities.
3. If small communities had lower population densities and significantly less environmental impact than large villages, then an analysis of wood charcoal from Wildcat will indicate lower diversity of exploited trees than at comparable excavation contexts from SunWatch due to a lesser degree of resource exhaustion near the smaller settlement and greater ability to selectively exploit resources (Gremillion, et al. 2008).

1.1 Case Sites

The data used for this project is derived primarily from the archaeobotanical macroremains of the Wildcat site (33MY499), a small Fort Ancient settlement excavated

Figure 1.1. 2008 Google Maps satellite image of the Wildcat site (available online).

under the supervision of Robert A. Cook of The Ohio State University (OSU) during the summers of 2007 and 2008 (see Field Sampling below). Wildcat is located near the town of Huber Heights, Ohio in an isolated area approximately 200 m from unnamed minor tributary of the Great Miami, about 1.6 km from the river. The site sits on a small rise in a former agricultural field, adjacent to a narrow floodplain of the tributary, with a small spring in the southwest corner of the field (Figure 1.1). The rise is in a glacial till area with irregular, rolling hills. Soils in the immediate vicinity of the Wildcat structures are

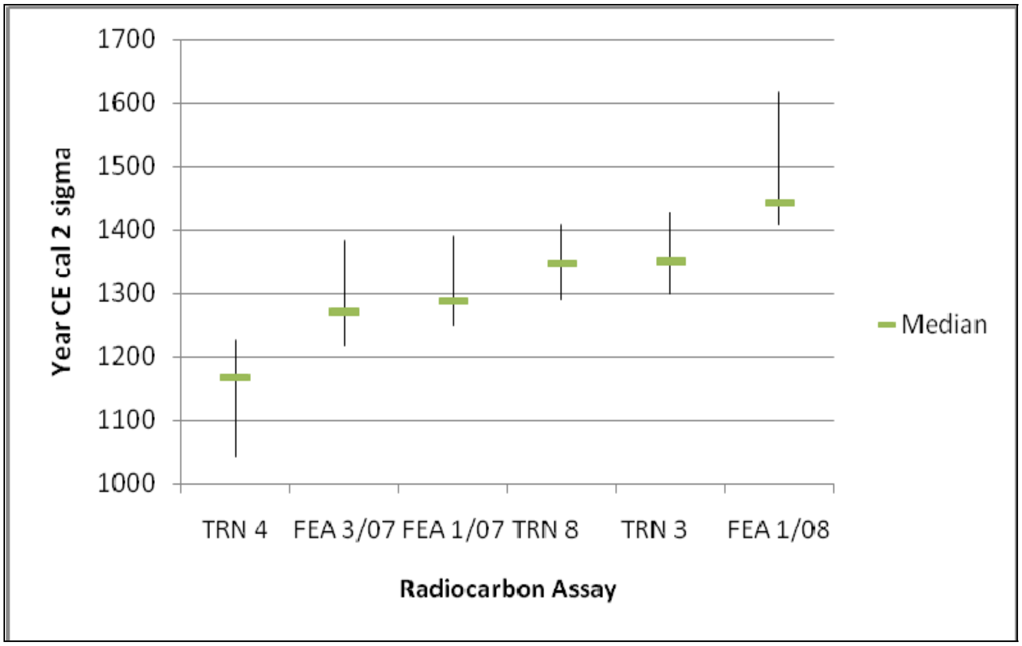


Figure 1.2. AMS radiometric dates from Wildcat, two sigma calibration (adapted from Cook 2008a). The abbreviation TRN designates trenches, FEA designates features, and the feature number includes the year of excavation after the slash.

moderately-well to well-drained and loamy and would have supported small garden plots within the village (NRCS Soil Survey Staff 2008).

Cement material quarry sites and regenerating secondary forest bound the location to the north; modern highway and commercial developments form the south and east boundary of the field. From the habitation location, the topography gradually rises to a broad crest to the east, now the site of a shopping mall.

Six radiocarbon assays were run on charcoal recovered from features 1/07, 3/07,

Sample	Conventional C14 age	Range No.	2 sigma Range	Relative Probability	Median Probable Date
FEA 1/07 (shallow basin)	700±40 BP	1	1229-1231 CE 721-719 BP	0.004	1289 CE 661 BP
		2	1240-1247 CE 710-703 BP	0.009	
		3	1251-1321 CE 699-629 BP	0.716	
		4	1349-1391 CE 601-599 BP	0.271	
FEA 1/08 (large post hole)	450±40 BP	1	1407-1513 CE 543-437 BP	0.964	1444 CE 506 BP
		2	1601-1616 CE 349-334 BP	0.036	
FEA 3/07 (bell-shaped pit)	730±40 BP	1	1218-1303 CE 732-647 BP	0.937	1272 CE
		2	1365-1383 CE 585-567 BP	0.063	
TRN 3	570±40 BP	1	1299-1370 CE 651-580 BP	0.6	1352 CE
		2	1380-1429 CE 570-521 BP	0.4	
TRN 4	870±40 BP	1	1043-1106 CE 907-844 BP	0.246	1169 CE
		2	1118-1255 CE 832-695 BP	0.754	
TRN 8	610±40 BP	1	1291-1408 CE 659-542 BP	1	1348 CE

Table 1.1. Accelerator mass spectrometry (AMS) radiocarbon assay data, cal 2 sigma (adapted from Cook 2008a).

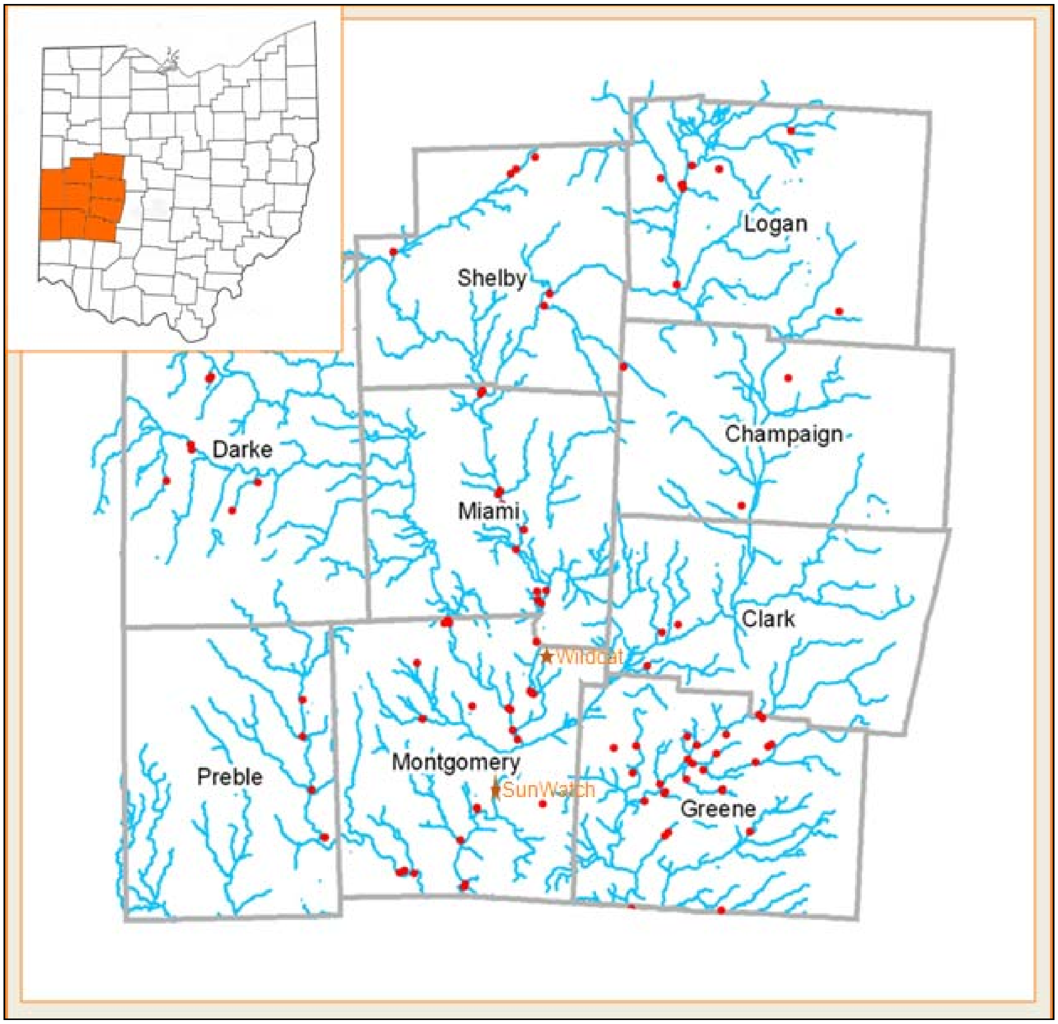


Figure 1.3. Miami River Valley of southwestern Ohio, showing SunWatch and Wildcat (Montgomery County) in relation to other Late Prehistoric site locations (adapted from Cook 2009).

and 1/08 and trench contexts (3, 4, and 8) at Wildcat during the 2007 and 2008 summer field seasons (Figure 1.2). Relative probabilities for each are presented in Table 1.1. All dates were calibrated by Beta Analytic Inc. using INTCAL98 Radiocarbon Age Calibration (Stuiver 1998) and cubic spline fit mathematics (Talma 1993). The calibrated dates indicate that this occupation range is roughly contemporary with one of the main occupations of SunWatch (Cook 2007:457; Wagner 2008:277). An isolated post (Feature 1/08) on the plain that extends west toward the unnamed creek that bounds the property differs from those observed in the habitation area by its significantly larger diameter, greater depth, and later median radiocarbon date of 1444 (Cook2008a) (see T.1, Figure 2.2).

SunWatch is one of the most completely studied Fort Ancient villages in terms of total excavated area (Cook 2007; Nass 1987; Wagner 2008). The site is located approximately 220 m above sea level on a 1-km wide floodplain of the Great Miami River near Dayton, approximately 24 km to the southwest of Wildcat (Figure 1.3). SunWatch defines the typical large Fort Ancient circular village in terms of size, measuring about 130 meters in diameter, with a 60-meter diameter central plaza (Henderson and Pollack 2001). The plaza alone exceeds the entire Wildcat site landform in size.

Cook (2007:458) argues that although SunWatch has been interpreted as a relatively short-duration site (occupied for 15 to 20 years), radiocarbon dates indicate multiple occupations over a 500-year period between 1000 and 1500 CE. He uses several lines of evidence (e.g., storage pit morphology and seasonality, spatial distributions of diagnostic artifacts and features, the arrangement of structures and intensity of rebuilding episodes, and temporal distributions of radiocarbon assays) to hypothesize that SunWatch represents either a single, 10- to 30-year occupation (in line with earlier interpretations) between the late 1200s and early 1300s CE, or more likely two 5- to 10-year occupations (Cook 2007:457).

The first of two shorter duration occupations would have occurred in the late 1100s and consisted of a smaller population (about half of the final village estimate) lacking evidence of Mississippian interaction. The second would have occurred in the mid- to late 1300s, showing clear indication of interaction with Mississippian groups (i.e., wall-trench house construction, similarity to Mississippian village plans, and appearance of negative-painted, shell-tempered ceramics). Cook (2007:458) makes the case that "reoccupation, Mississippian influence, and the joining of smaller groups to Fort Ancient villages is undoubtedly part of a much larger pattern."

My comparative data come from Gail Wagner's (1987) dissertation research on SunWatch as part of a regional summary of Fort Ancient plant use and her recently-published (2008) study on SunWatch seasonal diet as a Fort Ancient coping mechanism for environmental stress. This research comes from an examination of 39 underground storage/refuse pits that can be attributed to a season of deposition based on analyses of their faunal remains (Wagner 2008:278). The aggregated nature of the available

SunWatch data limited the comparisons I could make between the two sites to feature contexts.

Additional supporting data come from the Late Fort Ancient Goolman (15CK146) and Driving Range (33HA586) sites. Turnbow and Jobe (1984) characterize Goolman, located in Clark County, Kentucky, as a Madisonville phase (1400 to 1645 CE) winter camp inhabited by a small group such as an extended family or lineage. They note that the artifact assemblage largely consists of hunting and butchering implements. Purtil (1999) focuses on the Late Fort Ancient (post-1400 CE) occupation of the multicomponent Driving Range site, which is located in southwestern Ohio on a low terrace overlooking the Little Miami River floodplain. He interprets the remains as representing a late fall through early winter occupation.

Although these sites involve later occupations than Wildcat, they serve as good examples of late fall/winter procurement locations. Seasonal settlement patterns are rarely examined sufficiently in the archaeological record; researchers too often assume that any small site represents a seasonal camp. The existence of Middle Fort Ancient seasonal satellite settlements are inferred from evidence at large villages such as SunWatch; however, the record of the period lacks data for such sites (Henderson and Pollack 2001). Due to the unavailability of Middle Fort Ancient seasonal settlements, I used the archaeobotanical material totals from Goolman and the Driving Range site as proxies in an aggregate correspondence analysis with SunWatch and Wildcat to test my hypothesis that Wildcat is not a seasonal camp location.

1.2 Temporal Background

Temporal period designations in archaeology are, as Scarry (2008) says, "largely heuristic chronological divisions [that] also chart broad changes in material culture as well as other aspects of native lifeways." The Eastern Woodlands were peopled by the end of the last glaciation circa 10,000 BCE. The first wide-spread occupation took place during the early Paleoindian period at approximately 9500 to 9000 BCE, when small, highly mobile groups using Clovis technology adapted to rapidly-changing environmental conditions during the late Pleistocene or Pleistocene/Holocene transition (Tankersley 1996). Rapidly warming temperatures, coupled with decreases in cloud cover and generalized landscape instability, marked the beginning of the Holocene age, circa 9050-8050 BCE (Delcourt 1979; Webb and Bryson 1972). Estimated temperatures increased during this period by three times as much as later Holocene fluctuations (Webb and Bryson 1972).

The Archaic period encompassed roughly 7,000 years of the Holocene Epoch and witnessed gradual developments and changes in the technological and socio-cultural dimensions of indigenous hunter-gatherer cultures in response to increasingly modern environmental conditions. Changes in adaptive strategies, such as intensified use of estuarine and floodplain resources, resulted in larger and more intensively occupied sites in some areas than during the preceding periods as Archaic peoples diversified to a broad-spectrum resource base (Binford 1968; Flannery 1969). In many areas, the data suggest collector strategies had developed by Middle (circa 6000 to 3500 BCE) and/or Late Archaic (circa 3500 to 1000 BCE) times (Binford 1980).

Binford (1980) subdivides hunter-gatherers into forager and collector classes based on mobility and food storage practices. Binford's foragers move as a social group from patch to patch as they deplete resources, rather than storing food. Collectors rely on specialized, task-oriented groups to procure resources and return them to a central place, depending on stored foods for subsistence through (at least) part of the year (Binford 1980). These specialized task groups act in response to heterogenous spatial (across the landscape) and temporal (seasonal availability) resources—each independent aspects of the environment (Bamforth 1988).

The definition of the Archaic for parts of the Eastern Woodlands has been modified over the past couple of decades to include many of the variables (e.g., horticulture, pottery, and mound construction) traditionally used to define the Woodland period.

The Woodland period (1000 BCE to 1000 CE) continued and expanded on the developments of the preceding Archaic period. Populations continued to rise, associated with increased sedentism. Three major additions define the Woodland period: fired clay ceramics, the bow and arrow, and increased reliance on horticulture. Horticultural activities were conducted primarily within stream bottoms, although some cultivation along ridges is also considered possible (Gremillion 1994; Ison 1988). Charred Eastern Agricultural Complex (EAC) seeds and fruits appear in Middle Woodland (circa 1 to 500

CE) refuse with hickory, walnut, acorn, and hazelnut nuts remains and the seeds of fleshy fruits and weeds. Hunting strategies focused on white-tailed deer and wild turkey, supplemented by fish, waterfowl, and mollusks in some areas (Essenpreis 1982; Henderson and Pollack 2001:180).

By 500 BCE, small-scale agricultural economies of the Midwest were based on the suite of cultigens (some domesticated) known as the EAC (Asch and Asch 1985). This suite includes weedy greens (e.g., goosegrass and pigweed), starchy seed cultigens (e.g., maygrass, goosegrass, erect knotweed, and little barley), and oily seed cultigens (e.g., sunflower and sumpweed). Squash, sumpweed, and sunflower have a long history of cultivation in prehistoric North America and are typically included in the suite. Asch and Asch (1985) report thin, wild pepo gourd (*Cucurbita pepo* ssp. *ovifera*) rind in Illinois as early as 5000 BCE. A thin, hard-rind gourd or squash (*Cucurbita pepo* ssp. *ovifera*) with oily seeds was domesticated by 2500 BCE (Scarry 2008). Gourd/squash with edible, thick, fleshy rinds were cultivated later and may have served as an important source of nutrients during much of the Woodland through Late Prehistoric periods.

Sumpweed and sunflower belong to the Asteraceae family and have similar color, texture, and high oil content. Both are excellent sources of fat and protein. In west-central Illinois, wild sumpweed (*Iva annua*) use increases by the end of the Middle Archaic (circa 3000 BCE) and shows morphological indications of cultivation (increased achene size) by 2000 BCE (Asch and Asch 1985; Fritz 1990). Sunflower (*Helianthus annuus*) has likewise been cultivated since at least 2000 BCE, and achenes have increased in size over the past 3000 years (Yarnell 1978). Both wild and cultigens forms thrive in disturbed habitats.

Chenopod (*Chenopodium berlandieri*) seeds also appear in archaeological contexts by 2000 BCE and are presumed domesticated (based on changes in seed shape and surface texture) by around 1000-1500 BCE (Fritz 1990; Scarry 2008). Chenopod and knotweed (*Polygonum erectum*) produce small starchy seeds that are high in plant proteins. Clear morphological correlates of domestication have yet to be established for seeds from maygrass (*Phalaris caroliniana*), little barley (*Hordeum pusillum*), or (pre-Mississippian) erect knotweed, although these species repeatedly occur in association with seeds of domesticates or, in the case of maygrass and little barley, archaeologically occur in geographic zones outside the modern range (Fritz 1990; Scarry 2008). It is generally assumed that these were cultivated, probably as early as 2000 BCE (Scarry 2008).

The "three sisters," maize, beans, and squash (including introduced pumpkin and cushaw squashes after 1000 CE) formed a suite of cultigens introduced from Mexico that eventually superseded indigenous crops in dietary importance. Although maize was present in the Eastern Woodlands in limited quantities by the beginning of the Middle Woodland period, it took anywhere from several centuries to nearly a millennium to reach dietary prominence in any given locality. Beans were the last of the introduced taxa to be adopted, reaching the Eastern Woodlands around 1200 CE (Scarry 2008).

The Fort Ancient cultural designation refers to Upper Mississippian societies in the Ohio Valley region of southern Ohio, western West Virginia, eastern Kentucky, and southeastern Indiana (Griffin 1937; Schroeder 2004:311-312; Wagner 1987:3). Villages are the largest known social unit for Fort Ancient communities. The development of villages by 1200 CE likely represents an aggregation of small kin-based groups who organized for defense, food procurement, and storage of foods to offset periods of seasonal stress. Such communities often consisted of a politically and ritually integrated group (Nass 1987:6).

The environment that is now Montgomery County experiences marked seasonal differences due to the region's continental climate. (Chapter 3.5 presents a discussion of other environmental factors, such as soils and forest composition.) Such differences created a need for food storage strategies to minimize starvation risk during the non-productive period between Winter and Spring (Johnson and Earle 2000:53, 94). Seasonal stress (e.g., times of food shortage, such as winter or periods of drought) or internal disputes within a community could lead to fragmentation into new temporary or permanent settlements (Johnson and Earle 2000; Nass 1987).

Researchers have traditionally viewed Fort Ancient groups as participants in Fitting and Cleland's (1969) Miami-Potawatomi settlement pattern. O'Gorman (2007:373) notes that although they "were disturbed by a lack of fit" between their ethnohistoric inferences about western Great Lakes Native American groups and the archaeological record, this pattern has become the predominant model archaeologists and ethnohistorians use to understand these groups during the late Prehistoric period.

The Miami-Potawatomi pattern reflects a semi-permanent lifestyle where people occupied large, permanent villages during the summer and temporary hunting camps in the winter. Wagner (2008) assumes that SunWatch represents a single, short-duration occupation that engaged in such a seasonal subsistence strategy. However, Cook (2007) makes the case that while the first, late twelfth-century occupation fits this settlement pattern, the second, late fourteenth-century occupation shows evidence for year-round habitation of the site. He interprets this as a trend toward more permanent settlements.

Over time, formerly independent social groups become less mobile and began to integrate under a more complex, asymmetrical (although not necessarily hierarchical) settlement system in which more peripheral communities may have had less access to premium foods or trade goods (Cook 2008b:10). Pollack and Henderson (1992) proposed that Fort Ancient social groups developed from family level groups in the Early period, to "acephalous local groups" consisting of settlements divided into clan/lineage segments (Johnson and Earle 2000:20) during the Middle period, to a Big Man pattern of community-wide leadership based on participation in a prestige-goods economy during the Late Fort Ancient Madisonville Horizon (Drooker 1996). Since the maintenance of relationships between nearby communities would have been essential for security, small autonomous villages may have come together for ceremonial or exchange purposes at a central location to ease social tensions (Bush 2001:295-297; Cook 2004:92; Johnson and Earle 2000:33). If Fort Ancient peoples interacted with or shared cultural history with Lower Mississippian groups, ceremonial aggregations would likely

Season	Resources
Late Fall/Winter	large mammals, primarily deer; collection of nut mast --minimal marine resources
Early Spring	spawning fish --importance of large mammals decreases
Summer/Early Fall	agricultural activities and production, corn wide variety animals --annual low of large animal exploitation

Table 1.2. Fort Ancient seasonal focal resources.

have been similar to the busk or Green Corn ritual of the Mississippian Southeastern Ceremonial Complex (Essenpreis 1982:239; Heilman and Hoefer 1980). Ethnohistoric accounts document such ritual celebrations among various Eastern Woodlands tribes, which continue in Cherokee, Creek, and Seminole practices today.

Fort Ancient groups practiced a focal economy adapted to their environment—subsistence focused on a relatively small selection of abundant plant and animal foods, mainly northern flint corn, beans, curcurbits (squash and pumpkin), sunflower, deer, and fish protein (Cleland 1966; Essenpreis 1982; Nass 1987:57-58; Wagner 2008:278). Cowen et al. (1990) summarize the Fort Ancient subsistence base as seasonal resource exploitation (Table 1.2), with the level of exploitation tied to availability, or density-dependant encounter rates. Summer stood as the height of agricultural activities and most researchers assume production centered on maize. Large mammals reached an annual low, as a wider variety of animal species, including fish, were exploited during a time of resource abundance through early fall. Summer resources were often located near the agricultural village.

Maize was introduced to the Eastern Woodlands sometime before 1 CE from Mesoamerica, but did not make a significant dietary contribution until 800-1000 CE (Gremillion 1996; Riley et al. 1994). Based on excavations conducted at large Fort Ancient villages, the traditional argument is that maize replaces EAC by 1000 CE, although sunflower and chenopod were still used by Mississippian groups in the Midwest (Smith 1992). Fort Ancient farmers continued limited productive use of EAC plants; however, the use of such non-maize plants declined over time and largely ceased by the Late Mississippian and Middle Fort Ancient periods (Bush 2001:173; Wagner 1987:1-2).

However, EAC crops represented stable, long-term adaptations to resource-rich settings (Smith and Yarnell 2009). I argue that the EAC tradition persisted at small, permanent communities such as Wildcat, where native cultigens and wild resources served as viable subsistence alternatives to intensive maize agriculture. The decision to favor native plants could have resulted from: (1) environmental constraints such as availability of suitable land for cultivation; (2) opportunity costs related to mast harvesting, cultivation of native crops, hunting, and adequate storage of other foods (related to self-sufficiency); (4) reduced costs by access to maize through exchange; and (5) lower population size (related to environmental impact).

CHAPTER 2

STUDY DESIGN, MATERIALS, AND METHODS

Excavations at the Wildcat site were intended to build up the currently impoverished body of knowledge concerning small Middle Fort Ancient sites and to ground truth magnetic resistivity (a non-destructive survey technique) plots to assess their utility for future field research. My goal was to compare the plant-based portion of the subsistence economy between (1) a small, relatively-remote (in terms of being more than a mile away from a major river or tributary) and presumed permanent settlement, (2) a large village, and (3) two known seasonal procurement camps to assess how differences in settlement size, permanence of occupation, and landscape position would manifest in the archaeobotanical record.

Plant remains encountered on archaeological sites often result directly from economic activities, such as practices related to the production and consumption of foods and medicines and the manufacture of plant-based items ranging from tools and goods to shelters. However, not every activity involving plants will leave a record of its occurrence or use. Preservation depends on the plant or plant part's physical characteristics, the cause of charring, and/or the site inhabitants' frequency and method of use and means of disposal (Asch and Asch 1975:116; Lennstrom and Hastorf 1995; Wagner 1988). Many economically-important plants may leave little to no trace in the archaeological record, such as fleshy fruits, roots, and tubers that tend to be well digested after consumption and do not often become charred. The economic importance of those plants that tend to become charred during processing (e.g., parching or cooking) and leave traces in the archaeological record can sometimes be overstated as a result.

Sampling biases between Wildcat and SunWatch, in terms of the focus on feature contexts and the use of standardized laboratory techniques, are similar enough to allow inferences about plant populations associated with the prehistoric environment and Fort Ancient activities. The bias should have a similar effect on each site (Drennan 1996:90). I assume, based on evidence of similar environmental and cultural contexts, that preservation conditions and prehistoric plant usage are similar enough to compare the data between the two sites. Although Wildcat sits on a lowslope area of rolling glacial deposits (ground moraine) and SunWatch sits on a broad river terrace, both sites have well-drained, deep soils (greater than two meters above the water table) with no flooding or ponding during the year (NRCS Soil Survey Staff 2008). Similar concentrations of calcium carbonate in the soil should regulate pH levels and result in similar chance of preservation of organic materials. Detailed soil data are presented in Chapter 3, tables 3.10 and 3.11. Similarities in cultural materials and site assemblages suggest that the inhabitants of both sites shared cultural patterns and would therefore likely process available plant remains in similar ways.

2.1 Field Sampling

This is an observational study of botanical macroremains obtained from archaeological pit features (i.e., storage pits and trash basins), hearth, and structural post contexts at Wildcat and SunWatch. Soil flotation samples from which the preserved plant remains were recovered consist of convenience samples from features identified during the course of partial field excavations at the two sites. Most statistical analyses require the assumption that the samples are random, yet most archaeological data come from non-random sampling procedures (Drennan 1996:89). Convenience samples inherently contain bias and therefore a higher degree of error risk in their inferences than random samples; this is especially true of archaeobotanical data because the target population is seldom available for study due to differential preservation of plant tissues and, in archaeology in general, due to both preservation issues and the prohibitive costs of intensive excavation (Bush 2001:233; Drennan 1996:94; Shewhart (1986)). Even random samples will not technically be certain to accurately reflect the parent population unless a complete census of data is achieved. However, inferences made from non-random samples may be considered reliable when selection bias does not affect the inferences being made.

At the Wildcat site, Cook chose ten areas to be stripped of plowzone based on a magnetic resistivity survey map of soil anomalies with patterns considered to likely

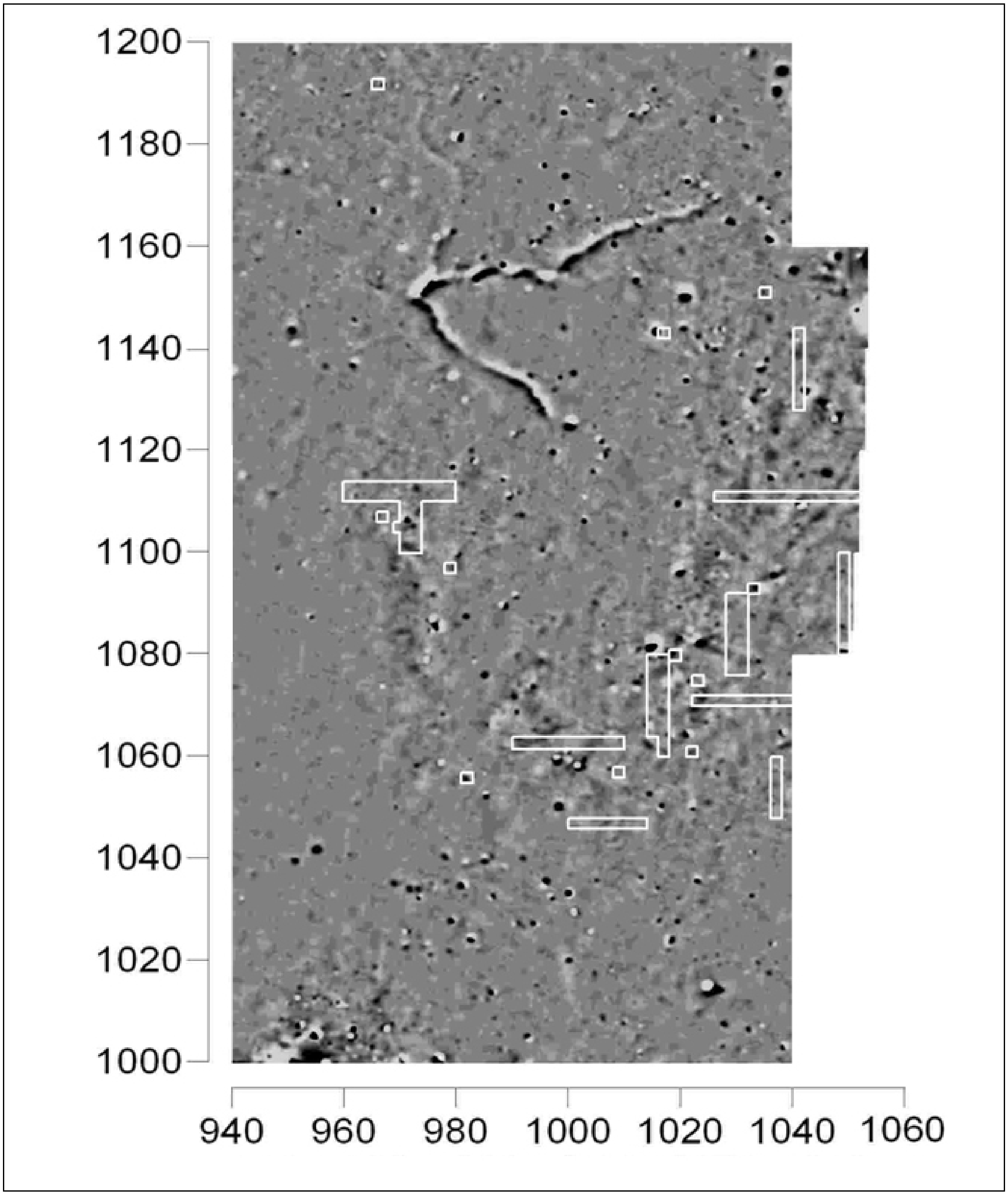


Figure 2.1. Magnetic resistivity survey map of soil anomalies and excavated areas at Wildcat (adapted from Cook 2009).

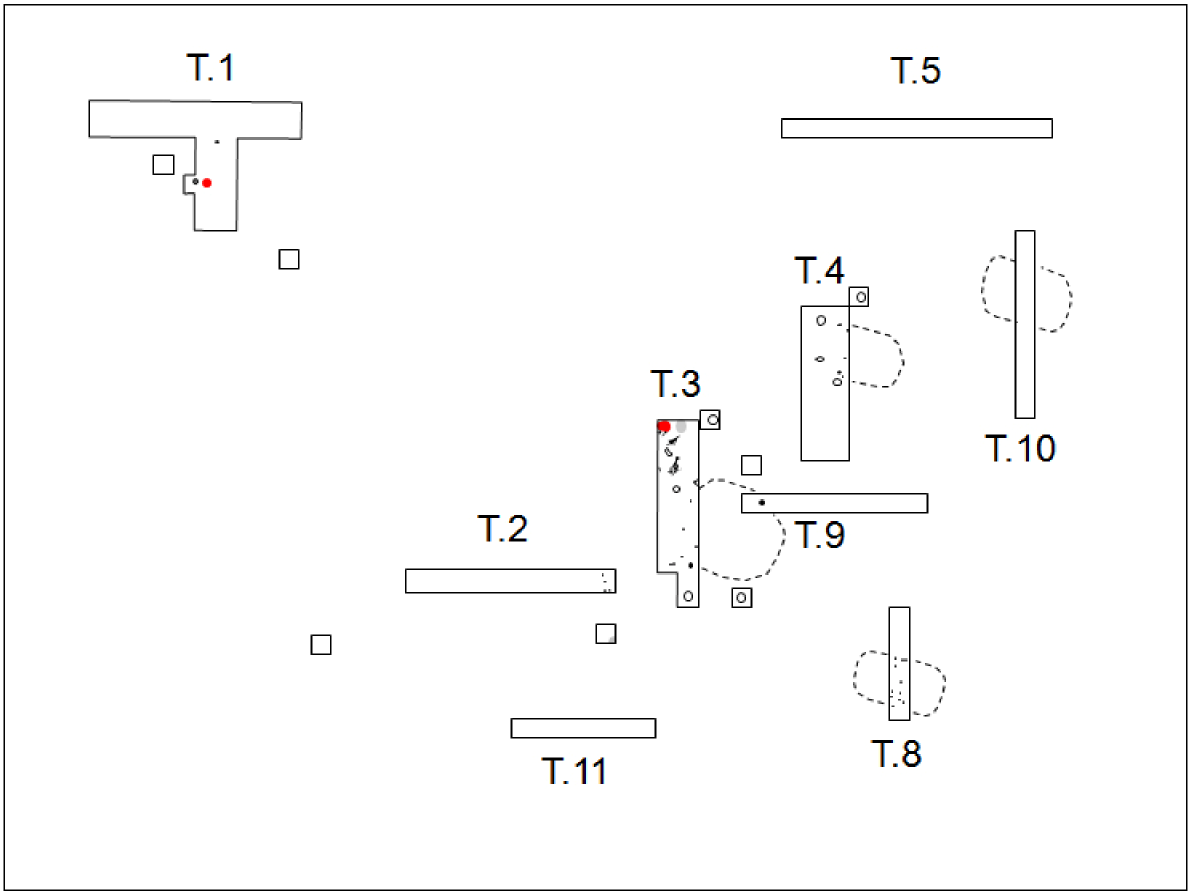


Figure 2.2. Wildcat site plan (adapted from Cook 2009).

represent structures and associated pit features (site records on file at The Ohio State University, Newark campus) (Figure 2.1). These anomalies matched up well with features and artifact concentrations associated with the activities and village layout. Although structure plans have not been conclusively determined, the current evidence suggests a fairly linear house arrangement (Figure 2.1) not uncommon for low-population settlements.

Field crew used a blanket sampling approach (Pearsall 2000:66), collecting up to 8 liters (ℓ) of soil for flotation from each arbitrary 5-cm level of each excavated feature context identified in trenches (Figure 2.2). The entire level was collected if it contained less than 8 ℓ of soil. Stratigraphic control of samples helped assess variability within and between samples and aided in the determinations of feature reuse.

At SunWatch, flotation samples were also taken at regular intervals from all storage/trash pits, as well as from burials, hearths, house floors, and other features (Wagner 1987:48). Excavators collected up to one fourth of the fill from most pits, although Wagner (1987) reports that the entire fill was occasionally floated, although the specific conditions that determined which features were floated in entirety were not specified in the available reports.

Future excavations at Wildcat will attempt to determine the overall site size and spatial patterning in the settlement. Preliminary estimates place the habitation area of the Wildcat settlement at less than 2.5 ha. Although structural posts have been identified, a larger portion of the site must be stripped before identification of households and other structures (e.g., palisades) can be determined. Additional excavation will be necessary to confirm the presence of a plaza and arrangement of structural features.

2.2 Flotation

I recovered preserved plant remains from measured soil through standard water flotation techniques (Hastorf and Popper 1988; Pearsall 2000). Prior to flotation, I re-measured each sample to the nearest liter, or 0.25 ℓ when the sample totaled less than one liter. This laboratory-measured soil volume forms the basis of all calculated plant densities. Detailed provenience information remained with each sample (including all spatial data, such as the name of the excavation context, the context type, its size, its coordinates, the soil level and depth, and the excavation trench).

I processed large samples with a Flote-tech Model A machine with a 90 percent recovery rate and small samples (less than two litres) with a sieve-bottomed bucket system with an approximate 85 percent recovery rate. I estimated recovery rates by poppy seed tests (Pearsall 2000; Wagner 1982). I chose to use a known quantity (n=50) of poppy seeds (*Papaver somniferum*) following Wagner (1982) because they (a) do not occur in archaeological contexts in the Eastern Woodlands, (b) are morphologically distinct from archaeological seeds I would likely recover, and (c) approximate the size (0.7-1.4 mm) of many possible archaeological seeds, such as goosefoot (*Chenopodium* spp.) and pigweed (*Amaranthus* spp.).

The heavy fraction collection mesh measured approximately 1 mm for both the machine and bucket, while the light fraction mesh measured approximately 250 microns—sufficiently small to recover archaeologically-significant remains (e.g., tobacco seeds). Soil that passed through the sieve was discarded.

2.3 Analysis.

I conducted a preliminary examination on two feature contexts (1/07 and 3/07) from the 2007 field season to help develop the research question for this project. The results suggest that Wildcat inhabitants used less maize relative to indigenous subsistence traditions than would be expected for the Fort Ancient period. I became interested in determining whether indigenous subsistence traditions were favored over corn and if such a preference was related to environmental factors.

Floated samples were dry sifted through a series of nested geologic sieves ranging in size from 4.00 mm to <0.50 mm to simplify identification by organizing sample materials by like size before sorting (following Yarnell 1974). I completed sorting and identification of botanical materials with a Leica stereo zoom microscope with a magnification range of 8 to 35x.

Recovered archaeobotanical materials were initially sorted into broad categories (e.g. carbonized nutshell, carbonized seeds, carbonized corn, unknown, and wood charcoal). Following initial sorting, I reexamined these generalized botanical classes and identified remains to generic or species level when suitable preservation of morphologic traits allowed. I only identify fresh (un-desiccated, non-carbonized) or dessicated botanical materials for open-air contexts associated with historic periods; such materials typically only survive in protected prehistoric contexts such as caves and dry rockshelters. The chances for preservation are low at sites subjected to repeated environmental fluctuations (e.g., temperature, moisture, and pH) and other agents of deterioration for long periods of time and it is improbable that many prehistoric seeds survive uncharred through common archaeological time spans. As Minnis (1981:147) argues: “by considering charred seeds as prehistoric and uncharred as modern, unless there is a reason to believe otherwise, some prehistoric patterning may be lost. However, to do otherwise will definitely increase the "noise" in the archaeological seed assemblage due to the potentially large number of seeds found naturally in soils.”

Macrobotanicals recovered from sieve mesh larger than 2.00 mm were identified, counted, and weighed on an OHAUS digital scale with an accuracy level of 0.001g (following Yarnell 1974). Weights were rounded up to the nearest 0.01g. Materials observed in smaller size categories were only noted as present to reduce inflation of counts and weights by highly-fragmented taxa, to reduce the lab processing time necessary to hand-sort the increased number of remains, and to allow inclusion of under-represented taxa in ubiquity (presence/absence) indices for site contexts. Exceptions include seeds, which are identified and counted in all categories, and taxa that would otherwise be underrepresented at the 2.00 mm size grade. Remains such as acorn shell and squash rind tend to fracture into smaller fragments, so they are identified, counted, and weighed when greater than 1.00 mm in size. I only scanned the <0.50 mm size grade in samples from features (F.6-08, F.7-08, and F.8a-08) that produced tobacco seeds, which occur at sizes as small as 0.30 mm.

Seeds are typically quantified by count because their weights are usually negligible, i.e., lower than the accuracy of the scale. Seeds may be introduced to a site through direct resource utilization (the direct result of the collection, processing, and use/consumption of plant resources), indirect resource utilization (the result of the use of the plant, not of the seed, i.e., grape seed waste from consumed fruit, seed from roof thatch, fuel wood, or fuel dung), and seed rain (accidental preservation of the prehistoric seed rain unrelated to any use of the seeds or plant) (Minnis 1981:145; Pearsall 2000:240). Counts help establish how fragmentary the assemblage is when paired with weights for material other than seeds. Counts standardized by weights give a better picture of the relative quantity of materials because of this tendency toward fragmentation, especially for parenchymous tissues of squash, roots, or tubers which tend to be light (not dense like nutshell) and highly susceptible to mechanical fragmentation pre- and post-recovery.

Wood charcoal fragments easily during flotation due to the action of the water's surface tension on wood surfaces (especially if the soil sample was allowed to dry before flotation). I selected a random subsample of twenty wood charcoal specimens per provenience location from various sizes above 2.00 mm (the size at which diagnostic features tend to be visible with minor magnification) for the sake of efficiency and to reduce the effects of preservation bias (some woods being more susceptible to fragmentation in water than others). I weighed but did not count unidentified specimens. I comparatively evaluated wood cross section morphology with printed keys and descriptions of wood structure (Core, et al. 1979; Hoadley 1990) in conjunction with a comparative wood collection maintained by the OSU Paleoethnobotany Laboratory.

Hardwood identifications depended on the arrangement of early- and latewood pores, as well as the size and frequency of multiseriate rays, while softwood identification relied on the texture of tracheids, the presence or absence of resin canals, and their relative frequencies.

All original data was recorded on standardized paper forms and, along with Wagner's SunWatch data, entered into a Microsoft Access relational database. I used the SAS statistical analysis software package and a biplot macro in Microsoft Excel 2007 to test and interpret sources of patterning in the plant data. In addition to the biases mentioned above, other factors that impacted statistical analyses include the greater number of samples recovered and analyzed from SunWatch and the summary fashion in which the data from that site is reported.

Statistical models were designed to address limitations introduced by the use of convenience samples (rather than true random statistical samples) and biases in the measurement system due to (1) the preservation of the plant material at each site, (2) possible errors in the identification of fragmentary plant remains, (3) the accuracy of the scales used to record weights and lengths, and (4) post-recovery fragmentation of remains.

I used correspondence analysis, a technique of exploratory data analysis, to filter noise from the macrobotanical data between the sites so patterns may be discerned and compared to expectations (following Bush 2001:234-237 and Mickelson 2002). Correspondence analysis uses traditional concepts such as marginals (column and row totals for aggregated data matrices) and chi-squared distances; however, it does not rely on assumptions of normalcy (Bush 2001; Panagiotakos and Pitsavos 2004). Lipkovitch and Smith (2001) detail the use of biplots—graphical displays of row and column markers from data that forms a two-way table—and the method of calculating the marker values on the graph from the singular value decomposition of the data matrix through a Microsoft Excel add-in macro. A biplot displays relationships between variables and objects in many multivariate methods and is commonly used in ecological applications to plot relationships between species and sites (Lipkovitch and Smith 2001:1).

I first created a series of two-way contingency tables of aggregated data (rows and columns) to create correspondence maps. The data matrix is reduced to a series of eigenvalues by a Microsoft Excel macro. The eigenvalues (also known as inertia, or the total Pearson chi-square for the two-way table divided by the total sum) are translated to vectors, called eigenvectors, that are mapped as points in multidimensional space (Mickelson 2002; Panagiotakos and Pitsavos 2004). Additional explanation is provided in Chapter 3 with examples.

CHAPTER 3

RESULTS

The preservation of a plant or plant part depends on many biological factors, including its physical characteristics (e.g., tissue density, size, surface characteristics), site formation processes (e.g., soil type, moisture, and deposit depth), the cause of the preservation (usually charring), and the frequency and manner of use by the site inhabitants and their patterns of disposal (Asch and Asch 1975:116; Wagner 1988:57). It is important to remember that:

1) not all preserved plant remains result from human activities at a site;
2) many economically or ritually important plants may not survive to be represented in the archaeological record;
3) remains will be biased toward those plants that tend to preserve well;
4) biases may also occur in the identification of plants and some genera that have similar characteristics, where less common ones may be misidentified as more common ones; and
5) charring also causes morphological changes in materials that can prevent the accurate identification of remains

Type	SunWatch			Wildcat			Total		
	Features (n)	**Samples (n)**	**Vol (ℓ)**	**Features (n)**	**Samples (n)**	**Vol (ℓ)**	**Features (n)**	**Samples (n)**	**Vol (ℓ)**
Pit Features	20	47	146.0	9	23	144.5	29	70	290.5
Postholes	3	12	17.25	1	3	4.25	4	15	21.5
Burials	6	8	23.5	-	-	-	7	8	23.5
Hearths	6	6	88.5	2	4	28	8	10	116.5
Sweat Lodge Features	3	11	27.0	-	-	-	3	11	27.0
Misc. Contexts	3	4	28.0	2	3	11.5	4	7	39.5
Total	**41**	**88**	**330.25**	**14**	**33**	**188.25**	**55**	**121**	**518.5**

Table 3.1. Analyzed soil volume (ℓ) from excavated feature contexts at SunWatch and Wildcat.

Therefore, interpretations of plant use must account for their sources (i.e., introduction to the site and means of charring) and depositional history.

3.1 Analysis

This analysis focused on feature contexts to allow better comparison of Wildcat data with the reported data from the Sunwatch, Goolman, and Driving Range sites. Table 3.1 shows the range and frequency of feature contexts and the total volumes (in liters, ℓ) of soil samples processed from SunWatch (330.25 ℓ) and Wildcat (188.25 ℓ). (Table 3.1). Detailed contextual information for Goolman (334.5 ℓ) and the Driving Range (66.0 ℓ) sites was not available at the time of this analysis. I analyzed a total of 33 samples from

14 excavated Wildcat feature contexts and compared those to totals from 88 samples from 41 SunWatch feature contexts analyzed by Wagner (1987).

Table 3.1 summarizes the sample sizes from SunWatch and Wildcat by feature type, the number of analyzed features, the total number of samples from each group, and the total processed soil volume in liters. The miscellaneous features (Features 3/08 and 11/08) from Wildcat are possible midden remnants. Reported volumes were used to calculate densities of materials at each site and for each context type for statistical analyses.

Many methods have been developed to interpret macrobotanical remains (see Hastorf and Popper 1988; Pearsall 2000, Scarry 1986). Deposits can be compared by looking at different types of ratios, such as their densities or the relative abundance (standardized and transformed counts by weight) of various plant remains. Percentages of functionally equivalent items (e.g., food plants, fuel taxa) allow for the detection of replacement of one category of material by another through time or along a geographic cline. However, such composite variables (such as *seed:nutshell*) must be homogenous to accurately reflect patterning in an archaeological plant assemblage (Miller 1988). Ubiquity (percentage presence) measures the proportion of samples containing a specific taxon (Hastorf 1999; Popper 1988). The ubiquity index expresses the number of samples containing species *x* divided by the total number of samples (Table 3.2).

Botanical Class	**Subsample Frequency**	**Ubiquity**	**Count**	**Density (Count/ 100 ℓ)**	**Weight (g)**	**Density (g/ 100 ℓ)**
Carbonized Bark	8	24.24	187	99.34	0.79	0.42
Carbonized Bean	2	6.06	8	4.25	0.40	0.21
Carbonized Corn	23	69.70	275	146.08	1.71	0.91
Carbonized Nutmeat	8	24.24	24	12.75	0.44	0.23
Carbonized Nutshell	26	78.79	554	294.29	7.31	3.88
Carbonized Seeds	27	81.82	255	135.46	-	-
Carbonized Squash/Gourd	27	81.82	764	405.84	2.34	1.24
Other, Carbonized	7	21.21	9	4.78	0.06	0.03
Unknown/Indet., Carbonized	17	51.52	51	27.09	0.38	0.20
Wood Charcoal	32	93.94	541*	287.38	296.37	157.43
Total	34	100.00	2677	1422.05	309.80	164.57

* count of identified specimens

Table 3.2. Summary of archaeobotanical classes documented at Wildcat.

Botanical Class	**Count**	**Density (Count/ 100 ℓ)**	**Weight (g)**	**Density (g/ 100 ℓ)**
Carbonized Bark			6.73	2.04
Carbonized Bean			0.16	0.05
Carbonized Corn			13.00	3.94
Carbonized Nutshell			21.50	6.51
Carbonized Seeds	453	137.17	-	-
Carbonized Squash/Gourd			0.02	0.01
Other, Carbonized			0.16	0.05
Unknown/Indet., Carbonized			2.64	0.80
Wood Charcoal	399*		200.64	60.75
Total			244.85	74.14

* count of identified specimens (37.72 g)

Table 3.3. Summary of archaeobotanical classes documented at SunWatch.

Density of material serves as a standardizing ratio to allow for the comparison of soil samples of unequal size, samples from different deposits or different levels of preservation, or relative quantities of different categories of materials (e.g., taxa) that are in some way equivalent, such as probable foods or structural remains. Table 3.2 summarizes Wildcat density data from 33 samples collected from 14 excavation contexts, total volume 188.25 ℓ liters. Table 3.3 summarizes SunWatch density data. Counts of non-seed taxa were not consistently available and are therefore excluded. Wood weight includes identified and unidentified specimens in Tables 3.2 and 3.3.

Density is often expressed as the weight or count of charred plant material observed per measured liter of soil from which the remains were recovered. I report densities here as quantity of material observed per 100 ℓ in order to account for values approaching zero. Seed densities represent a count per 100 ℓ of soil because of their negligible weights per sample. Specifically, densities provide a way to evaluate excavation contexts individually, to compare them to the surrounding deposits, and to compare relative quantities of materials from sites or contexts with different soil volumes.

For this analysis, I use density rather than percentages or comparison ratios because of the aggregate nature of the available data and differences in site volumes. Unfortunately, the SunWatch reports provide weights instead of frequencies, except for seeds (Table 3.3) and identified wood taxa and the Goolman site data does not report seed taxa (only a the total number of seeds recovered). I was unable to obtain the raw data from any of the sites other than Wildcat; therefore, I could not determine how many samples included any particular taxon in order to compare ubiquity of specimens, the contents of individual excavation contexts to look at depositional history at the sites, or the frequencies of non-seed taxa.

If I had access to counts as well as weights of specimens, I would have standardized counts by the weight of the material to measure the abundance of taxa. Such standardization would prevent the unequal density (as in material hardness, not quantity per liter soil) and fragmentation of materials from affecting measures of other taxa's abundance, which is one of the problems associated with using percentages, or counts of fragments standardized by total plant count or weight of fragments standardized by total plant weight (see Scarry 1986:191-214 for a full discussion). Skewed data could then be transformed mathematically to make the distribution more normal for statistical analyses or to allow inclusion of samples with zero counts (Welch and Scarry 1995).

Comparisons between non-seed taxa at the Wildact, SunWatch, Driving Range, and Goolman sites required grouping weight-based densities of functionally equivalent taxa (i.e., probable food taxa). Miller (1988:77) cautions that an analyst's assumptions must be explicitly stated because the differential preservation of taxa (as a result of processing practices or inherent physical characteristics) and assumptions of ecological or functional similarity of groups represented by different plant parts or taxa may introduce error in ratios which result in faulty cultural interpretations.

I assume that nutshells result from nut-processing for consumption, although it is possible that dense shells were used as a fuel source (Pearsall 2000:204). I also assume that wood charcoal from storage/trash pits results from fuel use because there is no evidence that any of the structures were burned. I excluded wood charcoal and bark from analyses that involved food taxa. For a porous taxon like squash, which tends to fragment easily in deposits and during flotation, the density compared to other taxa may vary considerably depending on whether the ratio is based on counts or weights. For example, in Table 3.2, squash (n=764) comprises 28.5 percent of the total number of identified taxa (n=2677) at Wildcat (note that the actual count of wood charcoal would be much higher than squash, but only identified specimens are included). By weight, squash (2.34 g) comprises only 0.8 percent of the Wildcat total (309.80 g). Excluding wood charcoal (n=541 identified fragments, 296.37 g total) and bark (n=187, 0.79 g), squash then comprises 39.2 percent by count and 20.1 percent of the assemblage by weight. The Wildcat assemblage, excluding wood and bark, totals 1949 specimens, weighing 11.64 g.

Figure 3.1 presents the range of variation between beans, corn, squash, and nutshell/nutmeat fragment densities (grams per 100 ℓ sediment) at Wildcat. Figure 3.2 shows the range of variation for each of these plant subsamples across the features. Overall median densities are low for each plant type (lines of central tendency, Figure 3.1). Only Feature 2/08, a basin-shaped pit, contained bean fragments. Two processed samples (6.06 percent ubiquity) produced eight bean fragments weighing 0.40 g (Table

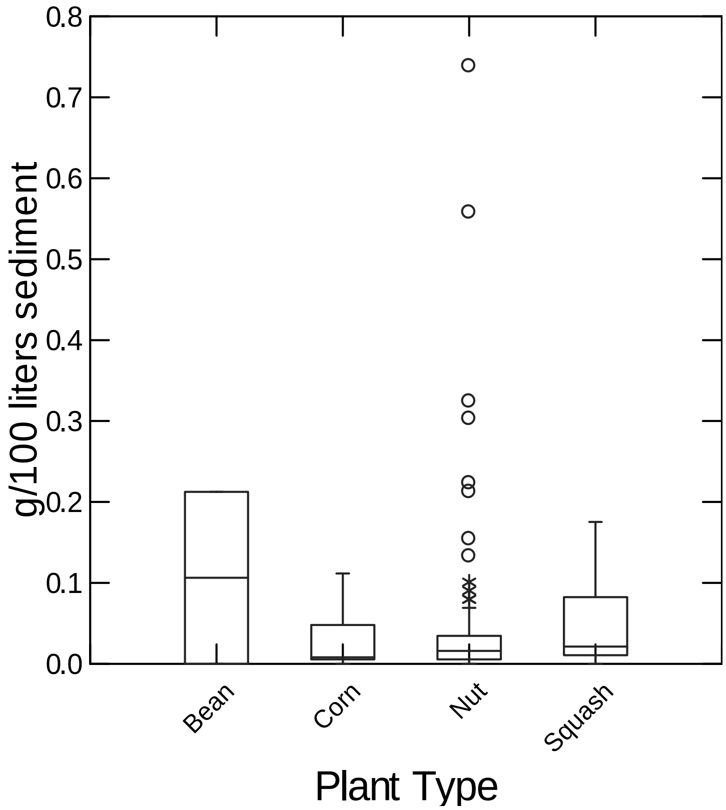


Figure 3.1. Summary of Wildcat bean, corn, squash, and nut fragments.

3.2). Nutmeat (24.24 percent ubiquity) and nutshell (78.79 percent ubiquity, Table 3.2) combined densities vary considerably by feature, with outliers (Figure 3.1) coming from Features 3/07, 2/08, 4/08, and 8a/08 (Figure 3.2). These features also contained the highest densities of other probable food remains, such as corn kernels (69.70 percent ubiquity) and squash (81.81 percent ubiquity) (Table 3.2).Table 3.5 presents a

Identification	Scientific Nomenclature	SunWatch Count	SunWatch Density ct / 100 l	Wildcat Count	Wildcat Density g / 100 l
Spring to Summer					
Amaranth (Pigweed) * s	*Amaranthus sp.*	1	0.30	7	3.72
Blackberry/Raspberry	*Rubus sp.*	6	1.82	16	8.50
Little Barley * s	*Hordeum pusillum*	3	0.91	1	0.53
Maygrass * s	*Phalaris caroliniana*	-	-	7	3.72
Summer					
Barnyard Grass	*Echinocloa sp.*	2	0.61	-	-
Blueberry	*Vaccinium sp.*	-	-	1	0.53
Flowering Dogwood	*Cornus florida*	-	-	1	0.53
Grass	*Poaceae*	8	2.42	8	4.25
Maypops	*Passiflora incarnate*	-	-	2	1.06
Nightshade	*Solanum nigrum*	37	11.20	3	1.59
Nightshade Family	*Solanaceae*	-	-	3	1.59
Nimblewill	*Muhlenbergia schreberi*	-	-	2	1.06
Panicgrass	*Panicum sp.*	17	5.15	-	-
Tick Trefoil	*Desmodium sp.*	2	0.61	-	-
Tobacco	*Nicotiana sp.*	6	1.82	3	1.59
Verbena (Vervain)	*Verbena sp.*	3	0.91	5	2.66
Witch Hazel	*Hamamelis sp.*	-	-	4	2.12
Summer to Fall					
Groundcherry	*Physalis sp.*	2	0.61	-	-
Heal-all	*Prunella sp.*	1	0.30	-	-
Jewelweed	*Impatiens biflora*	-	-	1	0.53
Paw Paw	*Asimina triloba*	-	-	15	7.97
Rattlebox	*Crotalaria sp.*	1	0.30	-	-
Spurge	*Euphorbia sp.*	2	0.61	-	-
Sumac s	*Rhus sp.*	103	31.19	57	30.28
Wild Bean	*Strophostyles sp.*	5	1.51	6	3.19
Fall					
Bedstraw	*Galium sp.*	1	0.30	3	1.59
Grape	*Vitis sp.*	3	0.91	2	1.06
Hackberry	*Celtis sp.*	3	0.91	1	0.53
Hawthorn	*Crataegus sp.*	2	0.61	-	-
Knotweed * s	*Polygonum erectum*	13	3.94	2	1.06
	Polygonum sp.	-	-	10	5.31
Pokeberry	*Phytolacca americana*	1	0.30	3	1.59
Sumpweed * s	*Iva annua*	-	-	1	0.53
Sunflower * s	*Helianthus sp.*	1	0.30	3	1.59
Unid. Composite	Asteraceae (Compositae)	1	0.30	-	-
Fall to Winter					
Chenopod * s	*Chenopodium sp.*	29	8.78	-	-
Penny Cress	*Thlapsi arvense*	-	-	1	0.53
Summer to Winter					
Pea Family	Fabaceae	4	1.21	2	1.06
Indeterminate Season					
Fragments		82	24.83	69	36.65
Unknown/Indeterminate	*(Blank)*	34	10.30	15	7.97
Total		373	112.94	255	135.46

* EAC suite, s likely stored

Table 3.4. Small seeds, SunWatch and Wildcat sites.

comparison of small seeds from SunWatch and Wildcat by season available (ripe fruit/seed). Recovered fruits include sumac, nightshade, and blackberry/raspberry.

The suite of six oily and starchy seed plants that comprise the EAC along with squash and gourds were cultivated by Eastern Woodlands peoples prior to the adoption of corn and tobacco as early as the Archaic period (pre-500 BCE). These include fall-maturing starchy-seeded goosefoot (*Chenopodium sp.*—also a leafy green available through summer) and erect knotweed (*Polygonum erectum*), late spring/early summer-maturing little barley (*Hordeum pusillum*) and maygrass (*Phalaris caroliniana*), and oily-seeded members of the daisy (Asteraceae) family—sunflower (*Helianthus sp.*) and sumpweed (*Iva annua*). In many situations, cultivation was intense enough to cause morphological correlates of domestication (see Cowan 1978; Smith 1992, 2006; Yarnell 1978).

Seed totals for Wildcat and SunWatch are presented in Table 3.5. Wagner (1987:71) reports that more than 6,936 purslane (*Portulaca sp.*) seeds were recovered from one liter of soil from a storage/trash pit (F.8/75). The seeds were still packed in seed capsules and it is unclear whether they were charred or not. I excluded the purslane seeds from the analysis as an extreme outlier, and suspect that they represent modern seeds deposited through bioturbation, plowing, or falling in soil cracks or root holes. Except for raspberry and pokeberry, uncharred modern seeds from Wildcat differ significantly from the charred assemblage and include smartweed (*Polygonum pensylvanicum)*, purslane (*Portulaca sp.*), saltbush (*Atriplex sp.*), sedge (*Carex sp.*),

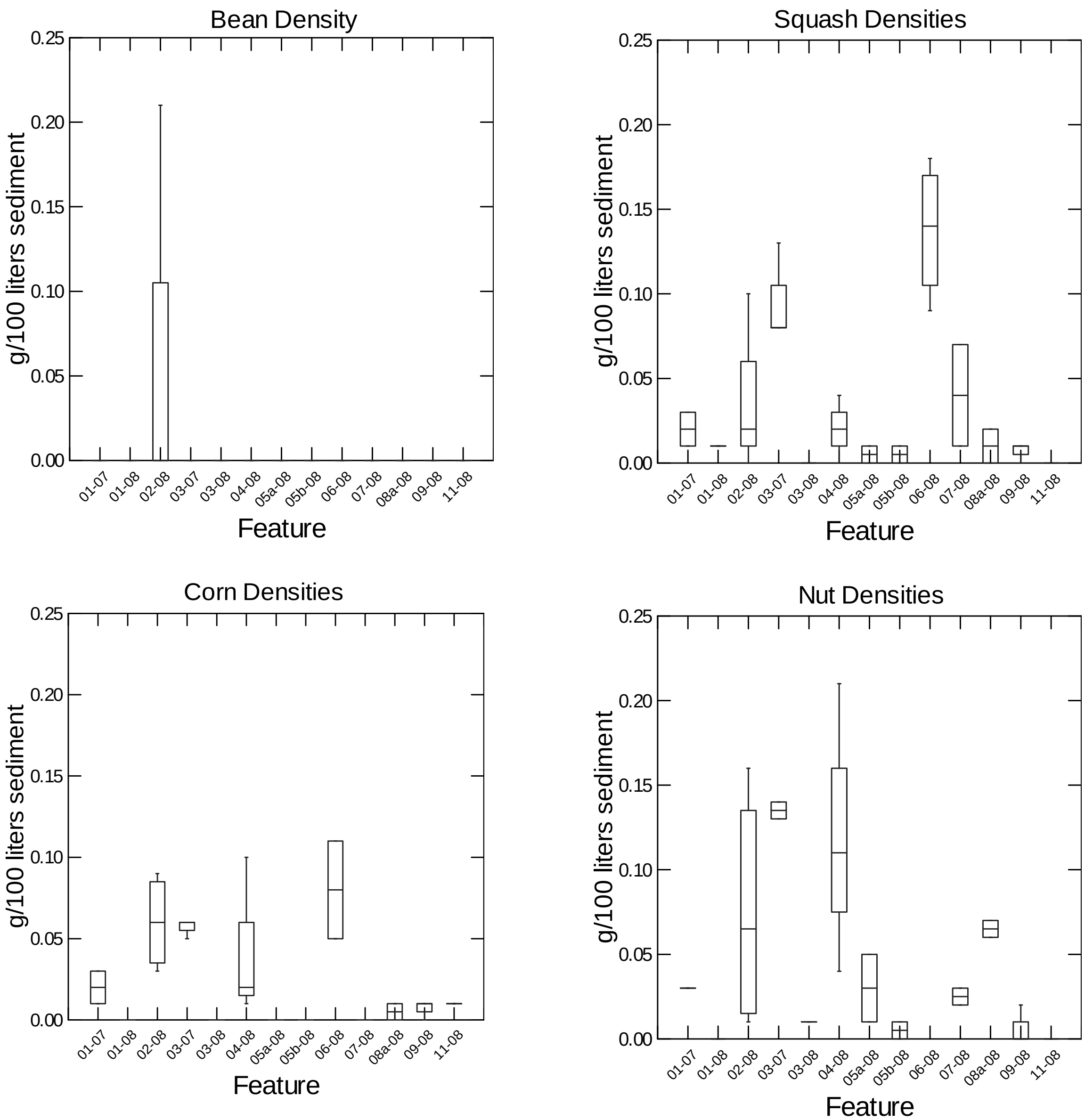
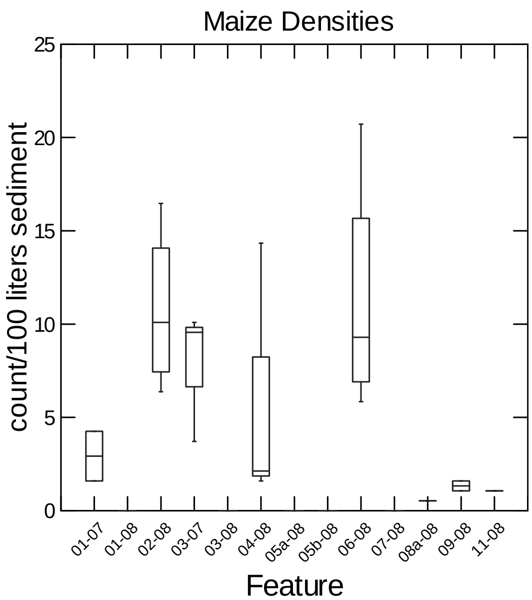


Figure 3.2. Comparison of Wildcat bean, squash, corn, and nut densities (grams per 100 ℓ sediment) by feature.



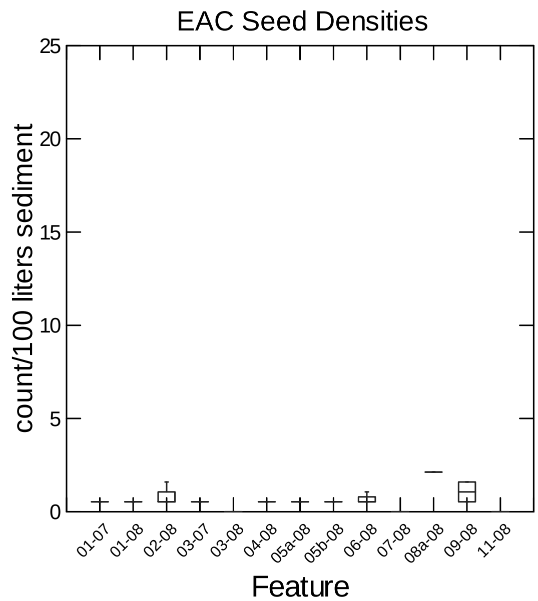


Figure 3.3. Comparison of Wilcat maize and EAC densities by feature.

spurge (*Euphorbia sp.*), woodsorrel (*Oxalis sp.*), and panicgrass (*Panicum sp.*).

EAC seeds are present in low densities in 17 samples (50.00 percent ubiquity) across the Wildcat site. Densities based on counts tend to be considerably higher for corn kernels than for EAC seeds (Figures 3.3 and 3.4). Recovered corn kernels are highly fragmented—264 fragments total only 1.63 g, averaging less than 0.01g per fragment. I used correspondence analysis (CA) to explore associations and variability between macrobotanical remains from the four sites: Wildcat, Sunwatch, Goolman, and the Driving Range site. Goolman and the Driving Range site are small, Late Fort Ancient

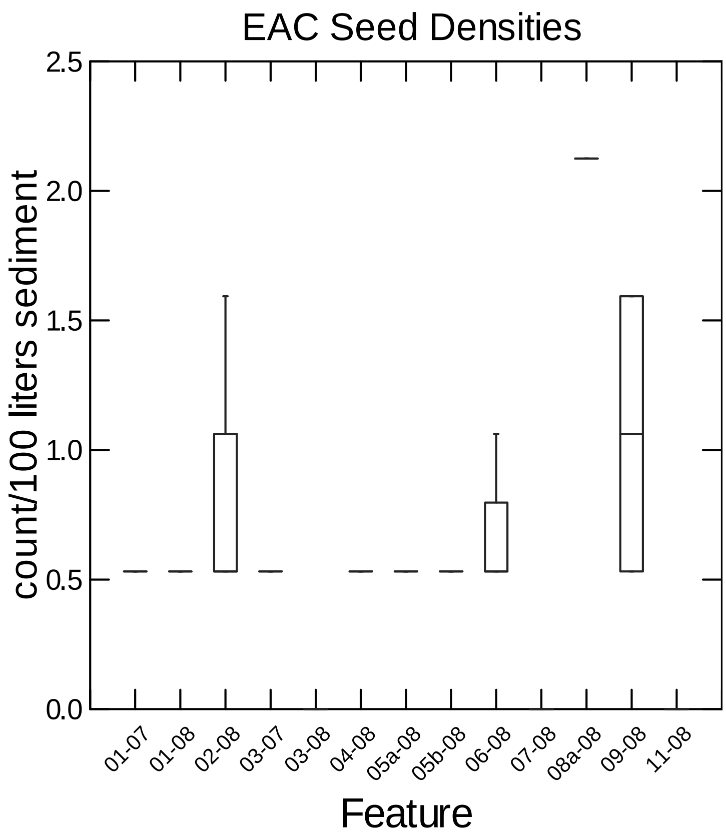


Figure 3.4. EAC seed densities (count per 100 ℓ sediment) by feature at Wildcat.

period procurement camps that allowed comparison of Wildcat against known late fall/winter seasonal sites. Two of the benefits of using CA as an exploratory data analysis technique come from not having to assume a normal distribution or requiring a model. The "structure" of the data biplot comes from a decomposition of the data matrix in a two-way contingency table.

I plotted each of the following sets of data based on the density of plant remains (count per 100 ℓ sediment for Categories 1 and 2; grams per 100 ℓ sediment for Categories 3, 4, and 5):

Category	Plant Remains	Row	Column
1. carbonized seed remains	EAC, Wilds, Tobacco	sites	seeds
2. carbonized seed remains	plant genus/species identifications	seeds	sites
3. non-seed plant remains	bean, corn, nutshell, squash	sites	taxa
4. non-seed plant remains	plant taxa	plants	sites
5. wood charcoal	plant taxa	plants	sites

Table 3.5. Biplot data for correspondence analysis.

Plots data are presented the Appendix and in Sections 3.2 and 3.3 of this chapter. Following Bush (2001:246), I divided plant remains into seven categories for CA: corn, beans, squash, EAC, nutshell, tobacco, and wild seeds. Corn refers to any recognizable portion of a *Zea mays* plant greater than 2.00 mm in size. Beans refers to domesticated *Phaseolus vulgaris* beans. Squash refers to any part of the *Cucurbita* cf. *pepo* members of the squash/gourd family (Curcurbitaceae) greater than 1.00 mm. I expanded the sample to 1.00 mm due to the tendency of squash rind to become highly fragmented on open air sites. Although indigenous squash is part of the EAC, indigenous and introduced varieties (including pumpkins) continue to be used long after the EAC loses prominence to maize in the Late Prehistoric period; therefore I have separated squash from inclusion with EAC plants for this analysis because I was unable to distinguish between indigenous and non-indigenous members. The EAC category includes a suite of plants commonly cultivated prior to maize agriculture in the Eastern Woodlands—*Amaranthus spp., Chenopodium spp., Polygonum erectum, Hordeum pusillum, Phalaris caroliniana, Helianthus annuus, Iva annua* seeds (Fritz 1990; Scarry 2008; Smith 2006). Nutshell refers to all nutshell and nutmeat fragments (*Quercus spp.*, *Corylus spp.*, *Carya spp.*, and *Juglans spp.*) greater than 2.00mm (1.00 mm in the case of acorn or chestnut to reduce underrepresentation due to fragmentation).

3.2 Eastern Agricultural Complex (EAC)

Fort Ancient assemblages occasionally contain chenopod and maygrass, but as Fritz (1990) notes, other fruits or weedy plants such as sumac (*Rhus sp*.), purslane (*Portulaca oleracea*), bedstraw (*Galium sp.*), and nightshade (*Solanum nigra*) are more likely to be associated with maize and beans than EAC starchy seed crops after 1000 CE. Although oily seeds (higher fat content) are nutritionally different from their starchy counterparts, I combined them for analytical purposes due to the small sample size of oily-seeded taxa. Figures 3.5 and 3.6 plot small seed taxa (row variables) and sites (column variables) for seed densities (count per 100 ℓ sediment) mapped along horizontal (Axis 1) and vertical (Axis 2) axes. The distance between clusters of seeds or

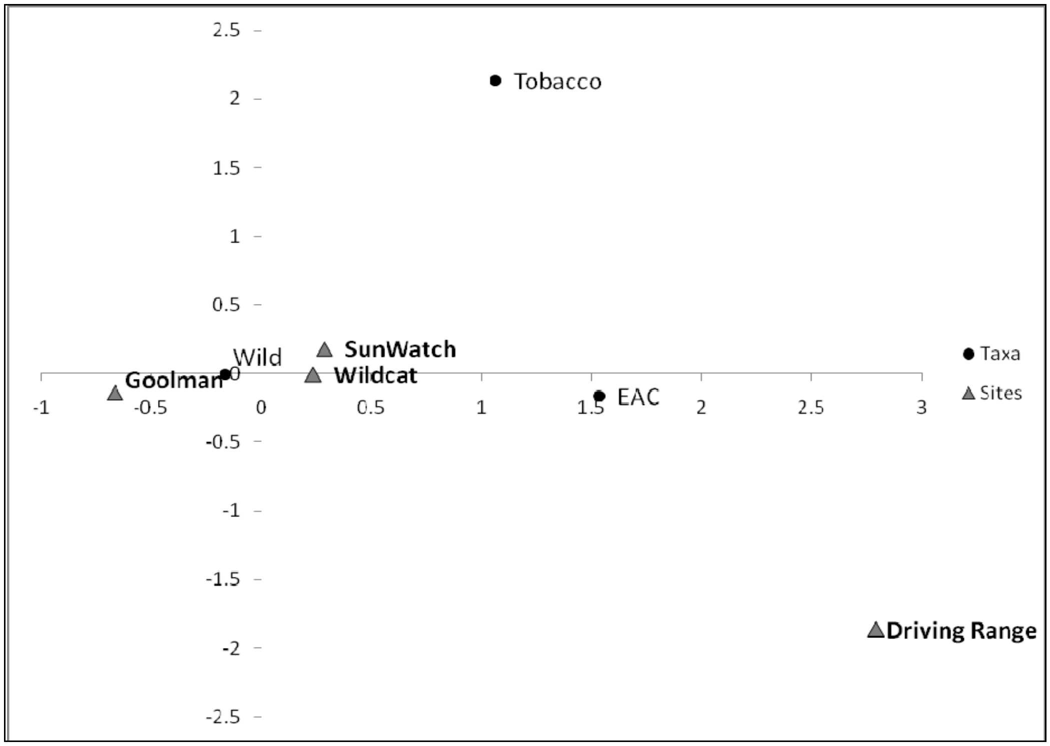


Figure 3.5. Correspondence map of aggregate small seed densities (count per 100 ℓ sediment).

Axis	Singular values	Eigenvalues	Cumulative percent of Eigenvalues
1	0.245680	0.060359	0.966818
2	0.045515	0.002072	0.033182
	Sum of eigenvalues	0.062430	1

Table 3.6. Singular values and eigenvalues for the SVD of Figure 3.5 aggregate small seed densities (count per 100 ℓ sediment).

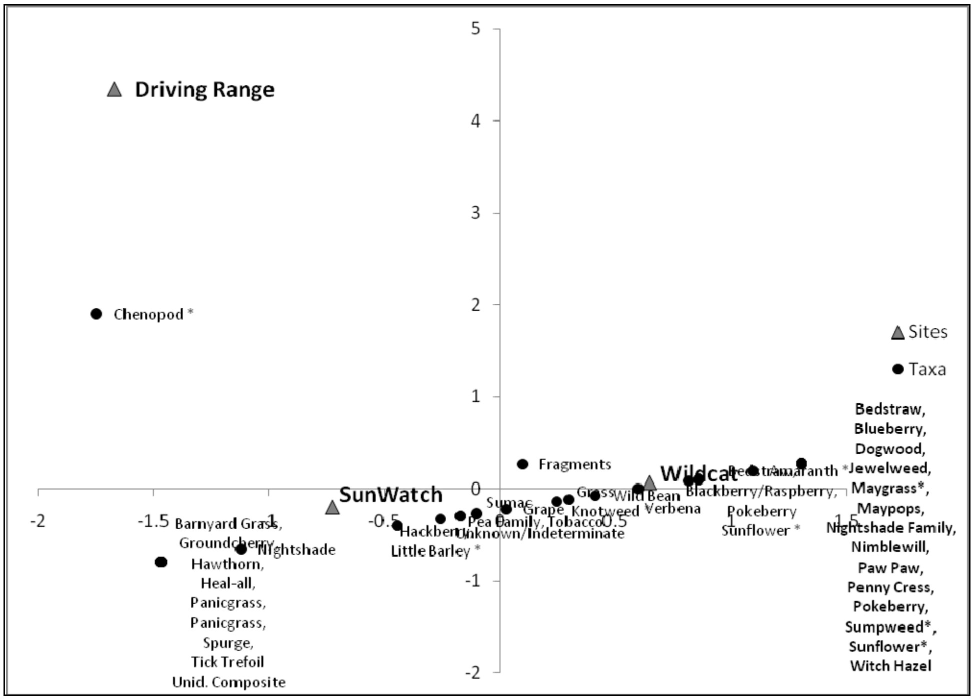


Figure 3.6. Correspondence map of aggregate small seed densities (count per 100 ℓ sediment). EAC taxa are marked with an asterisk.

Axis	Singular values	Eigenvalues	Cumulative percent of Eigenvalues
1	0.494248	0.244281	0.797943
2	0.248712	0.061858	0.202057
	Sum of eigenvalues	0.306138	1

Table 3.7. Singular values and eigenvalues for the SVD of Figure 3.6 small seed densities (count per 100 ℓ sediment).

sites indicates the degree of dissimilarity between them. The Microsoft Excel biplot macro decomposes the raw table data into a set of singular values for each axis, referred to as the Singular Value Decomposition (SVD) (Lipkovich and Smith 2001). Decomposition involves calculating a frequency table for the columns and rows, where the sum of all table entries equals one. Each value represents a proportion of the total, and the row and column totals of the matrix of relative frequencies are called the row mass and column mass, respectively (Panagiotakos and Pitsavos 2004).

The squares of the singular values, or eigenvalues, indicate the amount of variation accounted for by each dimension (Kroonenberg 2008). The sum of eigenvalues (or inertia) is the total Pearson chi-square for the two-way table divided by the total sum. Singular vectors account for as much of the variation in the contingency table data as possible through orthogonal arrangement (i.e., at right angles) to the origin on the plot (Kroonenberg 2008).

I used symmetric scaling so that the plot components of the sites and seed taxa would have lengths equal to the square root of the singular values and each would have approximately equal vectors. This was necessary because I wanted to look at the relationship between the seed taxa and sites rather than just the relationship between seed taxa themselves or the sites themselves. Kroonenberg (2008) notes that if the angle between two column vectors (sites) is small, they are highly correlated, but cautions that their exact correlation cannot be deduced from the graph and the association of row points cannot be properly read from the graph.

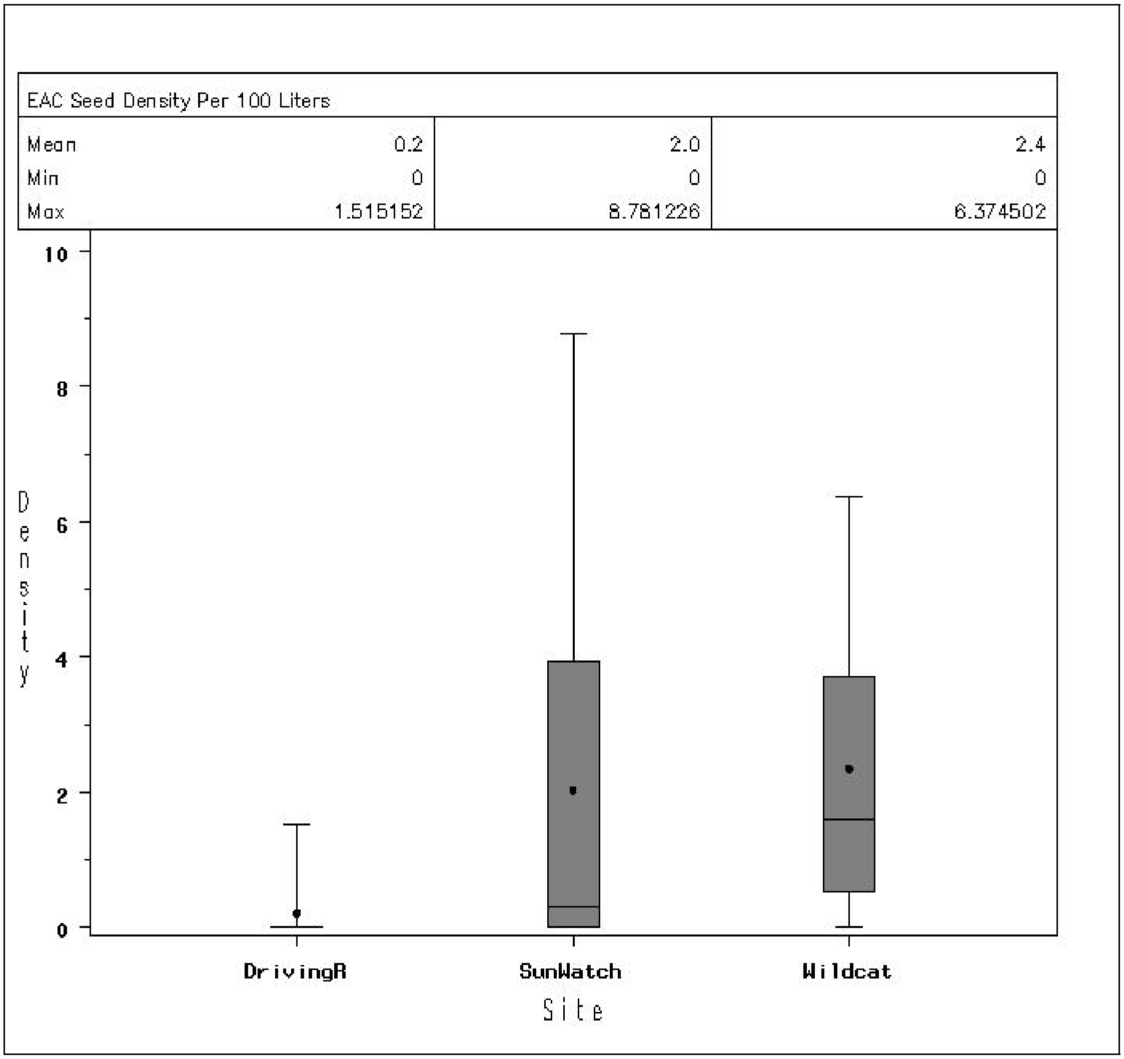


Figure 3.7. Comparison of EAC seed densities (count per 100 ℓ sediment) by site.

Figure 3.5 compares the density (count per 100 ℓ sediment) of EAC specimens at the Driving Range, SunWatch, and Wildcat sites. I calculated the range from aggregated totals of identified EAC species for each site. Although the plots do not represent the full variation within each site, the use of species identifiers as a grouping variable allowed comparison of the general central tendencies of the available data. SunWatch appears to have the greatest variability in density across species, although Wildcat specimens have higher mean density (Figure 3.7). Turnbow and Jobe (1984:37) report that that maize was the only cultigen recovered from the site. Although Goolman has a slightly higher quantity of seeds (n=364) than SunWatch, the seeds were not itemized in the available source and data was only available as a total seed count and description of "few cultigens" (Turnbow and Jobe 1984). Goolman data were therefore included in the Figure 3.5 plot of seed totals as "wilds." The Driving range site had a single chenopod seed and one unidentifiable seed fragment (Purtil 1999).

Nearly 97 percent of the variation in Figure 3.5 occurs along the horizontal axis (Table 3.6). The axes represent synthetic variables that capture the combined variation in the data set (group of response variables). The large proportion of explained variability indicates that the plot based on the singular vectors gives a good representation of the structure of the data table (Kroonenberg 2008). The sum of the first two eigenvalues (the singular values 0.245680and 0.045515, squared) divided by the total sum of the eigenvalues will give the proportion of the variability accounted for by the first two singular vectors. All of the variation was accounted for in the graph

(Table 3.6). Eighty-one percent of the variation in Figure 3.6 occurs along the horizontal axis (Table 3.7). Like the previous example, all of the variation was accounted for in the graph (Table 3.6).

Figure 3.5 suggests a slightly stronger correspondence between EAC taxa and Wildcat than with SunWatch; however, the strength of the relationship cannot be determined by the plot. Figure 3.7 supports the correspondence by showing higher mean and median (center line) densities of EAC taxa at Wildcat. Wildcat data are totaled by sample and better reflect the range of variation across the site than SunWatch, which has data totaled by feature type—thus reducing the actual range of variation at the site. Wild seed values are similar for Goolman, SunWatch, and Wildcat, with a slight skew toward Goolman.

Figure 3.6 suggests that Wildcat has a greater association with wild fruits (blueberry, paw paw, and raspberry), oily EAC cultigens (sumpweed and sunflower) and starchy cereals (amaranth, maygrass, and knotweed), and weedy successional species than SunWatch. SunWatch appears to have a closer association with shade-intolerant, open-habitat or prairie species. Goolman samples produced 364 carbonized wild seeds; 48 percent comprised of verbena, American pennyroyal, and grasses (Turnbow and Jobe 1984:37). Two hundred-forty seeds were found in the vicinity of a structure and interpreted as evidence for grass-bedding or thatch (Turnbow and Jobe 1984:37). The Driving Range site is the most dissimilar of the sites, with only a single chenopod specimen and unidentified fragment reported.

3.3 Maize

Corn (*Zea mays*) is present in nearly 70 percent of analyzed Wildcat samples (Table 3.1) and represents 16 percent of the total weight of the potential food assemblage (kernels and cupule fragments). Since kernels are extremely fragmentary, typically measuring just over 2 mm in diameter, weight-based densities are used instead of counts to express the relative abundance of corn at the two sites. Corn samples from SunWatch (Table 3.2) have a much higher total weight and density than Wildcat (Table 3.3). Maize large enough to be recognized by sight was recovered by troweling and screening at SunWatch, therefore the weight of 13.00 g recorded for the assemblage only includes flotation-recovered specimens. Further, Wagner (1987) reported measurements for a sample of the corn cob fragments and identifications for the wood recovered from screen and trowel methods from the 1971 to 1978 excavations.

Figure 3.8 and 3.9 points represent potential food plant taxa, excluding small seeds (row variables), and sites (column variables) for plant remain densities (gram weight per 100 ℓ sediment) mapped along horizontal (Axis 1) and vertical (Axis 2) axes. Fifty-eight percent of the variation in Figure 3.8 occurs along Axis 1 (horizontal) (Table 3.8). Fifty-two percent of the variation in Figure 3.9 occurs along Axis 2 (vertical) (Table 3.9). Although the proportion of the variability accounted for by the first two singular vectors accounts for only 79 percent (Table 3.9) of explained variability, the proportion is high enough to indicate that the plot gives a good representation of the structure of the data table (Kroonenberg 2008). However, the unexplained variation suggests that

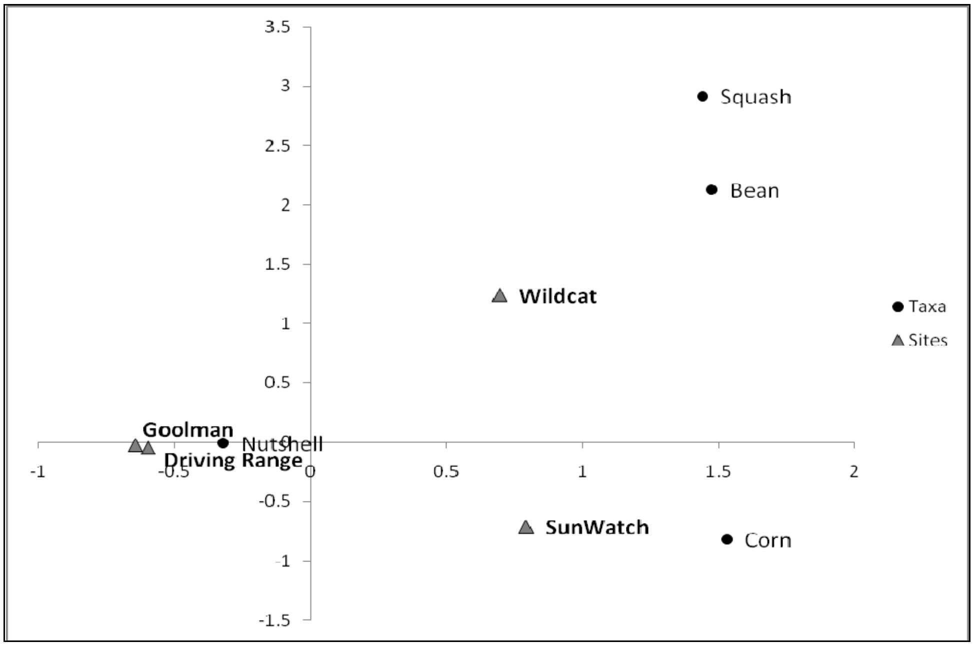


Figure 3.8. Correspondence map of densities of plant remains by type and site (grams per 100 ℓ sediment).

Axis	Singular values	Eigenvalues	Cumulative percent of Eigenvalues
1	0. 48374	0. 234005	0. 579672
2	0. 411922	0. 169680	0. 420328
	Sum of eigenvalues	0. 403685	1

Table 3.8. Singular values and eigenvalues for the SVD of densities of plant remains by type and site (grams per 100 ℓ sediment).

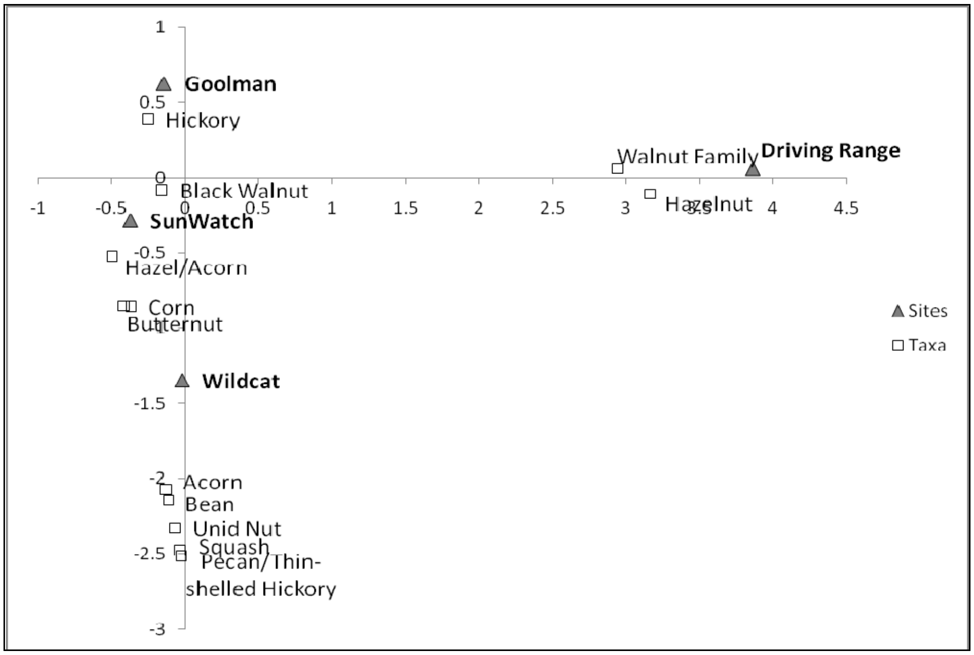


Figure 3.9. Correspondence map of densities of plant remains by type and site (grams per 100 ℓ sediment), with nut taxa separated.

Axis	Singular values	Eigenvalues	Cumulative percent of Eigenvalues
1	0.75031	0.562965	0.523769
2	0.536101	0.287405	0.267394
	Sum of eigenvalues	1.074834	0.791164

Table 3.9. Singular values and eigenvalues for the SVD of densities of plant remains by type and site (grams per 100 ℓ sediment), with nut taxa separated.

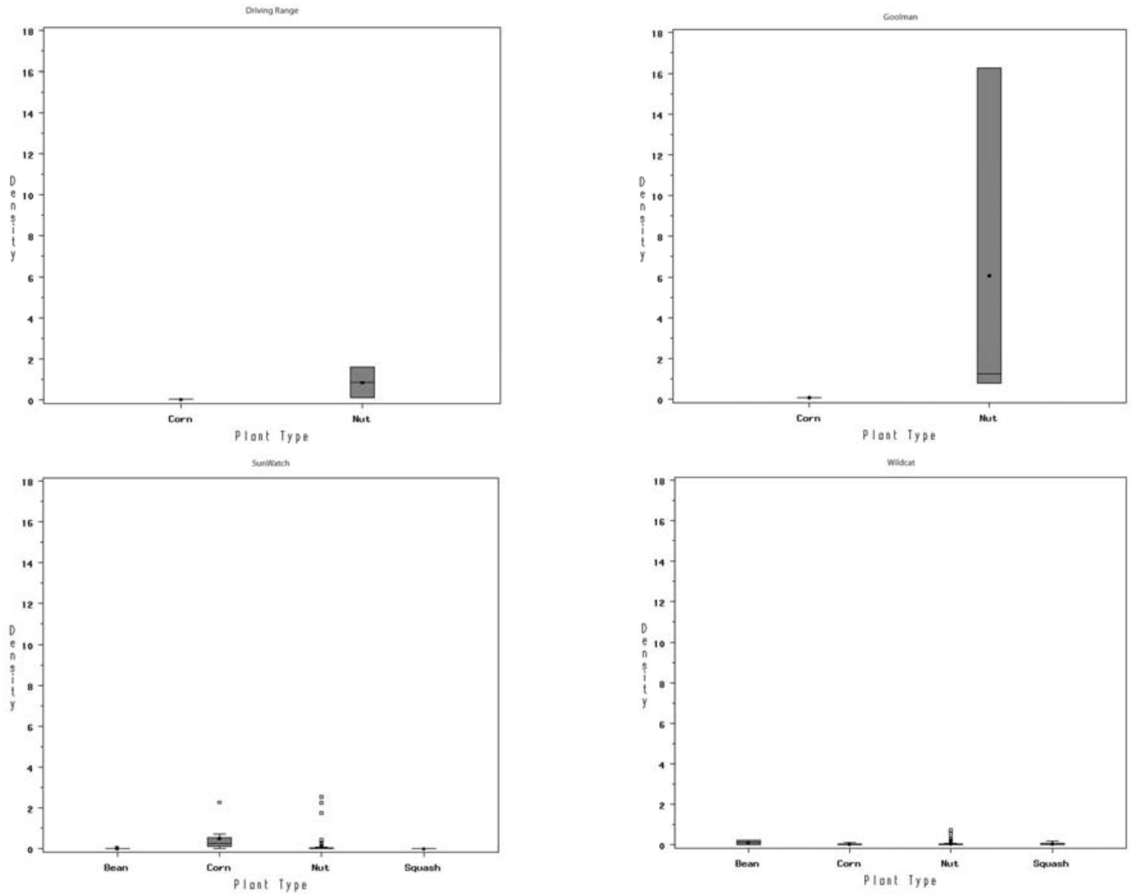


Figure 3.10. Comparison of bean, squash, corn, and nut densities (grams per 100 ℓ sediment) by site.

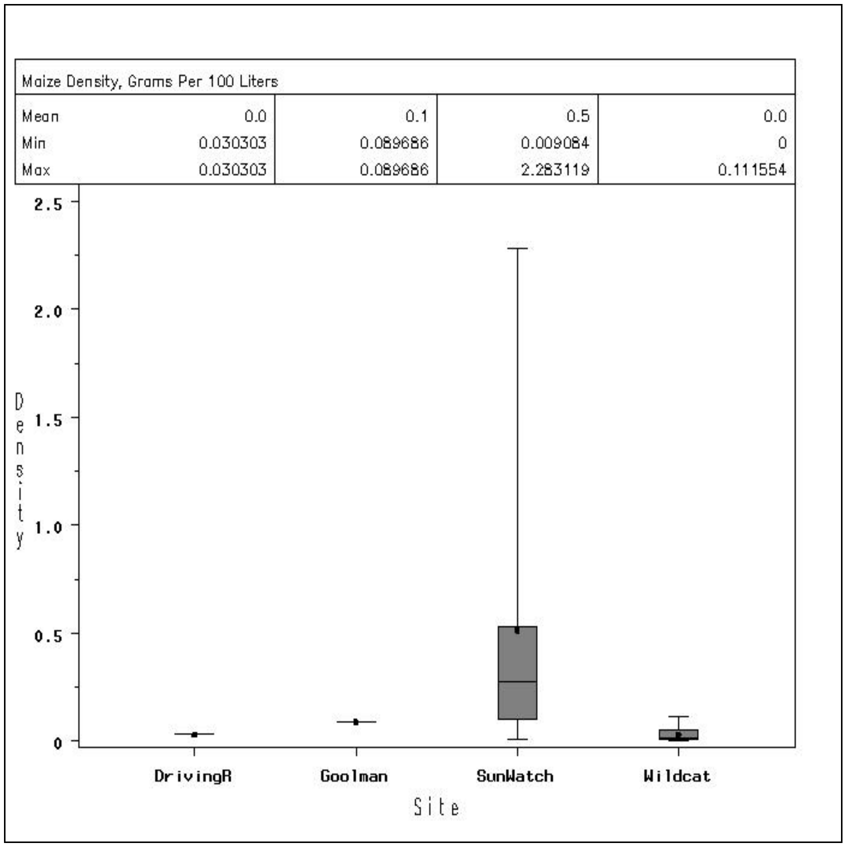


Figure 3.11. Comparison of maize densities (grams per 100 ℓ sediment) by site.

there is an additional, as yet unrecognized variable at play in the patterning of the data. Figure 3.10 compares relative densities of beans, squash, corn, and nuts across each site and with Figure 3.11 graphically explains the closer correspondences of corn to SunWatch, beans and squash to Wildcat, and nuts to Goolman and Driving Range in Figures 3.8 and 3.9. In particular, Figure 3.11 illustrates the greater median, mean, and range of variability at SunWatch in maize despite the small subsample reported for the site. Wildcat's range of variation is more representative of the actual variation at the site because values are figured by individual samples, rather than aggregated for batches of features (as SunWatch) or for the entire assemblage (as Goolman and Driving Range).

Figures 3.8-3.10 suggest that Wildcat has a greater association with squash and beans than any of the other sites. SunWatch has a closer association with corn, although the distance is not perceptibly different in Figure 3.9 where the variation from separate nut taxa are included in the calculation. Each site also has an apparent preference for particular nut taxa (nut shells being a product of nut processing rather than consumption) that may represent differences in environmental factors such as forest composition, moisture regimes, and geology (Figure 3.9). However, nuts are processed in a variety of ways based on the texture of the meat, oil content, hardness of the shell, and tannin content (as in the case of acorns, which requires lengthy soaking in water to remove the bitter chemicals). Hickory nut is most likely to be recovered from sites in higher quantities (when present) due to the need to process it in proximity to hearths for meat extraction. Boiling them to separate the nutshell from nutmeat would increase accidental loss and carbonization of the shells (Mickelson 2002:182). Other taxa may have been parched for storage, consumption, or to ease shell removal and shells may have been used as expedient fuel. The presence of oak and chestnut wood charcoal suggests that acorns and chestnuts may be underrepresented in the record due to preservation bias against uncarbonized shells on the open-air sites.

3.4 Wood

Although unsuitable for establishing foodways, wood charcoal is commonly used as an environmental indicator and as a means to discriminate cultural use patterns of environmental zones. One might assume that wood charcoal specimens documented in post molds is an indicator of the species selected for construction; however, unless the post has burned in place or the end was charred in preparation for construction, these fragments merely represent mixed debris from various thermal activities. I assume that charred, woody taxa recovered from features in the present sample represent fuel resources.

All reported SunWatch data comes from six hearths (six samples) and 20 pit features (47 samples) totaling 234.5 ℓ. Wildcat data comes from a total 188.25-ℓ sample assemblage (n=33) from 14 features. The Wildcat assemblage comes from approximately 80 percent as many features and 70 percent as many flotation samples as the SunWatch assemblage, so the Wildcat sample should be sufficiently large enough to capture a reasonable representation of preserved wood taxa used on site. Variation likely results from environmental factors rather than any sample size effect (see Chapter 4 discussion).

SunWatch and Wildcat exhibit almost identical species richness (total number of

Identification	SunWatch				Wildcat			
	Count	**% Count**	**Wt (g)**	**% Wt**	**Count**	**% Count**	**Wt (g)**	**% Wt**
Ash (*Fraxinus americana*)	54	13.5	5.78	15.3	55	11.6	5.94	13.2
Basswood (*Tilia sp.*)	3	0.8	0.04	0.1	-	-	-	-
Black Locust (*Robinia pseudoacacia*)	1	0.3	0.35	0.9	-	-	-	-
Cedar/Hemlock	-	-	-	-	19	4.0	0.22	0.5
Chestnut (*Castanea dentata*)	-	-	-	-	18	3.8	4.44	9.8
Eastern Red Cedar (*Juniperus virginiana*)	7	1.8	1.29	3.4	-	-	-	-
Elm (*Ulmus americana*)	8	2.0	0.66	1.7	4	0.8	0.45	1.0
Elm/Hackberry (Ulmaceae)	3	0.8	0.11	0.3	11	2.3	3.12	6.9
Hickory (*Carya sp.*)	83	20.8	8.13	21.6	11	2.3	1.61	3.6
Honeylocust (*Gleditsia triacanthos*)	-	-	-	-	12	2.5	1.49	3.3
Hornbeam (*Carpinus caroliniana*)	3	0.8	0.05	0.0	-	-	-	-
Kentucky Coffee Tree (*Gymnocladus dioicus*)	-	-	-	-	1	0.2	0.30	0.7
Maple (*Acer sp.*)	2	0.5	0.23	0.6	10	2.1	0.89	0.0
Mixed Hardwoods	-	-	-	-	119	25.1	3.51	7.8
Mulberry (*Morus sp.*)	5	1.3	0.32	0.8	-	-	-	-
Oak (*Quercus sp.*)	17	4.3	0.75	2.0	19	4.0	1.80	4.0
Oak (red) (*Quercus sp.*)	21	5.3	2.11	5.6	71	14.9	11.30	25.0
Oak (white) (*Quercus sp.*)	125	31.3	11.83	31.4	26	5.5	3.52	7.8
Pine (*Pinus sp.*)	-	-	-	-	7	1.5	0.11	0.2
Poplar, Tulip (*Liriodendron tulipifera*)	-	-	-	-	23	4.8	2.15	4.8
Indet. Softwoods				-	29	6.1	0.90	2.0
Sycamore (*Platanus occidentalis*)	15	3.8	1.61	4.3	-	-	-	-
Walnut (*Juglans sp.*)	26	6.5	1.93	5.1	39	8.2	3.34	7.4
Willow/Cottonwood	26	6.5	2.02	5.4	1	0.2	0.07	0.2
Total	399	100.0	37.72	100.0	475	100.0	45.16	100.0

excluding unknowns; Mixed Hardwoods include diffuse, ring, and semi-diffuse porous

Table 3.10. Identified wood charcoal recovered from SunWatch hearths and trash pits and Wildcat features.

identified taxa, excluding unidentified mixed hardwoods and unidentified softwoods) of wood taxa (Table 3.10). By weight, the SunWatch assemblage is dominated (in descending order) by white oak, hickory, and ash, with 13 taxa making up the remaining 31.7 percent of the assemblage. The most abundant wood taxa by weight at Wildcat include red oak, ash, and chestnut, followed by white oak, walnut, and elm/hackberry (Table 3.10). Eleven additional taxa make up the remaining 47.1 percent of the assemblage (Table 3.10).

The Mixed Hardwoods group comprises 7.8 percent of the Wildcat wood assemblage by weight and includes taxa which could not be identified with confidence beyond ring, semi-diffuse, or diffuse porous characteristics. Several of these mixed hardwoods are identified to possible/probable taxa based on morphological traits (such as the pore arrangement and the presence of rays), including the following:

Taxa	Count	Wt (g)	% Wt
Ash	9	0.48	1.1
Oak	28	1.12	2.5
Oak/chestnut	12	0.61	1.4
Walnut	16	0.48	1.1
Willow	1	0.12	0.3

Table 3.11. Possible taxa included in the Mixed Hardwoods category in Table 3.10.

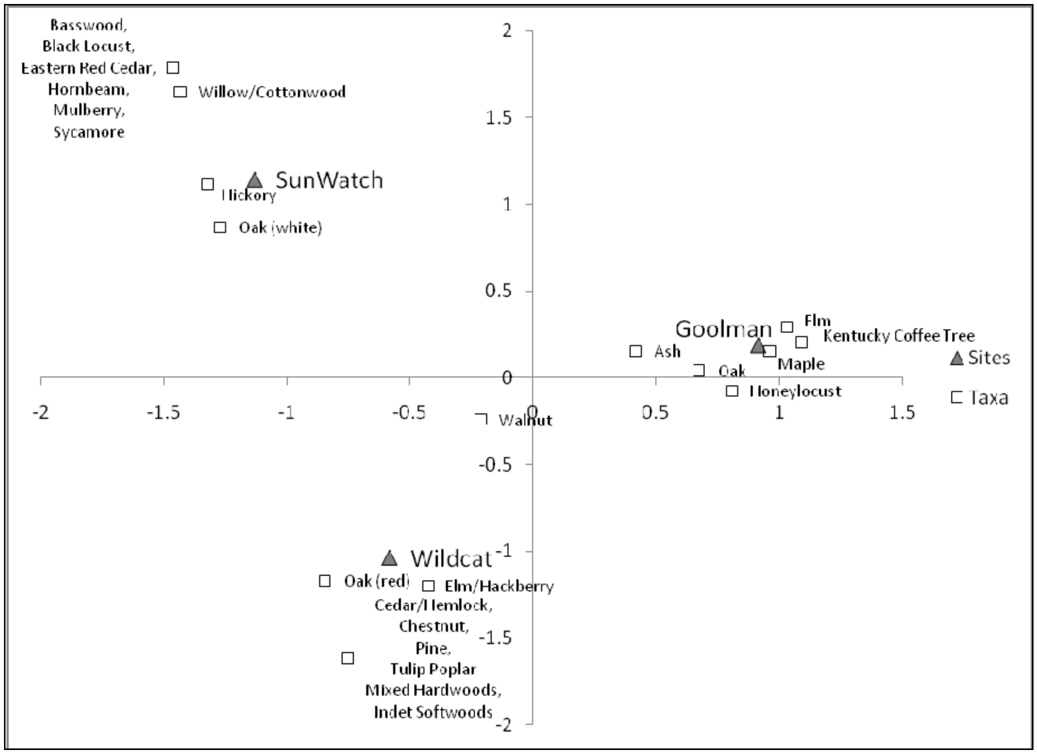


Figure 3.12. Correspondence map of densities of wood charcoal by type and site (grams per 100 ℓ sediment)

Axis	Singular values	Eigenvalues	Cumulative percent of Eigenvalues
1	0.791524	0.626510	0.581774
2	0.671108	0.450386	0.418226
	Sum of eigenvalues	1.076896	1

Table 3.12. Singular values and eigenvalues for the SVD of densities of plant remains by type and site (grams per 100 ℓ sediment), with nut taxa separated.

Figure 3.12 shows a correspondence plot of potential firewood taxa (row variables) and sites (column variables) for wood charcoal densities (gram weight per 100 ℓ sediment) mapped along horizontal (Axis 1) and vertical (Axis 2) axes. The data used to construct the plot is in the Appendix. Fifty-eight percent of the variation in Figure 3.8 occurs along Axis 1 (horizontal) (Table 3.11). Goolman taxa densities are presented in the Appendix. The Goolman site—located in a deeply-incised, narrow (only 30 m across) stream valley in the uplands of Kentucky (Turnbow and Jobe 1981)—unsurprisingly appears to have a stronger association with trees commonly found on upland ridgetops and sideslopes such as ash, oak, elm, maple, honeylocust, and Kentucky coffeetree. All sites correspond with fast-growing trees, such as basswood, black locust, eastern red cedar, mulberry, sycamore, and willow/cottonwood with SunWatch and tulip poplar, pine, and elm with Wildcat.

3.5 Analysis Summary

Chapter 3 compares macrobotanical data from Wildcat with reported data for the Sunwatch, Goolman, and Driving Range sites. Issues regarding preservation bias, comparative sample sizes, and aggregation of data from sources available for comparison to Wildcat, the solutions I tried for each, and my rationale for doing so are outlined. Comparisons are based on the density of charred plant material observed per 100 ℓ soil in order to account for taxa with values less than 0.01 g/ℓ.

Seasonal and compositional data are presented for the Wildcat, SunWatch, and

Driving Range small seed assemblages, including EAC taxa. Aggregate densities are plotted to show correspondence with the sites. Compared to SunWatch, Wildcat appears to have a slightly stronger correspondence with EAC taxa (Figure 3.5-3.7) and with wild fruits (blueberry, paw paw, and raspberry) (Figure 3.6).

Densities of identified non-seed food taxa (beans, corn, squash, and nuts) and wood charcoal are similarly compared by sites. Figures 3.8-3.10 suggest that Wildcat has a greater association with squash and beans than any of the other sites, while SunWatch has a closer association with corn.

SunWatch and Wildcat exhibit almost identical species richness (total number of identified taxa, excluding unidentified mixed hardwoods and unidentified softwoods) of wood taxa (Table 3.10). The SunWatch assemblage is dominated by ash, hickory, and white oak, while red oak, ash, and chestnut comprise the majority of the Wildcat taxa.

By weight, the SunWatch assemblage is dominated (in descending order) by white oak, hickory, and ash, while red oak, ash, and chestnut comprise the majority of the Wildcat taxa. A discussion of the results follows.

CHAPTER 4

DISCUSSION

Previous research on Miami Valley Fort Ancient settlements has generally focused on large communities supported by a maize-based agricultural economy. A preliminary examination of samples from Features 1/07 and 3/07 (trash-filled storage pits) led me to suspect that Wildcat's inhabitants used less maize than expected for a permanent Fort Ancient period village. I predicted that a preference for indigenous Woodland subsistence traditions over corn could be related to settlement characteristics and environmental factors, such as:

1. differential access to maize due to environmental constraints, including the availability of suitable soils or other landform characteristics;
2. self-sufficiency (as demonstrated by evidence of year-round occupation, rather than evidence of short-term occupation associated with seasonal hunting and gathering activities) that allowed for alternatives to the maize-based economy through lowered opportunity costs associated with availability of wild game and plant resources; and
3. less environmental impact (lesser degree of resource exhaustion) than large

villages due to a lower population to support and greater ability to selectively exploit resources (Gremillion, et al. 2008).

4.1 Wildcat Maize and the EAC Tradition

I compared the relative densities (count per 100 ℓ soil) of EAC plants at Wildcat and SunWatch to evaluate the hypothesis that small communities had less incentive to focus on maize agriculture and would therefore continue Woodland subsistence strategies. I expected Wildcat to have small EAC seeds in higher densities and in a higher percentage of contexts than at SunWatch. I was unable to determine ubiquity for EAC specimens at SunWatch.

The Wildcat data suggests that not all Fort Ancient groups were as heavily dependent on maize as commonly argued in the literature, supporting the idea that this change occurred at an uneven rate across the landscape and that there is greater variability in Fort Ancient economies than recognized. The rate and intensity of change differed from village to village due to differences among residential groups in terms of access to plant taxa, food preferences, or success at growing certain domesticates or cultivars over others.

While Wildcat did not have much higher densities of EAC plants relative to SunWatch, it had considerably lower densities of maize even though much of the recovered SunWatch maize was not included in the present analysis. Any maize kernels, cupules, or cobs large enough to be measured were recovered by screening or troweling rather than flotation at SunWatch; the reported data includes measurements and some counts, but no weights.

Maize kernels are common in Wildcat feature contexts, present in 23 (nearly 70 percent) of 33 processed flotation samples (total volume of 188.25 ℓ) from storage pit and hearth contexts. However, all of the recovered maize kernels appear to have been shelled; no cobs have been recovered beyond one small cupule and a few cupule fragments which likely were dislodged from cobs during the shelling process and transported on site with the kernels. Although it is possible that cobs were being used as a fuel source for activities such as hide preparation, and smudge pits may yet be uncovered, this lack of cobs suggests that maize kernels were transported to the site through exchange rather than direct agricultural production.

The relatively low quantities of maize (1.71g) and fragmentary nature of the remains at Wildcat may result from differential preservation, but it seems more likely to reflect lesser incentive to focus on maize agriculture by the smaller population. Compared to SunWatch (13.00 g flotation-recovered corn), which included numerous cob and cupule fragments, Wildcat corn densities (0.91 g/100 ℓ) are about one fourth those recorded for the larger village. Despite the lower number and volume of analyzed samples, EAC plants (excluding squash) had slightly higher densities in Wildcat contexts than in SunWatch features. Squash had a much higher presence at Wildcat. Taken together, the shelled corn, EAC densities, and high quantities of squash rind support my prediction that the smaller, more remote site maintained Woodland period subsistence traditions over maize agriculture.

With the exception of small seasonal camps following the Miami-Potawatomi system, most studied Fort Ancient settlements show evidence for a focal maize-based economy. Admittedly, these settlements have tended to be larger villages with fairly high population densities, while smaller sites are often underrepresented, overlooked, or automatically assumed to be procurement stations. Wildcat's inhabitants appear to have had less incentive to farm maize than expected from the published culture-history for the Middle Fort Ancient period and the Miami Valley region. Possible explanatory alternatives include: (1) environmental constraints such as availability of land suitable for cultivation; (2) self-sufficiency as manifested in reduced opportunity costs related to mast harvesting, cultivation of native crops, hunting, and adequate storage of other foods; (4) reduced costs by access to maize through exchange; and (5) low population size.

4.2 Soils and Vegetation

4.2.1 Vegetation

A discussion of soils and vegetation is necessary to understand possible explanations for differential access to maize and incentives for maintaining largely indigenous subsistence traditions. Distributions of species and vegetation patterns can be related to differences in soils and elevation. These distributions gradate on both a north-south axis related primarily to regional climate and the past history of climatic change and plant migrations following the last glaciation, and on an east-west axis related primarily to topography and local climatic factors.

Wildcat and SunWatch are located on the Illinoian Till Plain, in the Beech-Maple Forest region. The Illinoian Till Plain is characterized by late Wisconsin glacial till with a well-developed drainage network and fertile soils. The Beech-Maple Forest region is dominated by beech and sugar maple trees on better-drained Wisconsin till and outwash-free valleys, with extensive stands of black and white ash, elm, and red maple in depressions and intermorainal flats (Braun 1989 [1961]). As Sampson (1927) notes, forest composition changes with elevation and soils, transitioning from Beech-Maple to Oak-Maple (as a transition between Beech-Maple and Oak-Hickory near the prairie) to Oak-Hickory on uplands. Less-fertile, acidic soils in the region support mixtures of eastern hemlock (*Tsuga canadensis*), tulip-poplar (*Liriodendron tulipifera*), birches (*Betula* spp.), magnolias (*Magnolia* spp.), white pine (*Pinus strobus*), red maple (*Acer rubrum*), and oaks. Braun (Braun 1961 [1989]:22) observes that the Illinoian Till Plain was once occupied by tracts of swamp forest composed of oaks, red maple, sweet gum, beech, and a variety of hickories. Now much of the region is characterized by second-growth pin oak and sweet gum stands or farmland (corn, soybeans, wheat, livestock) on artificially-drained clayey soils.

Wagner (1987) presents a detailed discussion of the local vegetation of the SunWatch site. The moist, fertile soils of the floodplain hosted a forest of mixed hardwood trees—hickory (*Carya sp.)*, ash (*Fraxinus Americana*), buckeye (*Aesculus* *flava*), hackberry (*Celtis occidentalis*), elm (*Ulmus sp.*), honey locust (*Gleditsia triacanthos*), walnut (*Juglans sp.*), oak (*Quercus sp.*), sugar maple (*Acer saccharum* var. *saccharum*), hornbeam (or ironwood, *Carpinus caroliniana*), and dogwood (*Cornus sp.*) (Wagner 1988). Thirteenth-century faunal and floral remains suggest the presence of prairie habitats nearby. Historic land survey accounts refer to oak-hickory-ash forest on the ridge approximately 1.6 km east of SunWatch on the opposite side of the Miami River (Wagner 1988).

4.2.2 Soils

Researchers have found a strong correlation between site location and soil texture and drainage characteristics due to their effect on crop yields (Gremillion, et al. 2008:403, Krakker 1985; Smith 1992, 2006). Fort Ancient communities preferred to establish settlements on moderately-well to well-drained loamy soils suitable for maize agriculture and simple digging-stick and shell/bone hoe farming technology as a risk management strategy (Krakker 1985:100; Nass 1987:223). Krakker (1985:98-99) argues that "a shift toward cooler, if not wetter, conditions after about A.D. 1200 would have favored selection for better drained soils…. Lower moisture stress frequency or severity would reduce yield variability and make well-drained soils more productive. Possibly shorter growing seasons and moister spring conditions would increase the relative advantage of well-drained soils in order to plant as early in the season as possible." Further, the "increased risk of water-logging, flooding or frost would reduce the advantage of higher fertility of poorly drained soils" (Krakker 1985:300).

Figure 4.1. Montgomery County Soil Survey Area Map showing Wildcat village area. Map units correspond to Table 4.1 (NRCS 2008).

Location	Soil Unit	Typical Soil Setting	Description	Typical Profile
Habitation area	Miamian silt loam, 2 to 6 percent slopes, moderately eroded (MlB2)	Elev.: 210-470 m Mean ann. precip.: 89-114 cm Mean annual air temp.: 50-55 deg. F Frost-free period: 151-180 days Landform: Recessional and ground moraines Parent material: Silty loess over loamy till	Well drained > 2 m to water table No flooding or ponding 45 % maximum calcium carbonate content Moderate available water capacity (about 18 cm)	0-18 cm: Silt loam 18-61 cm: Clay loam 61-152 cm: Loam
West area	Corwin silt loam, 2 to 6 percent slopes (CoB)	Elev.: 180-244 m Mean ann. precip.: 81-114 cm Mean annual air temp.: 46 -55 deg. F Frost-free period: 160-190 days Landform: Ground moraines Parent material: Silty loess over loamy till	Moderately well drained 46-91 cm to water table No flooding or ponding 30 % maximum calcium carbonate content Moderate available water capacity (about 21 cm)	0 -23 cm: Silt loam 23-91 cm: Silty clay loam 91-152 cm: Loam
Floodplain	Sloan silt loam (So)	Elevation: 210-300 m Mean ann. precip.: 79-104 cm Mean annual air temp.: 50-55 deg. F Frost-free period: 145-200 days Landform: Depressions on flood plains Parent material: Loamy alluvium	Very poorly drained About 0 cm to water table Frequent flooding and ponding 40 % maximum calcium carbonate content Moderate available water capacity (about 21 cm)	0-30 cm: Silt loam 30-64 cm: Clay loam 64-152 cm: Gravelly loam

Table 4.1. Wildcat soil data (NRCS 2008).

Regarding environmental constraints on crop production, there is little variability between Wildcat and SunWatch in terms of growing periods, mean annual precipitation, and mean temperatures. Wildcat sits on a small rise in a former agricultural field, adjacent to a narrow floodplain of an unnamed tributary of the Great Miami River (about 1.6 km from the river), with a small spring in the southwest corner of the current field clearing (Figure 4.1). In terms of soils characteristics, the site should be suitable for low-intensity household gardening, as soils in the immediate vicinity of the structures are moderately-well to well-drained and loamy (Table 4.1). The presence of digging implements (shell hoes and deer scapulas), high quantities of domesticated squash, and anthropogenic seed plants indicates that gardening or other land management took place in the vicinity of the village. Although the floodplain would be organically rich, the poorly drained soils would not be suitable for intensive corn agriculture due to the constant risk of flooding during the summer growing season (Krakker 1985:100). If Wildcat households were involved in intensive corn production, fields would need to be farther from the site on better-suited soils. The lack of corn cobs at the site support the idea that corn was grown and processed elsewhere and transported to Wildcat.

The USDA Soil Conservation Service (1976) characterizes the Wildcat vicinity as "Prime Farmland With Conditions," a term that describes soils requiring artificial drainage practices for farming due to seasonally high water tables and/or protection from frequent flooding during growing seasons. This high water table and frequency of soil inundation (likely even higher due to the presence of two additional water courses

Figure 4.2. Montgomery County Soil Survey Area Map showing SunWatch village area.
Map units correspond to Table 4.2.

Location	Soil Unit	Typical Soil Setting	Description	Typical Profile
Visitor's Center	Warsaw silt loam, 0 to 2 percent slopes (WaA)	Elevation: 122-290 m Mean ann. precip.: 76-114 cm Mean annual air temp.: 50-57 deg. F Frost-free period: 140-210 days Landform: Terraces Parent material: Loamy outwash over sandy and gravelly outwash	Well drained 0.6-1.1 m to strongly contrasting textural stratification > 2 m to water table No flooding or ponding 25 % maximum calcium carbonate content Low available water capacity (about 12 cm)	0-15 cm: Silt loam 15-64 cm: Clay loam 64-81 cm: Gravelly sandy loam 81-152 cm: Sand and gravel
Village	Wea silt loam, 0 to 2 percent slopes (WeA)	Elevation: 183-305 m Mean ann. precip.: 89-114 cm Mean annual air temp.: 48-55 deg. F Frost-free period: 150-200 days Landform: Terraces Parent material: Loamy outwash over sandy and gravelly outwash	Well drained 1.0-1.5 m to strongly contrasting textural stratification > 2 m to water table No flooding or ponding 35 % maximum calcium carbonate content Moderate available water capacity (about 22 cm)	0-36 cm: Silt loam 36-119 cm: Clay loam 119-152 cm: Sand and gravel
Area South of Village	Lorenzo-Rodman complex, 4 to 12 percent slopes, moderately eroded(LxC2)	Elevation: 152-311 m Mean ann. precip.: 71-140 cm Mean annual air temp.: 43-55 deg. F Frost-free period: 125-180 days Landform: Stream terraces Parent material: Loamy outwash over sandy and gravelly outwash	Lorenzo: Well drained 25-61 cm to strongly contrasting textural stratification > 2 m to water table No flooding or ponding 45 % maximum calcium carbonate content Very low available water capacity (about 6 cm)	0-10 cm: Loam 10-38 cm: Clay loam 38-152 cm: Sand and gravel
			Rodman: Excessively drained 20-30 cm to strongly contrasting textural stratification > 2 m to water table No flooding or ponding 45 % maximum calcium carbonate content Very low available water capacity (about 3 cm)	0-8 cm: Loam 8-23 cm: Gravelly loam 23-152 cm: Sand and gravel

Table 4.2. SunWatch soil data (NRCS 2008).

bounding the habitation site to the north and south in the past) may have contributed to an unacceptable level of variance in corn yields that had not yet been offset by the adoption of more productive strains of maize or improved technology.

SunWatch, however, is located on well-drained Wea silt loam, and is surrounded by other rich, well-drained soils on a terrace of the Miami River perfectly suited for maize agriculture (Figure 4.2 and Table 4.2). Reports of high quantities of large cobs suggest that corn was grown and processed locally (although it may also have been brought to the site for ritual or social purposes).

4.3 Self Sufficiency

I predicted that Wildcat would be a largely self-sufficient community despite its small size. Evaluation required looking for evidence of strongly seasonal feature contexts at Wildcat to see whether it fit in the Miami-Potawatomi seasonal settlement pattern as either a summer village or a winter camp. I attempted to determine seasonality of excavation contexts in part from the densities of seasonal plant remains and by correlation with a preliminary analysis of faunal remains (e.g., deer antlers and teeth, fish bones, or mussel shell) conducted by Jacob Deppen (2008) under the supervision of Robert Cook.

4.3.1 Comparison to Winter Encampments

Wildcat lacks key characteristics of a winter encampment compared to sites such as Goolman in Kentucky and the Driving Range site in the Miami Valley, near Cincinnati.

Turnbow and Jobe (1984) argue that Goolman's structural plans and arrangements differ markedly from other small Fort Ancient villages. Small sleeping huts, apparently designed to maximize heat retention for one or two family units, cluster around a more permanent multi-purpose structure that may have served as a communal site for domestic activities. Its position in a narrow stream valley may have provided protection from frigid winter winds (Turnbow and Jobe 1984). Goolman's valley is unsuitable for agriculture due to its high water saturation and frequency of flooding episodes; therefore, it is not surprising that it exhibits no digging implements and few cultigens.

At Goolman (15CK146) white-tailed deer remains dominate the faunal assemblage, and fish are only minimally represented. Similarly, Purtil's (1999:123, 125) Driving Range site data reinforces the notion of a Fort Ancient late fall through early winter economy focused on white-tailed deer. Of particular note is the general lack of riverine resources such as fish and waterfowl and low ubiquity of mussel shell, despite the site's close proximity to Clear Creek, Little Miami River, and other water sources (Purtil 1999:105). A single feature (Feature 21) in the southern part of the habitation area produced 89 percent of nutshell remains and has been interpreted as a limited on-site nut processing station (Purtil 1999:123). Although nutshell densities are low overall, such nut processing stations are also consistent with expectations for Fort Ancient winter camps.

The Driving Range site excavation resulted in the recovery of few cultigens—four maize kernel fragments from Feature 1 and a single domesticated chenopod

(*Chenopodium bushianum*) seed—which Purtil (1999:126) remarks as standing in sharp contrast to the common high occurrence of cultigens at long-term village sites such as SunWatch and Shomaker (33HA400). The lack of cobs suggests that the inhabitants transported maize kernels to the site. Additionally, features produced no wild plant remains which strengthens the argument of winter-time use when such resources are generally lacking.

4.3.2 Seasonality

Floral and faunal remains from secondary refuse from storage pits and structural data (spatial arrangement) indicate that, despite its small size, Wildcat was occupied year-round rather than being a seasonal resource procurement camp. This may represent a change in the settlement pattern over time, as the Miami-Potawatomi pattern better fits data from earlier (e.g., late twelfth-century Early Fort Ancient) occupations at locations such as SunWatch and elsewhere. The apparent small size and likely low population density appears to have made it unnecessary for Wildcat inhabitants to branch out to other small settlements during the lean parts of the year.

Fort Ancient groups typically practiced a focal economy adapted to their environment, with the level of exploitation tied to seasonal availability, or density-dependant encounter rates (Table 1.2). Agricultural activities (particularly maize cropping) took place during summer and fall, supplemented by fishing and the hunting of small game during the season of resource abundance. During late fall to early winter, the exploitation pattern shifted to large mammals, primarily white-tailed deer, and the collection of nut mast, with minimal use of marine resources. Winter through early spring marked a decrease in the importance of large mammals decreased in favor of marine resources (as fish spawn).

Wildcat was certainly occupied during the warmer months of the year and therefore was clearly not a winter camp. Although storage technology may reduce the utility of using floral remains as indicators of seasonality, the range of plant remains (including weedy wild plants with little economic value) at Wildcat covers the full range of seasons (Table 3.4). Faunal remains include substantial quantities of fish scales and bone as well as deer bone and the remains of small mammal game. Deppen (2008) found that his sample size was too small to make a definite determination of seasonality. However, he argues that "the presence of individuals less than five months (based on unfused proximal radii) could indicate a warm season occupation at Wildcat" as white-tailed deer are typically born in late May or early June and a maximum age of five months would place those individuals' deaths around late October or early November(Deppen 2008:29). Large quantities of adult deer (for which the analysis is not yet complete) and the relatively high number of storage pits indicate that the village was occupied during the colder months as well.

The prevalence of storage pits in the portion of the site that has been excavated to date shows that storage was an important coping mechanism against periods of short-term, predictable (such as seasonal) food shortages (Brenton 1988; Wagner 2008). Dried food or planting seed can be stored for more than a year (Colson 1979). Coping practices represent changes in the relationship between expected average food requirements and minimum requirements for survival. These relationships will contract or expand diet breadth. Refusal to replace traditional crops (EAC) with more productive maize varieties may reflect an understanding on the part of the Wildcat population of the relationship between variance in yield and environmental risk, and may not have depended so much on energetic contribution or effect (Gremillion 1996).

4.4 Environmental Impact

4.4.1 Firewood Selectivity

I predicted Wildcat wood charcoal would indicate lower diversity of exploited trees than that of SunWatch based on the assumption that the smaller community and its lower population density would have significantly less environmental impact than the larger village. I expected Wildcat to exhibit less diversity in exploited trees because the lesser degree of resource exhaustion near the smaller settlement would allow the inhabitants to be more selective in their exploitation of local resources (Gremillion, et al. 2008). I assume that if Wildcat residents encountered less environmental stress and did not need to support a large population, they would correspondingly have less incentive to focus on a more intensive maize-based subsistence strategy.

SunWatch and Wildcat exhibit almost identical species richness of wood taxa (Table 3.10). Both sites show at least some use of successional forest species and weedy plants indicative of disturbed habitats—although some of the disturbance could be nonanthropogenic and instead relate to seasonal flooding. There appears to be a strong preference for white oaks, hickory, and ash at SunWatch and a preference for red oaks, ash, and chestnut at Wildcat (Table 3.10). The selection of woods at SunWatch seems focused on the dominant hardwood species of the surrounding forest noted by Wagner (1987).

Wildcat shows a preference for red oak (at 25 percent of the assemblage by weight) and ash (13.2 percent) followed by a more even representation of chestnut, white oak, walnut, and elm/hackberry. Thirteen taxa comprise the remaining 31.7 percent of the assemblage. The presence of chestnut seems strange considering that, according to Braun (1969) it typically occurs on non-calcareous soils and was restricted mostly to the Allegheny Plateau in Ohio.

My prediction about firewood selectivity at Wildcat did not bear out in the sample. It seems that for both sites, domestic fuel collection was expedient, providing a representative sample of the forest community that does not support an argument for selectivity. Deforestation would cause decreased returns to fuel collection and construction labor, and would require an adjustment to collection strategies. Labor costs could be offset partially by changing the species mix used or harvesting strategies rather than collecting deadwood from increasingly distant areas. It is possible that the variety of exploited trees reflects expedience rather than a need for diversification of firewood resources, though most of the wood charcoal comes from rapidly-growing species which points toward intensification of fuel collection.

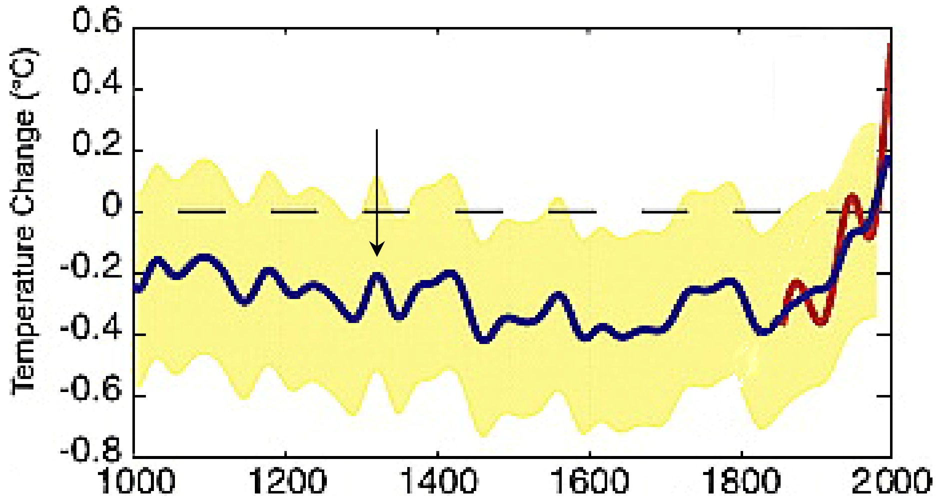


Figure 4.3 Northern Hemisphere annual temperatures from high-resolution proxy data, 1000-2000 CE (adapted from Jones and Mann 2004). The blue line represents an average of five data sets through the year 1400, and 6 datasets afterward. The red line represents the instrumental record.

4.4.2 Climate Stress

Climatic stress during the Medieval Warming Period (circa 1300-1450) may have decreased the viability of maize crops in southwestern Ohio at the time of the Wildcat occupation. Figure 4.3 shows a simplified graph of annual temperature fluctuations over the past millennium based on high-resolution, annually and/or seasonally-resolved proxy climate records—historical documents, dendroclimatic measurements (tree ring growth and density), corals, annually resolved ice cores, laminated ocean and lake sediment cores, and speleothems (Jones and Mann 2004). Median probable radiocarbon dates taken from Wildcat range from 1169 to 1444 (2 sigma cal) (Table 1.1), with a median date of occupation around 1319 CE, which coincides with the peak of the temperature elevation.

Even if the prolonged, severe drought did not affect the Wildcat inhabitants, maize production would have been problematic. Water stress at different times in the maize growth cycle will affect yields. The plants are particularly vulnerable to water shortages during tasseling/silking (Minnis 1985). Drought or excessive moisture, such as that produced by flooding or a high water table, during key periods of maize growth coupled with poor soils could reduce yields to the point where the costs of growing corn would exceed its benefits, especially at occupations like Wildcat, where any maize horticulture was likely to be small-scale and greatly susceptible to the adverse effects of prolonged drought or flooding.

4.4.3 Ritual and Exchange

The availability of maize as an exchange item may also have decreased the necessity to grow it for ritual or social purposes. Wildcat maize appears to come from shelled corn with virtually no cob fragments yet recovered. Ethnohistoric and ethnographic accounts of Eastern Woodlands cultures describe the economic, social, political, and religious significance of maize among many late prehistoric and historic groups in the region, particularly through the rituals of the Busk, or Green Corn Ceremony (Schroeder 1999; Witthoft 1949).

Indirect evidence for ritual may have been identified at Wildcat in the form of a large, isolated post feature. All of the possible cedar/hemlock wood charcoal specimens came from Feature 1, the large solitary post identified association with an area of burned earth in Trench 1 (Figure 2.2). Future investigations will attempt to determine the nature of the post, i.e., association with a structure, ritual context, or solar alignments. Sun-aligned cedar posts are commonly found in association with Fort Ancient and Mississippian circular villages, and were an important component of earlier Hopewellian sites (Brown 1997). Ethnographic accounts describe the prominence of such poles in Eastern green-corn ceremonies of the Delaware, Cherokee, Creek, and Natchez (Witthoft 1949). Witthoft (1949: 32, 53–62) notes that fire played a common role in these rituals, either through the renewal of fire throughout the community or in the roasting of the first green-maize ears.

CHAPTER 5

SUMMARY AND CONCLUSIONS

The Wildcat site (44MY499) is a small Middle Fort Ancient village in the Miami River Valley of southwestern Ohio. Data from the site seem to support the argument that small Fort Ancient communities did not depend on maize agriculture as much as Fort Ancient models of subsistence claim. Year-round occupation sometime during the late thirteenth to mid-fourteenth centuries is supported by the recovery of a variety of floral and faunal remains from all seasons as well as other marked contrasts in village organization and material culture from known Fort Ancient seasonal camps.

Although Wildcat does not appear to be reliant on maize agriculture, shelled corn is present in most samples and it is likely that maize was culturally important to the people of the village. Kernels likely came to Wildcat from an off-site processing location, possibly via exchange. Future research at Wildcat and other small settlements should attempt to define their place within the political economy of the Miami River Valley Fort Ancient area.

Current data are insufficient to determine whether the corn was intended for planting, offered to household visitors, or part of public gatherings (as food offerings, exchanges, or feast goods). Variables such as political or familial relationships between settlements or possible migrations to and from Mississippian regions will help identify incentives to farm more intensive, introduced crop species in some areas, and the choice to continue more traditional Woodland horticultural practices based on indigenous cultigens in other areas. Radioisotopic analyses of human remains, if encountered, will help solve the puzzle of the importance of maize in the Wildcat diet. For example, strontium isotopic analyses could be useful to determine population movement, coupled with staple carbon isotope analyses to determine the relative importance of maize in the diet of individuals.

A more comprehensive evaluation of environmental data, such as pollen information, phytoliths, or even experimental plantings of corn in the vicinity of the site (although waterways appear to have been altered during the historic period) should aid in determining what factors influenced Wildcat subsistence strategies and coping practices. Future research can address whether such practices arose from a need to offset periods of short-term seasonal stress, longer-term drought from wide-spread climatic change, or impacts to the local environment as a result of human activities, such as land management, foraging, and population pressures. Also, a comparison of wood charcoal across the site by temporally-secure contexts should show whether fast-growing tree species increase in frequency relative to slow- growing species, an indicator that Wildcat residents intensified fuel gathering over time.

Access to wild game and mast resources, tried-and-true EAC crops, a stable water supply, and adequate storage technology (pits and vessels) would allow a low-population, permanent community (consisting of a perhaps a few kin-based households) to maintain its food supply during winter and spring as resource availability decreases. Therefore, small settlements would have continued such indigenous subsistence strategies as long as their residents did not face greater cultural incentives (i.e., trade, prestige, or ritual purposes) or environmental incentives (i.e., climate change and decreased carrying capacity) to adopt maize or other introduced crops.

Perhaps for Wildcat residents, the total benefits from maize production were low in relation to rising opportunity costs against proven subsistence alternatives, such as traditional EAC crops (including indigenous squash) and wild resources that could reliably be stored for use during periods of seasonal stress and against animal protein sources. Refusal to replace these resources with potentially-more productive maize varieties may reflect their understanding of the relationship between variance in yield and environmental risk and was itself a coping mechanism. Risks could have related to climate and soil suitability, including the tendency of soils to flood and soil nutrient depletion issues. Similarly, cropping decisions could have been related to social factors, such as food preferences, ritual associations, or political issues.

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APPENDIX

Figure 3.5. Correspondence map of aggregate small seed densities

Site	EAC	Wild	Tobacco
Wildcat	16.46746	117.3971	1.593625
SunWatch	14.23164	96.89629	1.816805
Goolman	0	108.8191	0
Driving Range	1.515152	1.515152	0

Singular and eigenvalues for the SVD (U LAMBDA V')

Singular values	Eigenvalues	Cumulative % of Eigenvalues
0.24568	0.060359	0.966818
0.045515	0.002072	0.033182
Sum of eigenvalues	0.06243	1

Column coordinates = (ColTot/Tot)^(-0.5)*V

EAC	3.097876	-0.76562
Wild	-0.32999	-0.02909
Tobacco	2.148823	10.00075

Row coordinates = (RowTot/Tot)^(-0.5)*U

Wildcat	0.471721	-0.01384
SunWatch	0.577223	0.866583
Goolman	-1.34317	-0.6391
Driving Range	5.633099	-8.73025

Figure 3.6. Correspondence map of aggregate small seed densities

Identification (Count)	SunWatch	Wildcat	Driving Range
Amaranth (Pigweed) *	0.302801	3.718459	0
Barnyard Grass	0.605602	0	0
Bedstraw	0.302801	1.593625	0
Blackberry/Raspberry/Dewberry	1.816805	8.499336	0
Blueberry	0	0.531208	0
Chenopod *	8.781226	0	1.515152
Flowering Dogwood	0	0.531208	0
Fragments	24.82967	36.65339	1.515152
Grape	0.908403	1.062417	0
Grass	2.422407	4.249668	0
Groundcherry	0.605602	0	0
Hackberry	0.908403	0.531208	0
Hawthorn	0.605602	0	0
Heal-all	0.302801	0	0
Jewelweed	0	0.531208	0
Knotweed *	3.936412	6.374502	0
Little Barley *	0.908403	0.531208	0
Maygrass *	0	3.718459	0
Maypops	0	1.062417	0
Nightshade	11.20363	1.593625	0
Nightshade Family	0	1.593625	0
Nimblewill	0	1.062417	0
Panicgrass	5.147615	0	0
Paw Paw	0	7.968127	0
Pea Family	1.211204	1.062417	0
Penny Cress	0	0.531208	0
Pokeberry	0.302801	1.593625	0
Rattlebox	0.302801	0	0
Spurge	0.605602	0	0
Sumac	31.18849	30.27888	0
Sumpweed *	0	0.531208	0
Sunflower *	0.302801	1.593625	0
Tick Trefoil	0.605602	0	0
Tobacco	1.816805	1.593625	0
Unid. Composite	0.302801	0	0
Unknown/Indeterminate	10.29523	7.968127	0
Verbena (Vervain)	0.908403	2.656042	0
Wild Bean	1.514005	3.187251	0
Witch Hazel	0	2.124834	0

Column coordinates = (ColTot/Tot)^(-0.5)*V		
SunWatch	-1.03208	-0.3953
Wildcat	0.917247	0.134899
Driving Range	-2.37371	8.72715

Row coordinates = (RowTot/Tot)^(-0.5)*U

Amaranth (Pigweed) *	1.558858	0.381866
Barnyard Grass	-2.08819	-1.5894
Bedstraw	1.226103	0.202009
Blackberry/Raspberry/Dewberry	1.161249	0.166954
Blueberry	1.855844	0.54239
Chenopod *	-2.48764	3.808027
Flowering Dogwood	1.855844	0.54239
Fragments	0.141229	0.533061
Grape	0.037936	-0.44021
Grass	0.423898	-0.23159
Groundcherry	-2.08819	-1.5894
Hackberry	-0.63286	-0.80278
Hawthorn	-2.08819	-1.5894
Heal-all	-2.08819	-1.5894
Jewelweed	1.855844	0.54239
Knotweed *	0.350126	-0.27147
Little Barley *	-0.63286	-0.80278
Maygrass *	1.855844	0.54239
Maypops	1.855844	0.54239
Nightshade	-1.59704	-1.32393
Nightshade Family	1.855844	0.54239
Nimblewill	1.855844	0.54239
Panicgrass	-2.08819	-1.5894
Paw Paw	1.855844	0.54239
Pea Family	-0.24522	-0.59326
Penny Cress	1.855844	0.54239
Pokeberry	1.226103	0.202009
Rattlebox	-2.08819	-1.5894
Spurge	-2.08819	-1.5894
Sumac	-0.14535	-0.53928
Sumpweed *	1.855844	0.54239
Sunflower *	1.226103	0.202009
Tick Trefoil	-2.08819	-1.5894
Tobacco	-0.24522	-0.59326
Unid. Composite	-2.08819	-1.5894
Unknown/Indeterminate	-0.36744	-0.65932
Verbena (Vervain)	0.850703	-0.0009
Wild Bean	0.585698	-0.14414
Witch Hazel	1.855844	0.54239

Singular and eigenvalues for the SVD (U LAMBDA V')

Singular values	Eigen values	Cumulative % of Eigenvalues
0.494248	0.244281	0.797943
0.248712	0.061858	0.202057
Sum of eigenvalues	0.306138	1

Figure 3.8. Correspondence map of densities of plant remains by type and site

Site	Bean	Corn	Nutshell	Squash
Wildcat	0.212483	0.908367	4.116866	1.243028
SunWatch	0.048448	3.920969	6.51022	0.024224
Goolman	0	0.089686	18.29596	0
Driving Range	0	0.030303	1.712121	0

Column coordinates = (ColTot/Tot)^(-0.5)*V

Bean	2.122838	3.315075
Corn	2.202415	-1.27726
Nutshell	-0.45972	-0.00986
Squash	2.074741	4.544151

Row coordinates = (RowTot/Tot)^(-0.5)*U

Wildcat	1.000965	1.929942
SunWatch	1.140655	-1.10974
Goolman	-0.9235	-0.03894
Driving Range	-0.85464	-0.07744

Singular and eigenvalues for the SVD (U LAMBDA V')

Singular values	Eigen values	Cumulative % of Eigenvalues
0.48374	0.234005	0.579672
0.411922	0.16968	0.420328
Sum of eigenvalues	0.403685	1

Figure 3.9. Correspondence map of densities of plant remains by type and site, with nut taxa separated

Identification (Count)	**SunWatch**	**Wildcat**	**Goolman**	**Driving Range**
Bean	0.048448	0.212483	0	0
Corn	3.920969	0.908367	0.089686	0.030303
Squash	0.024224	1.243028	0	0
Acorn	0.006056	0.021248	0	0
Butternut	0.351249	0.069057	0	0
Hazelnut	0.057532	0	0	0.106061
Hickory	5.950038	2.52324	16.26308	0
Thin-shelled Hickory	0	0.063745	0	0
Pecan	0	0.207171	0	0
Black Walnut	0.115064	0.626826	1.255605	0
Walnut Family	0	0.371846	0.77728	1.606061
Unid Nut	0.024224	0.233732	0	0
Hazel/Acorn	0.006056	0	0	0

Column coordinates = (ColTot/Tot)^(-0.5)*V

SunWatch	-0.43011	-0.38378
Wildcat	-0.02325	-1.84055
Goolman	-0.16866	0.860029
Driving Range	4.458935	0.084403

Row coordinates = (RowTot/Tot)^(-0.5)*U

Bean	-0.13167	-2.92867
Corn	-0.42751	-1.1672
Squash	-0.04135	-3.38126
Acorn	-0.15125	-2.83051
Butternut	-0.48414	-1.16233
Hazelnut	3.651239	-0.14969
Hickory	-0.28883	0.532312
Thin-shelled Hickory	-0.03098	-3.43321
Pecan	-0.03098	-3.43321
Black Walnut	-0.18404	-0.1102
Walnut Family	3.39659	0.080998
Unid Nut	-0.08191	-3.17803
Hazel/Acorn	-0.57324	-0.71587

Singular and eigenvalues for the SVD (U LAMBDA V')

Singular values	Eigenvalues	Cumulative % of Eigenvalues
0.75031	0.562965	0.523769
0.536101	0.287405	0.267394
Sum of eigenvalues	1.074834	0.791164

Figure 3.12. Correspondence map of densities of wood charcoal by type and site

Identification (Count)	SunWatch	Wildcat	Goolman
Ash	2.46481876	3.15537849	10.8228401
Basswood	0.01705757	0	0
Black Locust	0.14925373	0	0
Cedar/Hemlock	0	0.11686587	0
Chestnut	0	2.35856574	0
Eastern Red Cedar	0.55010661	0	0
Elm	0.28144989	0.23904382	7.19994021
Elm/Hackberry	0.04690832	1.65737052	0.36687593
Hickory	3.46695096	0.85524568	0
Honeylocust	0	0.79150066	3.25602392
Hornbeam	0.02132196	0	0
Kentucky Coffee Tree	0	0.15936255	3.07258595
Maple	0.09808102	0.47277556	4.63180867
Mixed Hardwoods	0	1.86454183	0
Mulberry	0.13646055	0	0
Oak	0.31982942	0.9561753	3.98977578
Oak (red)	0.89978678	6.00265604	0
Oak (white)	5.04477612	1.86985392	0
Pine	0	0.05843293	0
Poplar, Tulip	0	1.14209827	0
Indet. Softwoods	0	0.47808765	0
Sycamore	0.68656716	0	0
Walnut	0.82302772	1.77423639	1.42164425
Willow/Cottonwood	0.86140725	0.03718459	0

Column coordinates = (ColTot/Tot)^(-0.5)*V

SunWatch	-1.2856	1.431695
Wildcat	-0.66216	-1.29307
Goolman	1.043815	0.238829

Row coordinates = (RowTot/Tot)^(-0.5)*U

Ash	0.475618	0.193126
Basswood	-1.6649	2.235717
Black Locust	-1.6649	2.235717
Cedar/Hemlock	-0.85753	-2.01924
Chestnut	-0.85753	-2.01924
Eastern Red Cedar	-1.6649	2.235717
Elm	1.173402	0.366791
Elm/Hackberry	-0.48447	-1.49913
Hickory	-1.50515	1.393777
Honeylocust	0.919747	-0.09485
Hornbeam	-1.6649	2.235717
Kentucky Coffee Tree	1.242844	0.254997
Maple	1.094147	0.190686
Mixed Hardwoods	-0.85753	-2.01924

Row coordinates = (RowTot/Tot)^(-0.5)*U

Mulberry	-1.6649	2.235717
Oak	0.767383	0.051711
Oak (red)	-0.96278	-1.46457
Oak (white)	-1.44657	1.085092
Pine	-0.85753	-2.01924
Poplar, Tulip	-0.85753	-2.01924
Indet. Softwoods	-0.85753	-2.01924
Sycamore	-1.6649	2.235717
Walnut	-0.24135	-0.30166
Willow/Cottonwood	-1.63149	2.059643

Singular and eigenvalues for the SVD (U LAMBDA V')

Singular values	Eigenvalues	Cumulative % of Eigenvalues
0.772177	0.596258	0.592503
0.640374	0.410079	0.407497
Sum of eigenvalues	1.006337	1

Fort Ancient Project - 33MY499 Wildcat Site Fieldschool Inventory of Archaeobotanical Materials

Context	Liters (L)	Subsample	Type	Scientific Nomenclature	Comments	Qty	Wt (g)	Qty / 100 L	g / 100 L
F.01-07 W1/2 20-25cm	6	Carbonized Bark	Unknown/Indeterminate			6	0.0	100.0	0.67
F.01-07 W1/2 20-25cm	6	Carbonized Corn	Corn Kernel Fragments	*Zea mays*	>1.18mm	8	0.1	133.3	0.83
F.01-07 W1/2 20-25cm	6	Carbonized Nutshell	Black Walnut	*Juglans nigra*	2.00mm only	2	0.0	33.3	0.50
F.01-07 W1/2 20-25cm	6	Carbonized Nutshell	Walnut Family	Juglandaceae	>1.18mm	5	0.0	83.3	0.33
F.01-07 W1/2 20-25cm	6	Carbonized Seeds	Fragments			1		16.7	
F.01-07 W1/2 20-25cm	6	Carbonized Seeds	Raspberry	*Rubus occidentalis*		2		33.3	
F.01-07 W1/2 20-25cm	6	Carbonized Seeds	Sumac	*Rhus glabra*		4		66.7	
F.01-07 W1/2 20-25cm	6	Carbonized Squash/Gourd	Squash Rind	*Cucurbita pepo*		14	0.1	233.3	1.00
F.01-07 W1/2 20-25cm	6	Wood Charcoal	Hickory	*Carya sp.*		2	0.3	33.3	4.33
F.01-07 W1/2 20-25cm	6	Wood Charcoal	Oak (white)	*Quercus sp.*		7	1.0	116.7	16.83
F.01-07 W1/2 20-25cm	6	Wood Charcoal	Poplar, Tulip	*Liriodendron tulipifera*		1	0.1	16.7	1.33
F.01-07 W1/2 20-25cm	6	Wood Charcoal	Unidentified		All Sizes; (n=1211)		9.3		154.17
					F.01-07 W1/2 20-25cm Subtotal:	**52**	**10.8**		
F.01-07 W1/2 5-10cm	5	Carbonized Bark	Unknown/Indeterminate		All Sizes	6	0.0	120.0	0.20
F.01-07 W1/2 5-10cm	5	Carbonized Corn	Corn Kernel Fragments	*Zea mays*	2.00mm only	3	0.0	60.0	0.20
F.01-07 W1/2 5-10cm	5	Carbonized Nutshell	Butternut	*Juglans cinera*	2.00mm only	1	0.0	20.0	0.20
F.01-07 W1/2 5-10cm	5	Carbonized Nutshell	Thin-shelled Hickory	*Carya sp.*	2.00mm only	5	0.0	100.0	0.60
F.01-07 W1/2 5-10cm	5	Carbonized Nutshell	Walnut Family	Juglandaceae	>1.18mm	2	0.0	40.0	0.20
F.01-07 W1/2 5-10cm	5	Carbonized Seeds	Grass	Poaceae	large grass	1		20.0	
F.01-07 W1/2 5-10cm	5	Carbonized Seeds	Little Barley	*Hordeum pusillum*		1		20.0	
F.01-07 W1/2 5-10cm	5	Carbonized Seeds	Raspberry	*Rubus occidentalis*		1		20.0	
F.01-07 W1/2 5-10cm	5	Carbonized Seeds	Sumac	*Rhus glabra*		1		20.0	
F.01-07 W1/2 5-10cm	5	Carbonized Seeds	Unknown/Indeterminate		sim. to Agrimonia striata, but with more closely-gathered striations	1		20.0	
F.01-07 W1/2 5-10cm	5	Carbonized Squash/Gourd	Squash Rind	*Cucurbita pepo*	All Sizes	3	0.0	60.0	0.40
F.01-07 W1/2 5-10cm	5	Wood Charcoal	Oak (white)	*Quercus sp.*		10	0.6	200.0	11.20
F.01-07 W1/2 5-10cm	5	Wood Charcoal	Unidentified		All Sizes; (n=502)		3.4		68.60
					F.01-07 W1/2 5-10cm Subtotal:	**35**	**4.1**		
F.01-07 Vol. Total:	**11 litres**				**F.01-07Total:**	**87**	**14.9**	**7.9**	**1.35**

Fort Ancient Project - 33MY499 Wildcat Site Fieldschool Inventory of Archaeobotanical Materials

Context	Liters (L)	Subsample	Type	Scientific Nomenclature	Comments	Qty	Wt (g)	Qty / 100 L	g / 100 L
F.01-08 ALL 15-cm	0.5	Carbonized Bark	Unknown/Indeterminate		1.00mm only	0		0.0	
F.01-08 ALL 15-cm	0.5	Carbonized Squash/Gourd	Squash Rind	*Cucurbita pepo*		9	0.0	1800.0	4.00
F.01-08 ALL 15-cm	0.5	Unknown/Indet., Carbonized			prob. bark/wood charcoal	7	0.1	1400.0	22.00
F.01-08 ALL 15-cm	0.5	Unknown/Indet., Carbonized			soil encrusted	2	0.0	400.0	8.00
F.01-08 ALL 15-cm	0.5	Wood Charcoal	Unknown/Indeterminate				0.1		14.00
					F.01-08 ALL 15-cm Subtotal:	**18**	**0.2**		
F.01-08 L.01 ALL 0-5cm	3	Carbonized Bark	Unknown/Indeterminate		incompl. carb.	10	0.2	333.3	5.67
F.01-08 L.01 ALL 0-5cm	3	Carbonized Bark	Unknown/Indeterminate			24	0.2	800.0	5.33
F.01-08 L.01 ALL 0-5cm	3	Carbonized Seeds	Bedstraw	*Galium sp.*	sm. var.	1		33.3	
F.01-08 L.01 ALL 0-5cm	3	Carbonized Seeds	Fragments			1		33.3	
F.01-08 L.01 ALL 0-5cm	3	Carbonized Seeds	Nightshade Family	*Solanaceae*		1		33.3	
F.01-08 L.01 ALL 0-5cm	3	Unknown/Indet., Carbonized			bean-like;<0.01g	1	0.0	33.3	0.00
F.01-08 L.01 ALL 0-5cm	3	Unknown/Indet., Carbonized	Poss. Chestnut Shell		<0.01g	2	0.0	66.7	0.00
F.01-08 L.01 ALL 0-5cm	3	Unknown/Indet., Carbonized	Poss. Corn Cupule Fragments			3	0.0	100.0	0.33
F.01-08 L.01 ALL 0-5cm	3	Unknown/Indet., Carbonized	Unid. Spongy		0.50mm only; poss. Root	0		0.0	
F.01-08 L.01 ALL 0-5cm	3	Wood Charcoal	Cedar/Hemlock			17	0.2	566.7	6.00
F.01-08 L.01 ALL 0-5cm	3	Wood Charcoal	Pine	*Pinus sp.*		2	0.0	66.7	0.33
F.01-08 L.01 ALL 0-5cm	3	Wood Charcoal	Ring Porus		prob. oak/chestnut; <0.01g	1	0.0	33.3	0.00
F.01-08 L.01 ALL 0-5cm	3	Wood Charcoal	Unidentified			34	0.2	1133.3	7.00
					F.01-08 L.01 ALL 0-5cm Subtotal:	**97**	**0.7**		
F.01-08 L.03 10-15cm	0.75	Carbonized Bark	Unknown/Indeterminate			4	0.0	533.3	1.33
F.01-08 L.03 10-15cm	0.75	Carbonized Seeds	Fragments			1		133.3	
F.01-08 L.03 10-15cm	0.75	Carbonized Seeds	Pea Family	*Fabaceae*		1		133.3	
F.01-08 L.03 10-15cm	0.75	Carbonized Seeds	Sumpweed	*Iva annua*		1		133.3	
F.01-08 L.03 10-15cm	0.75	Carbonized Seeds	Unknown/Indeterminate		poss. Alder (Alnus sp.)	1		133.3	
F.01-08 L.03 10-15cm	0.75	Wood Charcoal	Cedar/Hemlock			2	0.0	266.7	5.33

Fort Ancient Project - 33MY499 Wildcat Site Fieldschool Inventory of Archaeobotanical Materials

Context	Liters (L)	Subsample	Type	Scientific Nomenclature	Comments	Qty	Wt (g)	Qty / 100 L	g / 100 L
F.01-08 L.03 10-15cm	0.75	Wood Charcoal	Pine	*Pinus sp.*		2	0.0	266.7	1.33
F.01-08 L.03 10-15cm	0.75	Wood Charcoal	Ring Porus			1	0.0	133.3	1.33
F.01-08 L.03 10-15cm	0.75	Wood Charcoal	Semi-diffuse Porous		poss. Walnut	4	0.0	533.3	2.67
F.01-08 L.03 10-15cm	0.75	Wood Charcoal	Unidentified			5	0.0	666.7	4.00
					F.01-08 L.03 10-15cm Subtotal:	**22**	**0.1**		
F.01-08 Vol. Total:	**4.25 litres**				**F.01-08Total:**	**137**	**1.1**	**32.2**	**0.26**
F.02-08 L.01 W1/2 0-5cm	8	Carbonized Bean	Bean	*Phaseolus vulgaris*	1/4 coteledon	1		12.5	
F.02-08 L.01 W1/2 0-5cm	8	Carbonized Corn	Corn Kernel Fragments	*Zea mays*		22	0.2	275.0	2.13
F.02-08 L.01 W1/2 0-5cm	8	Carbonized Nutshell	Acorn	*Quercus sp.*	<0.01g	1	0.0	12.5	0.00
F.02-08 L.01 W1/2 0-5cm	8	Carbonized Nutshell	Black Walnut	*Juglans nigra*		3	0.0	37.5	0.38
F.02-08 L.01 W1/2 0-5cm	8	Carbonized Nutshell	Hickory	*Carya sp.*		17	0.3	212.5	3.13
F.02-08 L.01 W1/2 0-5cm	8	Carbonized Nutshell	Thin-shelled Hickory	*Carya sp.*		2	0.0	25.0	0.25
F.02-08 L.01 W1/2 0-5cm	8	Carbonized Nutshell	Walnut Family	Juglandaceae	<0.01g	1	0.0	12.5	0.00
F.02-08 L.01 W1/2 0-5cm	8	Carbonized Seeds	Flowering Dogwood	*Cornus florida*		1		12.5	
F.02-08 L.01 W1/2 0-5cm	8	Carbonized Seeds	Fragments			3		37.5	
F.02-08 L.01 W1/2 0-5cm	8	Carbonized Seeds	Hackberry	*Celtis sp.*		1		12.5	
F.02-08 L.01 W1/2 0-5cm	8	Carbonized Seeds	Knotweed	*Polygonum erectum*		1		12.5	
F.02-08 L.01 W1/2 0-5cm	8	Carbonized Seeds	Knotweed	*Polygonum sp.*	frag.	1		12.5	
F.02-08 L.01 W1/2 0-5cm	8	Carbonized Seeds	Sumac	*Rhus sp.*		2		25.0	
F.02-08 L.01 W1/2 0-5cm	8	Carbonized Seeds	Sumac	*Rhus sp.*	frags., prob. 1 seed	3		37.5	
F.02-08 L.01 W1/2 0-5cm	8	Carbonized Seeds	Unknown/Indeterminate		v. small (<500um)	1		12.5	
F.02-08 L.01 W1/2 0-5cm	8	Carbonized Squash/Gourd	Squash Rind	*Cucurbita pepo*		44	0.2	550.0	2.38
F.02-08 L.01 W1/2 0-5cm	8	Other, Carbonized	Grass Stem	Poaceae	<0.01g	1	0.0	12.5	0.00
F.02-08 L.01 W1/2 0-5cm	8	Unknown/Indet., Carbonized			prob. bark/wood charcoal	2	0.0	25.0	0.13
F.02-08 L.01 W1/2 0-5cm	8	Unknown/Indet., Carbonized			soil encrusted	1	0.0	12.5	0.25
F.02-08 L.01 W1/2 0-5cm	8	Wood Charcoal	Ash	*Fraxinus americana*		2	0.2	25.0	2.88
F.02-08 L.01 W1/2 0-5cm	8	Wood Charcoal	Diffuse Porus			1	0.1	12.5	1.38
F.02-08 L.01 W1/2 0-5cm	8	Wood Charcoal	Elm	*Ulmus americana*		4	0.5	50.0	5.63

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Context	Liters (L)	Subsample	Type	Scientific Nomenclature	Comments	Qty	Wt (g)	Qty / 100 L	g / 100 L
F.02-08 L.01 W1/2 0-5cm	8	Wood Charcoal	Oak (red)	*Quercus sp.*		12	3.9	150.0	48.50
F.02-08 L.01 W1/2 0-5cm	8	Wood Charcoal	Unidentified		incompl. carb.	4	0.0	50.0	0.13
F.02-08 L.01 W1/2 0-5cm	8	Wood Charcoal	Unidentified				22.4		279.88
F.02-08 L.01 W1/2 0-5cm	8	Wood Charcoal	Walnut	*Juglans sp.*		2	0.3	25.0	3.63
					F.02-08 L.01 W1/2 0-5cm Subtotal:	**133**	**28.1**		
F.02-08 L.03 W1/2 10-15cm	7	Carbonized Corn	Corn Cupule Fragments	*Zea mays*	<0.01g	1	0.0	14.3	0.00
F.02-08 L.03 W1/2 10-15cm	7	Carbonized Corn	Corn Kernel Fragments	*Zea mays*		12	0.1	171.4	0.86
F.02-08 L.03 W1/2 10-15cm	7	Carbonized Nutshell	Acorn	*Quercus sp.*	<0.01g	1	0.0	14.3	0.00
F.02-08 L.03 W1/2 10-15cm	7	Carbonized Nutshell	Hickory	*Carya sp.*		3	0.0	42.9	0.43
F.02-08 L.03 W1/2 10-15cm	7	Carbonized Nutshell	Walnut Family	Juglandaceae		1	0.0	14.3	0.14
F.02-08 L.03 W1/2 10-15cm	7	Carbonized Seeds	Bedstraw	*Galium sp.*		1		14.3	
F.02-08 L.03 W1/2 10-15cm	7	Carbonized Seeds	Grape	*Vitis sp.*	frag.	1		14.3	
F.02-08 L.03 W1/2 10-15cm	7	Carbonized Seeds	Grass	Poaceae	lg. frag.	1		14.3	
F.02-08 L.03 W1/2 10-15cm	7	Carbonized Seeds	Maygrass	*Phalaris caroliniana*		1		14.3	
F.02-08 L.03 W1/2 10-15cm	7	Carbonized Seeds	Nightshade Family	*Solanaceae*		1		14.3	
F.02-08 L.03 W1/2 10-15cm	7	Carbonized Seeds	Pokeberry	*Phytolacca americana*		1		14.3	
F.02-08 L.03 W1/2 10-15cm	7	Carbonized Seeds	Raspberry	*Rubus occidentalis*		1		14.3	
F.02-08 L.03 W1/2 10-15cm	7	Carbonized Seeds	Sumac	*Rhus sp.*		1		14.3	
F.02-08 L.03 W1/2 10-15cm	7	Carbonized Seeds	Verbena	*Verbena sp.*		1		14.3	
F.02-08 L.03 W1/2 10-15cm	7	Carbonized Squash/Gourd	Squash Rind	*Cucurbita pepo*		8	0.0	114.3	0.57
F.02-08 L.03 W1/2 10-15cm	7	Other, Carbonized	Grass Stem	Poaceae		1	0.0	14.3	0.00
F.02-08 L.03 W1/2 10-15cm	7	Unknown/Indet., Carbonized				2	0.0	28.6	0.14
F.02-08 L.03 W1/2 10-15cm	7	Unknown/Indet., Carbonized			poss. corn; <0.01g	2	0.0	28.6	0.00
F.02-08 L.03 W1/2 10-15cm	7	Wood Charcoal	Ash	*Fraxinus americana*		5	0.8	71.4	11.29
F.02-08 L.03 W1/2 10-15cm	7	Wood Charcoal	Chestnut	*Castanea dentata*		1	0.0	14.3	0.14
F.02-08 L.03 W1/2 10-15cm	7	Wood Charcoal	Diffuse Porus			2	0.0	28.6	0.43
F.02-08 L.03 W1/2 10-15cm	7	Wood Charcoal	Elm/Hackberry	*Ulmaceae*		3	0.7	42.9	9.43
F.02-08 L.03 W1/2 10-15cm	7	Wood Charcoal	Oak	*Quercus sp.*		3	0.5	42.9	7.29
F.02-08 L.03 W1/2 10-15cm	7	Wood Charcoal	Poplar, Tulip	*Liriodendron tulipifera*		1	0.1	14.3	1.00

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Context	Liters (L)	Subsample	Type	Scientific Nomenclature	Comments	Qty	Wt (g)	Qty / 100 L	g / 100 L
F.02-08 L.03 W1/2 10-15cm	7	Wood Charcoal	Ring Porus		poss. oak/chestnut	2	0.4	28.6	5.14
F.02-08 L.03 W1/2 10-15cm	7	Wood Charcoal	Unidentified				29.4		420.57
F.02-08 L.03 W1/2 10-15cm	7	Wood Charcoal	Unknown/Indeterminate		incompl. carb.	5	0.0	71.4	0.43
F.02-08 L.03 W1/2 10-15cm	7	Wood Charcoal	Walnut	*Juglans sp.*		4	0.2	57.1	2.71
					F.02-08 L.03 W1/2 10-15cm Subtotal:	**66**	**32.2**		
F.02-08 L.05 W1/2 20-25cm	5.5	Carbonized Bean	Bean	*Phaseolus vulgaris*		7	0.4	127.3	7.27
F.02-08 L.05 W1/2 20-25cm	5.5	Carbonized Corn	Corn Kernel Fragments	*Zea mays*		16	0.1	290.9	1.27
F.02-08 L.05 W1/2 20-25cm	5.5	Carbonized Nutshell	Hickory	*Carya sp.*		1	0.0	18.2	0.18
F.02-08 L.05 W1/2 20-25cm	5.5	Carbonized Nutshell	Walnut Family	Juglandaceae	1.00mm only	0	0.0	0.0	0.00
F.02-08 L.05 W1/2 20-25cm	5.5	Carbonized Seeds	Bedstraw	*Galium sp.*	unusually sm.	1		18.2	
F.02-08 L.05 W1/2 20-25cm	5.5	Carbonized Seeds	Fragments		1-poss. sumac	2		36.4	
F.02-08 L.05 W1/2 20-25cm	5.5	Carbonized Seeds	Fragments		poss. bedstraw	1		18.2	
F.02-08 L.05 W1/2 20-25cm	5.5	Carbonized Seeds	Knotweed	*Polygonum sp.*	smooth morph	1		18.2	
F.02-08 L.05 W1/2 20-25cm	5.5	Carbonized Seeds	Maygrass	*Phalaris caroliniana*		3		54.5	
F.02-08 L.05 W1/2 20-25cm	5.5	Carbonized Seeds	Pokeberry	*Phytolacca americana*		1		18.2	
F.02-08 L.05 W1/2 20-25cm	5.5	Carbonized Seeds	Sumac	*Rhus sp.*		6		109.1	
F.02-08 L.05 W1/2 20-25cm	5.5	Carbonized Seeds	Sumac	*Rhus sp.*	frags.	3		54.5	
F.02-08 L.05 W1/2 20-25cm	5.5	Carbonized Seeds	Sunflower	*Helianthus annuus*	frag.	1		18.2	
F.02-08 L.05 W1/2 20-25cm	5.5	Carbonized Squash/Gourd	Squash Rind	*Cucurbita pepo*	1.00mm only; <0.01g	2	0.0	36.4	0.00
F.02-08 L.05 W1/2 20-25cm	5.5	Unknown/Indet., Carbonized			poss. corn	3	0.0	54.5	0.18
F.02-08 L.05 W1/2 20-25cm	5.5	Wood Charcoal	Ash	*Fraxinus americana*		10	1.3	181.8	24.36
F.02-08 L.05 W1/2 20-25cm	5.5	Wood Charcoal	Diffuse Porus		poss. willow	1	0.1	18.2	2.18
F.02-08 L.05 W1/2 20-25cm	5.5	Wood Charcoal	Elm/Hackberry	*Ulmaceae*		5	0.6	90.9	10.91
F.02-08 L.05 W1/2 20-25cm	5.5	Wood Charcoal	Oak	*Quercus sp.*		3	0.8	54.5	14.73
F.02-08 L.05 W1/2 20-25cm	5.5	Wood Charcoal	Oak (red)	*Quercus sp.*		1	0.1	18.2	1.45
F.02-08 L.05 W1/2 20-25cm	5.5	Wood Charcoal	Unidentified				9.4		170.00
F.02-08 L.05 W1/2 20-25cm	5.5	Wood Charcoal	Unknown/Indeterminate		incompl. carb.	4	0.0	72.7	0.18
F.02-08 L.05 W1/2 20-25cm	5.5	Wood Charcoal	Walnut	*Juglans sp.*		2	0.3	36.4	4.91
					F.02-08 L.05 W1/2 20-25cm Subtotal:	**74**	**13.1**		

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Context	Liters (L)	Subsample	Type	Scientific Nomenclature	Comments	Qty	Wt (g)	Qty / 100 L	g / 100 L
F.02-08 L.07 W1/2 30-35cm	7	Carbonized Corn	Corn Kernel Fragments	*Zea mays*		31	0.2	442.9	2.14
F.02-08 L.07 W1/2 30-35cm	7	Carbonized Nutmeat	Unknown/Indeterminate			6	0.1	85.7	1.00
F.02-08 L.07 W1/2 30-35cm	7	Carbonized Nutshell	Black Walnut	*Juglans nigra*		1	0.0	14.3	0.29
F.02-08 L.07 W1/2 30-35cm	7	Carbonized Nutshell	Hickory	*Carya sp.*		4	0.1	57.1	1.14
F.02-08 L.07 W1/2 30-35cm	7	Carbonized Nutshell	Thin-shelled Hickory	*Carya sp.*		4	0.0	57.1	0.29
F.02-08 L.07 W1/2 30-35cm	7	Carbonized Nutshell	Walnut Family	Juglandaceae		8	0.0	114.3	0.29
F.02-08 L.07 W1/2 30-35cm	7	Carbonized Seeds	Fragments		lg. seed coats	7		100.0	
F.02-08 L.07 W1/2 30-35cm	7	Carbonized Seeds	Fragments		sm. seed	2		28.6	
F.02-08 L.07 W1/2 30-35cm	7	Carbonized Seeds	Grape	*Vitis sp.*	frag.	1		14.3	
F.02-08 L.07 W1/2 30-35cm	7	Carbonized Seeds	Grass	Poaceae	lg. frag.	1		14.3	
F.02-08 L.07 W1/2 30-35cm	7	Carbonized Seeds	Grass	Poaceae	sm. frag.	1		14.3	
F.02-08 L.07 W1/2 30-35cm	7	Carbonized Seeds	Maygrass	*Phalaris caroliniana*		1		14.3	
F.02-08 L.07 W1/2 30-35cm	7	Carbonized Seeds	Raspberry	*Rubus occidentalis*		1		14.3	
F.02-08 L.07 W1/2 30-35cm	7	Carbonized Seeds	Sumac	*Rhus sp.*		1		14.3	
F.02-08 L.07 W1/2 30-35cm	7	Carbonized Seeds	Unknown/Indeterminate			1		14.3	
F.02-08 L.07 W1/2 30-35cm	7	Carbonized Seeds	Witch Hazel	*Hamamelis sp.*	both halves	1		14.3	
F.02-08 L.07 W1/2 30-35cm	7	Carbonized Squash/Gourd	Squash Rind	*Cucurbita pepo*		9	0.0	128.6	0.57
F.02-08 L.07 W1/2 30-35cm	7	Wood Charcoal	Ash	*Fraxinus americana*		9	2.0	128.6	28.86
F.02-08 L.07 W1/2 30-35cm	7	Wood Charcoal	Chestnut	*Castanea dentata*		1	2.2	14.3	31.14
F.02-08 L.07 W1/2 30-35cm	7	Wood Charcoal	Elm/Hackberry	*Ulmaceae*		1	0.1	14.3	2.00
F.02-08 L.07 W1/2 30-35cm	7	Wood Charcoal	Oak (red)	*Quercus sp.*		3	0.4	42.9	5.43
F.02-08 L.07 W1/2 30-35cm	7	Wood Charcoal	Oak (white)	*Quercus sp.*		1	0.2	14.3	2.29
F.02-08 L.07 W1/2 30-35cm	7	Wood Charcoal	Unidentified				19.3		275.86
F.02-08 L.07 W1/2 30-35cm	7	Wood Charcoal	Walnut	*Juglans sp.*		5	1.3	71.4	18.14
F.02-08 L.07 W1/2 30-35cm	7	Wood Charcoal	Willow	*Salix sp.*		1	0.1	14.3	1.00
					F.02-08 L.07 W1/2 30-35cm Subtotal:	**101**	**25.9**		
F.02-08 Vol. Total:	**27.5 litres**				**F.02-08Total:**	**374**	**99.3**	**13.6**	**3.61**
F.03-07 E1/2 30-35cm	5.5	Carbonized Bark	Unknown/Indeterminate		>1.18mm	12	0.0	218.2	0.73
F.03-07 E1/2 30-35cm	5.5	Carbonized Corn	Corn Kernel Fragments	*Zea mays*	>1.18mm	18	0.1	327.3	2.00

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Context	Liters (L)	Subsample	Type	Scientific Nomenclature	Comments	Qty	Wt (g)	Qty / 100 L	g / 100 L
F.03-07 E1/2 30-35cm	5.5	Carbonized Nutshell	Black Walnut	*Juglans nigra*	2.00mm only	28	0.6	509.1	10.36
F.03-07 E1/2 30-35cm	5.5	Carbonized Nutshell	Hickory	*Carya sp.*	2.00mm only	24	0.4	436.4	7.27
F.03-07 E1/2 30-35cm	5.5	Carbonized Nutshell	Walnut Family	Juglandaceae	All Sizes	16	0.1	290.9	1.64
F.03-07 E1/2 30-35cm	5.5	Carbonized Seeds	Fragments			4		72.7	
F.03-07 E1/2 30-35cm	5.5	Carbonized Seeds	Raspberry	*Rubus occidentalis*		1		18.2	
F.03-07 E1/2 30-35cm	5.5	Carbonized Seeds	Sumac	*Rhus glabra*		2		36.4	
F.03-07 E1/2 30-35cm	5.5	Carbonized Squash/Gourd	Squash Rind	*Cucurbita pepo*	>1.18mm; (2) 2.6mm thick	41	0.3	745.5	4.55
F.03-07 E1/2 30-35cm	5.5	Wood Charcoal	Ash	*Fraxinus sp.*		3	0.4	54.5	7.09
F.03-07 E1/2 30-35cm	5.5	Wood Charcoal	Hickory	*Carya sp.*		4	1.0	72.7	18.36
F.03-07 E1/2 30-35cm	5.5	Wood Charcoal	Kentucky Coffee Tree	*Gymnocladus dioicus*		1	0.3	18.2	5.45
F.03-07 E1/2 30-35cm	5.5	Wood Charcoal	Oak (white)	*Quercus sp.*		1	0.3	18.2	6.18
F.03-07 E1/2 30-35cm	5.5	Wood Charcoal	Poplar, Tulip	*Liriodendron tulipifera*		1	0.1	18.2	1.45
F.03-07 E1/2 30-35cm	5.5	Wood Charcoal	Unidentified		All Sizes; (n=3118)		28.0		508.91
					F.03-07 E1/2 30-35cm Subtotal:	**156**	**31.6**		
F.03-07 E1/2 5-10cm	5.5	Carbonized Bark	Unknown/Indeterminate		All Sizes	13	0.0	236.4	0.73
F.03-07 E1/2 5-10cm	5.5	Carbonized Corn	Corn Cupule Fragments	*Zea mays*	>1.18mm	3	0.0	54.5	0.18
F.03-07 E1/2 5-10cm	5.5	Carbonized Corn	Corn Kernel Fragments	*Zea mays*	2.00mm only	7	0.1	127.3	1.45
F.03-07 E1/2 5-10cm	5.5	Carbonized Nutshell	Acorn	*Quercus sp.*	2.00mm only	1	0.0	18.2	0.18
F.03-07 E1/2 5-10cm	5.5	Carbonized Nutshell	Black Walnut	*Juglans nigra*	2.00mm only	11	0.2	200.0	3.09
F.03-07 E1/2 5-10cm	5.5	Carbonized Nutshell	Hickory	*Carya sp.*	2.00mm only	3	0.1	54.5	1.27
F.03-07 E1/2 5-10cm	5.5	Carbonized Nutshell	Thin-shelled Hickory	*Carya sp.*	1.18mm only	0	0.0	0.0	0.00
F.03-07 E1/2 5-10cm	5.5	Carbonized Nutshell	Walnut Family	Juglandaceae	>1.18mm	6	0.0	109.1	0.36
F.03-07 E1/2 5-10cm	5.5	Carbonized Seeds	Amaranth	*Amaranthus sp.*	embryo frag.	1		18.2	
F.03-07 E1/2 5-10cm	5.5	Carbonized Seeds	Fragments			2		36.4	
F.03-07 E1/2 5-10cm	5.5	Carbonized Seeds	Knotweed	*Polygonum erectum*	smooth morph	1		18.2	
F.03-07 E1/2 5-10cm	5.5	Carbonized Seeds	Penny Cress	*Thlapsi arvense*		1		18.2	
F.03-07 E1/2 5-10cm	5.5	Carbonized Seeds	Raspberry	*Rubus occidentalis*		3		54.5	
F.03-07 E1/2 5-10cm	5.5	Carbonized Seeds	Sumac	*Rhus glabra*		2		36.4	
F.03-07 E1/2 5-10cm	5.5	Carbonized Squash/Gourd	Squash Rind	*Cucurbita pepo*	All Sizes; (1) 1.5mm thick	36	0.2	654.5	2.91
F.03-07 E1/2 5-10cm	5.5	Wood Charcoal	Ash	*Fraxinus sp.*		2	0.1	36.4	1.09

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F.03-07 E1/2 5-10cm	5.5	Wood Charcoal	Chestnut	*Castanea dentata*		1	0.1	18.2	1.45
F.03-07 E1/2 5-10cm	5.5	Wood Charcoal	Hickory	*Carya sp.*		4	0.3	72.7	5.45
F.03-07 E1/2 5-10cm	5.5	Wood Charcoal	Oak	*Quercus sp.*		3	0.1	54.5	2.55
F.03-07 E1/2 5-10cm	5.5	Wood Charcoal	Unidentified		All Sizes; (n=464)		3.0		54.91
F.03-07 E1/2 5-10cm	5.5	Wood Charcoal	Unidentified Stem/Twig		2.00mm only	1	0.0	18.2	0.18
					F.03-07 E1/2 5-10cm Subtotal:	**101**	**4.2**		
F.03-07 E1/2 55-60cm	5	Carbonized Bark	Unknown/Indeterminate		All Sizes	112	0.3	2240.0	6.40
F.03-07 E1/2 55-60cm	5	Carbonized Corn	Corn Cupule Fragments	*Zea mays*		1	0.0	20.0	0.20
F.03-07 E1/2 55-60cm	5	Carbonized Corn	Corn Kernel Fragments	*Zea mays*	>1.18mm	19	0.1	380.0	2.00
F.03-07 E1/2 55-60cm	5	Carbonized Nutshell	Acorn	*Quercus sp.*	All Sizes	7	0.0	140.0	0.40
F.03-07 E1/2 55-60cm	5	Carbonized Nutshell	Black Walnut	*Juglans nigra*	2.00mm only	19	0.2	380.0	3.00
F.03-07 E1/2 55-60cm	5	Carbonized Nutshell	Butternut	*Juglans cinera*	2.00mm only	2	0.0	40.0	0.60
F.03-07 E1/2 55-60cm	5	Carbonized Nutshell	Hickory	*Carya sp.*		1	0.0	20.0	0.20
F.03-07 E1/2 55-60cm	5	Carbonized Nutshell	Walnut Family	Juglandaceae	All Sizes	8	0.0	160.0	0.60
F.03-07 E1/2 55-60cm	5	Carbonized Squash/Gourd	Squash Rind	*Cucurbita pepo*	>1.18mm; (1) 3.7mm, (1) 2.2mm	29	0.2	580.0	3.00
F.03-07 E1/2 55-60cm	5	Unknown/Indet., Carbonized			2.00mm only; poss. severely-burned corn kernel frags.	6	0.0	120.0	0.20
F.03-07 E1/2 55-60cm	5	Wood Charcoal	Ash	*Fraxinus sp.*		1	0.1	20.0	2.00
F.03-07 E1/2 55-60cm	5	Wood Charcoal	Maple, Hard	*Acer sp.*		2	0.2	40.0	3.40
F.03-07 E1/2 55-60cm	5	Wood Charcoal	Oak (white)	*Quercus sp.*		7	1.5	140.0	29.00
F.03-07 E1/2 55-60cm	5	Wood Charcoal	Unidentified		All Sizes; (n=2326)		20.0		400.60
					F.03-07 E1/2 55-60cm Subtotal:	**214**	**22.6**		
F.03-07 Vol. Total:	**16 litres**				**F.03-07Total:**	**471**	**58.3**	**29.4**	**3.65**
F.03-08 L.01 N1/2 0-5cm	5	Carbonized Nutshell	Pecan	*Carya illinoensis*		1	0.0	20.0	0.20
F.03-08 L.01 N1/2 0-5cm	5	Carbonized Nutshell	Walnut Family	Juglandaceae	1.00mm only	0	0.0	0.0	0.00
F.03-08 L.01 N1/2 0-5cm	5	Carbonized Seeds	Vetch	*Vicia sp.*	caroliniana species?	1		20.0	
F.03-08 L.01 N1/2 0-5cm	5	Wood Charcoal	Mixed Hardwoods			4	0.0	80.0	0.40
F.03-08 L.01 N1/2 0-5cm	5	Wood Charcoal	Poplar, Tulip	*Liriodendron tulipifera*		2	0.0	40.0	0.40
					F.03-08 L.01 N1/2 0-5cm Subtotal:	**8**	**0.1**		

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Context	Liters (L)	Subsample	Type	Scientific Nomenclature	Comments	Qty	Wt (g)	Qty / 100 L	g / 100 L
F.03-08 L.03 N1/2 10-15cm	3	Wood Charcoal	Unknown/Indeterminate		<2.00mm	0	0.0	0.0	0.00
					F.03-08 L.03 N1/2 10-15cm Subtotal:	**0**	**0.0**		
F.03-08 Vol. Total:	**8 litres**				**F.03-08Total:**	**8**	**0.1**	**1.0**	**0.01**
F.04-08 L.01 W1/2 0-5cm	8	Carbonized Corn	Corn Kernel Fragments	*Zea mays*		4	0.0	50.0	0.38
F.04-08 L.01 W1/2 0-5cm	8	Carbonized Nutmeat	Unknown/Indeterminate			1	0.0	12.5	0.38
F.04-08 L.01 W1/2 0-5cm	8	Carbonized Nutshell	Acorn	*Quercus sp.*		2	0.0	25.0	0.13
F.04-08 L.01 W1/2 0-5cm	8	Carbonized Nutshell	Black Walnut	*Juglans nigra*		3	0.1	37.5	0.63
F.04-08 L.01 W1/2 0-5cm	8	Carbonized Nutshell	Hickory	*Carya sp.*		9	0.2	112.5	2.38
F.04-08 L.01 W1/2 0-5cm	8	Carbonized Nutshell	Pecan	*Carya illinoensis*		5	0.0	62.5	0.50
F.04-08 L.01 W1/2 0-5cm	8	Carbonized Nutshell	Thin-shelled Hickory	*Carya sp.*		3	0.0	37.5	0.50
F.04-08 L.01 W1/2 0-5cm	8	Carbonized Nutshell	Walnut Family	Juglandaceae		5	0.0	62.5	0.38
F.04-08 L.01 W1/2 0-5cm	8	Carbonized Seeds	Sumac	*Rhus sp.*		8		100.0	
F.04-08 L.01 W1/2 0-5cm	8	Carbonized Seeds	Witch Hazel	*Hamamelis sp.*	both halves	1		12.5	
F.04-08 L.01 W1/2 0-5cm	8	Carbonized Squash/Gourd	Squash Rind	*Cucurbita pepo*		15	0.1	187.5	0.88
F.04-08 L.01 W1/2 0-5cm	8	Unknown/Indet., Carbonized			poss. resin	1	0.0	12.5	0.13
F.04-08 L.01 W1/2 0-5cm	8	Unknown/Indet., Carbonized	Unid. Spongy		0.50mm only; poss. squash or root	0	0.0	0.0	0.00
					F.04-08 L.01 W1/2 0-5cm Subtotal:	**57**	**0.5**		
F.04-08 L.03 W1/2 10-15cm	7	Carbonized Corn	Corn Cupule Fragments	*Zea mays*		1	0.0	14.3	0.14
F.04-08 L.03 W1/2 10-15cm	7	Carbonized Corn	Corn Kernel Fragments	*Zea mays*		27	0.2	385.7	2.43
F.04-08 L.03 W1/2 10-15cm	7	Carbonized Nutshell	Butternut	*Juglans cinera*		3	0.0	42.9	0.43
F.04-08 L.03 W1/2 10-15cm	7	Carbonized Nutshell	Hickory	*Carya sp.*		10	0.1	142.9	1.43
F.04-08 L.03 W1/2 10-15cm	7	Carbonized Nutshell	Walnut Family	Juglandaceae		15	0.1	214.3	1.00
F.04-08 L.03 W1/2 10-15cm	7	Carbonized Seeds	Amaranth	*Amaranthus sp.*		1		14.3	
F.04-08 L.03 W1/2 10-15cm	7	Carbonized Seeds	Fragments			9		128.6	
F.04-08 L.03 W1/2 10-15cm	7	Carbonized Seeds	Nightshade	*Solanum nigrum*		1		14.3	
F.04-08 L.03 W1/2 10-15cm	7	Carbonized Seeds	Nimblewill	*Muhlenbergia shreberi*		1		14.3	
F.04-08 L.03 W1/2 10-15cm	7	Carbonized Seeds	Paw Paw	*Asimina triloba*	frags.	2		28.6	
F.04-08 L.03 W1/2 10-15cm	7	Carbonized Seeds	Raspberry	*Rubus occidentalis*		1		14.3	

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F.04-08 L.03 W1/2 10-15cm	7	Carbonized Seeds	Sumac	*Rhus sp.*		2		28.6	
F.04-08 L.03 W1/2 10-15cm	7	Carbonized Seeds	Sunflower	*Helianthus annuus*		1		14.3	
F.04-08 L.03 W1/2 10-15cm	7	Carbonized Seeds	Unknown/Indeterminate		v. sm. spheroid, smooth ext.	1		14.3	
F.04-08 L.03 W1/2 10-15cm	7	Carbonized Seeds	Witch Hazel	*Hamamelis sp.*		1		14.3	
F.04-08 L.03 W1/2 10-15cm	7	Carbonized Squash/Gourd	Squash Rind	*Cucurbita pepo*		6	0.0	85.7	0.57
F.04-08 L.03 W1/2 10-15cm	7	Unknown/Indet., Carbonized				1	0.0	14.3	0.14
F.04-08 L.03 W1/2 10-15cm	7	Unknown/Indet., Carbonized	Unid. Spongy		<1.00mm; poss. squash/root	0	0.0	0.0	0.00
F.04-08 L.03 W1/2 10-15cm	7	Wood Charcoal	Chestnut	*Castanea dentata*		10	1.7	142.9	24.71
F.04-08 L.03 W1/2 10-15cm	7	Wood Charcoal	Oak (red)	*Quercus sp.*		10	2.1	142.9	29.71
F.04-08 L.03 W1/2 10-15cm	7	Wood Charcoal	Unidentified				36.8		526.00
					F.04-08 L.03 W1/2 10-15cm Subtotal:	**103**	**41.1**		
F.04-08 L.05 W1/2 20-25cm	7	Carbonized Corn	Corn Kernel Fragments	*Zea mays*		3	0.0	42.9	0.14
F.04-08 L.05 W1/2 20-25cm	7	Carbonized Nutmeat	Unknown/Indeterminate			1	0.0	14.3	0.43
F.04-08 L.05 W1/2 20-25cm	7	Carbonized Nutshell	Hickory	*Carya sp.*		2	0.0	28.6	0.29
F.04-08 L.05 W1/2 20-25cm	7	Carbonized Nutshell	Walnut Family	Juglandaceae		6	0.0	85.7	0.43
F.04-08 L.05 W1/2 20-25cm	7	Carbonized Squash/Gourd	Squash Rind	*Cucurbita pepo*	1.00mm only; <0.01g	1	0.0	14.3	0.00
F.04-08 L.05 W1/2 20-25cm	7	Unknown/Indet., Carbonized			<0.50mm; poss. corn	0	0.0	0.0	0.00
F.04-08 L.05 W1/2 20-25cm	7	Wood Charcoal	Oak (red)	*Quercus sp.*		10	0.5	142.9	6.86
F.04-08 L.05 W1/2 20-25cm	7	Wood Charcoal	Ring Porus		poss. oak/chestnut	2	0.1	28.6	0.86
F.04-08 L.05 W1/2 20-25cm	7	Wood Charcoal	Unidentified				1.3		19.14
F.04-08 L.05 W1/2 20-25cm	7	Wood Charcoal	Walnut	*Juglans sp.*		8	0.3	114.3	4.29
					F.04-08 L.05 W1/2 20-25cm Subtotal:	**33**	**2.3**		
F.04-08 Vol. Total:	**22 litres**				**F.04-08Total:**	**193**	**43.8**	**8.8**	**1.99**
F.05a-08 L.01 W1/2 0-5cm	7	Carbonized Nutmeat	Unknown/Indeterminate			1	0.0	14.3	0.43
F.05a-08 L.01 W1/2 0-5cm	7	Carbonized Nutshell	Butternut	*Juglans cinera*		1	0.0	14.3	0.43
F.05a-08 L.01 W1/2 0-5cm	7	Carbonized Nutshell	Walnut Family	Juglandaceae		5	0.0	71.4	0.57
F.05a-08 L.01 W1/2 0-5cm	7	Carbonized Seeds	Fragments		lg., poss grape	1		14.3	

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F.05a-08 L.01 W1/2 0-5cm	7	Carbonized Seeds	Paw Paw	*Asimina triloba*	frags	3		42.9	
F.05a-08 L.01 W1/2 0-5cm	7	Carbonized Seeds	Unknown/Indeterminate		v. sm. spheroid, smooth ext.	1		14.3	
F.05a-08 L.01 W1/2 0-5cm	7	Carbonized Seeds	Verbena	*Verbena sp.*		2		28.6	
F.05a-08 L.01 W1/2 0-5cm	7	Carbonized Seeds	Wild Bean	*Strophostyles sp.*		1		14.3	
F.05a-08 L.01 W1/2 0-5cm	7	Carbonized Squash/Gourd	Squash Rind	*Cucurbita pepo*		3	0.0	42.9	0.14
F.05a-08 L.01 W1/2 0-5cm	7	Other, Carbonized	Grass Stem	Poaceae		2	0.0	28.6	0.43
F.05a-08 L.01 W1/2 0-5cm	7	Wood Charcoal	Elm/Hackberry	*Ulmaceae*		1	0.0	14.3	0.43
F.05a-08 L.01 W1/2 0-5cm	7	Wood Charcoal	Hickory	*Carya sp.*		1	0.0	14.3	0.57
F.05a-08 L.01 W1/2 0-5cm	7	Wood Charcoal	Ring Porus		poss. chestnut/oak	1	0.0	14.3	0.43
F.05a-08 L.01 W1/2 0-5cm	7	Wood Charcoal	Semi-diffuse Porous			2	0.0	28.6	0.43
F.05a-08 L.01 W1/2 0-5cm	7	Wood Charcoal	Unid. Softwoods			15	0.5	214.3	7.14
F.05a-08 L.01 W1/2 0-5cm	7	Wood Charcoal	Unidentified				2.9		40.71
					F.05a-08 L.01 W1/2 0-5cm Subtotal:	**40**	**3.6**		
F.05a-08 L.03 W1/2 10-15cm	6.5	Carbonized Nutshell	Black Walnut	*Juglans nigra*		2	0.0	30.8	0.15
F.05a-08 L.03 W1/2 10-15cm	6.5	Carbonized Seeds	Amaranth	*Amaranthus sp.*		1		15.4	
F.05a-08 L.03 W1/2 10-15cm	6.5	Carbonized Seeds	Grass	Poaceae	sm.	1		15.4	
F.05a-08 L.03 W1/2 10-15cm	6.5	Carbonized Squash/Gourd	Squash Rind	*Cucurbita pepo*	<0.01g	2	0.0	30.8	0.00
F.05a-08 L.03 W1/2 10-15cm	6.5	Unknown/Indet., Carbonized			poss. resin	1		15.4	
F.05a-08 L.03 W1/2 10-15cm	6.5	Wood Charcoal	Semi-diffuse Porous		<0.01g	1	0.0	15.4	0.00
F.05a-08 L.03 W1/2 10-15cm	6.5	Wood Charcoal	Unknown/Indeterminate				0.0		0.15
					F.05a-08 L.03 W1/2 10-15cm Subtotal:	**8**	**0.0**		
F.05a-08 Vol. Total:	**13.5 litres**				**F.05a-08Total:**	**48**	**3.6**	**3.6**	**0.27**
F.05b-08 L.01 W1/2 0-5cm	7	Carbonized Seeds	Fragments			2		28.6	
F.05b-08 L.01 W1/2 0-5cm	7	Carbonized Seeds	Grass	Poaceae	lg.	1		14.3	
F.05b-08 L.01 W1/2 0-5cm	7	Carbonized Seeds	Knotweed	*Polygonum sp.*	frag.	1		14.3	
F.05b-08 L.01 W1/2 0-5cm	7	Carbonized Seeds	Nightshade	*Solanum nigrum*		1		14.3	
F.05b-08 L.01 W1/2 0-5cm	7	Carbonized Seeds	Nightshade Family	*Solanaceae*	frag.	1		14.3	
F.05b-08 L.01 W1/2 0-5cm	7	Carbonized Seeds	Paw Paw	*Asimina triloba*	frags.	4		57.1	
F.05b-08 L.01 W1/2 0-5cm	7	Carbonized Seeds	Sunflower	*Helianthus annuus*		1		14.3	

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F.05b-08 L.01 W1/2 0-5cm	7	Carbonized Seeds	Verbena	*Verbena sp.*		1		14.3	
F.05b-08 L.01 W1/2 0-5cm	7	Carbonized Squash/Gourd	Squash Rind	*Cucurbita pepo*		12	0.0	171.4	0.29
F.05b-08 L.01 W1/2 0-5cm	7	Unknown/Indet., Carbonized			poss. cupule frags.	3	0.0	42.9	0.14
F.05b-08 L.01 W1/2 0-5cm	7	Wood Charcoal	Indet. Softwoods			14	0.4	200.0	5.71
F.05b-08 L.01 W1/2 0-5cm	7	Wood Charcoal	Ring Porus		poss. oak/chestnut	6	0.2	85.7	2.29
F.05b-08 L.01 W1/2 0-5cm	7	Wood Charcoal	Unidentified				0.7		10.57
					F.05b-08 L.01 W1/2 0-5cm Subtotal:	**47**	**1.3**		
F.05b-08 L.03 W1/2 10-15cm	7.5	Carbonized Nutshell	Walnut Family	Juglandaceae		2	0.0	26.7	0.13
F.05b-08 L.03 W1/2 10-15cm	7.5	Carbonized Squash/Gourd	Squash Rind	*Cucurbita pepo*	<0.01g	1	0.0	13.3	0.00
F.05b-08 L.03 W1/2 10-15cm	7.5	Unknown/Indet., Carbonized			poss. resin	3	0.0	40.0	0.53
F.05b-08 L.03 W1/2 10-15cm	7.5	Wood Charcoal	Mixed Hardwoods			11	0.1	146.7	0.67
					F.05b-08 L.03 W1/2 10-15cm Subtotal:	**17**	**0.1**		
F.05b-08 Vol. Total:	**14.5 litres**				**F.05b-08Total:**	**64**	**1.4**	**4.4**	**0.10**
F.06-08 L.01 W1/2 0-5cm	7	Carbonized Corn	Corn Cupule Fragments	*Zea mays*		1	0.0	14.3	0.14
F.06-08 L.01 W1/2 0-5cm	7	Carbonized Corn	Corn Cupules	*Zea mays*		1	0.0	14.3	0.43
F.06-08 L.01 W1/2 0-5cm	7	Carbonized Corn	Corn Kernel Fragments	*Zea mays*		11	0.1	157.1	0.86
F.06-08 L.01 W1/2 0-5cm	7	Carbonized Nutmeat	Unknown/Indeterminate			1	0.1	14.3	1.00
F.06-08 L.01 W1/2 0-5cm	7	Carbonized Nutshell	Hickory	*Carya sp.*		67	1.1	957.1	15.00
F.06-08 L.01 W1/2 0-5cm	7	Carbonized Nutshell	Pecan	*Carya illinoensis*		10	0.3	142.9	4.14
F.06-08 L.01 W1/2 0-5cm	7	Carbonized Nutshell	Walnut Family	Juglandaceae		3	0.0	42.9	0.29
F.06-08 L.01 W1/2 0-5cm	7	Carbonized Seeds	Fragments		oily seed, poss. sunflower	3		42.9	
F.06-08 L.01 W1/2 0-5cm	7	Carbonized Seeds	Fragments			2		28.6	
F.06-08 L.01 W1/2 0-5cm	7	Carbonized Seeds	Grass	Poaceae	frags.	2		28.6	
F.06-08 L.01 W1/2 0-5cm	7	Carbonized Seeds	Knotweed	*Polygonum sp.*	frags.	2		28.6	
F.06-08 L.01 W1/2 0-5cm	7	Carbonized Seeds	Paw Paw	*Asimina triloba*	frags.	4		57.1	
F.06-08 L.01 W1/2 0-5cm	7	Carbonized Seeds	Sumac	*Rhus sp.*		2		28.6	
F.06-08 L.01 W1/2 0-5cm	7	Carbonized Seeds	Sumac	*Rhus sp.*	frags.	3		42.9	
F.06-08 L.01 W1/2 0-5cm	7	Carbonized Seeds	Unknown/Indeterminate		poss. v. sm. corn kernel	1		14.3	

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F.06-08 L.01 W1/2 0-5cm	7	Carbonized Seeds	Witch Hazel	*Hamamelis sp.*		1		14.3	
F.06-08 L.01 W1/2 0-5cm	7	Carbonized Squash/Gourd	Squash Rind	*Cucurbita pepo*		38	0.2	542.9	2.43
F.06-08 L.01 W1/2 0-5cm	7	Unknown/Indet., Carbonized	Unid. Spongy		poss. root	6	0.1	85.7	0.86
					F.06-08 L.01 W1/2 0-5cm Subtotal:	**158**	**1.8**		
F.06-08 L.03 W1/2 10-15cm	8	Carbonized Corn	Corn Cupule Fragments	*Zea mays*		2	0.0	25.0	0.13
F.06-08 L.03 W1/2 10-15cm	8	Carbonized Corn	Corn Kernel Fragments	*Zea mays*		39	0.2	487.5	2.50
F.06-08 L.03 W1/2 10-15cm	8	Carbonized Nutmeat	Unknown/Indeterminate			6	0.2	75.0	1.88
F.06-08 L.03 W1/2 10-15cm	8	Carbonized Nutshell	Hickory	*Carya sp.*		65	1.4	812.5	17.38
F.06-08 L.03 W1/2 10-15cm	8	Carbonized Nutshell	Pecan	*Carya illinoensis*		9	0.1	112.5	0.63
F.06-08 L.03 W1/2 10-15cm	8	Carbonized Nutshell	Walnut Family	Juglandaceae	1.00mm only	0	0.0	0.0	0.00
F.06-08 L.03 W1/2 10-15cm	8	Carbonized Seeds	Fragments			11		137.5	
F.06-08 L.03 W1/2 10-15cm	8	Carbonized Seeds	Knotweed	*Polygonum sp.*	frag.	1		12.5	
F.06-08 L.03 W1/2 10-15cm	8	Carbonized Seeds	Nimblewill	*Muhlenbergia shreberi*		1		12.5	
F.06-08 L.03 W1/2 10-15cm	8	Carbonized Seeds	Paw Paw	*Asimina triloba*	frags	2		25.0	
F.06-08 L.03 W1/2 10-15cm	8	Carbonized Seeds	Pokeberry	*Phytolacca americana*		1		12.5	
F.06-08 L.03 W1/2 10-15cm	8	Carbonized Seeds	Sumac	*Rhus sp.*		8		100.0	
F.06-08 L.03 W1/2 10-15cm	8	Carbonized Seeds	Unknown/Indeterminate		lg. frag., poss grape.	1		12.5	
F.06-08 L.03 W1/2 10-15cm	8	Carbonized Seeds	Unknown/Indeterminate		poss. coneflower	1		12.5	
F.06-08 L.03 W1/2 10-15cm	8	Carbonized Squash/Gourd	Squash Rind	*Cucurbita pepo*		130	0.3	1625.0	4.13
F.06-08 L.03 W1/2 10-15cm	8	Other, Carbonized	Grass Stem	Poaceae	<0.01g	1	0.0	12.5	0.00
F.06-08 L.03 W1/2 10-15cm	8	Unknown/Indet., Carbonized			tree product?	1		12.5	
F.06-08 L.03 W1/2 10-15cm	8	Wood Charcoal	Ash	*Fraxinus americana*		6	0.6	75.0	7.13
F.06-08 L.03 W1/2 10-15cm	8	Wood Charcoal	Diffuse Porus			1	0.0	12.5	0.50
F.06-08 L.03 W1/2 10-15cm	8	Wood Charcoal	Honeylocust	*Gleditsia triacanthos*		2	0.1	25.0	1.25
F.06-08 L.03 W1/2 10-15cm	8	Wood Charcoal	Oak	*Quercus sp.*		2	0.2	25.0	2.50
F.06-08 L.03 W1/2 10-15cm	8	Wood Charcoal	Oak (red)	*Quercus sp.*		4	0.4	50.0	4.50
F.06-08 L.03 W1/2 10-15cm	8	Wood Charcoal	Pine	*Pinus sp.*		1	0.1	12.5	0.63
F.06-08 L.03 W1/2 10-15cm	8	Wood Charcoal	Poplar, Tulip	*Liriodendron tulipifera*		1	0.1	12.5	0.88
F.06-08 L.03 W1/2 10-15cm	8	Wood Charcoal	Ring Porus		prob. oak	3	0.2	37.5	1.88

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Context	Liters (L)	Subsample	Type	Scientific Nomenclature	Comments	Qty	Wt (g)	Qty / 100 L	g / 100 L
F.06-08 L.03 W1/2 10-15cm	8	Wood Charcoal	Unidentified				13.0		162.00
					F.06-08 L.03 W1/2 10-15cm Subtotal:	**299**	**16.6**		
F.06-08 L.05 W1/2 20-25cm	8	Carbonized Corn	Corn Kernel Fragments	*Zea mays*		20	0.2	250.0	2.63
F.06-08 L.05 W1/2 20-25cm	8	Carbonized Nutmeat	Unknown/Indeterminate			6	0.1	75.0	0.63
F.06-08 L.05 W1/2 20-25cm	8	Carbonized Nutshell	Acorn	*Quercus sp.*	<0.01g	1	0.0	12.5	0.00
F.06-08 L.05 W1/2 20-25cm	8	Carbonized Nutshell	Black Walnut	*Juglans nigra*		4	0.0	50.0	0.50
F.06-08 L.05 W1/2 20-25cm	8	Carbonized Nutshell	Hickory	*Carya sp.*		27	0.6	337.5	7.63
F.06-08 L.05 W1/2 20-25cm	8	Carbonized Nutshell	Walnut Family	Juglandaceae		11	0.1	137.5	0.75
F.06-08 L.05 W1/2 20-25cm	8	Carbonized Seeds	Fragments			4		50.0	
F.06-08 L.05 W1/2 20-25cm	8	Carbonized Seeds	Maygrass	*Phalaris caroliniana*		1		12.5	
F.06-08 L.05 W1/2 20-25cm	8	Carbonized Seeds	Raspberry	*Rubus occidentalis*		1		12.5	
F.06-08 L.05 W1/2 20-25cm	8	Carbonized Seeds	Sumac	*Rhus sp.*		3		37.5	
F.06-08 L.05 W1/2 20-25cm	8	Carbonized Seeds	Sumac	*Rhus sp.*	frags.	2		25.0	
F.06-08 L.05 W1/2 20-25cm	8	Carbonized Seeds	Wild Bean	*Strophostyles sp.*		2		25.0	
F.06-08 L.05 W1/2 20-25cm	8	Carbonized Squash/Gourd	Squash Rind	*Cucurbita pepo*		173	0.3	2162.5	3.75
F.06-08 L.05 W1/2 20-25cm	8	Wood Charcoal	Chestnut	*Castanea dentata*		3	0.3	37.5	4.00
F.06-08 L.05 W1/2 20-25cm	8	Wood Charcoal	Honeylocust	*Gleditsia triacanthos*		4	0.9	50.0	10.75
F.06-08 L.05 W1/2 20-25cm	8	Wood Charcoal	Oak (red)	*Quercus sp.*		12	2.6	150.0	32.63
F.06-08 L.05 W1/2 20-25cm	8	Wood Charcoal	Poplar, Tulip	*Liriodendron tulipifera*		1	0.7	12.5	8.38
F.06-08 L.05 W1/2 20-25cm	8	Wood Charcoal	Unidentified				17.8		222.38
					F.06-08 L.05 W1/2 20-25cm Subtotal:	**275**	**23.5**		
F.06-08 L.07 W1/2 30-35cm	8	Carbonized Corn	Corn Kernel Fragments	*Zea mays*		15	0.1	187.5	1.25
F.06-08 L.07 W1/2 30-35cm	8	Carbonized Nutmeat	Unknown/Indeterminate			2	0.0	25.0	0.13
F.06-08 L.07 W1/2 30-35cm	8	Carbonized Nutshell	Acorn	*Quercus sp.*	<0.01g	1	0.0	12.5	0.00
F.06-08 L.07 W1/2 30-35cm	8	Carbonized Nutshell	Black Walnut	*Juglans nigra*		5	0.1	62.5	1.13
F.06-08 L.07 W1/2 30-35cm	8	Carbonized Nutshell	Butternut	*Juglans cinera*		3	0.0	37.5	0.38
F.06-08 L.07 W1/2 30-35cm	8	Carbonized Nutshell	Hickory	*Carya sp.*		27	0.4	337.5	5.25
F.06-08 L.07 W1/2 30-35cm	8	Carbonized Nutshell	Walnut Family	Juglandaceae		6	0.0	75.0	0.25
F.06-08 L.07 W1/2 30-35cm	8	Carbonized Seeds	Fragments		1-prob. sumac	2		25.0	
F.06-08 L.07 W1/2 30-35cm	8	Carbonized Seeds	Maygrass	*Phalaris caroliniana*		1		12.5	

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Context	Liters (L)	Subsample	Type	Scientific Nomenclature	Comments	Qty	Wt (g)	Qty / 100 L	g / 100 L
F.06-08 L.07 W1/2 30-35cm	8	Carbonized Seeds	Raspberry	*Rubus occidentalis*		1		12.5	
F.06-08 L.07 W1/2 30-35cm	8	Carbonized Seeds	Sumac	*Rhus sp.*		3		37.5	
F.06-08 L.07 W1/2 30-35cm	8	Carbonized Seeds	Tobacco	*Nicotiana rustica*		1		12.5	
F.06-08 L.07 W1/2 30-35cm	8	Carbonized Seeds	Unknown/Indeterminate			1		12.5	
F.06-08 L.07 W1/2 30-35cm	8	Carbonized Seeds	Verbena	*Verbena sp.*		1		12.5	
F.06-08 L.07 W1/2 30-35cm	8	Carbonized Seeds	Wild Bean	*Strophostyles sp.*		3		37.5	
F.06-08 L.07 W1/2 30-35cm	8	Carbonized Squash/Gourd	Squash Rind	*Cucurbita pepo*		124	0.2	1550.0	2.88
F.06-08 L.07 W1/2 30-35cm	8	Other, Carbonized	Grass Stem	Poaceae		3	0.0	37.5	0.13
F.06-08 L.07 W1/2 30-35cm	8	Unknown/Indet., Carbonized	Poss. Bean Skin		<0.01g	1	0.0	12.5	0.00
F.06-08 L.07 W1/2 30-35cm	8	Wood Charcoal	Chestnut	*Castanea dentata*		2	0.1	25.0	1.50
F.06-08 L.07 W1/2 30-35cm	8	Wood Charcoal	Elm/Hackberry	*Ulmaceae*		1	1.7	12.5	21.13
F.06-08 L.07 W1/2 30-35cm	8	Wood Charcoal	Honeylocust	*Gleditsia triacanthos*		3	0.5	37.5	5.75
F.06-08 L.07 W1/2 30-35cm	8	Wood Charcoal	Oak (red)	*Quercus sp.*		6	0.5	75.0	6.75
F.06-08 L.07 W1/2 30-35cm	8	Wood Charcoal	Ring Porus		poss. ash	3	0.2	37.5	2.38
F.06-08 L.07 W1/2 30-35cm	8	Wood Charcoal	Semi-diffuse Porous			1	0.2	12.5	1.88
F.06-08 L.07 W1/2 30-35cm	8	Wood Charcoal	Semi-diffuse Porous		poss. walnut	2	0.3	25.0	4.13
F.06-08 L.07 W1/2 30-35cm	8	Wood Charcoal	Unidentified				12.4		154.63
F.06-08 L.07 W1/2 30-35cm	8	Wood Charcoal	Unidentified		incompl. carb.	5	0.0	62.5	0.38
F.06-08 L.07 W1/2 30-35cm	8	Wood Charcoal	Walnut	*Juglans sp.*		2	0.2	25.0	2.00
					F.06-08 L.07 W1/2 30-35cm Subtotal:	**225**	**17.0**		
F.06-08 Vol. Total:	**31 litres**				**F.06-08Total:**	**957**	**58.9**	**30.9**	**1.90**
F.07-08 L.01 0-5cm	6	Carbonized Corn	Corn Kernel Fragments	*Zea mays*	<2.00mm	0	0.0	0.0	0.00
F.07-08 L.01 0-5cm	6	Carbonized Nutshell	Hickory	*Carya sp.*		1	0.0	16.7	0.17
F.07-08 L.01 0-5cm	6	Carbonized Nutshell	Walnut Family	Juglandaceae		6	0.0	100.0	0.67
F.07-08 L.01 0-5cm	6	Carbonized Seeds	Fragments			1		16.7	
F.07-08 L.01 0-5cm	6	Carbonized Seeds	Jewelweed	*Impatiens biflora*		1		16.7	
F.07-08 L.01 0-5cm	6	Carbonized Seeds	Sumac	*Rhus sp.*					
F.07-08 L.01 0-5cm	6	Carbonized Seeds	Tobacco	*Nicotiana rustica*		1		16.7	
F.07-08 L.01 0-5cm	6	Carbonized Seeds	Unknown/Indeterminate		poss. nightshade family	1		16.7	

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F.07-08 L.01 0-5cm	6	Carbonized Squash/Gourd	Squash Rind	*Cucurbita pepo*		9	0.0	150.0	0.33
F.07-08 L.01 0-5cm	6	Wood Charcoal	Oak	*Quercus sp.*		3	0.1	50.0	1.33
F.07-08 L.01 0-5cm	6	Wood Charcoal	Ring Porus		poss. ash	4	0.2	66.7	2.50
F.07-08 L.01 0-5cm	6	Wood Charcoal	Ring Porus		prob. oak	9	0.3	150.0	5.17
F.07-08 L.01 0-5cm	6	Wood Charcoal	Unidentified				2.1		35.33
F.07-08 L.01 0-5cm	6	Wood Charcoal	Walnut	*Juglans sp.*		5	0.3	83.3	4.17
					F.07-08 L.01 0-5cm Subtotal:	**41**	**3.0**		
F.07-08 L.03 10-17cm	5	Carbonized Corn	Corn Kernel Fragments	*Zea mays*	<2.00mm	0	0.0	0.0	0.00
F.07-08 L.03 10-17cm	5	Carbonized Nutshell	Black Walnut	*Juglans nigra*		4	0.0	80.0	0.40
F.07-08 L.03 10-17cm	5	Carbonized Nutshell	Hickory	*Carya sp.*		4	0.0	80.0	0.40
F.07-08 L.03 10-17cm	5	Carbonized Nutshell	Walnut Family	Juglandaceae	<0.01g	1	0.0	20.0	0.00
F.07-08 L.03 10-17cm	5	Carbonized Seeds	Fragments			3		60.0	
F.07-08 L.03 10-17cm	5	Carbonized Seeds	Raspberry	*Rubus occidentalis*		1		20.0	
F.07-08 L.03 10-17cm	5	Carbonized Seeds	Sumac	*Rhus sp.*		1		20.0	
F.07-08 L.03 10-17cm	5	Carbonized Squash/Gourd	Squash Rind	*Cucurbita pepo*		15	0.1	300.0	2.80
F.07-08 L.03 10-17cm	5	Wood Charcoal	Maple, Soft	*Acer sp.*		2	0.3	40.0	5.40
F.07-08 L.03 10-17cm	5	Wood Charcoal	Oak (red)	*Quercus sp.*		6	0.3	120.0	6.20
F.07-08 L.03 10-17cm	5	Wood Charcoal	Ring Porus		poss.oak	9	0.4	180.0	8.60
F.07-08 L.03 10-17cm	5	Wood Charcoal	Semi-diffuse Porous			1	0.1	20.0	1.00
F.07-08 L.03 10-17cm	5	Wood Charcoal	Unidentified				2.5		50.00
F.07-08 L.03 10-17cm	5	Wood Charcoal	Walnut	*Juglans sp.*		2	0.1	40.0	1.40
					F.07-08 L.03 10-17cm Subtotal:	**49**	**3.8**		
F.07-08 Vol. Total:	**11 litres**				**F.07-08Total:**	**90**	**6.8**	**8.2**	**0.62**
F.08a-08 L.01 W1/2 0-5cm	5	Carbonized Corn	Corn Cupule Fragments	*Zea mays*	<0.01g	1	0.0	20.0	0.00
F.08a-08 L.01 W1/2 0-5cm	5	Carbonized Corn	Corn Kernel Fragments	*Zea mays*		1	0.0	20.0	0.20
F.08a-08 L.01 W1/2 0-5cm	5	Carbonized Nutshell	Hickory	*Carya sp.*		4	0.1	80.0	1.00
F.08a-08 L.01 W1/2 0-5cm	5	Carbonized Nutshell	Thin-shelled Hickory	*Carya sp.*		1	0.0	20.0	0.20
F.08a-08 L.01 W1/2 0-5cm	5	Carbonized Nutshell	Walnut Family	Juglandaceae		9	0.1	180.0	1.00
F.08a-08 L.01 W1/2 0-5cm	5	Carbonized Seeds	Knotweed	*Polygonum sp.*	frags.	4		80.0	

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F.08a-08 L.01 W1/2 0-5cm	5	Carbonized Seeds	Maypops	*Passiflora incarnata*		1		20.0	
F.08a-08 L.01 W1/2 0-5cm	5	Carbonized Seeds	Raspberry	*Rubus occidentalis*		1		20.0	
F.08a-08 L.01 W1/2 0-5cm	5	Carbonized Seeds	Tobacco	*Nicotiana rustica*		1		20.0	
F.08a-08 L.01 W1/2 0-5cm	5	Carbonized Squash/Gourd	Squash Rind	*Cucurbita pepo*		17	0.0	340.0	0.80
F.08a-08 L.01 W1/2 0-5cm	5	Other, Carbonized	Grass Stem	Poaceae		1	0.0	20.0	0.40
F.08a-08 L.01 W1/2 0-5cm	5	Wood Charcoal	Ash	*Fraxinus americana*		17	0.4	340.0	8.80
F.08a-08 L.01 W1/2 0-5cm	5	Wood Charcoal	Oak	*Quercus sp.*		1	0.0	20.0	0.60
F.08a-08 L.01 W1/2 0-5cm	5	Wood Charcoal	Poplar, Tulip	*Liriodendron tulipifera*		2	0.1	40.0	2.00
F.08a-08 L.01 W1/2 0-5cm	5	Wood Charcoal	Unidentified				2.4		48.60
					F.08a-08 L.01 W1/2 0-5cm Subtotal:	**61**	**3.2**		
F.08a-08 L.03 W1/2 10-15cm	7	Carbonized Corn	Corn Kernel Fragments	*Zea mays*	<0.01g	1	0.0	14.3	0.00
F.08a-08 L.03 W1/2 10-15cm	7	Carbonized Nutshell	Hickory	*Carya sp.*		1	0.0	14.3	0.14
F.08a-08 L.03 W1/2 10-15cm	7	Carbonized Nutshell	Walnut Family	Juglandaceae		21	0.1	300.0	1.86
F.08a-08 L.03 W1/2 10-15cm	7	Carbonized Seeds	Fragments			3		42.9	
F.08a-08 L.03 W1/2 10-15cm	7	Carbonized Seeds	Nightshade	*Solanum nigrum*		1		14.3	
F.08a-08 L.03 W1/2 10-15cm	7	Carbonized Seeds	Pea Family	*Fabaceae*		1		14.3	
F.08a-08 L.03 W1/2 10-15cm	7	Carbonized Seeds	Unknown/Indeterminate		v. sm., oval; poss. tobacco	3		42.9	
F.08a-08 L.03 W1/2 10-15cm	7	Carbonized Squash/Gourd	Squash Rind	*Cucurbita pepo*	<0.01g	3	0.0	42.9	0.00
F.08a-08 L.03 W1/2 10-15cm	7	Wood Charcoal	Diffuse Porus			1	0.0	14.3	0.29
F.08a-08 L.03 W1/2 10-15cm	7	Wood Charcoal	Pine	*Pinus sp.*		2	0.0	28.6	0.57
F.08a-08 L.03 W1/2 10-15cm	7	Wood Charcoal	Ring Porus			3	0.0	42.9	0.43
F.08a-08 L.03 W1/2 10-15cm	7	Wood Charcoal	Semi-diffuse Porous		poss. walnut	10	0.1	142.9	1.86
F.08a-08 L.03 W1/2 10-15cm	7	Wood Charcoal	Unidentified		twig	1	0.0	14.3	0.14
F.08a-08 L.03 W1/2 10-15cm	7	Wood Charcoal	Unidentified				0.8		11.29
F.08a-08 L.03 W1/2 10-15cm	7	Wood Charcoal	Walnut	*Juglans sp.*		3	0.2	42.9	2.14
					F.08a-08 L.03 W1/2 10-15cm Subtotal:	**54**	**1.3**		
F.08a-08 Vol. Total:	**12 litres**				**F.08a-08Total:**	**115**	**4.5**	**9.6**	**0.37**
F.09-08 L.01 W1/2 0-5cm	6	Carbonized Corn	Corn Kernel Fragments	*Zea mays*		3	0.0	50.0	0.17
F.09-08 L.01 W1/2 0-5cm	6	Carbonized Nutshell	Hickory	*Carya sp.*		1	0.0	16.7	0.50

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F.09-08 L.01 W1/2 0-5cm	6	Carbonized Seeds	Amaranth	*Amaranthus sp.*		1		16.7	
F.09-08 L.01 W1/2 0-5cm	6	Carbonized Seeds	Fragments			2		33.3	
F.09-08 L.01 W1/2 0-5cm	6	Carbonized Seeds	Maypops	*Passiflora incarnata*		1		16.7	
F.09-08 L.01 W1/2 0-5cm	6	Carbonized Seeds	Raspberry	*Rubus occidentalis*		1		16.7	
F.09-08 L.01 W1/2 0-5cm	6	Carbonized Seeds	Unknown/Indeterminate		v. sm., trilobate	1		16.7	
F.09-08 L.01 W1/2 0-5cm	6	Carbonized Squash/Gourd	Squash Rind	*Cucurbita pepo*		13	0.0	216.7	0.33
F.09-08 L.01 W1/2 0-5cm	6	Wood Charcoal	Maple, Indeterminate	*Acer sp.*		4	0.3	66.7	5.33
F.09-08 L.01 W1/2 0-5cm	6	Wood Charcoal	Oak (red)	*Quercus sp.*		2	0.2	33.3	3.00
F.09-08 L.01 W1/2 0-5cm	6	Wood Charcoal	Poplar, Tulip	*Liriodendron tulipifera*		3	0.1	50.0	2.33
F.09-08 L.01 W1/2 0-5cm	6	Wood Charcoal	Ring Porus		poss. oak	4	0.2	66.7	3.00
F.09-08 L.01 W1/2 0-5cm	6	Wood Charcoal	Ring Porus		poss. ash	2	0.1	33.3	2.33
F.09-08 L.01 W1/2 0-5cm	6	Wood Charcoal	Unidentified				4.9		81.50
F.09-08 L.01 W1/2 0-5cm	6	Wood Charcoal	Unknown/Indeterminate		warped by burning	2	0.5	33.3	8.83
F.09-08 L.01 W1/2 0-5cm	6	Wood Charcoal	Walnut	*Juglans sp.*		3	0.2	50.0	3.67
					F.09-08 L.01 W1/2 0-5cm Subtotal:	**43**	**6.7**		
F.09-08 L.02 W1/2 5-10cm	6	Carbonized Corn	Corn Kernel Fragments	*Zea mays*		2	0.0	33.3	0.17
F.09-08 L.02 W1/2 5-10cm	6	Carbonized Seeds	Amaranth	*Amaranthus sp.*		3		50.0	
F.09-08 L.02 W1/2 5-10cm	6	Carbonized Seeds	Fragments			1		16.7	
F.09-08 L.02 W1/2 5-10cm	6	Carbonized Seeds	Raspberry	*Rubus occidentalis*		1		16.7	
F.09-08 L.02 W1/2 5-10cm	6	Carbonized Squash/Gourd	Squash Rind	*Cucurbita pepo*		7	0.0	116.7	0.33
F.09-08 L.02 W1/2 5-10cm	6	Unknown/Indet., Carbonized			bean-like frags.	2	0.0	33.3	0.50
F.09-08 L.02 W1/2 5-10cm	6	Wood Charcoal	Maple, Soft	*Acer sp.*		2	0.1	33.3	2.17
F.09-08 L.02 W1/2 5-10cm	6	Wood Charcoal	Oak (red)	*Quercus sp.*		5	0.4	83.3	6.67
F.09-08 L.02 W1/2 5-10cm	6	Wood Charcoal	Poplar, Tulip	*Liriodendron tulipifera*		10	0.9	166.7	15.00
F.09-08 L.02 W1/2 5-10cm	6	Wood Charcoal	Unidentified				7.9		131.00
F.09-08 L.02 W1/2 5-10cm	6	Wood Charcoal	Unknown/Indeterminate		incompl. carb.	5	0.1	83.3	1.67
F.09-08 L.02 W1/2 5-10cm	6	Wood Charcoal	Walnut	*Juglans sp.*		3	0.2	50.0	2.83
					F.09-08 L.02 W1/2 5-10cm Subtotal:	**41**	**9.6**		
F.09-08 L.03 W1/2 10-15cm	2	Carbonized Nutshell	Walnut Family	Juglandaceae	1.00mm only	0	0.0	0.0	0.00

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F.09-08 L.03 W1/2 10-15cm	2	Wood Charcoal	Honeylocust	*Gleditsia triacanthos*		3	0.1	150.0	3.50
F.09-08 L.03 W1/2 10-15cm	2	Wood Charcoal	Poplar, Tulip	*Liriodendron tulipifera*		1	0.0	50.0	1.00
F.09-08 L.03 W1/2 10-15cm	2	Wood Charcoal	Ring Porus			7	0.1	350.0	3.00
F.09-08 L.03 W1/2 10-15cm	2	Wood Charcoal	Ring Porus		poss. oak	3	0.1	150.0	2.50
F.09-08 L.03 W1/2 10-15cm	2	Wood Charcoal	Unidentified				0.4		17.50
					F.09-08 L.03 W1/2 10-15cm Subtotal:	**14**	**0.6**		
F.09-08 Vol. Total:	**14 litres**				**F.09-08Total:**	**98**	**16.8**	**7.0**	**1.20**
F.11-08 L.01 ALL 0-5cm	3.5	Carbonized Corn	Corn Kernel Fragments	*Zea mays*		2	0.0	57.1	0.57
F.11-08 L.01 ALL 0-5cm	3.5	Carbonized Seeds	Blueberry	*Vaccinium sp.*		1		28.6	
F.11-08 L.01 ALL 0-5cm	3.5	Carbonized Seeds	Fragments		poss. sm. grass	1		28.6	
F.11-08 L.01 ALL 0-5cm	3.5	Unknown/Indet., Carbonized			<0.01g	1	0.0	28.6	0.00
F.11-08 L.01 ALL 0-5cm	3.5	Wood Charcoal	Oak	*Quercus sp.*		4	0.0	114.3	0.86
F.11-08 L.01 ALL 0-5cm	3.5	Wood Charcoal	Ring Porus			10	0.1	285.7	1.43
F.11-08 L.01 ALL 0-5cm	3.5	Wood Charcoal	Semi-diffuse Porous			7	0.1	200.0	1.43
F.11-08 L.01 ALL 0-5cm	3.5	Wood Charcoal	Unidentified				0.1		4.00
					F.11-08 L.01 ALL 0-5cm Subtotal:	**26**	**0.3**		
F.11-08 Vol. Total:	**3.5 litres**				**F.11-08Total:**	**26**	**0.3**	**7.4**	**0.08**
33MY499 Vol. Total:	**188.25 litres**				**33MY499 Site Total:**	**2668**	**309.8**	**14.2**	**1.65**